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EDITORIAL

Sustainable fishing

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Fisheries are at a critical crossroads, as recently underlined during the 2025 UN Ocean Conference in Nice (France). As vital sources of food, livelihoods, and cultural heritage for communities around the world, fisheries are threatened by overexploitation, habitat degradation, marine pollution, and climate change. The transition toward sustainability requires a multidimensional transformation in both science and practice. Unsustainable fishing practices continue to undermine the health of aquatic ecosystems, with consequences that ripple far beyond individual stocks or national waters. Here, we reflect on several key themes emerging from contemporary fisheries research, while also extending the discussion to critical dimensions of sustainable fisheries that remain insufficiently addressed. We emphasize that the challenges facing fisheries cannot be resolved by ecological science alone; they require interdisciplinary collaboration and inclusive, context-specific solutions.

Advancing sustainable fisheries is not merely a scientific challenge; it is a global imperative. It requires integrated approaches that combine inter- and transdisciplinary understanding, with robust decisions making frameworks based on long-term sustainability and equitable access to resources, technological innovation, and social engagement. This Collection seeks to showcase a wide range of innovative research that informs and supports the complex transformation of fisheries science and management. From gear modifications that reduce bycatch and improve species selectivity[1–4], to studies on predator biomass and ecosystem resilience in community-managed marine areas[5], each contribution offers tangible insights into improving the sustainability of fishing activities. Technological tools, such as automatic fish behavior recognition, assessments of post-escape fish vitality, or the evaluation of biodegradable materials for gear fabrication, reflect the growing role of innovation in shaping more responsible fisheries. Equally important are studies that address deep uncertainty and long-term risks[6], such as those evaluating management strategies under unpredictable conditions or projecting shifts in species distribution due to climate change[7]. These works are crucial in informing adaptive and precautionary policies, thereby safeguarding food security and local economies, particularly in vulnerable regions. The inclusion of research from the Global South, spanning regions such as Northwest Africa, the Philippines, and Baja California, underlined the essential role of locally informed science in addressing global fisheries challenges.

Fisheries sustain hundreds of millions of people globally. Yet they are increasingly compromised by demand-driven pressure, which, in turn, is affected by marketing strategies, technological intensification, and weak governance structures. These pressures are compounded by ecosystem shifts resulting from overexploitation[7], warming oceans[8], and pollution[9], among other stressors. The sustainability of fisheries is no longer merely a question of biological yield or stock dynamics; it is a governance, equity, and climate resilience issue. This Collection demonstrates how interdisciplinary research is contributing to this shift, i.e., addressing the issue of fishing gear selectivity and its implications for biodiversity and sustainability. Hook size regulation, sorting grids, biodegradable gillnets, and sustainable bait development are all shown to influence catch composition, bycatch, and post-capture fish vitality[1–4]. These findings align with broader insights from Mediterranean trawl fisheries, where discard dynamics are shaped by ecological context and fishing depth[10]. Importantly, such gear-based solutions are rarely sufficient on their own. They must be embedded in adaptive, ecosystem-aware strategies that consider both biological and socio-economic realities[11] without forgetting that the objective of any fishery should be to maintain sustainable catches in the long term without negatively affecting either fisheries profitability[12], biodiversity conservation[13], and resiliency capability[14]. Adaptive habitat enhancement techniques have also shown promise in inland systems. For instance, floating artificial fish nests deployed in reservoirs exhibit varied reproductive performance depending on river reach and shoreline topography, suggesting the value of site-specific deployment models to support inland fisheries restoration[15]. The power of community-led initiatives is evident in the documented benefits of locally managed marine reserves[16], which maintain higher predator biomass and foster kelp forest resilience in Baja California[5]. These findings reinforce the growing recognition that sustainable outcomes are often best achieved when local knowledge[17], customary practices, and cooperative governance[18] are integrated with formal management structures. Such approaches can enhance compliance, foster stewardship, and produce outcomes that are both ecologically sound and socially equitable. Few challenges rival the complexity introduced by climate change vs overfishing. One study examines the shifting distribution of

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small pelagic fish in Northwest Africa, a region that is acutely vulnerable to climate impacts[8]. Another employs robust decision-making tools to assess management strategies for cod in the North Sea under thousands of uncertain future scenarios[6]. Together, these works highlight the need for adaptive management frameworks that can operate effectively under uncertainty, rather than relying solely on predictive precision. Such approaches must integrate biological and climate models, economic trade-offs, and governance feasibility. The growing use of automation and machine learning in fisheries is illustrated by work on the recognition of fish behavior using alternative baits[4]. These techniques promise non-invasive, scalable, and efficient monitoring tools that can improve selectivity and reduce environmental impacts, as well as fisheries acoustics tools[19].

While still emerging, these technologies signal a shift toward precision fisheries management, and they hold particular promise in data-poor contexts if made accessible and affordable. One of the strengths of this Collection lies in its geographic diversity. Contributions span the Philippines, Baja California, Northwest Africa, and European waters. This diversity is essential, as many of the world's most heavily fished and vulnerable waters are located in the Global South. Locally informed science is key to developing tailored solutions, and we are encouraged by the number of submissions from these regions.

While this Collection addresses several key aspects of sustainable fisheries, important dimensions remain underexplored and merit further attention. These include the integration of Indigenous knowledge[17], gender dimensions, and traditional fisheries[20], which are often overlooked in the scientific literature. Similarly, value chains, labor conditions, subsidy impacts[21,22], and institutional reform constitute essential areas for future research. The role of spatial protection measures, such as the establishment of a broader range of no-take areas[23,24], also deserves emphasis, particularly in facilitating stock recovery and enhancing fish reproductive capacity[25]. The ecological and social impacts of industrial practices such as bottom trawling (including diminished productivity of fishing grounds, biodiversity loss and pressure on artisanal sector) must be further assessed. Emerging concerns, such as the expansion of krill fishing in Antarctic waters and the use of fishmeal in aquaculture with consequences for wild fish stocks[26], likewise call for greater visibility within global sustainability debates.

The research gathered in this Collection exemplifies advances across multiple fronts: gear innovation, community governance, climate adaptation, and technology. Nevertheless, the road ahead remains challenging. Sustainable fisheries require not only better science but also better collaboration across disciplines, scales, and sectors. Future research must continue to bridge ecological, technological, and social insights to build resilient, equitable, and productive fisheries. We invite readers, researchers, and practitioners to join the effort to ensure that fisheries remain a source of life and identity for generations to come.

Published online: 09 February 2026

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Author contributions

P.B. wrote the main manuscript text, and F.T. and C.B. revised the text.

Declarations

Competing interests

The authors declare no competing interests.

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