



HAL
open science

How newborns perceive complexity: the nose capabilities

G rard G. Coureaud, Charlotte C. Sinding, Thierry Thomas-Danguin

► To cite this version:

G rard G. Coureaud, Charlotte C. Sinding, Thierry Thomas-Danguin. How newborns perceive complexity: the nose capabilities. Behavior 2011. Joint meeting of the animal behavior society & international ethological conference, Jul 2011, Bloomington, Indiana, United States. hal-01000618

HAL Id: hal-01000618

<https://hal.science/hal-01000618>

Submitted on 6 Jun 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destin e au d p t et   la diffusion de documents scientifiques de niveau recherche, publi s ou non,  manant des  tablissements d'enseignement et de recherche fran ais ou  trangers, des laboratoires publics ou priv s.

Behavior 2011 ABSTRACTS

Joint meeting of the
**Animal Behavior Society &
International Ethological Conference**

Plenary and Symposium Lectures, Contributed Talks and Posters

In alphabetical order by presenting author

230 Contributed Talk: COGNITION AND LEARNING IV (Thursday PM I)

THE EVOLUTION OF SUPERSTITION THROUGH OPTIMAL USE OF INCOMPLETE INFORMATION

Kevin Abbott, Thomas Sherratt

Carleton University, Canada; Email:kabbott3@connect.carleton.ca

While superstitions seem maladaptive, they may be an inevitable result of adaptive causal learning mechanisms that optimally tradeoff the risks of falsely 'detecting' non-existent causal relationships (superstition) and of failing to detect real relationships. An individual's exploration-exploitation strategy helps manage this tradeoff. On any given trial an individual must decide whether to act so as to maximise its expected fitness based on current information (exploit) or so as to provide the most information about the true nature of the causal relationship (explore). We present a two-armed bandit model that allows us to identify the optimal learning strategy and to determine how various parameters affect the probability that an individual will develop a superstition. We find that superstitions are more likely when the cost of the superstition is low relative to the potential benefits, and when the individual's prior beliefs suggest that the superstition is true. We also find that both the number of learning trials available and the nature of the individual's uncertainty affect the probability of superstition, but that these effects depend on the individual's prior beliefs.

P1 ABS Genesis Award Poster: APPLIED ANIMAL BEHAVIOR 1 (Poster Session A: Weds. eve)

DOES CANNIBALISM AID THE DEVELOPMENT OF THE COLORADO POTATO BEETLES WHEN EXPOSE TO PESTICIDE.

Vanessa Acosta

United States; Email:vacosta101@hotmail.com

Many potato agriculturists dwell with the same issue of dealing with the pests that damage their crops. Potato plants tend to have many different pest (host), however it is known that one of the most severe to their production are the Colorado potato beetle (CPB) also known as *Leptinotarsa decemlineata*. The problem with these pests is that they rapidly become resistant to insecticide and this makes it difficult to control them. Cannibalism can present important nutritional and competitive advantage to the cannibal and in addition it gives greater genetic similarity within conspecifics and selection for the host specificity and resistance to immunity against pathogens. The purpose of this research is to analyze the way CPB uses the egg as a refuge to develop among pesticide; in this case we will be using Imidacloprid. Pesticide resistance will be analyzed throughout development. In cases where a lot of susceptible and resistant mate in low initial frequency, the resistant allele is more resistant because of the use of refuge and this causes the delaying development of resistance. Further information will be available on the poster.

5 Plenary Lecture: (Thursday AM)

IN SICKNESS AND IN HEALTH: WEDDING IMMUNOLOGY TO ANIMAL BEHAVIOUR

Shelley Adamo

Dalhousie University, Canada; Email:sadamo@dal.ca

Disease kills. Not surprisingly, animals across phyla have evolved mechanisms to protect themselves from invading organisms. Some of these mechanisms, such as certain immune pathways, appear to have been conserved across a half billion years of evolution. Nevertheless, animals remain susceptible to disease. However, susceptibility can vary across species, across individuals within a species, and is often pathogen-specific. Understanding this variability is difficult, in part because immune function is difficult to measure. Moreover, immune systems exist within a web of connections with other physiological systems. These connections can lead to tradeoffs, some of which may be difficult to predict a priori. Such tradeoffs can have far-reaching effects on life history traits such as development rate and reproductive effort. Interactions between immunity and other functions have also been shown to influence the ability of animals to withstand climate change. This presentation

will review these issues, frequently using the cricket, *Gryllus texensis*, to illustrate these themes. The presentation will focus on the relevance of these issues for Animal Behaviourists.

340 Contributed Talk: SOCIAL BEHAVIOR VI (Friday PM I)

HAVE YOU LICKED YOUR KIDS TODAY? TRANSMISSION OF MICROBES THROUGH PARENTAL CARE IN A TELEOST FISH

Lyndsey Adams, Jodee Hunt, Aaron Koch

Grand Valley State University, United States; Email:adamsl@gvsu.edu

Previous work has postulated that microbial sharing, the transfer of bacteria between group members, is an underappreciated benefit of, and potential mechanism for, the evolution of social living. Considerable research has addressed this in birds and mammals, but none has examined the phenomenon in teleost fishes. Although parental care is unusual among teleosts, all known species in the family Cichlidae provide parental care. This study's objective is to compare microbes associated with parental convict cichlids (*Archocentrus nigrofasciatus*) to those associated with subsets of broods receiving parental care and others where parental contact is prevented. We used polymerase chain reaction (PCR) and denaturing gradient gel electrophoresis (DGGE) to detect the presence of microbes in parents and offspring. Preliminary results demonstrate that parent-offspring contact facilitates microbial transfer - offspring receiving care have a greater diversity of microbes compared to those on siblings that do not. This research represents a novel contribution to the study of parental care and the evolution of social behavior in fishes.

296 Contributed Talk: COGNITION AND LEARNING VI (Friday AM)

EXPANDING OUR THINKING ABOUT ANIMAL COGNITION: OBSERVATIONAL LEARNING IN JUMPING SPIDERS

R. Matt Adams, Alan Kamil

University of Nebraska, Lincoln, United States; Email:radams3@unlnotes.unl.edu

Observational learning is considered a cognitively challenging task. Given their relatively simple brains, it seems unlikely that arthropods would be capable of learning in this fashion. However, some jumping spiders (family Salticidae) possess advanced cognitive capabilities. Salticids also have very acute vision that is comparable to humans' in terms of both detail and perceived hues. Given the unique physiology and natural history of salticids, I hypothesized that salticids might be capable of learning about novel prey solely by watching a conspecific interact with the prey item, i.e. through observational learning. My most recent experiment established that salticids are capable of observational learning. Salticids were given the opportunity to watch one of two movies during which a conspecific either fed on or rejected (because of a mild electric shock) a novel prey item. Spiders were then given the chance to hunt a live milkweed bug. Animals that saw the prey rejected exhibited several alterations in behavior compared to the control treatment, including a significantly increased latency to attack the prey. Future work will focus on mechanism and stimulus generalization.

301 Contributed Talk: COMMUNICATION V (Friday AM)

AGGRESSIVENESS AND SIGNALING IN SONG SPARROWS ARE CONSISTENT OVER TIME

Caglar Akcay, Mari Tom, S. Campbell, Michael Beecher

University of Washington, United States; Email:caglar@uw.edu

Individual differences in animals that are consistent over extended periods of time are referred to as behavioral syndromes or personalities. We examined consistency over time in aggressive behavior and signaling of male song sparrows. We quantified individual differences in aggression and aggressive signaling in our resident population through a series of repeated aggression assays conducted at five points throughout a year from September 2009 through May 2010. We challenged each subject with 10 min of song playback from his center of the territory. We measured aggressive behavior (flights, closest approach to the speaker, and time spent within 5 m of the speaker) and signaling (wing waves, soft songs, and loud songs). We found that aggression and

signaling were highly repeatable (both around 0.5); moreover, repeatability did not decrease over time. Aggressive behavior and aggressive signaling were themselves correlated ($r = 0.67$). We also found that high levels of aggression were spatially correlated. We will discuss the extent to which aggressive personalities can be predicted by variables such as territory density, habitat, and song sharing with the neighbors.

190 Contributed Talk: MATING SYSTEMS I (Wednesday PM I)

THE IMPACT OF SOCIAL CONTEXT ON MALE MATE PREFERENCE IN A UNISEXUAL-BISEXUAL MATING COMPLEX

Laura Alberici da Barbiano, Andrea Aspbury, Chris Nice, Caitlin Gabor

Texas State University - San Marcos, United States; Email: la1122@txstate.edu

Male *Poecilia latipinna* (sailfin molly) were tested in five different treatments that varied in the relative frequency of heterospecific gynogens (*Poecilia formosa*, Amazon molly) to conspecific females to determine whether social interactions among males within a population may cause some males to mate with less optimal mates such as heterospecific females. The proportion of females with embryos and the total number of embryos were calculated for each species. Male *P. latipinna* inseminated a significantly higher proportion of conspecific females and fertilized a significantly higher number of conspecific eggs regardless of the treatment. Nonetheless, preference for conspecific females was not exclusive: 20% - 50% of heterospecific sperm-dependent unisexual females were fertilized depending on the treatment. Social interactions among males may best explain our results and may therefore play a crucial role in the maintenance of unisexual-bisexual mating complexes.

182 Contributed Talk: GENETICS AND EVOLUTION I (Wednesday PM I)

GROOMING SEQUENCES USED AS PHYLOGENETIC CHARACTERS: EXAMPLES WITH BIRDS, RODENTS AND PRIMATES

Carlos Alberts, Juliana Marques, Juliana Martinelli, Thais Teramussi

Universidade Estadual Paulista, Brazil; Email: calberts@assis.unesp.br

It is now well established that behavior is a good source of phylogenetic characters. Usually, phylogenetic reconstructions based on behavior are comparable to those based in morphology or molecules, in terms of internal consistency, and frequently generate topologies very similar to the later ones. In general, these characters are coded by the form or the frequency of the behaviors displayed by animals. The use of behavioral sequences is much less frequent and it is easier to justify it when it is about stereotyped behavior. A stereotyped pattern, such as grooming, when individually stable and present in an entire population is frequently considered as inherited and, therefore, usable as phylogenetic character. In this work of ours we present reconstructions of phylogenies, based on auto grooming sequences, of sample taxa of toucans, rodents and primates. We compare our results with those achieved with other type of characters. We also compare our different methods for grouping categories within sequences. Our results show good internal consistency and the topologies for toucans and rodents are similar to the ones using other characters, while this is not so for our primate data.

P123 ABS Founders Award Poster: MECHANISMS 1 (Poster Session A: Weds. eve)

RELATIONSHIPS BETWEEN AFFILIATION AND TYROSINE HYDROXYLASE IN SOCIAL BRAIN AREAS IN ZEBRA FINCHES

Sarah Alger, Charity Juang, Lauren Ritters

University of Texas, Austin, United States; Email: algersj@mail.utexas.edu

The catecholamines dopamine and norepinephrine are implicated in affiliative behavior, yet few studies have addressed whether affiliative behaviors within distinct social settings rely upon similar catecholaminergic mechanisms. We examined the density of the catecholamine synthetic enzyme tyrosine hydroxylase (TH) in brain regions within the mesolimbic dopamine system and "social behavior network" in male and female zebra finches (*Taeniopygia guttata*) paired for 21 days with either a same- or opposite-sex conspecific. Measures of affiliation related to TH labeling in the ventral tegmental area (VTA), nucleus accumbens (Ac), medial preoptic

nucleus (POM), and ventromedial nucleus of the hypothalamus (VMH). Relationships between TH labeling densities and affiliative behavior differed in Ac and VTA subregions. Finally, TH labeling density in VMH and rostral VTA were positively related to the amount of courtship received from the partner and TH labeling in Ac was denser in opposite-sex pairs compared to same-sex pairs, indicative of socially-induced brain plasticity. Overall, results highlight a complex region- and behavior-specific role for catecholamines in affiliation.

366 Contributed Talk: PREDATION AND FORAGING II (Saturday AM)

FEAR KILLS: ANTI-PREDATOR BEHAVIOUR REDUCES THE NUMBER OF OFFSPRING SONGBIRDS PRODUCE PER YEAR

Marek Allen, Aija White, Liana Zanette, Michael Clinchy

University of Western Ontario, Canada; Email:mallen27@uwo.ca

Though theory suggests that predator-induced changes in prey behaviour may affect prey demography there have been almost no experimental studies on birds examining all of the steps in the pathway from predation risk to behavioural responses to changes in demography. We tested the effects of predation risk on parental anti-predator behaviours and demography in song sparrows. Predation risk was manipulated by broadcasting either predator- or non-threatening- calls and sounds, every few minutes, throughout the 130 day breeding season. Predator playback females built their nests in denser, thornier vegetation; were more skittish; and spent shorter on- and longer times off- the nest during incubation; and predator playback parents made fewer feeding visits per hour during brood-rearing. Greater skittishness, and shorter on- and longer off- bouts during incubation, were associated with poorer hatching success; and nesting in denser, thornier vegetation, greater skittishness, and fewer feeding visits, were associated with increased nestling mortality. The cumulative consequence being that predator playback parents fledged 40% fewer offspring over the breeding season.

P110 Contributed Poster: MATING SYSTEMS 1 (Poster Session A: Weds. eve)

DOES REARING ENVIRONMENT AFFECT CORRELATIONS BETWEEN ATTRACTIVENESS AND COMPETITIVE SUCCESS?

Aitor Alvarez-Fernandez, Allen Moore, Christine Miller

University of Florida, United States; Email:aafa203@exeter.ac.uk

Mate choice and male-male competitions for access to mates can be powerful selective forces leading to evolution. Thus, a comprehensive understanding of factors determining these behaviors is critical. However, studies considering the role of natural resources in sexual selection are still lacking. The aim of this work was to examine the influence of food quality experienced when young on eventual attractiveness, male-male competitive success, and the phenotypic correlations between these traits. Cactus-feeding bugs, *Narnia femorata*, were reared on cactus pads with and without cactus fruit (high and low-quality diets, respectively). Upon reaching reproductive maturity, we tested males for their attractiveness to females. Two weeks later, we examined male success in male-male competitions. We predicted that males reared on the high-quality food would be more attractive and more successful in male-male competitions. Our results may suggest that phenotypic correlations between male attractiveness and male-male competitive success can be positive or negative depending on simple changes in natural resources.

P135 ABS Founders Award Poster: PARENTAL CARE 1 (Poster Session A: Weds. eve)

FAMILY VALUES: MATERNAL CARE IN RATTLESNAKES IS MORE THAN MERE ATTENDANCE

Melissa Amarello, Jeffrey Smith, John Slone

Arizona State University, United States; Email:amarello@asu.edu

Parental care is important in many diverse taxa because of its positive impact on the parent's fitness. Relatively simple forms of parental care, such as female attendance and defense, which is present in many squamate reptiles, will likely provide insight into the evolution of more complex forms observed in crocodylians, birds, and

mammals. Historically, observations of adult and newborn rattlesnakes in close proximity were dismissed as mere coincidence of live-birth, and only recently acknowledged as examples of parental care. In 2010, we monitored 11 pregnant Arizona black rattlesnakes (*Crotalus cerberus*): 4 solitary individuals and 2 aggregations composed of three and four individuals. We documented various forms of parental care, including active defense of neonates against potential predators. Parental care differed among solitary and aggregated females; solitary females spent more time attending and defending their progeny than individuals in aggregations. Natural variation in group size in *C. cerberus* provides an ancestral condition in which to examine how group membership may increase fitness through parental care.

P197 ABS Genesis Award Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

DEVELOPMENT OF DOMINANCE RELATIONSHIPS IN THE DOMESTIC CAT AT WEANING

Lucía Améndola, Hugh Drummond, Robyn Hudson

Universidad Nacional Autónoma de México, Mexico; Email: luciamendola@gmail.com

Dominance among littermates has been studied in few carnivores, but it has been suggested that in some species such as the red fox, dominance relationships may emerge at weaning to mediate competition for solid food. In order to investigate (1) whether kittens establish dyadic dominance relationships during the weaning period, (2) the effect of sibling weight differences in the direction of dominance, and (3) the effect of dominance on access to solid food, we observed 15 dyads of domestic cat kittens from 5 litters in staged dyadic encounters at a limited-access feeder between ages 35-63 d. Kittens progressively established dominance relationships through pushes, pawing and vocal threats, and these behaviors elicited withdrawal of the competitor, rather than submissive postures. This agonism increased with age, until at least 63 days. Dyadic weight differences were not related to direction of dominance, but dominant kittens controlled the feeder longer and consumed more food. Dyadic encounters during the weaning transition suggest that domestic cat kittens may compete for solid food by establishing dominance over their littermates.

P147 Contributed Poster: PREDATION AND FORAGING 1 (Poster Session A: Weds. eve)

SEX AND DANGER: A TWO-FOLD APPROACH TO STUDY THE EVOLUTION OF APOSEMATIC POLYMORPHISM IN POISON FROG

Adolfo Amézquita

Universidad de los Andes, Colombia; Email: aamezqui@uniandes.edu.co

Most predators avoid aposematic animals because they associate conspicuous coloration with distastefulness. Learning is faster and more durable when coloration is similar among aposematic individuals, which allegedly explains why syntopic species may converge to similar aposematic colorations. It, however, contradicts the perplexing existence of aposematic species that do vary in coloration, often locally. We tested several hypotheses on the origin and maintenance of aposematic polymorphism in poison frogs. Microsatellite analyses showed that new morphs arise by interspecific and perhaps intraspecific hybridisation. In mate choice experiments females preferred males bearing heterotypic rather than homotypic coloration. New coloration forms might, however, be disproportionately attacked by local predators that otherwise avoid the local aposematic form. Chickens trained to avoid one coloration morph did not generalise to other morphs. In the field, however, predators did avoid both homotypic and heterotypic colorations. Our results suggest the new morphs are protected by either predators' innate avoidance to new colorations or by predators' training with several aposematic patterns.

84 Contributed Talk: COMMUNICATION I (Tuesday AM)

COURTSHIP SOUNDS INDICATE MALE QUALITY IN THE PAINTED GOBIES (*POMATOSCHISTUS PICTUS*)

Maria Clara Amorim, Silvia Pedroso, Marta Bolgan, Joana Jordão, Paulo Fonseca

Instituto Superior de Psicologia Aplicada, Portugal; Email: amorim@ispa.pt

In many species courtship displays include acoustic signaling that is used in mate choice. Painted goby males (*Pomatoschistus pictus*) produce conspicuous visual and acoustic (drums and thumps) signals for mate attraction and provide parental care to the eggs. We tested the hypothesis that acoustic courtship signals advertise male quality such as male size and condition, using this species as a model. We recorded courtship interactions between one territorial male and one female in 35 l acoustically insulated aquaria (16°C). We analyzed drums for sound pressure level, duration, number of pulses, pulse period and dominant frequency. Drum, thump and total sound rate were also tallied. All drum features differed significantly among males. Drum duration and number of pulses were significantly correlated with male condition (Spearman correlation, $n=18$, $P > 0.05$) suggesting that these features can signal male quality. Body lipid content, the degree of nest cover with sand, and visual courtship rate are being analysed as other measures of male quality. We suggest that acoustic signals can advertise male quality in the painted gobies and could be used by females in mate choice.

45 Symposium: FEMALE COMPETITION (Thursday)

DYNAMIC SEX ROLES: FEMALE COMPETITION SHAPED BY OPERATIONAL SEX RATIO

Trond Amundsen, Lise Myhre, Karen de Jong, Elisabet Forsgren

Norwegian University of Science and Technology, Norway; Email:trond.amundsen@bio.ntnu.no

I will review how sex role dynamics, caused by temporal variation in the operational sex ratio (OSR), affects female competition in a small marine fish, the two-spotted goby. I will also briefly address the role of female competition in coral reef fishes. Two-spotted gobies breed repeatedly over the course of a single reproductive season. Early on, the OSR is strongly male biased and female competition rarely observed. By contrast, females frequently engage in aggressive interactions and eagerly court males towards the end of the season, when the OSR has become female biased. Courtship interactions are mostly initiated by males early in the season, but are almost always initiated, and almost never terminated, by females late in the season. Females seem to compete for access to males as much by active courtship as by being aggressive to other females. Late in the season, males are often surrounded by 'harems' of courting females despite that simultaneous courtship by multiple females rarely leads to spawning. We suggest that dynamic female (and male) mating competition as seen in two-spotted gobies may be more common than hitherto realized, due to temporal or spatial OSR variation.

P69 ABS Founders Award Poster: DEVELOPMENT (Poster Session A: Weds. eve)

DEVELOPMENTAL EFFECT OF EL NIÑO: OCEANOGRAPHIC CONDITIONS IN INFANCY INFLUENCE ONSET OF BREEDING

Sergio Ancona, Hugh Drummond

Universidad Nacional Autónoma de México, Mexico; Email:ancona.s@gmail.com

Environmental challenges in infancy can prejudice adult fitness as well as the fitness of offspring. These effects may differ between sexes and are expected to be more profound when environmental challenges occur earlier in life. Evidence of these effects has mostly come from experimental dietary restrictions in captive short-lived animals, so little is known about how natural environmental challenges during infancy affect wild animals over their lifetime. We tested for long-term impacts of El Niño on a long-lived tropical seabird (the blue-footed booby) whose growth and reproduction are prejudiced by the prey reductions associated with ongoing El Niño events. Using long-term data, we tested whether males and females establish their clutches later in the season when they or their mothers experienced El Niño in the year of birth or in one of the first three years of life. Laying date is often heritable in avian species, so we used quantitative genetic models to estimate the relative contribution of genes and environment (natal maternal, natal and current) on laying date. We found that El Niño conditions in infancy may affect timing of breeding differently in male and female boobies.

245 Contributed Talk: COGNITION AND LEARNING V (Thursday PM II)

PREFERENCE FOR LOCAL SONG CORRELATES WITH LEARNING PERFORMANCE IN FEMALE SWAMP SPARROWS

Rindy Anderson, Stephen Nowicki

Duke University, United States; Email: rca9@duke.edu

Song learning is a cognitive task in which young birds acquire and store information about adult song to shape their own song production (males) and song preferences (females). Recent work has shown that variation in male song complexity predicts performance on other cognitive tasks such as motor learning and detour-reaching. We asked whether variation in the strength of female song preference, which may reflect ability to assess song quality, is related to performance on cognitive tasks. We measured preference for local vs. foreign song in wild-captured adult female swamp sparrows, and tested their performance on a battery of learning tasks. Choosiness for local song correlated with the speed at which females learned to associate a particular color with food; choosier females solved the task in fewer trials. Performance on a detour-reaching task has been shown to predict song repertoire size in male song sparrows (faster learners had larger repertoires). We found that choosier females required more trials to solve this task. Further work is needed to understand the mechanism by which female song preference could become associated with cognitive abilities.

P273 Contributed Poster: CONSERVATION (Poster Session B: Thurs. eve)

THE EFFECT OF HUMAN ACTIVITIES AND THEIR ASSOCIATED NOISE ON UNGULATE BEHAVIOR

Lisa Angeloni, Casey Brown, Amanda Hardy, Jesse Barber, Kurt Fristrup, Kevin Crooks

Colorado State University, United States; Email: angeloni@colostate.edu

Anthropogenic noise has been identified as a disturbance that could induce behavioral responses in animals similar to those associated with predation risk. This study investigated potential impacts of human activities and their associated noise on the behavior of elk (*Cervus elaphus*) and pronghorn (*Antilocapra americana*) along a transportation corridor in Grand Teton National Park. We conducted roadside scan surveys and focal observations of ungulate behavior while concurrently recording human activity and anthropogenic noise. Ungulates were less responsive (less likely to perform vigilant, flight and defensive behaviors) in noisy environments when more vehicles were passing and more responsive when pedestrians and motorcycles were present. These findings suggest that ungulates did not consistently perceive noise as a form of predation risk or that they could not afford to maintain responsiveness to the most frequent human stimuli. Although reduced responsiveness to certain disturbances may allow for greater investment in fitness-enhancing activities, it may also decrease detections of predators and other environmental cues and increase conflict with humans.

149 Contributed Talk: SOCIAL BEHAVIOR III (Tuesday PM II)

COLONY RELOCATION DYNAMICS IN A QUEENLESS INDIAN ANT

Sumana Annagiri, Chandan Sona

Indian Institute of Science Education and Research-Kolkata, India; Email: sumana@iiserkol.ac.in

Several factors cause animals to relocate their nest. Ants are unique in having to, not only relocate the adults of the colony but also their brood and any stored resource in addition to their queen. They face the tradeoff between the risk of staying and the cost of moving, while maintaining colony cohesion. This problem was studied in *Diacamma indicum* by examining the mechanism of relocation, over short and long distances in the laboratory using 24 colonies. It was found that tandem running was the only means used by these ants to relocate. About 8 to 25% of the colony became tandem running leaders (TRL). TRL contributed disproportionately to the task. One leader (designated as the major leader) performed significantly more (range 18 to 100%) than other leaders, both in terms of the adults and brood transportation. The role played by the major leader was further investigated by her removal. It is generally understood that non-reproductive tasks in colonies of social insects are carried out by groups of individuals; we found that even though a small group of individuals are involved in relocation a single ant takes up a key role.

P12 Contributed Poster: COGNITION AND LEARNING 1 (Poster Session A: Weds. eve)

LETTING GO: AUTOTOMY AND PERSONALITY IN THE OCTOPUS *ABDOPUS ACULEATUS* FROM OKINAWA, JAPAN.

Amy Arnett, Yuzuru Ikeda

Japan; Email:arnett.student@gmail.com

Abdopus aculeatus belongs to a group of so-called "long-armed" octopuses that can autotomize, voluntary loss of a body part in defense, their arms. While costs of autotomy may be offset by regenerative abilities and super-redundancy of arms in octopuses, refraining from unnecessary loss of limbs may be beneficial and lead to individual differences in readiness to autotomize being favored. Consistent individual differences in behavior can be described as personality. In this study we investigated whether an individual's incidence of autotomy is correlated with any aspect of the individual's personality. Octopuses (n = 75) were collected from Okinawa Island and their body condition noted. Personality was described from behavioral assays in a Feeding Test and Threat Test. Three traits best described behavioral variation named for behaviors that most contributed to each trait as Boldness, Reactivity, and Activity. Weak correlation between incidence of autotomy and individual scores on Threat Reactivity was observed suggesting that more reactive individuals may tend to have more arms autotomized. No difference between sexes was found in likelihood to autotomize.

P33 Contributed Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

BUBBLE, BUBBLE, SURPRISE, PLAY, OR, TROUBLE?

Stephanie Artz, Christie Gutierrez, Marielle Kahn, Lucas Brilliot, Briana Roberts, Heather Hill

University of Texas At San Antonio, United States; Email:sartz99@gmail.com

Cetaceans produce large, forceful bursts of air underwater under different circumstances, including surprise, threats, and play. We investigated the frequency and function of these bubble bursts for 4 beluga (*Delphinapterus leucas*) mother-calf pairs housed at Sea World San Antonio (SWSA, 2007-2010). The mothers primarily produced bubble bursts while swimming with their calves. In contrast, their calves produced the majority of their bubble bursts during solitary activities. These results suggest that mothers may use their bubble bursts as a protective behavior or warning to threatening stimuli (e.g., other belugas). If threatening stimuli are not present, calves may produce bubble bursts as a form of play. Individual differences were also examined, suggesting that some belugas produced bubble bursts more frequently than others. Additional research is necessary to better understand if these bubble displays are under the intentional control of the animals producing them.

287 Contributed Talk: APPLIED ANIMAL BEHAVIOR III (Friday AM)

CAN A STANDARDISED BEHAVIOR TEST PREDICT YOUNG DOGS' SUITABILITY FOR GUIDING WORK?

Lucy Asher, Simon Blythe, Rena Roberts, Peter Craigon, Martin Green, Gary England

Nottingham University, United Kingdom; Email:lucy.asher@nottingham.ac.uk

An understanding of which behavioral traits relate to suitability for guiding work in domestic dogs (*Canis familiaris*) would be useful for organisations which train dogs as mobility aids, such as Guide Dogs. We explored the potential for a standardised test of behavior in young dogs to: i) reflect stable behavioral traits which can be recognised by Guide Dog staff; ii) predict success in Guide Dog training. 506 potential guide dogs were exposed to a series of eight stimuli at 6-8 weeks of age. The responses of dogs were scored on a 7 point scale according to responsiveness or confidence on stimuli comprising: following when called; reaction and recovery to a toy; reaction to gentle restraint; reaction to noise; reaction and recovery to stroking; reaction and recovery to an unusual moving object; encouragement to go through a tunnel; and encouragement over a ramp. Three of these stimuli were associated with success in guide dog training and six were associated with measures of dog behavior made by Guide Dog staff throughout the dogs' training. There is potential for this test to identify behavioral traits in young dogs which can predict suitability for guiding work.

P81 Contributed Poster: ECOLOGICAL EFFECTS 1 (Poster Session A: Weds. eve)

GERBIL TIME MANAGEMENT - DOES TEMPERATURE MATTER?

Doris Audet, Jody Rintoul, Nichole Vestby

University of Alberta, Canada; Email:doris.audet@ualberta.ca

Photoperiod and food have been identified as key synchronizers of mammalian circadian rhythms and as important cues mediating seasonal changes, while ambient temperature cues have received less attention. We explored that role in group-housed Mongolian gerbils, *Meriones unguiculatus*, using cue-conflict experiments. Gerbils experienced either normal light-temperature conditions or conflicting cues (cool in light phase, warm in dark). Gerbil activity, recorded via web-cams, was compared between conditions. Two sets of experiments were conducted: In the first protocol, the same 10 gerbils were exposed to the different temperature regimes sequentially and observed for 5 days in each condition whereas in the second protocol, 6 gerbils were assigned to each condition and observed for 20 days. In both protocols, gerbils were primarily diurnal and a slight phase shift toward nocturnality was observed under cue-conflict conditions. In the second protocol, activity levels were significantly higher in the cue-conflict group but overall, our results suggest that social influences and/or behavioural types might outweigh the response to temperature in the gerbil's behavioral decisions.

257 Contributed Talk: SEXUAL SELECTION III (Thursday PM II)

AUDIENCE EFFECT ON MALE MATE CHOICE IN THE TRINIDADIAN GUPPY, *POECILIA RETICULATA*

Heather Auld, Jean-Guy Godin

Carleton University, Canada; Email:hault@connect.carleton.ca

In mating systems wherein the levels of sexual and sperm competition are high, there should be selection on males to either shut down their sexual communication when in the presence of 'audience' males, conceal honest information about their true mating preferences or communicate false information about mate preference, thereby directing the attention of audience males away from preferred females. Using a binary mate-choice protocol, we investigated whether wild-caught male Trinidadian guppies *Poecilia reticulata* would modify their mate-choice in the presence of an audience of sexual competitors and whether any observed audience effect is graded. We show that, relative to a control treatment, focal males significantly reduced their preference for their initially-preferred female and spent less time associating with either of the stimulus females, in the presence of audience males. However, contrary to expectation, there was no effect of increasing audience members. Our results suggest that male guppies conceal their initial preference for particular females in the presence of a potential rival in an all-or-nothing manner, presumably reducing their risk of sperm competition.

P249 Contributed Poster: COGNITION AND LEARNING 2 (Poster Session B: Thurs. eve)

THE ROLE OF FEN-1 IN LONG TERM MEMORY FORMATION FOLLOWING A LEARNING CHALLENGE IN HONEY BEES

Arián Avalos, Tugrul Giray, Sandra Peña de Ortiz

University of Puerto Rico, Rio Piedras, United States; Email:avalos0912@gmail.com

Understanding functional correlations between expression of genes associated with learning and memory and behavioral response is key in furthering our understanding of neural systems. We analyzed the expression pattern of the gene that codes for flap structure-specific endonuclease 1 (*fen-1*) in honey bees. *Fen-1* is a DNA repair/recombination factor that has been associated with long term aversive memory in rats whose role might be conserved in the honey bee brain. The study involved providing honey bees with a learning challenge in which they were trained to avoid an electrified region of a grid associated with a color cue. After training session and short term memory test, we froze, dissected and extracted mRNA from the brain and thoracic muscle of individuals. Extracts will be analyzed this summer using qRT-PCR in order to define an expression profile. We hope to follow results from this study with molecular manipulations of *fen-1* in order to better define its association with long term memory potentiation in bees.

P373 Contributed Poster: PREDATION AND FORAGING 2 (Poster Session B: Thurs. eve)

PREY RECOGNITION RESPONSE AND THE EVOLUTION OF TOXIN RESISTANCE IN A NON-SPECIALIST PREDATOR

Leleña Avila, Edmund Brodie III

University of Virginia, United States; Email:laa8j@virginia.edu

Toxin resistance, in which consumers evolve resistance to toxins in their food, is observable in predator-prey and plant-herbivore interactions. Consumer specialization on a food type has generally been used to explain toxin evolution due to constraint on the consumer to coevolve with toxic defenses in the food organism. However, garter snakes (*Thamnophis sirtalis*) appear to consume their toxic newt prey (*Notophthalmus viridescens*) rarely but have evolved toxin resistance. We studied the behavioral ecology of prey recognition response in *T. sirtalis* to investigate if the evolution of toxin resistance may be explained by either a phenotypic correlation in their response to newt with another prey or by the canalization of newt response due to early exposure. In neonates, the use of the tongue-flick response assay to prey extracts was used for assessing both the congenital prey response and response after being fed a diet of newts. We found no evidence for either canalization to or phenotypic correlations with toxic newt and suggest that a more direct interaction with newt may explain the evolution of toxin resistance in *T. sirtalis*.

P34 ABS Founders Award Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

ANGRY BIRDS: DO VOCAL SIGNALS PREDICT ATTACK IN BLACK-CAPPED CHICKADEE SONG CONTESTS?

Tyne Baker, David Wilson, Daniel Mennill

University of Windsor, Canada; Email:baker11j@uwindsor.ca

Many animals engage in aggressive contests over territories and mating opportunities. Communicating aggression is a vital because signaling alone can be sufficient to ward off potential rivals, thereby reducing the chance of injury due to physical encounters. Signalers must periodically reinforce aggressive signals with aggressive acts, however, for these signals to remain meaningful. During aggressive encounters, not all behaviors will be aggressive signals; some may be submissive signals or unrelated signals, and some behaviors may not be signals at all, thus creating a challenge for animal behaviorists. In this experiment we explore aggressive vocal signals in male Black-capped Chickadees, *Poecile atricapillus*, using a recently developed playback protocol that combines loop playback of male song with presentation of a taxidermic mount to simulate a territorial intruder. We examine if specific vocal signals precede physical attack on the presented mount. We also evaluate whether the subject's dominance rank influences variation in its aggressive signaling strategies.

125 Contributed Talk: SOCIAL BEHAVIOR II (Tuesday PM I)

BIOLOGICAL MARKETS PRINCIPLES AND GROOMING EXCHANGE PATTERNS IN *MACACA THIBETANA*

Krishna Balasubramaniam, Carol Berman, Hideshi Ogawa, Jinhua Li

SUNY at Buffalo, United States; Email:bk46@buffalo.edu

Biological markets theory offers testable hypotheses to explain variation in grooming exchange patterns among nonhuman primates. It predicts that grooming interchange with other "commodity" behaviors should prevail when within group contest competition (WGC) is high and dominance hierarchies steep, and that grooming reciprocity should prevail when WGC is low and gradients shallow. We tested these predictions in a wild, provisioned adult female (*Macaca thibetana*) group across six time periods. Steepness varied significantly across periods but did not correlate with two indirect indicators of WGC (group size and range restriction) in predicted directions. While grooming reciprocity was significant in each period and negatively correlated with steepness, there was no evidence for grooming interchange with agonistic support. We suggest that stressful conditions and a stable hierarchy during each period may have led to a greater market demand for grooming than support in our

group. We suggest that future studies testing these predictions consider more direct measures of WGC and commodities in addition to support.

288 Contributed Talk: APPLIED ANIMAL BEHAVIOR III (Friday AM)

SEX-SPECIFIC BASKING AND ACTIVITY EFFECTS ON LIZARD SUPEROXIDE LEVELS

Cissy Ballen, Mats Olsson, Mo Healey, Mark Wilson, Michael Tobler, Erik Wapstra

University of Sydney, Australia; Email: cissy.ballen@sydney.edu.au

Ectotherms increase their body temperature in response to ambient heat, thereby elevating their metabolic rate. We studied temperature and associated activity effects in males and females of the Australian painted dragon lizard (*Ctenophorus pictus*) by allowing the lizards to bask for four hours, versus 12 hours, and scoring their associated activity (inactive versus active basking or foraging). As predicted, long-basking lizards (hereafter 'hot') showed heightened activity in both sexes, with a more pronounced effect in females. We then tested for sex-specific effects of basking treatment and activity levels on the increase in net levels of superoxide. In males, short-baskers (hereafter 'cold') had significantly higher superoxide levels than hot males but with faster decreasing levels of superoxide per unit heightened activity. In females, hot females had higher superoxide levels but these increased faster with increasing activity in the cold as opposed to hot basking treatment, and females earlier in the ovarian cycle had lower superoxide levels. Thus, males and females differ in how their levels of reactive oxygen species change with temperature.

P111 ABS Founders Award Poster: MATING SYSTEMS 1 (Poster Session A: Weds. eve)

A TUG-OF-WAR GAME THEORY MODEL OF MIXED-STRATEGY PARASITISM

Nicole Baran, Hudson Reeve

Cornell University, United States; Email: nmb68@cornell.edu

Obligate interspecific brood parasitism has been considered a model system for understanding the co-evolution of parasite tactics and host strategies for resisting parasitism. However, intraspecific brood parasitism has not yet been modeled as a host-parasite system. Here, we develop a tug-of-war game theory model of mixed-strategy intraspecific brood parasitism. Mixed strategy parasitism is the case in which individuals pursue a flexible behavioral strategy, laying some eggs in their own nest and laying some parasitically. Thus, an individual can be simultaneously host and parasite. This model captures the co-evolutionary dynamic of parental effort, parasitism, and resistance to others' parasitism, which has been excluded from previous models. Our model makes predictions about not only the rate of successful versus attempted parasitism, but also how parental effort, resistance to parasitism, and fitness vary as a function of population size and individual differences between players. We believe this model can be extended to 'cheating' and host-parasitic behaviors more broadly, including extra-pair mating, alternative mating tactics, kleptoparasitism and even crime in humans.

P70 Contributed Poster: DEVELOPMENT (Poster Session A: Weds. eve)

DIFFERENT BEHAVIOURAL REACTIONS TO TONIC IMMOBILITY TEST IN GROWING BROILER AND LAYER CHICKENS

Eva Baranyiova, Linda Balážová, Ing. Pavel Štarha

Czech University of Life Sciences, ITS, Czech Republic; Email: ebaranyi@seznam.cz, baranyiova@its.czu.cz

Selection for divergent purposes, egg or meat production lead to side-effects, also in the behaviour of fowl. Their fear as assessed by tonic immobility (TI) test may differ, too. We therefore compared TI in broilers (Ross 308) and layers (ISA Brown). Four-day-old males (n=12) and females (n=12) of each strain were induced to TI. Six tests were carried out at weekly intervals until d 39. Behaviour was analysed using ANOVA for repeated measures with Tukey post-hoc test, and Kruskal-Wallis test. In broiler males, TI increased from 38.8 ± 4.9 s (d 4) to 219.8 ± 36.8 s (d 39), at $P > 0.01$. Broiler females showed no changes. Broiler males had a longer TI than females only on d 39 ($P > 0.05$). In layer males, a non-significant trend to longer TI was noted, in females, TI increased ($P > 0.05$) between d 11 and 25. Kruskal-Wallis test revealed a longer TI in layer males ($P > 0.05$) on d

39. Layer males had a longer TI than broilers on d 25 and 32 ($p=0.04$, $p=0.01$), and layer females on d 18, 25 and 32 ($p=0.05$, $p=0.01$, $p=0.03$, resp.). Our results suggest another behavioural difference, a longer fear response in layers occurring soon after hatching. Supported by IGA VFUB grant 42/2007

93 Contributed Talk: SEXUAL SELECTION I (Tuesday AM)

THROAT FEATHER LENGTH, AGE, AND FEMALE MATE CHOICE IN THE EUROPEAN STARLING, *STURNUS VULGARIS*

Colleen Barber, Megan Wright, Lauren Wiebe

Saint Mary's University, Canada; Email: colleen.barber@smu.ca

Female birds often prefer to mate with older males, perhaps due to their proven survival ability and/or experience with offspring provisioning. To accurately assess male age, females require reliable age-dependent cues. Studies on European starlings (*Sturnus vulgaris*) have aged males (1 year old males vs. older) according to the length of the iridescent portion of the throat feather which males display to females during courtship. Our objective was to examine whether males with longer iridescent portions of their throat feathers (older males) were preferred by females as social and extra-pair mates. We have three years of data; results will be discussed.

306 Contributed Talk: SEXUAL SELECTION IV (Friday AM)

THE EFFECT OF PERCEIVED SPERM COMPETITION RISK ON FERTILIZATION SUCCESS IN A SOLDIER FLY

Flavia Barbosa

University of Missouri, United States; Email: fabdm2@mail.missouri.edu

If resources are limited, males are expected to selectively allocate them in a way that increases reproductive success. For example, sperm competition theory predicts that males will transfer more sperm when sperm competition risk is high. In the soldier fly *Merosargus cingulatus*, males selectively allocate resources: they prolong copulations when sperm competition risk is high and when mating with more fecund females. Here, I tested if selective resource allocation results in higher reproductive success for males. I submitted males to different treatments that simulated different levels of sperm competition risk (high and low male density at the oviposition site) and allowed them to mate and the female to oviposit. I determined the percentage of offspring sired by the male using AFLP profiles. I found that perceived risk of sperm competition did not affect clutch size, but it affected fertilization success: males under higher perceived risk of sperm competition fertilized a higher percentage of a female's egg clutch. Female size did not affect the relationship between sperm competition risk and clutch size or male fertilization success.

150 Contributed Talk: SOCIAL BEHAVIOR III (Tuesday PM II)

THE EFFECT OF WITHIN-GROUP COMPETITION ON COOPERATION IN HUMANS

Jessica Barker, Pat Barclay, Kern Reeve

Cornell University, United States; Email: jb453@cornell.edu

Social organisms in many taxa frequently contribute cooperatively towards resources shared among group members, such as food or reproductive opportunities. "Tug-of-war" theory uses group members' relative investments in competition to find the share of resources that each individual obtains, and has successfully predicted the balance between cooperation and competition in vertebrate and invertebrate societies. However, in human groups, it is commonly assumed that cooperatively obtained resources are split equally among all group members, leading to the standard enforcement of equal resource division in experimental tests of human cooperation. We hypothesize that humans, like other animals, are selected to invest in within-group competition when resources are depletable and contestable. We use a tug-of-war model to predict that when people can invest in competition over a group resource, they cooperate significantly less than when the resource is automatically divided equally. We support this prediction with empirical data from a laboratory game: our results expand on

current models of human cooperation, and demonstrate unifying principles in cooperation across the animal kingdom.

348 Contributed Talk: COGNITION AND LEARNING VII (Saturday AM)

ACQUIRED RECOGNITION OF NON-RISKY CUES IN THE CONVICT CICHLID *AMATITLANIA SIQUIA*

Patrick Barks, Jean-Guy Godin

Carleton University, Canada; Email:patrick.barks@gmail.com

For many animals, the ability to recognize cues from potential predators is not entirely innate, but rather is learned and improved with experience. Recent evidence suggests a high degree of efficiency and generality in these learning mechanisms, and animals may occasionally learn to "fear" cues that are not actually indicative of risk. Here we tested whether individuals can learn to *not* fear a novel cue via the association of the novel cue and a familiar cue indicative of non-risk. We tested this hypothesis using juvenile convict cichlids in a laboratory setting. The novel cue was a PVC pipe, and the familiar cue indicative of non-risk was the sight of actively foraging conspecifics. Groups of cichlid "observers" were simultaneously exposed to the novel cue and a group of "demonstrators" that had been previously trained either to fear or not fear the novel cue, or had no prior experience with it. When subsequently exposed to the novel cue alone, observers conditioned with demonstrators that were previously trained to not fear the cue exhibited a lower-intensity behavioural response than observers from the other treatments, suggesting an acquired recognition of non-risk.

384 Contributed Talk: SOCIAL BEHAVIOR VII (Saturday AM)

VARIANCE IN CENTRALITY WITHIN ROCK HYRAX SOCIAL NETWORKS PREDICTS LONGEVITY

Adi Barocas, Amiyaal Ilany, Lee Koren, Michael Kam, Eli Geffen

Tel-Aviv University, Israel; Email:adibarocas@yahoo.com

In communal mammals the levels of social interaction among group members vary considerably. Recent studies have shown that offspring survival is related to these levels. We applied network theory to the social rock hyrax (*Procapra capensis*), whose groups are composed mainly of females, using 11 years of behavioral data to quantify the centrality of individuals within groups, and found adult longevity to be inversely correlated to the variance in degree centrality. In other words, animals in groups with more equal associations lived longer. A higher variance in centrality implies that some individuals are less connected, and may be indicative of greater social tension between some group members. In such groups stress may be elevated, a known cause for reduced longevity in humans. Our current results support previous studies, and present the first non-primate results, emphasizing the adaptive value of social associations and the consequences of inequality among adults within social groups. Rather than the strength of associations that an individual has, it is the configuration of social relationships within the group that is a key factor in influencing longevity.

143 Contributed Talk: SEXUAL SELECTION II (Tuesday PM II)

SPERM PRECEDENCE PATTERNS AND FEMALE REMATING FREQUENCIES IN A SEXUALLY CANNIBALISTIC PRAYING MANTID

Katherine Barry

Macquarie University, Australia; Email:kate.barry@mq.edu.au

Scramble competition polygyny is expected when females and/or resources are widely dispersed and not easily monopolized by males, or when there is an abundance of mates during an extremely restricted reproductive period. Additional factors such as first male sperm precedence or low female re-mating rate might further explain the propensity of males to engage in scramble competition. The sexually cannibalistic praying mantid *Pseudomantis albobimbrata* exhibits a polygynous mating system, where females exist in low-density populations and male competition manifests as the race to find females. Here, we found no paternity advantage

for the first male to mate, rather a second male advantage. Although mated females were not rejected by males when approached from close-range, they were chemically unattractive to males searching from a distance. Since initial mate attraction in many praying mantids is mediated via long-distance chemical communication, we believe the latter result is more ecologically relevant and therefore more important. These results suggest that the low frequency of female re-mating observed in *P. albofimbriata* may be an additional factor driving scramble competition.

P96 Contributed Poster: GENETICS AND EVOLUTION 1 (Poster Session A: Weds. eve)

MODELING THE EVOLUTION OF CENTRAL-PLACE FORAGING IN DIGITAL ORGANISMS

Francis Bartlett, Fred Dyer, Robert Pennock, Charles Ofria

Michigan State University, United States; Email: bartle47@msu.edu

It is difficult to study the early evolution of complex behavior in natural systems. Behavior seldom leaves fossil evidence, limiting investigation to the patterns of behavior observable in existing species. Here we use the digital evolution platform Avida, to examine how environmental conditions select for the organization of rudimentary navigational strategies. This approach affords both careful experimental control of the environment and a complete evolutionary history of each digital organism. We found that complex behavior evolves in a simple spatial task. The fitness of Avidian organisms was based on their ability to move in search of reward, collect the reward, and return home to self-replicate. Starting with only a simple set of locomotor and sensory abilities, Avidians evolved a range of successful navigation strategies. We observed the evolution of edge-following, landmark orientation, as well as complex sequential strategies consisting of both fixed movement patterns and actions modified by environmental feedback. Our results establish the promise of digital evolution to explore how behavioral repertoires are shaped by spatial and temporal regularities of environments.

P282 Contributed Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

NUCLEAR SPECIES DYNAMICS: AN EXPERIMENTAL STUDY OF CAROLINA CHICKADEES AND TUFTED TITMICE

Julia Bartmess-LeVasseur, Alexandria Hickman, Joseph Wright, Jesse Papa

University of Tennessee, United States; Email: jbartmes@utk.edu

Selective forces that drive the formation of mixed-species flocks include enhanced predator detection and foraging success. Within these flocks, members' roles are described as either nuclear or satellite. Carolina chickadees and tufted titmice are both nuclear species and modify their calling behavior when presented with threatening stimuli. Here, we presented hawk and dove models to 38 mixed-species flocks at distances of 1 and 6 m from feeding stations. After the stimulus presentations, we recorded which species called first and took the first seed. Our results indicate that chickadees called first and took seed first in all but one context. These findings suggest that chickadees and titmice do not play equal nuclear roles in their mixed-species flocks. Chickadees are more likely to respond quicker by calling or foraging and thus, in the sense of a true nuclear species around which other species should group, chickadees seem far more central than titmice. We conclude that dichotomous labels like nuclear and satellite may not sufficiently describe the different sub-categories that characterize each species' contributions to functioning and living in mixed-species flocks.

289 Contributed Talk: APPLIED ANIMAL BEHAVIOR III (Friday AM)

PREGNANCY BLOCK IN DOMESTIC HORSE MARES: A COUNTERSTRATEGY AGAINST POSSIBLE MALE INFANTICIDE

Ludek Bartos, Jitka Bartosova, Jana Pluhacek, Jana Sindelarova

Institute of Animal Science, Czech Republic; Email: bartos@vuzv.cz

Based on reproduction records from horse breeders, we have recently published that bringing a pregnant mare which had been mated away from home into a vicinity of a familiar male who was not the father of her fetus increased probability of pregnancy disruption (Behav Ecol Sociobiol DOI: 10.1007/s00265-011-1166-6). These

mares aborted in 31% of cases, while none of those mated within the home stable aborted. Repeated sexual activity either by a stallion or dominant gelding from the normal home group was observed shortly after the mare came from away-mating. Pregnant mares isolated from home males by a fence were even seen soliciting them over the fence. We speculate that, once returned to the home "herd", and introduced to familiar males, mares were more likely to terminate their pregnancy to save energy and avoid likely future infanticidal loss of their progeny by dominant male (s) of the home social group. Additional data has now showed that if a mare was mated away from home and was brought into an environment containing mares only, she was less likely to abort than a mare returning to an environment containing familiar male or males. This further supports our above hypothesis.

P136 Contributed Poster: PARENTAL CARE 1 (Poster Session A: Weds. eve)

CONCURRENT LACTATION AND PREGNANCY: MOTHER-OFFSPRING CONFLICT IN PREGNANT DOMESTIC HORSE MARES

Jitka Bartosova, Martina Komarkova, Jana Dubcova, Ludek Bartos, Jan Pluhacek

Institute of Animal Science, Czech Republic; Email:bartosova.jitka@vuzv.cz

In some species females commonly become pregnant shortly after parturition of previous young. This further intensifies mother-offspring conflict due to concurrent pregnancy and lactation. In equids pregnant females wean their foals earlier than non-pregnant ones. We presumed intensive mother-offspring conflict associated with pregnancy also during the period of intensive lactation, i.e. before the weaning process starts. Contrary to expectation, here we provide evidence of a decreased mother-offspring conflict related to pregnancy in lactating females during first two trimesters of pregnancy. Pregnant mares provided longer suckling bouts and did not reject or terminate suckling of their foals more often than non-pregnant mares. Our results suggest that pregnant mares cope with parallel investment into a nursed foal and a foetus through enhancing nursing behaviour in early stages of pregnancy before the initially low requirements of the foetus increase. They compensate their suckling foal with the perspective of its early weaning due to ongoing pregnancy. Supported by AWIN EU FP7 project No. 266213.

P148 Contributed Poster: PREDATION AND FORAGING 1 (Poster Session A: Weds. eve)

EFFECT OF DIET ON PRODUCTION AND ATTRACTIVENESS OF SILK IN THE WESTERN BLACK WIDOW SPIDER

Luciana Baruffaldi, Maydianne CB Andrade

University of Toronto Scarborough, Canada; Email: l.baruffaldi@utoronto.ca

Chemical communication is used by a wide range of animals. In spiders, sex pheromones associated with the female's silk commonly attract males and trigger courtship. However, silk production by females may vary with diet. Here we analyze the effect of the female's diet on the production of silk and the extent to which that silk contains contact sex pheromones. Females were split in 2 groups on their first day as adults. High diet females were fed at normal levels for 4 weeks, while low diet females were not fed for 4 weeks. After this period they were allowed to construct webs for 4 days and the silk harvested. Solvent extraction of silk pheromone was made with methanol. We tested the activity of the sex pheromone by measuring the searching behavior of males on filter paper treated with the extract. Results suggest that low diet females produce less silk than high diet females, but may nevertheless have the same sexual attractiveness. We conclude that despite a low diet, females seem to allocate the same amount of resources to pheromone but not silk production. Furthermore, this suggests that silk production may be more expensive than the pheromone production in this species.

231 Contributed Talk: COGNITION AND LEARNING IV (Thursday PM I)

COGNITIVE BIAS IN HONEYBEES: THE STRESSED BEE'S GLASS IS HALF EMPTY

Melissa Bateson, Suzanne Desire, Geraldine Wright

Newcastle University, United Kingdom; Email:melissa.bateson@ncl.ac.uk

Measurement of negative emotional states in animals is crucial for assessing welfare and testing therapeutic drugs for treating anxiety and depression. Since animals cannot report of how they feel, emotional states can only be inferred using physiological, cognitive and behavioural measures. In humans, negative feelings are reliably correlated with pessimistic cognitive biases defined as the increased expectation of bad outcomes. Mammals and birds with poor welfare also display pessimistic-like decision-making, however cognitive biases have not thus far been explored in invertebrates. We tested whether honeybees display a pessimistic cognitive bias when stressed. We found that bees shaken vigorously are more likely to classify ambiguous odours as predicting punishment. In demonstrating state-dependent modulation of categorization, we show that the bee's response to stress has more in common with vertebrate emotion than previously thought.

P13 Contributed Poster: COGNITION AND LEARNING 1 (Poster Session A: Weds. eve)

DOES ENVIRONMENTAL ENRICHMENT AFFECT LEARNING, MEMORY AND TEMPERAMENT IN NILE TILAPIA?

Laura Batista, Marisa de Castilho

Universidade Federal do Paraná, Brazil; Email:laura_bts@hotmail.com

Nile tilapia post-larvae were maintained for six or twelve months under one of the conditions: a) enriched glass tank b) plain glass tank. After six months ten animals from each condition were submitted to the following tests: a) spatial-temporal association test - evaluate the ability of animals to associate a certain place with the time that food would be available at this place b) associative memory test - evaluate the ability of animals to associate visual cues to the feeding site as they should be able to predict the supply of food. After one year ten animals from each condition were subjected to the neophobia test, using a colorful cube as stimulus. In the spatial-temporal association test and in the associative memory test none of the groups learned the association proposed. In the neophobia test fishes from enriched group did not avoid the novel object while group without enrichment avoided the object. These results suggest that environmental enrichment does not affect learning and memory but it does affect the temperament of Nile tilapia.

P35 Contributed Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

FLY PARASITISM, TRADEOFFS, AND THE EVOLUTION OF COMMUNICATION IN A FIELD CRICKET

Oliver Beckers, William Wagner Jr.

University of Nebraska, Lincoln, United States; Email:beckersom@unlserve.unl.edu

Many animals produce conspicuous mating signals, which can also be used by predators to localize their host. Animals with signals that are exploited by unintended receivers have to balance the benefits and costs of attracting mates and predators. We investigated the effect of parasitism by the eavesdropping parasitoid fly, *Ormia ochracea*, on male mating songs in its cricket host, *Gryllus lineaticeps*. Both the fly and female crickets prefer songs with faster chirp rates and longer chirp durations. However, there is a genetically based tradeoff that prevents the traits from evolving independently of each other. Therefore an evolutionary effect of fly predation predicts that males from parasitized populations should produce either (a) slower chirp rates and longer chirp durations or (b) faster chirp rates and shorter chirp durations. We reared males from 6 parasitized and 6 non-parasitized populations in a common environment and recorded their songs. Males from parasitized population produced faster chirp rates and shorter chirp durations. This suggests that males trade off the production of longer chirps for the production of faster chirps in parasitized populations.

367 Contributed Talk: PREDATION AND FORAGING II (Saturday AM)

SENTINEL BEHAVIOR BY FLORIDA SCRUB-JAYS: EFFECTS OF SEASON, HABITAT STRUCTURE, AND FOOD SUPPLEMENTS

Peter Bednekoff, Reed Bowman

Eastern Michigan University, United States; Email:pbednekof@emich.edu

Florida scrub-jays are specialists of scrub oak habitat in Florida. They thrive in areas that combine vigorous acorn production with an open habitat structure. In their annual cycle, Florida scrub-jays must both cache large numbers of acorns in the fall and avoid predators throughout the year. Previous work has shown that jays during winter are sentinels more often and feed less after receiving supplemental food. We tested how habitat structure and season moderated time budgets and the effects of supplemental feeding. In overgrown scrub, jays were sentinels more and foraged less than in open scrub. In fall they were sentinel less and did more foraging and other behaviors, including flying and territorial defense. Across both habitats and seasons, Florida scrub-jays were sentinels more and foraged less when given supplemental food. Thus scrub-jays showed a clear seasonal shift in baseline behavior, AND increased sentinel behavior above this baseline when given supplemental food. The greater sentinel behavior in overgrown scrub likely counters higher predation risk there, and may contribute to Florida scrub-jays foraging less and reproducing less successfully in such habitats.

302 Contributed Talk: COMMUNICATION V (Friday AM)

ARE AGGRESSIVE SONG SPARROWS BETTER SONG TUTORS?

Michael Beecher, Caglar Akcay, Mari Tom, S. Campbell

University of Washington, United States; Email:beecher@u.washington.edu

Do young song sparrows learn more songs from adult males that are more aggressive or signal more? We used a song playback 'challenge' to measure these traits in a sample of 69 adult males during the course of the song learning period (which extends from fledging until the next breeding season for song sparrows). We traced the song repertoires of 41 young birds who established territories in our study area. The young birds had an average repertoire size of 8.7 songs and we were able to trace 94% of these songs to 84 song 'tutors' we had recorded in the study site. The young birds had an average of 5.4 tutors, but most of them learned more than half their songs from one 'primary' tutor. For the 69 adults for whom we had aggression and signaling scores, we asked whether these scores would predict their tutoring success (the total number of his songs that were learned by the 41 young birds). They did not (r -squares near 0). The best predictor of song learning was geography: the primary tutor was typically an adjacent neighbor of the young male or was replaced by him.

P371 Contributed Poster: PREDATION AND FORAGING 2 (Poster Session B: Thurs. eve)

CHARACTERISTICS OF WATER LOSS AND GAIN IN THE WOLF SPIDER *PARDOSA MILVINA*

Ryan Bell

Ohio State University, United States; Email:bell.586@osu.edu

Maintaining appropriate body water content is important for daily function and survival of all organisms. Water balance of an individual is based upon water lost (passive transpiration, respiration, and excretion) being compensated for by water uptake (passive sorption, consumption, metabolic water). *Pardosa milvina* was studied to determine water loss rates at 0% RH and total body water content. Predation was investigated as a potential source of water uptake by the spider. If individuals of *P. milvina* are able to obtain adequate moisture from their prey, it would be predicted that water stressed spiders would readily consume prey. Spiders were maintained under low and high relative humidity levels to examine their behavioral response when presented with the opportunity to feed. Spiders were subsequently presented with free standing water in an effort to determine the importance of water sources in maintaining water balance.

P250 Contributed Poster: COGNITION AND LEARNING 2 (Poster Session B: Thurs. eve)

COOPERATIVE SOCIAL OBJECT PLAY WITH SEAWEED BY ATLANTIC SPOTTED DOLPHINS (*STENELLA FRONTALIS*)

Courtney Bender, Denise Herzing, Ashley Garlick

United States; Email:courtbender@yahoo.com

A naturally occurring form of social object play with seaweed by Atlantic spotted dolphins (*Stenella frontalis*), in which dolphins pass seaweed between individuals, was studied using long-term video archives in order to clarify

the details of how dolphins play with objects in their natural environment, developmental trends in the play, and social behaviors or cognition used to participate in play. The play became more complex with age as adult dolphins had significantly more play behaviors and parts of the body used during play, and significantly longer time in possession of the seaweed than calves. A possible signal was observed that the dolphins may use to request the dolphin in possession of the seaweed to pass it by aligning themselves behind the tail of the dolphin in possession, despite the seaweed location on the body and the ability to pass from other body parts. Individuals that tail requested received significantly more passes. Also, individuals with the seaweed passed it significantly more in games in which they were tail requested. Furthermore every individual that was tail requested while in possession of the seaweed during the study subsequently released it.

269 Contributed Talk: GENETICS AND EVOLUTION II (Thursday PM III)

SONG EVOLUTION IN THE GENUS *CISTICOLA*: VOCAL DIVERGENCE WITH MORPHOLOGICAL CONSERVATISM

Lauryn Benedict, Rauri Bowie

University of Northern Colorado, United States; Email:lauryn.benedict@unco.edu

The genus *Cisticola* includes over 50 species of little brown birds with geographic ranges clustered primarily in Africa. Many species are sympatric with twenty or more congeners that all have strikingly similar morphology. In contrast, *Cisticola* song features are highly variable, suggesting that evolution has led to the elaboration of acoustic, rather than visual, communication signals. We developed a molecular phylogeny of the genus to examine song features from 42 species of cisticolas within an evolutionary framework. Preliminary results of our study indicate that songs are shaped both by stabilizing selection on indicators of species identity, and by diversifying selection on features that may reflect individual identity or quality. Levels of song divergence vary across the phylogeny with some traits being highly variable and others relatively conserved. Stable traits include both song features, such as note structure, and song production behaviors, such as partner duets.

9 ABS Allee Session: ALLEE I (Wednesday AM)

EXPERIMENTAL STUDIES OF COGNITIVE ABILITIES IN WILD SPOTTED HYENAS

Sarah Benson-Amram

Michigan State University, United States; Email:bensonam@msu.edu

The Social Intelligence Hypothesis (SIH) posits that intelligence evolved due to selection pressures associated with life in complex societies. If the SIH is correct, then many of the cognitive abilities observed in primates should also occur in non-primate mammals that live in primate-like societies. Spotted hyenas are an ideal system for testing the SIH as they share many life history traits with cercopithecine primates including complex, stable and hierarchical societies. I examined technical intelligence and behavioral flexibility in wild hyenas by investigating their responses to a novel problem-solving task. This experiment illuminated the role of innovation and persistence in determining problem-solving success. I also studied physical cognition in wild hyenas by determining if hyenas follow predictions of game theory and assess numerical advantage when played calls from varying numbers of unknown intruders. The results from these studies inform our understanding of the cognitive abilities of hyenas. Moreover, comparing the results of these studies to those from primate systems helps us better understand the selection pressures that have shaped the evolution of intelligence.

263 Contributed Talk: ECOLOGICAL EFFECTS III (Thursday PM III)

ECOLOGICAL AND SOCIAL ASPECTS OF BACHELOR GROUPS IN SOUTHERN SEA OTTERS, *ENHYDRA LUTRIS NEREIS*

Gena Bentall, Martin Tinker

Monterey Bay Aquarium, United States; Email:gbentall@mbayaq.org

Sexual segregation can be described as a pattern of spatial and/or behavioral separation of sexes within a population. Sea otters typically form loosely bonded aggregations associated with resting and social behaviors,

including male dominated bachelor (MDB) groups and high female density groups defended by a territorial male (HFDT). The contribution of social and ecological factors to the stability and prevalence of the MDB groups in California's sea otter population is the focus of this study. From 2009-2011 we conducted observations of MDB and HFDT groups which integrated behavioral, temporal and abiotic factors. Examination of these data showed differences in social behaviors between group types as well as between age-classes within groups. Long-term monitoring of sea otters instrumented with radio transmitters and time-depth recorders provided additional evidence that individual males utilize MDB groups differently, and these differences may be correlated with resource availability. Our results support a combination of energetic constraints and social affinity as important contributors to sexual segregation in sea otters and persistence of MDB groups.

P198 ABS Founders Award Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

EFFECT OF COMPETITION ON TREE SWALLOW (*TACHYGINETA BICOLOR*) OFFSPRING BEHAVIOR AND PHYSIOLOGY

Alexandra Bentz, Lynn Siefferman

Appalachian State University, United States; Email: ab74513@appstate.edu

Territorial animals breeding in high-densities experience increased competition with conspecifics for resources needed for reproduction. In many species, increased social aggression between breeding females promotes a greater transfer of androgens, e.g. testosterone, to their offspring. Maternal effects such as this are non-genetic mechanisms by which the conditions females experience can affect their offspring's phenotype. Elevated yolk androgen levels have been shown to increase nestling growth but decrease immune function. Few studies, however, have investigated the effects of yolk androgens on behavior. Consistent behavioral responses to stimuli have been documented in animals and the lack of flexibility across contexts leads to distinct personality types. Personality is the key determinant of success in social interactions and different strategies have been adopted, such as proactive (bold) and reactive (shy). My study determined if a naturally induced maternal effect could influence not only physiology but also the personality traits, such as aggressive and explorative behaviors, of nestling Tree Swallows (*Tachycineta bicolor*) by manipulating breeding density.

P320 Contributed Poster: GENETICS AND EVOLUTION 2 (Poster Session B: Thurs. eve)

EFFECTS OF ENVIRONMENTAL CONDITIONS ON STANDING BEHAVIORAL ISOLATION IN TWO SPECIES OF KILLIFISH

Emma Berdan, Rebecca Fuller

University of Illinois, United States; Email: eberdan@life.uiuc.edu

The environment has strong effects on communication in animals. Because of this, individuals often possess both signaling apparatuses and receptor organs that are maximized for signal integrity and reception in a specific environment. This situation, termed sensory drive, has strong implications for speciation. Populations diverging in different habitats may develop behavioral isolation (BI) through a mismatch of male traits in one population and female receptors in another. When this occurs, one species' signals should be maximized in environment 1 and the second species' signals maximized in environment 2. Therefore, the environment in which the two species interact may have strong effects on the strength of BI. Here we manipulated salinity, an environmental variable important in the divergence of two killifish and observed how this affected the strength of BI. Levels of behavioral isolation were mostly unaffected by salinity. However, several individual behaviors were strongly affected. Additionally, we uncovered asymmetry between species in male choice. These results have direct implications for the evolution of behavioral isolation and the direction of interspecific gene flow.

P358 Contributed Poster: PARENTAL CARE 2 (Poster Session B: Thurs. eve)

PARENTAL CARE IN AN ARIZONA POPULATION OF HELOBDELLA STAGNALIS (HIRUDINEA: GLOSSIPHONIIDAE)

Becky Beresic-Perrins, Stephen Shuster

Northern Arizona University, United States; Email:rkb32@nau.edu

Helobdella stagnalis is a common leech that exhibits parental care. Adults carry their broods ventrally for 50 days, ventilating young and providing the young food. We investigated whether offspring could recognize their parent when detached and whether offspring would reattach to parents or non-parents when given a choice. We removed the progeny from 81 brooding adults (N=342) and identified each individual by color or feeding history. We then allowed detached offspring to respond to 4 treatments: T1 offspring were allowed to attach to their own parent with no other offspring in the same 60x15mm petri dish; T2-two sets offspring were allowed to reattach to their parents; T3-one set of offspring was allowed to attach to their parent and to a non-parent; T4-one set of offspring were allowed to reattached to a nonparent. The results for both 20 minute and 24 hour trials showed no treatment effect; offspring tended to attach and remain attached to the nearest adult regardless of its identity parental identity. We conclude that offspring do not discriminate parental identity when spatial proximity to their parent may influence reattachment of the offspring.

275 Contributed Talk: MECHANISMS II (Thursday PM III)

COMPARING HORMONE SIGNAL, BRAIN SENSITIVITY AND BEHAVIOR IN TWO DIVERGENT DARK-EYED JUNCO SUBSPECIES

Christine Bergeon Burns, Kimberly Rosvall, Ellen Ketterson

Indiana University, United States; Email:cbergeon@indiana.edu

The relationship between testosterone (T) and aggression is well established, but the degree to which such hormone-phenotype relationships are conserved as species diverge is not well understood. We investigated neuroendocrine mechanisms of aggression in two distinct subspecies of dark-eyed juncos: the well-studied Carolina junco breeding in Virginia (*J. h. carolinensis*), and the largest and most ornamented subspecies, the white-winged junco (*J. h. aikenii*) endemic to the Black Hills of South Dakota. We assayed males for aggression and T, and then used qPCR to examine gene expression of T-processing molecules in brain regions associated with aggression. We found higher levels of both T and aggression in white-winged juncos. In the medial amygdala, white-winged juncos showed significantly less androgen receptor mRNA. In the hypothalamus, this subspecies displayed greater expression of aromatase, an enzyme that converts T to 17 β -estradiol. Populations also differed in some among-individual relationships between T, brain sensitivity to T, and behavior. Our findings provide insight into how selection may act on existing variation to modify hormone-phenotype relationships.

P309 Contributed Poster: ECOLOGICAL EFFECTS 2 (Poster Session B: Thurs. eve)

ALKYLPHENOL EFFECTS ON DEVELOPMENT, GROWTH, REPRODUCTIVE BEHAVIOR, AND SURVIVAL OF CRAYFISH

Daniel Bergman, Steve Gauthier

Grand Valley State University, United States; Email:bergmand@gvsu.edu

Crayfish are an important invertebrate that is affected by chemical pollutants, such as pesticide/herbicide runoff and industrial waste effluents. Crayfish are considered keystone species because they are an important resource for other species and consequently influence diversity and abundance. For these reasons, it is critical that we understand the effects of pollution on the behavior and ultimate survival of crayfish. Alkylphenols are a group of chemicals often concentrated in the tissues of crayfish, fish, and birds when released into nature. They are used in various detergents and pesticide formulations, which makes them very common pollutants. Exposure can lead to contamination levels between ten to several thousand times greater than in the surrounding environment. They have notably adverse effects in fish and likely have similar harmful impacts for crayfish. We examined the effect of exposure to two alkylphenol pollutants (nonylphenol and octylphenol) on development, growth, reproductive behavior, and success finding food. We found numerous impacts on crayfish when exposed to alkylphenols.

221 Contributed Talk: PREDATION AND FORAGING I (Thursday AM)

FEEDING BEHAVIOR IN PEACOCK CICHLIDS IS MEDIATED BY NON-VISUAL SENSES

Margot Bergstrom, Jacqueline Webb

University of Rhode Island, United States; Email:mbergstrom@my.uri.edu

Among fishes, several sensory systems, including the mechanosensory lateral line system, mediate prey detection. Cichlids, known for their adaptive radiations, are generally considered to be visual predators. However, peacock cichlids (*Aulonocara* spp.) are reported to use their unusual widened lateral line canals for the detection of hydrodynamic stimuli generated by benthic invertebrate prey. We analyzed the ability of individual *A. stuartgranti* to feed on live and dead tethered brine shrimp, under light and dark conditions with an intact or chemically ablated lateral line system using HD video. Prey detection behavior (time to first strike, # prey strikes, detection distance and angle, strike order [live/dead]) were analyzed. Results show that *Aulonocara* can successfully feed in the dark using its lateral line system, uses different strategies depending on light condition, and may rely on multimodal sensory input. This study provides novel insights into the ecological significance of lateral line-mediated feeding behavior in cichlid fishes, and more generally in teleosts fishes with widened lateral line canals. Supported by NSF grant IOS-0843307 to JFW.

P14 Contributed Poster: COGNITION AND LEARNING 1 (Poster Session A: Weds. eve)

MERCURY'S EFFECT ON SPATIAL MEMORY IN ZEBRA FINCH, *TAENIOPYGIA GUTTATA*

Amanda Bessler, Daniel Cristol, John Swaddle

College of William and Mary, United States; Email:ambessler@gmail.com

Mercury is a global and persistent neurotoxin that occurs naturally, with most being emitted by anthropogenic industrial processes. Research has focused on determining the levels and damage of mercury in organisms in mercury-contaminated food webs. Though studies have documented effects on breeding behaviors and reproductive success in birds, little attention has been paid to cognitive processes. Research performed on mammal cognition substantiated that mercury causes harm during development. We measured the effect of mercury on spatial memory of a model songbird, the zebra finch. Spatial memory is important for locating nests, resources, territory boundaries, and potentially migration routes, and is thus important for survival and fitness in birds. We compared the spatial memory of finches dosed since fertilization with mercury to controls. The subjects' spatial memory was quantified as the number of attempts made to relocate a food item using spatial memory. Using doses equivalent to those at a polluted site (0.5 and 1.0 ppm), we detected severe impairment of spatial memory in the dosed birds.

126 Contributed Talk: SOCIAL BEHAVIOR II (Tuesday PM I)

CONTEXT DEPENDENT BEHAVIORAL PLASTICITY DUE TO HABITAT ALTERATIONS AMONG WILD ZEBRAFISH POPULATIONS

Anuradha Bhat, Melissa Greulich, Emilia Martins

Indian Institute of Science Education and Research-Kolkata, India; Email:anuradhabhat@iiserkol.ac.in

Plastic responses can have adaptive significance for organisms occurring in unpredictable environments such as migratory species and organisms occupying novel environments. Behavioral responses of wild and laboratory bred zebrafish (*Danio rerio*) populations were measured. We found that type of behavior and populations were both important in determining the degree of observed plasticity. Behavioral responses and their plasticity in changing environments were found to be population dependent - while the small stream population fed more readily after a disturbance in vegetated and/or flowing habitats, individuals from the lake population and lab-reared ones showed little variation in foraging across different environmental conditions. In contrast, while the populations differed in shoaling distances, they showed little variation in shoaling distance across environmental conditions. These results suggest that some behavioral traits in zebrafish are more plastic and influenced by immediate context than others. We discuss the implications of these findings and their possible underlying mechanisms.

P283 Contributed Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

TAIL-LIFTING AS AN ANTI-PREDATOR SIGNAL IN TROGONS

Pierre-Paul Bitton, Stéphanie Doucet

University of Windsor, Canada; Email:bittonp@uwindsor.ca

A number of bird species have been observed to pump or wag their tails the presence of predators. Such displays may serve as predator-warning signals directed at conspecifics or pursuit-deterrent signals directed at predators. Few studies have rigorously tested the predictions of these hypotheses. Elegant trogons perform a display whereby the tail, which normally rests vertically, is conspicuously lifted above the horizontal, exposing the bright red belly and undertail coverts. We tested the function of tail-lifting behaviour in trogons using both observational and experimental approaches. During behavioural observations in Costa Rica, we recorded every tail lift and noted the presence or absence of male and female trogons and potential predators. From May-July 2011, we experimentally tested the possible anti-predation function of tail lifting behaviour by presenting a model of a natural predator (collared forest-falcon) and a non-threatening control (squirrel cuckoo). Although tail-lifting behaviour appears to be a multi-functional signal in trogons, our observations thus far suggest that it primarily functions as a pursuit-deterrent signal.

P36 Contributed Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

DESCRIPTION OF COURTSHIP VOCALIZATIONS IN BROCKET DEER (MAZAMA SP.)

Patricia Black-Decima, Alejandra Hurtado, Rita Albarracin, Ana Maria Nievas

Universidad Nacional de Tucuman, Argentina; Email:black.patricia@gmail.com

Deer vocalizations, especially rutting calls of Old World polygynous male deer, are conspicuous, honest indicators of male size and quality. Little is known of vocalizations in Neotropical deer. Our objective was to describe calls in 3 species of brocket deer. We recorded from tame, captive deer (3 red brocket males, 2 females (*M. americana*); 3 brown brocket males, 1 fawn (*M. gouazoubira*), 1 male *M. nemorivaga*, in Jaboticabal, SP, Brazil, and Tucumán, Argentina. Vocalizations were low intensity, short duration calls, produced in courtship (with females or humans) or greeting (with humans). Analysis with Praat gave these values: $F_0=347\pm 6.3$ Hz, duration= 129 ± 15 msec, red brocket males (N calls=19); $F_0=257\pm 5.8$ Hz, 200 ± 34 msec, females (N=18); $F_0=188\pm 40$ Hz, duration 85 ± 26 msec, brown brocket males (N=32); $F_0=597\pm 13.57$ Hz, 204 ± 11 msec, fawn (N=13); $F_0=251\pm 10.33$, duration 202 ± 20 msec, *M. nemorivaga* male (N = 22). These mean F_0 values and durations are not significantly different among species. Although these solitary deer are sympatric in parts of their range, the calls are used at short range and thus selection for species specificity should not be strong.

P97 Contributed Poster: GENETICS AND EVOLUTION 1 (Poster Session A: Weds. eve)

VARIATION IN RESPONSE TO SOCIAL ENVIRONMENT AFFECTS COOPERATION IN GUPPIES, *P. RETICULATA*

Bronwyn Bleakley

Stonehill College, United States; Email:bbleakley@stonehill.edu

Guppies, *Poecilia reticulata*, cooperate to perform antipredator behavior. Predator inspections and other social behaviors are influenced not only by the genes of focal individuals but also the genes carried in their social partners, termed indirect genetic effects (IGEs). The strength of IGEs is scaled by the coefficient of the interaction (ψ), which may be thought of as responsiveness to the genetic component of the social environment. Inbred lines of "tester" guppies provide a way of controlling and manipulating the genes present in the social environment. Although ψ is modeled as a population constant, individuals are predicted to vary in their responsiveness to the same genetic component of the social environment. We measured individual variation in responsiveness to IGEs by exposing genetically diverse guppies to two inbred tester strains each, in the presence of a model predator. We identified individual variation and indirect genetic effects, as well as interactions between the individuals and social environment for several aspects of cooperative antipredator behavior. Such differences may represent the genetic variation necessary for ψ and IGEs to evolve.

P374 Contributed Poster: PREDATION AND FORAGING 2 (Poster Session B: Thurs. eve)

PREY RECOGNITION OF PREDATOR SCENT CUES IN A CHANGING CLIMATE MANIPULATIVE EXPERIMENT

Sonny Bleicher, Burt Kotler, Joel Brown, Keren Embar

Ben Gurion University of the Negev, Israel; Email:bleicher.s.s@gmail.com

Summers in the Negev Desert of Israel have turned hotter and more humid over the past decade. Whilst doing field work in the dunes, we were curious how these warm, humid nights affect the behavior of species we work with. We therefore brought wild caught Allenby's gerbils (*Gerbillus andersoni allenbyi*) to the laboratory and exposed them to territory marking cues of three local predators that they encounter in nature: *Tyto alba* (barn owl), *Vulpes vulpes* (red fox) and *Cerastes cerastes* (Saharan horned vipers). We quantified the gerbils' response using giving up densities (GUDs) in artificial resource patches (seed trays). We also quantified foraging effort using the amount of seeds eaten at tray and seeds removed from treatment to safety. While increased heat and humidity led gerbils to exploit resource patches more thoroughly, they also enhance the gerbils' response to cues of predatory risk. Thus changing environmental conditions may lead to strong selection on how foragers should assess and respond to food and risk.

203 Contributed Talk: COMMUNICATION III (Thursday AM)

SCARED AND ARTICULATE: GLUCOCORTICOIDS ARE ASSOCIATED WITH ALARM CALL ENTROPY

Daniel Blumstein, Yvonne Chi

University of California, Los Angeles, United States; Email:marmots@ucla.edu

The nonlinearity and arousal hypothesis predicts that highly aroused mammals will produce non-linear, noisy, vocalizations. We tested this prediction by measuring fecal glucocorticoid metabolites in adult yellow-bellied marmots (*Marmota flaviventris*) and asking if variation in glucocorticoid metabolites was positively correlated with Wiener entropy--a measure of call noise. Contrary to our prediction, we found a significant negative relationship: marmots with more fecal glucocorticoid metabolites had less noisy and thus more articulated calls. A previous study suggested that glucocorticoids modulate the probability that a yellow-bellied marmot will call. Rather than "overblowing" their larynx and creating non-linear calls, this study suggests that scared marmots are clearly articulating their message. Interestingly, a rarely emitted lower risk alarm call type--the chuck--is very noisy. In this system, normal alarm calls have reduced noise, and those emitted when animals are relatively stressed have even less noise. Glucocorticoids thus play an important, yet underappreciated role, in alarm call structure.

P124 Contributed Poster: MECHANISMS 1 (Poster Session A: Weds. eve)

EVIDENCE FOR SLEEP IN THE COMMON CUTTLEFISH *SEPIA OFFICINALIS*

Jean Boal, Robert Waldrop, Marcos Frank

Millersville University, United States; Email:jean.boal@millersville.edu

Sleep is a widespread behavior with important physiological significance, but its precise function remains elusive. Criteria for sleep include quiescence, an expanded period of quiescence after deprivation (rebound), and a higher threshold for responding to external stimuli. The common cuttlefish, *Sepia officinalis*, is a large-brained invertebrate that could serve as a useful test species for one of the important hypothesized functions for sleep: memory consolidation. A set of three experiments were performed to determine if the common cuttlefish sleeps. Results revealed a pattern of diurnal quiescence in juveniles and sub-adults but not in senescent adults, and a significant rebound period after deprivation in sub-adults but not senescent adults. In addition, a REM-like state characterized by chromatophore activity and arm and eye movements was observed in both sub-adults and senescent adults. These results indicate that cuttlefish probably do sleep. Future investigations addressing whether resting cuttlefish show a higher threshold for responding to external stimuli are needed to confirm these promising findings.

P359 ABS Founders Award Poster: PARENTAL CARE 2 (Poster Session B: Thurs. eve)

NEST DEFENSE BEHAVIOR BY CAROLINA WRENS (*THRYOTHORUS LUDOVICIANUS*) IN AN URBAN ENVIRONMENT.

Ashley Bogrand, Diane Neudorf

Sam Houston State University, United States; Email:alb079@shsu.edu

We tested the hypothesis tested that Carolina Wrens can discern between different nest predators that they may encounter in an urban environment. The study was conducted in residential yards in the city of Huntsville, Walker County, TX where domestic and feral cats are common. We compared responses of parent birds to mounts of a feral cat (*Felis catus*), a Texas rat snake (*Elaphe obsoleta lindheimeri*), and a cardboard box (control) placed near the nest during the nestling stage. Wrens emitted a variety of alarm calls towards mounts and spent more time close to nest predators than the control. Rasp alarm calls were given in response to both the cat and snake whereas cheer calls were given only toward the cat. The control received very little response. Preliminary findings indicate that Carolina Wrens in urban environments can distinguish between potential nest predators and may use different alarm calls accordingly.

P199 Contributed Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

SOCIAL RANK MODULATES HORMONES AND COMMUNICATION IN A WEAKLY ELECTRIC FISH

Karen Bohorquez, Amanda Buck, Troy Smith

Indiana University, United States; Email:kacree@indiana.edu

Social environment affects hormones and behavior in many vertebrates. We studied the effects of social rank on hormones (cortisol (F) and 11-ketotestosterone (11KT)), agonistic behavior, and communication in the weakly electric fish *Apteronotus leptorhynchus*. Blood samples were collected from fish and playbacks were used to elicit electrical communication signals (chirps) before and after one week of social (4 males 4 females) or individual housing. Socially housed fish were then tested pairwise in a shelter tube competition assay to assess rank, agonistic behaviors, and chirping. 11KT levels increased in dominant males, and F levels increased in subordinate males (11KT $P > 0.04$, $r = -0.54$; F $P > 0.03$, $r = 0.56$). Social housing and rank did not affect chirping in response to playbacks. In live, same-sex dyadic tests, subordinate females chirped more than dominant females (Sign test $P > 0.03$). Fish chirped significantly more during and right after they were attacked. These results suggest that (1) chirping may be a signal of subordination; and (2) the effects of social interaction on hormones and communication depend on sex, social rank, and context. Supported by NSF IOS 0950721.

P284 ABS Founders Award Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

DIFFERENCES IN *LEMUR CATT*A RESPONSES TO THE VOCALIZATIONS OF A NOVEL PREDATOR

Laura Bolt

University of Toronto, Canada; Email:laurabolt@gmail.com

Feral dogs (*Canis familiaris*) are frequent predators of ring-tailed lemurs (*Lemur catta*) at Beza Mahafaly Special Reserve in Madagascar, but are unknown to the free-ranging population of *L. catta* on St. Catherines Island (SCI), USA. Dogs did not exist in the evolutionary past in Madagascar, but were introduced with human occupation of the island. To determine whether *L. catta* vigilance towards dogs is learned or is an adaptive response to a mammalian predator, playback experiments were conducted using the howl vocalization of the wolf (*Canis lupus*), an unfamiliar mammal to both populations but a close relative to the dog. Playbacks were conducted in 2009-2010 with 5 *L. catta* troops in Madagascar and 3 troops on SCI. On SCI, *L. catta* troops displayed little response to the wolf calls, suggesting that playbacks were not perceived as any potential threat. In contrast, troops of *L. catta* in Madagascar were vigilant, and moved and vocalized in response. These results suggest that *L. catta* vigilance towards the vocalizations of novel predators is not instinctive, but a learned response dependent on past exposure.

P251 Contributed Poster: COGNITION AND LEARNING 2 (Poster Session B: Thurs. eve)

IGNORING PERSONAL AND SOCIAL INFORMATION LEADS TO PERSISTENCE OF HABITS BY CAPTIVE CHIMPANZEES

Kristin Bonnie, Marissa Milstein, Steve Ross, Sarah Calcutt, Elizabeth Lonsdorf

Beloit College, United States; Email:bonniek@beloit.edu

Animals are expected to maximize their foraging success by adjusting their foraging strategies to variation in their environment. To do so, individuals can utilize information acquired personally, through trial and error, and/or socially, by observing the success and failures of others in their social group. We tested how two groups of captive chimpanzees adjust their foraging strategy as the location and availability of resources provided varied over a number of weeks. As predicted, chimpanzees adapted previously learned, successful foraging strategies in order to effectively obtain a food reward. However, individuals sometimes continued to practice outdated and unsuccessful strategies, while ignoring relevant personal and social information. The latter finding may be explained in part by the social dynamics occurring within the groups, or by the nature of the captive environment in which these chimpanzees live.

P415 ABS Founders Award Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

TOLERANCE AND COOPERATION IN SOCIAL FELIDS, *PANTHERA LEO*

Natalia Borrego

University of Miami, United States; Email:npezon@bio.miami.edu

Emotional-reactivity posits that tolerance constrains intelligence. In African lions (*Panthera leo*), tolerance may be bolstered by an egalitarian social structure; unlike other social carnivores, lions lack a dominance hierarchy. I explored tolerance by testing pairs of lions (N=13) in a food-sharing task. Dyads received one point if both lions ate, ate at the same time, or ate together in close proximity. A point was deducted if an individual growled, displayed physical aggression, or displayed aggression and made contact with their partner. For a maximum tolerance score of three and minimum of negative three. Between dyads, scores ranged from intolerant to highly tolerant. Dyads' scores were consistent across trials. Intolerant behaviors were individual specific, with the same lions monopolizing food and displaying aggression across trials. These results indicate that, although lions lack a ranking system, tolerance is variable and specific individuals are regularly dominant over others. Based on these findings, emotional-reactivity predicts lions differ in their cooperative abilities. To investigate this, dyads are participating in cooperative problem-solving tasks.

P414 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

SOCIAL INTERACTIONS IN THE COLONIAL MYGALOMORPH HETEROTHELE VILLOSELLA (STRAND 1907)

Jennifer M. Bosco, Brian Moskalik

College of the Holy Cross, United States; Email:jmbosc12@holycross.edu

Spiders are normally solitary animals, infrequently engaging in contact with conspecifics. In rare circumstances, species abandon their solitary tendencies and remain in a group. Extreme inbreeding, reduced genetic diversity, high colony turnover rates and high rates of extinction potentially account for the rarity of this phenomenon. A potentially useful subject for addressing the evolution of spider (Mygalomorph) sociality is the Ischnocolid tarantula species *Heterothele villosella*. The social lifestyle of this species is not unique among its congeners but not all of them have been documented for sociality. Herein, we aim to examine fundamental social interactions and how environmental conditions influence this species' sociality. Our results suggest that cannibalism increases directly with incidences of contact when there are no established territories. We can postulate that dispersal, either natural or stochastic, may lead to increased rates of cannibalism in nature. After acclimation, individuals were observed to establish retreats/territories. During this phase, we observed tolerance among individuals living in adjacent and shared retreats, greatly reducing the instances of cannibalism. Therefore, the

observed colonial nature of the species may be impacted by familiarity/residency duration and overall environmental stability.

242 Contributed Talk: ECOLOGICAL EFFECTS I (Thursday PM I)

VARIABLE ENVIRONMENTS, FLUCTUATING SELECTION AND THE STABILITY OF BREEDING PARTNERSHIPS IN BIRDS

Carlos Botero, Dustin Rubenstein

National Evolutionary Synthesis Center (NESCent), United States; Email:c.a.botero@nescent.org

Mate choice is often constrained by a variety of factors, including intrasexual competition, searching costs, spatial distribution of mates, and limits in memory capacity. Moreover, even the choosiest individual will sometimes make mistakes because the true quality or compatibility of a partner is sometimes only evident after a breeding attempt is already underway. Extra-pair mating and divorce are two of the main conditional strategies by which monogamous animals may attempt to alleviate the negative effects of suboptimal pairing. Here we explore the ecological correlates of these behaviors through a large-scale comparative analysis of socially monogamous birds. Our data indicate that both of these behaviors are strongly influenced by the variability and predictability of breeding conditions and that climate variables account for most of the variance that has been previously explained via life-history and demographic variables. We place these findings within the context of the hypothesis of fluctuating selection and suggest a general framework to study the effects of climate cycles on the evolution of behavior.

P171 Contributed Poster: SEXUAL SELECTION 1 (Poster Session A: Weds. eve)

SPECIATION BY SEXUAL SELECTION: UBIQUITOUS PROCESS OR SPECIAL CASE?

Jenny Boughman, Megan Head

Michigan State University, United States; Email:boughman@msu.edu

Elegant case studies tell us that sexual selection can cause speciation. Yet, these studies cannot tell us whether sexual selection is a primary process generating new species across taxa; only that it can do so. We use a comparative approach to circumvent this problem, estimating the strength of sexual selection within species and the extent to which it differs between species, considering mating traits from different modalities. We then ask whether the strength of sexual selection or the extent to which it diverges between species best predicts the strength of reproductive isolation. We also estimate the extent of divergence in naturally selected traits to compare the relative importance of sexual and natural selection. We show that sexual selection is a powerful driver of speciation across taxa. A key finding is that species differences in sexual selection predict the extent of reproductive isolation better than the opportunity or strength of sexual selection within species. Our results suggest that the presence of sexual selection may not be enough to cause reproductive isolation, even if it is strong. Sexual selection needs to be divergent to cause new species to form.

281 Contributed Talk: PARENTAL CARE II (Thursday PM III)

SEX ALLOCATION IN RELATION TO HATCHING SYNCHRONY AND OFFSPRING QUALITY IN HOUSE WREN BROODS

E. Keith Bowers, Scott Sakaluk, Charles Thompson

Illinois State University, United States; Email:ekbowers@ilstu.edu

In altricial birds, a major influence on the fitness prospects of offspring arises through the order in which nestlings hatch from their eggs, affecting individual mass and size. In house wrens (*Troglodytes aedon*), a sexually size-monomorphic species, the influence of hatching order depends on the degree of synchrony with which the eggs of a clutch hatch, with greater variation in offspring mass and size in clutches hatching asynchronously over a period of several days than those hatching synchronously within a day. First-hatching asynchronous nestlings are the heaviest and largest in the population, thus making them the most likely to survive and reproduce, while their youngest siblings are the lightest and smallest; however, all nestlings within

synchronous broods obtain similar, average mass and size. The effect of hatching order on nestlings is also sex specific; males are more sensitive to this than females. Mothers hatching their eggs asynchronously, thus, place sons in first-laid/first-hatching eggs and daughters in late-laid/late-hatching ones, while females hatching their eggs synchronously distribute the sexes randomly among the eggs of their clutch.

P15 Contributed Poster: COGNITION AND LEARNING 1 (Poster Session A: Weds. eve)

CAUSAL STRUCTURE IN PREDATION: BEHAVIOR SYSTEMS AND BAYES NETWORKS

Robert Bowers, William Timberlake

Indiana University, United States; Email:ribowers@indiana.com

Rats in an operant chamber display patterns of behavior predicted by normative theories of causal cognition. Blaisdell et al. (2006) highlighted such a prediction that appears inconsistent with most theories of associative learning. They conceived of stimuli and responses as causes and effects in a Bayes Network, and presented rat subjects with standard causal scenarios based on that formalism. The Bayesian causal reasoner should expect event A when presented with its effect, X; however, if X has another known cause, B, the presence of B should reduce expectation of all other causes of X, such as A. Evidence for such dependence among predictive cues was found in a feeding situation. This was taken to suggest an abstract, general capacity for causal reasoning. The present research took a behavior systems approach. Continuous observation of rats in such experiments revealed interactions among related behaviors that appear to produce the effect by strategic attentional shifts. This suggests that the structure of the motivational system underlying predation in rats is biased in a manner that provides patterns of behavior appropriate to the causality in a typical predatory circumstance.

P172 ABS Genesis & Charles H. Turner Award Poster: SEXUAL SELECTION 1 (Poster Session A: Weds. eve)

MATE PREFERENCES ASSOCIATED WITH MHC ALLELES IN THE SAILFIN MOLLY, *POECILIA LATIPINNA*

Rachel Bowes, Shala Hankison, Tami Panhuis

Ohio Wesleyan University, United States; Email:rebows.wildlife@gmail.com

The evolution of certain traits may be explained by sexual selection. For example, in the sailfin molly fish, *Poecilia latipinna*, female preference is an important sexual selective force in the evolution of male secondary sex characteristics and behaviors. However, the diverse allelic composition of the major histocompatibility complex (MHC) genes could also be an important factor in sexual selection of these fish. This study was designed to examine whether *Poecilia latipinna* females prefer males based on MHC genotype (MHC class-IIb genomic loci), as a means to benefit their offspring. Sailfin mollies were collected from the Gulf of Mexico, and DNA was collected from over 100 individual fish. These fish will be genotyped using a 454 platform adapted for analysis of the MHC multi-locus region. A flow tank was designed and built to expose females to the scent water of either similar or dissimilar male MHC genotype. I predicted that female mollies will prefer MHC-dissimilar males.

264 Contributed Talk: ECOLOGICAL EFFECTS III (Thursday PM III)

THE INFLUENCE OF PREDATION PRESSURE ON TEMPERAMENT AND STRESS HORMONES IN NATURAL POPULATIONS

Victoria Braithwaite, Gabrielle Archard, Amanda Henninen, Ryan Earley

Penn State University, United States; Email:v.braithwaite@psu.edu

Researchers studying behavioral differences between individuals that are consistent over time and context, known as temperament, or personality, are becoming increasingly interested in the physiological mechanisms that underlie these differences. Here we report the results of a comparative study of the poeciliid fish *Brachyrhaphis episcopi*. We investigated the relationship between temperament traits, cortisol rate of release and exposure to the threat of predation using three replicate rivers each with paired populations that experience either

high or low levels of predation. Fish living sympatrically with predators differ in their cortisol release rates compared to low predation populations, but this difference is only apparent after a mild stressor. In terms of temperament, fish from high predation sites are bolder, more explorative, more active and freeze less than fish from low predation sites. While similar combinations of temperament traits and stress responses have been found in domesticated animals, our study demonstrates that these combinations also occur naturally in wild populations where contrasting selection pressures are experienced.

P285 Contributed Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

TESTING HYPOTHESES ON DISTRESS CALLING IN TUFTED TITMICE: SUPPORT FOR VOCAL PROTEAN DEFENSE

Carrie Branch, Todd Freeberg

University of North Carolina, Willmington, United States; Email: clb5283@uncw.edu

Tufted titmice (*Baeolophus bicolor*), like many small songbird species, produce distress calls when they are captured by predators or by human researchers. In titmice, distress calls comprise variations of two of the notes used in their chick-a-dee calls: high frequency and relatively pure tone Z notes and low frequency and relatively broadband D notes. Here, we tested several hypotheses to explain such distress calling, including whether distress calls obey Motivation-Structural Rules, are sensitive to audience (presence or absence of conspecifics), might serve to attract larger avian predators, or might function in protean defense to confuse a predator. Individual titmice were captured in walk-in treadle traps. Titmice called more as the level of alarm increased (as the observer approached the trap) and substantially more as they were captured and held. Virtually every titmouse gave distress calls, whether flockmates were present or absent. Playbacks of distress calls never attracted large avian predators. Distress calls were highly variable, with titmice often producing long strings of both Z and A notes - vocal variability predicted by the protean defense hypothesis.

P37 Contributed Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

THE SELECTION FREE EVOLUTION OF COMPLEX SIGNALS

Nicholas Brandley, Sönke Johnsen

Duke University, United States; Email: ncb9@duke.edu

Investigators often invoke adaptive hypotheses for the origin of elaborate traits. In communication for example, the complexity of a signal (number of syllables in a signal) and repertoire size (# of signal types) are often thought to function as honest indicators of an individual's learning ability or the robustness of an individual's development. While an adaptive explanation for complex signals has been supported in certain species, recent meta-studies suggest that complex signals often have no fitness benefit. Here we explain a non-adaptive origin for complex signals, the zero evolutionary force law (ZEFL; McShea and Brandon 2010). The ZEFL states that, on average, complexity should tend to increase even when constraints and selection favoring it are absent. Invoking standard song development mechanisms (improper learning, improvisation, genetic mutation, etc.) we show how the random drift of bird song syllables could lead to a directional increase in song complexity. We suggest that while complex signals and repertoires may in some cases be explained by natural and sexual selection, in general it is the persistence of simple signals that points to the action of selection.

P2 Contributed Poster: APPLIED ANIMAL BEHAVIOR 1 (Poster Session A: Weds. eve)

AGGRESSION IN DOMESTIC DOGS: RECENT SELECTION FOR MORPHOLOGY RATHER THAN BEHAVIOR

Stan Braude

Washington University, United States; Email: braude@wustl.edu

The domestication of dogs from wolf ancestors is likely to have involved intense selection for behavioral tameness. Nonetheless, after thousands of years under domestication, millions of dog bites are reported annually in the US and worldwide. A number of alternative hypotheses have been offered to explain an apparent rise in

canine aggression in the last half century, including: Recent trends in the popularity of certain aggressive breeds, selective breeding for aggression, and inbreeding in registered breed populations. Here we offer and test two new hypotheses: 1. Attention to breeding for the show ring has focused on morphology and relaxed selection on behavior. 2. Intense breeding for particular morphological traits, specified in kennel club breed standards, might be accidentally selecting against genes that contribute to behavioral tameness. This would be the reverse of what Balayev found in his farm fox experiments in which selection for tameness resulted in evolution of a distinct suite of morphological characters in his population of foxes. This hypothesis offers a new explanation for the disproportionate representation of certain breeds in dogbite reports.

P274 Contributed Poster: CONSERVATION (Poster Session B: Thurs. eve)

VARIATION IN PERSONALITY OF URBAN VS NATURAL LANDS SAN JOAQUIN KIT FOX,
VULPES MACROTIS MUTICA

Samantha Bremner-Harrison, Brian Cypher

Nottingham Trent University, United Kingdom; Email:samantha.bremnerharrison@ntu.ac.uk

Knowledge of personality type can assist in the conservation practices of reintroduction or translocation. However, little study has been done on the variation of personality between individuals in source populations with differing environmental selection pressures. This study examined personality differences between San Joaquin kit foxes (*Vulpes macrotis mutica*) in urban and natural habitats using three measures of boldness. Overall, urban foxes were found to be bolder than foxes in natural lands, however differences in boldness were higher between adults and reduced between juveniles suggesting selection against high levels of boldness in the natural lands habitat. Boldness was also shown to have an effect on survival and reproduction.

P416 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

EVIDENCE FOR DIRECT BUT NOT INDIRECT RECIPROCITY IN THE EXCHANGE OF
SERVICES BETWEEN RHESUS MACAQUES

Lauren J Brent, Ann MacLarnon, Stuart Semple

Duke University, United States; Email:lauren.brent@duke.edu

Cooperation between unrelated individuals is usually explained by direct reciprocity, whereby individuals give services to those from whom they have received services. Indirect reciprocity may also occur, whereby individuals act positively with those who act positively toward others or act positively toward others if they themselves have received positive interactions. Indirect reciprocity may play an important role in human cooperation, but whether this is the case in other animals is unclear. Here, we examine direct and indirect reciprocity in free-ranging female rhesus macaques (*Macaca mulatta*) on Cayo Santiago Island for the exchange of grooming, agonistic support, tolerance at feeding sites and reduced aggression. We found evidence in support of direct, but not indirect reciprocity. Contrary to predictions, females preferred to groom those females who spent the least, not the most, amount of time grooming others, which may be a by-product of direct reciprocity. If inter-specific differences in the amount of cooperation can be explained by the type (s) of reciprocity at play, studies such as this could lead to a greater understanding of the evolution of cooperation.

P321 Contributed Poster: GENETICS AND EVOLUTION 2 (Poster Session B: Thurs. eve)

SONG COMPLEXITY INDEPENDENT OF ANONYMOUS AND GENIC MICROSATELLITE
DIVERSITY IN A SPARROW POPULATION

Jacob Brewer, Elizabeth MacDougall-Shackleton

University of Western Ontario, Canada; Email:jking88@uwo.ca

Correlations between heterozygosity and fitness are commonly reported, but the true extent of such correlations and the mechanisms which cause them remain controversial. Using a three-year dataset from a wild population of song sparrows *Melospiza melodia*, we investigated the relationship between heterozygosity and song complexity, an important sexually selected trait in this species. Heterozygosity was determined at 17 anonymous

('genomic') microsatellites as well as at 5 'genic' microsatellites located in the expressed sequence tag (EST) of proteins expressed in the songbird brain. Song and syllable repertoire size were used as measures of song complexity. Song complexity was unrelated to individual genetic diversity at either genomic or genic loci. Additional models allowing for effects of individual loci did not explain significantly more variation in song complexity than the multi-locus heterozygosity model. In this large and outbred population of song sparrows, our findings suggest that individual genetic diversity does not play a major role in individual song complexity.

18 Symposium: SENSORY POLLUTION (Tuesday)

SENSORY-BASED CONSERVATION STRATEGIES TO REDUCE BYCATCH IN THE FISHING INDUSTRY

Richard Brill, Yonat Swimmer, Amanda Southwood-Williard

National Marine Fisheries Service, NOAA, United States; Email: rbrill@vims.edu

Capture of nontarget species (i.e., bycatch) can result in stringent fishery regulations, especially when marine mammals or threatened/endangered species are involved. Current strategies to reduce sea turtle bycatch employ time and area closures plus hook and bait restrictions. Additional efforts to reduce directly sea turtle bycatch have centered on finding exploitable differences in behaviors and sensory biology of turtles and pelagic fishes. Although no chemical compounds have been found that reduce the willingness of sea turtles to attack bait, behavioral studies show that sea turtles react with a panic-flight response to realistic shark decoys; and that shark silhouettes deter sea turtles from gill nets. Electroretinography (ERG) studies have demonstrated that turtles, but not targeted fishes, are sensitive to ultraviolet (U.V.) wavelengths. Plexiglas transmits visible but not U.V. light, therefore silhouettes constructed from this material would appear as dark objects only to the former and could be a selective deterrence. Shark bycatch is also of growing concern. Recently, weak electric fields produced by electropositive metals have been shown repulsive to sandbar sharks.

94 Contributed Talk: SEXUAL SELECTION I (Tuesday AM)

ALTERNATIVE REPRODUCTIVE TACTICS IN FEMALE HORSESHOE CRABS

Jane Brockmann, Sheri Johnson

University of Florida, United States; Email: hjb@ufl.edu

Female horseshoe crabs (*Limulus polyphemus*) show consistent differences in whether they mate with one (monandrous) or multiple (polyandrous) males, suggesting female alternative reproductive tactics (ARTs). Even at high nesting densities with intense male-male competition, some females mate only with their attached male. Male ARTs are usually condition dependent but there is little evidence of this in females. Here we evaluate the evidence for condition dependent female ARTs in a marked population of horseshoe crabs. We use multiple lines of evidence including: mark/recapture; measurements of size, condition and eggs laid; field manipulations of female response to satellite males and satellite response to females; and IVF experiments that compare the success of monandrous and polyandrous females with their attached males. These studies suggest condition dependent differences between monandrous and polyandrous females that result in different context dependent mating decisions to cope with sexual conflict. As an ancient and independently evolved arthropod, *Limulus* provides a unique opportunity to extend our understanding of female ARTs and their role in sexual selection.

46 Symposium: FEMALE COMPETITION (Thursday)

FEMALE MATE COMPETITION IN MAMMALS: LIMITATIONS OF THE OSR CONCEPT

Jakob Bro-Jorgensen

University of Liverpool, United Kingdom; Email: bro@liv.ac.uk

Evidence of female mammals competing for access to mates is accumulating. This challenges the conventional logic used to explain patterns in reproductive competition between the sexes: a male-bias in individuals ready to mate (the operational sex-ratio, OSR) due to heavy female parental investment predicts competition among males rather than females. I here outline three scenarios that can lead to female mate competition even where the

OSR is male-biased. Firstly, focusing on topi antelopes, I address how sperm limitation may favour female mate competition and reversed sexual conflicts in systems characterized by strong unanimous female mate preferences, female promiscuity and breeding synchrony. Next, I consider the scope for seemingly spiteful female mate competition to emerge as a means of reducing future competition from descendants of current group members. Finally, I examine to what extent female mammals compete for mates to get access to resources these provide. I conclude that essential costs and benefits promoting female mate competition are not captured by an OSR-based approach predicting a simple negative link between selection on competitive traits in males and females.

368 Contributed Talk: PREDATION AND FORAGING II (Saturday AM)

GROUP LIVING REDUCES PREDATION RISK IN BELDING'S GROUND SQUIRRELS

Katherine Brooks, Jill Mateo

University of Chicago, United States; Email:kcraig@gmail.com

Predation risk likely promoted the evolution of group living in many prey species. In support of this theory, vigilance decreases with increasing group size in many taxa. Individuals may reduce their vigilance because their risk is diluted or because the chances of detecting a predator increase. Belding's ground squirrels, *Urocitellus beldingi*, live in groups of female kin and unrelated females and males. Females behave nepotistically towards their close female kin by alarm calling to warn relatives of predators. A two-year field study explored how the social environment influenced vigilance behavior in approximately 100 squirrels. Utilizing focal sampling methods, we recorded behavior, group size, group composition, nearest neighbor distances and location within the meadow. With these data, we looked for group size effects on vigilance as well as whether squirrels perceived diluted risk or an increased chance of detecting a predator in larger groups. Results will be interpreted in the context of kin relationships, behavioral trade-offs and fitness consequences. This study will help us better understand the benefits individuals may receive from group living.

246 Contributed Talk: COGNITION AND LEARNING V (Thursday PM II)

INDICATIONS OF DOGS? CONCEPTS OF RIGHT AND WRONG FROM AN OBEDIENCE TASK WHEN OWNER OUTSIDE THE ROOM

Donald Broom, Carla Torres-Pereira

University of Cambridge, United Kingdom; Email:dmb16@cam.ac.uk

Does a dog have a concept of right and wrong that is reflected by its behaviour and heart-rate? The owners of 32 dogs left a dog in a room for 30 seconds, after placing an object, food or a toy, on a table and giving the command "Leave it!". The command did not affect the dogs' heart-rates. The dogs obeyed in 33 of the 64 trials. The probability of food being taken was 0.41 and of the toy 0.16 ($p=0.026$). The dogs that took either had a higher mean heart-rate after taking the object from the table ($+0.001$) than those that did not. When the owner returned, the dogs were not reprimanded, threatened or praised. Dogs that had disobeyed the command and had taken the object on the table were less likely to look at the owner and then at the table in the 20 s after his/her return than the dogs that had obeyed ($P > 0.001$). The results were compared with those of studies in which the owner was present throughout the experiment and with other experiments with different commands and greater or lesser degrees of distraction. The existence of the concept of wrongness, which cannot be separated from an association of an action with predicted negative consequences, is implied by these results.

P137 ABS Founders Award Poster: PARENTAL CARE 1 (Poster Session A: Weds. eve)

ANTI-PATHOGENIC PROPERTIES OF BUBBLE NEST FOAM IN THE SIAMESE FIGHTING FISH, *BETTA SPLENDENS*

Alexandria Brown, Ethan Clotfelter

University of Massachusetts Amherst, United States; Email:acbro0@cns.umass.edu

Many organisms manipulate the environment to which their eggs or young are exposed in order to protect their offspring from pathogens. Some organisms even use antimicrobial substances that they produce themselves. Foams are a widespread nesting material that can provide a pathogen-resistant space for incubation of young. Little is known about the chemical constituents of the foams used in *Betta* fish nest construction, even though this type of nest building is a dominant reproductive strategy within the genus. Bronstein (1982) showed that the presence of a male caretaker greatly improved the hatching rate of Siamese fighting fish (*Betta splendens*) eggs. In this study, we determine if *B. splendens* nest material has anti-microbial properties against a bacterial fish pathogen (*Edwardsiella tarda*), a non-pathogenic bacteria (*Escherichia coli*), or a pathogenic oomycete (*Saprolegnia parasitica*). Finally, we determine if egg exposure to nest material is responsible for the increased larval hatch rate. If *B. splendens* foam is shown to have anti-pathogenic properties, this finding would constitute a novel form of indirect parental care.

P200 ABS Founders Award Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

HERITABLE CHOICE OF COLONY SIZE IN CLIFF SWALLOWS: DOES EXPERIENCE TRUMP GENETICS IN OLDER BIRDS?

Charles Brown, Erin Roche, Mary Brown

University of Tulsa, United States; Email:charles-brown@utulsa.edu

The variation in breeding-colony size seen in populations of colonial birds may reflect heritable choices made by individuals who are phenotypically specialized for particular social environments. We conducted a cross-fostering experiment on cliff swallows (*Petrochelidon pyrrhonota*) in western Nebraska, in which individuals were reared in colonies different in size from those in which they were born. Birds in their first breeding year chose colony sizes similar to those of their birth, regardless of their rearing environment. Beyond the first breeding year, cliff swallows' colony choice was less dependent on where they were born. Birds born in small colonies and reared in large colonies showed evidence of a delayed rearing effect. Heritabilities suggested strong genetic effects on first-year colony choice but not in later years. Cliff swallows' genetically based colony-size preferences their first year could be a way to ensure matching of their phenotype to an appropriate social environment as yearlings. In later years, familiarity with particular colony sites and information on site quality may override innate group-size preferences.

P82 Contributed Poster: ECOLOGICAL EFFECTS 1 (Poster Session A: Weds. eve)

CATHEMERALITY IN AN ANCIENT SPECIALIST: ACCELEROMETER-DESCRIBED ACTIVITY OF NORTHERN TAMANDUAS

Danielle Brown

University of California, Davis, United States; Email:Danielle.BrownOwusu@gmail.com

Anteaters are Neotropically distributed, morphologically and physiologically specialized mammalian predators of social insects (primarily ants and termites). Observers of northern tamanduas (*Tamandua mexicana*) reported wide individual variation in the timing of activity, degree of arboreality and diet. These differences remain unexplained, but reflect surprising flexibility for a primitive animal with such a restricted niche and suggest that *T. mexicana* may be resilient to some human modification of its habitat. Using recently-developed accelerometer telemetry I obtained unbiased measures of the activity patterns of 17 Northern tamanduas on Barro Colorado Island, Republic of Panamá. Anteater activity was concentrated in the afternoon and evening with an overall peak at 15:09 (± 4.5 hrs) and an average daily duration of 8.2 hrs (± 2.4). Most individuals displayed cathemerality and all had circadian and predominantly monophasic patterns of activity. High activity levels paralleled the daily oscillation in ambient temperature, but not lunar phase or prey season. Activity patterns appear to be driven by tamanduas' thermoregulatory abilities, but not predation risk or access to prey.

P98 ABS Founders Award Poster: GENETICS AND EVOLUTION 1 (Poster Session A: Weds. eve)

HIGH-THROUGHPUT TESTS OF VARIATION IN OLFACTORY BEHAVIOR IN A NATURAL POPULATION OF *D. MELANOGASTER*

Elizabeth Brown, John Layne, Stephanie Rollmann

University of Cincinnati, United States; Email:Brown2eb@mail.uc.edu

Olfactory signals are used by many animals to gain information about their environment. Individual variation in behavioral responses to these cues are influenced both by numerous genetic and environmental factors. We have designed a high-throughput behavioral assay system that differs from traditional olfactory behavioral assays in that it allows for fine scale assessment of temporal and spatial location of *Drosophila* in response to chemical cues. Video tracking revealed significant variation in responses to 2,3-butanedione (a volatile compound present in fermenting fruit) between 162 inbred *Drosophila melanogaster* lines from a single natural population. These responses were distinct from general activity patterns. These results next allow for studies of the specific genetic mechanisms underlying behavior, and how sequence variants that arise during the evolution of these genes can contribute to individual variation in behavior and give rise to subtle shifts in olfactory perception.

P201 ABS Genesis Award Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

TEMPORAL SYNCHRONY IN THE BUBBLING BEHAVIOR OF CAPTIVE BELUGA WHALES (*DELPHINAPTERUS LEUCAS*)

Meredith Brown, Debra Burhans, Michael Noonan

Canisius College, United States; Email:brownmeredithr@gmail.com

The influence of social contagion can sometimes be inferred when individual animals perform behaviors with a degree of synchrony not explainable solely by external variables. That is, it is inferred that the behavior of one individual increases the probability of the same behavior in others. The present investigation assessed the extent of temporal synchrony in underwater bubbling behavior in a captive population of beluga whales (N=13) held at Marineland of Canada. Computations of hypergeometric distributions revealed a degree of bubbling synchrony that far exceeded that expected by chance. The possibility of social contagion is therefore raised for this behavior. The analysis also showed greater synchrony between juvenile offspring and their mothers than for other combinations. It will be interesting in future studies to investigate the degree to which such synchrony reflects levels of affiliation among other individuals.

P286 Contributed Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

VOCAL AND BEHAVIORAL RESPONSES OF MIXED-SPECIES FLOCK MEMBERS TO NOVEL STIMULI AT FEEDING STANDS

Sheri Browning, Sheri Browning, Kathleen Morrison, Carrie Newton, Suzanne Winters, Vincent Terry

University of Tennessee, Knoxville, United States; Email:sbrown1@utk.edu

Encountering novel environmental stimuli is a normal occurrence in a species' life. How a species reacts to novel stimuli can affect many aspects of their lives including mating, predator detection and avoidance, as well as foraging. Few studies have tested the effects of novel stimuli on the feeding and vocal behavior of wild bird species. We studied the effects of three novel stimuli (a plastic bowl, a plastic dove model, and a person standing 5 meters from the feeding stand) on the seed-taking and calling behavior of Carolina chickadees (*Poecile carolinensis*) and tufted titmice (*Baeolophus bicolor*), two members of a mixed-species flock. We presented all three stimuli at 15 sites, in a counterbalanced order, and recorded vocalizations and seed taking rates for 10 minutes for each context. We found that novel stimuli decreased seed taking rates for both chickadees and titmice in all three contexts and increased chickadee calling rates in all three contexts. We will discuss our findings in relation to how a species' role in the flock may influence their vocal and behavioral reactions to novel stimuli.

P38 ABS Founders Award Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

LONG-TERM SOCIAL RECOGNITION IN BOTTLENOSE DOLPHINS

Jason Bruck

University of Chicago, United States; Email: JBruck@uchicago.edu

The capacity for long-term social recognition in animals is rare and best demonstrated in cognitively advanced animals like elephants, chimpanzees and humans. To date such assessments in bottlenose dolphins have been difficult as it is hard to get complete social histories on free-living pods. Also, dolphins have a unique identification system that is still poorly understood. In contrast to primates that use facial recognition and elephants that use odor, bottlenose dolphins use signature whistles to identify each other. Using these whistles in a playback design as well as the detailed histories of 55 animals maintained as part of a seven zoo captive dolphin breeding consortium I was able to assess dolphin long-term social recognition. Dolphins were presented with both previously familiar and unfamiliar whistles. Number of approaches as well as duration of time attending to the speaker post-playback will be compared for both familiar and unfamiliar presentations. Variables such as age, sex, relatedness and time together/apart will also be considered. Finally, replies to playbacks will be analyzed to see if dolphins use different whistles in response to these independent variables.

19 Symposium: SENSORY POLLUTION (Tuesday)

ACOUSTIC COMMUNICATION IN THE PRESENCE OF NOISE

Henrik Brumm

Max Planck Institute for Ornithology, Germany; Email: brumm@orn.mpg.de

Noise pollution is not only an annoyance to us humans (not to mention being damaging to our health), it also affects the life of wild animals that find themselves in an increasingly noisy world. High levels of ambient noise are particularly problematic for animals that use sound to communicate, as it masks their signals and thus impairs the exchange of vital information. This is the case, for example, in many species of amphibians or birds where males use their vocalizations to attract mates and to defend territories against rivals. This close relationship between male signals and sexual selection means that variation in signaling efficiency is likely to have major fitness consequences. Recent research has shown, however, that animals are equipped with means to deal with some interference from environmental noise. I will review findings from different taxa of terrestrial animals, covering the mechanisms of sound production and perception as well as the behavioural ecology of signaling. The question of whether and how animals can cope with signal masking has important implications not only for our understanding of animal communication, but also for the conservation of species.

P252 Contributed Poster: COGNITION AND LEARNING 2 (Poster Session B: Thurs. eve)

ONTOGENETIC EFFECTS ON COOPERATIVE BEHAVIOUR IN MARINE CLEANING MUTUALISM

Redouan Bshary, Sharon Wismer, Ana Pinto

University of Neuchâtel, Switzerland; Email: redouan.bshary@unine.ch

Evolutionary game theory typically assumes that behavioural strategies have a strong genetic component. In some cases, however, ample opportunity for learning exists. Learning could be particularly useful if conditions and hence associated optimal strategies differ unpredictably on very small scales. We will present data that suggest that these conditions apply to the cleaner wrasse *Labroides dimidiatus*. These fish occupy small territories where other reef fishes visit to have ectoparasites removed. Conflict arises because cleaners prefer protective client mucus over ectoparasites. Small scale variation in habitat is linked to client density, diversity, and composition. This may in turn affect the relative importance of learning for the development of optimal strategies. We compared cleaners from two habitats: patch reefs ('simple environment') and continuous reefs ('complex environment'). We found that cleaners from continuous reefs were more willing to eat cooperatively against their preference, and more able to solve cognitive tasks linked to cleaning interactions. Evolutionary models need to incorporate mechanisms to account for such differences.

P387 Contributed Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

DOES LEK DISRUPTION ALTER FEMALE MATE PREFERENCES?

Richard Buchholz

University of Mississippi, United States; Email:byrb@olemiss.edu

It is empirically difficult to separate the relative impacts of female choice and male-male competition on reproductive success. On leks females may vary in their mate preferences but the scale of male distribution may allow male dominance to limit female access to preferred mates. Female choice can also be disrupted by predators. Previous studies have not investigated the influence of copulatory disruption on the preferences of females independently of the intrasexual competition of males. In this study I used an artificial lek of wild turkeys (*Meleagris gallopavo*) to investigate the preferences of captive hens before and after experimental disturbance, without intrasexual competition. After disturbance wild turkey hens rarely returned to the male from whom they had initially solicited copulation. Interestingly many females who agreed on their initial choice of a mate, also agreed on the same post-disruption individuals as mates. I will report on the relative similarity of pre- and post-disruption choices of hens with regard to male display rates, sexual ornamentation, and parasite loads, and discuss the implications for understanding sexual selection in lekking species.

39 Symposium: SOCIAL COMPLEXITY (Wednesday)

RAVEN POLITICS: KNOWLEDGE AND USE OF SOCIAL RELATIONSHIPS

Thomas Bugnyar, Orlaith Fraser, Anna Braun

University of Vienna, Austria; Email:thomas.bugnyar@univie.ac.at

Complex social life has been proposed as one of the driving forces for the evolution of intelligence. Aside a large group size and a high degree of fission-fusion dynamics, the formation and use of valuable relationships (social bonds) have been discussed as the main factors constituting social complexity in mammals. Yet it is debated, if this is also true for birds. We here report on data from captive and wild non-breeding ravens, *Corvus corax*, collected in the last seven years in the Austrian Alps. We show that i) the quality of social relationships of these birds is comparable to that of primates and ii) that the relationship quality between individuals explains various patterns of their advanced conflict management (coalition formation, intervention in fights, post-conflict reconciliation and bystander-affiliation). In addition, we show iii) that social bonds may be advantageous during foraging but iv) that they may come with the costs of increased aggression by third parties in daily life. These findings support the idea that the need for, and use of, bonding partners outside reproduction may be one of the factors driving the cognitive evolution in these large-brained birds.

95 Contributed Talk: SEXUAL SELECTION I (Tuesday AM)

EFFECT OF DIET ON FEMALE SAMPLING BEHAVIOR AND PREFERENCE IN THE CRICKET, *GRYLLUS LINEATICEPS*

Heidi Bulfer, Cassandra Martin, William Wagner

University of Nebraska, Lincoln, United States; Email:hbulfer@huskers.unl.edu

The adaptive significance of variation in female sampling behavior and mate preference is poorly understood. One environmental factor commonly thought to affect female mating behavior is resource availability. Two hypotheses predict nutrition-dependent mating behavior: the search cost hypothesis and the direct benefits hypothesis. We tested these hypotheses by manipulating diet quantity and quality and testing female sampling behavior and preference in the field cricket, *Gryllus lineaticeps*. Females of this species directly benefit from mating with high chirp rate males, particularly in low nutrition environments. The search cost hypothesis predicts that low nutrition females will sample fewer songs and express weaker preferences because they have less available energy to invest in mate choice. The direct benefits hypothesis predicts that low nutrition females will express stronger preferences because they benefit more from mate choice. Diet quality affected sampling behavior; low nutrition females sampled significantly fewer songs. However, neither diet quantity nor quality affected female preference. These results partially support the search cost hypothesis.

155 Contributed Talk: COGNITION AND LEARNING III (Wednesday AM)

REVISIONARY FINDINGS ON THE FEAR OF SNAKES IN MONKEYS

Gordon Burghardt, Nobuyuki Kawai, Masahiro Shibasaki, Akira Mori, Nobuo Masataka

University of Tennessee, Knoxville, United States; Email: gburghar@utk.edu

Snake conservation is made difficult by the entrenched ophiophobia found in many cultures. One of Charles Darwin's first experiments involved informal tests of responses by monkeys to a snake, and his work on emotions was seminal. Subsequently, responses to snakes by humans and other primates have been investigated with some vigor in terms of looking at evolved, instinctive, and culturally imposed processes underlying fear. Current understanding of the issue of emotional responses to snakes, based on studies with rhesus monkeys, is that there are no instinctive fears to snakes, but that fear of snakes is an evolutionary predisposed product of observational learning. These experiments, widely cited, have a number of methodological, conceptual, and ethological flaws. Experiments with the closely related Japanese macaque carried out on adult animals reared without contact with snakes and tested in a modified Wisconsin General Test Apparatus with live snakes will be described that document that extreme emotional fear of snakes can be present without observational learning. The lessons to be learned about laboratory studies of responses to 'naturalistic' stimuli also will be discussed.

P138 ABS Genesis Award Poster: PARENTAL CARE 1 (Poster Session A: Weds. eve)

EVOLUTION OF EMBRYONIC DEVELOPMENTAL DEPENDENCE IN *HETERANDRIA FORMOSA*

Sarah Burke, Rebecca Hale

University of North Carolina, Asheville, United States; Email: seburke@unca.edu

Parental effort should depend on the marginal benefit of effort for parental fitness. In matrotrophic species, cumulative maternal effort during gestation can be measured as offspring size at birth. As a result, variation in the marginal benefit across populations should result in variation in offspring size at birth. The least killifish *Heterandria formosa* exhibits population variation in offspring size at birth. We quantified how embryo size changes with gestational stage in each of four populations. In a simultaneous project, the relationship between size at birth and offspring survival has been quantified. Parental care theory (see poster by Hale & Travis) makes clear predictions for how offspring size throughout gestation should correlate with size-specific survival. This study tests the specific prediction of the model that populations with smaller minimum birth size for survival should be further developed for a given size during gestation than populations with larger minimum size.

