Syllabus: Genetic Monitoring of Wildlife Populations using non-invasive approach
001.2.3100   2.5 Credits
Instructors: Shirli Bar-David, Noa Kan Lingwood, Naama Shahar

Audience
This intensive five-day course will focus on the genetic challenges faced by wildlife species, with an emphasis on practical methods for monitoring these populations, particularly through non-invasive genetic techniques (e.g., DNA extracted from dung, feathers, and fur). In addition to monitoring, the course will cover key strategies for enhancing genetic diversity in natural populations, including reintroduction and restoring connectivity. The course is designed for graduate students, post-doctoral researchers, and practitioners interested in applying population genetic data to the conservation and management of species. The course will include lectures, a field trip for sample collection, demonstrations of molecular laboratory techniques (e.g., DNA extraction, PCR, genetic marker-based sex determination), and a computer lab component with hands-on learning using real datasets and commonly used software.

Textbook and Readings
Textbook as a reference
Allendorf, F.W., G.H. Luikart, and S.N. Aikins et al. Conservation and the Genetics of
      Populations. (2nd ed) 2013. Wiley-Blackwell.

Prerequisite
Students should have a basic knowledge of genetics (introductory course) and some previous exposure to population biology/ecology.

Format
The course will include lectures, a field trip including sample collection (using non-invasive techniques), demonstrations of molecular laboratory techniques (e.g., DNA extraction, PCR, genetic marker-based sex determination), and a computer lab component with hands-on learning using real datasets and commonly used software.

Grading:
A final tutorial will be given to the students at the end of the course: Students will get datasets that will allow them to explore analyses and interpret results in light of management questions, there will also be an option for students to work on their own dataset.

Suggested Agenda (some adjustments are expected)
DAY 1: INTRODUCTION AND SMALL WILDLIFE POPULATION BASICS
- 9:00-12:00: Introduction Lecture: Genetics of Small Populations

- 14:00-17:00: Genetics and species management and conservation

DAY 2: WILDLIFE MONITORING AND GENETICS APPROACHES
- 9:00-12:00: Wildlife monitoring and introduction to genetic monitoring (molecular markers, genetic diversity measures)
- 14:00-16:00: Introduction to non-invasive genetics techniques: advantages, challenges and practical solutions
- 16:30-18:00: non-invasive genetics sampling

Day 3: MOLECULAR LABORATORY WORK AND DATA PROCESSING
- 9:00-13:00: DNA processing: DNA extraction, PCR amplification, sex determination using molecular markers: theory and practice
- 15:00-17:00: Genotyping errors and dataset filtering

Day 4: POPULATION GENETIC ANALYSES AND GENE FLOW
- 9:00-13:00: Basic population genetic analyses
- 15:00-17:00: Assessing and Monitoring Genetic Substructure

Day 5: PARENTAGE ANALYSIS, POPULATION DEMOGRAPHY
- 8:00-12:00: Parentage analysis, genetic relatedness, population demography
- 13:30-15:30: new directions using environmental DNA (eDNA)

Grades

1) Class participation – 10%

2) Final tutorial – 90%