Course Specifications
Valid as from the academic year 2019-2020

Course
Marine Genomics (C004045)

Valid as from the academic year 2019-2020

Course offerings and teaching methods in academic year 2019-2020

A (semester 1) Dutch, English
- Lecture: 12.5 h
- Seminar: 25.0 h

Lecturers in academic year 2019-2020
Derycke, Sofie WE11 lecturer-in-charge
De Clerck, Olivier WE11 co-lecturer

Offered in the following programmes in 2019-2020
Master of Science in Marine and Lacustrine Science and Management
- Credits: 3.0

Teaching languages
Dutch, English

Keywords

Position of the course
The course deals with genome-enabled insights into the broader framework of environmental marine science. Topics within the course include evolutionary as well as functional aspects of genes, genomes and metagenomes of marine organisms from the individual to the ecosystem-level.

Pre-requisites.
The course aims to provide students an introduction to the field of molecular ecology, specifically directed toward the marine environment on its organisms. The course is concerned with applying molecular population genetics, phylogenetics, as well as (meta-)genomics and (meta-)transcriptomics to traditional ecological and evolutionary questions (e.g., species diagnosis, conservation and assessment of biodiversity, quantitative genetics, heritability of traits and breeding studies, and questions of behavioral ecology).

Contents
The course is divided in modules which outline the use of genomic approaches, from the ecosystem-level, gradually narrowing to species-, population and individual-levels. Theoretical aspects and commonly used techniques will be demonstrated using examples and practical exercises from the marine environment.

a) Community-level addresses the use of genome data in assessing community structure of marine ecosystems. Techniques discussed include amplicon sequencing, qPCR, metagenomics (+ metatranscriptomics, metaproteomics, metabolomics).
b) Species-level offers an introduction to sequence alignment techniques, phylogenetics, species-delimitation, and phylogeography.
c) Population-level addresses the factors influencing population structure such as genetic drift, dispersal, mutation and selection. These aspects will be addressed using traditional organelle (mtDNA) and co-dominant markers (e.g. microsatellites) as well as NGS-based genome reduction techniques (Radseq, GBS). Aspects of speciation in the marine realm will be addressed also.
d) Individual-level: Heritability of physiological and morphological traits will be addressed using quantitative genetics, in combination with genome scans, QTL analyses and RNA-seq.

(Approved)
Initial competences
  Bachelor in sciences. Basic knowledge in ecology, evolution and genetics is highly recommended.

Final competences
  1 The graduated student understands the ecological and evolutionary processes acting at the genomic level in populations of marine organisms.
  2 The graduated student has a good knowledge of the terminology used in the field of molecular ecology.
  3 The graduated student understands the underlying principles of the commonly used molecular techniques, including preservation of tissues and specimens.
  4 The graduated student is able to make a considerate choice of molecular techniques to address specific ecologically or evolutionary questions.
  5 The graduated student has acquired the knowledge to correctly analyse and interpret molecular datasets from the individual to the community level.

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, seminar: practical PC room classes.

Learning materials and price
  PDF files of powerpoint presentations summarizing the oral lectures will be available through Ufora. Cost: 0 EUR.

References

Course content-related study coaching
  Opportunity for questioning the lecturers during the orals, and outside these via email, personal contact and in an electronic teaching environment.

Evaluation methods
  end-of-term evaluation and continuous assessment.

Examination methods in case of periodic evaluation during the first examination period
  Written examination.

Examination methods in case of periodic evaluation during the second examination period
  Written examination.

Examination methods in case of permanent evaluation
  Report.

Possibilities of retake in case of permanent evaluation
  Examination during the second examination period is possible in modified form.

Calculation of the examination mark
  UGent: Exam 80%; Evaluation of presentation 20%.