



HAL
open science

Seasonal incidence, sex-ratio, and population cohorts of hinge-back tortoises (genus Kinixys) in the wild and in bush-meat markets of the Niger delta, southern Nigeria: Are human predation effects random ?

Luca Luiselli, Edoardo Politano, Godfrey C. Akani

► To cite this version:

Luca Luiselli, Edoardo Politano, Godfrey C. Akani. Seasonal incidence, sex-ratio, and population cohorts of hinge-back tortoises (genus Kinixys) in the wild and in bush-meat markets of the Niger delta, southern Nigeria: Are human predation effects random ?. *Revue d'Écologie (La Terre et La Vie)*, 2003, 58 (2), pp.243-248. <hal-03529952>

HAL Id: hal-03529952

<https://hal.science/hal-03529952v1>

Submitted on 17 Jan 2022

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 destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



HAL Authorization

NOTE BRÈVE

SEASONAL INCIDENCE, SEX-RATIO, AND POPULATION COHORTS OF HINGE-BACK TORTOISES (GENUS *KINIXYS*) IN THE WILD AND IN BUSH-MEAT MARKETS OF THE NIGER DELTA, SOUTHERN NIGERIA : ARE HUMAN PREDATION EFFECTS RANDOM ?

Luca LUISELLI¹, Edoardo POLITANO² & Godfrey C. AKANI³

RÉSUMÉ

Trois espèces de tortues (*Kinixys belliana nogueyi*, *Kinixys erosa* et *Kinixys homeana*) se rencontrent dans les mosaïques forêt-plantations du delta du Niger, dans le sud-est du Nigéria où elles sont activement chassées par les populations humaines locales qui les utilisent pour leur subsistance et leur médecine traditionnelle. Dans cet article, nous confrontons les effectifs de tortues vendues sur les marchés de viande de brousse à ceux observés dans la nature, pour voir si la pression de chasse est aléatoire ou orientée vers un sexe ou une cohorte (adultes ou jeunes) particulière ou effectuée durant une période donnée. Il apparaît que (1) l'intensité relative de l'activité mensuelle terrestre des tortues influence fortement le nombre relatif de spécimens mensuellement vendus sur les marchés ; (2) la pression de chasse exercée par les populations humaines locales correspond à celle d'un prédateur généraliste, sans différence apparente entre les espèces et les sexes des tortues capturées ; (3) les juvéniles de *K. homeana* et de *K. erosa* sont les seules catégories d'animaux que les humains ne chassent pas en fonction de leur disponibilité locale.

SUMMARY

Three species of hinge-back tortoises (*Kinixys belliana nogueyi*, *Kinixys erosa*, and *Kinixys homeana*) are found in the forest-plantation mosaics of the Niger Delta region, in south-eastern Nigeria, where they are actively hunted by local people communities for subsistence and traditional medicine. In this paper, the numbers of tortoises traded in bush-meat

¹ F.I.Z.V. and Environmental Studies Centre "Demetra", via Olona 7, I-00198 Rome, Italy. E-mail: lucamlu@tin.it

² Environmental Studies Centre "Demetra", via Rossini 2A, Fano (PS), Italy. E-mail: politano.eco@tin.it

³ Department of Biological Sciences, Rivers State University of Science and Technology, P.M.B. 5080, Port Harcourt (Rivers State), Nigeria. E-mail: gakanina2000@yahoo.com

markets is contrasted to the numbers of tortoises found in the wild, to test whether the pressure of human hunters is random, or if it is biased towards a specific sex, population cohort (adults or juveniles), or monthly period. We concluded that: (1) the relative monthly intensity of above-ground activity of tortoises strongly influenced the relative monthly numbers of traded specimens in the bush-meat markets; (2) the pressure of local people on free-ranging tortoises is similar to that of a generalist predator, without apparent differences between species or sexes; (3) the juveniles of both *K. homeana* and *K. erosa* were the only category of animals which were not preyed upon by humans depending on their local availability.

INTRODUCTION

The decline of tortoises and freshwater turtles has been a large-scale environmental problem in the recent years, especially in the developing countries of Asia (Van Dijk *et al.*, 2000) and Africa, where these animals are traded for both food and traditional medicine (e.g., Lawson, 2000, 2001). In the African countries, there are several species which are declining due to the excessive removal of free-ranging specimens by humans, both for the international pet trade and for subsistence reasons, and the latter set of reasons seems to be even of greater relevance than the former (Lawson, 2000). In particular, the hinge-back tortoises (genus *Kinixys*) are especially vulnerable also for the habitat loss and fragmentation, other than for the hunting pressure itself (Luiselli *et al.*, 2000). Indeed, these tortoises are common items found in bush-meat markets of forest regions (Fa, 1992; Lawson, 2000). Although these tortoises have been subjected to careful research during the recent years, particularly in Cameroon (Lawson, 2000, 2001) and Nigeria (Luiselli *et al.*, 2000; Luiselli, submitted *a, b, c*), there is relatively little information on the threats to specific population cohorts and sexes, and on the seasons in which these reptiles are captured by people. In this paper, we test whether the pressure of human hunters is random, or if it is biased towards a specific species, sex, population cohort (adults or juveniles), or monthly period. We used two sympatric species of hinge-back tortoises (*Kinixys homeana* and *Kinixys erosa*) as study cases, and an area of plantation-forest mosaic inside the Guinea-Congo rainforest belt (i.e. Niger Delta, in southern Nigeria) as study territory.

