



Speaking “nature”: Methods for measuring the impact of environmental pollution on ecosystems

Teachers: Silvana Munzi (cE3c, Univ. Lisboa), Pedro Pinho (cE3c, Univ. Lisboa), Sofia Augusto (ISPUP, Univ. Porto), Cristina Branquinho (cE3c, Univ. Lisboa), Cristina Máguas (cE3c, Univ. Lisboa), Alexandra Oliveira (cE3c, Univ. Lisboa), Helena Serrano (cE3c, Univ. Lisboa)

Note: This course will be given remotely

Calendar: July 12th- 16th 2021

Schedule: 9:00-18:30 (36h)

Objectives: The course aims at enabling the participants to use different methods to measure the impacts of pollutants on ecosystems. Basic knowledge will be provided through theoretical and practical lessons on how to select and use the most suitable metrics based on the analysis of multiple compartments of the ecosystems.

General plan:

Environmental Pollution refers to the contamination of any component of an ecosystem causing adverse effects in its functioning. A widespread phenomenon in the Anthropocene, it impacts biodiversity, ecosystem functioning, and affects the ability of ecosystems to provide ecosystem services to humans. Besides, pollution also causes direct adverse effects on human health. Although the tools to measure pollutants concentration are increasingly well established, the tools available to measure the impacts of pollution on Ecosystems are far less known.

This course will train students on the use of tools to measure the impact of environmental pollution on ecosystems. These will include the use of ecological indicators based on biodiversity, physic and chemical measures and modelling,

to measure the impact of atmospheric, water and soil pollution. Examples will be provided for natural, semi-natural and human-built ecosystems.

The course will be organized in lectures, lab experiences and computer analysis.

This course can have a recognition of 6 ECTs for FCUL PhD students enrolling in it as part of their first doctoral year. For FCUL PhD students only requiring 5 ECTs recognized in their specific PhD programs the excursion is not mandatory and the certificate will be on 'Methods for measuring the impact of environmental pollution on ecosystems'.

Final program

| | 12 July Overview I | 13 July Urban ecosystems | 14 July Aquatic ecosystems | 15 July Agroecosystems/In dustrial ecosystems | 16 July Forest ecosystems |
|-----------------|---|---|---|--|---|
| 09:00- 09:45 | Introduction, and presentations Silvana Munzi, Margarida Matos | Urban birds Petra Bauerová | Monitoring water pollution using aquatic bryophytes Helena Serrano | Soil functional indicators Cristina Cruz | Snail and needles Firas Baroudi |
| 09:45- 10:30 | Global Change & Anthropocene Cristina Branquinho | Magnetic properties Aldo Winkler | Ecotoxicological test Bernardo Duarte | Effects of pollution on pollinators Juan Cancela | Lichens in montado Bernardo Rocha |
| 10:30- 10:45 | Coffee-break | Coffee-break | Coffee-break | Coffee-break | Coffee-break |
| 10:45- 11:30 | Introduction to Ecological indicators Cristina Branquinho | Effects of hydrothermal emissions Patrícia Garcia | Water quality assessment (fishes) Filomena Magalhães | Insects Clara Wendt | Dendrochemistr y Edoardo Alterio, Tommaso Sitzia |
| 11:30- 12:15 | Lichen functional diversity Silvana Munzi | Citizen Science Roeland Samson | Water quality assessment (plankton/algae) Ana Brito | Effects/risk assessment of pesticide Paulo Sousa | Vegetation Lina Fusaro |
| 12:15- 13:00 | Isotopes & pollution sources Cristina Máguas | Multi-Taxa Pedro Pinho | eDNA in ecological assessment Mathew Seymour | Metal accumulation in bats Joana Alves | Soil solution fluxes Anna Andreetta |
| 13:00- 14:00 | Lunch | Lunch | Lunch | Lunch | Lunch |

| | Overview II | | | Large-scale monitoring | |
|-------------|--|--|--|--|---|
| 14:00-14:45 | Human health & biomonitoring Sofia Augusto | Practical work | Practical work | Management tools Teresa Dias | Presentation of the practical work Closure |
| 14:45-15:30 | Application for management Domingos Leitão | | | Determination of nitrogen exceedances Alexandra Oliveira | |
| 15:30-15:45 | Coffee-break | | | Coffee-break | |
| 15:45-16:30 | Environmental justice assessment Tania Contardo | | | Satellite observations Jasdeep Anand | |
| 16:30-17:15 | Introduction to the practical work Silvana Munzi Pedro Pinho | Discussion about the practical work - the area & the problem | Discussion about the practical work - the general approach | Avian apex predators Alexander Badry | |

Aldo Winkler, Istituto Nazionale di Geofisica e Vulcanologia “*Magnetic biomonitoring of airborne particulate matter using tree leaves and lichens: principles and applications*”

Alexander Badry, Department Wildlife Diseases, Leibniz Institute for Zoo and Wildlife Research “*Towards harmonisation of chemical monitoring using avian apex predators: Identification of key species for pan-European biomonitoring*”

Alexandra Oliveira, Centre for Ecology, Evolution and Environmental Changes, Universidade de Lisboa “*Determination of exceedances using empirical CLs and user-friendly dashboard*”

Ana Brito, MARE - Marine and Environmental Sciences Centre, Universidade de Lisboa “*Environmental quality assessment of marine ecosystems*”

Anna Andreetta, Department of Earth Science, University of Florence “*Monitoring nitrogen deposition and leaching in European forests*”

