

# Ecology of the Arava

**Coordinator: Dr. Elli Groner,**

3 weekly lecture hours 4 short field work sessions and a one-day tour.

3 academic credits

## Course description

This course will present an overview of the ecology of the Arava desert. In this course, both basic principles of ecology followed by desert ecology will be introduced.

Students will learn about desert food webs, the interaction between ecosystems, pollution and other risks to the conservation of the Arava.

Students will study the link between the Arava ecosystems, they will study about plants, arthropods, mammals and birds of the terrestrial ecosystem and the principles and wildlife of the sea. While learning about different ecosystem and taxon students will study the anthropogenic impact on wildlife.

## Grade components:

Final exam 45%

Quizzes 10%

Midterm exam 5%

Attendance, Participation, discussions 10%

Projects, exercises, assignments 30%

## Evaluation :

- Exams will be made up of multiple choice questions as well as some essay questions that test the understanding of the material and the ability to extrapolate to similar problems.
- Exercises will include written work on either the reading material or the material taught in class. Exercises will also include trip reports, linking the ecology of the area and anthropological pressures on the environment.
- Projects will include the following :
  1. A webpage on a chosen species (from literature)
  2. Description of a landscape unit (from own field work data)
  3. Acacia trees – characteristics of wadis using aerial photos and ground truthing and validation.

Project will be divided to 2 sections:

- I. Identical protocols in the same wadi for the whole class and done individually.
- II. In groups of 3 with each group taking a different wadi.

## Readings:

The Biology of Deserts. David Ward 2009. Oxford university press. 339 pp

## Syllabus:

- Part A :**Getting to know the desert** – Introduction to the desert, learning tools to study desert ecology including pitfall traps, soil, Berleese traps and acacia tree monitoring.
- Part B :**Sea and Air of the Arava** – marine biology, bird migration
- Part C :**Socio-ecology** – policy, ecosystem services, planning, conservation

## **Course Schedule:**

### Week 1

**Title:** Introductions to deserts

**Topics:** Definition of desert, aridity index, deserts of the world Desert hazards for life, why do living organisms require water, precipitation and heat of deserts, unpredictability

### Week 2

**Title:** Animal adaptations to deserts

**Topics:** intro to ecology, Physiology, behavior, phenology; morphology, physiology, phenology, C4, CAM biogeography of desert plants

**Reading material:** Ward 29-39, 60-65

### Week 3

**Title:** Biodiversity in deserts including field work

**Topics:** Estimating arthropod diversity– Using pitfall traps to study the desert community. Setting up traps, collecting, calculating indices. Species richness, Simpson index, Bray-Curtis.

**Assignment:** an excel file with calculation of SR, Simpson index.

### Week 4

**Title:** Marine ecology

**Topics:** Marine oceanography, marine ecology, conservation

### Week 5

**Title:** Sand dunes; The diversity of life

**Topics** Evolution of animals, taxonomy and knowing the animal orders . Geomorphology of sand dunes, adaptations to sand dunes, policy of conservation of sand dunes.

### Week 6

The Arava ecology trip

### Week 7

**Title:** Desert food webs

**Topics:** predator-prey, the "green world hypothesis"

## Week 8

**Title:** Soil ecology – field work

**Topics:** Work includes extracting soil , setting up Berleese funnels, identification of arthropods to the order level, calculating QBS index

**Assignment:** an excel file including calculation of the QBS index

## Week 9

**Title:** Acacia as a key-stone species and plants adaptations to deserts

**Topics:** Geo-hydro-ecology of acacia in the Arava, tree-beetle-ungulate interactions, monitoring tree health (DBH, NDVI, phenology)

**Reading material:** Munzbergova and Ward 2002

**Assignment:** Acacia survey: learning how to estimate tree health in the field. Using NDVI, DBH and other parameters

## Week 10

**Title:** Bird migration

**Topics:** Bird ecology, physiology and behavior in migration between Europe and Africa.

## Week 11

**Title:** Desert ecosystem services

**Topics:** The history and the need of ecosystem services concept, the link between ecosystem integrity and ecosystem services, what's special about desert ES? The DPSIR model, human-nature conflict, disturbances, Pulse-pressure model

**Reading material:** Sagie et al 2013,

## Week 12

**Title:** Arid land management, Students seminar

**Topics:** Anthropological impacts on desert ecology

**Assignment:** every pair present a 7 min talk using their field work and analysis.

## Week 13

**Final Exam**