



HAL
open science

Bacterial Parasite Communities of the Fossorial Water Vole *Arvicola terrestris* During a Period of High Abundance: Richness and Similarity in a Dynamic World

Petra Villette, Eve Afonso, Geoffroy Couval, Aurélien Levret, Jean-François Cosson, Patrick Giraudoux

► To cite this version:

Petra Villette, Eve Afonso, Geoffroy Couval, Aurélien Levret, Jean-François Cosson, et al.. Bacterial Parasite Communities of the Fossorial Water Vole *Arvicola terrestris* During a Period of High Abundance: Richness and Similarity in a Dynamic World. Rodents 2018: 6th International Conference of Rodent Biology and Management & 16th Rodens et Spatium, Sep 2018, Potsdam, Germany. hal-01870903

HAL Id: hal-01870903

<https://hal.science/hal-01870903>

Submitted on 10 Sep 2018

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.



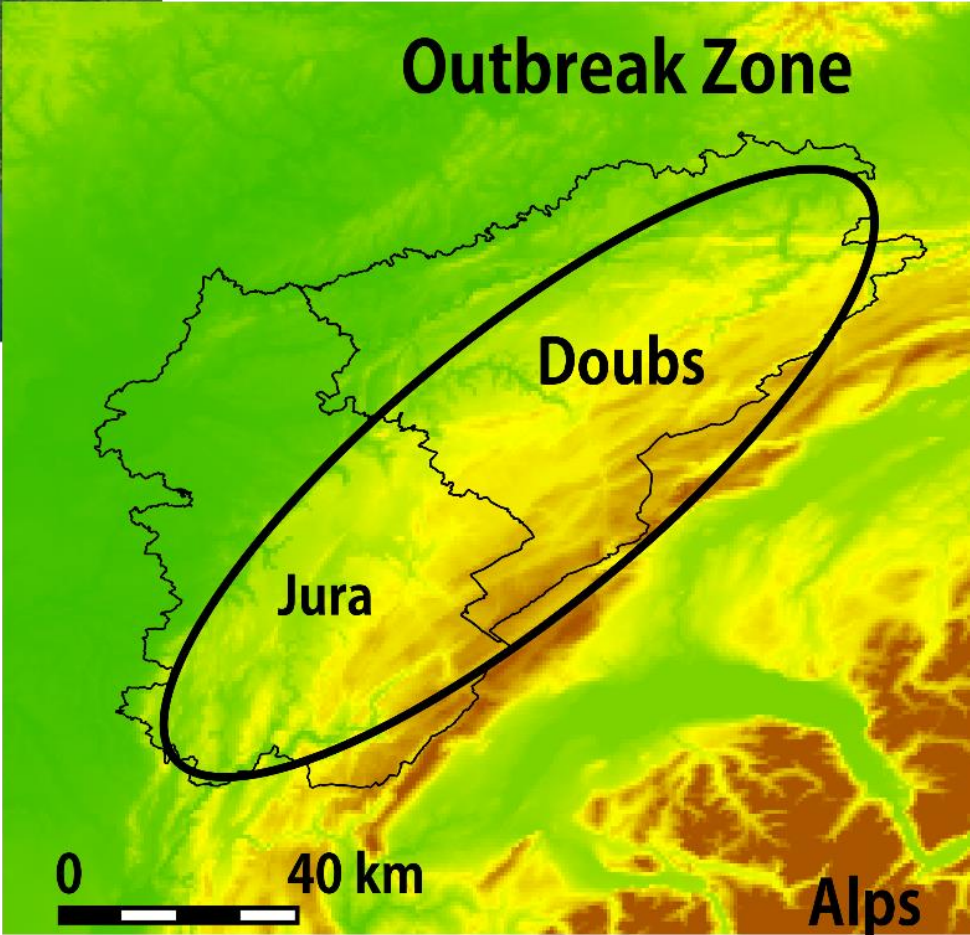
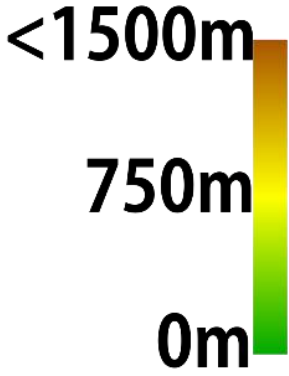
Bacterial Parasite Communities of the Fossorial Water Vole *Arvicola terrestris* during a period of high abundance: richness and similarity in a dynamic world

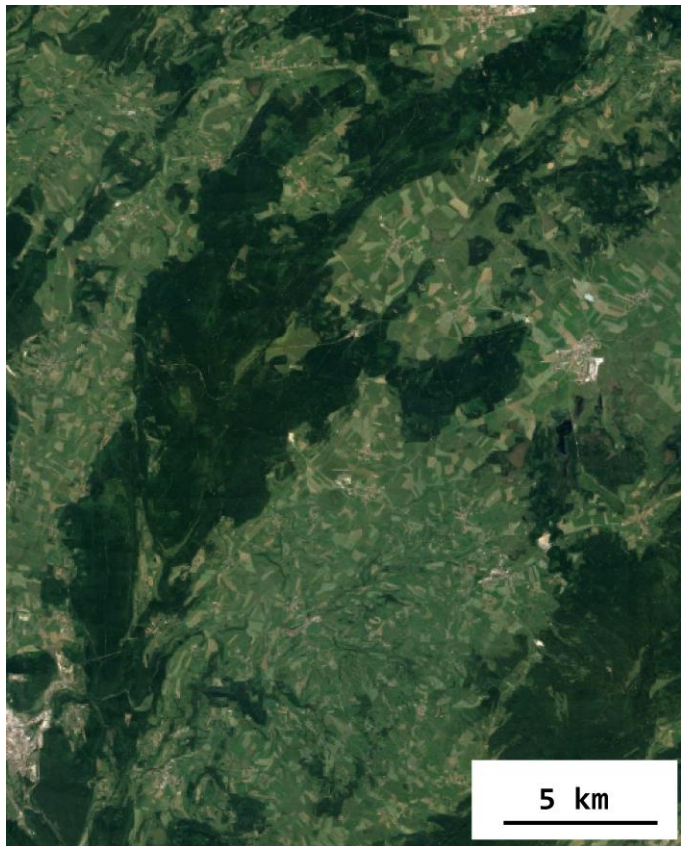


Petra Villette, Eve Afonso,
Geoffroy Couval,
Aurélien Levret, Jean-François
Cosson, Patrick Giraudoux



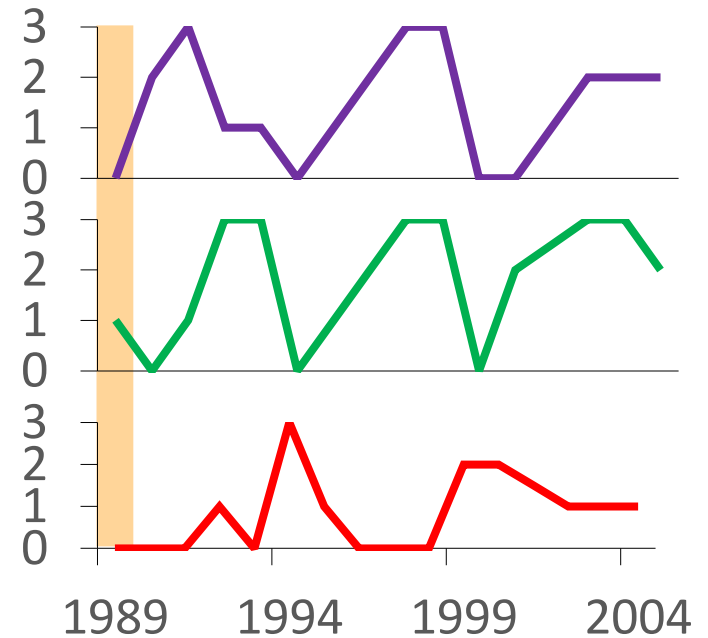
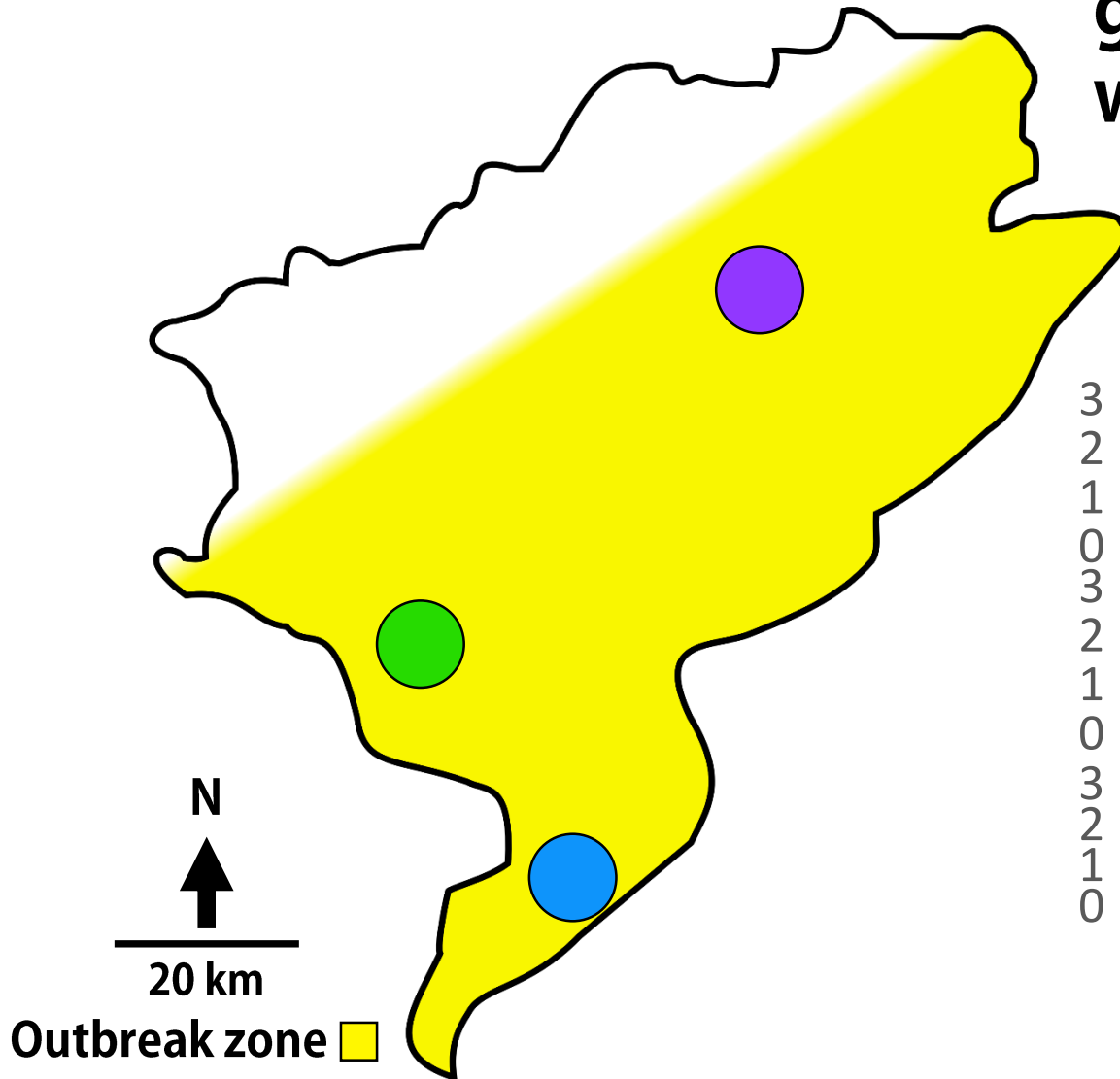
Arvicola terrestris in Franche-Comtè





Spatial Dynamics

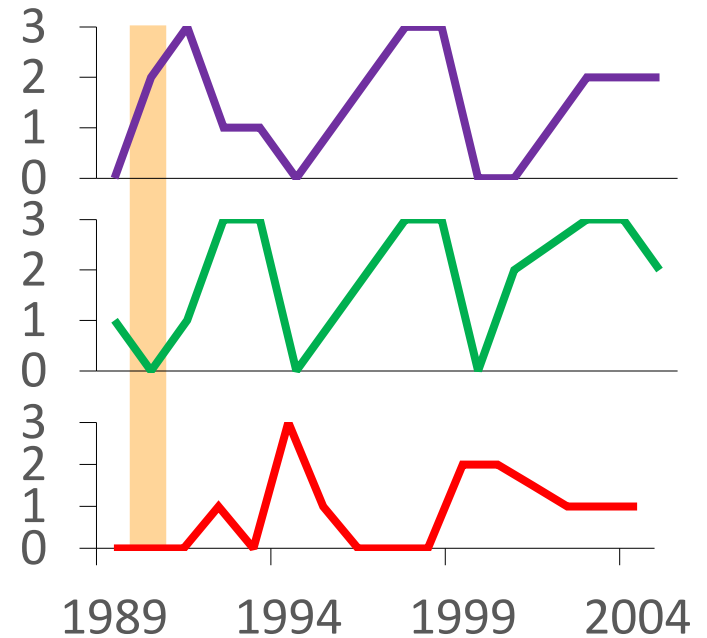
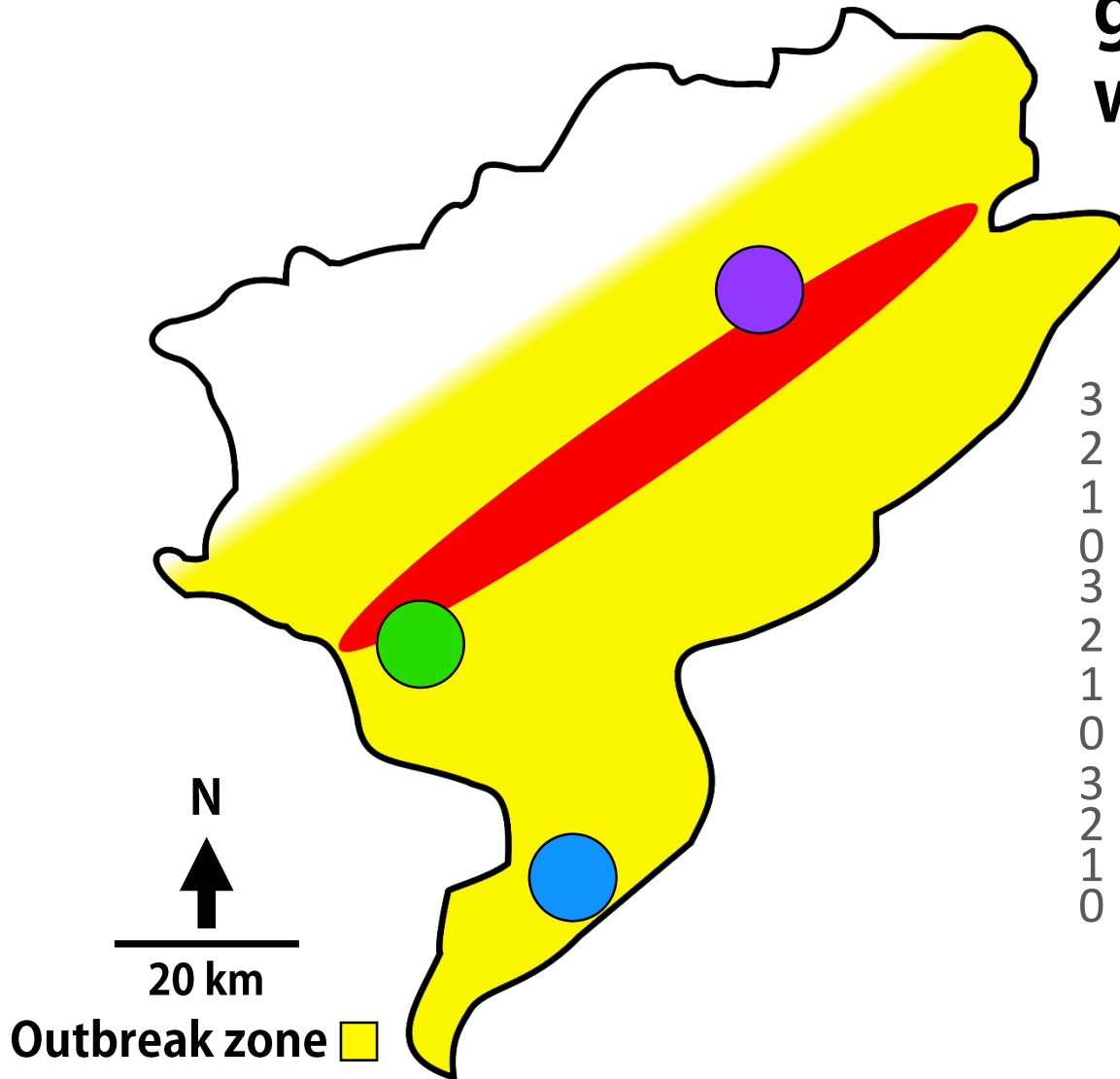
Lagged synchrony
generates travelling
wave



