



Ecological and evolutionary
implications of body size
illustration with a study on the common
lizard (*Lacerta vivipara*)

Manuel Massot

UMR 7625 (UPMC, Paris)

Research team 'Changement Globaux et Processus Adaptatifs'

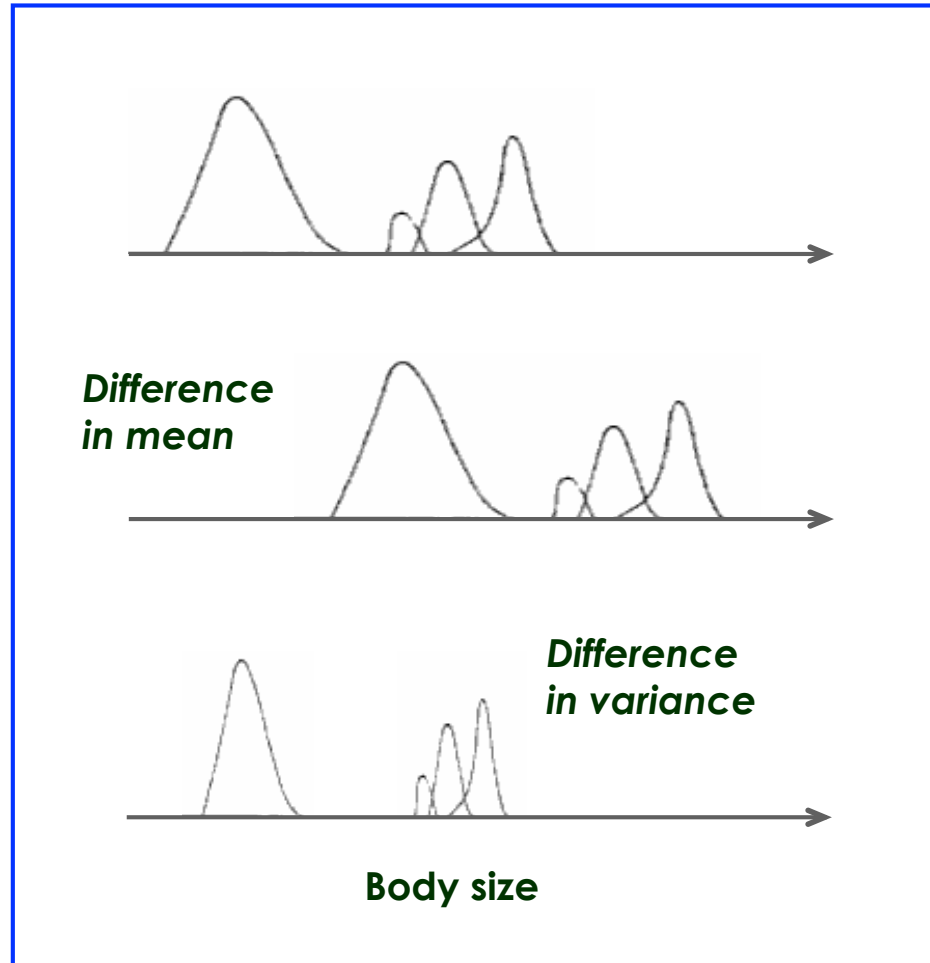
<http://ecologie.snv.jussieu.fr/mmassot/>

<http://ecologie.snv.jussieu.fr/cgpa/>

Works with UMS 3194 (Seine et Marne) & USR 2936 (Ariège)

Size-structured populations

Variability of body size frequency distributions



+ *temporal variation*
(*stability / instability*)

+ *spatial variation*
(*intra-pop variance, inter-pop variance*)

