EXTENDED ABSTRACT OF THE HYDROLOGIC STUDY OF MEDITERRANEAN TEMPORARY PONDS

Mediterranean Temporary Ponds (MTPs) constitute priority habitats (Natura Network Code: 3170) of unique ecological value according to the European legislation (Habitats Directive – 92/43/EEC). In Greece, twenty four (24) occurrences of Mediterranean Temporary Ponds (2002) have been recorded, five (5) of which are located in West Crete (Gavdos, Falasarna, Elafonisi, Georgioupoli, Omalos).

The present study has as its aim to study the hydrology and geochemistry of the MTPs in W. Crete (Gavdos, Falasarna, Elafonisi, Georgioupoli, Omalos). The realisation of such aim is possible with:

- A series of analyses and experiments, in order to determine the physicochemical characteristics of MTPs sediment (humidity, pH, density of dry material, porosity, particle analysis, chemical composition (metals-trace elements), mineralogical content).
- Monthly visits at the areas of the ponds for the collection of hydrological data and the accomplishment of in situ studies, such as experiments of determining the infiltration capacity of the ponds sediment, interactions between the water cycle components and the ponds and hydroperiod estimations.
- The realization of batch experiments in sediment samples from the ponds in order to study the main geochemical processes (mineralisation, extraction, adsorption) of the nitrogen and phosphorus cycles.

In particular, the report is composed of nine (9) chapters:

In the first chapter an introduction of the MTPs as significant habitats is presented along with the main objectives of the study. The 2nd chapter includes a literature review in relation with the Mediterranean Temporary Ponds. Since the main threat for the MTPs, excluding direct human interventions, is the impendent climate change, a trend analysis of precipitation timeseries for a number of rainfall stations in Crete, as well as a frequency analysis of rainfall data at Souda station has occurred to be related with the ponds hydroperiod. In the 3rd chapter a short description of the areas in W.

Crete where MTPs are met is presented. The description focuses mainly on climate, hydrogeology (water deficit) and the main threats for each area. In the 4th chapter there is an extensive account of the MTPs under study and the characteristics of the MTPs as a result of in situ studies and laboratory experiments are presented. Also in this chapter an estimate of the ponds hydroperiod in Kournas, Gavdos and Falasarna is given. In the 5th chapter the model (Hydro-Pond-Model) is presented developed using the mathematical software MATLAB for the determination of the ponds hydroperiod, while in the 6th chapter the simulation results are presented for the model's simulations in Elafonisi and Omalos ponds. In the 7th chapter the theoretical background and the experimental procedure followed during the experiments in order to study the basic geochemical processes (mineralisation, extraction, adsorption) taking place in the sediment of the ponds based on the analysis of the nitrogen and phosphorus cycles are described. Finally, in the 8th chapter a synopsis of the main conclusions as a result of the present study is presented.

Main conclusions:

Hydrology

- The ponds of Elafonisos are supplied almost exclusively from rain-water, while there is no groundwater supply. The mean hydroperiod length is estimated at 42.5 days.
- The pond of Omalos is mainly supplied by rain-water and secondly from flooding surface run-off, while there is no ground water-supply. The mean hydroperiod length is estimated at 146 days.
- The pond of Kourna is supplied mainly from the lake and secondarily from the rain-water. The mean hydroperiod length is estimated at 61 days.
- The pond of Falasarna is mainly supplied from ground water, while the pond 2 (by the sea) receives also significant surface run-offs. The mean hydroperiod length is estimated at 160 days.
- The ponds of Gavdos (aroliths) are mainly supplied from rainfall. The hydroperiod length ranges from 137 to 175 days.

Proposed measures for restoration actions for each study area are as follows:

Falasarna

Threats – Pressures:

1) Water quality (pollutants inflows from groundwater, glasshouses and drainage canal at the pond by the sea, solid wastes)
2) Hydroperiod (drainage canal inflows to the pond)

Potential measures:

1) Water quality (collaboration with the agricultural association of Platanos, reinforcement of soils biological fertilization, discontinuation of hydrological connection between the pond and the drainage canal, planting nutrient-absorbing plant species, repeated solid wastes removal and disposal)
2) Hydroperiod (discontinuation of hydrological connection between the pond and the drainage canal)

Elafonisi

Threats – Pressures:

1) Water quality (animal wastes, solid wastes, greenhouses)
2) Hydroperiod (reduced precipitation combined with climatic changes, excavations-soil/sediment removal for glasshouses)

Potential measures:

1) Water quality (fencing, animals' watering places, reinforcement of soils biological fertilization at glasshouses, repeated solid wastes removal and disposal)
2) Hydroperiod (continuation of hydroperiod monitoring and potential experimental deepening of a few centimeters if rainfall trend is decreasing, control of sediment removal with application of alternative solutions – set up with the local municipality special extraction areas)

Kourna

Threats – Pressures:

1) Water quality (urban wastewater, relatively low pressure, fertilisers, surface leaching from nearby field)

2) Hydroperiod (supply only from the lake, change in topography from nearby field erosion)

Potential measures:

1) Water quality (nutrient-absorbing plants buffer zone, small earth drainage canal between the field and pond area)
2) Hydroperiod (experimental small scale excavation for the creation of small depression which will reserve water for a few more days)

Gavdos

Threats – Pressures:

1) Water quality (animals waste)
2) Hydroperiod (animals watering)

Potential measures:

1) Water quality (fencing, waterers)
2) Hydroperiod (waterers and water supply works)

Omalos

Threats – Pressures:

1) Water quality (animals waste)
2) Hydroperiod (animals watering)

Potential measures:

1) Water quality (fencing, waterers)
2) Hydroperiod (waterers and water supply works)

The present study showed that Mediterranean Temporary Ponds constitute an ecosystem of high geochemical value, particularly sensitive to the impedent climate change, but also to human interventions and therefore their protection is imperative. A necessary condition for the appropriate management and protection of these habitats is the understanding of local hydrogeological, climatic and geochemical conditions for each study area.