(Berthier et al 2014)

Spatial Dynamics

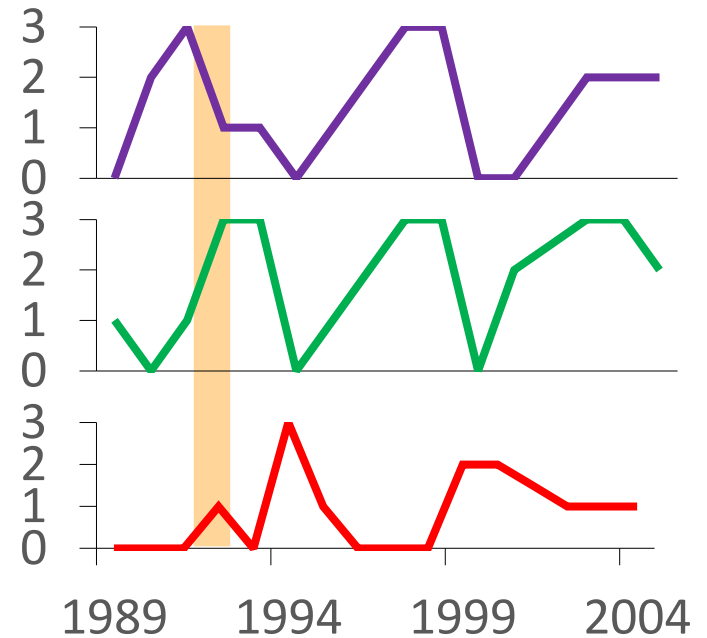
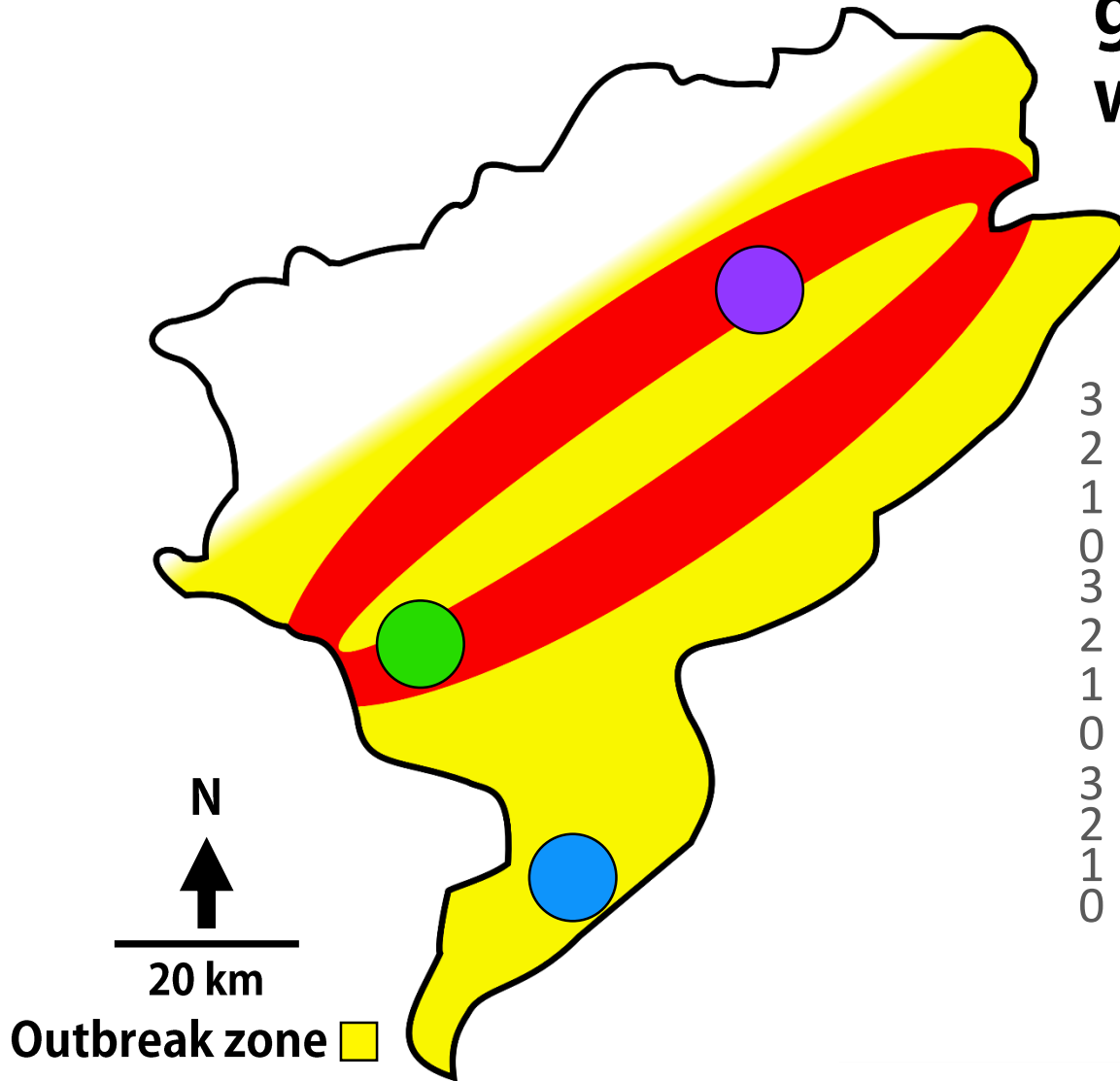
Lagged synchrony
generates travelling
wave



(Berthier et al 2014)

Spatial Dynamics

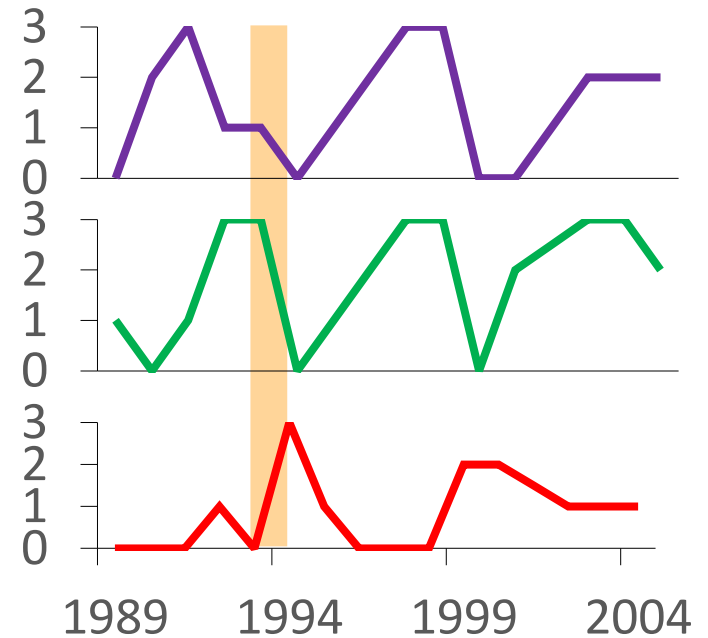
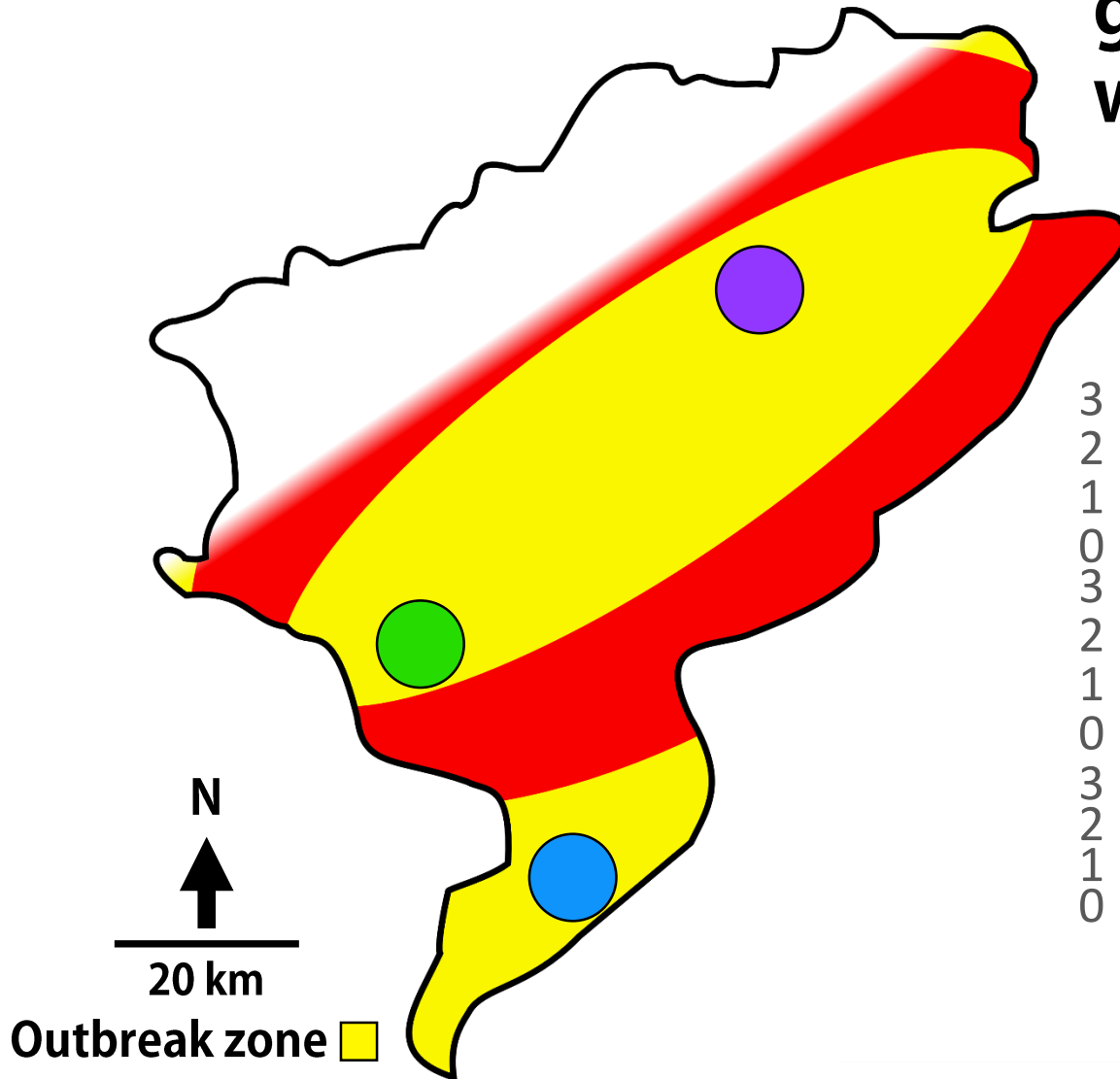
Lagged synchrony
generates travelling
wave



(Berthier et al 2014)

Spatial Dynamics

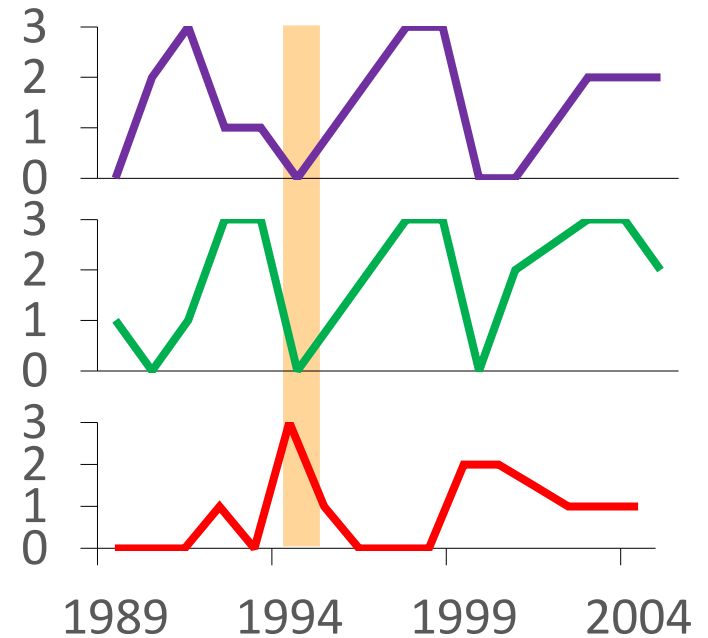
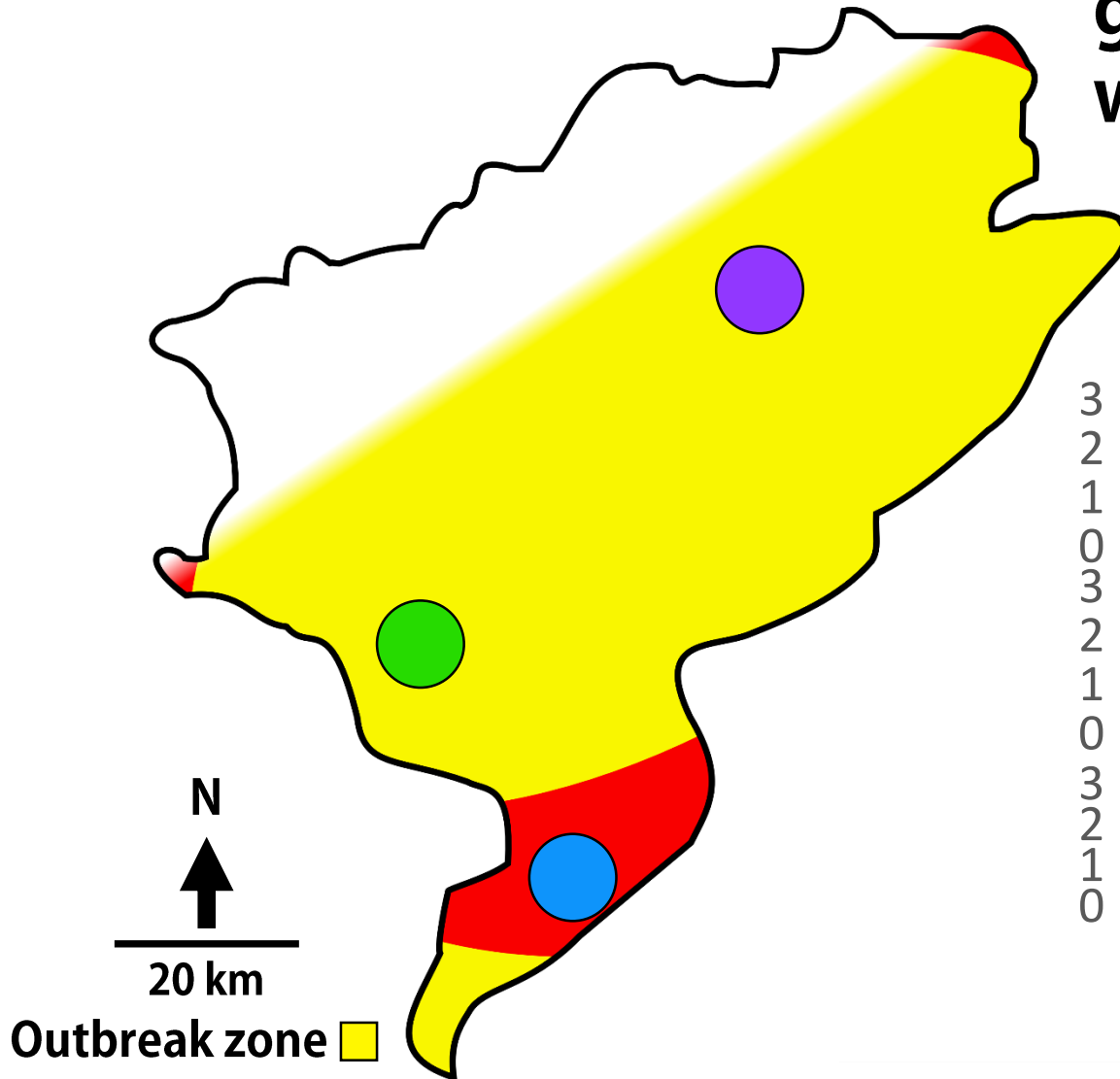
Lagged synchrony
generates travelling
wave



(Berthier et al 2014)