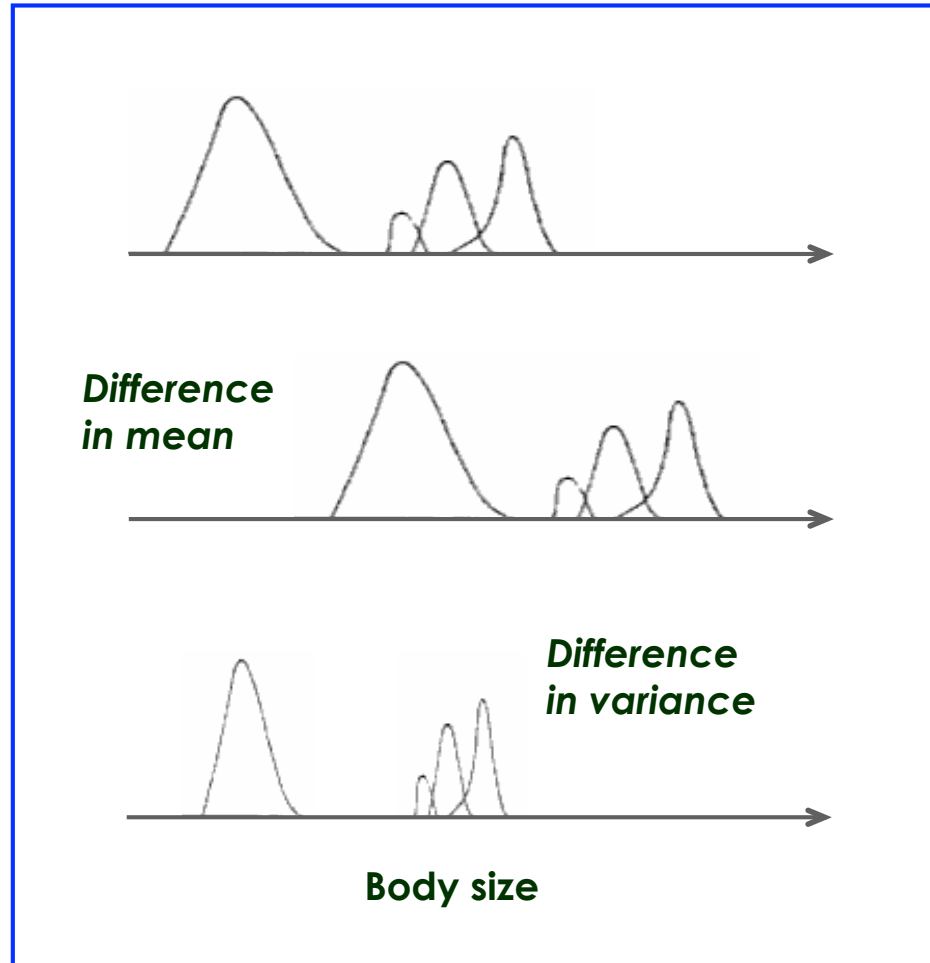


Multiple causes

**Multiple consequences for
individuals and populations**

Size-structured populations

Variability of body size frequency distributions



+ *temporal variation*
(*stability / instability*)

+ *spatial variation*
(*intra-pop variance, inter-pop variance*)



