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Predicting the distribution of young demersal fish integrating connectivity estimates and seascape metrics at variable spatiotemporal scales

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Providing accurate short-term predictions of species distributions and other relevant ecosystem services applicable to management goals are increasingly feasible through the effective integration of operational environmental information. However, this approach requires a better understanding of the mechanistic ecological processes that allow scientists to select the environmental drivers at the relevant temporal (from weekly to monthly) and spatial (from local to regional) scales in order to maximise the predictive capability of models. From a 'fish recruitment perspective', this can be successfully achieved parameterizing 1) the probability of a given area to receive and/or retain early live stages (ELS) and 2) the habitat quality that favours the survival from ELS to young recruits. Building upon recent results that used inter-annual connectivity estimates from a biophysical model to explain the temporal dynamics of recruitment of European hake in the Western Mediterranean, the present study will focus on the spatial dimension using the distribution of hake recruits captured by the scientific bottom trawl surveys. We used i) larval dispersion experiments from the Lagrangian Flow Network framework to obtain spatially explicit estimates of self-recruitment, and ii) seascape information that affect the survival such as chlorophyll concentration and surface hydroclimatic conditions. Our objective is to determine the spatial and temporal scales at which each mechanistic driver maximises the predictive capability of the distribution model. Our results evidence that a preliminary assessment of the spatial and temporal scales of the drivers will improve our ability to estimate distributions of young demersal fish.

Keywords: Mediterranean Sea, self-recruitment, European hake, nursery areas, operational oceanography, recruitment, connectivity, scale-dependent analyses

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