Spatial Dynamics

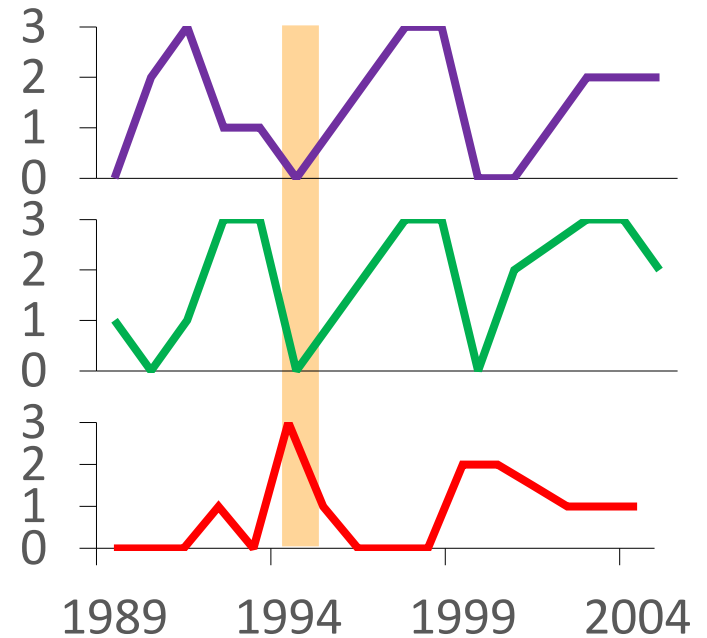
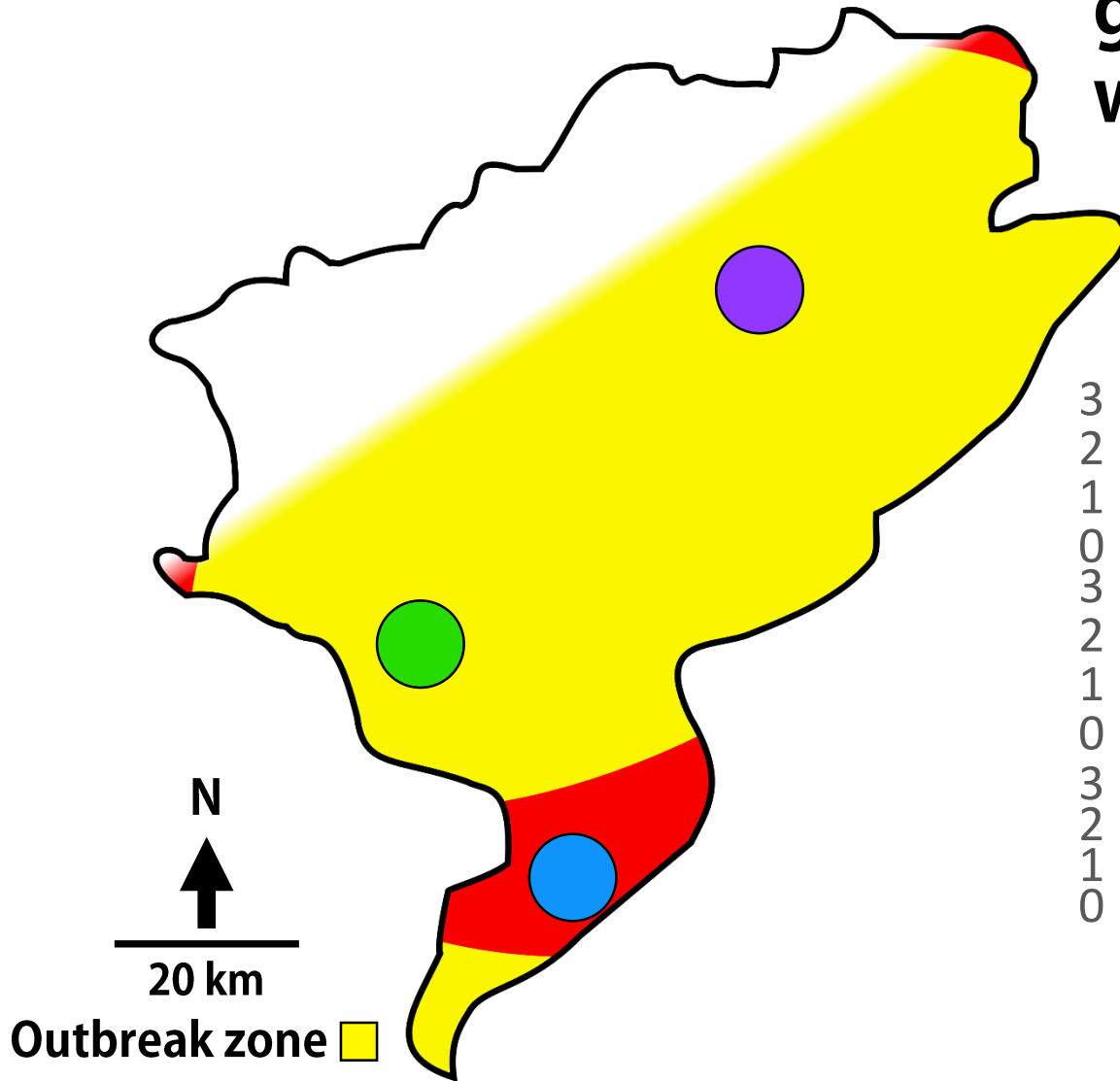
Lagged synchrony
generates travelling
wave



(Berthier et al 2014)

Spatial Dynamics

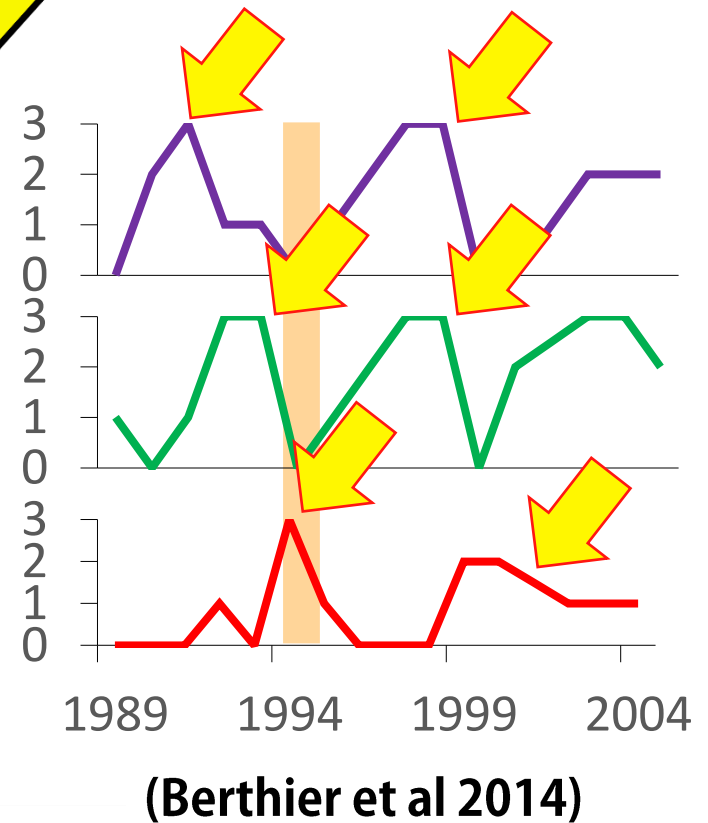
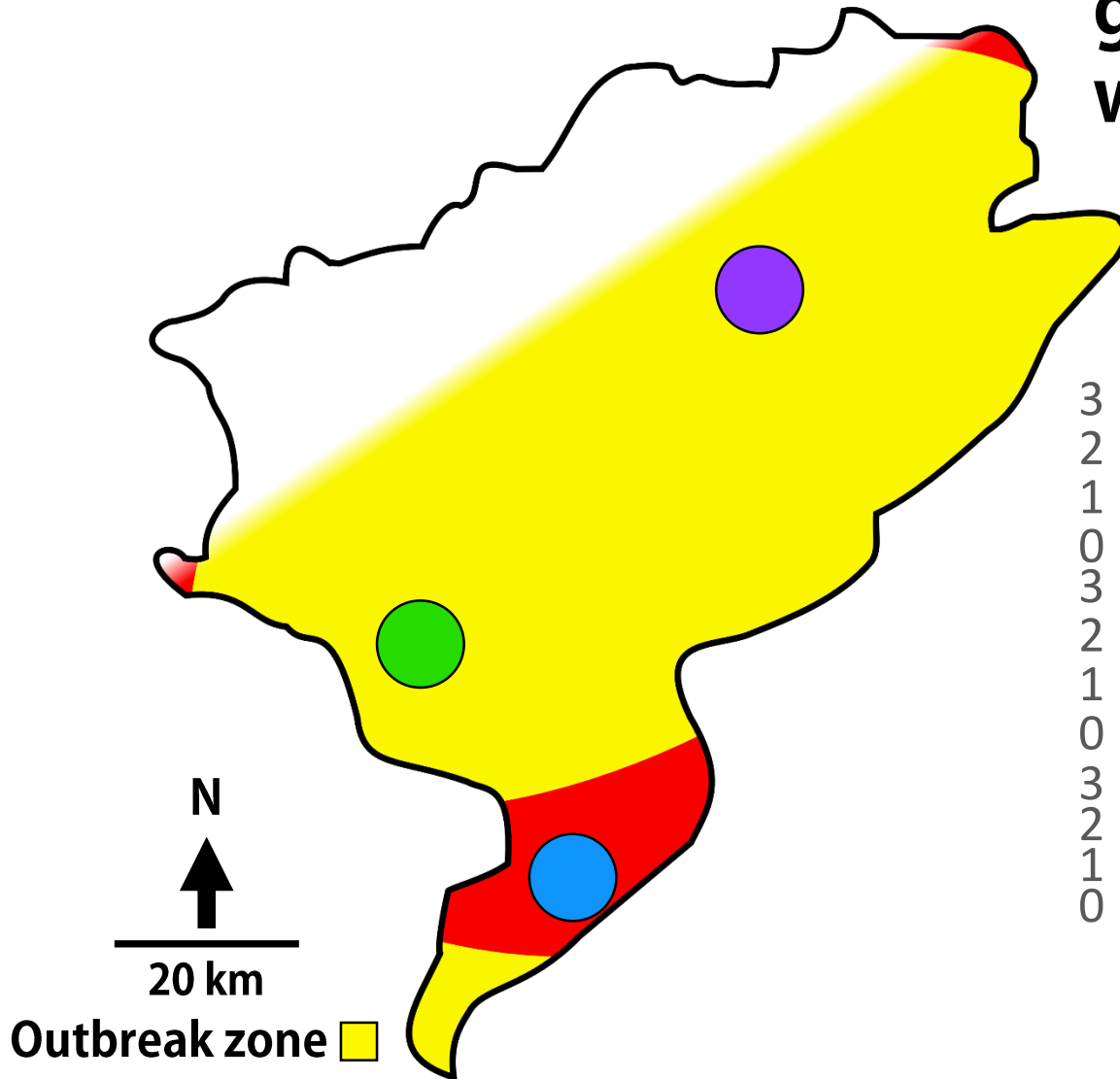
Lagged synchrony
generates travelling
wave



(Berthier et al 2014)

Spatial Dynamics

Lagged synchrony
generates travelling
wave



Decline hypotheses

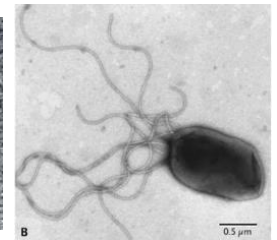
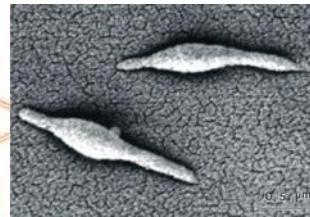
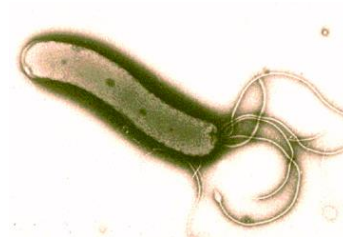
Predation -



Food limitation -



Parasites and Diseases -



Decline hypotheses

Predation -

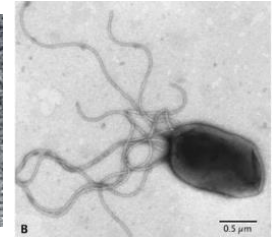
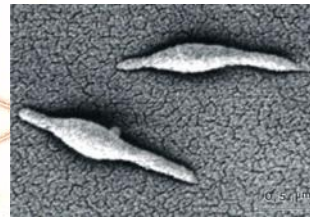
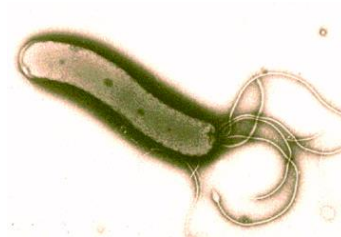