Intraspecific determinants

/ genetic

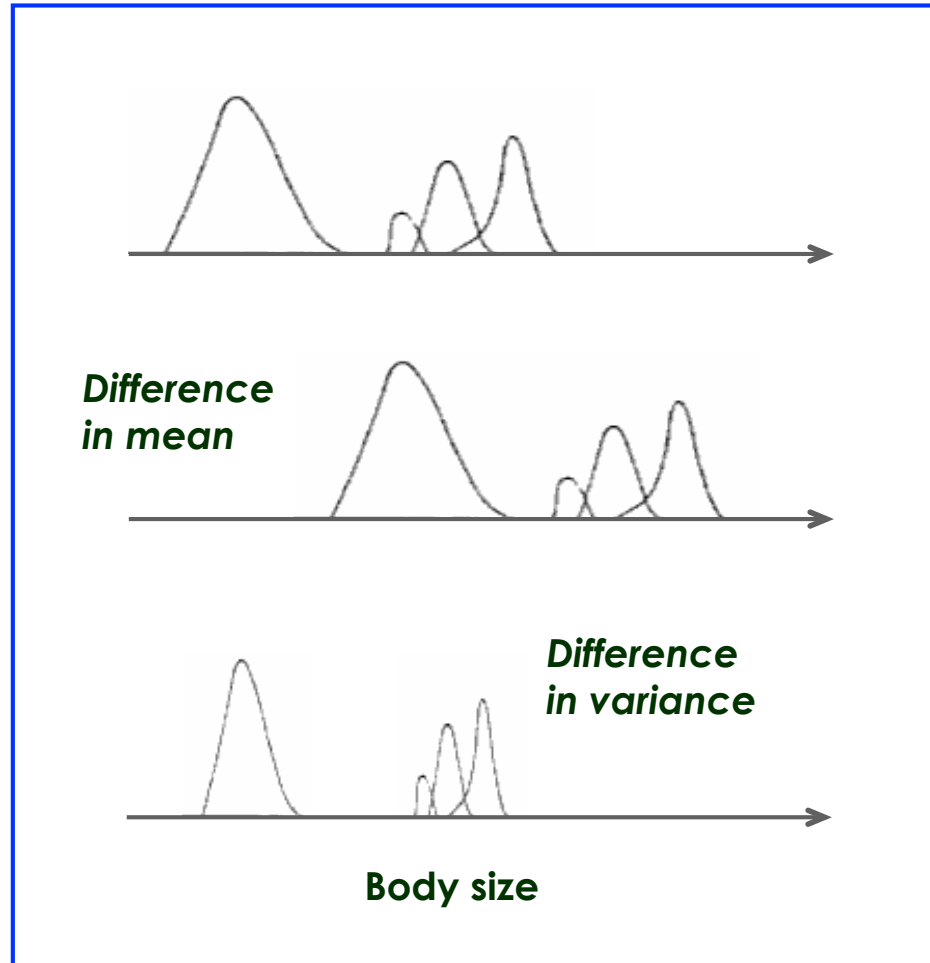
/ physiology

/ behaviour

in interaction with the Environment

Size-structured populations

Variability of body size frequency distributions



+ *temporal variation*
(*stability / instability*)

+ *spatial variation*
(*intra-pop variance, inter-pop variance*)

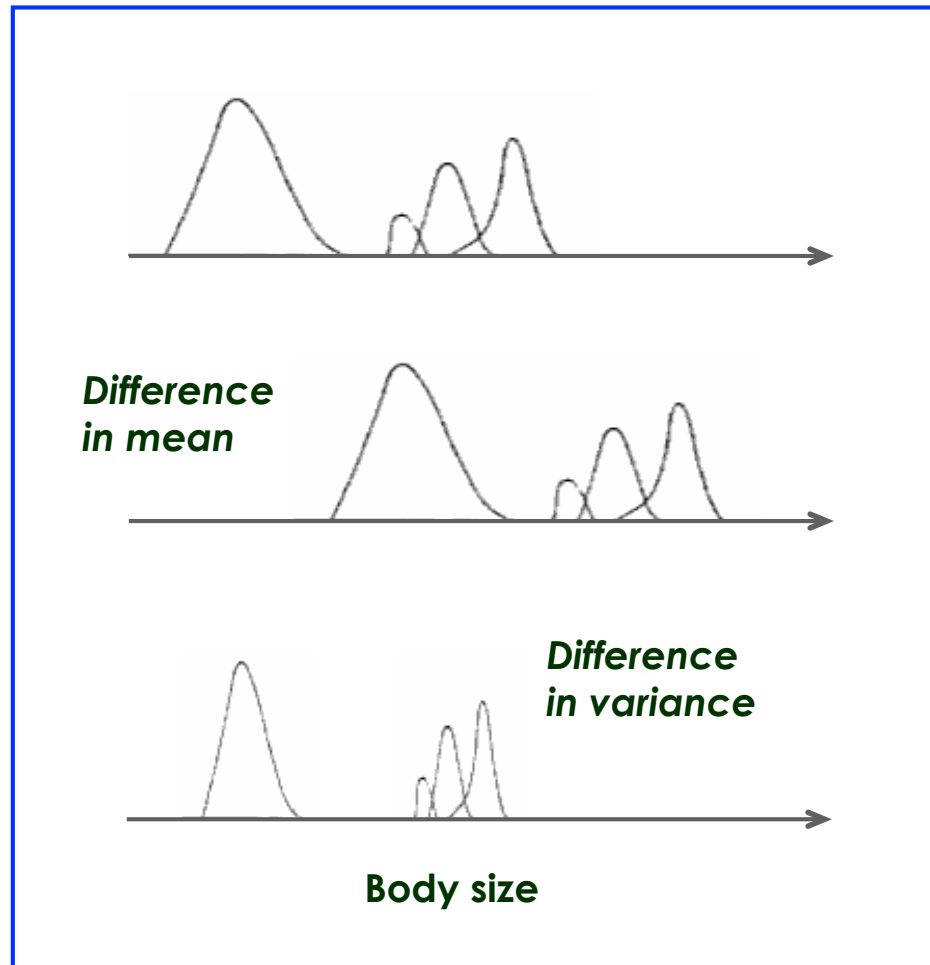


Intraspecific components

- / size at birth
- / individual growth
- / ontogeny and age structure
- / size-dependent mortality
- / size-dependent emigration
- / size-dependent immigration

Size-structured populations

Variability of body size frequency distributions



+ *temporal variation*
(*stability / instability*)

+ *spatial variation*
(*intra-pop variance, inter-pop variance*)

