

- Faculté des sciences
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Methods in biodiversity monitoring (3BL2270)

Filières concernées	Nombre d'heures	Validation	Crédits ECTS
Master en biologie	Cours: 30 pg	Voir ci-dessous	3
Master en conservation de la biodiversité	Cours: 30 pg	Voir ci-dessous	3

ph=période hebdomadaire, pg=période globale, j=jour, dj=demi-jour, h=heure, min=minute

Période d'enseignement:

- Semestre Automne

Equipe enseignante

Christophe Praz

Contenu

Biodiversity databases are experiencing exponential growth, offering a unique opportunity to monitor changes in biodiversity. Concurrently, there is a surge in the development of analytic tools and statistical models for tracking species and assessing shifts in biological communities. Additionally, DNA-assisted techniques are increasingly prevalent in biodiversity monitoring. This lecture equips participants with the theoretical and practical knowledge necessary to comprehend and effectively employ these methods, enabling them to acquire the essential background for successful biodiversity monitoring.

This lecture is mandatory for students in the Master in Biodiversity Conservation and optional for those in the Master in Biology. Some content may overlap with material covered in the Bachelor's program in Biology and could be repetitive for Biology Master's students. If you are a biology student and are unsure about taking this lecture, please feel free to contact me.

The following topics are covered:

1. Biodiversity databases: taking Switzerland as an example, we will examine and discuss how species occurrences are collected in the field and assembled in a database. Subsequently, we will explore the maintenance and validation of these databases, as well as the methods through which the information is made available to conservation practitioners.
2. IUCN red lists: Red lists play a crucial role in conservation biology, as they frequently carry legal implications for species and habitat protection while also serving as decision support tools for prioritization. In this context, we will present and discuss the red list criteria and categories, including the methodology used for compiling regional red lists. We will also discuss common pitfalls in the red list methodology and discuss the concept of "green lists".
3. Principles in biodiversity monitoring: To ensure effective species monitoring, it is essential to address common pitfalls in monitoring programs. Special emphasis should be placed on dealing with issues related to imperfect detection and ensuring appropriate sampling, both in terms of timing and spatial coverage.
4. Species indices and multi-species indices. Species trends are often computed based on monitoring programs, or, if these are not available, on opportunistic data. We will examine how species indices are calculated and how the indices of several species are combined to form a multi-species index.
5. Occupancy models. This important class of statistical models holds significant potential for monitoring species occupancy, taking into account factors like imperfect detection and sampling efforts. In this context, we will present and discuss these models.
6. DNA-assisted identifications. DNA-based techniques are increasingly employed for species identification and detection. We will cover the fundamental principles of DNA barcoding, as well as introduce the concepts of metabarcoding and environmental DNA.
7. Basics in conservation genetics. Genetic diversity monitoring is also conducted. We will provide a brief overview of the various DNA markers commonly used for studying genetic diversity. Additionally, we will explore some typical applications in conservation biology, including DNA-based fingerprinting, investigations of gene flow, and the field of landscape genetics.

Forme de l'évaluation

Written exam during exam session.

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No documentation is allowed. The questions will be in English, answers may be given in English, French or German. A bilingual dictionary (any language/English) is allowed. Questions will include short questions as well as essay-type questions. Each question will be assigned a certain number of points, indicated in parenthesis. The total number of points obtained by the candidate will be divided by the maximal number of points; this number will be multiplied by five and one unit will be added; the final grade will be rounded up to the nearest half point. A candidate obtaining 18 points out of a maximum of 24 will have a final grade of 5.0 (rounded up from 4.75).

Documentation

The PDFs of the lectures will be made available each week. Further documentation will be provided by email or through Moodle.

Pré-requis

There are no formal prerequisites for this class. However, several practical exercises will be conducted in R, and students without prior experience are encouraged to familiarize themselves with basic R syntax (opening and saving files, creating variables, running simple statistical tests). A wealth of online training material is available for this purpose.

Forme de l'enseignement

The course format includes a combination of traditional (ex cathedra) lectures and regular exercises that students are expected to complete outside of class hours.