Molecular Ecology and Evolution 001.2.3099
(2 credits)
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Course Description:

The course aims to demonstrate the power and potential of molecular and genetic methods as research tools in Ecology and Evolution. The course will present, through examples, a range of ecological and evolutionary processes, interactions and questions at different biological levels–individual, population, species and community—that can be explored using molecular genetics techniques. For example, in the field of behavior ecology: mating system and dispersal patterns; demography: parentage analysis, sex ratio; population genetics: gene flow and inbreeding; community ecology: species diet and trophic interactions; and conservation biology: applying molecular information to species conservation.
The course aims to provide-

1. A background information, central questions of interest and the underlying theory of various molecular ecology approaches.
2. Examples of case studies, including projects carried out in Israel.

The course consists of lectures and students' seminars.

Course structure and grade components:

Lectures are held weekly. Students are asked to present a seminar on concepts and topics studied during the course. Grading will be based on the student seminar (35%); a research proposal, i.e. how one can use molecular techniques in order to gain insights into a specific research question, preferably within the student's research topics (55%); and the student's participation in class (10%).

Topics of Lectures and Seminars:

Introduction: Molecular Genetics in Ecology and Evolution:
What is molecular ecology/evolution? The emergence of the field; sources of data; an overview of molecular techniques; molecular markers and their modes of inheritance.

Molecular identification:
Species (DNA barcoding), individuals and sex identification using molecular techniques.

Behavioral Ecology:
Why use molecules to study behavior? How to use molecular-genetic/genomic tools to infer species behavior? Relevant examples are: the inference of mating systems,

reproductive success and kinship, foraging (predators and prey, trophic ecology); dispersal; sex-biased dispersal.

Population Genetics and evolution:
Genetic diversity of natural populations; population structure; gene flow and migration rate; landscape genetics/genomics; neutral and adaptive variation and the study of adaptation.

Genetically-modified organisms (GMOs):
The potential use of cloning and gene-editing for agriculture and conservation. The effects of GMOs on natural communities.

Environmental DNA:
Tool for genetic monitoring of wild populations, e.g. the use of eDNA sampled from water or soil to identify the presence of invasive or rare species.

Molecular Ecology in the service of conservation:
Monitoring of wild populations (e.g. population size, wildlife diseases); identification of hybrids; conservation units; genetic management of captive populations.

Prerequisite:
A basic course (undergraduate level) in Genetics or Molecular biology.

Relevant textbooks:
Beebee, T. J. C. and G. Rowe. 2017. Third edition. An introduction to molecular ecology. Oxford University Press, Oxford; New York.
Freeland, J. R., H. Kirk, and S. Petersen. 2011. Molecular ecology. Wiley-Blackwell, Oxford.

Relevant articles will be given during the course.