P63 Contributed Poster: BEHAVIORAL COMMUNITY ECOLOGY 1 (Poster Session A: Weds. eve)

WHY DO CLOWNFISH HOST IN ONLY 10 ANEMONE SPECIES? A TOXICOLOGICAL EXPLANATION

Karen Burke da Silva, Anita Nedosyko

Flinders University, Australia; Email: karen.burkedasilva@flinders.edu.au

Clownfish use only 10 species of anemones as hosts. Some are used by multiple species of clownfish while others have a single clownfish symbiont. Multiple hypotheses for anemone host selection by clownfish have been proposed but none conclusively showing why this pattern of anemone host usage is observed. We propose a new hypothesis to explain the observed pattern of clownfish use: that anemone toxicity plays a significant role in the distribution of clownfish species, and that anemones which host higher numbers of fish symbionts is a likely indicator of anemone quality. An overall toxicity ranking for each anemone species was compared with the number of clownfish species that are known to associate with each species of anemone in the wild. Anemones with an intermediate toxicity had the highest number of clownfish associates, whereas anemones with either very low or very high toxicity had the fewest. We also found that when given a choice clownfish preferentially choose anemones with intermediate toxicity in the lab. These data demonstrate the variation in toxicity among host anemone species may be important in the establishment and maintenance of clownfish anemone symbiosis.

P71 ABS Founders Award Poster: DEVELOPMENT (Poster Session A: Weds. eve)

ARE DOMINANCE AND BEAK COLOR DEVELOPMENTALLY PLASTIC IN FEMALE MALLARDS, *ANAS PLATYRHYNCHOS*?

Mike Butler, Russell Ligon, Kevin McGraw

Arizona State University, United States; Email:Mike.Butler@asu.edu

Sexually mature animals use colorful ornaments to signal social status, but the role of early-life conditions on adult aggressive behavior and ornament expression is frequently neglected. We performed aggression trials with 46 female mallards to test 1) if beak color signals dominance rank, 2) if rank is related to individual quality (e.g., degree of immune response), and 3) if quality and rank are affected by nutrition during development. We reared female mallards, which have orange, carotenoid-pigmented beaks with no known signaling function, from hatch on one of four different diets: control, or carotenoid-supplemented during early, middle, or late stages of development. At adulthood, we quantified beak coloration and immune function (PHA swelling test), and placed groups of four in an arena and quantified aggression. We found that adult body mass positively predicted rank, that wing-web swelling negatively predicted rank, and that neither developmental treatment nor beak color predicted rank. Thus, neither beak color nor rank were affected by carotenoid supplementation during development, suggesting expression of these traits is dependent upon genetic or adult-stage factors.

270 Contributed Talk: GENETICS AND EVOLUTION II (Thursday PM III)

EVOLUTION OF IMMUNE SYSTEM GENES WITHIN THE HYAENIDAE FAMILY: IMPLICATIONS FOR MATE CHOICE

Katy Califf

Michigan State University, United States; Email:califfka@msu.edu

The major histocompatibility complex (MHC) is a group of highly diverse genes in the vertebrate genome that play a critical role in the immune system. These genes have been shown in a variety of taxa to influence mate choice by mediating individual odors. Many vertebrate species studied to date show a strong preference for mates dissimilar from themselves at MHC loci, providing their offspring with a diverse immune system capable of recognizing a large array of pathogens. We explore the extent to which MHC similarity influences mate choice decisions in wild and captive populations of a carnivore known to encounter high levels of immune insults, the spotted hyena (*Crocuta crocuta*). The social dominance and masculinized genitalia of female spotted hyenas, coupled with a robust immune system, make this a particularly interesting system in which to investigate questions of mate choice. Using over twenty years of pedigree data and behavioral discrimination assays, we investigate the extent to which variation at three MHC loci influences mate choice patterns and odor preference in this species.

P388 Contributed Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

WERE FEEDING RESPONSES INVOLVED IN THE EVOLUTION OF THE SWORD AS A SENSORY TRAP IN SWORDTAIL FISHES?

Jaime Camacho, Oscar Rios-Cardenas, Constantino Macías García

Universidad Nacional Autónoma de México, Mexico; Email:holajimy@gmail.com

It has been shown that sensory bias is involved in the evolution of female preference for the sword in fishes of the genus *Xiphophorus*, yet it is not known whether this bias is due to pre-existing adaptive responsiveness, and if so, what is the nature of such bias. Using several species of swordtails, we are testing whether a feeding response may be the original target of the fin sword. We expect the sword to elicit a feeding response by females and that this response would be higher in species where the sword has not evolved (platys) as opposed to species with a sword or where it has been secondarily lost. In a dichotomous choice test we exposed females of *X. helleri* and *X. pygmaeus* to caudal fins of their males with and without a sword. Females of both species did not discriminate between swordless and sworded fins. Females directed feeding response (bites) to both types of

fins, and there were no differences in the strength of preference and feeding responses between the two species. Our results are consistent with our prediction that swords should elicit feeding responses on the females, but we need to test more species before we can draw clear inferences.

282 Contributed Talk: PARENTAL CARE II (Thursday PM III)

ALLOMATERNAL CARE DURING FIRST YEAR OF LIFE FOR BELUGAS (*DELPHINAPTERUS LECUAS*) IN HUMAN CARE

Carolyn Campbell, Heather Hill

Texas A&M University, United States; Email:cacampbell08@gmail.com

Allomaternal care refers to care of a calf performed by an adult other than the mother. It is seen among many cetacean species in varying degrees, including maintaining proximity, engaging in play and nursing. Little is known about allomaternal care for belugas and for cetaceans in the care of humans. This study is directed at examining allomaternal care in four beluga mother-calf pairs during their first year of life in the care of humans. Each pair was videotaped twice a week and analyzed for the behaviors of: mother-calf swims, solo swims, social interactions, and allomaternal care. Two of the pairs showed little to no allomaternal care. The other two pairs showed relatively increased levels of allomaternal care interactions. The initiator and recipient of each behavior was also examined to establish which animal, the calf or the adult, were initiating the allomaternal care. The results showed the calf was primarily responsible for initiating the interactions, providing evidence of high independence. In the wild allomaternal care is thought to occur when the mother is not available. The role of allomaternal care for animals in the care of humans seems to be the calf's choice.

P231 Contributed Poster: APPLIED ANIMAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

BEHAVIORAL CHARACTERIZATION OF SPONTANEOUS EPILEPSY IN *TRINOMYS YONENAGAE*, A NEOTROPICAL RODENT

Lais Cantano, Elisabeth Oliveira

Universidade de São Paulo, Brazil; Email:lalinharuiz@hotmail.com

Trinomys yonenagae is a spiny rat that shows spontaneous seizures (EE) in wild and captivity. Seizures were registered in 18 rats of both sexes in captivity and they varied in frequency (1-12) and duration (19s-780s, median:2min). Using Racine's scale we observed freezing and facial movements, head nodding, forelimb clonus, rearing, rearing-and-falling. Open-field tests revealed hyperlocomotion in descendants of epileptics, as seen in epileptic rats, indicating hereditary character of their epilepsy. Therefore we surveyed data bank comprising three generations of six colonies, in which the prevalence was 7% [n=258;132 (5.3%) 126 (8.7%)]. Males represented 39% and females 61% within the EE group. The spontaneous limbic epilepsy in *T. yonenagae* seems to have a genetic component and to be idiopathic in nature, occurring more in female than males. The fact that epilepsy occurs spontaneously in this wild species opens perspectives regarding its evolutionary meaning. It could represent an anti-predatory strategy, possibility that deserves being further studied. As model it may also contribute to understanding of epilepsy as human pathology affecting 1% of world population.

P64 ABS Founders Award Poster: BEHAVIORAL COMMUNITY ECOLOGY 1 (Poster Session A: Weds. eve)

THE DIGGING BEHAVIOR OF THE RED IMPORTED FIRE ANT *SOLENOPSIS INVICTA* IN RELATION TO BODY SIZE

Jason Carbaugh, S. Bradley Vinson

Texas A&M University, United States; Email:jcarbaugh@tamu.edu

Workers of various body sizes exist in the red imported fire ant *Solenopsis invicta* forming a polymorphic caste. In previous studies, larger workers tend to forage more and carry larger objects compared to smaller workers. In addition, larger workers can move large soil particles when creating nests. This study observed the digging

behavior of the polymorphic workers to determine if a large body size worker could move a large size bead by digging compared to a small body size worker. In previous observations when picking up small beads, workers only use their mandibles and move forward out of the entrance hole. For larger beads, workers use both their mandibles and forelegs and move backwards out of the entrance hole. Ten colonies were collected from the field and housed in the lab. A random sample of workers were taken from a colony and introduced to various sizes of glass beads. The bead sizes ranged from 0.25 to 2.0 mm. The widths of the heads of workers that picked up beads were measured to determine if body size increases as the bead size increases. This study provides more information about the division of labor in the polymorphic caste of the red imported fire ant.

164 Contributed Talk: COMMUNICATION II (Wednesday AM)

BIRDSONG PERFORMANCE AND THE EVOLUTION OF SIMPLE (RATHER THAN ELABORATE) SEXUAL SIGNALS

Gonçalo Cardoso, Yang Hu

CIBIO-Universidade do Porto, Portugal; Email:gcardoso@mail.icav.up.pt

Sexual signals are often elaborate, due to sexual selection for signals of individual quality. Contrary to expectation, however, the elaboration of signals such as birdsong is not related to the strength of sexual selection across species. We show that, due to a compromise between song complexity and signaling high performance of trills (syllable repetitions), high performance singing can result in the evolution of simple, rather than elaborate, song. Across wood warblers (family Parulidae), species with higher trill performance evolved simple songs with more extensive trilled syntax; this advertises trill performance but reduces syllable diversity. Indexes of sexual selection were not related to either syllable diversity or performance, indicating that sexual selection does not target the same trait systematically. Song diversity in this group is best explained by selection targeting different traits in different species, sometimes resulting in simple rather than elaborate signals. We conclude that the evolution of sexual signals can be unpredictable when their physiology affords multiple or, as here, opposing ways of advertising individual quality.

P310 Contributed Poster: ECOLOGICAL EFFECTS 2 (Poster Session B: Thurs. eve)

EFFECT OF BLOOD SAMPLING ON SURVIVORSHIP AND SITE FIDELITY IN FIELD SPARROWS

Michael Carey, Robert Smith

University of Scranton, United States; Email:careym1@scranton.edu

Aspects of the breeding biology and behavior of a population of field sparrows (*Spizella pusilla*) in northeastern Pennsylvania, USA, have been monitored continuously since 1987. From 1990 through 2002, blood samples (~50µl) were taken from the brachial vein of virtually every breeding adult in every breeding season. No blood was sampled from any breeding adult in the years 1987-1989 and 2003-2010. In this presentation we (1) compare sampled and unsampled birds as to site fidelity, measured by whether they remained on territory following capture for the remainder of the breeding season. We also (2) used Program Mark to estimate annual survivorship of sampled and unsampled birds, measured by return rates of the birds to the study site in the following years. Sampled birds showed neither lower site fidelity nor lowered probability of survivorship. We conclude that blood sampling in field sparrows does not result in any long term harm to the sampled birds.

P389 Contributed Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

MALE SIZE VERSUS BREEDING SITE POSSESSION: FEMALE MATE CHOICE BEHAVIOR IN CONVICT CICHLIDS

Melissa Carlile, Adam McHenry, Jennifer Gagliardi-Seeley, Melissa Kyer, Nisa McVay-Bartnes

Metro State College of Denver, United States; Email:mcarlil1@mscd.edu

Previous research has shown that female convict cichlids prefer larger mates to smaller mates. However, a good breeding site is also important in mate selection. We are testing whether a female will choose a smaller male if a

higher quality-breeding site is available. The smallest male will have a terracotta pot as a breeding site in order to establish a more suitable nest. To test this we divided the tank into three compartments by placing two dividers with holes big enough for only the female to fit through. Two males with a difference in length of ~20mm are placed in the side compartment and a female that is ~10mm smaller than the smallest male is placed in the middle, neutral compartment. The null hypothesis would be that there will be no difference in female choice with females choosing large males as often as choosing small males with a quality site. Alternatively, females may either choose large male based on mate quality or female will choose smaller male based on breeding site quality.

P173 Contributed Poster: SEXUAL SELECTION 1 (Poster Session A: Weds. eve)

THE FUNCTION OF FEMALE COPULATION CALLS IN NORTHERN PIGTAIL MACAQUES (*MACACA LEONINA*)

Cindy Carlson, Dario Maestriperi, Ulrich Reichard

University of Chicago, United States; Email: carlsonc@uchicago.edu

The copulation calls given by some female primates at the end of a copulation are thought to be a mechanism of post-copulatory female, influencing paternity confusion and paternity certainty. This study examines copulation calls in a troop of Northern pigtail macaques (*Macaca leonina*) living in Khao Yai National Park, Thailand. If copulation calls increase paternity confusion, we predicted that females would be more likely to mate with a different male following a copulation call than following a copulation with no copulation call. If copulation calls increase paternity certainty, females should be less likely to change partners following a copulation call, and mount series containing copulation calls should be more likely to end in ejaculation. We found that a female is less likely to change partners after mount series containing a copulation call than she is after a mount series with no copulation call. Mount series containing a copulation call were also more likely to end in ejaculation. We therefore conclude that female pigtail macaques use copulation calls to increase paternity certainty by encouraging their current partner to continue a mount series.

P65 ABS Genesis Award Poster: BEHAVIORAL COMMUNITY ECOLOGY 1 (Poster Session A: Weds. eve)

THE EFFECTS OF BLOOD PARASITES ON IMMUNITY AND REPRODUCTIVE SUCCESS OF *PROTONOTARIA CITREA*

Cara Carne, Sarah Huber

Randolph-Macon College, United States; Email: caracarne@students.rmc.edu

The theory of sexual selection states that particular traits will improve mate attraction and enhance mating opportunities within a population. Secondary sex traits are generally elaborate characteristics used to entice members of the opposite sex to mate or to fight off potential competitors. However, maintaining these traits can come at a cost to an individual's health, immune function, or resistance to disease and parasites. The energy required to produce and maintain traits that are attractive to mates may have an adverse effect on an individual's ability to mount an immune response and, hence, fight off infection. Here we examined the relationship between immune response, blood parasite prevalence, and adult reproductive success in Prothonotary Warblers (*Protonotaria citrea*). Birds infected with blood parasites had a higher heterophil to lymphocyte ratio than birds without blood parasites. However, total white blood cell counts in parasitized individuals were not significantly different from non-infected birds. Additionally, parasite prevalence did not have an effect on the reproductive success of individuals within a breeding season.

369 Contributed Talk: PREDATION AND FORAGING II (Saturday AM)

WINTERING BIRDS AVOID WARM SUNSHINE WHILE FEEDING: AN ANTIPREDATOR PERSPECTIVE

Jennie Carr, Steven Lima

Indiana State University, United States; Email: jcarr1@indstate.edu

Overwintering birds can clearly gain thermal benefits by feeding in sunlight on cold days. However, feeding in sunlight may make predators difficult to detect (enhanced glare) or small birds less cryptic. Such factors may lead birds to seek shade rather than sunshine. We observed wintering emberizid sparrows foraging at midday in alternating bands of sun and shade to quantify any apparent preference for shade. Our results indicate that a large majority of feeding dark-eyed juncos (*Junco hyemalis*) and American tree sparrows (*Spizella arborea*) preferred shaded bands, even under thermally-challenging conditions. Thermophysiological measurements indicated a substantial thermal benefit to feeding in sunlight, yet this preference for shade remained consistent for all ambient temperatures (-12 to 13°C). Birds feeding in shade also tended to orient in the direction of the sun, which suggests the use of shade to enhance predator detection via reduced solar glare. We do not, however, rule out the possibility of shade-enhanced crypticity. Overall, our results provide evidence of an unforeseen but potentially widespread predation-thermoregulation trade-off in microhabitat choice by birds.

P95 Contributed Poster: EDUCATION (Poster Session A: Weds. eve)

THIRD-GRADE STUDENTS LEARN ABOUT SCIENTIFIC RESEARCH DESIGN BY STUDYING ZEBRAFISH BEHAVIOR

Carol S. Carter, Emília P. Martins

Clear Creek Elementary School, United States; Email: ccarter@mccsc.edu

Although Indiana's academic standards require that elementary school students be taught about research design, scientific thinking, and the living environment, third-grade students are not often exposed to biological research as conducted at tier one universities. Here, we used animal behavior and the students' natural curiosity about animals to lead a third-grade classroom through the process of designing and conducting a scientific experiment about zebrafish behavior. Tanks with small groups of Zebrafish were set up in a third-grade classroom to support this project. Initial activities focused on immersing the students in making observations, designing investigations, and forming theories based on evidence gathered. Students took a trip to the WonderLab, where the students participated in additional activities that emphasized animal behavior. Back in the classroom, the students collected and summarized their data, presenting their results and conclusions to a class visitor (a professional zebrafish researcher). The students were also given opportunities to use scientific design throughout the school year as a routine way to answer questions based on observations. In future years, lesson plans will be expanded to include practice with reading (through doing background research), writing (in a daily scientific journal), and mathematics (statistics and graphical representations).

P417 ABS Founders Award Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

A NON-INVASIVE METHOD FOR THE AUTOMATIC RECORDING OF MOVEMENTS OF NAKED MOLE-RATS IN THE LABORATORY.

Frank Castelli

Cornell University, United States; Email: frc5@cornell.edu

Naked mole-rats (*Heterocephalus glaber*) are eusocial rodents that live in colonies of up to 300 individuals and live in extensive networks of underground tunnels and chambers in dry regions of east Africa. In the laboratory, naked mole-rats are housed in networks of Plexiglas tubes and acrylic boxes. Experiments that require recording the movements of individuals through these tunnel systems are traditionally accomplished through direct observation or video review, time-consuming methods that can logistically limit the amount of data collected. I developed a novel and time-saving technique for labeling individuals and automatically recording their movements in the laboratory. Individuals were uniquely labeled with custom-made barcodes using temporary tattoo paper. Animals readily habituated to their labels which adhere to the body for about one week before falling off on their own. A barcode scanner, connected to a computer and placed above the colony, automatically recorded the identity and time at which each individual passed through a Plexiglas tube. Data from an experiment using these methods will be presented to illustrate the utility of this novel technique.

P390 Contributed Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

FLUCTUATING ASYMMETRY IN THE BREEDING BIOLOGY OF THE BLUE-BLACK GRASSQUIT

Leonardo Castilho, Jonas Maravalhas, Regina Macedo

Universidade de Brasília, Brazil; Email:leonardobcastilho@gmail.com

Fluctuating asymmetry (FA) reflects small, random deviations from perfect bilateral symmetry and may increase with developmental instability or homozygosity. It has been proposed that only individuals with good genetic and developmental conditions have low levels of FA, and that females during mate choice may assess FA levels in males. We evaluated this hypothesis using the blue-black grassquit (*Volatinia jacarina*), a small tropical passerine. We tested whether asymmetry of the wings and underwing patches, which are conspicuously shown during the breeding display performed by males, are negatively associated with an index of body condition and ectoparasite counts. Our results do not provide support for a negative association between FA and male condition. A high number of controversial findings in the literature point to a great variation of FA as an honest signal of quality among species. New studies focusing on the display characters of blue-black grassquits, other than body traits, may reveal if FA has any function in their breeding biology, since these characters have already been shown to correlate with breeding success.

P287 ABS Founders Award Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

SONG AND MALE QUALITY IN BLACK-THROATED SPARROW, *AMPHISPIZA BILINEATA*

Carina Castro, Anne Houtman

California State University, Fullerton, United States; Email:carina_castro1@csu.fullerton.edu

The Black-throated Sparrow is a small desert bird with one of most complex songs of the sparrow species. Black-throated Sparrow song has been described for a New Mexico population (Heckenlively 1970), but the function and correlates of the song have not yet been studied. Additionally, their contact call has not been studied. The purpose of this study is to 1) describe the song of the southern California Black-throated Sparrow population and compare it to the New Mexico population; 2) correlate male physical characteristics with their song; and 3) describe the contact call used by paired birds. I predict that the southern California population will have dialect distinct from the New Mexico population. The Black-throated Sparrow is sexually monomorphic and the contact call may be used for individual recognition as well as sex and species recognition. This study will help determine how song functions in this understudied and declining species.

3 Plenary Lecture: (Wednesday AM)

EPIGENETICS AND THE INHERITANCE OF BEHAVIORAL VARIATION

Frances Champagne

Columbia University, United States; Email:fac2105@columbia.edu

Traditional perspectives on the transmission of traits across generations are focused on DNA polymorphisms or broad genetic characteristics which are similar amongst parents and offspring. However, there are alternative mechanisms through which this similarity may be mediated. Across species, the experiences of an organism during the prenatal and early postnatal period are critical in shaping phenotypic variation and the quality of these experiences is primarily determined by the nature of parent-offspring interactions. In mammals, mothers are typically the primary caregiver and provide both a nutritional and social context for development. Studies in laboratory rodents indicate that variation in maternal care can lead to divergent phenotypes in offspring which include variation in social, sexual, and maternal behavior. This maternal effect can persist across generations, such that the frequency of mother-infant interactions is stably transmitted from mothers to offspring and grand-offspring. Studies of the molecular and neurobiological mechanisms regulating this transmission suggest a role for maternally induced epigenetic changes (e.g. DNA methylation, histone modifications) within brain regions involved in maternal behavior. In addition to this experience-dependent epigenetic mechanism of inheritance, there is recent evidence that environmentally-induced epigenetic variation may become incorporated into the

gametes leading to a germline epigenetic inheritance. The role of epigenetics in mediating developmental plasticity both within and across generations provides a novel framework for understanding the inheritance of individual variations in phenotype and the role of the environment in inducing heritable modifications.

202 Contributed Talk: SOCIAL BEHAVIOR IV (Thursday AM)

EFFECTS OF BEHAVIORAL TYPE AND SOCIAL ENVIRONMENT ON MATING SUCCESS IN STREAM WATERSTRIDERS

Ann Chang, Andrew Sih

University of California, Davis, United States; Email: antchang@ucdavis.edu

We examined effects of individual behavioral type (activity and aggressiveness) and social environment (aggressiveness of other individuals) on male mating success in stream waterstriders, *Aquarius remigis*. In particular, we focused on hyper-aggression - when males engage in extended struggles with other males or pairs. Males that were more active-aggressive tended to have higher mating success, but hyper-aggressive males had strongly reduced mating success. This produced stabilizing sexual selection on male aggression; intermediate aggressiveness resulted in the highest mating success. Individual male mating success was also significantly affected by the social environment. Being in a pool with a hyper-aggressive male strongly reduced male mating success. Although hyper-aggressive males had strong negative effects on other males, under most conditions, hyper-aggressive males had even lower mating success than other males in that pool; i.e., usually, both group and individual selection selected against hyper-aggressiveness. The effects of hyperaggressive males were reduced by social situation choice, where both males and females can leave pools with hyperaggressive males.

75 Contributed Talk: COGNITION AND LEARNING I (Tuesday AM)

SCALING AS AN INDEX OF SEQUENCE PLANNING IN COTTON-TOP TAMARINS (*SAGUINUS OEDIPUS*)

Kate Chapman, Daniel Weiss

Pennsylvania State University, United States; Email: kmc385@psu.edu

In humans, motor planning is often influenced by anticipation of a future posture or goal (Rosenbaum et al., 1990). It has been theorized that such abilities may be unique to tool-users. However, recent work suggests non-tool using primates also exhibit sophisticated anticipatory motor planning (e.g., Weiss, Wark & Rosenbaum, 2007; Chapman, Weiss & Rosenbaum, 2010). Here, we ask whether the scope of nonhuman primate motor planning extends to longer sequences of actions. We presented tamarins with a tape measure on which a food reward was located at a near or far distance and we measured their pulling behavior. In Experiment 1, subjects had visual access to the food as they pulled. In Experiment 2, subjects received no visual feedback while pulling the tape measure. In Experiment 3, the amount of rope that could be pulled forward in both near and far conditions was equated. In all experiments, tamarins scaled their inter-grasp distances to the distance of the food, using smaller inter-grasp distances when food was near relative to when it was far. Our results suggest that tamarins can plan for sequences of motor actions.

P333 Contributed Poster: MATING SYSTEMS 2 (Poster Session B: Thurs. eve)

ECOLOGICAL AND NEUROANATOMICAL CORRELATES OF MATING SYSTEM VARIATION IN *MICROTUS KIKUCHII*

Amanda Chappell, Kirk Lin, Larry Young, Sara Freeman, Loren Hayes

University of Louisiana at Monroe, United States; Email: chappea@warhawks.ulm.edu

Ecological variation (EV) has been linked to mating system (MS) strategies, but the underlying mechanisms controlling these strategies are largely unknown. It has been proposed that EV could influence the expression of neuropeptides controlling for social behavior. In mammals, social pair-bonding appears to be mediated by two neuropeptides: oxytocin and vasopressin (OT, VP). Socially monogamous species (*Microtus ochrogaster*) have high concentrations of these neuropeptide receptors in the reward and reinforcement regions of the brain. In

contrast, non-monogamous species (*M. pennsylvanicus*) lack OTR and VPR in these regions. By using viral-vector gene transfer, a causal link between receptor expression and MS has been determined. These observations suggest that EV influences receptor distribution in the brain, thereby influencing MS. I assessed the impact of EV on the MS and neuroanatomy of the Taiwan vole (*M. kikuchii*). Ecology data suggests the Taiwan vole is similar to *M. ochrogaster*, indicating possibly convergent phenotypes. However, neuroanatomical differences between these species may increase our understanding of MS and how it is controlled.

194 Contributed Talk: SOCIAL BEHAVIOR IV (Thursday AM)

ACOUSTIC SIGNALING OF ROOST LOCATION IN TENT-MAKING BATS

Gloriana Chaverri, Erin Gillam

Boston University, Costa Rica; Email:gchaverri@upacificosur.org

Roosts are vital resources to bats as they protect individuals from predators and inclement weather, and are one of the primary venues for social interactions. Many bats occupy roost sites that are relatively permanent, and possibly rely mainly on spatial memory to locate them. However, many tropical bats use roosting structures that last only a few weeks, thus facing the difficult task of having to constantly find roosting sites and groupmates in acoustically complex habitats. We present preliminary evidence of the use of acoustic signals to help group members locate roost sites in two tent-making species, *Artibeus watsoni* and *Ectophylla alba*. We monitored the behavior of bats at dawn when they arrived to the tent-roost using video and audio recordings. Individuals returning to the roost produced a series of calls right before and after their arrival. Calling often ended once other bats arrived, suggesting that the primary function of these signals was to announce location. We also observed that individuals returning to an empty roost vocalized and immediately left to another location, suggesting that these signals may also play an important role in group cohesion.

297 Contributed Talk: COGNITION AND LEARNING VI (Friday AM)

NATURE OF THE CELESTIAL COMPASS IN THE AUSTRALIAN DESERT ANT *MELOPHORUS BAGOTI*

Ken Cheng, Antoine Wystrach, Patrick Schultheiss, Sebastian Schwarz, Alice Baniel

Macquarie University, Australia; Email:ken.cheng@mq.edu.au

Desert ants are known to be champions in path integration, which allows foragers to keep track of the straight-line distance and direction home by continuously updating the direction and distance of the travel. Path integration in insects is largely dependent on a celestial compass, which extracts accurate directional information from the pattern of polarized light in the sky. In the well-studied desert ant *Cataglyphis fortis*, the sky compass is mediated by a UV channel. We examined the role of UV light and the sun's position in *M. bagoti*. Ants were caught at the beginning of their homeward path and released at an unfamiliar location with different cues eliminated. Results showed that the UV range of the electromagnetic spectrum was not essential for compass orientation. Even when deprived of both UV light and sun's position, the ants were still capable of retrieving the correct nest direction, indicating the use of another celestial cue, possibly a light gradient or polarized light perception outside the UV range. Further manipulations suggested the integration of multiple cues for compass direction.

P112 Contributed Poster: MATING SYSTEMS 1 (Poster Session A: Weds. eve)

SPATIAL EVOLUTION OF REPRODUCTIVE STRATEGIES: A MULTIPLE-SOLUTION PUZZLE IN A LIZARD MODEL

Margarita Chiaraviglio, Sergio Naretto, Cecilia Blengini, Gabriela Cardozo, Paula Rivera, Valeria Di Cola

Universidad Nacional de Cordoba, Argentina; Email:mchiara@eco.unc.edu.ar

We evaluated variations in reproductive strategies in natural populations of lizards from a spatial evolution perspective. As a model of study, we used two closely related oviparous species of Teiidae lizard whose distribution areas are partially overlapped. The species addressed in our work, *Tupinambis merianae* and

Tupinambis rufescens, have similar body size and external morphological traits. They are particularly interesting because they occupy the southernmost area of the *Tupinambis* group distribution in South America, presenting a wide contact zone. This zone of sympatry might be considered a natural laboratory of evolution. Intra- and interspecific interactions would represent a mixture of selective forces that provide an ideal scenario for studying microevolutionary reproductive processes. We observed significant differences in phenology, structural and behavioral reproductive traits, such as sperm size, jaw muscle mass and operational sex ratio between species and between populations. These results allow us to elucidate the mechanisms that contribute to the spatial evolution of reproductive strategies.

P334 Contributed Poster: MATING SYSTEMS 2 (Poster Session B: Thurs. eve)

SEASONAL VARIATION IN SINGING BEHAVIOR REFLECTS HIGH COMPETITION FOR MATES IN A TROPICAL BIRD

Ioana Chiver, Bridget Stutchbury, Eugene Morton

York University, Canada; Email: ichiver@yorku.ca

Tropical birds present an important opportunity to study the function of vocal signals in a breeding versus non-breeding context, as many species defend territories year-round but breed for only part of the year. An increase in singing effort during the breeding season is expected to be a consequence of courtship of mates or competition for extra-pair matings. We studied a population of red-throated ant-tanagers (*Habia fuscicauda*), a species with year-round territoriality, to determine seasonal changes in male singing effort and territory disputes. We also conducted paternity analysis to determine the presence of extra-pair young in the population. Singing effort and the frequency of border disputes increased significantly during the breeding season, particularly when females were fertile. Out of 41 nestlings in 19 broods, 17 (41%) nestlings in 10 (53%) broods were sired by a male other than the social father. Border disputes among neighboring pairs could be important in mate assessment for extra-pair matings. Our results suggest that seasonal variation in singing effort reflect high male-male competition for extra-pair mates rather than competition for territories.

298 Contributed Talk: COGNITION AND LEARNING VI (Friday AM)

LEARNING ABOUT NON-PREDATORS AND SAFE PLACES: THE FORGOTTEN ELEMENTS OF RISK ASSESSMENT

Douglas Chivers, Maud Ferrari

University of Saskatchewan, Canada; Email: doug.chivers@usask.ca

A basic concept related to antipredator response is the way in which prey distinguish predators from non-predators. Most research to date has focused on mechanisms allowing prey to learn to recognize predators. The paradox of predator learning is that its remarkable efficiency theoretically leaves room for potentially costly mistakes if prey inadvertently learn to recognize non-predators as risky. Here we show that mechanisms such as latent inhibition allow amphibians to collect information about non-predators during their embryonic development and to use this information later in life to infer on the nature of novel species in their environment. We found that embryonic woodfrog could learn to recognize a tiger salamander as a non-predator and showed that, as a result, tadpoles failed to learn salamander cues as risky. Surprisingly, the embryonic pre-exposure to salamander also prevented the learned recognition of a closely related newt, but salamander pre-exposure did not affect the ability of tadpoles to learn to recognize a fish as risky. Our results highlight the asymmetry in which amphibians incorporate information related to predators and non-predator on their decision-making

85 Contributed Talk: COMMUNICATION I (Tuesday AM)

RAPID ONSET OF DIET-QUALITY DETECTION VIA CHEMICAL SIGNALS IN A PLETHODONTID SALAMANDER

Adam Chouinard

Oregon State University, United States; Email: chouinad@onid.oregonstate.edu

Plethodontid salamanders have proven to be an excellent system for studying the social functions of pheromones. These chemical signals convey a surprising amount of information between individuals and facilitate numerous behavioral phenomena. One aspect of information conveyed via pheromones is the quality of the sender's diet, but it is unclear as to whether this information is actively produced by the sender (i.e. a pheromone) or simply inferred from non-pheromonal odors (i.e. a cue). The amount of time on different diets required for this to occur is also unknown. This research tested how quickly females could detect a difference between the scents of males on high- versus low-quality diets. Females were able to infer the quality of the male's diet after only one week of experimental feeding, independent of fecal cues. These data suggest a physiological pathway within the sender that relays changing environmental conditions (e.g. resource-availability) to a conspecific through chemical signals. This scenario highlights the ongoing interplay between an individual and its environment, as well as advertising the status of this relationship as an honest signal for mate assessment.

P99 Contributed Poster: GENETICS AND EVOLUTION 1 (Poster Session A: Weds. eve)

BEHAVIORAL GENETIC CHARACTERIZATION OF HUNTING IN DOMESTIC DOGS, *CANIS FAMILIARIS*

Budhaditya Chowdhury

Bowling Green State University, United States; Email:budhadc@bgsu.edu

A long history of selective breeding has endowed dogs with a fierce instinct to hunt and a keen desire to please. More than 50 breeds of hunting dogs show a phenotype of pointing behavior, where an energized searching run leads to a characteristic frozen stance, with one front leg tucked up and the muzzle pointing towards the location of the game bird. Such behavior offers a framework for an experimental dissection of the underlying physiological and genetic mechanisms. Focusing on behaviors under strong selective pressure, this project aimed to combine (i) spatial analysis, (ii) the use of objective quantifiable metrics, and (iii) whole genome sequencing to identify genetic signatures underlying instinctive behaviors. We have successfully characterized fundamental phenotypes of hunting behavior, such as speed, searching ability, and socio - spatial characteristics. This assessment has enabled us to select intra- as well as inter-breed subsets that can be probed in a subsequent genome wide association studies and candidate gene approaches.

P202 ABS Founders Award Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

WHO GOES TO THE MALL? THE SOCIAL ROLE OF COMMUNAL FORAGING AREAS FOR AMERICAN CROWS

Anne Clark, Andrea Vogel, Jennifer Campbell-Smith, Yvette Brown, Kevin McGowan

Binghamton University, United States; Email:aclark@binghamton.edu

American crows (*Corvus brachyrhynchos*) live in cooperative family groups living on territories year-round. They also forage communally off territory at sites of ephemeral (harvested fields) or stable (dumps) resource concentrations. In Ithaca, NY, Cornell University's Composting Facility provides stable, year-round communal foraging for a long-term study population of 30-50 families of marked crows. Using data from 4 years of watches at "the Compost" and behavioral observations on territories, we describe patterns of "Compost" attendance using social network analysis (UCINet). Crows vary markedly in "Compost" use, some forming a "central cluster" and others rarely visiting, variation not explained by distance from territory. Using individual attributes and social network descriptors, we asked 1) what are the attributes (age, sex, family status, etc) of crows that are or are not "Compost regulars", 2) how does centrality of crows at the Compost compare to their individual family network and their roles within it; 3) how time at the Compost varies by month and family activity (e.g. nesting). The goal is to understand the social function of such communal foraging.

P174 Contributed Poster: SEXUAL SELECTION 1 (Poster Session A: Weds. eve)

BACKGROUND CONTRAST AND SEXUAL ORNAMENTS INFLUENCE DETECTION OF MALE WOLF SPIDERS BY A PREDATOR

David Clark, Corinna Kizer, Andrew Roberts, George Uetz

Alma College, United States; Email:clarkd@alma.edu

Male wolf spiders (*Schizocosa ocreata*) actively search for females during the breeding season and run a high risk of exposure to potential predators. We used video playback to examine the ability of a predator, the American toad (*Bufo americanus*) to detect courting males as a function of distance, background (i.e. sunny vs. shady), and presence/absence of a visual component of male courtship display (foreleg tufts). We found no differences at a distance of 10 cm, but at 30 cm and greater, the percentage of toads detecting a courting male was significantly higher against sunny backgrounds than shady backgrounds. Likewise, beyond 30 cm the latency to orient was significantly less against the sunny background. In a choice test, toads oriented toward courting males with leg tufts more often than those without tufts. Results suggest that courting male wolf spiders are at risk of predation by toads, and that distance, contrast with the background, and the presence of foreleg tufts influences probability of detection. These findings suggest a possible tradeoff between reproductive success based on female preferences for decorations vs. costs of predator detection.

76 Contributed Talk: COGNITION AND LEARNING I (Tuesday AM)

BEHAVIOURAL AND BRAIN RESPONSES TO FLAVOURED-MEALS PAIRED WITH VISCERAL STIMULATIONS IN PIGS

Caroline Clouard, Mélanie Jouhannau, Marie-Christine Meunier-Salaün, Charles-Henri Malbert, David Val-Laillet

Institut National de la Recherche Agronomique (INRA), France; Email:caroline.clouard@rennes.inra.fr

Behavioural and brain responses towards conditioned flavours with different hedonic values were studied in twelve 30-kg pigs. During four 30-min conditioning sessions per flavour, the animals received a flavoured-meal paired with intraduodenal infusions of 15% glucose (FG), lithium chloride (FL), or saline (FS). Two-choice feeding tests were performed 1 and 5 weeks later, and in between, anaesthetised pigs were subjected to three PET brain imaging with exposure to the flavours. During conditioning, pigs spent more time inactive, explored and played less after FL than FS or FG meal. During the two-choice tests, the FS and FG flavours were significantly preferred over the FL flavour. FS was preferred over FG during the first test only. Exposure to flavours with different hedonic values induced metabolism differences in neural circuits involved in preference and aversion learning, feeding motivation, reward expectation and/or the characterisation of food palatability. In conclusion, post-ingestive visceral stimuli can modulate the flavour/food hedonicity and further feeding choices. Unconscious brain mechanisms are involved in flavour discrimination and expectation of food reward.

P164 Contributed Poster: RECOGNITION (Poster Session A: Weds. eve)

A NEW THEORY OF ANIMAL PHOBIA ACQUISITION

Geoff Cole, Arnold Wilkins

University of Essex, United Kingdom; Email:ggcole@essex.ac.uk

Two classical accounts of animal phobia acquisition argue that aversion to the critical stimuli is due to either a learned response or an innate phobic predisposition. The latter approach suggests that humans are innately predisposed to fear animals that pose a potential threat (e.g., snakes), whilst the former suggests that phobias occur via classical conditioning. There exists, however, many animal phobias that are difficult to explain with these two accounts such as the fear of fish (ichthyophobia). We assessed whether animal phobias are partly due to the phobic-inducing stimuli possessing a particular visual property known to induce stress in some observers. A spectral analysis was performed on 460 images of all the 23 animals that are associated with a recognised phobia (e.g., snakes & spiders). We compared their power spectra with control images of animals not associated with phobia. Results showed that the phobic-inducing animals possess relatively high luminance contrast energy

at mid-range spatial frequencies, a characteristic not possessed by non-phobic inducing animals. We suggest that the spectral characteristics of animals can contribute to an associated phobia.

P139 Contributed Poster: PARENTAL CARE 1 (Poster Session A: Weds. eve)

HOW DOES PARTIAL BROOD LOSS IN AMATITLANIA NIGROFASCIATUS AFFECT PARENTAL BEHAVIOR?

Justin Cole, Samantha Hilber, Colette St. Mary

United States; Email: JCSurf90@comcast.net

Previous studies examining the effects of brood loss on parental behavior, in biparental fishes, have found that males typically decrease the amount of care they provide offspring and are more likely to desert their mate and brood. Female care behavior often is unchanged. Our study was interested in understanding if parents respond similarly to brood loss when the offspring closer to independence. Changes in biparental Convict Cichlid (*Amatitlania nigrofasciatus*) behavior were examined after a partial brood reduction (45% of free-swimming fry over 4 days). Parental behavior was observed before partial brood reduction and after partial brood reduction. We expect that males will decrease the amount of care they provide offspring, because of the lowered benefits of providing care to a small brood, and the cost of lost (future) mating opportunity. Females may decrease the care provided to offspring for similar reasons as males.

P418 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

THE EFFECT OF GROUP SIZE ON RHEOTACTIC PERFORMANCE IN SCHOOLING GIANT DANIO.

Joseph Coleman, Sachit Butail, Derek Paley, Sheryl Coombs

Bowling Green State University, United States; Email: colemaj@bgsu.edu

When placed in a flow field, many fish exhibit positive rheotaxis, a tendency to swim upstream. Although rheotactic performance of individual fish has been characterized as a function of flow speed, little is known about rheotactic performance of conspecifics. In this study, we examine the effects of group size (N= 1, 2, 4z and 8) and flow speed (0 - 1 BL/s) on rheotactic performance of giant danio (*D. aequipinnatus*), a schooling species. Flow speed was not found to have an effect on rheotactic performance for group sizes smaller than 4, for which the mean % of time spent within +/- 45 deg of upstream was less than chance (25%) at all flow speeds. In contrast, the mean % of time spent upstream for the larger groups increased from chance to over 60%. Furthermore, the mean distance from the downstream end of the tank was significantly correlated with the degree of upstream orientation and larger groups of fish were significantly more likely to maintain an upstream position at higher flow speeds than smaller groups. These results indicate that rheotaxis is enhanced in larger groups of schooling fish. Future experiments will determine the proximal causes of the apparent enhancement.

P149 Contributed Poster: PREDATION AND FORAGING 1 (Poster Session A: Weds. eve)

FITNESS CONSEQUENCES OF SIBLING CANNIBALISM IN A BEETLE, LEPTINOTARSA DECEMLINEATA

Karyn Collie

The Graduate Center of the City University of New York, United States; Email: kcollie@gc.cuny.edu

Cannibalism is an extreme form of competition that provides a nutritional benefit for the cannibal while completely removing the competitor. In the potato beetle *Leptinotarsa decemlineata*, neonates eat sibling eggs, adding inclusive fitness costs that must be balanced by these benefits. In a study to measure direct fitness benefits of cannibalism, I provided neonates with either eggs and potato foliage or foliage alone. I then measured larval mass and developmental stage daily into adulthood. I also conducted a three-year field study to compare cannibalism rates from populations with different degrees of intraspecific competition. Finally, I examined whether mothers mediate cannibalism in response to environmental conditions by providing gravid females with either high- or low-quality plants for ovipositing and measuring resultant clutch sizes and the proportion of

unviable eggs. Results indicate that cannibalism does provide significant developmental benefits. Cannibalism rates also vary significantly between populations and seasons, which may be mediated by female provisioning of pseudo-trophic eggs.

195 Contributed Talk: SOCIAL BEHAVIOR IV (Thursday AM)

ASSESSING SYNCHRONY IN SOCIAL GROUPS: ARE YOU MEASURING WHAT YOU THINK YOU'RE MEASURING?

Lisa Collins, Lucy Asher

Queen's University Belfast, United Kingdom; Email:l.collins@qub.ac.uk

Behavioural synchrony is a measure of social behaviour, but has so far lacked a standard approach. Studies have varied greatly in the number of behavioural states considered and group sizes investigated. Very few published studies have considered the levels of synchrony expected by chance alone. Expected levels are sensitive to both the number of behaviour states being examined and group size, thus observed levels of synchrony should be compared against expected levels to provide meaningful standardised measures. We developed a simulation model to test four measures of behavioural synchrony commonly reported in the scientific literature. This model was tested against a dataset of laying hen social behaviour, and against a null (random) dataset. The results suggest that when fewer behaviour categories are recorded, 100% alignment was the method that most closely matched the true underlying level of synchrony. However, for more than three behaviour categories and for larger group sizes, this was no longer the case and more complex measures were required.

P83 Contributed Poster: ECOLOGICAL EFFECTS 1 (Poster Session A: Weds. eve)

OVIPOSITIONING BEHAVIOR OF *PIERIS RAPAE* (LEPIDOPTERA) ON INVASIVE AND CULTIVATED BRASSICA SPECIES

Rachel Collins, Ariel Firebaugh

Roanoke College, United States; Email:rcollins@roanoke.edu

Specialist, herbivore insects are "good mothers" when they oviposit on plants species that confer high fitness. When insect/plant systems are non-native, their relationship is important for conservation. We studied oviposit behavior of exotic cabbage white butterflies (*Pieris rapae*) on invasive garlic mustard (*Alliaria petiolata*; GM) and other brassica species. We hypothesized that if *Pieris* have an egg laying preference, then that plant species would confer high fitness for their offspring. We compared the egg laying preferences of *Pieris* on wild GM and other brassica species. Overwhelmingly, adults preferred to lay eggs on commercially-grown mustard greens (CMG; $P > 0.01$). We tested fitness: survival, fecundity, and total number of eggs laid. Larvae were fed one species: GM, CMG, or no-pesticide, garden-grown mustard greens (NPMG). Larvae fed GM had higher survival than larvae fed CMG. The higher survival resulted 450% more eggs laid in cohorts fed GM cohorts fed CMG. In these lab experiments, *Pieris* females preferred to oviposit on plants that conferred lower fitness suggesting *Pieris* egg laying behavior may be caused by GM antixenosis defenses.

P125 ABS Genesis & Charles H. Turner Award Poster: MECHANISMS 1 (Poster Session A: Weds. eve)

MEASURING WATER-BORNE CORTISOL IN SAILFIN MOLLIES: IS THE PROCESS STRESSFUL AND CAN IT BE MINIMIZED?

Adam Contreras, Caitlin Gabor

Texas State University - San Marcos, United States; Email:ac1597@txstate.edu

Recently, hormone research has turned to water-borne hormone collection techniques instead of measuring blood plasma hormones. While water-borne hormone collection can be less stressful, other stressors can be associated with this process. This study will observe stress response to water collections in the live-bearing fish sailfin mollies, *Poecilia latipinna*. Cortisol, a hormone released in response to stress, may potentially alter behavior and

interfere with the production of other hormones. Additionally, if an animal is stressed from handling, then cortisol production may become maxed out and could result in a reduced cortisol response to dependent variables in hormone research. Each fish will be confined to hormone collection beakers 1 hour, daily, over four days. On the fourth day, blood will be drawn to analyze the correlation between plasma hormones and water-borne hormones. This study will determine whether there is a pattern of stress response in the sailfin mollies and if they can habituate to water-borne hormone collection confinement within four consecutive days of testing. The results will also validate whether blood plasma and water-borne hormone levels are correlated

96 Contributed Talk: SEXUAL SELECTION I (Tuesday AM)

NATURAL SELECTION AND THE MAINTENANCE OF NUPTIAL GIFT IN TWO SYNTOPIC SPIDERS

Luiz Costa-Schmidt, Glauco Machado

Universidade de São Paulo, Brazil; Email: luizernesto@gmail.com

Spiders of the genus *Paratrechalea* offer a prey wrapped in silk as a nuptial gift (NG) during pre-copulatory courtship. Empirical experiments show that this NG is a male mating effort that chemically exploits female foraging motivation. *P. azul* and *P. ornata* are sister species with syntopic populations in southern Brazil. In heterospecific encounters, *P. ornata* males are frequently attacked and consumed by *P. azul* females, especially when males were carrying a NG, while *P. azul* males are rarely attacked and never consumed by *P. ornata* females. Therefore, NG increases conspicuousness of *P. ornata* males, making them more vulnerable to intraguild predation caused by *P. azul* females. As should be expected, *P. ornata* males invest in NG mostly when silk threads of receptive conspecific females are detected on the substrate. *P. azul* males build NG regardless the source of the silk threads. The information available so far indicates that male investment in NG is at least partially mediated by species recognition, suggesting a previously unsuspected role of natural selection on the expression of this sexual trait.

31 Symposium: PERINATAL INFLUENCES (Wednesday)

HOW NEWBORNS PERCEIVE COMPLEXITY: THE NOSE CAPACITIES.

Gérard Coureaud, Charlotte Sinding, Thierry Thomas-Danguin

CNRS - Centre des Sciences du Goût et de l'Alimentation, France; Email: gerard.coureaud@u-bourgogne.fr

All organisms face an environment inherently complex. From this complexity, they must extract information to survive. To that goal, they can either respond to constant stimuli, or rapidly acquire new information. Clearly, this challenge already exists at birth. Regarding olfaction, newborns may spontaneously respond to key-odorants, as the mammary pheromone (MP) in newborn rabbits, a molecule carried in the complex odor of milk. In addition, rabbit pups learn novel odorants from their perinatal environment. Strikingly, the MP by itself promotes the rapid acquisition of other, simple or complex, odors and constitutes an interesting tool to investigate how the neonatal brain deals with olfactory complexity. Here, we will illustrate the capacity of neonatal olfaction to function in the elemental way, through the extraction of the component's odors into a mixture, and in the configural way, through the perception of a new odor distinct from the constituents' ones. Similarities exist with human adults. Thus, from early in life, mammals may grasp their chemosensory surroundings through diverse perceptual strategies, contributing to their optimal adaptation.

P3 Contributed Poster: APPLIED ANIMAL BEHAVIOR 1 (Poster Session A: Weds. eve)

IMPACT OF HABITAT SIZE ON REPETITIVE BEHAVIOR AND ACTIVITY BUDGETS OF ELEPHANTS AT LOS ANGELES ZOO

Cathleen Cox, Shari Carroll, Nancy Yen, Ruth Yakushiji, Marissa Heil, Jennifer Becker

Los Angeles Zoo, United States; Email: Cathleen.Cox@lacity.org

Elephants are among the largest terrestrial animals and have remarkable cognitive abilities. In captivity elephants are often engage in repetitive activity. One explanation for repetitive activity is that it results from limitations in

available space; another is that it results from lack of appropriate environmental and/or social stimulation. In 2011 three Asian elephants, *Elephas maximus*, were introduced to a newly designed and considerably larger elephant habitat that totals 3.8 acres of usable space. This habitat is subdivided into several yards ranging in size from 0.25 to 1.60 acres and each yard has features that engage the elephants in exploration and foraging. The elephants occupy different yards on different days. In this study we compare elephant activity budgets using 2-way ANOVAs with individual elephants and different yards as independent variables. There is a significant difference between individuals in time spent in repetitive activity. However, there is no significant difference between yards in time spent in repetitive activity. This data does not support the hypothesis that repetitive activity results solely from space limitations.

165 Contributed Talk: COMMUNICATION II (Wednesday AM)

VARIATION IN VISUAL SENSITIVITY AMONG BOWERBIRDS AND THE IMPLICATIONS FOR COLOR SIGNAL DESIGN

Brian Coyle, Gerald Borgia, Karen Carleton, Nathan Hart

University of Maryland, College Park, United States; Email:bjcoyl@gmail.com

Bowerbirds are well known for their complex sexual color displays that are highly differentiated among species, yet our understanding of the evolution of color communication in this important avian model for sexual selection research is limited by a lack of information about their visual systems. Recent research highlights the importance of co-evolution between visual sensitivity and color signals. In particular, studies of fishes support the sensory drive model that attributes display diversity to adaptive variation in visual sensitivity. Here, we compared the visual systems of bowerbirds to assess possible association between sensitivity and colorful displays. Previous work found no difference ultraviolet sensitivity based on comparison of SWS1 opsin sequence. We sequenced the remaining classes of opsins and quantified relative proportions and intra-retinal distribution of cone photoreceptors and performed spectrophotometry to characterize the spectral properties of ocular media, visual pigments and colored oil droplets. These results have important implications for understanding the role of tuning in signal design among birds and other colorful terrestrial taxa.

P16 Contributed Poster: COGNITION AND LEARNING 1 (Poster Session A: Weds. eve)

AUDIENCE EFFECTS ON COGNITIVE TASK PERFORMANCE IN CAPUCHIN MONKEYS (CEBUS APELLA)

Sean Coyne, Erica Dunayer, Peter Judge

University of Chicago, United States; Email:spcoyne@uchicago.edu

Capuchin monkeys (*Cebus apella*) were tested on a cognitive task in three social contexts to determine social influence on performance, if any. The social contexts included: alone, a dominant individual nearby, and a subordinate individual nearby. The study was designed such that social context was the only variable influencing performance, unlike past studies whereby animals could physically interact. We predicted that the presence of a dominant individual would reduce task performance compared to the other conditions. The cognitive test was a match-to-sample discrimination task in which animals matched combinations of eight geometric shapes. Subjects successfully completed trials under all conditions. Results indicated that there were no significant differences in task performance across social conditions. Results are contrary to past studies reporting low status monkeys who "play dumb" when testing in a mixed social context. Results suggest that mere presence of a dominant individual does not necessarily affect performance on a cognitive task, but rather the imminence of physical aggression is the most important factor influencing testing in a social context.

166 Contributed Talk: COMMUNICATION II (Wednesday AM)

TRILL PERFORMANCE AND TRILL CONSISTENCY DO NOT AFFECT MALE RESPONSES TO PLAYBACK IN HOUSE WRENS

Emily Cramer, Sandra Vehrencamp

Cornell University, United States; Email:erc25@cornell.edu

Handicap and indicator signals are interesting because the costs maintaining signal reliability are clear. Two components of bird song, trill performance and consistency, have recently received attention as potential indicator or handicap signals of male quality. Virtually all published studies find support for these song components' role in communication either via differences in receiver responses or correlations between signaling ability and male quality. Moreover, mechanistic arguments suggest that producing high performance and/or high consistency trills is physically difficult, creating an intuitively appealing explanation for the constraint on signal production. We conducted a playback on house wren (*Troglodytes aedon*) males to test the hypothesis that males discriminate among songs using trill performance and consistency characteristics. Despite ample variation in males' responses and high sample size, we found no evidence that males responded differently to songs with different trill characteristics. This is one of the first studies to show no effect of trill performance and consistency on receiver responses, and explanations for the lack of response are considered.

P345 Contributed Poster: MECHANISMS 2 (Poster Session B: Thurs. eve)

STRESS PHYSIOLOGY, SEXUALLY SELECTED TRAITS, AND REPRODUCTIVE SUCCESS IN THE MOUNTAIN WHITE-CROWNED

Ondi Crino, Creagh Breuner

University of Montana, United States; Email:ondicrino@gmail.com

Individuals vary greatly in how they perceive and respond to stress. Sustained exposure to glucocorticoid hormones (the dominant steroids released in response to stress) are known to decrease body condition and immune function and may reduce survival, yet the effects of glucocorticoids on reproductive success are largely unknown. Glucocorticoids could affect reproductive success by modulating the expression of sexually selected traits. We investigated the associations between glucocorticoid physiology and both reproductive success and the expression of sexually selected traits in the mountain white-crowned sparrow (*Zonotrichia leucophrys oriantha*). Specifically, we compared stress hormone levels with nestling condition (a proxy for reproductive success) and three sexually selected traits: territorial defense, song quality, and crown coloration. Males with stronger stress responses vocalize less in response to a simulated territorial intrusion compared to males with lower stress responses. Additionally, males with strong stress responses rear nestlings in poor condition. These results suggest that stress physiology may have important consequences on reproductive success

222 Contributed Talk: PREDATION AND FORAGING I (Thursday AM)

ANTHROPOPHILY IN THE LIFE OF A MOSQUITO-EATING PREDATOR

Fiona Cross, Robert Jackson

University of Canterbury, New Zealand; Email:fiona.r.cross@gmail.com

Jumping spiders (Salticidae) are renowned for having unique, complex eyes and for seeing with exceptional spatial acuity. Not surprisingly, research on their vision-based behaviour has predominated in the literature. However, *Evarcha culicivora* is unusual for a salticid, as this East African species makes proficient use of olfaction, and some of the ways in which it uses olfaction have shown some remarkable convergences. *E. culicivora*'s preferred prey are blood-carrying mosquitoes, and this spider can identify its unusual prey by sight alone and by olfaction alone. However, *E. culicivora*'s use of olfaction goes further than this, and how it incorporates olfaction in its unusual predatory strategy will be discussed. For example, *Anopheles gambiae* is a mosquito species commonly found in *E. culicivora*'s habitat, and it is a mosquito notorious as a vector for human malaria. Human odour is salient to this mosquito, but recent findings have shown that this odour is also salient to *E. culicivora*.

58 Symposium: SENSORY NEUROECOLOGY (Thursday)

PREDICTING SIGNAL DIVERSITY IN THE COLOR AND POLARIZED REALM OF FISHES

Molly Cummings

University of Texas, Austin, United States; Email:mcummings@mail.utexas.edu

The underwater lightfield produces constraints on the visual and signalling world of its inhabitants. Here I examine the signal solutions to these constraints in two different aquatic systems: marine surfperch and freshwater swordtails. The extreme optical variability in the California kelp forest results in tremendous fluxes in background spectral and intensity features. Species-specific differences in surfperch optical habitats promotes the divergence of detectional biases (and a trade-off) for brightness or color contrast detection. Divergence in male signals, both color pattern reflectance and display behaviour, is predicted by each species' sensory bias. In the near-surface habitat of the freshwater swordtail, the highly structured yet angular-dependent polarized lightfield represents a complex backdrop for communication. Here we show that swordtails have evolved polarized ornamentation, as well as a female preference for this ornamentation, in this complex environment.

197 Contributed Talk: SOCIAL BEHAVIOR IV (Thursday AM)

THE FUNCTIONS OF INTRASEXUAL MALE AGGRESSION IN A ROLE-REVERSED MAMMAL

Leslie Curren, Kay Holekamp

Michigan State University, United States; Email:currenle@msu.edu

In most mammals, males compete intrasexually over access to such resources as food, females, and territory. Whereas in many species this competition manifests as male-male combat, spotted hyenas (*Crocuta crocuta*) present a striking contrast: intrasexual combat is typically of very low intensity relative to that in other species. This is most likely because the high degree of female control over copulation in this species means that gaining access to females does not imply access to copulations. However, male-male aggression does regularly occur, occasionally even causing injury to the recipient. If aggression does not directly result in copulations, what is the function of this behavior? Here, we address this question by testing three hypotheses, using a model selection approach to evaluate the relative support for each. First, we propose that male-male combat in this species may be over access to food. Second, males may act aggressively over access to territory. Finally, we test the hypothesis that females prefer to mate with aggressive males, suggesting that intrasexual male aggression is a courtship display for females.

P253 Contributed Poster: COGNITION AND LEARNING 2 (Poster Session B: Thurs. eve)

PERSEVERATION AND LEARNING IN ORANGE WINGED AMAZON PARROTS, *AMAZONA AMAZONICA*

Victoria Cussen, Joy Mench

University of California, Davis, United States; Email:vacussen@ucdavis.edu

Although perseveration of responses is hypothesized to underpin some stereotypic behavior in captive animals, little work has classified individual differences in perseverative tendencies. Captive-bred parrots (N=13) were tested on a Hamilton Search task, 15 trials per day for 5 days, to evaluate perseveration during trial-and-error learning. There was a significant decrease in number of choices on day 5 of testing ($p=0.0014$). 50% of all responses were classified as perseverative, ranging from 22% to 77% of responses across birds. There was no significant decrease in either the proportion of perseverative responses in general ($p=0.39$), or the number of highly perseverative errors ($p=0.40$), nor was there a significant difference in number of choices made on day 5 between high and low perseverative birds ($p=0.296$). The results indicate perseverative errors are independent of the animal's ability to learn. A significant proportion of perseverative errors were associated with the least preferred choice location ($p=4.76-9$), suggesting some of these errors were triggered by location avoidance. Future work will correlate individuals' degree of perseveration with stereotypic behaviors.

236 Contributed Talk: COMMUNICATION IV (Thursday PM I)

AN INVESTIGATION OF SYNTAX IN A COMPLEX VOCAL SIGNAL: DUETS OF THE YELLOW-NAPED AMAZON, *AMAZONA AURO*

Christine Dahlin, Timothy Wright

New Mexico State University, United States; Email: crdahlin@gmail.com

Signals in many species are characterized by syntax (rules governing note order), but the relationship of syntax to communicative function is not always well understood. Mated pairs of yellow-naped amazons, *Amazona auropalliata*, produce coordinated acoustic duets used for territory defense that follow a defined syntax. We tested the hypothesis that duet syntax is critical for communicative function by presenting territorial pairs with two types of playbacks: normal duets and duets with broken syntax (i.e. duets in which one of the syntactic rules was broken). We predicted that pairs would respond less strongly to broken syntax duets, with fewer vocalizations and slower approaches. Generally, pairs responded strongly to both playback treatments, although we did observe marginally longer latencies to loudspeaker approach after broken syntax duets, suggesting that pairs can differentiate between normal and broken syntax. One interpretation is that correct syntax is not critical to duet function; alternatively, birds may have responded strongly to all playbacks because nesting territories are too valuable to ignore the threat posed by any intruders, even those using broken syntax.

156 Contributed Talk: COGNITION AND LEARNING III (Wednesday AM)

LONG-TERM MEMORY FORMATION IS BLOCKED BY LOW CALCIUM AVAILABILITY IN A FRESHWATER SNAIL

Sarah Dalesman, Marvin Braun, Vikram Karnik, Ken Lukowiak

University of Calgary, Canada; Email: sarah.dalesman@ucalgary.ca

Dissolved calcium availability limits the distribution of many freshwater organisms, thought primarily due to limitations on growth and reproduction. For calciphiles, such as the great pond snail, *Lymnaea stagnalis*, environmental calcium is considered to be the major abiotic limitation on their distribution, with a lower limit of 20 mg/l cited. Here we investigate how *L. stagnalis* responds behaviourally to environmental calcium availability at levels experienced by natural populations. In our standard calcium environment (80 mg/l) snails form long-term memory (LTM: ~ 24 h) following operant conditioning to reduce aerial respiration. However, acute exposure to low environmental calcium (20 mg/l) blocks their ability to form LTM, demonstrated both behaviourally and via a reduction in the electrophysiological response to training in a neuron of the central pattern generator that controls aerial respiration, RPeD1. We demonstrate that this is due to the snail's ability to directly sense calcium availability in their environment. Thus, despite this species surviving in low calcium environments, they exhibit less adaptability due to a decreased capability of forming memory.

P419 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

SUBORDINATE EASTERN CHIPMUNKS PREFERENTIALLY ROB THE CACHES OF DOMINANT ANIMALS

Katherine Daniels, Lynn Devenport

United States; Email: katey.daniels@gmail.com

This study sought to examine whether particular traits, in this case, relative dominance influences whether *Tamias striatus* chooses to retrieve their own caches or exploit those of others. We assessed dominance status by observing the agonistic interactions of same-sex pairs. Once social status was determined, animals were allowed to cache, and one member of the pair was subsequently given the option of either recovering seeds from their own caches or pilfering those of their status-opponent partner. We found that dominant animals chose to recover more seeds from their own caches while submissive animals specialized in pilfering the caches of their dominant partner. This preference for pilfering was expressed in their first choice. These results suggest that a social trait affects the decision of whether or not to pilfer. It is possible that these observed differences could be the result of a more general behavioral syndrome.

P391 Contributed Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

NUPTIAL THIEF: MALE SPIDERS STEAL FOOD FROM MATING PARTNERS

Anne Danielson-Francois, Yevhen Drobot

University of Michigan - Dbn, United States; Email: danfranc@umd.umich.edu

Adult male spiders do not build webs. Once males molt to maturity, they wander in search of females to mate. For orb-weaving spiders, not building a web means that no prey can be captured and hence males cannot feed themselves. In some sexually dimorphic orb-weaving species with extremely tiny males, such as *Nephila*, the males are kleptoparasitic and subsist on the leftover remains of prey not eaten by females. No spider species has been observed to have males that steal prey items caught by females. Here, we report for the first time that males of at least one orb-weaving species, *Tetragnatha elongata*, are able to feed as adults by actively stealing food from their female partners after mating. We collected adult *T. elongata* in southeastern Michigan and performed 165 staged matings in the laboratory. We found that male food-stealing behavior was significantly influenced by the relative body masses of males and females. When the difference in body mass was minimal, males were able to steal prey. This finding suggests that males may have a trade-off between acquiring food resources and achieving greater reproductive success with larger more fecund females.

265 Contributed Talk: ECOLOGICAL EFFECTS III (Thursday PM III)

THE INDIRECT EFFECTS OF POPULATION DENSITY ON BEHAVIOR IN RED SQUIRRELS

Ben Dantzer, Andrew McAdam, Stan Boutin, Murray Humphries

Michigan State University, United States; Email: dantzer@msu.edu

A recent development is that predators can negatively influence the demographic parameters of their prey simply by inducing antipredator behavior. Similarly, population density may directly influence the behavior of conspecifics via its direct effects on the frequency of antagonistic interactions but also indirectly by behavioral time budgets. We used both observational and experimental approaches to examine how population density affects the frequency of antagonistic physical and acoustical interactions and modifies behavioral time budgets in territorial red squirrels. We found that the frequency of territorial intrusions was negatively associated with population density, but the frequency of territorial vocalizations was positively associated with increases in population density. Squirrels experiencing naturally or experimentally high density conditions spent less time in the nest and feeding but more time vigilant for conspecifics. This study demonstrates that the density-dependent changes in behavioral time budgets could also induce changes in survival and reproduction above and beyond the direct effects of antagonistic physical or acoustical interactions.

P203 Contributed Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

TEMPORAL DIFFERENCES IN AFFILIATIVE BEHAVIOR AMONG MALE VERVET MONKEYS, *CHLOROCEBUS AETHIOPS*

Jennifer Danzy Cramer, J. Paul Grobler, Nelson Freimer, Trudy Turner

University of Wisconsin, Milwaukee, United States; Email: jldanzy@uwm.edu

Vervet monkey grooming and proximity behaviors are important to sociosexual relationships. Captive studies suggest that dominant males affiliate more with females and juveniles and females are more tolerant of subordinate males who are tolerant of their offspring. We examined patterns of male behavior during a mating season to examine if rank predicted male affiliation with females and juveniles. Data were collected from two troops in South Africa during April-July 2010. In both troops, rank did not predict affiliative behavior. We also examined temporal trends in intra-individual behavior. Males spent significantly more time with females and juveniles in the morning (38%, 47%) than the afternoon (15%, 13%). At this site, vervets engage in sunbathing that is marked by close social proximity and behavioral stasis. Male affiliation with females and juveniles was significantly higher on sunbathing mornings (28%, 31%) than other mornings (14%, 22%). We suggest that these differences in male affiliative behavior between captive and free-ranging populations may be due to climatic differences that promote close social proximity. This research was supported by NIH R01RR016300.

32 Symposium: PERINATAL INFLUENCES (Wednesday)

PRENATAL EMBRYONIC LEARNING: EVIDENCE FROM THE CUTTLEFISH, *SEPIA OFFICINALIS*

Anne-Sophie Darmaillacq, Jean Boal, Ludovic Dickel

University of Caen Basse-Normandie, France; Email:anne-sophie.darmaillacq@unicaen.fr

The ability to learn about chemosensory stimuli in the prenatal period is now well established in a wide variety of vertebrates. This ability may help to shape development and behavior. Here, we review recent evidence that prenatal sensory exposure influences post-hatching prey preference in cuttlefish. Hatchling cuttlefish typically prefer to prey on shrimp rather than crabs. Cuttlefish visually familiarized to crabs *in ovo* had a subsequent visual preference for crabs rather than shrimp. Cuttlefish visually familiarized to white crabs *in ovo* had a subsequent visual preferences for white crabs rather than crabs of another color (intra-categorical discrimination) and black crabs rather than shrimp (prey generalization). Prenatal chemical exposure to prey did not influence later prey selection based on odors but did influence later prey selection by sight. Taken together, these results show that cuttlefish embryos have complex cognitive skills that may confer adaptive advantages to young cuttlefish when they hunt for food shortly after hatching.

P126 Contributed Poster: MECHANISMS 1 (Poster Session A: Weds. eve)

THE NEUROBIOLOGY OF DRUG-SENSITIVE REWARD IN CRAYFISH *ORCONECTES RUSTICUS*

Udita Datta, Robert Huber

Bowling Green State University, United States; Email:udatta@bgsu.edu

The medical, social, and psychological toll from substance abuse is immense. It is imperative that we gain a better understanding of the psychobiological aspects of motivation, memory, cognition, and other behaviors induced by the administration of the drugs. With a modularly organized nervous system and reward that is sensitive to human drugs of abuse, crayfish offer a new model for studying the biological basis of drug addiction. Two conditioning approaches were developed. An automated place conditioning paradigm pairs drug application with the movement patterns of a test animal. An operant conditioning paradigm allows crayfish to control drug application through exploratory behavior. In future, these paradigms will allow us to (1) characterize the system's behavioral and neural properties, (2) measure reward strength of different drugs, (3) assess dose response curves for drug-sensitive reward, and (4) analyze the role of neurochemical axes using receptor pharmacology.

341 Contributed Talk: SOCIAL BEHAVIOR VI (Friday PM I)

PERSONALITY PREDICTS SOCIAL DOMINANCE IN FEMALE ZEBRA FINCHES

Morgan David, Yannick Auclair, Frank Cézilly

University of Burgundy & University of Quebec at Montreal, France; Email:Morgan.David@u-bourgogne.fr

Although personality has been defined as a suite of correlated behaviours, most studies of animal personality actually consider correlations between a few traits. Here we examined the repeatability and correlational structure of five potential personality traits (activity, neophobia, exploratory tendencies, risk taking behaviour, and obstinacy), in female zebra finches, *Taeniopygia guttata*. In addition, we assessed to what extent personality influenced social dominance in a feeding context in this gregarious species. All personality traits were found to be highly repeatable within individuals. In addition, except for obstinacy, all of them were found related to each other, thus defining a behavioural syndrome. Social dominance was predicted by personality, with proactive individuals being more likely to be dominant. Our results suggest that personality can be considered as a new static factor influencing within-group hierarchies. We finally discuss these results in terms of the consequences on the evolution of personalities and the need to take several traits into account to provide full descriptions of individual personality.

4 Plenary Lecture: (Wednesday PM)

CUCKOO ADAPTATIONS: TRICKERY AND TUNING

Nick Davies

University of Cambridge, United Kingdom; Email:n.b.davies@zoo.cam.ac.uk

The sight of a little warbler feeding a huge cuckoo chick has astonished human observers for thousands of years. Why are the hosts apparently being so stupid? I suggest that the cuckoo's adaptations are of two kinds. The first is trickery, which is how adult cuckoos and cuckoo eggs and chicks evade host defences. These cuckoo adaptations have coevolved with host counteradaptations. The second is tuning which is how, once accepted, cuckoo egg and chick development are attuned to host incubation and provisioning strategies. Cuckoo trickery involves adaptations to counter successive lines of host defences and includes: tricks for gaining access to host nests, egg trickery and chick trickery. In some cases, particular stages of host defence and hence their corresponding cuckoo tricks, are absent. I discuss three hypotheses for this curious mixture of exquisite adaptation and apparent lack of adaptation: Different lines of defence best for different hosts, strategy blocking and time for evolution of defence portfolios.

P275 Contributed Poster: CONSERVATION (Poster Session B: Thurs. eve)

GENERALIZATION OF INTRODUCED PREDATORS BY A THREATENED SALAMANDER

Drew Davis, Caitlin Gabor

Texas State University - San Marcos, United States; Email:dd1292@txstate.edu

The introduction of novel predators may be detrimental to prey species, especially if they lack the ability to recognize these predators. One such species affected by introduced predators is the federally threatened San Marcos salamander, *Eurycea nana*. Predator-naïve (captive hatched) salamanders decreased activity in response to the chemical cues of both a native predator (*Micropterus salmoides*) and an introduced predator (*Lepomis auritus*). Since there are native congeneric predators in the San Marcos River, it is possible that there are similarities among *Lepomis* which are detected by salamanders. We examined the antipredator response of predator-naïve salamanders to chemical cues from (1) a native *Lepomis* (*L. cyanellus*), (2) an introduced *Lepomis* (*L. auritus*), (3) an allopatric *Lepomis* (*L. gibbosus*), (4) a sympatric introduced cichlid (*Cichlasoma cyanoguttatum*), and (5) a blank water control to further understand predator recognition by *E. nana*. Analyses reveal that salamanders reduced activity to all predator treatments suggesting that *E. nana* make generalizations about novel predators.

228 Contributed Talk: PREDATION AND FORAGING I (Thursday AM)

CONSPECIFIC PHENOTYPIC STATES INFLUENCE REPRODUCTIVE DECISIONS IN NONSOCIAL INSECTS

Jeremy Davis, Annamarie Pasqualone

Vassar College, United States; Email:jedavis@vassar.edu

The behavioral and physiological phenotypes of nearby conspecifics are a potentially usable source of information about the environment. Several studies on vertebrates have shown the use of such 'inadvertent social information,' but the extent to which insects use the phenotypes of conspecifics (as opposed to merely their presence or abundance) is less well understood. In this study, we explored how egg maturation and oviposition was influenced by social information in the walnut husk maggot (*Rhagoletis suavis*). We demonstrate that recently emerged females held in the presence of egg-bearing conspecifics mature eggs faster than females held with mature, but eggless, conspecifics. Furthermore, when given egg-laying opportunities, females that observed conspecifics actively laying eggs began the sequence of oviposition more readily than females that observed non-ovipositing conspecifics. Our results indicate that even specialist, non-social insects can make sophisticated use of inadvertent social information present in the physiological and behavioral states of conspecifics.

P420 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

SOCIALITY IN FRESHWATER AQUATIC TURTLES (EMYDIDAE)

Karen Davis

University of Tennessee, Knoxville, United States; Email:kdavis23@utk.edu

Turtles are little studied with respect to social behavior in spite of being phylogenetically a central group. Detailed comparative studies of social dynamics (such as social behavioral repertoire, categories of behavior, and dominance hierarchies), especially of aquatic turtles, are rare. This study investigated underwater turtle social behavior using naturalistic observations of an established mixed species group of closely related freshwater turtles (Emydidae) at the Tennessee Aquarium in Chattanooga. Turtle social behavioral repertoire and interaction sequencing while underwater were far more complex and varied than those recorded for turtle basking interactions. Turtles formed stable dominance hierarchies, but also had marked preferences for associating with conspecifics. These findings indicate that turtles are active social animals that interact preferentially with conspecifics. More studies into the social complexity of turtles of many species are needed and may be essential for their conservation.

P254 Contributed Poster: COGNITION AND LEARNING 2 (Poster Session B: Thurs. eve)

THE ROLE OF THE CHOLINERGIC SYSTEM AND CEREBELLUM IN SPATIAL COGNITION IN ZEBRA FINCH

Lainy Day, Diarra Williams, Brittany Simpson, Madeline Coltharp, Joshua Hamer, Gerald Stinson

University of Mississippi, United States; Email:lainyday@olemiss.edu

Spatial learning is associated with hippocampal function, but is also known to engage the cholinergic system and the cerebellum in mammals. We tested the role of these systems in spatial learning in birds. Spatial learning was measured using a spatial escape maze developed in our lab. Birds were required to escape through a hole in a clear cylinder to avoid a warm floor (54°C). The cylinder was located inside a curtain-lined aviary with prominent visual cues hung level with the cylinder. Birds were given 120 sec to escape the maze and allowed 60 sec to rest in the aviary before being returned to their home cages. Birds were trained for seven days with four trials per day. The last trial on the seventh day was a probe trial during which a cylinder with no escape replaced the escape cylinder and cues were rotated 180°. We tested the effects of: 1) scopolamine, a cholinergic muscarinic antagonist, known to effect homing in pigeons or schizandrol A, a purported cholinergic enhancer; 2) Sex differences in scopolamine action on the cholinergic system, and 3) puncture lesions of the medial cerebellar nuclei. Results suggest conservation of these systems in spatial learning in vertebrates.

349 Contributed Talk: COGNITION AND LEARNING VII (Saturday AM)

SOCIAL COGNITION: AN AUDIENCE EFFECT, AND VISUAL PERSPECTIVE TAKING IN MACAQUES

Anne de Vries, Berry Spruijt, Elisabeth Sterck

BPRC, Netherlands; Email:vries@bprc.nl

The behavior of social animals can be affected by an audience. However, which cognitive processes are responsible for these audience effects remains ambiguous. We investigated audience effects in sexual behaviour of captive group-living rhesus macaques. To escape from monopolization by the alpha-male, females and subordinate males may hide their copulations. Indeed, copulations between females and subordinate males almost exclusively took place in absence of the alpha male. To investigate the cognitive processes possibly involved in hiding copulations, we studied visual perspective taking in an experimental setting. We constructed pictures of social interactions between 3 group members. The pictures differed in the gaze direction and facial expression of the middle individual. Each picture was either logical or unlogical as regards the combination of social hierarchy of the pictured monkeys and their facial expressions. Preliminary analysis indicated that macaques looked longer at unlogic compared to logic pictures. Therefore macaques understand the object of attention of conspecifics. The question remains whether macaques use this capacity to hide sexual behavior.

69 Symposium: COMMUNICATIVE COMPLEXITY (Friday)

EULEMUR, ME LEMUR: SPECIES DIFFERENCES IN SCENT-SIGNAL COMPLEXITY IN A PRIMATE CLADE

Javier delBarco-Trillo, Christine Drea

Duke University, United States; Email:delbarcotrillo@gmail.com

Signal complexity has been linked to social complexity, but not in chemical communication studies. We addressed this gap in a socially diverse, macrosomatic primate clade by comparing the chemistry of male and female secretions in eight *Eulemur* species that differ by social system (pair-bonded vs. multimale-multifemale or MM-MF) and dominance system (female- vs. co-dominant). We applied principal component and linear discriminant analyses to data obtained by gas chromatography/mass spectrometry. Beyond chemical effects of gland type, sex, season, species and phylogeny we found effects of social variables: Although closely related species shared similar chemical profiles, pair-bonded species had the most distinctive odors. Also, the chemical richness of female odors was greater in MM-MF than pair-bonded species, whereas the chemical richness of male odors was greater in co-dominant than female-dominant species. Lastly, the traditional sexual dimorphism in co-dominant species, with male complexity exceeding that of females, was reversed in female-dominant species. Thus, the glandular secretions of lemurs can also signal social and dominance systems. Funded by NSF IOS-0719003.

P255 ABS Founders Award Poster: COGNITION AND LEARNING 2 (Poster Session B: Thurs. eve)

THE BEHAVIORAL CORRELATES OF FRUSTRATION IN THE FOX SQUIRREL, *SCIURUS NIGER*

Mikel Delgado, Lucia Jacobs

University of California, Berkeley, United States; Email:mikeldelgado@berkeley.edu

While emotional state in animals can be assessed through physiological measures, overt behaviors may be a non-invasive way to evaluate emotions. To study the effect of emotions on cognition, an ethogram of associated behaviors must be validated. Omission of expected reward can lead to frustration, an emotional response associated with aggression in several species. Emotional arousal impacts attention, memory and decision speed. In this study, squirrels are trained to open a puzzle box to obtain reinforcement and then assigned to one of four experimental groups: the box can be opened but the reinforcement is of a lesser value; where no reinforcement is available when the box is opened; the box is locked, rendering reinforcement unavailable; a control group, where the expected reinforcement is available. Frustration level is quantified by overt emotional behaviors, including tail piloerection and flicking, foot stamping, teeth grinding, vocalization, and perseverance in interacting with the puzzle box before giving up on the task. A scale to measure frustration will be created based on these behaviors which can be used to evaluate effects of frustration on squirrel cognition.

P322 Contributed Poster: GENETICS AND EVOLUTION 2 (Poster Session B: Thurs. eve)

EXPERIMENTAL EVOLUTION OF AGGRESSION, FORAGING AND ANTIPREDATION IN *DROSOPHILA MELANOGASTER*

Michael DeNieu, Ian Dworkin

Michigan State University, United States; Email:denieumi@msu.edu

A major question in behavior is the impact of phenotypic correlations on evolutionary trajectories. Many studies have found phenotypic correlations among several behavioral contexts including territoriality, courtship, foraging and predation. Because of these correlations, organisms cannot respond optimally to all contexts leading to the evolution of potentially maladaptive behaviors. As a result, trade-offs are generated for a particular behavioral type between favorable and non-favorable contexts. In order to better understand how phenotypic correlations affect evolution during adaptation, we investigated aggression and foraging in two replicate experimental evolution populations in which fruit flies (*Drosophila melanogaster*) have been subjected to predatory selection by nymphs of the Chinese mantis (*Tenodera aridifolia sinensis*) for 60 generations. Predatory

assays using mutants of the *foraging* gene and lines artificially selected for high aggression show the expected trade-offs in which low foraging and low aggression phenotypes have higher survival. Contrary to expectations, both predator populations show complex patterns of aggression and foraging.

266 Contributed Talk: ECOLOGICAL EFFECTS III (Thursday PM III)

CULTURAL EVOLUTION IN AN URBAN SONGBIRD AFFECTS COMMUNICATION

Elizabeth Derryberry, David Luther

Louisiana State University, United States; Email: ederry1@lsu.edu

Animals in urban areas often must adjust their vocalizations to be heard over the din of anthropogenic ambient noise. Most studies of this process compare current environments that vary in noise; here, we evaluate the effects of the urban environment on signal structure and salience over time. We show that white-crowned sparrow (*Zonotrichia leucophrys*) song increased in minimum frequency between 1969 and 2005 in San Francisco, CA coincident with rising levels of traffic noise. A higher minimum frequency is less likely to be masked by low frequency ambient noise and thus is more likely to be effective as a communication signal. To test if this change in song affected receiver response, we presented current and historical local songs to territorial males. Males responded more strongly to current than to historical songs, suggesting that current songs may communicate more effectively in the current local environment. The strength of discrimination varied significantly with ambient noise levels, such that males on moderately loud sites discriminated most. Overall, results suggest that behavioral adjustment to anthropogenic ambient noise over time affects communication.

P276 Contributed Poster: CONSERVATION (Poster Session B: Thurs. eve)

PREDATOR RECOGNITION IN RESPONSE OF THE BARTON SPRINGS SALAMANDER, *EURYCEA SOSORUM*

Dominic DeSantis, Drew Davis, Caitlin Gabor

Texas State University - San Marcos, United States; Email: dd1298@txstate.edu

In many systems, predation is a dominant and influential factor. Little is known about how the federally endangered Barton Springs salamander, *Eurycea sosorum*, responds to predators. Recent studies on predator-prey interactions of a similar species, *E. nana*, have shown a complex response towards native and introduced predatory fish and that learning can influence this response. The largest population of *E. sosorum* is located in Eliza Spring, a restored habitat which currently lacks predatory fish. Using captive hatched (predator-naïve) salamanders, we examined the antipredator response of *E. sosorum* to chemical cues from (1) a predatory bass (*Micropterus salmoides*), (2) a predatory sunfish (*Lepomis cyanellus*), (3) a non-predatory fish (*Gambusia affinis*), and (4) a blank water control. Further understanding of how this endangered species responds to predators is important for future management and conservation efforts.

102 Contributed Talk: SOCIAL BEHAVIOR I (Tuesday AM)

THE RESPONSE OF SOUTHERN HAIRY-NOSED WOMBATS (*LASIORHINUS LATIFRONS*) TO THE PRESENCE OF FAECES

Kris Descovich, Allan Lisle, Stephen Johnston, Vere Nicolson, Clive Phillips

University of Queensland, Australia; Email: krysalyss@yahoo.com

The southern hairy-nosed wombat (*Lasiorchinus latifrons*) appears to use scent marking such as defaecation to aid social stability and signaling. This relies on the ability of the receiver wombat to distinguish between faeces from different sources. Four faecal types (male wombat, female wombat, dingo and a plastic control) were placed into the enclosures of 12 captive wombats. Behaviour was recorded over three nights (pre, treatment and post-). The presence of faeces stimulated hiding behaviour, with wombats using concealed locations more often when enrichment was present compared to pre- ($p = 0.002$) or post-treatment nights ($p = 0.03$). Grazing and walking significantly ($P > 0.05$) decreased over the treatment night. Pacing and exploratory behaviour was unaffected ($P < 0.05$). Wombats approached the dingo faeces more often than the plastic ($p = 0.004$) or female faeces ($p =$

0.05), and retreated more from other group members when male faeces were present than when plastic ($p = 0.02$) or female faeces ($p = 0.01$) were used. We conclude that the southern hairy-nosed wombat is highly sensitive to the presence of faeces, responding most to that of predators and male conspecifics.

232 Contributed Talk: COGNITION AND LEARNING IV (Thursday PM I)

COGNITIVE BIAS AS A MEASURE OF AFFECTIVE STATE IN SHEEP

Alexandra Destrez, Véronique Deiss, Alain Boissy

Institut National de la Recherche Agronomique (INRA), France; Email:alexandra.destrez@clermont.inra.fr

In laboratory animals stress-induced cognitive biases can persist after a long-term negative emotional experience. We investigated whether similar biases could be occurred in farm animals. Twenty-four lambs were submitted to a treatment of repeated stress during 6 weeks (i.e. exposure to various unpredictable, uncontrollable and aversive events every day and/or night) and 24 other lambs were used as control group. Before treatment all the lambs were trained to approach/avoid a food bucket depending on its location. After treatment lambs were individually exposed to two tests: i) a judgment test (JT) consisting of testing the response of lambs to ambiguous bucket locations and ii) a learning test (LT) consisting of daily training lambs to distinguish two visual stimuli differing by their colour and form. During JT treated lambs made more time to approach ambiguous buckets (ANOVA, $P > 0.05$). After 7 days of LT, 26% of treated animals vs. 65% of control learnt to distinguish the two stimuli. Therefore sheep experiencing repeated negative emotions demonstrated a pessimistic-like judgment and a learning deficit, which can be used to assess affective states in farm animals.

P346 Contributed Poster: MECHANISMS 2 (Poster Session B: Thurs. eve)

THE COMPLEX RELATIONSHIP OF MALE NORTHERN CARDINALS, AGGRESSION, AND TESTOSTERONE (T)

Susan DeVries, Caitlin Winters, Jodie Jawor

University of Southern Mississippi, United States; Email:msd6602@gmail.com

Ultimate causations of aggression are universal among most vertebrates; yet, proximate mechanisms supporting such behavior are diverse. Among birds, males of many temperate species support the 'challenge hypothesis', which proposes a causative relationship between transient elevations of T and aggression. However, such a relationship is not as clear for males of tropical taxa exhibiting longer periods of breeding and territoriality. We examined the relationship between elevated T and aggression of the male Northern Cardinal, a resident, temperate songbird exhibiting some ecological and behavioral characteristics typical of many tropical species. Surprisingly, T levels of male cardinals captured during simulated territorial intrusions (STI) did not differ from levels of T of passively captured individuals. Yet, males captured during STIs could significantly elevate T levels in response to gonadotropin-releasing hormone (GnRH) injections given immediately after capture. To our knowledge, this is the first report that males of a resident, temperate species can have the physiological capacity to transiently elevate gonadal T, but might not in short-term aggressive encounters.

P421 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

DO SOCIAL FACTORS INFLUENCE SEXUAL BADGE DIMORPHISM IN COOPERATIVELY BREEDING PUKEKO?

Cody Dey

McMaster University, Canada; Email:deycj@univmail.cis.mcmaster.ca

Despite a comprehensive understanding of secondary sexual traits in males, the mechanisms underlying elaborate trait evolution and maintenance in females remain elusive. Recent studies have suggested that the degree of reproductive skew (i.e. reproductive sharing) can influence the intensity of intrasexual competition and select for female elaboration. However, high reproductive skew is often associated with natal philopatry, and long-standing associations between related females may decrease the importance of secondary sexual characteristics in determining reproductive success. Using two New Zealand populations of cooperatively

breeding pukeko (*Porphyrio porphyrio melanotus*) that differ in the degree of female reproductive skew and philopatry, we test these competing hypotheses. Our results show that sexual dimorphism is decreased and females have more elaborate ornaments under conditions of low reproductive skew. We discuss why reproductive skew may not provide an accurate estimator of the degree of intrasexual competition, and highlight the importance of life history in defining the evolution of female traits.

P39 Contributed Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

SOUTHERN HOUSE WREN AND RUFIOUS HORNERO SONG PITCH DOES NOT CORRELATE WITH BACKGROUND NOISE LEVEL

Alexandre Dias, Rafael Braga, Diego Gil, Regina Macedo

Brazil; Email:afsdias@gmail.com

Several studies have shown that passerines can adjust their song when facing loud and constant noises, by changing frequency parameters. However, few bioacoustical studies have been carried out comparing oscine and suboscine songs relative to background noise level. Our aim was to test whether songs of *Troglodytes musculus* (oscine) and *Furnarius rufus* (suboscine) change according to different amplitude levels of low-pitched noise. Thirty individuals of each species were recorded in urban and rural areas in central Brazil, which exhibit high and low background noise levels, respectively (from less than 30 to over 70dB). The measurements extracted from each song recording were minimum frequency, maximum frequency and peak frequency; background noise level was also measured during each event. None of the song variables showed a significant correlation with background noise amplitude. However, we highlight the need for future studies addressing a broader range of bird species, especially in tropical regions, so that the relation between oscine and suboscine bird song and urban environments may be better understood.

P72 Contributed Poster: DEVELOPMENT (Poster Session A: Weds. eve)

SENSORY DEVELOPMENT: DO VERTEBRATES AND INVERTEBRATE SHARE THE SAME MECHANISM?

Ludovic Dickel, Mathieu Guibe, Marine Mortier, Cecile Bellanger, Sebastien Romagny

University of Caen Basse-Normandie, France; Email:ludovic.dickel@unicaen.fr

During embryogenesis, sensory systems do not develop simultaneously and their developmental sequence is the same in all vertebrates. Tactile system is the first to become functional, followed by vestibular, chemical, acoustic and then visual system. However and to our knowledge, no study has explored yet this sequence in an invertebrate species. Embryonic development in cuttlefish has been sub-sampled in 30 morpho-anatomic stages. From stage 23, cuttlefish embryos increase the frequency of mantle contractions as response to sensory stimulation. Cuttlefish embryos respond to both chemical (i.e. predator odor) and tactile (prick) stimuli from stage 23 and to visual stimulus (i.e. light) from stage 25. This study demonstrates for the first time that cuttlefish and vertebrates could share the same sequence of sensory development. Evolutionary outputs are briefly discussed. This study is an opening for further experiments dealing with sensory development cognition and welfare in embryo.

P347 ABS Founders Award Poster: MEHCANISMS 2 (Poster Session B: Thurs. eve)

VISUAL PERCEPTION AND OBJECT RECOGNITION OF THE AFRICAN CICHLID, MELANOCHROMIS AURATUS

Jeremy Didion, Robert Huber, Moira van Staaden

Bowling Green State University, United States; Email:jeremyd@bgsu.edu

African cichlids, one of the richest concentrations of vertebrate species on earth, provide a model system for understanding speciation. As diurnal species of clear, shallow rocky habitats, visual cues appear to be of vital importance in mate choice and sexual selection. This project explores the visual perception and object recognition in the African cichlid *Melanochromis auratus* of Lake Malawi. Understanding the primary visual

constraints of this species will give us insight into how this species recognizes mates from other mbuna species. Using an unconditioned behavior minimum threshold intensities were measured for each color wavelength. The role that shape and color play in object recognition was tested with an operant conditioning setup. Although both cues are used, reliance on color seemed to dominate over matching shape information. The visual constraints that guide these behavioral decisions may also likely be structured by and reflected in feeding habits, species recognition, and mate choice.

237 Contributed Talk: COMMUNICATION IV (Thursday PM I)

PREDATOR-ASSOCIATED VOCALIZATIONS IN NORTH AMERICAN RED SQUIRRELS: TO WHOM ARE CALLS ADDRESSED?

Shannon Digweed, Drew Rendall

Grant MacEwan University, Canada; Email: digweeds2@macewan.ca

Alarm vocalizations produced by prey species encountering predators can serve a variety of functions. North American red squirrels are a small-bodied mammal known for producing loud, conspicuous alarm calls, but functional accounts of calling are few and contradictory. We recorded the production of alarm calls during squirrel encounters with natural predators and in a series of simulated predator experiments. We tested for variation in call production patterns consistent with three traditional hypotheses concerning the conspecific warning functions of alarm calling: warnings to kin, to potential mates, or to territorial neighbors with which callers have an established relationship. Patterns of calling did not provide clear support for any of these hypothesized functions. We also consider the possibility that conspicuous calls given by red squirrels during encounters with predators are directed at the predators themselves and function to announce their detection and possibly deter them. An important corollary of this account is that red squirrel alarm calls probably do not entail referentially specific messages about different types of predator, as proposed previously.

P288 Contributed Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

NEIGHBOR-STRANGER DISCRIMINATION IN THE BOLIVIAN GRAY TITI MONKEY, CALLICEBUS DONACOPHILUS

Kimberly Dingess, Anna Gabel

Indiana University, United States; Email: kdingess@uemail.iu.edu

This study examined the response of Bolivian gray titi monkeys, *Callicebus donacophilus*, to playbacks of duets of strange and neighboring groups on the territory boundary. The results show a positive trend towards higher aggression in response to strangers than to neighbors, as measured in terms of latency to vocalize and approach to the speaker. Significant differences could be found in the time monkeys spent in proximity to the speaker as well as in the length of their vocal response. The results suggest that titi monkeys are able to discriminate between neighbors and strangers by their loud calls and maintain dear-enemy relationships with their neighbors avoiding unnecessary aggressive encounters. Unfamiliar groups, however, constitute a higher threat of usurping the territory, and an escalation might be worth the cost in this context. This study provides the first evidence of acoustic neighbor-stranger discrimination in a New World primate.

P73 Contributed Poster: DEVELOPMENT (Poster Session A: Weds. eve)

JUVENILE EXPOSURE TO ACOUSTIC SEXUAL SIGNALS ALTERS ADULT PERSONALITY IN FIELD CRICKETS

Nicholas DiRienzo, Jonathan Pruitt, Ann Hedrick

University of California, Davis, United States; Email: ndirienzo@gmail.com

Animal personalities have received a surge of attention in recent years. Much of the work has focused on personality during only a single life stage (typically adults), and fails to consider aspects of early life experience and how they may influence the development of adult personality. Exposure to environmental cues such as conspecific signaling or predator cues may provide relevant information as to the makeup of the forthcoming

environment. Individuals may use these cues to adjust developmental trajectory, and ultimately, adult personality in order to prevent a personality-environment mismatch. To test this we exposed early juvenile *Gryllus integer* field crickets to conspecific acoustic sexual signals, a relevant signal regarding the level of intersexual competition and overall population density. Another group was reared in silence, which mimics early season field conditions. Individual life history characteristics, such as growth rate and date of maturity were tracked. Aspects of adult personality, such as aggression and boldness were measured, as well as calling behavior. Preliminary results suggest that adult personality is influenced by juvenile experiences.

20 Symposium: SENSORY POLLUTION (Tuesday)

OCEAN ACIDIFICATION EFFECTS FISH BEHAVIOR AND SURVIVAL AS A CONSEQUENCE OF IMPAIRED CHEMORECEPTION

Danielle Dixson

James Cook University, Australia; Email:danielle.dixson@gmail.com

Approximately 30% of the additional CO₂ produced by humans over the past 250 years has been absorbed by the oceans. While ocean acidification is predicted to threaten marine biodiversity, the direct effect it will have on marine organisms remains speculative. Here, I discuss laboratory and field-based experiments designed to test the effects of ocean acidification on larval coral reef fishes. Dramatic changes were observed in the behavior of larvae when exposed to seawater treated with CO₂-enriched air (simulating scenarios predicted in the next 50-100 years). Larval fish reared in control seawater discriminated between a range of chemical cues used for settlement site selection and predator avoidance, however discriminatory ability was impaired in larvae reared elevated CO₂ conditions. Larvae exposed to elevated CO₂ were more active, exhibiting riskier behavior in natural coral-reef habitats; resulting in markedly higher mortality from predation than current-day controls, with mortality increasing with CO₂ concentration. The disruption of larval behavior could have profound effects on population replenishment and connectivity patterns of many marine species.

70 Symposium: COMMUNICATIVE COMPLEXITY (Friday)

DOES SOCIAL COMPLEXITY DRIVE THE EVOLUTION OF PRIMATE FACIAL EXPRESSION?

Seth Dobson

Dartmouth College, United States; Email:seth.dobson@dartmouth.edu

Previous studies suggest that animal communication systems evolve in correlation with social complexity. Does this pattern apply to primate facial expressions? I will address this question by examining the co-evolution of facial muscle mobility with two comparative measures of social complexity: group size and brain size. Because social strategies may be sex-dependent, I analyzed male and female data separately. Results indicate that male, but not female, group size is a significant predictor of facial mobility after controlling for body size. Similarly, facial mobility is significantly correlated with male, but not female, brain size after controlling for body size and diet. Although the effect of male group size on facial mobility is statistically significant, the data do not fit a deterministic model of evolution. In contrast, the relationship between facial mobility and brain size does appear to be governed by a deterministic evolutionary process. Future studies of the relationship between social complexity and communication should take into account possible sex-dependent social strategies as well as the fit of the data to the hypothesized model of evolution.

183 Contributed Talk: GENETICS AND EVOLUTION I (Wednesday PM I)

BEHAVIORAL SYNDROMES CONSTRAIN EVOLUTIONARY POSSIBILITIES AND RATES OF ADAPTATION

Ned Dochtermann, Niels Dingemanse

University of Nevada, Reno, United States; Email:ned.dochtermann@gmail.com

Behavioral responses across taxa often covary as part of "behavioral syndromes" or "animal personalities". From an evolutionary perspective behavioral syndromes are an important research topic due to their potential to affect

how populations respond to selection. Correlations between traits--like those observed in syndromes--change the trajectories of evolutionary responses available to populations and can even prevent evolutionary change. We tested the degree to which evolutionary responses are affected by syndromes and found that syndromes substantially decreased the ability of populations to respond to selection. Behavioral syndrome structure reduces the ability of populations to respond to selection (i.e. evolvability) and decreases rates of adaptive responses. Interestingly, evolvability and the rate of adaptive response are only moderately correlated, likely because the latter is connected primarily to the sign of behavioral correlations while the former is affected by both the sign and magnitude of correlations. These results demonstrate that behavioral syndromes substantially alter both the evolutionary trajectories available to populations and potential rates of adaptation.

238 Contributed Talk: COMMUNICATION IV (Thursday PM I)

COLLECTIVE FORAGING AND COMMUNICATION IN HONEY BEES: HOW HABITAT AFFECTS THE BENEFIT OF DANCING

Matina Donaldson-Matasci, Anna Dornhaus

University of Arizona, United States; Email:matina@email.arizona.edu

The honey bee dance language, used to recruit nestmates to flowers, is thought to be adaptive because it allows colonies to forage more efficiently. However, this seems to be true only in certain habitats and seasons. Why? One important factor may be the distribution and diversity of floral resources around the hive. If flowers are difficult to find, communication might be important because it allows many recruits to take advantage of a single scout's find. Alternatively, if flowers are easy to find but variable in quality, then communication might be important because it allows the colony as a whole to concentrate on the best resources. We manipulated the ability to communicate location information for six colonies in five environments, and compared foraging success with and without communication. In each environment, we measured the abundance, spatial distribution and species composition of floral resources. We found that colonies in habitats with high species richness showed greater improvement in foraging success. This suggests that it is primarily communication of relative resource quality, not location information per se, that makes honey bee communication valuable.

P422 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

COLOR VISION IN CANADA GEESE: AN "OBLIQUE" VIOLET-SENSITIVE SYSTEM

Megan Doppler, Patrice Baumhardt, Bret Moore, Jacquelyn Randolet, Esteban Fernández-Juricic

Purdue University, United States; Email:mdoppler@purdue.edu

Canada geese (CG) have a band of high density ganglion cells oriented obliquely across the retina, which provides high visual resolution of the ground and sky simultaneously. However, no study has looked at the distribution of cone photoreceptors and their involvement in color perception. We characterized the peak sensitivity and density of different photoreceptors in the goose retina using microspectrophotometry and regular microscopy. We also estimated chromatic contrast (CC) of different goose plumage patches using avian visual models to determine their saliency for conspecifics. CG have a violet-sensitive visual system, with no ultra-violet cones. We found cones that were violet-sensitive (409 nm), short-wavelength sensitive (456 nm), medium-wavelength sensitive (507 nm), and long-wavelength sensitive (580 nm). These cones reached peak densities obliquely across the retina. CC was higher for some color patches on the wings and for the chinstrap which may be used in social interactions and in flight to establish the location of conspecifics. Overall, the highest color sensitivity of the CG visual system aligns with the oblique visual streak in the retina.

P423 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

DIVISION OF LABOR, MOVEMENT AND STABILITY IN THE SEA ANEMONE *ANTHOPLEURA ELEGANTISSIMA*

Anthony D'Orazio, Ian Hamilton, Marymegan Daly

Ohio State University, United States; Email:dorazio.8@osu.edu

The clonal, intertidal sea anemone, *Anthopleura elegantissima*, engages other species and other clones in agonistic encounters in competition for space. Occasionally these interactions lead to stable demilitarized zones between competing clones of the species. Individual agonistic interactions that occur at these boundaries have been well characterized; however the behavior of the clone as a whole has not been due to the difficult nature of tracking individual polyps in the field. Additionally, the stability of these demilitarized zones stands in stark contrast to the apparent superiority of one neighboring clone over the other in individual polyp contests. Here we discuss a series of experiments that investigated the movement of individual polyps relative to others in the clone and clones relative to their neighbors. Additionally, we see how movement strategies correlate with competitive ability in agonistic contests. These experiments extend previous work on the division of labor in this group and shed light on the behavior of individual polyps and clones as a whole.

271 Contributed Talk: GENETICS AND EVOLUTION II (Thursday PM III)

CONDITION, NATURAL SELECTION, AND THE EVOLUTION OF ANIMAL PERSONALITY IN BELDING'S GROUND SQUIRRELS

Andy Dosmann, Jill Mateo

University of Chicago, United States; Email: dosmann1@uchicago.edu

Animal personality refers to the common observation that for most behaviors, populations of animals have lower than expected within-individual variance and higher than expected between-individual variance. Both natural selection and positive feedback on state-based differences such as condition have been proposed as explanations that may account for both within-individual consistency and between-individual differences in behavior. Here we repeatedly measured a suite of anti-predator behaviors and condition in over 250 free-living Belding's ground squirrels (*Urocitellus beldingi*) over multiple years. Using survival as the component of fitness, we will analyze condition and personality as correlated traits to determine how natural selection operates on those factors. Preliminary analyses indicate significant selection operating on the behavioral traits, but that they are also condition-dependent. Combined analysis with the completed dataset will provide empirical evidence from nature that evaluates not just the two primary hypotheses explaining the evolution of animal personality, but also their relationship to each other since the hypotheses are not mutually exclusive.

P100 Contributed Poster: GENETICS AND EVOLUTION I (Poster Session A: Weds. eve)

THE EVOLUTION OF EGGSHELL COLOR: EGG VISIBILITY, SOLAR RADIATION, AND MICROBIAL INVASION

Stephanie Doucet, Daniel Hanley, Phillip Cassey

University of Windsor, Canada; Email: sdoucet@uwindsor.ca

The dramatic variation in avian egg coloration has been the subject of extensive research. We conducted a large comparative examination of selection pressures on egg coloration in birds. We examined whether nest type and environmental factors, such as habitat type, favor certain eggs colors. We found support for the hypothesis that eggs brightness increases egg visibility in cavity and burrow nests by showing that brightness was significantly higher in dark nest types, and was correlated with hatching success only within dark nests. We did not find consistent variation in egg coloration between nest environments that differ in susceptibility to microbial infestation and therefore provide little comparative support for the hypothesis that eggshell pigments provide antimicrobial protection. We also investigated whether certain eggs colors reduce the effects of harmful solar radiation on developing embryos by examining eggs colors in open nests across different habitats. We provide suggestive support, finding that eggs in the tundra are significantly darker than in other habitats. Our findings suggest that a diversity of factors influence the evolution of egg coloration in birds.

P175 ABS Genesis Award Poster: SEXUAL SELECTION I (Poster Session A: Weds. eve)

INFLUENCE OF HABITAT QUALITY ON ORNAMENTAL PLUMAGE COLORATION OF JUVENILE BLUEBIRDS

Amanda Doyle, Lynn Siefferman, Nicole Barrios

Appalachian State University, United States; Email:doyleaj@appstate.edu

Male eastern bluebirds (*Sialia sialis*) have brilliant, structural blue-ultraviolet coloration on their heads, backs, and wings; females display similar but duller plumage. This coloration correlates with mate quality and reproductive success in both males and females. For a trait like plumage coloration to serve as an honest signal of quality, it must be costly to produce or maintain. One potential constraint on production of structural coloration is access to adequate nutrition during molt. Taking advantage of the fact that bluebirds grow part of their first nuptial plumage in the nest, we tested whether habitat quality influences the expression of blue coloration. We used both correlational data and field experiments. In 2010, we measured insect abundance, primary productivity, and parental provisioning rates. Insect abundance was positively related to plumage coloration. Next, in 2011, we supplemented parents with mealworms during both incubation and nestling rearing and measured the effect on plumage coloration of juvenile bluebirds.

47 Symposium: FEMALE COMPETITION (Thursday)

FEISTY FEMALES: ANATOMICAL, BEHAVIORAL, NEUROENDOCRINE AND OLFACTORY ATTRIBUTES

Christine Drea

Duke University, United States; Email:cdrea@duke.edu

Species with 'sex-role reversals,' in which females display genital and behavioral masculinisation, reproductive skew, or ornamentation, present interesting case studies of sexual selection. Drawing from various non-traditional species of strepsirrhine primates (lemurs and lorises), I present evidence of reduced or even reversed sexual dimorphisms in morphology (e.g. body size, genitals, scent glands, and digit ratios) and behavior (e.g. aggression, social dominance, rough play, and scent marking). I also highlight various means by which females display intrasexual competition (e.g. overt aggression and overmarking), sometimes suffering a significant reproductive cost (e.g. wounding and infanticide). I further present neuroendocrine, semiochemical, and genetic data relevant to understanding the underlying proximate mechanisms associated with these traits. Within an evolutionary context, I cite substantial sex differences in hormones and olfactory ornaments, combined with male preference for these costly female attributes, to argue that sexual selection has likely acted directly on these female primates. Funded by NSF BCS-0409367 & IOS-0719003.

40 Symposium: SOCIAL COMPLEXITY (Wednesday)

DEVELOPMENT AND RECIPROCITY IN PECTORAL FIN CONTACT BETWEEN DOLPHINS

Kathleen Dudzinski

Dolphin Communication Project, United States; Email:kathleen@dcpmail.org

Pectoral fin contact among dolphins is a conserved behavior consistently documented between individuals. Social and hygienic functions have been identified with partner preference exhibited. Interactions of a group of captive bottlenose dolphins (*Tursiops truncatus*) were video-documented over a nine year period. Development of pectoral fin contact between individuals was examined among 33 dolphins, which were roughly divided into eight groups - one group of five unrelated males and seven matrilineal groups with two to five offspring. Immediate reciprocity in pectoral fin contact was observed more among non-kin than between related dolphins, whereas overall reciprocity seemed not related to kinship. Pectoral fin contact between same-sex versus mixed-sex sibling pairs was not significantly different, although non-kin same-sex pairs exchanged significantly more pectoral fin contact than mixed-gender pairs. Adult females were more likely to initiate pectoral fin contact with non-weaned calves than older offspring. These results, coupled with conclusions from a comparative study of the same behavior among three distinct populations, suggest that contact via the pectoral fin might be used to send.

119 Contributed Talk: PARENTAL CARE I (Tuesday PM I)

A PROXIMATE TEST OF THE DETECTABILITY HYPOTHESIS FOR COLORFUL NESTLING MOUTHPARTS

Matthew Dugas

University of Oklahoma, United States; Email:matthew.b.dugas@gmail.com

Dependent offspring often express specialized traits that help them obtain parental care. The bright and colorful mouthparts of nestling passerines are hypothesized to be such traits, and their evolution is typically explained by two non-exclusive hypotheses: i) colors function by signaling quantitative information about offspring (e.g., hunger or quality) and ii) colors function by increasing the visual conspicuousness of offspring, easing food transfer. This latter detectability hypothesis is supported mainly by comparative work revealing a positive relationship between the presumed difficulty of detection (e.g., ambient light levels) and colors associated with detectability (e.g., brightness). To test this hypothesis at the proximate level, I allowed cavity-nesting parents (house sparrows) to interact with offspring with mouthparts manipulated to be highly conspicuous and highly inconspicuous. The simple prediction was that parents would have more trouble transferring food to less conspicuous offspring. I found little evidence to support the detectability hypothesis at the proximate level, leaving open questions of why comparative studies have revealed such patterns.

71 Symposium: COMMUNICATIVE COMPLEXITY (Friday)

BRIDGING THE BONDING GAP IN THE TRANSITION FROM PRIMATES TO HUMANS

Robin Dunbar

University of Oxford, United Kingdom; Email:robin.dunbar@anthro.ox.ac.uk

Nonhuman primates are distinguished from other mammalian and avian taxa by the high proportion of bonded social groups. Monkeys and apes build these bonded relationships using social grooming, with vocal and gestural communication acting to supplement this process. However, the principal mechanism that underpins bonding is the endorphin surge generated by the physical processes of grooming. The time constraints that arise from this, however, impose limits on the size of social communities that can be bonded using this mechanism, and something else was needed to allow ancestral hominins to break through this glass ceiling limiting social group size. While language facilitates this, it does not provide the endorphin surge required for bonding. I shall argue that, successively, later hominins brought into play additional social communication mechanisms that provided the required endorphin activation. I shall argue that these involved, in time sequence, laughter, singing and the rituals of religion.

350 Contributed Talk: COGNITION AND LEARNING VII (Saturday AM)

WHEN SHOULD BUMBLEBEES USE SOCIAL INFORMATION? EFFECTS OF RELIABILITY OF FLORAL AND SOCIAL CUES

Aimee Dunlap, Anna Dornhaus, Daniel Papaj

University of Arizona, United States; Email:asdunlap@email.arizona.edu

How do animals weigh the relative value of social and individual sources of information? One link between theory of individual learning and of social information use is the importance of reliability of information. Foraging bumblebees provide a good system for evaluating the relative roles of these reliabilities in learning. Bees show robust individual learning of floral attributes and use a variety of social cues to inform their floral choices. We factorially varied the reliability of floral versus social information in predicting a reward. If following basic economic predictions, bees should rely primarily on the more reliable source of information; Deviations from this prediction can allow us to compare the importance of each information type. Indeed, bees do deviate from our economic predictions: unreliability has stronger effects on use of social information than use of personal information. Both types of information also interact across levels of reliability. The interacting effects of reliability in personal versus social information suggest that the role of reliability in one source of information must be considered in the context of reliability in the other source.

P17 Contributed Poster: COGNITION AND LEARNING 1 (Poster Session A: Weds. eve)

DISSECTING VISUAL INPUTS TO THE HONEY BEE SUN COMPASS

Fred Dyer

Michigan State University, United States; Email: fcdyer@msu.edu

To use the sun as a navigational compass, honey bees must integrate visual information with temporal information from the circadian clock. It is unknown how or even where in the brain this is accomplished. As a step toward answering this question, I sought to identify in which regions of the compound eye the different visual inputs to the sun compass originate. To do this I used black paint to ablate portions of the eyes of forager honey bees, and then tested their ability to use celestial cues or landmarks to follow familiar routes. This technique revealed that a region of the eye including the dorsal-most 50 rows of facets (subtending a visual angle of 70 degrees from the zenith) is necessary for orientation relative to celestial cues. An additional 30 rows of facets (subtending a visual angle of about 30 degrees viewing the horizon) is sufficient for orientation to landmarks when the dorsal field of view is also obscured. Identifying the boundaries between the regions of the eyes that subserve acquisition of celestial and landmark information may guide neuroanatomists investigating candidate brain regions where sun compass calculations are carried out.

176 Contributed Talk: PERSONALITIES (Wednesday AM)

BEHAVIORAL CONSISTENCY IN MALE SIAMESE FIGHTING FISH IS UNAFFECTED BY EXPERIENCE WITH A FEMALE

Teresa Dzieweczynski, Olivia Hebert, Lindsay Forrette

University of New England, United States; Email: tdzieweczynski@une.edu

Consistent individual differences in behavior suggest that individuals respond in a predictable and repeatable manner in a specific situation while differing from other individuals. Male Siamese fighting fish exhibit consistent individual differences in decision-making strategies when they encounter a female and a male conspecific simultaneously. In addition, males appear to fall into three categories based on the strategy they use when faced with this situation: 'lover,' 'fighter,' or 'divider.' How consistent these strategies are and whether they change as a result of experience is unknown. To address this question, we presented males with a dummy male and dummy female presented at the same time both when they had or had not interacted with a live female conspecific previously. This was done multiple times so that we could assess behavioral consistency. Males did not change the strategy they used when presented with a male and female simultaneously nor were their responses more or less consistent after interacting with a female. This suggests that short-term experience is not enough to affect behavioral consistency or decision-making to conflicting stimuli in this species.

198 Contributed Talk: SOCIAL BEHAVIOR IV (Thursday AM)

VISUALIZING THE COSTS OF COMBAT IN FISH: RELEVANCE FOR TESTING THE PREDICTIONS OF ASSESSMENT MODELS

Ryan Earley, Matthew May, Richard Morris, Robertson Pearce, Alexander Thompson, Jake Powers

University of Alabama, United States; Email: rlearley@bama.ua.edu

Models of animal contests focus on how fighting decisions are influenced by information exchange, costs accrued, and the ability to accurately gauge these costs. Cumulative assessment models assume that animals assess injury costs and give up once a threshold is crossed. Unlike metabolic or time costs, it is often difficult to quantify the costs inflicted by one animal on its opponent. This is particularly true for fishes because injuries sustained are not always obvious and because measures such as scale loss could vary with handling. We present a method for visualizing and quantifying injury costs while controlling for the effects of handling in mangrove rivulus (*Kryptolebias marmoratus*). Fish were immersed in fluorescein, a non-toxic dye, both before and after aggressive contests, and photographed under ultraviolet light. Quantitative measures of skin ulceration were related to contest intensity and duration. Controls allowed us to determine the effects of handling and pre-fight

fluorescein treatment on injury estimates. We discuss how minimally invasive techniques for quantifying injury costs can advance our understanding of the decision rules employed during animal fights.

290 Contributed Talk: APPLIED ANIMAL BEHAVIOR III (Friday AM)

INCREASING TREATMENT INTEGRITY IN THE USE OF COUNTER-CONDITIONING TO REDUCE AGGRESSION IN DOGS.

Kristyn Echterling-Savage, L. Keith Miller

University of Kansas, United States; Email:kristynsavage@ku.edu

Counter-conditioning is an effective treatment in reducing aggression in dogs. It is commonly used in practice by clinicians. While the treatment is effective, implementation commonly lacks treatment integrity. When treatment is not implemented with integrity, aggression returns to unacceptable levels. The current research attempted to increase treatment integrity and sustained use of treatment by owners. Data have suggested the following improves implementation: increased opportunities to respond to treatment protocol, decreasing effort required for implementation, social support for implementation, clear treatment protocols, and thorough problem solving strategies with respect to possible pitfalls of treatment. Groups were established with seven dog-owner dyads to create such conditions. The current results confirm pilot data. Within subjects comparisons was made. Data was analyzed graphically and will be further analyzed statistically. The protocol was designed to be used by clinicians in order to increase use of treatment by owners.

307 Contributed Talk: SEXUAL SELECTION IV (Friday AM)

IT'S A MARVELOUS NIGHT FOR A FOOT-DANCE: VISUAL CUES AND COURTSHIP SUCCESS IN A PLETHODON SALAMANDER

Sarah Eddy, Lynne Houck

Oregon State University, United States; Email:eddys@science.oregonstate.edu

The study of mate choice has often focused on single cues, but most organisms employ multiple cues across many modalities during courtship. In a study of the red-legged salamander (*Plethodon shermani*), we tested the contribution of two cues (chemical and visual) to a male's ability to persuade a female to enter into courtship with him. Although extensive work has been done in this system, most of the efforts have been concentrated on actual courtship interactions, rather than the earlier persuasion stage of a potential courtship. We found that, during the persuasion stage of courtship, the male visual cue increased the likelihood that a pair would engage in courtship. In contrast, the chemical cue had no effect on courtship initiation. Based on our results and the results of previous studies, the *Plethodon shermani* courtship involves a progression of cues, and the relative importance of each cue varies during different courtship stages. We propose that the visual cue may increase the male's success by indicating the context of his approach and subsequent behaviors.

P204 Contributed Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

STRUCTURE OF COOPERATION NETWORKS IN LONG-TAILED MANAKINS

Andrew Edelman, David McDonald

University of Wyoming, United States; Email:aedelman@uwyo.edu

Long-tailed manakins (*Chiroxiphia linearis*) engage in obligate cooperative dual-male displays to attract females. Males display at lek sites that consist of orderly queues of unrelated males differing in age and social status. Cooperative displays are performed to attract females, but only alpha males copulate, and benefits to males of lower status are delayed until they achieve alpha status later in life. We examined the social structure of this tropical bird based on 16 years of observations at a Costa Rica study site. Interactions were placed on a spatially embedded social network to determine social structure at different spatial scales such as communities and leks. At large scales, males were organized in communities that were partly influenced by lek affiliation, habitat structure, and spatial proximity. Communities typically consisted of males with similar or spatially proximate lek affiliations. Males separated by non-forested areas also exhibited fewer interactions. At smaller

scales, social structure was determined by past interaction history and social status. Males tended to interact more frequently with familiar partners and between social status levels.

P40 ABS Founders Award Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

NEURAL CORRELATES OF THREAT SIGNALLING IN BLACK-CAPPED CHICKADEES

Jesse Ellis, Lauren Ritters

University of Wisconsin, Madison, United States; Email: jmellis2@wisc.edu

Some species transmit information by varying vocalizations to reflect context. Black-capped chickadees (*Poecile atricapilla*) indicate predator threat level by varying a number of parameters of their chick-a-dee mobbing call. We asked whether brain areas previously shown to be involved in regulating context-specific vocalizations including the medial preoptic area (POM) and the lateral septum (LS), and those involved in motor control, dorsomedial nucleus of the intercollicularis, (DM), HVC, and the robust nucleus of the arcopallium (RA), were involved in vocal variation associated with perceived threat level in the chick-a-dee call. We presented chickadees with a hawk model, and found correlations between call rate and labeling for the early gene FOS in POM and LS. Labeling in HVC correlated with the number of D-notes per call. Labeling in the call control region DM was associated with the structure of D-notes. These results suggest that POM and LS, which may mediate social interactions, may also regulate vocal production in a context specific manner, and that these areas integrate with motor control regions to imbue mobbing signals with additional information on threat level.

P232 Contributed Poster: APPLIED ANIMAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

HOT TOPICS IN WILD SNAKES: OPERANT LEARNING AND THERMAL DISCRIMINATION TRAINING IN BURMESE PYTHONS

Sherri Emer, Michael Grace

Florida Institute of Technology, United States; Email: semer2007@my.fit.edu

Large pythons have biological functions that are extremely different from traditional animal models often used in learning experiments. These massive snakes are ambush predators of large, live prey, consumed on infrequent schedules. We report here conditioning of wild, invasive Burmese pythons (*Python molurus*) using pre-killed juvenile mice as positive reinforcers. Over the course of ten months, gradual modifications of the natural feeding biology were used to transition the pythons from weekly sessions with a live free-roaming adult rat, to sessions every 72 hours in which access to each of six, pre-killed juvenile mice was contingent on contact with an illuminated pushbutton. Learning was demonstrated by decreased latencies over the course of training sessions. Snakes did not forget despite several days without training during shedding cycles. This conditioning paradigm is being used in psychophysical tests of behavioral sensitivity to thermal stimuli, which are used to localize and acquire prey. This is particularly important in an invasive megapredator like the python, whose learned behaviors may have ecological consequences to the sensitive Florida Everglades.

251 Contributed Talk: ECOLOGICAL EFFECTS II (Thursday PM II)

RESOURCE USE BY SYKES' MONKEYS AT LAJUMA, SOUTH AFRICA

Sara Emerson, Joel Brown

Lawrence University, United States; Email: sara.e.emerson@lawrence.edu

We used giving up densities from artificial food patches and observation to test for diet selection and water limitation for Sykes' monkeys (*Cercopithecus albogularis erythrarchus*). To assess the influence of water on the value of food, we measured harvest of peanuts with water present or absent. To examine diet selection, we measured the harvest of peanuts, raisins, alfalfa pellets, mealworms and dry cat food mixed into substrate. Additionally, we observed the monkeys' order of selection of peanuts, raisins, alfalfa pellets and mealworms. Water did not influence Sykes' foraging. All experiments revealed that peanuts were always significantly preferred over other types of food, with either alfalfa pellets or raisins in second place, depending on the experiment. Mealworms were the least preferred foraged food, and cat food was never eaten. We conclude that

diet selection may change annually, Lajuma's Sykes' monkeys are not water-limited, high fat/protein seeds are preferred over any other food, and social rank may influence diet selection. Patch use experiments coupled with observation provide a useful means of examining primate diet selection and water limitation.

P165 Contributed Poster: RECOGNITION (Poster Session A: Weds. eve)

NESTMATE RECOGNITION OF NEOTROPICAL PARABIOTIC ANTS

Virginia Emery

University of California, Berkeley, United States; Email: vj.emery@berkeley.edu

Parabiosis is the only ant-ant nesting symbiosis to be considered as a mutualism. This unique nesting relationship involves shared nest space and foraging trails between two social insect species, usually of different subfamilies. We examined the nestmate recognition behaviors of two reputedly obligate parabiotic partners; *Camponotus femoratus* and *Crematogaster levior*. These two ants occur in the ant-gardens of Amazonia, and we studied their intra and interspecific behavior towards nestmate and non-nestmates during March and July 2010. We also examined the cuticular hydrocarbon cue diversity of the population under study. We found there was no significantly increased aggression towards non-nestmates of the different species, but that ants were aggressive to non-nestmates of the same species. These results may indicate that the close mutualistic nesting relationship does not result in colony-level distinguishing of the other species. The lack of shared cuticular cues may be one reason that ants have low recognition towards their nest partners. Understanding this shared nesting relationship will lead to a greater understanding of the behaviours involved in social colony function.

157 Contributed Talk: COGNITION AND LEARNING III (Wednesday AM)

HABITUATION AND NEOPHOBIA IN HOUSE SPARROWS: PERSONALITY, PLASTICITY, AND VARIATION IN PLASTICITY

Amanda Ensminger, David Westneat

University of Kentucky, United States; Email: alensm2@uky.edu

Heterogeneity in the environment favors flexible (plastic) foragers, but consistent individual differences in behavior (personalities) may exist that affect an individual's ability to find food and adjust to new conditions. In many species, individuals are consistent across contexts in their propensity to take risks (bold vs shy). Boldness affects fitness through a tradeoff between exploring the environment for food versus surviving risks. We examined plasticity and personality in the tendency to begin foraging in house sparrows (*Passer domesticus*). Males exhibited plasticity in habituation, but females did not. In both sexes, individuals were consistently different from each other in their average tendency to begin foraging. When a novel object was placed in the foraging area, both sexes changed their behavior by beginning to feed later, but birds varied in how they changed their behavior in the presence of an object. These results suggest that individuals differ in how they respond to risk. The presence of variation in plasticity implies that the raw material necessary for selection on neophobia exists, and that plasticity in boldness across contexts could evolve.

103 Contributed Talk: SOCIAL BEHAVIOR I (Tuesday AM)

AN AGENT-BASED MODEL CONCERNING MECHANISMS OF SOCIO-SPATIAL ORGANISATION IN PRIMATE GROUPS

Ellen Evers, Han de Vries, Berry Spruijt, Elisabeth Sterck

Utrecht University, Netherlands; Email: E.Evers1@uu.nl

The spatial organization of primate groups, with central dominants and peripheral subordinates, is often explained in terms of spatial preferences of individuals, since predation risk is lower at the group centre. Using agent-based models, it has been shown that such centrality pattern can also arise by self-organization as a result of subordinates fleeing from dominants after a fight (fleeing model). However, in real primates subordinates often avoid potential aggressors (dominants) from a distance to prevent aggressive interactions, which entails less fleeing after a fight. By replicating the fleeing model and implementing avoidance behaviour, we

investigated how avoidance may affect the central-peripheral pattern within primate groups. We found that avoidance exacerbates centrality of dominants. Moreover, individual variation in avoidance tendency is sufficient to generate spatial centrality of dominants, independently of fleeing after a fight. However, high degrees of avoidance, e.g. in highly aggressive species, may result in subgroup interaction patterns and break down the spatial centrality of dominants. Results are discussed in the light of group fissioning.

P277 ABS Founders Award Poster: CONSERVATION (Poster Session B: Thurs. eve)

CHANGES IN POPULATION DENSITY AND RANGING MOVEMENTS OF MARIANA CROWS (*CORVUS KUBARYI*) FROM 1996-2010

Sarah Faegre, Renee Ha, James Ha

University of Washington, United States; Email:sfaegre@gmail.com

The identification of density-dependent mechanisms is essential for the management of animal populations, particularly those of endangered species. Changes in space and resource utilization are common components of density dependent processes. I studied changes in ranging behavior of the critically endangered Mariana Crow (*Corvus kubaryi*) on Rota during two study periods (1996-99 and 2006-10), corresponding with a moderate and a low population density. I used location data from color banded birds that were re-sighted through regular searches, opportunistically, or via radio-telemetry. While the median distance of family groups from their core area did not change between study periods, maximum distance measures from paired samples showed a strong trend towards longer distances ranged from the core area during the second study period ($P = .028$ for comparisons that include telemetry-based locations; $P = .055$ and $P = .064$ for comparisons that exclude telemetry data). The results suggest that density-dependent mechanisms influence some aspects of ranging behavior in Mariana Crows. Possible mechanisms are identified and their implications are discussed.

P127 Contributed Poster: MECHANISMS 1 (Poster Session A: Weds. eve)

MATING ENHANCES IMMUNITY IN FEMALE CRICKETS: NUPTIAL GIFT, FEMALE RESPONSE OR BY-PRODUCT?

Evan Fairn, Shelley Adamo

Dalhousie University, Canada; Email:evan.fairn@dal.ca

Reproduction and immunity are both metabolically costly. These costs lead to tradeoffs between these two functions. After mating, investment in reproduction soars in most female insects, leading to a decline in immune function. Interestingly, mated female Texas field crickets (*Gryllus texensis*) exhibit both increased egg production (i.e. higher reproductive costs) and greater resistance to bacterial infection (i.e. increased immune function) than virgins. Why some cricket species are able to avoid a tradeoff between immune function and reproduction remains unclear. There are three non-mutually exclusive possible explanations for the enhanced immune function after mating. 1) Males provide a nuptial gift leading to increased female immunity, 2) Females upregulate their own immune response to protect from sexually transmitted diseases, 3) The increase is caused by a by-product of increased oviposition. We found that enhanced resistance occurs within a day of mating, suggesting a relatively rapid mechanism. We will present preliminary results testing for evidence of female upregulation of immune function and whether the increase may be a by-product of increased oviposition.

P323 Contributed Poster: GENETICS AND EVOLUTION 2 (Poster Session B: Thurs. eve)

PATERNAL IDENTITY AFFECTS OFFSPRING SWIMMING PERFORMANCE IN CHINOOK SALMON

Britney Falica, Dennis Higgs

University of Windsor, Canada; Email:falica@uwindsor.ca

While fish swimming behaviour has been extensively studied, the parental genetic basis for this critical behaviour has been rarely examined. Using juvenile Chinook salmon (*Oncorhynchus tshawytscha*) from a quantitative genetic breeding design, we investigated additive and non-additive genetic (from 'good genes' and

'compatible genes' respectively) and maternal effects on offspring swimming. We swam offspring to measure their critical swimming speed (Ucrit) at two different time points. During the first round of swimming conducted approximately 15 weeks post-hatch, there were no differences between groups for Ucrit. During the second round, approximately 18 weeks post-hatch, there were significant family and paternal effects but no maternal or interaction effects on Ucrit. There was no effect of offspring body size on Ucrit. Our results suggest that parental genetic benefits from 'good genes' do contribute to swimming performance but that the magnitude of these effects differ with development. The current study adds important data to the role of genetics in swimming behaviour and suggests that some of the previous disparities in this field may be due to developmental effects.

299 Contributed Talk: COGNITION AND LEARNING VI (Friday AM)

USE OF SPEARS BY WILD CAPUCHIN MONKEYS, *CEBUS LIBIDINOSUS*

Tiago Falotico, Eduardo Ottoni

University of Sao Paulo - Institute of Psychology, Brazil; Email:tfalotico@gmail.com

The use of wooden sticks as spears by non-human primates is known only in one population of chimpanzees, that use it to hunt prosimian prey. In neotropical primates the closest observed behavior is an anecdotic report of a wild *Cebus capucinus* using a club to hit a snake. Bearded capuchin monkeys (*C. libidinosus*) of Serra da Capivara National Park (SCNP), Brazil, are the only wild population known to use a complex toolkit for foraging, including stones to crack or dig food, and sticks as probes to drive prey out of narrow places. They also use tools to non-foraging activities like smashing quartz pebbles into powder to fur-rub and throwing stones as a sexual display. Here we present data from 2 years of observation of 2 groups of capuchin monkeys at SCNP, showing the use of sticks as spears during threat episodes towards potentially dangerous animals, like snakes and spiders. We registered 11 episodes of this behavior. These tools were used by 4 juvenile males and 3 subadult males, and 5 tools were modified prior to their use. No episode ended in kill, but some resulted in retreat of the target animal. Grants: FAPESP, CNPq and CAPES.

77 Contributed Talk: COGNITION AND LEARNING I (Tuesday AM)

PAVAROTTIS AND EINSTEINS: SONG COMPLEXITY IS INDICATIVE OF SPATIAL LEARNING ABILITY IN STARLINGS

Tara Farrell, Katelyn Weaver, Yong-Seok An, Scott MacDougall-Shackleton

University of Western Ontario, Canada; Email:tara.m.farrell@gmail.com

Adverse early developmental conditions negatively affect song learning in a variety of songbirds. However, few experiments have assessed how stress early in life may affect general cognitive function in songbirds, and no study to date has assessed this in conjunction with song learning. We subjected nestling- and juvenile-caught European starlings (*Sturnus vulgaris*) to either an *ad libitum* or food-restricted diet until approximately 90 days of age. As adults, birds' cognitive abilities were assessed via spatial foraging and social observation learning tasks. Song performance was assessed in fall and spring conditions. We found that birds from the *ad libitum* diet had significantly longer song bouts in both conditions, made fewer errors in our spatial foraging task, and that these behavioral measures correlated across individuals. Better singers demonstrated superior performance on the spatial task. We found no relation between song performance and observational learning. These data suggest that song could be indicative of other cognitive abilities, and that song and spatial learning may be developmentally correlated.

332 Contributed Talk: DEVELOPMENT II (Friday PM I)

YOUNG PIGEONS USE THE RIGHT EYE AND LEFT HEMISPHERE FOR PARENTS RECOGNITION

Mareike Fellmin, Inga Tiemann

Bruno-Duerigen Institute, Germany; Email:Mareike.Fellmin@uni-duesseldorf.de

In birds imprinting enables the offspring to recognize its parents. Many scientists have explored this period of rapid learning, but still there are some questions left open. Imprinting can be viewed as a special form of learning and subsequent social recognition. Earlier studies showed an impact of lateralization on the differentiation of a stranger versus a companion. Experimental models were often based on precocial species like chickens. In our study we wanted to examine whether lateralization has an impact on social recognition in altricial species such as the domestic pigeon. Young pigeons were bred naturally, and squabs were tested when they were 25 days old. Three pigeon breeds, the Texan Pioneer, the Classic Old Frill and the Homing Pigeon, were observed in a multi-choice setup using live birds as the social stimuli. Two of the stimulus birds were their parents, and the other two were familiar non-parent birds. We found a right eye and, therefore, left hemisphere advantage for parents' recognition in two of the three analyzed breeds. These findings are discussed in the context of brain lateralization, imprinting mechanisms, and the history of the breeds tested.

59 Symposium: SENSORY NEUROECOLOGY (Thursday)

GETTING OVER BACKGROUND NOISE: MECHANISMS OF SOUND COMMUNICATION IN ADVERSE ENVIRONMENTS

Albert Feng

University of Illinois, United States; Email:fengatcu@gmail.com

Odorrana tormota is one of two anuran species (the other is *Huia cavitympanum* from Borneo) that possess unusual ear morphology, i.e., having recessed tympanums that lie deep inside ear canals. Males of *O. tormota* produce complex broadband calls with harmonic energy well above 20 kHz (i.e., the ultrasonic range). My colleagues and I have obtained experiment evidence showing that the males can hear and respond to ultrasound - communication with ultrasound is likely an adaptation to avoid masking by the broadband but predominantly low-frequency stream noise in their habitat. Further experiments revealed that their ultrasonic sensitivity is due to a number of morphological and physiological adaptations: 1. Very thin tympanic membranes that are recessed, shortening their distances to the inner ears, 2. A unique mechanism of dynamic regulation of Eustachian tube opening (due to having unusual muscles and cartilages surrounding the Eustachian tubes), 3. Their basilar papilla has a smaller chamber size, and the hair cells are shorter with shorter hair bundles when compared to non-ultrasonic frogs (these morphological changes confer advantages for detection of high-frequency sounds).

P311 Contributed Poster: ECOLOGICAL EFFECTS 2 (Poster Session B: Thurs. eve)

COGNITION AND ENVIRONMENTAL TOXICOLOGY: USING MAZE TESTS TO MONITOR FISH CONTAMINATION

Marisa Fernandes-de-Castilho, Bruno Strapasson, Ciro Ribeiro, Laura Batista

Universidade Federal do Paraná, Brazil; Email:mafernandes@ufpr.br

Maze methodology adapted from rat and mouse has been proposed to study cognitive psychology of fish, including aspects of spacial and visual discrimination learning. Considering that pollution can affect different aspects of fish neurophysiology and behavior, we proposed to adapt some of those methodologies for using as environmental contamination protocols. The dark/light preference (scototaxis - open field maze) test, passive skive test (learning using negative reinforce) and agonistic social confrontation was adapted and tested. *Astyanax altiparanae* (Characidae) was exposed to sub lethal doses of the organophosphate Parathion Methyl - 0.50 ppm for 1 week and tested using a video camera apparatus. The low concentration used did not promote any animal dead, but it was enough to compromise fish behavior, especially related to learning. Contaminated fish tended to expose yourselves more to the aversive stimuli and stay more in the area where the stimuli was applied. The results suggest that the passive skive test can be considered an efficient non evasive test to be used in Characidae toxicological studies, since it can demonstrate the compromising of learning behavior.

370 Contributed Talk: PREDATION AND FORAGING II (Saturday AM)

HEAD MOVEMENT BEHAVIOR IN BIRDS AS A PROXY FOR VIGILANCE STRATEGIES IN GROUPS

Esteban Fernandez-Juricic, Guy Beauchamp, Ronald Treminio, Melissa Hoover

Purdue University, United States; Email: efernan@purdue.edu

Models of antipredator vigilance predict vigilance levels in different conditions, but fail to specify what animals should do while actually scanning. Head movements during scanning may allow animals to control the quality of scanning by increasing visual coverage or bringing objects to more sensitive parts of their retinas. We conducted an experiment with brown-headed cowbirds manipulating group size and neighbor distance, and recorded vigilance for peripheral and central individuals. Peripheral individuals increased head movement rate likely to enhance visual coverage due to higher perceived risk of predation. However, a different strategy emerged for individuals further apart and in smaller groups: reducing head movement rate probably to fixate their gaze longer on neighbors. Visual fixation may be useful to obtain social information about predation threats (collective detection). We show that a scanning metric associated with head movement behavior can provide novel information about vigilance in groups, and that birds have different scanning strategies, associated with different visual targets, when the risk of predation is higher

33 Symposium: PERINATAL INFLUENCES (Wednesday)

EMBRYONIC LEARNING AND THE GHOST OF PREDATION FUTURE

Maud Ferrari, Douglas Chivers

University of Saskatchewan, Canada; Email: maud.ferrari@usask.ca

Many aquatic prey animals hatch into a world that contains a myriad of predators and non-predators. A prerequisite for their success is the ability to distinguish animals that pose a threat from those that do not, and learning about risk early in life should provide animals with a selective advantage. Previous studies have demonstrated that embryonic amphibians can learn the identity of predators prior to hatching (the ghost of predation future). We will discuss recent studies that highlight the sophistication of embryonic learning in amphibians, including how embryos learn the danger level associated with predators and the time of day when predator are most active.

P113 Contributed Poster: MATING SYSTEMS 1 (Poster Session A: Weds. eve)

EXTRA-PAIR PATERNITY MATCHES PATTERNS OF FEMALE RECEPTIVITY: EVIDENCE FOR FEMALE CHOICE

Elise Ferree, Janis Dickinson

Claremont Colleges, United States; Email: eferree@jsd.claremont.edu

While observational and experimental field studies associate extra-pair paternity with male traits, rarely can researchers separate male competition from female choice. In this study we compared patterns of extrapair paternity in western bluebirds, *Sialia mexicana*, to published data on female extrapair mating preferences from the same population. Observations from past experiments, where females' mates were detained to prevent interference with extrapair mating, accurately predicted patterns of paternity at 217 unmanipulated nests. Specifically, consistent with which males were accepted for extrapair copulations, genetic extrapair sires were older but not larger than a female's social mate. This shows that female preferences observed when male competition was removed were expressed in paternity patterns under natural conditions of inter- and intra-sexual conflict. Male age and female choice are evidently important determinants of extrapair paternity in western bluebirds. More broadly, experimental approaches combined with measures of paternity under unmanipulated conditions provide important opportunities to test the potential role of female choice in extrapair copulations.

316 Contributed Talk: SOCIAL BEHAVIOR V (Friday AM)

STEREOTYPED BEHAVIOR IN CAPTIVE CAPUCHIN MONKEYS (*CEBUS SPP*)

Renata Ferreira

Universidade Federal do Rio Grande do Norte, Brazil; Email:rgf27br@yahoo.com.br

The new world capuchin monkeys (*Cebus spp*) are receiving increased attention from primatological literature due to their large neocortex ratio and high manipulative skills. Capuchins populations are capable of living in human altered areas. In this case, there are conflicts between humans and capuchins due to their attack on crops or on city park visitors. On the year 2008 the clinics from the Federal Center for Treatment of Wild Animals from northeast region (CETAS-NE) hosted over 150 capuchins in their enclosures. Using focal-scan method of 10 min windows for each animal, we recorded the activity budget of 49 animals *S. libidinosus* distributed over 6 groups. The resulting ethogram is composed of 23 stereotypes (or Behavior Indicative of Stress), divided in five major categories (Moving, Self-directed, Manipulative, Sexual, Social disturbed). Stereotypes comprise a mean of 19% of individuals' activity budget, with self-groom and pacing as the most frequent. Frequency of stereotypes did not differ in relation to sex, nor correlated to social proximity. An almost significant correlation was found between stereotype and rank.

342 Contributed Talk: SOCIAL BEHAVIOR VI (Friday PM I)

ASSESSING NETWORK FUNCTION IN ANTS AND BASKETBALL

Jennifer Fewell, Dieter Armbruster, John Ingraham

Arizona State University, United States; Email:j.fewell@asu.edu

Most network analyses describe the static structure of social groups; their use for understanding group function is still limited. Here we present two contexts in which we use network analyses to capture social interactions in a way that allows evaluation of efficiency and success in group function. We first use network motif analyses to demonstrate that social insect colonies are a different kind of social network in which efficient and directed information transfer is of primary importance. Their network characteristics fit the expectation that selection on network structure should differ between cooperative social groups formed for individual benefit and eusocial groups, for which selection operates primarily at the group level. We extend our network analyses to basketball, a game in which team dynamics is of primary importance, and for which success/failure outcomes can be instantly measured. We find that basketball serves as a useful proxy for capturing the dynamic between individual and group level goals, and evaluate the utility of different network metrics in assessing team strategy.

151 Contributed Talk: SOCIAL BEHAVIOR III (Tuesday PM II)

INSIGHTS INTO THE SOCIAL ORGANISATION OF WILD GUINEA BABOONS IN SENEGAL

Julia Fischer

German Primate Center, Germany; Email:fischer@cog-ethol.de

The social systems of hamadryas and savannah baboons have been extensively studied, but less attention has been paid to Guinea baboons *Papio papio*. While some previous studies, mainly from captivity, suggested that Guinea baboons live in one-male-units, field observations in the wild suggested a multi-male multi-female organization. In 2007, we initiated a long-term study of a community of ~350 subjects in the Niokolo Koba National Park in south-eastern Senegal. Based on observations during habituation, population genetic analyses, ranging data collected via GPS readings, and focal observations, we suggest that the population under study lives in a fluid fission-fusion society. The subgroup size and composition varies on a daily and seasonal basis. GPS ranging data and focal observations reveal preferential associations between specific individuals, indicating substantial sub-structuring within the population. Strikingly, genetic analyses indicate a higher genetic relatedness between males compared to females, an indicator of male philopatry. The results imply that the social system of Guinea baboons differs substantially from that of other baboon species.

25 Symposium: SIGNAL MEANING (Tuesday)

INFORMATION, MEANING AND "HONESTY" IN ANIMAL SIGNALS

W. Tecumseh Fitch

University of Vienna, Austria; Email:wtsf@st-andrews.ac.uk

Information theory provides one powerful foundation for the study of all signaling behavior. However, as clearly acknowledged by its creators, information theory does NOT provide a theory of meaning: the context-dependent interpretation of the information in a signal by a sentient receiver. I will argue that some recent debates about the value of information theory in animal communication fail to keep this information/meaning distinction clear enough and thus conflate two distinct issues: what discriminative information is present in a signal, and how communicators interpret and utilize this discriminative potential. I will illustrate the value of this distinction with the example of acoustic cues to body size in vertebrate acoustic communication, which nicely illustrates the complexity of analyzing meaning in even this simple dimension. I conclude that information theory remains essential in understanding animal signals, including language, but that information should not be confused with meaning.

P375 Contributed Poster: PREDATION AND FORAGING 2 (Poster Session B: Thurs. eve)

AN EXPERIMENTAL STUDY OF EXPLOITATIVE BEHAVIOR IN ARGYRODES SPIDERS

Meghan Fitzgerald

University of Wisconsin, Madison, United States; Email:mrfitzgerald@wisc.edu

The subfamily Argyrodes (Theridiidae) contains approximately 200 species, with diverse behavioral backgrounds. These spiders have drawn the curiosity of many researchers because of their exploitation of other arachnids, primarily arachnophagy (eating of other spiders) and kleptoparasitism (stealing food or web material from other spiders). These species have been separated into six species groups via behavioral and morphological characteristics. I focus on two species, each from a different species group: *Neospintharus trigonum* and *Faiditus cancellatus*. Though closely related, these two species have contrasting foraging strategies: *N. trigonum* is a generalist forager, using both arachnophagy and kleptoparasitism, whereas *F. cancellatus* appears to specialize in kleptoparasitism. Using a combination of field and lab studies, I have evaluated the effect of food limitation on each of these behaviors in these two species, and make predictions on the effect that food limitation has on the evolution of exploitative foraging strategies.

P176 Contributed Poster: SEXUAL SELECTION 1 (Poster Session A: Weds. eve)

MALE MATE CHOICE AND SEXUAL SELECTION IN THE AMBOSELI BABOONS

Courtney Fitzpatrick, Jeanne Altmann, Susan Alberts

Duke University, United States; Email:clynfitz@duke.edu

The paradigm of competitive, ornamented males vying to influence female mate choice has been repeatedly upheld in studies of animal reproductive behavior. Increasingly, however, studies find evidence that males also exhibit choice. This raises the question; to what extent might male mate choice shape the evolution of female traits? One trait that has been proposed as a sexually-selected trait in females is the exaggerated estrous swelling of many Old World primates. If male mate choice has selected for swelling size in the primates that display them, males should bias their mate-guarding effort toward females with larger swellings. Although some studies have demonstrated a relationship between swelling size and mate-guarding effort, none have been able to control for the potentially confounding variable of size variation within individual. Here we examine the relationship between swelling size and male mate choice for conceptive cycles only in a wild population of baboons in the Amboseli basin in Kenya. We report results from morphological data for 44 conceptive cycles and 390 hours of behavioral observation over 17 months in the field.

167 Contributed Talk: COMMUNICATION II (Wednesday AM)

SEXY MALES SIGNAL MORE OFTEN: THE RELATIONSHIP BETWEEN SIGNAL STRUCTURE AND QUANTITY

Lauren Fitzsimmons, Emily Whattam, Susan Bertram

Carleton University, Canada; Email: lauren.p.fitzsimmons@gmail.com

Female preferences tend to impose stabilizing selection on fine-scale signal components that enhance species recognition and directional selection on components that reflect signaling effort. However, we know relatively little about how fine-scale properties of signals correlate with signaling effort. We quantified calling behaviour in four cricket species: European house crickets (*Acheta domesticus*), Jamaican field crickets (*Gryllus assimilis*), Texas field crickets (*G. texensis*), and spring field crickets (*G. veletis*). Our research provides a formal test of whether crickets that produce attractive fine-scale temporal components also signal with high effort. We found that crickets that signaled more often on a fine temporal scale (e.g. longer pulses, shorter pulse durations, higher pulse rate) tended to call louder and more often. Our results suggest that different cricket species exhibit similar signaling trait correlations despite their exposure to different selective regimes, and that signaling effort and other conspicuous signaling traits may not evolve independently; thus, genetic quality may underlie variation in signaling traits.

P114 ABS Genesis Award Poster: MATING SYSTEMS 1 (Poster Session A: Weds. eve)

DO MALE PHYSIOLOGICAL CONDITION AND TERRITORY QUALITY AFFECT FEMALE CHOICE IN THE BROWN ANOLE?

Sarah Flanagan, Catherine Bevier

Colby College, United States; Email: spflanag@colby.edu

Female mate choice is an important component of sexual selection because traits that influence mate preference, such as physiology and ability to acquire resources, are favored. In lizards, the importance of female mate choice remains unclear as reported results are contradictory. I tested the hypotheses that female Brown Anoles, *Anolis sagrei*, 1) prefer males with greater physiological capacities and 2) prefer higher quality territories, regardless of male phenotype. First, male *A. sagrei* were rated for endurance and used in mismatched-pair female mate choice trials. Preference was scored as the time the female actively engaged a male. Male activity level was also scored. Blood glucose levels were measured before and after the endurance tests and mate choice trials. Finally, glycogen levels were measured in leg muscle and liver samples collected after mate choice trials. Second, females were given a choice between a male in a territory enriched with plants and a size-matched male in a bare territory. Females preferred males that 1) depleted liver glycogen, so were more active, and 2) spent more time with one of the two males irrespective of territory enrichment.

158 Contributed Talk: COGNITION AND LEARNING III (Wednesday AM)

INSIGHT PROBLEM-SOLVING THROUGH TOOL USE IN AN ASIAN ELEPHANT (ELEPHAS MAXIMUS)

Preston Foerder, Marie Galloway, Tony Barthel, Donald Moore III, Diana Reiss

The Graduate Center of the City University of New York, United States; Email: pfoerder@gc.cuny.edu

Although considered highly intelligent, elephants have failed to show insight problem-solving - the sudden solution to a problem without evidence of trial and error learning. This ability, recognized as the "aha" moment in humans, has also been shown in other species. Köhler (1925) reported the first evidence for insight problem-solving in a non-human species when chimpanzees used boxes and sticks to reach bananas hung out of reach. In testing whether elephants would use sticks or other movable objects to obtain food out of reach and overhead, a young Asian elephant (*Elephas maximus*) demonstrated insight by spontaneously moving a large plastic cube and using it as a tool to stand on to acquire the food. He showed behavioral flexibility, retrieving the cube from various locations, moving and employing other objects as platforms in the absence of the cube, and obtaining different items in varied locations. When given smaller objects, the elephant stacked them in an attempt to reach

the food. Previous failures to demonstrate insight in elephants may not have resulted from a lack of cognitive ability but rather from tasks prohibiting the use of the trunk as a sensory organ.

P348 Contributed Poster: MECHANISMS 2 (Poster Session B: Thurs. eve)

ENERGETIC STRESS IN A TROPICAL FOREST GUENON: CAUSES AND IMPLICATIONS FOR FEMALE REPRODUCTION

Steffen Foerster, Marina Cords, Steven Monfort

Boston College, United States; Email:sf2041@columbia.edu

Animals facing seasonal variation in food availability can adapt in different ways. As eclectic omnivores, many primates evolved the ability to process low-quality fallback food when preferred food is rare. A flexible diet, however, is not sufficient to eliminate constraints on reproduction in all species, including those that live in evergreen forests. Here we tested whether temporal energetic stress can explain reproductive seasonality and unusually long birth intervals in a tropical forest guenon (*Cercopithecus mitis*). We used fecal glucocorticoid concentrations as indicators of energetic stress, and controlled for the potentially confounding effects of social interactions and reproductive state on glucocorticoids. Multivariate analyses showed that females experienced temporal energetic stress when consuming more fallback foods, the likely proximate cause of reproductive seasonality. We also found preliminary evidence that seasonal energetic stress lengthens birth intervals and influences the timing of infant independence, highlighting the role of stress physiology in the expression life history traits.

252 Contributed Talk: ECOLOGICAL EFFECTS II (Thursday PM II)

PERSONALITY-DEPENDENT INVASION: SOCIAL CONTEXT, PERFORMANCE AND DISPERSAL IN AN INVASIVE FISH

Sean Fogarty, Julien Cote, Tomas Brodin, Kelly Weinersmith, Andrew Sih

University of California, Davis, United States; Email:spfogarty@ucdavis.edu

Ecological invasions are a major worldwide problem exacting tremendous costs. Classical species-trait based approaches to predicting invasion have been relatively unsuccessful. We show that in the invasive mosquitofish, *Gambusia affinis*, a recognition of social behavioral variation enhances our understanding of both performance within patches and dispersal between patches. In both foraging and antipredator contexts, individual social type and group social environment interact to affect performance. Differences in social context preferences lead to adaptive correlations between individual social type and group context. Furthermore, dispersal between patches is biased toward the social type that does well alone. A mathematical model integrating insights from behavioral syndromes and spatial ecology indicates a new mechanism for explaining variation in invasion success. Rapid, epidemic-like spread occurs most readily when a species includes a mix of social and asocial behavioral types that differ in density-dependent dispersal tendencies. The results hold implications for the prediction of invasion impacts, as well as the classification of traits associated with invasiveness.

86 Contributed Talk: COMMUNICATION I (Tuesday AM)

FISHTALK, A NEW DEVICE TO PLAYBACK UNDERWATER FISH SOUNDS ACCURATELY

Paulo Fonseca, Jorge Maia Alves, Ana Nunes da Ponte, Stefania Rismondo, Maria Clara Amorim

University of Lisbon, Portugal; Email:pifonseca@fc.ul.pt

Many fish communicate with acoustic signals mostly in mating and agonistic contexts. These signals are often pulsed low frequency sounds with fast transients. Playback experiments, a widespread tool to study the function of animals' acoustic signals, have been hampered in fish due to limitations of commercially available underwater loudspeakers, which do not reproduce fish sounds appropriately. In fact such devices have typically a strongly irregular frequency response, generate damped oscillations (resonance) being inappropriate to reproduce fast transients in a signal, are affected by water level (pressure), cannot be used beyond a depth of a few meters, and are usually relatively large. We developed a device that overcomes these limitations that is small sized, has a

smooth frequency response in the range 20-30 Hz up to above 1000 Hz (typical frequencies of fish sounds) and can reproduce underwater sounds with a high fidelity. Preliminary tests with *Pomasthoschistus* point to a behaviour modulation in response to conspecific sound playbacks. Examples of the device performance and of such behavioural responses will be given.

168 Contributed Talk: COMMUNICATION II (Wednesday AM)

SONG PLAYBACK ADVANCES THE START OF THE DAWN CHORUS IN MALE BLACK-CAPPED CHICKADEES

Jennifer Foote, Lauren Fitzsimmons, Daniel Mennill, Laurene Ratcliffe
Algoma University, Canada; Email: jennifer.foote@algonau.ca

Variation in the level of competition for mates and territories is likely to influence the behaviour of competitors. The start of the dawn chorus in songbirds is influenced by a variety of internal factors (circadian rhythms) and external factors (light levels, social cues). Here we investigate whether the start time of the dawn chorus is influenced by the singing behaviour of conspecific competitors. We used playback to simulate an unfamiliar male performing a dawn song bout within an existing (focal) male black capped chickadee's (*Poecile atricapillus*) territory. Playbacks were performed within a 16-microphone Acoustic Location System covering the territories of 5-10 chickadees. Playback began 15 min before the earliest song sung by any male on the preceding (control) day. Focal males and neighbours began singing significantly earlier on the day of playback compared to the control day. Changes in dawn chorus timing were thus detected at both the individual and communication network level. Our results show that animals adjust the timing of their sexual communication in response to increased levels of competition.

324 Contributed Talk: BEHAVIORAL COMMUNITY ECOLOGY (Friday PM I)

INTERSPECIFIC SOCIAL TRANSMISSION OF BEHAVIORAL TRAITS ACROSS SPECIES AND TIME

Jukka Forsman, Janne-Tuomas Seppänen, Mikko Mönkkönen, Tuomo Jaakkonen, Tuuli Salmi, Indrikis Krams, Lars Gustafsson, Blandine Doligez
University of Oulu, Finland; Email: jukka.forsman@oulu.fi

Social learning is considered to be common in animals, yet little is known about its consequences in nature in multi-species communities. We experimentally examined in the wild i) interspecific success-dependent adoption of behavioral traits and ii) their social transmission across time. The design manipulates and then measures novel, arbitrary preferences in cavity nesting birds (titmice *Parus* spp. and flycatchers *Ficedula* spp.) for neutral nest-site features (geometric symbols). We show, first, that the success of tutors affects the adoption of traits. Flycatchers copied and rejected tit preference depending on whether tit clutch size was high and low, respectively. Second, the preferences of other species affect the choices in the next breeding period. We attached different symbols on nest boxes depending on whether the box was occupied by tits, a flycatcher or was empty during the breeding period, and then monitored the choices in next spring. Titmice preferred the symbol that indicated an empty box. Our results show that behaviors can traverse selectively across species boundaries and time, and the overlap in niches among co-existing species can be dynamic.

51 Symposium: GEOGRAPHIC VARIATION (Thursday)

BEHAVIORAL EXPRESSION AND THE EVOLUTION OF PLASTICITY: INFLUENCES ON GEOGRAPHIC VARIATION

Susan Foster
Clark University, United States; Email: sfoster@clarku.edu

Behavioral phenotypes are typically responsive to environmental conditions, yet populations differ in range and patterns of responses. These differences can be expressed as phenotypic norms of reaction. Variation in norms of reaction reflects the evolution of plastic responses to environmental variation, and can be used to understand

how the genetic capacity to respond to environments evolves as populations diversify. As with other plastic traits, effects of selection on behavioral phenotypes depend on ancestral genetic variation, and on the nature of selection on individual populations. Traits that are that are expressed in some form in all environments (constitutive), will be continuously subject to selection, and often exhibit ecotypic variation. In contrast, behaviors that are expressed only in some environments are unlikely to be subject to selection in the environments in which they are not expressed, and thus can potentially persist for long periods of disuse without loss or modification. I will illustrate these concepts with examples from the adaptive radiation of threespine stickleback fish, (*Gasterosteus aculeatus*) supplemented with examples from other taxa.

P205 Contributed Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

POPULATION DYNAMICS IN TUCO-TUCOS (*CTENOMYS PEARSONI*) : A PRELIMINARY FIELD STUDY

Gabriel Francescoli, Graciela Izquierdo, Natalia Mannise, Mariana Cosse

Facultad de Ciencias, UdelaR, Uruguay; Email:gabo@fcien.edu.uy

A tuco-tuco population from southwest Uruguay was studied in a two year period (2005-2007) using direct observation, radio-tracking and data from 8 microsatellite markers. In a working grid, 35 individuals were captured; males represented 34.3% of the population. Sexual proportion was female biased (2.28:1) as expected for a polygynous species. A Mantel test revealed a positive correlation between spatial proximity and relatedness coefficient for males, hence males more closely related ($r \geq 0.25$) were spatially closest. From 7 males captured in 2005, 4 were highly related ($r \geq 0.5$) with the 2006 generation and were central to the population. Two of the 16 females captured in 2005, closely related with many individuals of 2006, were spatially located near the 4 "central" males. Three groups were defined based on animals' spatial distribution. In one group central females were surrounded by males (conversely to the pattern found in *C. talarum* from Argentina). Other groups presented an interspersed pattern. Our results are a contribution to understand several aspects of reproductive strategies linked to mating behaviour and many aspects of demography, selection and ecology.

117 Contributed Talk: SENSORY POLLUTION (Tuesday PM I)

ANTHROPOGENIC NOISE FILTERS BIRD COMMUNITIES NONRANDOMLY.

Clinton Francis, Catherine Ortega, Alexander Cruz

National Evolutionary Synthesis Center (NESCent), United States; Email:clinton.francis@nescent.org

Hypotheses for the negative effects of anthropogenic noise on birds include the disruption of acoustic communication, potentially forcing many species to abandon otherwise suitable areas. We tested this hypothesis by examining whether species' signal frequency, duration, or loudness influenced patterns of abundance of individuals or nests in woodlands surrounding natural gas wells with (noisy treatment sites) and without (control sites) noisy compressors. Because body size can co-vary with signal features, it was also included as a predictor variable. Both datasets revealed that larger birds with low-frequency signals that are more susceptible to masking from low-frequency noise avoided noisy areas, yet smaller birds with higher pitched vocalizations persisted. Signal duration and loudness, which may also facilitate signal transmission in environments where communication is difficult, had no influence on patterns of individual and nest abundance with respect to noise. These results suggest that noise may filter avian communities nonrandomly via acoustic masking and provide critical insight as to which species may tolerate these novel acoustics as the spatial extent of noise grow.

P256 Contributed Poster: COGNITION AND LEARNING 2 (Poster Session B: Thurs. eve)

LEARNING THE CONCENTRATION OF AN HERBIVORE-RELATED TOMATO VOLATILE BY *COTESIA CONGREGATA*

William Franklin, David Lincoln, Karen Kester

United States; Email:wefranklin@yahoo.com

Learning of olfactory cues for resource location provides a mechanism by which parasitoids can increase foraging efficiency. If herbivore-related plant volatile (HRPV) concentration is indicative of host location, then parasitoids that learn to use volatile concentration as a cue during associative learning could increase their ability to locate hosts. This study tested the effect of olfactory cue concentration during learning on subsequent concentration-dependent attraction to specific concentrations of HRPV's. When adult female wasps of *C. congregata* were conditioned by oviposition in the presence of β -caryophyllene, their subsequently-tested attraction peaked at the same high concentration to which they have previously demonstrated learned attraction. When wasps were conditioned by oviposition using a single low concentration to which they had not shown previous learned or innate attraction, wasp attraction peaked at that same low concentration. These results suggest that wasps learned the concentration of the olfactory cue present during conditioning, resulting in differences between the response curves, which have implications for host searching behavior.

291 Contributed Talk: APPLIED ANIMAL BEHAVIOR III (Friday AM)

INDIVIDUAL DIFFERENCES IN GAIN-MAXIMIZATION & LOSS-REDUCTION BEHAVIORS: A REGULATORY FOCUS APPROACH

Becca Franks, Frances Champagne, E. T. Higgins

Columbia University, United States; Email: beccafranks@gmail.com

The discovery of consistent individual differences in species ranging from dogs to damselflies has transformed the field of animal behavior. Characterizing these differences is crucial. We propose regulatory focus as a model for understanding common patterns of behavioral variation. Regulatory distinguishes the "promotion focus"—being gain motivated—from the "prevention focus"—being loss-prevention motivated. In humans it is established as a powerful predictor of behavior. For example, under conditions of loss, a strong prevention focus is predictive of riskier behavior. We present evidence indicating that it uniquely describes nonhuman animal behavior as well. In rats, maintaining darkness (safety) was positively related to confronting threatening objects (loss-prevention). In tamarin monkeys, pursuing food treats (gains) was negatively related to approaching novel non-gain objects. Alternative models of behavior (e.g. bold/shy, approach/avoidance, extroversion/introversion) cannot explain these patterns. Adopting the regulatory focus perspective can resolve apparent behavioral inconsistencies and suggests applications to social network theory, animal welfare and neurobiology.

292 Contributed Talk: APPLIED ANIMAL BEHAVIOR III (Friday AM)

CAN EXPERT CODINGS OF DOG BEHAVIOR BE REPLICATED BY NOVICES?

Jamie Fratkin, Sam Gosling, Zezelia Olson, Scott Thomas, Diana Thomas, Stewart Hilliard, David Sinn

University of Texas, Austin, United States; Email: fratki@mail.utexas.edu

Many working-dog programs use behavioral test instruments to select dogs for service. One way experts could save time would be to have non-experts code the behavioral test instrument from videotapes. Before novice codings can be used, they must be shown to be reliable and to replicate the codings yielded by experts. This study examined inter-rater reliability of a standardized behavioral test instrument in two separate working dog programs and evaluated whether novice coders could replicate experts' observations in each. Study 1 used a population of 8 week old military working dogs (MWDs) that were assessed on 10 behavioral traits. Results from Study 1 indicated there was a high correlation between novice and expert codings (mean correlation = .85). Study 2 assessed inter-rater reliability for dog behavioral tests from TSA's explosion detection dog program. Study 2, which will be analyzed, differed in that 3 levels of expertise of observers coded behavior of dogs at 4 different ages. Our talk will focus on insights gained from both studies in terms of how different levels of expertise, types of animals, and their ages may influence human perceptions of behavior.

159 Contributed Talk: COGNITION AND LEARNING III (Wednesday AM)

EFFECT OF ELEVATION-RELATED ENVIRONMENT ON MEMORY AND THE HIPPOCAMAPUS IN MOUNTAIN CHICKADEES

Cody Freas, Lara LaDage, Timothy Roth II, Vladimir Pravosudov
University of Nevada, Reno, United States; Email:freascody@gmail.com

Harsh environmental conditions may lead to increased demands for memory in food caching birds that rely on memory-based cache retrieval for survival. Such reliance on caches should result in differences in memory and the brain between populations that inhabit drastically different environments. Previous studies have shown stark differences in spatial memory and brain morphology on a large geographic scale along a latitudinal gradient in black-capped chickadees. Here, we attempt to determine if similar differences are present on a smaller geographical scale along an altitudinal gradient in mountain chickadees. There are large environmental differences between mountain and foothill elevations within close geographical proximity. To test the hypothesis that elevation-related environmental conditions affect cognition and the brain, we collected chickadees from three elevations: high, medium, and low (2400m, 1800m, and 1200m). Under identical laboratory conditions high elevation individuals cached significantly more food and performed better on spatial learning tasks compared to mid elevation chickadees. We will report differences in hippocampal morphology across all three elevations.

72 Symposium: COMMUNICATIVE COMPLEXITY (Friday)

SOCIAL COMPLEXITY AND COMMUNICATIVE COMPLEXITY: A BIRD'S EYE VIEW AND SYMPOSIUM OVERVIEW

Todd Freeberg, Indrikis Krams, Cecilia Kullberg
University of Tennessee, Knoxville, United States; Email:tfreeber@utk.edu

This symposium addresses how the complexity of social groups influences the complexity of their communication systems. This idea has roots back to Darwin, but has only recently been tested, primarily with vocal signaling. Comparative evidence, and recent experimental evidence, indicates that species in which individuals occur in larger or more diverse groups have greater vocal diversity compared to species in which individuals occur in smaller groups or as solitary individuals. In our presentation, we will first provide some theoretical and methodological background to potential links between social complexity and communicative complexity. We then summarize much of the research on the social and vocal complexity question in birds. Although most of the theory and work on this question has centered on vocal signaling, the argument should hold for signaling in other communication channels. We end our presentation by suggesting some potentially useful directions to take our work in the future, as will be exemplified by symposium presenters.

P150 ABS Genesis Award Poster: PREDATION AND FORAGING 1 (Poster Session A: Weds. eve)

EGG PREFERENCE OF THE COLORADO POTATO BEETLE LARVAE, *LEPTINOTARSA DECEMLINEATA*

Annick Fremont
United States; Email:afremont100@yahoo.com

Certain animals lay eggs that do not develop into an embryo and larvae hatching in the egg batch use them as a food source. Hatchlings of the Colorado potato beetle (CPB), *Leptinotarsa decemlineata*, usually feed on eggs that they find in their surroundings. This species lays both viable and non-viable eggs. An important question is whether the Colorado potato beetle will have a preference for fertile or infertile eggs. It was assumed based on kin selection that the hatchling would prefer infertile eggs over fertile ones. I placed newly hatched larvae on a total of four eggs, two from each type, and checked for cannibalism. According to my findings, I found that the Colorado potato beetle does prefer non-viable eggs over viable eggs. The hatchlings ate more infertile eggs than fertile eggs. In addition, a larger proportion of non-viable eggs were eaten first by the hatchling before viable eggs. Therefore, my results do agree with my hypothesis that newly hatched larvae would prefer to consume infertile eggs over fertile eggs.

P101 Contributed Poster: GENETICS AND EVOLUTION 1 (Poster Session A: Weds. eve)

HOW DO ORIOLES EVOLVE ORANGE? THE PHYLOGENY AND MECHANISM OF GAINS AND LOSSES OF CAROTENOID PIGMENTS

Nicholas Friedman, Kevin McGraw, Kevin Omland

University of Maryland, Baltimore County, United States; Email:friedmn1@umbc.edu

Many animals use carotenoids to produce elaborate coloration. These pigments must be obtained from the diet, and are frequently deposited directly into the integument to make yellow hues. Birds generally need to modify dietary carotenoids to produce orange and red hues, which are much more rare. The New World orioles exhibit a range of yellow and orange plumage coloration. Phylogenetic ancestral state reconstruction suggests that orange coloration evolved several times in the orioles from a yellow common ancestor. We sought to determine whether the same pigment mechanism might explain these repeated gains of orange. We used high performance liquid chromatography (HPLC) to examine carotenoid pigmentation in the feathers of 15 oriole taxa. Our data suggest that orange coloration arose with a gain of two red keto-carotenoids in the common ancestor of the Baltimore oriole and its relatives. While oriole species appear to vary continuously in coloration, the evolution of this variation may have been caused by discrete gains and losses of specific carotenoid pigments.

64 Symposium: COGNITION AS FORAGING (Friday)

MODELS OF INFORMATION FORAGING

Wai-Tat Fu

University of Illinois, United States; Email:wfu@illinois.edu

Generally speaking, there are two conditions that make intelligent search possible: (1) there are symbolic structures (e.g., information or spatial patterns) in the environment, and (2) the searcher can detect these structures and behave differentially based on the structures detected. I will focus on information search on the World Wide Web to illustrate how a theoretical framework that focuses on these two conditions is useful for understanding intelligent search. I will first briefly discuss the theory of information foraging theory and a computational model called SNIF-ACT to illustrate the importance of the two conditions in developing a theory of search. I will also discuss how information foraging theory can be extended to explain search behavior that involves incremental learning of the search environment. I will then illustrate how different forms of semantic structures may exist in the World Wide Web, and show how human searchers can learn from these structures to improve their search. Finally, I will show how the SNIF-ACT model can be extended to characterize this form of exploratory information foraging behavior.

P424 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

THE EFFECTS OF SOCIAL ENVIRONMENT ON MANGROVE RIVULUS *KRYPTOLEBIAS MARMORATUS*

Adam Fuller

University of Alabama, United States; Email:atom.fullerene@gmail.com

We used natural isogenic strains of the mangrove rivulus *Kryptolebias marmoratus* to investigate the effects of social environment on behavior and phenotype. The unique reproductive strategy (self-fertilization) and population structure (numerous isogenic lines) of the mangrove rivulus allowed us to expose genetically identical fish to different social environments. Fish were raised from hatching to maturity either in isolation or in groups of 4 animals. We measured total and standard length of fish three times and levels of aggression against a model twice. We also observed social interactions between group-housed individuals over the course of the experiment. Group-housed fish grew larger, but were more variable in size. There was no overall difference in aggression between treatments, but group-housed fish did reduce aggression between their first and second encounters with the model fish. Group-housed fish also formed a distinct dominance hierarchy. We are conducting follow-up experiments to examine how social environment affects feeding rates and boldness as well as aggression.

385 Contributed Talk: SOCIAL BEHAVIOR VII (Saturday AM)

"THE NEARNESS OF YOU" SOCIAL SPACING FOR HAREM MAINTENANCE IN *SACCOPTERYX BILINEATA*

Andrew Fulmer, Mirjam Knörnschild

Hampshire College, United States; Email: agf06@hampshire.edu

Understanding patterns and motivations for social spacing greatly illuminates the structure and internal dynamics of given groups or social systems. The highly social, polygynous greater sac-winged bat, *Saccopteryx bilineata*, represents an excellent model for social spacing analysis, since the choice of roost-sites within a day-roost constitutes an enduring repeated decision about proximity to conspecifics. Day-roost colonies consist of one or more harems, each with several females and a single reproductive male. A social-distance-time-budget metric revealed that social types differed significantly in their respective spatial association while roosting. Harem males and females were most closely associated, with males located at the center of harems instead of at the boundaries. The signaling modality mediating social interactions depended on the social distances between bats. Our results suggest a concentric social organization based around harem males, which may select roost sites in greatest possible proximity to females to enhance courtship signal strength. This constitutes an interesting deviation from the normative form of harem defense, patrolling boundaries, in mammals.

179 Contributed Talk: APPLIED ANIMAL BEHAVIOR II (Wednesday AM)

OUT OF SIGHT, OUT OF MIND! ARE HORSES SENSITIVE TO HUMAN ATTENTION DURING AN INTERACTION?

Carole Fureix, Carol Sankey, Anne-Sophie Vallet, Nicolas André, Martine Hausberger

University of Rennes 1, France; Email: carole.fureix@univ-rennes1.fr

Horses, like other domestic animals, have been shown to be sensitive to human attention while begging for food, but results are less clear when humans approach or catch a horse. Here we investigated whether horses are sensitive to human attention, testing 1) whether humans' visual attention and positions influenced horses' reactions in a simple leading task and 2) using a task where horses have to remain immobile 60s under a vocal order given by an experimenter, who a) stood straight facing the horse looking at its eyes, b) stood straight facing the horse, eyes closed, c) stood straight facing the horse looking above it and d) turned his back to the horse. In both studies, obedience levels were higher when the person was visually attentive than when he/she was not attentive (Spearman correlation, binomial and Wilcoxon tests, $P > 0.05$). Altogether, our results showed that horses are able to perceive human attention, underlining human attention as a major reinforcement enhancer in human-horse interactions.

52 Symposium: GEOGRAPHIC VARIATION (Thursday)

GEOGRAPHIC VARIATION IN MATE CHOICE IN A UNISEXUAL-BISEXUAL COMPLEX: ARE POPULATIONS CONSISTENT?

Caitlin Gabor, Andrea Aspbury

Texas State University - San Marcos, United States; Email: gabor@txstate.edu

We will examine behavioral variation across populations from multiple perspectives, such as variation in: preference functions, repeatability and endocrinology, as well as the evolution of reproductive character displacement. We will also discuss whether individual populations show consistent behaviors across behavioral contexts. The discussion will focus on a unique mating complex consisting of the unisexual, gynogenetic fish *Poecilia formosa* (Amazon molly) and its bisexual parental species *P. latipinna* and *P. mexicana*.

P84 Contributed Poster: ECOLOGICAL EFFECTS 1 (Poster Session A: Weds. eve)

MUSKING AS A DEFENSIVE BEHAVIOR IN URBAN GARTER SNAKES (GENUS *THAMNOPHIS*)

Jennifer Gagliardi-Seeley

Metro State College of Denver, United States; Email: jgaglia1@mscd.edu

Despite an abundance of studies documenting the antipredator and defensive behaviors of garter snakes (genus *Thamnophis*), none have quantitatively examined musking in free-ranging snakes. Musking, or cloacal discharge, is a common defensive behavior across many snake taxa that involves the release of foul-smelling compounds, including feces and urates, that makes the snake appear distasteful to potential predators. We examined musking behaviors in two species of free-ranging snakes, the Western Terrestrial Garter Snake (*T. elegans*) and the Plains Garter Snake (*T. radix*), when hand-captured at an urban site in Denver, Colorado. We found no correlation of this behavior with ambient temperature, humidity, snout-vent length (SVL), or mass, all factors which have been documented to cause variation in other defensive behaviors in garter snakes. However, we did find a significant difference in musking behavior between the species, with *T. radix* musking significantly more often than *T. elegans*.

204 Contributed Talk: COMMUNICATION III (Thursday AM)

THE SENDER-RECEIVER MATCHING HYPOTHESIS IN TWO SONGBIRDS: IMPLICATIONS FOR ACTIVE LISTENING SPACE

Megan Gall, Lauren Brierley, Jeffrey Lucas

Purdue University, United States; Email: mgall@purdue.edu

Vocalizations, particularly of avian species, have been well studied, and design rules have emerged that link the structural features of vocalizations to their function. The design rules of the auditory system have received relatively less attention. However, an expectation has emerged that the spectral and temporal features of species-specific vocalizations should be reflected in the auditory system (**sender-receiver matching hypothesis**). We tested this hypothesis in red-winged blackbirds (*Agelaius phoeniceus*) and brown-headed cowbirds (*Molothrus ater*). We predicted that high frequency vocal elements in brown-headed cowbird song would lead to enhanced high frequency sensitivity in cowbirds as compared to blackbirds. However, we found no species differences in the auditory thresholds of the two species. Interestingly, we did find large differences between the sexes, with female thresholds on the order of 3-7 dB lower than those of males. We discuss the potential sources of sender-receiver mismatch in the brown-headed cowbird and the implications of sex differences for the active listening space in terms of detection of vocal signals and discrimination among vocal signals.

P425 ABS Founders Award Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

MECHANISMS DRIVING WINNER AND LOSER EFFECTS IN THE GREEN ANOLE LIZARD (*ANOLIS CAROLINENSIS*)

Mark Garcia, Joe Murphree, Jonathan Wilson, Ryan Earley

University of Alabama, United States; Email: mjgarcia@crimson.ua.edu

Fighting experience can alter an individual's probability of winning future contests. It has been hypothesized that fighting experiences alter an individual's perceived and/or actual fighting ability. We addressed these hypotheses and potential physiological mechanisms driving experience effects in the green anole lizard. Focal individuals were given a loss/win in a contest against larger/smaller opponent. Following the contest focal individuals were: 1) processed immediately to examine changes in tissue metabolism, 2) processed 2d later, or 3) given a secondary contest prior to processing. Changes in perceived/actual fighting ability were determined by examining probabilities of victory in escalated or non-escalated secondary contests. Metabolic parameters, lactate and glucose, were examined in muscle, liver, and plasma to determine whether persistent changes in energetic state could drive changes in future contest success. Results reveal a significant loser effect but no

winner effect. Perceived fighting ability was significantly altered due to losing experience only and changes in metabolic physiology were not responsible for the presence/absence of either experience effect.

253 Contributed Talk: ECOLOGICAL EFFECTS II (Thursday PM II)

FERAL DOGS IN COLOMBIA: WHAT ARE THEY, WHAT ARE THEY DOING, AND WHAT TO DO?

Andres Felipe García-Londoño

BioEthos Foundation, Colombia; Email: agarcialondono@gmail.com

A feral organism is one that has escaped from domestication and has returned, partly or wholly into the wild. Feral animals can cause negative effects on ecosystems and can sometimes contribute to the extinction of native species. Apparently, there is no morphological difference between a domestic dog and a feral. The main difference lies in their behavior and dependence on humans. They subsist without food provide directly for humans and live in the wild, also feed mainly on food waste and are good hunters. They have a social structure usually rigid and highly organized. Through behavioral works made by Bioethos in Andean wetlands, moors and several natural areas of Colombia and thorough review of other studies conducted in Colombia and the world, seeks to highlight aspects of their ecology, behavior, interactions and impacts that may be generating feral dogs on ecosystems and health of human and nonhuman animals. It is suggested action plans to management feral populations and contribute to the knowledge of their ecology and behavior to control and mitigate its impacts. It is also recommended conducting a public policy of management of pets and education as possible alternatives.

P18 Contributed Poster: COGNITION AND LEARNING 1 (Poster Session A: Weds. eve)

FINDERS KEEPERS: ATTRIBUTION OF PERCEPTION IN NORTH ISLAND ROBINS (PETROICA LONGIPES)

M. Alexis Garland, Jason Low, KC Burns

Victoria University of Wellington, New Zealand; Email: Alexis.Garland@vuw.ac.nz

The capacity to attribute perception - and thus intention - to others is a keystone of more complex social cognition. Despite its importance, the extent such of capacities in other species has only recently been recently studied. Food-storing corvids adjust their cache protection and storage strategies depending upon the observation and behavior of conspecifics. Little is known about the extent to which wild food-storing birds will adjust their pilfering behavior based on perceived observation, and no study has examined perception of intention in interspecific interaction between human experimenters and wild birds. Here, we present North Island Robins (*Petroica longipes*) with a task in which subjects could pilfer a mealworm from one of two human experimenters. In six experiments, robins were given the choice to retrieve the mealworm from either an experimenter who was incapable of seeing the worm or an experimenter who was visually aware. The presence of interspecific sensitivity to gaze in a competitive paradigm with a wild population of birds can help us understand the nature of complex social cognition.

293 Contributed Talk: APPLIED ANIMAL BEHAVIOR III (Friday AM)

ENERGY REALLOCATION TO BREEDING PERFORMANCE THROUGH IMPROVED BEHAVIORAL THERMOREGULATION

Brianna Gaskill, Joseph Garner, Kathleen Pritchett-Corning

Purdue University, United States; Email: bgaskill@purdue.edu

Mice are housed at temperatures which increase their basal metabolic rates and impose high energy demands to maintain core temperatures. Thus, energy may be reallocated from other biological processes to increase heat production. We hypothesized that nesting material will allow for behavioral thermoregulation by reducing heat loss. We predict this reduction will improve feed conversion as well as breeding performance. We housed naïve C57BL/6NCrI, BALB/cAnNCrI, and CrI:CD1 (ICR) breeding pairs (30 cages per strain) at 20°C with a nesting treatment: no additional material, 8g Enviro-Dri®, or 8g Nestlets® for 6 months. Feed was weighed when added

and at the end of the experiment, and fresh nesting material provided weekly. Pups were counted at birth and weighed and sexed at weaning. Analyses used GLMs with post-hoc contrasts. Nesting material improved feed efficiency per pup weaned ($P=0.02$). However, there were no differences in the total feed consumed ($P=0.49$). The breeding index (pups weaned/dam/week) was higher when either nesting materials were provided ($P=0.02$). Thus, the energy conserved by nesting material was reallocated from heat generation to improved breeding performance.

21 Symposium: SENSORY POLLUTION (Tuesday)

ECOLOGICAL CONSEQUENCES OF ARTIFICIAL NIGHT LIGHTING FOR NIGHT-MIGRATING BIRDS

Sidney Gauthreaux

Clemson University, United States; Email:sagth@clemson.edu

Sidney A. Gauthreaux, Jr., Clemson University, South Carolina, USA, sagth@clemson.edu. During nocturnal migration hundreds of thousands of birds collide with man-made structures (e.g., buildings, broadcast towers, wind turbines, offshore platforms). The extent of this mortality is of concern to conservationist because the populations of many species are declining, and for rare, threatened, and endangered species, collision mortality could have devastating population consequences. In most cases the underlying cause of the mortality is the attraction of migrating birds to light sources associated with the structures. The attraction depends on the spectrum of light and whether the light is constant, slowly blinking, or pulsing (strobe). I will review how light at night influences the behavior of flying birds and examine the experiments designed to study the mechanisms of light attraction. The problem of light-attraction at night extends beyond migrating birds, because seabirds also are attracted to artificial lights near nesting colonies, and many of the species are of great conservation concern.

205 Contributed Talk: COMMUNICATION III (Thursday AM)

TIGHT HORMONAL PHENOTYPIC INTEGRATION ENSURES HONESTY OF A COMMUNICATION SIGNAL

Sat Gavassa, Ana Silva, Philip Stoddard

Florida International University, United States; Email:satgavassa@gmail.com

Hormones mediate sexually selected traits including advertisement signals. Hormonal co-regulation links the signal and the traits such that the tighter the integration, the more reliable the signal. Androgens increase the duration of the communication signal in both sexes of the electric fish *Brachyhyopomus gauderio*. We studied whether the duration of the signal functions as an honest indicator of androgen levels and other androgen-mediated traits. We studied the variation in sex steroids, signal duration, and sexual development in a natural population of *B. gauderio*. In both sexes circulating levels of the androgens testosterone and 11-ketotestosterone were strongly related to signal duration. Thus, signal duration can serve as an honest indicator of androgens levels in both sexes. Additionally through phenotypic integration, signal duration also predicts other traits causally related to androgens, gonad size and development in both sexes, and estradiol levels in females. We show that tight hormonal phenotypic integration between advertisement signal and other androgen-mediated traits renders the advertisement signal an honest indicator of a suite of reproductive traits.

213 Contributed Talk: MATING SYSTEMS II (Thursday AM)

SEX/FOOD TRADE-OFF IN A PROMISCUOUS MAMMAL: HOW IMPORTANT IS FORAGING FOR MALE CHIMPANZEES?

Alexander Georgiev, Melissa Emery Thompson, Andrew Russell, Martin Muller, Richard Wrangham

Harvard University, United States; Email:georgiev@fas.harvard.edu

Male mating competition in mammals can be energetically costly. Males' ability to obtain copulations depends on them building energy reserves when sex is not available to support male-male competition when it is. This is true of many polygynous seasonal breeders but how the relationship between energy use and mating success

varies across mating systems is unclear. We tested the hypothesis that in a promiscuous aseasonally breeding mammal, the chimpanzee, mating success is energetically constrained. We observed 12 males on 124 days in Kibale National Park, Uganda in the presence and in the absence of sexually receptive females. Linear-mixed modeling showed that when females were in estrus all males fed less. However, high-ranking males, those most successful in obtaining copulations, did not feed more than subordinates on non-mating days, nor did they feed less than them on mating days. We conclude that mating competition is energetically costly for male chimpanzees and compromised foraging is partly responsible. Males' success in mating competition, though, is not as critically dependent on energetic condition as it is in polygynous or promiscuous seasonal breeders.

P19 ABS Genesis Award Poster: COGNITION AND LEARNING 1 (Poster Session A: Weds. eve)

A TALE/TAIL OF TWO ORCAS - THE SLEEP PATTERNS AND CARE OF A MOTHER AND HER CALF

Caitlyn Geraci, Heather Hill

United States; Email:tonythetiger9213@aol.com

Cetaceans have developed a unique mechanism to sleep in which they alternate slow wave sleep (SWS) patterns between hemispheres. This uni-hemispheric SWS allows them to maintain constant vigilance while resting. An earlier study involving a killer whale mother-calf pair had suggested that the mother never slept, or floated, following the birth of her calf for the first month (Lyamin et al. 2005). With the birth of a new calf at Sea World San Antonio, the sleep patterns of a mother-calf pair were investigated one month prior to parturition and one month, six months, and twelve months, post-parturition. Samples of calf watch records and videos were analyzed to determine if the mother changed her sleep strategy following the birth of her calf. Results demonstrated that changes in the killer whale mother's swim patterns corresponded to the calf's increasing levels of independence and social interactions with other whales. In summary, the findings suggest that killer whale mothers may change their swim strategy based on the presence of a calf and replace floating with slow swims and pattern swims until their calves have matured enough to not be constantly monitored.

53 Symposium: GEOGRAPHIC VARIATION (Thursday)

MATE-ATTRACTING SIGNALS: SEXUAL SELECTION, GEOGRAPHIC VARIATION AND SPECIATION

H Carl Gerhardt

University of Missouri, Columbia, United States; Email:gerhardth@missouri.edu

The potential for geographic differences in mate-attracting signals under sexual selection to influence speciation can be assessed: (1) by estimating patterns of call variation in populations of wide-ranging species; and (2) by establishing minimum differences in call properties that predict positive assortative mating by population. In one species of treefrog (*Hyla chrysoscelis*), only acoustic property - pulse rate - was sufficiently differentiated between geographically distant populations to elicit selective phonotaxis by females. In two other species, pulse rate was not sufficiently differentiated among lineages within their extensive North American ranges of distribution to do so. In one of these (*Hyla arenicolor*), the lack of call differences contrasts with a high degree of genetic differentiation between groups of populations isolated from one another on "sky islands" in the southwestern USA. In the other, biparental tetraploid species (*Hyla versicolor*), little differentiation occurs among lineages with different, independent origins. Potential explanations for the lack of differentiation in the last two species complexes will be discussed.

137 Contributed Talk: MECHANISMS I (Tuesday PM II)

EXPERIMENTAL ELEVATION OF TESTOSTERONE LOWERS FEMALE FITNESS: EVIDENCE FOR ADAPTATION AND CONSTRAINT

Nicole Gerlach, Ellen Ketterson

Indiana University, United States; Email:nmgerlac@indiana.edu

Testosterone (T) is often referred to as the "male hormone," but it can influence aggression, parental behavior, and immune function in both sexes. By experimentally relating hormone-induced changes in phenotype to fitness, it is possible to ask whether prevailing phenotypes perform better or worse than altered phenotypes; i.e. whether current phenotypes are adaptive or constrained. In the dark-eyed junco (*Junco hyemalis*), high levels of T in males decrease survival and parental care, but increase the production of extra-pair offspring, leading to higher net fitness, which suggests constraint. In this study, we implanted female juncos with exogenous T and examined its effect on fitness (survival, reproduction, extra-pair mating). We found that females that received T implants were no more likely than control females to produce extra-pair offspring or mate with multiple males. However, exogenous T did decrease the likelihood that a female would breed successfully, suggesting that increased T may have opposite effects on male and female fitness, and that prevailing levels in females may be adaptive for them. These findings are consistent with sexual conflict.

P206 Contributed Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

EFFECT OF CHOLESTEROL REDUCTION ON AGGRESSIVE BEHAVIOR IN NILE TILAPIA

Percilia Giaquinto

State University of São Paulo, Brazil; Email:perciliag@gmail.com

The negative association between low serum cholesterol and aggressive behavior has led to the cholesterol-serotonin hypothesis: low dietary cholesterol intake leads to depressed central serotonergic activity, reported in numerous studies of aggression. We investigated the relationship between low plasma cholesterol in aggressive behavior of Nile tilapia, *Oreochromis niloticus*, species with clear dominant-subordinate relationship. In this study, fish were exposed to statin, substance prescribed when the goal is the reduction of cholesterol. Aggressive behavior was analyzed after chronic administration of statin. Our results show that fish treated with statin had reduced plasma cholesterol and increased aggressive behavior compared to control. This increase is corroborated by higher emission of agonistic behavior and larger index of dominance hierarchy in treated fish. These observations may indicate that changes in plasma cholesterol can affect neurochemical processes and provide a mechanism for increased aggressive behavior. Thus, this study confirms that changes in plasma cholesterol levels may depress the serotonergic action, triggering aggressive behavior.

P128 Contributed Poster: MECHANISMS 1 (Poster Session A: Weds. eve)

THE BENEFITS OF SHADE-SEEKING BY COMMON GRACKLE (*QUISCALUS QUISCULA*) NESTLINGS

Barb Glassey, Melanie Gunson, Robert Muir

Cape Breton University, Canada; Email:bglassey@ns.sympatico.ca

The amount of shade available to open-cup passerine nestlings is both temporally and spatially variable. Common Grackle (*Quiscalus quiscula*) nestlings detect and respond to nanoclimate heterogeneity (sun and shade) by shade-seeking, behaviour which includes orienting, neck-stretching, and moving within the nest cup. The aim of our research was to explore the value of shade-seeking by measuring the metabolic cost of nestling exposure to solar radiation. We measured the energetic costs of begging and thermal behaviours using open-system respirometry on irradiated nestlings under conditions of full shade, full sun, and partial shade generated by a 1.0KW Illumination System. Our results showed a significant reduction in energy expenditure associated with being in the shade. Nestlings exposed to sunlight sustained a metabolic and behavioural (reduced begging) cost, highlighting the value of shade as a resource. When shade was available in limited amounts, nestlings oriented to it, leaving the body exposed to the sun. Our results confirm shade-seeking behaviour as an important mechanism for reducing metabolic costs, such that access to even partial shade may benefit nestlings.

120 Contributed Talk: PARENTAL CARE I (Tuesday PM I)

A BENEFIT OF PARASITE EGG TOLERANCE BY A HOST OF THE SHINY COWBIRD

Ros Gloag, Vanina Fiorini, Juan Carlos Rebores, Alex Kacelnik
University of Oxford, United Kingdom; Email:ros.gloag@zoo.ox.ac.uk

Even when parasites are host-tolerant, their eggs impose a cost of incubation and nestling rearing to the host, but while some hosts remove foreign eggs others don't. We investigate the hypothesis that the presence of parasite eggs reduces host egg loss in subsequent parasitic attacks to a sufficient degree to compensate for the extra parental effort. Chalk-browed mockingbirds *Mimus saturninus* are parasitized by the host-tolerant shiny cowbird *Molothrus bonariensis*, which punctures one or more eggs when visiting host nests. Mockingbirds struggle to prevent puncturing and laying, but seldom remove parasite eggs once laid. We filmed cowbirds visiting mockingbird nests manipulated to contain one mockingbird egg plus zero, one or three cowbird eggs. We found that mockingbird eggs were considerably more likely to survive the larger the number of cowbird eggs in the nest. A model of the trade-off between egg loss and cost of rearing shows that given the intensity of this dilution effect, for moderate rearing costs the presence of parasite eggs confers a net advantage to the host, and may explain why egg tolerance is evolutionarily stable.

308 Contributed Talk: SEXUAL SELECTION IV (Friday AM)

CONCURRENT EFFECTS OF SPERM COMPETITION AND FEMALE QUALITY ON MALE MATE CHOICE IN THE GUPPY

Jean-Guy Godin, Sarah Jeswiet, Stacey Lee-Jenkins
Carleton University, Canada; Email:jgodin@carleton.ca

How sperm competition and female quality interact to influence male mating decisions remains poorly understood. Here, we explored the concurrent effects of sperm competition and female body size on male mating decisions in the Trinidadian guppy *Poecilia reticulata* as a model system. We used female body length as a proxy for fecundity and manipulated the relative size difference of paired stimulus females concurrently with socio-sexual cues (presence of rival males) that may predict the immediate risk (SCR) and intensity (SCI) of sperm competition. The presence of either one or two rival males near the initially-preferred female (usually the larger female) increased the probability that a focal male would reverse his initial mate preference. However, after observing initially-preferred females interacting with one rival male, focal males were more likely to reverse their initial preference when the females were similar in body length than when they differed considerably (~25%) in body length. Our results suggest that males simultaneously evaluate SCR and female quality and accept the potential cost of sperm competition to mate with a larger, more fecund female.

P349 Contributed Poster: MECHANISMS 2 (Poster Session B: Thurs. eve)

CHANGES IN SEX STEROIDS AND TERRITORIAL AGGRESSION IN FREE-LIVING HUMMINGBIRDS

Paulina Gonzalez-Gomez, W. Skyler Blakeslee, Sara Hiebert, John Wingfield Wingfield
University of California, Davis, United States; Email:plgonzalezgomez@ucdavis.edu

In year-round territorial species male-male territorial aggression is similar between breeding and non-breeding seasons, however the endocrine mechanism could be different. In several species, testosterone (T) triggers increased aggression the breeding season, whereas territoriality in the non breeding season can be regulated by the production of the biologically inert sex steroid precursor, dehydroepiandrosterone (DHEA). The hormonal regulation of hummingbird territorial behavior, however, was heretofore unknown. Our goal was to assess seasonal changes in sex steroids, territorial aggression levels and body condition in reproductive and non-reproductive seasons in hummingbirds. As expected, steroids in plasma and cloacal fluid (CF) in *Sephanoides sephanoides* were correlated. CF of *Calypte anna* showed high levels of DHEA during the non-reproductive season, high levels of T during the reproductive season, and levels of both steroids were positively correlated with aggressive behaviors. Furthermore, body condition was positively correlated with steroid levels and aggressive behaviors, suggesting that more aggressive individuals are able to secure better resources.

P41 Contributed Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

RAPID MODULATION OF SONG FREQUENCIES IN RESPONSE TO OVERLAPPING NOISE

Sarah Goodwin, Jeff Podos

University of Massachusetts Amherst, United States; Email:segoodwi@cns.umass.edu

Transmitting and detecting signals in ambient noise is a challenge across many taxa and modalities. Mounting evidence suggests that signalers not only favor signals that circumvent ambient noise, but may also adapt to immediate changes in patterns of ambient interference. Here we explore possible adaptations to interference in an acoustic communication system, asking whether singing male Black-capped Chickadees (*Poecile atricapillus*) shift their songs away from tones of overlapping frequency. For 20 territorial male birds we determined song frequency using real-time spectrograms, broadcast overlapping tones through a portable speaker, and documented birds' subsequent vocal behavior. We found that males singing in the presence of masking tones quickly shifted vocal frequencies (average 61.3 seconds). This contrasts with males challenged with a control tone well outside their natural frequency, during which birds retained their original frequencies for on average 92.9 seconds. The ability to respond rapidly to masking noise provides new evidence for vocal behavioral plasticity, which may have implications for singing behavior across different environments and social contexts.

P129 Contributed Poster: MECHANISMS 1 (Poster Session A: Weds. eve)

ACOUSTIC AND AMPLEXUS-RELATED SOCIAL SIGNALS INFLUENCE STEROIDS AND OVIPOSITION IN FEMALE TREEFROGS

Noah Gordon, Carl Gerhardt

University of Evansville, United States; Email:ng62@evansville.edu

Steroid hormones regulate reproduction and influence behaviors, but how hormones respond to exogenous cues is poorly understood. We investigated how the presence of an amplexant male and acoustic social signals interact to influence the hormones that regulate female reproductive behavior in the gray treefrog, *Hyla versicolor*. We tested the hypotheses that advertisement calls and the presence of an amplexant male advance oviposition by influencing steroid hormone levels. Female treefrogs that heard conspecific signals had elevated plasma estradiol relative to females that heard pink noise or silence, and females had elevated estradiol and testosterone when ovipositing with an amplexant male. Progesterone levels were unaffected by either call reception or amplexus. We have also shown that females took longer to oviposit when exposed to conspecific signals regardless of whether a male was present for oviposition. Consequently, our data do not support the long-supported hypothesis that social stimulation hastens reproduction, since we have shown oviposition took longer in the presence of acoustic stimulation.

258 Contributed Talk: SEXUAL SELECTION III (Thursday PM II)

IS MALE SONG A RELIABLE SIGNAL OF NUPTIAL GIFT QUALITY IN THE ACOUSTIC ORTHOPTERA?

Marlene Goubault, Alicia Colin, Michael Greenfield

University of Tours, France; Email:marlene.goubault@univ-tours.fr

In acoustic insect species wherein males provide females with a substantial nuptial gift and females evaluate males based on their calling song, the long-range advertisement may be a reliable signal of gift quality. This expectation assumes that females would benefit from the ability to assess such gifts prior to close-range courtship and mating. We addressed this question in *Ephippiger diurnus* (Orthoptera: Tettigoniidae), a katydid species wherein males provide females with a large spermatophore during mating, a transfer that appears to represent a direct (material) benefit for the female. Moreover, *E. diurnus* females orient and move toward males who sing with greater acoustic power. Thus, we asked whether female preferences for male song might afford them greater material benefits. We report that certain male song traits may inform females on the protein content of the spermatophore to be transferred. However, we also report that the reliability of this information is confounded by male preferences, as males appear to transfer larger gifts to older females.

P392 Contributed Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

FEMALE PREFERENCE FOR NOVEL MALES IN GUPPIES: DOES A FRESH FACE MATTER?

Robin Graber, Madhavi Senagaloge, Elizabeth Ross, Anne Houde

Lake Forest College, United States; Email: grabere@lakeforest.edu

Previous studies suggest frequency dependent mating success could be a possible mechanism for maintenance of the color polymorphism in guppies. We hypothesized that when courted by several males, a female guppy would be less responsive to a male with a color morph similar to the most recently courting male than to a male with a different color morph. Using social groupings including a virgin female and two males from one color morph and two from a different color morph, we observed the sequence of displays and responses for the virgin female on two consecutive days. On the first day, females were less responsive to males with the same morph as the previous male to court, but on the second day there was no significant difference between her response to different and same morph males. Initially, females may have been unable to recognize similar morph males as different individuals suggesting that similar morph males could be at a disadvantage. However, on the second day, greater familiarity with individual males may have increased females' ability to recognize males with similar color patterns as different individuals.

333 Contributed Talk: DEVELOPMENT II (Friday PM I)

EARLY ENVIRONMENT AND MATERNAL PHENOTYPE INFLUENCE PERSONALITY DEVELOPMENT AND STRESS SENSITIVITY

Giulia Graceva, Jaap Koolhaas, Ton G Groothuis

University of Groningen, Netherlands; Email: g.graceva@rug.nl

Animal personality is predominantly studied from a functional and evolutionary perspective, not much attention has been paid to its developmental plasticity. This may be relevant since either the mother or the young may adjust personality according to the environment. Since in rodents the sex ratio of the litter influences aggression, we studied the effect of litter composition on personality development in the Groningen wild-type rat, known for variation in personality. We measured aggression, defensive burying, open field behaviour and the level of plasma corticosterone after a challenge. Contrary to expectation the treatment did not have main effects on single behaviors. Compared with unmanipulated litters behavioral correlations changed in both treatments suggesting that early handling disrupts adult personality. Prenatal litter size and maternal body weight predicted offspring plasma corticosterone levels linked to personality. Maternal burying and body weight predicted offspring burying behavior. These findings suggest long-lasting effects (programming) of the prenatal-maternal environment on personality and additional plasticity in personality due to early postnatal handling.

P426 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

HORMONAL EFFECTS OF MALTREATMENT IN NAZCA BOOBY NESTLINGS: IMPLICATIONS FOR THE CYCLE OF VIOLENCE

Jacquelyn Grace, Karen Dean, Mary Ann Ottinger, David Anderson

Wake Forest University, United States; Email: gracjk7@wfu.edu

Non-breeding Nazca booby adults exhibit an unusual and intense social attraction to non-familial conspecific nestlings. Non-parental Adult Visitors (NAVs) seek out and approach unguarded nestlings during daylight hours and display parental, aggressive, and/or sexual behavior. In a striking parallel to the cycle of violence of human biology, degree of victimization as a nestling is strongly correlated with frequency of future maltreatment behavior exhibited as an adult. We investigate candidates for permanent organization of this behavior, including immediate and long-term changes in circulating corticosterone and testosterone due to victimization, by protecting some nestlings with portable enclosures that prevented NAV visits and comparing them to controls. During maltreatment episodes, nestlings experience an approximate five-fold increase in corticosterone concentration, and corticosterone remains elevated until at least the following morning. Our results are consistent

with the possibility that repeated activation of the hypothalamic-pituitary-adrenal axis permanently organizes future adult maltreatment behavior.

P312 Contributed Poster: ECOLOGICAL EFFECTS 2 (Poster Session B: Thurs. eve)

A NOVEL RESOURCE-SERVICE MUTUALISM BETWEEN BATS AND PITCHER PLANTS

Ulmar Grafe, Caroline Schöner, Gerald Kerth, Anissa Junaidi, Michael Schöner

Universiti Brunei Darussalam, Brunei Darussalam; Email:grafe@biozentrum.uni-wuerzburg.de

Mutualistic relationships between vertebrates and plants apart from the pollen and seed-dispersal syndromes are rare. At first view, carnivorous pitcher plants of the genus *Nepenthes* seem to be highly unlikely candidates for mutualistic interactions with animals, as they form dimorphic terrestrial and aerial pitchers that trap arthropods and small vertebrates. However, we consistently found Hardwicke's woolly bats (*Kerivoula hardwickii*) roosting within the aerial pitchers of *Nepenthes rafflesiana* variety *elongata* in a peatswamp forest of Brunei Darussalam, Borneo. We followed 17 woolly bats radio-telemetrically and found that they exclusively used these pitchers as daytime roosts although other roosting sites were abundant. We also found bat faeces in the digestive fluid of the pitchers. Using stable isotope analyses we estimated that the pitcher plant *N. r. elongata* gains an average of 33.8% of its total foliar nitrogen from the faeces of Hardwicke's woolly bats. These observations suggest a resource-service relationship between a bat and a carnivorous pitcher plant, with clear benefits to both mutualistic partners.

P393 Contributed Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

TRAITS INFLUENCING MALE MATING SUCCESS IN A FIELD CAUGHT CRICKET, *GRYLLUS PENNSYLVANICUS*

Caitlin Grant, Ian Thomson, Sarah Harrison, Susan Bertram

Carleton University, Canada; Email:caitlingrant4@gmail.com

It is common for females to assess multiple male signals during mate choice decisions. Male crickets use both sequential and simultaneous signals when attracting potential mates. In crickets, receptive females use males' long distance attraction calls to acoustically orient towards territories held by potential mates. Once a female approaches, the male will switch to a short distance courtship call in the hopes of persuading the female to mount and copulate. During this time the female may assess both the courtship call and condition of the male. Little is known about the collective influence of long distance attraction calls, courtship calls and condition on mating success of males. Females of many cricket species favour larger males, generally thought to be a reflection of male condition, and energetically expensive calls, such as more rapid pulse and chirp rates. Here we examine the influence of auditory signals and condition on male mate success in a wild caught field cricket, *Gryllus pennsylvanicus*.

P257 Contributed Poster: COGNITION AND LEARNING 2 (Poster Session B: Thurs. eve)

INSIGHTS FROM MOBILE ROBOT CONTROLLERS FOR RESOLUTION OF CONFLICTION BEHAVIORS IN A SINGLE ANIMAL

Frank Grasso

Brooklyn College, CUNY, United States; Email:fwgrasso@gmail.com

In ethology we often seek or contrive situations in which two or more behaviors are placed into conflict. This approach often yields valuable insights into the central organization of behavioral mechanisms. I will outline research from my lab exploring the resolution of behavioral conflict within mobile robots as a model for a behavioral conflict resolution within a single animal. The control (decision) systems are based on biological principles rather than technological applications. They are simple compared to animal systems and more easily analyzed. Yet they are complex compared to many mobile robot controllers used for commercial applications or BioRobot implementations used to describe a single animal behavior. These controllers use recurrent neural networks and implement a form of short-term memory in explicit sensory, central processing, and motor levels

of the controller. Our studies provide insights into the causes of variable responses of an animal presented with the same environmental situation on multiple occasions. These studies explain behavioral variability as a result of competing dynamic processes rather than learning processes, environmental or internal noise.

P427 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

THE INTERPLAY BETWEEN MONKEY SEE AND MONKEY DO: VISUAL ACCESS IN A SOCIAL PREFERENCE TASK

Helen Marie Graves, Daniel Weiss

Pennsylvania State University, United States; Email:hug124@psu.edu

Past research demonstrates that social context modulates nonhuman primate social behavior. In partner preference tests with tamarin monkeys, focal animals spent more time investigating opposite sex strangers when their mate could not see them vs. when they could. It is unclear what aspect of social context drives this change in behavior. Changes in the focal monkey's social preferences may be due to the obstruction of the mate's view, suggesting the focal is sensitive to the knowledge state of others, or the obstruction of its own view, in which case the sensitivity to the knowledge state of others is undetermined. In this study, cotton-top tamarins explored a Y-maze in which their mate and an opposite sex unfamiliar monkey were placed at opposing ends of the maze. Visual access among the animals was manipulated across conditions such that all animals had full visual access to each other, visual access for all monkeys was occluded, or only the focal monkey's visual access was occluded. Monkeys spent more time with the mate only when the mate's visual access was not occluded, suggesting that they modulate their social behavior based on knowledge state of others

144 Contributed Talk: SEXUAL SELECTION II (Tuesday PM II)

**SOCIAL CUES AND SPERM COMPETITION RISK IN THE PACIFIC FIELD CRICKET
*TELEOGRYLLUS OCEANICUS***

Brian Gray, Marlene Zuk, Maxine Beveridge, Leigh Simmons

University of California, Riverside, United States; Email:brian.gray@email.ucr.edu

Sperm competition (SC) game theory predicts that males should increase ejaculate expenditure as sperm competition risk increases. Most studies to date have experimentally manipulated SC risk by using direct physical interactions between conspecific males. More recently, investigators have suggested that more indirect cues, such as acoustic, visual, or olfactory cues, may indicate SC risk. We looked at one such indirect cue by rearing individual male Pacific field crickets in either song-dense or song-free acoustic environments, mimicking "high SC risk" and "low SC risk" situations. This also mimics the natural acoustic environment of this species; on some Hawaiian islands, a wing mutation has silenced male crickets. Islands with many of these silent males have an acoustic landscape very different from islands with normal males. We measured male ejaculate expenditure by assaying sperm viability, the percentage of live sperm contained within a fresh spermatophore. Consistent with SC game theory, males reared in song-dense environments had greater sperm viability than males reared in song-free environments, indicating that males may use social cues to gauge SC risk.

7 Plenary Lecture: (Friday PM)

NEW CALEDONIAN CROWS AND THE EVOLUTION OF COGNITION WITHOUT MIRACLES

Russell Gray

University of Auckland, New Zealand; Email:rd.gray@auckland.ac.nz

Debates in the study of animal cognition of often oscillate between over-hyped claims of "human-like" cognitive abilities and deflationary "killjoy" accounts. In this talk I argue that studies of cognitive evolution should follow studies of morphological complexity and seek incremental Darwinian accounts rather than postulating miraculous cognitive leaps. Our focus should therefore be on studies of intermediate cognition rather than all or nothing claims about our pet species possessing some complex human ability. I will use our work on tool

manufacture in New Caledonian crows to illustrate how quite complex behavioral traditions might have evolved without miracles.

P20 ABS Founders Award Poster: COGNITION AND LEARNING 1 (Poster Session A: Weds. eve)

OBSERVATIONAL LEARNING AND COGNITION IN ZOO AFRICAN ELEPHANTS
(*LOXODONTA AFRICANA AFRICANA*)

Brian Greco, Nancy Caine

California State University San Marcos/San Diego Zoo Global, United States; Email: greco003@cougars.csusm.edu

Little is known about the ways in which elephants solve novel foraging problems or how conspecifics may influence problem solving. However, anecdotal evidence suggests that social learning may play an important role in elephant behavioral ecology. We asked if learning is facilitated after viewing a conspecific's interactions with a novel task. Serving as the model, the most dominant female in an African elephant herd at the San Diego Zoo Safari Park learned how to extract food from each of six apparatus. Five subdominant females each interacted with three apparatus after watching the model; they interacted with three other apparatus without having first watched the model (unmodeled condition). On average, subjects spent 16% more time interacting with the novel apparatus in the modeled than in the unmodeled condition. Additionally, 5 of the 6 apparatus were solved more quickly by subjects who had seen the model. However, the elephants did not necessarily solve the task in the way the model solved it. Elephants may become more motivated to explore a novel task when it is first used by a conspecific, and this may improve the efficiency with which an elephant learns.

P42 ABS Genesis Award Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

SENDING MIXED SIGNALS: OLFATORY COMMUNICATION IN COQUEREL'S SIFAKAS,
PROPITHECUS COQUERELI

Lydia Greene, George Dubay, Christine Drea

Duke University, United States; Email: lydia.greene31@gmail.com

Sociality and diurnality, coupled with complex urinary cues and frequent odorant mixing, distinguish the sifaka, a strepsirrhine primate, from other members of its clade. We further explored the relation between socioecology and modes of scent signaling in this interesting model. To test if odor cues convey sex, reproductive state or social status, we observed scent marking in Coquerel's sifakas (8 M, 7 F) over three reproductive phases, and characterized the chemical composition of their odorants using gas and liquid chromatography/mass spectrometry. Olfactory behavior varied by sex (M ~ F), reproductive phase (prebreeding or breeding ~ postbreeding), and male gland use (sternal ~ genital) as well as intrasexual status (dominant ~ subordinate). Although often mixed with urine, genital and sternal secretions were chemically unique and either varied by sex, season or rank. Thus, visually elaborate scent-marking displays in sifakas combine distinct urinary and glandular chemicals, maybe to prolong signal longevity, and serve to communicate socially relevant information. Perhaps sociality and diurnality selected for increased olfactory complexity in lemurs. Funded by NSF IOS-0719003.

P85 Contributed Poster: ECOLOGICAL EFFECTS 1 (Poster Session A: Weds. eve)

EFFECT OF MIGRATORY STRATEGY ON DISTRIBUTIONAL SHIFTS OF BREEDING BIRD SPECIES IN ONTARIO, CANADA

Erin Greenlee, Evan Greenlee, Ian Hamilton

Ohio State University, United States; Email: greenlee.27@buckeyemail.osu.edu

During the last century the northern hemisphere has experienced rapid changes in temperature and precipitation patterns and these have affected the distribution and abundance of many organisms. We hypothesized that species in Ontario, Canada are responding to climate change by shifting their distributions northward. Using Ontario Breeding Bird Atlas data we evaluated geographic range changes for 138 species. Using a combination of methods to measure distribution shifts within the core of the distribution and along range margins, an

originally composed software program, and AICc model selection, we found support for shifts along northern and southern range margins and the center of distribution for all species. Shifts along northern and southern range margins were largely driven by differences in migratory strategy and breeding habitat. The effect of behavioral variables, such as migration strategy, on these shifts will be presented. Additionally, the implications of different methods for measuring range shifts will be discussed. Our results are similar to other studies, however, in contrast we find evidence that response to climate change may differ depending on migratory strategy.

P289 Contributed Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

THE EVOLUTION OF FAIRY-WREN TRILLS FROM ALARM CONTEXT TO DISPLAY: A POSSIBLE PATH TO NOVEL SIGNALS

Emma Greig, Michael Webster

Cornell University, United States; Email: eig9@cornell.edu

Understanding the evolution of novel traits is necessary to explain the diversity of phenotypes that occur in nature. The dynamics of antipredator signaling and conspecific advertisement provide a framework in which to investigate this phenomenon, through shifts in signal function and the recombination of existing signals. Several species of fairy-wrens (*Malurus* sp.) give song-like trills in response to vocalizations of avian predators. Despite this alarm context, in some species the trills are thought to function as conspecific-directed displays and are also given in the absence of predators, e.g. during the dawn chorus. We investigate two hypotheses for the origin of these predator-elicited trills: 1) Predator-elicited trills originate as antipredator signals, then shift to a display function, or 2) Predator-elicited trills originate as conspecific-directed songs, then shift into a predator context. Our results suggest that these trills may originate through the elaboration of antipredator calls with subsequent inclusion in conspecific-directed displays, providing a possible example of the generation of novel signals through recombination and a shift in function.

188 Contributed Talk: MATING SYSTEMS I (Wednesday PM I)

MICRO-SCALE LASER SURGERY REVEALS ADAPTIVE FUNCTION OF *D. ANANASSAE* MALE GENITAL SPINES

Karl Grieshop

University of Cincinnati, United States; Email: karlgrieshop@gmail.com

Current literature best attributes the remarkable and widespread morphological diversity of male genitalia observed among internally fertilizing animal species to sexual selection. Although insects offer abundant opportunity to study the causal mechanisms of such rapid divergent evolution, the microscopic size of most insect genitalia impedes the manipulative experimentation needed to effectively study functional morphology. I use micro-scale laser surgery to investigate the adaptive function of male genital spines in *Drosophila ananassae* [Doleschall] (Diptera: Drosophilidae). My research supports the pre-insemination sexual selection hypothesis for genital trait function and evolution--indicating the genital spines of *D. ananassae* enhance competitive male mating success. Here I test for the role of post-insemination sexual selection in the evolution of *D. ananassae* genital spines. This research is unique not only for the novel laser-based surgical technique employed, but also because the results address an area of the field that is relatively neglected--the role of pre-insemination sexual selection in the evolution of genital morphology.

111 Contributed Talk: COGNITION AND LEARNING II (Tuesday PM I)

LIFE IN THE CITY: SOCIAL LIVING, NEOPHOBIA AND INNOVATION IN A COMMUNITY OF URBANIZED AVIAN SPECIES

Andrea Griffin, Marie Diquelou

University of Newcastle, Australia; Email: andrea.griffin@newcastle.edu.au

Social living, reduced neophobia and enhanced behavioural flexibility are thought to facilitate adaptation to urban environments, but support for a key role of these behavioural processes has been mixed. We measured neophobia and innovation experimentally, as well as the intervening effect of sociality, in a range of free-ranging urbanized avian species in Australia. Survival analyses revealed significant cross-species differences in neophobia, but no systematic bias towards reduction. Rather some species were highly attracted to novel objects, while others avoided them. Sociality facilitated approach, suggesting that group-living may be adaptive in an environment where encounter with anthropogenic objects is likely to occur frequently. The ability to innovate also varied across species, with the Australian raven, *Corvus coronoides*, and introduced Indian myna, *Sturnus tristis*, ranking as the fastest and most successful innovators. Motor diversity, but not neophobia, influenced innovation success significantly. Implications of these results for our current understanding of the behavioural attributes required to adjust to rampant worldwide urbanization will be discussed.

P207 ABS Genesis Award Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

INDIVIDUAL DIFFERENCES IN SHOALING AND LATENCY TO EMERGE IN STICKLEBACKS

Matthew Grobis, Simon Pearish, Alison Bell

University of Illinois, United States; Email: grobis1@illinois.edu

There is growing evidence for consistent intraspecific variation in behavior. For example, some individuals are consistently more 'bold' in the presence of a predator compared to other individuals. However, in general, we know less about individual variation in social behavior. This is a gap in our knowledge because many social behaviors are important for fitness. In a field study, we found that freshwater juvenile sticklebacks (*Gasterosteus aculeatus*) that were collected while shoaling with other sticklebacks emerged faster from a refuge into a novel environment compared to sticklebacks that were collected while alone. To complement our field observations, we conducted a controlled lab experiment to study the relationship between shoaling and latency to emerge in sticklebacks. We measured individual differences in latency to emerge and then quantified individual differences in shoaling using an artificial shoal that could 'swim' around a testing pool. We found that individuals that emerged faster spent more time orienting to the model shoal. These results provide independent support for our field study, and suggest that individual sticklebacks that shoal might be more 'bold'.

34 Symposium: PERINATAL INFLUENCES (Wednesday)

HORMONE MEDIATED MATERNAL EFFECTS AS EPIGENETIC PATHWAYS FOR THE DEVELOPMENT OF PERSONALITY

Ton Groothuis

University of Groningen, Netherlands; Email: a.g.g.groothuis@rug.nl

In many animal species embryos are exposed to steroid hormones of their mother. This can have organizing and pleiotropic effect on brain and behaviour with the potential for inter and trans generational effects. Such effects can change our view on the heritability of behavioural profiles/personalities, phenotypic plasticity, sexual differentiation, and evolution. The latter is due to the fact that variation in embryonic exposure to maternal hormones often depends on the environmentally induced hormonal status of the mother so that hormone-mediated maternal effects can have an almost Lamarckian characteristic. A central question therefore is to what extent hormone mediated maternal effects are adaptive, providing a maternal tool to adjust the offspring to prevailing conditions, or alternatively, a maladaptive or neutral byproduct from variation in maternal hormonal state. The integration of both proximate and ultimate approaches is necessary for answering this question. I will discuss results from both approaches focusing on androgens and glucocorticoids in avian species, in which the embryo develops outside the mother's body, facilitating descriptive and experimental studies.

P43 Contributed Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

COMPARATIVE SOCIAL FUNCTION OF VOCALIZATIONS IN NONHUMAN PRIMATES AND PRELINGUISTIC INFANTS

Julie Gros-Louis

University of Iowa, United States; Email:julie-gros-louis@uiowa.edu

Comparisons of nonhuman primate vocalizations and human language focus on "semantic" properties of calls, such as the meaning and underlying representation of alarm calls; however, the majority of vocalizations in nonhuman primates are not alarm calls, but intragroup calls produced in close-range, dyadic interactions. These calls mediate social interactions, such as facilitating reconciliation and affiliation, even for traditionally labeled "semantic" calls, such as food-associated calls. Recent studies of human infant prelinguistic vocalizations reveal a similar social function for vocalizations, such as facilitating social interactions involving toys with parents and establishing joint engagement (Gros-Louis & Wu, in prep.; Dewey & Gros-Louis, in prep.). Studies of prelinguistic infants provide an ideal comparison with nonhuman primates because infants communicate via pragmatic means during the prelinguistic stage. Results suggest that potentially informative comparisons for exploring language origins may be the social and pragmatic function of prelinguistic infant and nonhuman primate vocalizations, rather than semantic or syntactic properties.

325 Contributed Talk: BEHAVIORAL COMMUNITY ECOLOGY (Friday PM I)**TWO EGG PARAMETERS AND INTERACTION WITH THE PARASITE ELICIT REJECTION IN A BROOD-PARASITIC HOST**

Mélanie Guigueno, Spencer Sealy, Ashleigh Westphal

University of Western Ontario, Canada; Email:mguiguen@uwo.ca

Egg mimicry and host-egg recognition characterize the co-evolutionary arms race between avian brood parasites and their hosts. To examine cues used by yellow warblers (*Dendroica petechia*) to reject parasitic eggs of brown-headed cowbirds (*Molothrus ater*), we added model eggs that differed in size, ground color and maculation, or both, and presented a robotic egg-removing cowbird. Rejection increased with divergence in egg size and color, with both cues acting independently. Warblers responded primarily to egg size, followed by color, as cues for rejection. Egg size is a more reliable parameter for warblers because cowbirds parasitize hosts of variable sizes and lay eggs that are twice the size of warbler eggs. Interaction with the egg-removing parasite also increased rejection in warblers. Multiple cues are important for hosts that use burial and desertion, both costly rejection methods, as they reduce the amount of time and energy lost when rejection mistakenly occurs in the absence of parasitism. High rejection costs favor the evolution of multiple parasite recognition abilities in the host-parasite arms race.

112 Contributed Talk: COGNITION AND LEARNING II (Tuesday PM I)**BEHAVIOURAL PROFILES IN BLACK-CAPPED CHICKADEES: COGNITION AND EXPLORATION**

Lauren Guillette, Adam Reddon, Marisa Hoeschele, Peter Hurd, Christopher Sturdy

University of Alberta, Canada; Email:guillett@ualberta.ca

Black-capped chickadees have long served as a model species for examining cognitive phenomena. In the current set of experiments we used an operant discrimination task to assess individual differences in the number of trials taken to learn an acoustic discrimination. Each individual was also tested in a novel environment exploration task. In the first experiment, birds that were fast-explorers in the novel environment learned the acoustic discrimination task in fewer trials than slow-exploring birds. In a second experiment, the reward contingencies associated with previously learned stimulus categories were reversed. Slow-exploring birds learned the reversal task more quickly. Our work supports the hypothesis that proactive birds are faster, more superficial explorers that are less flexible and sensitive to environmental stimuli, whereas reactive birds are slower, thorough explorers that are more flexible and sensitive to environmental stimuli. These studies are the first to examine individual differences in cognitive performance that are not driven by simple associative processes (i.e., classical conditioning), which are often mediated by an animal's willingness to explore.

184 Contributed Talk: GENETICS AND EVOLUTION I (Wednesday PM I)

GENETIC MECHANISMS UNDERLYING VARIATION IN VISUAL SYSTEMS IN DARTERS (*ETHEOSTOMA*)

Jennifer Gumm, Karen Carleton, Ellis Loew, Tamra Mendelson

University of Maryland, Baltimore County, United States; Email: jgumm@umbc.edu

Variation in visual systems may lead to differences in visually mediated behaviors. In fishes, visual sensitivity has been correlated with behaviors such as female mate preferences. Visual sensitivity is determined predominantly by visual pigments composed of an opsin protein bound to a light-sensitive chromophore. Proximally, at least two molecular mechanisms underlie variation in visual sensitivity: 1) Structural changes, wherein sequence differences in the coding regions of opsin proteins alter the types and spectral characteristics of the visual pigment and 2) differential gene expression, which alters spectral sensitivity through regulation of opsin genes. In darters (*Etheostoma*), visual sensitivity varies among and within species. We tested whether this variation is due to differences in gene sequence, gene expression, or both. By linking visual physiology and genetic mechanisms within and among species, our results may elucidate the relative contributions of structural and regulatory changes during the diversification of visual systems.

65 Symposium: COGNITION AS FORAGING (Friday)

HOW SEARCH IN THE MIND GUIDES SEARCH IN THE WORLD

Todd Gureckis

New York University, United States; Email: todd.gureckis@nyu.edu

A key feature of human cognition is our endless creativity in constructing hypotheses to explain events around us and our ability to gather new information to refine these hypotheses. Success requires the coordination of two mutually interacting search processes: search in the mind through the space of hypotheses, and search in the world to gather new information. We will describe a project exploring how people plan sequences of information collection actions in a cognitive search task based on the children's game Battleship. Computational models are developed which predict the observations people will make on any given trial and when they should stop. Our models suggest that people consider a relatively small number of hypotheses and use this active set to design information foraging decisions. The relation between this internal hypothesis generation process and animal foraging behavior will be explored.

P208 ABS Founders Award Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

AN EXPERIMENTAL STUDY OF BEHAVIORAL COPING STRATEGIES IN FREE-RANGING FEMALE BARBARY MACAQUES

Morgan Gustison, Ann MacLarnon, Stuart Semple

University of Michigan, United States; Email: mlgustison@gmail.com

Research on a range of vertebrate species suggests that three groups of behavior - affiliative, aggressive and displacement - may serve as coping strategies to mitigate the effects of stressors. To date however, few systematic studies on such strategies have been carried out on in naturalistic conditions. We investigated these coping behaviors among semi-free ranging female (n=12) Barbary macaques (*Macaca sylvanus*) in Trentham Monkey Forest, UK. We utilized a novel playback approach to quantify subjects' 'coping' responses to aversive threat-grunt playbacks, compared to control playbacks. We explored relationships between these behaviors and average physiological stress levels, collecting fecal samples to determine mean fecal glucocorticoid metabolite (FGC) levels. Threat-grunt playbacks elicited displacement and aggressive behaviors, but not affiliative behaviors. Females' elevation in rates of lunging following threat-grunt playbacks compared to controls were positively related to their mean FGC levels. Our results illustrate that playback studies may provide a powerful tool to explore coping strategies in naturalistic and wild settings.

48 Symposium: FEMALE COMPETITION (Thursday)

FEMALE ORNAMENTS: SEXUAL SELECTION AND VIABILITY

Darryl Gwynne

University of Toronto in Mississauga, Canada; Email: darryl.gwynne@utoronto.ca

Sexual selection on females is more widespread than once thought and can be due to mechanisms such as mate choice by males. More rare are reversals in the mating roles where mate choice by males co-occurs with direct sexual competition among females. Although sexual selection on females is widespread, examples of sexual dimorphism with sexually-selected female-limited ornaments are rare compared to the ubiquity of male-limited ornamentation. I will focus on ornaments in insect systems in which males feed their mates. For a local species of dance fly I will discuss sexual selection and viability selection in the wild on some particularly elaborate ornaments displayed by females.

P360 Contributed Poster: PARENTAL CARE 2 (Poster Session B: Thurs. eve)

PARENTAL CARE BY AN AVIAN BROOD PARASITE: PROVISIONING OFFSPRING WITH ENHANCED IMMUNE DEFENSES

Caldwell Hahn, Lawrence Igl, Gisela Erf, James Burnett

USGS - Patuxent Wildlife Research Center, United States; Email: chahn@usgs.gov

Birds provision their offspring with nutrients adapted to their niche. Since avian brood parasites do not build nests, but lay their eggs in the nests of other species, they must provision their young with resources appropriate to environments with foreign microbes and parasites. The brown-headed cowbird is a host-generalist that lays its eggs in the nests of more than 225 different avian species, so female cowbirds provision their young to survive in a range of unpredictable, foreign environments. We compared the eggs of cowbirds and a related species, red-winged blackbird, hypothesizing that cowbird eggs contain more provisions for immune defenses. We measured the lysozyme content, since lysozymes are antimicrobial proteins effective against most Gram+ bacteria. We measured albumen volume, since albumen plays a protective role in keeping the egg free from infection via mucosal antibodies formed to pathogens entering through the respiratory, digestive and reproductive tract. Cowbird eggs had both higher levels of lysozymes in eggs and higher volume of albumen. We suggest that cowbird parental care entails provisioning offspring with stronger immunity.

P140 Contributed Poster: PARENTAL CARE 1 (Poster Session A: Weds. eve)

THE EVOLUTION OF DEVELOPMENTAL DEPENDENCE OR "WHY DO MY KIDS NEED ME SO MUCH?"

Rebecca Hale, Joseph Travis

University of North Carolina, Asheville, United States; Email: rhale@unca.edu

In many species with parental care, offspring hatch or are born needing prolonged investment from parents beyond the guarding, incubation, or gestation they received during earlier developmental stages. That parents should continue to invest into such young can be explained by current parental care theory. More difficult to explain, however, is how developmental dependence of young evolves in the first place: what causes the evolution of development such that independence is delayed, despite the high cost of such dependence if parents desert or are killed? We have explored this question in a model that builds on the classic Smith and Fretwell model of reproductive investment. Our model demonstrates that selection on young favors an increase in developmental dependence because it increases optimal parental investment to the extent that offspring with greater dependence have higher fitness than offspring with lower dependence. We describe these results and present specific predictions, drawn from the model, for how developmental dependence and parental effort might covary across populations.

118 Contributed Talk: SENSORY POLLUTION (Tuesday PM I)

LOW SONGS LOSE ATTRACTIVENESS IN URBAN NOISE CONDITIONS

Wouter Halfwerk, Sander Bot, Jasper Buikx, Marco vd Velde, Jan Komdeur, Carel ten Cate, Hans Slabbekoorn
Leiden University, Netherlands; Email: W.Halfwerk@biology.leidenuniv.nl

Many animal species attract mates with acoustic signals, but this seems to become a struggle due to urbanization and the rise in environmental noise levels related to human activities. Species relying on low frequencies for mate attraction are expected to suffer most due to the masking impact of spectrally overlapping anthropogenic noise. We may therefore demonstrate an impact of noise on avian reproductive success if low frequencies are in some way better than high frequencies for attracting a mate and if this advantage gets lost under noisy conditions. We studied the dawn chorus ritual of the great tit (*Parus major*) and show that males lower their song frequencies at the peak of female fertility and that low-singing males get cuckolded less. Furthermore, we show that low-frequency noise interferes with male-female communication and specifically reduces the attractive power of low-frequency songs. These data are critical for our understanding of the impact of anthropogenic noise on wild-ranging animals as they provide both a direct link between song frequency and reproductive success as well as experimental evidence for noise-dependent signal efficiency for low-frequency songs.

P290 Contributed Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

BURYING BEETLE BIOACOUSTICS: THE ROLE OF SOUND IN INTRASPECIFIC COMMUNICATION IN NICROPHORUS

Carrie Hall, Daniel Howard, Andrew Mason, Rosemary Smith
Augustana College, United States; Email: carrie.hall@augie.edu

Stridulation is known to mediate contest and reproductive behavior in insects. Studies of stridulatory behavior in the Coleoptera include morphological descriptions of the sound-producing structures, characterization of the sound, and manipulations of sound production to understand its behavioral function. In this study I recorded and characterized the sound produced by stridulation in eight North American *Nicrophorus* beetle species, and conducted experimental manipulations of sound production to test hypotheses regarding the function of sound in contests for carrion breeding resources and in reproduction. *Nicrophorus* stridulations are biphasic and broadband with weak dominant frequency structure. Removing sound does not influence contest outcomes in male *N. marginatus*; body size remains the best predictor of competitive ability. Removing sound does not affect reproductive success. The evidence presented in these studies indicates that stridulatory behavior is likely under natural selection as an aposematic warning signal, or possibly serves as an intraspecific aggregation signal between parent and offspring.

P151 Contributed Poster: PREDATION AND FORAGING 1 (Poster Session A: Weds. eve)

DISGUIISING A MOVING OBJECT

Joanna Hall, Nick Scott-Samuel, Roland Baddeley, Prof Innes Cuthill
University of Bristol, United Kingdom; Email: psjrh@bristol.ac.uk

Camouflage strategies, such as background matching and disruptive coloration, that prove successful for stationary objects are generally assumed to fail for objects in motion. Since animals cannot remain stationary at all times any strategy that decreased their vulnerability, whilst moving, would greatly increase their fitness. The process of predation can be broken down into three stages: detection, identification and capture. A computer-based detection task investigated the stages of detection and capture by human subjects. When targets did not move, both background matching and disruptive coloration were effective in hindering capture. However, once motion was introduced, all camouflage strategies applied to a single moving object on a stationary background broke down. A second study required subjects to identify a moving elliptical target amongst moving circular distractor items. The identification of the moving target was significantly delayed if the target pattern matched both the distractors and the background. Therefore, although movement breaks camouflage, under certain conditions cryptic coloration can still significantly reduce predation risk for moving targets.

P335 ABS Founders Award Poster: MATING SYSTEMS 2 (Poster Session B: Thurs. eve)

BEHAVIORAL STUDIES IN LIZARD SPECIES OF THE LIOLAEMIDAE FAMILY: EXPERIENCES FROM ARGENTINA

Monique Halloy, Cecilia Robles, María José Salica

Instituto de Herpetología, Fundación Miguel Lillo, Argentina; Email: mhalloy@webmail.unt.edu.ar, moniquehalloy@gmail.com

The study of animal behavior has been slow in developing in Argentina although in the last few years it has aroused a lot of interest, offering numerous options for new research of its poorly known fauna. Here we present a summary of studies carried out by our group in neotropical lizard species of *Liolaemus* and *Phymaturus*, Liolaemidae, from different regions of Argentina. We report work carried out in communication (visual displays, particularly headbobs), territoriality (home ranges, core areas and defense), reproductive strategies (polygynandry, monogamy and opportunistic strategies), female nuptial coloration (related to her reproductive state but not to male response), parental care (mostly protection and defense), and phylogeny of sand burying behavior (using behavioral characters to construct a phylogeny). Besides the intrinsic value of this type of studies, they provide valuable information on many related species, some of which have only recently been described, allowing for numerous comparative studies and its use in the development of management strategies and their conservation if needed.

239 Contributed Talk: COMMUNICATION IV (Thursday PM I)

COMMUNICATION ABOUT CHANGES IN PREDATION RISK BETWEEN PARENTS AND OFFSPRING IN A TREEHOPPER

Jennifer Hamel, Reginald Cocroft

University of Missouri, United States; Email: jahtf7@mail.missouri.edu

In group-living species, individuals may assess predation risk from the behavioral cues or signals of other group members. If prolonged vigilance is costly, group members should communicate not only about increases in risk, but also about decreases. This communication task poses two challenges: signalers must decide when a predator is gone, and receivers must discriminate between signals about risk increase and reduction. We describe a communication system that meets these challenges. We conducted a playback experiment in a field population of insects with maternal defense of offspring groups. Offspring produce synchronized vibrational signals that communicate predator presence to mothers. Mothers produce vibrational signals after driving away the predator. We hypothesized that maternal signals communicate reduced risk to offspring, in which case offspring signaling should be inhibited by maternal signals. As predicted, offspring signaled less when maternal signals were played than when silence or control signals were played. Because mothers have the best information about whether a predator has been evicted, they can provide the most reliable signals of reduced risk.

P428 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

PHENOTYPIC VARIATION AND THE EVOLUTION OF EVICTION AND UNCONDITIONAL SELF-RESTRAINT

Ian Hamilton

Ohio State University, United States; Email: hamilton.598@osu.edu

Understanding the evolution of eviction and self-restraint under the threat of eviction in dominance-structured groups requires a multilevel approach. Groups that persist through the eviction process are unlikely to be a random subset of all possible groups if there is variation in costliness and propensity to evict. I develop a model in which dominants evict conditionally and subordinates respond to the population-level expectation of eviction. Under assumptions similar to existing optimal skew models, group living and unconditional self-restraint can be evolutionarily stable in this model and the model predictions are identical to those of the restraint skew model for non-relatives. Including non-random association between phenotypes results in selection for decreased costliness of subordinates and decreased tolerance for cost by dominants. If there is heritable variation in

dominant sensitivity, restraint is never evolutionarily stable under the assumptions of the restraint optimal skew model. However, including non-random phenotypic association in the model results in a stable equilibrium at which costly subordinates are evicted and subordinates exhibit self-restraint.

303 Contributed Talk: COMMUNICATION V (Friday AM)

SIMILARITIES AND DIFFERENCES IN MALE AND FEMALE MOUSE ULTRASONIC VOCALIZATIONS

Kurt Hammerschmidt, Julia Fischer

German Primate Center, Germany; Email:hammerschmidt@cog-ethol.de

The last years have seen an increased interest in mouse ultrasonic vocalizations (USV) as behavioral read-outs in studies of the genetic foundations of speech and social behavior. We have, however, only a limited knowledge about the biological functions of and putative sex differences in mouse USVs. To address these questions, we analyzed male and female USVs during resident/intruder encounters. Because it is often difficult to identify the caller in such experiments, we used a modified design in which the intruders were anaesthetized. Residents responded strongly to such intruders; thus, the experimental design avoids one of the major problems in previous studies. We found that females produced significantly higher numbers of calls in such encounters than males. In terms of their structure, calls did not differ substantially. Interestingly, females produced similar call sequences during such encounters as males during courtship encounters, implicating that male mouse courtship song may not be as unique as previously suggested.

P376 Contributed Poster: PREDATION AND FORAGING 2 (Poster Session B: Thurs. eve)

WHAT IS ATTACKING PREY MODELS IN WARNING COLOR STUDIES?

Hanh Han, Kimberly Pegram, Ronald Rutowski

Arizona State University, United States; Email:hanhhan@gmail.com

One tool in our efforts to understand how colors and patterns influence interactions between predators and prey are field predation studies in which prey models are placed in the environment, and their survivorship is recorded. However, in most of these studies the specific predators attacking the models are unknown and only generally inferred from the damage done to the models. In a field experiment of butterfly warning coloration in Arizona, USA, we used continuous recording and motion-activated cameras to record 69 models, and found that 11 were attacked by avian predators, seven were blown away by wind or damaged by tree branches, and the damage or disappearance of four models was due to unknown causes. Predators caught attacking models were all insectivorous, passerine birds. Future predation studies using prey models should include video cameras to assess the relative importance of the reasons that models disappear or are damaged. The high incidence of models disappearing or being damaged by factors other than predators will weaken the ability of such experiments to reveal effects of subtle manipulations of coloration and make significant effects that much more convincing.

P361 ABS Founders Award Poster: PARENTAL CARE 2 (Poster Session B: Thurs. eve)

INCUBATION BEHAVIOR IN A HUMMINGBIRD IS EXPLAINED BY SELF-MAINTENANCE, NOT EMBRYONIC TEMPERATURE

Rachel Hanauer, Gustavo Londoño

Indiana University, United States; Email:rhanauer@indiana.edu

Avian incubation presents a trade-off between embryonic development and adult self-maintenance. The energy and time investment of incubation is expensive for any bird, but it presents a special challenge to hummingbirds because of their high metabolic rate, nectivorous diet, and the relatively low thermal inertia of their eggs. Despite this, many species of hummingbirds nest successfully in the cool climate of tropical montane forests. We used temperature sensors and data loggers to investigate incubation behavior in *Doryfera ludovicae* in humid montane forest in southeastern Peru. Foraging trips were expected to be shorter in cooler ambient temperatures, because

eggs cool at a faster rate at lower temperatures. However, we found that ambient temperature generally did not explain the length of foraging trips, contrary to previous findings in other birds. Instead, length of the previous incubation bout and time of day were significant factors explaining length of foraging trips. This suggests that *D. ludovicae* females behave so as to maintain a balanced energy budget over short timescales, prioritizing self-maintenance over embryonic development.

60 Symposium: SENSORY NEUROECOLOGY (Thursday)

THE BEHAVIORAL ECOLOGY OF VISUALLY CONTROLLED RAPID ADAPTIVE CAMOUFLAGE IN CEPHALOPODS

Roger Hanlon

Marine Biological Laboratory, United States; Email: rhanlon@mbl.edu

The diversity of coloration and patterning throughout nature is stunning, and rapid adaptive coloration is best developed in cephalopods. I will present new discoveries and simplifying principles of how dynamic camouflage operates under natural conditions (e.g., coral reefs, kelp forests, temperate rock reefs). Visual control of skin patterning is a key feature of these diverse behaviors and enables complementary experimental testing of concepts in the laboratory. Different visual stimuli evoke different types of camouflage patterning, and the change in appearance, which is neurally controlled, can be as fast as 700msec. Recent discovery of light-sensing opsins in the skin of cuttlefish and squid add a new dimension to sensory neuroecology of cephalopods. Hyperspectral imaging of camouflaged cuttlefish reveals that their spectral and spatial match to the background is effective in the eyes of some hypothetical di- and tri-chromatic fish predators, which is particularly interesting since cephalopods are color blind. Subjects to be discussed include background matching, disruptive coloration, masquerade, postural camouflage, night camouflage and motion camouflage.

P313 Contributed Poster: ECOLOGICAL EFFECTS 2 (Poster Session B: Thurs. eve)

BEHAVIORAL EFFECTS OF PESTICIDES ON THE AGRICULTURAL PEST PREDATOR, OXYOPES SALTICUS

Catie Hanna, Chadwick Hanna

Robert Morris University, United States; Email: catie@byersweb.net

The striped lynx spider, *O. salticus* is a natural predator of agricultural pests. Pesticides are used to control such pests with little regard to how the chemicals affect spiders. We studied the effects of three common pesticides, Malathion, an organophosphate; OrthoMax (OM), a pyrethroid; and Sevin, a carbaryl, on *O. salticus*. We exposed spiders to the recommended pesticide concentration and observed mortality, general behavior, and feeding. Malathion was most lethal; spiders lived 3.7 days on average. Mortality of spiders exposed to Sevin was similar to water (18.3 and 22.4 days) ; OM spiders lived a mean of 9.8 days. Mortality did not translate to behavioral changes. In all groups except OM, mean time spent stopped (~76%) and moving (~21%) was within 1%. On OM, spiders rubbed their legs through their pedipalps and chelicerae, consuming ~24% of their time. This behavior likely had a negative impact on prey capture (57% success rate), while spiders on Malathion and Sevin had higher capture rates than water (80.8%, 96.2% and 65.9% respectively). This underlines the importance of studying the behaviors of animals exposed to pesticides to fully assess ecological impacts.

276 Contributed Talk: MECHANISMS II (Thursday PM III)

HORMONAL PLASTICITY IN TIDAL ENVIRONMENTS: A REACTION NORM APPROACH IN AN AMPHIBIOUS FISH

Amanda Hanninen, Gabriell Davis, Elizabeth Lee, Stephanie Wong, Ryan Earley

University of Alabama, United States; Email: amanda.hanninen@gmail.com

Mangrove rivulus (*Kryptolebias marmoratus*) are self-fertilizing hermaphroditic fish that often occupy terrestrial habitats with low food availability during tidal recessions. Wild rivulus populations are characterized by a diverse set of isogenic lineages. We explored within- and between-genotype variation in cortisol along tidal and

food availability gradients using a reaction norm approach. Given age-dependent differences in fecundity we expected animals to adjust their stress response according to future reproductive prospects. We employed three age groups (3-9;10-15;~15 mo) in two isogenic strains divided among three treatments (low/high/changing tides) under fed or fasted conditions. Hormones were collected using a water-borne method and tissues were stored for future assay of metabolic enzymes and reproductive investment. Initial analyses show that prolonged exposure to tidal and fasting regimes trigger marked, age-dependent reductions in cortisol, indicative of negative feedback inhibition. Future work aims to reveal age- and strain-dependent patterns of metabolic plasticity in response to environmental stressors in this powerful, genetically tractable model system.

P394 Contributed Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

DIETARY NUTRIENT BALANCE AND CRICKET FITNESS: A GEOMETRIC ANALYSIS APPROACH TO STUDYING NUTRITION

Sarah Harrison, Susan Bertram

Carleton University, Canada; Email:sharris2@connect.carleton.ca

Organisms are often faced with nutritional limitations in their environment, such as inadequate food quality or quantity, resulting in a reduced pool of resources available to allocate towards phenotypic traits. Many studies on crickets have found that variation in life-history traits like growth and lifespan, as well as reproductive behaviors such as acoustic mate attraction signaling, may be explained by either the quantity of food available, or by the amounts of specific macro or micronutrients contained within the cricket's diet. However, very few studies to date have examined the effects of dietary nutrient balance on these condition-dependent traits and behaviors. Geometric analysis is a new mathematical modeling tool being used in the field of nutritional ecology that allows examination of the interactive effects of multiple dietary nutrients on various fitness-related traits and behaviors. Here we use a geometric analysis approach to examine the interactive effects of dietary phosphorous, carbohydrates, and protein on long distance acoustic mate attraction signals, adult body mass changes, and lifespan in male Northern spring field crickets, *Gryllus veletis*.

P122 Contributed Poster: MATING SYSTEMS 1 (Poster Session A: Weds. eve)

PACIFIC TRAVELLER: THE EPIC MIGRATION OF THE LONG-TAILED CUCKOO

Mark Hauber, Brian Gill

Hunter College/CUNY, United States; Email:mark.hauber@hunter.cuny.edu

Specialist parasites face similar or more severe extinction pressures compared to their hosts. Long-tailed cuckoos (*Eudynamys [Urodynamis] taitensis*) breed only in New Zealand, and parasitize three species of endemic Mohoua songbirds. After performing a remarkable overwater migration, the cuckoos winter in a vast arc of Pacific islands extending 10,000 km from Palau (134.5°E) to Henderson Island (Pitcairn group; 128.3°W; Bogert 1937). This study aims to reassemble data on the long-tailed cuckoo's migration, using specimens and literature records. At the start of the austral breeding season (October-December), practically all birds in New Zealand are in adult plumage. Data also show that adults move north ahead of immatures in the autumn migration. In turn, many birds in the wintering are in intermediate plumage and are presumably moulting from immatures to adults during their first winter. As one of the three hosts (yellowhead *M. ochrocephala*) is now critically endangered, populations of cuckoos potentially adapted to parasitizing yellowheads may be endangered or extinct now, calling for future tracking and genetic analysis of host-use and migratory behaviors in this parasite.

317 Contributed Talk: SOCIAL BEHAVIOR V (Friday AM)

TERRITORIAL FROGS MAY LEARN ABOUT INTRUDERS THROUGH REPEATED INTERACTIONS

Stephen Heap, Devi Stuart-Fox, Phillip Byrne

University of Melbourne, Australia; Email:smheap@student.unimelb.edu.au

Territorial animals must optimise their investment towards exploiting their territory and defending it from competition. However, the manner in which this investment changes in response to repeated interactions with a rival remains unclear. We experimentally exposed nest-defending terrestrial frogs (*Pseudophryne bibronii*) to playback that simulated a repeatedly returning intruder and measured the change in each resident's investment towards calls that function to advertise their presence to mates (territory exploitation) or threaten competitors (territory defence) over successive interactions. Results indicated that the changes in calling behaviour over time were not consistent across the population yet gradually converged. This pattern was interpreted as a result of learning, whereby residents were initially uncertain about the threat that the intruder posed but were able to optimise their response as their uncertainty towards the intruder decreased.

315 Contributed Talk: SOCIAL BEHAVIOR V (Friday AM)

THE RELATIONSHIP BETWEEN PLAY AND CORTISOL IN WILD CHIMPANZEES (PAN TROGLODYTES)

Matthew Heintz, Rachel Santymire, Carson Murray, Elizabeth Lonsdorf

University of Chicago, United States; Email: mheintz@uchicago.edu

During play animals put themselves in situations where they lose control and the training for the unexpected theory suggests that individuals learn to regulate their stress response. This theory has gained recent support; however there are not any field studies that examine the relationship between play and stress. We examined the relationship between play rates and fecal glucocorticoid metabolite (FGM) concentrations from wild infant (n=9) and juvenile chimpanzees (n=6). Behavioral observations were collected on infants and juveniles over two 6-month field seasons (May-November 2009 and 2010) using instantaneous scan-sampling (1143 h) in Gombe National Park, Tanzania. Fecal samples were collected from known individuals (n=312) and analyzed using a cortisol enzyme immunoassay. Analyses from 2009 data demonstrate a positive correlation between play rates and both FGM variance ($P > 0.05$) and FGM mean ($p = 0.07$). Most play maintained at least one stationary point so energy expenditure was unlikely to influence FGM concentrations. We will also discuss play styles and FGM reactivity; however, initial findings do not support the training for the expected theory for wild chimpanzees.

P177 ABS Founders Award Poster: SEXUAL SELECTION 1 (Poster Session A: Weds. eve)

EFFECTS OF ENVIRONMENTAL VARIATION ON COURTSHIP IN THE HARLEQUIN BUG, *MURGANTIA HISTRIONICA*

Wendy Helmey-Hartman, Christine Miller

University of Florida, United States; Email: wlhelmey@ufl.edu

Although environmental variation is ubiquitous, few studies have examined the ways in which sexual selection varies across environments. For herbivorous insects, host plant availability is a major and persistent source of environmental variation that may affect sexual selection. This experiment was designed to determine the effects of natal and current host plant on courtship and mating behavior of the harlequin bug, *Murgantia histrionica* (Hemiptera: Pentatomidae). This insect feeds on a variety of crops that often shift in availability throughout the year. We reared insects in separate containers with either mustard or broccoli for food. Virgin adults of similar ages were later paired in behavioral trials to include all combinations of natal plant and testing plant contexts. Behavior was analyzed to detect any effects of host plant. Observed differences may result from varying nutritional quality of the host plants or phenotypic plasticity in mate-recognition signals based upon natal or testing host plant. These differences may provide a mechanism for sympatric speciation or result in adaptive change that maximizes the success of this species in a heterogeneous environment.

267 Contributed Talk: ECOLOGICAL EFFECTS III (Thursday PM III)

DOES MATERNAL HEAT STRESS ADJUST OFFSPRING TO HIGH TEMPERATURE? AN EXPERIMENT IN QUAILS

Rie Henriksen, Sophie Rettenbacher, Ton Groothuis

University of Groningen, Netherlands; Email:riehe@sol.dk

Whereas maternal stress has often been reported to reduce the offspring's phenotypic quality it has also been suggested that these maternal effects prepare offspring for a stressful environment. Japanese quails are temperate zone birds that experiences stress at high ambient temp. We heat stressed (HS=35°C, 7 h/day) 20 female Japanese quails for 3 weeks and kept 20 other females at control temp. (C=22°C). Half of the offspring from each group were housed under HS whereas the other half were C housed. HS-females laid smaller eggs and produced smaller chicks. From 2 weeks of age HS-offspring were smaller independent of mother's treatment. HS-offspring of HS-mothers had a higher respiratory quotient and a lower ACTH induced cort response than HS-offspring of C-mothers indicating maternal effect on the utilization of energy resources and a stress response that may be contingent on offspring environment. HS-mothers offspring drank more in the morning independent of their own treatment indicating prenatal behavioural programming for the anticipation of a hot day. Whether these finding suggest adaptive effects of maternal stress will be discussed together with results on immunocompetence.

35 Symposium: PERINATAL INFLUENCES (Wednesday)

COMPARATIVE ANALYSIS OF PRE-NATAL LEARNING: FROM FISH TO PRIMATES

Peter Hepper

Queens University Belfast, United Kingdom; Email:p.hepper@qub.ac.uk

Prenatal experience may profoundly influence subsequent behaviour and function. Here I explore how, in the normal course of prenatal development, 'experiences' may affect the individual after birth and the functions this may serve. Representatives of all major vertebrate groups: fish (Rainbow trout), amphibian (European common frog), reptile (saltwater crocodile), bird (domestic chicken), and mammal (rat, dog, human) were studied, using a similar methodology, to examine the effect of 'natural' 'prenatal' exposure to chemosensory stimuli on their subsequent olfactory and gustatory preferences. The results were similar across all groups tested. Preference for an olfactory stimulus in newborns and juveniles became significantly more positive following prenatal exposure. Animals, when tested once feeding independently, ate significantly more food flavoured with the stimulus they had experienced prenatally. Prenatal learning across all vertebrates groups appears a ubiquitous phenomema, following a similar developmental path. It is suggested that this ability has evolved to serve two key survival functions: to ensure safe feeding; and, to ensure recognition of their prime caregiver.

