



## IDENTIFYING DATA

### Genetic Diversity and its Application to Study of Marine Organisms

Subject	Genetic Diversity and its Application to Study of Marine Organisms			
Code	V02M098V01205			
Study programme	(*)Máster Universitario en Bioloxía Mariña			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Pérez Diz, Ángel Eduardo			
Lecturers	Galindo Dasilva, Juan Martínez Lage, Andrés Naveira Fachal, Horacio Pérez Diz, Ángel Eduardo Quesada Rodríguez, Humberto Carlos			
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General description	<p>The subject Genetic Diversity and his applications to the study of the marine organisms contributes a wide vision on concepts and genetic tools of application for the management, conservation and study of species and marine populations. The questions treated in this subject include the study of the molecular technicians for the analysis of the genetic variation, the distribution of the intraspecific variability and his quantification, the molecular footprint of the adaptation, the study of the genic expression, and the variation in quantitative characters. The lessons *magistrales will be complemented with practical sessions in which the students will be able to exercise the knowledges purchased in the theoretical classes. As I complement to the face-to-face training, will make activities no face-to-face in which the students will put in practice the concepts learnt in the matter through the resolution of practical cases and the realisation of works *tutorizados by a professor, facilitating like this the personalised work and the integration of different sources of information.</p>			

## Competencies

Code	
A1	(*)Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoito nun contexto de investigación.
A2	(*)Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
A3	(*)Que os estudantes sexan capaces de integrar coñecementos e se enfrontar á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos.
A4	(*)Que os estudantes saiban comunicar as súas conclusións, e os coñecementos e razóns últimas que as sustentan, a públicos especializados e non especializados dun xeito claro e sen ambigüidades.
A5	(*)Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun xeito que terá que ser, en grande medida, autodirixido e autónomo.
B1	Utilización de criterios y métodos científicos en el planteamiento y resolución de problemas aplicando los conocimientos adquiridos
B2	Búsqueda, análisis e integración de información a partir de diferentes fuentes y capacidad para su interpretación y evaluación
B3	Aprendizaje de diversas técnicas y métodos analíticos tanto en el medio natural como en el laboratorio
B4	Desarrollo de habilidades en el manejo y tratamiento de herramientas, matemáticas, estadísticas e informáticas
B5	Desarrollo de la habilidad de elaboración, presentación y defensa de trabajos e informes técnicos
B6	Desarrollo de la curiosidad científica, de la iniciativa y la creatividad

C2	Conocimiento de la diversidad de organismos marinos y sus estrategias adaptativas
C4	Conocimiento y búsqueda del potencial interés económico y biotecnológico de los organismos marinos
C7	Catalogación, evaluación, conservación, restauración y gestión de áreas marinas y litorales protegidos. Elaboración, asesoramiento legal y ejecución de planes de ordenación del litoral
C10	Inspección y asesoramiento técnico en la evaluación, explotación y gestión de pesquerías, extracción de recursos e instalaciones de acuicultura
C11	Estudios de dinámica poblacional, mejora genética y selección de stocks en pesquerías, acuicultura y programas de repoblación
C12	Control de calidad y seguridad de alimentos y de productos de transformación y biotecnológicos de origen marino
C14	Elaboración, discusión, interpretación, asesoramiento y peritaje de informes científico-técnicos, éticos, legales y socioeconómicos relacionados con el ámbito marino y pesquero
D1	Desarrollo de las capacidades comprensivas, de análisis y síntesis
D2	Desarrollo de la capacidad de razonamiento crítico y autocrítico
D4	Desarrollo de la capacidad para actualizar el conocimiento de forma autónoma

### Learning outcomes

Expected results from this subject	Training and Learning Results
Development of the understanding capacities, of analysis and synthesis	A1
	A2
	A3
	A4
	A5
	B1
	B2
	B4
	B5
	B6
	C2
D1	
Utilisation of criteria and scientific methods in the approach and resolution of problems applying the knowledges purchased	A1
	A2
	A3
	B1
	B2
	B3
	C2
	C4
	C7
	C10
	C11
	C12
	C14
D1	
D2	
Development of the capacity of critical reasoning and *autocrítico	A1
	A2
	A3
	B2
	B6
	C2
	C4
	C7
	C11
	C12
D2	

