



Ciências  
ULisboa  
Faculdade  
de Ciências  
da Universidade  
de Lisboa



## Natural History Collections and Biodiversity

**Note:** This course is intended to be presential, but if needed (e.g. due to COVID-19 security measures by the time of the course) it may be adapted to be given remotely

### Organized by:

Centre for Ecology, Evolution and Environmental Changes and Museu Nacional de História Natural e da Ciência (<http://www.MUHNAC.ul.pt/>)

### Teachers:

Maria Judite Alves (coordinator, MUHNAC/ cE3c), Raquel Barata (MUHNAC), Cristiane Bastos-Silveira (MUHNAC), Rui Castanhinha (Univ. de Aveiro e Museu da Lourinhã), Teresa Catry (CESAM), Luís Ceríaco (MUHNAC), Ana Isabel Correia (MUHNAC/ cE3c), César Garcia (MUHNAC/cE3c), Luís Filipe Lopes (MUHNAC/ cE3c), Paulo Marques (MUHNAC/ISPA), Gabriel Martins (IGC), Cecília Sérgio (MUHNAC/ cE3c), Manuela Sim-Sim (MUHNAC/ cE3c).

**Calendar:** November 15<sup>th</sup>-19<sup>th</sup> 2021

**Duration:** 36 hours (TP) of lectures and practical sessions

**Schedule:** 9h-13h and 14h30-17h30 Monday to Thursday; 9h-13h and 14h30-18h30 Friday

### Objectives:

Natural history museums are privileged spaces for seminal research on different subjects of biological sciences such as biodiversity, evolution, ecology, biogeography and taxonomy. This crucial role is due to the fact that they represent biological diversity repositories becoming huge libraries of information on Earth living organisms. The long-term sampling through various decades renders to natural history collections an historic perspective that allows reconstructing a “memory”, sometimes secular, of natural patterns and processes. This aspect gains particular relevance nowadays because of the increasing rate of species extinctions and biodiversity decrease.

This course aims:

- To evidence the importance of natural history collections for the study of biodiversity.
- To show new tools and approaches to extract and disseminate biodiversity data from natural history collections
- To increase awareness of young researchers for the scientific and cultural value of Natural History Museums.

## **General plan:**

### **Introduction** (Maria Judite Alves)

What are scientific collections? Why do we keep scientific collections? What to keep in the biological collections?

### **NHC and the Study of Biodiversity in Portugal** (Luís Ceríaco)

The beginnings of the natural history collections in Portugal. The first institutional scientific collections of the XVIII century. Portuguese naturalists and scientific expeditions. New perspectives and uses of historical data to modern day biodiversity studies. Brief overview of current natural history collections in Portugal.

### **Herbaria and the Botanical Gardens in Portugal** (Ana Isabel Correia)

Brief history of botany. Botanical Gardens and the herbaria of Coimbra and Lisbon. Other national herbaria.

### **NHC Management** (Maria Judite Alves)

What does management mean? Management in practice: the pathway from nature to museum reserves. Scientific curation. Organization, management, use, and preventive conservation of collections. Legal and ethical issues.

### **Herbaria Management** (Ana Isabel Correia)

Main functions of an herbarium. Types of collections and collecting procedures. Different types of herbaria. Collecting for specific purposes. Carpological collections. Bulky specimens. Illustrations. Microscope preparations. Collecting, drying, identifying, mounting and registering specimens. Storage and storage conditions. Preventing infestations. Loans and loan conditions. Sampling for anatomical, palynological, phytochemicals and DNA studies. Expansion of herbaria: collecting, gifts and exchange of specimens.

### **Zoological collections: preparation and preservation** (Maria Judite Alves, Cristiane Bastos-Silveira, Luís Filipe Lopes).

Type of zoological collections: specimens preserved dry; specimens preserved in fluids. Collecting and preparation procedures. Long-term conservation.

### **Tissue and DNA Collections and Museomics** (Maria Judite Alves)

Tissue and DNA Collections as biological repositories and its role in the preservation of biological resources. Classification of Tissue and DNA Collections (aims, target species and types of biological material). Conservation of DNA and of biological tissues. Defining Museomics. Sources of DNA in NHC specimens. Working with DNA from NHC specimens - difficulties, precautions and new possibilities. Increasing importance of NHC in genetic studies.

### **Stable isotopes in ecology: the role of natural history collections** (Teresa Catry)

What are, how to measure and how to express stable isotopes? Sampling animal tissues for stable isotope analysis. Using stable isotopes to determine trophic relationships in animal populations. Stable isotopes as tracers to infer geographical origins and movements of migratory animal populations. The value of NHC in isotopic studies.