54 Symposium: GEOGRAPHIC VARIATION (Thursday)

PONDS AS ISLANDS: BEHAVIORAL AND LIFE-HISTORY ADAPTATIONS TO LIFE IN PREDATOR FREE ISOLATES

Gabor Herczeg

University of Helsinki, Finland; Email:gabor.herczeg@helsinki.fi

Like islands for terrestrial fauna, isolated ponds present both opportunities and challenges for fish colonizing them. In terms of biotic environment, ponds are characterized by reduced risk of predation and reduced intensity of interspecific competition. These selection pressures are expected to be accompanied by increased intraspecific competition and selection for traits improving intraspecific competitive ability. Nine-spined stickleback (*Pungitius pungitius*) has a circumpolar distribution, and occurs in a wide variety of habitats from coastal marine areas as a member of a diverse fish community to isolated ponds where it is the only fish species. Here, I will overview results on the adaptation of nine-spined sticklebacks to pond habitats with particular emphasis of behavioral and life-history traits. I found repeated evolution of fast growing, giant, aggressive, bold and 'antisocial' sticklebacks with reduced or lost body armor in geographically and genetically isolated ponds, suggesting that the superior competitive ability is indeed a key fitness component in island habitats.

P152 Contributed Poster: PREDATION AND FORAGING 1 (Poster Session A: Weds. eve)

EFFECT OF BODY SIZE AND THE SWORD OF XIPHOPHORUS HELLERI IN THE LIKELIHOOD OF BEING ATTACKED

Armando Hernandez, Oscar Ríos-Cárdenas

Instituto de Ecología A.C., Mexico; Email:ripsus@hotmail.com

In general, we assume that natural and sexual selection have opposing effects on the evolution of characters that serve as ornaments. Males of *Xiphophorus helleri* have an elongation of the caudal fin known as a sword that is used to attract females as it increases the apparent size of males. Previous studies have found a correlation between large body size and the presence of piscivorous cichlids in natural populations of *X. helleri*. By increasing apparent body size, the sword may decrease the likelihood that a predator attacks a swordtail. However, the sword may also attract the attention of a predator. We evaluated separately the effect of body size and presence of the sword on the likelihood of being attacked. We conducted preference test using a sympatric cichlid. For the effect of body size we used different size, swordless, live pairs of swordtails as stimuli. For the effect of the sword we used videos of fish with and without their sword photoshoped. We found no effect of body size, but the cichlids directed more bites to individuals with their swords. We confirmed that an ornament, despite their benefits in terms of attracting mates, may increase predation.

P362 Contributed Poster: PARENTAL CARE 2 (Poster Session B: Thurs. eve)

EFFECTS OF BREEDING HABITAT ON OTHER REPRODUCTIVE TRAITS OF POISON FROGS

José Alfredo Hernández Díaz, Adolfo Amézquita

Colombia; Email:alfred.hd@gmail.com

Neotropical amphibians have experienced changes in their reproductive strategies to be more independent from permanent water bodies. These changes may be associated with new reproductive traits such as parental care and clutch size. In this study I investigated a possible association between the independence from permanent water bodies and changes in reproductive traits among poison frogs. I tested the hypotheses that breeding habitat among dendrobatids is associated with changes in parental care strategy, and that clutch size is affected by breeding habitat and parental care type. I used a phylogeny of 45 species of dendrobatids. Phylogenetic comparative analyses included A) testing for a correlation of discrete states, B) a GLS model and C) a phylogenetic ANOVA. I found the evolution between breeding habitat and tadpole transport strategy to be correlated, such as the evolution between body size and clutch size, and smaller clutch sizes in species breeding in phytotelmata than those breeding in ponds or streams. I found no correlation between breeding habitat and parental care type, and no differences in clutch size between species with different parental care type.

P350 Contributed Poster: MEHCANISMS 2 (Poster Session B: Thurs. eve)

PLASMA ANDROGENS & BRAIN AR CELL COUNTS CORRELATE WITH SPECIES DIFFERENCES IN AGGRESSION IN SCELOPOR

Diana Hews, Erina Hara, Maurice Anderson

Indiana State University, United States; Email:diana.hews@indstate.edu

Some *Sceloporus* lizard species with blue abdominal patches are more aggressive than white species. Studying *S. undulatus* (males blue, high aggression; females white, low aggression) and *S. virgatus* (both sexes white, low aggression), we measured plasma testosterone (T) and counts of cells with androgen receptor- immunoreactivity (AR-ir) in three brain regions of breeding season adults. Blue species males had the highest mean plasma testosterone (T), and differed significantly from conspecific females. In the white species mean plasma T did not differ between sexes. In the preoptic area, blue males had the highest mean AR-ir cell counts, and the sexes differed in *undulatus* but not in *virgatus*; females of the two species did not differ in mean counts. In the ventral medial hypothalamus, blue males had higher mean AR-ir counts than conspecific females, but there was no sex difference in the white species, and, for each sex, the species did not differ. The habenula did not exhibit sex or

species differences. Thus, hypothalamic AR cell counts paralleled sex and species differences in aggression, as did breeding-season plasma T levels.

P243 Contributed Poster: BEHAVIORAL COMMUNITY ECOLOGY 2 (Poster Session B: Thurs. eve)

THE EFFECTS OF AN INVASIVE SHRUB ON ANTIPREDATOR BEHAVIORS OF LARVAL AMPHIBIANS

Caleb Hickman, James Watling, John Orrock

United States; Email:calebhickman@gmail.com

Previous studies show that some larval amphibians will increase activity when raised in water laden with leaves from an invasive honeysuckle shrub (*Lonicera maackii*). Altered activity has the potential to leave larval amphibians vulnerable to predation where antipredator response aid in escape and vigilance. This study examines response of amphibians to predators when raised in extracts from honeysuckle leaves. After raising three tadpole species (*Hyla chrysoscelis/versicolor*, *Lithobates blairi*, *Anaxyrus americanus*) in honeysuckle, native and no-leaf water habitats, I tested their response to predator (*Notophthalmus viridescens*) kairomones. This work seeks to understand a novel way invasive species might impact native species through alteration of predator-prey interactions, especially pertaining to communication via chemical cues.

309 Contributed Talk: SEXUAL SELECTION IV (Friday AM)

MALE-MALE ENDURANCE RIVALRY IN THE RHESUS MACAQUE

James Higham, Michael Heistermann, Dario Maestriperi

German Primate Centre, United States; Email:jhigham@dpz.eu

Males of many animal species engage in endurance rivalry, competing for matings over extended periods. In the rhesus macaque, a seasonally breeding primate, energetically costly consortship strategies increase paternity success, but not all males may be in sufficient condition to employ such strategies. We measured male dominance, behavior, body mass index (BMI), and Urinary C-Peptide of insulin levels (UCPs) over a 6-month birth, and subsequent 6-month mating, season. In the birth season, high-ranked males undertook more energetically positive (feeding), and less energetically negative (travelling; restlessness, defined as the rate of cycling through behavioral repertoires) behaviors. Energetically negative behaviors were negatively correlated with BMI and UCPs. In the mating season, high-ranked males undertook more consortships. Copulation rates were higher during these periods, and were negatively correlated with UCPs. As a consequence high-ranked males had the lowest UCP levels by the end of the mating season. Our results suggest that male rhesus engage in endurance rivalry, and that condition built during the previous birth season is an integral part of mating success.

P74 Contributed Poster: DEVELOPMENT (Poster Session A: Weds. eve)

AN ECOLOGICALLY-RELEVANT EARLY-ENVIRONMENT MANIPULATION WITH INBRED LABORATORY MICE

Elizabeth Hill, Sylvia Malcore, Dana Wolak

University of Detroit, Mercy, United States; Email:hillelm@udmercy.edu

Early environment appears to affect behavior related to fear and exploration. Male C57BL/6J mice whose mothers had been exposed to predator odor (rat feces) showed higher exploratory behavior than an unexposed group (Priebe et al., 2005). In this study, we subjected mice from two commonly-used laboratory strains (C57BL/6J and BALB/c) to an ecologically relevant early environmental intervention. In one condition, mouse pups were exposed to predator cues (fox odor and recorded owl calls), while in a control condition, pups were exposed only to home cage bedding. They were observed as adults (n=63) in an open-field apparatus with a shelter. Strain and sex differences were significant; BALB/c mice spent less time in the open center than C57BL/6 mice ($P > .001$), and female mice spent more time in the center area ($p = .019$). The predator-exposed group appeared to spend more time in the center (18.89s vs 9.57s), but the main effect of group was not statistically significant ($p = .115$). A trend was seen for a three-way interaction (Strain X Sex X Group, $p = .097$).

These results add to the literature on developmental susceptibility to ecologically-relevant environmental manipulations.

334 Contributed Talk: DEVELOPMENT II (Friday PM I)

O MOTHER, MOTHER - WHEREFORE ART THOU? CALF DEVELOPMENT AND MATERNAL CARE BEHAVIORS IN DOLPHINS

Heather Hill, Stan Kuczaj, Drew Vastano, Carolyn Campbell, Caitlyn Geraci

St. Mary's University, United States; Email:hhill1@stmarytx.edu

Cetaceans have long been in the care of humans. While a fair amount of research exists on the behavioral development of dolphin calves, less is known about the behavioral development of belugas and killer whales. Our understanding of their maternal care behaviors is also limited to meeting calf physiological needs. Over the last 10 years, I have investigated these topics in captive bottlenose dolphins, belugas, and most recently, killer whales. Using observations and video recordings of these species, preliminary developmental milestones of a variety of behaviors during the first year of life have been established. Given their shared evolutionary history, calf behavioral development is fairly similar across calves of these species with all of them swimming with their mothers, initiating separations from and reunions with their mothers, socializing with other conspecifics, and playing. Consistent maternal care behaviors are also shared among these cetaceans. Species differences and individual differences exist for mother-calf reunions, solitary activities, and maternal care. A longitudinal, cross-species approach is critical in the care and conservation of these species.

66 Symposium: COGNITION AS FORAGING (Friday)

THE EVOLUTION OF GOAL-DIRECTED COGNITION AS A SEARCH PROCESS: FROM FORAGING TO MIND

Thomas Hills

University of Basel, Switzerland; Email:thomhills@gmail.com

Understanding the evolutionary history of goal-directed cognition requires that we identify the shared ecological circumstances and neural correlates that have defined the problem that cognition has evolved to solve. A common ecological trade-off, central to many control problems--from foraging to problem solving--is the exploration/exploitation trade-off. Across species, the neural correlates that mediate this trade-off often involve dopaminergic processing, in predictable ways, from worm to man. I will present both comparative biological evidence and recent empirical studies of cognition, which suggest that the search for internal information (i.e., internal goal-directed cognition) is the evolutionary descendent of external search processes related to spatial foraging.

P130 Contributed Poster: MECHANISMS 1 (Poster Session A: Weds. eve)

POPULATION DIVERGENCE IN SEXUAL DIMORPHISM AND ANDROGEN SENSITIVITY OF ELECTROCOMMUNICATION SIGNALS

Winnie Ho, G. Troy Smith

Indiana University, United States; Email:wwho@indiana.edu

Apteronotid fish produce electric organ discharges (EODs) for electrolocation and communication. EOD frequency (EODf), and modulations of EODf (chirps), convey information about species, sex and social hierarchy. In black ghost knifefish *Apteronotus albifrons*, we found that the magnitude of sex differences in EOD behavior varies within species: populations from the Orinoco river basin show pronounced sexual dimorphism in EODf and chirping, while those from the Amazon basin are sexually monomorphic. We tested whether differences in androgen sensitivity could explain population differences in sexual diethism by treating females from two populations (Brazilian Amazon - BR, Colombian Orinoco - CO) with 11-ketotestosterone (11-kT) or (DMSO) vehicle. The effect of 11-kT on chirping did not differ across populations; however, EODf was more sensitive to 11-kT in the sexually dimorphic CO population than in the sexually monomorphic BR population (P

>0.05). Differences in the magnitude of sexual dimorphism in EODf across *A. albifrons* populations may therefore be influenced by population differences in androgen sensitivity. Supported by NIH T32HD49336, IU FRSP, NSF IOS0950721.

P44 Contributed Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

REPRODUCTIVE STATE OF FEMALE VOLES AFFECTS MALE'S RESPONSE TO SAME- AND MIXED-SEX OVER-MARKS

Nicholas Hobbs, Michael Ferkin

University of Memphis, United States; Email:nhobbs@memphis.edu

Many mammals use scent marks and over-marks to signal their condition and willingness to mate with conspecifics. During the breeding season, the condition of female meadow voles, *Microtus pennsylvanicus*, may vary. Females may be in a heightened state of receptivity known as postpartum estrus (PPE). Alternatively, they may be in a moderate state of sexual receptivity (REF females). We conducted three experiments that determined whether males exposed to over-marks containing the scent marks of PPE and REF females respond preferentially to females based on either the position of their scent mark in the over-mark or their reproductive state. In experiment 1, we tested the hypothesis that a female's reproductive state affects a male's response to scent donors of a same-sex over-mark. Experiments 2 and 3 tested the hypothesis that the reproductive state of a female in a mixed-sex over-mark affects how males respond to her scent mark relative to that of a novel female. Our results suggest male voles may prefer PPE females relative to REF females, independent of the position of their scent marks in the over-mark, due to benefits associated with mating with a PPE female.

196 Contributed Talk: SOCIAL BEHAVIOR IV (Thursday AM)

THE FORMATION AND DYNAMICS OF DOMINANCE HIERARCHIES AND SOCIAL NETWORK STRUCTURE IN MONK PARAKEETS

Elizabeth Hobson, Timothy Wright

New Mexico State University, United States; Email:emoseman@nmsu.edu

Animal interactions are traditionally studied from a dominance hierarchy perspective but recent interest has shifted focus towards social network structure. However, the relationship between hierarchical and network structures remains unclear. We compared short-term social dynamics in 2 groups ($n=21$, $n=19$) of captive Monk Parakeets (*Myiopsitta monachus*) released in a large flight pen. We quantified social interactions for 24 days, pooling into 8 3-day bins for analysis. Patterns of dominance and associations established quickly but neither remained constant over the entire study period. Dominance hierarchies showed significant overall linearity (0.71 and 0.70; $P > 0.05$) and some temporal instability in dominance rankings. Network structure was highly correlated among time periods despite shifts in dyadic association strength. Neither dominance nor networks fully described observed social dynamics but the use of both methods did provide complementary information. Our results suggest that better resolution of social structure can be achieved by a combined approach that considers associations or interactions across multiple behavioral contexts when studying complex sociality.

P178 Contributed Poster: SEXUAL SELECTION 1 (Poster Session A: Weds. eve)

INDIVIDUAL PREFERENCE FUNCTIONS AND SEXUAL SELECTION IN GRAY TREEFROGS

Gerlinde Hoebel, Robb Kolodziej

University of Wisconsin, Milwaukee, United States; Email:hoebel@uwm.edu

Female mate preferences are an important component of sexual selection. Preferences can be described by preference functions, which plot female responses across a range of display values. The shape of preference functions (i.e., open or closed) interacts with the distribution of display values to determine the form of selection on displays. Preferences can be further broken down into separate components, like peak preference, selectivity, and responsiveness. Exploring variation in preference shape, and in the components of preference is important, because this variation can influence the strength and direction of sexual selection. In Gray Treefrogs (*Hyla*

versicolor), the population-level preference function for call duration is open, and that for pulse rate is closed. We show that there is substantial among-female variation in preference shape, with open and closed functions possible for both call duration and pulse rate preferences. There is also substantial variation in the components of preference. We explore potential trade-offs between preference shape and preference components, as well as between preference components, and discuss their implications for sexual selection.

2 Plenary Lecture: (Tuesday PM)

DIGGING FOR GENES THAT CONTRIBUTE TO BEHAVIORAL VARIATION

Hopi Hoekstra

Harvard University, United States; Email:hoekstra@oeb.harvard.edu

Understanding how and which genes affect ecologically important behaviors remains a major challenge. To address this goal, we are capitalizing on natural variation in burrowing behavior within and between species of deer mice (genus *Peromyscus*). We have found that several, but not all, deer mouse species construct stereotyped burrows, and that dramatic burrow differences can evolve rapidly. Moreover, deer mice reared in captivity recapitulate their natural burrowing behaviors under controlled laboratory conditions, suggesting that burrowing has a genetic component. To understand how changes at the genetic level lead to innate behavioral differences, we currently are using several complementary approaches. Here, I will talk about our efforts to: (1) identify the genetic basis of burrow size and shape, (2) understand how differences in mouse behavior lead to differences in burrow shape, (3) test how these behavioral differences arise over ontogeny, and (4) explore the evolution of cooperative burrowing. Together, we expect these studies to elucidate the links between evolution, genetics and behavior in wild mice.

247 Contributed Talk: COGNITION AND LEARNING V (Thursday PM II)

PITCH CHROMA AND HEIGHT PERCEPTION IN HUMANS AND BLACK-CAPPED CHICKADEES

Marisa Hoeschele, Ronald Weisman, Lauren Guillette, Allison Hahn, Christopher Sturdy

University of Alberta, Canada; Email:hoeschel@ualberta.ca

Pitch chroma refers to perceiving the quality of a musical note and this quality repeats each time frequency is doubled (an octave in musical terms). Pitch height refers to perceiving differences in frequency on a log linear scale. Humans use both pitch chroma and height perception: when an adult male and a child sing together, they tend to sing at different frequencies separable in pitch height, but identical in pitch chroma (i.e., they sing the same musical note). In practice, it is difficult to assess chroma perception in musically untrained humans and likewise in other species. Here we present a simple go/no-go discrimination in which we divided octave 4 into 3 ranges of 4 notes that alternated in reward contingency (e.g., unrewarded, rewarded, unrewarded). Humans showed positive transfer when trained with the same contingency pattern in octave 5 and negative transfer to a reversed discrimination in octave 5. Black-capped chickadees showed exactly the opposite result: positive transfer to the reversed discrimination and negative transfer to the similar discrimination in octave 5. Although adept at pitch height discriminations, chickadees may be chroma blind.

P278 Contributed Poster: CONSERVATION (Poster Session B: Thurs. eve)

HATCHLING BEHAVIORAL DIFFERENCES IN HIGH AND LOW RECRUITMENT POPULATIONS OF THE GOPHER TORTOISE

Aaron Holbrook, Jodie Jawor, Carl Qualls

University of Southern Mississippi, United States; Email:aaron.holbrook@eagles.usm.edu

Federally threatened in Mississippi, the gopher tortoise (*Gopherus polyphemus*) populations there have strongly variable recruitment and are generally in decline. Hatching success is significantly lower in Mississippi than in any other part of the species' range and most hatchlings die within the first year. Burrowing is essential for protection from predation, however many hatchlings dig shallow burrows (or no burrows) that leave them

exposed. Burrowing behavioral differences (interpreted as anti-predator behavior here) between high and low recruitment populations could be linked to altered corticosterone levels, both baseline and stress induced, leading to the development of behavioral syndromes. To begin testing this possibility, we determined baseline and stress-induced corticosterone levels via restraint stress and we will compare these to hatchling burrowing behavior (data currently being collected) from individuals collected from high and low recruitment sites and raised in a common garden environment.

P429 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

HOW DOES COLONY SIZE AFFECT TASK ORGANIZATION IN THE HARVESTER ANT *POGONOMYRMEX CALIFORNICUS*?

Carter Holbrook, Jennifer Fewell

Arizona State University, United States; Email: ctholbrook@asu.edu

Colony size plays an important role in the organization of insect societies. In the harvester ant *Pogonomyrmex californicus*, division of labor increases with colony size, both during colony ontogeny and among unmanipulated same-aged colonies. However, the mechanism (s) integrating individual task specialization and colony size is unknown. To test whether higher division of labor is an emergent consequence of increased colony size, as predicted by self-organizational models, we manipulated colony size in *P. californicus* and quantified task performance over several days. Experimental variation in colony size failed to elicit a short-term response in division of labor; we propose that the previously observed scaling relationship is mediated by developmental processes that require longer-term size differentiation. In contrast, the overall allocation of workers to tasks shifted with colony size, suggesting that colony needs or task priorities depend, in part, on colony size alone. Finally, colony members differed consistently in task performance across colony size treatments, indicating intrinsic behavioral variability.

41 Symposium: SOCIAL COMPLEXITY (Wednesday)

SOCIAL AND OTHER FORMS OF COMPLEXITY IN THE EVOLUTION OF INTELLIGENCE IN MAMMALS & BIRDS

Kay Holekamp, Eli Swanson

Michigan State University, United States; Email: holekamp@msu.edu

Despite huge metabolic costs of neural tissue, some mammals & birds exhibit relatively large brain:body ratios and relatively sophisticated cognitive abilities. However, it is not clear whether big brains & great intelligence have generally evolved to cope with social complexity, complexity in the physical environment, neither or both. Primatologists have recently claimed that non-primate animals rarely form aggregations that impose rigorous cognitive demands, and that their evolutionary success seldom depends on intelligence. They have therefore concluded that non-primate animals have no need to solve social problems that require knowledge of kinship, rank or past history of give-and-take, as do the primates. Here I assess this assertion in light of recent data from birds and non-primate mammals, focusing in particular on mammalian carnivores. The literature suggests that there has been considerable convergence between primates and non-primate animals with respect to the selection pressures favoring the evolution of intelligence. Recent work also suggests that both social and non-social variables shape brain evolution, as do phylogenetic relationships and recent history.

P21 Contributed Poster: COGNITION AND LEARNING 1 (Poster Session A: Weds. eve)

SPATIAL NAVIGATION IN FIDDLER CRABS: GAINING ABSOLUTE DIRECTION REFERENCE FOR GOALS AWAY FROM HOME

Luke Hong, John Layne

University of Cincinnati, United States; Email: hongso@mail.uc.edu

Accurate spatial navigation is essential for motile animals to reach specific locations suitable for foraging, reproduction, or shelter. The sensory cues supporting spatial navigation are of two classes: Idiopathic cues are

produced by movement of the animal itself and allothetic cues are external and independent of animal movements. Fiddler crabs (*Uca pugilator* Bosc 1802) leave and return to their inconspicuous burrows in the sand without using allothetic cues. However, other *Uca* species perform navigational feats which seem impossible without allothetic cues; they appear to obtain an absolute direction reference to reach specific location away from home. To see if *U. pugilator* possess an absolute reference direction, we analyzed the directions of excursions from the burrow. The excursion pattern of *U. pugilator* was highly non-random ($X^2=10.8$, $df=1$, $P=0.0010$), meaning that at some level the crabs 'know' the direction of previous excursions, and subsequent excursions are directed with reference to these. Such a reference can only be obtained from allothetic cues or from a novel way of utilizing idiothetic cues.

P395 Contributed Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

WHAT OVERCOME BODY SIZE ADVERSE?

Yoshihito Hongo

Kyoto University, Japan; Email:yoshihon@ethol.zool.kyoto-u.ac.jp

In general, asymmetries in body size often play the most important role, with larger animals being superior competitors. Males of Japanese stag beetles, *Lucanus maculigemoratus* and *Prosopocoilus inclinatus*, exhibit exaggerated mandibles. Body size of *Lucanus* is generally larger than that of *Prosopocoilus*. These two stag beetles inhabit sympatrically and feed on same food resources. This suggests that male ability of interspecific competition over access to resources could have great effect on fitness. If the outcomes of interspecific competitions between these two stag beetles are simply driven by body size, we can expect that larger *Lucanus* should hold the advantage in interspecific competitions. Then, the detailed contest behaviors of these beetles and the outcome of the contests were examined. As a result, however, it is revealed that the size superiority in males of *Lucanus* is not lead to the advantage in the contest against *Prosopocoilus*, because of the differences in the detailed behaviours of their mandible use. That is, males of *Lucanus* tended to nip the opponent from dorsal side, whereas those of *Prosopocoilus* tended to do it from ventral side.

P141 ABS Genesis Award Poster: PARENTAL CARE 1 (Poster Session A: Weds. eve)

DO MALE EUROPEAN STARLINGS USE EGG SPOTS TO MAKE DECISIONS ON PROVISIONING EFFORT?

Mark Hornsby, Evan Fairn, Colleen Barber

Saint Mary's University, Canada; Email:hornsby.mark@gmail.com

Secondary-cavity nesting species frequently experience ectoparasitic infestations. The effects of parasites in avian nests range from negligible to significant changes in parental behaviour, decreases in nestling fitness and death. One ectoparasite species, *Carnus hemapterus*, has been implicated in causing spots to appear on eggs of the spotless starling *Sturnus unicolor*, apparently allowing the male to infer the level of parasitism within his brood and reduce his provisioning to the offspring. The objectives of my study were to determine whether *C. hemapterus* varied with Julian day, investigate the hypothesis that *C. hemapterus* caused egg spots and to assess how spots influenced paternal provisioning behaviour and nestling condition in European starlings *Sturnus vulgaris*. Number of *C. hemapterus* was significantly associated with Julian date. No significant correlation was detected between *C. hemapterus* and egg spots or between *C. hemapterus* and nestling condition. However, male starlings provisioned nestlings from spotted-egg nests significantly more than did males from unspotted-egg nests. Males may be compensating for the potential effects of parasitism.

P209 ABS Genesis Award Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

MODELING THE SOCIAL INFLUENCES ON GROWTH IN THE GROUP-LIVING FISH *NEOLAMPROLOGUS PULCHER*

Elizabeth Hoskins, Ian Hamilton, Elizabeth Marschall

Ohio State University, United States; Email:hoskins.56@buckeyemail.osu.edu

In several group-living fish, subordinate growth rate depends on the relative size of more dominant fish, decreasing as the difference in size with dominant fish decreases. Why subordinates show reduced growth remains unknown. Subordinates gain future reproductive benefits from large size but may come into conflict with dominants. Using stochastic dynamic models of *Neolamprologus pulcher* we tested two hypotheses. First, we assumed that subordinate growth was regulated by the cost of foraging and competition with dominants. Second, we tested that subordinate growth was regulated by the threat of eviction from the dominants. For both hypotheses, we used the optimal subordinate foraging efforts resulting from these models in a simulation of dominant and subordinate growth. However, the predictions of both models fit experimental data poorly. Future models should investigate the role of other social interactions on growth in group-living fish.

P210 ABS Genesis Award Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

EFFECT OF ISOLATION PRIOR TO TESTING ON THE SHOALING BEHAVIOR OF THREESPINED STICKLEBACKS

Lauren Hostert, Simon Pearish, Alison Bell

United States; Email: lhoster2@gmail.com

Shoaling is an important social behavior in teleost fish. We are quantifying individual variation in shoaling in sticklebacks (*Gasterosteus aculeatus*) using an artificial shoal. In preliminary studies, we found that when individuals were immediately tested following transfer to an experimental arena, they did not show high levels of shoaling. We suspected that a longer acclimation period and/or isolation from other sticklebacks prior to testing might elicit higher levels of shoaling. To test this hypothesis, we compared the effect of three different isolation times (0, 1, and 24 hours) prior to testing on shoaling. Fish that were isolated for 24 hours started shoaling sooner and shoaled for longer. The higher frequency of shoaling in the 24 hour isolation group might be due to either recovery from netting or a higher motivation to shoal following isolation. In future studies we will isolate fish for 24 hours prior to testing in order to elicit high levels of shoaling behavior.

97 Contributed Talk: SEXUAL SELECTION I (Tuesday AM)

STRONG SEXUAL SELECTION DRIVES VARIATION IN MALE COURTSHIP PHEROMONES.

Lynne Houck, Sarah Eddy, Adam Chouinard, Pamela Feldhoff, Richard Feldhoff

Oregon State University, United States; Email: houckl@onid.orst.edu

In most species of plethodontid salamanders, an adult male is characterized by the seasonal hypertrophy of a mental (chin) gland during the reproductive season. In studying the mating system of the red-legged salamander, *Plethodon shermani*, we identified two distinct courtship pheromones that a male delivers to the female during courtship: plethodontid receptivity factor (PRF) and plethodontid modulating factor (PMF). Both of these protein pheromones have a history of substantially high levels of genetic variation, far surpassing baseline levels of expected genetic changes. New evidence supports the premise that female response to varying pheromone isoform combinations drives the evolutionary change in male pheromones.

P115 Contributed Poster: MATING SYSTEMS 1 (Poster Session A: Weds. eve)

FEMALE CHOICE IN THE LEK-MATING PRAIRIE MOLE CRICKET (*GRYLLOTALPA MAJOR*)

Daniel Howard, Norman Lee, Carrie Hall, Andrew Mason

Augustana College, United States; Email: daniel.howard@augie.edu

The prairie mole cricket *Gryllotalpa major* is a lek-mating subterranean insect; males construct spatially aggregated acoustic burrows from which they project their call song to attract females. We conducted a field study to measure the relationship between call song parameters and female attraction and discovered that the most attractive males produced songs with a higher dominant frequency. In two-choice phonotaxis experiments, females were subjected to the broadcast of song models that varied in regard to temporal and spectral parameter of the call song. Females were also presented with a choice between a conspecific or heterospecific song. Females displayed strong preference for louder conspecific songs at higher chirp rates and at higher dominant

frequencies. Preference for higher dominant frequency songs is consistent with field measures of mate attraction, but such song corresponds to smaller males. This mis-match in predicted preference may be driven by species recognition mechanisms, as the closely related sympatric mole cricket *Neocurtilla hexadactyla* advertise with similar calling songs at a slightly lower dominant frequency.

P179 Contributed Poster: SEXUAL SELECTION 1 (Poster Session A: Weds. eve)

SONG SHARING IN PROTHONOTARY WARBLERS (*PROTONOTARIA CITREA*)

Sarah Huber, Amanda Steinagel, Cara Carne

Randolph-Macon College, United States; Email:sarahhuber@rmc.edu

Bird songs function in mate attraction and male-male interactions. This latter function is thought to be facilitated by the use of song or repertoire matching in neighboring males. Thus, males in geographic proximity should share songs. Here we describe patterns of song sharing in a population of male Prothonotary Warblers (*Protonotaria citrea*) in Henrico County, VA. These birds breed in nest boxes along the banks of the James River. Males were recorded at boxes in 2009, 2010, and 2011. We find significant variation in song types within the population, as well as a few dominant song types that were shared by multiple males. Here we test whether shared songs are more common among neighbors. In addition, we test whether intrinsic song characteristics such as trill rate, frequency bandwidth, and vocal deviation are more similar among males in close proximity.

P324 Contributed Poster: GENETICS AND EVOLUTION 2 (Poster Session B: Thurs. eve)

SEASONAL VARIATION IN METABOLISM, FLIGHT ACTIVITY, AND ECOLOGY OF *ANOPHELES GAMBIAE* IN MALI

Diana Huestis, Alpha Yaro, Adama Traore, Kathryne Dieter, Juliette Nwagbara, Aleah Bowie, Adama Dao, Tovi Lehmann

National Institutes of Health, United States; Email:diana.huestis@nih.gov

Although several areas of basic mosquito biology are well-studied in the laboratory, little is known about their ecology, physiology, or behavior in the field. However, many behavioral traits, such as activity level and biting rate, are integral to malaria transmission and thus deserve further study. In many parts of sub-Saharan Africa, disease transmission is seasonal and linked to rainfall, as malaria cases and mosquito abundance virtually disappear during the 5-7 month dry season between rainy seasons. The mechanisms by which vector species survive the dry season are still unknown, yet this knowledge could ultimately lead to successful vector control in these regions. To explore the dry-season ecology of the African malaria mosquito, *Anopheles gambiae* s.l., we undertook a year-long study to measure seasonal variation of many aspects of their biology in the field, including population and community structure, metabolic rate, body-size, flight behavior, feeding response, and oviposition behavior. These results provide unique insight into the field biology of these species, and may result in creative, better-informed approaches to vector control in the future.

P396 Contributed Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

SEX AND WEAPONRY: FEMALE AGGRESSION IN SEXUALLY DIMORPHIC, MONOGAMOUS SNAPPING SHRIMP

Melissa Hughes, Kathleen Hollowell, Rachel Vickery

College of Charleston, United States; Email:hughesm@cofc.edu

Sexual dimorphism in weaponry is often attributed to intra-sexual selection, wherein one sex maximizes reproductive success through competition. In snapping shrimp (*Alpheus spp.*), sexual dimorphism in snapping claws - a deadly weapon - is common, with males having larger claws than females. Most species are monogamous, however, and the advantage of larger weaponry in males is not clear. To determine whether aggressive behavior is similarly greater in males than females, we staged competitive and pairing interactions in 2 species: *A. heterochaelis* and *A. angulosus*. Although sexual dimorphism is greater in *A. angulosus*, *A. heterochaelis* is more aggressive overall. Although they have smaller claws, females of both species are more

aggressive than males in competitive interactions. Female reproductive success is limited by body size; sexual dimorphism in weaponry, then, may result not from differential advantages of large weapons and competitive behavior, but from female investment in growth of body size rather than weapon size.

P291 ABS Founders Award Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

SIGNAL COMPLEXITY AND FEMALE MEMORY IN GRAY TREEFROGS (*HYLA VERSICOLOR*)

Sarah Humfeld

University of Missouri, United States; Email: humfelds@missouri.edu

In a variety of animal species, females prefer to mate with males producing complex signals. However, it is not always clear why they do so. A recent study in túngara frogs has found that two-part male advertisement calls increase the period of time over which that signal influences a receiver's phonotactic response. In essence, female memory is hypothesized to favor the evolution of increasing signal complexity. To determine whether this might be a generalized phenomenon, we conducted a similar study in a species which produces only simple calls, the gray treefrog (*Hyla versicolor*). Previous studies in this species indicate that females prefer complex signals in some instances; perceptual rules determine whether a complex signal is relatively attractive or unattractive compared to a simple call. Using artificial acoustic appendages known to increase and decrease the attractiveness of the simple call, we used two-speaker choice tests to determine whether complex calls increase a female's working memory. We present preliminary results indicating that female memory may not be an ubiquitous phenomenon favoring the evolution of call complexity in amphibians.

343 Contributed Talk: SOCIAL BEHAVIOR VI (Friday PM I)

HONEY, I MOVED THE KIDS! DIVISION OF LABOR AND FITNESS BENEFITS IN A BIPARENTAL CICHLID FISH

Jodee Hunt, Lyndsey Adams, Monica Zipple

Grand Valley State University, United States; Email: huntj@gvsu.edu

Parental care is an important form of social behavior that increases offspring fitness. Unlike most fishes, convict cichlids (*Archocentrus nigrofasciatus*) form mate bonds and exhibit long-term, biparental care. Because such parental care might yield specialized behavior, i.e., division of labor, males and females might contribute to offspring fitness in different ways. We quantified parental behaviors of females and males to determine whether they differed in (a) amount or type of contact with offspring and (b) time spent near offspring. We also sampled microbes from embryos, fry, and female and male parents, from which we extracted, amplified and examined bacterial DNA (DGGE electrophoresis) to explore whether parental contact contributed to transmission of microbes to offspring. Females remained near broods and exhibited contact behaviors with offspring significantly more than males, and contact appears to link to the microbial flora of fry. Because of behavioral differences, females may contribute more to transmission of beneficial microbes, while males specialize in defensive behaviors.

185 Contributed Talk: GENETICS AND EVOLUTION I (Wednesday PM I)

EXPANSION DIFFERENCES IN TWO ECTOPARASITE POPULATIONS: LIFE-HISTORY CHARACTERS AND BEHAVIOR

Eija Hurme, Arja Kaitala, Laura Härkönen, Johan Månsson

University of Oulu, Finland; Email: eija.hurme@oulu.fi

We examined if the life-history characters and host location behavior of an ectoparasite are related to range expansion patterns. Our model species was a deer ked (*Lipoptena cervi* L.), a Eurasian louse fly that parasitizes Cervidae, that has a two-fold distribution pattern in Fennoscandia, Northern Europe. It has invaded over 500 km northwards in the Eastern population during the past 50 years, while its range has remained almost stable in the Western population. Host density is high in both areas. We found that Eastern deer keds developed faster, grew larger, and lived longer as adults than Western deer keds. In behavior experiments we used a dark moving object

as an artificial host since deer keds use simple visual cues in their host location. We found that Eastern deer keds were also more eager to attack towards a potential host than Western deer keds. Our results indicate that both life-history and behavior characteristics may promote dispersal and invasion in the deer ked, partly explaining the geographical range differences.

283 Contributed Talk: PARENTAL CARE II (Thursday PM III)

FACULTATIVE MATERNAL CARE OF SCHOOLING TADPOLES IN THE FROG, *LEPTODACTYLUS INSULARUM*

Kristiina Hurme

University of Connecticut, United States; Email:kristiina.hurme@gmail.com

Facultative parental care can evolve when offspring are capable of survival without care, yet still benefit from it. I describe facultative maternal care in a Neotropical frog, quantifying the variation in frequency and duration of care, and examine the causes and consequences of this variation. Females of the Panamanian frog *Leptodactylus insularum* guard their nests and schools of tadpoles, communicate with their schools using body-pumping movements, lead them around the swamps, and aggressively defend their offspring against predators. Maternal care was provided by only about half of all females. Among females that provided care, the duration of attendance was variable and was not influenced by female body size or rainfall. Attending mothers improved tadpole survival; attended schools survived almost twice as long as deserted schools. Out of 66 schools monitored in two seasons, only eight schools survived until metamorphosis, and all received maternal care. These schools also received more care than did attended schools that did not reach metamorphosis. The presence of an attending female had no effect on the speed of tadpole development or growth rates, however.

P86 Contributed Poster: ECOLOGICAL EFFECTS I (Poster Session A: Weds. eve)

BEHAVIORAL AND MORPHOLOGICAL DIFFERENCES BETWEEN URBAN AND RURAL SONG SPARROWS

Jeremy Hyman

Western Carolina University, United States; Email:jhyman@email.wcu.edu

Urban habitats present animal populations with unique environmental conditions which can cause changes in both behavior and morphology. This study compared territorial behavior and morphological measurements between the urban and rural populations of Song sparrows. Consistent with previous studies, we found that urban birds showed significantly higher levels of territorial aggression. We found no differences between populations in any measures of body size or condition, but found significant differences in bill measures, with urban birds having deeper bills and with rural birds having longer bills. The behavioral differences suggest that the urban habitats present very different selective forces on the urban birds, but the lack of differences in measures of body size or condition suggest that the two habitats do not differ strongly in the quality of the diets available to adult birds. However, the differences in bill morphology suggest that there are differences in specific contents of the diet which are driving morphological divergence at the two sites.

10 ABS Allee Session: ALLEE I (Wednesday AM)

WESTERN SCRUB-JAY FUNERALS: CACOPHONOUS AGGREGATIONS IN RESPONSE TO DEAD CONSPECIFICS

Teresa Iglesias, Gail Patricelli, Richard McElreath

University of California, Davis, United States; Email:tliglesias@ucdavis.edu

All organisms must contend with the risk of injury or death. Many animals reduce this danger by assessing environmental cues to avoid areas of elevated risk and produce alarm signals that alert others to perceived risks. Alarm signaling has been extensively reported to occur in response to detection of or encounters with a predator. However a dead conspecific, a salient cue of risk, has not previously been shown to elicit alarm signaling. This work shows that a dead conspecific is sufficient to induce alarm calling and risk-reducing behavioral

modification in Western Scrub-Jays (*Aphelocoma californica*). Experiments demonstrate that jays respond similarly to the presence of a predator, but do not respond to novel objects. Further, birds who encounter a dead conspecific alter their foraging behavior by temporarily avoiding rich food resources, similar to avoidance after exposure to predator models. These results show that without witnessing the struggle and manner of death, a dead conspecific is used as public information regarding risk and that this information is actively shared with conspecifics and used to reduce exposure to risk.

P211 Contributed Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

POSTCONFLICT AFFILIATION IN BUDGERIGAR, *MELOPSITTACUS UNDULATUS*

Yuko Ikkatai, Ei-ichi Izawa, Shigeru Watanabe

Keio University, Japan; Email:ikkatai@z2.keio.jp

Postconflict affiliation is commonly known to play a role in conflict management. A large number of primate studies have shown that postconflict affiliation occurred in close kinship between group members. Recently, studies on birds have reported that postconflict affiliation was found in pair-bond of social birds such as rooks (*Corvus frugilegus*). These studies predict that postconflict affiliation serves to maintain affiliative social bonds in group-living animals. In this study, we investigated whether life-long monogamous budgerigar, an avian species distant from the corvid, engage in postconflict affiliation or not. If postconflict affiliation serves to maintain social bonds, it should be observed in pair-bond of budgerigars. We compared the interval between the onset of an agonistic conflict and a subsequent affiliative interaction with a randomization simulation as a control. The interval was significantly shorter than the control. Our finding suggests that postconflict affiliation serves to maintain life-long pair-bond of budgerigars.

104 Contributed Talk: SOCIAL BEHAVIOR I (Tuesday AM)

MY FRIEND'S ENEMY IS MY ENEMY: STRUCTURAL BALANCE IN A WILD MAMMAL POPULATION

Amiyaal Ilany, Adi Barocas, Lee Koren, Michael Kam, Eli Geffen

Tel Aviv University, Israel; Email:amiyaal@gmail.com

The social structure of a population is based on individual social associations, which can be described using network motifs. Structural balance theory was proposed for understanding the emergence of conflict and tension in human social systems. It models the presence of specific triads in the network and their effect on the global population structure, based on the differential stability of specific triad configurations. These ideas have never been tested in animal societies. Here we use empirical data from an animal social network to examine, for the first time, the presence and effects of structural balance. We confirm the presence of structural balance and show its ability to predict social changes resulting from local instability. We show that new individuals entering the population introduce social instability, which counters the tendency of social relationships towards stable structures. Our findings imply that structural balance has a role in the evolution of social structure.

P45 ABS Founders Award Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

SEX-DIFFERENCES IN SONG AND SELECTION IN FEMALE AND MALE STRIPE-HEADED SPARROWS

Anya Illes

University of Washington, United States; Email:ailles@u.washington.edu

Recent work on sexual selection in female animals suggests that because resource acquisition may have a stronger effect on female reproductive output than does mating success, intrasexual selection is a stronger factor in female evolution than intersexual selection. In animal communication studies, song usage and repertoire complexity are used as indicators of sexual selection. Previously, I showed that in stripe-headed sparrows, females responded to same-sex song playback intrusions more strongly than did males, which suggested that intrasexual selection is stronger on females in this species than on males. Here I further test this hypothesis by

comparing repertoire usage and complexity of the sexes. While I found little difference in repertoire complexity, males devoted nearly half of their repertoire specifically to mate attraction while females did not. Male song output was driven by mate attraction, while female output was driven by territory defense. These and other sex-differences in song suggest that territory defense has a strong effect on female trait evolution, while mate acquisition has strong effect on male trait evolution.

P258 Contributed Poster: COGNITION AND LEARNING 2 (Poster Session B: Thurs. eve)

PIGEONS (*COLUMBA LIVIA*) MAY MONITOR THEIR OWN KNOWLEDGE STATES AND SEEK INFORMATION.

Sumie Iwasaki, Sota Watanabe, Kazuo Fujita

Kyoto University, Japan; Email:s.iwasaki623@gmail.com

Seeking information in uncertain situations has been interpreted as evidence of metacognitive abilities. We examined whether pigeons could monitor their own knowledge states and seek new information in need. We required the pigeons to learn novel sequences of responses for various trios of illustrations. On half of the trials, subjects were given the opportunity to ask for "hints" as to the next correct response in a sequence. If the subjects completed a trial correctly without any hints, they were rewarded with food and light. If the subjects sought one or more hints during the course of completing a trial correctly, they were rewarded either with food and light, or with light only. Incorrect responses resulted in a timeout. We analyzed when the pigeons sought hints. Two out of four pigeons sought hints in the first sessions more often than in the last sessions of learning novel sequences, and the frequency of hint seeking was inversely correlated with the accuracy on the trials in which hints were unavailable. This result may show that pigeons have an ability to differentiate between the cognitive states of knowing and not knowing.

11 ABS Allee Session: ALLEE I (Wednesday AM)

MALE ORNAMENTATION AND FEMALE BENEFITS OF CHOICE IN A LEK-MATING PAPER WASP

Amanda Izzo

University of Michigan, United States; Email:mizzo@umich.edu

Sexual selection has seen many advances over the past several decades, yet many questions remain. *Polistes dominulus* paper wasps are a good system in which to study sexual selection, as males have a lek-based mating system and sexually dimorphic abdominal spots. Here, I demonstrate that these spots are used in both inter- and intra-sexual selection. Males with smaller, elliptically-shaped spots are more dominant over male rivals and are more preferred by females than males with larger, irregularly shaped spots. Additionally, the spots are condition-dependent and advertise quality. Further, spots function as signals: males with experimentally reduced abdominal spots win a greater proportion of fights and are preferred by females as mates over control males. Finally, female choice for attractive spots results in direct benefits to females. Females mated to males advertising high quality survive hibernation longer than females mated to males that advertise low quality. These results demonstrate that male ornaments are an important mediator of mating dynamics in paper wasps, and that females can gain direct benefits in non-economic mating systems.

113 Contributed Talk: COGNITION AND LEARNING II (Tuesday PM I)

FLEXIBLE STRATEGIES FOR BLINDFOLDED IMITATION IN A BOTTLENOSE DOLPHIN, *TURSIOPS TRUNCATUS*

Kelly Jaakkola, Emily Guarino, Mandy Rodriguez, Jane Hecksher

Dolphin Research Center, United States; Email:kelly@dolphins.org

Three studies examined a dolphin's ability to adapt a previously learned "do-as-I-do" procedure to copy another individual while blindfolded (i.e., wearing eyecups). In Study 1, the dolphin accurately copied familiar behaviors of another dolphin, whether sighted or blindfolded (Jaakkola et al., 2011). He echolocated primarily when

copying *motor* behaviors *blindfolded*, but since blindfolded trainers also identified many behaviors, it is unclear if the dolphin recognized motor behaviors via echolocation or via characteristic sounds of the behavior. In Studies 2 and 3, the same dolphin copied comparable behaviors demonstrated by a human in the water (Study 2) or by another dolphin (Study 3). Blindfolded accuracy increased in Studies 2 and 3, suggesting improvement due to experience with the task. However, blindfolded echolocation dramatically increased specifically when copying a human (Study 2) as compared to other dolphins (Studies 1 and 3). This suggests the dolphin recognized behaviors based on their characteristic sounds when possible, but flexibly switched to recognition by echolocation for the more novel sounding behaviors of the human.

P22 Contributed Poster: COGNITION AND LEARNING 1 (Poster Session A: Weds. eve)

HOW TO ENCODE THE WORLD: INTEGRATING MULTIPLE FRAMES OF REFERENCE

Lucia Jacobs, Anna Waisman, Molly Nicholas, Mikel Delgado

University of California, Berkeley, United States; Email: jacobs@berkeley.edu

Adaptive behavior is shaped by the distribution of critical resources. The need to encode the pattern of resources and competitors in time and space shapes the evolution of spatio-temporal cognition, thus creating a universal paradigm with which to trace patterns of cognitive evolution. The need to encode a location using multiple frames of reference is thus universal, but the degree to which an individual can flexibly integrate such frames varies by age, sex, season and species. We summarize a pattern of results on a simple paradigm requiring memory for a single location, across diverse experimental paradigms: captive-reared rodents (Southern flying squirrel, Mongolian gerbil), wild rodents (fox squirrel) and developmental changes in humans (toddlers). Two dominant spatial strategies are revealed by this simple task: the use of an un-integrated hierarchy and the use of a majority strategy, where integrating multiple frames of reference leads to the choice of the most probable correct answer. These results support the parallel map theory, where graded stimuli, such as gradients, form a permanent scaffold for the later encoding of discrete object stimuli.

P259 Contributed Poster: COGNITION AND LEARNING 2 (Poster Session B: Thurs. eve)

LEARNING KILLS: THE EFFECT OF LEARNING ON HONEYBEE SURVIVAL

Sarah Jaumann, Dhruba Naug

Colorado State University, United States; Email: sjaumann@rams.colostate.edu

While learning is generally considered to be an all-beneficial behavior, what is often overlooked is that there is a substantial energetic cost associated with it. Therefore, a major dilemma facing animals under energetic stress is the amount of energy reserves to allocate to learning. In such situations it makes sense to conserve energy, but it is also precisely the time when investing in learning can generate a potentially high payoff that would be the difference between life and death. We tested the energetic cost of learning in the honeybee *Apis mellifera* by monitoring the survival of two groups of bees that were or were not subjected to an associative learning protocol using the proboscis extension reflex. Bees that were made to learn died sooner than bees that were not made to learn, suggesting a significant energetic cost of learning. Based on our earlier findings showing an energetic stress in bees that are harboring a parasite, we suggest that the current results provide a possible novel link between parasitic disease and cognitive impairment that also has implications for the recently observed phenomenon of bees disappearing from their colonies.

P166 Contributed Poster: RECOGNITION (Poster Session A: Weds. eve)

IS FACE-PROCESSING SPECIES-SPECIFIC IN PAPER WASPS?

Judy Jinn, Michael Sheehan, Elizabeth Tibbetts

University of Michigan, United States; Email: judyjinn@umich.edu

Individual recognition is crucial to social interactions. Recognizing individuals presents a number of cognitive challenges including the need to discriminate among multiple individuals reliably. Models of cognitive processes underlying individual recognition generally assume that recognition of social partners is based on the

comparison of observed phenotypes to mental templates. Two central questions regarding templates are: (1) the specificity or breadth of the template and (2) the extent to which experience shapes the template. Here, we investigate the specificity of the template used for individual recognition in *Polistes fuscatus* wasps. Previous research has demonstrated that *P. fuscatus* recognizes individuals with variable facial patterns. Furthermore, *P. fuscatus* possesses cognitive adaptations for learning wasp faces. Whether the template is species-specific or general to all wasp faces is unknown. To examine species-specificity of face learning, we compare the ability of *P. fuscatus* to differentiate between pairs of conspecific versus heterospecific faces. We discuss the results in light of species-specific face processing in primates and sheep.

P116 ABS Genesis & Charles H. Turner Award Poster: MATING SYSTEMS 1 (Poster Session A: Weds. eve)

MALE ADVERTISEMENT STRATEGIES ON LEKS: BETTER TO BE ERRATIC AND FLASHY, OR A RELIABLE AVERAGE JOE?

Christina Johnson, Courtney Moore, Brooke Woelber, Daniel Howard, Norman Lee, Carrie Hall
Augustana College, United States; Email: chjohnson09@ole.augie.edu

In lek mating systems, previous studies have established the pattern that those males exhibiting the most robust and conspicuous displays often monopolize female attractions. This results in the mating skew characteristic of leks, with a small proportion of the advertising males receiving most of the attention of visiting females. Sexual selection as a result of female mate choice decisions is thus assumed to influence display phenotypes in lek mating systems. The prairie mole cricket (*Gryllotalpa major* Saussure) is a lek-mating insect that displays for females using an acoustic advertisement signal. Males call at sunset from a constructed burrow, and females are known to preferentially visit males calling from the lek periphery, and those males with calling songs of higher intensity, chirp rate and dominant frequency. It is not known how lek attendance over the 4-6 week reproductive season, lek entry sequence, or night-to-night calling variation influences attractiveness to females. Here we report on male calling strategies related to these variables, and female response to males' acoustic advertisement on two focal leks consisting of 63 advertising males.

P314 Contributed Poster: ECOLOGICAL EFFECTS 2 (Poster Session B: Thurs. eve)

URBAN BLACK WIDOW INFESTATIONS: THE EFFECT OF RELATEDNESS ON HABITAT CHOICE AND CANNIBALISM

James Johnson

Arizona State University, United States; Email: jchadwick@asu.edu

Relatedness is known to have a strong influence on the behavior and population ecology of the small fraction of spider species that display some level of sociality. The majority of spider taxa, however, are solitary and very little is known about their ability to recognize kin and behave accordingly. Here I report on several studies that examine the behavioral response of urban black widows to related and unrelated conspecifics. Black widows are an interesting test case because they are ancestrally a solitary, highly cannibalistic species but have more recently proven to thrive as dense aggregations (infestations) in disturbed, urban habitats. Specifically, we ask whether microhabitat choice and cohabitation/cannibalism are displayed differentially based upon relatedness. Finally, we present preliminary estimates of genetic variation within and among collection sites along an urban-desert gradient. Determining whether urban infestations in this medically-important spider are characterized by kin recognition and reduced levels of genetic variation will aid our ability to control the spread of black widows in urban habitat.

P142 ABS Genesis Award Poster: PARENTAL CARE 1 (Poster Session A: Weds. eve)

BELUGA (*DELPHINAPTERUS LEUCAS*) MOTHER-CALF SWIM POSITIONS DURING THE FIRST YEAR OF LIFE

Jennifer Johnson, Lorae Marquez, Heather Hill

Texas A&M University, United States; Email:jenjohn08@neo.tamu.edu

Consistent developmental changes in calf swim position have been documented for bottlenose dolphins. These swim positions are considered to be indicators of behavioral development and a measure of the mother-calf relationship. An examination of swim positions in belugas (*Delphinapterus leucas*) has only been carried out for beluga mother-calf pairs in their natural habitats. The swim positions of four beluga calves in the care of humans were recorded from birth to one year. During 15 min sessions for each mother-calf pair 2 to 4 times a week. The results indicated that the distance between mothers and their calves increased as the calves matured. Unexpectedly, an increase in the frequency of echelon swim was observed over time while the frequency of infant position remained consistent across the first year. Calves did not show a swim position preference with other whales. These data suggest that beluga calves in the care of humans both compare and contrast to previous findings on captive and wild bottlenose dolphins and belugas in their natural habitat.

310 Contributed Talk: SEXUAL SELECTION IV (Friday AM)

SPERM MOTILITY REQUIRES A FEMALE'S TOUCH: DOES A PROTEIN MEDIATE THIS EFFECT?

Sheri Johnson, Patrice Rosengrave, Janine Carthy, Alan Carne, Torsten Kleffmann, Neil Gemmell

University of Otago, New Zealand; Email:sheri.johnson@otago.ac.nz

Cryptic female choice involves differential usage of sperm from one male over another, with a presumed benefit to offspring fitness. How exactly this choice is exerted in many species largely remains a mystery. Salmon ovarian fluid (OF) differentially alters male sperm velocity and is dependent upon the female OF to which it is exposed, with sperm from one male swimming up to four times faster in the OF of one female compared to another. As sperm velocity is a key determinant of fertilization success in many species, including salmon, this finding suggests that a female's OF may bias paternity of one male over another under conditions of sperm competition. It is likely that some component of the OF either interacts with the sperm or the sperm's motility machinery. Proteins and peptides are known to govern gametic interactions in other species, hence we suspect one or more of these mediate the differential sperm function we observe in salmon. We are using bioassays to identify differences in sperm velocity between high and low molecular weight OF fractions and using mass spectrometry and two dimensional-gel electrophoresis to characterize and compare protein composition differences.

P167 ABS Genesis Award Poster: RECOGNITION (Poster Session A: Weds. eve)

MULTI-ODOR REPRESENTATIONS OF INDIVIDUALS & UNDERLYING NEURAL MECHANISMS

Robert Johnston, David Rollins

Cornell University, United States; Email:rej1@cornell.edu

Memory for individuals is prevalent in a wide range of animal species and this ability is crucial for many aspects of social interactions including dominance relationships, pair bonds, and cooperation. In these experiments we use male golden hamsters in the context of the Coolidge effect - that a male expresses a preference for a less familiar female over a more familiar female- to first test for the presence of individual recognition and then to analyze what brain regions may be activated and involved in such recognition. First we show that males do recognize individuals because they differentiate between two familiar females in a habituation-dishabituation task. Second, we show that males cross-habituate to different odors of a familiar individual but they do not cross-habituate to the odors of a novel female -i.e., they don't know her characteristics. We also show that the flank gland odor of a novel female causes a higher level of neural activation than in a familiar female in the following brain regions based on activation of immediate early genes - perirhinal cortex, posterior piriform cortex, lateral entorhinal cortex, and prelimbic cortex.

114 Contributed Talk: COGNITION AND LEARNING II (Tuesday PM I)

DO SOLITARY NOCTURNAL ARBOREAL MAMMALS SHOW PLANNING ABILITIES WHILE FORAGING?

Marine Joly, Elke Zimmermann

University of Veterinary Medicine Hannover, Germany; Email:marine.joly@tiho-hannover.de

Large-brained diurnal mammals with complex social systems are known to plan where and how to reach a resource as shown by a systematic movement pattern analysis. We examined large-scale movement patterns of a solitary ranging and small-brained mammal model, the mouse lemur (*Microcebus murinus*), by using the Change-Point Test (CPT) and a heuristic random travel model to get insight into foraging strategies and potential route planning abilities. Mouse lemurs are small nocturnal primates inhabiting the seasonal dry deciduous forest in Madagascar. During the lean season, they rely on few stationary food resources. We studied movement patterns of 7 radiocollared lemurs. By identifying significant travel direction changes using CPT, we found that the first change-point coincided with an out-of-sight food resource. Travel paths were more efficient in detecting this resource than the random travel model within limits of assumed visibility. Findings suggest that nocturnal, arboreal and solitary ranging mammals may plan their route. This supports the idea that similar ecological pressures may lead to comparable spatial cognitive skills irrespective of the degree of sociality.

P131 ABS Genesis Award Poster: MECHANISMS 1 (Poster Session A: Weds. eve)

MULTIMODAL EXPERIENCE AND BUMBLE BEE BRAIN DEVELOPMENT

Beryl Jones, Anne Leonard, Daniel Papaj, Wulfila Gronenberg

University of Arizona, United States; Email:beryl@email.arizona.edu

From honey bees to humans, the developmental environment influences brain structures involved in sensory integration, learning and memory. However, comparisons of such effects in closely-related species are uncommon. We investigated how sensory stimuli influence development of the bumble bee (*Bombus impatiens*) brain, as a comparison with the more extensively-studied honey bee. First we compared the brains of newly-emerged vs. 7-day-old bees. Most sensory processing regions showed age-related volume increases. To determine whether changes depended upon experience with particular stimuli, we manipulated bees' exposure to visual stimuli (colored LEDs, ambient light) independently of exposure to supplemental olfactory stimuli (floral odors) in a 2x2 factorial design. Newly-emerged bees held in experimental chambers for 7 days showed no effect of olfactory stimuli, but exposure to visual stimuli led to growth and refinement of brain regions responsible for sensory integration and learning. There was no interaction between effects of visual and olfactory stimuli. We relate our results to brain development in honey bees, which show an age-related polyethism absent in *Bombus*.

223 Contributed Talk: PREDATION AND FORAGING I (Thursday AM)

PREY JITTERS; PROTEAN BEHAVIOUR IN GROUPED PREY

Katherine Jones, Andrew Jackson, Graeme Ruxton

University of Nottingham, United Kingdom; Email:kaj@cantab.net

There have been many descriptive accounts of so-called "protean" or unpredictable escape tactics in prey animals. It is assumed that predators will have difficulty targeting more protean prey either via difficulty predicting prey's escape trajectory and/or via enhancement of the confusion effect (reduced ability to track an individual target in a group of moving and phenotypically similar prey). However, to date no studies have examined whether protean movements decrease predation risk as predicted. I will present data using humans as model predators, to investigate whether "protean" prey that have a higher variance in turning angle (and thus change direction abruptly rather than move on a smoother trajectory) are more difficult to capture and whether this interacts with the confusion effect. Protean prey were significantly harder to capture. However, protean behaviour did not enhance the confusion effect. We suggest that the primary purpose of protean movements may simply be to make it more difficult for a predator to chase and capture prey, increasing the likelihood predators will give up chase sooner, and that such protean behaviour need not be contingent on prey aggregation.

P292 Contributed Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

INTERSPECIFIC DIVERSITY OF ACOUSTIC SIGNAL STRUCTURE IN NOCTURNAL LIZARDS, *GEKKO* SPECIES

Tepei Jono

Kyoto University, Japan; Email:mjustinondo@gmail.com

The coexistence of closely related species facilitates the evolution of species-specific signaling systems for accurate species identification. Eight species of nocturnal geckos *Gekko* are currently recognized in Japan, these species have similar morphological and ecological characteristics. Some congeneric species co-occur without causing hybridization, whereas some native species hybridize with syntopic congeners introduced by human activity. I conducted acoustic analyses of male calls of five species of *Gekko*, including one non-hybridizing and two hybridizing combinations of syntopic species. Calls of each species in the non-hybridizing combination had a species-specific pattern. On the other hand, in the two hybridizing combinations, calls of introduced species had a species-specific pattern, but those of native species did not have any patterns. I hypothesize that the *Gekko* species use calls with the species-specific patterns for species identification, which prevents hybridization with syntopic congeners.

131 Contributed Talk: APPLIED ANIMAL BEHAVIOR I (Tuesday PM II)

DOMESTIC SHEEP AND THEIR INDIVIDUAL DISTANCES WHEN RESTING OR FEEDING INDOORS

Grete Helen Jørgensen, Knut Boe, Inger Lise Andersen, Øystein Holand

Bioforsk, Norwegian Inst. Agric. Envir. Res., Norway; Email:grete.jorgensen@bioforsk.no

We aimed to investigate the individual distance of two different breeds of sheep during resting and feeding. Eight groups of 4 Spæl sheep, a light, native Norwegian breed, and 8 groups of 4 Nor-X sheep, a heavy white sheep, bred for meat production, were used. After one week of acclimatisation to the experimental pens, 24 hour video recordings were performed. The distance between all 4 individuals (6 possible pairings) when resting was scored every 15 minutes, during 12 hours. In addition, the distance between the ewes at the feed barrier was scored every second minute for 2 hours after each feeding. The heavy Nor-X ewes kept a significantly larger individual distance to their pen mates during resting ($P > 0.0001$), but not when feeding compared to the lighter Spæl ewes. Spæl ewes however, kept a significantly smaller individual distance during resting than during feeding ($P > 0.001$). This difference was not found in Nor-X ewes. Our results indicate that selection for growth and meat quality might influence spacing behaviour in sheep. The possible effects of carnivore exposure and the role of domestication in modifying spacing behaviour are also discussed.

P75 ABS Founders Award Poster: DEVELOPMENT (Poster Session A: Weds. eve)

AGGRESSIVE COMPETITION BETWEEN TWO-DAY-OLD CRICKETS (*GRYLLUS VELETIS*) AFFECTS DEVELOPMENT

Kevin Judge, Briana Smith, William Cade

University of Lethbridge, Canada; Email:kevin.judge@uleth.ca

Life-history traits under directional selection are predicted to be condition-dependent. In organisms where these traits are fixed at adulthood, the ability to acquire resources as a juvenile is critical for determining individual fitness. We tested whether competition between juveniles affected adult body size and shape in the field cricket, *Gryllus veletis*. We paired two-day-old *G. veletis* (starved since hatching) in an arena with a small piece of food glued to the floor. Two control individuals (with, and without food) were placed in separate arenas. We recorded the competitors for ten minutes and examined the videos to determine who won the food contest. All individuals were weighed before and after the trial, and every two weeks thereafter. Although winners and losers did not differ in their initial body size, we found that losers gained weight more quickly than winners. These results could mean either that: a) losers were initially in better condition and thus less motivated to fight for food, or b) since losers are at a competitive disadvantage they shifted their growth to mature faster and thus mate earlier.

P4 Contributed Poster: APPLIED ANIMAL BEHAVIOR 1 (Poster Session A: Weds. eve)

PREVALENCE OF PICA IN DOMESTIC CATS KEPT IN JAPANESE HOUSEHOLDS.

Yoshie Kakuma, Atsuko Ohnaru, Yoshito Nishino, Nodoka Onodera, Miki Ito

Teikyo University of Science, Japan; Email:kakuma@ntu.ac.jp

Eating, chewing or licking inedible materials such as fabric and plastic is called as pica and this behavior is often reported by owners of domestic cats. Excessive intake of items that are hard to digest may lead the cats into intestinal blockages, which require surgical removal of substances. Although several factors such as early weaning and nutritious deficiency have been suggested as reasons, there are few studies which investigated this behavior. In this study we carried out a questionnaire survey for cat owners to examine the prevalence and possible factors of pica. The incidence rate of pica was 41 % among 130 cats and the materials most consumed were plastic (68%), cardboard (58%), rubber (30%) and wool (26%). The objects most targeted were plastic bags (53%), strings (53%), cords of electric appliances (21%) and clothes (13%). Statistical analyses showed some keeping conditions like indoor-only or multiple cats may relate to higher incidence of pica. A previous study in the UK in 1997 showed wool as the most favored material for pica in cats, whereas our results were different probably because of different housing environment or changes in human lifestyle.

358 Contributed Talk: COMMUNICATION VI (Saturday AM)

FACE SCANNING IN HUMANS, CHIMPANZEES, GORILLAS, AND ORANGUTANS: AN EYE-TRACKING STUDY

Fumihiko Kano, Josep Call, Masaki Tomonaga

Primate Research Institute, Kyoto University, Japan; Email:fkanou@pri.kyoto-u.ac.jp

The pattern of face scanning has been previously examined in the context of facial perception and communication in macaques and humans. We examined the patterns of face scanning in non-human great apes, chimpanzees (n = 6), gorillas (n = 5), and orangutans (n = 10), using a non-invasive infrared eye-tracking system and compared them with those of humans. Human and ape participants viewed still pictures of conspecific and allospecific faces. All species viewed the inner features more intensely than the peripheral features of faces, a pattern not found clearly in previous studies of macaques. They viewed the eyes in particular among those inner features. Apes were not significantly different from each other but differed from humans in their pattern of face scanning. Humans were more likely than apes to fixate the eyes directly (i.e. eyeballs rather than around eyes) and alternate their fixation to right and left eyes. In contrast apes were more likely than humans to shift their fixation from the eyes to other facial features such as the mouth. These results showed both similarities between apes and humans and also revealed ape- and human-specific patterns of face scanning.

P180 Contributed Poster: SEXUAL SELECTION 1 (Poster Session A: Weds. eve)

NATURAL VARIATION OF POST-MATING BEHAVIOR IN AMERICAN AND CARIBBEAN *DROSOPHILA MELANOGASTER*

Joyce Kao, Sergey Nuzhdin

University of Southern California, United States; Email:joycekao@usc.edu

Studying reproduction barriers is a valuable asset to understanding the dynamics of sympatric populations. We are interested in determining whether there exists a geographical pattern of post-mating behavior in *Drosophila melanogaster* females collected from multiple locations along the southeast United States and Caribbean islands. After mating, females exhibit a variety of behavioral changes, but we are most interested in the reduced receptivity to re-mating and increase in egg laying behaviors. We measure the effects of reduced receptivity to re-mating by introducing males to mated females 3 day and 7 days after initial mating and recording when females choose to re-mate. We record the daily rate of egg laying by counting the number of eggs laid by each female each day of the first 10 days of the post-mating assay. Hatchability of the laid eggs will be tracked by recording the number of flies that eclose. In addition to these post-mating phenotypic data, we are also currently

working on whole-genome sequencing via Solexa technology to survey the sequence variation in all known genes involved in post-mating behavior.

P87 Contributed Poster: ECOLOGICAL EFFECTS 1 (Poster Session A: Weds. eve)

INSECTIVOROUS BIRDS ARE TOLERANT TO RISK; RELATIONSHIP BETWEEN RISK SENSITIVITY AND FOOD HABIT

Ai Kawamori, Toshiya Matsushima

Hokkaido University, Japan; Email:kawamori_i@mail.sci.hokudai.ac.jp

Stochastic nature of food inevitably causes risk, which animals generally avoid. It has not been fully understood how food habit evolutionarily / developmentally affects risk sensitivity. In this study, three closely related sympatric avian species of family *Paridae* were compared. Though all of them are reported to be omnivorous, Great tits are more insectivorous than Varied and Marsh tits. Subjects were captured from the wild, and fed with identical mash food for 1 - 17 months. We examined their choices between an un-risky food option (amount = 1, probability = 1) and a risky food option (amount = 3, probability = 1/3); notice that the expected amount was the same. Great tits showed risk prone, whereas Varied tits showed risk averse, and Marsh tits were intermediate between them. We further compared preference to insects (mealworm) vs. seeds (sunflower), and found that the preference was correlated with the risk sensitivity at individual level; the higher the preference to insects, the higher the risk proneness. The present results suggest that the insectivorous birds (G. t.) depend on high-risk food, thus are more tolerant to the risk than the herbivorous species (V. t.).

145 Contributed Talk: SEXUAL SELECTION II (Tuesday PM II)

COGNITIVE ABILITY AND THE EVOLUTION OF MULTIPLE BEHAVIORAL DISPLAY TRAITS

Jason Keagy, Jean-Francois Savard, Gerald Borgia

Michigan State University, United States; Email:keagy@msu.edu

Males of many species have multiple behavioral display traits (BDTs). Females may be able to use these multiple BDTs to evaluate a male's overall cognitive ability, which is likely related to his genetic quality. It is also possible that individual BDTs indicate unique aspects of male quality related to cognitive ability. We tested predictions of these two hypotheses in satin bowerbirds, *Ptilonorhynchus violaceus*, a species with a large number of BDTs involved in mate choice. We used two statistical measures of male overall cognitive ability. Three different aggregate measures of male display quality (produced from four BDTs) were correlated with one measure of overall cognitive ability and with mating success. Multiple BDTs used together, rather than individually, more accurately predicted this measure of overall cognitive ability. In addition, we found some support for the hypothesis that separate BDTs may indicate different aspects of male quality. These results suggest that multiple BDTs may have evolved because of the large variety of information they can convey about male quality.

277 Contributed Talk: MECHANISMS II (Thursday PM III)

NONAPEPTIDE MODULATION OF SONGBIRD FLOCKING AND RESPONSES TO NOVELTY

Aubrey Kelly, Marcy Kingsbury, James Goodson

Indiana University, United States; Email:aubkelly@indiana.edu

Previous comparisons of territorial and gregarious finches suggest the hypothesis that arginine vasotocin (VT) neurons in the medial bed nucleus of the stria terminalis (BSTm) and VT V1a-like receptors in the lateral septum (LS; a major BSTm projection target) promote flocking behavior. Based on much indirect evidence, homologous circuitry is likewise thought to promote affiliation in other tetrapods. Consistent with this hypothesis, we now show that V1a antagonist infusions into the LS and VT antisense infusions into the BSTm reduce gregariousness (preference for a group of 10 versus 2 conspecific males) in male zebra finches (*Taeniopygia guttata*) without decreases in total social contact. Both manipulations strongly increase anxiety-like responses to novelty, suggesting that endogenous VT promotes gregariousness in a manner that is coupled to anxiolysis. These studies

are currently being extended to include female zebra finches, and experiments are being conducted in a territorial finch species to determine whether VT similarly modulates anxiety and inter-specific flocking.

P351 Contributed Poster: MECHANISMS 2 (Poster Session B: Thurs. eve)

REPRODUCTIVE AND PHYSIOLOGICAL COSTS OF REPEATED IMMUNE CHALLENGES IN FEMALE WELLINGTON TREE WETA

Clint Kelly

Iowa State University, United States; Email:cdkelly@iastate.edu

Fitness-related traits, such as immunity and reproduction, are typically condition-dependent and should trade-off with each other because they share a pool of energy and resources. It is assumed that the material required for immune processes and reproduction in insects are contained in the fat body. If mounting an immune response is physiologically costly in terms of consuming limited resources in the fat body and reproduction also relies on these resources, then an immune-challenge should cause a reduction in fat load and an associated decline in reproduction. I assayed the fat content of female Wellington tree weta (*Hemideina crassidens*) after repeated challenges with lipopolysaccharide (LPS) and counted the number, and measured the quality, of oviposited eggs. As predicted, immune-challenged females had significantly smaller fat loads and laid significantly fewer eggs than saline-injected controls. Moreover, the quality of the eggs (i.e. protein content) laid by immune-challenged females was significantly lower than that of controls. My findings support the hypothesis that reproduction and immunity are condition-dependent and trade-off with each other.

78 Contributed Talk: COGNITION AND LEARNING I (Tuesday AM)

THE VISUAL SIDE-BIAS IN PIGEONS (*COLUMBA LIVIA*) : THE INFLUENCE OF AGE AND GENDER.

Debbie Kelly, Christiane Wilzeck

University of Manitoba, Canada; Email:Debbie_Kelly@UManitoba.ca

Humans, pigeons, and chicks have been shown to over-attend to objects on the left side of space. For humans, this is generally tested using cancellation tasks in which participants cross-out visual characters presented on a sheet of paper. In a modified version of this task, birds are tested by selecting grains from the floor of a testing arena. The left-sided bias likely reflects a right hemispheric specialization for spatial attention. However, little is known about the hemispheric distribution of attention across the lifespan. For humans, spatial attention is vulnerable to aging and models predict reduced hemispheric specialization and increased individual variability with age. To test aging effects on spatial attention young, adult and aged pigeons were tested using an adapted cancellation task. Adult pigeons showed a strong leftward bias, preferring to choose grain on the left side of space, confirming former findings. The bias for this age group was stable over a two year period. In contrast, young and aged birds showed a different pattern with more individual variation. These findings show that hemispheric contributions to spatial attention may change across the lifespan.

259 Contributed Talk: SEXUAL SELECTION III (Thursday PM II)

GOOD FATHERS? RELIABLE SIGNALING OF PARENTAL CARE IN THREESPINE STICKLEBACK, *GASTEROSTEUS ACULEATUS*

Natasha Kelly, Susan Foster, Suzanne Alonzo

Yale University, United States; Email:natasha.kelly@yale.edu

Life-history theory suggests that male reproductive investment is subject to trade-offs among multiple components of current reproduction. However, the resources available for allocation among components of reproduction will differ between males as a result of variation in both genetic and phenotypic quality. For species with paternal care, current sexual signaling theory predicts that male investment in mate attraction will be correlated with investment in paternal care (a reliable indicator signal for females) but may not be correlated with male quality. We experimentally manipulating male physical condition in an iteroparous species with

obligate male care (threespine stickleback, *Gasterosteus aculeatus*). Significantly fewer low-condition males built nests or courted females, indicating a possible effect of condition on allocation to current reproduction. Poor-condition males courted more than males in good condition, showing that male advertisement may be an unreliable indicator of male quality. Nest defense behavior was only correlated with courtship for high-condition males, indicating that courtship may be an unreliable signal of investment in paternal care.

P76 Contributed Poster: DEVELOPMENT (Poster Session A: Weds. eve)

TESTOSTERONE AND DEVELOPMENT POST HATCHING IN THE DOMESTIC FOWL (*GALLUS GALLUS*)

John Kent

University College Dublin, Ireland; Email:john.kent@ucd.ie

Testosterones role in development both pre and post hatching is increasingly well studied due in no small part to developments making it easier to measuring same. Here it's changing role over the course of development from the juvenile pro-social phase to the adult phase is examined in domestic fowl. During the pro-social phase, T levels were low and male and female chicks lived in close proximity. As T levels started to rise an increase in inter-individual distance was recorded especially in males. This continued and T levels peaked in males when they formed individual male territories. Then T levels dropped dramatically in this new adult social structure. Later when mating commenced T levels fluctuated in accord with its new modulating role in regulating social behaviour. Increasing T levels played a role in driving behavioural change in the juvenile fowl. During the adult phase T's role is more complex in response to social changes when different behavioural strategies may emerge.

P117 ABS Founders Award Poster: MATING SYSTEMS 1 (Poster Session A: Weds. eve)

FUNCTIONS OF SEXUAL PROMISCUITY IN FEMALE BLUE-FOOTED BOOBIES (*SULA NEBOUXII*)

Lynna Kiere, Hugh Drummond Durey

Universidad Nacional Autónoma de México, Mexico; Email:lynnamiss@gmail.com

In birds, social monogamy is the most common mating system ($\geq 90\%$ of species) but sexual and genetic monogamy are rare due to extra-pair (EP) copulations in both sexes. Though the benefit of promiscuity in males is well explained and generally accepted, the function of this behavior in females remains controversial. Multiple direct and indirect benefits have been proposed to explain the evolution and maintenance of female EP behavior despite their investment in social pair formation and costs of infidelity. In the blue-footed booby, a socially monogamous colonial marine bird, as many as 50% of males and females engage in EP courtship, and many perform EP copulations. In this study, we evaluate the most relevant proposed hypotheses to explain the function (s) of EP behavior in female boobies: acquiring good or compatible genes, evaluating future social mates, facilitating quasi-parasitism, preventing infanticide, and assuring fertilization. We also evaluate the "constrained female" hypothesis by examining how female sexual behavior varies with female and habitat quality, using behavioral observation, morphological measurements, microsatellite paternity analysis, and life history data.

206 Contributed Talk: COMMUNICATION III (Thursday AM)

VOCAL FLEXIBILITY OF ZEBRA FINCHES IN A VARIABLE AMBIENT NOISE ENVIRONMENT

Caitlin Kight, Joshua Rellick, John Swaddle

University of Exeter-Cornwall Campus, United Kingdom; Email:C.R.Kight@exeter.ac.uk

A variety of bird species adjust their vocalizations in response to anthropogenic noise. Recent evidence indicates that these song manipulations are not permanent, but are made "on the fly." Here, we have examined such short-term vocal plasticity in zebra finches, birds that may be preadapted to mitigate the effects of noise disturbance because of their evolutionary experience in habitats that often have loud and variable noise regimes. We presented male zebra finches with 4 different types of ambient noise (biotic and abiotic), each played at 3

different amplitudes. Thus, we investigated not only whether birds altered their songs in response to shifting ambient noise levels, but also whether vocal responses differed depending on the type of noise encountered. Our results are useful in understanding the mechanisms behind the vocal plasticity recorded in an increasing number of species worldwide, and whether such song manipulations could eventually lead to acoustic habitat-driven species divergence. These data are also critical for developing management and conservation strategies in noisy habitats.

P397 ABS Founders Award Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

ALTERNATIVE MATING TACTICS AND MALE ATTRACTIVENESS IN *HYLA VERSICOLOR*

Diana (Son Young) Kim, Gerlinde Hoebel

University of Wisconsin, Milwaukee, United States; Email:sonyoung@uwm.edu

Male gray treefrogs, *Hyla versicolor*, use advertisement calls to attract mates. Some males use an alternative mating tactic known as satellite behavior. Here, the satellite does not call, but positions itself near a caller and attempts to intercept females attracted by him. If the caller is removed, some satellites will call. I investigated what mediates the expression of satellite behavior in *H. versicolor*, by comparing differences in size, body condition, and call traits between callers and satellites. I found that satellites are smaller but do not differ in body condition. When comparing call traits, I found that call duration is similar between satellites and the calling males they are associated with, but callers with a satellite have longer calls than their nearest calling neighbor. Longer calls are preferred in female choice trials, suggesting that satellites associate preferentially with males that are more attractive. Further, the calls of satellites are higher in frequency and their calls are more variable. I discuss whether these differences in frequency and variability affect female choice, and therefore may explain why some males adopt satellite behavior.

P398 Contributed Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

SHOULD HE STAY OR SHOULD HE GO: THE FUNCTION OF MALE ATTENDANCE IN A PARASITIC WASP

Bethia King, Kaylee Kuban

Northern Illinois University, United States; Email:bking@niu.edu

In species without nuptial gifts or parental care, postcopulatory attendance of females by males has generally been interpreted as males guarding against sperm competition. Guarding benefits may be concurrent with attendance. In addition, male behavior during attendance may make the female unreceptive, thus providing guarding in absentia. Male behavior may also facilitate the female's use of sperm and production of offspring. In the parasitic wasp *Urolepis rufipes* (Pteromalidae), postcopulatory attendance involved the male remaining mounted after copulation and resuming courtship. A male's presence on a female did not reduce the probability, or quickness, of another male mounting, and the second male frequently copulated with her before she became unreceptive. She became unreceptive soon after mating ended, but not due to postcopulatory attendance. Postcopulatory attendance did, however, give males some influence on offspring sex ratios. It caused females to subsequently produce more daughters and not more sons. In wasps, only daughters, not sons, are produced sexually and so have fathers. In short, he should stay and should not go, for the sake of daughters.

P102 Contributed Poster: GENETICS AND EVOLUTION 1 (Poster Session A: Weds. eve)

SONG COMPLEXITY INDEPENDENT OF ANONYMOUS AND GENIC MICROSATELLITE DIVERSITY IN A SPARROW POPULATION

James King, Elizabeth MacDougall-Shackleton

University of Western Ontario, Canada; Email:jking88@uwo.ca

Correlations between heterozygosity and fitness are commonly reported, but the true extent of such correlations and the mechanisms which cause them remain controversial. Using a three-year dataset from a wild population of song sparrows *Melospiza melodia*, we investigated the relationship between heterozygosity and song

complexity, an important sexually selected trait in this species. Heterozygosity was determined at 17 anonymous ('genomic') microsatellites as well as at 5 'genic' microsatellites located in the expressed sequence tag (EST) of proteins expressed in the songbird brain. Song and syllable repertoire size were used as measures of song complexity. Song complexity was unrelated to individual genetic diversity at either genomic or genic loci. Additional models allowing for effects of individual loci did not explain significantly more variation in song complexity than the multi-locus heterozygosity model. In this large and outbred population of song sparrows, our findings suggest that individual genetic diversity does not play a major role in individual song complexity.

294 Contributed Talk: APPLIED ANIMAL BEHAVIOR III (Friday AM)

THE IMPORTANCE OF BREEDING DOGS FOR BEHAVIOR RATHER THAN BEAUTY

Tammie King, Linda Marston, Pauleen Bennett

Anthrozoology Research Group, Monash University, Australia; Email:tammie.king@monash.edu

Dogs were originally bred to perform specific utilitarian roles but nowadays the dog's most common role is that of human companion. Research indicates that a dog's behaviour, rather than appearance, is vital to a successful dog/owner relationship. Dogs exhibiting unsuitable behavior can cause stress to owners and are often relinquished to shelters where many are euthanized. Although some specific dog behaviors are learned, there is strong evidence to suggest that genetic factors make a strong contribution to general behavioral predispositions. Hence it is not surprising that the combination of inexperienced and uneducated dog owners with dogs who have been bred because of how they look rather than how they behave, and who, in fact, may reflect decades of selection on the basis of behaviours no longer desired by most dog owners, is frequently disastrous. In this presentation original research which identifies behaviors that people consider important in pet dogs will be discussed. A new way of potentially measuring these behaviors in breeding dogs will then be outlined, along with data demonstrating the test's effectiveness relative to expert and owner ratings.

375 Contributed Talk: SEXUAL SELECTION V (Saturday AM)

SPECIATION BEFORE OUR EYES? USING BEHAVIOUR TO INTERPRET GENE FLOW IN DARWIN'S TREE FINCHES

Sonia Kleindorfer, Jeremy Robertson, Diane Colombelli-Negrel, Jody O'Connor

Flinders University, Australia; Email:sonia.kleindorfer@flinders.edu.au

We have been studying Darwin's tree finches on Floreana Island since 2004; David Lack was the only other person to measure the tree finches on Floreana. In comparison with Lack's data, and comments by Peter Grant, we think that the Large Tree Finch is extinct on Floreana Island. We make the case that our data show a bimodal Medium Tree Finch population in the act of speciating. Evidence for this claim comes from population genetic analysis (two genetic populations), morphology (three clusters), foraging (three clusters), and song (two clusters). We use playback of song to test interspecific response, and find evidence for two species (between Small Tree Finch and the larger two populations). But morphology and foraging data show range expansion across a five year period, and evidence for three species. Our genetic data show little recent hybridisation. Importantly, our song data show a change in slope for trill rate and frequency bandwidth across the three populations/species that could be used as a cue for the recognition of species boundaries.

P430 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

ENRICHED OPEN FIELD FACILITATES EXERCISE & SOCIAL INTERACTION IN GUINEA PIGS, *CAVIA PORCELLUS*

J.S. Brewer, M. Voogd, L. Rosenthal, **G.A. Kleven**

Wright State University, United States; Email:gale.kleven@wright.edu

The IAF hairless strain of guinea pig, *Cavia porcellus*, is the result of a spontaneous mutation in the Hartley strain. Although, the IAF guinea pigs have been used in research for over 30 years, very little information is available about the behavior of the IAF strain. In order to bridge this gap, behavior of IAF hairless and Hartley

guinea pigs was observed in both home cage and open field enriched environments. Hartley and IAF strains were housed separately in groups of 2-3 for the home cage observation. However, guinea pigs were grouped as a herd of 10 in the open field arena. Both the open field and home cage behaviors were recorded for 1 hour each in 1080p and scored using JWatcher video software. Salivary cortisol, as a measure of stress level, was collected both prior to and immediately after behavioral observations. Analyses revealed higher levels of social interaction and physical activity in the open field environment, suggesting the open field may be providing increased opportunities for exercise and over-all enrichment.

359 Contributed Talk: COMMUNICATION VI (Saturday AM)

DIFFERENTIATION WITHIN A POSSIBLE CRYPTIC SPECIES, THE CANYON TREEFROG, *HYLA ARENICOLOR*

Katy Klymus, Sarah Humfeld, Vince Marshall, David Cannatella, Carl Gerhardt

University of Missouri, United States; Email:kektgb@mail.missouri.edu

Cryptic species, morphologically indistinguishable taxa, are often identified through behavioral and molecular traits. We tested the hypothesis that the canyon treefrog may comprise a cryptic species complex, as previous work found three highly divergent, mitochondrial clades within the US. Expecting to see differences in male advertisement calls among populations, we compared call traits from populations throughout the US and Mexico. We also re-assessed phylogenetic relationships using mitochondrial and nuclear sequences. Our acoustic analyses found no biologically significant variation in advertisement calls among the three US clades, whereas Mexican populations show large differences. Playback experiments show that females from the US populations discriminate against calls of the Mexican populations, but they do not discriminate against calls of other US populations. Our genetic data help explain these behavioral results. Incongruence between the two molecular data sets indicates mitochondrial introgression with the sister species group *H. eximia/wrightorum*, suggesting that, within the US, populations are not as genetically divergent as previously thought.

248 Contributed Talk: COGNITION AND LEARNING V (Thursday PM II)

TO PERCH TOGETHER IS NOT SUFFICIENT INFORMATION FOR FEMALE ZEBRA FINCHES TO COPY MATE CHOICE

Nina Kniel, Jennifer Schmitz, Klaudia Witte

University of Siegen, Germany; Email:kniel@biologie.uni-siegen.de

Mate-choice copying occurs when an individual observes a sexual interaction between two heterosexual conspecifics and chooses the individual as a mate as the observed individual did before. It is still unknown what information influences the decision of an individual to copy the mate choice of others. We tested female zebra finches (*Taeniopygia guttata castanotis*) in a standard mate-choice copying experiment with wild-type males and males artificially adorned with a red feather. After a first preference test females could observe a single wild-type male and a pair of a wild-type female with her adorned mate. Half the pairs were separated by a clear glass screen, half by an opaque screen. Afterwards females could choose between new males of both types. In experiments with a clear glass screen, females showed typical mate-choice copying behaviour after observing the pair and preferred the adorned male type. In experiments with on opaque screen, females did not show the typical change in mate choice behaviour. We conclude that a certain amount of interaction, rather than proximity alone, is necessary for females to gain sufficient information to copy the mate choice of others.

P132 Contributed Poster: MECHANISMS 1 (Poster Session A: Weds. eve)

DISTRIBUTION OF GLUTAMIC ACID DECARBOXYLASE (GAD) IMMUNOREACTIVITY IN OVAL SQUID

Shiori Kobayashi, Chitoshi Takayama, Yuzuru Ikeda

University of the Ryukyus, Japan; Email:pop-american@piano.ocn.ne.jp

The modern cephalopod mollusks are the most behaviorally advanced invertebrate as they possess elaborate sense organs (camera-eye) and a well-developed, large brain (central nervous system, CNS). We identified for the first time neurotransmitters and neuromodulators of the CNS of oval squid (*Sepioteuthis lessoniana*) that were reared from hatching to subadult stage. For this observation, we applied an antibody raised against mammalian glutamic acid decarboxylase (GAD). GAD-immunoreactive cell bodies were detected in the cell layer of the following brain regions of subadult squid: the inferior frontal lobe, the post-frontal lobe, the precommissural lobe and the subvertical lobe. On the contrary, immunoreactive cell bodies were detected only from the inferior frontal lobe in hatchlings. Although GAD-immunoreactive fibers were detected in the neuropile layer of all lobes of the CNS for both hatchlings and subadult, relative abundance of GAD-immunoreactive fibers were subdivided within lobes. The GAD-immunoreactive fibers were more abundant in the vertical lobe of hatchlings, but being more less in the vertical lobe of subadult. These results were discussed in relation to diff

P143 ABS Founders Award Poster: PARENTAL CARE I (Poster Session A: Weds. eve)

THE EFFECT OF MERCURY ON PARENTAL CARE IN CAPTIVE ZEBRA FINCHES

Megan Kobiela, Gregory Tito, Claire Ramos, Daniel Cristol, John Swaddle

College of William and Mary, United States; Email:mekobiela@email.wm.edu

Parental care is essential to birds with altricial young, but few studies have examined how parental behavior may be affected by toxic environmental contaminants. Methylmercury (MeHg) is a known neurotoxin that persists in the environment and has long been associated with reproductive failure in many taxa. It was only recently discovered that terrestrial songbirds can accumulate relatively high levels of MeHg, and our study is one of the first long-term captive dosing experiments investigating the consequences to songbirds of sublethal MeHg exposure. Adult zebra finch pairs fed a diet containing 1.0ppm MeHg or no MeHg were video recorded when their nestlings were 9 days old. These videos were analyzed for parental care behaviors, including amount of time spent eating, delivering food to the nest, and brooding nestlings. Preliminary results indicate that MeHg-dosed pairs increased their brooding time, which is consistent with a general increase in lethargy when exposed to MeHg.

P46 Contributed Poster: COMMUNICATION I (Poster Session A: Weds. eve)

WITHIN AND BETWEEN MALE VARIATION IN THE MECHANICAL SOUNDS OF THE GREATER SAGE-GROUSE

Rebecca Koch, Alan Krakauer, Gail Patricelli

United States; Email:rebeccabethkoch@gmail.com

Communication in some bird species relies not only on vocally-produced calls, but also on mechanical sounds generated elsewhere on the body. While many mechanical sounds are used in a courtship context, inter-individual variation in these sounds has rarely been explored. We investigated an example of this phenomenon in the "swish" sounds of the male greater sage-grouse (*Centrocercus urophasianus*), a lekking species with elaborate male displays. The swishes are frequency-modulated mechanical sounds preceding the better-studied vocal components. We used two years of vocal and behavioral data to determine relationship between the time and frequency characteristics of the swishes and male mating success; neither univariate nor multi-variate analyses revealed any correlation between the variation and the swish and our measure of male fitness. We therefore found no evidence that the swish functions as a signal of male quality or attractiveness to females, so we discuss other possible functions of this sound. Studies such as ours will help to broaden our understanding of the evolution of sound production in this and other taxa.

284 Contributed Talk: PARENTAL CARE II (Thursday PM III)

PARENT-OFFSPRING COADAPTATION

Mathias Koelliker

University of Basel, Switzerland; Email:mathias.koelliker@unibas.ch

Parent-offspring coadaptation describes the process and outcome of reciprocal adaptation of offspring to parents, and of parents to offspring, from an evolutionary genetic perspective. Once parental care evolved, a significant component of the environment in which offspring develop is provided by parents. Viewing parental care as a heritable and evolving component of the family environment affecting offspring development and behaviour is more than as yet another way of defining parental care. It allows us to ask questions about phenotypic expression, inter-individual variation and genetic bases of parent-offspring interaction. And it reveals that the traits expressed in families can have a socially complex genetic basis. In this talk, I will discuss why and how the explicit consideration of the socially complex genetic architecture of parent-offspring interaction matters for the evolution of family interactions. I will present models of parent-offspring coadaptation and the growing experimental evidence supporting predictions of these models. Finally, I will make a brief excursion on how I see the relationship between parent-offspring coadaptation and conflict resolution.

P325 Contributed Poster: GENETICS AND EVOLUTION 2 (Poster Session B: Thurs. eve)

DIFFERENCES IN SURVIVAL FOUND IN T-HAPLOTYPE CARRIERS CORRELATE WITH DIFFERENT ANIMAL PERSONALITY

Barbara Koenig, Yannick Auclair, Anna Lindholm

University of Zurich, Switzerland; Email: barbara.koenig@ieu.uzh.ch

Female house mice carrying the t-haplotype, a selfish genetic element known to exert reproductive costs to its bearers, have recently been shown to have a survival advantage in a wild population. According to life history theory, consistent behavioural differences, also called animal personality, can be expected whenever individuals differ in expected future fitness. Thus, theory predicts that the longer living t-haplotype females should express "reactive" personality traits and be more shy, less active and less explorative compared to wildtype females. Reactive individuals are known to form routines slower and have been shown to need less energy due to a lower basal metabolic rate than proactive individuals. As males do not differ in survival, no similar pattern of behavioral tendencies is expected. To test these predictions, we performed behavioural tests in our laboratory to assess classical personality traits as explorative behaviour, basic activity and boldness. In addition, for a sub-sample of these mice food consumption was monitored and used as a proxy of energy intake.

105 Contributed Talk: SOCIAL BEHAVIOR I (Tuesday AM)

SOCIAL NICHEs AND SEX ASSORTMENT: UNCOVERING THE DEVELOPMENTAL ECOLOGY OF BROWN-HEADED COWBIRDS

Gregory Kohn

Indiana University, United States; Email: gmkohn@umail.iu.edu

Individual variation in interaction patterns creates different social niches. These social niches afford differential exposure to social information that individuals utilize to develop species-typical behavior. Brown-headed cowbirds (*Molothrus ater*) depend on social interaction to develop competent reproductive behavior. We used a fission-fusion paradigm to perturb two different flocks, in order to investigate age-sex differences in the stability of an individual's social niche. Two flocks, one adult (N = 38) and one juvenile (N = 24), were split then recombined while recording the frequency of individual approaches. We quantified an individual's social niche by looking at the consistency in individual gregariousness and attractiveness between perturbations. Females maintained equivalent levels of gregariousness and attractiveness across perturbations. Juvenile females maintained higher levels of sex assortment than adults. The consistency of female niche construction may be explained by females' reliance on interaction with other females to assess males. Early sex assortment may also foster the development of social preferences by biasing exposure to certain individuals.

351 Contributed Talk: COGNITION AND LEARNING VII (Saturday AM)

SOCIAL ENVIRONMENT IMPACTS PERFORMANCE IN A COGNITIVE TASK IN NATURAL VARIANTS OF THE FORAGING GENE

Nancy Kohn, Christopher Reaume, James Burns, Marla Sokolowski, Frederic Mery
CNRS, France; Email:kohn2000@hotmail.com

How social environment affects behavior has recently received increased attention. In *Drosophila*, natural genetic variation in the *foraging* gene, which encodes for a cGMP-dependent protein kinase (PKG), affects the foraging activity of larval and adult flies. Sitters tend to be more sedentary and aggregate within food patches whereas rovers have greater movement within and between patches of food. Additionally, rovers and sitters vary in their performance on a number of cognitive tasks. We hypothesized that these variants would also differ, in a classical olfactory conditioning test, depending on whether they were in groups or alone. Individual performance was affected by PKG activity. In sitters, but not in rovers, the acquisition of information was facilitated by the social interaction (being in a group). In rovers, but not in sitters, the type of social interaction (with other rovers or with other sitters) affected learning and memory. Also, naive individual rovers tended to follow groups of conditioned sitters but not groups of conditioned rovers. Our results suggest that for mediates some social aspects involved in learning and memory in *Drosophila melanogaster*.

P377 Contributed Poster: PREDATION AND FORAGING 2 (Poster Session B: Thurs. eve)

DO FEMALE JAPANESE WATER SNAKES FORAGE FOR TOADS TO PROTECT THEIR OFFSPRING WITH TOXINS?

Yosuke Kojima, Akira Mori

Kyoto University, Japan; Email:y_cojima@ethol.zool.kyoto-u.ac.jp

In species that depend on dietary source for defensive chemicals, the necessity for defensive chemicals would influence their foraging behavior and ecology. The Japanese Water Snake, *Rhabdophis tigrinus*, sequesters toxins from toads, and use them to deter predators. The toxins are solely derived from toads among various preys. In addition, females provide their offspring with toxins while they are gravid. Therefore, females are expected to require additional toxins to produce chemically defended offspring. We radio-tracked 11 females and 13 males to clarify their habitat use pattern and explore its possible sexual differences. Because toads generally occur in the forest, we predicted that females use forest more frequently than males reflecting biased foraging for toads. The grassland was preferentially used throughout active seasons in both sexes. Especially in the spring, males predominantly used grassland (grassland, 82%; forest, 6%). On the other hand, females used forest more frequently than males in the spring of their gravid season (grassland, 56%; forest, 36%). This result supported our hypothesis that females forage for toads to protect their offspring with toxins.

42 Symposium: SOCIAL COMPLEXITY (Wednesday)

THE UPHILL STRUGGLE TO UNDERSTAND SOCIAL BEHAVIOR - STRUCTURE AND FUNCTIONING IN AVIAN SOCIETIES

Jan Komdeur, Hannah Dugdale, Terry Burke, David Richardson

University of Groningen, Netherlands; Email:j.komdeur@rug.nl

Social behavior receives broad interest as most animals live in social environments, their lives affected by others. Given the complexities of social evolution we have limited understanding of the environmental and social factors that determine individual fitness in wild populations. However, recent advances in molecular and statistical techniques have contributed to what we know about social behavior. I focus on how social interactions and frequency-dependence of cooperative behaviors influence the expression of individuals' parenting and helping behaviour, and the consequences this for their lifetime fitness. I explore the heritability of these behaviors and how the (social) environment influences this. The Seychelles warbler provides a system in which comprehensive long-term data on the constitution of breeding groups (dominants, co-breeders, (non-) helpers), relatedness between individuals and accurate measures of lifetime reproductive success have been collected across environments. This enables elucidating factors driving the evolutionary dynamics of social systems and to gain insight into selection on individual behaviour to allow adaptation to changing (social) environments.

132 Contributed Talk: APPLIED ANIMAL BEHAVIOR I (Tuesday PM II)

SPECIES DIFFERENCES IN THE PREY RECOGNITION ALGORITHM USED BY PRAYING MANTISES (INSECTA: MANTODEA)

Justin Komito, Salina Dominguez, Robert Theis, Jessica Dominguez, Frederick Prete

Northeastern Illinois University, United States; Email: jlokom@yahoo.com

Praying mantises are a diverse group of opportunistic predators that capture prey ranging from small arthropods to same-sized conspecifics and small vertebrates. The variety of retinal images created by such diverse prey suggests mantises do not identify prey by a matching-to-template strategy. They identify an object as prey if it falls within a well-defined perceptual envelope. If threshold levels of key stimulus parameters are met, and motivational state is appropriate, the mantis will strike. Behavioral and psychophysical studies in our lab have produced a body of data indicating that the "schema" used to define prey is based on ten stimulus parameters: (1) overall size; (2) leading edge length; (3) contrast to the background; (4) location in the visual field; (5) speed; (6) direction; (7) geometry; (8) retinal distance traversed; and, (9,10) the degree to which sub-threshold elements are summed over space and time. Although this algorithm is similar across species, there are key differences which seem to be unrelated to mantis morphology or ecology. Rather, they appear to be related to species differences in compound eye structure and visual system organization.

P168 Contributed Poster: RECOGNITION (Poster Session A: Weds. eve)

CROSS-MODAL INDIVIDUAL RECOGNITION IN LARGE-BILLED CROWS

Noriko Kondo, Ei-Ichi Izawa, Sigeru Watanabe

Japan; Email: nrk.kondo@gmail.com

Social animals are required to recognize individuals to form social relationships with other individuals. Audiovisual cross-modal individual recognition has been recently reported in mammals but not in birds. Here we show the evidence of audiovisual cross-modal individual recognition in large-billed crows (*Corvus macrorhynchos*), using an expectancy violation procedure. This procedure uses the natural behaviour of animals, that is, subjects respond strongly to given stimuli when their expectancy is violated. If crows recognize individuals audiovisual cross-modally and expect voice of specific individuals based on the visual presentation of the individuals, the subjects were predicted to respond strongly when the vocal playback and the preceding visual presentation were incongruent in terms of individual identity than were congruent. As was predicted, we found that crows showed the longer pecking behaviour with shorter latency in incongruent condition but not in congruent one. Such differential response was found only for the stimuli of group members but not of group non-members, suggesting the first evidence of audiovisual cross-modal individual recognition in birds.

233 Contributed Talk: COGNITION AND LEARNING IV (Thursday PM I)

PAW PREFERENCE IS NOT AFFECTED BY POSTURAL DEMAND IN A NON-PRIMATE MAMMAL, THE DOMESTIC CAT

Wiebke Konerding, Hans-Jürgen Hedrich, Eva Bleich, Elke Zimmermann

University of Veterinary Medicine Hannover, Germany; Email: wiebke.konerding@tiho-hannover.de

It is known that manual preferences are not unique to humans, but are common to a variety of vertebrate species. Still, they scarcely reach the strong human population bias, leading to the hypothesis that only high demanding tasks cause strong laterality. We performed two food-grasping tasks to explore whether postural demand affects paw preference in the domestic cat, *Felis silvestris catus*. The cat is a good model for paw preference, due to its frequent paw usage in hunting. Subjects extracted food from a plastic box attached at different heights, leading to stable or unstable body posture. Cats exhibited paw preferences at an individual, but not at a population level. Postural demand was linked to task difficulty: the unstable posture was significantly more difficult. However, differences in postural demand/ difficulty did not lead to differences in direction or strength of paw preference. Findings are not in line with major models for the evolution of primate handedness, but coincide with those of

basal primates, supporting the notion that with the development of high specialization for locomotion, strong individual laterality evolved to a more flexible hand preference.

P293 Contributed Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

HUMAN-DIRECTED GAZING IN JAPANESE AKITA INU

Akitsugu Konno, Toshikazu Hasegawa

University of Tokyo, Japan; Email:konno@darwin.c.u-tokyo.ac.jp

Japanese Akita Inu is one of the most primitive-type dog breeds native to Japan. This breed has a very ancestral origin and relatively short history of artificial selection, which provides us valuable information to understand the evolutionary process of canine behavior. In the present study, we performed two experiments for examining the gazing/looking behavior at the humans in Japanese Akita Inu. In experiment 1, dogs were confronted with a human experimenter looking straight in the subject's eyes for a minute. In experiment 2, we applied an 'unsolvable' task similar to that used by the previous studies (Miklosi et al. 2003; Marshall-Pescini et al. 2009). Compared to other dogs such as Labrador retriever, Japanese Akita Inu tended to exhibit shorter gazing time at the experimenter and higher frequency of gaze-aversive responses. They also spent shorter time looking back at the experimenter when engaging in the unsolvable task. These results suggest that human-directed gazing responses in a communicative situation are different between primitive-type dog and other breeds, and influence of genetic closeness to wolves on canine behavior will be discussed.

P352 Contributed Poster: MECHANISMS 2 (Poster Session B: Thurs. eve)

FEATHER TESTOSTERONE AND CORTISOL PREDICT SURVIVAL IN WILD HOUSE SPARROWS

Lee Koren, Shinichi Nakagawa, Terry Burke, Kiran Soma, Katherine Wynne-Edwards, Eli Geffen

University of Calgary, Canada; Email:lzkoren@ucalgary.ca

Potential mechanistic mediators of Darwinian fitness such as stress or sex hormones are the focus of many studies. The relationship between fitness and stress hormone concentrations has been widely assumed, although empirical evidence is scarce. Using a reliable and sensitive quantitation technique (LC-MS/MS), we measured testosterone, cortisol and corticosterone in the feathers from house sparrows (*Passer domesticus*) in a wild population, which is under a systematic long-term study. Feathers gradually accumulate hormones during their growth and provide a novel way to non-invasively measure hormone concentrations integrated over time. We found that feather testosterone and cortisol levels were significantly higher in birds that died over the winter than in birds that survived. Importantly, we discovered significant quantities of cortisol in the plasma and feathers of a bird species for the first time, although corticosterone is generally considered the dominant avian glucocorticoid. Contrary to a wide-held belief, cortisol does not seem to be a redundant glucocorticoid, but is probably an important early indicator of health issues that predicts survival of individuals in the wild.

P326 ABS Founders Award Poster: GENETICS AND EVOLUTION 2 (Poster Session B: Thurs. eve)

PARASITES AND PATHOGENS AS PLAYERS IN THE EVOLUTION OF ANIMAL PERSONALITY TRAITS

Raine Kortet, Ann Hedrick, Anssi Vainikka

University of Eastern Finland, Finland; Email:raine.kortet@uef.fi

Animal personalities (consistent, individually characteristic expression of behavioral traits) and their evolutionary importance are currently a topic of extreme interest. One important question which remains unanswered is why animal personalities are found in the wild. We suggest that parasites and pathogens may provide an ultimate explanation for the evolution and diversification of animal personalities. This proposition is based on the negative frequency-dependent selection generated by parasites and pathogens - that are ubiquitous. By supplying genetic variation in host immune function, parasites affect the optimal behavior of individuals. This occurs if personality traits are dependent on individuals' immunological capacity. In this scenario,

individuals that are inherently resistant or able to improve parasite resistance through high food intake rate behave more boldly than less resistant individuals. The stronger is the risk of parasitism, the more strictly individuals are predicted to follow their optimal behavioral trajectories. Therefore, animal personalities should be most easily detected in highly parasitized populations.

P233 Contributed Poster: APPLIED ANIMAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

CANIS FAMILIARIS BEHAVIORAL CONFORMATION IN HOBBY HERDING

Karen Kostan

Missouri Southern State University, United States; Email: kmkostan@gmail.com

In order to address livestock management challenges, herders developed a variety of dog breeds suited to specific herding demands. Modern American herding breed dogs are more likely act as family pets than as working livestock herders. However, when these pet dogs do participate in hobby herding, I predicted that they would differ in their means of managing the stock in a way that reflects the working traits of their ancestors. The behavior of 45 hobby herding dogs was recorded while they worked sheep, with a focus on locomotion, undesirable behaviors, and spacing issues. Analyses of these data suggest that there are differences in the behavior of border collies and upright herding breeds that follow patterns based on ancestral herding demands. Strong-eyed breeds worked further off the sheep and were more likely to circle sheep than upright herding breed dogs, who were more likely to split the stock. German shepherd dogs were significantly more likely to grab sheep than other herding breeds. Studies on canine behavioral conformation can elucidate behavioral differences maintained through breeding lines and can lead to more suitable choices of companion dogs.

P431 ABS Founders Award Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

INFLUENCE OF SOCIAL ENCOUNTERS IN CAPTIVITY ON NEW INTERACTIONS BETWEEN MICROTUS PENNSYLVANICUS

Amaranta Kozuch, Elsbeth McPhee

University of Wisconsin, Oshkosh, United States; Email: kozuca93@uwosh.edu

Individuals brought into captivity for a brief time destined for reintroduction may be housed individually. Understanding how solitary housing affects an individual's interaction with new conspecifics is critical for successful reintroduction. Meadow voles are an excellent model species because they are characterized as independent and territorial, yet during the winter familiar individuals may group together. I am testing the null hypothesis that there is no difference in response to social interaction between socially experienced and socially inexperienced individuals. Thirty-four voles were equally assigned to one of two lines, social or solitary. Within the social line, voles have been periodically housed with other individuals. Solitary individuals did not have the opportunity to socialize with others. Both lines were housed for 8 months before being tested for their response to a social interaction with a same-sex stimulus that has also been periodically housed with others. This testing design assesses social interaction by examining two variables: individual to first approach the other and encounter type, either positive or negative.

P432 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

LATERAL BIAS IN AGGRESSIVE BEHAVIOR AMONG MALE SAGE-GROUSE?

Alan Krakauer, Melissa Blundell, Tawny Scanlan, Emily McCloskey, Jennifer Yu, Gail Patricelli

University of California, Davis, United States; Email: ahkrakauer@ucdavis.edu

There is mounting evidence that animals react differently to stimuli on the left or right side of their bodies, either due to differential capabilities of the sensory organs themselves or because of brain lateralization. Little is known about the prevalence or importance of these differences in the wild. We studied the relationship between relative orientation and aggressive behavior in lekking sage-grouse (*Centrocercus urophasianus*). Agonistic interactions among males take the form of side-to-side posturing that may escalate to combat. We asked whether there is a side-bias to males interactions, and whether males interacting in certain orientations were more likely to escalate

to fighting. Using a data set of ~ 400 interactions and ~ 25 males, we found no significant bias in orientation initiating or ending the interaction, nor when males fought. Future analyses will focus on individual differences in orientation in relation to mating success and measures of social and environmental responsiveness. Lateral biases in sensory processing or cognition may account for some of the unexplained variation in how animals respond to stimuli, although they may be unimportant some cases.

P372 Contributed Poster: PREDATION AND FORAGING 2 (Poster Session B: Thurs. eve)

BEHAVIORAL SYNDROME IN ANTI-PREDATOR RESPONSES OF A BEETLE

Tatjana Krama, Indrikis Krams, Santa Znotina

University of Daugavpils, Latvia; Email:tatjana.krama@biology.lv

When predators attack, mealworm beetles *Tenebrio molitor* usually feign death by entering a state known as tonic immobility. In a series of experiments we placed adult beetles in Eppendorf test tubes. Tonic immobility was evoked by flipping the tube. We repeatedly observed time to reach immobility and the duration of immobility. The tube containing a beetle was connected to microrespirometer that was combined with an infrared optical-actographic system. After being shaken most of the immobile beetles reduced the CO₂ release. Time until immobility was found to be repeatable between the trials, and the duration of immobility was also highly repeatable. Negative relationship between response latency to mechanical stimulus and duration of time spent motionless revealed a behavioral syndrome in the anti-predator behavior of mealworm beetles.

335 Contributed Talk: DEVELOPMENT II (Friday PM I)

EFFECTS OF STRESS AT DIFFERENT DEVELOPMENTAL TIME PERIODS ON LEARNING IN ZEBRA FINCHES

Buddhamas Kriengwatana, Sean Aitken, Beatriz Diez Mendieta, Scott MacDougall-Shackleton

University of Western Ontario, Canada; Email:bkrieng@uwo.ca

Stress experienced early in life is known to have permanent effects on song learning and song-related brain areas, but the effects of stress on song development in the juvenile period are equivocal. Additionally, whether stress affects global cognitive functioning (i.e. non-song learning) also remains unclear. Our study investigated the effects of nutritional stress during different developmental periods on song learning compared to non-song learning. We compared learning abilities of adult zebra finches (*Taeniopygia guttata*) that were either food restricted as nestlings (6-35 days post-hatch) or as juveniles (36-65 days post-hatch) to controls (fed *ad libitum*). We quantified song learning ability with adult song complexity and imitation accuracy measures. Using a set shifting task, we measured behavioural flexibility as an index of non-song learning ability. To behave flexibly, birds must suppress previously correct responses while simultaneously attending to cues that were previously irrelevant. Results will show whether stress is a mechanism for functional correlations between independent traits that were both developing when stress was experienced.

P23 Contributed Poster: COGNITION AND LEARNING 1 (Poster Session A: Weds. eve)

CONCURRENT SPATIAL RELATIONS CHALLENGE CAPUCHIN MONKEYS *CEBUS APELLA* USING HAND TOOLS

Lucy la Cour, Dorothy Fragaszy

United States; Email:lucy.lacour@gmail.com

Using a hand tool involves producing particular spatial relations between a held object and another object or surface. In an effort to develop a comparative theory of tool use with relevance for all species, we draw upon Gibsonian perception-action theory to model relational spatial reasoning. One prediction of this model is that managing spatial relations simultaneously rather than sequentially is more difficult. We presented 8 captive capuchin monkeys with stick objects to insert into matching grooves in a flat tray. A straight stick presented one relation; a T shape presented two relations, and the two parts of the T were presented joined (concurrent placement) or separated (sequential placement). We coded several behavioral variables per attempt to insert the

stick and the outcome of each trial for a subset of three subjects. These subjects displayed significantly more attempts with the two concurrent relations (T stick) than with a single relation (straight stick) or two sequential relations (two straight sticks). This facet of the capuchins' behavior constrains the kinds of tool use they are likely to master and provides insight into tool use evolution across species.

P294 Contributed Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

THE SCREAM OF THE WEEPING LIZARD: INVESTIGATING ITS FUNCTION

Antonietta Labra, Misque Hoare, Andrea Zapata, Javiera Constanzo

University of Oslo; Universidad de Chile, Norway; Email: a.lillo@bio.uio.no

Reports of vocalizations in non-gekkonid lizard families have been increasing, but mainly nothing is known about their functions. Because most of the vocalizations are emitted when lizards are at risk of predation, the potential functions of vocalizations are predator deterrents and/or alarm calls to conspecifics. We tested both hypotheses in the "weeping lizard", *Liolaemus chiliensis*, the only species of a genus with more than 220 species, which vocalizes. Lizards confronted by models of their two main predators (a raptor and a snake) did not scream, although a high frequency of these (88%) was obtained when animals were taken by the researcher. Thus, vocalizations may function as a last-chance predator deterrent. We also demonstrate that lizards reacted to the vocalizations of conspecifics. Thus, lizards may use the scream to assess predation risks, possibly functioning as a warning call. Finally, lizards responded to the vocalization with immobility, regardless if these were presented or not together with visual cues (e.g., presence of predators), thus the weeping lizard relies mainly on acoustic information to assess predation risk. Funds: Fondecyt 1090251.

386 Contributed Talk: SOCIAL BEHAVIOR VII (Saturday AM)

BURROW SHARING IN TUCO-TUCOS: NEW OPPORTUNITIES FOR UNDERSTANDING SOCIALITY

Eileen Lacey, Pablo Cuello, Julie Woodruff, Mauro Tammo, John Wiczorek

University of California, Berkeley, United States; Email: ealacey@berkeley.edu

Independently evolved examples of group living provide valuable opportunities to test hypotheses regarding the adaptive bases for social behavior. Although rodents in the genus *Ctenomys* are geographically widespread and often locally abundant, quantitative evidence of group living in these animals has - until now - been limited to a single species, the colonial tuco-tuco (*C. sociabilis*). Here, we demonstrate that the highland tuco-tuco (*C. opimus*) is also social. Our field studies indicate that multiple adult *C. opimus* share the same burrow system and nest site. Unlike *C. sociabilis*, however, group mates display only partial spatial overlap with one another and groups are not characterized by discrete spatial boundaries. Based on these data, the social structure of *C. opimus* appears to be intermediate between that of *C. sociabilis* and strictly solitary species of tuco-tucos. Phylogenetic analyses suggest that *C. sociabilis* and *C. opimus* represent evolutionarily independent examples of group living, making them ideal for comparative studies of the proximate and ultimate bases for differences in social behavior.

P181 Contributed Poster: SEXUAL SELECTION 1 (Poster Session A: Weds. eve)

ALTERED FEMALE MATE CHOICE: LOSS OF REPRODUCTIVE ISOLATION IN A THREESPINE STICKLEBACK SPECIES PAIR

Alycia Lackey, Janette Boughman

Michigan State University, United States; Email: reyno340@msu.edu

Mate choice behavior can be critical for maintaining distinct species. In species with female mate choice, female conspecific mate preferences restrict hybridization between species. Female conspecific mate preference requires three things: (1) females must discriminate between con- and heterospecific mates, (2) females must prefer conspecific mates, and (3) males must have distinct, species-specific traits. In limnetic-benthic stickleback species pairs, female conspecific mate preference greatly minimizes hybridization. However, sticklebacks in Enos Lake, British Columbia began hybridizing at high rates following a drastic environmental change in the last

30 years. We tested for the loss of female conspecific mate preference in Enos sticklebacks compared to historical measures and measures from a currently reproductively isolated species pair. We found that Enos females either had no mate preference or had preferences that could promote hybridization. Further, Enos males have lost distinct, species-specific color and shape, which hinders female discrimination. Our results highlight the contribution of behavior in the breakdown of reproductive isolation between species.

55 Symposium: GEOGRAPHIC VARIATION (Thursday)

SEXUAL ISOLATION VIA SEXUAL SELECTION DURING ECOLOGICAL SPECIATION

Brian Langerhans, Amber Makowicz

North Carolina State University, United States; Email: langerhans@ncsu.edu

During speciation in animals, populations often become reproductively isolated due to variation in behaviors associated with the acquisition of mates. Recent work suggests that divergent natural selection often underlies the evolution of reproductive isolation--"ecological speciation"--and that one of the fastest routes to speciation is the case of assortative mating based on a phenotype experiencing divergent selection. This scenario, however, can occur via multiple mechanisms: 1) within-population sexual selection, where mating preferences diverge among ecologically divergent populations, or 2) between-population mate choice, where the "marker" trait is only involved in between-population mating decisions (i.e., in a "species recognition" manner). Here, we examined which mechanism might underlie ongoing ecological speciation in a post-Pleistocene radiation of Bahamas mosquitofish (*Gambusia hubbsi*). We found that this pattern is largely caused by within-population sexual selection for subtle variation in body shape. Male body shape and female mating preferences for body shape have coevolved across divergent predatory environments, driving the process of speciation.

P433 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

DOES PEER PRESSURE MATTER? SOCIAL ENVIRONMENT INFLUENCES ON BEHAVIORAL STRATEGY USE IN STICKLEBACKS

Kate Laskowski, Alison Bell

University of Illinois, United States; Email:klaskow3@life.illinois.edu

Recent theoretical work suggests that repeated social interactions can promote behavioral consistency through positive feedback, and can maintain differences among individuals if different strategies gain equal benefits. Here, we tested how individual threespine sticklebacks responded to a changing food resource within a group setting. We found that some individuals consistently exploited a new food source ("responsive strategy") while others did not ("non-responsive strategy"). Interestingly, individual behavioral consistency increased with time spent in the same social group, suggesting positive feedback. We then compared behavioral consistency within and across social groups under two different feeding regimes. When the benefits to responding did not depend on the behavior of others, we found that individuals maintained the same strategy when they were placed in a new social group. However, when the benefits of responding depended on the behavior of others, individuals did not behave consistently when they were placed in a new social group. These results suggest that the social environment affects behavioral consistency sometimes, but not always.

180 Contributed Talk: APPLIED ANIMAL BEHAVIOR II (Wednesday AM)

ENVIRONMENTAL ENRICHMENT MODULATES EFFECTS OF UNPREDICTABLE REPEATED NEGATIVE STIMULATIONS IN BIRDS

Agathe Laurence, Cécilia Houdelier, Christophe Petton, Ludovic Calandreau, Cécile Arnould, Angélique Favreau-Peigné, Alain Boissy, Christine Leterrier, Marie-Annick Richard-Yris, Sophie Lumineau

University of Rennes 1, France; Email:agathe.laurence@univ-rennes1.fr

We investigated interactions between environmental enrichment and repeated negative stimulations during the ontogeny of Japanese quail. Half of the treated individuals and half of the control animals were housed in enriched cages (set E), whereas the other halves were housed in traditional cages (set NE). Treated individuals

were submitted to repeated negative stimulations for two weeks. All subjects were observed during the stimulation procedure, and were then presented emotional reactivity tests. During the stimulation procedure, treated quails preened less frequently than control quails, independently of cage type and E treated quails keep more distance with the human experimenter. The procedure affected the emotional reactivity of the quail in relation to cage type: E treated quails were less reactive than were NE treated quails. We evidenced an interaction between the two tested factors: negative stimulations inhibited dust bathing in NE quails whereas they enhanced it in E quails. Thus, environmental enrichment had a positive effect on emotional reactivity when quails were exposed to repeated negative stimulations, but it had little effect on control quails.

214 Contributed Talk: MATING SYSTEMS II (Thursday AM)

ODOR SIGNALS GENETIC MAKE-UP IN A SEABIRD SPECIES

Sarah Leclaire, Scott Hatch, Etienne Danchin

Laboratoire Evolution & Diversité Biologique, France; Email:sarahlecl@hotmail.com

The importance of olfaction in birds' social behavior has long been denied. Recent studies have however shown that birds' body scent conveys information about species, sex, hormonal level or individuality, and influences sexual behavior and mate recognition. However, whether birds use odor in mate choice has not yet been demonstrated. Many vertebrates mate according to genetic heterozygosity and relatedness, and in most of them except birds, odor cues are used to assess the conspecifics' genetic makeup. Kittiwakes preferentially mate with unrelated individuals. Here we combine Gas-Chromatography data and genetic analyses to test whether semiochemical messages in preen secretion of kittiwakes carries information about genetic heterozygosity and relatedness. Semiochemicals were correlated with heterozygosity in males and females, while semiochemical distances were correlated with genetic distance only in male-male dyads. Our study is the first to demonstrate that odor may signal genetic traits in birds. Our results suggest that female kittiwakes may use odor cues to assess the heterozygosity of potential males, and their genetic relatedness through a negative imprinting mechanism.

152 Contributed Talk: SOCIAL BEHAVIOR III (Tuesday PM II)

GENETIC EVIDENCE FOR BROOD MIXING IN WILD CONVICT CICHLID FISH (AMATITLANIA SIQUIA)

Stacey Lee-Jenkins, Brian Wisenden, Myron Smith, Jean-Guy Godin

Carleton University, Canada; Email:ssy.leejenkins@gmail.com

Alloparental care represents a potential challenge to evolutionary theory. Biparental convict cichlid fish exhibit an extended period of care of their brood, and are known to accept or 'adopt' foreign fry (free-swimming young from another mated pair) into their own brood, thereby providing alloparental care. To date, all evidence for putative brood mixing events in this species has been inferred from behavioural observations and brood manipulations. The genetic composition of convict cichlid broods in nature remains unknown. To better understand the composition of wild convict cichlid broods and the evolution of alloparental care in this species, we characterised the genetic composition of 50 broods collected along 12 pool areas of the Rio Cabuyo, Costa Rica using polymorphic microsatellite markers. These data reveal brood mixing events of varying degrees (no foreign fry to over four different 'families' of foreign fry in host broods) and cases of fry body-size assortment within broods based on genotype (i.e. host fry vs. foreign fry within a brood). This study therefore provides the first genetic evidence for brood mixing and alloparental care in the convict cichlid in nature.

P399 Contributed Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

FEMALE MATE PREFERENCE IS INDEPENDENT OF MALE HORMONE-MEDIATED COURTSHIP BEHAVIOR IN A CICHLID FISH

Joseph Leese

Lehigh University, United States; Email:jml206@lehigh.edu

Many monogamous animals lack the sexual signals observed in other mating systems used in mate choice decisions. It is hypothesized that for these species, the display of certain types of courtship behavior are more important for selecting a mate than morphological differences. Often, the expression of these courtship behaviors is linked to levels of steroid hormones. We explored the relationship between hormone-mediated courtship behavior and mate preference in the monogamous convict cichlid, *Amatitlania nigrofasciata*, in two choice paradigms. First, we administered 11-ketotestosterone (11KT) as well as the anti-androgen flutamide to males and provided them with a choice of mates. Males given 11KT showed no difference in patterns of courtship behavior from controls, while males treated with flutamide showed significantly less. Second, we investigated the influence of these treatments on female mate preference. Females showed no preference between males administered 11KT or flutamide and untreated males. These data suggest that while androgens may function to regulate levels of courtship behavior in males, female choice remains independent of these behaviors.

P260 ABS Founders Award Poster: COGNITION AND LEARNING 2 (Poster Session B: Thurs. eve)

BAYESIAN-LIKE INTEGRATION OF TERRESTRIAL AND CELESTIAL INFORMATION IN DESERT ANTS

Eric Legge, Antoine Wystrach, Marcia Spetch, Ken Cheng

University of Alberta, Canada; Email: elegge@ualberta.ca

Navigating ants are known to rely on both celestial and terrestrial information to relocate places of interest such as stable food sources or their nest. Here we present two experiments in which we test how the Central Australian desert ant, *Melophorus bagoti* retrieves a homebound direction when two sources of information are placed in conflict. In our first experiment, we trained ants to find their way out of an artificial arena where they could use both the shape of the artificial skyline (i.e., terrestrial cues) and a context-specific local vector (i.e., based on celestial cues). In our second experiment, we trained ants to return from a feeder along a cleared path in their natural environment where they could rely on both path integration (i.e., based on celestial cues) and the natural skyline (i.e., terrestrial cues) for directional information. In both experiments, conflict tests revealed that ants did not choose to follow a particular source of information but integrated the two, choosing an intermediate direction. Integrations followed Bayesian-like rules. Specifically, each cue was integrated according to weights based on its reliability.

P212 Contributed Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

PRELIMINARY DESCRIPTION OF COOPERATIVE NEST-BUILDING BEHAVIOR IN SOCIABLE WEAVERS

Gavin Leighton, William Searcy

University of Miami, United States; Email: gleighton@bio.miami.edu

Despite the ubiquity of cooperation, the evolutionary stability of cooperative behaviors is perplexing. Especially vexing are those cooperative behaviors where individuals contribute to a public good from which all individuals derive benefits. For example, the communal nest of sociable weavers (*Philetairus socius*) benefits colony members; but individuals may obtain higher reproductive success if they focus on self-maintenance behaviors instead of nest construction. As a preliminary step towards analyzing the evolution of cooperative nest building, I described the nest-building behavior of a captive colony of sociable weavers to quantify cooperation between sexes and across ages. The level of cooperation in subsets of the population suggests specific mechanisms that likely stabilize the cooperative nest construction of sociable weavers. The suggested mechanisms provide an avenue for designing experiments that will further hone our understanding of cooperative behaviors that produce public goods. Understanding the stability of public goods is critical because they often provide a foundation for complex animal societies.