Bernardo Duarte, MARE - Marine and Environmental Sciences Centre, Universidade de Lisboa “*Ecotoxicology tests in impact assessment: from biomarkers to indexes development*”

Bernardo Rocha, Centre for Ecology, Evolution and Environmental Changes, Universidade de Lisboa “*The amazing world of lichens - tools to measure the impacts of pollutants on ecosystems*”

Clara Frascioni Wendt, Research Centre Laimburg “*Insects as indicators of environmental pollution: insights at different spatial scales*”

Cristina Branquinho, Centre for Ecology, Evolution and Environmental Changes, Universidade de Lisboa “*Global change & anthropocene*” and “*Introduction to ecological indicators*”

Cristina Cruz, Centre for Ecology, Evolution and Environmental Changes, Universidade de Lisboa “*Soil health indicators*”

Cristina Máguas, Centre for Ecology, Evolution and Environmental Changes, Universidade de Lisboa *“Tracing and mapping pollution sources using pollutants' isotope fingerprint”*

Domingos Leitão, Divisão de Gestão Ambiental, Departamento de Ambiente e Equipamento, Câmara Municipal de Oeiras *“Monitoring of urban ecosystems – the example of Oeiras Municipality”*

Edoardo Alterio and **Tommaso Sitzia**, Department of Land, Environment, Agriculture and Forestry, Università degli Studi di Padova *“Dendrochemistry: the power of tree rings to archive pollution events”*

Filomena Magalhães, Centre for Ecology, Evolution and Environmental Changes, Universidade de Lisboa *“Water quality assessment using fishes”*

Firas Baroudi, Institute of Chemistry and Processes for Energy, Environment and Health ICPEES, UMR 7515 Group of Physical Chemistry of the Atmosphere, University of Strasbourg *“The use of snails and conifers as environmental biomonitors for the study of temporal air pollution variation in the atmosphere”*

Helena Cristina Serrano, Centre for Ecology, Evolution and Environmental Changes, Universidade de Lisboa *“Monitoring water pollution using aquatic bryophytes”*

Jasdeep Singh Anand, University of Leicester *“Estimating ozone-induced vegetation damage from space using satellite data”*

Joana Alves, Centre for Functional Ecology - Science for People & the Planet, UNESCO CHAIR in Biodiversity Safeguard for Sustainable Development, Department of Life Sciences, University of Coimbra *“Bioaccumulation of metals in bats”*

Juan Pablo Cancela, Centre for Ecology, Evolution and Environmental Changes, Universidade de Lisboa; University of the Azores *“Effects of (soil/air) pollution on pollinators”*

Lina Fusaro, National Research Council, Institute of BioEconomy *“Plants in a challenging world: monitoring the abiotic stress in natural and urban ecosystems”*

Mathew Seymour, Swedish University of Agricultural Sciences *“Executing multi-taxa eDNA ecological assessment via traditional metrics and interactive networks”*

Patrícia Garcia, cE3c-ABG, Centre for Ecology, Evolution and Environmental Changes, and Azorean Biodiversity Group, Faculty of Sciences and Technology, University of the Azores *“Sleeping volcanoes, awaking health issues: the hazardous effects of hydrothermal emissions on the human respiratory system”*

Paulo Sousa, Centre for Functional Ecology, Department of Life Sciences, University of Coimbra *“Effects and risk assessment of pesticide in soil”*

Pedro Pinho, Centre for Ecology, Evolution and Environmental Changes, Universidade de Lisboa *“Sampling urban biodiversity under the influence of multiple environmental factors: a multitaxa approach”*

Petra Bauerová, Czech Hydrometeorological Institute, Division of Air Quality, Tušimice Observatory *“Trace metal levels in blood and feathers of urban birds and their relationship to the individual's health and condition”*

Roeland Samson, Department of Bioscience Engineering, University of Antwerp *“Citizens as strong partners in urban air quality monitoring”*

Silvana Munzi, Centro Interuniversitário de História das Ciências e da Tecnologia; Centre for Ecology, Evolution and Environmental Changes, Universidade de Lisboa *“Lichen functional diversity”*

Sofia Augusto, Institute of Public Health (ISPUP-EPIUnit), University of Porto *“Human health & biomonitoring”*

Tania Contardo, Department of Life Sciences, University of Siena *“Biomonitoring of air pollution and environmental justice”*

Teresa Dias, Centre for Ecology, Evolution and Environmental Changes (cE3c), Faculdade de Ciências, Universidade de Lisboa *“Setting environmental management tools using different ecosystem components”*

Nº (min, max) students: 10 – 15

Minimum formation: “Licenciatura” (bachelor) in Biology, Natural Science or related areas

Directed to: PhD or MSc students in Biology, Microbiology, Ecology, Environmental Studies 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) and Biology and Ecology of Global Changes (BEAG UL, UA) 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); 30 € for more advanced PhD students of cE3c of other programmes; 60 € for PhD students of the PEERS network (CFE); 105 € for FCUL Master students and unemployed; 160 € for BTI, BI and other PhD students; 230 € for Professional and postdocs.

When the maximum number of students is reached 8 vacancies will be available for non-paying 1st year PhD students mentioned above, being, by order of preference: 1) cE3c students; 2) BIODIV students (not from cE3c); 3) FCUL students (not from cE3c); 4) BEAG students (not from FCUL).

Deadline for applications: June 16th 2021

Candidates should send an e-mail to “lichenscourse@fc.ul.pt” with a short 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: