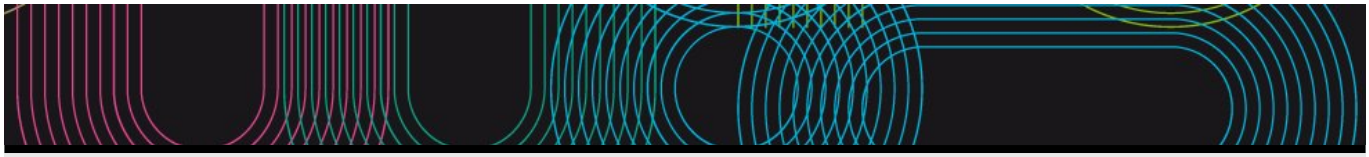

IDENTIFYING DATA				
Marine genetic resources				
Subject	Marine genetic resources			
Code	V10G061V01412			
Study programme	Grado en Ciencias del Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Presa Martínez, Pablo			
Lecturers	Presa Martínez, Pablo			
E-mail	pressa@uvigo.gal			
Web	http://https://moovi.uvigo.gal/			
General description	English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English. The "Marine Resources" appear with frequency in the profile of the Marine Sciences Degree. They are thus a fundamental object of academic study and of professional management. The central role of the marine biota has to be dealt from industrial, technological, physical-chemical, oceanographic and biological (Biochemical, Physiology, Genetics, Ecology, etc.) disciplines. The genetic "approach" is crucial in the management of the biological resources as much from the natural point of view (genetic conservation) as from the exploitation view from an intensive production (aquaculture). ¿Where is the point of elaborating a complex plan of exploitation on economic feasibility, technical and sociological viability if the resource lacks the sufficient genetic diversity to adapt to environmental challenge, to allow strategies of genetic selection or simply to keep it at its reproductive optimum?. Genetics plays as a central paper in the management of living resources, whose knowledge can not be obviated given the actual current easy going analyses of the genomes.			

Training and Learning Results	
Code	
A1	Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
A2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
A3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
B1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
B2	Plan and execute surveys in the field and laboratory work, applying basic tools and techniques for sampling, data acquisition and analysis in the water column, sea bottom and marine substratum.
B3	Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory.
B4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
C1	know at a general level the fundamental principles of sciences: Mathematics, Physics, Chemistry, Biology and Geology.
C9	Acquire basic knowledge about the structural and functional organization and the evolution of marine organisms.
C10	Know the biological diversity and functioning of marine ecosystems.
C11	Apply the knowledge and techniques acquired to the characterization and sustainable use of living resources and marine ecosystems.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.

D5 Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Expected results from this subject	Training and Learning Results			
Cognitive (knowledge): comprehension of the concepts and the basic processes of genetic variability, genetic differentiation and evolutionm and divergence of the species in qualitative and quantitative genetic characters.	A1	B1	C1 C9	D2
Procedures/Instrumental (know-how): to obtain and to organise information; to design experiments and interpreting results; to apply molecular techniques to practical cases of management of marine genetic resources; to analyse and tp characterise DNA samples; to perform computational phylogenetic analyses.	A3	B2 B3 B4	C10 C11	D1
Transversal abilities: Critical reasoning; autonomous work and team work; capacity to carry knowledge into practice; computational analytical solvency; professional interpersonal communication.	A2	B1	C11	D5

Topic	
INTRODUCTION	Presentation of the subject. Evaluation of the level of genetic knowledge of the students. Analysis of the program. Taking of decisions on the process of learning and the system of evaluation of the course. Review of basic genetic concepts.
CHAPTER I. Genetic variability.	Origin and maintenance of the genetic variability. Mendelian analysis and relations between alleles. Genic interaction. Genetic analysis of the continuous variation and biometric methods of Quantitative Genetics. Genetic improvement in aquaculture.
CHAPTER II. Population genotyping.	Strategies of genotyping for populations. Types of molecular polymorphisms. Register and tabulation of the polymorphism.
CHAPTER III. Populational genetic structure.	The ideal population and the populational equilibrium. Systematic factors of change: mutation, migration, selection. Factors of random change or dispersive: drift and endogamy. Computational basis of populational structures.
CHAPTER IV. Management of marine genetic resources.	Structural genetics in fishery management. Genetic evaluation. Genetics and genomics in the management of fisheries. Genetic management in aquaculture. Genetic management of biological invasions.
PRACTICE 1. Identification of marine species with genetic markers diagnostic.	Amplificacion Of DNA, migration by electroforesis of PCR products, interpretation of genetic patterns. Bioinformatic analysis of interspecific allocation and phylogenetic inference. Scientific and industrial applications of the genetic assignment.
PRACTICE 2. Calculation of populational genetic structures of marine species.	Populational genotyping, tabulation of data. Bioinformatic computation of genetic structures and connectivity between fish stocks with Bayesian methods. Scientific and industrial applications of the genetic structure.