MATERIALS AND METHODS

STUDY AREAS

Data were collected, from September 1996 to January 2002, in south-eastern Nigeria (eastern side of the Niger Delta – Bayelsa State, capital: Yenagoa; Rivers State, capital: Port Harcourt; Anambra State, capital: Onitscha –, Uyo and Eket areas in Akwa-Ibom State, and Ugep, Akamkpa, and Calabar areas in Cross River State), where rainforest fragments (generally of the seasonal swampy type) are interspersed into a mosaic of farms, plantations, marshes, and urban centres. A detailed description of the study sites where most of the data were collected is presented in Luiselli *et al.* (2000).

METHODS

The main proteic source of Niger Delta tribes is the wildlife, which is normally captured by traditional hunting practices (Ojonugwa, 1986). Wildlife is traded in local bush-meat markets, which are found along the main roads and in the riverine villages (Ojonugwa, 1986). We visited all the bush-meat markets situated along the courses of the rivers Sambreiro (= Sombreiro) and Orashi, and those in the vicinities of the following urban centres: Yenagoa, Sagbama, Port Harcourt, Peterside, Bonny, Obrikom, Oguta, Ahoada, Abonnema, Degema, Uyo, Eket, Calabar, Ugep, Akamkpa. Every possible effort was done to maintain a constant surveying effort throughout the research period, so that the hunting activities of local tribes were monitored during both the dry and the wet season. Nevertheless some minor sampling bias is likely, because we were unable to maintain an identical monthly effort throughout the study period.

To collect natural history data, every traded tortoise was examined to species, sex, age, carapace length and height, plastron length, body weight, and dissected (if the specimen was already dead at the time of examination) for any food item in the stomach, and for assessing clutch size and reproductive condition (if they were adult females). The specimens that were still alive at the time of examination, were bought, individually marked, and then set free in the nearest forest place where the presence of that species was known. Moreover, the sellers (which normally were also the hunters) were interviewed to learn more about the time of capture and the habitat of capture of the traded specimens. Data on the ecology of hinge-back tortoises are presented elsewhere (Luiselli *et al.*, 2000 ; Luiselli, submitted *a, b, c*).

Data coming from market surveys were compared with field data on free-ranging specimens that were marked and released during our staff's regular fieldwork (e.g., Luiselli *et al.*, 1998, 2002; Luiselli & Angelici, 2000). Free-ranging tortoises were routinely measured, and were permanently individually marked by unique sequences of notches filed into the marginal scutes (Luiselli, submitted *b*). Tortoises were classified as adults or juveniles by following criteria in Lawson (2000, 2001).

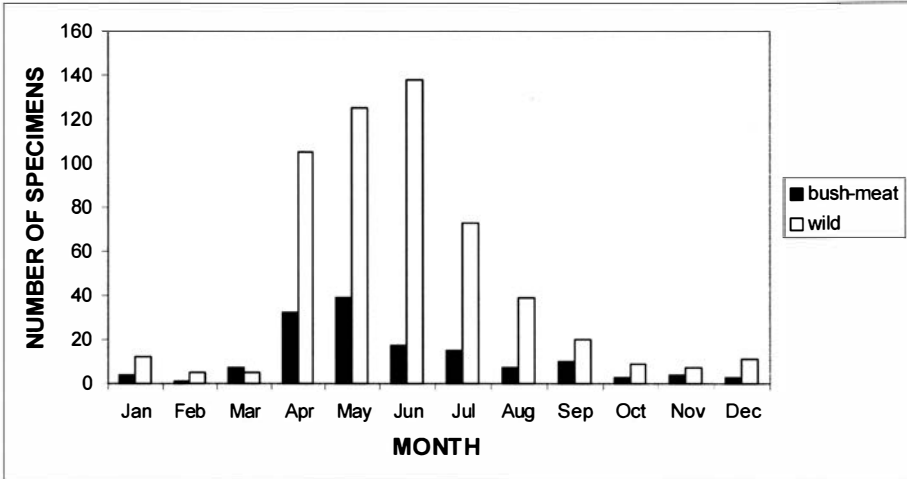
All data were statistically analysed by STATISTICA (version 5.0, for Windows) PC + package (Statsoft Inc., 1996), with all tests being two-tailed and alpha set at 5 %.

