{rokbox title=|Figure :: Image: Authors| thumb=|images/stories/ieo/imagenespublicaciones/centro-oceanografico-baleares-ieo-ocean-connectivity-hidalgo-et-al-2019-thumb.jpg|}images/stories/ieo/imagenespublicaciones/centro-oceanografico-baleares-ieo-ocean-connectivity-hidalgo-et-al-2019.jpg{/rokbox}

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Accounting for ocean connectivity and hydroclimate in fish recruitment fluctuations within transboundary metapopulations.
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Abstract: Marine resources stewardships are progressively becoming more receptive to an effective incorporation of both ecosystem and environmental complexities into the analytical frameworks of fisheries assessment. Understanding and predicting marine fish production for spatially and demographically complex populations in changing environmental conditions is however still a difficult task. Indeed, fisheries assessment is mostly based on deterministic models that lack realistic parameterizations of the intricate biological and physical processes shaping recruitment, a cornerstone in population dynamics. We use here a large metapopulation of a harvested fish, the European hake (*Merluccius merluccius*), managed across transnational boundaries in the northwestern Mediterranean, to model fish recruitment dynamics in terms of physics-dependent drivers related to dispersal and survival. The connectivity among nearby subpopulations is evaluated by simulating multi-annual Lagrangian indices of larval retention, imports, and self-recruitment. Along with a proxy of the regional hydroclimate influencing early life stages survival, we then statistically determine the relative contribution of dispersal and hydroclimate for recruitment across contiguous management units. We show that inter-annual variability of recruitment is well reproduced by hydroclimatic influences and synthetic connectivity estimates. Self-recruitment (i.e., the ratio of retained locally produced larvae to the total number of incoming larvae) is the most powerful metric as it integrates the roles of retained local recruits and immigrants from surrounding subpopulations and is able to capture circulation patterns affecting recruitment at the scale of management units. We also reveal that the climatic impact on recruitment is spatially structured at regional scale due to contrasting biophysical processes not related to dispersal. Self-recruitment calculated for each management unit explains between 19% and 32.9% of the variance of recruitment variability, that is much larger than the one explained by spawning stock biomass alone, supporting an increase of consideration of connectivity processes into stocks assessment. By acknowledging the structural and ecological complexity of marine populations, this study provides the scientific basis to link spatial management and temporal assessment

within large marine metapopulations. Our results suggest that fisheries management could be improved by combining information of physical oceanography (from observing systems and operational models), opening new opportunities such as the development of short-term projections and dynamic spatial management.

Keywords: ecosystem-based management, fish recruitment, fisheries conservation, hydroclimate variability, metapopulations, ocean connectivity, self-recruitment