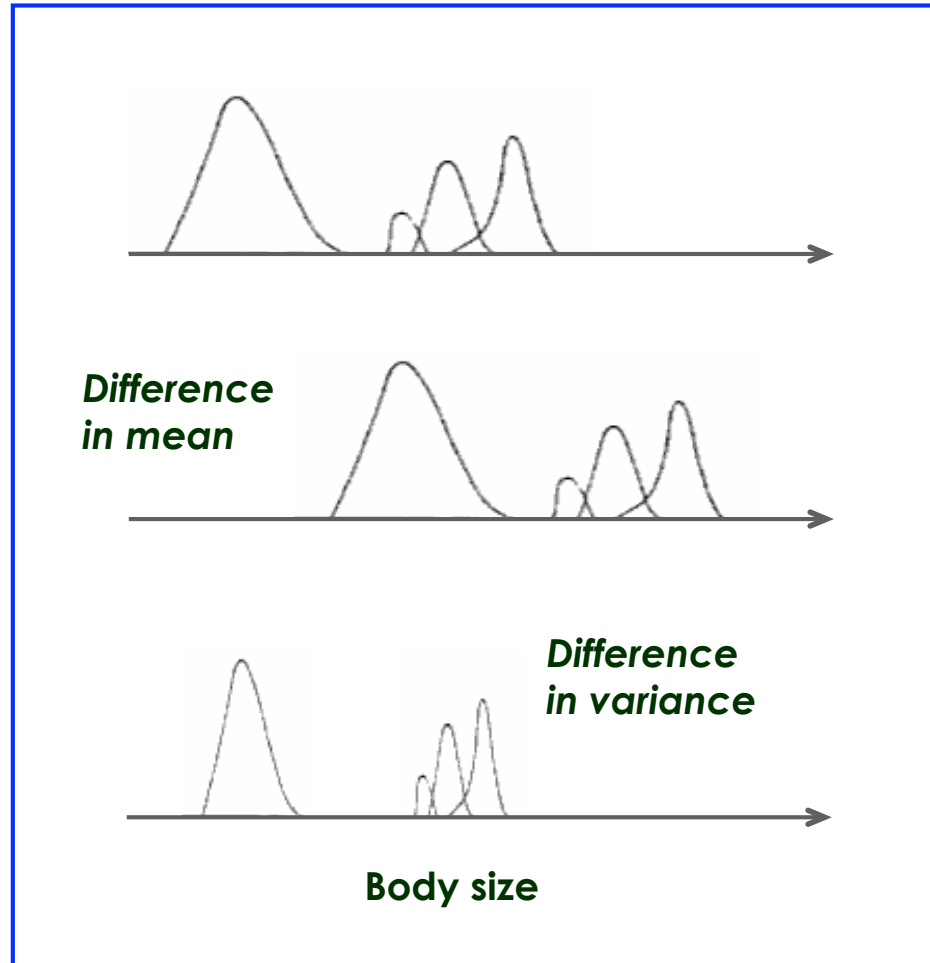


Influence of other species

- / preys
- / competitive species
- / predators
- / pathogens, parasites
- / ...

Size-structured populations

Variability of body size frequency distributions



+ *temporal variation*
(*stability / instability*)

+ *spatial variation*
(*intra-pop variance, inter-pop variance*)

