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Editorial: Ecocentric fisheries management in European seas: Data gaps, base models and initial assessments, volume I

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Editorial on the Research Topic
Ecocentric fisheries management in European seas: Data gaps, base models and initial assessments, volume I

Fisheries exploitation has historically been considered as the strongest driver of fish population dynamics (Jackson et al., 2001). Existing fisheries management practices have not always been successful in sustainably exploiting fish stocks (Froese et al., 2018) because of weaknesses in management approaches (Froese et al., 2021), the lack of consideration of ecosystem processes (Skern-Mauritzen et al., 2016), improper management implementation (Schnute et al., 2007), harmful government subsidies (Sumaila et al., 2021), and illegal, unreported and unregulated fishing (Agnew et al., 2009). Moreover, data deficiencies often constrain stock assessments and ecosystem model construction, tools that provide the basis for decision-making in fisheries management (Dimarchopoulou et al., 2017). Stocks that do not exhibit commercial interest have generally been given a low priority (Tsikliras et al., 2021), and the conservation status of marine megafauna is unknown in many European areas, especially in the Mediterranean and the Black Sea (Gremillet et al., 2022). Commercial and recreational fishing strongly influence all levels of biological organisation, from populations to ecological communities, directly affecting ecosystem structure and function (Pauly et al., 1998). Such circumstances raise the pressing need for a paradigm shift from the anthropocentric (=human-centred) perception of commercial stock surplus yield (Chapman, 1949) to an ecocentric (=ecosystem-centred) fisheries management that

incorporates all ecosystem components, including abiotic and socio-economic factors (Link, 2010), aiming at rebuilding fish stocks, and restoring ecosystems and habitats (Lotze et al., 2011). This whole-ecosystem approach to managing fisheries aspires to ensure a balance between food security and healthy seas (Schiller et al., 2018), secure fisheries jobs (Teh and Sumaila, 2013), and even minimising exploitation while prioritising sustainable fishing practices that feed people (Jacquet and Pauly, 2022).

The design of interactive policies that aim to implement the ecocentric fisheries management is better served through a holistic and integrated perspective to maintain ecosystem integrity. They should be supported by the adoption of a precautionary approach to fisheries with broad stakeholder participation, while also promoting sector integration (Pikitch et al., 2004). This will require interdisciplinarity among scientists to achieve the best possible knowledge of biotic, abiotic, and human components of ecosystems and their interactions (Cury, 2004), as well as information on social and economic factors that affect the availability of ecosystem services within marine ecoregions (FAO, 2021).

Understanding the biology and ecology of most species within an ecosystem is, in some areas, far from complete, and appropriate assessment models and decision-support tools need to be further developed. Sources of uncertainty, such as ecological and biological knowledge gaps and future climatic conditions must be accounted for (Link et al., 2012). Basic biological data are essential for stock and vulnerability assessments as well as for ecosystem models that facilitate the understanding of ecosystem functioning and responses to change and can, therefore, inform ecosystem-based fisheries management (EBFM: Daskalaki et al., 2022). Measuring the human impact on organisms, habitats and ecosystems (Piroddi et al., 2017), assessing the status and trends of fisheries and stocks (Froese et al., 2018), and evaluating ecosystem health using novel indicators (Link and Watson, 2019) and technologies (Coro et al., 2013) are also prerequisites for effective ecocentric fisheries management. These measures, in fact, provide the baseline of current and past ecosystem status, which in turn can be used to define future management targets. Finally, ecosystem models (Christensen and Walters, 2004) are the key tool to studying marine ecosystems (Heymans et al., 2020), and exploring fisheries management and climate change scenarios by incorporating temporal and spatial ecosystem dynamics (Heymans et al., 2016).

Addressing trade-offs among the wide range of issues involved in EBFM, such as ecological principles, legal mandates, climate change and economic interests (Hart and Fay, 2020) will hopefully lead to a shift towards the perception that ecocentric fisheries management, albeit demanding and challenging, is a necessary and feasible option. In Europe, the specific objectives of fisheries management within the full ecosystem framework will have to be designed to fulfil the requirements of the Common Fisheries Policy (CFP) and the Blue Growth Strategy (BG). They will also have to aim at the Good Environmental Status (GES) as defined for the Marine Strategy Framework Directive (MSFD) descriptors and will have to be aligned with the EU Green Deal, the EU Biodiversity Strategy for 2030 and the Maritime Spatial Planning (MSP) Directive.

The present Research Topic aimed to (i) identify gaps in biological and ecological knowledge across marine ecosystem components, ecosystem models, food web models, fisheries catch statistics, and survey data; (ii) assess the current status of exploited populations; (iii) evaluate the efficiency of current fisheries management approaches within the context of ecosystem and anthropogenic impact including climate change; and (iv) create base ecosystem models across the European Seas that will be used to examine ecosystem management scenarios in the future.

The present Research Topic included six original articles, two reviews, and one policy and practice review. The six original articles focused on Mediterranean ecosystems, where data gaps and deficiencies are wider. Spatiotemporal and environmental modelling, that can be applied to areas with varying heterogeneity, was used to identify and fill gaps in trawl surveys in the Adriatic Sea (Coro et al.). In the same area, a timely manuscript examined the (beneficial) effects of the COVID-19 lockdown related fishing restrictions and the involuntary fishing effort reduction on the status of target stocks (Scarcella et al.). The impact of fisheries on ecosystem structure and functioning was examined in the Sea of Marmara over a period of thirty years (Saygu et al.), while data availability and the participatory approach for promoting fisheries sustainability were reported for the central and western Mediterranean Sea (Malvarosa et al.). Two trophic structure models were developed using the EwE modelling approach, one focusing on the oligotrophic ecosystem of the Balearic Islands in the western Mediterranean Sea (Sánchez-Zulueta et al.) and the other evaluating fisheries management policies in the alien-rich eastern Mediterranean Sea (Ofir et al.). An exhaustive review of all EwE models applied in European marine ecosystems stressed the importance of ecosystem modelling in studying the structure and dynamics of ecosystems and examining management and climate scenarios (Keramidas et al.). Another article reviewed all available biological information on non-fish marine organisms and identified gaps in knowledge across European Seas (Abucay et al.). Finally, the policy and practice review included the global and European policies and implementing bodies which have a repercussion on the implementation of EBFM, highlighting specific stakeholder needs, which ecosystem models could help address (Rodriguez Perez et al.).

Author contributions

AT: Conceptualization, Writing – original draft. GC: Writing – review & editing. GD: Writing – review & editing. DG: Writing – review & editing. MS: Writing – review & editing. GS: Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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