Research, analysis and integration of information from different sources and capacity for his interpretation and evaluation	A1 A2 A3 A5 B1 B2 B4 B6 C2 C4 C7 C10 D1 D4
Learning of diverse technical and analytical methods so much in him half natural as in him laboratory	A1 A2 A3 B3 B4 C4 C10 C11 D1 D2 D4
Development of skills in him handle and treatment of tools, mathematical, statistical and computer	A1 A2 A5 B1 B2 B4 B6 C10 C11 C12 D1 D2 D4
Development of the capacity to update he knowledge of autonomous form	A3 A5 B2 B6 C12 C14 D4
Development of the skill of preparation, presentation and defence of works and technical reports	A1 A2 A4 A5 B5 B6 C14 D1 D2 D4
Development of the scientific curiosity, of the initiative and the creativity	A1 A2 A3 A4 A5 B1 B2 B6 C11 D1 D2 D4

Knowledge of the diversity of marine organisms and his adaptative strategies	A1 A2 A3 B1 B2 B3 C2 C11 D1
Knowledge and understanding of the interactions of the marine organisms and the marine and coastal ecosystems	A2 A3 B1 B2 B3 B4 C2 C7 C11 D1
Cataloging, evaluation, conservation, restoration and management of marine and coastal areas protected. Preparation, legal advice and execution of plans of ordination of the seaboard	A1 A2 A3 A5 B1 B2 B3 B4 B5 C7 C11 D1 D2 D4
Knowledge of the principles of exploitation and sustainability of the half marine and planning and supervision of his management	A1 A2 A5 B1 B2 B3 B4 C4 C7 C10 C11 C12 D2
Divulging of knowledges of the biology and the half marine: programs of training and teaching; planning and direction of aquariums, museums, centres of environmental interpretation, natural parks and natural spaces protected	A1 A2 A3 A4 B1 B2 B5 C7 D1 D2 D4
Preparation, discussion, interpretation, advice and *peritaje of scientific reports-technical, ethical, legal and socioeconomic related with him marine field and *pesquero	A1 A2 A3 A4 A5 B1 B2 B5 C14 D1 D2 D4

Knowledge and research of the potential economic interest and *biotecnológico of the marine organisms	A1 A2 A3 A5 B1 B2 B3 B4 C4 D1 D2 D4
Knowledge and handle of the methodology of investigation, of the technicians of sampling and instrumental and of analysis of data applied to the half marine	A1 A2 A3 A5 B1 B2 B3 B4 C10 D1 D2 D4
Studies of populational dynamics, genetic improvement and selection of stocks in *pesquerías, aquaculture and programs of *reproducción	A1 A2 A3 A5 B1 B2 B3 B4 C11 D1 D2 D4
Inspection and technical advice in the evaluation, exploitation and management of *pesquerías, extraction of resources and installations of aquaculture	A1 A2 A3 A5 B1 B2 B3 B5 C10 D1 D2

## Contents

Topic	
SUBJECT 1: GENETIC VARIATION IN MARINE ORGANISMS	Molecular techniques for the scrutiny of the populational genetic variation. Databases. Identification of species (Barcoding), individuals and sexes.
SUBJECT 2: DISTRIBUTION OF THE GENETIC VARIABILITY INSIDE SPECIES	Estimators of the genetic diversity. Populational subdivision and migration. Phylogeography.
SUBJECT 3: GENETIC VARIATION IN NATURAL POPULATIONS: EFFECTS OF THE POPULATIONAL SIZE	Genetic drift in natural populations. Effective population size. Demographic effects. Inbreeding due to genetic drift. Strategies to handle populations in captivity.
SUBJECT 4: NATURAL SELECTION, ADAPTATION And GENETIC DIVERSITY	Natural selection and adaptation. Neutral theory of the molecular evolution. The molecular footprint of the natural selection. Inference of selection from intra- and interspecific molecular variation.
SUBJECT 5: ADAPTATIVE And NEUTRAL VARIATION IN THE GENIC EXPRESSION	Techniques to quantify gene expression. Proteomics. Variation of gene expression within and between populations. Neutral and adaptative variation in gene expression. Phenotypic plasticity.
SUBJECT 6: VARIATION IN QUANTITATIVE CHARACTERS	The continuous variation. Components of variance. Heritability. Estimation of the heritability. The action of the natural selection on the quantitative traits. Methods for the cartography of QTLs

## Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	28	56	84
Mentored work	0	30	30
Practices through ICT	12	24	36

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

### Methodologies

	Description
Lecturing	The teacher explains the theoretical content of each topic. Extensive diagrams of the subject and a specific bibliography will be provided so that the student can delve into the different topics. The student assimilates and writes down concepts. It raises doubts and questions.
Mentored work	Students will prepare a written report on a topic proposed and tutored by a teacher
Practices through ICT	Students will be trained in the use of the most relevant online programs and tools related to each topic. The teacher guides and solves doubts.

### Personalized assistance

#### Methodologies Description

Mentored work	The process of learning of the student that complements the masterclasses and the practices, will be carried out by means of the preparation of a memory written on a topic related with the subject, proposed and supervised by a professor. The professors will reserve a time to attend and resolve the doubts of the students. In this activity professors have the function to orient and guide the process of learning of the students and will help them to make successfully the corresponding autonomous work. The professors indicate during the beginning of the term the place, day and hours for this personalised attention.
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### Assessment

	Description	Qualification	Training and Learning Results
Lecturing	They will evaluate the answers to a final examination writing in which they will pose relative questions to the theoretical concepts given along the subject.	50	A1 B1 C2 D1 A2 B3 C4 D2 A3 B4 C7 D4 A4 B6 C10 A5 C11 C12 C14
Mentored work	It will evaluate the quality of the memory written presented by the students in base to the subject posed by his tutor.	20	A1 B1 C2 D1 A2 B2 C4 D2 A3 B5 C7 D4 A4 B6 C10 A5 C11
Practices through ICT	The answers to a practical exercise in which questions related to the practical concepts taught throughout the course will be evaluated.	30	A1 B1 C2 A2 B2 C11 A3 A4 A5

### Other comments on the Evaluation

It will be necessary to obtain a minimum score of 4,0 points in the final exam to pass the subject. Delaying in the presentation of working tasks will be penalised up to 20% of the corresponding score assigned to the concerned task (if this is presented inside the penalised extended term, otherwise a zero will be obtained). It will not be admitted the delivery of works a week later of the term of delivery (penalised extended term). Any attempt of plagiarism in the activities will make to get a qualification of zero in the activity affected, without possibility to recover it in the second chance-call (July). The students that do not attend to the final exam will count as no presented. To pass the subject will be necessary to obtain 5 points of 10 in the weighted global evaluation. For the second chance-call (final exam in July), the student will conserve the scores of the activities made previously.

Date of examination 1st chance/call: 1 March 2021

Date of examination 2nd chance/call: 1 July 2021

Tutorials: Tuesday, Wednesday, Thursday of 15:00 to 17:00 h

### Sources of information

#### Basic Bibliography

#### Complementary Bibliography

John C. Avise, **Molecular Markers, Natural History, and Evolution**, Springer, Second Edition,

Philip W. Hedrick, **Genetics of Populations, Fourth Edition, Jones & Bartlett**, Fourth Edition,  
Anne Charmantier, Dany Garant, Loeske E.B. Kruuk, **Quantitative Genetics in the wild, OUP Oxford**, Primera Edición,  
Arthur Lesk, **Introduction to Bioinformatics, OUP Oxford**, Fourth Edition,  
Johanna R. Freeland, Heather Kirk, Stephen D. Petersen, **Molecular Ecology, Wiley-Blackwell**, Second Edition,

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## Recommendations

### Subjects that continue the syllabus

Techniques to Study Marine Organisms/V02M098V01108

### Subjects that it is recommended to have taken before

Molecular Basis of Adaptation to the Marine Environment/V02M098V01107

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## Contingency plan

### Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

\* Teaching methodologies that are modified

Blended case: Both the theoretical and practical classes will be followed in a mixed way in the classroom by a small group of students who will rotate, and telematically for the rest, as long as the maximum capacity allowed in the teaching classroom is exceeded .

Non-face-to-face case: Both the theoretical and practical classes will be taught electronically following the schedule established in the academic calendar, leaving all the material available on FAITIC and/or by email.

\* Non-face-to-face mechanism for student meetings (tutorials)

All the tutorial meetings will be carried out in group or individually using the remote campus following the hours indicated by the center or agreeing dates and times previously with the students by email.

=== ADAPTATION OF THE EVALUATION ===

- Blended modality: they are not modified.

- Non-face-to-face mode: The tests will be carried out virtually using the existing mechanisms (remote campus and FAITIC).