

BIODIVERSITY MONITORING AND ADAPTIVE MANAGEMENT IN THE COASTAL LAGOONS

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To stop the loss of biodiversity by 2020 in Europe and to achieve a “significant loss reduction” worldwide are ambitious goals, even if widely accepted.

You can't manage what you don't measure: therefore, especially in the last years, several efforts have been undertaken on “2020 relevant” biodiversity indicators.

The conservation of marine biodiversity is an overarching aim of the Marine Strategy Framework Directive 2008/58/EC (MSFD) and is also the first of the 11 descriptor of a “Good Ecological Status” (GES), to be achieved within 2020 in all the four European marine regions. Therefore, today the assessment of the present status, the monitoring and the management of marine biodiversity is a precise legislative obligation for every Member State.

Even the average-informed policy-maker is aware that the biodiversity cannot be simply weighted “as much as better”: however, there is not yet a clear consensus among scientists regarding a relevant set of indicators to be used for this purpose. A specific topic in the FP7-ENV 2012 call, open in July 2011, is addressing this issue, asking also to test indicators already proposed and develop options for new ones, for assessment of biodiversity at several ecological levels (species, habitat, ecosystems), and to model the economic and societal consequences of the implementation of the possible measures to reach GES.

Among water bodies, transitional waters have been defined as Critical Transition Zones (CTZ). due to their position at terrestrial, freshwater and marine interfaces (Levin *et al.*, 2001). CTZ provide essential ecosystem services, such as shoreline protection, water quality improvement, fisheries resources, habitat and food for migratory and resident animals and recreational areas for human populations (Levin *et al.*, 2001). CTZ are also very productive ecosystems (Knoppers, 1994), but are under severe stress due to human activities and climatic change inducing sea-level rise. Human impacts are mainly due to permanent and seasonal population density increases, aquaculture, fisheries, agriculture and industry.

From a legislative point of view, CTZ belong to both MSFD and the Water Framework Directive 2000/60/EC (WFD) domain, the latter being extended from coastline to 1 mile in the sea. Therefore, almost in principle, there should be already in place plans in order to achieve a “good status” of marine coastal waters within 2015.

The relation “high biodiversity=good ecological functioning” is in any case very little effective for describing the situation of transitional ecosystems, where the environmental conditions require a high selectivity. In these ecosystems, the biological richness is naturally reduced, because few species are able to adapt to these environmental features. In fact, transitional waters are usually characterised by a low diversity. even though the species which inhabit the areas are well adjusted to the stressful and widely varying environmental conditions (Elliott and Quintino, 2007). In particular, biodiversity and ecosystem functioning in coastal and transitional waters requires to be studied from different perspectives and especially by investigating biological communities at the different trophic levels (Franco, Elliot and Torricelli, 2007).

In this complex framework, both from the ecological and the legislative points of view, the information got from monitoring activities appears absolute necessary for individuating any reasonable management target and the adaptive approach a constraint of any credible management.

In 2011 in the Lagoon of Venice a “Monitoring plan of the water bodies for defining the ecological status” has started, in order to meet the requirements of WFD and to establish a coherent and comprehensive overview of the ecological status of the lagoon waters, belonging to a sub-unit of the river basin district of Easter Alps, established by the State according to the principles of WFD. Therefore the monitoring activities, being an integral part of the Management Plan of the basin sub-unit, have an operational/management purpose, while maintaining a scientific rigor and proper accuracy, so they can be used also for improving the understanding of the natural phenomena. According to what expected and defined by the WFD, three integrated lines are actually foreseen: surveillance, operational and investigative monitoring.

As well known worldwide, in the Venice Lagoon the main defence from flooding (MOSE) is being built. The works started in 2004 and they expected to be completed in 2014. The MOSE construction requires the execution of wide engineering works in environmentally precious and fragile coastal areas. The Venice Water Authority, which is in charge of the “high surveillance” of the works, implemented also the indications of the Habitat directive “to support the assessments made on the impact of plans and projects,

which could have negative impacts on species, habitats and the Natura 2000 network". Actually, almost all the lagoon is classified as SPA (Directive 79/409/EC), and some Sites of Community Importance areas (according to Directive 92/43/EC) are near to the work sites.

Therefore, the Venice Water Authority entrusted CORILA, as an independent body, to perform a wide monitoring program, with two main aims:

- to provide a quick feedback of the maintenance of the environment impact level foreseen by the yard activities;
- to provide objective elements of the real incidence of the yard activities, considering the variability of the environmental conditions.

The Monitoring Plan can also be seen as an element of an adaptive management approach, that involves "learning from management actions, and using that learning to improve the next stage of management" as stated by Holling, 1978. This approach uses management as a tool not only to change the system, but as a tool to learn about the system.

The structure of the monitoring plans of the Venice lagoon, with particular emphasis on biodiversity monitoring, and their "management outputs" is presented.

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