224 Contributed Talk: PREDATION AND FORAGING I (Thursday AM)

'X' MARKS THE SPOT: DO NECTAR GUIDES ALWAYS BENEFIT BOTH BEES AND PLANTS?

Anne Leonard, Daniel Papaj

University of Arizona, United States; Email: Leonard9@email.arizona.edu

Many floral displays transmit patterns thought to direct pollinators to nectar. These nectar guides may be mutually beneficial, if they reduce pollinators' handling time, leading to an increased pollen transfer rate. Yet the details of how patterns influence foraging efficiency are unknown, as is the potential for learning to alter this relationship. We compared the responses of bumblebees to artificial flowers that either possessed or lacked patterns. Bees discovered nectar more quickly on patterned flowers, regardless of corolla shape. This effect was immediate (innate), but also had a learned component; additionally, differences in discovery time between patterned and unpatterned flowers persisted with experience. When conditions over successive days changed such that flowers no longer provided a reward, bees visited the now-unrewarding flowers more persistently when they were patterned. This project is the first to explore how bees' use of nectar guides changes with experience. More broadly, bees' persistent response to patterned flowers even after rewards ceased suggests that nectar guides can at times promote the plant's pollen transfer at the expense of foraging success.

311 Contributed Talk: SEXUAL SELECTION IV (Friday AM)

TESTING EBERHARD'S HYPOTHESIS REVEALS VERY RAPID EVOLUTION OF SEXUAL BEHAVIOR IN BANANA SLUGS

Janet Leonard, John Pearse, Hilde Vrijers, Sanne Helsen, Karin Breugelmanns, Kurt Jordaens, Thierry Backeljau
University of California-Santa Cruz, United States; Email: Jlleonar@ucsc.edu

Eberhard hypothesized that where genital characters serve to distinguish congeners sexual selection has been involved in the evolution of the characters. We have tested this hypothesis in a simultaneously hermaphroditic taxon, giant banana slugs of the genus *Ariolimax*. Species descriptions have been based on genital morphology. Species vary in courtship behavior, intromission pattern, bout structure and the presence of apophallation. Some species show phally polymorphism. Evidence for sexual selection in various species includes a) long and expensive courtship and copulation behavior; b) variation among species in methods of reciprocity; c) multiple mating and multiple paternity; and d) apophallation. The potential for self-fertilization suggests that sexual selection may vary in importance among populations. Evidence from mt DNA and microsatellites indicates that behavior has diverged more rapidly than neutral genes in this genus. All six described species share the same 18 polymorphic microsatellite loci, indicating very recent divergence. Sexual behavior has therefore evolved very rapidly in the genus and is associated with sexual selection.

P47 Contributed Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

ECOLOGICAL INFLUENCES ON SINGING ON THE NEST

Maureen Leonard

Mount Mary College, United States; Email: leonardm@mtmary.edu

Singing on the nest is a relatively uncommon behavior, occurring in 10% of North American breeding birds. Previous work showed incubation sharing and taxonomic family are predictors of this behavior, as well as solitary nesting (Leonard 2008). This study seeks to identify any common patterns in ecological factors such as nesting habitat, distribution, or demography that may also influence this behavior. Data were collected from the Birds of North America species accounts for both singers on the nest and non-singers. Comparisons among the ecological factors between each group will show if there are ecological predictors for singing on the nest.

360 Contributed Talk: COMMUNICATION VI (Saturday AM)

COLORFUL STRIPES SEND MIXED MESSAGES TO SAFE AND RISKY PARTNERS IN A DIFFUSE CLEANING MUTUALISM

Liliana Lettieri, J. Todd Streebman

Michigan State University, United States; Email: lettiери@msu.edu

The initial steps by which neutral and/or negative biological interactions between species evolve into reciprocally positive (mutualistic) ones remain poorly understood. Here, we study Caribbean *Elacatinus* gobies and the 'client' fishes they clean. Colorful stripes are common to mutualist cleaners and non-cleaning sister species. Blue stripes are unique to cleaners and are more conspicuous to predators than are basal yellow or green stripes. In turn, we focused on the role of stripe color as a potentially specialized signal. We show that wild-caught cleaners possess a putative chemical defense and demonstrate that basal yellow stripe patterns are sufficient to elicit client posing behavior and to deter attack. Previously published records of cleaning show that yellow cleaners tend to predators less frequently than more derived striped cleaners. Our results highlight evolution from predator deterrence to close physical interaction with conspicuous advertising, reinforced by chemical defense. Blue cleaners, in particular, are well-equipped to tolerate risky clients. We suggest that this shift was facilitated by signals among a large and diverse pool of reef fishes.

P153 ABS Genesis Award Poster: PREDATION AND FORAGING 1 (Poster Session A: Weds. eve)

FAMILY EFFECTS ON SIBLING CANNIBALISM IN REDBACK SPIDERS (*LATRODECTUS HASSELTII*)

Lucy Dong Xuan Li, Nizanthan Rathitharan, Hosay Said, Maria Modanu, Maydianne C.B. Andrade
Canada; Email:lucydxli@yahoo.ca

Sibling cannibalism occurs across diverse taxa in response to factors such as competition, low prey availability, and density. In our study, we used the Australian redback spider, *Latrodectus hasselti*, to investigate the effects of sibling density on cannibalism and survivorship. We used a paired design in which we assigned newly hatched siblings from single family lines to a low density (LD) (10 spiderlings) or a high density (HD) (30 spiderlings) treatment, then left them confined with siblings and unfed for a week. In nature, spiderlings are found in close proximity on their natal web during this period, in clusters of variable density. Surprisingly, our results showed no effect of density on sibling cannibalism. However, there were strong family-line effects on rates of cannibalism and on spiderling mortality (where the latter also incorporates non-cannibalistic mortality). This is consistent with results reported for the congener, *L.hesperus*. We discuss these results in reference to implications for female reproductive tactics in nature.

P182 ABS Genesis Award Poster: SEXUAL SELECTION 1 (Poster Session A: Weds. eve)

ADAPTIVE RESPONSE TO SEX RATIO IN SPERM-LIMITED FEMALE *DROSOPHILA HYDEI*

Henry Liang, Dorothy Thomas, Jeremy Davis
Vassar College, United States; Email:heliang@vassar.edu

The sperm of *Drosophila hydei* is extraordinarily long and costly to produce, and as a result, females may be sperm-limited. Since males in more anisogamous species become more sexually aggressive when reared in male-biased sex ratios, we predicted that the mating behavior of female *D. hydei* would also respond to changes in sex ratio. We housed recently emerged females in male or female biased sex ratios for 3 days. When females from each ratio were tested together with a mature male, we found that females previously housed with few males were courted more by the male, and performed courtship behaviors that were not seen in females that were previously housed with many males. In a second experiment, we demonstrated that females use both odor cues and behavioral interactions to assess the availability of sexually mature males in the environment. Our results indicate that female sexual behavior is sensitive to early social environment, and that females shift from passive to active roles in courtship depending on the availability of sperm.

326 Contributed Talk: BEHAVIORAL COMMUNITY ECOLOGY (Friday PM I)

FIGHT OR FLIGHT? CONFLICT COSTS DRIVE HETEROSPECIFIC EAVESDROPPING BY COMPETING TROPICAL BEES

Elinor Lichtenberg, James Nieh
University of California, San Diego, United States; Email:emlichtenberg@gmail.com

Animals eavesdrop by exploiting signals aimed at others. Competing eavesdroppers must show adaptive responses despite conflicting pressures: increasing search efficiency while minimizing conflict costs. I determined how eusocial stingless bees assess heterospecific food recruitment signals. Pheromone chemistry was distinct but overlapping between *Trigona hyalinata* and *T. spinipes*, indicating these species have the capacity to eavesdrop on each other. In eavesdropping experiments, the dominant *T. hyalinata* showed a concentration-dependent response to *T. spinipes* pheromone; it was attracted to low concentrations but avoided higher concentrations maintained by an actively-foraging *T. spinipes* colony. Economic modeling supports the empirically-derived hypothesis of conflict avoidance through eavesdropping. This work indicates that eavesdroppers respond to perceived costs, and highlights the importance of indirect conflict costs such as access time.

36 Symposium: PERINATAL INFLUENCES (Wednesday)

PRENATAL EXPERIENCE AND POSTNATAL PERCEPTUAL PREFERENCES

Robert Lickliter

Florida International University, United States; Email:licklite@fiu.edu

The restricted and relatively unobservable world of the prenatal environment of birds and mammals has contributed to prenatal development often being overlooked as a key contributor to postnatal behavior. This state of affairs has allowed researchers working with a variety of species to promote strongly nativist views of early perceptual, cognitive, and social development. I will present data from our work with bobwhite quail embryos and chicks supporting the view that behavior cannot be understood in an ahistorical context - the developmental history (including the prenatal history) of an individual is essential to understanding its behavioral outcomes. Our results consistently indicate that infant biases and "predispositions" develop. In particular, prenatal sensory experience can bias postnatal perceptual preferences and predispositions for socially derived auditory stimuli. These biases can significantly influence the course of early species identification, individual recognition, and perceptual learning and memory.

344 Contributed Talk: SOCIAL BEHAVIOR VI (Friday PM I)

BETTER THE DEVIL YOU KNOW: FAMILIARITY AFFECTS FORAGING ACTIVITY OF RED-BACKED SALAMANDERS

Eric Liebgold, Christopher Dibble

University of Virginia, United States; Email:caecilian@virginia.edu

One hypothesis for increased fitness when interacting with familiar individuals is that animals forage less in the presence of unfamiliar conspecifics to avoid interacting with these potentially more aggressive individuals. We tested this hypothesis in a territorial salamander, *Plethodon cinereus*. In our first enclosure experiment, we tested whether nocturnal activity was a quantitative reflection of foraging. Level of nocturnal activity had a significant positive effect on mass gain and a significant negative effect on prey abundance. In our second experiment, we tested whether a lack of familiarity between juveniles and adults decreased nocturnal foraging activity of juveniles or adults. Juveniles were less active in enclosures with unfamiliar females than familiar females, but there were no differences based on familiarity with males. Surprisingly, adult salamanders in enclosures with familiar juveniles were more active than those with unfamiliar juveniles even though juveniles are much smaller and do not pose physical danger towards adults. We conclude that the presence of an unfamiliar individual, even without overt aggressive behavior, may reduce foraging activity.

P434 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

THE IMPACT OF THIRD-PARTY INTERACTIONS ON BEHAVIOR AND GROWTH IN *NEOLAMPROLOGUS PULCHER*

Isaac Ligocki, Ian Hamilton

Ohio State University, United States; Email:ligocki.3@osu.edu

A number of explanations have been proposed regarding the evolution of cooperation. Though the majority of empirical work on this topic has focused on interactions between two individuals, recent attention has shifted to how third-party interactions influence such interactions. In the present study, interactions were observed in the cooperatively breeding cichlid *Neolamprologus pulcher*. We assembled focal groups with a dominant breeding pair and a subordinate, unrelated male. Behavioral observations as well as data on growth rate were used to evaluate the impact of the relative distribution of "power" in the breeding pair (based on the relative size ratio of the pair) on the growth and behavioral interactions of the subordinate male. Differences in behavioral interactions reflecting the relative power in the breeding pairs were observed depending on this size ratio. When the size ratio in the breeding pair was small, subordinate males grew at an increased rate. They also displayed increased submissive and affiliative behaviors towards the female. These findings show that other individuals have an impact on pairwise interactions within social groups.

P213 Contributed Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

EFFICIENT PREDATION AND THE EVOLUTION OF ALTRUISM IN PREY

Susan Lingle

University of Winnipeg, Canada; Email:s.lingle@uwinnipeg.ca

Prey engage in many forms of cooperation and assistance when encountered by predators. When trying to understand why an animal is willing to help another individual while expending time and energy, sometimes risking injury and death, biologists typically focus on events that unfold when a predator meets a group of prey, and neglect to consider that a predator's efficiency can vary with prey density. However, predators can increase the efficiency by which they encounter and capture prey as the size of the prey population falls due to flexibility in the predator's behaviour or a decline in the effectiveness of prey defences. A simple model reveals that, under such conditions, prey can be expected to engage in altruistic behaviour to help keep other individuals alive, because this enables helpers to avoid an immediate decline in their own probability of survival that would otherwise occur with the loss of each member from the prey population. The efficient predation hypothesis may be applicable to many animal systems and many forms of apparently altruistic behaviour, even when groups in a population are loosely structured or comprised of unrelated individuals.

207 Contributed Talk: COMMUNICATION III (Thursday AM)

SOCIAL STATUS AND URINARY COMMUNICATION IN DOMESTIC DOGS

Anneke Lisberg

University of Wisconsin, Whitewater, United States; Email:lisberga@uww.edu

Although urine marking and countermarking are familiar components of communication systems across Canidae, little empirical work has been done to identify the information communicated through canid urine marks or to test how urine marks may be used to mediate canid social interactions. Controlled urine presentations and observed behaviors at off-leash dog parks show that male and female dogs displaying high tail postures differ from low-tailed same-sex dogs in urine marking, countermarking and urine investigation and suggest that social status may be one piece of socially-relevant information communicated by urine marks.

P24 ABS Founders Award Poster: COGNITION AND LEARNING 1 (Poster Session A: Weds. eve)

WILD CAPUCHIN MONKEYS (*CEBUS LIBIDINOSUS*) USE NOVEL IRREGULAR STONES EFFECTIVELY IN NUT-CRACKING

Qing Freya Liu, Dorothy Fragaszy

United States; Email:freyaall@gmail.com

Wild capuchins are skilled in selecting the most effective stones and other materials (nuts, anvils) in nut-cracking. Skill in tool use can also be reflected by using an irregular less-suitable tool in an effective way. Can capuchins use novel manufactured stones effectively? In two experiments, we provided eight wild capuchins with novel artificial stones of asymmetrical shape (exp1. one concave side and one convex side) and of

asymmetrical mass distribution (exp2. one half weighed 2/3 and the other half weighed 1/3). We coded frequency of strikes, orientation of the stone per strike and turning the stone before a strike from video. Results revealed that the monkeys struck with the concave side up significantly more often than with the concave side down ($p = 0.02$) in experiment 1 and they struck with the heavier side down significantly more often than with the lighter side down ($p=0.002$). They also turned the experimental stones more often than the symmetrical control stones. Our findings suggest that wild capuchin monkeys can detect properties of novel tools and use them effectively, thus demonstrating embodied cognition in a species-typical activity in their natural environment.

106 Contributed Talk: SOCIAL BEHAVIOR I (Tuesday AM)

THE SOCIALITY AND ONTOGENY OF POSTCONFLICT AFFILIATION IN ROOKS, JACKDAWS, AND EURASIAN JAYS

Corina Logan, Will Hoppitt, Nathan Emery, Nicola Clayton

University of Cambridge, United Kingdom; Email:cl417@cam.ac.uk

Humans and non-humans alike seek support after conflicts by making up with their former opponent (former opponent affiliation) or by going to a bystander for attention (third-party affiliation). Primates and dogs use both strategies; wolves, goats, and dolphins do the former; and rooks and ravens do the latter. Former opponent affiliation repairs relationships, reduces relationship uncertainty, and prevents further aggression, while third-party affiliation is hypothesized to strengthen social bonds and reduce stress. Postconflict behaviour has been studied in many mammals which gives us a more complete understanding of how and why postconflict affiliation is used, however this behaviour is known in only 2 bird species leaving us to rely on hypotheses about its prevalence and function. We present a 3 year study on postconflict affiliation in 3 corvids (crow family) with differing levels of sociality. Subjects were followed as juveniles through early adulthood to determine if postconflict affiliation changes during development. We also examine if postconflict affiliation reduces stress in jackdaws, and present a new way to analyze postconflict data using a statistical model.

199 Contributed Talk: SOCIAL BEHAVIOR IV (Thursday AM)

AGGRESSIVENESS AND SIZE: A MODEL AND TWO TESTS

David Logue, April Takahashi, William Cade

University of Puerto Rico, Mayaguez, Puerto Rico; Email:david.logue@upr.edu

Individual variation in aggressive behavior might be caused by adaptive covariation with body size. We developed a model that predicts the benefits of aggressiveness as a function of body size. The model indicated that individuals of intermediate sizes derive the greatest benefits from being aggressive. Assuming that the cost of aggression is approximately uniform with respect to body size, selection should favor higher aggression in intermediate sized individuals than in large or small individuals. This prediction was tested by stimulating male Madagascar hissing cockroaches, *Gromphadorhina portentosa*, with disembodied antennae and recording the males' aggressive responses. We found support for the key prediction of our model: aggressiveness peaked at intermediate sizes. Data from actual male-male interactions validated that the antenna assay accurately measured aggressiveness. Analysis of an independent data set generated by staging male-male interactions also supported the prediction that intermediate-sized males were most aggressive. We conclude that adaptive covariation between body size and aggressiveness explains some interindividual variation in aggressiveness.

61 Symposium: SENSORY NEUROECOLOGY (Thursday)

HARDWIRED FOR NAVIGATION: HOW AN INHERITED MAGNETIC MAP GUIDES YOUNG LOGGERHEAD SEA TURTLES

Ken Lohmann, Nathan Putman, Catherine M Lohmann

University of North Carolina, Chapel Hill, United States; Email:klohmann@email.unc.edu

Young loggerhead sea turtles from Florida undertake a transoceanic migration in which they gradually circle the north Atlantic Ocean before returning to the North American coast. Hatchlings begin the migration with a 'magnetic map' in which regional magnetic fields function as navigational markers and elicit changes in swimming direction at crucial points in the migration. In effect, the first trans-oceanic migration appears to be accomplished as a series of sequential steps, in which different, distinctive regional magnetic fields each in turn trigger orientation responses that lead turtles in the appropriate direction for the next segment of the migration. These responses appear to be inherited, inasmuch as they are expressed by turtles that have never been in the ocean. Given that the Earth's field gradually changes, strong selective pressure presumably acts to maintain an approximate match between the responses of turtles and the fields that exist at critical points along the migratory pathway at any point in time.

P295 Contributed Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

EARLY VOCAL DEVELOPMENT AND ASSOCIATED PARENTAL BEHAVIOR IN GRASSHOPPER SPARROWS

Bernard Lohr, Lacey Laudick

University of Maryland, Baltimore County, United States; Email:blohr@umbc.edu

Vocal variation and adult nesting behavior has been measured for the past 10 years in at least one well-studied population of grasshopper sparrows (*Ammodramus savannarum*). Grasshopper sparrows go through 2-4 nesting cycles per season, each one lasting approximately 1 month. Young sparrows remain in the nest after hatching for an 8-9 day nestling period. Recently, we discovered that nestling grasshopper sparrows also produce vocalizations, in the form of begging calls that occurred predominantly during parental feeding visits. These nestling calls changed both qualitatively and quantitatively with age, becoming acoustically more complex by the time of fledging. Average begging call duration increased over the nestling period, and average note frequency also increased over the course of this period. Grasshopper sparrows increased the rate at which they fed nestlings as the young aged, eliciting more calls. Adult males and females contributed equally in parental care, as measured by the number of feeding visits.

107 Contributed Talk: SOCIAL BEHAVIOR I (Tuesday AM)

THE IMPACT OF THE SOCIAL CONTEXT ON SICKNESS BEHAVIOR

Patricia Lopes, George Bentley

University of California, Berkeley, United States; Email:pclopes@berkeley.edu

During the course of an infection, animals experience nonspecific symptoms, including weakness, lethargy and decreased appetite, collectively called "sickness behavior". Sickness behavior is hypothesized to increase survival by reallocating energy from other activities to fight the infection. Simultaneously, adaptive opportunities, such as mating, are being forsaken. Would it be of fitness value for animals to adjust sickness behavior according to their social environment? We tested this idea by injecting zebra finches (*Taeniopygia guttata*) with a non-pathogenic bacterial component capable of inducing sickness behavior and placing them in different social treatments: in a group or in isolation. Zebra finches are gregarious birds and we hypothesized the intensity of their sickness behavior would be affected by changes in their social surroundings. After an immune challenge, birds kept in isolation exhibited a marked decrease in activity compared to those kept in a group. Performing "normally" in certain social contexts might increase adaptive opportunities, such as mating, providing enough motivation to suppress signs of sickness.

327 Contributed Talk: BEHAVIORAL COMMUNITY ECOLOGY (Friday PM I)

DO FLYCATCHERS COPY AND REJECT BEHAVIOR OF TITS WITH HIGH AND LOW CLUTCH SIZE?

Olli Loukola, Jukka Forsman, Janne-Tuomas Seppänen

University of Oulu, Finland; Email:olli.loukola@oulu.fi

Recent studies imply that migratory pied flycatchers (*Ficedula hypoleuca*) can copy or reject the behavioral traits of their competitors, resident tits (*Parus* spp.), associated with good or poor fitness correlates, respectively. Such a selective social learning may aid animals in making optimal decisions. We do not know, however, whether flycatchers also use other cues, such as the phenotype of tits. Here, we test whether flycatchers use tutor fitness as a basis of decision-making by manipulating the clutch sizes of naturally breeding tits. We tested whether flycatcher choice between two neutral behavioral traits (geometric symbols) is affected by observing the apparent nest-site choice and clutch size (5 or 13 eggs) of tits. Our results suggest the quantity of eggs affected flycatcher choices: the trait associated with low clutch size was rejected while the trait associated with high clutch size was preferred. Interspecific social learning (ISL) can be an adaptive strategy whereby good and poor behaviors can be adopted and rejected, respectively. Our finding also implies that the observed convergence and divergence of traits of co-existing species may partly be due to ISL.

P48 Contributed Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

A CO-EVOLUTIONARY MISMATCH BETWEEN SIGNALERS AND RECEIVERS IN GRAY TREEFROGS

Elliot Love, Mark Bee

University of Minnesota, United States; Email:love0251@umn.edu

Animals that communicate acoustically must cope with background noise. To ameliorate this problem for receivers, signalers often change features of their signals to make them stand out against loud background noise. Frogs are excellent model organisms for studying this problem because they call in noisy social environments. We used Cope's gray treefrog (*Hyla chrysoscelis*) to test the hypothesis that changes in male signaling behavior in noise and female call preferences under similar conditions exhibit a co-evolutionary match between signaler and receiver. In a laboratory playback experiment, males increased call duration (pulses/min) in the presence of noise while decreasing call rate (calls/min), thus keeping pulse effort constant (pulses/min). In two-choice phonotaxis tests conducted in the presence and absence of noise, females preferred short calls at a fast rate as opposed to long calls at slow rates. The changes males made to their advertisement calls in noise were opposite of what females actually prefer. It appears that in gray treefrogs, there is a co-evolutionary mismatch between male behavior and female preference under noisy conditions.

P378 Contributed Poster: PREDATION AND FORAGING 2 (Poster Session B: Thurs. eve)

EVOLUTION OF FEARFULNESS AND BOLDNESS IN A BIRD POPULATION

Nan Lu, Yue-Hua Sun

Institute of Zoology, Chinese Academy of Sciences, China, People's Republic of; Email:lvnan@ioz.ac.cn

We present a simulation model for the evolution of anti-predator behavior in birds to explore the population size and predation risk effects in reality. Two pure strategies of fearful (Rf) and bold (Rb) were assumed to do the simulative experiments with both predatory attacks and nonlethal disturbance. For simplicity, we consider an asexual population. Our results directly revealed that: (1) the coexistence of fearfulness and boldness is impossible that the fearfulness is preferred in a small population, while the boldness is preferred in a large population, i.e. for only two phenotypes, Rf can be considered to be an ESS if the population size is small, and Rb is an ESS if the population size is large; (2) the effect of the number of attacks on the evolution of fearfulness and boldness still strongly depends on the total population size generally as illustrated in (1); (3) in a moderate population, the fearful individuals prefer moderate number of attacks, i.e. in our simulations, the peak proportion of total fearfulness is symmetric when attack number is about 70.

87 Contributed Talk: COMMUNICATION I (Tuesday AM)

INFORMATION THEORY AND THE CHICK-A-DEE CALL

Jeffrey Lucas, Todd Freeberg

Purdue University, United States; Email:jlucas@purdue.edu

We applied information theoretical analyses to the chick-a-dee calls of Carolina chickadees, *Poecile carolinensis*, and compared Carolina chickadee calls to the structural complexity of the calls of black-capped chickadees, *P. atricapillus* (described in Hailman, Ficken, & Ficken, 1985). Chick-a-dee calls were recorded from Carolina chickadees in a naturalistic observation study in eastern Tennessee. Calls were analyzed using approaches from information theory, including transition probability matrices, Zipf's rules, entropies, and information coding capacities of calls and notes of calls. As described for black-capped chickadees, calls of Carolina chickadees exhibited considerable structural complexity. Most results suggested that the call of Carolina chickadees is more structurally complex than that of black-capped chickadees. These findings add support to the growing literature on the complexity of this call system in Paridae species. Furthermore, these results point to the feasibility of detailed cross-species comparative analyses that may allow strong testing of hypotheses regarding signal evolution.

138 Contributed Talk: MECHANISMS I (Tuesday PM II)

EFFECTS OF DOMINANCE ON STRESS RESPONSE, PARASITE LOAD AND IMMUNE PARAMETERS IN GREYLAG GEESE

Sonja Ludwig, Isabella Scheiber, Kurt Kotrschal, Claudia Wascher
Konrad Lorenz Research Station, Austria; Email:sonja.ludwig@klf.ac.at

In social species, social stress is among the most potent stressors and can affect individual behavior, physiology and the immune system. However, individuals of a population respond differently to social stress, depending upon an individual's social embedding. Support by social allies (mates, family members) can significantly reduce these costs. Greylag geese (*Anser anser*) show mammal-like social complexity, and antagonistic effects of social stressors and social support on heart rate and glucocorticoid excretion were shown. To investigate the influence of dominance rank on stress physiology and correlated health effects, we experimentally elevated glucocorticoid levels in high and low ranking male and female geese for 10 days. We conducted behavioral observations and assessed immune parameters as a consequence of the increased stress level. To determine intestinal parasite burden, we collected fecal samples for up to two months after the experiment. Our study shows behavioral differences due to increased glucocorticoid levels, and we will discuss subsequent effects on parasite load and immune parameters as well as the influence of dominance rank. Funded by the FWF.

387 Contributed Talk: SOCIAL BEHAVIOR VII (Saturday AM)

KINSHIP AND THE EVOLUTION OF HELPING BEHAVIOUR IN MAMMALIAN SOCIETIES

Dieter Lukas, Tim Clutton-Brock
University of Cambridge, United Kingdom; Email:dl384@cam.ac.uk

In a small proportion of mammals, breeding females are assisted in protecting and feeding their offspring by non-breeding helpers (cooperative or eusocial breeding). The evolution of cooperative breeding has commonly been attributed to the operation of kin selection and in insects and birds cooperative breeding systems are confined to species where female promiscuity is low and levels of relatedness are consequentially high. Here, we perform phylogenetic reconstructions to show that cooperative breeding in mammals only evolved from ancestors where a single female and a single male monopolize breeding, so that neither maternal nor paternal kinship is diluted. However, cooperative breeding does not occur in all monogamous lineages, and we perform additional phylogenetic reconstructions to identify the factors that restrict its evolution. We discuss the implications of our results in light of the debate regarding a potential parasocial route towards cooperative breeding and for understanding helping behaviour in other mammals, including humans.

P435 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

SOCIAL HIERARCHY AND THE DEVELOPMENT OF DANCING ABILITY IN YOUNG MANAKINS

Katrina Lukianchuk, Stephanie Doucet

University of Windsor, Canada; Email: lukianc@uwindsor.ca

Long-tailed Manakins, *Chiroxiphia linearis*, follow a lek-based mating system where males perform complex displays to attract females. Males affiliate at display areas and are thought to exhibit a dominance hierarchy where only the alpha and beta display for females. These displays, which include coordinated hopping, flights and dives to and from the display area, and various postures associated with these manoeuvres, require cooperation of the two males. Young males often practice displaying with each other or with older males in the absence of females. Our objective was to determine how dancing ability develops in young males, and to establish whether males follow an age-graded dominance hierarchy. We recorded videos at display areas to compare differences in display behaviour and dominance among males in five age classes. Initial analyses suggest display elements performed by young males are shorter and less complex than those of older males. In addition, males exhibit a number of behaviours consistent with a dominance hierarchy, including chases, chatters, and supplants. Our findings provide insights into the development of complex display behaviour in lek-mating animals.

37 Symposium: PERINATAL INFLUENCES (Wednesday)

NON GENOMIC INFLUENCES ON BEHAVIORAL DEVELOPMENT IN BIRDS: PRE- AND POST-NATAL MATERNAL EFFECTS.

Sophie Lumineau, Cécilia Houdelier, Emmanuel de Margerie, Marie-Annick Richard-Yris

University of Rennes 1, France; Email: sophie.lumineau@univ-rennes1.fr

The construction of phenotypes implies influences imposed indissociably by each individual's own genetic program and by the environment where this program develops (Hinde, 1975; Gottlieb, 1991). The first development stages of young animals constitute a particularly important period during which environmental influences can profoundly affect subsequent behavioral capacities (Rozenzweig, 1984). Thus, mothers of mammals and of many birds constitute the major part of the environment of young animals. The maternal influences could intervene as a non-genetic mechanism of inheritance that can interfere with genetic transmission events and facilitate the emergence of real "ontogenetic trajectory" events that lead to important phenotypic variability within a species (Poindron & Schaal, 1991). For the last few years, we have placed our research within this theoretic context. Scientists show an increasing interest in behavioral plasticity, and research on birds on this theme is relatively novel. We focus on maternal influences in gallinaceans, and in particular in Japanese quail. We propose here to review our works on the prenatal (via egg hormones) and the postnatal maternal effects on

P183 ABS Founders Award Poster: SEXUAL SELECTION 1 (Poster Session A: Weds. eve)

DIET, MATERNAL EFFECTS, LIFE HISTORY AND FEMALE MATE PREFERENCES IN *XIPHOPHORUS MULTILINEATUS*

Susan Lyons, Molly Morris

Ohio University, United States; Email: sl411302@ohio.edu

Female mate preference can entail direct costs to females and indirect benefits for offspring and may be best understood from a life history perspective. If preference is life history dependent, it should vary with condition dependent life history traits. We tested this hypothesis in *Xiphophorus multilineatus* by determining how diet and paternal genotype influenced female size, growth, and mate preference for male size and male vertical bar number symmetry. We show that diet treatment and paternal genotype influence female growth measurements, and that preference for male symmetry varies with paternal genotype and adult growth rate. Because paternal genotype is determined by a Y-chromosome linked allele and cannot directly influence daughters, these differences result from maternal effects. Additionally, only females on the low protein diet prefer large males, suggesting that benefits of mating with large males may be greater in a low resource environment. These results suggest that female preference is life history dependent. Additionally, as different factors influenced mate preference for the two male traits, these traits could provide different information for females.

P103 ABS Founders Award Poster: GENETICS AND EVOLUTION 1 (Poster Session A: Weds. eve)

THE EVOLUTIONARY RELATIONSHIP BETWEEN SOCIAL MATING SYSTEM AND SEX-BIASED DISPERSAL IN MAMMALS

Karen Mabry, Daniel Blumstein, Dirk Van Vuren, Erin Shelley

New Mexico State University, United States; Email: kmabry@nmsu.edu

In vertebrate animals, natal dispersal is often sex-biased (one sex disperses farther, or more frequently, than the other). Birds are often socially monogamous and have female-biased dispersal, while mammals are typically socially polygynous and have male-biased dispersal. A hypothesized evolutionary relationship between social mating system and sex-biased dispersal in vertebrates is widely accepted, but has never been subjected to a phylogenetic analysis. To elucidate the evolutionary relationship between mating system and dispersal in mammals, we applied modern comparative methods to a phylogenetic tree of 45 species for which both social mating system and degree of sex-biased dispersal are known. Our results indicate that the most likely path from the ancestral state of non-monogamy and male-biased dispersal to the derived state of monogamy and female-biased dispersal is a change in social mating system followed by a change in the direction of sex-bias in dispersal. However, our analyses also suggest that the relationship between these two traits is more complex than previously thought.

1 Plenary Lecture: (Tuesday AM)

SOCIAL AND MATING SYSTEMS OF TROPICAL BIRDS: ELABORATE COSTUMES AND WILD DANCES

Regina Macedo

Universidade de Brasilia, Brazil; Email: rhfmacedo@unb.br

Our understanding of sexual selection has been revolutionized in the last three decades. Numerous studies have shown that traits difficult to explain as solely evolved through natural selection were shaped by both intrasexual and intersexual selection. These traits include acoustic signals, physical ornaments and courtship and mating behaviors. The vast majority of studies of social and mating systems of birds, however, were conducted with species that reside in temperate regions. Yet, the diversity of birds, biological interactions as well as social systems peak in the tropics. Research on tropical organisms can provide new insights, allowing us to test concepts originally formulated based on animals adapted to temperate conditions. Thus, generalizations often found in the literature may not encompass the array of phenomena exhibited by animals through a broader latitudinal range. I will use three neotropical species-- the guira cuckoo, the campo flicker and the blue-black grassquit--to illustrate the evolution of sexually selected traits within different social and mating contexts. More than anything else, I hope these insights highlight how much work is needed in the tropics!

P400 Contributed Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

PREFERENCE FOR LATERAL PROJECTION AREA IN POECILIID FISHES

Ronald MacLaren, Adam Fontaine

Merrimack College, United States; Email: maclarenr@merrimack.edu

Female preference for male fin elaborations in Poeciliid fishes may be driven by a sensory bias for increased lateral projection area (LPA) that has existed since the lineages diverged from a common ancestor. Previous research supports this hypothesis demonstrating female *Poecilia latipinna*, *P. mexicana*, and most recently *P. reticulata* and *Xiphophorus variatus* prefer males of larger body and dorsal fin size, but exhibit no such preferences when controlling for total LPA. However, this bias need not be limited to females. We review our female preference studies to date and describe a preliminary investigation of whether the same bias exists in male *X. variatus* (a species with sexually monomorphic fins), presenting them with a series of female dummies of varying body and dorsal fin size in two experiments. Preliminary results indicate a congruency between the sexes in preferences for body but not dorsal fin size, suggesting the fitness benefits of mating with larger more

fecund females has favored an ability on the part of males to discriminate between the fin and body size of opposite sex individuals that is not found in females.

189 Contributed Talk: MATING SYSTEMS I (Wednesday PM I)

REPRODUCTIVE SENEESCENCE AND TERMINAL INVESTMENT IN FREE-RANGING FEMALE RHESUS MACAQUES

Dario Maestripieri, Christy Hoffman, James Higham

University of Chicago, United States; Email:dario@uchicago.edu

The process of senescence predicts decreased female reproductive output with increasing age due to an age-related decline in body condition whereas the terminal investment hypothesis predicts increased female reproductive effort with increasing age. In this study, we integrated data collected over 48 years from 637 adult female rhesus macaques (*Macaca mulatta*) and their offspring residing on Cayo Santiago, with new morphometric and behavioral data collected from 26 adult females and their infants, to test the predictions of the senescence and the terminal investment hypotheses. We examined relationships between maternal age and the body condition of both mothers and infants, mother's interbirth intervals, measures of mother's behavioral investment in offspring, and offspring survival and fitness. Older mothers had lower body mass indices and were less active, had longer interbirth intervals, invested more behaviorally in infants, but nonetheless had infants of lower masses and survival rates. Our results provide strong evidence for reproductive senescence in female rhesus macaques, but are also consistent with some of the predictions of the terminal investment hypothesis.

P296 Contributed Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

TERRITORIAL INTRUSIONS ARE RELATED TO THE PEAK FREQUENCIES OF YODELS GIVEN BY MALE COMMON LOONS

Jay Mager, Charles Walcott, Julie Backus, Emily Nebgen, Dexter Norris

Ohio Northern University, United States; Email:j-mager@onu.edu

In addition to their identity, male Common Loons (*Gavia immer*) communicate condition-dependent fighting abilities through the dominant frequencies (better condition individuals produce lower-frequency signals), and a heightened aggressive motivational state by lengthening their territorial yodels by adding two-syllable repeat syllables. Through an acoustic playback experiment, we experimentally examined whether the dominant frequencies of either resident or non-resident yodels affected an intruder's (i.e., conspecifics flying over a territory) propensity to land upon a breeding territory. Among 33 territories from which we broadcast yodels having three repeat phrases, we found that potential intruders were more likely to land on territories when we broadcast higher-frequency yodels to them. These results provide the first empirical support of the idea that conspecific prospectors consider the dominant frequencies of a yodel in deciding whether to land upon a potential breeding territory, and support observational studies that infer that males that communicate poorer fighting ability can hold onto breeding territories by communicating greater aggressive motivation.

P401 ABS Founders Award Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

EVOLUTION OF IRIDESCENCE IN COELIGENA HUMMINGBIRDS: NEW METHODS, NEW INSIGHTS

Rafael Maia, Juan Parra, Matthew Shawkey

University of Akron, United States; Email:rm72@zips.uakron.edu

Iridescent structural colors are among the most dazzling of animal visual signals. However, proper quantification of iridescence can be extremely challenging. Hummingbird feathers have tilted barbules and platelet-shaped hollow melanosomes that result in the greatest diversity of iridescent colors in birds. We used multi-angle reflectance spectrometry and visual models to measure the breadth of color change and reflectance geometry, thus quantifying the iridescence phenomena independent of color. We used these to test hypotheses for the evolution of iridescence in *Coeligena* hummingbirds. Controlling for phylogeny, gorget and crown feathers were

more iridescent than body feathers. Iridescence of ornamental and non-ornamental feathers followed different evolutionary patterns and showed different levels of phylogenetic signal. Body feathers followed constrained models of diversification, suggesting adaptive evolution towards low iridescence, whereas ornamental feathers displayed greater and phylogeny-dependent variance. Our results highlight the need for proper quantification of iridescence, and the interplay of natural and sexual selection during its evolution in hummingbirds.

79 Contributed Talk: COGNITION AND LEARNING I (Tuesday AM)

INFLUENCE OF TACTILE DEMANDS ON MANUAL LATERALITY: A COMPARATIVE STUDY IN THREE CATARRHINIAN SPECIES

Audrey Maille, Philippon Justine, Déruti Laure, Viandier Chloé, Blois-Heulin Catherine
Station Biologique de Paimpont, France; Email:audrey.maille@univ-rennes1.fr

Manual laterality can be affected by the motor, cognitive and perceptual demand of a task. However, few studies examined the interaction between hand preference and sensory laterality. Our study aimed to investigate the influence of tactile requirements on manual laterality. In a comparative approach we focused on both human and non-human primates, with making a point of setting them similar procedures to ensure a data standardization. Sixteen white-collared mangabeys (*Cercocebus torquatus*), 9 brazza monkeys (*Cercopithecus neglectus*) and 140 humans (*Homo sapiens*) of various ages participated in four tasks that differed in their exploration demands and availability of visual cues. Increasing of tactile requirements induced a higher strength of laterality in brazza monkeys and more left-hand usage in juvenile mangabeys (manual laterality of adult mangabeys was not affected). In human, despite data analysis is still in progress, sensory modality did not seem to influence hand preference. In the light of our results together with previous literature we will suggest an evolutionary model of the implication of tactile modality in the modulation of manual laterality.

P261 Contributed Poster: COGNITION AND LEARNING 2 (Poster Session B: Thurs. eve)

SPATIAL LEARNING BY POLLINATORS BEHIND THE EVOLUTION OF FLORAL COLOR CHANGE

Takashi Makino, Kazuharu Ohashi
University of Toronto, Canada; Email:mknktst@gmail.com

Spatial learning by pollinating animals is considered to be an important factor driving the evolution of floral traits. Ontogenetic changes in floral color, found in hundreds of plant species, may be an example. Color change often correlates with declines in stigma receptivity and floral rewards like nectar. Retention of post-change flowers therefore seems useless, but is demonstrated to attract more pollinators by making larger floral displays. Color change is also assumed to reduce pollen loss on old flowers because it guides pollinators to new flowers. In addition to these roles, we propose another role for floral color change. Imagine a dishonest plant that keeps empty flowers without changing their color. Its fake display will lure many pollinators, but may gradually be avoided by pollinators based on spatial memory because it should be time-consuming for pollinators to locate rewarding flowers. A plant that honestly changes the color of empty flowers, in contrast, may succeed in not only attracting "beginner" pollinators, but also getting repeat visits by "veterans". Our new hypothesis was supported by experiments using artificial flowers and bumble bees.

388 Contributed Talk: SOCIAL BEHAVIOR VII (Saturday AM)

MALE GUPPIES (*POECILIA RETICULATA*) ADJUST THEIR MATE CHOICE BEHAVIOR TO THE PRESENCE OF AN AUDIENCE

Amber Makowicz, Martin Plath, Ingo Schlupp
University of Oklahoma, United States; Email:amber_makowicz@ou.edu

In recent years analyzing animal behavior in light of the social environment has become widely accepted. Especially many mating interactions do not happen in privacy, but in a public arena, raising the question of how this affects the behavior of both the focal individual and the observing audience individual. Here, I investigated,

in feral guppies, whether male preferences for female body size, a correlate of fecundity, are influenced by the presence of another male, the audience. I also studied whether the audience was influenced by the observed interactions. These two aspects are not normally studied together. Furthermore, I was interested in the question of how long changes in the behavior of the audience male might last. I found that male preferences (measured as nipping/approaches) decreased in the presence of an audience. Moreover, I will argue that the audience males showed no preference for larger females when tested right after the interaction with the focal male, but returned to the typical preference for larger females after 24 hours. This study highlights the relevance of the social conditions under which mating decisions are being made.

225 Contributed Talk: PREDATION AND FORAGING I (Thursday AM)

SOCIAL CONTEXT AS AN ANTI-PREDATOR RESPONSE IN A NON-SHOALING CORAL REEF FISH

Rachel Manassa, Mark McCormick

James Cook University, Australia; Email: rachel.manassa@jcu.edu.au

An individual's ability to assess, identify and react to predators is fundamental to their survival. Although individuals possess sophisticated sensory abilities, knowledge on the behavior of nearby prey may further reduce predation risk. Species-specific behavior and social context can influence anti-predator responses, with shoaling known to provide a decreased risk in freshwater fishes. As coral reef fish are exposed to a diverse and unpredictable array of predators, it is suggested that selection should favor behavior which eliminates the threat of capture or death. In this study, we investigated if the presence of a shoal mediates the response of the anemone fish, *Amphiprion percula* to conspecific and heterospecific chemical cues. *A. percula* displayed decreased anti-predator behavior when an adjacent conspecific shoal was observed, demonstrating that social context significantly influences anti-predator behavior in coral reef fish. This research highlights the importance of social interactions in predator-prey relationships on coral reefs; suggesting the advantage of being in a shoal prevails over that of individual benefit regardless of social structure.

P25 Contributed Poster: COGNITION AND LEARNING 1 (Poster Session A: Weds. eve)

RISK AVERSION IN LEMURS

Tara Mandalaywala, Evan MacLean, Elizabeth Brannon

University of Chicago, United States; Email: tmandalaywala@uchicago.edu

This study examined risk preferences in lemurs, a group of primates that evolved on Madagascar, an island with a highly variable and harsh ecology. Prior research in lemurs has documented the presence of anatomical and behavioral adaptations that might aid survival by reducing exposure to risk in an unpredictable environment; however, it is unknown whether lemurs possess cognitive strategies that may also minimize exposure to environmental risk. We conducted two experiments at the Duke Lemur Center to measure the presence and extent of risk aversion in three species of lemurs. Experiment 1 replicated a phenomenon seen across many taxa; when the payout between a safe (consistent) and risky (variable) option was equal, lemurs displayed high levels of risk aversion. In Experiment 2, the risky option payout was increased gradually, relative to the safe option payout. Lemurs became less risk averse as the payout improved; however, they maintained high levels of risk aversion even when the risky option yielded a payout twice that of the safe option. These results are consistent with the notion that lemur cognition has evolved to minimize risk in an unpredictable island environment.

254 Contributed Talk: ECOLOGICAL EFFECTS II (Thursday PM II)

THE EFFECTS OF UV RADIATION ON FATHEAD MINNOWS (*PIMEPHALES PROMELAS*)

Aditya Manek, Maud Ferrari, Jeff Sereda, Som Niyogi, Doug Chivers

University of Saskatchewan, Canada; Email: aditya.manek@usask.ca

Recent anthropogenic activities have caused deleterious effects to the stratospheric ozone layer, resulting in a global increase in levels of ultraviolet radiation. Understanding the way organisms respond to such stressors is

key to predicting the effects of anthropogenic activities on aquatic ecosystems and the species that inhabit them. The epidermal region of the skin of many species of fish contains large epidermal club cells that are known to release chemicals (alarm cues) that serve to warn other fishes of danger. However, the alarm role of the cells is likely secondary to their role in the immune system. In the present study, we examined the effects of in vivo exposure to UV radiation on fathead minnows (*Pimephales promelas*). We found that fish exposed to UV showed an increase in cortisol levels and a substantive decrease in club cell investment compared to non-exposed controls. Surprisingly, our subsequent analysis of the behavioural response of fish to alarm cues revealed no difference in the potency of the cues prepared from the skin of UV exposed or non-exposed minnows. Our results indicate that, while non-lethal, UV exposure may lead to secondary mortality by al

12 ABS Allee Session: ALLEE II (Wednesday PM I)

INTRASPECIFIC VARIATION IN MALE MATING TACTICS IN RESPONSE TO FEMALE DISTRIBUTION

Mary Beth Manjerovic, Jane Waterman

University of Central Florida, United States; Email:mbmanjerovic@gmail.com

Social and ecological environments including female distribution and intrasexual competition affect male mating tactics. As variance in reproductive success increases, opportunities for sexual selection intensify but reproductive skew is difficult to predict without direct knowledge of male reproductive success. We looked at male success related to female resource distribution and male tactics in two populations of the social, promiscuous ground squirrel, *Xerus inauris*. Male tactics differ most likely due to differences in female distribution. In areas where females are evenly distributed, males encounter more estrous females and have increased breeding opportunities. Males invest more in post-copulatory competition than males in a population with clustered females, where dominance hierarchies form that affect pre-copulatory success and lead to greater skews in reproduction. Despite these differences, both sites have highly skewed variance in reproduction and intense sexual selective pressure. These populations may have increased opportunities for selection but different mechanisms of competition resulting in rapid evolutionary change affecting reproductive morphology and behavior.

43 Symposium: SOCIAL COMPLEXITY (Wednesday)

COMMUNICATION IN MAMMALS WITH DIFFERENT SOCIAL STRUCTURE: A COMPARISON OF MONGOOSE SPECIES

Marta Manser

University of Zurich, Switzerland; Email:marta.manser@ieu.uzh.ch

Social complexity is assumed to be an important selective force in the evolution of communicative and cognitive skills. Social complexity may refer to different aspects of social living, such as group size or group structure, reflected by dominance hierarchies, or fission-fusion character. To test how the social environment affects communication and cognitive aspects, it is best to compare closely related species occurring in ecologically similar habitats, but living in different socially structured units. Within the mongoose family *Herpestidae*, I review research investigating the influence of the social and ecological environment on the vocal communication and underlying cognitive skills of five species. This comparison indicates that social species have a more diverse vocal repertoire than solitary or socially flexible species. Yet, within social species, both social and ecological factors determine the diversity of the vocal repertoire. I conclude that it is important to take the interaction of the social and ecological environment into account to make the best predictions on the diversity of the vocal repertoire and the underlying cognitive mechanisms of a species.

P262 Contributed Poster: COGNITION AND LEARNING 2 (Poster Session B: Thurs. eve)

A NOVEL CASE OF TOOL-USE IN ZOO-HOUSED WESTERN LOWLAND GORILLAS (*GORILLA GORILLA GORILLA*)

Sue Margulis, Gary Steele, Raymond Kleinfelder
Canisius College, United States; Email:margulis@canisius.edu

While all great apes have been documented to use tools, gorillas are arguably the least proficient tool-users. In 2009, a western lowland gorilla (*Gorilla gorilla gorilla*) at the Buffalo Zoo was observed using a bucket, which had been provided as part of normal enrichment, as a tool to collect water. We initiated a systematic investigation of this behavior in 2010. We collected 72 hours of videotaped data, and tested the null hypothesis that the gorillas did not differ in their prevalence of engaging in bucket-use behaviors. We documented that all four adult gorillas in the group used buckets as drinking tools however there was significant individual variation in frequency and type of use of buckets. Categories of bucket interaction ranged from filling the bucket and drinking from it, to hitting the bucket as part of a display, to inverting the bucket as a surface for other activities. One female was the most frequent bucket-user. This poster explores the various occurrences of this unique behavior, describes ongoing efforts to further elucidate the cognitive capacities of gorillas via more complex tasks, and attempts to place this behavior in evolutionary context.

255 Contributed Talk: ECOLOGICAL EFFECTS II (Thursday PM II)

DIFFERENCES IN FITNESS EXPECTATION LEAD TO ANIMAL PERSONALITIES

Nicolaus Marion, Joost Tinbergen, Karen Bouwman, Stephanie Michler, Richard Ubels, Christiaan Both, Bart Kempenaers, Niels Dingemans

Max Planck Institute for Ornithology, Germany; Email:mnicolaus@orn.mpg.de

Research in recent years has shown that individual animals from single populations often differ consistently in their behaviour (or suites of behaviours) over time or contexts. This variation in 'animal personality' is intriguing because behavioural flexibility has long been assumed to evolve instead. Recent theoretical models nevertheless imply that natural selection can favour the evolution of personalities, but their assumptions and predictions remain to be tested. Here we evaluate the predictions of an adaptive model explaining why animals differ consistently in suites of risky actions. Risky personalities would evolve if individuals had different future fitness expectations, where those with high expectations should behave consistently risk-averse. We manipulated reproductive effort in a wild passerine bird, thus creating experimental variation in future fitness expectations, and assayed exploratory behaviour of individuals before and after manipulation. As predicted, experimental increase in future fitness expectations made birds more shy. This study thereby provides the first experimental evidence of key predictions of adaptive personality theory.

389 Contributed Talk: SOCIAL BEHAVIOR VII (Saturday AM)

WHEN GOOD NEIGHBORS DON'T NEED FENCES: TEMPORAL LANDSCAPE PARTITIONING AMONG BABOON GROUPS

A. Catherine Markham, Vishweshia Guttal, Susan Alberts, Jeanne Altmann

Princeton University, United States; Email:amarkham@princeton.edu

Intraspecific competition is a key factor shaping space-use strategies and movement decisions. This competition may result in extreme spatial landscape partitioning in which overlapping territories are rigidly maintained. Alternatively, intraspecific competition may result in temporal landscape partitioning in which ranges overlap yet neighbors are rarely in close proximity. We investigated group-level temporal landscape partitioning in wild savannah baboons (*Papio cynocephalus*) using observer-collected datasets and remotely collected data from GPS collars pre-programmed to record group locations on a synchronous schedule. Annual home ranges of neighboring groups overlapped substantially, supporting the characterization of savannah baboons as non-territorial, but home ranges overlapped less when space-use was assessed over shorter time intervals (e.g. monthly). Strikingly, the proportion of days during which neighboring groups were in close spatial proximity was much less than predicted if groups moved independently of each other, suggesting an avoidance-based social spacing pattern. Our findings highlight the dynamics of landscape partitioning at varying temporal scales.

P144 Contributed Poster: PARENTAL CARE 1 (Poster Session A: Weds. eve)

PROVISIONING ROUTINES IN BIRDS: THE ROLE OF SELF-FEEDING

Shai Markman, Ronald Ydenberg, David Stephens

University of Haifa - Oranim, Israel; Email:shaimarkman@gmail.com

Few studies of patch use have distinguished between acquiring food for self-feeding and for delivery to offspring, and even fewer studies have considered how the balance between self-feeding and provisioning affects the behavior of central place foragers. Palestine sunbirds eat both nectar and arthropods but they only feed arthropods to their nestlings, enabling us to separate self-feeding and delivery decisions. We conducted an experiment which allowed parents to choose between a short feeding route with low self-feeding rate and a longer feeding route with varying rates of self-feeding on their way to a patch for food delivery. We found that sunbirds choose longer routes when their self-feeding rate is higher, therefore spending less time on self-feeding and gaining more energy following a particular foraging bout, while delivering more arthropods for their nestlings. These findings suggest that foraging sunbirds are sensitive to the rate of self-feeding and energy gain, and choose foraging routes to increase food delivery to their young while maintaining sufficient self-feeding to fuel their activities.

P154 ABS Genesis Award Poster: PREDATION AND FORAGING 1 (Poster Session A: Weds. eve)

DOES APOSEMATIC EQUIVALENCE EXPLAIN YELLOW COLORATIONS IN HYPERTOXIC FROGS (*PHYLLOBATES* SPP) ?

Roberto Márquez, Adolfo Amézquita

Universidad de Los Andes, Colombia; Email:r.marquez96@uniandes.edu.co

Animals can modify the behavior of their predators by sending signals that indicate their unprofitability, and make them look for more profitable prey; this strategy is known as aposematism. Aversions are more often generated in predators if the signals are conspicuous, easy to detect and to remember. Bearing conspicuous signals is, however, disadvantageous if aposematic individuals are relatively rare. Both encounter rate with predators and predator learning are reduced, complicating the fixation of conspicuousness. Aposematic coloration could evolve from cryptic ancestors in a step-like manner if predators do generalize from slightly to strongly conspicuous colorations. We assess aposematic equivalence in frogs of the genus *Phyllobates*, where an all-yellow coloration has evolved twice from black with yellow dorsal stripes. We study predator pressures on the different colorations in this genus by using wax models to simulate the appearance of a yellow morph in locations where it is inexistent. To date, equivalence has been observed in avian but not other (e.g. crustacean) predators. Birds attacked ancestral and yellow morphs in equally low frequencies.

P297 ABS Founders Award Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

MOTIVATION-STRUCTURAL CODE AND EXTENDED SONG IN NEIGHBOR-STRANGER DISCRIMINATION INTERACTIONS

Leesia Marshall

University of Arkansas, Fayetteville, United States; Email:seiurusmotacilla@gmail.com

Neighbor-stranger and individual discrimination increases a territory holder's fitness by allowing allocation of appropriate energy to different degrees of threat. The Louisiana Waterthrush, *Parkesia motacilla*, defends linear breeding territories along streams. Its song repertoire includes primary song that contains an individual's song signature and extended song that begins with primary song and continues with a suffix of harsh, low-frequency notes. Playback studies were run to determine if males are capable of discrimination between neighbors, strangers, and neighbors at incorrect boundaries and to determine if changes in aggression and extended song correlate. Louisiana Waterthrushes discriminated between neighbors, strangers, and neighbors at incorrect boundaries with different degrees of aggression. In response to strangers' songs, and to a lesser extent to males at incorrect boundaries, males used more extended song, responded more rapidly, and made more flights in search

of a perceived intruder. Higher levels of aggression resulted in lower low frequency notes and longer song suffixes as predicted by Morton's motivation-structural rules of vocalizations.

P184 ABS Founders Award Poster: SEXUAL SELECTION 1 (Poster Session A: Weds. eve)

FEMALE FIELD CRICKETS ARE NOT MORE RISK-SENSITIVE IN POPULATIONS WITH PHONOTACTIC PARASITIDS

Cassandra Martin, William Wagner Jr.

University of Nebraska, Lincoln, United States; Email: cassiem@unlserve.unl.edu

Female animals may risk predation when associating with conspicuous males. In the variable field cricket (*Gryllus lineaticeps*), male song attracts lethal parasitoid flies (*Ormia ochracea*). Females do not attract flies but can become parasitized when near singing males. In order to reduce their parasitism risk, females from areas with flies may be less responsive to male song. We conducted a reciprocal transplant study to determine if female responsiveness differed between a parasitized and a non-parasitized population. Females from the parasitized population spent more time near male song than females from the non-parasitized population. This was contrary to our expectation that females from the parasitized population would be less responsive. Since male singing activity decreases as males die from parasitism, one possible explanation is that a lack of mating opportunities outweighs the risk of parasitism. We conducted a laboratory study to determine if chorus density affected female responsiveness to male song. We found no effect of chorus density on female responsiveness for either the parasitized or the non-parasitized population.

P402 Contributed Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

DIVERGENCE OF SECONDARY SEXUAL TRAITS IN ALLOPATRY

Michael Martin, Tamra Mendelson

University of Maryland, Baltimore County, United States; Email: mmartin4@umbc.edu

It is well established that speciation can be initiated by geographic isolation; however, the processes and patterns of phenotypic change following initial isolation are not well understood. Divergence in secondary sexual traits is of particular interest as these differences can generate reproductively isolated lineages through the evolution of behavioral isolation. We characterize male color, genetic, microecological, and climatic differences, and geographic distance among 12 allopatric species of darters. Mantel tests show that male color differences increase with genetic distance ($r=0.50$, $p=0.001$) and geographic distance ($r=0.35$, $p=0.009$); however, partial Mantel tests reveal no correlation between geographic distance and male color differences when correcting for genetic distance ($r=0.14$, $p=0.40$). Neither of the environmental measures correlate with differences in male color between species. Our results suggest that changes in male color may not be primarily influenced by differences in a species' environment, and that a model of mutation-order speciation by sexual selection may explain the clock-like manner of changes in male color among darter species.

P214 Contributed Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

THE INFLUENCE OF STREAM FLOW ON SOCIAL STRUCTURE

Arthur Martin III, Emilia Solá Gracia

Saginaw Valley State University, United States; Email: almarti2@svsu.edu

Communication between social organisms develops and sustains the relationships that exist within populations. Animals engage in agonistic interactions that confer the dominance status of an individual. Environmental and physiological factors influence behavior by altering the agonistic interactions that structure social dynamics. Some factors include: the presence of food, shelter, conspecifics, habitat structure, and mates. In aquatic ecosystems understanding factors like shelter location and flow dynamics are crucial to an animal's survival. Analysis of these factors may provide further insight into the effects of agonism on the development of social structure. The crayfish, *Orconectes rusticus*, has been a model organism for understanding dominance and social structure. Four male crayfish placed in an artificial stream were run for 72 hours to analyze the influence of

stream flow on social structure and shelter use. Preliminary data suggests that there is no significant relationship between dominance and time spent upstream. Further analysis of our data set will provide a larger sample size to extrapolate more efficient results on the effects of flow on dominance positioning.

318 Contributed Talk: SOCIAL BEHAVIOR V (Friday AM)

PRO-SOCIAL CHOICES IN RELATION TO DOMINANCE RANK AND RELATIONSHIP QUALITY IN A DESPOTIC PRIMATE

Jorg Massen, Elisabeth Sterck

Utrecht University, Netherlands; Email: j.j.m.massen@uu.nl

Pro-sociality was considered uniquely human, yet has recently been shown in several animal species too. Its evolution is attributed to cooperative breeding and tolerance. However, in an experiment, we demonstrated that also non-cooperative breeding, despotic long-tailed macaques can be pro-social, especially towards kin. Moreover, dominance rank determined pro-social behaviour in an unexpected way; high-ranking individuals grant, while low-ranking individuals withhold their partner access to food. Thus, pro-social behaviour is not used by subordinates to obtain benefits from dominants, but by dominants to emphasize their dominance position. In a second experiment subjects could choose to give to either a friend or a non-friend, since we expected that individuals are more pro-social towards their friends. There was, however, only a minor indication that long-tailed macaques prefer to give to their friends. In contrast, subordinates avoid giving to the individual closest in rank. We conclude that pro-sociality to kin is consistent with tolerance, yet pro-sociality of dominant individuals and to distantly ranked individuals suggest that it may also mediate in competitive strategies.

P169 Contributed Poster: RECOGNITION (Poster Session A: Weds. eve)

THE EFFECTS OF KIN NETWORKS ON PHYSIOLOGY AND SURVIVAL IN BELDING'S GROUND SQUIRRELS

Jill Mateo

University of Chicago, United States; Email: jmateo@uchicago.edu

Belding's ground squirrels (*Uroditellus beldingi*) are group-living rodents that live in high elevation meadows and are active only 3-4 months each summer. Males disperse as juveniles whereas females are philopatric, thus living near kin and favoring the evolution of cooperative behaviors. In humans and some primates, social support and kin networks can lead to improved health, reduced stress responses and enhanced survival, but this phenomenon has not been studied in shorter-lived species. Using a 19-year demographic dataset, with extensive pedigrees and reproductive histories, as well as repeated non-invasive adrenal hormonal monitoring and spatial mapping, I model how these factors affect survival. In particular, I focus on the effects of the number of kin each individual has alive each summer (r , coefficient of relationship = 0.125-0.5) on stress hormones, fitness and survival. I discuss the result in terms of sex and age (yearling, adult) differences, territoriality, and fitness-related heritabilities.

P49 ABS Founders Award Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

ACOUSTIC PROFILING OF WILD AMERICAN CROWS

Exu Mates, Robin Tarter, James Ha, Anne Clark, Kevin McGowan

University of Washington, United States; Email: xamates@uw.edu

The American crow is a highly social bird that forms long-lasting familial relationships. The crow possesses a complex but still poorly understood vocal communication system; many of the calls in its diverse repertoire are difficult to classify and analyze using traditional methods of analysis. Here we examine a collection of calls from a marked population of American crows in Ithaca, NY, with over 20 years of recorded demographic data. Using a novel analytical technique, the calls are represented as locally periodic harmonic stacks with continuously varying pitch. We identify acoustic correlates of sex, age, family membership, and individual identity, and test the utility of these features in caller classification.

P240 Contributed Poster: APPLIED ANIMAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

ETHICS, INVERTEBRATES AND ANIMAL WELFARE

Jennifer Mather

University of Lethbridge, Canada; Email:mather@uleth.ca

What defines an animal? Until recently, regulations for welfare in most countries have specified 'A vertebrate'. Yet 99% of the animals on the planet are invertebrates. Concern for animals often centers on two key questions: how aware are they, and to what extent are they able to perceive pain and have suffering? In the European Union, regulators debated the inclusion of cephalopods and decapod crustaceans under revised Directives for Animal Research. In the end, the new legislation included the cephalopods and excluded the decapods. In preparation for the legislation, the community of cephalopod researchers met at the Euroceph conference in Italy in April, and discussed the problems that this directive brings. A consensus of the group was that we need much more information about what pain and suffering in these animals are, that research is needed to evaluate their responses to standard experimental procedures, and that the issue of awareness in cephalopods is wide open, as there are many opinions about this controversial ability. Still, the regulations will come into force at the end of the year, and w

P77 Contributed Poster: DEVELOPMENT (Poster Session A: Weds. eve)

PERCEPTION OF THE SPAWNING ENVIRONMENT BY CUTTLEFISH EMBRYO INCREASES CRYPTIC BEHAVIOR AT HATCHING

Guibe Mathieu, Dickel Ludovic

GMPc, France; Email:mathieu.guibe01@unicaen.fr

Camouflage is the primary defense mechanism of cephalopods. Cuttlefish show various color patterns to conceal themselves after hatching. These patterns are affected by the previous visual experience of the young. This study investigates whether camouflage in hatchlings is influenced by visual experience of the embryo, *in ovo*. Eggs were incubated in groups with either grey PVC, white sand, yellow sand, checkerboard, or variegated backgrounds. Camouflage efficiency of hatchlings was assessed on the above four substrates by measuring the contrast between the cuttlefish and the background (for uniform body patterns), or by scoring disruptive chromatic components (for disruptive body patterns). Hatchlings coming from eggs that were incubated on sand are the most efficient at matching fine yellow sand while those coming from eggs incubated on variegated substrate displayed the strongest disruptive patterns when placed on a variegated background. This study provides new evidence of the prenatal experience's contribution to defensive behavior development in cuttlefish.

371 Contributed Talk: PREDATION AND FORAGING II (Saturday AM)

INDIVIDUAL VARIATION IN BEHAVIORAL PLASTICITY IN RED KNOTS (*CALIDRIS CANUTUS*)

Kimberley Mathot, Piet van den Hout, Theunis Piersma, Bart Kempenaers, Denis Réale, Niels Dingemanse

Max Planck Institute for Ornithology, Germany; Email:kmathot@orn.mpg.de

Behavior is often thought of as being highly plastic, yet individuals from the same population often differ in their degree of plasticity. Theoretical work suggests that negative-frequency dependent payoffs may favor individual variation in plasticity, because under negative-frequency dependence, the behavioral plasticity of a single individual can benefit all group members. We tested this prediction in a series of experiments using 8 flocks of 6 red knots. Knots were exposed to three levels of predation danger and we recorded the use of two behaviors that differ in the nature of their frequency-dependent payoffs: escape flight duration (positively frequency-dependent) and vigilance (negatively frequency-dependent). In line with our prediction, we observed consistent individual differences in plasticity for the proportion of time spent vigilant, but not the duration of escape flights. However, negative-frequency dependence alone is insufficient to explain why individual differences in plasticity would be

consistent across repeated observations, and we suggest that state-dependence may provide a framework for predicting which individuals should be most plastic

P436 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

THE DISTRIBUTION AND FUNCTION OF AFFILIATIVE BEHAVIOURS IN LIONS, *PANTHERA LEO*

Tomoyuki Matoba, Nobuyuki Kutsukake, Toshikazu Hasegawa

University of Tokyo, Japan; Email: tmatoba@darwin.c.u-tokyo.ac.jp

Affiliative behaviours often characterize individualized intra-group relationship in social animals, but few have investigated functions of these behaviors in non-primate mammals that exemplify convergent social complexity, such as group-living carnivores. Here we investigated the social function of common affiliative behaviours in lions: head rubbing and licking. We conducted behavioural observation on 21 lions kept as one social group and tested four hypothesis. Disproportionately frequent male-male and female-to-male head rubbing were observed, while more than 95% of all licking interaction occurred in female-female dyads. In accordance with social bond hypothesis, and contrary to social status expression hypothesis, both head rubbing and licking were reciprocated in dyads. Dyadic frequencies of head rubbing and licking were positively correlated with relatedness and association index, and negatively with age difference. Contrary to mate attraction and tension reduction hypothesis, neither estrus cycle nor reunion of group members affected the frequency of affiliative behaviours. These results supported social bond hypothesis on the function of head rubbing and licking.

361 Contributed Talk: COMMUNICATION VI (Saturday AM)

POTENTIAL USE OF RUDIMENTARY ECHO-RANGING BY THE HIPPOPOTAMUS (*HIPPOPOTAMUS AMPHIBIUS*)

Maria Maust-Mohl, Joseph Soltis, Diana Reiss

The Graduate Center of the City University of New York, United States; Email: mmaust@gc.cuny.edu

In light of recent genetic evidence supporting a hippo-whale clade and reports that hippos produce click trains underwater, this study investigated whether the hippopotamus (*Hippopotamus amphibius*) uses a rudimentary form of echo-ranging. We recorded the acoustic signals and concurrent behavior of five male hippos at Disney's Animal Kingdom®. Hippos were individually tested on an object detection task to determine whether they produced click trains while searching for food items underwater. During 28 out of 59 experimental sessions with two males that were responsive to the object detection task, 50 clicks trains were produced while hippos were searching underwater and one click train was produced before carrots were offered. No click trains were recorded during baseline recordings or when hippos were not searching for carrots. The restriction of click train production by solitary males searching for carrots underwater provides preliminary evidence these signals serve a non-social role and may function as rudimentary echo-ranging signals. Hippos, like cetaceans, may have developed convergent sensory adaptations to life in the water.

278 Contributed Talk: MECHANISMS II (Thursday PM III)

A CHANGE IN ENERGETIC STATE DICTATES PERCEPTION OF REWARD VALUE AND SENSITIVITY TO RISK

Christopher Mayack, Dhruva Naug

Colorado State University, United States; Email: Chris85@rams.colostate.edu

The energy budget rule of Risk Sensitivity Theory predicts that it is adaptive for an animal to choose a constant reward (be risk-averse) when it is on positive energy budget and choose a variable reward (be risk-prone) when it is on a negative budget. It has however been notoriously difficult to find conclusive empirical support for these predictions. We performed a comprehensive test of the energy budget rule in the honeybee by constructing empirical utility functions and by testing the choice of bees for a constant or a variable reward with an olfactory conditioning assay subsequent to manipulating their energy budgets. We demonstrate that bees on an increasing

energy budget are risk-averse and those on a declining budget are risk-prone in accordance to the energy budget rule but also show that subjects maintained on constant high or low energy budgets are risk-indifferent, which suggests that an animal must perceive a change in its energetic state to be risk-sensitive. These results indicate that individual energy budgets can regulate decision-making in social animals and energetic stress can be the cause of risky foraging observed in parasitized honeybees.

73 Symposium: COMMUNICATIVE COMPLEXITY (Friday)

A PHYLOGENETIC REVIEW OF THE EVOLUTION OF COMMUNICATIVE IN CETARTIODACTYLA

Laura May-Collado

University of Puerto Rico, United States; Email:lmaycollado@gmail.com

Cetartiodactyls emit a variety of acoustic signals during social interactions described as whistles, grunts, moans, bursts, among others. While the evolution of some of these sounds remains uncertain others have been hypothesized to evolved in concert with sociality. However, the confusing nomenclature of cetartiodactylan sounds tends to obscure homologies and frustrates comparison of sounds across mammalian groups. To understand how cetartiodactylan acoustic signals have evolve and how sociality may have play a role in their evolution I 'reclassified' signals into frequency and time components and correlate these variables with discrete and continuous categorizations of their social structure. I reviewed over 500 studies on cetartiodactylan acoustic signals and social structure and phylogenetically test proposed hypotheses of their co-evolution on a recently published species-level phylogeny of 620 cetartiodactylans. I used a variety of phylogenetic methods (independent contrast, character association tests, concentrated changes test) to test the various hypotheses while accounting for phylogenetic uncertainty, variation in body size, and differences in sound producing mechanism

98 Contributed Talk: SEXUAL SELECTION I (Tuesday AM)

MALE VOCAL BEHAVIOUR AND FEMALE MATE CHOICE IN A TROPICAL LEKKING BIRD, THE LONG-TAILED MANAKIN

Dugan Maynard, Kara-Anne Ward, John Burt, Stephanie Doucet, Daniel Mennill

University of Windsor, Canada; Email:maynardd@uwindsor.ca

Long-tailed Manakins (*Chiroxiphia linearis*) are neo-tropical lekking birds with an unusual mating system; pairs of unrelated males perform coordinated duets and elaborate dances to attract females and entice them to mate. The goal of our research is to determine how male vocalizations influence female reproductive behaviour in a wild population of manakins located in Costa Rica. Our research employs a novel radio-tracking system which records the movement of tagged females through the environment. We evaluate these spatial data in conjunction with acoustic information obtained from recording devices. We explore the relationship between male vocal output, male duet synchrony, and female visitation. Evaluating diel variation in male vocal behaviour shows a radically different pattern relative to other populations of Long-tailed Manakins in different habitats. Our study examines the relationship between male advertisement behaviour and female mate choice in a natural setting, in a tropical system where male-male aggression and variation in territory quality do not influence reproductive behaviour.

200 Contributed Talk: SOCIAL BEHAVIOR IV (Thursday AM)

SOCIAL NETWORKS AND DOMINANCE: TRIAD MOTIFS AS A GUIDE TO DYNAMIC PROCESSES

David McDonald, Daizaburo Shizuka

University of Wyoming, United States; Email:dbmcd@uwyo.edu

Fitness can hinge on dominance status. We propose applying social networks to dominance because: 1) contrasting empirical data with simulated biologically-motivated or random networks generates alternative hypotheses for experimental test; 2) one can track dynamic trajectories driven by intrinsic (condition, size) or

extrinsic factors (winner, audience effects) ; 3) level of analysis ranges from individual to dyad to entire group; 4) network data can address other questions (are the highly-connected more likely to disperse?) ; 5) many algorithms exist, using accessible software (R, UCINet). Theory suggests that low-level triadic interactions largely determine high-level structure (clustering, linearity). Using a well-developed theoretical framework, the triad census, we show that published data have excess double-dominant triads (a~b, a~c) and few pass-along triads (a~b~c). Such deviations from expectation suggest hypotheses about time (unfolding process vs. behavioral equilibrium?), stakes (mating success vs. a grain of corn?), winner effects (if a~b, do hormones or motivation change the odds of a~c?) and audience effects (is non-interaction avoidance or insufficient sampling?).

240 Contributed Talk: COMMUNICATION IV (Thursday PM I)

SIGNAL PRODUCTION BY WAGGLE-DANCING FORAGERS IN GENETICALLY DIVERSE HONEY BEE COLONIES

Katherine McDonald, Morgan Carr-Markell, Heather Mattila

Wellesley College, United States; Email: kmcdonal@wellesley.edu

Queens of most social species of bees, ants, and wasps mate singly and give rise to colonies whose members are highly related to one another because of shared parentage. Honey bees are unusual because queens of all species are extremely polyandrous, which lowers average relatedness within each colony and introduces an enormous level of genetic diversity into its work force. This increase in genetic diversity is associated with an increase in the production of waggle dances by foraging workers who are recruiting nest mates to lucrative food sources. Here, we determine whether an increase in waggle dancing is linked to enhanced release of "dance" pheromone by workers. By manipulating insemination status of queens, we created colonies that were genetically diverse or genetically uniform and trained workers to visit a sucrose feeder. Signal production by foragers upon return to their hive was assessed in light of the genetic profile of their colonies and their subfamily. Genetic status of workers and colonies did not influence per-capita pheromone production, however, increases in pheromone release (regardless of paternity) were linked to increased dance duration and frequency.

201 Contributed Talk: SOCIAL BEHAVIOR IV (Thursday AM)

MALE COMPETITION IN A SOCIAL LIZARD; NEITHER SIZE OR AGGRESSION PREDICT A WIN

Jo McEvoy, Geoff While, David Sinn, Erik Wapstra

University of Tasmania, Australia; Email: jmcevoy@utas.edu.au

Competition between males influences resource acquisition, reproductive success, & survival & is thus a key component of natural & sexual selection. Size is typically advantageous in competition, with larger males doing better than smaller males. However, larger males are also often more aggressive, it is therefore difficult to disentangle the relative roles of size & aggression in mediating the outcome of competitive interactions & to elucidate the consequences for social system dynamics. In *Egernia whitii*, a social lizard species which exhibits consistent individual variation in aggression, male size is decoupled from aggression, providing an opportunity to examine the relative importance of size & aggression in competitive interactions. We integrated a detailed field study, with a laboratory experiment designed to test competition over a limited resource. Neither aggression or size predicted competition outcome in the laboratory nor did they predict home range size, overlap, or reproductive success in the field. This suggests additional behavioural, morphometric, or social traits (& their interactions) may be key to understanding male competition within this species.

P363 Contributed Poster: PARENTAL CARE 2 (Poster Session B: Thurs. eve)

EFFECT OF PATERNAL CARE ON OFFSPRING BEHAVIOR AND WHOLE GENOME EXPRESSION IN THREESPINED STICKLEBACK

Katie McGhee, Alison Bell

University of Illinois, United States; Email:kemcgree@illinois.edu

Parental effects have the potential to influence offspring phenotype non-genetically. In species with paternal care, these parental effects may occur behaviorally via the offspring care provided by fathers. We examined how fathers might influence offspring antipredator behavior in the threespined stickleback where fathers are solely responsible for offspring care. We split a father's brood into those that were reared artificially (orphans) and those reared by the father (father-reared). We assessed antipredator behavior in the juveniles and examined their brain gene expression using whole genome microarrays. On average, father-reared offspring exhibited higher levels of antipredator behavior than orphaned offspring. However, there was large variation among fathers in the degree to which their orphaned and father-reared offspring differed from one another, both in antipredator behavior and brain gene expression. In addition, the intensity of a father's paternal care corresponded to the levels of expression of particular genes in his offspring. Altogether, these results suggest that the potential importance of paternal effects may depend on the identity and behavior of the father.

336 Contributed Talk: DEVELOPMENT II (Friday PM I)

NATAL PHILOPATRY, RANGING, AND HABITAT USE OF JUVENILE BOTTLENOSE DOLPHINS IN SARASOTA BAY, FL

Katherine McHugh, Jason Allen, Aaron Barleycorn, Randall Wells

Sarasota Dolphin Research Program, United States; Email:kmchugh@mote.org

While the behavior of adult dolphins has been explored, relatively little is known about behavioral development of juveniles. This study investigated natal philopatry and the development of ranging and habitat use patterns in newly-independent juvenile bottlenose dolphins (*Tursiops truncatus*) at a long-term study site, utilizing both long-term sighting data and new information on movements, habitat selection, activity patterns, and social associations collected through focal animal behavioral observations during 2005-2008. We documented differences in juvenile dolphin ranging patterns and habitat use by sex, season, and age, and investigated the degree of maternal influence on these behaviors and the functional significance of juvenile groups. We found that both males and females exhibited a high degree of natal philopatry and had similar ranging and habitat selection patterns during the juvenile period. Seasonal and age related differences in juvenile behavior were evident, and there appear to be lasting maternal influences on habitat selection and ranging patterns. These findings provide a more comprehensive picture of inshore dolphin behavior throughout life history.

376 Contributed Talk: SEXUAL SELECTION V (Saturday AM)

EXPERIMENTALLY DELAYED AMERICAN REDSTART MALES SUFFER REDUCED REPRODUCTIVE SUCCESS

Ann McKellar, Peter Marra, Laurene Ratcliffe

Queen's University, Canada; Email:ann.mckellar@queensu.ca

Early-breeding birds often have higher reproductive success than late-breeders, either as a consequence of timing-specific advantages (timing hypothesis) or because these individuals and/or their resources are of higher quality (quality hypothesis). We test these hypotheses by experimentally delaying arrival date to the breeding grounds in a group of male American redstarts (*Setophaga ruticilla*), a species for which early male arrival is known to increase reproductive success. Experimentally delayed males were made to "arrive" approximately 1-2 weeks later than their true arrival date, forcing them to lose their first female mate and/or territory, and the manipulation itself did not result in any decrease in body condition in delayed males. We found that naturally early-arriving but delayed males suffered reduced reproductive success in comparison to both early-breeding and late-breeding control males. These results indicate that neither timing alone nor individual quality can explain the relationship between arrival and reproductive success in this species. We present evidence for two alternatives under the quality hypothesis: female quality and territory quality.

P26 Contributed Poster: COGNITION AND LEARNING 1 (Poster Session

A: Weds. eve)

DO ANIMALS NEED WATCHES? ORDINAL AND INTERVAL TIMING IN PIGEONS (*COLUMBA LIVIA*)

Neil McMillan, William Roberts

University of Western Ontario, Canada; Email:nmcmill2@uwo.ca

Interval timing in animals is ubiquitous, and appears to be automatic in a variety of behavioural tasks. However, timing of ordinal events has only been modestly studied, mostly in ecological settings. We compared timing of ordinal and interval sidekeys for pigeons in an operant chamber. On different trials, pigeons were presented with sequences of red-green-blue (rewarded) or green-red-blue (nonrewarded) on one sidekey [ordinal go/no-go], or a circle (rewarded) or triangle (nonrewarded) stimulus on the other sidekey [interval go/no-go]. Grain reward was available to the first peck 60 s after initial stimulus onset in both reward contingencies; in the nonreward contingencies, the stimulus shut off after 60 s. Results indicated that pigeons were able to accurately 'time' the sequence of information on the ordinal sidekey, but surprisingly showed disrupted timing for the interval sidekey. Pigeons appeared to readily track identity of stimuli, but only used interval duration as a secondary predictor for food reward.

328 Contributed Talk: BEHAVIORAL COMMUNITY ECOLOGY (Friday PM I)

RELAXED SELECTION AND ENVIRONMENTAL CHANGE DECREASE REINTRODUCTION SUCCESS IN SIMULATED POPULATIONS

M. Elsbeth McPhee, Nicholas McPhee

University of Wisconsin, Oshkosh, United States; Email:mcpheem@uwosh.edu

Increased variance in captive-bred populations could be one cause of high mortality rates observed when they are released into the wild because a significant proportion of the release population exhibits traits that are not appropriate for the wild. We used evolutionary simulation to examine the effects of relaxed selection on trait variance and reintroduction success when populations are released into static and changing environments. Our simulations show that when wild environments remained stable and selective pressures on given traits were quite strong (1) relaxation of selective pressures led to significant increases in trait variance, (2) trait variance rapidly decreased when pressures were restored, (3) the smaller the population size, the lower the probability of persistence, and (4) there was often a significant lag time between reintroduction and eventual extinction, reinforcing the importance of long-term monitoring after release. When captive-bred populations were reintroduced into changing environments, strength of selection in the release habitat most influenced survivorship.

P298 ABS Founders Award Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

TAIL SIGNALS OF EASTERN GRAY SQUIRRELS INCLUDE BOTH GENERIC AND PREDATOR-SPECIFIC ALARMS

Thaddeus McRae

University of Miami, United States; Email:mcrae@bio.miami.edu

Eastern gray squirrels (*Sciurus carolinensis*) have both aerial and terrestrial predators and are known to use tail signals as alarms. To test whether tail signal amplitude (small or large) is associated with predator type (aerial or terrestrial), individual squirrels were presented with two moving predator models, namely hawk and cat, and three kinds of controls: a ball thrown through the air, a ball on a motorized base, and the motorized base alone. Small tail signals were generic alarm signals; there was no association of small tail signal use with object presented. In contrast, large tail signals were strongly associated with object type, suggesting that gray squirrels discern specific threats and respond accordingly. The association is largely due to inhibition of large tail signals in response to the model hawk. When facing terrestrial predators squirrels are safe from attack once in a tree and

so use large tail signals - advertising their locations with impunity. However, aerial predators can pluck squirrels right out of trees, so in the presence of a hawk squirrels may benefit from using only small tail signals that are less likely to attract a hawk's attention.

P403 ABS Founders Award Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

DIETARY PROTEIN AFFECTS IRIDESCENT COLORATION IN ANNA'S HUMMINGBIRDS (*CALYPTE ANNA*)

Melissa Meadows, Kevin McGraw

Arizona State University, United States; Email:melissa.meadows@asu.edu

Many animal displays involve colorful ornaments that signal an individual's quality as a mate or rival. Brilliant iridescent ornaments are common, but currently little is known about their production cost and signaling value. In this study, we experimentally manipulated the level of dietary protein available during molt in male Anna's hummingbirds (*Calypte anna*). Protein, the primary component of feathers, is naturally restricted in hummingbirds' diet, which consists mostly of nectar. We predicted that hummingbirds fed higher protein during molt would produce more colorful ornaments. We fed captive birds either a 6% (HIGH) or 3% (LOW) protein diet and stimulated molt by plucking half the gorget and crown ornaments on each bird as well as a non-ornamental iridescent green tail feather. We found that birds fed higher protein diets molted in significantly more colorful crown feathers (higher red chroma and redder hue) than those fed the low protein diet. Additionally, HIGH birds molted in more yellow-shifted green tail feathers than LOW birds. These results indicate that iridescent ornamental feathers are sensitive to diet quality, and may serve as a signal to mates or rivals.

P263 ABS Founders Award Poster: COGNITION AND LEARNING 2 (Poster Session B: Thurs. eve)

ASSESSING MATE PREFERENCES VIA OPERANT CONDITIONING IN CICHLID FISHES

Angela Medina-Garcia, Moira van Staaden

Bowling Green State University, United States; Email:angelam@bgsu.edu

Female mate preference and subsequent mate choice depend on evaluating the attributes and behaviors of the courting male, but also on the internal state of the female. Operant behaviors reflect the motivational state of an individual through its willingness to 'work' to gain access to positive reward. Thus, an associative learning paradigm has significant potential for unraveling the complex factors underlying mate choice. Here we test the utility of this approach to assess mate preferences in the Malawian cichlid, *Metriaclima zebra*. Females were trained in an automated system in which swimming through a hoop was rewarded with visual access to a computer animation of a conspecific male. We then measured the relative preference of gravid females for a set of conspecific and heterospecific males in a series of two-choice tests. Results demonstrate that *M. zebra* females show association between task and reward, and that computer-animated stimuli effectively serve the latter function. Combining an operant conditioning paradigm with computer-animated stimuli creates a powerful tool for resolving the sensory and motivational factors underlying mating preference in cichlids.

234 Contributed Talk: COGNITION AND LEARNING IV (Thursday PM I)

NAVIGATIONAL EXPERIENCE HAS AN INFLUENCE ON BRAIN LATERALISATION AND HIPPOCAMPUS SIZE IN PIGEONS

Julia Mehlhorn, Gerd Rehkämper

University of Düsseldorf, Germany; Email:julia.mehlhorn@uni-duesseldorf.de

The brain of homing pigeons seems to be functionally adapted to homing with e.g. larger hippocampi and olfactory bulbs. Furthermore, functional lateralisation occurs as well in homing pigeons. To show in what way brain structure volume and lateralisation is caused by experience, the brains of two groups of homing pigeons were investigated. One group exhibit a lot of navigational experience, e.g. acquired by participating in pigeon races, the other group stayed permanently in the loft and did not share these experiences. All individuals were sacrificed and morphometric analyses were carried out to measure the volumes of 12 brain structures.

Individuals with navigational experience had an 11.2% larger hippocampus relative to the telencephalon compared to unexperienced individuals. Both pigeon groups show a lateralised hyperpallium apicale. Additionally, experienced pigeons show as well a volumetrical lateralised nidopallium, hippocampus and optic tectum. Our data confirms that the brain of homing pigeons is an example for mosaic evolution and indicate that plasticity and lateralization are correlated with individual life history and not exclusively genetically determined.

P196 Contributed Poster: SEXUAL SELECTION I (Poster Session A: Weds. eve)

PLASTICITY IN A PREEEXISTING MATING BIAS IN RESPONSE TO VARIATION IN THE PREDATION ENVIRONMENT

Andrew J. Melie, Alexandra L. Basolo

University of Nebraska, Lincoln, United States; Email:andrew.melie@huskers.unl.edu

Female green swordtails, *Xiphophorus helleri*, prefer males with long swords, yet the preference is plastic; under high predation conditions, they do not prefer longer sworded males. It is not clear whether a female would show similar plasticity when she has experienced a successful predation event versus the presence of a nearby, potential predator. In this study, we examined whether different levels of perceived predation risk affect the female sword response to different degrees. We used video playback to examine female response to two courting males: one with a long sword and the same male with a short sword. We scored female responses prior to and after exposure to one of the treatment videos: a predation event on a male swordtail with a short sword by a cichlid, a cichlid swimming in a tank devoid of other fish; or a control. Females showed a greater shift in their preference after a predation event than in the presence of a predator alone, suggesting that a successful predator is a greater threat to the female than a nearby predator. This suggests that female preference for long sworded males can have differing degrees of plasticity depending on the predation environment.

P90 Contributed Poster: EDUCATION (Poster Session A: Weds. eve)

TROUBLED TRANSITIONS INTO COLLEGE AND THE EFFECTS OF A SMALL CLASS INTERVENTION ON RETENTION

David Mellor, Rebecca Jordan

Rutgers University, United States; Email:dmellor@rci.rutgers.edu

Student achievement during the first two semesters at college is a predictor of the likelihood of attrition. In the following study, the causes of poor academic performance in the first semester are examined through interviews and questionnaires. A small intervention class is then implemented and administered to a random sample of students on academic probation after their first semester. The effects of this course on students' locus of control, academic self-efficacy, rate of retention, and GPA are measured. The course had a modest positive effect on retention and academic self-efficacy, but not on locus of control or GPA. Preliminary data from the second year of intervention will also be reported.

169 Contributed Talk: COMMUNICATION II (Wednesday AM)

LOVE SONGS OR BATTLE CRIES: DO DUETS OF TROPICAL WRENS INFLUENCE EXTRA-PAIR AND PARENTAL BEHAVIOUR?

Daniel Mennill, Sarah Douglas

University of Windsor, Canada; Email:dmennill@uwindsor.ca

In many tropical animals breeding partners coordinate their songs in vocal duets. Based on 8 years of research on Rufous-and-white Wrens in Costa Rica, we explore the function of duets in extra-pair mating behaviour and parental behaviour. Microsatellite paternity analysis using four variable loci reveal that Rufous-and-white Wrens follow a mixed reproductive strategy. We found extra-pair young sired by neighbouring males in a small minority of broods, yet we found no compelling evidence that duets play a role in guarding paternity in this species. We compare extra-pair paternity estimates between duetting versus non-duetting species of tropical birds, and find significantly lower levels in the former group. Based on detailed observations of parental

behaviour, we found only a weak relationship between vocal duets and parental investment. We found no compelling support for the reproductive synchrony or signaling quality hypotheses, and weak support for the signaling commitment hypothesis for duet function. Cumulative results from eight years of study on this population reveal that duets play a more prominent role in other functions, including territory defense and acoustic contact.

P353 ABS Founders Award Poster: MECHANISMS 2 (Poster Session B: Thurs. eve)

SEXUAL SIGNALS, IMMUNITY AND CORT IN TWO ICTERID BLACKBIRDS: STATIC SIGNALS MEET CURRENT CONDITION

Loren Merrill, Adrian O'Loughlen, Stephen Rothstein, John Wingfield

University of California, Santa Barbara, United States; Email:lmerrill@lifesci.ucsb.edu

Secondary sexual traits in males are thought to convey information about the quality of the male to rivals and potential mates. Static signals such as song repertoire size in close-ended learners and sexually selected plumage are thought to convey information about how well a male went through a critical period, such as development or molt, but it is unclear whether they should be related to a male's current condition. We examined repertoire size in brown-headed cowbirds (*Molothrus ater*) and epaulet size in red-winged blackbirds (*Agelaius phoeniceus*) as well as two measures of immune function and levels of corticosterone (CORT) to determine if these signals are related to current condition. We found that both repertoire size and epaulet size were significantly negatively correlated with the bactericidal capacity (BC) of the blood but neither was correlated with the phytohemagglutinin swelling response. CORT was significantly positively correlated with repertoire size but not BC in cowbirds. There was no significant correlation between CORT and epaulet size, but there was a significant positive correlation between CORT and BC in redwings.

P91 Contributed Poster: EDUCATION (Poster Session A: Weds. eve)

TEACHING ANIMAL BEHAVIOR IN A LEARNING COMMUNITY AT RAYSTOWN FIELD STATION

Justin Merry

Saint Francis University, United States; Email:jmerry@francis.edu

Raystown Field Station offers immersion semesters to students enrolled at Saint Francis University and Juniata College. Up to fourteen students, split between the institutions, live at the station and take courses that are designed to complement one another in scope and focus. Academics at the station includes not only coursework, but also a cumulative research project that requires students to integrate several small projects on a common theme into a single paper. During Spring Semester 2011, I taught BIOL 208 Animal Behavior at the station. A variety of pedagogical approaches were used during the lecture portion of the course, ranging from traditional lectures, discussions, Q&A sessions, and student-led presentations. Laboratories were usually inquiry-based, allowing students to explore proximate and ultimate causes of animal behavior using living animals. Due to issues of reliability and weather, most labs were conducted indoors using animals purchased or reared in culture. In future semesters at the station, I plan to add more field-based labs to take better advantage of the immediate access to fauna around the station.

243 Contributed Talk: ECOLOGICAL EFFECTS I (Thursday PM I)

DIFFERENCES IN SPATIAL EXPLORATION BETWEEN RESIDENT AND NOMADIC PARROT SPECIES

Claudia Mettke-Hofmann

Liverpool John Moores University, United Kingdom; Email:C.C.Mettke-Hofmann@ljmu.ac.uk

Resident and migratory bird species differ tremendously in their reaction when confronted with changes in their familiar environment or when exploring a novel environment. Generally, residents readily investigate changes in their familiar environment and explore novel environments very detailed. Likewise, nomadic species explore

changes in their familiar environment less than closely related resident species. However, little is known about spatial exploration in nomads. I experimentally compared spatial exploration of ten closely related parrot species. Four each were pure residents or nomads and two consisted of resident and nomadic populations (res/nom). Birds were kept in same-species pairs and allowed to explore two unfamiliar but identical rooms left and right of their familiar aviary. Nomads explored the rooms for a shorter time and started tactile exploration later but visited more new perches per movement than residents or res/nom. Neither diet nor habitat type did explain differences in behaviour. It is concluded that nomads similarly to migrants invest less time in information gathering in a novel environment than residents as an adaptation to their life on the move.

P104 Contributed Poster: GENETICS AND EVOLUTION 1 (Poster Session A: Weds. eve)

ONTOGENY OF COMPLEX BEHAVIOR: BURROW CONSTRUCTION IN DEER MICE (PEROMYSCUS)

Hillery Metz, Linda Pan, Hopi Hoekstra

Harvard University, United States; Email:hillerymetz@gmail.com

Complex behaviors often first appear during ontogenesis, but the timing and progression of behavioral development within and between species with distinct adult behavior is often unknown. To study this problem, we capitalize on interspecific variation in burrowing behavior in deer mice (genus *Peromyscus*). Here we examine the ontogeny of burrowing in two sister species *P. polionotus* and *P. maniculatus* that construct markedly different burrows as adults: 'complex' burrows of *P. polionotus* are long with defined entrance and escape tunnels, while simple burrows of *P. maniculatus* comprise a single, short tunnel. By measuring burrow construction in juveniles, we found striking ontological differences between species in both timing and development of burrowing behavior. *P. polionotus* excavated burrows as early as 19 days of age, while *P. maniculatus* did not burrow until 27 days, and throughout ontogeny *P. polionotus* burrows were always longer. *P. polionotus* juveniles also produced burrows with the typical complex shape of their species, although smaller than adult burrows, even at the earliest ages tested. These data show that species-specific burrowing behavior appears early in life.

P327 Contributed Poster: GENETICS AND EVOLUTION 2 (Poster Session B: Thurs. eve)

ARACHNOLINGUA: A CONTROLLED VOCABULARY FOR SPIDER BEHAVIOR

Peter Midford

National Evolutionary Synthesis Center (NESCent), United States; Email:pmidford@nescent.org

Although ontologies have played an increasing role in the study of genomics and have recently attracted attention among comparative anatomists, ontologies are relatively unknown amongst behaviorists. Several difficulties may be impeding further interest in an informatics tool kit of value in comparative studies as well as documenting behavioral diversity. This poster describes a controlled vocabulary of names applied to behavior patterns in spiders (across the range of behaviors, including locomotion, habitat construction, prey capture, courtship and mating) being constructed as a test bed. This vocabulary can serve as a source of example of challenges in capturing behavior descriptions in logical formalism. The vocabulary is also used to explore the quality of term coverage provided by several existing behavior ontologies. These include Ethosource's 'Core' behavior ontology and the combination of the Biological Process branch of the Gene Ontology with the Phenotypic Quality Ontology (also known as PATO). The vocabulary itself will be available as both a browsable website (<http://ethontos.org/arachnolingua>) and as an RDF file.

8 Plenary Lecture: (Saturday AM)

ON DOGS, ROBOTS AND BEHAVIOURAL DATA: THE MAKING OF ETHOLOGY IN THE 21ST CENTURY

Ádám Miklósi

Eötvös University, Hungary; Email:amiklosi62@gmail.com

In the presentation I would like to raise the issue to what degree the concept of ‘cognition’ (and related terms) helps behavioural biologists who are interested in animal problem solving. Taking a functional approach, problem solving (in nature) is the behavioural manifestation of cognitive (mental) skills. Although cognitive terms (intention, imitation etc.) have the advantage to provide a general “code” for conceptualizing animal and human minds, they may be biased because they reflect the (linguistic) thinking of one species, humans. The many different definitions of some cognitive terms may also show the effort of researchers to accommodate a human-based concept to the species under investigation. In a few years new methods of studying behaviour may be available, and we should start to think about how to utilise this possibility. Behaving agents whether virtual or real may provide new tools for understanding behaviour. The historic question “How does it work?” could be extended to “How do I make one that works like that?” which is an alternative way for modeling behaving systems. These views on future behavioural studies in next 10-20 years could be visionary or very naive (or simply wrong), but in any case we have to start thinking about ethology moving into the 21st century.

P328 ABS Founders Award Poster: GENETICS AND EVOLUTION 2 (Poster Session B: Thurs. eve)

A POPULATION GENETIC APPROACH INVESTIGATING EFFECTS OF URBANIZATION ON THE BLACK WIDOW SPIDER

Lindsay Miles, Robert Ziemba, Brian Verrelli, J. Chadwick Johnson

Arizona State University, United States; Email: lsmiles@asu.edu

Urbanization causes a sudden and drastic change to the landscape. This new urban landscape will fragment habitats, disrupting dispersal, leading to a reduction in genetic diversity of the organisms living in the urban habitats. Some species maintain levels of genetic diversity similar to their non-urban counterparts. Due to the variable effects caused by urbanization, it is important to understand the genetic variation if we wish to understand why some species thrive in urban environments and become pest species. I test the hypothesis that urbanization and habitat fragmentation does not restrict gene flow in urban black widow populations. Certain landscape features may have a greater impact on gene flow than the standard isolation by distance model. I test the extent to which urban landscape characteristics, such as extreme disturbance, moderate disturbance, and undisturbed desert, impact genetic differentiation of black widow spiders. The results found in this study provide insight as to what landscape features have a greater impact on genetic diversity which can be applied to landscape management techniques.

P215 Contributed Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

SOCIALITY IN NEWBORN AND YOUNG GUPPIES

Maria Elena Miletto Petrazzini, Christian Agrillo, Stefania Candilera, Marco Dadda, Angelo Bisazza

Italy; Email: mariaelena84_m@libero.it

Assessment of cognitive abilities often involves individual training and hence requires that an animal is maintained in social isolation for prolonged periods. This raises ethical problems, especially when newborns and young individuals are the target of the research. In order to design ethically acceptable procedures to study ontogeny of cognitive abilities, we investigated development of sociality in guppies from birth to adulthood. Using a two choice apparatus, we measured gregarious tendency at different ages. Newborns were found to spend similar amount of time near an empty compartment as near a group of same age fish. Gregariousness increased with age and adults were found to significantly prefer the vicinity of conspecifics. In a second study we investigated the possibility of using mirrors as a surrogate of social companions, when individual testing is unavoidable, by measuring the preference of single guppies for either real conspecifics or their own mirror image. Guppies of all ages showed no preference for real fish over virtual ones a result that indicates the possibility of using mirror images to avoid social deprivation during individual cognitive tasks.

P315 Contributed Poster: ECOLOGICAL EFFECTS 2 (Poster Session B: Thurs. eve)

FEMALE REPRODUCTIVE PHYSIOLOGY AND BEHAVIOR IN RED COLOBUS MONKEYS, *PROCOLOBUS RUFOMITRATUS*

Krista Milich, Rebecca Stumpf, Janice Bahr

University of Illinois, United States; Email: kmilich2@illinois.edu

Understanding the factors influencing female reproduction is essential for the conservation of endangered species and can provide insight into behavioral adjustments in response to environmental change. This study examines the impact of habitat quality on reproductive physiology and behavior in the female red colobus monkeys (*Procolobus rufomitratu*s) of Kibale National Park, Uganda. We investigate the relationship between reproductive hormone profiles, genital swellings, and mating behaviors in logged vs unlogged areas. Focal follows of 40 females from 6 groups of habituated red colobus monkeys (3 groups in logged and 3 in unlogged areas) resulted in approximately 7000 hours of observation time. Focal female genital swelling size and all mating behaviors were recorded daily, and 600 fecal samples from focal females were assayed for reproductive hormone concentrations. Results indicate that despite having similar hormone profiles, females in logged areas had lower rates of mating behaviors than females in unlogged areas ($P > 0.05$) and mating bouts were more constrained to periods of maximum swelling. This provides insight for the proper management of this endangered species.

256 Contributed Talk: ECOLOGICAL EFFECTS II (Thursday PM II)

IS THIS A GOOD NEIGHBORHOOD TO RAISE KIDS? AN INSECTS CONSULTS BOTH CONSPECIFICS AND HETEROSPECIFICS

Christine Miller, Robert Fletcher, Jr., Stephanie Gillespie

University of Florida, United States; Email: cwmiller@ufl.edu

Animals commonly look to others when making decisions. Not only are individuals of the same species informative, but individuals of other species have the potential to provide different and possibly more useful information. Here we report that an insect species can recognize and respond to information provided by both conspecifics and heterospecifics, and furthermore, that the response to each type of information changes with environmental circumstances. We studied *Narnia femorata* and its relative, *Chelinidea vittiger* (Hemiptera: Coreidae), that live together on prickly-pear cactus plants, sharing the same predators, but feeding on different parts of the plant. *N. femorata* feeds on and performs best on cactus with fruit, while *C. vittiger* only needs cactus pads. *N. femorata* females alone on low-quality cacti (without fruit) produced few offspring, but boosted egg production when conspecific juveniles were present. Conversely, females on high-quality hosts (with fruit) responded most positively to heterospecific juveniles. These responses are likely due to the unique information conveyed by conspecifics and heterospecifics.

P185 Contributed Poster: SEXUAL SELECTION 1 (Poster Session A: Weds. eve)

FEMALES IN A FLIGHT POLYPHENIC FIELD CRICKET EXPRESS ALTERNATIVE REPRODUCTIVE TACTICS

Chandreyee Mitra, William Wagner Jr., Anthony Zera

University of Nebraska, Lincoln, United States; Email: cmitra@unlserve.unl.edu

Examining variation in female reproductive behaviors is important, as variation among females can affect the evolution of traits in both sexes. We examined variation in female mating behaviors of a flight polyphenic field cricket. Previous studies have found that different morphs of these crickets trade-off early reproduction with flight-capability. We hypothesized that flight-capable and flightless morphs may be expressing alternative reproductive tactics. Flight-capable females may trade-off early reproduction for flight, allowing them access to areas with more males. They may benefit from being choosy because, as their initial reproductive investment is lower, direct benefits from males may strongly affect their fitness. In contrast, flightless females may trade-off flight capability for earlier reproduction, at the risk of not mating if males are scarce. Their reduced mobility

may limit the ability to be choosy, and since they do not invest in flight muscles, their fitness may not be as affected by direct benefits from males. Our results supported these hypotheses: flight-capable females had smaller ovaries, were less responsive to average male song, and were more choosy.

285 Contributed Talk: PARENTAL CARE II (Thursday PM III)

BIPARENTAL CARE: ASYMMETRIES IN THE VALUE OF CARE

Douglas Mock, P Schwagmeyer, Geoffrey Parker

University of Oklahoma, United States; Email:dmock@ou.edu

Most empirical tests of ESS biparental care models have focused on avian provisioning of offspring, where units of care contributed by either parent are equally valuable. Males and females may not be equally good at all forms of care, however, and sexual asymmetries in the value of care may underlie sex differences in contributions to care. We have recently begun studies of how potential conflicts of interest over parental investment by house sparrows are resolved during the incubation phase. As a preliminary step, we are comparing the competence of males and females at rewarming and maintaining nest/egg temperatures. Our results so far show no evidence that average nest temperatures differ according to sex of the on-duty parent. However, nest temperatures tend to be cooler when females begin a bout, and females raise nest temperatures more than males after four minutes on-duty. Along with sex differences in opportunity costs, this sexual asymmetry in the value of care may explain why females of this species contribute far more than males during incubation; it also has implications for the relative level of sexual conflict over care during incubation vs. provisioning.

P50 ABS Founders Award Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

COMPLEX VOCAL REPERTOIRES IN A LEAF-ROOSTING BAT

Bianca Montero, Erin Gillam

North Dakota State University, United States; Email:Bianca.Montero@ndsu.edu

Bats have developed a series of morphological, physiological and behavioral characteristics that have allowed them to exploit diverse roosting structures. Spix's disk-winged bat, *Thyroptera tricolor*, illustrates these adaptations with presence of suction disks used to roost along the inner sides of developing furled leaves of the Order Zingiberales. Despite the need for regular roost switching, associated with the use of ephemeral leaves, *T. tricolor* social groups remain cohesive for up to 420 days. Moreover, these bats have developed cooperative strategies, such as exchanging information with conspecifics about the location of suitable roosts through acoustic signaling. Here we characterize the vocal repertoires of *T. tricolor* in various contexts, including periods when bats are emerging from roosts and evaluating developing furled leaves for roost suitability. Such communication systems may promote the group cohesiveness necessary to utilize ephemeral roosting resources. Complex signaling behavior in *T. tricolor* may reflect the high behavioral plasticity necessary to overcome ecological pressures that result from roosting in highly ephemeral shelters.

P66 Contributed Poster: BEHAVIORAL COMMUNITY ECOLOGY 1 (Poster Session A: Weds. eve)

RESEARCH ON ADAPTABILITY OF MULTIPLE SPECIES OF CHIROPTERA IN VARIOUS REGIONS OF KOREAN PENINSULA.

Rachel Moon

South Korea; Email:ansaud2003@naver.com

Chiroptera, commonly known as Bat, has been labeled as such due to the fact that its forearms have developed into wings, allowing them to navigate freely on air. Becoming the only kind of mammal species that could fly, bats were able to evolve without much competition. Nowadays, more than 28 bat species reside in various locations of Korea, constituting about one-fourth of mammal species in Korea. However, since the 1980s, the population number of Korean Bats has been decreasing at an alarming rate. Invasion of their habitats triggered by nationwide development plans and destruction of local eco-system due to pollution are the main causes. *Myotis formosus* (known as Golden Bat in Korea), *Murina ussurensis*, and *Plecotus auritus* have been classified

as endangered species by Ministry of Environment, and others, such as *Miniopterus schreibersii* (Long-winged bat), are soon to be added to that list. While these bats used to share their habitats with humans, they were forced to migrate to other locations. The purpose of this research is to identify new habitats for Korean bats and find out how they have adapted to their new surroundings.

372 Contributed Talk: PREDATION AND FORAGING II (Saturday AM)

IT'S ALL ABOUT EYE MOVEMENT: DIFFERENT VISUAL AND FORAGING STRATEGIES OF CHICKADEES AND NUTHATCHES

Bret Moore, Megan Doppler, Esteban Fernandez-Juricic

Purdue University, United States; Email:bamoore@purdue.edu

Visual system configuration can affect the ability to gather information about food, but little is known about this relationship in forest specialists. We studied the visual system, eye and head movements of two tree foragers that feed on similar food types, yet differ in bill length and foraging strategies. Carolina Chickadees have short bills that are placed perpendicular to the substrate and White-breasted Nuthatches have long bills that are held nearly parallel to the substrate while foraging. We found that both species have large binocular fields and a centro-temporal fovea. Nuthatches have a larger degree of eye movement below the bill, whereas chickadee eye movement is largest right above the bill. Therefore, these species rely on moving the eyes to sample different parts of visual space with their foveae, in both cases positioning the foveae to detect food with high resolution. Also, chickadees move their heads more in relation to nuthatches, in order to align the fovea above the bill on the foraging substrate. Overall, these tree foragers have specific eye and head movement strategies that enable them to find food given the morphological constraints of their bill lengths.

P437 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

COOPERATION WITHOUT ENFORCEMENT IN INCIPIENT COLONIES OF THE ANT *CAMPONOTUS FLORIDANUS*

Dani Moore, Jürgen Liebig

Arizona State University, United States; Email:dani.moore@asu.edu

Cooperative behavior appears throughout the animal kingdom, but it can be a challenge to explain how cooperation is maintained. In social insects, policing is considered to be of utmost importance in limiting worker reproduction. Policing is theoretically predicted to be strongest in incipient colonies, when the costs of worker reproduction are highest. In established colonies of the ant *Camponotus floridanus*, workers destroy worker-laid eggs, a behavior has been interpreted as policing. We show that workers from incipient colonies do not exhibit egg-eating behavior and instead tolerate all conspecific eggs. We also find no evidence for the destruction of worker-produced, male larvae by workers or the consumption of worker-laid eggs by queens. In the absence of evidence of enforcement in incipient colonies, we propose an alternate explanation: policing is not necessary to achieve worker sterility in incipient colonies. External enforcement of worker sterility in social insects may not be necessary in all cases; it is essential to consider life history and colony context.

P404 Contributed Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

SICK BUT SEXY? MANIPULATION OF HOST SEXUAL SIGNALS FOR PARASITE TRANSMISSION

Adrienne Mora, Marlene Zuk

University of California, Riverside, United States; Email:amora008@student.ucr.edu

Many manipulative parasites intensify "risky" intermediate host behaviors to increase susceptibility to predation by final hosts; this is a necessary step for life cycle completion. While sexual selection often involves risky behaviors, the relationship between manipulative parasites and host sexual signaling remains unknown. Contrary to the predictions of parasite-mediated models of sexual selection, manipulative parasites may intensify conspicuous sexual characters in hosts for transmission; such hosts could be more attractive to potential mates

and predators. Paradoxically, conflicts between natural and sexual selection would result if hosts experience a short-term increase in mating success as well as increased predation risk. The California fiddler crab, *Uca crenulata*, provides a unique system to test this hypothesis as males engage in risky courtship displays and are hosts to numerous helminth parasites that are transmitted via predation. Although an initial observational study with naturally infected fiddler crabs revealed no relationship between parasitism and signaling, other aspects of crab behavior appear to be affected by infection.

22 Symposium: SENSORY POLLUTION (Tuesday)

SENSORY POLLUTION- A NEW SUB-DISCIPLINE AND THE NEED FOR AN INTERDISCIPLINARY, MULTI-AGENCY APPROACH

Cordula Mora, Björn Siemers, Sheryl Coombs

Bowling Green State University, United States; Email:cmora@bgsu.edu

Anthropogenic activities can cause sensory pollution, which has the potential for either misguiding behaviour or otherwise interfering with an animal's ability to correctly detect, process, interpret or use information normally available to them through their external senses. Sensory pollution can thus lead to physiological stress and/or maladaptive behaviours and, like more conventional forms of pollution, it can reduce overall fitness and survival. While there are a number of studies on light and sound pollution, little is known about the effects of other types of pollutants on the detection of chemical, hydrodynamic, electrical, thermal and magnetic signals. To facilitate future scientific cooperation and exchange of ideas, we will review how recent studies from such diverse disciplines as behaviour, neurobiology, neuroethology, sensory psychology, ecology, conservation biology and environmental science have examined the effects of sensory pollution on animal behaviour, what the most pressing gaps are in our knowledge, and why an interdisciplinary & multi-agency approach is needed to ensure the continued survival of species affected and to minimize effects at the ecosystem level.

226 Contributed Talk: PREDATION AND FORAGING I (Thursday AM)

DIVERSE PHOTONICS UNDERLIE MIMETIC CONVERGENCE OF BLUE BUTTERFLY COLORATION

Nathan Morehouse, Marco Giraldo, Ronald Rutowski, Peter Vukusic

Universite de Tours, France; Email:nathan.morehouse@univ-tours.fr

Butterfly mimicry complexes are stunning examples of convergent color evolution. However, while color pattern similarities in well-studied mimicry complexes are remarkable, the underlying mechanisms responsible for color production are often shared amongst mimics and models. Here, we consider a mimicry complex surrounding the butterfly *Battus philenor* where part of the mimicked color pattern is blue, a color that must be reproduced using photonic nanostructures. Employing electron microscopy, color measurement and physical modeling, we evaluated the photonic structures used by each member of the mimicry complex to achieve the blue component of their warning coloration. Our results indicate that each mimetic species has evolved its own design solution for producing blue, with one exception. The two most-closely-related mimetic species employ similar optical morphologies, suggesting some level of phylogenetic constraint despite the fact that these two species are likely to have evolved mimetic patterning independently. Thus we find that selection for convergence has been met by a surprisingly diverse set of responses at the level of optical morphology.

244 Contributed Talk: ECOLOGICAL EFFECTS I (Thursday PM I)

THE LARGE VIEW OF A SMALL SPECIALIST: BELDING'S GROUND SQUIRREL DISPERSAL ACROSS THE LANDSCAPE

Toni Lyn Morelli, Marisa Lim

University of California, Berkeley, United States; Email:morelli@berkeley.edu

The Belding's ground squirrel, *Urocitellus beldingi*, a montane meadow specialist, has been a model species for investigations of ultimate and proximate causes of dispersal. However, previous research has focused intensively

on just a few populations, primarily in the eastern central Sierra Nevada. As part of the Grinnell Resurvey Project, we surveyed populations of Belding's ground squirrels across California, from the Oregon border to the southern range limit of the species, to investigate connectivity of populations across a broad range. We used both molecular and ecological methods to investigate how Belding's ground squirrels disperse across the landscape, which habitat, geographic, and artificial features create the most significant impediments to gene flow, and source-sink dynamics. We found that there is significant population structure across the state, with an effect of temperature, precipitation, land use change, and the availability of meadows. Focusing on areas where Belding's ground squirrels disappeared over the last century, we found that certain populations are being maintained only in "anthropogenic refugia", such as county park

227 Contributed Talk: PREDATION AND FORAGING I (Thursday AM)

HIDING BEHIND A BRANCH: DEFENSIVE REACTION TO A SNAKE PREDATOR AND ITS EYE BY A MADAGASCAN CHAMELEON

Akira Mori, Teppei Jono

Kyoto University, Japan; Email: gappa@ethol.zool.kyoto-u.ac.jp

Although cryptic coloration aids prey in avoiding detection by visually hunting predators, a simpler way to avoid visual detection is hiding the body behind an object. Some animals recognize the eyes of predators and then evaluate the risk level. A direct gaze by a predator indicates a high risk requiring a prompt response. As a counter strategy, some predators have black eye lines to conceal the conspicuousness of their eyes and obscure their gazing direction. We conducted a field experiment in Madagascar to examine the responses of an arboreal chameleon *Furcifer oustaleti* to a snake predator. The chameleon typically flips its body to the opposite site of a perch from the snake to prevent its visual detection. We presented four stimuli: normal snake with an eye line, snake with artificially painted lineless eye patch, snake with a patch obscuring the eye altogether, and wooden stick as control. The chameleon discriminated the snake from the stick and responded most strongly to the snake with the eye patch. Our study showed that while chameleons are often regarded as "masters of disguise", they also rely on simple hiding behind an obstacle.

P155 Contributed Poster: PREDATION AND FORAGING 1 (Poster Session A: Weds. eve)

DIVING BEHAVIORS OF THE CHINSTRAP PENGUIN IN RELATION TO BREEDING STAGE AND SEX

Yoshihisa Mori

Teikyo University of Science, Japan; Email: moripe@ntu.ac.jp

The chinstrap penguins *Pygoscelis antarctica* is a monogamous species and the male and the female in a pair makes foraging trip by turns during incubation and chick guarding periods. In the incubation period, the male and the female forage for their own whereas in the chick guarding period, they also forage for their chicks. This suggests that foraging strategy in diving behavior may change between incubation and chick guarding periods. In addition, sex difference in diving ability due to difference in body size predict that the foraging strategy should differ between males and females. Therefore, it can be predicted that foraging effort such as dive duration, dive depth, number of dives in a bout should be different between sexes and/or breeding stages. We recorded diving behaviors of 9 chinstrap penguins (5 males and 4 females) during incubating and chick guarding period, in King George Island. We found that (1) diving behaviors differed between incubating and chick guarding stages, and (2) the males dived harder in incubating period than chick guarding period and the females vice versa, probably due to the difference in diving ability.

P186 Contributed Poster: SEXUAL SELECTION 1 (Poster Session A: Weds. eve)

ALTERNATIVE REPRODUCTIVE TACTICS IN SWORDTAIL FISH AS GENETICALLY INFLUENCED RESPONSE THRESHOLDS

Molly Morris, Elizabeth Clowes, Susan Lyons, Donelle Robinson

Ohio University, United States; Email:morrism@ohio.edu

The alternative reproductive tactics (ARTs) in the swordtail *Xiphophorus multilineatus* are influenced by the number of mc4R genes on the Y chromosome. Previous studies suggested that mating behaviors were tightly linked to Y chromosome genotype: smaller sneaker males were facultative in their use of sneak-chase and courtship behaviors depending on social situation, while larger courter males were fixed in their use of courtship. We reexamined the hypothesis that the mating behaviors are influenced by Y chromosome genotype rather than male size. In addition we examined the hypothesis that variation in mating behavior within the sneaker males could be due to genetic variation in a threshold response. We found that propensity to use sneak-chase behavior was highly repeatable across sneaker males, absent in courter males, and not influenced by size when very large sneakers were produced by splitting broods between low and high quality diets. The variation in propensity to use sneak chase we detected in the laboratory was also detected across males in the field. Results are discussed in the context of antagonistic selection and intergenomic conflict.

88 Contributed Talk: COMMUNICATION I (Tuesday AM)

WHISPERING IN A NON-HUMAN PRIMATE

Rachel Morrison, Diana Reiss

The Graduate Center of the City University of New York, United States; Email:rachel.morrison2@gmail.com

Communication systems in humans and other animals have been shaped by selection pressures to evolve strategies that benefit signal transmission while minimizing the costs of eavesdropping. Krebs and Dawkins predicted that highly cooperative species would evolve and use 'conspiratorial whispers,' less conspicuous signals with reduced amplitude, as a potential counter-eavesdropping strategy. While investigating the presence or absence of mobbing calls in the highly cooperative cotton-top tamarin (*Saguinus oedipus*), we discovered the first evidence of whispering in a non-human primate. We documented the behavioral and vocal responses of 5 cotton-top tamarins after being exposed to an animal supervisor, who previously elicited a strong mobbing response. Consistent with whispering, the tamarins produced calls with significantly reduced amplitudes only in the presence of the supervisor. Perhaps due to the subtle properties of whispering, it has previously eluded detection in non-human primates. The increasing evidence of eavesdropping in non-human species, suggests that whispering may have co-evolved as a counteractive strategy and may be more widespread than previously thought.

26 Symposium: SIGNAL MEANING (Tuesday)

WHAT IS A SIGNAL AND WHAT DOES INFORMATION HAVE TO DO WITH IT?

Eugene Morton

Hemlock Hill Field Station, United States; Email:mortone@si.edu

Human speech consists of arbitrary sounds. We learn what words mean and call this knowledge "information." As a speech metaphor, information has great intuitive appeal. The human capacity to infer the mental states of others emerged 50,000 to 100,000 yrs ago making it easy to anthropomorphize, attributing human characteristics to anything with a face, a voice, a trajectory. Thus parsimony suggests information might describe to humans what animal vocalizations can/could do, but it should not be viewed as content because this canalizes thinking, deflecting attention from relationships between signal structure and function. "Grounding the idea of communication in undefined informational constructs renders both those constructs and others that flow from them untenable" "Sharing information" implies selection favors efficiency and correct reception of signals. Selection on senders favors correct signal reception and honesty, enforced by handicaps and females who discount all but honest signals of male quality via sexual selection. Information makes the sender the mover. A biological view suggests listeners are the mover because their responses affect what is accomplished for senders.

P51 Contributed Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

THE EFFECT OF VOCAL PERFORMANCE ON MALE AGGRESSIVE RESPONSES IN SWAMP SPARROWS (*MELOSPIZA GEORGIANA*)

Dana Moseley, David C. Lahti, Jeffrey Podos

University of Massachusetts Amherst, United States; Email:dmoseley@bio.umass.edu

Mating behavior in many species involves communication displays that are vigorous or difficult to perform. Individuals that maximize such features might be of higher quality and thus favored as prospective mates. In songbirds, males produce song both for mate attraction and territory defense. Aspects of vocal performance might allow other males to assess the fighting prowess of signalers in territorial disputes, with males who are better able to sing at higher performance levels perhaps posing a greater threat. We here tested, in swamp sparrows (*Melospiza georgiana*), how territorial males respond to playback of songs of various levels of performance. Our main findings are twofold. First, low-performance stimuli elicited significantly lower aggressive responses. Second, male response to normal and high performance songs showed significant individual variation. Closer examination revealed that male response varied with both the subject's own vocal performance, and the degree to which the performance level of the playback stimuli was elevated. These findings provide insight into if and how vocal performance may indicate threat levels posed by a signaler.

62 Symposium: SENSORY NEUROECOLOGY (Thursday)

AUDITORY AND TACTILE SENSING SUPPORT 3-D SPATIAL NAVIGATION IN ECHOLOCATING BATS

Cynthia Moss, Chen Chiu, Janna Barcelo, Wei Xian, Benjamin Falk, Mohit Chadha, Susanne Sterbing-D'Angelo

University of Maryland, United States; Email:cynthia.moss@gmail.com

Echolocating bats use sonar to sense their surroundings, and exhibit extraordinary flight maneuverability to negotiate complex environments. By controlling the aim, spectrum, and duration of signals to probe the scene, bats directly influences input to its imaging system. Object echoes carry information about the 3-D acoustic scene, which guides adaptive commands for call production, head aim and flight control. Sensing airflow along the wing membrane also contributes to exquisite bat flight control. Microscopically small hairs embedded in the bat wing play a role in sensing air flow. Neurons in bat primary somatosensory cortex (S1) respond to directional stimulation of the wing with low-speed air flow, and this response is diminished after removal of the hairs. Moreover, S1 neurons show directional selectivity to reverse airflow, and the wing hairs might therefore act as stall detectors. Further, depilation of the wing membrane alters flight behavior by reducing aerial maneuverability. Collectively, these findings suggest that bat aerial navigation engages multisensory processes that guide a suite of adaptive motor behaviors. Supported by AFOSR, and NSF.

115 Contributed Talk: COGNITION AND LEARNING II (Tuesday PM I)

POTENTIALITIES AND THE INDETERMINACY OF NONHUMAN ANIMAL MINDS

Alexis Mourenza

University of California, Santa Cruz, United States; Email:amourenz@ucsc.edu

Refocusing attention on the potentialities rather than the competencies of nonhuman animal minds changes the debate and the implications for responsibility in scientific practice. Recognizing the plasticity of minds and role of interactions between experimenter and subject in the emergence of complex cognition raises problems for assumptions about ecological validity in ABC research as well as for claims of the uniqueness of human cognition. By examining the process by which an experimental program seeks to demonstrate the possession or absence of a given cognitive capacity by an animal subject I will show that cognitive competencies demonstrated are the product of the interaction of the organism's physiological potentials with the training and testing procedures they undergo in the lab. I advocate a shift from the emphasis on epistemological uncertainties (questions of species-typical traits and failure to elicit them in the lab) to include an exploration of the

ontological indeterminacy (potentialities and plasticity) of what nonhuman animal minds can do and the roles of both the human experimenters and the animal subjects in demonstrations of complex cognition.

177 Contributed Talk: PERSONALITIES (Wednesday AM)

CONSISTENT BEHAVIOURAL SYNDROMES REVEAL COMPLEX ANIMAL PERSONALITIES IN HERMIT CRABS

Sophie Mowles, Peter Cotton, Mark Briffa

University of Plymouth, United Kingdom; Email:sophie.mowles@gmail.com

Consistent between-individual variation in behaviour or 'animal personalities' have been identified across a range of behavioural contexts. When behaviours are correlated across multiple contexts, 'behavioural syndromes' are said to be present. It is possible that behavioural syndromes may also show consistencies, yet it is not clear how to test statistically for the presence of complex suites of behaviour that show consistent differences between individuals. We investigated the presence of a behavioural syndrome involving agonistic signals, boldness and exploratory behaviours in hermit crabs and assessed its stability across two situations (low versus high predation risk). As behavioural syndromes may be influenced by an individual's internal state, this was also measured by assaying haemolymph haemocyanin to assess aerobic capacity. Factor analysis revealed the presence of a clear behavioural syndrome, which was consistent between situations. Here we demonstrate consistent individual differences in the expression of a behavioural syndrome, revealing the presence of complex animal personalities.

P337 ABS Founders Award Poster: MATING SYSTEMS 2 (Poster Session B: Thurs. eve)

DIFFERENCES IN BEHAVIORAL TYPE AMONG FEMALES OF A UNISEXUAL-BISEXUAL MATING COMPLEX

James Muraco, Caitlin Gabor, Andrea Aspbury

Texas State University - San Marcos, United States; Email:JM2343@txstate.edu

The persistence of gynogenetic organisms is paradoxical. One mechanism to explain the maintenance of gynogens is the differential expression of correlated behaviors (i.e. behavioral syndromes) between sexually and asexually reproducing individuals. The Amazon molly, *Poecilia formosa*, is a gynogenetic (i.e. all-female) fish species that requires sperm from either male *P. latipinna* (sailfin molly) or *P. mexicana* (Atlantic molly) to induce embryogenesis, but paternal genetic information is not inherited by the offspring. As such, Amazon mollies benefit from any matings, as compared to preferring high quality mates. Therefore, we predict that Amazon mollies will be more active, bold, exploratory and social than Atlantic or sailfin molly females, as these behaviors are likely to increase their chances of obtaining mates. We quantified female behavior based on individual responses to an open-field test (*activity, boldness and exploration*) and in a sociability experiment. Preliminary results suggest that an identifiable behavioral syndrome occurs in this system and that differences in behavioral type exist between species.

