

Conceptes i Mètodes en Paleobiologia de Vertebrats

2014/2015

Code: 43133

ECTS Credits: 6

Degree	Type	Year	Semester
4314104 Paleontologia	OT	0	1

Contact

Name: David Martinez Alba

Email: David.Martinez.Alba@uab.cat

Use of languages

Principal working language: català (cat)

Some groups entirely in English: No

Some groups entirely in Catalan: Yes

Some groups entirely in Spanish: No

Teachers

Àngel Galobart Lorente

Soledad de Esteban Trivigno

Daniel de Miguel

José Manuel Marmi Plana

Marcos Furio Bruno

Isaac Casanovas Vilar

Josep Fortuny Terricabras

Xavier Jordana Comin

Prerequisites

In order to have the previous necessary knowledge to be able to take the module, it is recommended to have taken a degree on biology, geology or similar, or else to have taken complementary subjects providing the necessary background on general paleontology, evolutionary biology and statistics.

Objectives and Contextualisation

Providing the scientific and methodological bases enabling the development of research capacity and professional exercise in Vertebrate Paleontology, with particular emphasis on a paleobiological approach.

Skills

- Analyse data using the appropriate tools in the field of palaeontology.
- Apply the theories, paradigms and concepts of biology and ecology to analyse the biological aspects of organisms and ecosystems of the past.
- Communicate and justify conclusions clearly and unambiguously to both specialised and non-specialised audiences.
- Design and conduct research in the field of palaeontology and disseminate the results.
- Develop a capacity for criticism and self-criticism in the field of palaeontology:

- Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
- Obtain and synthesise information from the scientific literature (library, databases, online journals or reliable websites) in the field of palaeontology.
- Recognise and use appropriately the fossil record to solve specific problems in the different areas of palaeontology.
- Show mastery of the various methodologies for studying the different fossil groups, gathering and integrating field and laboratory data.
- Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
- Use the different techniques for studying, conserving and disseminating the fossil record.

Learning outcomes

1. Analyse data using the appropriate tools in the field of palaeontology.
2. Apply knowledge of comparative anatomy, functional morphology and biomechanics to analyse the biological aspects of the vertebrates of the past.
3. Communicate and justify conclusions clearly and unambiguously to both specialised and non-specialised audiences.
4. Develop a capacity for criticism and self-criticism in the field of palaeontology:
5. Initiate research in the field of palaeobiology and vertebrate evolution and disseminate the results.
6. Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
7. Obtain and synthesise information from the scientific literature (library, databases, online journals or reliable websites) in the field of palaeontology.
8. Recognise and appropriately use the vertebrate fossil record in the field of palaeobiology.
9. Show mastery of new technologies for the non-invasive analysis of vertebrate fossil remains.
10. Show mastery of the different fieldwork methodologies for collecting vertebrate fossil remains.
11. Show mastery of the different laboratory methodologies for studying vertebrate fossil remains.
12. Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
13. Use the different techniques for studying, conserving and disseminating the vertebrate fossil record.

Content

Block 1: Methods

Field and lab methods. Macrovertebrates

Field and lab methods. Microvertebrates

Analysis of paleontological data

Norms, rules and aims in vertebrate paleontology research

Geometric morphometrics. Paleobiological applications

New technologies and methods applies to the study, recovery and visualization of vertebrate fossils

Block 2: Concepts in paleobiology

Vertebrate skeletal anatomy, generalities and terminology

Functional morphology and biomechanics

Ecomorphology and paleoecology

Evolutionary patterns and rates

Allometry and heterochrony

Block 3: Paleobiology

Evolution under insularity conditions

Ecology, demography and life history features from a paleontological viewpoint

Paleohistology and its applications

Life history reconstruction in fossil vertebrates

Methodology

Theoretical contents will be taught by means of lectures in Catalan or, depending on the professor, in Spanish, with the aid of audiovisual material (powerpoint) in English. The participation by and dialog with the students will be favored in all instances. More practical contents will be also taught by means of computer support; in these lessors, students will have to solve problems posed by the professor. Students will have to further consolidate and familiarize with the contents of the module autonomously by reading the specialized literature and studying the teaching material given by the professors, as well as by making various works supervised by the professors of the module.