Food limitation -

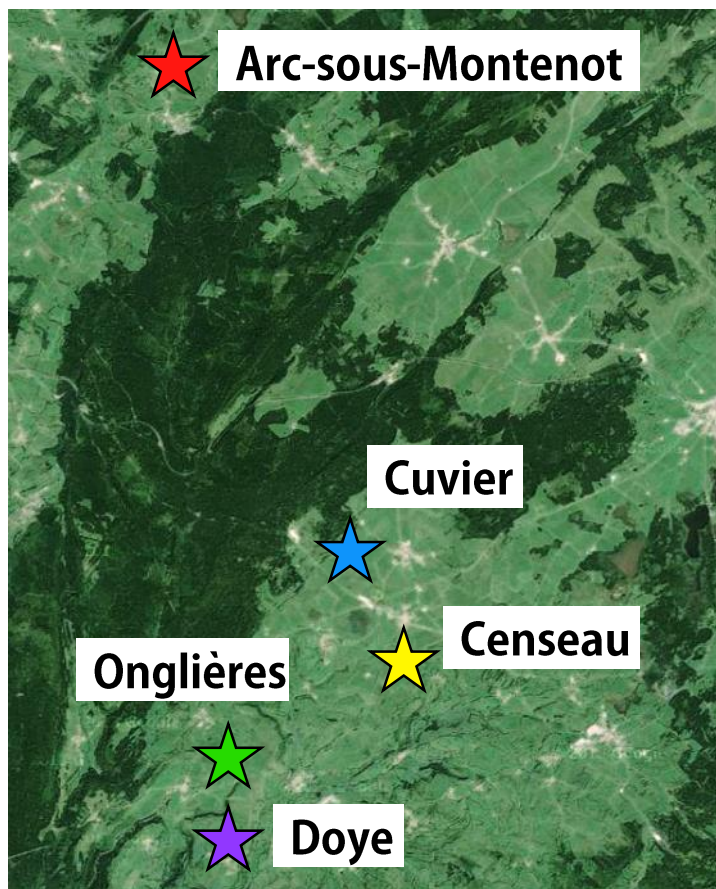


Parasites and Diseases

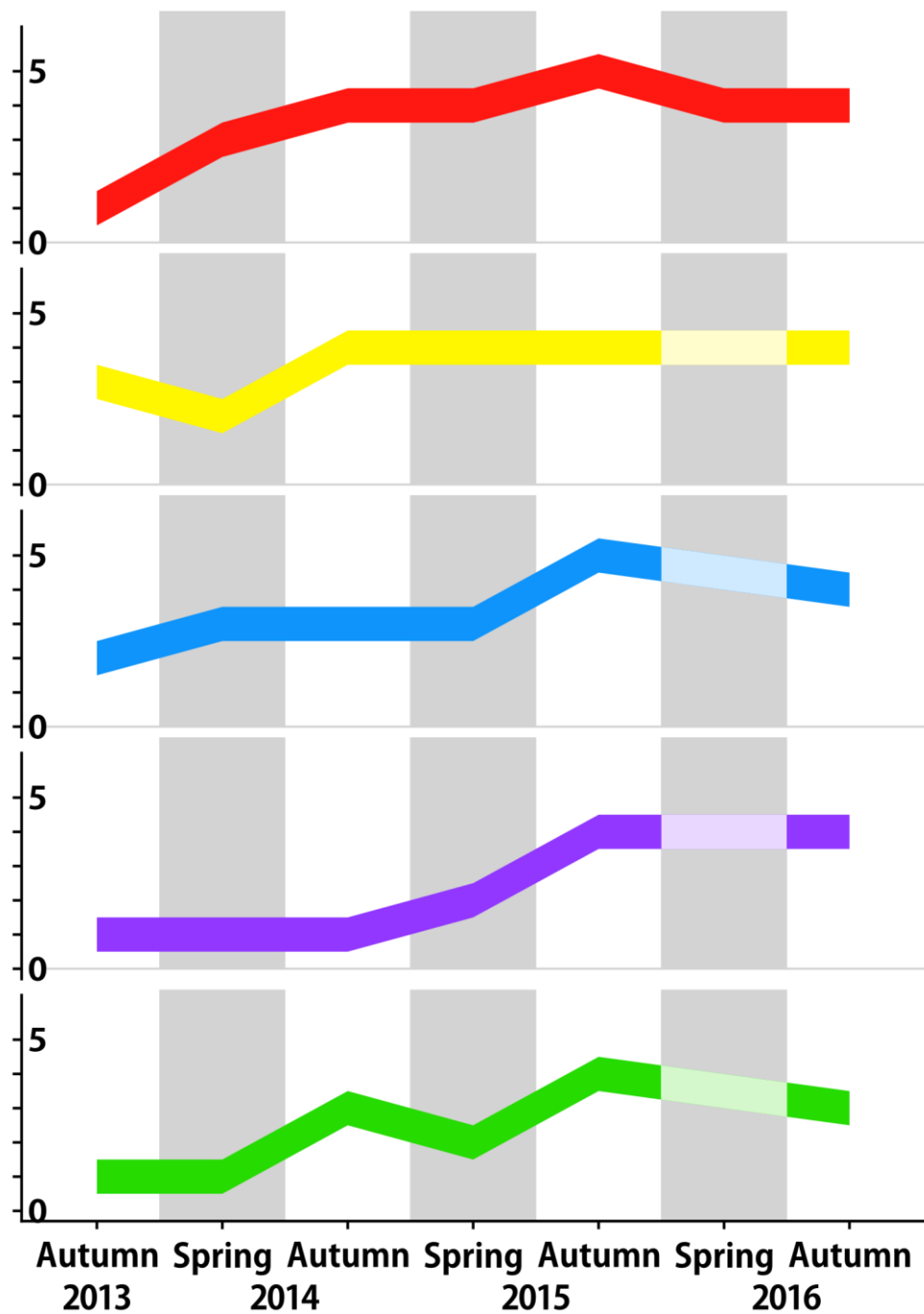
- **Communities**
- **Bacteria**



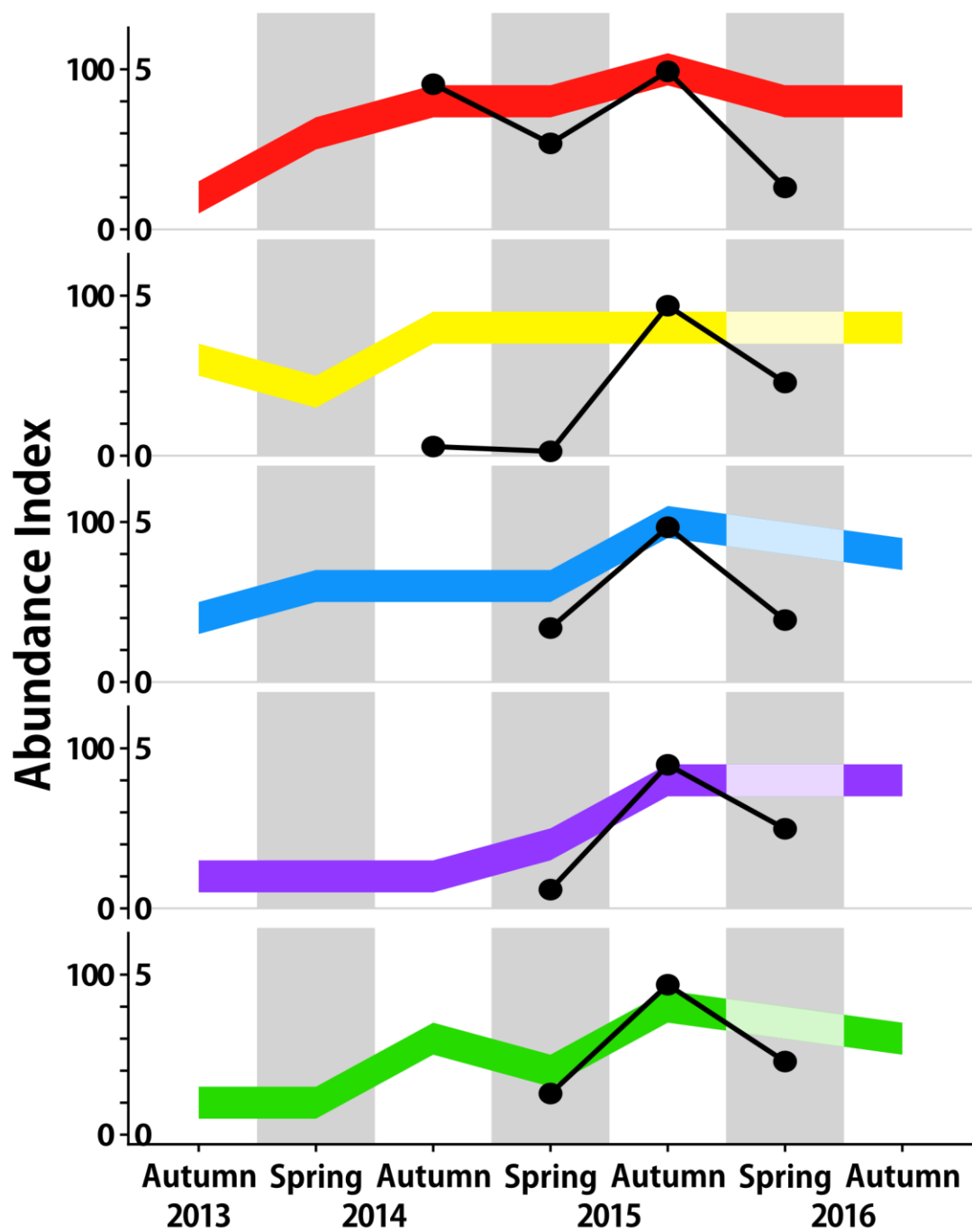
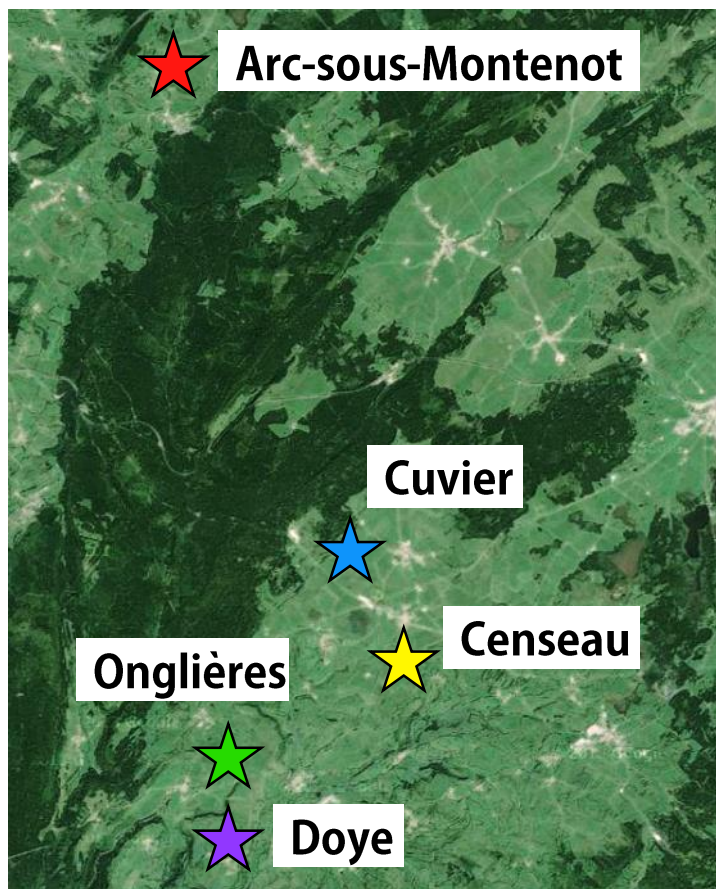
8 km



Abundance Index

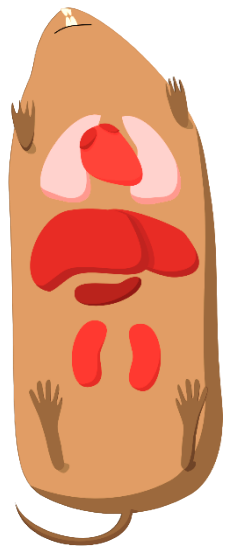


8 km

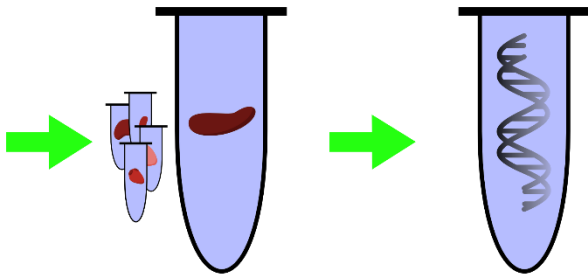






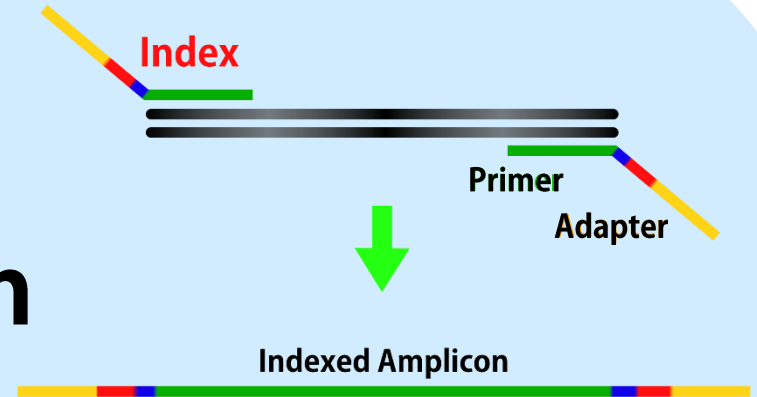


DNA extraction

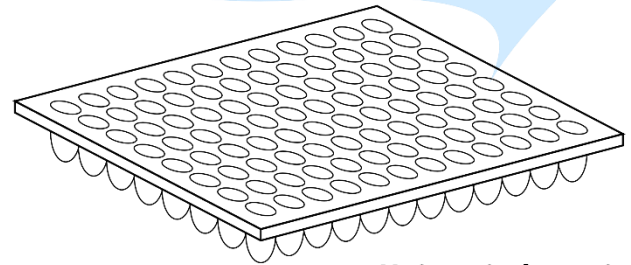
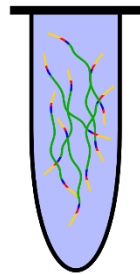


Next Generation Sequencing

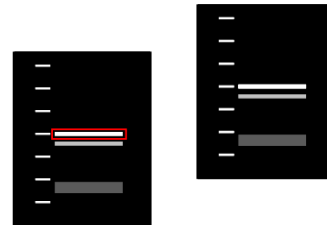
PCR amplification of V4 region of 16s rRNA gene



Pooled amplicons sent to sequencer

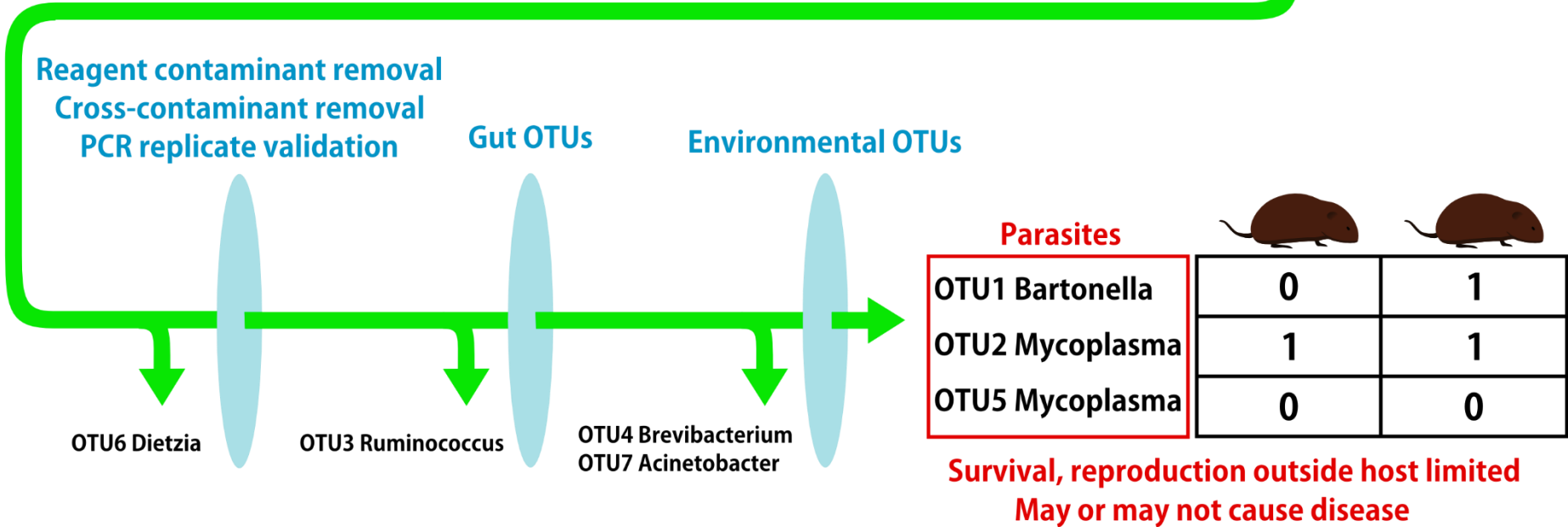
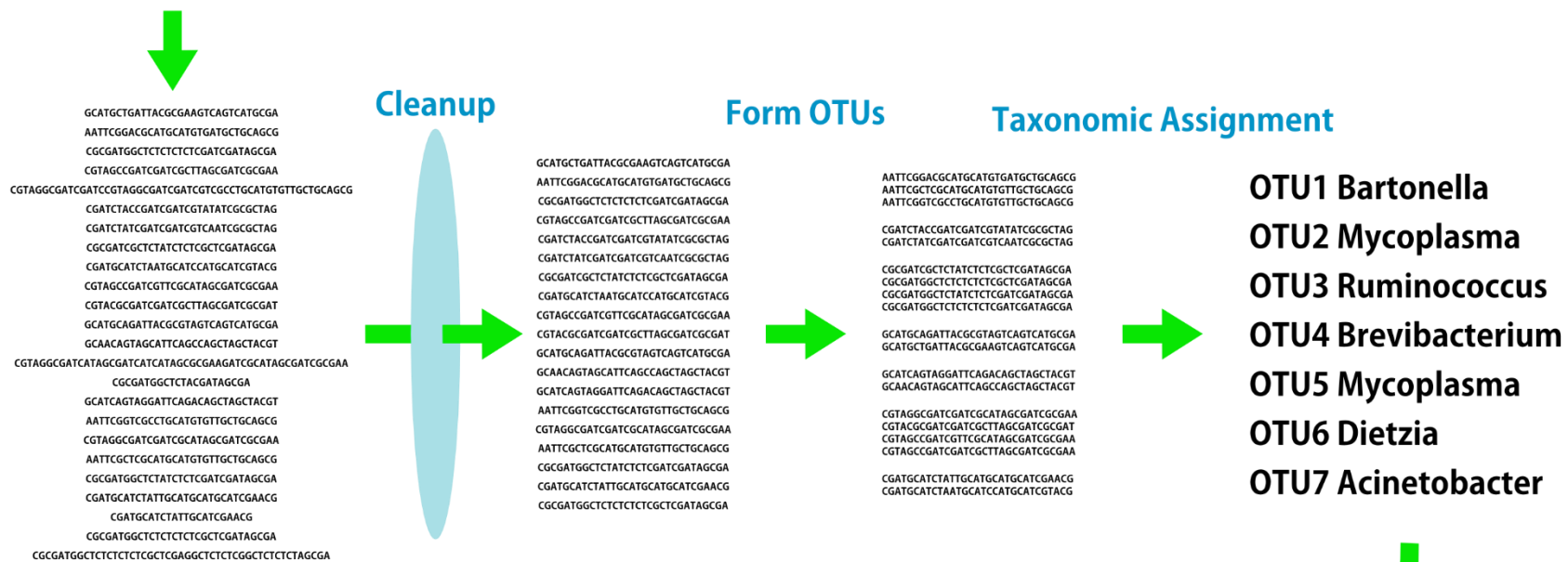


Unique index pairs in each well



Amplicons pooled, purified





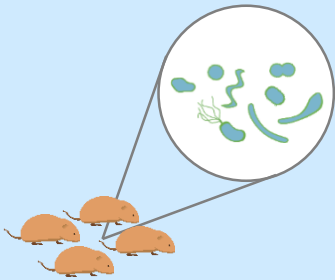
Peak Phase: Bacterial Parasite Richness Bacterial Parasite Community Similarity

Scales

Infracommunity



Component Community



Intrinsic Factors

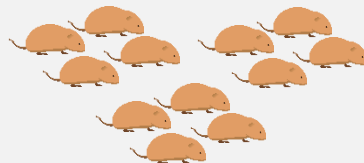
Age Class



Sex



Abundance (Local, Commune)