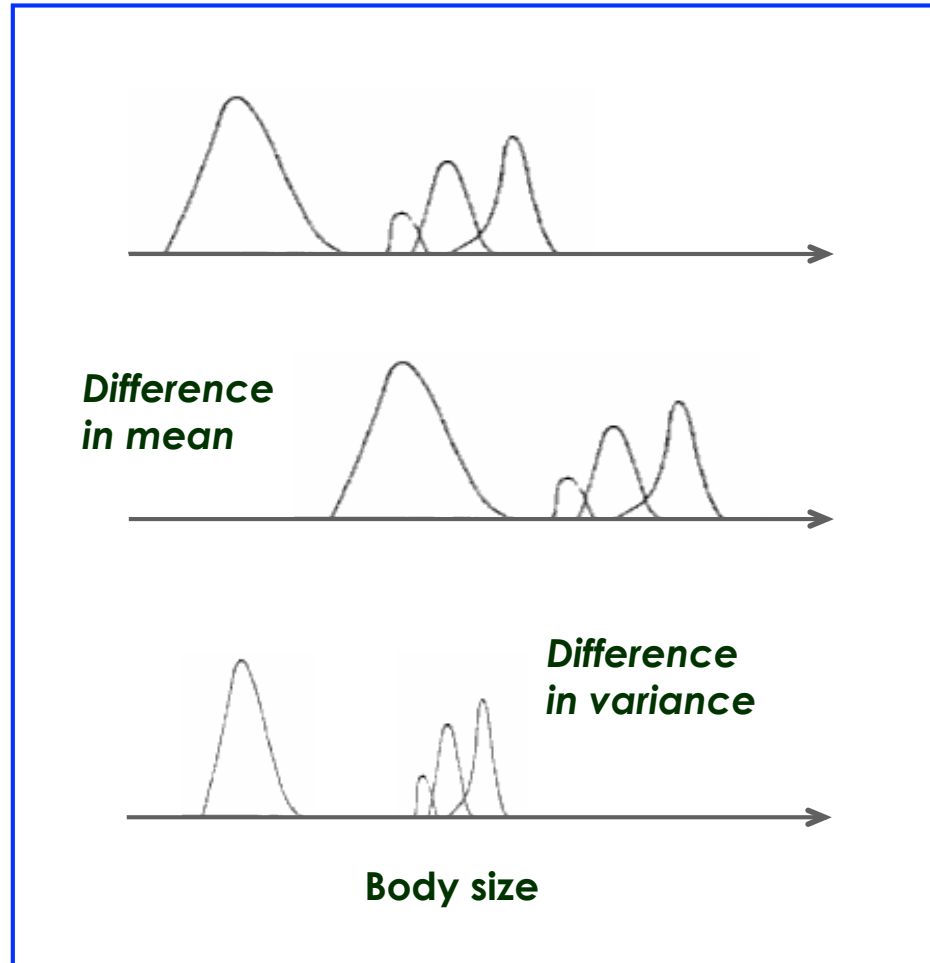


Abiotic environment

- / temperature
- / humidity
- / shelters
- / reproductive sites
- / ...

Size-structured populations

Variability of body size frequency distributions



+ *temporal variation*
(*stability / instability*)

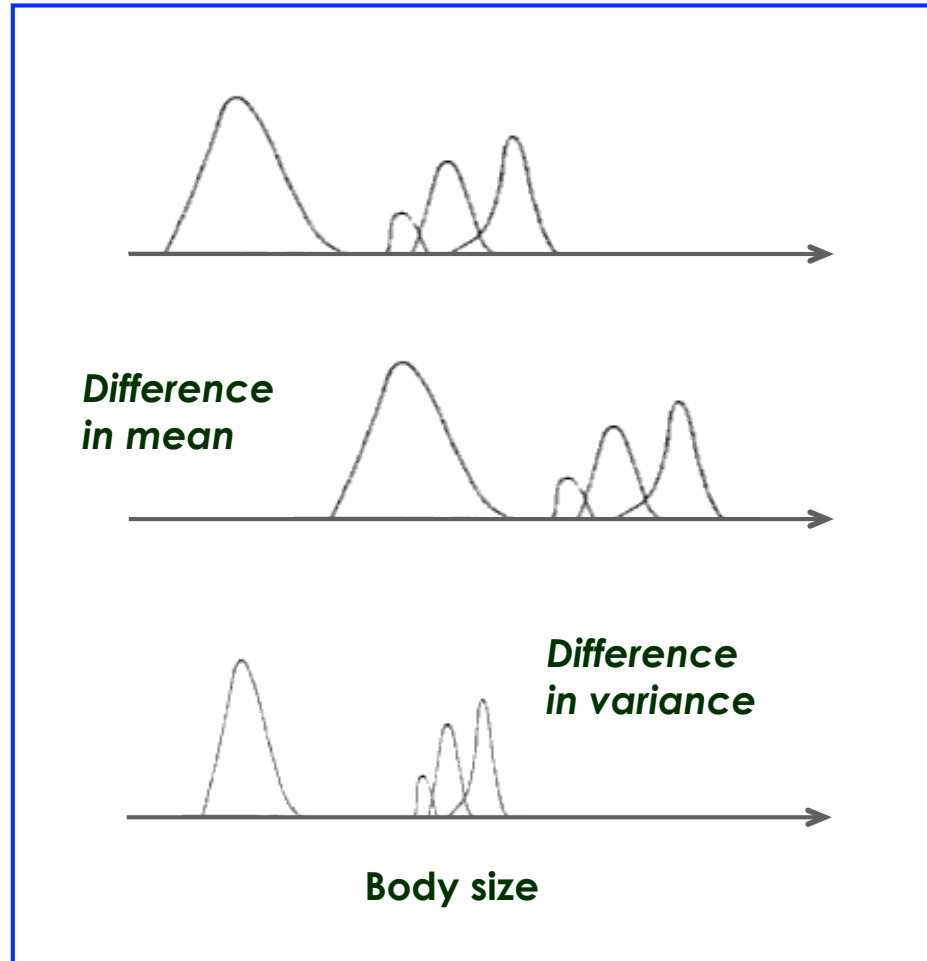
+ *spatial variation*
(*intra-pop variance, inter-pop variance*)

Intraspecific relationships

- / size-dependent physiology
- / size-dependent behaviour
- / competition
- / sexual selection
- / cooperation
- / cannibalism

Size-structured populations

Variability of body size frequency distributions



+ *temporal variation*
(*stability / instability*)

