

*WADI: Water Demand Integration  
CEAB-CSIC contribution*

***THE MACROPHYTOBENTHOS: ELEMENTS FOR ASSESSING  
ECOSYSTEM HEALTH IN COASTAL WATER BODIES***



Burano Lake, Tuscany, Italy. By Cecconi



# Bionomic cartography

Benthic vegetation

Food webs



Indicator species

Water mass health

Pollution gradients

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# The CEAB-CSIC team

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## The CEAB-CSIC team: Fields of Expertise

- Ecological and eco-physiological research in macrophyte-dominated communities occurring in estuaries, marine subtidal and intertidal environments, and coastal lagoons.
- Research on biogeochemical cycles (mainly of carbon, nitrogen, and phosphorus) and ecosystem metabolism (carbon budgets).
- Paleo-reconstruction of biological and environmental variables using seagrasses and the sedimentary record.

## CEAB-CSIC goals in WADI

We are looking forwards to collaborating in all four work packages but focusing our contribution in **WP2** and **WP3**, concretely:

- **Ecosystem structure:**
  - General description and cartography of the most relevant aquatic plants inhabiting the water bodies under study.
  - Identification of water quality indicator species.
  - The general food web structure of the water bodies studied will be explored using the stable isotopes approach.
- **Ecosystem health:**
  - Basic assessment of the presence of organic and inorganic pollutants using isotopic and heavy metal analysis.
  - Establishment of relationships cause-effect between pollution gradients and vegetation distribution.
  - The incorporation of pollutants from the environment into the biota will be explored.

To promote **transference of scientific knowledge** between countries, each one of the three years of the project, our group will welcome a student from a North African participating country (Tunisia, Morocco, Egypt) for a 2-month period (6 months in total).

# Specific Objectives

ECOSYSTEM	COMPARTMENT	VARIABLE	METHOD	OBJECTIVE	COMMENTS
Structure	Macrophytes	Biodiversity	Field surveys and specimens sampling	Identification of indicator species	Use of documents and in situ assessment
		Distribution	Transects, GPS	System description	Use of documents and in situ assessment
	Other key organisms (e.g. endangered spp.)	Abundance	Biomass, density measurements	System description	Above and belowground
		Abundance	Biomass, density measurements	System description	Use of documents and in situ assessment
Health	Macrophytes	C, N, P content	Autoanalyser/ICP	Eutrophication assessment	Sampling along a pollution gradient
	Food web (vegetation, macroinvertebrates, plankton, detritus)	Heavy metals	Wet digestion/ICP	Pollution assessment	Fe, Cd, Cr, Zn, Cu, As, Pb, Mn, Ni
		C and N stable isotopes	Mass spectrometry (IRMS)	Pollution flow through food web	Tentative. From pollutants sources to commercial goods
	Water column	Transparency	Secchi disc	Eutrophication assessment	Where depth allows for it
	Sediments	Organic mater	Sediment combustion	Effect of increased environmental impacts	Only upper layers

# Working Plan: study cases

WADI: CEAB-CSIC

## Stakeholders:

- Local farmers who experience both water scarcity and irregular inundation of the land (high dependence on water supply)
- Fishermen in coastal area
- Local population (deteriorating quality of water)
- Governmental authorities (Centre Régional Développement Agricole)

## Environment\*\*:

- Around 24 macrophyte species, including seagrasses and semi-submerged vegetation.
- The brackish water phanerogam *Ruppia cirrhosa*, dominates.
- Important seasonal changes in species abundance
- Symptoms of water quality deterioration since the 70's

Ghar El Melh  
(Tunisia)

\*\*Shili, A., Trabelsi, E.B., Ben Maïz, N. 2002. Benthic macrophyte communities in the Ghar El Melh lagoon (North Tunisia). *Journal of Coastal Conservation* 8:135-140

# Working Plan: study cases

WADI: CEAB-CSIC

## Oued Tahaddart (Morocco)

### Stakeholders:

- Tourism agencies
- Local breeders and fishermen in coastal area
- Local authorities depending on the Ministeries Intérieur, Pêche Maritime, Agriculture, Eaux et Forêts, Equipement.
- Governmental authorities (Centre Régional Développement Agricole)

### Environment:

- Water flow down to the sea controlled by dams.
- Regular tide invasion of the oued estuary.
- Abundance of marshy basins, coastal mudflats, merjas, and dayas.
- Human activities include cultivation, pastoralism, fishing and hunting.
- Identified by Moroccan Government as a site with high need of stringent conservation measures.

[http://news.4eco.com/preservations\\_habitats/](http://news.4eco.com/preservations_habitats/)

# Working Plan: study cases

al-Iskandariyah

WADI: CEAB-CSIC

el Guna el Dalma

## Lake Maryut (Egypt)

### Stakeholders:

- Fishermen, and fish traders.
- Governorate, represented by the Sewage General Authority, which is dumping sewage into the Lake
- Irrigation drainage water authorities, dumping drainage water into the Lake
- Industrial firms either discharging their industrial wastewater into the lake or using the Lake water for cooling purposes.
- The local population of Alexandria.

### Environment:

- Intense object of many uses.
- Highly deteriorated by domestic sewage and industrial and agricultural wastewater.
- Land reclamation for agriculture.
- High abundance of macrophytes but deteriorated habitat.
- High metal pollution in the food webs (fish, birds, ...)

Bab el- Arab Bay

Mareotis

El-Dishudi Drain

WAHBY, S.D.; EL-MONEIM, M.A.A., 1979 "The problem of phosphorus in the eutrophic Lake Maryut."  
*Estuar. Coast. Mar. Sci.*, V.9, N°5, pp. 615-622.

## Working Plan: Chronology

This is a tentative schedule. Dates for meetings, missions, and sampling sites may vary depending on the plans of other partners, and on the sampling logistics available for specific study sites

- **2006:**
  - February: Meeting and tentative sampling in El Hondo, Alicante, Spain.
  - April: Meeting in Cairo and full sampling in Mareotis Lake, Egypt.
  - October: Meeting in the Moroccan sites and full sampling in Tahaddard, Morocco.
  - November: Meeting in Tunisia.
- **2007:**
  - Spring: Full sampling in Tunisia.
  - Autumn: Full sampling in El Hondo (tentative).
- **2008:** This year will be devoted to laboratory procedures, other meetings scheduled, and preparation of scientific and dissemination material.