Extrinsic Factors

Location

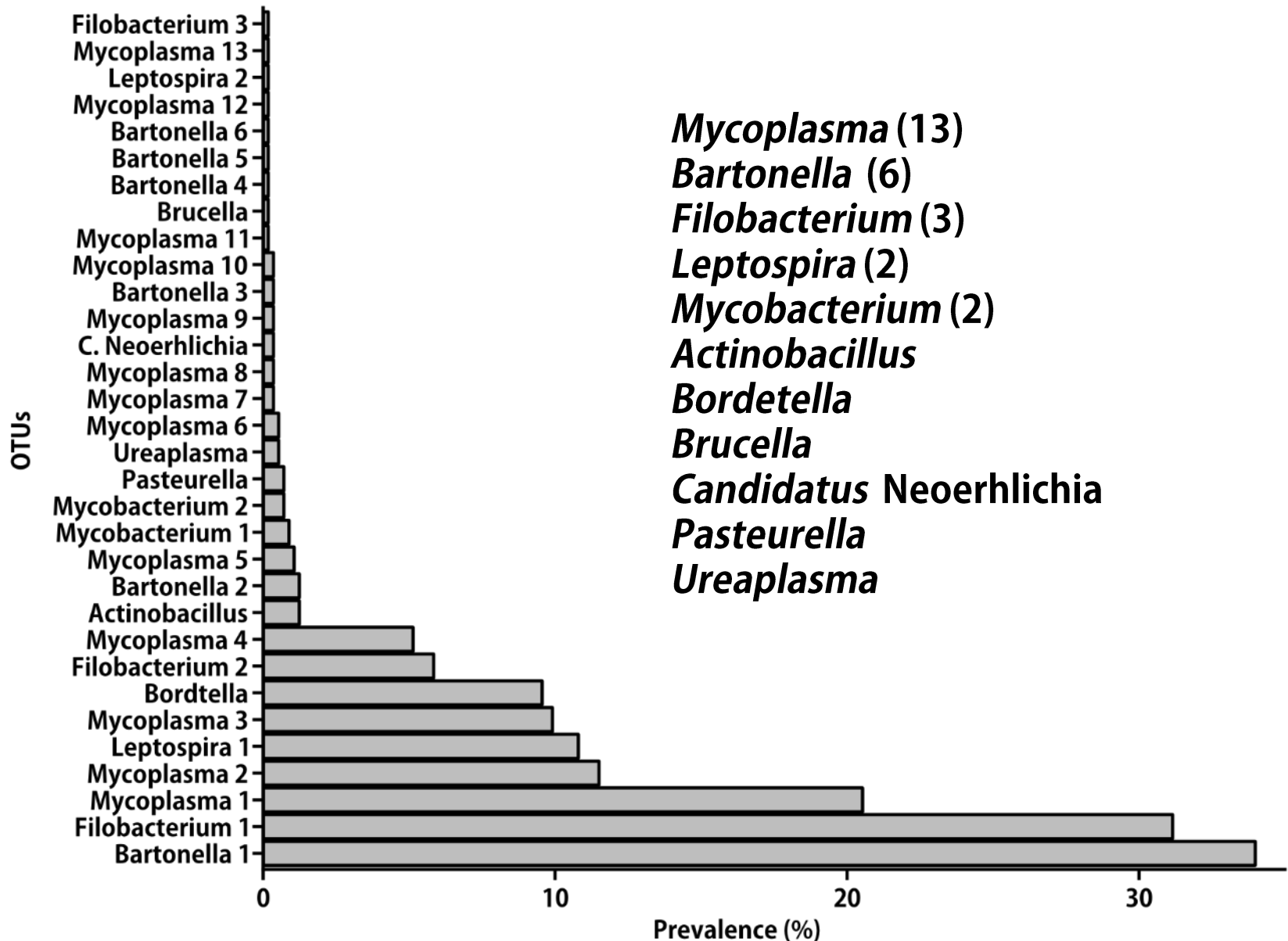


Date (Season, Year)



2014 2015 2016

Bacteria

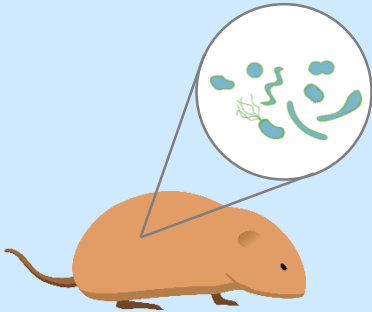


Questions:

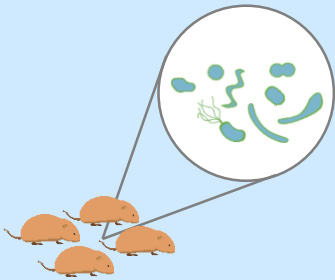
Parasite Richness
Parasite Community Similarity

Scales

Infracommunity



Component Community



Intrinsic Factors

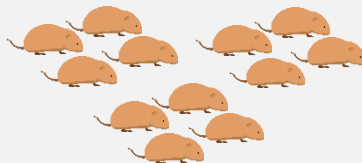
Age Class



Sex



Abundance (Local, Commune)



Extrinsic Factors

Location

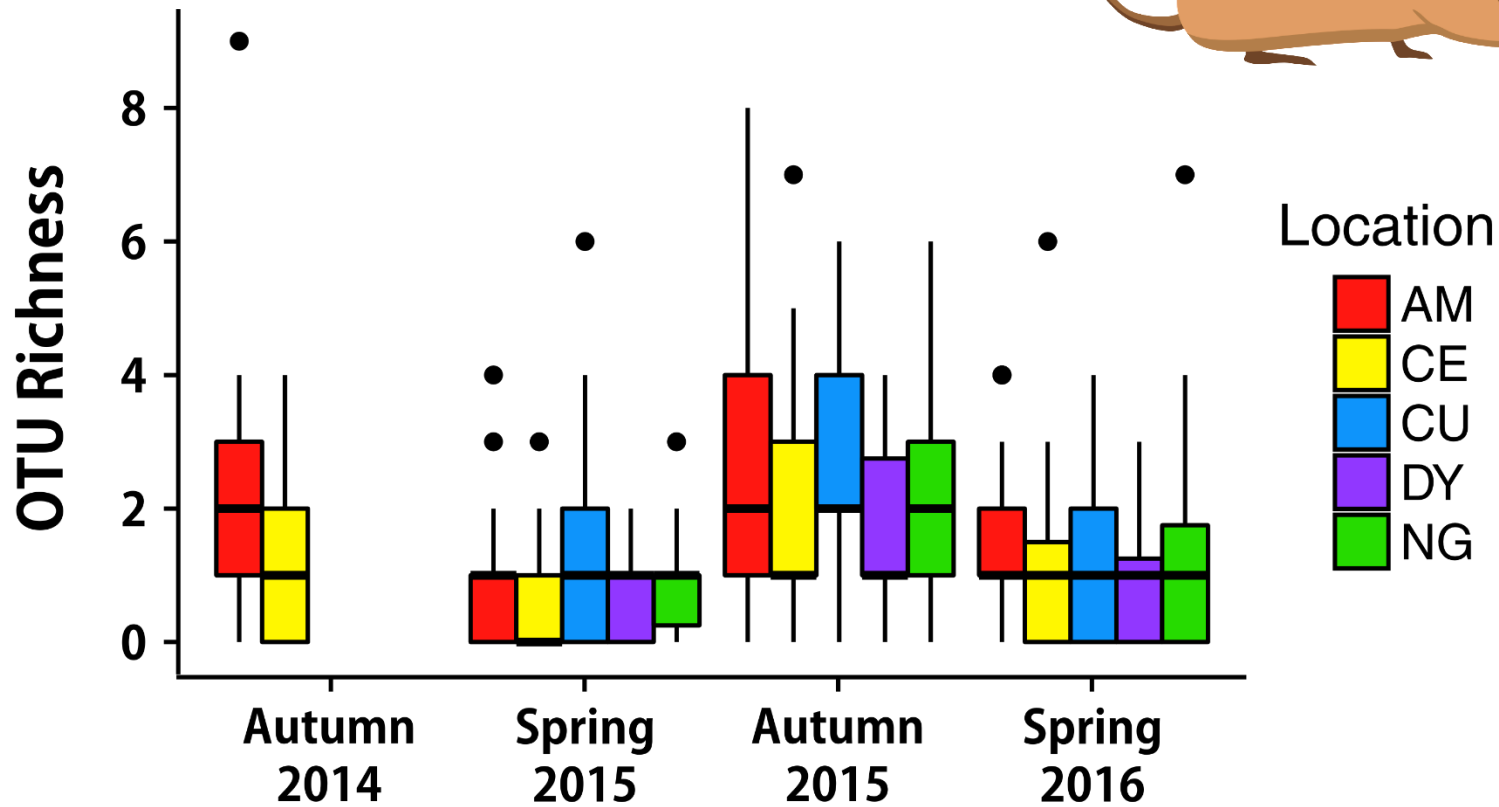
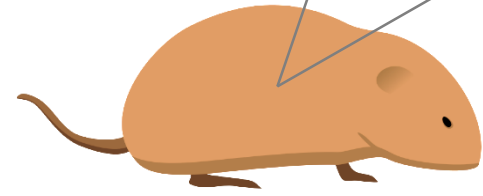
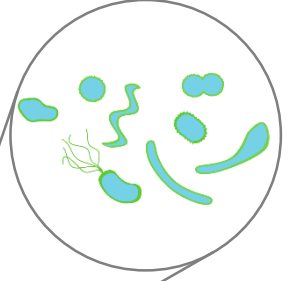


Date (Season, Year)



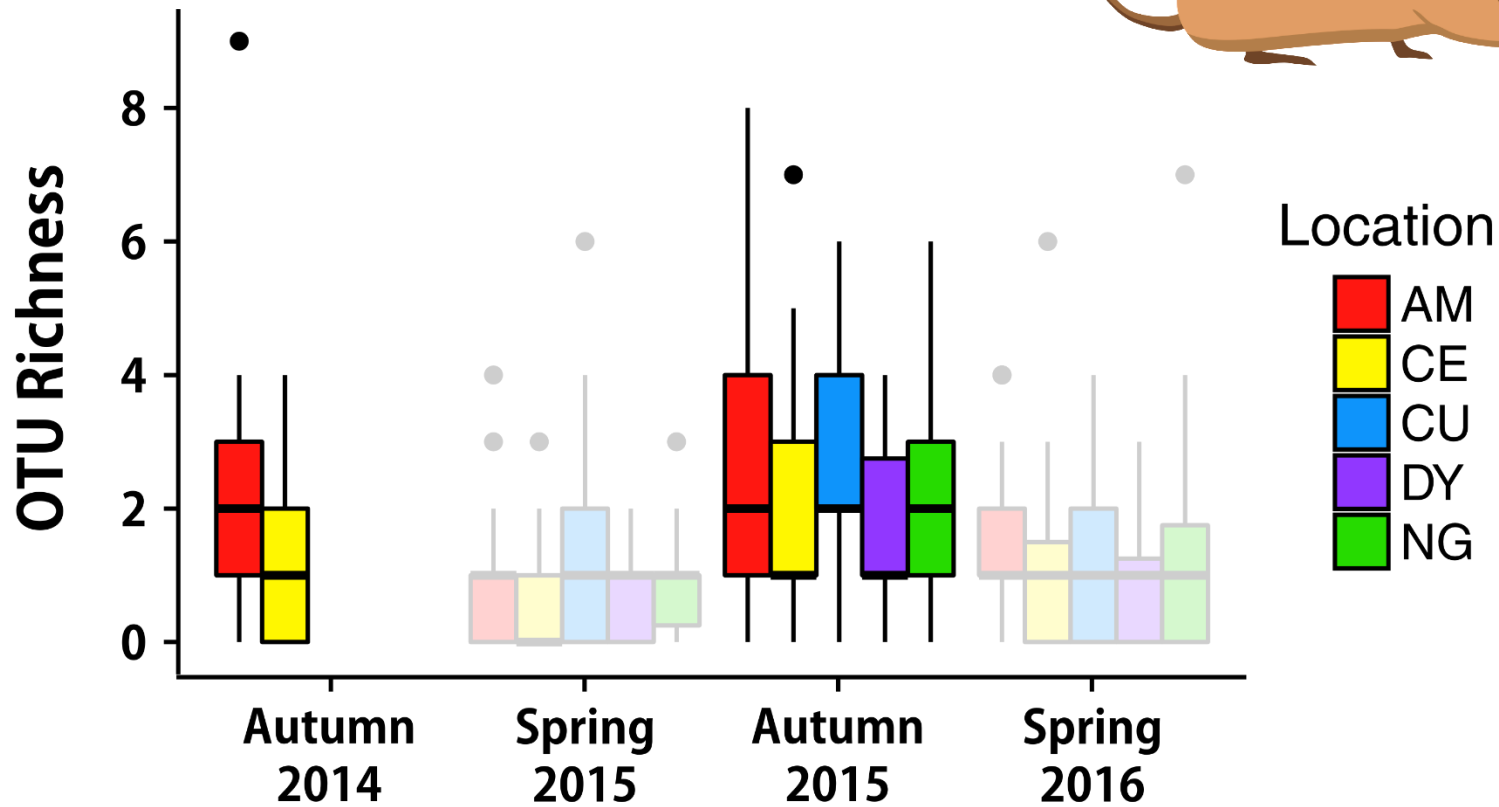
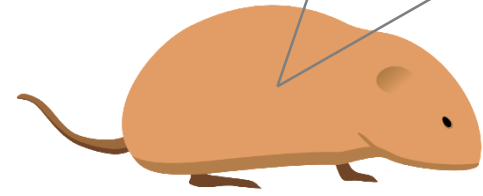
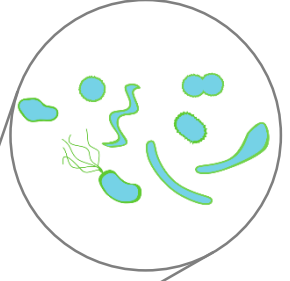
2014 2015 2016

Infracommunity richness



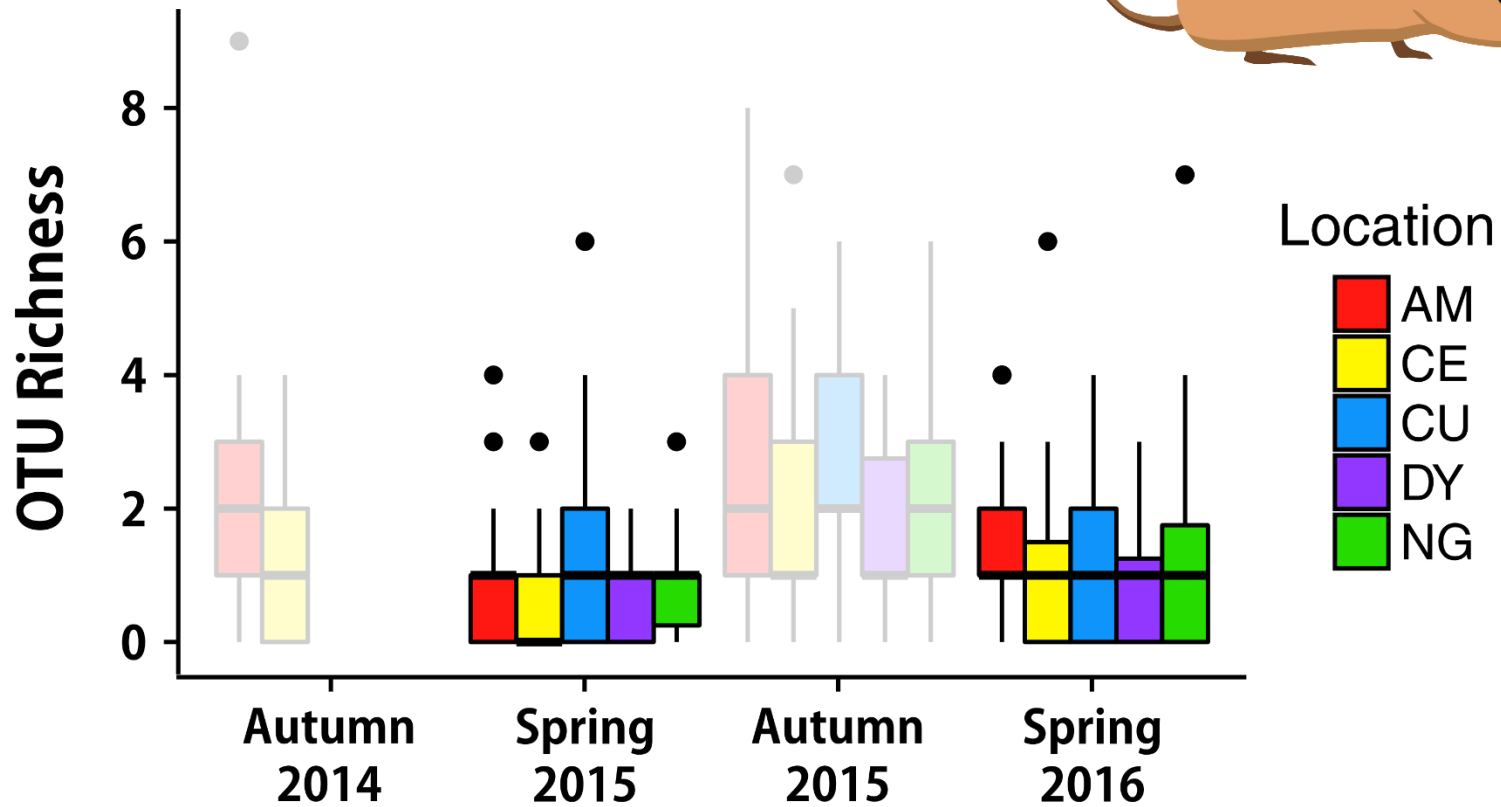
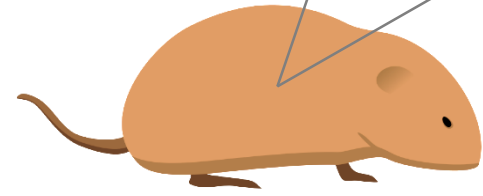
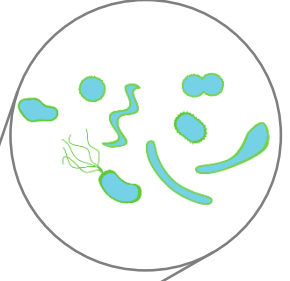
Zero-inflated Poisson Regression, AIC model selection

