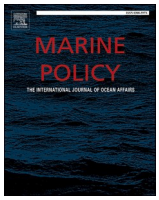
Marine Policy 191 (2026) 107152

Contents lists available at ScienceDirect

Marine Policy

journal homepage: www.elsevier.com/locate/marpol



Full Length Article

Integrating global targets for protected areas and sustainable fisheries

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ARTICLE INFO

Keywords:
Biodiversity conservation targets
Fisheries management
Marine protected areas
Assessment indicators
Kunming-Montréal Global Biodiversity Framework
Spatial planning

ABSTRACT

The global ocean harbors millions of unique species, many of which help to provide food and nutrients for nearly half of the world's human population. Yet, the continued viability of this critical food source is uncertain as unsustainable exploitation has eroded marine biodiversity, and ecosystems are affected by a changing climate. Efforts to rebuild overexploited fisheries, restore marine biodiversity, and build climate resilience are underway, following international policy commitments. Here we analyze global progress in implementing these commitments through the expansion of protected area coverage (GBF Target for 2030: 30%) and sustainable fisheries management (GBF Target for 2030: 100%) under the Kunming-Montréal Global Biodiversity Framework (GBF) in 2022. When comparing GBF objectives, we show that as of 2025, achieving fisheries targets has progressed significantly further relative to protected area targets. On average, 62% of assessed industrialized fisheries were reported within sustainable limits across nineteen FAO major fishing areas, while protected area coverage averaged 10% across the same areas, with 3% highly or fully protected. Notably, we find little evidence for the integration of targets related to these two objectives. Given this, we propose an integrated assessment framework by which the biodiversity outcomes of both fisheries and conservation measures can be evaluated in relation to common reference points, helping to ensure their individual effectiveness and maximizing their joint co-benefits. Thereby we aim to help resolve disparate and sometimes conflicting agendas in marine conservation and move towards more integrated policies for protected area expansion and sustainable fisheries management.

1. Introduction

Marine ecosystems make up 71% of Earth's surface, and more than 90% of livable habitat by volume. Although the land likely hosts more individual species [1] biodiversity at higher taxonomic levels is centered in the ocean, with 36 of 38 recognized animal phyla occurring there, and half of those being exclusively marine [2]. Collectively, an estimated 2.2 million marine species [1] produce a wide range of essential ecosystem services, some of which have been compromised by ongoing biodiversity loss [3].

Among these services, the provision of healthy and nutrient-rich seafood, produced without external inputs and at relatively low cost, is considered particularly valuable [4] and could contribute decisively to a sustainable global food system [5]. Wild-caught fish and invertebrates currently provide essential nutrients to at least 40% of the global human population [4], and would produce such benefits indefinitely, if managed sustainably and equitably [6]. Yet, these desirable outcomes are undermined by overexploitation affecting one-third [7] to

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https://doi.org/10.1016/j.marpol.2026.107152
Received 17 October 2025; Received in revised form 15 April 2026; Accepted 16 April 2026
Available online 24 April 2026

two-thirds [8] of fish stocks globally, alongside a legacy of depleted species that are no longer assessed due to their present rarity [9]. These overexploited stocks are now less productive, profitable, and resilient than they could be under optimal management [8], and such deficits are compounded by the erosion of marine biodiversity from other human influences, notably the effects of climate change, habitat degradation and pollution [10].

Countering these adverse trends, the twin aims of rebuilding marine biodiversity [11] and ensuring sustainable fisheries [12] have come into focus at a global scale to repair past damage, build resilience, and prevent further losses. Building on previous frameworks under the Convention on Biological Diversity (CBD), the 2022 Kunming-Montréal Global Biodiversity Framework (GBF) is now the central policy commitment aimed at protecting and restoring global biodiversity by 2050, while ensuring sustainable provision and equitable sharing of ecosystem benefits and services [13]. To achieve this vision, the GBF outlines four main goals supported by 23 specific Targets for the conservation, restoration, and sustainable use of biodiversity at the global scale [13]. As an immediate first step, the agreement prescribes a range of urgent actions through to 2030, with a guiding vision to 'halt and reverse biodiversity loss and thereby put nature on a long-term path to recovery for the benefit of people and planet' [13]. Progress towards this vision is tracked via a small set of Headline Indicators, augmented by a larger number of detailed Component and optional Complementary Indicators for more in-depth analysis [14]

Here we specifically focus on the key area-based GBF Targets relevant to marine conservation efforts (see Fig. 1): *(i)* Target 3, which aims to expand effective, equitable, and ecologically representative protected and conserved areas to at least 30 % of global ocean area by 2030 (GBF Headline Indicator 3.1.; see [14] for details), using a combination of marine protected areas (MPAs) and other effective area-based conservation measures (OECMs) and *(ii)* Targets 5 and 10, which aim to ensure the sustainable and productive use of wild species and areas under human use for food production and forestry. In the ocean, this applies to all areas that sustain fisheries and aquaculture operations, with the stated aim of managing exploited fish stocks within biologically sustainable levels (GBF Target 5, Headline Indicator 5.1) and applying sustainable ecosystem-based management approaches throughout fished ocean areas [13] (GBF Target 10, no marine Indicator proposed; see [14] for details).

