



## ЦЕНТЪР ЗА ОБУЧЕНИЕ – БАИ

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### Basic Information:

Course Title: **Introduction to DNA barcoding – from DNA sequences to species**

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Total Teaching Hours: 30 (10 h lectures and 20 h practical sessions)

### Annotation (up to 150 words)

DNA barcoding is a marker-based method for the taxonomic identification of organisms using short DNA sequences known as DNA barcodes. The course aims to provide participants with fundamental theoretical and practical knowledge in the field of DNA barcoding across different taxonomic groups of organisms. The lecture component will cover the genetic foundations of the method, as well as a broad range of applications in areas such as biodiversity and evolution, environmental monitoring, food product composition analysis, and others. Through laboratory exercises involving specific biological materials (plants, phytopathogenic fungi, and honey), participants will gain hands-on experimental experience in all stages of the DNA barcoding workflow—from sample preparation to statistical analysis and storage of DNA barcode data. The course is intended for PhD students with basic experience in molecular biology who are interested in applying DNA-based technologies in their work in fields such as biodiversity, ecology, plant breeding, and related disciplines.

### Course content (brief description by topics or modules):

**Module 1 (theoretical): Biodiversity and species delimitation** – basic species concepts; challenges in the taxonomic discrimination of organisms; contemporary approaches to biodiversity monitoring.

**Module 2 (theoretical): Introduction to DNA barcoding and metabarcoding** – principles, types of markers, main methodological steps, practical applications.

**Module 3 (theoretical and practical): Statistical analysis of DNA barcode data** – DNA sequences processing and statistical methods.

**Module 4 (theoretical and practical): Management of DNA barcode data** – working with reference databases (emphasis on BOLD and NCBI)

**Module 5 (practical): Laboratory practical in DNA barcoding** – sample pre-processing, genomic DNA extraction, PCR amplification, analysis of genomic DNA and PCR products by gel electrophoresis, sample preparation for sequencing (16 hours).

### Teaching and assessment methods

*Forms of education and assessment:*

1. Lectures and practical sessions; group work
2. Assessment in the form of tests and discussion sessions, as well as during individual or group practical exercises in every course module.



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### Competencies acquired as a result of training (3–5 points)

1. Acquisition of fundamental theoretical and practical knowledge in DNA barcoding and metabarcoding technologies and their fields of application;
2. Experience in the statistical analysis and storage of genetic data;
3. Ability to analyze and interpret scientific data;
4. Understanding and critical evaluation of the use of DNA barcodes for biodiversity research and with benefits to society.

### Literature:

1. CBOL Plant Working Group<sup>1</sup>, et al., (2009) A DNA barcode for land plants, Proc. Natl. Acad. Sci. U.S.A. 106 (31) 12794-12797, <https://doi.org/10.1073/pnas.0905845106>
2. Antil S, Abraham JS, Sripoorna S, et al. (2023) DNA barcoding, an effective tool for species identification: a review. Mol Biol Rep. 50(1):761-775. doi: [10.1007/s11033-022-08015-7](https://doi.org/10.1007/s11033-022-08015-7)
3. Letsiou, S., Madesis, P., Vasdekis, E., Montemurro, C., Grigoriou, M. E., Skavdis, G., Moussis, V., Koutelidakis, A. E., & Tzakos, A. G. (2024). DNA Barcoding as a Plant Identification Method. Applied Sciences, 14(4), 1415. <https://doi.org/10.3390/app14041415>
4. DNA Barcoding at the DNA Learning Center (<https://dnabarcoding101.org/lab/>)
5. DNA barcode reference database BOLD (<https://boldsystems.org/>)

### Additional information (optional):

*Desired requirements and prior knowledge:*

1. Basic knowledge of molecular genetics, including PCR, gel electrophoresis, and related techniques;
2. Previous laboratory experience, including handling laboratory equipment and instruments;
3. Diligence and adherence to laboratory hygiene and safety practices.