Deep-sea biodiversity and conservation (CFA.2.2.2020_21)

Orientations:
✓ Ocean Observation and Global Change
✓ Sustainable use of Marine Resources
✓ Integral Management of the Sea
✓ Technological Progress, Engineering and Business Management

Dates
26 – 30 April 2021

Timetable
09:00 to 12:30 and 13:30 to 18:00

Type of course
Advanced training

Venue*
University of Aveiro, room TBD, with videoconference connection to the remaining Do*Mar *campi*

University of Porto/CIIMAR, room TBD, with videoconference connection to the remaining Do*Mar *campi*

*venue will alternate between UA and UP between calendar years.

Lecturers
Ana Hilário, Centre for Environment and Marine Studies, Department of Biology, University of Aveiro, Portugal

Joana Xavier, Interdisciplinary Centre of Marine and Environmental Research
University of Porto, Portugal

Invited lectures (TBC)
Chris German (Woods Hole Oceanographic Institution, USA)
Eva Ramirez-Llodra (REV Ocean, Norway)
Harriet Harden-Davies (University of Wollongong, Australia)
Jon Copley (National Oceanography Centre, University of Southampton, UK)
Lisa Levin (Scripps Institution of Oceanography, USA)
Marta Chantal Ribeiro (University of Porto, Portugal)
Merete Tandstad (FAO)
Paul Snelgrove (Memorial University, Canada)
Paul Tyler (Emeritus Professor, National Oceanography Centre, University of Southampton, UK)
Shirley Pomponi (Harbor Branch, Florida Atlantic University, USA)

Objectives

The course presents the basics for understanding the ecology of deep-sea communities in a dynamic and changing ocean environment. It is intended that at the end of course, students should:

1. Recognise the principal deep-sea marine ecosystems at global and regional scale;
2. Acquire knowledge on biodiversity and biogeographical patterns in the deep sea;
3. Become acquainted with the main global biodiversity data portals;
4. Have an appreciation for the impact of habitat perturbation on deep-sea organisms, and subsequent ecosystem-level consequences and feedbacks;
5. Be able to identify challenges and opportunities in developing policy and governance tools;
6. Be able to identify and discuss pressing topics on sustainable use and conservation of deep-sea resources.

Description

The deep-sea, i.e. the water column and seafloor below 200 m depth, is the vastest and most underexplored biome on Earth. This biome hosts a rich, and often specialized, diversity of species, habitats and ecosystems. It provides a variety of fundamental supporting, provisioning and regulating and services for the health of the oceans. This course focuses on establishing a baseline of knowledge on deep-sea ecosystems and their functioning, as well as on how disturbance and changes, both natural and anthropogenic, affect these ecosystems. The syllabus integrates science, technology, policy and law, providing key concepts to develop ecosystem-based management of resource use and strategies to maintain the integrity of marine ecosystems within and beyond national jurisdiction.

Syllabus

1. Deep-sea ecosystems: biodiversity and functioning
2. Methods in deep-sea ecology and exploration
3. Human Impacts on deep-sea ecosystems
4. Sustainable use of deep-sea resources
5. Law and policy in deep-sea conservation

Assessment

The evaluation will be based on the following exercises:

Exercise 1 (in class, individual): Short presentation (3 minutes) of a “hot topic” in deep-sea biology and its relevance based on a list of papers provided before the course;

Exercise 2 (in class, in group): Hands-on exploration of deep-sea biodiversity on public data portals (OBIS, GBIF, ICES VME) and presentation of findings;

Exercise 3 (in class + delivery 2 weeks after the course, in group): Based on the selected hot topics (Exercise 1) each group will prepare and publish on a website dedicated to the course one interview with an expert in the field.

Exercise 4 (in class): Debate on the sustainable and equitable use of deep-sea resources

Organization of the course

Day 1	Introduction to the course and to the deep-sea environment
	Exercise 1: Hot topics in deep-sea biology
	Break
	Lecture: A brief history of deep-sea research
	Lunch
	Lecture: Methods in deep-sea ecology and exploration
	Science chat: Exploration
Day 2	**Lecture:** Biodiversity patterns/ biogeographical classification systems
	Break
	Exercise 2: Data exploration on deep-sea biodiversity portals
	Lunch
	Exercise 2: Data exploration on deep-sea biodiversity portals
	Break
	Exercise 2: Summary of findings
Day 3	**Lecture:** Ecosystem functions, goods and services
	Break
	Lecture: Human impacts: fisheries
	Lunch
	Lecture: Human impacts: seafloor mining and climate change
	Exercise 3: Scoping of the interview
Day 4	**Lecture:** Area-based management tools
	Lecture: Law of the sea
	Lunch
	Presentation of international bodies + panel discussion
Day 5	**Exercise 4:** Preparation of debate on sustainable and equitable use of deep-sea resources
	Lunch
	Debate: Sustainable and equitable use of deep-sea resources

Bibliography

Baker M, Ramirez-Llodra E, Tyler PA (Eds) (in press) Natural Capital and Exploitation of the Deep Ocean. Oxford University Press, 220 pp.

Clark MR, Consalvey M, Rowden AA (2016) Biological sampling in the deep-sea. John Wiley & Sons, 840pp.

Ramirez-Llodra E (2020) Deep-Sea Ecosystems: Biodiversity and Anthropogenic Impacts. In: The Law of the Seabed. Brill, p 36–60.

Rex MA and Etter RJ (2010) Deep-Sea Biodiversity: Pattern and Scale. Harvard University Press, 354 pp.

Sharma R (Ed.) (2019) Environmental Issues of Deep-Sea Mining: Impacts, Consequences and Policy Perspectives. Springer, 577 pp.

Lecturers

Ana Hilário (PhD) - Researcher at Centre for Environment and Marine Studies, University of Aveiro (Portugal). Ana Hilário is a deep-sea ecologist with 20 years of research experience and 8 years of teaching experience at post-graduate level. Her research focuses on reproductive ecology and population connectivity, and its implications for biogeography and conservation. She has participated in more than 20 oceanographic cruises dedicated to the study of deep-sea ecosystems and currently she co-leads the Deep Ocean Stewardship Initiative (DOSI) and Scientific Committee on Oceanic Research (SCOR) working groups aiming at the implementation of the UN Decade of Ocean Science for Sustainable Development (2021-2030) in relation to the deep ocean. www.cesam.ua.pt/ahilario

Joana Xavier (PhD) - Principal Investigator and leader of the Deep-Sea Biodiversity and Conservation Team at CIIMAR, University of Porto (Portugal), and an invited Associate Professor II in Deep-Sea Biology at the Department of Biological Sciences, and KG Jebsen Centre for Deep-Sea Research of the University of Bergen (Norway). Her research focusses on the understanding of basin to global scale diversity, distribution and connectivity patterns of deep-sea vulnerable marine species and ecosystems, and how ecological and evolutionary processes, as well as anthropogenic pressures underpin such patterns. https://www2.ciimar.up.pt/team.php?id=495