Infracommunity richness

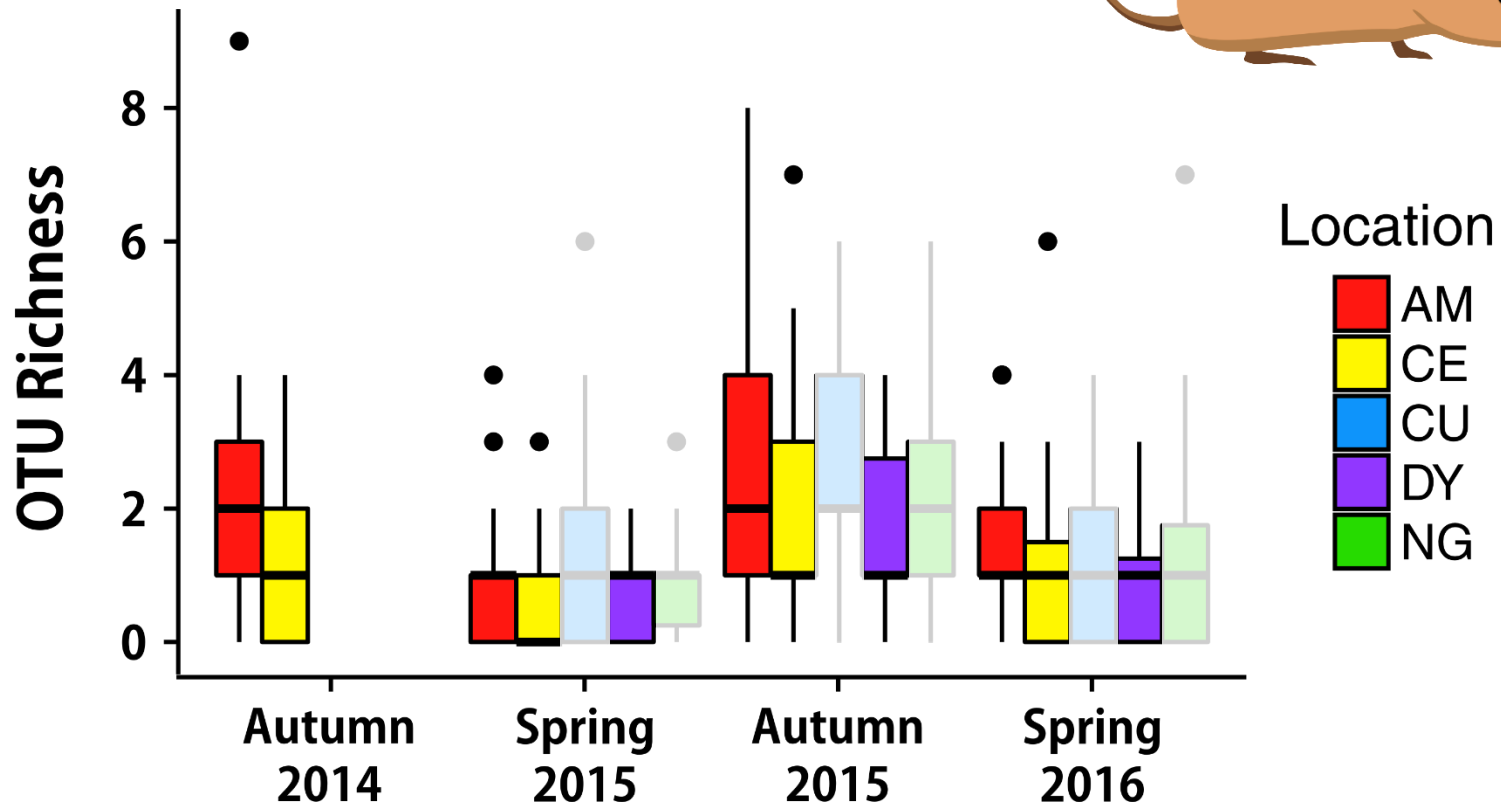
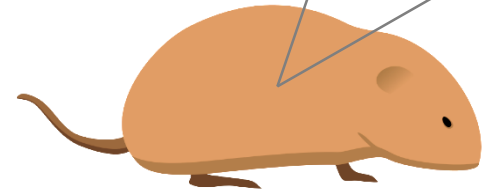


Zero-inflated Poisson Regression, AIC model selection

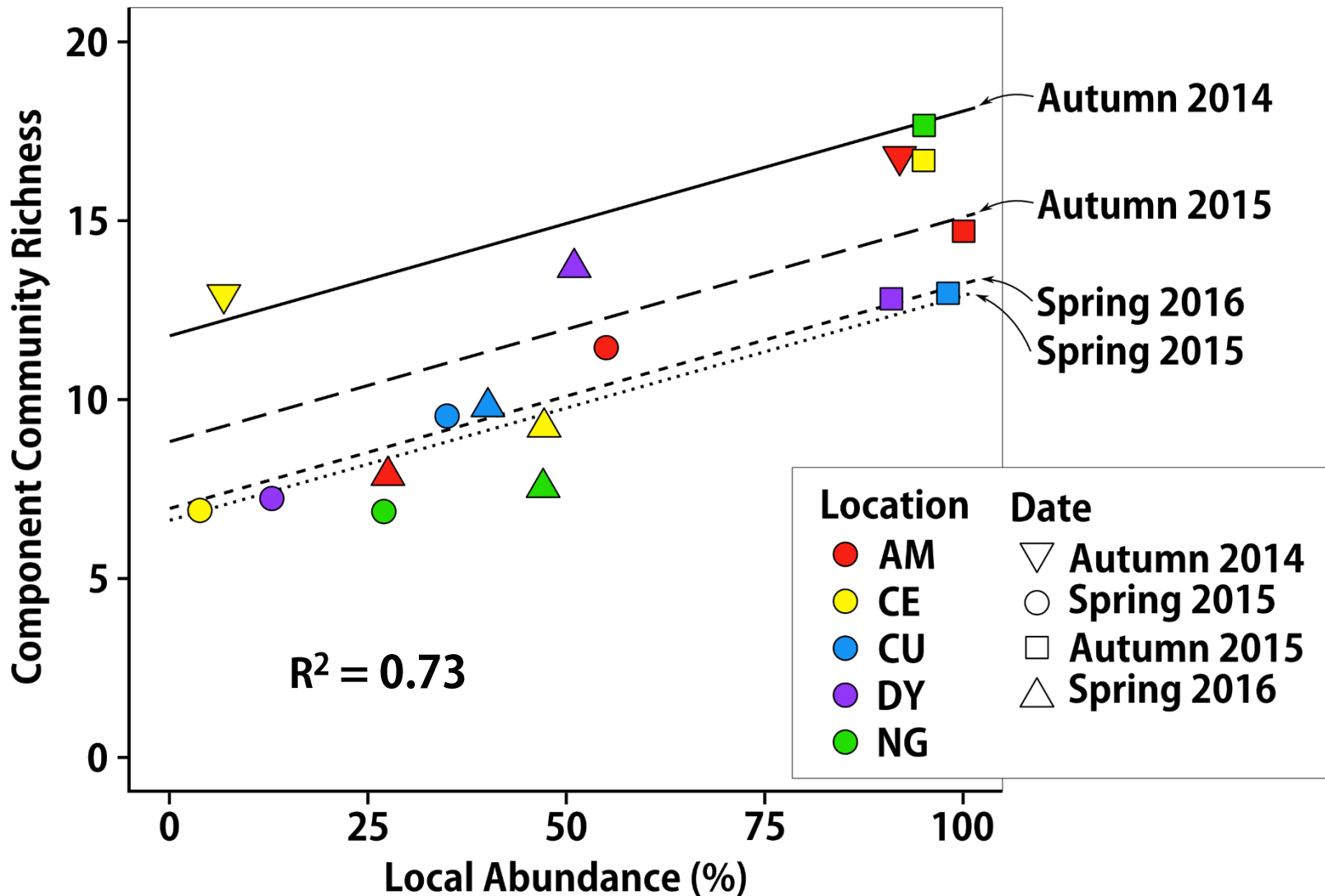
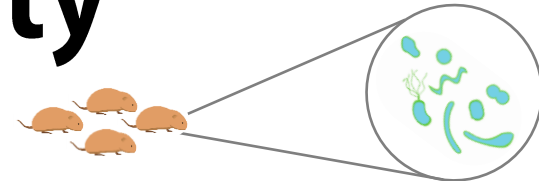
Infracommunity richness



Infracommunity richness

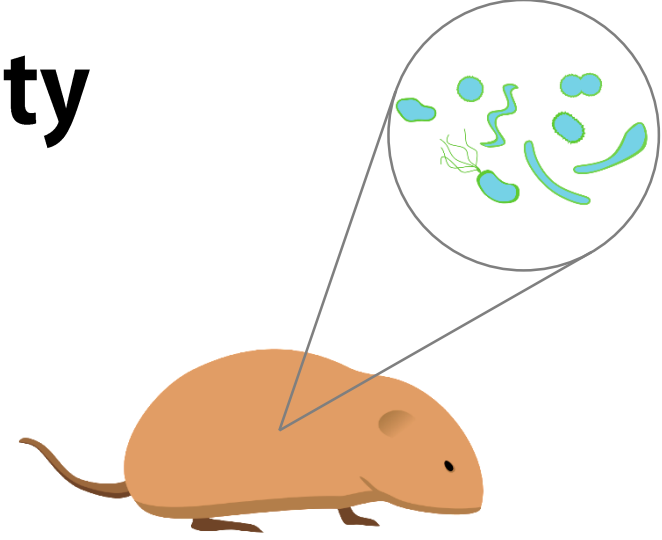
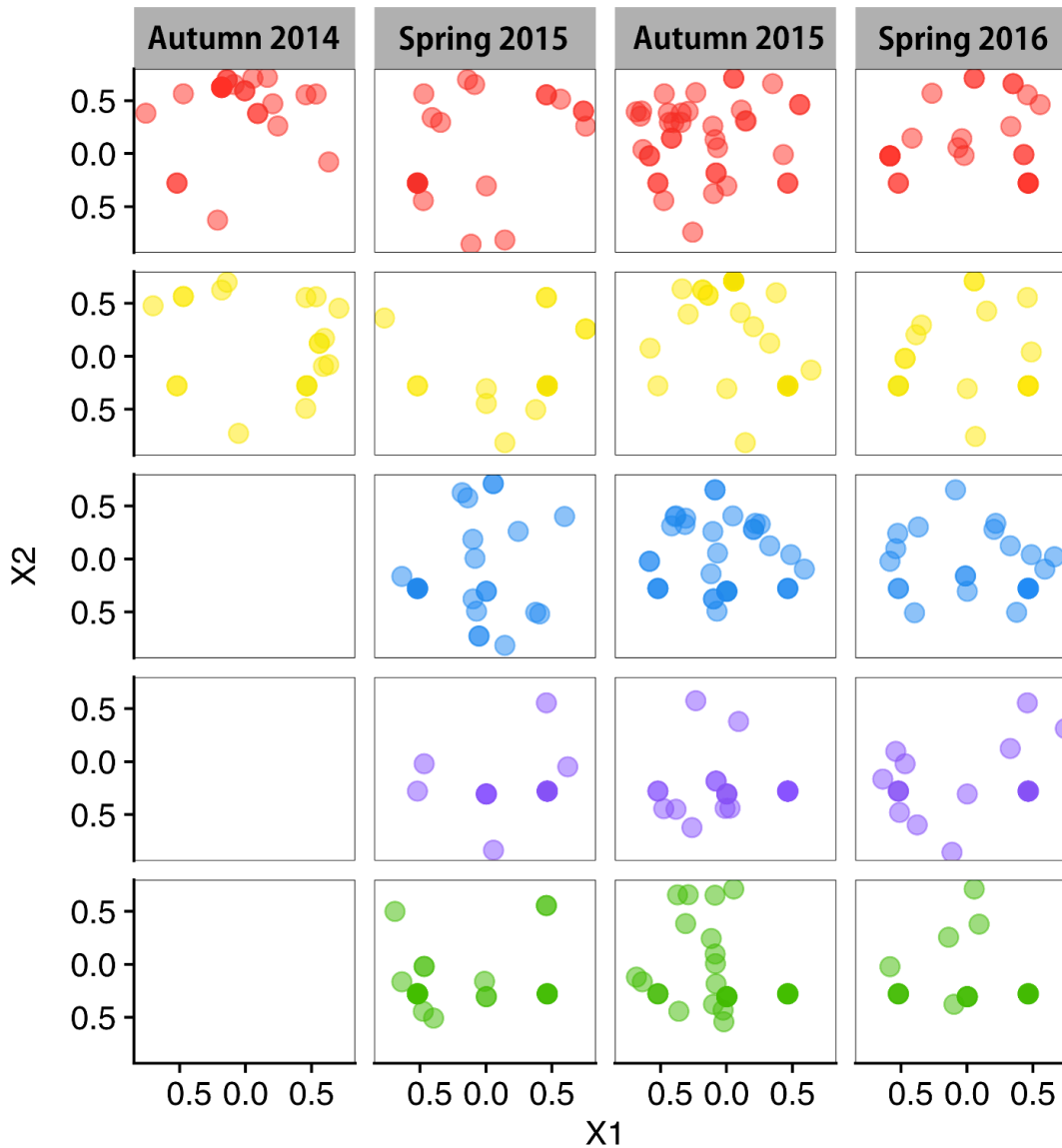


Component Community richness



GLM, AIC model selection

Infracommunity Similarity



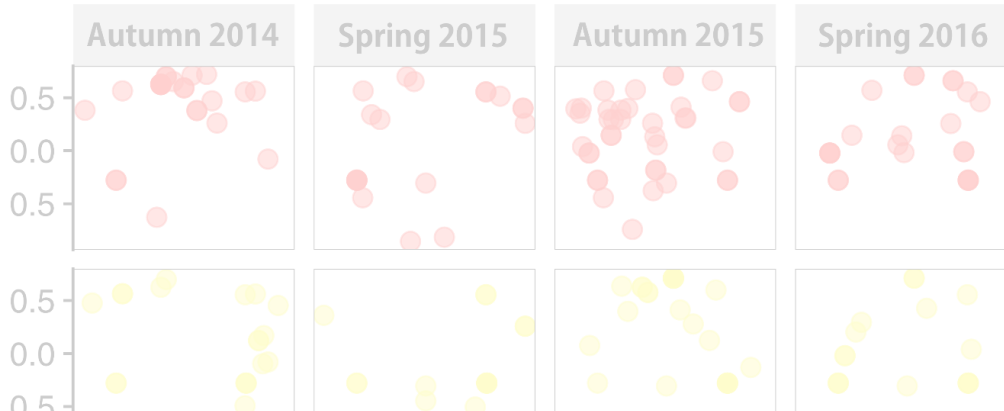
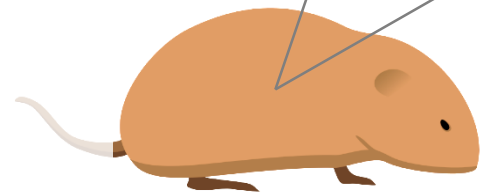
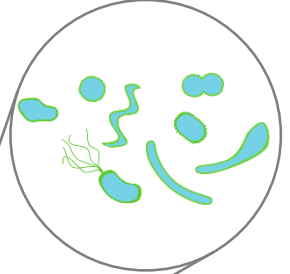
Location