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			
Lectures	26	1.04	2, 13, 4, 10, 11, 5, 8
Practical lessons	8	0.32	1, 13, 9, 6, 12
Type: Supervised			
Presentation of works	41	1.64	3, 4, 5, 6, 7, 8, 12
Type: Autonomous			
Personal study	50	2	1, 2, 3, 13, 4, 10, 11, 9, 5, 6, 7, 8, 12
Reading of papers	25	1	3, 4, 7, 8

Evaluation

Qualification will be based on the student's attendance and participation in lectures and practical lessons, and also on the basis of the grades obtained by the student in the various works.

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Attendance at lectures and practical lessons	50.00%	0	0	1, 2, 13, 4, 10, 11, 9, 5, 6, 8, 12
Presentation of a work on paleobiology	12.07%	0	0	3, 4, 5, 7, 8

Solving of a problem on allometry	14.65%	0	0	3, 4, 5, 6, 12
Solving of problems and exercises on statistics/geometric morphometrics	23.28%	0	0	3, 4, 5, 6, 12

Bibliography

Alba, D.M. (2002). Shape and stage in heterochronic models. In: N. Minugh-Purvis and K. J. McNamara (Eds.), *Human Evolution through Developmental Change*, pp. 28-50. The Johns Hopkins University Press, Baltimore.

Alexander, R.M. (2003). *Principles of animal locomotion*. Princeton, Princeton University Press.

Benton, M.J. & Harper, D.A.T. (2009). *Introduction to paleobiology and the fossil record*. Wiley-Blackwell, Chichester.

Briggs, D.E.G. & Crowther, P.R., Eds. (2003). *Palaeobiology II*. Blackwell Publishing, Malden.

Carroll, R. L. (1988). *Vertebrate paleontology and evolution*. W. H. Freeman and Company, New York.

Cunningham, J.A., Rahman, I.A., Lautenschlager, S., Rayfield, E.J. & Donogue, P.C.J. (In press). A virtual word of paleontology. *Trends in Ecology and Evolution*.

Elewa, A.M.T., Ed. (2011). *Computational paleontology*. Springer.

Foote, M. & Miller, A.I. (2007). *Principles of paleontology*. 3rd edition. W.H. Freeman.

Gould, S.J. (1966). Allometry and size in ontogeny and phylogeny. *Biological Reviews* 41: 587-640.

Gould, S.J. (1977). *Ontogeny and phylogeny*. The Belknap Press of Harvard University Press, Cambridge.

Gould, S.J. (2002). *The structure of evolutionary theory*. Harvard University Press.

Jablonski, D. (2000). Micro- and macroevolution: Scale and hierarchy in evolutionary biology and paleobiology. *Paleobiology* 26 (Suppl. to n. 4): 15-52.

Jablonski, D., Erwin, D.H. & Lipps, J.H., Eds. (1996). *Evolutionary paleobiology*. University of Chicago Press.

Kardong, K.V. (2006). *Vertebrates. Comparative anatomy, function, evolution*. Fourth Edition. McGraw-Hill, New York.

Hammer, Ø. & Harper, D.A.T. (2006). *Paleontological data analysis*. Blackwell Publishing, Malden.

Hammer, Ø., Harper, D.A.T. & Ryan, P.D. (2001). PAST: Paleontological statistics software package for education and data analysis. *Palaeontologia Electronica* 4: Art. 4.

Harper, D.A.T. (1999). *Numerical paleobiology: Computer-based modelling and analysis of fossils and their distributions*. Wiley.

López Martínez, N. (1992). Técnicas de estudio de microvertebrados. Los micromamíferos y su interés bioestratigráfico. In: Astibia, H. (Ed.), *Paleontología de vertebrados. Faunas y filogenia, aplicación y sociedad*, pp. 345-365. Servicio Editorial Universidad del País Vasco.

López Martínez, N. & Truyols Santoja, J. (1994). *Paleontología*. Editorial Síntesis, Madrid.

McKinney, M.L. & McNamara, K.J. (1991). *Heterochrony. The evolution of ontogeny*. Plenum Press, New York.

Prothero, D.R. (2004). *Bringing fossils to life. An introduction to paleobiology*. Second edition. McGraw-Hill, New York.

Sokal, R.R. & Rohlf, F.J. (2011). *Biometry: The principles and practice of statistics in biological research*. 4th edition. W.H. Freeman.

Sutton, M., Rahman, I. & Garwood, R. (2014). *Techniques for virtual paleontology*. Wiley-Blackwell,

Zelditch, M.L., Swiderski, D.L., Sheets, H.D. & Fink, W.L. (2004). *Geometric morphometrics for biologists: a primer*. Elsevier Academic Press, San Diego.