Monitoring and modelling coastal lagoons: making management tools for aquatic resources in north Africa - MELMARINA

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Website: http://www.geog.ucl.ac.uk/melmarina/

Context and Objectives

Many North African coastal lagoons are severely degraded yet some remain high value aquatic ecosystems that are important as natural resources for local human populations and contribute substantially to regional biodiversity. North Africa's lagoons are all impacted by a variety of environmental change processes but human activities have had the greatest effect during the 20th century. Pressures resulting from these activities are set to continue and in many cases increase through the 21st Century. Environmental monitoring within North Africa's aquatic ecosystems is inadequate and management planning and policies are poorly supported by relevant scientific information. This proposal concerns the development of lagoonal ecosystem monitoring (by field survey, long-term monitoring through field instrumentation and remote sensing) and its integration within hydraulic/ecological modelling. It has several aims and objectives designed to help tackle current deficiencies.

General objectives are:

- Development of early warning tools and decision support systems that examine with the environmental equilibrium between the aquatic resources of specific coastal and inland lagoonal areas.
- Establish and evaluate long-term research on monitoring, measuring and modelling sustainable development in the coastal lagoonal areas.
- Assess and model the impact of human activities on water availability, distribution and quality.
- Promote communality in research methodology through information exchange and by instigating training programmes for young scientists within North African partner institutions in specialist areas of aquatic resource monitoring and modelling.
- Forge active links with other international and national bodies concerned with management of aquatic (especially lagoonal) resources and to exploit further the results of the project by widely disseminating results.

Activities

Three key sites have been selected for the intensive task of implementing full monitoring and modelling exercises, secondary sites will be used to provide reference conditions. These and associated data will be incorporated into site specific dynamic models of lagoon function. In order to achieve this basic aim, the skills and co-operation of research scientists in five partner countries is required together with several important sub-contracts to specialists elsewhere. During the prosecution of the project skills transfer in monitoring, modelling and remote sensing techniques will take place between the European and North African groups and within the North African groups. In the final phase of the project the models will be tested and demonstrated to management agencies in each North African country.

The workplan structure includes the collection of high quality environmental data from monitoring and from spatial survey (including water and sediment quality), identification of aquatic ecosystem linkages and attributes, hydrology, establishing long term monitoring, environmental reconstruction and plant-environment interactions, data analysis and modelling with applications to integrated management. Additional activities include data exchange, training and quality control and information dissemination. A series of workshops will be needed to initially establish common methodologies and to check and verify on-going progress.

Results and outcome

Water quality and freshwater availability are the principal factors regulating the quality of North African lagoonal systems. Within key sites in three North African countries (Morocco, Tunisia and Egypt) hydrological instrumentation will be installed and programmes of water quality and ecological monitoring initiated.

- Implementation of an integrated monitoring programme at each key site to establish space-time changes in hydroecological characteristics. Automated measurement and best practice procedures (from the EU Water Framework Directive) will be introduced.
- Monitoring the extent of aquatic vegetation and water resources, detecting long-term trends in hydroecological and topographic conditions (including estimates of historical water levels). Baselines for present and past vegetation and for open water areas.
- Identification of environmental variables controlling aquatic vegetation characteristics to generate relationships between environmental controls and site vegetation characteristics. Identification of controlling variables and empirical relationships.
- Development of simulations for key lagoons Model simulations of future scenarios (concerned with eutrophication, sea level change and hydrologic manipulations) will be undertaken.
- Making data and model simulations available to end-users, through workshop proceedings, training seminars and a www site GIS database.

Selected publications

Ahmed, M.H and A.E. Abdel Aal, 2003. Study of molluscan shells and their enclosed bottom sediments in Manzala Lagoon, Nile Delta, Egypt. *Bull Nat. Inst. of Oceangr. & Fish. A.R.E.*, 29:423-446.

Ahmed, M.H., D. Noha and M.A. Fahmy, 2006. Eutrophication assessment of Lake Manzala Egypt using GIS techniques. *Journal of Hyrdroinformatics, Hydro*., 5_014-29/10/2005:1-11.

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Zakaria, H.Y., M.H. Ahmed and R. Flower, 2007. Environmental assessment of spatial distribution of zooplankton community in Lake Manzalah, Egypt. *ACTA ADRIAT*., 48(2):161 – 172. ISSN: 0001-5113 AADRAY.

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