<table>
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<tr>
<th>Module Name</th>
<th>Advanced Practical Course in Biological Oceanography</th>
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<tr>
<td>Module Number</td>
<td>MNF-bioc-202</td>
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| Person in Charge | Prof. Dr. Alexandra Worden  
Phone: +49-(0)431-600-4400, E-mail: azworden@geomar.de |
| Semester / Duration | 2. semester / one semester |
| Regular Cycle | annual in summer semester |
| Study Programme | Master of Science in Biological Oceanography |
| Classes | Class Title (Teaching Form)  
Lecturers  
Contact Time / Group Size |
| Marine Molecular and Chemical Ecology (Practical)  
Prof. Dr. Thorsten Reusch  
Prof. Dr. Martin Wahl  
PD Dr. Frank Melzner  
Dr. Olivia Roth  
Dr. Florian Weinberger et. al.  
Marine Molecular and Chemical Ecology (Exercise / Tutorial)  
Plankton Ecology and Pelagic Biogeochemistry (Practical)  
Prof. Dr. Ulf Riebesell  
Prof. Dr. Anja Engel  
Dr. Birte Matthiessen  
Dipl. Biol. Annegret Stuhr et. al.  
Plankton Ecology and Pelagic Biogeochemistry (Exercise / Tutorial)  
Microbial Ecology, Microbial Interactions and Marine Biotechnology (Practical)  
Prof. Dr. Alexandra Worden  
Prof. Dr. Ute Hentschel Humeida  
Dr. Marco Scotti et. al.  
Microbial Ecology, Microbial Interactions and Marine Biotechnology (Exercise / Tutorial) | 3 hrs per week / 10 students  
1 hr per week / 10 students  
3 hrs per week / 10 students  
1 hr per week / 10 students  
3 hrs per week / 10 students  
1 hr per week / 10 students |
| Credit Points / Workload | 5 ECTS / 150 hours |
| Prerequisites | MNF-bioc-102 |
| Completion Module | None. |
| Following Module | None. |

### Educational Objectives

**Section A: Marine Molecular and Chemical Ecology**  
On completion of this course, the students should have an in-depth understanding of stress reactions, chemical interactions and evolutionary processes in marine ecosystems. They should be able to understand the design of experiments / sampling schemes, and the concept of molecular markers. They will learn to conduct experiments, retrieve and evaluate data and put their findings into the context of the scientific literature on chemical ecology, population genetics and evolutionary biology.

**Section B: Plankton Ecology and Pelagic Biogeochemistry**  
On completion of this course, the students should have an in-depth understanding of plankton ecology and pelagic biogeochemistry. They should be able to understand the design of experiments and sampling schemes, conduct experiments, retrieve and evaluate data and put their findings into the context of the scientific literature on pelagic ecology and biogeochemistry.

**Section C: Microbial Ecology, Microbial Interactions and Marine Biotechnology**  
On completion of this course, the students should have an in-depth understanding of marine microbial ecology and its contribution to biogeochemical cycles. They should be able to understand the design of experiments and sampling schemes, conduct
**Content of Teaching**

- **Section A**: Marine Molecular and Chemical Ecology: We aim at dividing the entire group into smaller groups of 3-5 students who will work on one continual project in one of the lecture topics for 3 weeks. At the end of the course, time will be given to mutually exchange information among groups. Additionally, practical courses are aimed at teaching laboratory skills in addressing research questions on selected topics (Stress ecology & transcription analysis: Stress, interaction between stressors, biotic modulation of stress, quantitative genetics of stress genes in fucoid algae and shore crabs, gene expression responses of shore crabs to ocean acidification - Chemical Ecology: Main principles and regulation of predator-prey- and host-pathogen interactions, substrate recognition, anti-fouling defences - Population genetics & evolution: gene flow & dispersal estimates, marine speciation, phylogeography & hybridisation, selection & adaptation, rapid evolutionary processes, marine genomics, practical DNA sequence analysis of immune genes in coastal fish, microsatellite genotyping of an invasive jellyfish). A weekly tutorial will update students and lecturers on progress made and clarify open questions.

- **Section B**: Plankton Ecology and Pelagic Biogeochemistry: Practical courses are aimed with a mesocosm experiment for an integrated study of specific topics (e.g. seawater carbonate system, carbon and nutrient cycling, nutrient limitation, competition, grazing). A weekly tutorial will update students and lecturers on progress made and clear outstanding questions.

- **Section C**: Microbial Ecology, Microbial Interactions and Marine Biotechnology: Practical courses are aimed at teaching laboratory skills in addressing research questions on selected topics (e.g. ecophysiology of microbial groups and their genetic analysis in the environment, microbial CO2-fixation, secondary metabolites of marine microorganisms, marine biotechnological applications etc.) A weekly tutorial will update students and lecturers on progress made and clarify open questions.

**Examination**

Graded protocols (all protocols have to be passed) 100%

For details see “Additional Information”

**Literature**


**Additional Information**

This Module comprises of 3 main sections (A, B, C) containing different practical/exercise combinations. Students must choose two practical/exercise combinations of different sections: Section A: Chemical Ecology and Fish Ecology Section B: Plankton Ecology and Pelagic Biogeochemistry Section C: Microbial Ecology, Microbial Interactions and Marine Biotechnology.