

## Dynamics of Marine Biodiversity and Conservation (C004310)

Due to Covid 19, the education and assessment methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

**Course size** *(nominal values; actual values may depend on programme)*

**Credits 6.0**

**Study time 150 h**

**Contact hrs**

60.0h

**Course offerings in academic year 2021-2022**

A (semester 1)

English

Gent

**Lecturers in academic year 2021-2022**

Thiebaut, Eric

PARISO1 lecturer-in-charge

Davoult, Dominique

PARISO1 co-lecturer

Simon, N.

PARISO1 co-lecturer

Viard, F.

PARISO1 co-lecturer

**Offered in the following programmes in 2021-2022**

[International Master of Science in Marine Biological Resources](#)

**crdts**

**offering**

6

A

**Teaching languages**

English

**Keywords**

- species diversity
- genetic diversity
- functional diversity
- diversity and ecosystem functioning
- human threats
- climate change
- fishing impacts

**Position of the course**

Growing threats on marine ecosystems induce an unprecedented erosion of marine biodiversity and alterations of the goods and services they provide to human societies. The study of marine biodiversity is currently a central issue in fundamental research in marine ecology and a major concern for stakeholders in their decision for environment management and conservation.

In this context, the aims of this course are to provide theoretical knowledge and methodological tools to measure marine biodiversity at different levels and different spatial scales, and to assess the impact of major human threats on the diversity distribution and ecosystem functioning. A focus is made on two major human threats: the exploitation of marine resources and climate change. One of the original aspects of this course is to analyse in parallel the different levels of diversity (genetic diversity, species diversity, functional diversity) and their responses to disturbances.

The teaching is based on a combination of lectures and analyses of different datasets on biodiversity changes.

**Contents**

1. Introduction to marine biodiversity: definition of marine biodiversity, the different biological levels and different scales of marine biodiversity; the current and past states of marine biodiversity; main threats on marine biodiversity
2. Methods to measure marine biodiversity
  - a. Methods to measure  $\alpha$  diversity
  - b. Methods to measure  $\beta$  diversity
  - c. Methods to measure taxonomic and phylogenetic diversity

(Approved)

- d. Methods to measure functional diversity
- e. Methods to estimate species richness
- f. Methods to measure genetic diversity
- g. Taxonomic sufficiency and surrogacy
3. Species identification and delineation
4. Methods to assess micro-organisms biodiversity
5. Links between marine biodiversity and ecosystem functioning: concepts, theories and new challenges
6. Impact of climate change on marine ecosystems: the case of the plankton organisms
7. Impact of fisheries on marine biodiversity and ecosystem functioning

#### **Initial competences**

Basic knowledge in Marine Biology and Ecology

#### **Final competences**

- 1 Mastering the different measurement techniques of marine biodiversity at different spatial scales ( $\alpha$ ,  $\beta$  and  $\gamma$ ) and at different biological levels (genetic, species and functional diversities).
- 2 Understanding the relationship among the different diversity metrics.
- 3 Understanding the role of biodiversity in ecosystem functioning.
- 4 Assessing the responses of the different diversity dimensions to anthropogenic disturbances.
- 5 Be able to support stakeholders in their decisions for biodiversity management.

#### **Conditions for credit contract**

Access to this course unit via a credit contract is determined after successful competences assessment

#### **Conditions for exam contract**

This course unit cannot be taken via an exam contract

#### **Teaching methods**

Lecture, Seminar: practical pc room classes

#### **Extra information on the teaching methods**

- Lectures on dedicated topics (40 hours)
- Practical works in a computer room to measure the different facets of biodiversity (20 hours)

#### **Learning materials and price**

- Data from the long-term monitoring program of biodiversity in the Bay of Morlaix
- Computerized classrooms for the data analysis and writing

#### **References**

- Anderson M.J., Crist T.O., Chase J.M., Vellend M., Inouye B.D., et al. (2011) Navigating the multiple meanings of  $\alpha$  diversity: a roadmap for the practicing ecologist. *Ecology Letters*, 14, 19-28.
- Bremner J. (2008) Species' traits and ecological functioning in marine conservation and management. *Journal of Experimental Marine Biology and Ecology*, 366, 37-47.
- Gamfeldt L., Lefcheck J.S., Byrnes J.E.K., Cardinale B.J., Duffy J.E., Griffin J.N. (2015) Marine biodiversity and ecosystem functioning: what's known and what's next? *Oikos*, 124, 252-265.
- Gotelli N.J., Colwell R.K. (2001) Quantifying biodiversity: procedures and pitfalls in the measurement and comparison of species richness. *Ecology Letters*, 4, 379-391.
- Gray J.S. (2000) The measurement of marine species diversity, with an application to the benthic fauna of the Norwegian continental shelf. *Journal of Experimental Marine Biology and Ecology*, 250, 23-49.
- Kaiser M.J., Clarke K.R., Hinz H., Austen M.C.V., Somerfield P.J., Karakassis I. (2006) Global analysis of response and recovery of benthic biota to fishing. *Marine Ecology Progress Series*, 311, 1-14.
- Magurran A.E. (2011) *Biological diversity: frontiers in measurement and assessment*. Oxford University Press.
- Moullot D., Graham N.A.J., Villéger S., Mason N.W.H., Bellwood D.R. (2013) A functional approach reveals community responses to disturbances. *Trends in Ecology and Evolution*, 28, 167-177.

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- Sala E., Knowlton N. (2006). Global marine biodiversity trends. *Annual Review of Environmental Research*, 31, 93-122.
- Solan M., Aspden R.J., Paterson D.M. (2012). *Marine Biodiversity and ecosystem functioning: frameworks, methodologies, and integration*. Oxford University Press.
- Stachowicz J.J., Bruno J.F., Duffy J.E. (2007) Understanding the effects of marine biodiversity on communities and ecosystems. *Annual Review of Ecology, Evolution and Systematics*, 38, 739-766.

#### **Course content-related study coaching**

##### **Assessment moments**

end-of-term and continuous assessment

##### **Examination methods in case of periodic assessment during the first examination period**

Written examination

##### **Examination methods in case of periodic assessment during the second examination period**

Written examination

##### **Examination methods in case of permanent assessment**

Assignment

##### **Possibilities of retake in case of permanent assessment**

examination during the second examination period is possible

##### **Extra information on the examination methods**

- personal project on the measures of biodiversity
- final written exam.

##### **Calculation of the examination mark**

- report 40%
- written 60%