RESULTS

A total of 691 *K. homeana*, 218 *K. erosa*, and 8 *K. b. nogueyi* were observed in the study area, including both wild and traded specimens. Specimens found in bush-meat markets accounted for 20.6 % of the total *K. homeana* observed, 18.3 % of the total *K. erosa* observed, and 25 % of the total *K. b. nogueyi* observed. The numbers of hinge-back tortoises observed in the wild and in bush-meat markets, in relation to month, are presented in figure 1A (*K. homeana*) and 1B (*K. erosa*). As for *K. b. nogueyi*, due to the very small sample size, an equivalent graphic is not presented. Anyway, just two specimens were found in markets (both in April), whereas six specimens were found in the wild (two in April, three in May, one in June). For both *K. homeana* and *K. erosa*, most of the traded specimens were offered for

sale during the wet months (April to September), when also most of the free-living specimens were observed (Fig. 1).

A



B

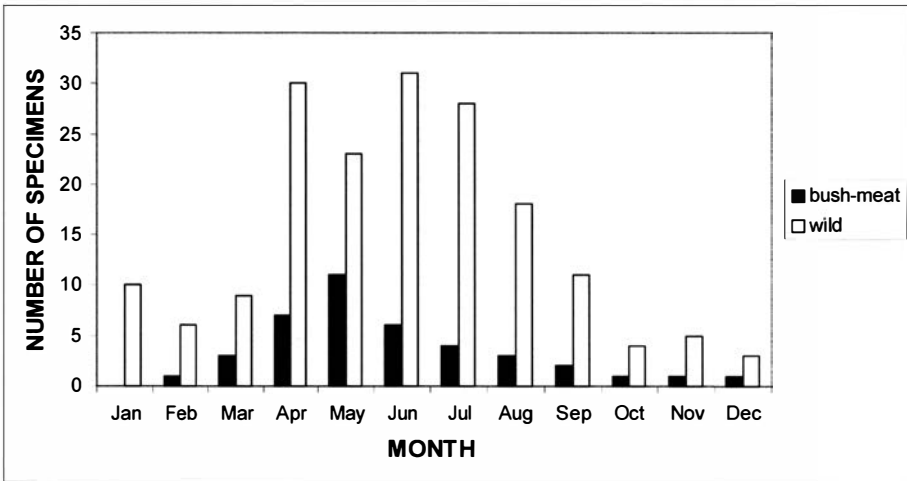


Figure 1. — Numbers of hinge-back tortoises observed in the wild and in bush-meat markets, during the study period, in the Niger Delta (southern Nigeria). A = *Kinixys homeana*; B = *Kinixys erosa*.

The regression of the (log-transformed) monthly numbers of traded tortoises on wild-observed tortoises was highly positively significant in both *K. homeana* $r^2 = 0.753$; slope = 0.725 ± 0.131 , significantly different from 0: $F_{1,10} = 30.59$,

$P = 0.003$) and *K. erosa* ($r^2 = 0.826$; slope = 0.922 ± 0.134 , significantly different from 0: $F_{1,10} = 47.50$, $P < 0.0001$), and the two regressions did not differ significantly (heterogeneity of slopes: $F_{1,20} = 0.929$, $P = 0.347$). When we performed the same regression analysis on the specimens of both species divided by sex, it resulted that the (log-transformed) monthly numbers of traded tortoises was strongly positively related to the (log-transformed) monthly numbers of wild-observed tortoises, in both sexes of either species (in all cases, at least $r^2 > 0.702$, $P < 0.01$). However, when we performed a regression analysis on the specimens of both species divided by population cohorts (i.e. after dividing tortoises into adults and juveniles), it resulted that, contrary to what was apparent as for adults, the monthly numbers of traded juveniles was independent on the monthly numbers of juveniles observed in the wild both in *K. homeana* ($r^2 = 0.076$; slope not significantly different from 0: $F_{1,10} = 0.137$, $P = 0.337$) and in *K. erosa* ($r^2 = 0.094$; slope not significantly different from 0: $F_{1,10} = 0.156$, $P = 0.312$).

DISCUSSION

The most important conclusions of this study are that: (1) the relative monthly intensity of above-ground activity of tortoises strongly influenced the relative monthly numbers of traded specimens in the bush-meat markets; (2) the pressure of local people on free-ranging tortoises is similar to that of a generalist predator, without apparent differences on the two tortoise species (*K. homeana* and *K. erosa*); (3) the two sexes were preyed upon by humans in similar rates, i.e. depending on their availability in the field; (4) the juveniles of both species were the only category of animals which were not preyed upon by humans depending on their local availability (it most likely depended on the fact that many hunters would not collect small-sized tortoises because they are too small to be useful for any subsistence reason).