377 Contributed Talk: SEXUAL SELECTION V (Saturday AM)

THE FUNCTION OF THE FOUR TYPES OF WAVING DISPLAY IN THE FIDDLER CRAB, *UCA LACTEA*

Daisuke Muramatsu

Kyoto University, Japan; Email:muramatsu@ethol.zool.kyoto-u.ac.jp

Four types of claw-waving display were found in male fiddler crabs. I will present the videos of these claw-waving displays, which may have different functions. Lateral-circular waving (slow extension and fast dorsal flexion) was mostly performed to female audiences and was observed frequently in the breeding season. Lateral-flick waving (rapid lateral abduction) was observed throughout the observation period, and was performed mostly to neighboring resident males. Rapid vertical waving (rapid dorso-ventral protraction and retraction) was observed throughout the observation period and was most frequently performed to burrowless males. Circular waving (circumduction of a large claw) was frequently observed prior to the breeding season and had no obvious

audiences in most cases. Larger males tended to perform Lateral-flick and Circular waving, while small males showed Rapid-vertical waving more frequently. Males that have sand structures (which can attract females) tended to perform Lateral-circular and Circular waving, while Lateral-flick waving was performed frequently by males that do not have sand structures. The function of each display will be discussed in the presentation.

P405 Contributed Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

MATE SAMPLING AND MATE CHOICE: A UNIFYING CONCEPTUAL FRAMEWORK

Christopher Murphy

Indiana State University, United States; Email: Christopher.Murphy@indstate.edu

Although much of the research on mate choice has focused on the benefits and evolution of mate choice, there is considerable interest in the process whereby individuals gather information about potential mates and incorporate that information into mating decisions. Theoretical and empirical investigations into this topic have described this process using a diversity of terms, including mate sampling, mate searching, mate-choice tactics (or strategies), and decision rules. Different models emphasize different aspects of the process, and what are viewed as competing or alternative models often do not address the same subsets of the process. I present a conceptual framework that unifies previous theoretical treatments of the process of mate choice. The framework consists of four components: search behavior, information gathering, information processing, and mating behavior. I demonstrate the utility of this framework with specific examples from theoretical and empirical studies.

260 Contributed Talk: SEXUAL SELECTION III (Thursday PM II)

SAME TRAIT, DIFFERENT SIGNALS: FEMALE GOLDFINCHES SIGNAL STATUS WITH BILL COLOR, BUT MALES DO NOT

Troy Murphy, Jordan West, Tiffany Pham, Keith Tarvin

Trinity University, United States; Email: tmurphy@trinity.edu

In species where both sexes are similarly ornamented, female ornaments generally function in a similar way to male ornaments, and are often used in mutual mate choice. However, in some species both sexes are ornamented but the sexes use their ornament in different signaling contexts. To build on previous work on the American goldfinch (*Spinus tristis*) that supported the role of female bill color as a signal of status during intrasexual competition, we tested whether male bill color also functions as a status signal. Using the same experimental protocol previously used with females, we tested whether caged males and females avoided feeding adjacent to male taxidermic models as a function of the male model's bill color, which was experimentally augmented or dulled. Unlike the previous results with female models, neither sex avoided males with more colorful bills. These results suggest that the male's carotenoid-based bill coloration does not function as a signal of status. As such, it appears that male bill color does not function in a similar way to female bill color, and more studies are required to further explore the adaptive nature of male bill color.

P299 Contributed Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

SONG AND SYLLABLE USE EVOLUTION IN FUELLEBORN'S SUNBIRDS, *NECTARINIA FUELLEBORNI*

Nadje Najar, Jay McEntee

United States; Email: nadjenajar@gmail.com

Fuelleborn's sunbirds, *Nectarinia fuelleborni* are oscine (song-learning) songbirds with large song repertoires. Their songs comprise sequences of discrete syllables, which are continuously re-arranged in successive songs. Here we catalog syllable usage and syllable sharing within and among populations. Analyses of syllable types among isolated sky island populations suggest long-term persistence of some of these syllables.

63 Symposium: SENSORY NEUROECOLOGY (Thursday)

GROUND SOUND DETECTION IN GOLDEN MOLES: COMPENSATING FOR REDUCED VISION WITH GEOPHONE EARS

Peter Narins

University of California, Los Angeles, United States; Email:pnarins@ucla.edu

Golden moles are nocturnal, surface-foraging mammals with rudimentary vision. Several species possess massively hypertrophied mallei that presumably confer substrate-vibration sensitivity through inertial bone conduction. When foraging, *Eremitalpa granti namibensis* moves between sand mounds topped with dune grass that contain most of the living biomass in the Namib Desert. We have observed that foraging trails are punctuated with sand disturbances in which the animal "head dips", presumably to obtain a seismic "fix" on the next mound to be visited. Seismic playback experiments suggest that in the absence of olfactory cues, golden moles are able to locate food sources solely using vibrations generated by the wind blowing the dune grass on the mounds. Laser measurements of the malleus in response to seismic stimuli reveal a geophone-like ear with peak sensitivity to frequencies below 300 Hz. Functionally, golden moles appear to be low-frequency specialists, and it is likely that they detect prey principally through substrate conduction. The possibility of using these animals to detect precursors of earthquakes will be discussed. Supported by NIH grant no. DC00222 to PMN.

P379 Contributed Poster: PREDATION AND FORAGING 2 (Poster Session B: Thurs. eve)

GREEN TREE FROGS DO NOT EAVESDROP ON PREY SIGNALS

Daniel Neelon, Diana Kim, Gerlinde Höbel

University of Wisconsin, Milwaukee, United States; Email:dpneelon@uwm.edu

Sexual signals, such as advertisement calls and courtship songs, have evolved in many species to attract potential mates. These signals may face exploitation, however, by various predators that use the songs to locate the caller. We tested the hypothesis that frogs eavesdrop on cricket calls. We conducted phonotaxis trials using a series of acoustic and visual stimuli to assess the ability of green tree frog females (*Hyla cinerea*) to use auditory cues of house crickets (*Acheta domesticus*) to facilitate localization of prey. The phonotaxis trials revealed that frogs do not approach cricket calls; rather, there was an aversion to cricket calls and white noise stimuli. While our results indicate that females are able to discriminate auditory cues, they do not appear to use them to enhance foraging success by means of auditory eavesdropping.

99 Contributed Talk: SEXUAL SELECTION I (Tuesday AM)

EXTRA-PAIR FERTILIZATIONS AND THE POTENTIAL FOR SEXUAL SELECTION IN A SOCIALLY MONOGAMOUS SONGBIRD

Angelika Nelson, H Lisle Gibbs, Douglas Nelson

Ohio State University, United States; Email:nelson.794@osu.edu

Variation among individuals in mating success is the substrate for sexual selection and ultimately for the evolution of elaborate traits and sexual dimorphism. In socially monogamous species variation in social mating success is generally thought to be small, but extra-pair fertilizations (EPFs) may increase variance in reproductive success. Here, we investigate mechanisms that generate opportunity for sexual selection in the socially monogamous and sexually monomorphic white-crowned sparrow, *Zonotrichia leucophrys pugetensis*. We found (1) a 32% increase in variance due to EPFs based on the ratio of actual to apparent standardized variance in reproductive success. However, (2) partitioning variance into within-pair and extra-pair components showed that the majority of variance in male reproductive success was attributable to within-pair success. (3) Reproductive success increased significantly with the number of matings in males but not females suggesting stronger sexual selection in males than females in this population. To conclude, social mating success may increase the variance in reproductive success more than EPFs, and more in males than females.

67 Symposium: COGNITION AS FORAGING (Friday)

SYNTACTIC VS. SEMANTIC STOPPING RULES IN MEMORY FORAGING

Hansjörg Neth

Max Planck Institute for Human Development, Germany; Email:

Is search in memory governed by the same principles that make us rummage from room to room in search of our keys? When do we stop retrieving items from memory? To address these questions we conducted a series of experiments that studied human free recall in analogy to animal foraging theory. Throughout a 45-minute session participants retrieved exemplars in response to category labels. Participants received instant accuracy feedback, accumulated a monetary reward for correct answers, and could switch to a new task at any time. This self-paced procedure ensured that time-on-task and giving-up times were at the participants' discretion. We first investigate how well several simple stopping rules that only consider syntactic information (e.g., the number and time course of item retrievals) account for participants' behavior. We then contrast them with semantic models that incorporate additional information (e.g., category size and expected number of retrievals). Although the semantic models mostly outperform the purely syntactic models, a purely syntactic reinforcement-learning model performs well on an aggregate level.

337 Contributed Talk: DEVELOPMENT II (Friday PM I)

CHILDHOOD ENVIRONMENT AND LIFE HISTORY STRATEGY IN HUMAN FEMALES

Daniel Nettle

Newcastle University, United Kingdom; Email:daniel.nettle@ncl.ac.uk

We know that the reproductive schedules of female mammals can be affected by the conditions they experience during development, but how this applies to humans is less clear. Here, I present data on the relationships between childhood environmental conditions and age at first pregnancy in a large, longitudinally studied cohort of British women. Women who received low investment in the first 7 years of life, for example by not being breastfed, being separated from their parents, or experiencing family disruption, went on to have their own first pregnancy at a significantly younger age than their peers. These effects were robust to controlling for confounding factors, and were partly mediated by earlier puberty and a motivational orientation to early parenthood.

P52 Contributed Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

THE JACKY DRAGON DISPLAY - A FLICK OF THE TAIL CATCHES THE EYE

Shaun New, Richard Peters, Jan Hemmi

The Australian National University, Sullivans Cree, Australia; Email:shaun.new@anu.edu.au

Male Jacky dragons (*Amphibolurus muricatus*) compete for territories using a rapid, stereotyped sequence of distinct body movements starting with tail flicks. The structure of these tail flicks is known to be adjusted to overcome 'motion noise' induced by background plant movements. To better understand how sensory capabilities of receivers influence signal design we examined the visual field properties and the topography of resolution of these lizards. While lateral placement of the eyes provides an extensive field of vision, a non-uniform spatial distribution of photoreceptors and ganglion cells afford variable resolution in different parts of the visual field. We also show that lizards presented with a tail flick motion stimulus rapidly respond with head movements that centre the stimulus on the centro-temporal sector of their retina. This allows later signal components to be viewed through the convexiculate fovea, where high ganglion cell density and low photoreceptor summation ratios provide high visual acuity. The tail flick thus appears to serve an alerting function which captures the receivers attention, orients their gaze and optimizes signal information transfer.

P105 ABS Founders Award Poster: GENETICS AND EVOLUTION 1 (Poster Session A: Weds. eve)

DIVERSE SIGNALS: A CASE OF SENSORY DRIVE IN *ANOLIS DISTICHUS*?

Julienne Ng, Alison Ossip-Klein, Richard Glor

University of Rochester, United States; Email:julienne.ng@rochester.edu

Sensory drive is a mechanism that has been hypothesized to play an important role in signal divergence and contribute to the extensive speciation and adaptive diversification of such radiations as cichlids. Recent studies suggest that sensory drive is also responsible for signal variation in another classic example of a species-rich adaptive radiation, *Anolis* lizards. The signal that male anoles prominently use in signaling displays is the dewlap; an extensible throatfan that varies in color, pattern and size both amongst and within species. Despite the evidence that dewlaps are adapted to local signaling environments, it remains unclear whether such dewlap divergence actually leads to reproductive isolation between populations. Thus, we use replicated tests to investigate the key predictions of the sensory drive hypothesis in a Hispaniolan trunk anole that exhibits striking geographic variation in the dewlap. We present results from (1) comparative analyses using quantitative measures of the dewlap and environmental data, and (2) phylogenetic and population genetic analyses of transects that extend across contact zones between phenotypically divergent populations.

P118 ABS Founders Award Poster: MATING SYSTEMS 1 (Poster Session A: Weds. eve)

DENSITY DEPENDENT FEMALE-BIASED SEXUAL SIZE DIMORPHISM IN TARRKAWARRA (MAMMALIA: *NOTOMYS ALEXIS*)

Nansi Ngahere, Alan Taylor

Macquarie University, Australia; Email:nansi.ngahere@gmail.com

Our understanding of mammalian sexual size dimorphism (SSD), and its relationship with mating systems, is hindered by limited empirical data on species where females are the larger sex. Captive tarrkawarra (*Notomys alexis* or spinifex hopping mice), an arid zone rodent, are female-biased sexually size dimorphic (FSSD) in early life. However, field data suggest FSSD varies with population age and density. We found that tarrkawarra females were significantly heavier than males from birth, despite longer gestation of male pups. Neonatal weights predicted male growth trajectories, whilst weaning weights predicted female trajectories. Post-weaning growth increased the degree of FSSD in low-density housed animals. However, high-density housed animals initially attained sexual size parity. Growth to asymptote occurred in standardized housing from six to 18 and 24 months (males and females respectively) and reduced the between-group differences in FSSD. Flexibility of FSSD, during both ontogeny and adulthood, may equip tarrkawarra for life-long fluctuations in local conditions and optimal mating strategies.

P67 ABS Genesis Award Poster: BEHAVIORAL COMMUNITY ECOLOGY 1 (Poster Session A: Weds. eve)

TRACKING FINE-SCALE DISPERSAL IN BIRDS USING TRACE ELEMENT ANALYSIS

Ben Nickley, Douglas Nelson, H. Lisle Gibbs, John Olesik, Angelika Poesel

Ohio State University, United States; Email:nickley.4@osu.edu

Dispersal movements in songbirds can have an important influence on gene flow and genetic population structure, but can be difficult to measure. Elemental signatures of feathers may be useful in determining the geographic origin of individuals when differences in element composition exist among breeding sites. We investigated fine scale dispersal of white-crowned sparrows *Zonotrichia leucophrys pugetensis*, a species in which male song structure varies geographically. We used trace element analysis to assign birds that sang non-local dialects in a focal population to four different song dialect populations along the Pacific Northwest coast. Furthermore, we used elemental analysis of female feathers to investigate differences in dispersal between the sexes. Mass spectrometry detected 37 trace elements in sampled feathers. In a discriminant analysis, 55 percent of the non-local-dialect singers were assigned to the population that sang their dialect. Of 35 females, 7 were assigned to non-local populations whereas 12 of 35 males were assigned to non-local dialect populations. The results show that trace element analysis may be a useful tool to track dispersal between populations.

P156 Contributed Poster: PREDATION AND FORAGING 1 (Poster Session A: Weds. eve)

THE SPECIFICITY OF PREDATOR CUE DETECTION IN THE STREAMSIDE SALAMANDER

John Niedzwiecki

Belmont University, United States; Email:john.niedzwiecki@belmont.edu

The chemical detection of Green Sunfish, *Lepomis cyanellus*, predators by larval *Ambystoma barbouri* has been widely studied. In understanding both the nature of the chemical cue and the evolution of anti-predator behavior it is important to understand the specificity of this anti-predator response. In this study *A. barbouri* larvae were exposed to chemical cues from the *L. cyanellus* and two closely related centrarchid species, as well as a number of potential controls. Spot checks were used to assess movement and shelter use. *A. barbouri* larvae responded significantly more to green sunfish than other fish species, interestingly the mean decreases in activity levels corresponded to the relatedness of each species to green sunfish. Reactions to minnows and metabolites from other salamander larvae were indistinguishable from freshwater controls. These results indicate that the anti-predator response of *A. barbouri* is very specific and that the cue may diverge with phylogeny.

P244 Contributed Poster: BEHAVIORAL COMMUNITY ECOLOGY 2 (Poster Session B: Thurs. eve)

DANGEROUS BLOSSOMS: HOW HONEY BEES RESPOND TO SIGNALS AND CUES OF COMPETITION AND PREDATION

James Nieh, Eben Goodale

University of California, San Diego, United States; Email:jnieh@ucsd.edu

The remarkable honey bee foraging system that has been shaped by natural selection in response to multiple pressures, including predation and intraspecific competition. We present preliminary data on the effect of predators such as spiders and praying mantids and the effects of predation cues (predator odor, honey bee hemolymph, and sting pheromone) on honey bee foraging choices at paired feeders. Honey bees that are attacked at a food source by predators or conspecifics and escape can return to the nest where they produce "stop signals," brief vibrational pulses directed at waggle dancers visiting the same food source. These stop signals reduce the number of waggle circuits performed and can therefore reduce recruitment to a dangerous location. In this way, foragers with current information can inform recruiters acting on older information of changing foraging conditions. Thus, foragers can alter their behavior according to the presence of predators or cues related to predation and also inform nestmates of perilous conditions at a food source.

329 Contributed Talk: BEHAVIORAL COMMUNITY ECOLOGY (Friday PM I)

INTEGRATING BEHAVIOR WITH LIFE-HISTORY: BEHAVIOR OF FIELD CRICKET, *GRYLLUS INTEGER* DURING ONTOGENY

Petri Niemelä, Anssi Vainikka, Ann Hedrick, Raine Kortet

University of Oulu, Finland; Email:petri.niemela@oulu.fi

Expression of life-history strategy has been suggested to influence the development of behavior, since certain combinations of behavior and life-history may enhance fitness compared to others. We studied integratively how boldness, measured as hiding behavior, develops during ontogeny in the field cricket, *Gryllus integer*, and associates with life-history traits. Hiding behavior was repeatable in males, but not in females. Juveniles were bolder than adults. Cautiously behaving individuals had higher immunological capacity to encapsulate a nylon implant. Moreover, short development time was coupled with a relatively weak encapsulation response. Furthermore, fast growing individuals matured earlier and invested less in immune defense compared to their slower growing conspecifics, i.e. showed indications of a "grow fast, die young" life history strategy. Our results propose a potential trade-off between bold behaviors and immunity-dependent survival, which could explain the maintenance of variation in behavior and induce the evolution of integrated behavioral and life-historical syndromes.

249 Contributed Talk: COGNITION AND LEARNING V (Thursday PM II)

LOVE PRETENDER AND COSTS OF MATE-CHOICE COPYING IN ATLANTIC MOLLY MALES AND FEMALES

Sabine Noebel, Katharina Baumgaertner, Corinna Roehrig, Klaudia Witte

University of Siegen, Germany; Email: noebel@biologie.uni-siegen.de

Using public information can be a good strategy to assess the quality of potential mates by observing conspecifics during sexual interactions. But this strategy can be maladaptive when an observed individual conceals its true mate preference in the presence of an audience. It has been shown that Atlantic molly males, *Poecilia mexicana*, changed their initial mate choice decision for larger females when a conspecific audience male was watching and spent more time with smaller females. Thus, males conceal their true mate preference in the presence of an audience. Here we tested whether Atlantic molly males and females can be deceived by other conspecifics and copy a pretended mate choice for the wrong type of mate. In general, males and females preferred larger over smaller mates. But when an audience was present, these fish deceived and pretended a preference for smaller mates. And thereafter, the audience indeed copied the pretended wrong preference. These experiments showed that mate-choice copying can be costly when the copier is recognized by others as an audience.

P216 ABS Genesis Award Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

BEHAVIORAL SYNDROMES IN NEST SITE SELECTION BY THE ANT *TEMNOTHORAX RUGATULUS*

Forrest Noelck, Takao Sasaki, Stephen Pratt

Arizona State University, United States; Email: fnoelck@asu.edu

Behavioral syndromes are defined as consistent behavior across situations and contexts and have been observed in a variety of animal groups. This concept can readily be applied to social insects, where colony labor is typically divided among distinct worker groups. In this study, we investigated the consistency of individual behavioral differences in nest site selection by the ant *Temnothorax rugatulus*. Past research has shown a diversity of scouting and recruitment behavior when a colony moves into a new home. Based on these differences, we divided individuals into four groups. Each ant was then isolated with two brood items and given a choice between nests of different quality. We observed her behavior as she moved the brood into a nest, an analog for her behavior during an actual emigration. The results showed that behavioral differences among groups persisted when the ants were isolated. For example, isolated active scouts who recruited many nestmates during a migration made faster but slightly less accurate decisions than inactive ones. These findings lead into a question: Why do the ants vary? We are currently testing the benefit of group diversity.

160 Contributed Talk: COGNITION AND LEARNING III (Wednesday AM)

BUBBLING BEHAVIOR IN THE BELUGA WHALE (*DELPHINAPTERUS LEUCAS*)

Michael Noonan, Adrienne Salerno

Canisius College, United States; Email: noonan@canisius.edu

In discussions of cetacean behavior, underwater bubbling is most often attributed to agonistic- or dominance-related motivations. However, there are indications that bubble play often occurs in contexts that are not at all suggestive of aggression/dominance. The present investigation assessed the frequency and forms of bubbling in beluga whales. The subjects were 4 male and 17 female wild-caught adults, and 6 of their captive-born offspring. Of 1000+ instances of bubbling, only 4% were attributed to aggressive behavior whereas 70% appeared to be non-aggressive play. (Twenty six percent fell into neither category.) Of those attributed to play, 53% involved formation of circular rings from either the blowhole or mouth, 39% took the form of a single bubble, and 7% were bubble bursts. The production of bubbles was followed 94% of the time by a second manipulation, consisting of biting/mouthing that resulted in misting (71%) or shape distortion (2%), swatting (4%), or swim-

throughs (2%). These findings establish belugas as among the most creatively playful of all animal species, and highlight a need to explain the functional significance of this highly energetic behavior.

P380 Contributed Poster: PREDATION AND FORAGING 2 (Poster Session B: Thurs. eve)

BLUE JAY CALLS AFFECT THE CACHING BEHAVIOR OF EAVESDROPPING GRAY SQUIRRELS

Shawn Nordell, Thomas Valone, Courtney Harrington, Tina Mozelewski
Saint Louis University, United States; Email:nordell@slu.edu

For species that cache food for future use, it can be important to acquire information about their environment by eavesdropping on interactions between others. Gray squirrels (*Sciurus carolinensis*) cache food items in autumn and winter but these caches are susceptible to both conspecific and heterospecific cache robbers. We examined the caching behavior of squirrels in response to heterospecific vocalizations of a potential cache pilferer, blue jays (*Cyanocitta cristata*) and a non-pilfering species, American robins (*Turdus migratorius*). We predicted that squirrels would cache less and carry food farther before caching to reduce pilfering when jays are vocalizing nearby. We recorded whether food was eaten or cached, the distance carried prior to eating or caching and the direction moved relative to the speaker. When jay vocalizations were played, squirrels cached fewer items and carried them farther compared to the robin vocalizations. There was no difference in direction moved between treatments. Our data suggest that squirrels use the heterospecific vocalization of jays and modify their behavior to reduce the likelihood of losing their caches.

P300 ABS Founders Award Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

ANCESTRAL STATE RECONSTRUCTION AND LIFE HISTORY CORRELATES OF DUETTING IN THE NEW WORLD BLACKBIRDS

Karan Odom, Kevin Omland, J. Jordan Price

University of Maryland, Baltimore County, United States; Email:kodom1@umbc.edu

A diverse array of mated animals produce coordinated vocal duets, yet almost no studies have investigated evolutionary patterns or life history correlates to try to explain why these elaborate acoustic displays exist. We used ancestral state reconstruction to evaluate the prevalence and phylogenetic patterns of duetting in the New World blackbirds. We also compared the occurrence of duets to the occurrence of female song and other life history traits. Parsimony and maximum-likelihood reconstructions revealed several independent gains of duetting in a small number of lineages. Duetting occurred in only 11 of the 25 New World blackbirds known to have frequent female song. Duets were loosely correlated with tropical breeding, sexual monochromatism, and social monogamy, but most closely matched patterns of solitary nesting behavior. Our results indicate that duetting is linked to life history traits typical of tropical species, but our results do not explain why only a subset of tropical species duet. Future plans include a comparative field study to explore whether finer-scale life history traits better explain the evolution of duets among several closely related oriole species.

P217 Contributed Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

MODERATE TURBIDITY IMPROVES SCHOOLING BEHAVIOR IN JAPANESE ANCHOVY LARVAE

Ryosuke Ohata, Reiji Masuda, Yoh Yamashita

Kyoto University, Japan; Email:ohata@kais.kyoto-u.ac.jp

Schooling is an important anti-predator behavior for fishes. Japanese anchovy *Engraulis japonicus* larvae often live in turbid estuarine waters where visual cues are limited. We evaluated the effects of turbidity on school formation by laboratory experiments. Larvae were introduced into 30-L tanks at one of five turbidity levels obtained by dissolving 0, 5, 20, 50, or 300 ppm of kaolin into the seawater. After fish were acclimated to each turbidity level, their behavior was video recorded from above, and nearest neighbor distance (NND) and separation angle (SA) were compared among turbidity levels. Mean NND of larvae was significantly smaller at 5

and 50 ppm, as was mean SA at 50 ppm. These results suggest that moderate turbidities induce schooling behavior in anchovy larvae. Our previous study revealed that turbidity reduces predation by visual predators (jack mackerel *Trachurus japonicus*) but not those by tactile predators (moon jellyfish *Aurelia aurita*). Therefore, an anti-predator strategy utilizing turbidity would only be effective against visual predators such as fishes.

208 Contributed Talk: COMMUNICATION III (Thursday AM)

VOCAL TRACT ARTICULATION REVISITED: THE CASE OF THE MONK PARAKEET

Verena Ohms, Gabriel Beckers, Carel ten Cate, Roderick Suthers

Institute of Biology Leiden, Netherlands; Email:verena.ohms@gmail.com

Birdsong and human speech share many parallels regarding vocal learning and development but vocal production has been considered to be different. The syrinx of songbirds is more complex than the human larynx, proposing that variation in birdsong originates at the sound source while in humans is primarily due to sound filtering. However, recent studies indicate the importance of vocal articulators such as beak gape. In contrast to most other bird groups, parrots have a prominent tongue raising the possibility that tongue movements may be of significance in vocal production in parrots. Using X-ray cinematography of vocalizing monk parakeets we observed prominent tongue height changes, beak opening movements and tracheal length changes. This suggests an important role of tongue and beak in producing a resonance cavity and identifying the trachea as another vocal articulator. We also found strong correlations between beak opening and amplitude as well as changes in tongue height and amplitude in several call types. This indicates clear differences between parrot and songbird vocal production while at the same time parrots articulation might resemble human speech production.

P78 Contributed Poster: DEVELOPMENT (Poster Session A: Weds. eve)

CONSISTENT INDIVIDUAL DIFFERENCES IN CAMOUFLAGE PATTERNS IN CUTTLEFISH

Kohei Okamoto, Akira Mori, Yuzuru Ikeda

Kyoto University, Japan; Email:kohei.o@ethol.zool.kyoto-u.ac.jp

Cephalopods can change their body color pattern drastically. This ability enables them to match their body patterns to the surrounding background instantly. Because their body patterns are extremely plastic, it is assumed that they would show the most effective body pattern against any background. However, it is empirically known that cephalopods show diverse body patterns even when the surroundings are the same. No studies have hitherto focused on this variation in camouflage patterns. We conducted an experiment to clarify whether variation in camouflage patterns is explained by intra-individual differences or inter-individual differences, using the cuttlefish *Sepia pharaonis*. We video-recorded camouflage patterns of each individual of *S. pharaonis* for 24 hours once a week for 4 successive weeks. We found that each individual showed various camouflage patterns during the observation. On the other hand, there were consistent individual differences in the frequency of exhibiting each camouflage pattern. This result indicates that both intra-individual and inter-individual differences are attributed to the variation in camouflage patterns in *S. pharaonis*.

279 Contributed Talk: MECHANISMS II (Thursday PM III)

GENE EXPRESSION IN THE BRAINS OF MONOGAMOUS VS. POLYGAMOUS CICHLID FISHES

Ronald Oldfield, Rayna Harris, Dean Hendrickson, Hans Hofmann

Case Western Reserve University, United States; Email:rgo@cwru.edu

Endocrine pathways that regulate social behavior are remarkably conserved across divergent taxa. The neuropeptides arginine vasopressin/vasotocin and oxytocin/isotocin regulate social behavior in every species studied. These peptides and their receptors are important for pair-bond formation in both monogamous prairie voles and monogamous convict cichlids, specifically by stimulating affiliative behavior toward the mate and aggression toward non-mates. The hormone prolactin also regulates social behavior across vertebrates. We

compared AVT, V1a, PRL, and PRL receptor gene expression in the brains of free-living reproductively active males of two closely related North American cichlid species, the monogamous *Herichthys cyanoguttatus* and the polygamous *H. minckleyi*, which defend larger territories, bond with several females, and show little paternal care. Surprisingly, expression of AVT, V1a, and PRL receptor was elevated in both the hypothalamus and the telencephalon of the polygamous species. Our results indicate that mechanisms in the brain are more closely associated with particular patterns of behavior than to monogamous or polygamous mating systems, per se.

P5 Contributed Poster: APPLIED ANIMAL BEHAVIOR 1 (Poster Session A: Weds. eve)

SPONTANEOUS EPILEPSY AND FITNESS IN A WILD LIVING RAT (*TRINOMYS YONENAGAE*)

Elisabeth Oliveira, Lais Cantano

Universidade de São Paulo, Brazil; Email:lispinelli@hotmail.com

Affiliation is an important aspect of the social life of *Trinomys yonenagae*, a small long-lived spiny rat that endures the challenges of an arid environment. Spontaneous seizures (SS) were observed randomly in individuals of these species during ordinary situations in captivity. Epilepsy in human is considered to occur often in children; and pregnancy presents a high risk of complications. In the present study we have tested when SS first occurs and its impact in pregnancy. The first crisis occurred only in adults, when the rats were at least one year old (median: 39m). Epileptic (EE) pups of eleven couples corresponded to 18% of all newborns. EE parents were able to have a successful reproductive life. In one case the pair had 14 offspring, generating a total of 32 pups (9% were EE) ; all of them were well cared and raised. The interval between each pregnancy (median: 136.5d) was equivalent to the estimated gestational period (median: 90d) and postpartum estrus was observed five times. Since SS does not occur during infancy it spares adulthood from negative side effects related to brain development, indicating that SS may be part of the natural cycle for this wild species.

P234 Contributed Poster: APPLIED ANIMAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

GROUP TRAINING OF PREDATOR-NAÏVE FISH TO RECOGNIZE AND RESPOND TO PREDATORS

Justin Olson, Jenae Olson, Rachel Walsh, Brian Wisenden

Minnesota State University Moorhead, United States; Email:olsonju@mnstate.edu

Hatcheries are effective in producing large numbers of fish for augmenting fisheries, but the fish they produce are predator-naïve resulting in high levels of predation mortality when first released into natural water bodies. Past research has demonstrated that predator-naïve hatchery-reared fish can be trained to recognize predators but to implement predator training into fishery management, predator-recognition training must be feasible on a large scale. Here, we demonstrate that large groups of fish can be quickly and easily be conditioned to recognize and react with antipredator behavior to the odor of a novel predator. This simple method can potentially improve cost effectiveness of any stocking program, result in greater density of managed stocks and enhance the direct and indirect economic benefits of a fishery.

P106 ABS Genesis Award Poster: GENETICS AND EVOLUTION 1 (Poster Session A: Weds. eve)

RETENTION OF UNEXPRESSED ANCESTRAL BEHAVIOR: CUES AND CONSEQUENCES

Shannon O'Neil

Clark University, United States; Email:shoneil@clarku.edu

Anthropogenic environmental change can cause populations to go extinct; an outcome that Baldwin argued could be mitigated by behavioral plasticity. The threespine stickleback, *Gasterosteus aculeatus*, is an excellent subject for evaluation of this possibility because Alaskan populations are subject to inescapable changes in productivity. Productivity enhancement has caused increases in size and a foraging shift to benthic invertebrates in certain freshwater populations. As productivity increased, an ancestral response to cannibalistic foraging groups, a diversionary display, re-emerged as benthic foraging groups also cannibalize young in nests defended by parental males. We demonstrate that, despite the importance of visual cues in stickleback behavior, video

stimuli are insufficient to elicit the full array of diversionary and defensive behaviors observed in the field in response to cannibalistic groups, and we extend that the potential to express the ancestral diversionary display is retained despite disuse for 12,000yr. The potential to express the ancestral display pre-adapts populations to respond to a reversion to ancestral environments, reducing risk of extinction.

P218 ABS Founders Award Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

GROOMING-RELATED FEEDING AFFECTS THE RECIPROCITY AND DURATION OF GROOMING IN JAPANESE MACAQUES

Kenji Onishi, Kazunori Yamada, Masayuki Nakamichi

Osaka University, Japan; Email: o-nishi@hus.osaka-u.ac.jp

Allogrooming is an altruistic behavior wherein primates exchange grooming as a tradable commodity for reciprocal grooming or other services (e.g. support during aggression, tolerance during co-feeding). We observed a case of grooming relationships of the lowest-ranking adult female (Lp) in a group of Japanese macaques (*Macaca fuscata*). The female had lost fur on her back and received grooming from higher-ranking individuals without providing reciprocal grooming or other services. The groomers fed on objects from the fur of Lp more frequently than from the fur of other adult gramees. This suggests that grooming-related feeding (GRF) benefits the groomers, and consequently affects reciprocity if feeding efficiency reaches a certain level. We also investigated grooming data of adult females other than Lp. High GRF efficiency was found to lengthen the duration of grooming, suggesting that, highly efficient GRF motivates groomers to extend the length of grooming episodes. Hereafter, we should reconsider the balance between benefit and cost in grooming, and investigate the reciprocity of whole group members in primates while considering the groomer's benefits obtained from GRF.

173 Contributed Talk: DEVELOPMENT I (Wednesday AM)

EFFECTS OF PERINATAL FLAVOUR LEARNING ON STRESS-RELATED PARAMETERS IN PIGLETS AFTER WEANING

Marije Oostindjer, J. Elizabeth Bolhuis, Kristina Simon, Henry van den Brand, Bas Kemp

Wageningen University, Netherlands; Email: marije.oostindjer@wur.nl

Previously we found positive effects of perinatal flavour exposure to anethol (anise) through the maternal diet on food intake, growth and behaviour of piglets after weaning when provided with anise-flavoured food. The food was not preferred, suggesting that the familiar flavour may have reduced weaning stress which was investigated in the current study. Sows were offered an anethol-flavoured diet (Flavour treatment) or control diet (Control treatment) during late gestation and lactation. Piglets were provided with anethol in their food (Feed treatment) or in the air (Air treatment) after weaning. Flavour piglets showed the shortest latency to eat after weaning. Flavour-piglets also played more, indicating low stress, especially in the Air-treatment. Control-pigs vocalized more on day 1 postweaning and directed more oral behaviour towards pen mates, which is likely the result of high stress levels. Salivary cortisol levels tended to still be higher 7 hours postweaning for Control-Air piglets compared to Flavour-Air piglets. Perinatal flavour learning decreased stress in newly weaned piglets, yet it seems not necessary to provide the flavour in the food to obtain such effects.

139 Contributed Talk: MECHANISMS I (Tuesday PM II)

NAVIGATING MONOGAMY: SOCIO-SPATIAL NEURAL MECHANISMS AND ALTERNATIVE MATING TACTICS

Alexander Ophir

Oklahoma State University, United States; Email: ophir@okstate.edu

Monogamy is usually characterized by affiliative and defensive behaviors (pairbonding, mate guarding, etc). The role of memory in mating systems is often neglected. Despite being socially monogamous, prairie voles (*Microtus ochrogaster*) vary in both sexual and spatial fidelity. Vole pairbonding is mediated by the neuropeptide

hormones oxytocin and vasopressin, and their receptors (OTR and V1aR). V1aR expression in regions governing pairbonding does not predict pairing. Instead, both V1aR and OTR density in socio-spatial memory structures relates to space use and breeding success within a chosen mating tactic. The ability to mate effectively as monogamous individuals may be linked to the ability to track conspecifics in space. Given the connectivity among social or spatial memory nuclei, we hypothesize that the peptide receptors within these structures form a 'socio-spatial memory neural circuit', which may integrate social and spatial information to shape mating decisions. Identifying the mechanisms responsible for relating information about the social world with the mechanisms that mediate mating tactics is crucial to fully appreciate the suite of factors driving mating systems.

312 Contributed Talk: SEXUAL SELECTION IV (Friday AM)

CHANGE IN THE SEX ROLES ACROSS THE NUPTIAL SEASON IN A PATERNAL CARE FISH

Cynthia O'Rourke, Tamra Mendelson

University of Maryland, Baltimore County, United States; Email:kickseine@gmail.com

The sex roles are hypothesized to be behavioral strategies that have evolved in response to the operational sex ratio (OSR). Within the last few decades, research has suggested that the sex roles may also respond plastically when the OSR changes within a generation or mating season. In many systems, however, components of the OSR, such as the adult sex ratio (ASR), develop predictably over the course of a single mating season, making it difficult to disentangle ontogenetic from plastic changes in the sex roles. Using the fantail darter, *Etheostoma flabellare*, we ask whether the sex roles vary as a plastic response to an unpredictably changing OSR, or rather develop ontogenetically along with a predictably changing OSR. We found that several aspects of the sex roles vary across the season regardless of ASR, arguing either for ontogenetic development of the sex roles in *E. flabellare* or for the influence of other OSR components in this system.

352 Contributed Talk: COGNITION AND LEARNING VII (Saturday AM)

SPONTANEOUS INNOVATION FOR FUTURE DECEPTION IN A MALE CHIMPANZEE

Mathias Osvath, Elin Karvonen

Lund University, Sweden; Email:mathias.osvath@lucs.lu.se

The ability to invent means for deceiving others in the future requires a combination of cognitive skills, coordinated toward a single goal, not previously reported outside humans. The social cognition required for deception and the ability to foresee future events are hypothesised to rely on a common core brain network in humans, one that involves perceptual simulations. Intentional deception and cognitive foresight are both disputed when it comes to non-human animals. Here we report systematic observations suggesting innovation for future deception by a captive male chimpanzee, as an extension of previously documented behaviour of caching projectiles for later throwing at zoo visitors. On these occasions, the chimpanzee manufactured concealments and used naturally occurring ones all placed near the onlookers' area, allowing throws before the crowd could back off. We describe the first occasion of this innovation and the events that likely led to it; we provide documentation showing that concealment became the preferred strategy. The findings support a co-evolutionary link between these cognitive skills, emerging not later than our last common ancestor with chimpanzees.

116 Contributed Talk: COGNITION AND LEARNING II (Tuesday PM I)

COMPARING THE USE OF STICK TOOLS BY 3 WILD GROUPS OF BEARDED CAPUCHIN MONKEYS (*CEBUS LIBIDINOSUS*)

Eduardo Ottoni, Tiago Falótico, Massimo Mannu

University of Sao Paulo, Brazil; Email:eduardo.ottoni@gmail.com

The use of sticks as tools, though sometimes observed in human-induced contexts, is generally absent in the spontaneous behavior of wild tufted capuchin monkeys (*Cebus* spp), having been reported, till recently, only in Serra da Capivara National Park (Brazil) groups - mostly as probes to access small prey, or honey from wasps' nests. Though stick tool use can be underreported as compared to stone tools, there is at least one well-studied

population of stone tool users that do not use stick tools (in Boa Vista, about 350 km from SCNP). Stick tools pose many intriguing questions: firstly, our hypothesis correlating (stone) tool use to terrestriality does not explain the rarity of stick tools in more arboreal populations - let alone in other, equally terrestrial populations; also, our explanation for the male bias in stone tool use (sex dimorphism) does not apply to the same bias in stick tools use, strength not being a limiting factor. Sticks are also the only known case in which wild capuchins modify objects used as tools (sticks' preparation can involve up to 4 modification steps). Here we compare data on stick tool use from 3 groups in SCNP [Grants: FAPESP/CNPq/CAPES].

313 Contributed Talk: SEXUAL SELECTION IV (Friday AM)

FEMALE PREFERENCE FOR A NOVEL MALE PHENOTYPE IN ZEBRAFISH (*DANIO RERIO*)

M. Aaron Owen, Karl Rohrer, Richard Howard

The Graduate Center of the City University of New York, United States; Email:mowen@gc.cuny.edu

Females of several species are known to prefer males with manipulated or novel phenotypes; however, few studies have investigated the mechanisms that underlie female preferences for such novelty. Employing genetic modification, a relatively underutilized technology in studies of mate choice, we used transgenic zebrafish (*Danio rerio*) to evaluate female preference for normal versus novel, transgenic (red GloFish™) males. We conducted four mate choice experiments in which females differed in rearing history to determine if female mating preferences were influenced by population history, sexual imprinting, or color of food in their diet. Association tests revealed that females strongly preferred novel, transgenic males to normal males; however, females showed no preference in single-male mating trials, likely due to male coercion. Overall, our results suggest that zebrafish possess a sensory bias for the color red; more research using both closely related species and other color morphs of GloFish™ is needed to resolve this issue. Our study exemplifies the utility of using transgenic organisms in mate choice research.

154 Contributed Talk: SOCIAL BEHAVIOR III (Tuesday PM II)

LONG-TERM EXPOSURE TO TRAFFIC NOISE ALTERS SOCIAL AND RISK-TAKING BEHAVIOR

Jessica Owens, Courtney Stec, Amy O'Hatnick

University of Tennessee, United States; Email:jowens16@utk.edu

Traffic noise is associated with low avian population density and reduced pairing and mating success; but, few studies propose possible mechanisms underlying these patterns. Because pairing and mating are inherently social, 'lower-level' socially functional behaviors may be partly responsible. We tested the effects of long-term exposure to traffic noise on social and risk-taking behavior of mixed-species aviary flocks of Carolina chickadees, *Poecile carolinensis*, and tufted titmice, *Baeolophus bicolor*. Half of the flocks were exposed to simulated traffic noise for 8 hours/day; the other half was treated as a control. Over two weeks, data were collected on nearest neighbor distances, close-proximity associations and latency to take food near novel stimuli. Noise exposure significantly reduced distance between flockmates and preference for conspecific partners while increasing close-proximity associations, altering social interactions at the individual and flock level. Noise also significantly increased latency to take food, strengthening the neophobic response. It may be through these mechanisms of sociality and risk-taking that population density and mating are being affected.

P264 Contributed Poster: COGNITION AND LEARNING 2 (Poster Session B: Thurs. eve)

A CHIMPANZEE (*PAN TROGLODYTES*) RECOGNIZES ACOUSTICALLY IMPOVERISHED SYNTHETIC SPEECH.

Michael Owren, Lisa Heimbauer, Michael Beran

Georgia State University, United States; Email:owren@gsu.edu

The human ability to understand synthetic speech lacking normative acoustic cues to phonetic content has been taken as evidence of specialized perceptual processing. To examine this claim, a 23-year-old chimpanzee named

Panzee (*Pan troglodytes*) was tested with two such forms, namely "noise-vocoded" and "sine-wave" speech. The first consists of modulated noise bands, while the second is made using just three pure tones. Panzee was of interest for the work having been reared by humans from infancy on and being able to identify spoken words using visuo-graphic "lexigrams." Testing presented 48 familiar words one at a time in natural or synthetic form, with Panzee choosing a corresponding lexigram from four alternatives. The chimpanzee performed well above chance levels with both synthetic forms, even though rewarded non-contingently throughout with no feedback on her choices. For comparison, humans transcribed natural and synthetic versions of the words. Overall, results indicate that functionally relevant experience with spoken language can be sufficient to allow recognition of even acoustically transformed synthetic speech, without needing uniquely human specializations.

362 Contributed Talk: COMMUNICATION VI (Saturday AM)

VOCAL COMMUNICATION IN CATTLE (*BOS TAURUS*) : MOTHER-OFFSPRING RECOGNITION

Monica Padilla-de la Torre, Brad Ochocki, Elodie Briefer, Tom Reader, Alan McElligott

University of Nottingham, United Kingdom; Email:plxmp4@exmail.nottingham.ac.uk

Individual recognition is crucial in order to avoid misdirected maternal investment and to ensure survival of young. In ungulates, parent-offspring identification is often achieved through vocal communication, but in cattle it is poorly understood. A few studies have suggested that calls may reflect the motivations and intentions of the calling animal. Because cattle vocalisations are probably meaningful to other members of the herd, we tested the hypothesis that mother-offspring individual vocal recognition exists. Mutual mother-offspring vocal recognition is expected to be more important in follower species than in hider species. This was tested in the field using playback experiments with a beef cattle herd living on a farm. Our results show that cows responded more strongly to calls of their own calves than to calls from unknown calves, but that calves did not show differential responses to their own mothers and unknown cows. Therefore, our results suggest that there is unilateral individual vocal recognition in cattle. In the context of the hider/follower dichotomy, this result is consistent with the theory that hider species display unilateral vocal recognition.

212 Contributed Talk: MATING SYSTEMS II (Thursday AM)

MATING SYSTEM OF FREE-RANGING DOMESTIC DOGS (*CANIS FAMILIARIS*)

Sunil Pal

Katwa Bharati Bhaban School, India; Email:drskpal@rediffmail.com

The purpose of this study was to investigate the mating systems of free-ranging domestic dogs. During the oestrus period, the focal females were followed for the first 6 days of the oestrus. A combination of ad libitum and focal animal sampling yielded data on the mating behaviour, and a total of 2750 h were devoted to collect data. Fourteen females belonging to five different groups were selected for this study. Both males and females differed in their degree of attractiveness to the opposite sex. The duration of courting association increased with the number of courting males in an association. Frequency of mounting increased with the number of males present in a courting association as well as with the duration of association. The rate of mounting was higher in the case of old adults than in the case of young adults. Young adult males were more likely to copulate successfully than the old adult males. The number of successful copulation decreased with the number of courting males. Six types of mating (monogamy, polygyny, promiscuity, polyandry, opportunity and rape) were recorded. Mean (\pm S.E.) duration of copulatory tie was 25.65 (\pm 1.43) min, and several factors were identified.

80 Contributed Talk: COGNITION AND LEARNING I (Tuesday AM)

USING IDEAS OF KOLMOGOROV COMPLEXITY FOR STUDYING BEHAVIORAL AND COGNITIVE SPECIALIZATION

Sofia Panteleeva, Zhargal Danzanov, Zhanna Reznikova

Institute of Systematics and Ecology of Animals SB RAS, Russia; Email:psafia@mail.ru

Behavioral variability serves as a basis for behavioral, cognitive and social specialization in populations. Carriers of "at once and entirely" behavioral patterns can spread them by means of social learning. To identify the "source" (completely innate) patterns we suggest a new method based on ideas of Kolmogorov complexity. A pilot study of hunting behavior in "wild" and naïve ants (*Myrmica rubra*) and in mice (*Mus musculus*) and Mongolian gerbils (*Meriones unguiculatus*) is based on comparison of complete (successful) and incomplete hunting stereotypes. We represent behavioral sequences as "texts" composed of "letters" (behavioral units) and compress them using a data compressor. Successful hunting patterns in three species are characterized by smaller "Kolmogorov complexity"; they have less redundancy and are more predictable. The method allows us to extract source behaviors by comparing behavioral sequences of different levels of complexity, as opposed to rearing naive animals. We speculate that in social species completeness of many complex behaviors is based on distributed social learning whereas solely living species enjoy entirely inherited patterns.

P88 Contributed Poster: ECOLOGICAL EFFECTS 1 (Poster Session A: Weds. eve)

ALL-MALE GROUPS AFFECT GROUPING AND SPACING IN A MULTI-LEVEL PRIMATE SOCIETY

David Pappano, Noah Snyder-Mackler, Thore Bergman, Jacinta Beehner

University of Michigan, United States; Email:pappano@umich.edu

When males exclude competing males from reproductive units, excluded males often form all-male groups (AMGs) that associate with reproductive units. The bachelor-threat hypothesis (Rubenstein, 1986) posits that AMGs represent a sociosexual pressure, i.e. risk of takeover and infanticide, which affects the spatial patterning of reproductive units. We examined the socioecological pressures that affect the spatial patterning of geladas (*Theropithecus gelada*) a primate with AMGs that loosely associate with reproductive units. First, we observed that group size was positively correlated with the number of bachelors present in the area. Second, the distance from bachelor groups positively correlated with inter- and intra-unit spacing. We found no relationship between the total number of geladas present and spacing, suggesting that the bachelors' effect on unit cohesion was density independent. Finally, environmental factors, such as rainfall and temperature, did not affect bachelor number, group size, or spacing. Results suggest that, like other species (Grueter & van Schaik, 2010), the threat of bachelor males has a significant effect on the grouping of gelada reproductive units.

P68 Contributed Poster: BEHAVIORAL COMMUNITY ECOLOGY 1 (Poster Session A: Weds. eve)

INTERSPECIFIC DOMINANCE & SONG INTERACTIONS MEDIATE ALTITUDINAL ZONATION IN NEOTROPICAL SINGING MICE

Bret Pasch, Steven Phelps

University of Florida, United States; Email:bpsch@ufl.edu

Interspecific aggression between ecologically similar species may influence species distributions by causing competitive exclusion at the range edge. Within species, male advertisement vocalizations mediate competitive and dominance interactions; though less studied, acoustic communication between species may also reflect dominance interactions and contribute to species limits. We studied the behavioral mechanisms underlying altitudinal range limits in Neotropical singing mice. Chiriqui singing mice (*Scotinomys xerampelinus*) abruptly replace Alston's singing mice (*S. teguina*) on the highest mountains of Costa Rica and Panamá. Comparative biogeographical surveys, interspecific behavioral trials, and reciprocal removal experiments indicate that *S. teguina* is limited by the presence of dominant heterospecifics, whereas *S. xerampelinus* may be limited by temperature tolerance. Playback experiments show that *S. teguina* is silenced by heterospecific song, whereas *S. xerampelinus* responds to both conspecifics and heterospecifics. Thus, response to song reflects underlying dominance interactions and suggests that interspecific communication contributes to altitudinal zonation.

P145 ABS Genesis Award Poster: PARENTAL CARE 1 (Poster Session A: Weds. eve)

ALLOMOTHERING IN THE BELUGA WHALE (*DELPHINAPTERUS LEUCAS*)

Kimberly Patterson, Michael Noonan

Canisius College, United States; Email:patter23@canisius.edu

Allomothering in beluga whales can take the form of parallel swimming, touching, and/or actual suckling. The extent to which allomothering occurs in the beluga was examined in a captive population at Marineland of Canada. 1. Immediately postpartum, all individuals characteristically mouthed the newborn or swam in close proximity to it. 2. Among nulliparous adult females, one instance of long-term "adoption" of a juvenile was recorded. 3. One instance of "baby stealing" was recorded in which a dominant peri-parturient female took over the entirety of maternal care (including nursing) from a subordinate female. 4. One adult male showed 24h of allomothering with a neonate. 5. Among established mother-infant pairs, instances of cross-pair mixing was found to be extremely rare. 6. Adolescent females often engaged in allomothering behaviors with juveniles. It therefore appears that adult females with their own calves do not ordinarily share maternal care. It is suspected that the exceptions observed here may have been artifacts of the close quarters of captivity. Allomothering by adolescent females may play a role in the development of their skills with juveniles.

P27 Contributed Poster: COGNITION AND LEARNING 1 (Poster Session A: Weds. eve)

AUTOMATED COGNITIVE TEST PERFORMANCE BY MONKEYS IN LABORATORY AND LARGE SEMI-NATURAL SOCIAL GROUPS

Regina Paxton, Emily Brown, Benjamin Basile, Robert Hampton

Emory University, United States; Email:rpaxton@emory.edu

We tested two groups of rhesus monkeys (*Macaca mulatta*) on a battery of automated perceptual and cognitive tasks presented on touch screen computers. The *Lab* group consisted of all male monkeys housed and tested in a typical laboratory setting, with access to testing computers in their home cages 6 hours per day, 6 days per week. The *Field Station* group lived and was tested in a large semi-free ranging naturalistic social group. This group had shared access to four touch screen computers 24 hours per day, 7 days per week. Each monkey in the Field Station group had RFID chips implanted in both arms such that our computer software identified individuals and delivered the appropriate tests to monkeys that approached the equipment. Monkeys in both groups tested at their own pace for food rewards. We conducted two perceptual discrimination tests, a perceptual classification test, and a transitive inference test. Despite the differences in housing, sex, and social environment, monkeys in the two groups performed at similar levels. These preliminary results suggest that semi-free ranging animals with complex social lives are viable subjects for cognitive testing.

P170 ABS Founders Award Poster: RECOGNITION (Poster Session A: Weds. eve)

NEST SITE SELECTION IN THE EUROPEAN WOOL-CARDER BEE, *ANTHIDIUM MANICATUM*

Ansel Payne, Dustin Schildroth, Philip Starks

American Museum of Natural History, United States; Email:ansel@post.harvard.edu

For many organisms, choosing an appropriate nest site is a critical component of reproductive fitness. Here we examine nest site selection in the solitary, resource defense polygynous bee, *Anthidium manicatum*. Using a wood-framed screen enclosure outfitted with food sources, nesting materials, and bamboo trap nests, we show that female bees prefer to initiate nests in sites located high above the ground. We also show that nest sites located at higher levels are less likely to contain spiderwebs, suggesting an adaptive explanation for nest site height preferences. We report size differences between this study's source populations in Boston, Massachusetts and Brooklyn, New York; male bees collected in Boston have smaller mean head widths than males collected in Brooklyn. Finally, we argue that methods for studying captive populations of *A. manicatum* hold great promise for research into sexual selection, alternative phenotypes, recognition systems, and the evolution of nesting behavior.

P438 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

INDIVIDUAL DIFFERENCES IN SOCIAL BEHAVIOR: PART OF A BEHAVIORAL TYPE WITH CONSEQUENCES FOR GROWTH

Simon Pearish, Alison Bell

University of Illinois, United States; Email:pearish1@illinois.edu

Individuals that form groups with other individuals can gain benefits in the form of enhanced predator defense or energy acquisition. While an extensive literature has addressed the costs and benefits of aggregating with conspecifics, we know less about individual differences in grouping behavior. In a field study, I found that juvenile three-spined sticklebacks that had been collected while in a group (shoaling) emerged more quickly from a refuge compared to size-matched juveniles that had been collected while alone. I quantified individual variation in shoaling behavior and monitored growth rate in the laboratory and found that individual sticklebacks that shoaled more grew slower. Altogether, these results suggest that individuals that shoal might gain benefits by being more willing to take risks but shoalers pay a cost in terms of growth rate.

373 Contributed Talk: PREDATION AND FORAGING II (Saturday AM)

EFFECT OF DIURNAL LIGHT VARIATION ON PREDATOR RECOGNITION OF A VISUAL MULTICOMPONENT WARNING SIGNAL

Kimberly Pegram, Ronald Rutowski

Arizona State University, United States; Email:kpeggram@asu.edu

Warning coloration deters predators from attacking distasteful or toxic prey items. Distasteful animals often display multicomponent warning signals composed of orange coloration adjacent to blue coloration. We hypothesized that this type of multicomponent signal evolved in response to diurnal variation in ambient light environment and predicted that each component would be more effective during different times of day. We tested this hypothesis by placing models of the distasteful Pipevine Swallowtail Butterfly (*Battus philenor*) in a natural setting. We created five different color models from *B. philenor*: all black, both orange and iridescent blue, only iridescent blue, only orange and matte blue with orange. We checked for attacks on models three times a day over 72 hours and characterized attacks on the butterflies as occurring in one of three periods: dusk/overnight/dawn, morning, and afternoon. Attack rates vary with model color and time of day in ways that support our hypothesis and suggest how variation in light environment shapes the evolution of multicomponent warning signals.

P245 Contributed Poster: BEHAVIORAL COMMUNITY ECOLOGY 2 (Poster Session B: Thurs. eve)

INTERFERENCE COMPETITION BETWEEN A RESIDENT AND MIGRANT PASSERINE DURING THE NON-BREEDING SEASON

Kathryn Peiman, Greg Grether

University of California, Los Angeles, United States; Email:kpeiman@ucla.edu

Interference competition over shared resources may result in non-overlapping territories that are maintained by aggression. In birds, conspecific aggression and territoriality can affect habitat use, body condition, and migration date, and thus fitness. Similar effects are predicted to occur as a result of interspecific interactions but have rarely been studied. The White-eyed Vireo (*Vireo griseus*) migrates to The Bahamas in the winter, where it encounters the resident Thick-billed Vireo (*Vireo crassirostris*). I examined territory overlap and aggressive behavior within and between these species. *V. crassirostris* occurs in all habitats, while *V. griseus* is restricted to coppice. Fruiting *Bursera simeruba* trees, a shared resource, were much more common in coppice than scrub habitat. Both species have non-overlapping territories with conspecifics but overlap with heterospecifics in coppice habitat. *V. crassirostris* is more aggressive to both species of intruder than *V. griseus*. The dominant species excludes the subordinate from low-quality scrub habitat; only in areas of high resource abundance do these two territorial species coexist.

338 Contributed Talk: DEVELOPMENT II (Friday PM I)

THE ROLE OF AGGRESSION AND PHEROMONES IN REGULATING QUEEN DEVELOPMENT IN A SOCIAL INSECT

Clint Penick, Jürgen Liebig

Arizona State University, United States; Email: Clint.Penick@asu.edu

A fundamental aspect of eusocial evolution is the separation between reproductive and non-reproductive castes. In higher social insects, this division emerges during the larval stage, when a larva can develop into either a worker or a queen. This switch is generally regulated through control over larval nutrition. However, in many social insect species, fine control over larval nutrition may not be feasible. In the ant *Harpegnathos saltator*, we have discovered an alternative means to regulate larval development. Workers bite queen-destined larvae to inhibit queen development during periods when their colony is not producing sexuals. In order for workers to successfully inhibit queen development, however, workers must have a reliable method to identify queen-destined larvae. Our investigations have revealed a non-polar compound on the surface of queen-destined larvae that workers use to distinguish between castes. In general, larval pheromones in ants have proven elusive, and some have speculated that conflict between larvae and adults has selected against cues that distinguish larvae by sex or caste. Our results support an alternative hypothesis, which will be discussed.

P53 ABS Founders Award Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

VARIATION IN VOCALIZATIONS BY THE WEEPING LIZARD *LIOLAEMUS CHILIENSIS*

Mario Penna, Gabriela Silva, Fernanda Norambuena, Antonieta Labra

Universidad de Chile, Chile; Email: mpenna@med.uchile.cl

Vocalizations produced in predation contexts act as predator deterrents or warning signals for conspecifics. We characterized the screams produced by *Liolaemus chiliensis*, the only vocal species in this diversified lizard genus, in response to threats. Ninety lizards were stimulated to scream by gently touching their heads. The sound produced was a soft scream having an average duration of 70 ms and an amplitude averaging 56 dB RMS SPL, at 15 cm from the subject. The signals had a harmonic structure, with an average fundamental frequency of 3.1 kHz, which in most cases (72 %) corresponded to the dominant frequency. 4-8 harmonics were identified, the higher of which extended into the ultrasound range up to about 40 kHz). The screams had different frequency modulation patterns, the most common (50 %) being descending or constant. Female screams had a higher number of harmonics than males, and larger individuals produced screams having a larger amplitude and a higher number of harmonics. The high frequency contents and low intensity of these vocalizations suggest a primary role in deterring predators, rather than in warning conspecifics. Funding: FONDECYT Grant 1090251.

P219 ABS Genesis & Charles H. Turner Award Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

I KNOW YOU: FAMILIARITY WITH AN AUDIENCE INFLUENCES MALE-MALE INTERACTIONS IN SIAMESE FIGHTING FISH

Christina Perazio, Teresa Dzieweczynski

University of New England, United States; Email: cperazio@une.edu

The presence of an audience during information transfer within a network of individuals may alter male-male interactions. Additionally, familiarity may affect the outcome of the interaction. However, how these phenomena interact has not been explored, although familiarity likely affects information exchange. This study examined the effects that audience familiarity might have on male-male interactions in *Betta splendens*. By using seven different treatment conditions that varied based on familiarity with and sex of the audience, whether male aggressive interactions were affected by these two factors was investigated. Males first had exposure to an audience and then interacted with each other in the presence or absence of this audience conspecific. We hypothesized that interactions involving a familiar female audience would be the least aggressive whereas interactions in the presence of an unfamiliar male audience would be the most aggressive. Our study will provide

important insight into Betta communication as well as provide a new and important addition to the study of communication networks by investigating phenomena that have not been explored simultaneously previously.

286 Contributed Talk: PARENTAL CARE II (Thursday PM III)

REPRODUCTIVE STATUS AFFECTS PLACENTOPHAGIA IN MALE CALIFORNIA MICE *PEROMYSCUS CALIFORNICUS*

Juan Perea-Rodriguez, Tynke de Jong, Breanna Harris, Miyetani Chauke, Wendy Saltzman
University of California, Riverside, United States; Email:jpere035@ucr.edu

Ingestion of placenta is thought to facilitate the onset of maternal behavior. In biparental species such as the California mouse, in which both parents ingest placenta and invest heavily in offspring, placentophagia might promote parental responsiveness in both parents. To determine if attraction to placenta varies with reproductive status, we presented fresh placenta from an unrelated female to Virgin Males (VM, n=8), Virgin Females (n=10), First-Time Expectant Males (FTEM, n=8), First-Time Expectant Females (n=10), Experienced Fathers (EF, n=13) and Experienced Mothers (n=6). As a control, liver from a virgin female was presented in the same manner several days later. Differences in placentophagia were seen among male but not female reproductive groups: VMs were less likely to eat placenta than FTEMs or EFs ($P > 0.05$). The proportion of mice that ingested liver did not differ among reproductive groups of either sex. Our results suggest that males' propensity to eat placenta is increased by cohabitation with a female, perhaps specifically with a pregnant female. Additional studies are needed to identify the functional significance of placentophagia in males.

295 Contributed Talk: APPLIED ANIMAL BEHAVIOR III (Friday AM)

CHRONOBIOLOGICAL SHIFTS IN CAPTIVE NEWBORN GIANT PANDA CUBS (*AILUROPODA MELANOLEUCA*)

Martina Pertl, Annette Krop-Benesch
University of Vienna, Austria; Email:martina.pertl@chello.at

Despite the general interest in the rhythmical organisation of mammal life, only few studies have examined the development of this timekeeping system. The structure of circadian rhythms in giant panda can serve as a case study. Here, we provide the very first results on the behavioural ontogeny of two giant panda cubs, born at the Vienna Zoo in 2007 and 2010, including the development of their activity rhythm and time budgets. We also investigate whether zoo-specific external factors (e.g. animal keepers, zoo visitors, medical examinations etc.) influence the activity rhythm of the cubs. Lomp-Scargle Periodograms revealed that circadian rhythmicity is not fully established at birth, but develops within the third and fourth month. Whereas the activity of the cubs is evenly distributed over 24 h within the first month, they become increasingly diurnal thereafter. Adults, in contrast, show two activity bouts (mainly feeding behaviour) between 8a.m.-10a.m. and 3p.m.-6p.m.. Although the animal keepers do not directly affect cub behavioural patterns, they clearly influence the dams' behaviour due to their daily routine.

374 Contributed Talk: PREDATION AND FORAGING II (Saturday AM)

SCATTER-HOARDING OF ACORNS BY ISLAND SCRUB-JAYS

Mario Pesendorfer, T. Scott Sillett, Alan Bond, Alan Kamil
University of Nebraska, Lincoln, United States; Email:mario.pesendorfer@yahoo.com

Scatter-hoarding by scrub-jays (*Corvidae: Aphelocoma sp.*) has been studied extensively in laboratories, but field observations are needed to determine the ecological context of the behavior. We present data from over 200 h of observations of Island Scrub-Jays (*A. insularis*) recorded in the fall of 2009 (n=247 caches) and 2010 (n=317 caches) on Santa Cruz Island, CA (USA). The caches were predominantly placed in the ground, at a mean distance of 46.4 ± 50.2 m (mean \pm SD) from the source tree (median: 34 m, max: 400 m). In an area with reduced acorn availability, jays cached at higher frequencies (9.73 ± 1.37 /h) than in two areas with abundant acorns (4.78 ± 1.37 /h; 7.08 ± 1.44 /h), but transportation distances did not differ between areas. 75% of caches

were placed below vegetation and 88% in the shade. Our results reflect the close interaction often found between jays and oaks. The jays are the dominant seed dispersers of the endemic Island Scrub-Oak (*Quercus pacifica*), yearly scatter-hoarding up to 5000 acorns per bird. Scatter-hoarding jays may thus play a crucial role in the restoration of oak chaparral recovering from disturbance.

P316 ABS Founders Award Poster: ECOLOGICAL EFFECTS 2 (Poster Session B: Thurs. eve)

CONTEXT-DEPENDENT EFFECTS OF THE ENVIRONMENT ON MARMOT PERSONALITY TRAITS

Matthew Petelle, Daniel Blumstein

University of California, Los Angeles, United States; Email:mpetelle@ucla.edu

It has been shown that consistent inter-individual differences in behaviors exist in a wide variety of taxa, and are referred as animal personality. Because personality could have an important impact on life-history traits and on fitness, it is important to understand its underlying causes. To understand the importance of environmental and social factors on personality, we conducted 204 Open-field (OF) and Mirror Image Stimulation (MIS) experiments on 131 yellow-bellied marmots (*Marmota flaviventris*) during summer 2010 at the Rocky Mountain Biological Laboratory, Gothic, Colorado. Marmot behavior was rated on 15 subjective indexes in each test. The indexes were subjected to a PCA and three factors were retained, boldness, activity, and aggression. Mixed-model analyses indicate that personality traits are not influenced by the same variables in the two tests. Aggression was influenced by trial, age, and season in the OF test, but only by trial in MIS test. Similarly variables affecting Activity and Boldness differed between OF and MIS tests. This study suggests that environmental variables may differentially influence personality traits between contexts.

P329 ABS Founders Award Poster: GENETICS AND EVOLUTION 2 (Poster Session B: Thurs. eve)

TRANSGENERATIONAL EFFECTS OF LEAD ON BEHAVIOR IN *DROSOPHILA MELANOGASTER*

Elizabeth Peterson, Helen Ghiradella, Bernard Possidente, Helmut Hirsch

University at Albany-State University of New York, United States; Email:ep486766@albany.edu

The multigenerational implications of lead are unknown. Wildtype Canton-S *D. melanogaster* were raised in control or leaded medium. Treatment groups were cross mated to determine how parental exposure affects the fecundity and activity of offspring raised on control medium. Fecundity was significantly reduced by lead exposure of parental females, but not of parental males. Activity was not significantly affected. This is evidence for a transgenerational effect on fecundity mediated by maternal lead exposure. We are replicating this with inbred lines to deduce the transgenerational epigenetic effects of lead. Then, we can explore epigenetic mechanisms in behavioral evolution.

280 Contributed Talk: MECHANISMS II (Thursday PM III)

GENE EXPRESSION IN THE BRAIN OF A NON-MODEL SONGBIRD: SEXUAL DIMORPHISM AND THE ROLE OF TESTOSTERONE

Mark Peterson, Kimberly Rosvall, Jeong-Hyeon Choi, Haixu Tang, Ellen Ketterson

Indiana University, United States; Email:petersmp@indiana.edu

Males and females share genomes, yet often differ dramatically in behavioral phenotype. This paradox is likely resolved by differential gene expression, and brain regions related to sexually dimorphic behavior, e.g., medial amygdala and hypothalamus, offer a window into transcriptional and hormonal control of behavior. We captured wild dark-eyed juncos (*Junco hyemalis*) and experimentally elevated testosterone (T), a hormone known to affect many aspects of phenotype. After 3 weeks, we collected tissues and assessed gene expression on a junco-specific microarray. Control male and female gene expression differed in several functional categories in both brain regions, including protein modification and cell signaling. T also affected the expression of several genes, including those that mediate transcription and hormone metabolism. As predicted, T caused female gene

expression to become like that of males; surprisingly, male gene expression became more female-like, rather than hyper-masculinized. Our use of genomic tools in a non-model system reveals that T indeed mediates sexual dimorphism through gene expression and that the sexes respond differently to T.

357 Contributed Talk: COMMUNICATION VI (Saturday AM)

FEMALE CALL PREFERENCES IN A NEOTROPICAL FROG WITH BIPARENTAL CARE

Beth Pettitt, Godfrey Bourne, Mark Bee

University of Minnesota, United States; Email:pett0033@umn.edu

Preference functions describe female preference relative to variation in male secondary sex traits. We studied how patterns of natural variation in call duration, call rate and dominant frequency of male advertisement calls are related to female population-level preference functions for these traits in the golden rocket frog (*Anomaloglossus beebei*). We used two-choice phonotaxis experiments to examine female preference. Results from experiments using equal playback levels showed that the preference function for call duration was strongly directional, favoring longer calls. We found no preference for either call rate or dominant frequency. Results from experiments representing potentially costly mate choice (i.e., unequal playback levels) showed a non-linear preference function for call duration when the amplitude of the longer alternative was attenuated by 3 dB and an elimination, but not reversal, of this directional preference for longer calls with an attenuation of 6 dB. We discuss these findings in the context of female choice for mate signals that, according to preliminary results, may indicate paternal care effort in the golden rocket frog.

P133 Contributed Poster: MECHANISMS 1 (Poster Session A: Weds. eve)

THE BEHAVIORAL NEUROENDOCRINOLOGY OF FEMALE DOMINANCE: A COMPARATIVE STUDY ACROSS EULEMUR

Joseph Petty, Christine Drea

Duke University, United States; Email:joseph.petty@duke.edu

Female social dominance is rare among mammals, but characterizes many strepsirrhine primates, including most species in the genus *Eulemur*. Although the benefits of dominance for reproductive females are clear, the proximate mechanisms underlying these social systems remain a mystery. To investigate the behavioral and hormonal correlates of female dominance, we selected for comparative study six *Eulemur* species that show a gradient of social and behavioral variation. We observed behavior (e.g. aggression, affiliation, and scent marking) in 18 mixed-sex dyads during the breeding and nonbreeding seasons, and collected blood samples for analyses of serotonin, androgens, and estradiol. Our behavioral neuroendocrine data show provocative species, seasonal, and sex differences, including the absence or reversal of typical sexually dimorphic patterns. Seasonal changes in behavior and hormones varied by species, sex, and social system. Like female dominance in the spotted hyena and ring-tailed lemur, we suggest that female dominance in *Eulemur* is driven by masculinization of the neuroendocrine system. Funded by NSF IOS-0719003 and the Margot Marsh Biodiversity Fund.

P301 ABS Founders Award Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

EFFECTS OF URBAN NOISE ON SONG STRUCTURE IN A SEDENTARY AND MIGRATORY BIRD SPECIES

Jenny Phillips, Pedro Garcia, Lauryn Moles

California State University, Fresno, United States; Email:jnphilli@mail.fresnostate.edu

Many animal species are dependent upon vocal communication to mate and defend territories. Selection will favor individuals that produce vocalizations that transmit best in their environments. The sensory drive concept suggests that environmental conditions, such as ambient sound, will influence the evolution of vocal behavior. Thus, background noise levels may have a profound effect on communication. We study how urban noise affects the cultural evolution of birdsong in two species: the migratory white-crowned sparrow (*Zonotrichia leucophrys gambelii*) and the sedentary house finch (*Carpodacus mexicanus*). These two species are ideal study organisms

because they each have one song type, are territorial, and are easy to identify. We recorded songs and ambient noise concurrently across the Fresno-Clovis Metropolitan Area (FCMA) and in outlying rural areas for comparative analysis of acoustic properties, in particular the frequency and temporal structure of songs. Because song influences fitness via phenotypic and genotypic mate quality, understanding how song changes in an urban environment may allow us to predict species adaptability in a changing world.

128 Contributed Talk: SOCIAL BEHAVIOR II (Tuesday PM I)

INDIVIDUAL VARIATION IN THE INTERACTION NETWORKS OF HARVESTER ANTS

Noa Pinter-Wollman

Stanford University, United States; Email:nmpinter@stanford.edu

Social insects exhibit coordinated behavior without central control. Local interactions among individuals determine their behavior and regulate the activity of the colony. Harvester ants are recruited for outside work, using networks of brief antennal contacts, in the nest chamber and nest tunnels closest to the nest exit. I combine empirical observations in the lab and field with computer simulations to investigate the structure and function of the ants' interaction network. I show that ants vary in how they interact with one another. This variation is a result of the ants' movement patterns but it also persists across days, such that certain individuals are more interactive than others. The interactions inside the nest of ant colonies in the field regulate the foraging activity of the colony. The rate and location of these interactions change according to the rate of food that is brought to the nest by returning foragers. Changes in the interaction network influence the rate at which foragers leave the nest and therefore the foraging efficiency of the colony.

P157 ABS Genesis Award Poster: PREDATION AND FORAGING 1 (Poster Session A: Weds. eve)

VISUAL FIELDS AND FORAGING TECHNIQUES IN BLUE JAYS AND RED-WINGED BLACKBIRDS

Diana Pita, Bret Moore, Esteban Fernandez-Juricic

Purdue University, United States; Email:dpita@purdue.edu

The configuration of the visual field determines the extent of visual information the animal can obtain around its head. We measured the visual fields and degree of eye movements in two Passeriformes with different foraging strategies: Blue Jays (BJ) *Cyanocitta cristata* and Red-winged Blackbirds (RWBB) *Agelaius phoeniceus*. BJs use a broad array of foraging strategies (pecking, gleaning, scavenging, hawking, caching), whereas RWBBs generally use a gaping strategy (jabbing the bill into the substrate, opening it widely to create a hole, exposing prey). RWBBs have wide binocular fields and can see their bill tips, which can facilitate the detection of food with the gaping strategy. RWBBs can also diverge their eyes (increasing the size of their lateral fields) probably to enhance predator detection. BJs have intermediate sized binocular fields and degrees of eye movement enabling them to converge (increasing the size of the binocular field) or diverge their eyes with greater flexibility than RWBBs, which is likely related to the BJs diverse foraging strategies. Our findings indicate that the visual field configuration of both species is associated with their foraging behaviors.

121 Contributed Talk: PARENTAL CARE I (Tuesday PM I)

EFFECTS OF AGE AND BROODING EXPERIENCE IN THE MATERNAL BEHAVIOR OF A PRECOICIAL BIRD

Florent Pittet, Maud Coignard, Cecilia Houdelier, Marie-Annick Richard-Yris, Sophie Lumineau

UMR 6552 Ethologie Animal et Humaine, France; Email:florent.pittet@univ-rennes1.fr

The female can express a specific behavior to provide warmth, food, protection and social stimulation to its offspring, in order to ensure its survival, welfare and its future independence. This maternal behavior is known to be highly influent over young's behavioral development. We studied the impact of two endogenous factors: age and prior maternal experience on the expression of this maternal behavior in the Japanese quail. Before the brooding period, young and older females, like experienced and naive ones, do not differ in their emotional

reactivity or social motivation but their maternal behavior is different. Indeed, we highlighted that experienced females express some care behaviors absent in naive mothers. Moreover young females show a lower quality and quantity of care compared to older females. Finally, chicks brooded by experienced females express more neophobia than young brooded by naive mothers. Besides, chicks brooded by young females are less emotive than young of older females. These results attest the role of experience and age of the mother on its maternal behavior and the development of its chicks.

P54 Contributed Poster: COMMUNICATION I (Poster Session A: Weds. eve)

WITHIN-ISLAND SONG VARIATION IN GALAPAGOS FINCHES: DISCRIMINATION AND GEOGRAPHICAL DISTANCE

Jeff Podos, Rie Dybboe, Mads Ole Jensen

University of Massachusetts Amherst, United States; Email: jpodos@bio.umass.edu

Geographic variation in mating signals can serve as both an indicator and a mechanism of inter-population divergence. In Galapagos finches, songs of some species vary in structure across islands, and territorial males are sensitive to between-island song variations, responding more strongly to local song types. A pair of recent studies, on the medium ground finch, asked whether birds can also discriminate among songs from different localities on a single island (Santa Cruz). The results of these studies have been mixed and difficult to reconcile: males at one site (El Garrapatero, EG) showed strong discrimination against songs from a second nearby site (Academy Bay, AB), yet not from a third site much farther away (Borrero Bay, BB). The present field study expands on this latter finding in a reciprocal design - we ask whether territorial males at BB can discriminate local versus EG songs. Our main result is that males respond strongly to both BB and EG songs, and do not show obvious discrimination by locality. These results provide further support for functional equivalence of BB and EG songs, and thus deepen the enigma of the initial EG/AB discrimination result.

209 Contributed Talk: COMMUNICATION III (Thursday AM)

SIGNALLING IN ANTHROPOGENIC NOISE - THE RECIPIENTS' PERSPECTIVE

Nina Pohl, Hans Slabbekoorn, Georg Klump, Ulrike Langemann

University of Oldenburg, Germany; Email: nipomi@freenet.de

Recent studies have shown that in urban environments small song birds produce on average higher pitched songs than in nearby woodland habitats (e.g., Slabbekoorn & den Boer-Visser, 2006, *Curr. Biol.*, 16, 2326-2331). This change in song frequency has been interpreted as a counter strategy to avoid masking by low frequency traffic noise present in cities. To test this hypothesis, we investigate the perception of great tits (*Parus major*) under controlled laboratory conditions with trained animals. We compared the perception of song signals in urban and woodland environmental noise. The effect of song frequency on signal detection was tested by using songs that were shifted up or down in frequency. In addition we evaluate the birds' ability to discriminate between high and low frequency songs. Our results emphasize the benefit of using high frequency communication signals in urban environments. To investigate further which signal features are especially prone to masking effects by environmental noise, artificial signals were created in which typical features of natural great tit communication signals were varied (e.g., bandwidth, number of tonal components).

378 Contributed Talk: SEXUAL SELECTION V (Saturday AM)

SEXUAL SELECTION AND THE EVOLUTION OF THE DROSOPHILA SEX COMB

Michal Polak

University of Cincinnati, United States; Email: polakm@uc.edu

The *Drosophila* sex comb is a condition-dependent secondary sexual trait that exhibits extraordinarily rapid diversification among even closely related species within the genus. This dramatic evolutionary pattern parallels that seen in male reproductive traits of many animal groups, such as male genitalia. We have been capitalizing on the many practical advantages of using *Drosophila* to understand pre- and post-copulatory mechanisms that

may be driving phenotypic evolution of this remarkable morphological trait. An especially fruitful approach has been the use of laser phenotypic engineering to precisely define the role of micron-scale morphological traits such as the sex comb in mate competition. Results of integrative research combining laboratory experimentation with field studies of mating behavior across the species' range (from Taiwan to French Polynesia) shed light on the mechanisms driving the diversification of this evolutionarily labile reproductive trait.

74 Symposium: COMMUNICATIVE COMPLEXITY (Friday)

EVOLVING COMMUNICATIVE COMPLEXITY: SCIURIDS AS A MODEL SYSTEM

Kimberly Pollard, Dan Blumstein

University of California, Los Angeles, United States; Email:kpollard@ucla.edu

Communicative complexity occurs at multiple levels, from a species' entire repertoire to signallers' individualistic signatures, to complex acoustic phenomena within a single call. Sciurid rodents provide an excellent model system in which to study the evolution of these traits. Their acoustic communication includes a range of calls that vary across species, context, and individuals, carrying a wealth of information with different degrees of complexity. By comparing this communicative variation against social, environmental, and phylogenetic variation, much has been learned about how complex communication evolves. We will review what has been learned about communicative complexity in sciurid rodents and will discuss remaining questions and future prospects.

P265 Contributed Poster: COGNITION AND LEARNING 2 (Poster Session B: Thurs. eve)

SIGNALING INTERACTIONS IN A SKINNER'S BOX

Timothy Polnaszek

University of Minnesota, United States; Email:polna005@umn.edu

An organism making any decision faces a fundamental problem - should it attend to experience or use available signals and cues? In animal communication, the receiver is confronted with this same problem, and its actions affect the signaler. The value of any signaled information hinges on two key variables, environmental uncertainty and reliability. Therefore, the critical level of reliability necessary to promote signal following is set via environmental uncertainty. Despite its predicted importance, environmental uncertainty is not often considered in discussions of honesty and reliability. Can signaling individuals successfully exploit uncertainty? Here, we present the results of a pilot experiment exploring this question in a signaling simulation. Two blue jays were placed in adjacent operant boxes to create an experimental signaler/receiver dyad. The signaler provides a positional cue to the receiver, signaling which side is best, by hopping to a perch on the left or right. Results show signalers change signaling behavior based on two experimental variables, receiver strategy, or sensitivity to signaled information, and whether the signaler and receiver had shared interests.

P302 Contributed Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

VARIATION IN MALE-BUILT COURTSHIP STRUCTURES IN THE FIDDLER CRAB *UCA MUSICA*: SIGNAL OR NOISE?

Denise Pope, Kathryn Chang, Alison Zulick

Mount Holyoke College, United States; Email:dspope@mtholyoke.edu

In the fiddler crab *Uca musica*, many courting males build sand structures ("hoods") next to their breeding burrows. Previous work on this and other fiddler crab species has demonstrated that females are attracted to these structures and are more likely to approach courting males with hoods than those without hoods. Hood-building males spend less time feeding and more time courting than males without hoods, suggesting that the hood is a condition-dependent signal. Clearly the presence of a hood on a male's burrow is salient to females; among hood-building males, there is also substantial variation in hood size and shape that may provide relevant information to mate-searching females. Is any of the variation in hood dimensions correlated with other male features that may be of interest to females? As a first step towards elucidating the potential signal function of

male hoods, I will present data on hood variation in relation to male size, density of courting males, substrate quality, season, and year.

23 Symposium: SENSORY POLLUTION (Tuesday)

EFFECTS OF NOISE POLLUTION ON FISH BEHAVIOR AND PHYSIOLOGY

Arthur Popper

University of Maryland, United States; Email: apopper@umd.edu

There is increasing concern that human-generated (anthropogenic) noise in the aquatic environment could have an impact on physiology and/or behavior of fish and other organisms. Some source, such as seismic air guns used for off-shore oil exploration, high-powered naval sonars, and pile driving used in wind farm construction produce very loud but intermittent sounds, whereas other sources such as pleasure boats and shipping produce long term, but lower intensity sounds that cover broad areas such as a harbor. The intense intermittent sounds can result in death or damage to fishes, or masking of detection of biologically relevant sounds. The longer term sounds have the potential to alter behavior and/or produce masking. One major problem in understanding the effects of these sounds, however, is that there is a substantial lack of data. In particular, almost nothing is known about behavioral effects of these sounds. This paper will review some of the most recent data on the potential impacts of anthropogenic sound on fish and consider the broader implications of anthropogenic noise for fish populations.

161 Contributed Talk: COGNITION AND LEARNING III (Wednesday AM)

LONG-TERM ASSOCIATIVE SPATIAL MEMORY IN A FOOD-CACHING PARID

Vladimir Pravosudov, Timothy Roth II, Lara LaDage

University of Nevada, Reno, United States; Email: vpravosu@unr.edu

Many avian species utilize a food-caching strategy to survive difficult and unpredictable conditions during the winter. Parids, for example, have been reported to cache hundreds of thousands of individual food items each year. Although cached food is often recovered on a short-term basis using spatial memory, the existence of long-term spatial memory in parids has been questioned. We tested long-term spatial memory in black-capped chickadees using an associative memory task. We rewarded a single spatial location in a grid of 15 sites over 17 repeated trials, gradually increasing the retention interval between consecutive trials from 1 day to over 6 months. Chickadees performed better than expected by chance at all retention intervals, suggesting that they can remember a single spatial location for at least 6 months. Although our repeated associative test is different from a cache-recovery task, it nonetheless clearly demonstrates that chickadees can retain spatial memories for a lengthy, ecologically relevant period of time. Our findings therefore suggest that it is possible that spatial memory may be utilized during the retrieval of long-term caches.

146 Contributed Talk: SEXUAL SELECTION II (Tuesday PM II)

SIGNATURES OF DIFFERENT SEXUAL SELECTION MECHANISMS IN THE NEW WORLD BLACKBIRD FAMILY

Jordan Price

St. Mary's College of Maryland, United States; Email: jjprice@smcm.edu

As suggested by R. A. Fisher and others, secondary sexual traits can evolve purely as an intrinsic consequence of their genetic correlation with mating preferences, even in the absence of any additional evolutionary forces. Such traits should exhibit evolutionary patterns different from those expected under other sexual selection models. For example, the Fisher process predicts the accumulation of arbitrary display traits over time with little convergence among taxa, whereas most other models predict a more constrained pattern within a relatively limited range of potential display traits. Here I describe the evolution of songs and plumage colors in the New World blackbirds (Icteridae), a songbird family with a wide range of mating systems. Both songs and colors have changed more dramatically in polygynous than in monogamous taxa, yet polygynous taxa also show much less evolutionary

convergence. Moreover, increased rates of change show little relationship with levels of sexual dimorphism in these traits, suggesting few constraints imposed by natural selection. Such phylogenetic signatures may provide valuable insights into the mechanisms and consequences of sexual selection.

56 Symposium: GEOGRAPHIC VARIATION (Thursday)

GEOGRAPHIC VARIATION IN SEXUAL SIGNALS AND BEHAVIOR IN TWO SPECIES OF POISON FROGS

Heike Pröhl, Oscar Brusa

University of Veterinary Medicine, Germany; Email:heike.proehl@tiho-hannover.de

Populations of poison frogs (Dendrobatidae) vary geographically in phenotypic traits, acoustic signals and behavior. We explored the variation in advertisement calls and color patterns among two species of poison frogs, *Oophaga pumilio* and *O. granulifera* which are allopatrically distributed in lowland rainforests in Central America. Both species showed a geographic cline of bioacoustic variation from calls of longer duration emitted at a lower rate towards calls of shorter duration emitted at a higher rate. Also in both species we found color pattern diversity with more brightly colored populations (e.g. red or orange) as well as more cryptic populations (e.g. blue or green). We found some similarity between call and color pattern variation indicating parallel selection pressures on phenotypic traits in both species. In *O. pumilio* behavioral observations indicated that brightly colored populations display a more conspicuous behavior while more cryptic frogs behave more secretively regarding anti-predator activities and foraging. Together with other studies our results suggest that the divergence in calls, colors and behavior contributed to speciation in the family Dendrobatidae.

13 ABS Allee Session: ALLEE II (Wednesday PM I)

THE PERSONALITY COMPOSITION OF SOCIAL GROUPS MEDIATE SPECIES INTERACTIONS

Jonathan Pruitt

University of California, Davis, United States; Email:agelenopsis@gmail.com

One goal of ecologists is to understand and predict the nature and magnitude of interactions among species. Although the study of ecological interactions often takes into account functional variation between species, intraspecific variation is virtually ignored. Here I investigate the importance of an intraspecific polymorphism in shaping the nature and magnitude of interspecific interactions in a habitat-building species. Colonies of the social spider *Anelosimus studiosus* provide habitat for dozens of arthropod species, and colony members exhibit markedly polymorphic behavioural tendencies (BT - "aggressive" or "docile"). I manipulated colony phenotypic compositions (100% aggressive, 50% aggressive 50% docile, 100% docile) and measured the nature and magnitude of the species interactions between *A. studiosus* and four heterospecific (spider) web associates. I found that BT composition significantly affected the outcome of interspecific interactions, and introducing BTs into my statistical models predicting colony performance dramatically increased my R² (on average: from 0.22 to 0.56). These results have noteworthy implications for community ecology.

P6 ABS Founders Award Poster: APPLIED ANIMAL BEHAVIOR 1 (Poster Session A: Weds. eve)

AN EVALUATION OF STRESS LEVEL INDICATING AN ACCLIMATISATION PERIOD OF WILD MICE FOR LAB STUDY

Nattida Puenphasook, Steve Harris, Innes Cuthill

Bristol University, United Kingdom; Email:Nattida.Puenphasook@bristol.ac.uk

Wood mice (*Apodemus sylvaticus*) and house mice (*Mus musculus*) are suitable for the study regarding the impact of urbanisation as they are abundant and small. Bringing these wild-caught mice into laboratory is essential to consider level of stress caused by environmental changes since this would interfere animal's natural behaviour. This study determined a minimum acclimatisation period of wild mice, caught from urban and rural areas, in laboratory by evaluating the level of faecal corticosterone metabolites (FCMs) which indicating level of

stress using a non-invasive method. Six wood mice and six house mice were caught from urban area in Bristol, UK. Another 12 wood mice and 6 house mice were caught from rural area. Faeces were collected every morning for 15 days. The results show that both species reacted to captive conditions differently over time ($P \leq 0.05$). Wood mice showed higher level of FCMs than house mice whilst there was no significant difference between sexes and locations of capture ($P \geq 0.05$). It is concluded that wood mice and house mice, from both urban and rural areas, need 7 and 5 days of minimum acclimatisation period respectively.

P338 Contributed Poster: MATING SYSTEMS 2 (Poster Session B: Thurs. eve)

TESTOSTERONE AND PAIR-BONDING EFFECTS ON ULTRASONIC COURTSHIP VOCALIZATIONS IN A MONOGAMOUS MOUSE

Joshua Pultorak, Matina Kalcounis-Rueppell, Matthew Fuxjager, Catherine Marler

University of Wisconsin, Madison, United States; Email: Pultorak@wisc.edu

The steroid hormone testosterone is well established as a sexual behavior mediator in many vertebrates. However, less is known about its rapid effects on ultrasonic vocalizations, which are believed to play a role in mate acquisition in rodents. Using the monogamous California mouse (*Peromyscus californicus*), we tested the rapid effects of testosterone on vocalizations of sexually naïve males upon exposure to an unfamiliar female. Furthermore we conducted the same test using males that had reared many litters and had been pair-bonded to another female in order to investigate whether this experience (and presumably different hormonal profile) alters the capability of testosterone to produce changes in courtship behavior toward an unfamiliar female. Our lab has recently discovered that testosterone responsiveness in *P. cal* males during courtship predict future paternal behavior and that testosterone-mediated behaviors may act as cues for female choice. To determine the potential significance of variation in vocalization behavior in courtship, we also conducted observations to assess paternal care efforts. Supported by NSF grants IOS-0620042 and IOB-0641530

379 Contributed Talk: SEXUAL SELECTION V (Saturday AM)

MALE COERCION LIMITS FEMALE REPRODUCTIVE OPTIONS IN PUKEKO (*PORPHYRIO PORPHYRIO MELANOTUS*)

James Quinn, Cody Dey, John Haselmayer, Ian Jamieson

McMaster University, Canada; Email: quinn@mcmaster.ca

Despite wide interest in animal sociality, research on intra-group conflicts of interests in joint-laying birds (species where multiple females contribute eggs one nest and share parental care) is lacking. Joint-laying usually results in conflicts between co-breeding females, since joint-laying may produce larger clutches than can be raised to adult-hood. We combine experimental and descriptive studies to understand the selective pressures favoring joint-laying in the pukeko. In contrast to other joint-layers, pukeko females do not show overt reproductive conflict. We investigate why female pukeko do not attempt to monopolize egg-laying within their group; specifically we show that hatching success (per egg) is reduced in larger joint-clutches, yet females do not recognize the eggs of co-breeders and attempt to remove them. Furthermore, we show that female joint-nesters do not retaliate when their entire clutch is removed. A recent experiment shows that males reduce their incubation of experimentally reduced clutches which leads to lowered hatching success. As a result, females would not benefit from performing ovicide because males decrease their parental investment.

P279 ABS Founders Award Poster: CONSERVATION (Poster Session B: Thurs. eve)

PEDESTRIAN FOOT TRAFFIC DISTURBS OVIPOSITING KARNER BLUE BUTTERFLIES

Vanessa Quinn, Victoria Bennett, Patrick Zollner

Purdue University North Central, United States; Email: vquinn@pnc.edu

One factor threatening the persistence of the federally endangered Karner blue butterfly (*Lycæideia melissa samuelis*) is the effect of recreational disturbance on Karner blue behavior. We conducted a field study to explore the implications of recreation on this butterfly at the Indiana Dunes National Lakeshore. We observed butterflies

in the presence and absence of recreationists to investigate whether such disturbance influences behavior. Female flight distances in the presence of a pedestrian were longer than flight distance when no pedestrians are present. This was not the case for males. Thus, potentially ovipositing females may be more sensitive to pedestrian traffic than males. We used a spatially-explicit individual-based simulation model to compare the frequency and location of disturbance associated with alternative management strategies (proximity of paths to lupine and timing of pedestrian activity).

P241 Contributed Poster: BEHAVIORAL COMMUNITY ECOLOGY 2 (Poster Session B: Thurs. eve)

HANUMAN LANGUR (*SEMNOPTHECUS ENTELLUS ENTELLUS*) FEMALES LIVE LONGER THEN MALE LANGURS

L.S. Rajpurohit, Goutam Sharma

Jai Narain Vyas University (JNV), India; Email:drlsrajpurohit@yahoo.in

The city of Jodhpur (26° 18'N, 73° 08'E and 241m MSL) supports a pocket population of about 2100 Hanuman langurs (*Semnopithecus entellus*) divided into 37 bisexual troops and 15 all male bands in an area of about 150 km². Recent observation of this langur population during May-June, 2010 revealed that there are total 2100 animals in the bisexual troops and all male bands. The male: female sex ratio in 2011 was 1.47. Thus, compared to sex ratio of 2005 (1.75) the percentage of male in the population decreased. Although the number of individuals living in bisexual troops increased from about 1600 to 2100 during past decade, the number of male living in all-male bands remained constant. It could already be shown, that sex ratio of the Jodhpur langur population is female biased due to higher mortality of juvenile and adult males. Members of all male bands are exposed to higher risks compared to individuals living in bisexual troops because they have larger home range, traverse unfamiliar areas and fight with competing males. Humans at least partially contribute to the increased risk of mortality by creating additional sources of accidents (electrocution, vehicles).~

P220 Contributed Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

INDICATORS OF MATING SUCCESS IN FREE-RANGING ADULT MALE RHESUS MACAQUES

Maria Rakhovskaya

University of Pennsylvania, United States; Email:mrakhovs@sas.upenn.edu

The reproductive success of mammalian males is typically determined by male mating success. Male competitive abilities have been postulated to primarily determine male mating success in multi-male multi-female groups. In the present study, I proposed that male dominance rank, age and intragroup social interactions with adult males and females contribute to male mating success in a seasonally breeding primate species with limited sexual dimorphism. I tested this prediction during one mating season in a free-ranging population of rhesus macaques, where, due to high food availability and the lack of predation, social, rather than ecological factors are likely the principal determinants of reproductive success. The male subjects came from two social groups and were of known ages and transfer histories. Using a multivariate approach, I showed that male dominance rank, age, and male-male aggression were the significant factors in male mating success. Affiliative interactions with conspecifics did not increase the reproductive success of males during the study period.

81 Contributed Talk: COGNITION AND LEARNING I (Tuesday AM)

VISUAL PERSPECTIVE TAKING IN PEOPLE WITH APHASIA: THE ROLE OF LANGUAGE AND EXECUTIVE FUNCTIONS

Vijayachandra Ramachandra, Elizabeth Schneider

Marywood University, United States; Email:ramachandra@maryu.marywood.edu

The relationship of theory of mind (TOM) to other cognitive processes is controversial. A few studies in adults with left cerebrovascular accidents indicate that TOM reasoning can exist despite severe deficits in language processing. Studies examining the role of executive functions in TOM reasoning in people with brain damage

suggest that there is no single executive function that can be linked to TOM reasoning. The current study aimed at extending these findings by investigating the role of language and executive functions in TOM reasoning of people with aphasia. Eight subjects with aphasia were administered a language test, an executive function test, and visual perspective taking (TOM) tasks. The results suggest that grammar may not be necessary for TOM but we cannot exclude the role of semantic knowledge in TOM reasoning. The findings also bolster the idea that a single executive function cannot be associated with TOM reasoning. Finally, we found that temporoparietal junction and the frontal lobes play an important role in TOM reasoning.

P235 ABS Founders Award Poster: APPLIED ANIMAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

PRE-BREEDING BEHAVIOR AND BREEDING SUCCESS IN CAPTIVE PUERTO RICAN PARROTS (*AMAZONA VITTATA*)

Brian Ramos

University of Puerto Rico, Mayaguez, Puerto Rico; Email:brian.ramos4@upr.edu

Understanding behavioral compatibility is critical to the success of breeding programs for monogamous species. If breeders could accurately measure behavioral compatibility between potential breeding partners, they could improve reproductive success and reduce aggression in their breeding colonies. We are testing several potential indicators of behavioral compatibility in a captive population of the critically endangered Puerto Rican parrot (*Amazona vittata*). Specifically, we are asking how well pair duration, duet frequency, duet synchronization, allopreening frequency, allopreening duration, and copulation frequency predict reproductive success. These data will also allow us to test the hypothesis that duetting plays a role in pair bonding in parrots. We have gathered data from nine pairs and we intend to take data from nine different pairs next breeding season. We are hopeful that our data will allow us to improve our ability to quickly identify high-quality breeding partnerships and also to clarify the function of duetting in parrots.

P439 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

GROUP MATES: HOW CLOSELY ARE THEIR VIGILANCE LEVELS MONITORED?

Jacquelyn Randolet, Jeffrey Lucas, Esteban Fernandez-Juricic

Purdue University, United States; Email:jrandole@purdue.edu

Animals monitor their environments to gather information about predators through vigilance behavior. Animals living in groups benefit by the vigilance of conspecifics (many-eyes hypothesis). This assumes that individuals within a group monitor the vigilance of group mates. However, the number of group mates and their vigilance behavior can influence how individuals adjust their own vigilance. Theoretical models predict that when group mates increase their vigilance, individuals will decrease their vigilance behavior. In contrast, several empirical studies have shown that in some species individuals mimic their group mates' vigilance behavior. In this study, we assessed how dark-eyed juncos responded to changes in the number and vigilance behavior of group mates. We used robotic juncos as group mates and manipulated their vigilance and pecking behaviors. The results of this study have implications for the understanding the mechanisms of social information use in foraging groups.

P28 Contributed Poster: COGNITION AND LEARNING 1 (Poster Session A: Weds. eve)

THE DEVIL LIES IN THE DETAILS: SOCIAL LEARNING IN WOLVES AND DOGS

Friederike Range, Zsófia Virányi

University of Vienna, Wolf Science Center, Austria; Email:friederike.range@univie.ac.at

Domestication is thought to have strongly influenced dogs' cognitive abilities to communicate and interact with humans. However, studying other aspects of social cognition might further enhance our understanding of the selective forces that might have been in place during domestication. We investigated whether, after watching conspecific or human demonstrators in different social learning tasks, similar raised and kept juvenile wolves and dogs solved the given problem and what kind of information they extracted from the demonstrations. We found in all tasks that wolves were better at solving the specific tasks, and that they extracted more details of the

provided social information than the dogs. These differences could not be explained by differential motivation or a higher dependency of the dogs on humans. Instead these results suggest that the higher intra-specific cooperativeness and dependency on close coordination during daily life in wolves compared to domestic dogs may influence the tendency to extract social information from partners. These data are discussed in relation to current domestication hypotheses and results linking cooperativeness and imitation.

P79 ABS Genesis Award Poster: DEVELOPMENT (Poster Session A: Weds. eve)

TEMPERATURE, DEVELOPMENT TIME AND SIBLING CANNIBALISM IN AUSTRALIAN REDBACK SPIDERS

Nizanthan Rathitharan, Lucy Dong Xuan Li, Hosay Said, Maria Modanu, Maydianne C.B. Andrade
University of Toronto, Canada; Email:n.rathitharan@utoronto.ca

In many taxa low temperatures suspend growth and development, but both resume when temperatures are favorable again. For invasive redback spiders (*Latrodectus hasselti*), this pattern may facilitate colonization of cooler climates. Prolonged development may increase sibling cannibalism within the confines of the egg sac. We exposed spider egg sacs to a cold shock of 15C and predicted this would prolong development, increase spiderling size, but also increase sibling cannibalism rates. As expected, spiderlings exposed to cold were larger than those incubated continuously at 28C, though the duration of the cold shock did not affect development time or size. In contrast, incubation duration at 26C following the cold shock predicted size, suggesting that development was totally suspended at 15C. Consistent with this, sibling cannibalism did not vary as a function of temperature. Data suggest spiderlings can delay development through cool temperatures, and that a cold shock may trigger a shift in physiology which increases body size. Moreover, there is no evidence for a trade-off between the developmental response to a cold shock and decreased maternal fitness due to sibling cannibalism.

P7 Contributed Poster: APPLIED ANIMAL BEHAVIOR 1 (Poster Session A: Weds. eve)

THE WORLD IS A NATURAL LABORATORY, SOCIAL MEDIA THE NEW PETRI DISH: VIDEO MINING OF BEHAVIORAL DATA

Jean-Loup Rault, Monica Elmore, Dara Biehl, Mark Russell, Joseph Garner
Purdue University, United States; Email:jrault@purdue.edu

Many high interest species are understudied due to the difficulty in obtaining sufficient sample sizes. The recent explosion in social and online media could provide opportunities to collect data for behavioral studies. We investigated the possibility of exploiting social media as a new data source, using horses as a case study. We selected two different horse riding disciplines, jumping versus western riding, from various video sources, to test particular behaviors as indicators of discomfort, irritation, or frustration. The effectiveness of video mining of social media was illustrated by the range of behavioral differences seen between and within riding disciplines, which demonstrated both sensitivity and specificity in the data set generated by this technique. Furthermore, we deliberately used a variable set of video sources which confirmed the robustness of this approach. We describe the epidemiological and ethological field techniques needed to gather and screen online or social media as a data source before using traditional ethological methods to analyze the videos. This novel method provides a rich source of unexploited knowledge for original research and teaching activities.

P221 Contributed Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

WHAT CHANGES WITH EVOLUTION OF SOCIALITY? A COMPARATIVE STUDY IN SOCIAL & SOLITARY HUNTSMAN SPIDERS

Linda Rayor
Cornell University, United States; Email:LSRI@cornell.edu

All of the endemic Australian huntsman spider species (Deleninae) are attentive mothers, aggressively guarding egg sacs and newly emerged young. Three species have significantly prolonged the period of maternal and sibling association to produce matrilineal, multigenerational colonies or subsocial groups sharing retreats.

Patterns of group-living in these non-web building spiders are quite different from those in all other web-based social spider species. The monophyletic social and solitary delenine species share habitats, body size, and natural history. They provide an opportunity to comparatively assess the distinguishing traits and benefits associated with living in groups within a phylogenetic context. Across 18+ species from 9 out of 10 of the delenine genera, I compared patterns of prey sharing, early interactions in mother-offspring-sibling groups, developmental patterns, and metabolic rates. Results indicate many significant benefits and reduced costs, as well as physiological adaptations associated with group-living in the social huntsman species. In contrast, comparable benefits and cost reductions are not seen in solitary species, resulting to early natal dispersal.

345 Contributed Talk: SOCIAL BEHAVIOR VI (Friday PM I)

GROUP JOINING DECISIONS IN A COOPERATIVELY BREEDING CICHLID FISH

Adam Reddon, Daniel Balk, Sigal Balshine

McMaster University, Canada; Email:reddonar@mcmaster.ca

In social animals, group-joining decisions can have important fitness consequences especially when individuals exist in a dominance hierarchy that relates to reproductive success. Choosing to join a large group may maximize safety but a small group can minimize the delay to dominant status. We explored this trade-off using *Neolamprologus pulcher*, a cooperatively breeding cichlid fish in which individuals conform to a rigid dominance hierarchy and females are philopatric. We predicted that because females have less opportunity to switch groups, they would place higher value on social rank than safety. We found that males prefer larger groups regardless of the rank they must assume when they join while females preferred larger groups only when joining did not compromise social rank. Our results help to elucidate factors underlying social decision-making and suggest that females value both rank and safety while males are primarily concerned with safety.

100 Contributed Talk: SEXUAL SELECTION I (Tuesday AM)

DOES SEXUAL SELECTION PREDICT EXTINCTION THREAT STATUS IN AFRICAN BIRDS?

Luke Reding, John Swaddle

College of William and Mary, United States; Email:lpreiding@email.wm.edu

Characterization of macroevolutionary patterns is essential to our understanding of how and why large-scale evolutionary events occur. Sexual selection has often been implicated as opposing organismal fitness at the expense of maximizing mating success, and is thus thought to predispose species to population decline and extinction. Here, we investigate the role of sexual selection intensity on extinction risk in African birds of conservation concern, while controlling for aspects of shared ancestry and factors typically implicated in avian extinction. As expected, several ecological and life history variables were found to explain a significant proportion of the difference in threat status between threatened and non-threatened birds. Additionally, contrary to our predictions, we found a negative relationship between threat status and intensity of sexual selection as measured by variation in mating system. This may represent an underlying weakness of how macroevolutionary theory incorporates sexual selection processes, and/or it may highlight the potential susceptibility of monogamous avian species when challenged with significant anthropogenic change.

170 Contributed Talk: COMMUNICATION II (Wednesday AM)

SECRET SERENADES: COMPLEX, LOW-AMPLITUDE SONG ELICITS AN ELEVATED RESPONSE IN A MALE SONGBIRD

Dustin Reichard, Rebecca Rice, Carla Vanderbilt, Ellen Ketterson

Indiana University, United States; Email:dgreicha@indiana.edu

The majority of research on the function of acoustic signals has focused on high-amplitude, long-range song (LRS) and largely ignored low-amplitude songs produced during close-proximity, conspecific interactions. Low-amplitude songs can be divided into two distinct structural classes: (1) soft, long-range song (soft LRS), which is structurally identical to LRS and (2) short-range song (SRS), which typically shares few spectral and temporal

elements with LRS. To assess the function of these low-amplitude songs, we compared the responses of male dark-eyed juncos, a socially monogamous songbird, to differences in song structure (SRS v. LRS/soft LRS), amplitude (SRS/soft LRS v. LRS), and tempo (slow v. fast SRS). Male juncos responded more strongly to SRS than to LRS or soft LRS; however, SRS tempo did not detectably affect male response. When males' mates were fertile and the risk of paternity loss was greatest, males responded more strongly to SRS than to soft LRS. These results suggest that male response to low-amplitude song is more dependent on song structure than amplitude, and corroborate previous contextual data indicating that SRS functions as a courtship signal.

89 Contributed Talk: COMMUNICATION I (Tuesday AM)

DETERMINANTS OF RHP AND THE LEVEL OF ESCALATION IN AGGRESSIVE INTERACTIONS OF GRAY TREEFROGS

Michael Reichert, Carl Gerhardt

University of Missouri, United States; Email:msrgh9@mizzou.edu

Aggressive interactions in animals are often resolved in favor of the individual with superior fighting ability, or resource holding potential (RHP). RHP differences between competitors have been invoked in models that seek to explain variation in interaction duration and escalation. Disputes may be resolved through mutual- or self-assessment of RHP; these models differ in the predicted relationship between interaction duration and each competitor's relative and absolute RHP. We studied the components of RHP and their relationship to contest duration and escalation in the gray treefrog, *Hyla versicolor*, using a novel method to stage aggressive interactions. Males that were heavier and in better condition were more likely to win, although this was only true for aggressive calling interactions, and not for physical fights. Size was related to the discrete level of escalation, but not to actual interaction duration. We found little support for either model of assessment. Relatively little is known about aggressive behavior in frogs. By staging interactions, we can address predictions of game theory models in an important group for studies of animal communication.

27 Symposium: SIGNAL MEANING (Tuesday)

NO MEANING REQUIRED: ABANDONING LANGUAGE-BASED AND INFORMATIONAL CONSTRUCTS IN ANIMAL COMMUNICATION

Drew Rendall, Michael Owren

University of Lethbridge, Canada; Email:d.rendall@uleth.ca

Research in animal communication often leans heavily on analogy to human language and related informational constructs. Hence, a central focus is on identifying the meaning of signals, or how they encode and transmit information. Such language-based and informational approaches are familiar and intuitive to us. Following the spreading appeal of computer metaphors of mind, language and communication that launched the Cognitive movement, they have become deeply entrenched in scientific theorizing. However, we argue that, as applied to animals, these metaphorical constructs entail a variety of conceptual ambiguities, are often out of step with fundamental tenets of biology and evolution, and ultimately obscure more than they clarify core processes of communication. We suggest that these constructs have largely outlived their early heuristic value to the field and should be abandoned. In their place, we recommend a return to classic functional emphases commensurate with core evolutionary principles, and an integration of them with novel mechanistic emphases emerging from modern theories of cognition that are not so strongly wedded to a computer metaphor of mind.

380 Contributed Talk: SEXUAL SELECTION V (Saturday AM)

AVAILABILITY OF PREFERRED MATES CHANGES FEMALE CHOOSINESS IN A HARVESTMAN WITH PATERNAL CARE

Gustavo Requena, Glauco Machado

Universidade de São Paulo, Brazil; Email:billy.requena@gmail.com

The strength and direction of female mate choice may be affected not only by direct and indirect benefits to her fitness, but also by temporal and spatial variation on ecological conditions. During one year, we monthly captured, measured, and marked adults of the neotropical harvestman *Iporangaia pustulosa*, classifying males as caring or non-caring individuals. Using a model selection approach, we investigated female preferences for male attributes and how changes in the social context affect this pattern. While male body size weakly influences their probability of mating, parental status and the relative abundance of caring males in the population strongly affect their mating success and the number of eggs received. We suggest that paternal care itself is as a condition-dependent behavioral trait and female choice based on this trait may confer both direct and indirect benefits. When relative abundance of caring males is low, females become less choosy and mate even with non-caring males. These results highlight the importance of considering the interactions within and between the sexes to understand the evolution of sexually selected traits and mate choice.

268 Contributed Talk: ECOLOGICAL EFFECTS III (Thursday PM III)

SLEEPLESS IN SAN DIEGO: MIGRATORY RESTLESSNESS AND FAT IN TWO RECENTLY DIVERGED SONGBIRD POPULATIONS

Rebecca Rice, Jonathan Atwell, Ellen Ketterson

Indiana University, United States; Email: rejrice@indiana.edu

Variation in seasonal behavior and physiology has been characterized in several taxa, including differences among species, sexes, and ages. However, few studies have examined differences among closely related populations, or whether rapid shifts in seasonal strategies are due to plasticity or genetics. In this study, we compared migratory restlessness behavior (*Zugunruhe*) and fat deposition in a common garden study of birds from two recently diverged songbird populations. Dark-eyed juncos are typically a montane forest-breeding species, but in 1983, a small isolated population became established in a novel urban and climatically mild habitat. Because juncos from the colonist population have ceased migrating, and have nearly doubled the length of their breeding season, we predicted that seasonal differences would persist in captivity. Such a result would suggest rapid evolution, and would be consistent with prior studies indicating genetic control of migratory biology in birds. We found evidence for persistent population and sex differences in migratory restlessness and seasonal fat, but our data also suggest that environmental factors play a role in mediating migratory behavior.

319 Contributed Talk: SOCIAL BEHAVIOR V (Friday AM)

COLOR-ASSORTATIVE MATING AND AGONISTIC BEHAVIORS IN A POLYMORPHIC POISON FROG: INNATE OR LEARNED?

Corinne Richards-Zawacki, Anisha Devar

Tulane University, United States; Email: cori@tulane.edu

The strawberry dart frog (*Dendrobates pumilio*) exhibits an amazing array of color and pattern variation in and around the Bocas del Toro archipelago of Panama. These frogs are toxic and in most cases, exhibit bright, conspicuous coloration suggesting that color acts as a warning to would-be predators (aposematism). However, recent studies have also demonstrated that color is important in female mate choice and male-male agonistic interactions. While imprinting has not previously been reported in frogs, the unusual form of parental care exhibited by *D. pumilio* could allow for learning of mate choice and/or agonistic behavior during the larval stage. To investigate whether mate choice preferences are innate or learned, we conducted behavioral experiments with captive-bred, virgin *D. pumilio*. By comparing mate choice and agonistic behaviors between (1) purebred, (2) crossbred, and (3) cross-fostered offspring, our work aims to clarify the mechanisms behind the rapid color-pattern divergence of *D. pumilio* populations across the Bocas del Toro archipelago.

133 Contributed Talk: APPLIED ANIMAL BEHAVIOR I (Tuesday PM II)

STRESS IN GESTATION, LACTATION HOUSING AND MATERNAL BEHAVIOUR IN THE PIG, *SUS SCROFA*

Nadine Ringgenberg, Renée Bergeron, Marie-Christine Meunier-Salaün, Nicolas Devillers
Agriculture & Agri-Food Canada, Canada; Email:nringgen@uoguelph.ca

The impacts of social stress in gestation and enriched housing in lactation on maternal behaviour were studied in 41 Yorkshire-landrace sows. They were assigned to either a social stress treatment (T) during mid-gestation or a control group (C). In lactation, half of the T and C sows were housed in straw enriched pens (E) and the others in standard farrowing crates (S). The responses of sows to playbacks of recorded piglet screams were observed in 2 tests. In addition, postural budgets and social contacts between sows and piglets were recorded. Stress in gestation negatively impacted maternal behaviour: for the maternal responsiveness tests, T sows tended to respond later to piglet screams than C sows. And T sows spent more time lying ventrally and less time lying laterally than C sows in early lactation. In terms of housing, the enriched pens had positive impacts on behaviour with E sows initiating more contacts with piglets than S sows and tending to spend less time lying ventrally and sitting than S sows in late lactation. Social stress in gestation may thus negatively impact maternal behaviour while enriched pens in lactation allow more opportunity for its expression.

14 ABS Allee Session: ALLEE II (Wednesday PM I)

MORTALITY RISK AFFECTS MATING DECISIONS IN THE SPIDER *NEPHILA CLAVIPES*

Clare Rittschof

University of Florida, United States; Email:clare.rittshof@gmail.com

Risk assessment is a fundamental component of any decision-making process, including mate choice. For males, one element of risk that is rarely considered is that a female mate may not survive to offspring independence, resulting in total reproductive failure. This element of risk is particularly important in short-lived species where all individuals, regardless of condition, attempt to reproduce, and developing eggs is an energetically expensive process during which females are at risk of predation, starvation, and disease. I evaluate whether males use mortality risk as a mate choice criterion in the golden orb-web spider *Nephila clavipes* by assessing how male reproductive investment changes with female proximity to oviposition. Males mate at higher frequencies, transfer more sperm, and sire more offspring when mated with females close to oviposition compared to younger adult females. Furthermore, females close to oviposition have a lower probability of mortality prior to egg deposition compared to younger adults. My results support the hypothesis that males increase reproductive effort as a female approaches oviposition, possibly because these females are a low-risk investment.

P55 ABS Genesis Award Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

A METHOD FOR THE DETERMINATION OF ELECTRORECEPTION THRESHOLDS IN WEAKLY ELECTRIC FISH

James Roach, Philip Stoddard

Florida International University, United States; Email:jroac001@fiu.edu

Weakly electric fish produce an electric organ discharge (EOD) for communication and navigation. The EOD of many gymnotiforms is a dynamic signal that changes amplitude during social interactions. However, it is not clear whether fish increase amplitude to improve electrolocation acuity or to improve communication efficacy. We ask whether increasing signal amplitude enables a fish to increase its electroreceptive sensitivity to resistive objects. To determine if EOD modulations elicited in the social context improve acuity of object detection through electrolocation, we developed an automated method for measuring electroreception thresholds using a classical conditioning paradigm. We built a robotic system that presents an electrical stimulus to the fish then moves the fish's shelter tube, requiring the fish to follow the tube. The fish's anticipatory motion is tracked automatically as the assay of sensory detection. Stimulus magnitude was lowered until a detection threshold was determined. By understanding the electroreceptive thresholds of individuals, we hope to evaluate the evolutionary interplay between two conflicting sensory forces, social communication and navigation.

90 Contributed Talk: COMMUNICATION I (Tuesday AM)

THE EFFECT OF AMBIENT TEMPERATURE ON COURTSHIP AND MATING SUCCESS IN WOLF SPIDERS

Jefferson Roberts, Ian Ackers, Ben Zajd

Ohio State University at Newark, United States; Email:roberts.762@osu.edu

This study explores the effect of temperature on courtship behavior and mating success in the wolf spider *Schizocosa bilineata*, a species common in grasslands in eastern North America. The breeding season is in late spring, when temperature fluctuation can influence daily activity patterns. As ectotherms, wolf spider body temperature is similar to that of the surrounding environment. Colder or warmer temperatures should mean correspondingly reduced or enhanced behavioral activity, respectively. Further, temperature fluctuation has the potential to influence mating success as colder temperatures should mean reduced courtship vigor in males. Male *S. bilineata* were exposed to female cues across temperatures from 2.5°C to 40°C, and mating trials were conducted from 15°C to 40°C. Courtship elements were exhibited by 40% or more males between 15°C and 40°C in response to chemical cues alone, though with predictably reduced vigor at lower temperature. Copulation occurred in at least 60% of mating trials across all temperature treatments. Results suggest considerable behavioral flexibility in courtship and mate selection across a wide temperature range for this species.

24 Symposium: SENSORY POLLUTION (Tuesday)

THE EFFECTS OF POLARIZED LIGHT POLLUTION ON ANIMAL BEHAVIOR

Bruce Robertson, Gábor Horváth, Miklós Blahó, Ádám Egri, György Kriska

Smithsonian Conservation Biology Institute, United States; Email:robertsonbr@si.edu

Polarized light pollution (PLP) is a newly identified form of light pollution in which artificial surfaces (e.g. asphalt, solar panels, glass buildings) polarize reflected light where does it not naturally occur. PLP triggers a range of maladaptive behaviors in aquatic insects that use horizontally polarized light to locate natural water bodies. We review experimental evidence for PLP including: 1) trapping of aquatic insects by oil; 2) insects attracted to black sheeting; 3) oviposition of mayflies onto asphalt roads; 4) attraction of polarotactic insects to car paintwork; 5) attraction of dragonflies to gravestones; 6) mass swarming of caddis flies at glass surfaces; 7) attraction of insects to solar panels. Evidence suggests any strongly and horizontally polarizing artificial surface will create an ecological trap for polarotactic insects. PLP can also create novel species interactions. We discuss the possible benefits and/or disadvantages of predators (spiders, birds, bats) feeding on the polarotactic insects attracted to different sources of PLP are discussed. Finally, we suggest some methods for eliminating PLP and mitigating its ecological impacts.

57 Symposium: GEOGRAPHIC VARIATION (Thursday)

GENETIC VARIATION AND PHENOTYPIC PLASTICITY IN RELATION TO SEXUAL SELECTION

Rafael Rodriguez

University of Wisconsin, Milwaukee, United States; Email:rafa@uwm.edu

The study of geographic variation is intimately intertwined with the study of reaction norms, which plot the phenotypes expressed by different genotypes as a function of the environment. Recent work has uncovered widespread genetic variation in the reaction norms of behavioral traits such as mating signals, or genotype \times environment interaction (G \times E). G \times E offers solutions to important problems in animal behavior and evolution, and novel challenges. For example, it may help solve the lek paradox (the maintenance of genetic variation under selection), since phenotypes favored by selection may differ in genetic background across environments. A more basic problem is the maintenance of G \times E, since it should be eroded by selection across environments. I suggest that understanding the conditions that can sustain G \times E may help understand its consequences for sexual selection. I conduct a preliminary review of the strength of G \times E in relation to environmental variables that may

influence the ability of selection to shape reaction norms. I suggest that the conditions that may sustain G×E may, in turn, allow it to sustain genetic variation and promote divergence by sexual selection.

P146 Contributed Poster: PARENTAL CARE 1 (Poster Session A: Weds. eve)

MATE SIZE EFFECT ON MATERNAL REPRODUCTIVE EFFORT IN THE CONVICT CICHLID, *AMATITLANIA SIQUIA*

Ashley Rogers

University of California, Santa Cruz, United States; Email: arogers@biology.ucsc.edu

When mated to an attractive partner individuals are expected to increase the amount they invest in reproduction. In fish with biparental care large males are preferred mates due to their greater ability to protect young from predators. I examined the relationship between intra-pair (M-F) size difference, parental care and offspring number in a natural population of convict cichlids (*Amatitlania siquia*). Females increased the frequency of chases towards predators and spent less time away from the brood, while males decreased the number of displays towards brood predators, as the intra-pair size difference increased. The number of offspring was correlated with male, but not female, standard length. These results support the differential allocation hypothesis in that females offered more parental care to progeny of a larger male, while their mate decreased the amount of care they provided. Females also gained a benefit in terms of number of young by pairing with larger mates. Increased female investment may provide an incentive to ensure male care and maintain the pair-bond, which could lead to greater reproductive success through increased offspring survival.

215 Contributed Talk: MATING SYSTEMS II (Thursday AM)

EFFECTS OF MULTIPLE MATING ON FEMALE FERTILITY AND OFFSPRING QUALITY IN THE GUPPY

Gunilla Rosenqvist, Christophe P'elabon, Line Larsen

Norwegian University of Science and Technology, Norway; Email: gunilla.rosenqvist@bio.ntnu.no

Polyandrous females that mate with several males during one reproductive event may increase their fitness by producing more offspring of higher quality. Studies testing this hypothesis have, however, yielded inconsistent results. Here we compared clutches produced by female guppies from experimental populations maintained during nine generations under two different breeding regimes, allowing or not polyandry. At the ninth generation, females from the two treatments were isolated to give birth and we recorded several variables on all clutches produced during six months. We found that polyandrous females produced larger young that survived better during their first year. Polyandrous females tended to produce slightly more offspring than monandrous ones. There was no difference in sperm depletion on fertility. These results suggest that benefits of polyandry on fertilization insurance are limited in guppies. Polyandry, however, positively affects offspring quality. Further analyses suggested that the differences between the two treatments resulted from differential allocation of the maternal resources between polyandrous and monandrous females.

P187 Contributed Poster: SEXUAL SELECTION 1 (Poster Session A: Weds. eve)

COMPLEX COURTSHIP AND MATE-CHOICE IN A WOLF SPIDER

Malcolm Rosenthal, Eileen Hebets

University of Nebraska, Lincoln, United States; Email: malcolm.rosenthal@gmail.com

Multimodal courtship signaling, often including morphological and behavioral components, is common in *Schizocosa* wolf spiders. In *S. floridana*, the morphological component consists of pigmentation on a mature male's forelegs (i.e. ornamentation), which is fixed at maturity. Behavioral components include foreleg taps and seismically transmitted "songs". Though all components are included in the display, the seismic signal is both necessary and sufficient for copulation, raising the question of the function of the visual components. To explore the expression and function of both visual and seismic components in more detail, we used juvenile and adult diet manipulations (fully crossed 2x2 design) to examine diet's influence on: (i) expression of foreleg

ornamentation, (ii) parameters of seismic signals, (iii) adult body condition, and (iv) courtship intensity. We also ran mate choice trials to examine how each of these traits, and their potential interactions, influence copulation frequency. Copulation frequency was influenced by a complex interaction between juvenile diet (i.e. ornamentation), adult diet (i.e. body condition), and courtship rate.

320 Contributed Talk: SOCIAL BEHAVIOR V (Friday AM)

VISUAL SELECTIVE ATTENTION IN DOGS

Alejandra Rossi, Francisco Parada, Colin Allen

Indiana University, United States; Email:alrossi@indiana.edu

We have developed a head-mounted wireless lightweight dual-camera eye tracking system for dogs (DogCam-v2) providing for first time a reliable source of more precise information about the dog's moment-to-moment visual attention as measured by gaze direction in naturalistic settings. This technology allows us to track where the dog's visual attention is directed by means of gaze direction. Our current version of DogCam-v2 is comfortably worn by dogs and provides a more reliable source of information to study visual attention when engaged in social interactions. With this new technology we are putting some of the techniques that have been effective in generating knowledge about human cognition to work in studying dog-dog and dog-human interaction.

49 Symposium: FEMALE COMPETITION (Thursday)

PROXIMATE MECHANISMS AND ULTIMATE CONSEQUENCES OF FEMALE COMPETITION: HORMONES, GENES AND FITNESS

Kimberly Rosvall, Kristal Cain

Indiana University, United States; Email:krosvall@indiana.edu

A wealth of research has focused on reproductive competition among males, the resultant reproductive skew, and the phenotypes favored through same-sex competition among males. Comparatively less work has focused explicitly on females, which also compete directly or indirectly with one another for breeding resources (e.g. nesting sites, territories, mates). We summarize our recent empirical work on two mildly dimorphic, socially monogamous songbird species, the dark eyed junco and tree swallow, which collectively demonstrates the following: 1) Females vary in their expression of competitive phenotypes (aggression, morphology, etc.) 2) Variation in trait expression predicts significant variance in female mating success and reproductive success, likely via intrasexual competition. 3) Aggressiveness in females is mediated by some, but not all, of the genetic and neuroendocrine mechanisms regulating the expression of competitive phenotypes in males. This developing body of research on competitive phenotypes in females enhances our understanding of the evolution of mating systems, sex differences, and sexual selection, but there are still many unanswered and possibly unasked questions.