+ *spatial variation*
(*intra-pop variance, inter-pop variance*)

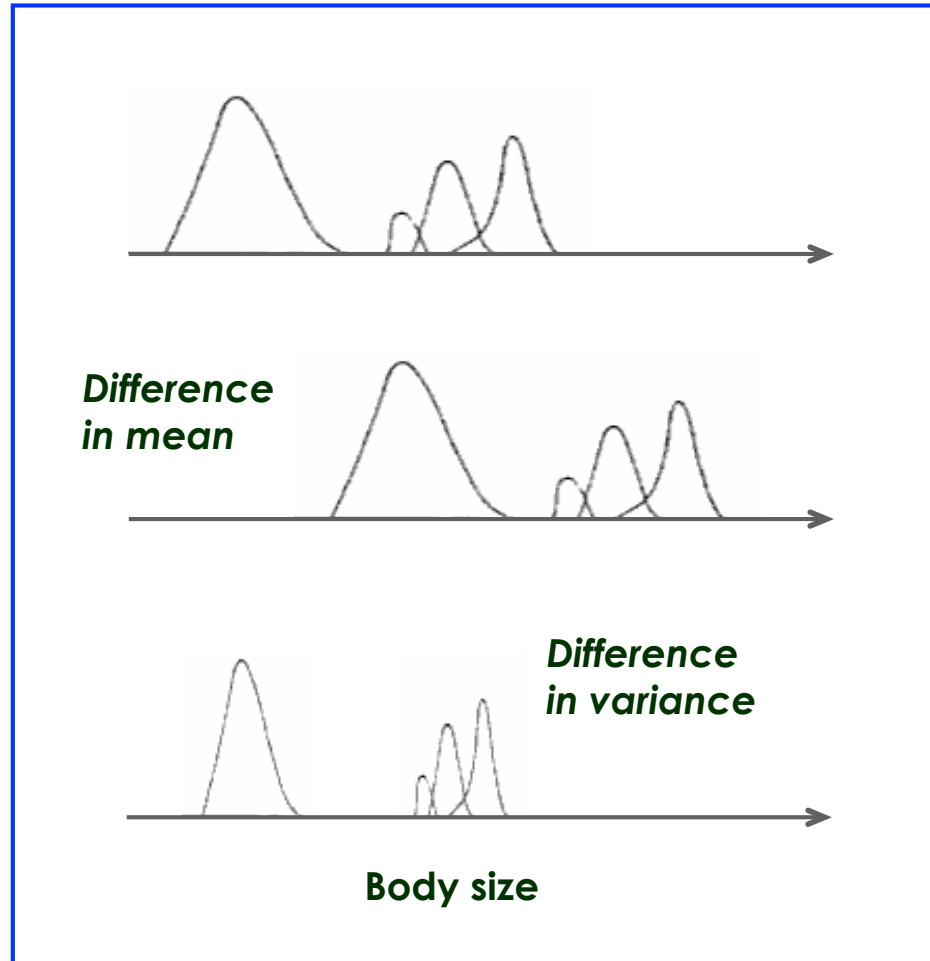


→ **Effects on other species**

- / preys
- / competitive species
- / predators
- / ...