The preponderance of *K. homeana* in markets merely reflects its abundance pattern in the field: this species appeared indeed much more common than the other species in six rainforest areas of the same geographic territory where capture-mark-recapture studies have been conducted since several years (Luiselli *et al.*, 2000; Luiselli, submitted *b*).

As a corollary of the results emerged from the present study, it should be stated that our research testifies that, at least with regard to hinge-back tortoises, it may be assumed that bush-meat market surveys are a reliable methodology to indirectly assess the population structure and, especially, the monthly intensity of above-ground activity of these vulnerable chelonians, at least in places where they are actively hunted by people.

ACKNOWLEDGEMENTS

We are gratefully indebted to ENI S.p.A. Environmental Department, Snamprogetti S.p.A., Aquater S.p.A., Demetra s.r.l., Ecosystem s.r.l., Italian Foundation of Vertebrate Zoology, and T.S.K.J. Nigeria Ltd. which supported parts of our continued research in Nigeria. The *Kinixys* conservation project was conducted

under the economic support of Chelonian Research Foundation through The Linnaeus Fund (Annual Turtle Research Grants Program; years 1999 and 2000). A. Hailey (London) and D. Lawson (Atlanta) kindly sent their *Kinixys* research papers to us. F.M. Angelici (Rome), J. Lea (Abraka), Z. Tooze (Calabar), C.O. Ebin (Calabar), and E.A. Eniang (Calabar) were of invaluable help in the field. J. Butler (Charlottesville, Florida) and two anonymous referees critically reviewed this paper.

REFERENCES

- FA, J.E. (1992). — *La Conservation des écosystèmes forestiers de la Guinée*. IUCN Forest Conservation Programme, Gland, 221 pp.
- LAWSON, D.P. (2000). — Local harvest of hinge-back tortoises, *Kinixys erosa* and *K. homeana*, in southwestern Cameroon. *Chelonian Conservation and Biology*, 3: 722-729.
- LAWSON, D.P. (2001). — Morphometrics and sexual dimorphism of the hinge-back tortoises *Kinixys erosa* and *Kinixys homeana* (Reptilia: Testudinidae) in southwestern Cameroon. *African J. Herpetol.*, 50: 1-7.
- LUISELLI, L. (submitted a). — Comparative seasonal activity patterns and feeding ecology of three sympatric species of hinge-back tortoises (genus *Kinixys*) from the rainforests of the Niger Delta, Nigeria. *Contributions to Zoology*.
- LUISELLI, L. (submitted b). — Comparative abundance and population structure of sympatric hinge-back tortoises in six rainforest areas of the Niger Delta, Nigeria: the importance of local people's "traditional beliefs" for tortoise conservation in tropical Africa.
- LUISELLI, L. (submitted c). — Aspects of comparative thermal ecology of sympatric hinge-back tortoises (*Kinixys erosa* and *Kinixys homeana*) in the Niger Delta, southern Nigeria.
- LUISELLI, L. & ANGELICI, F.M. (2000). — Ecological relationships in two Afrotropical cobra species (*Naja melanoleuca* and *Naja nigricollis*). *Can. J. Zool.*, 78: 191-198.
- LUISELLI, L., AKANI, G.C. & CAPIZZI, D. (1998). — Food resource partitioning of a community of snakes in a swamp rainforest of south-eastern Nigeria. *J. Zool., Lond.*, 246: 125-133.
- LUISELLI, L., ANGELICI, F.M. & AKANI, G.C. (2002). — Comparative feeding strategies and dietary plasticity of the sympatric cobras *Naja melanoleuca* and *Naja nigricollis*, in three diverging Afrotropical habitats. *Can. J. Zool.*, 80: 55-63.
- LUISELLI, L., POLITANO, E. & ANGELICI, F.M. (2000). — Ecological correlates of the distribution of terrestrial and freshwater chelonians in the Niger Delta, Nigeria: A biodiversity assessment with conservation implications. *Rev. Ecol. (Terre Vie)*, 55: 3-23.
- OJONUGWA, O.S. (1986). — *A survey of wildlife in bushmeat markets in Rivers and Imo State, Nigeria*. Unpublished B. Sc. Thesis, Rivers State University of Science and Technology, Port Harcourt.
- STATSOFT INC. (1996). — *STATISTICA for Windows, release 5.0*. Statsoft Inc, Tulsa.
- VAN DIJK, P., STUART, B.L. & RHODIN, A.G.J. (eds) (2000). — *Asian turtle trade*. Chelonian Research Foundation, Lunenburg (USA), Chelonian Research Monographs, number 2, 164 pp.