- AM
- CE
- CU
- DY
- NG

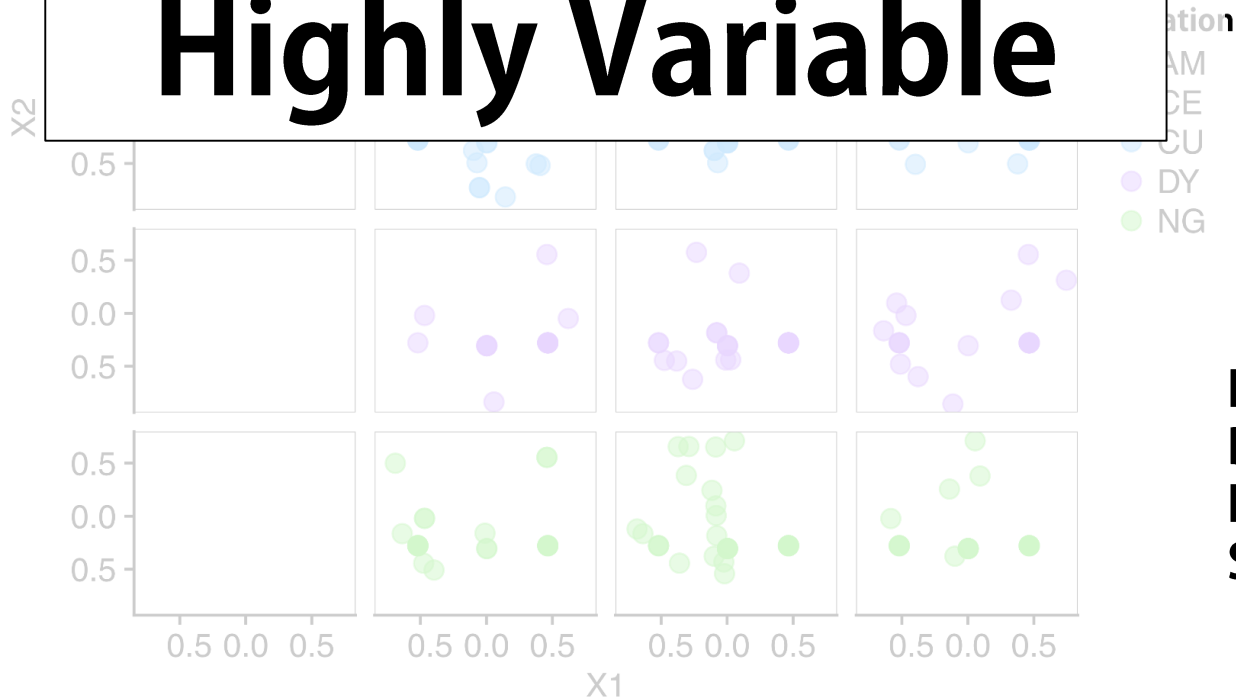
PERMANOVA

Location - 3%
Date - 3%
Local abundance - 2%
Sex - 1%

Infracommunity Similarity



Highly Variable



PERMANOVA

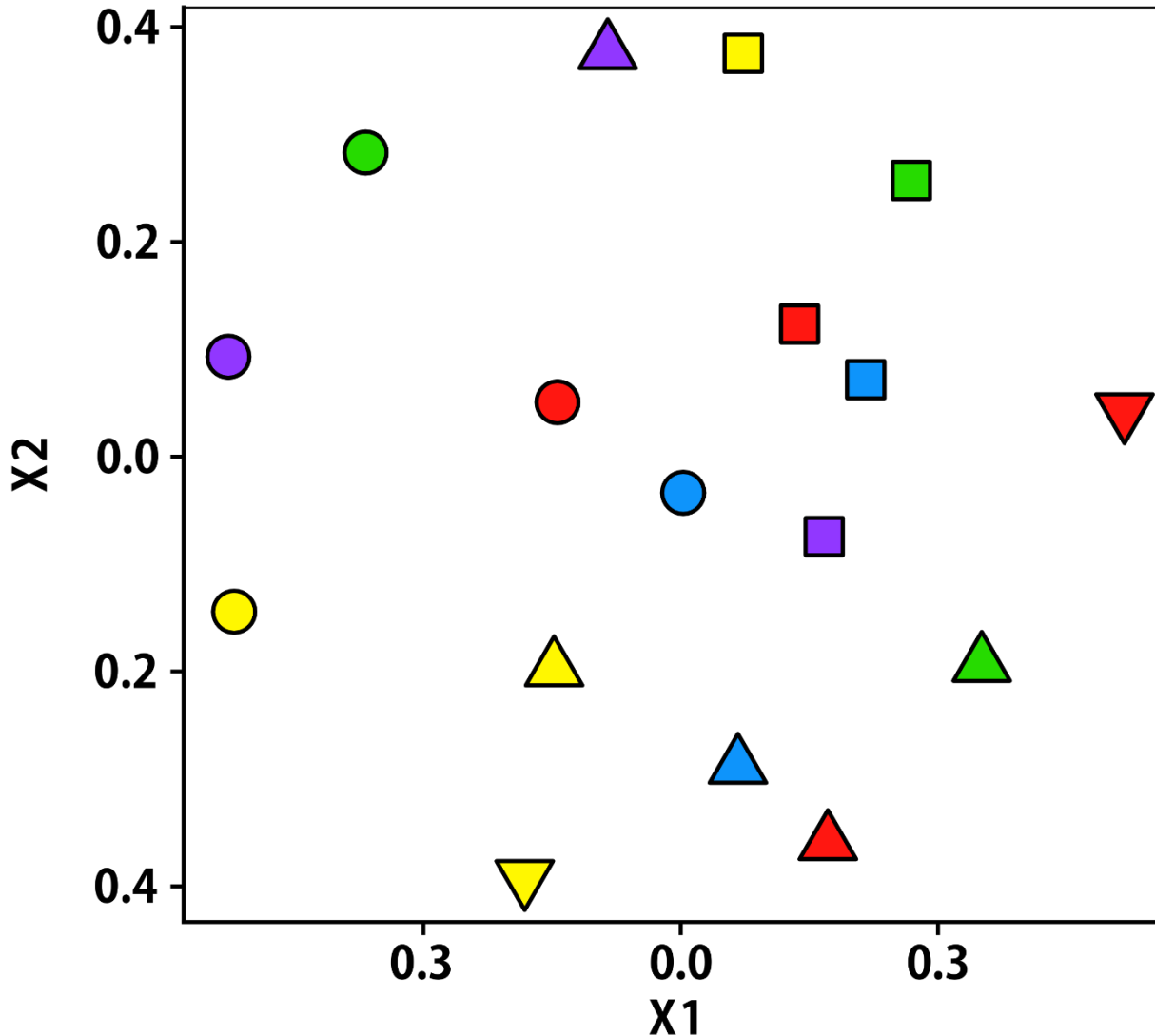
Location - 3%

Date - 3%

Local abundance - 2%

Sex - 1%

Component Community Similarity



Date

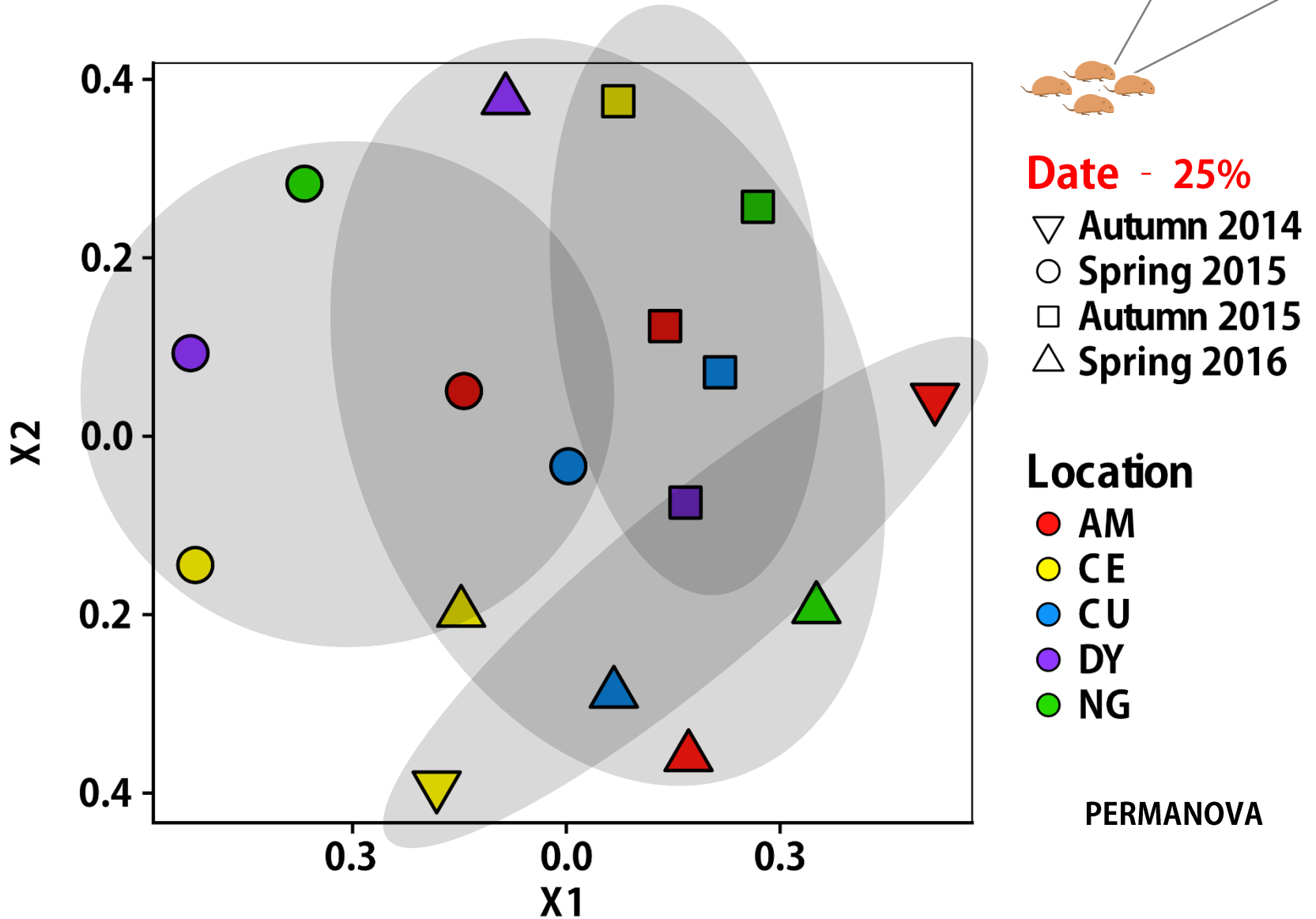
- ▽ Autumn 2014
- Spring 2015
- Autumn 2015
- △ Spring 2016

Location

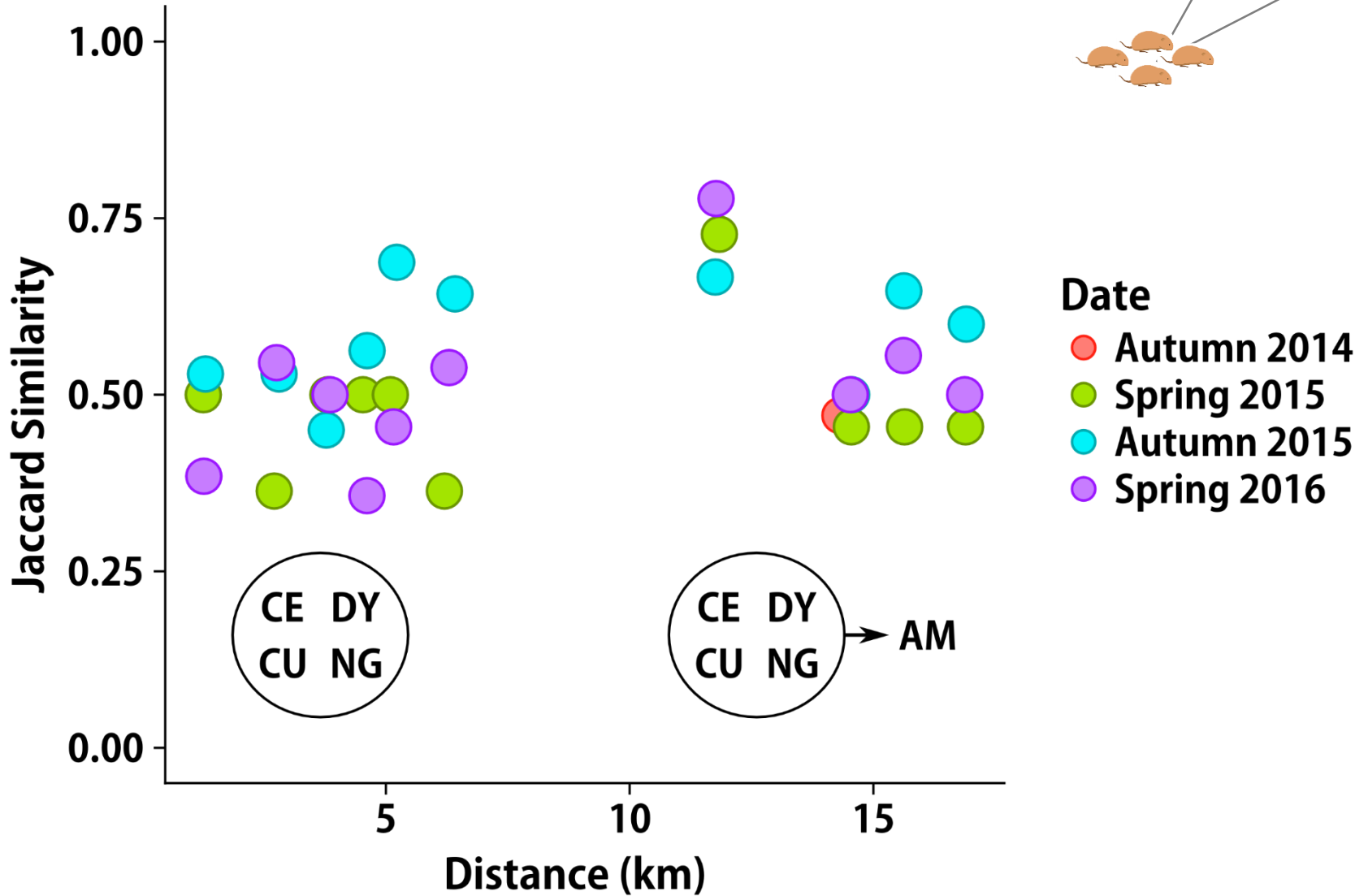
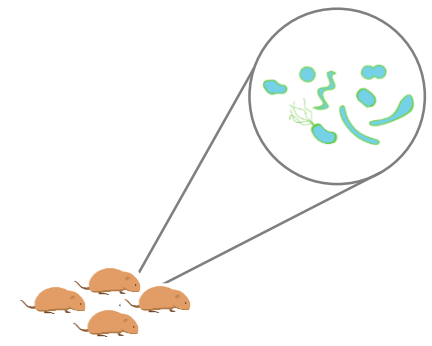
- AM
- CE
- CU
- DY
- NG