	Class hours	Hours outside the classroom	Total hours
Lecturing	18	25	43
Practices through ICT	8	4	12
Laboratory practical	12	6	18
Seminars	12	12	24
Problem and/or exercise solving	0	14	14
Report of practices, practicum and external practices	0	6	6
Presentation	1	10	11
Objective questions exam	2	16	18
Debate	2	2	4

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

	Description
Lecturing	The professor will present the conceptual basis of each subject and the strategies of the corresponding calculation process. The student will apprehend such concepts by means of the bibliographic query and daily exercises.
Practices through ICT	The students will analyse the experimental data of their previous practices in the laboratory, using specific software and on-line servers.

Laboratory practical	The educational guide of the practices will allow to develop several experiments for the genetic traceability of marine products and genotyping the populations for the calculation of the structure of fisheries.
Seminars	Students will solve out practical cases in the classroom, which are associated to each theoretical concept, analytical technique or biological situation of marine genetic resources.

Personalized assistance

Methodologies	**Description**
Practices through ICT	There will be a personalised attention according to the needs of each student
Lecturing	The questions or synchronous explanations are part of the participatory class.
Laboratory practical	The personalised guide will apply according to the needs of each student.
Seminars	Seminars allow to identifying the understanding or executive difficulties of each student in real time.
Tests	**Description**
Problem and/or exercise solving	The face-to-face virtual tutorship will be held syncronously or asyncronously, by email and by the virtual classroom of remote campus UVIGO, respectively.
Report of practices, practicum and external practices	A predesigned protocol will be presented during the lab. practices for the preparation of the final report.
Presentation	The rules of an efficient presentation will be discussed in order to work out an outstanding dissemination of the practical case assigned to each student.
Debate	

Assessment

	Description	Qualification	Training and Learning Results			
Problem and/or exercise solving	Daily execution of exercises from each class, for its conceptual apprehension; consists on problems, multiple questions or practical cases with simple mathematical applications.	20	A3	B2 B3	C9 C11	D2
Report of practices, practicum and external practices	Preparation of a report of the practice made, with illustrations of the proofs, statitistical tests performed and the conclusions.	20	A1	B4	C10	D1
Presentation	Presentation and defence in class of the practical case assigned. The teacher will evaluate the effort, the clarity of the presentation, the structure of the work and the argumentative level of the conclusions.	20	A2	B1 B4	C11	D1 D2 D5
Objective questions exam	Written exercise of short practical questions comprising the main phenomena studied in the course.	30	A1 A2 A3	B1 B2	C1 C11	D1
Debate	Active participation in classes, seminars and practices, with reasoning and scientific and ethical position on the exploitation of living marine resources.	10	A1 A3	B1	C10	D5

Other comments on the Evaluation

Continuous evaluation option (regular): the contents taught in the master classes and in the experimental and computer practices, will be evaluated respectively through the daily resolution of homework (electronic correction), the execution and attitude towards the practices (performance face-to-face), the final report of the practices (memory correction) and the oral defense of the practical case (on the established day of the last problems seminar). In addition, an exam of objective questions is proposed for all students with a weight of 30% of the final grade.

Global assessment option: for those students who were unable to follow the subject daily in person for personal or work reasons, an extraordinary written test will be given, coinciding on the date and place with the regular continuous assessment written exam. Given the experimental nature of the practices, attendance at them is mandatory to be eligible for this evaluation option.

Extraordinary evaluation option (2nd opportunity): it is carried out on the second date of July of the academic year and its requirements do not differ from the continuous evaluation or the global evaluation, that is, it is necessary to previously carry out the practices and they are maintained. the marks of the continuous evaluation obtained during the course, except those of the written exam of the first call.

The date, time and place of the evaluation tests will be published on the official website of the Faculty of Marine Sciences: http://mar.uvigo.es/alumnado/examenes/

Sources of information

Basic Bibliography

Hedrick, P.W., **Genetics of Populations**, 4th, Jones & Bartlet Publ, 2011

Avise, J., **Molecular Markers: Natural Hist ory and Evolution**, 2nd, Sinauer Associates Inc.,U.S., 1994

A. Moya y A. Fontdevila, **Introducción a la genética de poblaciones**, New edition, Sintesis Editorial, 2018

Matthew Hahn, **Molecular Population Genetics**, 1st, Oxford University Press Inc, 2018

Andy Beaumont , Pierre Boudry, Kathryn Hoare, **Biotechnology and Genetics in Fisheries and Aquaculture**, 2nd, John Wiley and Sons Ltd, 2010

Complementary Bibliography

Recommendations

Other comments

The students immatriculated in this subject would need to have previous knowledge on the nature of the hereditary material (DNA), i.e. structure, transmission rules and evolution, tackled in the subject Biology of the first course of the Degree. It is advisable to account for basic knowledge of calculation of probabilities, proofs of significance (e.g. the test of chi-square), and the concepts and calculations of regression and analysis of variance. The dynamics of fisheries and the marine biological cycles, are as well essential to understand the connectivity of the exploited fishery stocks.