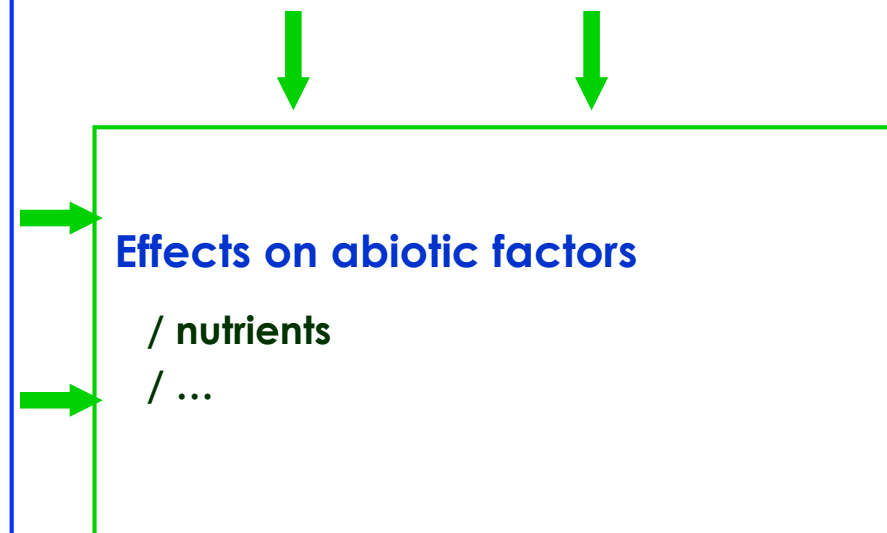
Size-structured populations

Variability of body size frequency distributions



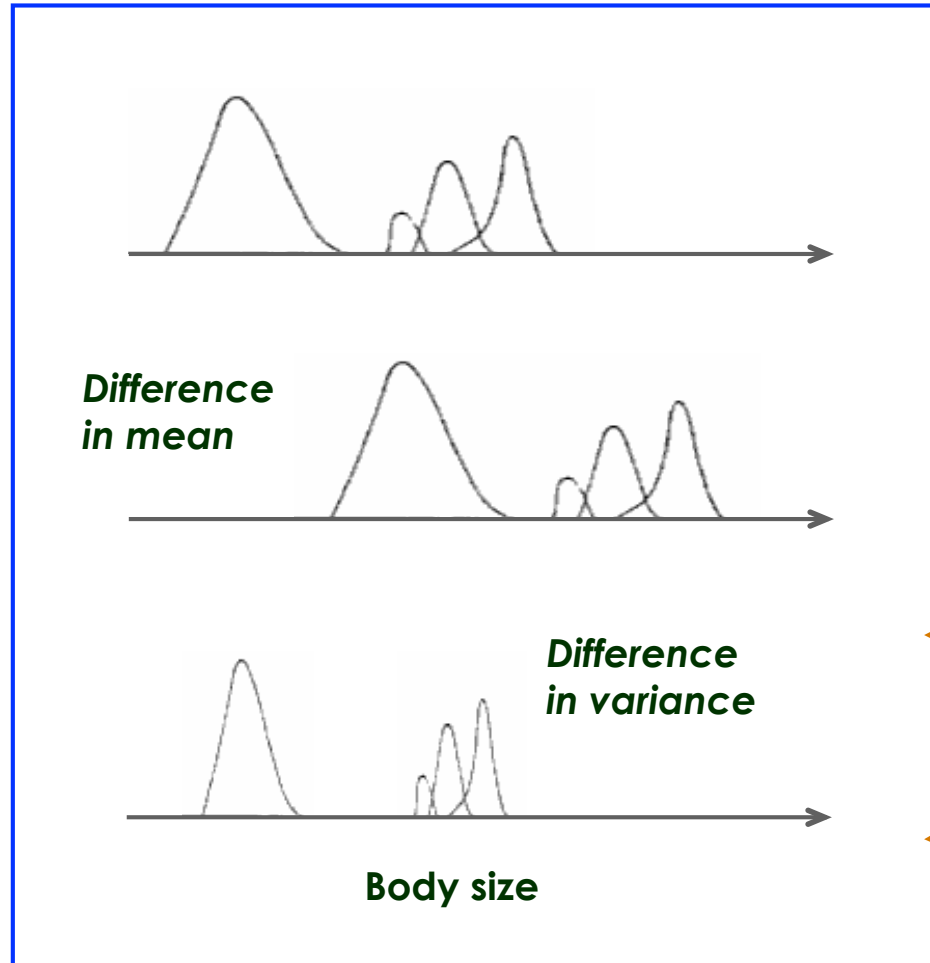
+ *temporal variation*
(*stability / instability*)

+ *spatial variation*
(*intra-pop variance, inter-pop variance*)



Size-structured populations

Variability of body size frequency distributions



+ *temporal variation*
(*stability / instability*)

+ *spatial variation*
(*intra-pop variance, inter-pop variance*)

Different scales

- / individual (plasticity, fitness, dispersal)
- / population (demography, genetic)
- / metapopulation (colonisation, extinction)
- / species (biogeography, speciation)
- / community (linked species, indirect effects)

→ **Ecology and Evolution**



illustration with a study on the common
lizard (*Lacerta vivipara*)