### **Biodiversity informatics and Museum-based informatics** (Cristiane Bastos-Silveira)

Introduction to Museum informatics. The Information Age and the Digital Revolution. Museums and the Web: online databases, digital libraries; citizen science, e-learning and biodiversity portals. The interactions between people, information, and technology in museums. Major national and international initiatives related to the assembling, processing and dissemination of digital and molecular data from natural history collections.

### **NHC and the Conservation of Biodiversity** (Manuela Sim-Sim)

Biodiversity in a global context. The different levels of biodiversity. Biodiversity conservation and biological resources. Regulations and Conventions on conservation of biodiversity. The role of the NH collections (NHC) for *in situ* and *ex situ* plant conservation. The IUCN Red Lists. A widely understood system for classifying species at high risk of global extinction. Seed banks and *ex situ* conservation.

### **NHC in Biodiversity Assessment Studies** (César Garcia & Cecília Sérgio)

The role of natural history collections in biodiversity research. The role of natural history collections to determine areas of conservation importance and estimate species richness and diversity, in documenting species declines, in Environmental Impact Assessment (EIA) studies, in Legal Medicine, and in monitoring air quality.

**Sound Archive** (Paulo Marques).

Challenges to the traditional definition of specimen. Technological aspects. Collection of natural sounds: acquisition, databases, storing, access, Intellectual Property Rights (IPR), data quality.

**NHC Digitization** (Luís Filipe Lopes)

Introduction to natural history specimen digitization: equipment and methods. Digital repositories.

**3D Imaging** (Gabriel Martins e Rui Castanhinho)

3D Imaging principles. Equipment and techniques. Use of imaging to study biological specimens and 3D visualization. 3D anatomical databases.

**NHC and Non-Formal Education for the Conservation of Biodiversity** (Raquel Barata).

Collections of NH museums as tools to promote science education and facilitate pro-environmental and scientific attitudes. The projects BigPicnic: Big Questions, Learn to Engage and European Researchers' Night.

**Visits to MUHNAC's natural history collections.**

**Theme presentation and discussion.**

This course can have a recognition of 6 ECTS for FCUL PhD students enrolling in it as part of their first doctoral year. These students need to deliver two reports after the course. For students only requiring 5 ECTS recognized in their specific PhD programmes the last 3.5 hours of the course are not mandatory, they need to deliver only the main report and the certificate will be on '**Topics in Natural History Collections and Biodiversity**'. Such report(s) are also advised for other students requesting creditation of the course in their institutions.

**Nº (min, max) students:** 6 - 20

**Minimal formation of students:** bachelor degree in Biology or related areas

**Directed to:** PhD or MSc students in Biology, Evolution, Ecology or related areas, and postdocs and other professionals working in related topics.

#### **FEE**

Free for 1st year PhD students in Doctoral programmes at FCUL (e.g. Biologia), Biodiversity, Genetics and Evolution (BIODIV UL; UP), Biology and Ecology of Global Changes (BEAG UL, UA) and Sustainability Science (UL, several institutions), when the course counts credits for their formation, in which case the delivery of a final report done after the course is mandatory; the course is also free for more advanced PhD students of the BIODIV programme (ULisboa or UPorto); 50 € for more advanced PhD students of cE3c of other programmes; 80 € for PhD students of the PEERS network (CFE); 125 € for FCUL Master students and unemployed; 180 € for BTI, BI and other PhD students; 250 € for Professional and postdocs.

When the maximum number of students is reached, 10 vacancies will be available for non-paying 1st year PhD students mentioned above, being, by order of preference students from: 1) cE3c; 2) BIODIV (not from cE3c); 3) FCUL (not from cE3c); 4) Sustainability Science (not from cE3c or FCUL); 5) BEAG (not from cE3c or FCUL).

**Deadline for applications:** October 22<sup>nd</sup> 2021

To apply send an e-mail to Maria Judite Alves at the following email address: [mjalves@fc.ul.pt](mailto:mjalves@fc.ul.pt) with a cv and motivation letter. The cv and letter should be named as *1st-lastNAME-CV.pdf* and *1st-lastNAME-ML.pdf* (that is personalize the name of each file with your first and last name).

**In the email please add the following information:**

Full Name:

E-mail:

Phone:

Professional activity: Professional/Postdoc, BTI, BI (or other non-post-doc research grant), PhD student (with/ without scholarship), Lic. (Bachelor)/Master student

PhD student of the 1st year of a Doctoral programme at FCUL, BIODIV (FCUL/FCUP), or BEAG (FCUL or UA)?

If yes to the above question, PhD student doing the Course to count credits for 1st year?:

PhD student of cE3c or CEF (Centro de Ecologia Funcional)?:

Name of the PhD programme: