

Evaluation of the ecological status of reconstructed habitats in the Venice lagoon

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Introduction: The morphological reconstruction projects carried out by the Venice Water Authority (Magistrato alle Acque di Venezia), through its concessionary Consorzio Venezia Nuova, began about 20 years ago and concern the reconstruction of mudflats and salt marshes using sediments from maintenance dredging of lagoon canals. Up to now, interventions have been realised in eighty sites distributed in the whole basin of the Venice lagoon.



Fig. 1: Example of a 10 year reconstructed salt marsh in the southern Venice Lagoon.

The reconstruction activities have also taken in consideration goals and strategies set by the related European Community Directives (“Habitats” Directive 92/43 and “Birds” Directive 209/147) in particular pursuing the biodiversity preservation and the protection of high-value natural habitats. A study on the biological and ecological characteristics of eight reconstructed sites was recently performed. The study aims to define the evolutionary status of the investigated reconstructed morphological structures in relation to an ideal evolutionary scheme elaborated during previous studies [1]. Differences between the studied sites were also assessed, considering the influence of various characteristics (location, sediment typology, elevation, morphology, age, etc.).

Methods: The eight investigation sites (two mudflats and six salt marshes) were identified according to their structural and functional characteristics, year of realisation, geographic location and materials used for their construction.

The study design includes field surveys on terrestrial (salt marshes, brackish ponds, tidal creeks) and aquatic habitats (tidal flats), as well as the integrated assessment of the results. In the terrestrial habitats the distribution of halophyte vegetation by

phytosociological method, the nesting and wintering avifaunal distribution and the occurrence and frequency of terrestrial invertebrates (ground beetles) were investigated. In the aquatic habitats the fish community, the seagrass and macroalgae coverage and the macrozoobenthos community were surveyed. For some aquatic *taxa* of different trophic levels (microphytobenthos, polychaetes, gastropods, gobies and shrimps) the study investigated the bioaccumulation of five significant (also in relation to the national legislation) micropollutants (Cd, Pb, Hg, HCB, HCBD) in organism tissues.

Results: Acquired data show that the evolutionary status of the structures under investigation is rather advanced as compared to the ideal evolution scheme. The extension of different halophytic habitats and the presence of faunal and floral species of communitarian importance (Dir. CE 92/43; Dir. EEC 209/147) in the artificial structures reached levels comparable with those of natural salt marshes and tidal flats. Some differences have been observed in the biological communities of the studied sites, likely due to their geographical distribution along the mainland – sea gradient, to the different elevation above the sea level and to the related different morphological features.

The comparison between habitats constructed with sediments of different typologies doesn’t show significant differences. Sediments quality appears to not influence the community composition and the species distribution in the studied sites. Bioaccumulation data highlight that the accumulation processes are influenced mainly by the *taxa* and probably by the diet rather than by the characteristic of the sediments of the investigated sites.

Discussion: The activities of morphological reconstruction and restoration realised by the Venice Water Authority through the Consorzio Venezia Nuova positively influence the protection of high-value habitats, communities and species of the Lagoon of Venice. They also promote their further expansion, enhance the lagoon biodiversity and trigger the development of a more complex trophic network.

References: [1] Cecconi et al. (2009) *Ecosystem and Sustainable Development VII*: 35-41.