162 Contributed Talk: COGNITION AND LEARNING III (Wednesday AM)

ROLE OF EXPERIENCE IN PRODUCING HIPPOCAMPAL VARIATION IN POPULATIONS WITH DIFFERING MEMORY DEMANDS

Timothy Roth, Lara LaDage, Cody Freas, Vladimir Pravosudov

University of Nevada, United States; Email:tcroth@unr.edu

Selection for advanced cognitive traits is hypothesized to produce enhancements in the brain. Although this pattern is robust, there are at least two mechanisms that may produce this association. Advanced cognitive traits and their neural underpinnings may be fixed as a result of differential selection within specific environments. Alternatively, these relationships may be the product of plasticity, where differences are due to an individual's experiences. We have dissociated these hypotheses and found that variation in hippocampal (Hp) neural traits among populations of wild birds persisted when birds were raised in controlled environments, although volume did not. These results suggest that Hp neuron number, neurogenesis, and spatial memory across different

environments may be fixed and reject the hypothesis that the variation is due to memory-based experiences. Moreover, neuron number and neurogenesis were strikingly similar between captive and wild birds from the same populations. Our results indicate that the production of some Hp factors may be independent of experiences in adult life in animals under high selection pressure for memory. Volume, however, may be more plastic.

P92 ABS Genesis Award Poster: EDUCATION (Poster Session A: Weds. eve)

FIELD RESEARCH STUDYING WHALES IN AN UNDERGRADUATE ANIMAL BEHAVIOR LABORATORY

Christopher Round, Ronald MacLaren

Merrimack College, United States; Email:roundce@merrimack.edu

This work describes a new field research laboratory in an undergraduate animal behavior course involving the study of whale behavior, ecology, and conservation with emphasis on field laboratory experiences in partnership with a non-profit research organization - the Blue Ocean Society for Marine Conservation (BOS). The whale project involves two weeks of training and five weekend trips on whale watch vessels to the Jeffreys Ledge region of the Gulf of Maine to collect behavioral data, track, and individually identify humpback and fin whales as well as document the presence and behavior other marine mammal and seabird species. Students learn to use an ethogram of over fifty whale behaviors, as well as methodology related to individual identification in the field using natural markings. Students work in collaboration with BOS scientists, using the BOS field research protocol described herein. In conjunction with the whale project, students keep a journal, pass whale data collection and ethogram proficiency tests, and complete data sheets associated with each trip. The project has been a great success and may serve as a model for the development of similar partnerships.

P317 Contributed Poster: ECOLOGICAL EFFECTS 2 (Poster Session B: Thurs. eve)

BEHAVIORAL CORRELATIONS IN A JUMPING SPIDER DIFFER BETWEEN TREATED AND NON-TREATED ORCHARDS

Raphael Royaute, Chris Buddle, Charles Vincent

McGill University, Canada; Email:raphael.royaute@mail.mcgill.ca

Recent developments in behavioral ecology emphasize "animal personalities" or "behavioral syndromes" i.e. temporally consistent suites of behaviors correlated across ecological gradients. With the objective to test whether personality is consistent across orchard management practices, we tested for correlations between activity, aggressiveness, boldness, exploration and voracity in the field and laboratory for *Eris militaris* (Araneae: Salticidae), a jumping spider common in apple orchards. We first compared personality across life stages in an insecticide-free orchard and found a shift in personality between immature and penultimate stages. Spiderlings showed a weak correlation between activity and boldness ($r = 0.31$, $P = 0.12$), whereas penultimates had a strong correlation between aggressiveness and boldness ($r = 0.54$, $P > 0.001$). We then compared behavioral correlations in an insecticide-free and an insecticide-treated orchard. Exploration and activity were significantly correlated in the non-treated orchard ($r = 0.35$, $P > 0.05$), whereas aggressiveness and activity were significantly correlated in the treated orchard ($r = 0.5$, $P > 0.05$).

346 Contributed Talk: SOCIAL BEHAVIOR VI (Friday PM I)

SOCIAL NETWORKS: LINKING FORM WITH FUNCTION IN ANIMAL SOCIETIES

Daniel Rubenstein

Princeton University, United States; Email:dir@princeton.edu

Animal societies develop from the interactions and relationships of individuals within populations. Since social network theory provides a convenient way of visualizing and characterizing multi-lateral relationships, it should help to illustrate the link between form and function in animal societies. Doing so will require a better understanding of how different networks--proximate, agonistic and affiliative, as well as directed and undirected-

-within populations are related to each other and shape individual 'social personality'. This talk will explore the nature of personality of individuals sharing multiple networks, the link between personality and leadership, especially in altruistic situations, and how the removal or addition of individuals with different personalities could theoretically affect the spread of memes, genes or disease vectors.

321 Contributed Talk: SOCIAL BEHAVIOR V (Friday AM)

EUSOCIALITY CONTINUUM OR ALTERNATIVE ROUTES TO SOCIALITY? SINGULAR VERSUS PLURAL BREEDING IN ANIMALS

Dustin Rubenstein, Eileen Lacey, Paul Sherman

Columbia University, United States; Email: dr2497@columbia.edu

Because social vertebrates and invertebrates share many behavioral attributes, some have argued that they represent continuous variation in animal social structure. This idea of a 'eusociality continuum' has been controversial because the occurrence of permanently sterile castes is often viewed as evidence that eusociality in invertebrates is evolutionarily distinct from cooperative breeding in vertebrates. Using comparative data from ~300 species of social vertebrates and invertebrates, we tested the hypothesis that animal societies can be arrayed along a continuum of reproductive skew. Rather than a single continuum, species occurring in groups with a single breeding female (singular breeding or monogyny) were quantitatively distinct from those with multiple breeding females (plural breeding or polygyny). Within each subset of social species, however, data from vertebrates and invertebrates were fully overlapping. Thus, the critical distinction was not between cooperatively breeding vertebrates and eusocial invertebrates, but rather, between social groups with only a single versus multiple breeding females, regardless of taxonomic affiliation.

P56 ABS Founders Award Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

RECEIVER USE OF REDUNDANT MULTICOMPONENT SIGNALS

Tricia Rubi, David Stephens

University of Minnesota, United States; Email: tricia.rubi@gmail.com

Within the signaling literature there has been a recent surge of interest in the striking complexity of some natural signals and the benefit that complex signaling might confer for receivers. A predicted advantage of multicomponent signals is that incorporating multiple sources of information increases the overall reliability of the signal. However, the benefit of such redundancy in signaling is unclear. If learning and processing information is costly for receivers, when, if ever, does it pay to attend to multiple redundant signal components? Do receivers always process a signal as a whole, or do they selectively attend to the most reliable or detectable signal component? Here we present the first experiment in a research program aimed at characterizing multicomponent signal use by receivers, using blue jays (*Cyanocitta cristata*) as our study system. Subjects were presented with two-component signals in an operant-style setup, and responses to complete signals and isolated components assessed over a range of component reliability pairings. Results show that receivers did indeed selectively attend to a single component.

P8 ABS Genesis Award Poster: APPLIED ANIMAL BEHAVIOR 1 (Poster Session A: Weds. eve)

EFFECTS OF OPERANT CONDITIONING ON THE REACTIVITY OF NELLORE HEIFERS DURING HANDLING

Paola Rueda, Aline Sant'Anna, Cintia Gonçalves, Mateus Rodrigues Paranhos da Costa

Universidade Estadual Paulista, Brazil; Email: paolamrueda@yahoo.com.br

The aim of this study was to assess the effect of operant conditioning with positive reinforcement on the reactivity of Nellore heifers. An operant conditioning protocol was applied to 195 Nellore heifers with 24 months. The reinforcement was realized once a week during four weeks consisting of a delivery of supplement after the animals have been conducted by the corral. The reactivity tests were applied just before and after the conditioning period, recording: 1) movement inside the crush (MOV), from 1 (no movement) to 5 (frequent

movements), 2) tension in the crush (TEN), from 1 (relaxed) to 4 (very tense) and 3) flight speed (FS), recording the speed at which an animal exit of the squeeze chute. Statistical analyses were done using Paired t Test for FS and Wilcoxon test for MOV and TEN. All variables were affected by the operant conditioning protocol ($P > 0.01$). MOV: from 2.44 ± 0.87 to 2.08 ± 0.66 , $Z = -4.85$; TEN: 2.60 ± 0.66 to 2.43 ± 0.62 , $Z = 2.61$; and FS: 4.06 ± 1.04 to 2.83 ± 0.63 m/s, $t = 14.58$, showing a strong indication that the animals were less reactive to handling after the conditioning. We conclude that the operant conditioning had positive effect on heifers' temperament.

174 Contributed Talk: DEVELOPMENT I (Wednesday AM)

SOCIAL EXPERIENCES DURING ADOLESCENCE SHAPE SEXUAL BEHAVIOR IN ADULT MALE ZEBRA FINCHES

Tim Ruploh, Nikolaus von Engelhardt, Hans-Joachim Bischof
University of Bielefeld, Germany; Email: tim.ruploh@uni-bielefeld.de

The social environment during the crucial period of adolescence may indicate social conditions during adulthood and induce adaptive modifications of social behaviour. In large groups individuals have to tolerate competitors, but need more skills to compete for and attract mates compared with solitary or pair-living individuals. Such differences may be caused by the high frequency of social interactions, competition and courtship that individuals experience in large, mixed-sex groups in contrast to individuals living in pairs. To study the long-term consequences of the social environment during adolescence on male sexual behaviour, we kept zebra finches after nutritional independence in pairs (1 male 1 female or 2 males) or larger mixed-sex groups (3males 3 females). Males reared with a single female were most aggressive and competitive and initially more attractive for unfamiliar females. In contrast, the attractiveness of males raised in larger mixed-sex groups was initially low but increased once females were familiar to the different males. These findings suggest that zebra finches may possess behavioral adaptations to territorial or group-living lifestyles.

P246 Contributed Poster: BEHAVIORAL COMMUNITY ECOLOGY 2 (Poster Session B: Thurs. eve)

INTERACTIONS BETWEEN ECTOPARASITES AND INNATE IMMUNE FUNCTION IN FREE-LIVING RODENTS

Evelyn Rynkiewicz, Hadas Hawlena, Keith Clay
Indiana University, United States; Email: ecrynie@indiana.edu

Parasites and pathogens do not infect all hosts equally. Differences in host immune function are a proposed mechanism for heterogeneity in parasite distribution on hosts. We studied rodent hosts and tick vectors to investigate interactions between host immune function and ectoparasite load. Two hypotheses that could explain observed relationships are 1) Hosts with high parasite burden with have lower immune function due to reduced ability to mount a response, and 2) Hosts with high parasite burden with have higher immune function due to parasites selecting for higher immunity. We measured innate immune function with bacterial killing assays and quantified tick load. There were more ticks found on *Peromyscus* than *Microtus* and males had higher tick burdens than females. *Peromyscus* serum had higher bacterial killing ability than *Microtus*. Male *Peromyscus* had a higher killing ability than females, but there were not sex differences in *Microtus*. This supports hypothesis 2 because *Peromyscus* had the highest ectoparasite burden and the highest bacterial killing ability. Sex differences between male and female *Peromyscus* may be caused by reproductive trade-offs in females during breeding.

P107 ABS Founders Award Poster: GENETICS AND EVOLUTION 1 (Poster Session A: Weds. eve)

THE IMPORTANCE OF SOCIAL SYSTEMS IN FIXATION OF CHROMOSOMAL REARRANGEMENTS

Maria Sagot, Caleb Phillips, Richard Stevens, Robert Baker
Louisiana State University, United States; Email: msagot1@lsu.edu

High incidence of species that differ karyotypically suggests that chromosomal rearrangements are important isolating mechanisms during speciation. However, heterozygotes for rearrangements tend to be the least fit due to partial or complete sterility related to pairing problems and structural aberrations. In 1941, Sewall Wright proposed that to fix chromosomal rearrangements, a species should have social groups that are formed by single matrilineal lines, monopolized by a single male and with high levels of inbreeding. Although this hypothesis has been widely accepted, it lacks empirical evidence. The tent-roosting bat *Uroderma bilobatum* represents an ideal system to test the proposed hypothesis because it has fixed three rearrangements and it lives in small harem groups. Preliminary results suggest that groups are not formed by single matrilineal lines, rejecting the first prediction. Therefore, our objective is to determine the degree of inbreeding and male monopolization by genotyping individuals at multiple microsatellite loci. With this investigation we aim to determine the role of social systems in fixation of rearrangements and their importance in speciation.

P236 Contributed Poster: APPLIED ANIMAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

COMMUNAL NEST CONSTRUCTION ACTIVITY IN MONK PARAKEETS VARIES WITH MATING CYCLE AND NEST SECTION

Hager Salem, Christopher Petersen, Frank Grasso

United States; Email: drsalemh@aol.com

Monk parakeets, thought to be cooperative breeders (Eberhardt et.al., 1998), share in the assembly of their large stick-nests. Previous studies (Petersen & Grasso, 2010) show variation in nest construction activity throughout the mating cycle. Our study begins to distinguish the areas of nest that receive construction attention. We hypothesized that breeding-specific nest construction is focused on the chamber area of chambers receiving eggs rather than the nest exterior. We scored the rate of stick addition, stick manipulation, stick relocation, and stick removal associated with each chamber based on whether that activity was at the chamber interior, chamber entrance, and outer area. Stick manipulation was the most frequent activity across nest areas. Roughly 30 hours of video footage of two nests was collected during the courtship and mating periods of 2009. The chamber area had proportionally more activity than the other nest areas. This shift in the focus of construction activity is correlated with the changes in the numbers of birds present at the nest. These results point to seasonal specialized construction phases and differential division of labor in nest construction.

108 Contributed Talk: SOCIAL BEHAVIOR I (Tuesday AM)

VOCAL LEARNING AS THE MECHANISM FOR THE MAINTENANCE OF VOCAL DIALECTS IN A PARROT: FIELD EVIDENCE

Alejandro Salinas-Melgoza, Timothy Wright

New Mexico State University, United States; Email: aletz@nmsu.edu

Studies of avian vocal dialects commonly find evidence of geographic and acoustic stability even with substantial gene flow between dialects. The vocal imitation hypothesis states that immigrants learn the local call type upon arrival, but direct evidence is meager. The yellow napped amazon parrot (*Amazona auropalliata*) exhibits three dialects in Northern Costa Rica that have shown long-term stability. We experimentally simulated dispersal across dialect boundaries and monitored their vocal, roosting and social integration behavior. Analysis of the contact calls from translocated individuals showed that one juvenile altered its call to match the acoustic form of the local contact call six weeks post-release while six adults did not. Translocated individuals were able to attend traditional roost sites regardless of vocal imitation. The contrasting patterns of social affiliation between the juvenile and the six adults suggest that vocal imitation may be facilitated by social interaction rather than limiting it. These results suggest that the observed inconsistencies between patterns of vocal and genetic variation may be reconciled by vocal learning following dispersal.

P440 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

HOW AND WHEN TO COOPERATE: SOCIAL FORAGING DYNAMICS IN NEOTROPICAL SPIDERS

Maxence Salomon, Karen Whitaker

University of British Columbia, Canada; Email:salomon@zoology.ubc.ca

Despite a large body of research on spider sociality, we still lack a good understanding of the fundamental differences in behaviour between social systems and how this variation may contribute to the evolution of sociality. In many group-living species, individuals partly or fully cooperate in various tasks to increase individual survival or achieve reproductive success. We tested the hypothesis that the extent of cooperation during foraging depends on group size and relative prey size, and that it further co-varies with the level of social organization. We conducted a manipulative experiment to examine the foraging behaviours of several species of social and subsocial *Anelosimus* spiders in their natural habitats in Ecuador, and show that inter- and intraspecific variation in cooperation reflects differences in social organization, group size and relative prey size.

272 Contributed Talk: GENETICS AND EVOLUTION II (Thursday PM III)

GENETIC VARIATION IN SOCIAL NICHE CONSTRUCTION: INSIGHTS FROM *DROSOPHILA MELANOGASTER*

Julia Saltz

University of California, Davis, United States; Email:jbsaltz@ucdavis.edu

Social niche construction (SNC) describes the situation in which individuals actively choose or shape their social environments. SNC is important because the social environment can determine behavioral development and fitness. I present evidence for two types of SNC in male *D. melanogaster*: aggressiveness and social preference. In both cases, I demonstrate that SNC has a genetic basis and profound effects on male aggressive behavior and mating success. Specifically, SNC appears to mediate disruptive selection on male aggressiveness, suggesting a possible reason for the maintenance of genetic variation in this behavior. Many animals have the opportunity to shape their own social experience, suggesting that SNC and its associated effects may be widespread.

P364 Contributed Poster: PARENTAL CARE 2 (Poster Session B: Thurs. eve)

SPAWNING SAME-SEX PAIRS OF CONVICT CICHLIDS SHOW PARENTAL ROLES ARE CHOSEN BASED ON GENDER NOT ABILITY

Nick Santangelo, Alyssa Underwood

Eastern Kentucky University, United States; Email:nicholas.santangelo@eku.edu

In biparental species, parents may exhibit sex-specific behaviors while caring for young. In convict cichlids (*Amatitlania siquia*), larger males defend nests while smaller females tend offspring. We tested whether these sex typical roles were regulated by an individual's sex or ability (i.e. size). We recorded spawning female-female pairs and compared their egg caring behaviors to that of control male-female pairs. Ability did not predict parental behaviors. Larger female parents spent more time tending eggs than their smaller female partners ($P=0.001$), whereas, in control pairs, the smaller females tended eggs more so than their larger male mates ($P=0.028$). Within-pair aggression did not differ between pairs; yet, larger individuals within pairs aggressed their smaller partner more so than vice versa. Though theory predicts a parent should offset direct care to their partner if possible, here females chose to tend offspring when able. Choosing specific roles based on gender rather than on ability may stem from natural sex differences in reproductive potential in a breeding season where males can have up to four broods while females typically have one brood per season.

P9 Contributed Poster: APPLIED ANIMAL BEHAVIOR 1 (Poster Session A: Weds. eve)

GENETIC VARIABILITY FOR BEEF CATTLE TEMPERAMENT USING DIFFERENT METHODS OF ASSESSMENT

Aline Sant'Anna, Paola Rueda, Fernando Baldi, Lucia Galvão de Albuquerque, Mateus Paranhos da Costa
State University of São Paulo, Brazil; Email:ac_santanna@yahoo.com.br

The aim of this study was to estimate genetic parameters for temperament using three methods for assessing cattle temperament. Records from 4,590 Nelore cattle were obtained using the following methods: a) flight speed (FS) ; b) crush score (CS), ranging from 1 (very calm) to 5 (very reactive) ; and c) score of movement inside the crush (MOV), ranging from 1 (no movement) to 4 (movements frequent and vigorous). Variance components were estimated by an animal model that included the random effects of additive genetic and residual effects and fixed effects of contemporary group (CG), age of dam in annual classes (from 4 to 14), and the age of animal at measurement as covariable (linear effect). Variance components were estimated by a linear model (for FS trait) and a threshold model (for MOV and CS traits) using Bayesian inference via Gibbs sampling. Heritability estimate posterior mean was slightly higher for FS (0.18 ± 0.05), than for CS (0.09 ± 0.04) and MOV (0.11 ± 0.04). Therefore, response to selection for temperament, measure by any of these methods, will be slow. Moreover, consequences of physiological and behavioral changes related to selection for these traits remain unclear.

P330 ABS Founders Award Poster: GENETICS AND EVOLUTION 2 (Poster Session B: Thurs. eve)

DOES HOST GENETIC STRUCTURE REFLECT THAT OF THEIR BLOODBORNE PARASITES?

Yanina Sarquis-Adamson, Elizabeth MacDougall-Shackleton
University of Western Ontario, Canada; Email:ysarquis@uwo.ca

Parasites can have severe effects on host fitness, and may thus play a key role in the evolution of their host populations. For example, they may act to reduce gene flow among populations if these subpopulations are adapted to local parasite strains. We hypothesized that the genetic structure of song sparrow (*Melospiza melodia*) populations should correspond to that of their haematozoan parasites. To test this hypothesis, we collected blood from song sparrows at 11 eastern Ontario sites in spring and summer of 2009 and 2010. We genotyped birds at 17 microsatellite loci and identified strains of malarial bloodborne parasites by sequencing a portion of cytochrome b. Here we compare the genetic structure observed for song sparrows to that observed for their malarial parasites. We also compare parasite diversity of juveniles captured on their natal (breeding) grounds to that of adults.

353 Contributed Talk: COGNITION AND LEARNING VII (Saturday AM)

DO GROUPS HAVE A LARGER COGNITIVE CAPACITY THAN INDIVIDUALS?

Takao Sasaki
Arizona State University, United States; Email:tsasaki1@asu.edu

Cognitive overload occurs when a decision-maker attempts to process more information than it can handle. This leads to the paradoxical result that enlarging the option set degrades decision performance. Past research on cognitive overload has focused only on individuals, but the concept may also be relevant to the collective decisions of animal groups. A group, however, can distribute the burden of decision-making among its members. Therefore, we hypothesized that a group has a larger cognitive capacity than any single member, and so is less vulnerable to cognitive overload. To test this, we compared the ability of *Temnothorax* ant colonies and individuals to choose the best among several nest sites. We found that individuals performed significantly worse when the number of options was 8 compared to 2. Colonies, on the other hand, performed equally well with either 8 or 2 options. These results suggest that a colony can evade cognitive overload by having each colony member assess only a subset of available options. We are currently examining this possibility using uniquely marked ants. Our findings suggest a previously unknown advantage of collective cognition.

P406 Contributed Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

DIFFERENCES IN SPERM ATTRIBUTES ACROSS POPULATIONS OF THE HORSESHOE CRAB, *LIMULUS POLYPHEMUS*

Daniel Sasson, Jane Brockmann

University of Florida, United States; Email: dsasson@ufl.edu

Sperm attributes may vary across closely related taxa, often in response to levels of sperm competition. Within a species, animals often differ morphologically, physiologically, and ecologically between populations. Few studies, however, have investigated population differences in sperm attributes. The American horseshoe crab, *Limulus polyphemus*, ranges from the Yucatan to Maine with a number of genetically distinct populations. Here we show that sperm attributes differ across these populations. Preliminary data suggest that these differences in sperm attributes are related to variation across populations in body size, physical condition, and the operational sex ratio.

P318 Contributed Poster: ECOLOGICAL EFFECTS 2 (Poster Session B: Thurs. eve)

HANDEDNESS INFLUENCES DARWINIAN FITNESS COMPONENTS

Sara Schaafsma, Reint Geuze, Wulf Schiefenhövel, Ton Groothuis

University of Groningen, Netherlands; Email: s.m.schaafsma@rug.nl

In human societies right- and left-handers coexist with left-handers always being in the minority. Left-handedness has been associated with fitness costs and is substantially heritable, which raises the question of why left-handedness has not yet gone extinct. In this study we investigated direction and strength of handedness (hand preference and asymmetry of hand skill) and its relation with several Darwinian fitness components in a non-industrial society in Papua, Indonesia. Darwinian fitness components included number of births, number of children that deceased in the first two years of life, number of children that were still alive and self-reported health of the subjects themselves. Results show that in men strength of lateralization, and not direction, is positively associated with the number of children produced, but also positively associated with the number of children deceased. Strongly lateralized man tended to produce more children that were still alive at the time of testing. Laterality of women had no effect on these fitness parameters. The results, including the complex interaction between lateralization and health, will be discussed within an evolutionary framework.

38 Symposium: PERINATAL INFLUENCES (Wednesday)

EXUBERANT ODOR LEARNING IN INFANT MAMMALS: A COMPARATIVE STUDY

Benoist Schaal

Centre des Sciences du Goût, CNRS, France; Email: benoist.schaal@u-bourgogne.fr

Mammals have faced selective pressure enforcing neonates to attend stimuli that guide them to the mother without distraction. One strategy has been to limit effective sensory systems, another to specify in a same sensory system subsystems that process salient stimuli. The most ubiquitous strategy relies on experience-sensitive processes that shape the functional properties of the concerned system before actual involvement in adaptive responses (prenatal induction of receptor expression, familiarization, learning), as well as during/after such responses (postnatal learning). These different cognitive strategies are not exclusive, leading to overdetermined learning of efficient stimuli. Mammalian females carrying altricial newborns favored olfactory/tactile signalization of the mammarys, and took advantage of cognitive solutions that could be mediated by neonatal olfaction. Convergent cognitive means to milk intake are effective in species bearing precocial neonates. In sum, the comparative investigation of female-offspring exchanges should come out to specify the solutions co-evolved by mammalian females/neonates, and to assess how far they reflect species-specific constraints.

P222 Contributed Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

WHY ANIMAL BEHAVIOR NEEDS AGENT-BASED MODELING: SPACE AND MOVEMENT MATTER

Jeff Schank

University of California, Davis, United States; Email: jcschank@ucdavis.edu

The field of animal behavior investigates the most complex phenomena we know. Mechanisms of behavior span multiple levels of organization: from genomic to social levels. We do have methods and approaches for dealing with pieces of these complex behavioral mechanisms such as computational neuroscience, social network analysis, multilevel modeling (statistical), game theory, and a myriad of experimental methods in different areas of behavioral research. We have lacked, up until recently, theoretical tools for dynamically connecting these pieces to understand the complex and multilevel mechanisms that are the subject of behavioral research. In this talk, I will focus on only a part of what agent-based modeling can contribute to our understanding of behavior, that is, the importance of space and movement strategies for understanding social behavior and its evolution I will briefly illustrate their importance with some examples of agent-based modeling of social behavior from my lab.

P223 ABS Genesis Award Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

FLEXIBILITY OF NEST SITE PREFERENCES BASED ON CUE VALIDITY IN THE ANT *TEMNOTHORAX RUGATULUS*

Gage Schaper, Takao Sasaki, Stephen Pratt

Arizona State University, United States; Email: gschaper@asu.edu

When choosing mates or habitats, animals may assess an option's quality based on multiple attributes. They can benefit from adjusting the weight placed on each attribute, especially when all are not equally informative. For example, some attributes may vary more than others in a given environment and thus have greater cue validity, or effectiveness in discriminating option quality. Past research has shown that humans and several other mammals can capitalize on cue validity. In this study, we tested whether the ant *Temnothorax rugatulus* can learn cue validity during nest site selection. Colonies were given repeated choices between candidate sites in which only one of two important attributes (light level or entrance size) consistently varied between options, and thus had higher cue validity. We found that colonies shifted their preference over time in the direction expected; they increased the weighting of the variable attribute. These data support the hypothesis that *T. rugatulus* adaptively adjust weights on attributes to account for environmental conditions.

44 Symposium: SOCIAL COMPLEXITY (Wednesday)

POST-CONFLICT BEHAVIOR IN GREYLAG GEESE (*ANSER ANSER*)

Isabella Scheiber, Brigitte Weiß, Kurt Kotrschal, Orlaith Fraser

Konrad Lorenz Research Station, Austria; Email: isabella_scheiber@t-online.de

Greylag geese show marked similarities in social complexity to mammals and corvids, but we do not know if they also display sophisticated social behaviors after agonistic conflicts. Association with the loser by winner, kin or mate is one such a behavior, and certain affiliative behaviors between the loser and a 3rd party are taken as evidence of post-conflict (PC) consolation. Contrary to altricial corvids and mammals, precocial geese show solely non-tactile social bonds, expressed acoustically or through close proximity. We examined if losers of agonistic conflicts and their mates seek each other's proximity to alleviate PC stress. Although minimum inter-partner distances PC did not differ from those during a matched control (MC), losers approached the mate faster PC. Once reunited, losers greeted their mate more often during PC than MC. This suggests that losers actively seek to re-establish closeness to their mates PC, whereas mates did not approach losers more often PC than MC. In geese, quickly restoring the functional social unit PC seems crucial, as losers may benefit from the stress-reducing effects of social support despite the lack of a mate's active consolation.

P29 ABS Founders Award Poster: COGNITION AND LEARNING 1 (Poster Session A: Weds. eve)

THINKING ABOUT THINKING - STUDYING A THEORY OF MIND IN CHIMPANZEES

Martin Schmelz, Josep Call, Michael Tomasello

Max Planck Institute for Evolutionary Anthropology, Germany; Email:martin_schmelz@eva.mpg.de

A "theory of mind" has been studied in non-human great apes in various studies. Here, we present a series of three experiments, all based on one set-up: two chimpanzees were facing each other in a back-and-forth food competition with two food locations. One chimpanzee (the subject) always knew that there was identical food in both locations, the other one (the competitor) had to make her decision based on the information given to her: in all three studies one location was much more likely to be chosen for different reasons. If the subject knew what the competitor had known and which one she had likely chosen before her, she should avoid that location afterwards. Two of the studies yielded positive results, suggesting that chimpanzees in these experiments could indeed think about what others were thinking.

P57 ABS Genesis & Charles H. Turner Award Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

VIBRATIONAL COMMUNICATION IN THE COOK STRAIT GIANT WETA (*DEINACRIDA RUGOSA*)

Ashley Schmidt, Claire Bestul, Daniel Howard, Andrew Mason

Augustana College, United States; Email:apschmidt10@ole.augie.edu

The Cook Strait giant weta, *Deinacrida rugosa* Buller (Insecta: Orthoptera: Anostomatidae), is a rare New Zealand endemic of conservation concern found primarily on predator-free island reserves along the Cook Strait corridor. Extirpated in most cases from the New Zealand mainland, giant weta have emerged as prominent models for invertebrate species conservation, with reintroduction efforts focused upon establishing new populations on restricted-access island sites managed by the New Zealand Department of Conservation. The species exhibits female-biased size dimorphism, and both males and females are nocturnal foragers. The smaller adult males are known to move greater distances each night while foraging and searching for mates, and recent studies have shown that differences between the sexes in regard to overall size and mobility are strongly influenced by sexual selection pressures. The communication system of the species has not been previously described, however. Here we show that the Cook Strait giant weta utilize substrate-borne vibration for intraspecific communication in some contexts, and describe the spectral and temporal characteristics of these seismic signals.

140 Contributed Talk: MECHANISMS I (Tuesday PM II)

THE EFFECTS OF EARLY-LIFE STRESS ON SONG PREFERENCES IN FEMALE SONG SPARROWS (*MELOSPIZA MELODIA*)

Kim Schmidt, Erin McCallum, Elizabeth MacDougall-Shackleton, Scott MacDougall-Shackleton

University of Western Ontario, Canada; Email:kschmi5@uwo.ca

Male songbirds learn song early in development. Both male song production and female song preferences can be influenced by early-life environmental factors. The Developmental Stress Hypothesis proposes that a poor rearing environment may impair development of the brain regions involved in song acquisition thereby affecting the quality of songs produced by adult males. Although there is now substantial evidence suggesting that early-life stressors affect male song production, the effects of developmental stressors on female song preferences are less clear. In the present study, we determined the effects of early-life stress (food restriction or corticosterone treatment) on song preferences in female song sparrows. Song sparrows exposed to either treatment weighed less throughout the treatment period, but did not differ from controls in adult body mass. When females were 9 months of age, we tested their preference for conspecific versus heterospecific songs, as well as for high complex versus low complex song bouts. We predict that control females will prefer high complex and conspecific songs, but that these preferences will be attenuated for females exposed to early-life stressors.

6 Plenary Lecture: (Friday AM)

MATING SYSTEM EVOLUTION: LESSONS FROM SPIDER SEX

Jutta Schneider

University of Hamburg, Germany; Email:jutta.schneider@uni-hamburg.de

Mating systems in which males are monogamous while females mate multiply are generally associated with male offspring care. It has largely been ignored that there are taxonomically widespread accounts of species with low male mating rates in the absence of paternal care, including angler fish, honey bees, and many spiders. Recent advances of empirical and theoretical research using spiders as model systems have now provided us with a solid understanding of the evolution and dynamics of mating systems that involve low male mating rates. Sexual cannibalism, male self-sacrifice and further extreme adaptations such as genital damage to the point of complete emasculation are all parts of mating strategies that enable males to monopolize or at least maximize their paternity share with a single female (monogyny). Because monogynous males need not mate in the future, they are free to invest genitalia and their life if this results in winning sperm competition. Polyandry is a prerequisite and a monogynous mating strategy will invade if a monogynist's paternity share is sufficiently larger than the average paternity share. I will illustrate the convergent evolution of adaptations to monogyny

390 Contributed Talk: SOCIAL BEHAVIOR VII (Saturday AM)

HABITAT SATURATION AND REPRODUCTIVE COMPETITION INFLUENCE SOCIALITY IN THE AFRICAN STRIPED MOUSE

Ivana Schoepf, Carsten Schradin

University of Zurich, Switzerland; Email:ivana.schoepf@ieu.uzh.ch

The African striped mouse (*Rhabdomys pumilio*) is an ideal species to study the factors that determine sociality, as it can be both solitary and group-living. Previous correlative studies have shown that reproductive competition during the breeding season favors solitary-living, while high population density favors group-living. In our study, we tested experimentally whether population density causally affects striped mice sociality, by removing groups. Mice from experimental groups, who directly neighbored removed groups' territories, were expected to become solitary, while mice from control groups were expected to remain group-living. We controlled for the effect of reproductive competition, by repeating the experiments both in the breeding and the non-breeding season. More experimental than control mice became solitary during the breeding season, while during the non-breeding season, in absence of reproductive competition, mice remained group-living. Changes from group to solitary-living were accompanied by hormonal and behavioral changes. In sum, there is a tradeoff between conflict over reproduction and benefits of group-living that determines sociality in the striped mouse.

P441 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

EXAMINING DOMINANCE AND STRESS RELATIONSHIP IN A NON-COOPERATIVE BREEDER (*EQUUS CABALLUS*)

Bruce Schulte, Carly Sinderbrand

Western Kentucky University, United States; Email:bruce.schulte@wku.edu

Social animals are often organized in a hierarchy where rank is associated with access to limited resources. For solitary species, winner-loser trials in a confined arena reveal higher stress in losers (subordinate-stress hypothesis). In cooperative breeding mammals, dominant animals may be the sole breeders and higher rank is associated with greater physiological stress (dominance-stress hypothesis). Domestic horses exhibit hierarchies yet are not cooperative breeders and typically are housed so space and other resources are not limiting. At two facilities in Kentucky, we examined the social interactions and measured fecal cortisol in pastured, pregnant female horses that were either lactating or not. While fecal cortisol level did not differ between reproductive state and rank, activity behavior showed significant differences between reproductive states. Higher energetic requirements of lactation were reflected in significantly longer bouts of eating and significantly less time spent

alert and socializing. Rank in domestic horses may not limit their opportunity for reproduction or resources, and thus not be reflected in stress levels, suggesting rank-stress independence.

273 Contributed Talk: GENETICS AND EVOLUTION II (Thursday PM III)

COMPARASIONS OF SEX-SPECIFIC BEHAVIOR AND GENE EXPRESSION IN TWO AFRICAN CICHLID FISHES

Molly Schumer, Kavita Krishnakant, Susan Renn

Reed College, United States; Email:schumerm@gmail.com

Julidochromis marlieri and *Julidochromis transcriptus* are two substrate-brooding Tanganyikan cichlids that have evolved different sex-specific behavior. While *J. transcriptus* has male biased sexual size dimorphism and aggression, this pattern is reversed in *J. marlieri*. This raises the question of whether female *J. marlieri* achieve the aggressive phenotype by expressing the same genes as *J. transcriptus* males, or whether a novel brain gene expression pattern has evolved. This study characterizes behavior in both species and applies a cDNA microarray to investigate patterns of brain gene expression. Comparison of microarray data from both species identifies gene expression patterns associated with behavioral phenotypes independent of gonadal sex, and to a lesser extent, gene modules associated with gonadal sex independent of behavioral phenotype. Overall, the data suggest that there has been significant divergence in gene expression patterns between *J. transcriptus* and *J. marlieri*. However, our study detects a core set of genes with shared phenotype-specific regulation between species which may be crucial in regulating aggressive behavior in *Julidochromis*.

129 Contributed Talk: SOCIAL BEHAVIOR II (Tuesday PM I)

INFERENCES FROM MOVEMENT DATA ON SOCIALITY IN FOREST ELEPHANTS (*LOXODONTA CYCLOTIS*)

Stephanie Schuttler, Stephen Blake, Lori Eggert

University of Missouri, United States; Email:sgschuttler@mizzou.edu

Home range size and space use can vary greatly across ecological gradients within species and populations. African elephant species exhibit large variation, yet most telemetry studies have focused on savanna elephants (*Loxodonta africana*) living in arid and semi-arid habitats with strong seasonality. We analyzed GPS telemetry data of forest elephants (*L. cyclotis*) in a lowland tropical forest to infer the social and ecological cues influencing movement. Six female elephants were tracked daily in Loango National Park, Gabon from November 2003 to July 2005. Home range estimates were among the smallest recorded for African elephants (11.10 - 105.32 km²) and were positioned adjacent to one another. The probability of co-occurrence between the home ranges of different individuals was low, suggesting that individuals may be avoiding conspecifics. Home range size increased with marginal significance in relation to rainfall. Understanding the spatial requirements and underlying causes of movements are essential for the conservation of this threatened species.

354 Contributed Talk: COGNITION AND LEARNING VII (Saturday AM)

RECIPIENTS' BEHAVIOR AFFECT OTHER-REGARDING PREFERENCES IN JACKDAWS, *CORVUS MONEDULA*

Christine Schwab, Ruth Swoboda, Kurt Kotrschal, Thomas Bugnyar

KLI for Evolution and Cognition Research, Austria; Email:christine.schwab@kli.ac.at

To what extent non-human animals show other-regarding preferences is recently subject of intensive discussion. Here we tested if jackdaws show prosocial (providing benefits to others at no costs for oneself) and altruistic behavior (providing benefits to others while incurring costs) with either a sibling or non-sibling recipient. In the prosocial condition, a box was baited on the actor's and the recipient's side, whereas a second box provided food only for the actor. In the altruistic condition, a box contained food either for the actor or the recipient. Focusing solely on the actors' behavior, jackdaws made more selfish choices in both conditions, which matches results from most primate studies. However, when considering only those cases, in which recipients positioned

themselves next to the baited box, actors made more prosocial choices for siblings and non-siblings, whereas they made more altruistic choices for siblings only. Hence, recipients could significantly influence actors' choices when there were no costs for the actors and they could do so even at high costs for the actors when they were kin. We propose local enhancement as a low-cognitive mechanism for this effect.

P119 Contributed Poster: MATING SYSTEMS 1 (Poster Session A: Weds. eve)

TESTOSTERONE MANIPULATION IN MULTI-BROODED HOUSE SPARROWS AND SUCCESS IN ACQUIRING ALTERNATIVE MATES

Patricia Schwagmeyer, Patricia Parker, Douglas Mock, Hubert Schwabl

University of Oklahoma, United States; Email:plsch@ou.edu

Engaging in paternal care has been proposed to diminish avian male abilities to acquire alternative reproductive opportunities via polygynous or extrapair matings. To date, most evidence suggests that these opportunity costs are mediated at a proximate level by the declines in testosterone (T) that accompany male parenting. We implanted male house sparrows with T to test the prediction that, if parenting carries opportunity costs in terms of lost alternative matings, high-T/low-parenting males should have enhanced mating rates. In support of the prediction, T-males proved to be polygynous during a higher proportion of their breeding attempts than C-males; however, they were not more successful than C-males in siring offspring through extrapair fertilization. The estimated numbers of fledglings sired by T- and C-males across the breeding season were strongly influenced by whether they became polygynous and their age; the effect of T-treatment was marginal, and favored C-males.

141 Contributed Talk: MECHANISMS I (Tuesday PM II)

POSSIBLE TRANSGENERATIONAL EFFECTS OF YOLK TESTOSTERONE ON SEXUAL DIFFERENTIATION IN JAPANESE QUAIL

Cecile Schweitzer, Michael Goldstein, Ned Place, Elizabeth Adkins-Regan

Cornell University, United States; Email:cs742@cornell.edu

In birds, early exposure to steroid hormones deposited in egg yolks is hypothesized to result in long-lasting organizing effects on brain and behavior. In order to investigate these maternal effects, we enhanced yolk testosterone by injecting testosterone into Japanese quail (*Coturnix japonica*) eggs prior to incubation. From 3 weeks to 8 weeks old, measurement of traits indicating sexual development and two behavioral tests were carried out to assess sexual and social motivation in males and females from testosterone-injected and control eggs. We also measured plasma testosterone levels and analyzed acoustic features of crowing in males. Prenatal exposure to testosterone boosted growth, delayed laying and tended to increase social attraction for other females in female quail. In male quail, acoustic features of the crow and affiliative preference for familiar females were affected regardless of sexual maturity. Our findings of persistent and sex-specific effects of yolk testosterone support the long-lasting organizing effects of maternal steroid hormones on social behavior in Japanese quail.

P188 Contributed Poster: SEXUAL SELECTION 1 (Poster Session A: Weds. eve)

GEOGRAPHICAL VARIATION IN THE TARGETS OF SEXUAL SELECTION IN THE GREENISH WARBLER RING SPECIES

Elizabeth Scordato

University of Chicago, United States; Email:escordato@uchicago.edu

Sexual selection is believed to play an important role in speciation, but the mechanisms by which this occurs remain relatively untested. One way sexual selection could contribute to population divergence is if the strength and/or targets of selection vary in different habitats. Shifts in selective pressures may lead to divergence in traits and correlated preferences, ultimately resulting in prezygotic barriers to reproduction. I tested for variation in the strength and direction of sexual selection on song characteristics in multiple populations of the Greenish warbler (*Phylloscopus trochiloides*) ring species. Within populations, there is an apparent tradeoff between selective pressures due to male-male competition and those due to female choice. Between populations, the relative

strength of female choice vs. male-male competition changes, such that more northern populations are subject to stronger female choice. I also find evidence for a shift in the targets of female preferences. Changes in the strength and direction of sexual selection may contribute to ongoing divergence in sexually selected traits in *P. trochiloides*, and could aid the formation of barriers to reproduction.

28 Symposium: SIGNAL MEANING (Tuesday)

A GENERAL ACCOUNT OF THE EVOLUTION OF COMMUNICATION

Thom Scott-Phillips

University of Edinburgh, United Kingdom; Email:thom@ling.ed.ac.uk

There has been much recent debate about the best way in which to conceptualise communication (e.g. 1, 2). In my talk I will advance this discussion in two ways. First, I will defend a definition of communication based upon the effects that signals have (3), and show how such a definition allows us to specify exactly what we mean by information transfer (4). Second, I will show how such a definition predicts that signals must necessarily evolve either by ritualisation or by sensory bias, and I will present ongoing modeling work that supports these predictions. I will hence conclude that an account of communication based upon effects not only accurately defines communication, but it also allows us to specify what information is transferred during communication, and explain general patterns of how signals evolve. 1. Rendall, D., Owren, M. J., & Ryan, M. J. (2010). *Animal Behaviour*, 78, 233-240. 2. Seyfarth, R. M., Cheney, D. L., Bergman, T., Fischer, J., Zuberbühler, K., & Hammerschmidt, K. (2010). *Animal Behaviour*, 80 (1), 3-8. 3. Scott-Phillips, T. C. (2008). *J. of Evolutionary Biology*, 21 (2), 387-395. 4. Carazo, P., & Font, E. (2010). *J. of Evolutionary Biology*, 23, 661-669.

29 Symposium: SIGNAL MEANING (Tuesday)

AGGRESSIVE SIGNALS ARE INFORMATIVE IN SONGBIRDS AND OTHER ANIMALS.

William Searcy, Stephen Nowicki

University of Miami, United States; Email:wsearcy@miami.edu

In situations in which the interests of signalers and receivers conflict, it is not obvious that signalers will be selected to provide information in their signals that is useful to receivers. Models of aggressive signaling, however, indicate that such signaling systems will only be evolutionarily stable if information is in fact communicated. Theory thus predicts that aggressive signals will be informative, and empirical research has supported that prediction. We here review studies of birds that have examined the reliability of vocal signals as predictors of aggressive intentions. These studies demonstrate that attack in a number of species is reliably predicted by specific displays, in particular by vocal displays of low amplitude (i.e. 'soft song' or 'soft calls'). The properties of these aggressive displays are not in accord with alternative theories of communication, in which receivers are constrained to respond to signals because of sensory biases or other properties of nervous systems. We conclude that both theory and empirical work strongly support an informational interpretation of aggressive signaling.

30 Symposium: SIGNAL MEANING (Tuesday)

MEANING AND INFORMATION IN ANIMAL COMMUNICATION

Robert Seyfarth, Dorothy Cheney

University of Pennsylvania, United States; Email:seyfarth@psych.upenn.edu

Whenever two individuals come into close contact, there is inherent uncertainty on both sides, because the best strategy for one depends on what the other does and vice versa. Current research suggests that communicative signals have evolved at least partly because they help to resolve this uncertainty. Even when there is a conflict of interest between participants, honest, low-cost signals can be evolutionarily stable. This is particularly true when coordination is valued, individuals interact repeatedly, or the interests of participants overlap. Such conditions apply widely, in many animals. Listeners respond to signals based on the integration of information from signal

type, the signaler's identity, memory of recent events, and the context in which the signal is given. Research is beginning to reveal the neural basis of this information.

241 Contributed Talk: COMMUNICATION IV (Thursday PM I)

BEES IN A BOX: COLLECTIVE FORAGING OF THE ANT *TEMNOTHORAX RUGATULUS*

Zachary Shaffer, Stephen Pratt

Arizona State University, United States; Email: zshaffe@asu.edu

The collective decisions of social insects depend critically on positive feedback from nest-mate recruitment. Differences in the mathematical linearity of recruitment have been invoked to explain variation in the dynamics of social insect foraging. For example, an ant's pheromone trail grows more attractive with each additional recruiter, while the waggle dance of the honeybee retains the same attractiveness regardless of the number of recruiters. This distinction may explain why mass recruiting ants demonstrate stronger consensus but less flexibility than honeybees. However, not all ants use trail recruitment; the tandem run is utilized by some species including *Temnothorax rugatulus*. In terms of mathematical linearity, tandem running is more similar to the waggle dance than to trail recruitment. Does *Temnothorax* collective foraging resemble honeybees or other ants? In foraging choice experiments we have found that *Temnothorax* foraging dynamics are similar to honeybees, demonstrating a similar level of flexibility and choice. While not as famous as the waggle dance, the tandem run may also provide valuable insight into the mathematical properties of recruitment.

P242 Contributed Poster: BEHAVIORAL COMMUNITY ECOLOGY 2 (Poster Session B: Thurs. eve)

CHANGE IN NATURAL BEHAVIOR OF HANUMAN LANGUR (*SEMNOPIITHECUS ENTELLUS*) DUE TO ARTIFICIAL FEEDING

Goutam Sharma, Prateek Vijay, Devi Lal, Lal Singh Rahpurohit

Jai Narain Vyas University (JNV), India; Email: gautam_234746@yahoo.co.in

+We observed different patterns of behaviour in different Hanuman langur (*Semnopithecus entellus*) groups depending on the intensity of provisioning during the study period in. We examined the effects of artificial feeding and between two troops which having minimum and maximum provisioning by local peoples. Results are based on focal animal sampling and ad libitum sampling of 18 adult females in the group Kaga North (low artificial feeding) and Mandore troops (High artificial feeding) of the langur population of Jodhpur. We found that in Mandore troop which having high provisioning and more interacting with human population was more aggressive and play more agnostic interaction within and between two troops compare to low provisioned troops. We observed that highly provisioned troop has high-intensity aggression (68.9%) and aggressiveness. In Mandore total 185 incidents were observed when troop members play a major role in aggressiveness. Studies on the nature of changing the aggressiveness with the intensity of provisioning and or human interaction are essential for a basic understanding the behavioral strategies that individual displays when faced with changing food rapidly.~

P158 ABS Genesis Award Poster: PREDATION AND FORAGING 1 (Poster Session A: Weds. eve)

QUANTITATIVE COMPARISONS OF GENERALIST TYRANT FLYCATCHER FORAGING BEHAVIORS IN BELIZE

Megan Shave

Stonehill College, United States; Email: mshave@students.stonehill.edu

Tyrant flycatchers in general utilize a search-and-capture foraging strategy; however, different species show variations in their techniques and diets which likely reflect the morphological radiation within the Tyrannidae family. This study compared two generalist species, the Social Flycatcher (*Myiozetetes similis*) and the Great Kiskadee (*Pitangus sulphuratus*), within a single habitat in Belize, Central America. I recorded data for each observed foraging movement according to five components of foraging: Search, Attack, Foraging Site, Food, and Food Handling. Within these components I recorded a total of eleven foraging measures. Given the

morphological differences between the two species, I expected the species to differ for each measure overall, and I found statistically significant differences for nine of eleven measures. Overall, the results indicate that the two species are indeed foraging generalists and that they differ significantly in their techniques. However, some results did not follow the classic foraging profiles for these species, suggesting the influence of habitat features, time, and individual variation on generalist foraging.

15 ABS Allee Session: ALLEE III (Thursday PM)

INDIVIDUAL RECOGNITION IN PAPER WASPS: CORRELATED EVOLUTION OF COGNITION AND IDENTITY SIGNALS

Michael Sheehan

University of Michigan, United States; Email:mic@umich.edu

Individual recognition (IR) is essential for the highly differentiated relationships that are a hallmark of complex animal societies, though little is known about how IR evolves. Here, I examine the evolution of cognitive abilities and phenotypes used for IR in *Polistes fuscatus* wasps, which recognize conspecifics using variable color patterns. I first demonstrate that *P. fuscatus* wasps have specialized cognitive adaptations for learning conspecific wasp faces and that wasps have surprisingly robust social memories despite their small brain size. Next, I show that the variable color patterns are the result of selection for easily recognizable identity signals. *P. fuscatus* have evolved specialized cognitive abilities and distinctive color patterns - how selection can favor the elaboration of sender phenotypes and receiver cognition in the absence of the other? I demonstrate that *P. metricus*, a close relative lacking IR, has a receiver bias towards IR when experimentally given rudimentary identity signals. Receiver bias provides a mechanism for the initial elaboration of identity signals to be followed by selection for increased cognitive abilities in *Polistes* wasps.

130 Contributed Talk: SOCIAL BEHAVIOR II (Tuesday PM I)

UNFAVORABLE ENVIRONMENT PROMOTES COOPERATION IN JOINT-NESTING TAIWAN YUHINAS

Sheng-Feng Shen

Academia Sinica, Taiwan; Email:shensf@gate.sinica.edu.tw

Identifying the factors that modulate cooperative and competitive behaviors is the key to understanding social evolution. However, how ecological factors affect social conflict remains relatively unexplored. Here, we develop a game-theoretical model predicting that social aggression will be less, number of offspring produced will be less and offspring fitness will be higher in unfavorable environments. As a result, the total group productivity will not necessary be higher in good environments. We then use a joint-nesting species, Taiwan yuhinas (*Yuhina brunneiceps*) to test these predictions. Based on our 4-year studies, we found that, as predicted, yuhinas employ more cooperative strategies in unfavorable environmental conditions: fighting duration was lower, fewer total eggs were laid, and incubation was more likely to start after all females completed egg laying (which causes more synchronous egg hatching). As a consequence, there were a similar number of surviving offspring in different ecological conditions. To our knowledge, our study is the first theoretical analysis and empirical study demonstrating that an unfavorable environment promotes cooperation.

P237 Contributed Poster: APPLIED ANIMAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

ETHOSEARCH: A NEW ONLINE RESOURCE FOR BEHAVIORAL ETHOGRAMS

Marisa Shender, Elizabeth Lonsdorf, Steven Ross, Steven Thompson, Megan Ross, Leah Melber, Anne Clark
Lincoln Park Zoo, United States; Email:mshender@lpzoo.org

Ethograms, a catalog of a species' behavioral repertoire, represent a fundamental underpinning of behavioral research. Well-designed ethograms underlie any quantitative study of behavior, because they specify "units" of data, the acts or events that are recorded and relationships analyzed. The collection of standardized behavioral information, along with the increase of collaborative, multi-institutional research, presented a need for a

searchable and easily used database of ethograms. Ethosearch: the Ethogram Archive Project (www.ethosearch.org) is designed to address this lack of consistency and provide a resource to both researchers and students. The structure of Ethosearch is based upon the classification of specific behaviors and their functional and operational definitions. Every ethogram has a number of informative "metadata" tags, such as author, publication, citation information, and details on the animal population on which the ethogram is based. With potential application to both the scientific and education community, Ethosearch has a proven niche to address and has positioned itself as a critical resource to encourage high quality ethological endeavors.

P30 ABS Genesis Award Poster: COGNITION AND LEARNING 1 (Poster Session A: Weds. eve)

EFFECTS OF SEXUAL EXPERIENCE ON SPATIAL MEMORY AND BEHAVIORAL FLEXIBILITY IN MALE RATS

Leanne Shulman, Mark Spritzer, Mark Stefani

Middlebury College, United States; Email:anneking27@gmail.com

Higher levels of testosterone are known to improve spatial memory and impair behavioral flexibility. Given that sexual activity increases testosterone levels, a corresponding increase in spatial memory and decrease in behavioral flexibility were hypothesized. Two experiments were conducted examining spatial memory and behavioral flexibility in male rats exposed to sexually receptive females for 30 min periods daily for two weeks. Experiment 1 tested how sexual interactions affected spatial memory and perseverance in the Morris water maze. Experiment 2 tested how sexual interactions affected behavioral flexibility using a set shift task. In Experiment 1 no differences between groups in spatial memory were found, but rats that had contact with females displayed higher perseverance than control rats. Results from Experiment 2 showed no significant effects of sexual interactions upon behavioral flexibility. Sexual activity in male rats was found to be cyclic across interaction days and was inversely correlated with stress. Overall these data indicate that sexual activity does not alter spatial learning and memory but does cause a decrease in behavioral flexibility for certain tasks.

216 Contributed Talk: MATING SYSTEMS II (Thursday AM)

BREAKING THE BEST OF A BAD JOB: BROOD PARASITISM AS AN ALTERNATIVE REPRODUCTIVE STRATEGY

Stephen Shuster

Northern Arizona University, United States; Email:stephen.shuster@nau.edu

Intraspecific brood parasitism, in which non-nesting members of a population deposit their eggs into established nests, is often reported among group nesting birds. The current explanation for this behavior is that brood parasites "make the best of a bad job;" i.e., they experience fitness that is less than the average fitness of nesting individuals. I show that brood parasitism may instead represent a conditional polymorphism that persists because nest loss prevents a fraction of the population from breeding at all. When the fitnesses of such zero-class individuals are included in estimates of the average fitness of nesting birds, the fitnesses of nesters and brood parasites are in fact equal. Such conditions are necessary and sufficient to maintain quantitative genetic variation underlying the tendency to become a brood parasite, wherein individual genotype determines the response to environments in which brood parasitism is favored. This hypothesis provides a framework for considering the expression and evolution of other conditional phenotypes, and suggests that the current interpretation of "making the best of a bad job" is a fallacy.

P365 Contributed Poster: PARENTAL CARE 2 (Poster Session B: Thurs. eve)

PARENTAL FAVORITISM FOR OFFSPRING SEX AND ORNAMENTATION IS INFLUENCED BY MATE QUALITY

Lynn Siefferman, Nicole Barrios

Appalachian State University, United States; Email:sieffermanlm@appstate.edu

Parents of multiple offspring may be expected to favor particularly valuable offspring. Offspring characteristics like sex and ornamentation influence their future reproductive value and parental favoritism. Because sons exhibit greater variability in reproductive potential than daughters, parents in high-quality nest environments should preferentially defend sons. Because brighter adult Eastern Bluebirds (*Sialia sialis*) gain higher reproductive success, parents should favor the brighter sons. We tested parental favoritism for fledgling-aged offspring by simultaneously threatening two offspring with mock predators. When given the choice of protecting sons versus daughters, fathers protected sons when mated to high quality-mates. When given the choice of protecting more versus less colorful sons, fathers favored brighter over duller sons. Mothers did not discriminate between offspring. Fathers may show favoritism because plumage coloration is used in male-male interactions or because they assume the primary responsibility for fledglings.

P319 Contributed Poster: ECOLOGICAL EFFECTS 2 (Poster Session B: Thurs. eve)

MAN-MADE MIRROR-LIKE SURFACES GENERATE SERIOUS SENSORY ILLUSIONS FOR ECHOLOCATING BATS

Björn Siemers, Sándor Zsebok, Daniela Schmieder, Stefan Greif

Max Planck Institute for Ornithology, Germany; Email:siemers@orn.mpg.de

Smooth water surfaces are the only extended acoustic mirrors in nature. When echolocating down on a water surface at an acute angle, the echo from ahead is reflected away. The bat only receives a weak echo from straight below, way off-centre of the sonar beam aim. Bats recognize water bodies by their mirror-like echo reflection properties: they try to drink from different solid materials, provided the surface is acoustically smooth and hence mirror-like (Greif & Siemers 2010, Nature Communications). Vertical water surfaces do not exist in nature and we thus predicted that bats would perceive extended vertical mirror as an open flyway, provided they approach at an acute angle. Indeed, we found that bats repeatedly try to fly through extended horizontal mirror-like plates. The same bats take the same smooth plates for water if presented horizontally on the ground. Absolute orientation of acoustic mirrors thus fundamentally changes the bats' interpretation of echo scenes. Our study has important implications for conservation, as it raises the question whether bats collide with windows and other large smooth vertical surfaces on human buildings much more often than we currently know.

153 Contributed Talk: SOCIAL BEHAVIOR III (Tuesday PM II)

SOCIAL SKILL AND SEXUAL SELECTION

Andrew Sih, Sean Fogarty, Ann Chang

University of California, Davis, United States; Email:asih@ucdavis.edu

Social skill clearly influences human mating patterns, but is not often studied in other animals. Here, we present a general framework for studying social skill and sexual selection, and show data on social skill and mating success in the stream water strider, *Aquarius remigis*. Social skill can affect male success in each of 3 steps in the mating process: 1) adaptive choice of places to search for females; 2) adaptive choice of who to attempt to mate with; and 3) adaptive use of traits that enhance the success of mating attempts. While male mating success is sometimes well explained by 'fixed' traits (e.g. ornaments) that influence female choice in step 3, we suggest that social skill might often heavily affect overall variation in male mating success in all 3 steps. Using ~19,000 observations of ~200 male water striders involving ~1000 mating events, we quantified the effects of male morphology, behavioral type (activity and aggressiveness) and social skill on success in each of the 3 steps of the mating process. Social skill, particularly in adaptive patch choice and male mate choice had major effects on overall variation in mating success.

P224 Contributed Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

SIZE AND EXPERIENCE, BUT NOT SEX, PREDICT DOMINANCE IN A MONOMORPHIC WEAKLY ELECTRIC FISH

Ana Silva, Gervasio Batista

Facultad de Ciencias, UdelaR, Uruguay; Email:asilva@iibce.edu.uy

The outcome of animal contests is determined by individuals' asymmetries in RHP or resource value. Further, previous winners increase their probability of winning subsequent fights (winner effect), whereas previous losers decrease their chances of winning (loser effect). In some teleosts, 11-KT variations mediate the winner effect. *Gymnotus omarorum* is a sexually monomorphic species that exhibits territorial aggression all year round and uses unambiguous submissive electric displays during agonistic interactions. Non-breeding contests are resolved by RHP asymmetries independently from contenders' sex. To explore winner and loser effects during the non-breeding season, we tested previous losers and winners against pair-sized individuals. Fish with loser experience exhibited a robust loser effect at different time scales. In addition, contest duration was reduced and the rate of submissive electric signals increased. Previous winners presented a winner effect mediated by an increase of their aggressive motivation. Hormonal measurements suggest that 11-KT variations are not involved in the winner effect of this species. Partially supported by ANII FCE2010_2657 and PEDECIBA.

P339 Contributed Poster: MATING SYSTEMS 2 (Poster Session B: Thurs. eve)

THE EFFECTS OF AVIAN MALARIA ON REPRODUCTIVE SUCCESS AND MIGRATION BEHAVIOUR IN A COLONIAL SWALLOW

Cassandra Silverio, Bridget Stutchbury

York University, Canada; Email:cassang@yorku.ca

Haemoproteus is the most common of the avian malaria parasites, however its influence on fitness and behavioural traits is largely unknown. Fitness costs imposed by parasitic infections may result in parasite mediated selection influencing social and extra-pair mate choice. This study quantified *Haemoproteus* infection in purple martins (*Progne subis*) using quantitative PCR and determined if birds with increased infection loads have reduced reproductive success for females and fewer within pair young for males. Additionally, this study looked at the influence of infection on fall migration behaviour from geolocator tracking to the wintering grounds in Brazil. This study took place at martin colonies in Northwestern Pennsylvania where research has been ongoing since 2006. Infection loads of *Haemoproteus prognei* were determined using quantitative PCR. Results indicate female reproductive success and male mating success do not correlate significantly with infection loads. Experimental reduction of infection loads will provide further insight to the effect of parasites on reproductive success and various fall migration parameters.

P189 ABS Genesis Award Poster: SEXUAL SELECTION 1 (Poster Session A: Weds. eve)

THE LOSS OF FEMALE ORNAMENTATION: DOES THE COST OF MIGRATION FAVOR SEXUAL DICHROMATISM IN WARBLERS?

Rick Simpson, Troy Murphy

Trinity University, United States; Email:rsimpson@trinity.edu

In many bird taxa, there is evidence that sexual dichromatism has arisen due to the loss of female ornamentation (i.e., ancestors had both ornamented males and females). The driving selective factors underlying the loss of female ornamentation are not well understood. We hypothesize that the cost of migration may explain female loss of ornamentation. Specifically, we hypothesize that the distance a species migrates will be positively related to the degree of sexual dichromatism, as those species that migrate farther will experience greater risk of being detected by visual predators. We propose that the cost of being visible to predators has a stronger negative effect on the expression of female ornamentation compared to male ornamentation, because the strong benefits associated with male mating signals outweigh these costs. We compared the degree of sexual dichromatism among New-World warblers to the average distances migrated for each species. Preliminary results indicate that warblers that migrate greater distances are more sexually dichromatic.

178 Contributed Talk: PERSONALITIES (Wednesday AM)

PERSONALITY AND PERFORMANCE IN WORKING DOGS: RELIABILITY AND VALIDITY OF BEHAVIORAL TESTS

David Sinn, Samuel Gosling, Stewart Hilliard

University of Texas, Austin, United States; Email:david.sinn@mail.utexas.edu

Recognition of personality is well-established in domestic dogs. What is less well-known is the predictive ability of personality for working outcomes. Here we evaluate a test instrument given to military working dogs (MWDs). A 15-item instrument was applied on three separate occasions, after which dogs were given patrol-only, detection-only, or dual-certification status. Average inter-rater reliability for all 15 items was high (mean = 0.77), but some items had lower reliability (+0.40). Test-retest reliability for most single items was strong (~0.50) across shorter test intervals, but decreased with increasing test interval (+0.40). Four principal components resulted in aggregate traits that had the same pattern of short-, but not long-term test-retest reliability observed for single item behaviors. Certification outcomes were not predicted by breed, sex, or early test behaviors. However, prediction was improved by models that included two aggregate and three single item behaviors measured at the final test period, with 1 unit increases resulting in 1.7 - 2.8 increased odds of certification. We discuss these results in terms of how dog programs select dogs for duty.

P407 Contributed Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

TEMPORAL VARIABILITY OF SEXUAL SELECTION IN AUSTRALIAN *DROSOPHILA BIPECTINATA*

Jane Sledd, Alexandra Warner, Michal Polak

United States; Email:superjane812@hotmail.com

Secondary sexual traits often have high heritabilities and are subject to intense directional sexual selection, and therefore, typically possess enormous evolutionary potential. Indeed, sexual traits among even closely related taxa show dramatic diversification. Few studies examine temporal variability in the direction and strength of sexual selection, and of predicted change in mean phenotypic values, over ecological time. Our previous studies of *Drosophila bipectinata* Duda (Diptera: Drosophilidae) at Cape Tribulation (Australia) conducted in 2003 demonstrated significant heritability of sex comb size, as well as directional pre-copulatory sexual selection for increasing trait size. Here, we present the results of a field study of selection conducted in January 2011 of this same population. We measured sexual selection approximately 180 fly generations after the original study to evaluate the longer-term temporal dynamics of sexual selection in a natural population. We also evaluate whether mean trait size increased over time, as predicted by micro-evolutionary theory.

P108 ABS Founders Award Poster: GENETICS AND EVOLUTION 1 (Poster Session A: Weds. eve)

RELATIVE CONE OPSIN GENE EXPRESSION AND BEHAVIORAL VARIATION IN THE CICHLID FISHES OF LAKE MALAWI

Adam Smith, Ke Ma, Karen Carleton

University of Maryland, United States; Email:adasmi@umd.edu

The cichlids of Lake Malawi are model organisms for the study of both sexual selection and the evolution of color vision. Extensive research has demonstrated that the relative expression of cone opsin genes varies within and between species. Furthermore, gene expression appears to be developmentally plastic in certain species. In this study, we profiled changes in the expression of the long wavelength-sensitive (LWS) opsin gene with developmental ambient light environment and the behavioral consequences of these expression changes in two species. Using the optomotor behavioral paradigm (OMR), we found that individuals expressing relatively more LWS performed better on the OMR task in both long- and short- wavelength dominant light environments. Using basic models integrating gene expression and the predicted absorbance of opsin pigments, we attempted to predict behavior under various light environments using a single behavioral measure. Our models suggest that

the LWS pigment alone is responsible for the OMR behavior. This LWS-predominant mechanism has important implications for visual sensitivities and the recognition of conspecific signals.

91 Contributed Talk: COMMUNICATION I (Tuesday AM)

DISTINGUISHING DEATH MARKS FROM FERTILITY SIGNALS IN A DESERT ANT

Adrian Smith, Bert Hölldobler, Jürgen Liebig

Arizona State University, United States; Email:Adrian.Smith@asu.edu

Fertility signals, in the social insects, are chemical blends used to distinguish reproductive queens from other members of a colony. Potentially any chemical mixture that is unique to a reproductive queen could serve as a fertility signal. The multiple receiver hypothesis, generated to explain multiple male ornaments in birds, suggests that similar traits can co-occur as signals if they are directed towards different receivers. In the ant, *Aphaenogaster cockerelli*, we show that both cuticular hydrocarbons and the contents of the Dufour's gland have the potential to be fertility signals. However, we present causal and correlative data showing that reproductive workers are singled out and aggressed (policed) by both their nestmate workers and queens based on changes in their cuticular profile. Furthermore, we show that when queens are policing reproductive workers they dispel the contents of their Dufour's gland onto the aggressed worker, causing nestmates to respond aggressively (sometimes lethally) towards the marked individual. Although both signals distinguish queens from workers, as the multiple receiver hypothesis predicts, the similar signals differ in their function.

274 Contributed Talk: GENETICS AND EVOLUTION II (Thursday PM III)

UNDERSTANDING CHEMOTAXIS IN *CAENORHABDITIS ELEGANS* BY LINKING GENES AND BEHAVIOR

Heidi Smith, Oliver Hobert

Columbia University, United States; Email:hks2102@columbia.edu

The nematode *C. elegans* relies on chemotaxis- movement in response to chemical stimuli- for finding food, locating mates, and avoiding noxious chemicals. The simple nervous system and assayable behavior of *C. elegans* make it an ideal model system for studying the mechanistic basis of chemotaxis. We have taken a novel approach to this subject by addressing genotype and behavior simultaneously. Chemotaxis mutants recovered in a screen for defective NaCl sensing (Lewis and Hodgkin, 1977) were tested for behavioral responses to taste and odor cues. Although roughly mapped, the identities of the causal mutation (s) were unknown. We employed a whole genome sequencing approach to identify the causative mutation by comparing entire genomes of each mutant to wild type. Differences were filtered and candidate alleles were screened behaviorally. Tissue-specific rescue experiments will identify cells where these gene products are required, allowing us to make inferences about their role in chemotaxis. This isolation and characterization of these genes will help elucidate functions in vertebrate homologs, shedding light on how genes influence behavior in more complex taxa.

P442 ABS Founders Award Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

SOCIAL NETWORK DYNAMICS AMONG SPOTTED HYENAS

Jennifer Smith, Christopher Strelhoff, Kay Holekamp

University of California, Los Angeles, United States; Email:smith780@ucla.edu

Because group dynamics have fitness consequences for individuals, revealing the rules structuring social group stability and membership is central to understanding the evolution of sociality. Spotted hyenas (*Crocuta crocuta*) are large mammalian carnivores that live in groups, called clans. Clans resembles groups of Old World Monkeys and contain both kin and non-kin. Here we apply social network theory to analyze the effects of kinship on social bond stability among hyenas in Kenya. First, 16 years of data from a single, large stable clan suggest that individuals adjust social ties dynamically in response to fluctuations in resource availability. Although prey scarcity reduced the strength of network connections among clan members, kin fostered more enduring social bonds than did non-kin. A second analysis revealed the gradual splitting of this large group into two permanent

daughter clans, providing natal females with a unique opportunity for dispersal. These data support the hypothesis that pre-fission alliances among kin and non-kin, not pre-fission overlap in space use, structure post-fission clan membership. We discuss network dynamics as drivers of social evolution.

109 Contributed Talk: SOCIAL BEHAVIOR I (Tuesday AM)

AERIAL ALARM CALLING AND RISK-MANAGEMENT TACTICS IN FOWL, *GALLUS GALLUS*

K-lynn Smith, Artemi Kokolakis, Christopher Evans

Macquarie University, Australia; Email:klynn.smith@mq.edu.au

Alarm calling is a classic problem in evolutionary biology. Although a signaler may increase the likelihood of survival for group members, which typically include kin and mates, there are inherent risks associated with any behaviour that increases conspicuousness to predators. Possible tactics for controlling costs include flexibility in call structure and timing, as well as sensitivity to the environmental and social factors that predict personal vulnerability. We examined individual variation in the alarm calling behaviour of male fowl in naturalistic social groups. Previous studies of cost management have focused on variation at the level of alarm call rate. We used wireless sound recording and remote video monitoring to test for more subtle variation in signal structure and timing. These were then mapped onto individual mating success and moment-to-moment changes in environmental and social context. As expected, alarm calling is sensitive to both social rank and mating success. We also found systematic variation in call structure as a function of proximity to a rival male and refuges. Taken together, these results reveal several novel tactics for risk-management.

P159 Contributed Poster: PREDATION AND FORAGING 1 (Poster Session A: Weds. eve)

PLASTIC TITS: SEASONAL CHANGES IN BRAIN AND BODY ACCOMPANY BEHAVIORAL ADAPTATIONS TO WINTER SURVIVAL

Tom Smulders, Henrik Lange, Lauren Walker, E. Maria Toivanen, Esa Hohtola, Markku Orell

Newcastle University, United Kingdom; Email:tom.smulders@ncl.ac.uk

Tits are resident year-round at high latitudes. To survive the harsh winters, they have evolved many behavioral adaptations, such as a change in diet and, in some species, food hoarding. We investigate changes in brain, muscle and digestive tract that accompany changes in behavior throughout winter in great tits *Parus major* and willow tits *Poecile montanus* in Finland. In both species, the digestive tract grows, with longer gut and heavier proventriculus, gizzard and liver in winter. This may be related to low food availability or the change in diet from summer to winter. In great tits, which become nomadic in winter, heart muscle and flight muscle also increase, which they do not in willow tits. In the willow tit brain, the hippocampus is larger, containing more large neurons, during the hoarding peak than at other times of the year. This may relate to a larger memory capacity during seasonal hoard distribution. In great tits, the hippocampus is smaller, containing fewer large neurons, in the summer than in the winter. Whether this is due to energetic constraints in summer, or an increased need for spatial memory during the nomadic winter months remains to be seen.

P93 Contributed Poster: EDUCATION (Poster Session A: Weds. eve)

BEHAVIORAL DATA - MANAGEMENT, ARCHIVING, AND SHARING: ADVANTAGES OF USING A LIBRARY REPOSITORY

Eric Snajdr

Indiana University - Purdue University Indianapolis, United States; Email:esnajdr@iupui.edu

An often-overlooked aspect of scientific research in animal behavior has been the preservation of data and gray literature (unpublished products) that lie behind the scenes of the research. If preserved, many of these materials could likely be of use to the present and future scientific community. Institutional repositories of college and research libraries can play an important role in this regard. Unlike lab web pages, institutional repositories provide a permanent location for research products. Files are stored in optimal formats and are managed such that access will be possible far into the future. In addition, repositories provide support for the creation of

descriptive information (metadata) for making mounted works findable by others (e.g. through search engines). Restrictions on access (embargo periods) can be placed. A research lab at Indiana University is using their campus institutional repository to archive data and gray literature from long-term studies on songbird behavior. Examples of items preserved are protocols, yearly goals, and field notes. The group is currently working to preserve various data, summaries, and media related to their research.

163 Contributed Talk: COGNITION AND LEARNING III (Wednesday AM)

NUTRITIONAL CONSTRAINTS IN THE EVOLUTION AND DEVELOPMENT OF LEARNING

Emilie Snell-Rood, Aaron Dahl, Paula Trillo

University of Minnesota, United States; Email:emilies@umn.edu

Understanding why organisms vary in learning ability is key to predicting how individuals will respond to changing and novel environments. This research integrates the field of cognitive evolution with that of ecological stoichiometry to investigate ecological constraints on the evolution of learning. Specifically, this research tests the hypothesis that environmental variation in the availability of elements critical for neural functioning (sodium, potassium, and calcium) will constrain the evolution and development of learning. This work uses butterflies as a study system because their learning is easy to measure, nutrient availability is easily manipulated in artificial diets, and element concentration of host plants varies widely. Preliminary results will be presented that test two key predictions. First, variation in host plant nutrition should be correlated with neural investment across 30 species of butterflies. Second, nutritional manipulations in artificial diets (using the species *Pieris rapae*) should affect the development of learning ability, potentially resulting in tradeoffs between learning and other traits.

P340 ABS Founders Award Poster: MATING SYSTEMS 2 (Poster Session B: Thurs. eve)

THE ONTOGENY OF MULTI-LEVEL SOCIETIES: THE SOCIO-GENETIC STRUCTURE OF GELADAS (*THEROPITHECUS GELADA*)

Noah Snyder-Mackler, Susan Alberts, Thore Bergman

University of Pennsylvania, United States; Email:snydern@sas.upenn.edu

Multi-level societies are characterized by core social units embedded within one or more larger social groups. Despite the prevalence of these societies across a variety of taxa, little is known about their ontogeny. It is possible that large units become unstable and split into small units which then associate more often - resulting in a "team". Alternatively, related males in separate units could cause their units to forage together more often, or units could associate at random. Using a combination of genetic and behavioral data we describe the underlying structure of one species of primate, the gelada, which has a multi-level society of units, teams, bands, and herds. We found that society is mediated by female relatedness and association at all levels - suggesting that geladas are matrilineal. Female relatedness was positively correlated with association both within and between units. Using data from three unit fissions, we found a higher relatedness within than between newly formed units, which nonetheless foraged together more often than less closely related units. Thus gelada society results from the percolating effect of units' tendency to split along familial lines.

134 Contributed Talk: APPLIED ANIMAL BEHAVIOR I (Tuesday PM II)

THE ROLE OF DIRECTIONAL PERSISTENCE IN EXPLORATION

Benjamin Soibam, Shishir Shah, Gemunu Gunaratne, Gregg Roman

University of Houston, United States; Email:bsoibam@cs.uh.edu

Exploratory behaviors are the acts and postures which allow an animal to gather information about a novel environment. In novel open field arenas, many species typically spend a majority of time near the arena edge, executing motions along the walls. Thigmotaxis and/or centrophobicity have been credited with this edge preference. Another characteristic of animal exploration is directional persistence. A measure of direction persistence, P , is closely correlated with exploratory activity. We hypothesize that directional persistence can be

thought of as a fundamental aspect of exploration and edge preference is a consequence of directional persistence. Our analysis involves a new simulation program, whose inputs are modeled after the experimentally obtained probability distributions for *Drosophila melanogaster* movement in center and boundary zones of circular open field arenas. We show that the spatial distribution of our simulated fly in both a circular arena as well as an hour-glass arena closely match those in the experiment. We will further present data in which we model the time-dependent components of exploration and directional persistence on edge preference behavior.

P120 Contributed Poster: MATING SYSTEMS 1 (Poster Session A: Weds. eve)

**CONSEQUENCES OF ALTERNATIVE REPRODUCTIVE TACTICS IN MALE PRAIRIE VOLES
(MICROTUS OCHROGASTER)**

Nancy Solomon, Regina Willen, Brian Keane

Miami University, United States; Email:solomong@muohio.edu

Male alternative reproductive tactics have been documented in numerous species but much less is known about fitness consequences of males exhibiting these alternative tactics. A relatively common set of alternative tactics seen in male rodents is for them to be either a territorial resident at a nest with a female or a wanderer that is caught at multiple females' nests. It has been suggested that the alternative tactic of wandering may allow males that are unable to acquire a territory to make the best of bad situation, which would be better than not siring any offspring. To test this hypothesis, we examined data from semi-natural and natural populations of prairie voles where both reproductive tactics are observed. We were able to assign paternity to ~80% and ~60% of offspring in our semi-natural and natural populations, respectively. There was no relationship between number of females with which males sired pups and the tactic displayed by males. Further, residency of males and number of offspring sired were not correlated. Based on these data, wandering male prairie voles do not appear to be making the best of a bad situation.

P366 ABS Founders Award Poster: PARENTAL CARE 2 (Poster Session B: Thurs. eve)

MODELING THE COEVOLUTION OF BIPARENTAL CARE, BROOD NEED, AND PAIR-BOND NETWORKS

Zhiyuan Song, Joan Roughgarden, Marc Feldman

Stanford University, United States; Email:zysong@stanford.edu

Biparental care is the norm in avian species, but less common in other taxa, and the evolution of biparental care remains an unsolved puzzle. The sexual conflict hypothesis, however, predicted the difficulty for biparental care to evolve as care is costly and either parent could benefit from deserting the brood if its partner provides care. Thus, biparental care is optimal for each parent only when brood need of care is sufficiently high, but on the other hand, high brood need can evolve only on condition that biparental care is available. Here we use a model to show the coevolutionary pathway of biparental care and brood need. Beginning with a population of few carers and low brood need, the brood need boosts the frequency of carers, which in turn creates conditions for higher brood need to evolve. Furthermore, as a pair of carers have a higher probability to maintain the pair-bond across breeding bouts, the pairwise network with assortment emerges dynamically at the population level that enhances the positive feedback loop between the frequency of carers and brood need. We also analyzed the impact of mortality and other ecological factors on the coevolutionary dynamics.

P303 ABS Founders Award Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

VOCAL BEHAVIOUR OF A TROPICAL SONGBIRD, THE BROWN-THROATED WREN

Jose Roberto Sosa Lopez, Daniel Mennill

University of Windsor, Canada; Email:sosalo@uwindsor.ca

The extensive diversity of vocalizations found across different animal taxa provides rich material for researchers interested in understanding the ecology and evolution of complex behaviours. Species, however, differ enormously in their song styles and vocal organization and documenting this variation presents great challenges.

Empirical assessment of vocal behaviour is needed for understanding patterns of geographic variation, adaptation, speciation, population demography, and the responses to anthropogenic disturbance. In this study, we provide the first detailed analysis of the vocal behavior of the Brown-throated Wren *Troglodytes (aedon) brunneicollis*, a tropical songbird found in the oak forest highlands of Mexico and the United States. We describe the fine structural characteristics of the song, assess the repertoire size in terms of both songs and syllables, estimate the repertoire sharing among neighbours, and evaluate diel variation in behavior. We explore the relationship between shared songs elements and geographic distance, and whether these wrens follow syntactic rules. We discuss the findings in light of the vocal behavior of wrens in the House Wren complex.

P354 Contributed Poster: MECHANISMS 2 (Poster Session B: Thurs. eve)

EFFECTS OF TESTOSTERONE ON SPATIAL STRATEGIES USED BY ADULT MALE RATS

Mark Spritzer, Elliott Fox, Greg Larsen

Middlebury College, United States; Email:mspritze@middlebury.edu

Male rodents out-perform females on some spatial tasks, and this difference may be due to the activational effects of testosterone. Various spatial strategies can be used to navigate a maze, and we conducted two experiments that tested whether testosterone biases male rats toward a particular spatial strategy. Both experiments involved castrated male rats (n=9-12/group) given daily injections of testosterone (control, 0.125, 0.250, or 0.500 mg/rat) starting 7 days prior to maze testing and continuing throughout testing. In the first experiment, rats were tested in a T-maze, and the second experiment involved a cued version of the Morris water maze. In the T-maze, intermediate doses of testosterone (0.125 and 0.250 mg) significantly biased males toward a response strategy over a place strategy. In the water maze, all groups seemed to use a combination of place and response strategies to solve the task, but the 0.500 mg dose of testosterone resulted in better performance than the control group when the local cue was removed. In combination, these results suggest that testosterone has dose-dependent activational effects that facilitate the use of different spatial strategies.

101 Contributed Talk: SEXUAL SELECTION I (Tuesday AM)

SEXUAL SELECTION IN THE SEA; THE BENEFIT OF FEMALE MULTIPLE MATING IN AN AUSTRALIAN SQUID

Zoe Squires, Bob Wong, Mark Norman, Devi Stuart-Fox

University of Melbourne, Australia; Email:z.squires@pgrad.unimelb.edu

Sex differences in reproduction lie at the heart of sexual conflict. One controversial aspect of sexual conflict is the evolution and maintenance of polyandry, particularly in systems where there are no direct benefits, and mating is highly costly. Cephalopods provide a model system with which to address this question as all species mate multiply and have the potential for strong sexual selection. To test this hypothesis, we mated female squid (*Euprymna tasmanica*) polyandrously or monandrously. Analysis of mating behaviour showed that male squid, regardless of mating treatment, increased the duration of 'flushing' behaviour (which arguably removes previous male's sperm) when mating with a non-virgin female, compared with a virgin female. Polyandrous females did not produce more eggs, or have more hatching success than monandrous females, but they produced eggs faster. This indicates a significant benefit of polyandry, because producing eggs faster in the wild, where reproductive bouts may be cut short by predation or environmental change will result in higher reproductive fitness. These results demonstrate the first benefit, to our knowledge, of polyandry in any cephalopod.

P381 Contributed Poster: PREDATION AND FORAGING 2 (Poster Session B: Thurs. eve)

FECAL CORTISOL CONCENTRATIONS AND BEHAVIOR OF ALLENBY'S GERBIL FORAGING UNDER THE RISK OF PREDATION.

Justin St. Juliana, Burt Kotler, Berry Pinshow, Noga Kronfeld-Schor

Indiana State University, United States; Email:jstjuliana@indstate.edu

We studied the influence of manipulating predation risk on: giving up densities (GUDs), apprehension, time allocation to foraging, harvest strategy [grab and go (GAG) vs. eat at tray (EAT)], and fecal cortisol concentration in Allenby's gerbil (*Gerbillus andersoni allenbyi*). First, in order to utilize feces from trapped animals we established that after 8 h, fecal cortisol concentration was significantly higher in handled animals relative to control. We used a dog trained to chase gerbils to increase predation risk for foraging gerbils. We predicted that fecal cortisol concentrations would increase directly in the face of predation risk, or indirectly, due to reduced foraging time because of perceived predation risk that, in turn, leads to increased hunger levels. As predicted, in the presence of a predator, GUD was higher, time allocation lower, and GAG foraging was used more in treatment animals, but we found no change in apprehension. There was no difference in cortisol concentration between predator present and no-predator treatments. However, individuals that tended to have higher average fecal cortisol concentrations also tended, on average, to spend more time foraging.

331 Contributed Talk: BEHAVIORAL COMMUNITY ECOLOGY (Friday PM I)

DANGER IN THE DARK: THE EVOLUTION OF NOXIOUS WEAPONRY IN CARNIVORES

Theodore Stankowich, Tim Caro

University of Massachusetts Amherst, United States; Email:teds@bio.umass.edu

Many species show elaborate and extreme morphological adaptations that aid in their defense against predators. The ability to spray noxious anal gland secretions at potential predators is a highly effective defense against large carnivores and has evolved independently in several different lineages of mammalian Carnivorans (e.g., skunks, striped polecats). We set out to explain why this trait has evolved in some lineages but not others. Using a comparative phylogenetic approach, ecological and morphological data, and GIS range maps, we show that the ability to spray noxious secretions is primarily found in nocturnal species with extreme levels of potential predation pressure from great numbers of larger Carnivoran species, which are primarily nocturnal and more sensitive to such defenses. These spraying species also tend to be intermediate in size and live in somewhat exposed environments without refuge (e.g., trees, water). Diurnal Carnivorans experience greater a diversity of potential avian predators (which are less susceptible to noxious odors) than potential large carnivore predators and should, therefore, find spray defenses less useful.

P367 Contributed Poster: PARENTAL CARE 2 (Poster Session B: Thurs. eve)

NATURAL VARIATION IN PARENTING BEHAVIOR IN THE THREESPINE STICKLEBACK *GASTEROSTEUS ACULEATUS*

Laura Stein, Alison Bell

University of Illinois, United States; Email:stein12@illinois.edu

Parental care has direct impacts on individual reproductive success and fitness. Individual variation in parental care has been well-established in females and males in maternal and biparental systems, yet individual variation in parental behavior in paternal-only systems remains largely unexplored. Here we quantify natural variation in parental care in a uniparental system where the father is the sole parent, the threespine stickleback (*Gasterosteus aculeatus*). The parenting behavior of individual males was evaluated every day from spawning through fry dispersal. Despite dramatic changes in parenting behavior across the nesting cycle, individual males behaved consistently different from one another. Males were then allowed to breed again and parental behavior was observed daily. Males retained their individually distinctive parenting style across both clutches. Together with other studies on sticklebacks that have shown that fathering influences offspring antipredator behavior, our results suggest that some of the ubiquitous behavioral variation observed in sticklebacks could reflect differences in the way that individuals were parented by their fathers early in life.

355 Contributed Talk: COGNITION AND LEARNING VII (Saturday AM)

WHAT-WHERE-WHEN MEMORY IN CHIMPANZEES AND HUMAN CHILDREN

Elisabeth Sterck, Johan de Vries, Berry Spruijt, Maaike Kempes, Marusha Dekleva

Utrecht University, Netherlands; Email:e.h.m.sterck@uu.nl

Adults recall past events using episodic memory. They combine unique features and employ mental time travel, a capacity related to Theory of Mind (ToM). Corvids show retrospective knowledge in a caching paradigm that does not require mental time travel: the birds combine the what-where and when (WWW) memory of caching events to retrieve food. WWW memory may present a behavioural version of episodic memory, possibly related to ToM, but may also represent a separate capacity. We measured WWW memory with adjusted caching tasks in chimpanzees and 3 and 5 year old children, the age ToM develops. In children we linked WWW memory to ToM tasks. Chimpanzees failed to combine the WWW of events, but instead used an associative location strategy. Children of 3 years also failed, while some of the 5 year olds passed, yet this did not depend on passing ToM tasks. Incorporating the when component seemed most demanding for children. Therefore, the WWW memory task is difficult for both chimpanzees and young children, in contrast to corvids. Moreover, it may be independent of ToM, suggesting that WWW memory may differ from episodic memory.

217 Contributed Talk: MATING SYSTEMS II (Thursday AM)

OUTCOMES OF A TUG-OF-WAR OVER EXTRA-PAIR PATERNITY AND PATERNAL INVESTMENT

Caitlin Stern, H. Kern Reeve

Cornell University, United States; Email:cas245@cornell.edu

Despite the widespread occurrence of extra-pair mating across socially monogamous species with biparental care, a predictive framework for understanding variation in the frequency of extra-pair paternity (EPP) at multiple levels is still lacking. Using a tug-of-war modeling approach, we incorporate key elements including incomplete control of within-brood paternity, co-evolving investments in conflict, tradeoffs between investments in conflict and parental care, and individual variation in the benefits gained from extra-pair copulations (EPCs) in a game theoretic model of conflict over paternity and paternal investment. This model is applicable across socially monogamous taxa. Major predictions about conflict outcomes include: 1) the lowest parental effort occurs not when EPP is highest but instead when the female but not the male has a strong incentive to seek EPCs (when EPP is intermediate); and 2) total conflict will be highest when the female's extra-pair option is high-quality and the male's is poor, due to the male's massive energy investment in resisting female EPCs. We discuss the implications of the predictions for explaining variation in EPP among populations and species.

P58 Contributed Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

INTRASPECIFIC VARIATION IN THE ALARM CALLS OF A SOCIAL SUBTERRANEAN RODENT *SPALACOPUS CYANUS*

Monica Stewart, Mauricio Soto-Gamboa, Loren Hayes, Rodrigo Vasquez, Claudia Cecchi

University of Louisiana at Monroe, United States; Email:monicastewart1186@gmail.com

Alarm signals, such as vocalizations, play a critical role in the social structure of group-living mammals. In some mammals, the characteristics of a signal vary across geographical ranges and can be population-specific. An important question to ask is 'what are the environmental and genetic sources of intraspecific variation in auditory signals?' Ecological data and acoustic recordings were collected from 22 individual *Spalacopus cyanus* from Rinconada de Maipú, and 50 individuals from La Parva, Chile to determine the relative importance of intraspecific variation in ecology, genetics, and body size. Sound analysis software was used to analyze vocalizations. Preliminary laboratory investigations on alarm calls demonstrated differences in syllable structure between the populations. Data suggests stronger trends in the La Parva population. Ecological data in conjunction with analysis of calls using spectrogram software will provide insight into factors most greatly influencing alarm call variation among populations. Research linking sources of variation can improve our understanding of proximate and ultimate causation.

16 ABS Allee Session: ALLEE III (Thursday PM)

EXQUISITE FORGERY: THE EVOLUTION OF EGG COLOR MIMICRY IN THE COMMON CUCKOO

Mary (Cassie) Stoddard, Martin Stevens

University of Cambridge, United Kingdom; Email:mcs66@cam.ac.uk

Brood parasite-host dynamics provide textbook examples of coevolutionary arms races, but there is more than meets the human eye. Different host-races of the common cuckoo, *Cuculus canorus*, lay eggs in the nests of other species, offloading all parental care on hosts. To human vision, cuckoo eggs often (but not always) appear to perfectly match the color and pattern of host eggs, which minimizes detection by hosts. Most studies of egg mimicry rely on human assessments or reflectance spectra, which fail to account for bird vision. Here, we use discrimination and tetrachromatic color space modeling of avian vision to quantify egg background and spot color mimicry in the common cuckoo and its principal hosts, and we relate this to egg rejection by different hosts. Egg background color and luminance are strongly matched by most cuckoo host-races, and mimicry is improved when hosts show strong rejection. We show that cuckoo and host egg colors increasingly overlap in avian color space as hosts show stronger egg rejection. Finally, cuckoo eggs with the best color mimicry have the best pattern mimicry. We will discuss which cues appear to be crucial in egg rejection decisions.

P160 Contributed Poster: PREDATION AND FORAGING 1 (Poster Session A: Weds. eve)

VIGILANCE IN CAPUCHIN MONKEYS: EVIDENCE FOR AN ENDOGENOUS RHYTHM?

Brian Stone, Qing Liu, Tephillah Jeyaraj, Giulia Sirianni, Melanie Busch-Dienstfertig, Marianne Christel, Josh Vickers, Elisabetta Visalberghi, Dorothy Fragaszy

University of Georgia, United States; Email:bstone@uga.edu

Vigilance behavior functions to mitigate danger, but may also impose a cost, and so it might be expected to vary in proportion to perceived risk. To test this prediction, we coded vigilant looks by capuchin monkeys across a variety of circumstances in the wild and in captivity with various levels of risk. While the amount of time spent on vigilance did vary, we found a surprising amount of consistency and cyclicity in the rate at which looks were deployed, whether cracking nuts in the wild or in the safety of a closed, familiar lab environment. This is consistent with a baseline rate of vigilance imposed by an endogenous rhythm in capuchin monkeys. To the extent that they adapt their vigilance to circumstance, it may largely come from changes in look duration. We also found that looks were distributed unevenly but predictably within the components of a short action, not just between actions, and that the timing varied inversely with the amount of visual control needed for a given action component. Thus, at time frames shorter than their baseline rate of vigilance, the temporal distribution of looks may be under some strategic control.

P382 Contributed Poster: PREDATION AND FORAGING 2 (Poster Session B: Thurs. eve)

PREDATOR-NAÏVE SOUTHEASTERN FIELD CRICKETS RESPOND TO THE CHEMICAL CUES OF WOLF SPIDERS

Jon Storm, Ronnetta Sartor

University of South Carolina Upstate, United States; Email:jstorm@uscupstate.edu

Few studies have addressed whether terrestrial insects assess predation risk via chemical cues. We exposed predator-naïve juvenile southeastern field crickets (*Gryllus rubens*) to chemical cues of adult female dotted wolf spiders (*Rabidosa punctulata*), house crickets (*Acheta domesticus*) and blank filter paper. Crickets exhibited greater immobility when exposed to chemical cues of wolf spiders. Time spent immobile did not differ between cues of house crickets and blank filter paper. There was no relationship between cue type and speed of movement by crickets. In addition, mass of the cue-depositing spider did not influence the time spent immobile by crickets. However, there was a significant negative relationship between time spent immobile and cricket mass, suggesting that larger crickets may be at a reduced risk of predation from *R. punctulata*.

122 Contributed Talk: PARENTAL CARE I (Tuesday PM I)

PARENT CAVE SWALLOWS LEARN TO RECOGNIZE FAMILIAR YOUNG

Stephanie Strickler

University of Oklahoma, United States; Email:stephanie-strickler@ou.edu

Parents ought to restrict costly parental care to their genetic offspring and, particularly when the risk of misdirecting care is high, may evolve the ability to discriminate against unrelated young. The cave swallow, a colonially-nesting passerine with conspecific brood parasitism, is a likely candidate for parent-offspring recognition. Behavioral experiments indicate that cave swallows are able to recognize their own young when nestlings are near fledging, but not when they are younger. I used a cross fostering experiment to examine how parents learn to identify their offspring. Two weeks after cross-fostering, I tested whether parents would favor their own offspring over unrelated nestlings when all had been reared in a different nests (i.e., all nestlings were unfamiliar) : they did not. When parents encountered two of their genetic offspring, one of which was reared by foster parents before the test ('unfamiliar'), they biased food allocation to the familiar nestlings. Together, these results suggest that parents learn to recognize familiar offspring; this might be facilitated by variable visual (facial patterns) and/or vocal (begging calls) cues possessed by nestlings.

P225 ABS Founders Award Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

SAFETY IN NUMBERS: SHOALING AS AN ANTI-PARASITE DEFENCE IN FATHEAD MINNOWS EXPOSED TO CERCARIAE

Anthony Stumbo, Clayton James, Cam Goater, Brian Wisenden

University of Lethbridge, Canada; Email:anthony.stumbo@uleth.ca

Foraging success and predator avoidance are well-documented benefits associated with group living. To test the anti-parasite benefits of shoaling in fathead minnows, the response of 5 minnows exposed to minnow cercariae, non-minnow cercariae, and various chemical and mechanical stimuli was evaluated. Results demonstrated that school cohesion increased for groups of minnows exposed to minnow cercariae compared controls, and differed significantly from all groups except those exposed to alarm cue. A follow-up experiment demonstrated that metacercariae intensity obtained in outdoor mesocosms is higher in individually caged minnows than those in artificial shoals. Finally, we showed that minnows confined within screened cages with no peripheral fish, and then exposed to cercariae, had 3 times the number of metacercariae than those caged with minnows in peripheral locations. These results indicate that minnows detect various threats present within the water column, and respond via a generalized shoaling response. Further, living in a shoal, particularly in its center, reduces risk of cercariae exposure.

P443 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

AUTOMATED VIDEO ANALYSIS OF ANIMALS IN THEIR NATURAL HABITATS

Martin Stumpe

United States; Email:info@antracks.org

Analysis of animal behavior requires accurate observation to build models for social interactions, colony organization, or individual behavior. Automated video analysis is often complicated by the challenges inherent to animal tracking. Detection of the individual can be difficult, especially when studying a species in its natural habitat where camouflaging may occur. Moreover, social interactions complicate the tracking, as contact makes separation of individuals difficult. We developed a video analysis software, AnTracks, which is specifically designed to handle these challenges. Using state-of-the-art image processing and machine learning techniques, AnTracks allows animal observation not only in lab experiments, but also in the field. Along with the video processing, the integrated analysis tools can be used to visualize trajectories and interactions, and to compute properties like the speed profile, interaction frequency, transition rates between regions of interest, etc. Examples of studies where AnTracks is successfully used include simultaneous tracking of more than hundred forager ants on desert soil, ant interaction networks, firefly mating, and correlated fish movement.

P226 Contributed Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

MATING CYCLE PHASE AND SIZE OF YEAR-ROUND COMMUNAL NESTS IN FERAL MONK PARAKEETS IN BROOKLYN, NY

Alfie Supan, Frank Grasso

United States; Email: eon_001a@yahoo.com

Monk parakeets (*Myiopsitta monachus*) are an invasive species that build and maintain stick nests year-round, suggesting an evolutionary adaptation of theoretical and conservation interest. A photographic record was made of eight nests in the Brooklyn population from April, 2008 to March, 2010 from which quantitative estimates of nest size were made to track annual variation. Significant differences in nest size followed a seasonal pattern with annual construction peaks during the spring breeding season and during the fall ($F(3,90) = 11.309, P > 0.001$). Nest size is correlated with annual temperature ($r(92) = 0.392, P > 0.001$). The effect of mating cycle phase on nest size remained significant after the effect of temperature was removed ($F(9,67.05) = 3.17, p = 0.003$). The fall construction peak did not correspond to production of young and may offer insight into their mechanism of year-round nest-maintenance behavior. Monk parakeets in their native Argentina mate and build nests six months out of annual phase with their northern-hemisphere conspecifics (Spryer & Brucher, 1998). We suggest that the fall increase in nest size may be triggered by annual cues common to their native and invasive ranges.

P190 ABS Founders Award Poster: SEXUAL SELECTION 1 (Poster Session A: Weds. eve)

GENDER DIFFERENCES IN TERRITORIAL DEFENSE IN *NEOLAMPROLOGUS MULTIFACIATUS*

Piyumika Suriyampola, Perri Eason

University of Louisville, United States; Email: piyumika101@yahoo.com

Despite both males and females of many species engage in resource defense, most studies of territorial behavior have emphasized on agonistic interactions between individuals of one sex or the other. In this study, we compare intrasexual and intersexual aggression in *Neolamprologus multifaciatus*, a small shell-inhabiting cichlid fish from Lake Tanganyika. *Neothauma* snail shells were used to create two territories on either side of the aquarium. Two matched heterosexual pairs were placed on opposite sides of an opaque divider and allowed to acclimate for five days. Agonistic behaviors were recorded over a three-hour period after the removal of the divider. Both males and females respond to intrasexual intrusion to a greater extent than to intersexual intrusion. However, male interactions were more likely to occur at the boundary whereas female fights tend to occur at the interior of the territory. When intruders are of the opposite sex, territory holders may not be directly threatened and might even benefit from polygamy or mate switching. Intrasexual aggression is important as invasion by individuals of the same sex can decrease the territory holder's fitness.

P341 Contributed Poster: MATING SYSTEMS 2 (Poster Session B: Thurs. eve)

GROUP CHARACTERISTICS AFFECT AGGRESSION LEVELS AND PREGNANCY OUTCOMES IN PIGTAILED MACAQUES

Adrienne Sussman, James Ha, Hayley Alloway

University of Washington, United States; Email: adriennesussman@gmail.com

Aggressive behaviors were recorded in a captive breeding colony of pigtailed macaque monkeys (*Macaca nemestrina*) and related to female reproductive outcome. For 22 weeks, behavioral data were collected from 9 breeding groups of 4-8 females, with or without males. Observations included all occurrences of 11 aggressive behaviors during 15-minute, weekly observation sessions. Aggression data were summarized with Principal Components Analyses (PCA). Results indicate that pigtailed macaque aggression falls into 5 categories: warn, engage, threaten, pursue, and attack. Breeding groups differed in their levels of aggression, even after controlling for group size, presence of a sire, and group stability. Levels of the 5 aggression categories were found to affect the probability that a pregnancy ended in either a natural birth of a live infant, a clinical intervention producing a live infant, or a nonviable outcome. The predictive value of aggression was significant when clinical

interventions were included as possible reproductive outcomes. Behavioral observation of captive groups could identify conditions affecting pregnancy outcome and the requirement for clinical intervention.

82 Contributed Talk: COGNITION AND LEARNING I (Tuesday AM)

DEVELOPMENTAL STRESS AS A NESTLING ERODES COGNITIVE PERFORMANCE AS AN ADULT

John Swaddle

College of William and Mary, United States; Email: jpswad@wm.edu

The developmental stress hypothesis predicts that exposure to stressors during early life stages influences later adult performance. Several studies have shown that early life developmental stressors can influence adult song expression in birds, but there have been very few studies of whether early life stress affects general cognitive processes such as associative learning. Here, I measure the rate and overall degree of associative visual learning in wild-caught, adult European starlings and relate this learning to tarsal and wing feather fluctuating asymmetry (FA) of individuals. FA results from disruptions of symmetric growth, brought about by the inability of the genotype to buffer against environmental stressors. FA is an index of developmental stress. Tarsal FA, which is determined in nestling life stages, was positively associated with a decreased rate and a lower final degree of learning. However, wing FA (which is determined during molt and feather re-growth at later life stages) was not related to either metric of associative learning. These data support the developmental stress hypothesis and indicate that stressors experienced in the nest have

218 Contributed Talk: MATING SYSTEMS II (Thursday AM)

SPATIAL PATTERNS OF EGG LAYING AND NEST PREDATION BY BROWN-HEADED COWBIRDS (*MOLOTHRUS ATER*)

David Swan, Liana Zanette, Michael Clinchy

University of Western Ontario, Canada; Email: dswan3@uwo.ca

Brood parasitic brown-headed cowbirds (*Molothrus ater*) reduce the reproductive success of host populations by removing host eggs from nests they parasitize while nestlings redirect parental care. Cowbirds also act as nest predators, causing complete nest failure by removing all eggs and killing nestlings from nests that are unparasitized. While much research has focused on the impact of cowbirds on host demography, considerably less attention has been given to the spatial distribution of cowbirds to determine the existence and characteristics of their breeding and predatory ranges. We documented cowbird movements, in addition to their patterns of parasitism and predation over two breeding seasons near Victoria, Canada. We mapped the homeranges of radio-tagged cowbird females. We then used DNA markers to examine the spatial and temporal pattern of egg laying by cowbird females and overlaid this onto their homeranges. Finally, we assessed the identity of cowbirds that were responsible for nest predation events using miniature video cameras. We show that cowbirds hold exclusive core ranges and suggest that their predatory behaviour may increase reproductive success.

P280 ABS Founders Award Poster: CONSERVATION (Poster Session B: Thurs. eve)

EFFECTS OF TURBIDITY AND VISUAL VERSUS CHEMICAL CUES ON PREDATOR AVOIDANCE IN THE FOUNTAIN DARTER

Lily Swanbrow, Caitlin Gabor

Texas State University - San Marcos, United States; Email: swanbrow@txstate.edu

The San Marcos and Comal Rivers are unique to the southwestern United States and support many endemic flora and fauna. Yet these waters are facing anthropogenic threats and a number of species are threatened or endangered. This study examined the effect of one such threat, increased turbidity on the endemic and federally endangered fountain darter, *Etheostoma fonticola*. Rising turbidity degrades visual information, which can impair an animal's behavior. Specifically, we tested the impact of turbidity on anti-predator response in *E. fonticola*. We examined the response of *E. fonticola* to four predator cue treatments (chemical, visual, chemical

and visual, and no cues) using a native predator, the green sunfish (*Lepomis cyanellus*). All cue treatments were tested across two vision levels: clear and impaired, to simulate the visual effects of turbidity. We predicted that turbidity would decrease the response of *E. fonticola* to visual cues of a predator. Preliminary results suggest that the strongest anti-predator response of *E. fonticola* is to a combination of visual and chemical cues under full vision conditions.

P304 Contributed Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

COMPLEX COMMUNICATION VIA ACOUSTIC AND SEISMIC SIGNALS IN *GLADICOSA GULOSA* WOLF SPIDERS

Alexander Sweger, George Uetz

University of Cincinnati, United States; Email:swegera@gmail.com

Many wolf spiders produce complex multimodal signals, making them excellent models for testing hypotheses about the evolution of signaling behavior. My research examines acoustic/vibratory communication in the "purring" wolf spider *Gladicosa gulosa*. Only minimal research has been conducted on this species, but early studies describe the loud volume of its courtship. Using Laser Doppler Vibrometry and sensitive microphones, I recorded and characterized the components of male courtship. Preliminary results suggest that courtship displays by males of this species produce both airborne (acoustic) and seismic (vibration) signals, and that these complex signals are produced by both stridulation and percussion mechanisms. These components of courtship may also be affected differently by varying ecological conditions. Results suggest that signaling in this species may be energetically costly and potentially vulnerable to eavesdropping, which could lead to male competitive behavior in the form of social facilitation of courtship.

P191 Contributed Poster: SEXUAL SELECTION 1 (Poster Session A: Weds. eve)

MATING TACTICS IN A SCRAMBLE SYSTEM: PHENOTYPIC DRIVERS OF MATING SUCCESS AT VARIED SEX RATIOS

Lindsey Swierk, Tracy Langkilde

Penn State University, United States; Email:lindseyns@psu.edu

In some species, the number of males per female varies throughout a breeding season. More male-biased operational sex ratios (OSRs) can increase intrasexual competition. In these situations, male phenotype can predict mating success: larger or more competitive males are usually more successful. In contrast, if OSR is equal or female-biased, males face less competition and should have high reproductive success regardless of phenotype. We examined how OSR affects male mating success in wood frogs (*Rana sylvatica*), a species with scramble competition for females. We conducted video-recorded trials in arenas within natural breeding ponds, manipulating sex ratio (number of females to males) as follows: even (1:1 and 4:4), slightly male-biased (1:4), and highly male-biased (1:7). Our results suggest that at even sex ratios, male morphology does not affect mating success, whereas at male-biased sex ratios larger males are more likely to mate. Male behavioral tactics also change at different OSRs. This suggests that mating success in this scramble system is influenced by male phenotype, and males may be able to alter strategies as OSRs change over a season.

P121 ABS Genesis & Charles H. Turner Award Poster: MATING SYSTEMS 1 (Poster Session A: Weds. eve)

SUBSTRATE CHOICE BY FEMALE BEAN BEETLES *CALLOSOBRUCHUS MACULATUS* AND COMPETITION AMONG LARVAE

Delawrence Sykes, Lawrence Blumer

Indiana University, United States; Email:delawrencesykes@yahoo.com

The relationship between bean choice and the survival of developing progeny was studied in the bean beetle, *Callosobruchus maculatus*. Beetle larvae hatch from eggs laid on the surface of a host bean, and burrow into the

interior for nourishment which sustains the beetles to the end of their life. Past research indicated that females preferred large beans in one beetle strain (LB), but not in another strain (FM). We hypothesized that female preference for large beans reflects larval competition differences between LB and FM strains. A 24hrs oviposition preference assay consisted of 15 small and 15 large mung beans, with one male and one female. Significantly more eggs were laid on large beans in LB (binomial test, $P > 0.0001$) but not FM (binomial test, $P < 0.14$) strains. Furthermore, significantly more eggs were laid on large than small beans in LB than FM strain (Mann-Whitney $U=89.5$, $z=2.64$, $p=0.0041$). There also was a significant positive correlation ($r^2 \sim 0.90$, $p=0.0015$) between eggs per bean and mortality in both strains. However, this negative effect was greater in LB than FM strain. These findings suggest that strains display differences in reproductive strategies.

P59 Contributed Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

TRANSMISSION OF STRUCTURALLY DISTINCT SONG PHRASES IN THE WHITE-CROWNED SPARROW

Erica Szezyller-Macolley, Angelika Poesel, Douglas Nelson

Ohio State University, United States; Email:szezyller.1@osu.edu

Song in many birds has evolved to transmit long-distances to potential mates and competitors. Within a song, there is often structural variation that may influence how different parts degrade as they transmit through the environment. To understand how structural variation may affect fidelity of transmission, we broadcast songs of the white-crowned sparrow, *Zonotrichia leucophrys pugetensis*, which contain four structurally distinct phrases. We investigated the amount of degradation of each phrase over two biologically relevant distances (48 m and 96 m) within the species' natural habitat. Sound degradation was measured using spectrogram cross-correlation. Overall, sound degradation increased from 48 to 96 meters, but at 48 meters, degradation differed among phrases. In particular, the introductory whistle phrase appeared less degraded than all other phrases. Our results suggest a correlation between signal structure and function such that certain phrases propagate long-distances differently than others.

339 Contributed Talk: DEVELOPMENT II (Friday PM I)

PROXIMATE CAUSES AND FITNESS CONSEQUENCES OF CONTEXT-DEPENDENT MATERNAL EFFECTS

Barbara Taborsky, Francisca Segers, Alexander Kotrschal

University of Bern, Switzerland; Email:barbara.taborsky@iee.unibe.ch

Females may influence offspring phenotypes directly via environmental maternal effects. Mothers can maximize their own fitness by tailoring young to postnatal conditions. More investment, for example in egg size, does not always translate into higher offspring fitness, however. Often a larger investment pays only when the offspring environment will be harsh. As yet the behavioural and physiological mechanisms are poorly understood that underlie context-dependent maternal effects and environmental cues used by mothers. In the mouthbrooding cichlid fish *Simochromis pleurospilus*, females produce larger eggs when they had grown up in a food-limited environment, suggesting that they prepare their offspring for conditions similar to their own early environment. By combining behavioural experiments, yolk gene expression analysis, ecological surveys and population genetics we show that (i) this maternal effect is adaptive, as only the early maternal environment reliably predicts the offspring environment, (ii) mothers determine growth trajectories of young via yolk gene expression and (iii) context-dependent fitness of young mainly results from behavioural mechanisms.

127 Contributed Talk: SOCIAL BEHAVIOR II (Tuesday PM I)

DIVISION OF LABOR AND TASK SPECIALIZATION IN COOPERATIVE ANIMAL SOCIETIES

Michael Taborsky, Rick Brintjes, Peter Biedermann

Institute of Ecology and Evolution, University of Bern, Switzerland; Email:michael.taborsky@iee.unibe.ch

In a wide range of social species group members cooperate in various tasks, such as food acquisition, resource defense, territory maintenance and brood care. Different tasks may be shared equally among group members, such as in many carnivore packs, or individuals may specialize in specific tasks in dependence of their attributes. The most extreme manifestation of task sharing is the life-long specialization of morphological castes in some eusocial insects. However, behavioral specialization is often changing with time, as exemplified by the age polyethism of honeybees. Task specialization of group members can greatly improve efficiency and is hence a cornerstone of the evolution of advanced sociality. Apart from eusocial insects, task specialization of group members has yet received little attention. Here we show that cooperatively breeding cichlid fish and fungus cultivating ambrosia beetles exhibit a marked age polyethism where individuals specialize in particular duties dependent on their life stage and body size. This might be an important reason for the ecological success of these taxa.

381 Contributed Talk: SEXUAL SELECTION V (Saturday AM)

MULTI-MODAL SEXUAL SELECTION IN A WARBLER: PLUMAGE AND SONG RELATE TO DIFFERENT FITNESS COMPONENTS

Conor Taff, Corey Freeman-Gallant, Linda Whittingham, Peter Dunn
University of California, Davis, United States; Email:cctaff@ucdavis.edu

Many species possess multiple sexual signals that are produced in different modalities and these signals may have different functions. We studied sexual selection on two types of signals--plumage and song--over three breeding seasons in the common yellowthroat (*Geothlypis trichas*). Plumage signals are produced few times over an individual's lifetime and are relatively static within a breeding season. Songs are produced repetitively throughout the breeding season and variability in production itself may be a target of sexual selection. Overall, we found that plumage ornaments best predicted within pair reproductive success, while song consistency predicted extra-pair success. Only plumage ornaments were related to measures of male condition, but consistent singers had higher survival rates in some cases. Singing consistency, however, was more variable than plumage, as performance varied across multiple observations of the same male in relation to social context and recording date. Our results suggest that song and plumage may signal different information in this species and that the two types of signals are most important in different sexual selection contexts.

P266 ABS Founders Award Poster: COGNITION AND LEARNING 2 (Poster Session B: Thurs. eve)

ONTOGENETIC CHANGES IN LEARNING CAPABILITY OF JACK MACKEREL DURING HABITAT SHIFTS

Kohji Takahashi, Reiji Masuda, Yoh Yamashita
Kyoto University, Japan; Email:tkouji@kais.kyoto-u.ac.jp

We investigated the ontogenetic changes in learning capability of the jack mackerel *Trachurus japonicas*, a fish that undergoes a major habitat shift during life history. First, the learning capability of juveniles (20 to 92mm, Standard Length) was individually evaluated using a Y-maze. We found that the learning capability, an ability to adapt to a changing feeding area, peaked at the size of recruitment from pelagic to demersal, i.e., 50mm. Second, pelagic (40mm) and demersal (60mm) stage juveniles were conditioned to food in the presence of either surface structure, bottom structure or aeration. Results revealed that pelagic juveniles tended to learn surface stimuli faster than bottom stimuli, whereas demersal juveniles were conditioned to bottom stimuli more quickly than to surface stimuli. Third, we investigated whether observational learning capability is involved in the development of social behaviors in jack mackerel. Observational learning was confirmed in schooling stage fish (35mm), but not in pre-schooling stages (15mm). These studies show that jack mackerel become equipped with appropriate learning capabilities in accordance with ontogenetic changes in habitat.

330 Contributed Talk: BEHAVIORAL COMMUNITY ECOLOGY (Friday PM I)

HABITAT USE BY EASTERN AND ALLIGATOR SNAPPING TURTLES IN MISSOURI: CONSERVATION IMPLICATIONS

Zuleyma Tang-Martinez, Timothy Lescher, Jeffrey Briggler

University of Missouri, St. Louis, United States; Email: zuleyma@umsl.edu

Alligator snapping turtles and eastern snapping turtles co-exist in the rivers and streams of Missouri. The larger of the two species, the alligator snapping turtle, is classified as a species of conservation concern within Missouri and has a more limited range. We examined differences in habitat use by the two species. Turtles were trapped and habitat characteristics collected at each trapping site. Data analyses revealed that the two species use their habitat differently. Sites used by alligator snappers were characterized by increased physical structure, deeper water, increased detritus, and warmer temperatures. Sites used by eastern snappers were characterized by increased aquatic vegetation and mud substrates. Only once were the two species trapped at the same location. Observational and anecdotal information suggests that alligator snappers compete with the eastern snappers and can kill (and sometimes eat) the smaller species. Thus, it is possible that alligator snapping turtles may competitively exclude the eastern snappers from some, otherwise, suitable habitats. Future conservation plans for these two snapping turtles should consider their differential microhabitat use.

P368 ABS Founders Award Poster: PARENTAL CARE 2 (Poster Session B: Thurs. eve)

FACTORS AFFECTING VARIABILITY OF INFANT DEVELOPMENT DURING PARENTAL PERIOD IN COMMON MARMOSETS

Ikuko Tatsuta, Nobuyuki Kutsukake, Chihiro Yokoyama, Hirotaka Onoe, Mariko Hasegawa

The Graduate University for Advanced Studies (SOKENDAI), Japan; Email: tatsuta_ikuko@soken.ac.jp

The cost of parental care in the cooperatively breeding common marmoset has been thought to be large because of their necessity of continuous care of infants until at least weaning period. Unlike most other primates, adult males, especially fathers, contribute to infant care, which is crucial for infants' growth and survival in this species. The purpose of this study is investigating if individual variability of parental behaviors influences upon infants' development before complete weaning. Using pair-living groups kept in RIKEN CMIS, Kobe, we measured individual variability of parental behaviors such as carrying, grooming, interest, retrieval etc., as well as each pair's infants' weight changes as an index of infant development for 8 weeks after birth on 14 families. We found the length of grooming from fathers to infants and mothers, and frequency of interest from fathers to infants, are both correlated with infants' growth rate. This result indicates that fathers' active caring behaviors towards infants and lactating mothers affect infant development in common marmosets.

P305 Contributed Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

LIGHT-ENVIRONMENT-DEPENDENT FEMALE CHOICE FOR MALE ORNAMENTAL COLORATION IN A JUMPING SPIDER

Lisa Taylor, Kevin McGraw

Arizona State University, United States; Email: Lisa.A.Taylor@asu.edu

In many animals, males display colorful ornaments to females during courtship. While a variety of functions have been proposed to explain both the presence of and variation in such ornaments, many researchers propose that they function as signals that are either required for or improve successful sex/species recognition and mating. In *Habronattus pyrrithrix* jumping spiders, males have conspicuous, condition-dependent red faces and green legs, which they display to drab, brown females. In Experiment 1, we paired males and females in the lab and found that blocking either the red or green color, or both, had no effect on any measure of mating success compared to sham-treated control males. In Experiment 2, we gave females the choice between two courting males, one with his facial color blocked and the other that received a sham treatment, and ran trials outdoors in both sun and shade. We found that blocking red facial color reduced a male's ability to approach a female, but

only when he was courting in the sun. This suggests that ornamental color is not required for mating in *H. pyrithrix*, but that red color improves mating success in certain environmental contexts.

229 Contributed Talk: PREDATION AND FORAGING I (Thursday AM)

ASSASSIN BUGS CRACK THE CODE OF SPIDER PERCEPTION

Phillip Taylor, Anne Wignall, Robert Jackson

Macquarie University, Australia; Email: phil.taylor@mq.edu.au

Assassin bugs (*Stenolemus bituberus*) hunt web-building spiders using two tactics; sometimes they stalk the spider in its web and strike once within range and sometimes they pluck the silk to generate vibrations that lure the spider into range. Both tactics show exploitation of prey perception. When stalking spiders, assassin bugs exploit environmental noise as 'opportunistic smokescreens' to mask their approach while their prey's perception is compromised. They are more likely to begin hunts during episodes of noise and are also more likely to succeed. During episodes of environmental noise, hunting assassin bugs are less cautious, and approach spiders more quickly. Vibrations used to lure spiders into range closely resemble those of struggling prey, and elicit similar approaches from spiders, indicating that the luring tactic constitutes 'aggressive mimicry'. Perceptual systems have limited ability to filter biologically important information from noise and then have well-defined algorithms for categorization of extracted information. Assassin bugs exploit opportunities arising from both of these characteristics of prey perception when hunting web-building spiders.

250 Contributed Talk: COGNITION AND LEARNING V (Thursday PM II)

THE ROLE OF VISUAL CUES IN SPECIES AND SEX RECOGNITION IN THE JUMPING SPIDER *LYSSOMANES VIRIDIS*

Cynthia Tedore, Sonke Johnsen

Duke University, United States; Email: cynthia.tedore@duke.edu

Few individual visual features are unique to any one species of terrestrial arthropod, even in sympatry. Misidentifying and displaying at the wrong species or sex of arthropod predator is dangerous. In taxa that identify conspecifics visually, selection should favor individuals capable of analyzing multiple features holistically. We tested the specificity of species and sex recognition in *Lyssomanes viridis* by presenting males with various images in the presence of female silk. Spider images having a conspecific face and/or legs elicited the expected threat and courtship displays. When a male face was combined with female legs and vice versa, roughly half of males courted and half threatened. Significantly fewer males displayed at a spider image that completely lacked the conspecific color pattern but had conspecific-shaped legs. Most males courted a female *Thiodina sylvana* image and were split between threatening and courting a male *Hentzia palmarum* image. Males did not display at a black circle. Results suggest males can assess multiple isolated features, but do not synthesize and evaluate features holistically, at least not in the presence of female silk.

P60 Contributed Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

A CRY FOR HELP: JUVENILE DISTRESS CALLS IN DIFFERENT SPECIES OF UNGULATES

Lisa Teichroeb, Tobias Riede, Radim Kotrba, Susan Lingle

Canada; Email: lisa_dragonfly@hotmail.com

Some adult female ungulates respond to juvenile distress calls of different species as well as their own species, while females of other species respond only to distress calls of their own species. Therefore, distress calls of different species must contain traits that are similar and salient enough to elicit the same basic response by certain species, but must also contain properties that enable other species to distinguish these calls. The goals of this study were to identify the similarities and differences in distress calls emitted by juveniles of five ungulate species (eland, red deer, pronghorn, white-tailed deer and mule deer), and to predict which traits may be salient to females. In general, these calls had a similar basic form: they were tonal and tended to rise and then fall in frequency. A discriminant analysis revealed that fundamental frequency enabled the best discrimination among

species. Filter-specific parameters contributed little to species discrimination. Future playbacks will test whether (i) selective species base their response on fundamental frequency and (ii) indiscriminant species respond to similar traits such as the frequency modulation and tonality.

171 Contributed Talk: COMMUNICATION II (Wednesday AM)

FEMALE AND MALE HAPPY WRENS RESPOND DIFFERENTLY TO DUET AND SOLO SONG PLAYBACK

Chris Templeton, Peter Slater

University of St Andrews, United Kingdom; Email:ct510@st-andrews.ac.uk

Vocal duetting occurs in diverse animal groups and is common in neotropical wrens. We evaluated the function of happy wren (*Pheugopedius felix*) duets using a two speaker playback experiment. We broadcast of solo male, solo female, and male/female duet songs to pairs of happy wrens. Compared with heterospecific song control trials, subjects responded aggressively to conspecific song playback, by increasing singing rates, moving closer to their mate, and approaching the playback speakers, suggesting cooperative territory defence. During duet playbacks, male and female subjects preferentially approached the same sex speakers, consistent with the mate guarding hypothesis. However, males and females did not show the same pattern of response. Males responded equally to any type of happy wren playback but females only responded strongly to playbacks including female song and largely ignored male solo playback. These results indicate that male and female members of a pair have different motivations for responding to territorial intrusions by members of the same and opposite sexes and support the idea that duetting may serve multiple functions even within a given species.

P383 Contributed Poster: PREDATION AND FORAGING 2 (Poster Session B: Thurs. eve)

INNATE PREDATOR RECOGNITION AND CULTURAL TRANSMISSION IN DOMESTICATED ZEBRA FINCHES

Jennifer Templeton, Kelly Wiggen

Knox College, United States; Email:jtemplet@knox.edu

Cultural transmission is a process that involves the transfer of fitness-enhancing information from one individual to another via social learning. In an endangered species captive breeding program, recognizing predators is one of the most important lessons. Using domesticated Zebra Finches as a model species, we first determined whether they had innate predator recognition. We presented a familiar non-predator, two unfamiliar non-predators, and two unfamiliar predators. For each model, we recorded the latency to land and feed and compared these to baseline measurements when there was no model present. Zebra Finches do not have innate predator recognition; instead, they appear to be wary of all novel objects, with wariness increasing as the size of the model increases. The cultural transmission portion of the research entailed presenting a model snake concurrently with one of four playbacks: silence, background noise, wild finch social calls, or wild alarm calls. We found that although domesticated Zebra Finches have retained some capacity for fear and can be conditioned to fear a novel object, they do not recognize wild alarm calls nor do they respond appropriately to them.

83 Contributed Talk: COGNITION AND LEARNING I (Tuesday AM)

WHAT ARE THE RULE LEARNING SKILLS OF ZEBRA FINCHES?

Carel ten Cate, Jiani Chen, Irene van Laatum, Bonnie van der Hulst, Caroline van Heijningen

Leiden University, Netherlands; Email:c.j.ten.cate@biology.leidenuniv.nl

A key property distinguishing language and the vocal communication in other animals is our ability to apply abstract rules (syntax) to create an infinite set of linguistic constructions. Animals don't apply rules of any great complexity in producing vocalizations, but it is unclear how far their abilities reach for detecting the presence of underlying rules in perceiving structured acoustic stimuli. We examine whether zebra finches are able to discriminate three-element sequences structured according to various patterns similar to those employed in Artificial Language Learning experiments examining the rule detection skills of young infants. We show that

zebra finches are able to distinguish ABA and BAB from AAB, ABB, BAA and BBA element sequences. Such a task can be resolved in various ways. Testing with deviant probe sequences and novel sounds, and by training and testing on more complex sequences, we examine two questions: (1) what is the 'rule' used by zebra finches to distinguish the stimuli, and (2) can they transfer the acquired distinction to novel types of sounds? We discuss our findings in relation to those obtained in other species.

