ESRI

Marine Protected Area (MPA) of "Porto Cesareo"

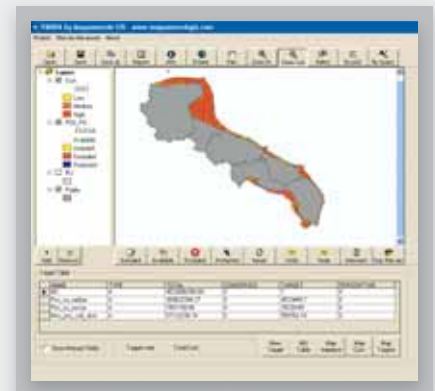## Developing informed management measures and regulations

The Marine Protected Area (MPA) of "Porto Cesareo" established in 1997 is located in the south of Italy in the Puglia Region. It is one of the biggest MPA in Italy (16.654 hectares, 32 km of coast) where 27 MPAs have been instituted till now. The objectives of the MPA are to protect marine habitats of outstanding ecological values such as *Posidonia oceanica* prairies, marine caves and coralligenous habitats, to regulate recreational and commercial activities within its boundaries, to promote environmental education and to perform scientific research.

The challenge

Worldwide, the establishment of Marine Protected Areas (MPAs) as a tool for local management of marine resources and biodiversity is considered effective. In the area managed by the MPA of Porto Cesareo the submarine landscape is a hot spot of biodiversity, with large extension of crucial habitats such as *Posidonia oceanica*, coralligenous formations and marine caves. Here, professional fishermen represent an important category with over 250 artisanal fishermen and about 110 boats. Sport fishing is also very active together with hundreds of divers and tourists, especially during summer months. These anthropogenic pressures increasingly affect the marine coastal system, its health and resources. Current regulations tend to manage each activity separately without considering their spatial distribution over time and their often conflicting interactions and do not completely acknowledge their potential impacts. Assessing the potential for cumulative impacts of multiple activities along the coast is a challenge for the effective management and the conservation of the MPA's marine resources.

The solution

The MPA strictly collaborates with the Laboratory of Marine Biology of the University of Salento to develop programs to gather a better understanding of the ecological processes regulating biodiversity within the area, and to assess and monitor the health of marine habitats and the impact of human activities. Data are being collected and analysed using a Geographic Information System. In particular the acquisition, management and analysis of GIS data are implemented using ESRI ArcGIS desktop software with the custom applications Fishery Analyst and PANDA developed by the company Mappamondo GIS, specialised in GIS solutions for environmental management. Fishery Analyst is an ArcGIS application developed to effectively analyze and visualize temporal and spatial patterns of fishery dynamics. The main functions include quantitative estimation and visualization of catch and effort and their variation in space and time, analyzing fishing vessel utilization, data quality control, and deriving information on the location of important economic and threatened species. The application provides a user-friendly interface for easy data selection, analysis and diverse output production.

Exploring alternative MPA's zoning scenarios with PANDA

Challenge
- Gathering a better understanding of ecological processes
- Assessing cumulative impacts of multiple activities

Objective
- Developing informed management measures and regulations

Results
- GIS database for monitoring the coast
- Spatial and temporal distribution of natural resources and human activities
- Multiple conservation scenarios aiming to minimize costs and maximize conservation targets

PANDA (Protected Areas Network Design Application) is a stand-alone application developed using Visual Basic and ArcObjects. It provides a user friendly framework for systematic protected areas network design to ArcGIS users. Through the use of PANDA the designer can explore different hypothetical configurations of a system of protected areas in the planning area and asses conservation achievements and associated implementation costs. PANDA allows interacting with Marxan, a freely available conservation planning software developed by the University of Queensland. The Marxan algorithm computes optimal scenarios aiming to minimize costs and maximize conservation targets and is used to support designing new reserve systems, reporting on the performance of existing ones and developing multiple-use zoning plans.

The results

A GIS database has been produced for monitoring the coastal area. Through the use of GIS the MPA was able to produce marine habitat maps with information about habitat typology, distribution, extension and structural and functional importance. Morpho-batimetric maps were also produced in order to analyse the complex suite of environmental processes driving changes in this area. Fishery Analyst is being used by the MPA for the analysis and the management of fishing activities and the idea is to expand its use to map all the human activities present in this area. The analysis and the representation of spatially explicit models of the fishing effort together with the analysis of its temporal distribution is critical for the monitoring of the areas more intensely harvested, also considering fishing tools selectivity. These information are also crucial for the governance of the MPA, allowing to localize potentially overfished areas and set appropriate ad hoc regulations. PANDA has been adopted for producing alternative protection scenarios improving the present zonation of the MPA. Presently, the collaboration between the MPA and the University of Salento is also devoted to select new areas to be protected at regional scale on the base of a priori identified conservation targets, minimizing the socio-economical conflicts inevitably coming from protection interventions.

Underwater monitoring data collection in the MPA

ESRI software used
- ArcGIS Desktop

Ohter software used
- Fishery Analyst
- PANDA

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