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Modelling population connectivity between proposed Marine Protected Areas in the North Sea

J. van der Molen, J.R. Ellis, and S.I. Rogers

CEFAS, Environment and Ecosystems, Lowestoft, United Kingdom (johan.vandermolen@cefas.co.uk)

A network of offshore Marine Protected Areas (MPAs) has been proposed to protect key species and habitats in response to the EU Habitats Directive. To provide such protection these MPAs must include habitats suitable for the different life history stages of marine organisms, and reduce the levels of human impact on them. As different life history stages of marine organisms may occur in different geographic locations, achieving protection may require that the locations used by these life-stages are all represented in the MPA network. A model study was carried out to simulate the connectivity between MPAs in a proposed network, where coonectivity was assessed in terms of the proportion of larvae from one MPA that would survive to settle in the same or other MPAs in the network. Flow fields were simulated with the three-dimensional hydrodynamic model GETM, together with a Lagrangean Individual Behaviour Model to simulate egg and larval dispersal. Eggs of a variety of species, each with their own spawning, development and behavioural characteristics, were 'released' in the proposed MPAs. Results for each species showed the origin and destination of the eggs and larvae, and provided insight into the potential connectivity among MPA in the network.