210 Contributed Talk: COMMUNICATION III (Thursday AM)

THE ROLE OF PREDISPOSITIONS AND EXPERIENCE IN BIRDSONG AND LANGUAGE ACQUISITION

Sita ter Haar, Clara Levelt, Carel ten Cate

Leiden University, Netherlands; Email: smterhaar@gmail.com

Many parallels have been found between birdsong and language. One commonality is that both systems show population specific and universal sound patterns. The population specificity can be explained by cultural transmission, whereas the universals suggest a predisposition. We studied this issue for songbirds and human infants. We tested if human infants prefer listening to more universal syllables and if songbirds prefer universal note types, both independent of experience. We also studied the role of experience in human infants by testing different age groups. For similar purposes, songbirds were exposed to songs with either universal or non-universal note types during their sensitive phase. Results indicate a preference for universals in 9-month-old human infants, which shifts to non-universals in 12-month-olds. Songbirds prefer universals initially. Subsequent exposure to non-universal songs elicited a shift in preference towards non-universals in songbirds. In both species initial biases for universals, independent of exposure, indicate possible predispositions. The shift in preference to non-universals as a result of experience indicates a role for cultural transmission.

300 Contributed Talk: COGNITION AND LEARNING VI (Friday AM)

NO EVIDENCE FOR COGNITIVE ADAPTIVE SPECIALIZATIONS RELATED TO TOOL-USE IN WOODPECKER FINCHES

Irmgard Teschke, Erica Cartmill, Sophia Stankewitz, Sabine Tebbich

Max Planck Institute for Ornithology, Germany; Email: teschke@orn.mpg.de

Tool-use has been considered cognitively demanding and thus a potential driving factor in the evolution of human intelligence. The use of tools in animals provides the opportunity to comparatively investigate whether tool-use evolved along with a cognitive adaptive specialization in the physical domain. Tool-use also might have evolved with enhanced general learning abilities or even without any tool-related cognitive adaptations. To test these possibilities, we compared general and physical cognition in woodpecker finches (*Cactospiza pallida*), an avian species that habitually uses twigs or cactus spines to probe arthropods out of tree holes, and the closely related non-tool-using small tree finch (*Camarhynchus parvulus*). Both species belong to the Darwin's finch clade and are similar in diet, morphology and size. Subjects received two general learning tasks and two tests of physical cognition. Woodpecker finches did not outperform small tree finches in physical tasks and only excelled in one general learning task. Thus, our data provided no evidence supporting the hypothesis that tool-use in woodpecker finches evolved with enhanced physical cognition.

363 Contributed Talk: COMMUNICATION VI (Saturday AM)

A FERMENTATION HYPOTHESIS FOR GROUP-SPECIFIC CHEMICAL RECOGNITION IN THE SPOTTED HYENA

Kevin Theis, Kay Holekamp, Thomas Schmidt

Michigan State University, United States; Email: theiskev@msu.edu

All animals harbor diverse communities of symbiotic bacteria, yet very few researchers have considered how they beneficially affect animal behavior. One aspect of behavior to which bacteria may contribute greatly is chemical communication, especially among mammals. It has been postulated that mammals co-opt the odorous

products of bacterial metabolism for communication, and that variation in mammalian chemical signals is due to underlying variation in the structures of their bacterial communities. We used 454 Titanium sequencing technology to evaluate the hypothesis that group-specific bacterial communities underlie group-specific scent pouch odors in the spotted hyena. We characterized the bacterial communities in the pouches of 16 adult, lactating females representing 4 distinct clans in a Kenyan Reserve. The vast majority of bacteria were novel anaerobes whose characterized relatives produce short-chain fatty acids and other odorants via fermentation. Furthermore, there was evident variation in the structure of bacterial communities among hyena clans, providing support for the hypothesis that bacteria underlie group-specific chemical recognition in the spotted hyena.

219 Contributed Talk: MATING SYSTEMS II (Thursday AM)

HOW ANIMALS WIN THE GENETIC LOTTERY: BIASING BIRTH SEX RATIO RESULTS IN MORE GRANDCHILDREN

Collette Thogerson, Colleen Brady, Richard Howard, Georgia Mason, Edmond Pajor, Greg Vicino, Joseph Garner

Purdue University, United States; Email: collette@purdue.edu

In theory, a parent can maximize fitness by biasing its birth sex ratio (BSR) in favour of offspring which will outperform their peers. All Sex Ratio Manipulation (SRM) theories share a fundamental prediction - grandparents who bias BSR should produce more F2 offspring specifically via the favoured sex. However this prediction has never been tested in mammals. Using 100 years of breeding records from San Diego Zoo Global, we constructed a 3 generation pedigree (198 species). GLM analyses controlled for confounding variables. Granddams (N=1677, $P > 0.0001$) and grandsires (N=703; $P > 0.0108$) who bias their BSR had more F2 offspring in total. Furthermore, male-biased BSRs correlated with F2 success (F2 born per male F1) for granddams ($P > 0.0001$) and grandsires ($P > 0.0001$). Female-biased BSRs correlated with F2 success (F2 born per female F1) for granddams ($P = 0.0272$), but not for grandsires ($P = 0.9426$). Thus, biased BSRs increase F2 descendants specifically via the biased sex. These data confirm the adaptive value of SRM in mammals for the first time, and show that it is widespread and robust. However in a captive population, SRM may accelerate genetic loss and risk of extinction.

391 Contributed Talk: SOCIAL BEHAVIOR VII (Saturday AM)

SELECTIVE FORCES DRIVING INTERGROUP AGGRESSION IN WHITE-FACED SAKI MONKEYS, *PITHECIA PITHECIA*

Cynthia Thompson, Marilyn Norconk, Patricia Whitten

Kent State University, United States; Email: cthomps9@kent.edu

Between-group aggression is a common feature of many group-living animals. This aggression can generally be attributed to one or more of the following: defense of feeding resources, hired-guns resource defense (resource defense polygyny), mate defense, and/or infanticide. White-faced sakis live in small groups with slightly overlapping home ranges. Encounters between neighboring groups always entail aggression, which is biased toward male participation. We assessed the above hypotheses in three habituated, free-ranging groups of white-faced sakis at Brownsberg Naturepark, Suriname from June 2008-November 2009. Data on intergroup encounter frequency was compared to temporal changes in dietary components, variation in ovarian hormones, copulations, and the presence of dependent infants. Presence of cycling females was a significant predictor of intergroup encounter frequency ($P > 0.01$). Proportion of mesocarp in the diet ($p=0.053$) as well as copulation frequency ($p=0.079$) trended toward significant effects on intergroup encounter frequency. These data suggest that a combination of direct mate defense and hired-guns resource defense drives between-group aggression in this species.

P94 Contributed Poster: EDUCATION (Poster Session A: Weds. eve)

UNDERGRADUATE EDUCATION REFORM: WHERE IS ANIMAL BEHAVIOR?

Kaci Thompson

University of Maryland, United States; Email:kaci@umd.edu

Undergraduate science education is in an era of profound change, inspired by grassroots efforts of faculty and the publication of high-profile reports such as Bio2010 (NRC, 2003), Scientific Foundations for Future Physicians (HHMI/AAMC, 2009), and Vision and Change (AAAS, 2011). Collectively, these reports urge that the content of undergraduate education needs to become more quantitative, interdisciplinary, and reflective of the way science is practiced. At the same time, we need to engage students through active learning approaches rather than a reliance on extensive lecturing. This study surveys the science education literature to investigate to what extent these reforms have permeated the field of animal behavior and assess how those who study animal behavior have contributed to undergraduate science education reform efforts. Results are reported in comparison to other biological fields of study.

P134 Contributed Poster: MECHANISMS 1 (Poster Session A: Weds. eve)**VARIATION IN CRICKET ACOUSTIC MATE ATTRACTION SIGNALING EXPLAINED BY BODY MORPHOLOGY AND METABOLISM**

Ian Thomson, Susan Bertram, Bourne Auguste, Jeffrey Dawson, Charles Darveau

Carleton University, Canada; Email:iant001@sympatico.ca

In crickets, some males signal extensively, spending over 50% of their adult lives attempting to attract a mate, while other males signal rarely. Given signaling efforts are usually correlated with mating success, males should be selected to signal with high effort. Why then, do males exhibit such variability? To address the proximate causes underlying variation in signaling effort, we quantified the morphological, physiological, and biochemical variation among male European house crickets and assessed whether they correlated with signaling effort variation. Variation in signaling efforts were driven by differences in body size and differences in the activity of the glycolytic enzyme pyruvate kinase. Surprisingly variation in signaling effort did not appear to be influenced by lipid metabolism. These findings suggest that the ability to locate and assimilate high quality diets during development and into adulthood may drive a substantial portion of the variation in signaling effort in this species.

304 Contributed Talk: COMMUNICATION V (Friday AM)**SOCIAL COSTS AND THE EVOLUTIONARY STABILITY OF VISUAL STATUS SIGNALS IN *POLISTES DOMINULUS* WASPS**

Elizabeth Tibbetts

University of Michigan, United States; Email:tibbetts@umich.edu

The idea that social punishment of individuals with inaccurate signals can maintain signal honesty over evolutionary time is appealing, but questions about this hypothesis remain. For example, how do individuals know a rival is signaling inaccurately? Why are receivers aggressive to rivals with inaccurate signals? The variable facial patterns in *Polistes dominulus* wasps will be used as a model to address these questions. First, we will show that *P. dominulus* facial patterns are a conventional signal of agonistic ability. Then, we will show that individuals use information about the match between signaled fighting ability and true fighting ability to assess rivals. Individuals with experimentally altered signals received more aggression from rivals. Individuals with experimentally altered behavior were less able to establish dominance relationships. In contrast, control individuals and those with experimentally altered signal and behavior suffered neither cost. These results support the incongruence hypothesis for the evolutionary stability of agonistic signals and provide a simple solution to key questions about social costs.

186 Contributed Talk: GENETICS AND EVOLUTION I (Wednesday PM I)**TONIC IMMOBILITY IN THE DOMESTIC CHICKEN: A WITHIN-SPECIES COMPARISON**

Inga Tiemann

Bruno-Duerigen Institute, Germany; Email:tiemanni@uni-duesseldorf.de

Fear related responses are among the most basic behavior categories investigated in a wide range of species. Induced by the environment, this group of behaviors also shows a high level of heritability. One of the most investigated fear responses is tonic immobility in domestic chickens. When being turned on its back, the chicken remains in a catatonic-like state of reduced responsiveness to external stimulation. During the period of tonic immobility a defined sequence of responses occurs: a first gross leg movement, first head movement, and the righting of the animal, respectively. Latencies for each phase are recorded and analyzed. We tested a variety of chicken breeds including meat and egg production strains, old, modern, and endangered local breeds. The results will be discussed in the context of fear and stress in relation to the breed and its breeding history. Our findings will also give a greater idea of the behavioral diversity within a single species, the domestic chicken *Gallus gallus* f.d. Since chickens are amongst the most popular animal models, future research should examine influences of the chicken's breed and its peculiarities on those behavioral variables in focus.

P444 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

FOOD ABUNDANCE, GROUP FORAGING AND TERRITORIAL INTERACTION IN A CALIFORNIA ORB WEAVING SPIDER

Mark Tiemeier, George Uetz

University of Cincinnati, United States; Email:tiemeimk@mail.uc.edu

Spiders tend to be solitary and aggressive, although some species exhibit group-living behaviors. *Metepeira spinipes*, a facultatively colonial orb-weaver from Mexico and California, occurs in groups as well as solitarily, depending on environmental conditions. Risk-sensitivity theory predicts that well-fed spiders will join groups, while starved spiders will forage solitarily, as colonial foraging reduces variance in the amount of prey captured. However, colonial aggregation is likely the consequence of both individual foraging decisions and specific interactions between spiders. In field experiments, we manipulated the food intake of spiders and found that well fed individuals (*ad lib* feeding) are significantly more likely to join a nearby colony than are starved spiders. Additionally, staged interactions between spiders residing within colonies and diet-manipulated spiders added to their webs found that larger spiders, particularly those in good body condition, are more likely to escalate encounters and overtake webs than smaller spiders. The role of these factors in colony formation will be discussed.

187 Contributed Talk: GENETICS AND EVOLUTION I (Wednesday PM I)

BEHAVIOURAL AND GENETIC CHARACTERIZATION OF COMPULSIVE TAIL CHASING IN DOGS

Katriina Tiira, Catherine Escriou, Anne Thomas, Sophie Renier, Caroline Dufaure de Citres, Osmo Hakosalo, Lauri Kareinen, Paul Arnold, Hannes Lohi

University of Helsinki, Finland; Email:katriina.tiira@helsinki.fi

Obsessive Compulsive Disorder (OCD) is human anxiety disorder characterized by intrusive thoughts or repetitive behaviour; in animals, this exaggerated and repetitive behaviour is often called compulsive disorder (CD). Canine CD examples include stereotypic tail chasing (TC), light/shadow chasing and flank sucking. Using owner-filled questionnaire and high-density SNP chip arrays we aimed to investigate the TC behaviour and its relationship with environmental factors and dog's personality (N=368, three dog breeds) and map the trait loci using a genome-wide association study (N=230). Dogs receiving dietary supplements, especially vitamins and minerals, expressed significantly less TC compared to dogs not receiving any supplements (P = 0.006). In addition, sterilization (P = 0.006) and company of several dogs (P = 0.004) seemed to have a reducing effect on tail chasing. Tail chasers had also increased risk for other stereotypies (P = 0.035), furthermore they were also more shy (P = 0.011) and less aggressive (P = 0.017) than controls. Preliminary results exclude the only canine CD candidate locus found in Dobermans and final results of the GWAS will be discussed in the presentation.

P227 Contributed Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

MATE FAMILIARITY AND REPRODUCTIVE SUCCESS IN MESOCRICETUS HAMSTERS

Mary Timonin, Sumona Bhattacharya, Robert Johnston

Cornell University, United States; Email:met92@cornell.edu

In the wild, female rodents are likely to become familiar with neighbouring males through exposure to their scents rather than through direct interactions with those males. However, the effects of familiarity gained through odour exposure versus direct contact on behaviour during mating and reproductive success have not been well studied. We exposed female golden hamsters (*Mesocricetus auratus*) to a male across a wire mesh barrier, or to male flank gland secretions, for 10 minutes a day on the three non-estrus days prior to mating. On the day of sexual receptivity, the female was allowed to mate with either the familiar or an unfamiliar male. Although mate familiarity altered aspects of male and female sexual behaviour, it did not affect the probability of a female producing a litter, or the number and quality of pups weaned. Thus, in a captive golden hamster population where females typically show very low levels of aggression during mating interactions, mate familiarity does not increase reproductive success.

P408 Contributed Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

MATE AVAILABILITY AND HYBRIDIZATION IN THE THREE-SPINED STICKLEBACK

Robin Tinghitella, Janette Boughman

Michigan State University, United States; Email:hibbsr@msu.edu

Animals often make what appear to be suboptimal mating decisions. Some of this variation in mating decisions may result from environmental influences on trait development. We're investigating the influence of mate availability on mating decisions in the three-spined stickleback. In one lake (Enos Lake), a well-established limnetic-benthic species pair collapsed rapidly (+ 20 generations) into a hybrid swarm. In a field study, we measured the operational sex ratio (OSR) of limnetic and benthic stickleback from Enos Lake and a second nearby lake, Paxton, at three timepoints throughout the breeding season. For both limnetics and benthics, OSR varies across the season. OSR was male biased at the beginning of the season (high mate availability), became more so at mid-season, and declined late in the season. If mate availability influences mating decisions, with females relaxing their preferences when mates are scarce, this may facilitate mating with heterospecifics. We will also discuss the preliminary results of a lab study in which we varied OSR, and assessed female mating decisions with conspecifics and heterospecifics throughout the breeding season.

P109 ABS Genesis Award Poster: GENETICS AND EVOLUTION 1 (Poster Session A: Weds. eve)

THE BRAIN-BODY CONNECTION: DO TESTOSTERONE LEVELS, NEURAL SENSITIVITY AND TRAIT EXPRESSION COVARY?

Natasha Tonge, Kimberly Rosvall, Ellen Ketterson

Indiana University, United States; Email:Natasha.Tonge@gmail.com

A fundamental question in biology is the degree to which behavior, morphology, and physiology evolve interdependently. Hormones, such as testosterone (T), mediate many aspects of the phenotype and might be expected to support strong interdependence if hormone levels and tissue sensitivity are related. We assessed correlations among levels of circulating T, gene expression for T-binding neural targets (androgen receptor and aromatase), and expression of T-mediated traits, including ornamentation and song in wild dark-eyed juncos (*Junco hyemalis*). We found strong inter-individual correlations among these traits, consistent with interdependence. Females and males were similarly sensitive to T at the neural level, but they differed in how sensitivity was related to trait expression, a result that suggests a possible sex bias in the degree of interdependence/independence. We consider the implications of these findings for correlational selection and phenotypic integration.

P192 Contributed Poster: SEXUAL SELECTION 1 (Poster Session A: Weds. eve)

FEMALE CHOICE FOR CAROTENOID-BASED COLOR IS LINKED TO FEMALE CAROTENOID INTAKE AND ACCUMULATION

Matthew Toomey, Kevin McGraw

Arizona State University, United States; Email:mbtoomey@asu.edu

Mate choice is a costly process and the expression of choice has been linked to the general condition of the choosy sex. However, the specific mechanisms of this condition dependence are not well known. Diet-derived carotenoids pigment the plumage of male house finches, but also promote immune function and can provide antioxidant protection. Thus, color reveals honest information about male condition and quality. Dietary carotenoids may also counter the costs of female choice behaviors and we hypothesized that choice for male color would be linked to female dietary carotenoid access and accumulation. To test this hypothesis, we manipulated dietary carotenoid levels of captive female house finches and assessed mate choice in response to color-manipulated males. All females had a strong and significant preference for red males. However, carotenoid supplementation increased female responsiveness to males, and a female's ability to accumulate carotenoids was positively correlated with her discrimination among males. Therefore, carotenoids may provide a physiological link between the female choice and male coloration and promote the evolution of carotenoid-based ornaments.

P31 ABS Founders Award Poster: COGNITION AND LEARNING 1 (Poster Session A: Weds. eve)

INFERENCE BY EXCLUSION IN THE CLARK'S NUTCRACKER (*NUCIFRAGA COLUMBIANA*)

Jan Tornick, Brett Gibson

University of New Hampshire, United States; Email:j.tornick@unh.edu

When examining cognitive problem solving in animals, it is important to distinguish between reasoning and learning (trial and error). We tested inferential reasoning in the Clark's nutcracker using two-way choice procedures. While the nutcracker is well known for its spatial learning abilities, little is known about its other cognitive abilities. Food was baited (unseen) in one of two opaque containers. The subjects were shown either an empty or a full container. When shown only an empty container, all of the birds were able to infer that the other container contained food. Next, to limit associative explanations, birds were trained about a third container, a transparent "trash bin". During training, each of two non-food items was always found in a fixed location, but during testing one of the items was found in the "trash bin". To solve this problem, birds were required to infer that if one toy is in the "trash" (unavailable), then the other should be still available in its trained location. Only one out of six birds was immediately able to make this inference, suggesting that associative learning may account for the results in the simple two-way choice task.

P162 Contributed Poster: PREDATION AND FORAGING 1 (Poster Session A: Weds. eve)

KEEPING `EM DOWN ON THE FARM: NEGATIVE CONTRAST EFFECTS IN HONEYBEES IN A NATURAL FORAGING CONTEXT

John Townsend-Mehler, Fred Dyer

Michigan State University, United States; Email:townse96@msu.edu

Negative contrast is a behavioral phenomenon in which animals exhibit a reduction in response (in terms of food consumption, approach tendency, or both) following a downshift in reward relative to animals that receive only a low level of reward. In functional terms, this phenomenon is intriguing in that it remains unclear what role a reluctance to exploit available food would play in natural foraging contexts. We examined the dynamics of this phenomenon over the lifetime of free-flying honeybees in a large flight cage. Bees foraged at a low quality sugar solution (0.25 M) for two days, then were trained to a high quality food source (2.0M) in the opposite direction. Subsequently the 2.0M food was presented briefly each morning, and then removed. Bees were then free to resume foraging at the 0.25M food, or to refrain from foraging. Relative to non-shifted bees, these bees visited the low quality food at a much lower rate throughout their lives, and never fully reaccepted the 0.25M food when

the 2.0M food was removed. This implies that there is a major fitness cost to accepting low quality food when the environment signals that better food is available.

P161 ABS Founders Award Poster: PREDATION AND FORAGING 1 (Poster Session A: Weds. eve)

COMPARISON OF CHEMICAL FORAGING AND AGGRESSIVE BEHAVIORS BETWEEN TWO SYMPATRIC HERMIT CRAB SPECIES

Mark Tran, Richard Hill

Michigan State University, United States; Email:tranmark@msu.edu

Aquatic crustaceans rely heavily on chemical cues while foraging. It has been suggested that competition for food can be relaxed through the use of non-overlapping foraging cues between sympatric species. This study compares the foraging behaviors of *Clibanarius digueti* and *Paguristes anahuacus*, two sympatric species of hermit crabs which compete directly for access to food resources. Attractiveness of various chemical foraging cues was tested in both species using a novel methodology previously unused in hermit crabs. Aggressive interactions between the focal pair of species were observed during mixed-species foraging bouts to determine whether species can gain competitive advantages through aggression. Results indicate that both species show similar foraging behaviors when stimulated with an extract from commercial pellet food, but that individual chemical cues, such as amino acids, elicit different responses between species. During mixed-species foraging bouts, *C. digueti* shows significantly higher ($P > 0.0001$) frequencies of aggressive behaviors, indicating that this species may use aggression as a means of increasing access to food resources.

P61 ABS Founders Award Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

CORRELATES OF SONG IN COSTA'S HUMMINGBIRD, *CALYPTE COSTAE*

Uyen Tran, Anne Houtman

California State University, Fullerton, United States; Email:uyen@csu.fullerton.edu

Costa's Hummingbird *Calypte costae* is a native of the Sonoran Desert and found exclusively in arid environments with extreme temperature variation. Because of this, males may be subject to stressors that interfere with development, including the development of song; therefore, song should be an honest advertisement of male health and quality. I collected daily time budgets of males' territorial behavior and estimated males' territory quality via the number of nectar-producing perennials available. I predict that larger, more brightly colored males will have 1) higher song bout rates, 2) songs with higher peak and maximum frequencies, 3) songs with a lower mean and variance in the inter-click interval, 4) higher measures of territorial aggression and defense, and 5) higher territory quality. The results of this research will lead to a better understanding of the function of song in Costa's Hummingbird and, more generally, of the conditions under which complex vocal behavior evolves.

P306 Contributed Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

COMPARISON OF *ANABRUS SIMPLEX* AND *PERANABRUS SCABRICOLLIS* CALLS

Lara Trozzo, Patrick Lorch

Kent University, United States; Email:ltrozzo@kent.edu

Many katydids including *Anabrus simplex* and *Peranabrus scabricollis* use acoustic calls to attract mates. Males rub their forewings together, making characteristic chirps and in *P. scabricollis*, trills are interspersed. Field recordings were obtained from calling individuals. Short segments of calls containing chirps from *A. simplex* and chirps and trills from *P. scabricollis* were isolated and analyzed for dominant frequency and chirp rate using R software. In *A. simplex* chirps, dominant frequency was 13.03 ± 0.31 kHz (mean \pm st err) and chirp rate was 11.12 ± 0.30 chirps/sec. In *P. scabricollis* chirps, dominant frequency was 16.94 ± 0.23 kHz and chirp rate was 2.63 ± 0.19 chirps/sec; in their trills, dominant frequency was 16.46 ± 0.21 kHz and chirp rate was 27.97 ± 1.44 chirps/sec. The differences between chirp recordings of the two species were significant in both dominant frequency ($P > 0.001$) and chirp rate ($P > 0.001$). Also, within *P. scabricollis*, chirp rate of trills was significantly

faster than in chirps ($P > 0.001$), but there was no difference in dominant frequency. Future work will compare wing morphology in these species.

P384 ABS Founders Award Poster: PREDATION AND FORAGING 2 (Poster Session B: Thurs. eve)

THE EFFECTS OF PREY QUANTITY AND QUALITY ON BLACK WIDOW HABITAT CHOICE AND FORAGING BEHAVIOR

Patricia Trubl, Lindsay Miles, J. Chadwick Johnson

Arizona State University, United States; Email: patricia.trubl@asu.edu

Urbanization is a rapid change to the environment which leads to reduced species diversity but increased abundances of a few urban adapted taxa. However, little is known about how prey availability and quality of prey in urban environments affects these urban taxa. The Western black widow spider, *Latrodectus hesperus*, a web builder, thrives in urban environments and is often found in dense aggregations. We used black widows to test the hypotheses that prey availability and the quality of prey will 1) affect spider movement (web abandonment vs. web volume) and 2) influence foraging behavior (latency to attack and cannibalism). Females were placed in one of four treatment groups: high prey availability/ high quality prey, high prey/low quality, low prey/high quality and low prey/low quality. Females were paired with an unrelated female in the same treatment group. Variables examined include: web volume, cannibalism occurrences, latency to attack prey, distance between webs and female activity (e.g. foraging). These data will give insight into the population dynamics of black widow spider infestations characteristic of urban environments.

P445 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

DECISION MAKING DURING GROUP MOVEMENT IN FERAL HORSES (*EQUUS CABALLUS*)

Kaori Tsuboyama, Masaru Akita, Mariko Hasegawa, Nobuyuki Kutsukake

The Graduate University for Advanced Studies (SOKENDAI), Japan; Email: tsuboyama_kaori@soken.ac.jp

Group decision-making during movement often involves a complex process of building up a consensus to keep the group cohesive in spite of their different interests. It is predicted that individual intrinsic (e.g., sex, age, and reproductive status) and social factors (e.g., the presence of kin) as well as the group stability affect their decision-making. To examine these predictions, we compared group movement between two types of groups with different stabilities (harem and bachelor groups) in feral horses at Cape Toi, Japan. In harem groups, group movements were predominantly initiated by lactating females with foals. Young horses are more likely to delay following the first individual than old ones, while harem males were often the last to move. In bachelor groups, no individual factors explained who initiated the movement. There was no tendency of elder bachelors following younger ones nor vice versa. However, a bachelor was more likely to move when his brother moved. We conclude that pattern of group decision making differ between stable harem and fluid bachelor groups, which difference was caused by both individual intrinsic and social factors.

P336 ABS Founders Award Poster: MATING SYSTEMS 2 (Poster Session B: Thurs. eve)

PARALLEL CHANGES IN MATING CALLS AND FEMALE PREFERENCES IN AUTOTRIPLOID TREEFROGS

Mitch Tucker, H. Carl Gerhardt

University of Missouri, United States; Email: matkcc@mail.mizzou.edu

Cryptic species of North American gray treefrogs differ in mate-attracting calls and chromosome number. Biparental tetraploids (*Hyla versicolor*) originated multiple times via hybridization between diploid lineages. We show that artificially produced autotriploid females of the diploid species (*H. chrysoscelis*) show a shift in pulse-rate preference that parallels the shift in pulse rate of the calls of artificially produced male autotriploids. The parallel shift would facilitate this form of sympatric speciation by promoting reproductive isolation of polyploids from their diploid parental forms and also help to explain the extensive interbreeding of different lineages of polyploids, whose calls and preferences are similar.

382 Contributed Talk: SEXUAL SELECTION V (Saturday AM)

TERRITORY QUALITY PREDICTS MATE CHOICE IN FEMALES AND MALES

M Scarlett Tudor, Stephanie Gillespie, Allen Moore, Christine Miller

University of Florida, United States; Email:studor@ufl.edu

Female and male mating decisions are made in a temporal and spatial mosaic of resource quality, yet most studies examine these behaviors in only a single, simplified context. Changes in natural resources may alter the costs and benefits of mate choice, leading to the evolution of adaptive plasticity in these behaviors. Not only do mate choice behaviors evolve, but they also cause evolution, thus an understanding of their expression across contexts is crucial. Here, we examine mate selectivity in the leaf-footed cactus bugs, *Narnia femorata*. This species experiences seasonal and spatial variability in an important food, cactus fruits. We found that males were only selective in their courtship when they held high-quality territories, those with cactus fruit. Females showed evidence of preferring large mates, but they, unlike males, became choosier on the low-quality territories, presumably because few direct benefits from mating were present. Our results suggest that fluctuations in resource quality can drastically alter mating behaviors and may be a potent, and predictable, force maintaining genetic variation in natural populations.

P247 Contributed Poster: BEHAVIORAL COMMUNITY ECOLOGY 2 (Poster Session B: Thurs. eve)

A GAME MODEL FOR FOOD COMPETITION AND SIZE COMPOSITION OF FISH SOCIETY

Takashi Uehara

The Graduate University for Advanced Studies (SOKENDAI), Japan; Email:uehara_takashi@soken.ac.jp

Individuals in a society sharing space are involved in competition of limited food resources among the society members. Competitions over limited resources bring asymmetric food allocation resulting in different growth speed. Previous studies reported several kinds of size composition in fish communities both by field observation and laboratory experiment. In this study, fish growth under food competition is modeled. Individuals have options to pay costs by attacking others or not. If other fish attacks a fish, its feeding behavior is interrupted and therefore energy intake decreases. Fishes are assumed to learn the worth of each behavior (attack/non-attack) by energy budget, energy intake minus costs of attacking, and choose the better option against other society members respectively. The energy budget also determines growth speed. Analysis of the combination of these dynamics brought three distinguishing size compositions: (a) uniform growth (b) a dominant and subordinates (c) equally maintained size difference between neighboring classes. Interestingly, equal size difference was maintained by bullying lower classed individuals than itself.

261 Contributed Talk: SEXUAL SELECTION III (Thursday PM II)

THE ROLE OF SOCIAL CONTEXT IN FEMALE MATE CHOICE AND MALE EAVESDROPPING BY WOLF SPIDERS.

George Uetz, Emily Galbraith, Shira Gordon, David Clark, Corinna Kizer, J Andrew Roberts

University of Cincinnati, United States; Email:george.uetz@uc.edu

Social context can influence the behavior of signalers as well as receivers. Within communication networks, females may evaluate multiple males simultaneously, and weigh male traits depending on the choice context (relative trait levels, number of males). Males may exhibit eavesdropping and social facilitation of courtship depending on context (male density, sensory cues). We examined the role of social context in female mate choice and male eavesdropping of *Schizocosa ocreata* wolf spiders with video digitization and playback. Female preferences varied with relative levels of male traits (decorations, courtship vigor), and the number of males presented, indicating context-dependence and comparative mate evaluation. While lab-reared (naïve) males showed no tendency to eavesdrop, field-collected (experienced) males were more likely to initiate courtship when exposed to male signals. The number of courting males and available sensory information increased the tendency of focal males to respond. Results suggest that social context plays an important role in mate choice decisions and male competition tactics in wolf spiders.

P10 Contributed Poster: APPLIED ANIMAL BEHAVIOR 1 (Poster Session A: Weds. eve)

HIGH AGGRESSION IS ASSOCIATED WITH BOLD PROFILE IN NILE TILAPIA

Graziela Valença-Silva, Fernanda Corbeira-da-Silva, Gilson Volpato

Institute of Biosciences, Unesp-Botucatu, SP, BR, Brazil; Email: grazivs@gmail.com

We evaluated whether personality profiles (shy/bold) are associated with aggressiveness in the fish Nile tilapia (*Oreochromis niloticus*). We tested 115 fish (8.8 ± 0.6 cm) for shy/bold profiles by measuring their reaction to a sudden introduction of a novel object into the aquarium. We used two tests (distinct object) performed with a 24-h interval. Fish considered shy (27 fish did not leave their initial place) or bold (22 fish approached the object in less than 40 s) in both tests were tested for aggression 60 days later. We then tested individual aggressiveness in a mirror test (20 fish per profile) and subsequently by pairing size-matched fish of a same personality trait (10 pairs per profile). Both aggression and personality profiles were not associated with sex. In the mirror and pairing tests the bold fish fought more ($p = 0.03$) and spent more time engaged in fights ($p = 0.02$ and $p = 0.014$, respectively). Bold fish started fighting the mirror sooner than shy fish ($p = 0.03$). Thus, we showed a clear association between personality profile and aggression, where the bold fish are the most aggressive.

P267 Contributed Poster: COGNITION AND LEARNING 2 (Poster Session B: Thurs. eve)

CONDITIONED FLAVOUR PREFERENCE IN PIGS: COMPARISON BETWEEN CALORIC AND/OR GUSTATIVE REINFORCEMENTS

David Val-Laillet, Caroline Clouard, Mathieu Chataignier, Marie-Christine Meunier-Salaün

Institut National de la Recherche Agronomique (INRA), France; Email: david.val-laillet@rennes.inra.fr

We induced a conditioned preference toward a flavoured beverage via caloric and/or gustative reinforcement. During 6 two-day conditioning sessions, 9 juvenile pigs received flavoured beverages added with sucrose (F+) or with no additive (F-). During conditioning, the pigs consumed F+ more than F-. F+ was also significantly preferred during a further two-choice drinking test without sucrose, suggesting that the pigs developed a short-term preference for a flavour previously paired with sucrose. To study the efficiency of visceral (calories) vs. gustative (sweet taste) reinforcements in preference conditioning, 9 pigs were subjected to 4 three-day conditioning sessions and received flavoured beverages added with maltodextrin (F+m, calories), saccharin (F+s, sweet taste), or no additive (F-). During conditioning, the pigs consumed F+s less than F+m and F-. During further two-choice tests, no clear-cut preference emerged, but the consumption of F+m was 107% higher than that of F-. These findings suggest that a visceral reinforcement might be sufficient to condition a flavour preference. Further studies are needed to investigate the failure of saccharin-conditioned preference.

P342 Contributed Poster: MATING SYSTEMS 2 (Poster Session B: Thurs. eve)

HIGHER TEMPERATURES MEAN FEWER EGGS? THE IMPACT OF THE WARMING WORLD ON A TROPICAL SEABIRD SPECIES

Adriana Vallarino, César González-Zuarth, Alfonso Vázquez-Botello

Universidad Nacional Autónoma de México, Mexico; Email: avallarinom@gmail.com

Clutch size in least terns in the southern Gulf of Mexico ranges from 1 to 3 eggs. Environmental temperatures during breeding season fluctuate from 26 to 52°C. Ideal incubation temperature is between 36 to 40.5°C for optimal development. A predicted increase of ~4°C in earth global temperature could make difficult to incubate and raise large clutches in hot environments. We measured and compared nest temperatures and incubation behaviour between 2-egg clutches (2-ec) and artificially enlarged 3-egg clutches (3-ec). In 3-ec, nest attendance was higher and changeovers were lower than in 2-ec and adults from 3-ec spent more time incubating tight than adults from 2-ec. Less frequent changeovers indicate that individuals had to spend more time foraging to satisfy their energetic needs. Despite the behavioural differences, nest temperatures in 2-ec were more stable and closer to the ideal incubation temperatures. In conclusion birds breeding in hot environments might lay fewer eggs as environmental temperatures increase due to climate change because behavioural modifications are not enough to maintain ideal incubation temperatures of large clutches and more energy is needed as well.

P409 ABS Founders Award Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

DIFFERENTIAL EFFECTS OF A STRESSOR ON THE EXPRESSION OF ACOUSTIC AND VISUAL ORNAMENTS.

Jeff Van Camp, Rianne Pinxten, Marcel Eens

Universiteit Antwerpen, Belgium; Email: jeff.vancamp@ua.ac.be

The multiple message (MM) hypothesis states that sexual ornaments may signal different aspects of male quality. To test this, we examined the effects of stress on the expression of multiple sexual ornaments. A reduction in blood volume is usually considered a cause of stress that may significantly affect the expression of behavior and sexually selected traits. Here, we sampled blood ($\pm 750 \mu\text{l/day}$) during two consecutive days to examine whether this affected bill coloration and song rate in captive male European starlings, *Sturnus vulgaris*. Three weeks after blood sampling, the bill of males subjected to the stressor displayed changes in red chroma and UV chroma, two condition-dependent color traits, while this was not the case in control males. In contrast, song rate, often considered a condition-dependent trait, did not differ significantly before and after treatment. Our results seem to support the MM hypothesis and suggest that stress may differently affect the expression of sexual ornaments. Given that blood sampling is a standard tool in ornithological and behavioral research, our results may have important implications, not in the least for sexual selection studies.

P307 ABS Founders Award Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

CHANGING THE SONG: VOCAL PLASTICITY IN THE CLAY-COLORED THRUSH TURDUS GRAYI THROUGH TIME

Luis Vargas, Natalie Sánchez, Gilbert Barrantes

Universidad de Costa Rica, Costa Rica; Email: luissum@gmail.com

Although song plays a major role in songbird social communication, vocal plasticity and song learning have received considerably less attention during adulthood than in early stages of life. We studied vocal plasticity in the songs of adult Clay-colored Thrushes, *Turdus grayi*, in Costa Rica between 2008 and 2011. Three males were recorded for four consecutive years, two males for three consecutive years and two males during two years. We also analyzed vocal plasticity within one breeding season (2009) in six males. In total, 17607 song elements were classified. Element repertoire size did not change with age, but mean element turnover was 49-68% between successive years. Few elements were used during all four years while other elements were hidden and later reappeared. Addition, deletion and gradual transformation of element types were observed within one year. Both levels of vocal plasticity, between and within breeding seasons, demonstrate the existence of a larger 'hidden' repertoire and suggest that adult males can learn new element types. Vocal plasticity may favor song sharing, individual recognition and/or be used to improve song versatility in varied time scales.

P308 Contributed Poster: COMMUNICATION 2 (Poster Session B: Thurs. eve)

ANTHROPOGENIC NOISE, CALLING BEHAVIOR, AND HABITAT USE BY THE FROG *RANITOMEYA BOMBETES*

Fernando Vargas-Salinas, Adolfo Amézquita

University of Los Andes, Colombia; Email: vargassalinasf@yahoo.com

Species using auditory signals must develop strategies that overcome signal masking effects when its habitat is under pressure by human activities disturbing the acoustic environment. To test the presence of those strategies in anurans, we compared calling behavior of the frog *Ranitomeya bombetes* in one population that has been exposed to noise produced on a highway during more than 40 years, against two populations free of this kind of disturbance. In addition, to test whether anthropogenic noise is reflecting in a segregation of frogs in the disturbed population, we established a set of 28 sampling plots covering different distances from the road, and measured abundance of frogs and habitat environment factors. Our results suggest that anthropogenic noise induced plastic behavioral responses and evolutionary changes in signal communication on *R. bombetes*. In the population under noise disturbance frogs tended to call when traffic noise was lower and tended to stop calling

when noise increased due to a passing vehicle. In addition, frogs in this population exhibited the highest call frequency. Apparently, those strategies allowed *R. bombetes* to overcome de

364 Contributed Talk: COMMUNICATION VI (Saturday AM)

SOUNDSCAPE ORIENTATION IN TREEFROGS: THE ROLE OF TEMPORAL STRUCTURE

Alejandro Velez, Noah Gordon, Mark Bee

University of Minnesota, United States; Email:velez011@umn.edu

The sounds of frog breeding choruses can act as cues that allow individuals to locate breeding sites. The acoustic properties used for chorus localization, however, remain poorly understood. We tested the hypothesis that gray treefrog (*Hyla chrysoscelis*) and green treefrog (*H. cinerea*) females exploit the temporal structure of chorus sounds to locate breeding sites. Frequency and modulation spectra of chorus sounds differ between species in ways determined by species-specific call properties. In phonotaxis experiments, females of both species oriented to chorus recordings but not to steady-state chorus-shaped noises (i.e. noises with a flat temporal envelope and the long-term frequency spectrum of a chorus). When chorus-shaped noises had the modulation spectrum of natural choruses, gray treefrogs oriented to noises when the temporal structure was natural, but not when it was random. Green treefrogs oriented to chorus-shaped noises with both natural and random temporal structure. Our results suggest that the preserved temporal structure of individual vocal signals in chorus noise is important for soundscape orientation in gray treefrogs, but not green treefrogs.

P62 ABS Genesis & Charles H. Turner Award Poster: COMMUNICATION 1 (Poster Session A: Weds. eve)

SEXUAL DIFFERENCES OF FLUCTUATING ASYMMETRY IN *POLISTES DOMINULUS*

Cassandra Vernier, Amanda Izzo, Elizabeth Tibbetts

University of Michigan, United States; Email:verncass@umich.edu

Developmental stress is the physiological susceptibility to random developmental errors. Fluctuating asymmetry (FA), the deviation from bilateral symmetry, is often used to monitor developmental stress in individuals. Condition dependent traits, those that are typically determined by environmental conditions, may indicate the presence of developmental stress and should display FA, while condition independent traits should not. We compared male and female *Polistes dominulus* paper wasps to determine the relative frequency of FA, and thus developmental stability, between sexes. Dorsal abdominal spots, a sexually selected condition dependent trait in males (but not females), were photographed, measured in pixels, and compared between sexes. For both sexes, we used the area of thoracic stripes and the number of antennal segments, which are condition independent traits, as control variables. Overall, it was expected that haploid male wasps would show more variation in symmetry than diploid females, and that male condition dependent spots would show higher levels of FA than control traits.

135 Contributed Talk: APPLIED ANIMAL BEHAVIOR I (Tuesday PM II)

TAIL BITING ALTERS FEEDING BEHAVIOR OF VICTIM PIGS

Elina Viitasaari, Laura Hänninen, Marja Raekallio, Mari Heinonen, Anna Valros

University of Helsinki, Finland; Email:elina.viitasaari@helsinki.fi

Little is known about the effect of pain on the feeding behavior of tail-biting victim pigs. Thus, we studied automatically collected feeder data from 13 tail-bitten pigs weighing 30 - 90 kilograms in 7 pens from 5 days before to 5 days after the bite wound was first noticed. Pigs with fresh bite wounds were selected from a finishing herd with one automatic one-space feeder per group of 11 pigs. We calculated daily feeding duration, mean daily feeder visit intervals and mean daily feeding efficiency. The differences between observed days were compared with repeated measures mixed models. All parameters differ significantly between days ($P > 0.001$ for all). Feeding duration decreased between days -1 to day 0 and increased again until day 2 ($P > 0.05$). Feeding interval increased from day 0 on day 2 ($P > 0.05$) and feeding efficiency elevated significantly during days -1 and 2 ($P > 0.05$). Tail-biting altered victims feeding behavior in this study setup. Observed change in feeding

efficiency from day -1 indicates the difficulty in detecting tail-biting damage. We suggest that these changes in feeding patterns at the onset of tail-biting might be due to pain experienced by the victim pigs.

P228 Contributed Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

DEVELOPMENT OF SEX DIFFERENTIAL PLAY BEHAVIOR IN LANGUR INFANTS
(*SEMNOPITHECUS ENTELLUS ENTELLUS*)

Prateek Vijay, Goutam Sharma, L.S. Rajpurohit, Chena Ram

Jai Narain Vyas University (JNV), India; Email: vijayprateek4@gmail.com

Playing is the most common in the primates. For analysis the Development of play we were record the various elements of play behaviour of 15 male and 15 female infants of the Hanuman Langur (*Semnopithecus entellus entellus*) from birth to 12 months of age. Infants were selected from a free-ranging bisexual troop Daijar (B-1) near Jodhpur in Rajasthan. The behavioural elements such as Self/solitary play, mutual contact play, mutual noncontact play, contact play initiated by others and contact play with others were included. Analysis of developmental trend, in the two-month age-blocks, suggests that all behavioral elements appeared and took the typical shape in the first age-block. The occurrence, in terms of frequencies, was high in the 3rd and 4th age-block for elements of social play, whereas self-play and social play were found to be decreasing although in last age-blocks. Sex differences were also obvious in terms of interactional patterns. Male infants in all respects were more playful. Male infants exhibited overdue preference for same-sexed peers and juveniles, whereas among female this pattern was not evident.

P32 Contributed Poster: COGNITION AND LEARNING 1 (Poster Session A: Weds. eve)

FOLLOWING GAZING AND POINTING IN DOMESTIC DOGS AND IN WOLVES:
COMMUNICATION OR BEHAVIOUR-READING?

Zsofia Viranyi, Friederike Range

University of Vienna, Austria; Email: zsofi.viranyi@gmail.com

Albeit pointing is a uniquely human gesture, several animal species have been tested whether they follow this arbitrary hand cue. The assumption behind is that pointing is a more explicit form of gaze cues and has a similar potential to direct the attention of an observer. Domestic dogs outperform chimpanzees as well as human-raised wolves in locating hidden food based on human pointing in object-choice tasks, which, if the above assumption is correct, predicts that dogs should be good in following gaze cues as well. Though earlier results on adult pet dogs seem to confirm this prediction, recent comparisons of similarly raised dogs and wolves show that young wolves follow gaze into distant place as well as around barriers more reliably than dogs do, and are more willing to choose one of 2 containers indicated by either conspecific or human gaze. These results suggest that following pointing and following gaze are likely to imply different mechanisms. With this presentation we hope to demonstrate that more refined theories as well as methods are needed to differentiate between animals simply reading others' behaviour or recognizing the communicative nature of their signals.

P385 Contributed Poster: PREDATION AND FORAGING 2 (Poster Session B: Thurs. eve)

SLIPPER LOBSTERS ADJUST BIVALVE-SHUCKING BEHAVIOR WITH PREY SIZE AND SHAPE

Maksim Vlasyuk, Frank Grasso

Brooklyn College, CUNY, United States; Email: Maxvlasyuk@yahoo.cmo

Slipper lobsters are obligate bivalve (clams, oysters etc.) feeders that are found worldwide. Their preferred food requires dexterous handling of the shells as these animals, which lack claws for crushing, rely on wedging to pry open bivalve shells. We hypothesized that slipper lobster clam handling varies with the size and shape of the clam. Occasionally, this wedging behavior is complemented by the animal using its mandibles to take chips from the shell, presumably to permit more effective wedging. We studied the chip patterns on shells from 92 successful *Scyllarides nodifer* predation episodes. We found a significant preference for the lobster to chip the

right valve over the left [binomial test, $n=79$ $P > 0.001$]. We also found that chips tended to vary with the wideness of the shell with more chips being made on the anterior third of the left shell wider shells [$F(2,78) = 3.49$ $P > 0.05$]. This position coincides with the attachment point of one of the clam's adductor muscles. Since slipper lobsters cannot see the clam while shucking these patterns are likely due to tactile and possibly chemical information that the animal uses in order to open a bivalve.

P163 Contributed Poster: PREDATION AND FORAGING 1 (Poster Session A: Weds. eve)

MEADOW VOLES DIFFER SEXUALLY IN A SPACE-USE TASK INVOLVING THE SCENTS OF PREDATORS AND CONSPECIFICS

Christian Vlautin, Michael Ferkin

University of Memphis, United States; Email: cvlautin@memphis.edu

We tested the hypothesis that scent marks of both hetero- and conspecifics may affect whether individuals to take a long or short path to reach a sexually receptive, opposite-sex conspecific. In an arena devoid of scent marks, male voles chose the short path to reach the goal, but females chose the long arm and the short arm equally to reach the goal. Male and female voles, however, had a similar latency to enter the arena and spent a similar amount of time reaching goal. In an arena containing the scent marks of a same-sex conspecific or a predator, male and female voles chose the long and the short arm equally to reach the goal and spent similar time to reach the goal. Males and females also had a similar latency to enter an arena containing the scent marks of a predator. Males, however, had a greater latency to enter the arena than did females, independent of whether the scent mark of a same-sex conspecific was in the long or short arm. The scent marks of a same-sex conspecific or a predator affects the path taken by males but not by females to reach the marks of a potential mate.

175 Contributed Talk: DEVELOPMENT I (Wednesday AM)

IS ZEBRA FINCH MATURATION & BEHAVIOURAL PHENOTYPE AFFECTED BY DAY LENGTH DURING EARLY DEVELOPMENT?

Nikolaus von Engelhardt, Anjuli Barber, Ingo Catalano, Sarah Schmid

University of Bielefeld, Germany; Email: nvengelhardt@gmx.de

Theoretical models predict that animals with high future fitness expectations should avoid risks, whereas those with low future reproductive expectations should be bolder. Zebra finches born early within seasons (i.e. spring) can reproduce in the same year, whereas those born later delay reproduction. This may indicate a trade-off between current and future fitness expectations leading to the prediction that late-born zebra finches should be more cautious than animals born early in the year. Experimental studies on the effects of birth season on life-history and behavioural strategies are however lacking. To simulate different birth seasons, we exposed zebra finches before and after independence (day 35) to either short (9h light: 15h dark) or long (18h light: 6h dark) days. Photoperiod before and after independence, and their interaction had strong effects on sexual maturation and weaker effects on behavioural phenotype (risk-sensitivity, exploration and social behaviour). Our findings, which are only partly in line with predictions, are discussed in the light of adaptive phenotypic plasticity in respect of birth season and its potential physiological mechanisms.

136 Contributed Talk: APPLIED ANIMAL BEHAVIOR I (Tuesday PM II)

SHORT- AND LONG TERM EFFECTS OF MOTHER-BONDED REARING ON RELATIONSHIP OF DAIRY CATTLE WITH HUMANS

Kathrin Wagner, Kerstin Barth, Edna Hillmann, Susanne Waiblinger

Institute of animal husbandry and welfare, Austria; Email: kathrin.wagner@vetmeduni.ac.at

The study investigated the potential effect of mother-bonded (M) vs. artificial rearing (A) on the animal-human relationship (AHR) of dairy cattle. A were in the calving pen with the cow for 12h, M for 5 days. Afterwards both were kept together in a calf group until weaning at week 12. M had additional access to the mother in the herd. A were bottle-fed for 5days, thereafter by automatic milk feeder. To assess the AHR we tested animals'

avoidance distance (AD) and, in calves, reaction to a stationary person, in the home pen or a novel arena. AD to an unfamiliar person was higher in M compared to A in 28 days old calves (n=39; home $F_{1,36}=4.21$, $P > 0.05$; arena $F_{1,36}=18.66$, $P > 0.001$) and in 15 months old heifers (n=21; home $F_{1,18}=4.98$; $P > 0.05$). In addition, AD of 26 primiparous cows that had been reared artificially or mother-bonded was tested. AD to a familiar person did not differ ($F_{1,23}=0.003$; $P < 0.05$). These results suggest higher fear of humans in M compared to A lasting for at least 1 year. The lack of a treatment difference in the cows may rely on the reversal of effect over time or on the fact that frequent handling had occurred in both rearing groups in these animals.

P238 Contributed Poster: APPLIED ANIMAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

EFFECTS OF SEXUAL PHEROMONES AND MATURATION ON LOCOMOTOR BEHAVIORAL PATTERNS IN FEMALE SEA LAMPREYS

Erin Walaszczyk, Nicholas Johnson, Henry Thompson, Weiming Li

Michigan State University, United States; Email:walaszcz@msu.edu

As sea lamprey, *Petromyzon marinus*, progress through their life cycle, their locomotor activity pattern changes. Our goal was to elucidate the activity patterns of adult female lampreys during the sexual maturation process and to discern the interactions of these patterns with pheromones. Adult females are exposed to male pheromones that attract ovulatory females to the nest for spawning. Our results show that pheromone exposure and maturation interact to modulate female activity rhythms ($P > 0.0001$). Immature females produce a nocturnal locomotor activity pattern, whereas mature females have a reduction in overall activity and an extension of activity into the daylight hours. Exposure to male pheromones affects both immature and mature females, in which both groups show a reduction in activity. Ovulating females exposed to pheromones also show a change in locomotor activity pattern, becoming arrhythmic. Our results suggest that the interaction between maturity stage and exposure to male pheromone compounds contributes to altering locomotor activity patterns in female sea lamprey. This study was supported by the Great Lakes Fisheries Commission and NIGMS grant: 1R24GM083982-0.

P281 Contributed Poster: CONSERVATION (Poster Session B: Thurs. eve)

BEHAVIOR OF REARED JAPANESE FLOUNDER AS BOTH PREDATOR AND PREY: IMPLICATIONS FOR STOCK ENHANCEMENT

Michelle Mick Walsh, Reiji Masuda, Yoh Yamashita

University of New Hampshire, United States; Email:michelle.walsh@unh.edu

Mostly attributed to the unnatural characteristics of the hatchery environment, reared flatfish often exhibit irregular behavioral patterns compared with wild conspecifics, and these "deficits" are assumed to translate to increased predation risk upon release. Initially releasing fish in predator-free acclimation cages may help fish adjust to the wild environment. We conducted video trials with 100 mm reared Japanese flounder *Paralichthys olivaceus* in sand-bottomed tanks to assess the behavior of: (1) reared fish conditioned for 7 d in an acclimation cage in the shallow coast, (2) reared fish directly from tanks, (3) wild fish, and (4) "hatchery-wild fish" - those reared, released and recaptured after 6 d in the wild. Burying, feeding ability, and threat perception to a model predator was assessed. At the end of trials, fish were preserved and the amount of prey consumed was verified by stomach content analysis. Wild flounder revealed a significantly higher ($P > 0.01$) mean stomach contents index at the end of trials than that of other treatments. Release strategies that maximize post release recruitment to the fishery can boost the economic efficiency of a stocking effort.

P410 ABS Founders Award Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

EGG COLOR INFLUENCES THE NESTLING PROVISIONING RATE OF MALE HOUSE WRENS

Lindsey Walters

Northern Kentucky University, United States; Email:waltersl3@nku.edu

Recent research suggests that female birds could use eggshell color as a signal to advertise their quality or investment in order to secure more parental care from their mates. Previous studies have found support for this hypothesis in bird species that lay blue eggs, but it has not been thoroughly tested in species that lay brown eggs. In house wrens (*Troglodytes aedon*), browner eggs are associated with lower female investment. I present results from a study testing whether males respond to this potential cue. I experimentally manipulated egg color by randomly adding either a brown or white plastic egg to each nest during incubation. Male house wrens whose nests had received a white egg provisioned their nestlings at significantly higher rates than males whose nests had received a brown egg. These results suggest that male house wrens pay attention to female investment when deciding how much energy they should spend on nestling provisioning. This study supports the generality of the hypothesis of egg color as a sexually selected signal by demonstrating for the first time that males of a species with brown eggs also respond to egg color.

P268 ABS Founders Award Poster: COGNITION AND LEARNING 2 (Poster Session B: Thurs. eve)

COLOR PREFERENCE IN THE PIPEVINE SWALLOWTAIL, *BATTUS PHILENOR*: IS HUE OR BRIGHTNESS MORE IMPORTANT?

D. Lisa Wang, Daniel Papaj

University of Arizona, United States; Email:wangd88@gmail.com

Floral preference studies extensively explore visual cues, such as color, because pollinators use these cues to locate flowers for nectar foraging. However, the methodology of many color preference studies confounds three distinct properties of color: hue, brightness, and chroma. For example, individuals may prefer yellow over blue because of differences in brightness between the two colors and not necessarily because of differences in hue. In this study, we use neutral density filters and LED technology to tease apart the roles of hue and brightness in innate floral color preference by the pipevine swallowtail, *Battus philenor*. Our data show that both hue and brightness contribute to innate floral color preference by male and female butterflies.

322 Contributed Talk: SOCIAL BEHAVIOR V (Friday AM)

THE EFFICIENCY OF INFORMATION COLLECTION AND USE IN DECISION-MAKING INCREASES WITH SOCIAL GROUP SIZE

Ashley Ward, David Sumpter, James Herbert-Read, Jens Krause

Leibniz Institute & Humboldt University, Germany; Email:ashleyjward@gmail.com

A huge number of the world's animal species live in groups, suggesting that sociality conveys major benefits to group members. The resource that arguably drives all of the key benefits of sociality is information. Based on this, we predict that the efficiency of information gathering and its use in decision-making should increase with increasing group size. Using the mosquitofish (*Gambusia holbrooki*) as a model species, we show first how individuals in groups of 8 or of 16 fish are able to more rapidly and effectively explore a novel environment in comparison to isolated conspecifics and those in smaller groups of fish, demonstrating social facilitation of exploratory behaviour and increased access to vital information about their environment. Second, we show that mosquitofish under a simulated predation threat are better able not only to acquire information in larger groups, but also to use subsequently it to make decisions that were both faster and more accurate than fish in smaller groups and those on their own. Hence, animals in groups are better able both to gather and to use information, potentially representing a powerful driving force behind the evolution of sociality.

220 Contributed Talk: MATING SYSTEMS II (Thursday AM)

FEMALE MANAKIN MATE SEARCHING STRATEGIES REVEALED BY A NOVEL TRACKING SYSTEM

Kara-Anne Ward, Dugan Maynard, Daniel Mennill, John Burt, Stéphanie Doucet

University of Windsor, Canada; Email:ward13@uwindsor.ca

Long-tailed manakins, *Chiroxiphia linearis*, have a lek-based mating system with a high skew in male mating success and complex, cooperative male displays. Female manakins are very cryptic, and their movements and behaviors are therefore poorly understood. Our objective was to characterize the mate searching strategies employed by female long-tailed manakins. We monitored female movements using a novel tracking system, Encounternet, which uses receivers positioned at male leks to record the movement of females fitted with transmitters. We also video-recorded display perches to characterize the frequency and quality of male display behaviors. Preliminary analyses reveal that females visit multiple males and usually visit a single male multiple times, supporting a best-of-n-males search strategy. Further analysis will reveal whether the initial rejection of visited males was based on the quality of their display. Our study represents the first in-depth analysis of sequential intersexual interactions in long-tailed manakins, and provides insight into female mate searching tactics and mate choice in lek-based mating systems.

347 Contributed Talk: SOCIAL BEHAVIOR VI (Friday PM I)

SOCIAL INFORMATION, CONFORMITY AND OPPORTUNITY COSTS: EXPERIMENTS WITH FORAGING FISH SHOALS

Mike Webster

University of St Andrews, United Kingdom; Email:mike.m.webster@gmail.com

Animals pay opportunity costs when exploiting one source of information over another. We quantified opportunity costs due to conformity and social information use in foraging sticklebacks (*Pungitius pungitius*), using an arena containing a hidden prey patch and, some distance away, a static conspecific stimulus shoal. Subjects foraging in the absence of the stimulus shoal were significantly more likely to find the prey patch, and spent longer feeding at it, than those in trials where a stimulus shoal was present. Furthermore, in trials where the stimulus shoal exhibited feeding cues, subjects approached them sooner and spent more time shoaling with them, exploring less of the arena than in trials where the stimulus shoal exhibited no such cues. This suggests sensitivity not only to the mere presence of conspecifics, but also to social information that they produce. Opportunity costs such as reduced foraging rate may be offset by benefits including lower predation risk, and increased foraging efficiency. Ongoing work tests the prediction that larger groups of subjects, which bear lower per capita predation risk, will be less likely to conform to the behaviour of the stimulus shoal.

314 Contributed Talk: SEXUAL SELECTION IV (Friday AM)

SEXUAL CONFLICT IN CEPHALOPODS: SPERMATOPHORE CONSUMPTION & MATE CHOOSINESS SQUID

Benjamin Wegener, Devi Stuart-Fox, Mark Norman, Bob Wong

Monash University, Australia; Email:benjamin.wegener@monash.edu

Sexual conflict is a cornerstone of sexual selection research. How an individual manages this conflict greatly determines their eventual reproductive success. As a result, males and females exhibit a range of different mating strategies aimed at maximizing their own reproductive output, often to the detriment of the other sex. In the Australian squid, *Sepiadarium austrinum*, we discuss a remarkable set of previously unknown, sex-specific adaptations that individuals use to maximize fitness. In an experimental study, we found that males of this species are highly choosy, and prefer females closest to egg-laying condition. We also document, for the first time in any cephalopod, *post-copulatory consumption of male spermatophores* by the females. Here we discuss the unique life-history and evolutionary consequences of these previously unknown traits.

142 Contributed Talk: MECHANISMS I (Tuesday PM II)

TREMATODE PARASITES ARE ASSOCIATED WITH STEROID HORMONE PROFILES IN THE CALIFORNIA KILLIFISH

Kelly Weinersmith, Amanda Hanninen, Andy Sih, Ryan Earley

University of California, Davis, United States; Email:KLSmit@UCDavis.edu

Trophically transmitted parasites can have profound effects on host physiology and behavior. California killifish (*Fundulus parvipinnis*) infected by the trematode parasites *Euhaplorchis californiensis* (EUHA) and *Renicola buchmanani* (RENB) exhibit increased frequencies of conspicuous behavior, which are associated with increased risk of predation by the parasites' shared definitive host. Steroid hormones may play an important role in host-parasite dynamics because they can influence both infection rates with parasites via effects on host behavior and immunity and can be modulated by the parasite post-infection. We examined the relationship between sex (11-ketotestosterone, testosterone, and estradiol) and stress (cortisol) hormones and EUHA and RENB load in wild-caught killifish. Using a water-borne steroid collection method to determine hormone concentrations, we found that the interaction between EUHA and handling stress was a strong predictor of sex steroid profiles, and that RENB was a strong predictor of cortisol profile. Future work using experimental infections will examine the extent to which these relationships are driven by parasite manipulation of host hormone profiles.

P80 Contributed Poster: DEVELOPMENT (Poster Session A: Weds. eve)

TEMPERAMENT PREDICTS MOTHERS' RESPONSES TO SEPARATION FROM THEIR INFANTS IN RHESUS MONKEYS

Tamara Weinstein, Laura Del Rosso, John Capitanio

California National Primate Research Center, United States; Email: tarweinstein@ucdavis.edu

We examined consistency in behavioral style between infancy and adulthood in female rhesus monkeys *Macaca mulatta* by assessing willingness to take a food treat in a stressful context. We offered the treat to 258 mothers (mean age = 4.5 yrs) separated from their infants for 25 hours at the California National Primate Research Center, and recorded whether they took it. We also rated responses using seven adjectives: aggressive, bold, calm, depressed, fearful, gentle, nervous. Subjects had participated in a 25-hr BioBehavioral Assessment (BBA) at 3-4 months of age. We tested whether eight BBA-derived temperament scores predicted treat acceptance using logistic regression. The model was significant ($\chi^2 = 34.76$, $p = 0.001$): mothers who took the treat scored higher in emotionality as infants, indicating less behavioral inhibition. Mothers' response ratings showed significant concordance with their previous ratings on the same-named BBA temperament traits (Lawlis & Lu chi-square, all $P > 0.0001$). Our results reveal that, during maternal separation, less inhibited infants become more willing to accept a food treat as adults, and show continuity in overall behavioral style.

P269 Contributed Poster: COGNITION AND LEARNING 2 (Poster Session B: Thurs. eve)

REVISITING ACTION PERCEPTION IN COTTON-TOP TAMARINS (*SAGUINUS OEDIPUS*)

Daniel Weiss, Kate Chapman

Penn State University, United States; Email: djw21@psu.edu

Recent research suggests that action perception abilities may be ubiquitous in primates (Wood, Glynn, Phillips & Hauser, 2007). However, these results have been questioned on several grounds (e.g., Shettleworth, 2010). The present study revisits whether cotton-top tamarins (*Saguinus oedipus*), demonstrate sensitivity to a human experimenter's goal-directed actions. In Experiment 1, we replicated previous research (Wood et al.) demonstrating that tamarins prefer to explore a bowl contacted in a goal-directed manner by a human experimenter versus one contacted incidentally. In Experiment 2, we used a novel goal-directed gesture to contact the bowl and found the tamarins randomly chose between the goal-directed and incidentally acted-on bowls. In Experiment 3, we replicated Experiment 1 to ensure these results did not reflect habituation. In Experiment 4, tamarins observed an experimenter contact a food bowl with an elbow while her hands held a board (constrained) or with her arms free (unconstrained). Unlike Wood et al., our tamarins chose randomly. Our results question the tamarins' abilities to infer the goal structure of human actions and suggest this methodology may be fragile.

P355 Contributed Poster: MECHANISMS 2 (Poster Session B: Thurs. eve)

PTERIN, NOT CAROTENOID, PIGMENTS UNDERLIE THE FEMALE-SPECIFIC ORNAMENT OF STRIPED PLATEAU LIZARDS

Stacey Weiss, Katharina Foerster, Jocelyn Hudon

University of Puget Sound, United States; Email:sweiss@pugetsound.edu

Indicator models of sexual selection suggest that signal honesty is maintained via costs of signal expression. Yellow, orange & red carotenoid-based signals are a well-studied example, as carotenoids may be environmentally limited & impact health. However, such colors may also be produced by pterin pigments. We examined the contribution of carotenoid & pterin pigments to the orange reproductive color of female striped plateau lizards (*Sceloporus virgatus*). This ornament reliably indicates female mate quality, yet costs maintaining honesty are unknown. Dietary carotenoid manipulations did not affect color, and orange skin differed from white skin in drosopterin, not carotenoid, content. Further, orange color positively correlated with drosopterin, not carotenoid, concentration. Drosopterin-based female ornaments avoid the direct tradeoff of using carotenoids for ornament production vs. egg production, thus may relax counter-selection against exaggeration. Experiments are needed to determine the actual costs of pterin-based signals. Like carotenoids, pterins influence important biological processes, such as immune & antioxidant function; predation & social costs may also be relevant.

P446 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

SEEING (WILD) DOGS THROUGH 'NEW EYES': 'READING' BODY LANGUAGE AND COOPERATIVE BEHAVIOR

Harry Wels

VU University Amsterdam, Netherlands; Email:harry.wels@falw.vu.nl

(Wild) dogs are social non-human animals. In social interaction, also across species, participants 'read' each other's body language and on that basis behave towards each other in a way that usually serves peaceful and cooperative social relations and avoids (escalating) conflicts. New research technologies offer new chances for data collection and scientific interpretations in this field. The particular research technique suggested here to register the reading of body language makes use of dog goggles linked to a computer that registers eye movement and can determine where the subjects are looking at. This registered perceptual information is then linked to the social behavior and interaction that follows, amongst each other and across species. Using these particular goggles on dogs cannot be done with wild dogs, but the outcomes of the research on domestic dogs will lead to new scientific angles for observational fieldwork studying the social behavior of wild dogs. The research on domestic dogs will thus inform the research on wild dogs, like described of Lory Frame: 'What she knew from her experience with domesticated dogs helped inform her observations of wild dogs'.

P369 Contributed Poster: PARENTAL CARE 2 (Poster Session B: Thurs. eve)

WHERE TO PLACE YOUR EGGS: THE EFFECTS OF CONSPECIFIC EGGS AND WATER DEPTH ON OVIPOSITION DECISIONS

Daniel Welsh, Rebecca Fuller

University of Illinois, United States; Email:dwelsh@life.illinois.edu

In species with external development, egg placement is expected to impact the fitness of females and males via offspring survival. In nest building fishes with male parental care, females frequently prefer to lay eggs in areas where eggs are already present. However, few studies have examined oviposition strategies in species lacking parental care. This study tested whether female bluefin killifish *Lucania goodei* prefer to lay eggs in spawning substrates that already contain eggs from other females. *L. goodei* is a non-nest building species with no parental care and high levels of iteroparity. Females preferred to lay eggs in areas where eggs were already present but these effects decreased with increasing clutch size. We suggest that females prefer to lay small bouts of eggs in areas already containing eggs of other females, but that in nature, they distribute these eggs across multiple males and locations. By doing so, females may increase the probability of offspring survival via either the

dilution effect (reduced individual probability of predation due to increased group size) or the selection of 'good locations' for offspring development.

147 Contributed Talk: SEXUAL SELECTION II (Tuesday PM II)

MATE PREFERENCE LEARNING IN A BUTTERFLY

Erica Westerman, Antonia Monteiro

Yale University, United States; Email:erica.westerman@yale.edu

Lepidopterans are remarkable for their high biodiversity and spectacular variety of distinct, species-specific wing patterns. In vertebrates, a high rate of signal diversity evolution is associated with sexual imprinting, but this form of learning has never been observed in butterflies. Here we demonstrate that mate preference learning occurs in a butterfly, *Bicyclus anynana*. Naïve *B. anynana* females mate preferentially with the prevalent wild type male phenotype, (two forewing UV-reflective spots), over manipulated males with four UV-reflective spots. However, females briefly exposed to these manipulated males demonstrated significant preference for four-spotted males over two-spotted males during later mate choice trials. In contrast, females exposed to manipulated males with fewer UV-reflective spots (one or no spots) did not learn to prefer a reduced spot phenotype. Thus, we observe a sensory bias in learning of novel phenotypes in that an increased signal is easier to learn than a reduced one. Our findings suggest a role for sexual imprinting in driving signal augmentation and signal diversification in butterflies.

323 Contributed Talk: SOCIAL BEHAVIOR V (Friday AM)

SOCIAL ATTRIBUTES AND ASSOCIATED CONSEQUENCES IN YELLOW-BELLIED MARMOTS

Tina Wey, Daniel Blumstein

University of California, Davis, United States; Email:twwey@ucdavis.edu

Sociality consists of distinct attributes, and studying the functional correlates of separate attributes offers more specific insights into the adaptive value of sociality. We determine attributes of importance, test hypotheses about the adaptive basis of individual social variation and assess the utility of the social attribute-based approach in yellow-bellied marmots, *Marmota flaviventris*. Extraction of components from network centrality measures highlighted four main social attributes: affiliative connectivity, weighted affiliation, agonistic reception and agonistic initiation. We tested relationships of these attributes and spatial overlap with reproductive success, parasites, and stress hormone metabolites. Distinct social attributes were differentially associated with female and male reproductive success, offering insights into important aspects of sociality. Social attributes had less utility for understanding variation in parasites and stress hormone metabolites. We discuss implications, benefits and limitations of a social attribute-based approach in this system and animal groups in general.

P386 Contributed Poster: PREDATION AND FORAGING 2 (Poster Session B: Thurs. eve)

INFLUENCE OF LEARNED HANDLING TIMES ON HUNTING DECISIONS IN PRAYING MANTISES

Kyle Whelan, Ethan Rundell, Jeremy Davis

United States; Email:kywhelan@gmail.com

Models of optimal diet selection assume that animals behave as though they have knowledge of relevant environmental parameters, such as the energy each prey item provides, and the amount of time required to capture and eat prey. However, in variable environments, this assumption may not be met. The present study investigates the ability of juvenile Chinese praying mantises (*Tenodera aridifolia sinensi*) to adjust their assessment of how long it takes to eat a particular prey item, and change their hunting behavior accordingly. We show preliminary evidence that at normal hunger levels, mantids experienced with easy prey travel greater distances to obtain beetles when compared with mantids trained on difficult prey. However, in starvation conditions, this observed difference decreases. This result is consistent with optimal foraging theory, which

predicts that individuals should only pursue a food source with high handling time in conditions of limited food availability. In addition, our study demonstrates the utility of a novel predation preference test for mantids, which quantifies the effort mantids will exert to obtain a particular prey item.

50 Symposium: FEMALE COMPETITION (Thursday)

FEMALE AGGRESSION AND THE EVOLUTIONARY ECOLOGY OF SOCIAL SYSTEMS

Geoff While, Tobias Uller, Erik Wapstra

University of Tasmania, Australia; Email: gwhile@utas.edu.au

Many organisms are social and the organisation and stability of social systems can have important ecological and evolutionary implications for populations and ecosystems. Because social systems emerge from individual interactions typically mediated by environmental conditions, addressing the causes and consequences of sociality requires an understanding of the links between individual behaviour, population dynamics, and natural selection. Here we show that in a social lizard species (*Egernia whitii*), social structure is dependent on behavioural responses, and in particular female aggression levels that mediate mating strategies and the quality and quantity of parental care. Specifically, increased female aggression is strongly linked to rates of extra-pair paternity, which themselves impose severe fitness costs in terms of reduced paternal care (i.e., males do not tolerate extra-pair offspring). These results suggest that the consequences of environmental quality for social dynamics will depend on the degree and direction of changes in female behaviour, with high aggression levels potentially resulting in the dissolution of social monogamy.

305 Contributed Talk: COMMUNICATION V (Friday AM)

IS BILL-WIPING A FORM OF AVIAN SCENT MARKING?

Danielle Whittaker, Dustin Reichard

Michigan State University, United States; Email: djwhitta@msu.edu

Challenges to the paradigm that birds have little sense of smell are increasing, with many studies showing that olfaction may play an important role in bird behavior. The uropygial gland of most birds produces preen oil that is applied to feathers by the bill. Volatile compounds in preen oil produce an odor with information about species, sex, and condition; birds can discriminate among individual odors. Scent marking has never been explored in birds, but is common in other animals. Bill-wiping, the repeated wiping of a bird's bill on a substrate, is widespread in songbirds and performed during courtship and aggression, but its role is poorly understood. Studies have examined its function in cleaning or honing the bill, and have generally dismissed it as a displacement behavior occurring in stressful situations. We suggest that bill-wiping may function as scent-marking behavior. We tested this hypothesis by examining bill-wiping, and the residue left behind, by male and female dark-eyed juncos (*Junco hyemalis*) in both aggressive and courtship contexts. We will discuss the implications of our findings for the role of bill-wiping as a potential territorial or courtship signal.

P193 Contributed Poster: SEXUAL SELECTION 1 (Poster Session A: Weds. eve)

MATE CHOICE DECISIONS AND THE VARIABILITY OF QUALITY AMONGST PROSPECTIVE MATES

Daniel Wiegmann, Lisa Angeloni

Bowling Green State University, United States; Email: ddwiegm@bgsu.edu

The magnitude of the variability of quality amongst prospective mates is expected to influence the mate choice decisions of searchers who adopt a fixed sample (best-of- n) or sequential (fixed threshold) search strategy. The variance of quality amongst prospective mates fails to dictate the behavior of searchers who employ either of these search strategies. The appropriate means by which to evaluate this variability is shown to depend on which search strategy is employed.

P411 Contributed Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

PROTEIN-SPECIFIC MANIPULATION OF EJACULATE COMPOSITION IN RESPONSE TO FEMALE MATING STATUS

Stuart Wigby, Laura Sirot, Mariana Wolfner

College of Wooster, United States; Email:lsirot@wooster.edu

In most insects, females store sperm for prolonged periods (up to several years in honey bees) and from multiple males. Therefore, even after mating with a male, a female can influence the reproductive success of her mate by modulating the number of sperm she stores, the timing and number of eggs she lays, and/or whether and when she mates a subsequent male. Interestingly, males have evolved their own behavioral and molecular mechanisms by which to modulate these very same female post-mating behaviors. The best understood example of such male effects involves proteins that males transfer to females during mating in their seminal fluid (seminal fluid proteins or Sfps). Evolutionary theory predicts that, if Sfps are costly and limiting, then males should strategically allocate these proteins to females in order to maximize reproductive success. We investigated variation in Sfp transfer by male *Drosophila melanogaster* in response to female mating status using ELISAs. Our results suggest that males adjust the composition of the Sfp component of their ejaculate in a sophisticated protein-specific manner consistent with predictions from evolutionary theory.

191 Contributed Talk: MATING SYSTEMS I (Wednesday PM I)

SYNERGISTIC EFFECTS OF A HYPERVARIABLE COURTSHIP PHEROMONE IN THE RED-LEGGED SALAMANDER

Damien Wilburn, Sarah Eddy, Adam Chouinard, Kari Leichty, Richard Feldhoff, Lynne Houck

University of Louisville, United States; Email:damien.wilburn@louisville.edu

During their annual mating ritual, male plethodontid salamanders deliver a mixture of non-volatile proteinaceous courtship pheromones that affect female behavior by decreasing courtship time. In *Plethodon shermani*, two major classes of pheromones have been identified. One of the components is a multi-isoform blend of 7 kDa proteins termed Plethodontid Modulating Factor (PMF) that is related to the three-finger protein superfamily of proteins, including snake venom cytotoxins and neurotoxins. In contrast to the complete pheromone mixture, a subset of PMF isoforms was previously demonstrated to increase courtship time and proposed to decrease female receptivity. In the current study, both the effects of a single recombinant isoform and a complete PMF blend were tested in staged courtship trials. While the single isoform produced no significant effect relative to saline control, the complete PMF mixture decreased courtship time equivalent to whole pheromone extract. From these data, it is hypothesized that each male synthesizes an array of PMF isoforms that must act synergistically in order to successfully stimulate any female in the population and promote reproductive success.

123 Contributed Talk: PARENTAL CARE I (Tuesday PM I)

VARIATION IN FEMALE NEST ATTENDANCE IN FLORIDA SCRUB-JAYS: CORRELATES AND CONSEQUENCES

Travis Wilcoxon, Michelle Rensel, Stephan Schoech

Millikin University, United States; Email:twilcoxon@millikin.edu

In avian species with obligate biparental care, the contribution of both members of the breeding pair is critical for the healthy development and successful fledging of offspring. With Florida scrub-jays (*Aphelocoma coerulescens*) as a study species, we investigated several factors that are predicted to influence maternal nest attendance behavior, including variation in male breeder provisioning, female breeder age, food supplementation, and the timing of clutch initiation within a given season. We also investigated the relationship between parental care and fledging success. Females were more attentive to the nest in territories that were supplemented prior to clutch initiation, as well as in those non-supplemented females whose mates delivered more food to the nest. Food availability, as well as the provisioning rates of male breeders, thus, appear to play important roles in determining female nest attendance patterns in this species. Our results also show negative

consequences of female nest absence for reproductive success, as females that were less attentive to the nest were less likely to fledge offspring.

P229 Contributed Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

COOPERATIVELY BREEDING GROUPS AS SUPERORGANISMS

Haven Wiley, Kerry Rabenold

University of North Carolina, United States; Email: rhwiley@email.unc.edu

Understanding the evolution of social organization is a challenge because aggregates of individuals can have properties that transcend the properties of the individuals themselves. The evolution of social behavior thus has parallels to other major transitions in the evolution of life, such as the evolution of eukaryotes, sexuality, and metazoans (Maynard Smith and Szathmáry 1995, Queller and Strassmann 2005, Wilson and Hölldobler 2009, Bourke 2011). When coordinated aggregates of individuals themselves acquire the basic properties of "individuals" or "organisms", they might compete as individuals ecologically and evolutionarily. In this way social groups might become units of natural selection or "superorganisms". The important question thus is, do a species' social groups have the basic properties of "individuals"? This presentation uses the Stripe-backed Wren *Campylorhynchus nuchalis*, a well-studied cooperatively breeding species (for instance, Wiley and Rabenold 1984, Rabenold 1990), to compare the properties of their social groups with those of "individuals" or "organisms". I conclude that these groups do not meet all criteria of "individuals" -- but come close!

17 ABS Allee Session: ALLEE III (Thursday PM)

COMPLEXITIES OF WOLF SPIDER COMMUNICATION: COURTSHIP SIGNAL FUNCTION ACROSS VARIABLE ENVIRONMENTS

Dustin Wilgers

University of Nebraska, Lincoln, United States; Email: dwilgers@huskers.unl.edu

In environments where signal transmission is highly variable, signalers may utilize complex signals to maintain effective communication. Male *Rabidosa rabida* wolf spiders use complex courtship signals, consisting of both visual and seismic components to attract mates. I test the hypothesis that the complex signaling of *R. rabida* contributes to male reproductive success by first examining the condition-dependence of ornamentation and the seismic signal. I found that both may provide potentially redundant information on foraging history. Next, I assessed reproductive success across manipulated signaling environments that varied in modality transmission. Both the visual and seismic modalities were used in mate choice, and pairs successfully copulated across environments in which the transmission of each signal component was independently ablated. Males also showed plasticity in courtship displays across environments, reducing the use of a visual component when visual signal transmission was ablated. Together, this suggests these complex courtship displays function as content and efficacy backups, facilitating reproductive success despite environmental variability.

68 Symposium: COGNITION AS FORAGING (Friday)

EXPECTATIONS OF CLUMPY RESOURCES INFLUENCE CHOICE OF ENVIRONMENTS TO SEARCH IN

Andreas Wilke

Clarkson University, United States; Email: awilke@clarkson.edu

How do people decide where to search? That is, if they have more than one environment or task in which they can choose to seek resources, what guides their choice of environment? When predicting the next outcome in a sequence of events, people often appear to expect streaky patterns even if the sequence is actually random. This expectation, referred to as positive recency, can be adaptive for foraging in environments characterized by resources that are clustered across space or time (e.g., expecting to find multiple berries on separate bushes). But how strong is this disposition towards positive recency? If people perceive random sequences of resource opportunities as streaky, will there be situations in which they miss out on a payoff because they prefer what is

actually an unpredictable random environment over one with an exploitable alternating pattern? To find out, participants repeatedly chose to seek resources in one of two sequences of (binary) events, presented next to each other, by betting on the next outcome of either one. One sequence comprised random events while the other sequence was either more streaky (positively autocorrelated) or more alternating (negatively autocorrelated) than chance. Most people preferred to predict purely random sequences over those with moderate negative autocorrelation and thus missed the opportunity for above-chance payoff. Positive recency persisted despite extensive feedback and the opportunity to learn more rewarding behavior over time. We discuss the implications regarding an evolved human tendency to expect streaky patterns when searching for resources, even if the environment is actually random.

P270 Contributed Poster: COGNITION AND LEARNING 2 (Poster Session B: Thurs. eve)

HEAD-COLOUR REFLECTS PERSONALITY IN THE GOULDIAN FINCH (*ERYTHRURA GOULDIAE*)

Leah Williams, Andrew King, Claudia Mettke-Hofmann

Liverpool John Moores University, United Kingdom; Email: l.j.williams@2010.ljmu.ac.uk

Personality describes the observation that animals differ consistently in their behaviour across time and context, and has been discovered in many species. However, little is known about whether an individual's physical characteristics can predict personality. The Gouldian finch exhibits colour polymorphism, the most common of which are black-headed and red-headed morphs. These colour 'morphs' have previously been found to be indicative of social dominance. Here, we tested the hypothesis that colour morphs can act as an honest signal of personality - since this would be mutually beneficial (to the signaler and receiver) in competitive and cooperative contexts. We tested four of the five personality domains and found that red-headed birds were more aggressive, but not as bold as black-headed birds, and these differences were shown to be repeatable. Age, sex and size had no effect upon these traits, and no correlation was found with object or spatial neophilia/neophobia, activity or sociability (however, activity correlated with object neophilia and spatial neophilia). These results indicate that Gouldian finches exhibit personality traits that are related to colour morph.

P370 Contributed Poster: PARENTAL CARE 2 (Poster Session B: Thurs. eve)

ANTI-PREDATOR COMPETENCE IN CONVICT CICHLIDS: OFFSPRING DEVELOPMENT, BROOD DEFENSE AND PREDATORS

Nicole Williams, Kimberley Fritel, Anthony Stumbo, Patrick Self, Jennifer Snekser, Daniel McEwen, Ellen Brisch, Brian Wisenden

Minnesota State University Moorhead, United States; Email: savageauni@mnstate.edu

Convict cichlids form monogamous pair bonds and jointly defend their free-swimming young for 4-6 wk. Reproductive success depends on the ontogeny of anti-predator competence of the young, the efficiency of brood defense as a function of attack radius and predator density. Here, we present data on the ontogeny of larval swimming performance and how that correlates with timing of skeletal ossification and brood radius from two field populations in Central America that differ in predator density. We conclude with an outline of two new experiments currently underway.

262 Contributed Talk: SEXUAL SELECTION III (Thursday PM II)

PREFERENCES FOR COLOR AND PATTERN CONTRIBUTE TO BEHAVIORAL ISOLATION IN SYMPATRIC DARTER SPECIES

Tory Williams, Tamra Mendelson

University of Maryland, Baltimore County, United States; Email: tory1@umbc.edu

Animal color patterns are among the most striking examples of biological diversity. Elaborate coloration is thought to play a role in mate choice within populations and to pose a barrier to interbreeding between species, with individuals preferring the coloration of conspecifics. Ideally, the importance of coloration as a reproductive

barrier would be tested by holding all traits constant and manipulating only color to test its effect. Here we use motorized models to test whether individuals in a pair of sexually dimorphic fish species (genus: *Etheostoma*) prefer conspecific male coloration over heterospecific. By isolating and manipulating specific components of male coloration, we show that females of both species significantly prefer conspecific male color (red vs. green) and pattern (stripe vs. bars). We also demonstrate that males significantly prefer conspecific male coloration. Further, we begin to disentangle the importance of color vs. pattern in the association preferences of the focal species. These results provide strong evidence that female preference for conspecific male nuptial coloration may play a critical role in behavioral isolation.

181 Contributed Talk: APPLIED ANIMAL BEHAVIOR II (Wednesday AM)

ADAPTIVE SIGNIFICANCE OF BEHAVIORAL PLASTICITY IN A HETEROGENEOUS ENVIRONMENT

Kelly Williams-Sieg, Donald Miles

Ohio University, United States; Email:kw114105@ohio.edu

Behavioral plasticity describes the ability of an organism to shift behaviors in order to exploit heterogeneous environments. Disturbance can create a patchy distribution of resources, and alter the abundance and prey types available to insectivorous birds. Individual birds may have to adjust foraging behaviors across patches to acquire sufficient resources. Yet, foraging behaviors are constrained by intrinsic and extrinsic factors such that alteration of one behavior may induce trade-offs with other behaviors. We compared the feeding and social behaviors of Hooded Warbler (*Wilsonia citrina*) in an undisturbed and disturbed forest in southern Ohio. We detected spatiotemporal plasticity in foraging behaviors across plots. Analysis of Similarity showed significant differences in prey attack type and foraging moves between plots. Time budget trade-offs were also observed with Hooded Warblers in the undisturbed forest devoting more time to foraging behaviors while those in the disturbed forest spent more time singing and being vigilant. These results demonstrate that behavioral plasticity in foraging in response to disturbance involves trade-offs with other life history traits.

110 Contributed Talk: SOCIAL BEHAVIOR I (Tuesday AM)

SOCIAL NETWORK POSITION: A NEW PERSONALITY TRAIT?

Alexander Wilson, Stefan Krause, Niels Dingemanse, Jens Krause

Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Germany; Email:alexander.wilson@ymail.com

The notion of network position as a personality trait offers new opportunities for research on personality traits in a social context. As such, a personality trait derived from a network position may provide a novel perspective on consistent individual differences in behaviour in the context of an individual's group or population. We discuss the requirements for network positions to be regarded as personality traits, a conceptual framework for testing the consistency of network positions in individuals and experimental evidence from network data collected using the Trinidadian guppy (*Poecilia reticulata*). Should particular individuals consistently occupy key positions in social networks then this is likely to have consequences for their fitness and potentially for that of others in the population if these positions are important for the transmission of diseases, socially learnt information and genetic material.

P271 ABS Founders Award Poster: COGNITION AND LEARNING 2 (Poster Session B: Thurs. eve)

PROSPECTIVE MEMORY IN THE RAT

Arlington Wilson, Jonathon Crystal

Indiana University, United States; Email:arlington.wilson@gmail.com

The content of prospective memory is comprised of representations of an action to perform in the future. When people form prospective memories, they temporarily put the memory in an inactive state while engaging in other activities, and then activate it in the future. Ultimately, successful activation of the memory yields an action at an appropriate, but temporally distant, time. A hallmark of prospective memory is that activation of the memory has

a deleterious effect on current ongoing activity. We hypothesized that prospective memory produces a selective deficit in performance at the time when rats access a memory representation but not when the memory representation is inactive. Rats were trained in a temporal bisection task (90 min/day). Immediately after the bisection task, half of the rats received an 8-g meal (meal group) and the other rats received no additional food (no-meal group). Sensitivity to time in the bisection task was reduced as the 90-min interval elapsed for the meal group but not for the no-meal group. This time-based prospective-memory effect was not based on a number of alternative hypotheses. Our results suggest that rats form prospective memories.

92 Contributed Talk: COMMUNICATION I (Tuesday AM)

DUTY CYCLE, NOT SIGNAL STRUCTURE, EXPLAINS RECEIVER RESPONSES TO CALLS OF THE BLACK-CAPPED CHICKADEE

David Wilson, Daniel Mennill

University of Windsor, Canada; Email: drwilson@uwindsor.ca

The chick-a-dee call of Parid birds is a structurally complex signal that conveys food- and predator-related information to conspecific and heterospecific receivers. Although it is considered among the most sophisticated signaling systems known, the basic mechanism by which it communicates information is unclear. Previous studies suggest that variation in the number of terminal notes is important, but this structural trait has not been manipulated independently from other structural traits or from sequence-level parameters such as duty cycle. We independently manipulated the fine structure and duty cycle of the calls of Black capped Chickadees, and then broadcast these calls to potential receivers. Both conspecific and heterospecific receivers ignored manipulations to the fine structure of individual calls when the duty cycle of the signaling sequence was held constant. In contrast, receivers exhibited significantly stronger responses when the duty cycle was experimentally increased and the fine structure of individual calls was held constant. These findings show that sophisticated information is communicated by a simple sequence-level trait in a structurally-complex avian signal.

P331 Contributed Poster: GENETICS AND EVOLUTION 2 (Poster Session B: Thurs. eve)

HERITABILITY OF EXPLORATORY/BOLDNESS BEHAVIORAL SYNDROME IN ZEBRAFISH

Brian Wisenden, Cory Sailer, Sonny Radenic, Randy Sutrisno

Minnesota State University Moorhead, United States; Email: wisenden@mnstate.edu

Correlated behavioral traits (behavioral syndromes) influence ecological interactions and how natural selection shapes behavioral evolution. Here, we sorted wild-caught zebrafish for increasing exploratory tendency using a serial open field maze. Highly exploratory individuals spent more time near a novel predator than non-exploratory individuals, showing behavioral consistency indicative of an exploratory-boldness behavioral syndrome. We then bred the zebrafish to create F1 offspring from four crosses: 1) Bold x Bold, 2) Shy x Shy, 3) Bold females x Shy males, and 4) Shy females x Bold males. F1 offspring were tested in a miniature exploratory maze similar to the one used to sort the adults. Personality of offspring of shy females depended on the personality of the father. F1 from Shy x Shy were the least exploratory of all offspring while F1 from Shy females x Bold males were of intermediate exploratory tendency. Offspring of bold females were always highly exploratory regardless of the personality of the father suggesting that maternal effects may influence expression of exploratory-boldness behavioral syndrome in zebrafish.

383 Contributed Talk: SEXUAL SELECTION V (Saturday AM)

MATE-CHOICE COPYING IN FEMALE ZEBRA FINCHES: DOES PREVIOUS MATING EXPERIENCE PLAY A ROLE?

Klaudia Witte, Lila Zimmermann, Nina Kniel

University of Siegen, Germany; Email: witte@biologie.uni-siegen.de

Mate-choice copying occurs when an individual observes a sexual interaction between two heterosexual conspecifics and chooses the individual as a mate as the observed individual did before. We tested two groups of

zebra finch females (*Taeniopygia guttata castanotis*) to investigate whether sexual experience can influence mate-choice copying: sexually experienced females and sexually non-experienced females. We used a standard mate-choice copying experiment with wild-type males and males artificially adorned with a red feather. After a first preference test females could observe a single wild-type male and a pair of a wild-type female with her adorned mate. We then again measured their preferences. In the first preference test non-experienced females did not discriminate between males, whereas experienced females had a tendency to prefer the natural phenotype. During the second preference test both significantly preferred the adorned over the natural phenotype. They showed no preference during the third preference test. We also found that females chose consistently without the opportunity to copy. Therefore sexual experience of a female did not influence mate-choice copying.

P356 Contributed Poster: MECHANISMS 2 (Poster Session B: Thurs. eve)

GABA, GLUTAMATE AND ANT AGGRESSIVE BEHAVIOR: INTER-SPECIFIC DIFFERENCES

Andrzej Wnuk, Wojciech Kostowski, Julita Korczynska, Anna Szczuka, Beata Symonowicz, Przemyslaw Bienkowski, Pawel Mierzejewski, Ewa Godzinska

Nencki Institute of Experimental Biology, Poland; Email:awnuk@nencki.gov.pl

Widespread involvement of gamma-aminobutyric acid (GABA) and glutamate (Glu) in the control of aggressive behavior of both vertebrates and invertebrates led us to explore the role of these compounds in the mediation of ant aggressive behavior. A new technique of HPLC measurements of GABA and Glu levels in single ant brains allowed us to analyze correlations between neurochemical variables and behavioral ones in ants from two subfamilies, *Myrmica ruginodis* (Myrmicinae) and *Formica polyctena* (Formicine), reared in queenright/queenless groups and tested in three types of dyadic aggression tests. Our study revealed striking interspecific differences. In particular, whereas in queenright workers of *M. ruginodis* paired with non-nestmates some variables quantifying overt aggression were negatively correlated with GABA levels and/or GABA:Glu ratio, in *F. polyctena* correlations between GABA and/or Glu levels and variables quantifying threatening behavior were mostly positive and were found mostly in queenless workers. These data suggest that exact links between neurochemical and behavioral variables may show profound differences between ant subfamilies.

P194 Contributed Poster: SEXUAL SELECTION 1 (Poster Session A: Weds. eve)

SIGNAL PLASTICITY AND MATE RECOGNITION IN THE PINE WOODS TREEFROG, *Hyla femoralis*

Jessica Wood

University of Missouri, Columbia, United States; Email:jawfz2@mail.missouri.edu

In the complex acoustic environment of anuran breeding aggregations, signalers are challenged to transmit signals that receivers must be able to detect and recognize. Both female preference and male competition shape the evolution of acoustic sexual signals. Often signal traits are classified as static or dynamic based on the amount of within-individual variation. Static traits have little variation, while dynamic traits can vary drastically within a single calling bout. For North American hylids, fine-scale temporal patterns are generally static. In several species, females show a strong preference for a narrow range of variation; therefore, the static nature of certain temporal traits is presumed to be crucial for mate choice. The advertisement signal of *Hyla femoralis* is characterized by a highly unusual, irregular series of pulses. Our research is the first to explicitly investigate pulse period irregularity in this group of hylids and may reveal new recognition mechanisms in females of this species. Our results suggest a strong role of competition on male signaling as well as female preference for fast rates. These factors may enhance signal detection in noisy choruses.

192 Contributed Talk: MATING SYSTEMS I (Wednesday PM I)

DO HOUSE CRICKETS STRATEGICALLY EJACULATE IN THE FACE OF SPERM COMPETITION?

Amy Worthington, Brian Gress, Abigail Neyer, Clint Kelly

Iowa State University, United States; Email:aworthin@iastate.edu

Sperm competition theory predicts that males should strategically adjust their ejaculate expenditure according to the number of competing ejaculates because sperm production is costly. That is, males should provide females with larger or higher quality ejaculates when one rival male is present (high risk) but then decrease ejaculate size or quality as the number of rivals increases past one (increasing intensity). We tested this hypothesis in the lab by subjecting male domestic crickets (*Acheta domesticus*) to increased sperm competition risk (one rival male) and intensity (two rival males) and then measuring the ejaculate's sperm number and viability (proportion of living sperm). Contrary to prediction, our results suggest that male *A. domesticus* do not strategically adjust either ejaculate size or quality in the face of increasing sperm competition. However, that males did not decrease their ejaculate size under increased intensity is similar to other empirical studies across taxa.

P332 Contributed Poster: GENETICS AND EVOLUTION 2 (Poster Session B: Thurs. eve)

THE GENETIC ARCHITECTURE OF FEAR: A QTL AND EQTL EXPERIMENT IN THE CHICKEN

Dominic Wright, Per Jensen, Martin Johnsson

Linköping Universitet, Sweden; Email:domwright@gmail.com

The genetic analysis of phenotypes and the identification of the causative underlying genes remains central to molecular and evolutionary biology. By utilizing the domestication process it is possible to exploit the large differences between domesticated animals and their wild counterparts to study the genetic mechanisms causing such changes. One of the strongest domestication effects is a reduction in fear-avoidance and anti-predator behaviour relative to their wild-counterparts. To map the genetic architecture of these changes we generated an 8th generation advanced intercross between domestic chickens and their wild ancestor the red junglefowl. 575 chickens were genotyped for 650 SNPs and assayed for four different behavioural assays (open field test, social reinstatement, tonic immobility and novel object inspection), with a subset of these birds (n=130) also used in an eQTL experiment. Hypothalamus RNA samples from each individual were run on a Nimblegen microarray, with these expression phenotypes then being utilized in the same manner as a normal QTL trait. QTL and eQTL results have been combined to identify several putative causative genes for behavioural traits.

172 Contributed Talk: COMMUNICATION II (Wednesday AM)

THE ROLE OF VOCAL COMMUNICATION IN HYBRIDIZATION BETWEEN POLYGYNOUS DEER SPECIES

Megan Wyman, David Reby

University of Sussex, United Kingdom; Email:wyman.mt@gmail.com

Reproductive isolating mechanisms are integral to the process of speciation and breakdowns in interspecific barriers can lead to hybridization. These isolating mechanisms often include species-specific signals in the context of. Vocal communication in the context of sexual selection is used extensively by many polygynous deer species and theoretically should present reproductive barriers to hybridization. However, interspecific breeding is known to occur between several species of cervinae, pointing to breakdowns in reproductive barriers. Our project examines the possible contribution of vocal behavior to species discrimination in the context of mate competition and attraction in two closely related species of polygynous deer, red deer and sika deer, which are known to hybridize in the wild. Playback experiments were conducted on captive females in controlled two-speaker choice experiments as well as on free-living male and female groups during the breeding season. Differences in reactions to conspecific vs. heterospecific vocalizations between the sexes or species point to possible weaknesses in reproductive barriers and potential sources of hybridization and introgression.

P447 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

SHOAL CHOICE IN KILLIFISH (*APHANIUS CHANTREI*) (GALLIARD, 1895), AN ENDEMIC SPECIES FROM TURKEY

Elif Yamac, Serdar Öncül

Anadolu University, Turkey; Email: eerdogdu@anadolu.edu.tr

Social groups are widespread in the animal species. Group living provides benefits such as enhanced foraging opportunities and reduction predation risk. Structure of a group generally is nonrandom in different animal species. A number of different factors affect decision of shoal preferences in fish species likewise body size, group size and age. In this study, it was investigated the roles of diet, familiarity, group size and body size for association preferences in Killifish (*Aphanius chantrei*) an endemic species from Turkey. It was found that, individuals fed sludge worm was preferred not only by fish feeding with similar diet but also by fish feeding with flake food. In addition, individuals fed sludge worm associated with familiar. When tested for group size, it was found tendency to join the largest group in the groups of 1:2, 3:5 and 2:6. But there was no significant choice in other studied groups (2:3, 3:4, 4:5). Lastly, it was found that individuals associated with same or larger body size. According to our results all studied factors affect shoaling behavior in Killifish.

124 Contributed Talk: PARENTAL CARE I (Tuesday PM I)

MALE ALARM CALLING, NESTLING BEGGING AND FEMALE PROVISIONING IN RED-WINGED BLACKBIRDS

Ken Yasukawa, Jacy Bernath-Plaisted

Beloit College, United States; Email: yasukawa@beloit.edu

Parent-offspring interactions such as nestling begging and parental provisioning can attract nest predators and reduce reproductive success. We might expect, therefore, that parents and their offspring have ways to minimize predator-attracting cues when predators are near the nest. Male red-winged blackbirds (*Agelaius phoeniceus*) are well known for their anti-predator alarm calls, which transmit vocal cues about the approach of potential nest predators. One way to reduce predator-attracting cues would be for nestlings to switch to silent begging upon hearing a male alarm call. To test this possibility, we used observations and a male alarm-call playback experiment to examine the vocal begging behavior of nestling red-winged blackbirds. Additionally, we used observational data to investigate the possibility that females respond to these alarm calls by staying away from the nest to avoid revealing its location to predators using visual cues.

P230 Contributed Poster: SOCIAL BEHAVIOR 1 (Poster Session A: Weds. eve)

FOR SMALL SOCIAL HUNTSMAN SPIDERS IN A SATURATED HABITAT, THERE IS NO PLACE LIKE HOME

Eric Yip, Linda Rayor

Cornell University, United States; Email: ecy7@cornell.edu

Group living through the delayed dispersal of offspring is one of the primary routes to sociality. Individuals of a variety of animals are known to postpone dispersal from the natal territory when suitable habitats are saturated; however, this has never been demonstrated in spiders. The huntsman spider, *Delena cancerides*, is unusual among social spiders in forming groups under bark without a capture web, and suitable pieces of bark are often fully occupied at collection sites. Here, we show that offspring in these colonies benefit from delaying dispersal until maturity by demonstrating that dispersing while small is costly. We collected spiders at 30 sites, reared them to adulthood, marked them, and released them back into the field. We set up nest boxes and measured the number of available retreats at each site. We found that sites with fewer available retreats had greater nest box occupancy, larger nest box occupants, and more frequent usurpation of nest boxes by other spiders. Usurping spiders were usually larger than the ousted resident. Spiders therefore benefit by staying in the natal bark retreat until they are large and the most competitive for a retreat.

P357 Contributed Poster: MECHANISMS 2 (Poster Session B: Thurs. eve)

BEHAVIORAL AND HORMONAL CORRELATES OF REDNECKS IN MASCULINIZED FEMALE THREESPINE STICKLEBACKS

Lengxob Yong, Devaleena Pradhan, Matthew Grober, Jeffrey McKinnon
East Carolina University, United States; Email: yongl09@students.ecu.edu

Female coloration in the form of "masculinized" traits, has been perplexing, and mechanisms underlying their evolution remained unresolved. Such traits are often correlated with agonistic behaviors, suggesting co-evolution by a common mechanism. Sex hormones are a candidate, potentially facilitating their expression and evolution as a correlated response to selection for hormone-mediated aggression during intrasexual competition. I examined the relationship between hormones, aggression and a male typical trait, red throat coloration, found in female sticklebacks. Using behavioral and hormonal assays, I tested whether 11-ketotestosterone, testosterone, and 17- β estradiol are associated with female red throats linked with aggression and redder females are more aggressive and have a higher hormonal response to a social intrusion. No hormones were unequivocally correlated with red intensity or aggressive behaviors, and redder females were not more aggressive. Females also displayed a decreasing hormonal response after the social intrusion, suggesting that variation in androgens, often linked with males' ornaments and behaviors, may not underlie variation in female throat intensity.

356 Contributed Talk: COGNITION AND LEARNING VII (Saturday AM)

COSTS AND BENEFITS OF VOCAL IMITATION IN BUDGERIGARS: A TEST OF THE PASSWORD HYPOTHESIS

Anna Young, Timothy Wright

New Mexico State University, United States; Email: annay@nmsu.edu

In budgerigars (*Melopsittacus undulatus*), vocal imitation of a flock's shared contact call by an immigrant bird has been demonstrated, but the function of vocal imitation by immigrants remains unclear. The 'password hypothesis' states that shared signals act as badges of group membership that allow individuals access to group benefits. We simulated immigration in captive budgerigars to determine if there is a social cost to immigrant birds which do not share the flock call, and if these costs are alleviated once the immigrant imitates the flock call. We recorded contact calls, affiliative and aggressive behavior and analyzed fecal glucocorticoid metabolites as an indicator of stress levels. Contrary to predictions, immigrants were not subject to more aggression than controls, and immigrant stress hormones rose acutely but returned to baseline levels before they imitated the flock's dominant shared call. An analysis of rare call types revealed that imitation occurred faster than previously reported and that some flocks imitated immigrants. Our findings question the underlying assumption that group membership is exclusive and suggest alternative functions for vocal imitation.

P11 Contributed Poster: APPLIED ANIMAL BEHAVIOR 1 (Poster Session A: Weds. eve)

BEHAVIORS RELATED TO MARKING, OLFACTION AND SCENT DETECTION IN LUMHOLTZ'S TREE KANGAROO

Emma Young

Vassar College, United States; Email: emyoung90@gmail.com

This study focuses on gaining a better understanding of marking, olfactory, and scent detection behavior in the cryptic Lumholtz's tree kangaroo (*Dendrolagus lumholtzi*), with emphasis on potential aversion to novel environments and unfamiliar conspecific scents. A blind female subject was observed in three control trials, three experimental trials in which novel structures were inserted into her environment, and three experimental trials in which male pellets and paraoccal gland samples were exposed to the subject. All behaviors related to olfaction were described in a comprehensive ethogram. The subject was not averse to either the novel objects in her enclosure, or the paraoccal gland samples from an unfamiliar male. Conversely, she rejected the scent of the pellets from the unfamiliar male. Tongue flicking and potential flehmen behavior were observed in the subject in both experimental trial types, indicating a potentially well-developed vomeronasal organ in the species. Further studies on olfaction in *D. lumholtzi* are incredibly important in terms of understanding how territoriality and novel environments affect species dispersal across fragmented and damaged landscapes.

P89 ABS Genesis Award Poster: ECOLOGICAL EFFECTS 1 (Poster Session A: Weds. eve)

OLFACTION IN THE COLORADO POTATO BEETLE

Kristina Zabierek

Queens College, United States; Email:kzabierek100@gmail.com

Resistance to pesticides often has negative deleterious effects that can negatively affect physiology and behavior, including olfaction. The olfactory response of the Colorado Potato Beetle (*Leptinotarsa decemlineata*) was tested using a Y-maze olfactometer with various concentrations of potato plant (*Solanum tuberosum*) odors. Two populations were tested for olfactory response; New Jersey, which is susceptible to Imidacloprid and Mac, which is resistant to this pesticide. Although initial tests were inconclusive and attributed to chance, final results are pending in comparing the two populations.

P448 Contributed Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

CHICK-A-DEE CALL VARIATION IN THE CONTEXT OF 'FLYING' AVIAN PREDATOR STIMULI

Chris Zachau

United States; Email:zachauce@gmail.com

Chick-a-dee calls function in social organization in *Poecile* (chickadee) species. Recent field and aviary studies have found that variation in chick-a-dee calls relates to the type of avian predator or level of threat. Here we tested whether 'flying' avian predator and control models influenced chick-a-dee calling behavior of wild Carolina chickadees, *Poecile carolinensis*. Chickadee subjects were presented with wooden models that were painted to resemble either a predatory sharp-shinned hawk (*Accipiter striatus*) or a blue jay (*Cyanocitta cristata*) and that were made to 'fly' down a zip line near a feeding station chickadees were using. Our findings on call variation in this moving predator context suggest some interesting similarities and differences with experimental findings with congeners. Finally, increased production of certain notes to the detected 'flying' of both model types provides support for a "Better Safe than Sorry" strategy. When costs of alarm calling are low but costs of discriminating potentially serious threats may be extremely high, individuals should err on the side of false positives, and should alarm call to any potentially threatening stimulus.

P239 Contributed Poster: APPLIED ANIMAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

STEREOTYPIC BEHAVIOR OF AYE-AYES *DAUBENTONIA MADAGASCARIENSIS* AT ZOO FRANKFURT/MAIN, GERMANY

Stephan Zander

Germany; Email:stephan-zander@web.de

Stereotypic behavior often occurs to captive or zoo animals due to monotone daily routine and the lack of naturally stimuli. Environmental enrichment fitted to the needs of concerned animals can provide a remedy for stereotypic behavior. The influence of various environmental enrichments on the diurnal activity pattern of two Aye-Ayes (*Daubentonia madagascariensis*) at Zoological Garden Frankfurt was in the focus of this study. In the beginning of the observation the normal behavior of the animals was observed. Afterwards, the behavior due to the influence of enrichment was gathered. Considering the fact that the Aye-Ayes in this zoo show a form of stereotypic behavior, called Pacing, the enrichment was designed to be suitable for the biology and behavior of Aye-Ayes. The main aim was to reduce this stereotypical motion pattern and to increase the welfare of these animals. After specific enrichment was provided the stereotypic behavior was significantly reduced and the welfare of the animals was influenced in a positive way.

148 Contributed Talk: SEXUAL SELECTION II (Tuesday PM II)

MALES PREFERENCE FOR SPOTTY FEMALES. NOT EVERYONE HAS THE NUMBERS TO WIN A MATE

Valeria Zanollo, Matteo Griggio, Jeremy Robertson, Sonia Kleindorfer
Flinders University, Australia; Email:zano0006@flinders.edu.au

The controversial idea of female male choice on the basis of their ornaments has only been recently developed. The Diamond Firetail is an endemic Australian finch. Both sexes exhibit a striking plumage characterized by white spots on the black flanks. Females have significantly more spots than males, and in females spot number is related to cell-mediated immune response (PHA-test) during the breeding season. During the sexual display, spots are exposed by males, but also by females when approaching a displaying male. These observations suggest the number of female spots could be a criterion in male mate preferences. Here we report on two experiments on male mate selection. In the first, males chose from three groups of females that had few, modal or many natural spots. In the second experiment, we manipulated the spot number so the previous 'many spot' females became the 'few spot', 'modal' females become 'many spot' and the 'few spot' become the 'modal'. We found that in both experiments males prefer to spend time with the females with modal or many spots, confirming the number of female spots is a reliable signal that males might use to assess female quality during mate choice.

P248 ABS Founders Award Poster: BEHAVIORAL COMMUNITY ECOLOGY 2 (Poster Session B: Thurs. eve)

COMPETITION OF GEESE SPECIES FOR NESTING AREA NEAR PEREGRINE FALCON NESTS ON KOLGUEV ISLAND.

Elmira Zaynagutdinova

Saint Petersburg State University, Russia; Email:zem9@rambler.ru

Our research was made in Russian Arctic on Kolguev Island in Barents Sea. This small island (5000 sq. km) is extremely important for geese. 15% (750000) of all Eurasian geese (5 million) spend summer there. 3 geese species (white-fronted geese, barnacle geese and bean geese) breed there. Number of barnacle geese is still increasing there. Geese breed all over the island, but their concentrations are higher near Peregrine falcons, because falcons protect their nesting area from gulls and arctic foxes. Geese use this protection and build their nests near falcons. Nesting success of geese is much higher near falcons according to our calculations. As result there is a competition between geese for nesting area near falcons. Barnacle geese are more aggressive than white-fronted and bean geese. We observed that nests of barnacle geese are situated closer to falcons than nests of other geese. We calculated date of nest initiation according to egg's weight loss. The most successful geese breed earlier and closer to falcons as result of competition.

P343 ABS Founders Award Poster: MATING SYSTEMS 2 (Poster Session B: Thurs. eve)

COOPERATIVE BREEDING IN KALIJ PHEASANT (*LOPHURA LEUCOMELANOS*) : THE ROLE OF HABITAT SATURATION

Lijin Zeng

University of California, Riverside, United States; Email:lijin.zeng@gmail.com

In a comparatively isolated 40-ha forest patch in Hawai'i, introduced Kalij Pheasants attain an unusually high density of ~4 birds per hectare, and most (~63%) occur in a polyandrous breeding group of multiple males and one female, with one male dominant. Banding studies show some males are former offspring from the breeding group, and some flock males are brothers. Although chicks are precocial, they receive some parental care from all adult group members including subordinate males, indicating a cooperative breeding relationship among flock males. I hypothesize that cooperation reflects a shortage of breeding opportunities due to habitat saturation, and thus sexually-mature subordinate male helpers will form new breeding groups with female floaters (non-group affiliated birds) if new breeding sites become available. In winter 2011, I removed 14 of 30 groups in the population to create empty breeding sites. Initially, the 16 groups remaining resolved into 29 new groups. In total, 14 subordinate males in old groups left to form new breeding groups with floater females. The majority of new groups were socially monogamous.

P412 ABS Founders Award Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

SOCIALLY MONOGAMOUS MALE PRAIRIE VOLES RECOGNIZE MALE, BUT NOT FEMALE IDENTITY.

Da-Jiang Zheng, Britta Larsson, Alex Ophir

Oklahoma State University, United States; Email:dj.zheng@okstate.edu

Intuitively, social recognition plays a fundamental role in mating behavior and social monogamy. Territorial males must know the identity of neighboring males to successfully defend boundaries. Single males should recognize female identity if mating opportunities depend on female pairing status. Here, we test the social recognition capabilities of the socially monogamous prairie vole (*Microtus ochrogaster*). We began by using a standard 'habituation/dishabituation' paradigm to ask if males recognize novel males or females. Our results indicate that males learn the identity of males, but not females. To confirm the apparent lack of recognition of females was not an artifact of our testing paradigm, we employed the more sensitive 'social discrimination test', in which two females are presented simultaneously throughout the test. Again, males were unable to recognize female identity. Taken together our data indicate social recognition responses depend on the social context. We speculate that the ability to recognize males but not females reflects selective pressures that have operated to enhance male territorial behavior, and indiscriminate mate selection.

235 Contributed Talk: COGNITION AND LEARNING IV (Thursday PM I)

EPISODIC-LIKE MEMORY IN RATS

Wenyi Zhou, Jonathon Crystal

Indiana University, United States; Email:zhouw@indiana.edu

Episodic memory provides information about what, where and when a unique event occurred, which may be important for brood parasitism, mating and food caching in animals in nature. An important feature of episodic memory is that people can report details about an event when they were not expecting to have their memory probed. We conducted three experiments to determine if rats can answer an unexpected question. Chocolate replenishment was trained in one room, and then rats were asked to report about a recent event (chocolate [Experiment 1] or sucrose [Experiment 2]) in a different room, where they had no expectation that the memory assessment would occur. Rats incidentally encoded the presence or absence of food when searching for food in a radial maze. Subsequently, they were unexpectedly asked to report if they had eaten or not (Experiment 3). In each experiment, rats answered an unexpected question. Our studies provide converging lines of evidence that rats remember a specific earlier episode and contribute to the validation of a rodent model of episodic memory.

365 Contributed Talk: COMMUNICATION VI (Saturday AM)

ACOUSTIC EVALUATION IN A NON-PRIMATE MAMMAL, THE TREE SHREW, NOT SOLELY AFFECTED BY CONTEXT

Elke Zimmermann, Wiebke Konerding, Jennifer Brunke, Simone Schehka

University of Veterinary Medicine, Germany; Email:elke.zimmermann@tiho-hannover.de

Sound categorisation plays a crucial role for processing ecological and social stimuli in a species' natural environment. We applied the reciprocal habituation-dishabituation paradigm to a non-primate mammal, the tree shrew, to explore to what extent non-primate mammals share the ability to evaluate communication calls with primates. Playback stimuli were three types of communication calls, differing distinctively in context and acoustic structure, as well as two artificial control sounds, differing solely in frequency. We assessed the attention towards the playback stimuli by the latency to respond to the test stimulus. Subjects evaluated two pairs of communication call types as well as the artificial playback stimuli. Attention towards the test stimuli differed significantly in strength for one pair of communication calls (by trend for the other one), with subjects dishabituating faster to one category than the other. Interestingly, subjects did also evaluate the artificial control sounds. Findings provided first evidence that in non-primate mammals acoustic evaluation is not solely affected by context, but also linked to other cues, such as peak frequency and unusualness.

P413 Contributed Poster: SEXUAL SELECTION 2 (Poster Session B: Thurs. eve)

FEMALE MATE PREFERENCE IN MICE DEPENDS ON MALE QUALITY AND FEMALE EARLY EXPERIENCE

Lea Zinck, Susana Lima

Champalimaud Neuroscience Program, Portugal; Email:leazinck@gmail.com

Mate choice is a key driving force of evolution but the proximate mechanisms allowing mate assessment in the brain are still unknown. In order to understand how mate value and preferences are translated into the appropriate choice, we have established a behavioral paradigm where the subjective value of prospective mates can be manipulated. Our behavioral paradigm takes advantage of a natural situation occurring in Europe where two subspecies of mouse, *Mus musculus musculus* and *M. m. domesticus*, form a narrow hybrid zone, and show asymmetric mate choice. By using inbred strains of mice we were able to translate this situation into laboratory conditions and to control female preference in a reproducible way. In particular, *musculus* females exhibit a strong homosubspecific preference, as the one found in nature, that is stable over time and reproducible across individuals (n=54). However if females are fostered in a *domesticus* environment they show a reversed preference (n=16). This situation therefore allows us to compare the neuronal representation of the same stimulus male which has a different value, depending on the female's early experience.

211 Contributed Talk: COMMUNICATION III (Thursday AM)

IMPACTS OF NOISE EXPOSURE ON SONG LEARNING AND PRODUCTION IN GREAT TITS, PARUS MAJOR

Sue Anne Zollinger

Max Planck Institute for Ornithology, Germany; Email:zollinger@orn.mpg.de

Anthropogenic noise has been linked to changes in the vocal behaviour of many bird species. In one well-studied example, great tits living in noisy urban areas sing with higher minimum frequencies than great tits in quieter rural areas. Many hypotheses have been proposed to explain differences between rural and urban great tit songs, but little is known about the developmental mechanisms underlying changes in song behaviour. Like human speech, birdsong is learned by listening to and copying adult tutors during a sensitive phase in ontogeny. Noise may interfere with sensory or sensory-motor feedback and thus impair song learning. I hand-reared great tits in the laboratory and exposed them to different background noise conditions during their first year. Birds were tutored with recordings of great tit songs that varied in frequency range and acoustic structure. When the birds reached maturity, I recorded their song repertoires from birds in each noise condition and compared them with those of tutor songs. The results will show whether noise exposure can account for changes in song pitch. In addition, I discuss the impact of noise exposure on the timing and accuracy of song learning.

392 Contributed Talk: SOCIAL BEHAVIOR VII (Saturday AM)

KINSHIP AND PAY-TO-STAY AFFECT REPRODUCTIVE INVESTMENT AND BROOD CARE OF FEMALE HELPERS

Markus Zöttl, Noémie Chervet, Michael Taborsky, Dik Heg

Universität Bern, Switzerland; Email:markus.zoetl@iee.unibe.ch

Kin selection is assumed to be important for reproductive skew and helping behaviour in cooperative breeders. However, studies in vertebrates are usually limited to an observational approach because kinship is difficult to vary experimentally. We manipulated kinship between females and tested for effects on reproduction and brood care in the cichlid *Neolamprologus pulcher*. Relatedness increased subordinate females' investment in reproduction due to a rise in egg mass, while clutch size and clutch number remained unaffected. Subordinates provided more alloparental and maternal brood care in the non-kin treatment, which was not reciprocated by the dominant females suggesting kin dependent pay-to-stay as a mechanism. Importantly dominants' reproductive performance as well as their brood care were independent of treatment, which confirms pay-to-stay theory stating that subordinates should only compensate for the costs inflicted to dominants. Our results stress the

importance of interactions between different evolutionary hypotheses aiming to explain cooperative breeding. Despite having large impact, mechanisms can be obscured unless scrutinized by controlled experiments.

193 Contributed Talk: MATING SYSTEMS I (Wednesday PM I)

ACOUSTIC EXPERIENCE SHAPES MATING BEHAVIOR & FACILITATES ESTABLISHMENT OF A NOVEL TRAIT IN CRICKETS

Marlene Zuk, Nathan Bailey

University of California, Riverside, United States; Email:marlene.zuk@ucr.edu

The Pacific field cricket *Teleogryllus oceanicus* is subject to an acoustically-orienting parasitoid fly, and a silent male morph, controlled by a single sex-linked gene, evolved within 20 generations in some populations in Hawaii. These flatwings are protected from parasitism, but face difficulties in mate attraction and courtship. Such problems may have been overcome, and the rapid evolution of a sexual signal facilitated, by pre-existing behavioral plasticity, with individuals responding to silent environments, like those with the flatwings, by altering their response to conspecifics. Males reared in an environment mimicking a population with few calling males were more likely to exhibit satellite behavior, while females reared in silent conditions were less discriminating of male calling song and more responsive to playbacks, compared with females that experienced song during rearing. Variation in this plasticity could explain the paucity of examples of rapidly-evolving secondary sexual characteristics.

P195 ABS Genesis Award Poster: SEXUAL SELECTION 1 (Poster Session A: Weds. eve)

FEMALE MATE CHOICE FOR SAND STRUCTURES IN THE FIDDLER CRAB *UCA MUSICA*: IS TALLER BETTER?

Alison Zulick, Denise Pope

Mount Holyoke College, United States; Email:zulic20a@mtholyoke.edu

In many species, females have multiple male traits they can use to assess potential mates. Individual females may use information from these various traits differently, resulting in variation in female mate preference. Fiddler crabs are ideal for investigating female mate-searching based on multiple male signals; in *Uca musica*, females can assess potential mates based on male size, courtship displays, sand structures (called "hoods"), and burrow quality. I focused on female attraction to hoods alone and in combination with other male traits. Mate-searching females preferentially approach males with hoods. When I examined female preference for hood height in isolation, I found that females preferentially orient to taller hoods. However, this preference disappeared when I measured female response to taller hoods in the presence of males. These data indicate that while females may be more attracted to taller hoods, this preference does not override female response to other male traits. In addition, variation in male size, hood height, and hood width do not explain variation in male attractiveness to females, suggesting that females may vary in their preference for male traits.

P272 Contributed Poster: COGNITION AND LEARNING 2 (Poster Session B: Thurs. eve)

HOW DO SALTICID SECONDARY EYE OPTICS CORRELATE WITH VISUALLY GUIDED BEHAVIOR?

Daniel Zurek, David O'Carroll, Ximena Nelson

Macquarie University, Australia; Email:daniel.zurek@gmail.com

Jumping spiders (Salticidae) are equipped with an intricate modular visual system, consisting of three distinct pairs of eyes. The sophisticated optics of the forward-facing primary eyes have been extensively investigated, as has their input on visually guided behaviour. The two secondary eye pairs mediate orientation turns, whole-body optomotor responses, that bring relevant visual stimuli into a fixation region in the frontal visual field. Of their optical arsenal, salticid anterior lateral (AL) eyes are particularly interesting because they possess a wide field of view as well as remarkable acuity. We examined motion detection by the AL eyes by eliciting turns in response to small computer-generated targets, as well as to video footage from the spiders' habitat. We obtained the range

of stimulus characteristics to which turns are preferentially mediated, and generated a map of the 'response field' of the AL eyes. This was then correlated to an ophthalmoscopic receptor density map. Furthermore, we obtained velocity and magnitude characteristics of whole-body saccades made during tracking sequences, which underline their apparent similarity to vertebrate eye saccades.

P344 Contributed Poster: MATING SYSTEMS 2 (Poster Session B: Thurs. eve)

SONG VARIATION IN CAROLINA CHICKADEES (*POECILE CAROLINENSIS*) AND IMPLICATIONS FOR HYBRIDIZATION

Karen Zusi, Robert Curry

Villanova University, United States; Email:karen.zusi@villanova.edu

In songbirds, female mate choice is driven by a variety of factors, especially male song performance. I investigated the dynamics of song structure in a population of pure Carolina chickadees (*Poecile carolinensis*) in eastern Pennsylvania in order to describe the use of song repertoires in relation to patterns within a nearby hybrid zone between Carolina and black-capped chickadees. Using dawn chorus recordings gathered south of the hybrid zone, I analyzed song notes and their patterns of use, and determined that Carolina chickadees possess two distinct songs which can be quantitatively separated based on note pitch and duration. Carolina chickadees use these two songs during dawn chorusing in patterns of long runs that do not resemble patterns recorded in the hybrid zone. My results suggest that the structure of the Carolina repertoire is currently different from that of the hybrid, although the hybrid repertoire continues to change and may be growing more Carolina-like over time.

P449 ABS Founders Award Poster: SOCIAL BEHAVIOR 2 (Poster Session B: Thurs. eve)

HOUSE FINCH SOCIAL BEHAVIOR VARIES WITH IMMUNE FUNCTION AND PARTNER HEALTH TO REDUCE INFECTION RISK

Maxine Zylberberg, Kirk Klasing, Thomas Hahn

University of California, Davis, United States; Email:mzylberberg@ucdavis.edu

The importance of behavior in human disease dissemination has long been recognized by the scientific community. In contrast, in studies of wildlife disease dynamics, behavioral variation has received less attention. The immunocompetence handicap hypothesis (IHH) suggests that testosterone activity mediates trade-offs between secondary sexual characters (including behavior) and immune function, which could have important implications for disease transmission. However, the IHH has been the subject of numerous ambiguous and contradictory studies. Here, we hypothesize a broad relationship between individual behavior and immune function. We test both the IHH and our alternate "disease defense trade-off hypothesis" in captive house finches (*Carpodacus mexicanus*). We find that individuals alter behavior in response to social partner health status, and that behavior towards sick partners is correlated with individual immune status. We conclude that the relationship between behavior and immune function is more complex than previously thought and demands further attention to understand the ramifications of individual immunological and behavioral variation for disease ecology in wildlife.