

BBIO413 Ecosystem Processes

ECTS Value: 5 ECTS

Module Description

This module, together with the other Biology content modules will provide future biology teachers with the knowledge required to teach the topics covered from SEC up to Advanced Level. The module unit content will include the following topics:

- a) Structure of ecosystems
 - o Abiotic & biotic components
- b) Energy flow in ecosystems
 - o Energy and carbon sources in ecosystems
 - o Pyramids of biomass, numbers & energy
 - o Transfer of energy between trophic levels
- c) Climate and biomes · Biogeochemical cycles
- d) Climate change and its effect on species · The ecological niche
- e) Fundamental and realized niche
- f) Competition, predation, parasitism and mutualism;
 - o The role of reproductive isolation in speciation:
 - o Allopatric, sympatric, parapatric and quantum speciation
- g) Ecological succession
- h) Local ecosystems - to include examples from each habitat type
 - o Terrestrial habitats including disturbed habitats
 - o Marine habitats
 - o Effect of alien/invasive species including local examples
- i) Ecological techniques
 - o Capture recapture techniques
 - o Random and non-random sampling
 - o T-test to compare independent samples
 - o Diversity Indices
 - o Data analysis using provided data sets

Overall Objectives and Outcomes

By the end of this module, the learner will be able to:

Competences

- a. Interpret field data and provide conclusions;
- b. Describe the basics of population and community ecology;
- c. Describe the fundamental interactions between species, and between species and their abiotic environment;
- d. Identify common plant species found in the Maltese terrestrial environment.
- e. Engage critically with literature.

Knowledge

- a. define biodiversity and explain its importance, as well as measures to conserve it;
- b. identify the range of habitats constituting the coastal and marine environment of the Maltese Islands together with their associated biota;
- c. demonstrate understanding of the basic principles of behavioural, organismal, population, community, ecosystem ecology and global patterns of biodiversity;
- d. define various ecological techniques
- e. examine applied ecological statistics;
- f. define biogeochemical cycles and their importance in ecology
- g. demonstrate understanding of the effects of climate change on biodiversity and ecosystems

Skills

- a. apply knowledge of biology to assess biodiversity, and to develop and
- b. implement management and conservation measures;
- c. explain the central principles governing the interactions of organisms and their environment at the organism, population, community, and ecosystem levels;
- d. describe how organisms acquire energy;
- e. Connect the relationship between ecology, behaviour and evolution;
- f. develop knowledge and awareness of the ecological principles underlying key environmental issues;
- g. plan and apply a basic biological field survey;
- h. evaluate how interactions between species can determine population size and abundance;
- i. describe and give examples of key ecological principles, such as predation, competition, herbivory and mutualism, and dynamics controlling the distribution and abundance of individuals and communities;
- j. describe the local terrestrial and marine habitats and their ecosystems;
- k. identify local common plant species;

- I. identify and describe the effects of some terrestrial and marine alien species found in the Maltese Islands.

Mode of Delivery

This module adopts a blended approach to teaching and learning. Information related to the structure and delivery of the module may be accessed through the IfE Portal. For further details, kindly refer to the Teaching, Learning and Assessment Policy and Procedures found on the Institute for Education's website.

Assessment Methods

This module will be assessed through: Research Assignment and Online Tasks/Reflections.

Suggested Readings

Core Reading List

1. Begon, M., Howarth, R.W. and Townsend, C.R. (2014). *Essentials of Ecology*. 4th edition. Wiley.

Supplementary Reading List

1. Weber, H. C., Kendzior, B. (2006) *Flora of the Maltese Islands: A Field Guide*. Margraf.
2. Schembri, PJ & Baldacchino, AE (1998) *Ilma, blat u ħajja: is-sisien tal-ambjent naturali Malti*. [It-tielet edizzjoni riveduta] Malta University Publishing Ltd.
3. Agius Darmanin, S., Vella, N., & Vella, A. (2016). Genetic, morphometric and meristic analyses of first Monrovia Surgeonfish *Acanthurus monroviae* (Steindachner, 1876) specimens recorded in Maltese waters (Central Mediterranean). *Cybiium: International Journal of Ichthyology*, 40(4), 338–340.
4. Schembri P.J. (1993). Physical geography and ecology of the Maltese Islands: a brief overview. In S. Busuttill, F. Lerin, & L. Mizzi (Eds.), *Malta : food, agriculture, fisheries and the environment* (pp. 27-39). Montpellier: CIHEAM
5. Schembri, P. J., Barbara, J., Deidun, A., Lanfranco, E., & Lanfranco, S. (2015) It was only a matter of time: occurrence of *Caulerpa taxifolia* (Vahl) C. Agardh var. *distichophylla* (Sonder) Verlaque, Huisman and Procaccini in the Maltese Islands (Chlorophyta, Ulvophyceae, Caulerpaceae). *BioInvasions Records*, 4(1), 9–16.
6. Vella, A., Vella, N., & Agius Darmanin, S. (2016). The first record of the African Sergeant, *Abudefduf hoefleri* (Perciformes: Pomacentridae), in the Mediterranean Sea. *Marine Biodiversity Records*, 9, 15. <https://doi.org/10.1186/s41200-016-0008-7>
7. Vella, N., Vella, A., & Agius Darmanin, S. (2016). Morphological and genetic analyses of the first record of the Niger Hind, *Cephalopholis nigri* (Perciformes: Serranidae), in the Mediterranean Sea and of the African Hind, *Cephalopholis taeniops*, in Malta. *Marine Biodiversity Records*, 9(99), 1–5.

8. Vella, N., Vella, A., & Mifsud, C. M. (2017). First Scientific Records of the Invasive Red Swamp Crayfish, *Procambarus clarkii* (Girard, 1852) (Crustacea: Cambaridae) in Malta, a Threat to Fragile Freshwater Habitats. *Natural and Engineering Sciences*, 2(2), 58–66.
<https://doi.org/10.28978/nesciences.328931>