Habitat modelling limitations – Puck Bay, Baltic Sea – a case study*

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Abstract

The Natura 2000 sites and the Coastal Landscape Park in a shallow marine bay in the southern Baltic have been studied in detail for the distribution of benthic macroorganisms, species assemblages and seabed habitats. The relatively small Inner Puck Bay (104.8 km^2) is one of the most thoroughly investigated marine areas in the Baltic: research has been carried out there continuously for over 50 years. Six physical parameters regarded as critically important for the marine benthos (depth, minimal temperature, maximum salinity, light, wave intensity and sediment type) were summarized on a GIS map showing unified patches of seabed and the near-bottom water conditions. The occurrence of uniform seabed forms is weakly correlated with the distributions of individual species or multi-species assemblages. This is partly explained by the characteristics of the local macrofauna, which is dominated by highly tolerant, eurytopic species with opportunistic strategies. The history and timing of the assemblage formation also explains this weak correlation. The distribution of assemblages formed by long-living, structural species (*Zostera marina* and other higher plants) shows the history of recovery following earlier disturbances. In the study area, these communities are still in the stage of recovery and recolonization, and their present distribution does not as yet match the distribution of the physical environmental conditions favourable to them. Our results show up the limitations of distribution modelling in coastal waters, where the history of anthropogenic disturbances can distort the picture of the present-day environmental control of biota distributions.

1. Introduction

The Baltic Sea displays a specific gradient in species richness and functional diversity that falls away with diminishing salinity from W to NE (Bonsdorff & 1999, Bonsdorff 2006). The Polish Exclusive Economic Zone (Polish EEZ) is situated in the centre of the above gradient, and the inner part of Puck Bay is regarded as the most diverse and biologically valuable part of the Polish Marine Areas (PMA, Węsławski et al. 2009). Puck Bay is protected as a Natura 2000 site under both the birds and habitats directives; it is also a designated Baltic Sea Protected Area (BSAP), and its inner waters are part of the Coastal Landscape Park. Puck Bay