PERMANOVA

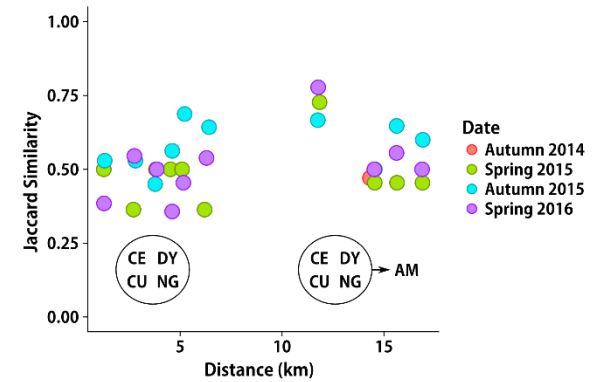
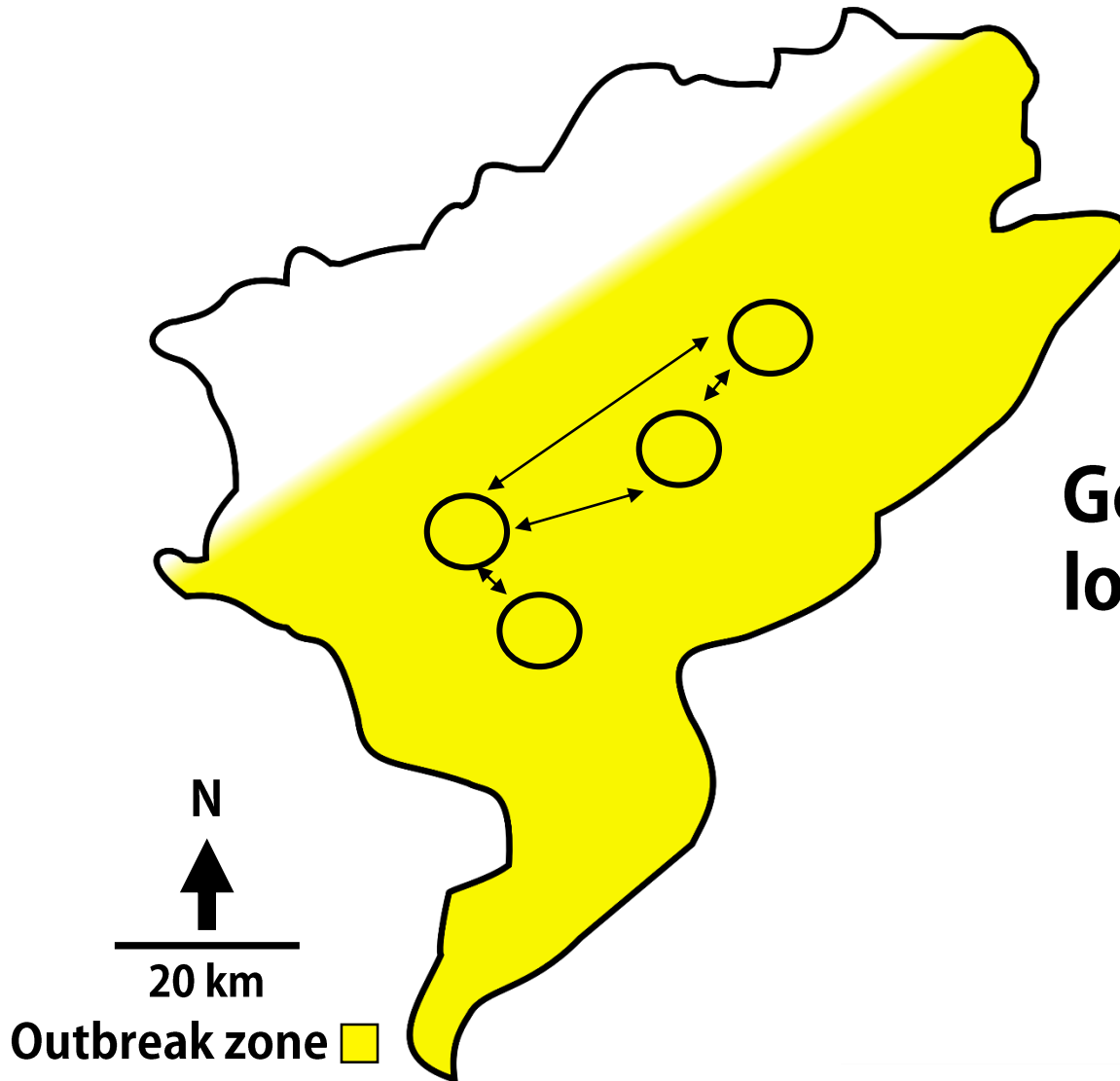
Component Community Similarity



Geographic Distance



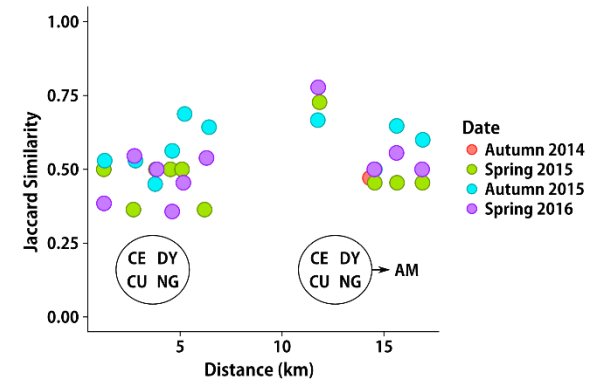
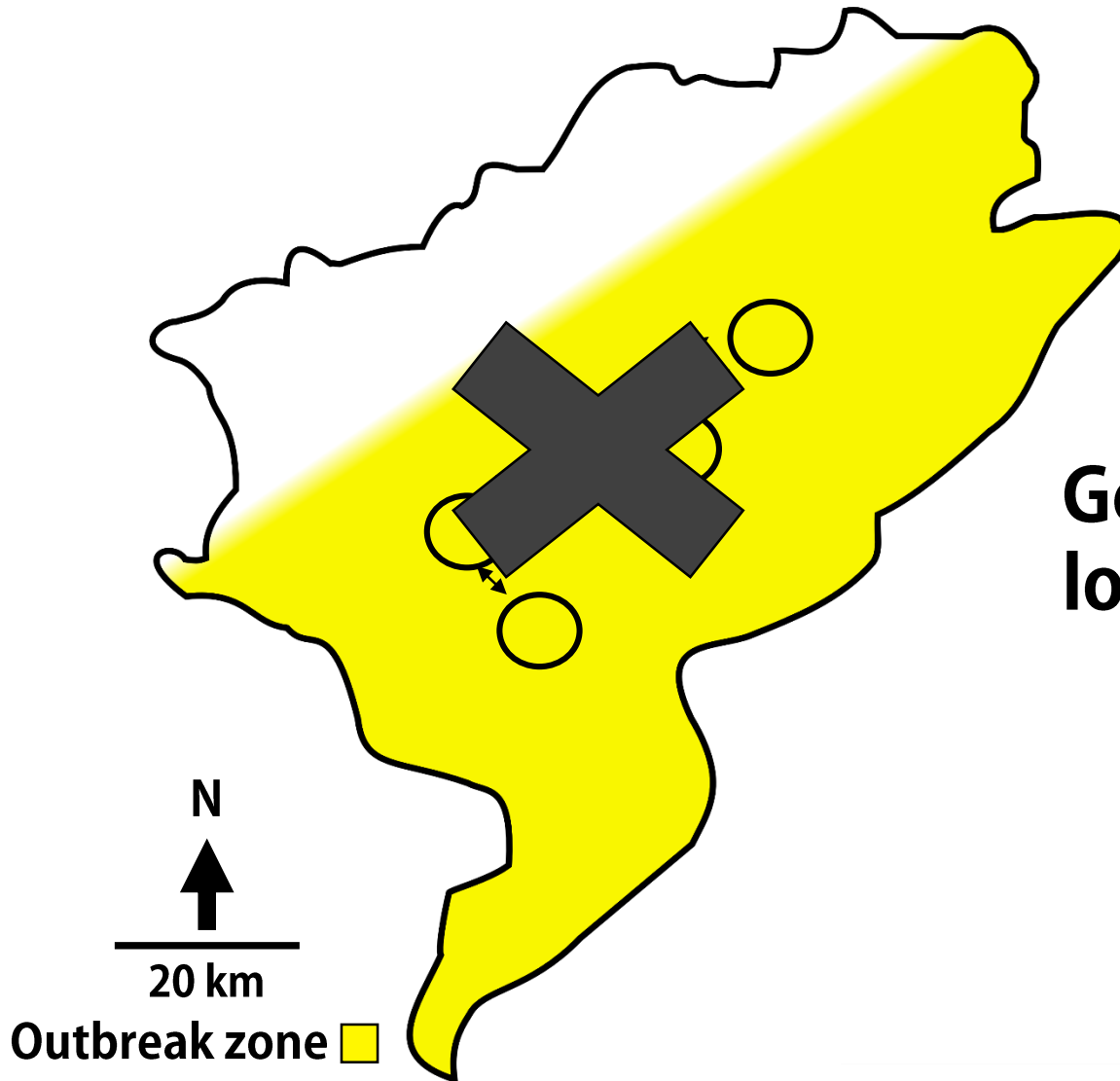
Geographic Distance



Gene flow low at low density

(Berthier et al 2005, 2006)

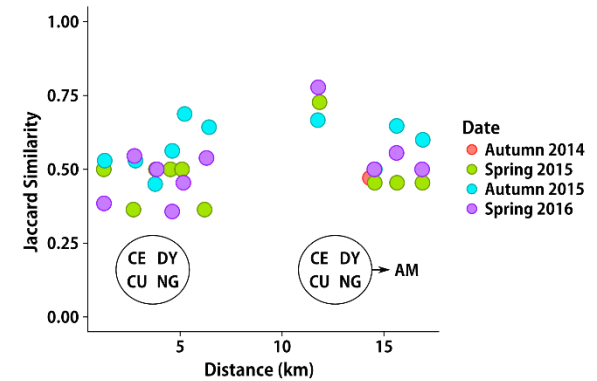
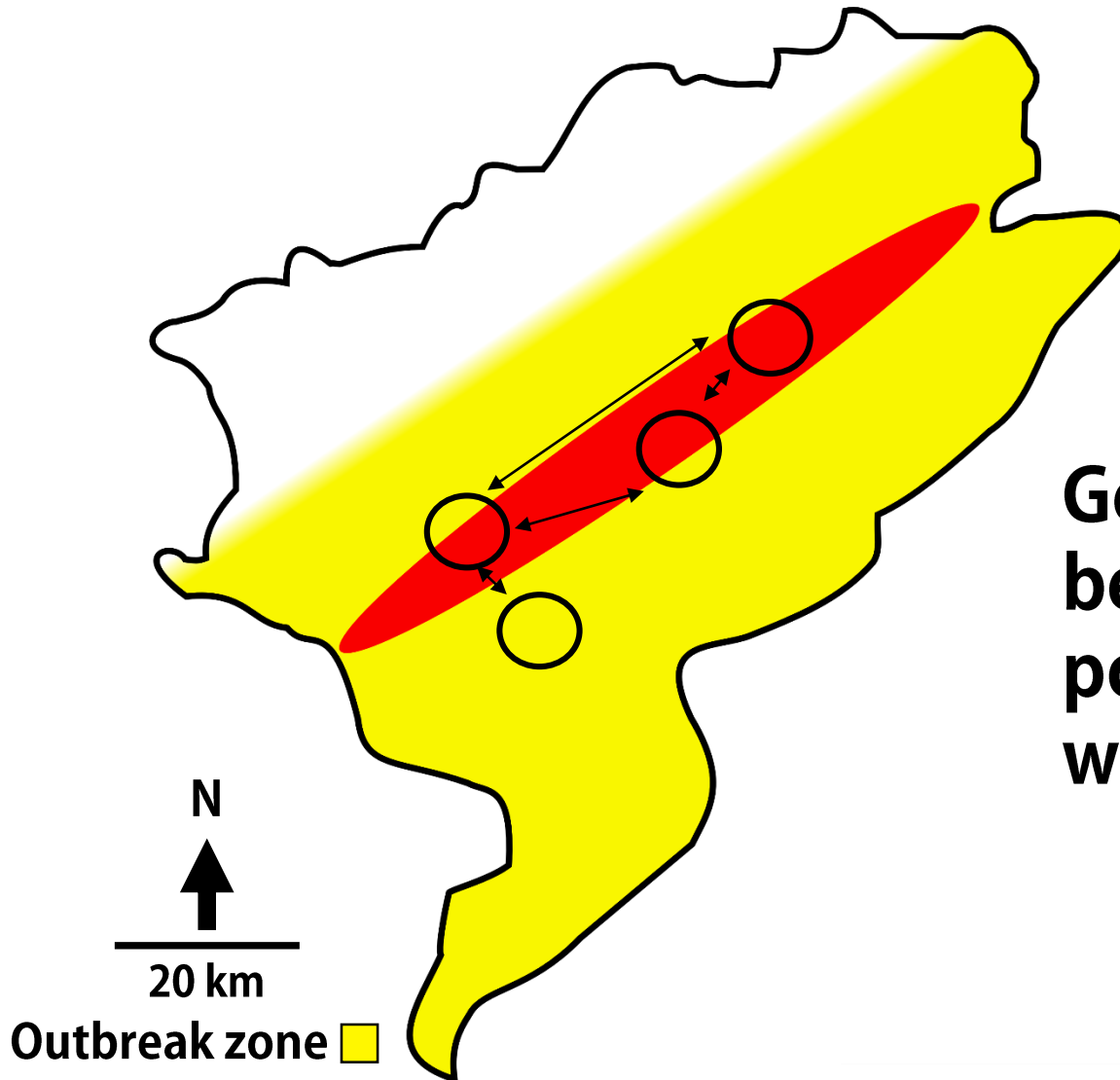
Geographic Distance



Gene flow low at low density

(Berthier et al 2005, 2006)

Geographic Distance



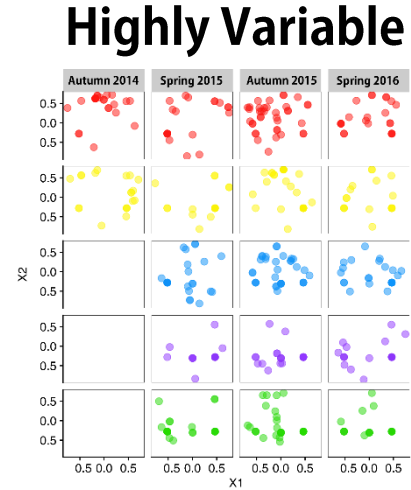
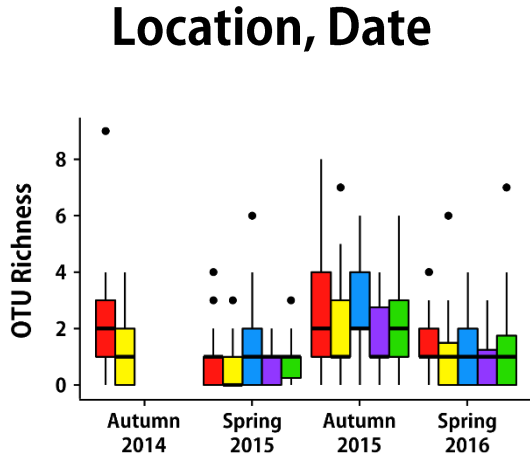
Gene flow high between peak populations, decays with distance

(Berthier et al 2005, 2006)

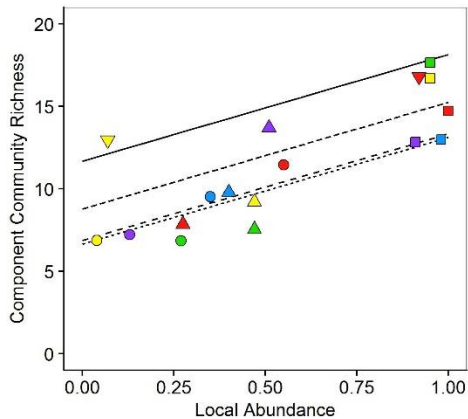
Summary

Richness

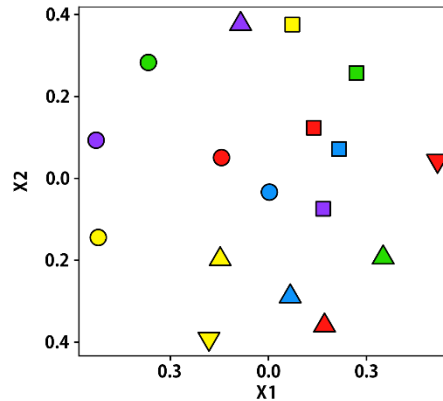
Community Similarity



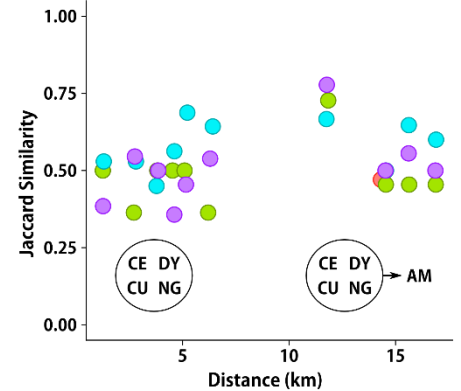
Local Abundance, Date



Date



Geographic Distance



Thanks for all the help!

- Amaël Dupaix
- Aurélie Guislain-Vitek
- Aurélien Levret
- Bérangère Foscarin
- Caroline Tatard
- Dominique Rieffel
- Eve Afonso
- Geoffroy Couval
- Herminie Piernavieja
- Javier Fernandez-de-Simon
- Jean-Baptiste Pons
- Jean-Francois Cosson
- José Gonzalo Zapata Carbonell
- Julie Montas
- Lexa Villette
- Marilyne Fontanier
- Maxime Galan
- Nathalie Charbonnel
- Nicolas Bassin
- Patrick Giraudoux
- Thibault Moulin
- Virgile Baudrot
- Vincent Driget



UNIVERSITÉ
BOURGOGNE FRANCHE-COMTE



CHRONO
ENVIRONNEMENT

INRA
SCIENCE & IMPACT

UMR CBGP



Zone
Atelier

LTER FRANCE ARC JURASSIEN

Merci!



RÉGION
BOURGOGNE
FRANCHE
COMTÉ



Future Directions - Decline

