MSc Behavior, Evolution, Conservation (BEC)

Prof Jerome Goudet Jerome.goudet@unil.ch

https://www.unil.ch/eb-bec
Msc Behaviour, Evolution, Conservation (BEC)

• How does evolution work?
• How do organisms interact with their environment?
• What does this imply for conservation?

If you want to learn about these questions, the master BEC is for you
A master program where personal research is central

- 2/3 of the program is **pure research**, embedded in one of the 20+ research groups of the Dept of Ecology and evolution, but also in other UNIL departments or outside UNIL.
- From field work to published scientific discovery
- You will learn to master **all the skills** necessary to convey your message: designing, collecting, processing analysing, writing, speaking.
Diverse Methods...

- **Evolutionary Theory, Fundamental concepts**
- **Statistics, Hypothesis Testing**
- **Analytical Thinking, Experimental Design**
- **Laboratory Experiments**
- **Constructing Phylogenetic Trees**
- **Genetics (Evolutionary & Molecular)**
- **Mathematical Modeling**
- **Genomics; Sequencing; Genotyping Methods**
- **Bioinformatics**
- **Selection Experiments, “Experimental Evolution”**
- **Field Experiments & Measurements**
...and organisms

Alpine Plant Communities

Bats and their parasites

Fruit flies

Avian malaria

Ants

Lizards

Plants

Snakes

European wolf

Green/Water Frogs

Clown fish

Mycorrhizal fungi

Barn owls

Stick insects

White fish

Freshwater snails
Observe, plan and design...

- Everything starts in the field.
- The master program offers several field courses (Spain, Tenerife, Brittany, Africa, and... The Alps)
- Planning and experimental design is essential.
Record...
Collect...
Experiment...
Analyse...
Where are our alumni working?

- UNI, EPF, HES
- Teaching
- Private sector
- NGO and prof. Ass.
- Public admin
- Industry
- Culture (libraries, museum...)
- Others (tourism, sports coaches...)
- Health
Three specialisations in MSc BEC

Specialisation: 30 ECTS credits of focused topics leading to a mention on the master’s diploma.

- Behavior, Economics, and Evolution (BEE)
- Computational Ecology and Evolution (CEE)
- Geosciences Ecology and Evolution (GEE)
Why does economics matter for an MSc BEC biologist?

Economics studies how individuals can make well-informed decisions when they have limited resources and interact with each other.

- Plants, animals, and humans are decision makers.
- Understanding how scarce resources are efficiently allocated is a common problem in biology.
(1) How does evolution shape behaviour?

- adaptation
- trade-offs
- human evolution

- strategy
- cooperation/conflict
(2) How to achieve resource conservation?

Biology
- how species evolve
- how resource dynamics occurs
- how interactions with the environmental evolved

Economics
- how to allocate resources
- how to solve conflicts
- how to incentives behavior to achieve certain goals

Institutions for resource conservation

How to achieve resource conservation?
Why does computational biology matter for an MSc BEC biologist?

Quantitative tradition in ecology and evolution:
- population & behavior & quantitative genetics.
- ecological models and management of resources.
- geographic information systems.
- phylogenetic modeling of biodiversity.

Genomics increasingly important:
- population genomics.
- sex determination systems, chromosome evolution.
- convergent evolution of genomes and phenotypes.
(1) Use statistics and computers for biology

**Genomics**
- Ant social chromosome
- Transposon evolution in asexuals
- Species definition

**Modeling**
- Climate change and trout biomass variation
- Positive selection in human evolution
- Predicting effectiveness of bird conservation
- Parameters for species distribution models
(2) Develop useful methods

**Databases**
- Selectome

**Software**
- QuantiNemo

**R packages**
- MigClim
Why does geosciences matter for an MSc BEC biologist?

• Be able to **solve complex ecological problems** through quantitative and modelling approaches, using complementary knowledge acquired in **geosciences and environmental sciences**.

• Have an integrated view of natural systems and conduct **interdisciplinary research projects** in ecology / environment.

• Transfer scientific knowledge and skills
Useful additional skills for ecological studies

Geoinformatics, Remote Sensing & Spatial modelling

Ecotoxicology & Pollution

Geomorphology & Cryology

Climatology

Mountain studies in the Swiss Alp http://rechalp.unil.ch

Numerous lab equipment (spectroscopy, isotopic rates, particle size, ...)

Water & Geochemistry

Field work

Field stations

Soil sciences and plant-soil interactions

Clean lab

Drones

GPS

Lidar
BEE, CEE & GEE: various type of integrative courses

• Disciplinary courses of MSc BEC.

• Cross-disciplinary courses at HEC for BEE and at GSE for GEE

• Inter-disciplinary courses specific to the specialization, like environmental economics (BEE), bioinformatics algorithms (CEE) or mountain ecosystems (GEE).
BEE, CEE & GEE specialisations: summary

• Interdisciplinary and integrative.

• Bridges gaps among fields, thus makes you extra special.

• Details about program and motivation of the specializations available from MSc BEC website: https://www.unil.ch/eb-bec
For more information see:

MSc BEC website:
https://www.unil.ch/eb-bec

Department of Ecology & Evolution:
http://www.unil.ch/dee