

Subject Area: Advanced Methods in Biotechnology and Biodiversity

Subject: Molecular methods in plant and animal biodiversity research

Level: PhD

Year: I - IV

Semester: 1-2

Speciality: N/A

Status: Facultative

ECTS: 2

Department(s): Botany and Nature Protection

Cooperating Department: Zoology Dept.

Form of teaching (Number of hours; Form of assessment: Exam or Credit)

Lectures	Seminars/Conversatoria -	Practicals	Total
		15	15

Staff:

SUBJECT COORDINATOR: Prof. Barbara Tokarska-Guzik, PhD

LECTURE/CONVERSATORIA: Ewa Mróz, PhD

PRACTICALS: Ewa Mróz PhD, Prof. Barbara Tokarska-Guzik PhD, Teresa Nowak PhD,
Katarzyna Bzdęga PhD

Contents:

Aim of the course: developing of theoretical and practical skills in assessing biodiversity. Bringing together a very wide range of skills and holistic approach for solution of assessing biodiversity; ability to select sources of information. Becoming familiar with the possibilities of the use of molecular methods in taxonomy.

LECTURES: The presentation of possibilities of the use of molecular markers in zoology (paleontology, archaeozoology, zoogeography, molecular taxonomy, phylogenetics of animals) with a special regard of phylogenetic studies of insects. The introduction of phylogenetic problems and the explanation of some basic concepts related to them. The possibilities of using proper molecular markers, such as EF1- α , COI, COII, 16S rRNA, 18S rRNA, cytochrom b, to reconstruct ancestral relationships of trees on different taxonomic levels (species, genus, tribe, subfamily and higher). The comparison of molecular analysis results with the classic classification based on morphological characters.

PRACTICALS: The practical use of molecular data in phylogenetics of insects. Becoming familiar with molecular databases. Processing of DNA sequences achieved after isolation with the usage of programmes, such as: Chromas, ClustalX, BioEdit. The reconstruction of phylogenetic trees basing upon different methods (UPGMA, Neighbor-Joining, Maximum Likelihood, Maksymalna Parsymonia) and the evaluation of their reliability. The trees' visualization (TreeView) and interpretation of achieved results.

Molecular systematics and biogeography of angiosperms: measuring and monitoring diversity within ecosystems, biom(s) or for the entire Earth. Molecular techniques as a tool for understanding of microevolution of endangered and invasive plant species: origin, distribution and local co-occurrence of cytotypes at the different spatial scales.

Taxonomic treatment of higher plants based on morphological, cytological and genetic characters (a critical re-evaluation of taxon limits from species level upwards). Measures of geographical distribution of genetic diversity.

Methods and forms of teaching: Lecture, computer analysis of the data, discussion, individual work

Requirements: The report of made analyses

Literature (maximum 5, preferably recent sources, all in English):

1. Avise J. C. 2004. Molecular markers, natural history, and evolution. Sinauer Associates, 684 pp.
2. Briggs D., Walters S.M., 1997. Plant variation and evolution. 3rd edition. Cambridge University Press, Cambridge
3. Graur D., Wen-Hsiung Li. 2000. Fundamentals of Molecular Evolution, Second Editon. University of Chicago, 439pp

4. Hall B. G. 2004. Phylogenetic Trees Made Easy: a How-to Manual, Second Edition (With Cd-Rom). Sinauer Associates, Inc 221pp.
5. Judd W.S., Campbell Ch., S., Kellog E.A. Stevens P.F. Donoughue M.J. 2002. Plant Systematics. A Phylogenetic Approach. 2nd edition. Sinauer Associates Inc. Publishers, Sutherland, Massachusetts
6. Leadlay E., Jury S. (eds), 2006. Taxonomy and Plant conservation. Cambridge University Press, Cambridge
7. Nei M., Kumar S. 2000. Molecular Evolution and Phylogenetics ,Oxford University Press, USA, 333pp.
8. Online manuals and guides available at different web pages, such as:
9. <http://www.ncbi.nlm.nih.gov/>
10. <http://evolution.genetics.washington.edu/phylip/software.html>
11. <http://www.technelysium.com.au/chromas.html>
12. <http://www.clustal.org/>
13. <http://www.mbio.ncsu.edu/BioEdit/BioEdit.html>
14. http://taxonomy.zoology.gla.ac.uk/rod/treeview/treeview_manual.html

Remarks (*if necessary*):