

Unit Name: Animal Population Genetics

Person in charge: dr hab. Andre Moura

Forms of teaching:

Lecture; Computer practical; Seminar

Implementation:

In-room teaching (can be online if needed)

Number of hours:

Lecture: 15 hours; Computer practical: 6 hours, Seminar: 9 hours

ECTS credits:

3

ESTIMATE OF WORKING TIME

Work in contact with the teacher:

Participation in classes: 30 hours

Consultation: 10 hours

Exam: 3 hours

Independent work of this student:

Preparation for passing - 32 hours

Language of Instruction: English

Didactic methods:

- Discussion
- Lecture with multimedia presentation
- Seminar sessions involving discussions around the module subjects
- Bioinformatic method (data preparation, data analyses, computer practical)
- Presentation on a research project: working in groups, joint development of a research project (project based learning), discussion, preparation of presentations

Forms of credit:

- Written exam with short questions and tasks
- Determination of the passing grade on the basis of partial scores obtained during the course of the semester
- Presentation based on seminar work

Basic evaluation criteria:

Method of verification of the assumed learning outcomes:

- Research project plan – 20%
- Presentation on research project – 30%
- Written exam – 50%

Learning Objectives

- Overview of theoretical population genetics and its applications to animal science.
- Understanding of factors causing changes in genetic composition of populations over time and space, and how these changes constitute a link between molecular and ecological processes.
- Case studies will illustrate how the theory and molecular techniques are applied to address questions in evolutionary biology, ecology and animal behaviour.
- Practical applications of population genetics will be discussed, with the particular emphasis identifying operational taxonomic units, distinct populations of wild animals, and breeding of domesticated animals.
- Students will be introduced to commonly used bioinformatic methods of evolutionary genetics.

Program content:

A. Lecture topics

1. Theoretical basis of population genetics
2. Types of molecular markers and their application in population genetics
3. Methods of assessing genetic diversity in individuals, populations and species
4. Genetic problems associated with small populations; inbreeding and its consequences in wild populations and domesticated species
5. Application of population genetic approaches in evolutionary biology, ecology and animal behaviour research
6. Application of phylogeographic approaches to infer evolutionary history of populations and species
7. Conservation genetics and its application to in situ and ex situ conservation management
8. Case studies based on a wide range of taxonomic groups

B. Topics of exercises / seminar / laboratory

1. Seminars and computer-based practical exercises
2. Obtaining and preparing data for analyses
3. Phylogenetic tree reconstruction vs network tree reconstruction.
4. Identify population structure in wild animals
5. Different methods to estimate number of populations in wild populations

List of literature:

Allendorf, F.W., and Luikart, G. (2011) Conservation and the Genetics of Populations. Blackwell Publishing. ISBN 1405121459

Beebee, T., and Rowe, G. (2010) An Introduction to Molecular Ecology. 2nd Edition. OUP. ISBN 0199292051

Bertorelle, G., Bruford, M.W., Hauffe, H.C., Rizzoli, A., and Vernesi, C. (Eds.) (2009) Population Genetics for Animal Conservation. Cambridge University Press. ISBN 0521685370

Freeland, J.R., Kirk, H. and Petersen, S.D. (2011) Molecular Ecology. 2nd Edition. Wiley-Blackwell. ISBN 0470748338

Frankham, D., Ballou, J., and Briscoe, D. (2010) Introduction to Conservation Genetics. 1st or 2nd Edition. Cambridge University Press. ISBN 0521702712

Hamilton, M.B. (2009) Population Genetics. Wiley-Blackwell. ISBN 1405132779

Hartl, D. (2000) A Primer of Population Genetics. 3rd Edition. Sinauer Associates. ISBN 0878933042

Hartl, D. and Clark, A.G. (2007) Principles of Population Genetics. 4th Edition. Sinauer Associates. ISBN 0878933085
Supplementary literature