Research Group

UMR 7625 (UPMC, Paris) – Manuel Massot

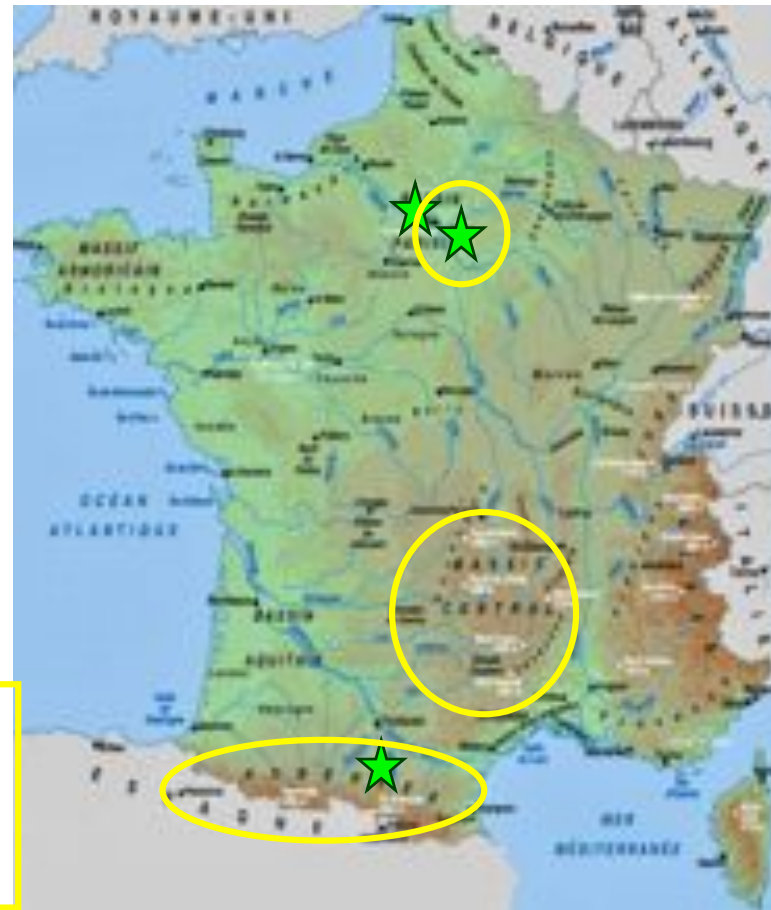
UMS 3194 (CEREEP, Seine et Marne,) – Jean-François Le Galliard

USR 2936 (SEEM, Ariège) – Jean Clobert

- Researchers: 6
- Technicians: 3
- Post-docs: 4
- PhD: 2
- National and international collaborations
- 10-12 students per year
- PhD: 14 since 1989
- 81 international papers specifically on the common lizard

**Long term survey of natural populations
in the Massif Central from 1984**

+ 2 experimental sites (CEREEP, SEEM)





Main research topics

- **Demographic and Genetic studies** of natural populations
- **Ecology & Evolution**
 - Responses to environmental variations
 - Adaptive processes
 - Natural and sexual selection
- Impacts of **Global Changes**
 - Alteration / Fragmentation / Destruction of habitats
 - Dynamics of small populations
 - Climate warming

Integrative Ecology

from individual to metapopulation

- **Demography**

/ long-term survey of natural populations

/ experiments (CEREEP, SEEM)

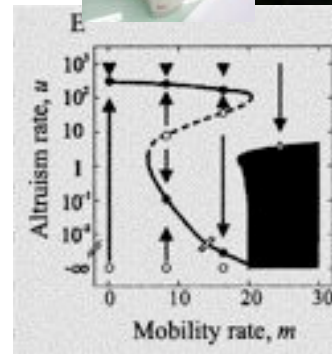
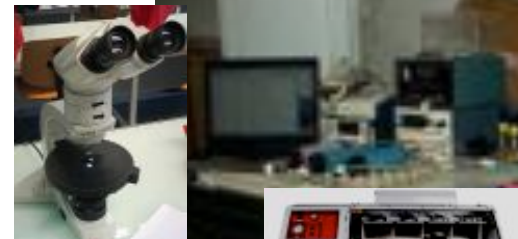
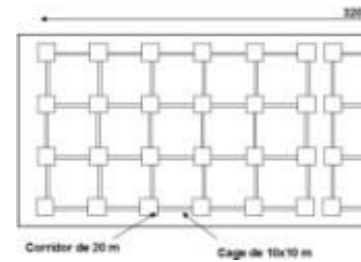
- **Genetic**

- **Behaviour**

- **Physiology**

- **Microbiology**

- **Models**



The common lizard (*Lacerta vivipara*)



- Live bearing lacertid (...)
- One litter per year
- 5 offspring per litter (1-12)
- No parental care

- Juveniles immediately active after birth
- 30% survive until the end of hibernation
- Juvenile dispersal within the first 10 days of life



Why study the common lizard?

Few studies on ecology
and evolution in reptiles



Advantages of the common lizard (*Lacerta vivipara*)



- **Model species** (demography, physiology)
- **Diversity of habitats**
- **Large sample sizes** (1000 individuals / ha)
- **Species easy to capture, rear and manipulate**
- **High sensitivity to temperature** (activity, dispersal, physiology)

24 study years of natural populations in the National Park of Cévennes



The largest reptile geographic range

- . Phenotypic plasticity
- . Colonizing ability
- . Viviparity (oviparity in the south !)
- . Adaptations to cold temperatures