Collectively, these three targets prioritize positive outcomes for the conservation and sustainable use of marine life, and their implementation is critical to halting and reversing ongoing biodiversity losses. Yet, their conceptual and practical connections have not been explored in much detail; specific fisheries management outcomes are not usually discussed in the context of existing or planned protected area networks, and vice versa.

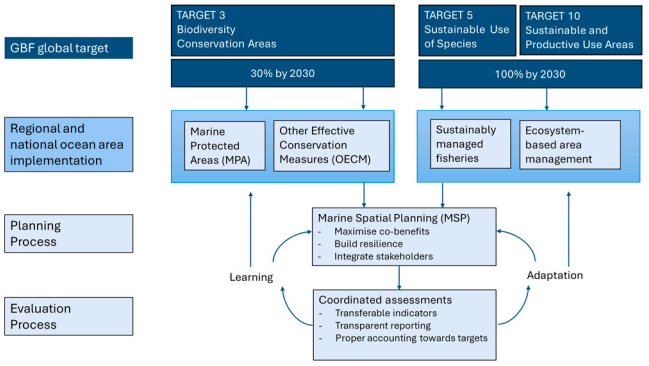

Fig. 1. Implementing Global Biodiversity Framework (GBF) targets for the ocean. The schematic outlines the policies and processes by which GBF global targets for spatial conservation and sustainable fishing are implemented at national and regional scales, the types of measures envisioned in the GBF and an integrated assessment framework discussed in this paper. Learning outcomes from coordinated assessments can inform and help adapt spatial planning processes and the implementation of future conservation and management measures. MPAs and OECMs may also include Indigenous and Traditional Territories (ITTs).

In the following we use available GBF Lead Indicators [14] to empirically assess global progress toward GBF Targets 3 and 5, explore their connections and co-benefits, and highlight ways to improve joint implementation, assessment, and accounting at national and regional scales. We then develop a conceptual framework for improved integration between global targets for protected areas (GBF Target 3) and sustainable fisheries (GBF Targets 5 and 10) through coordinated assessments of biodiversity change. Recognizing the broader goals of the GBF to restore biodiversity through a portfolio of measures, this suggested framework aims to provide a practical tool to track and connect biodiversity outcomes from protected areas and fisheries management measures, respectively.

2. Co-benefits between fisheries management and biodiversity conservation

There is a clear understanding that improving management practices is essential to rebuilding overexploited stocks and maintaining productive fisheries [8,12,15,16]. Fisheries management measures such as precautionary catch limits, spatial and temporal area closures, gear restrictions, ecosystem-based and community co-management, among others, are now becoming more widely adopted [12,16] and can improve long-term ecological and economic outcomes [8], while building adaptive capacity and resilience to climate change [17]. Driven by enhanced public awareness, market pressure, and legislation, these measures have improved fisheries management outcomes in some national and international fisheries [18,19], but with large regional variation [16,20], even within countries [21].

Likewise, targeted spatial conservation efforts to safeguard and rebuild global biodiversity have increased significantly over the last few decades [22], especially in the ocean where protected areas and other habitat restoration efforts increased more than 10-fold since the year 2000 [11]. These efforts have led to remarkable recovery for some threatened species, notably marine turtles [23] and mammals [24]. However, similar successes have yet to be achieved for endangered marine fishes [25–27]. Still, protected areas have contributed to rebuilding local populations, especially where they have been endowed with comprehensive conservation measures [28] and management capacity [29]. Importantly, these efforts have also helped to improve human livelihoods and well-being [30,31], especially where protective measures have been strong, complied with, and consistently enforced [32].

Thus, fisheries management and biodiversity conservation efforts have both increased considerably over the last 20 years [11], with the potential for achieving significant co-benefits. Both modeling [33–35] and empirical studies [36–38] have explored the connections between marine protected areas and fisheries management measures in some detail, highlighting synergies and trade-offs. For example, there is strong evidence that well-placed and managed protected areas can support nearby fisheries through spillover of larval and adult fish [38–40]. In addition, the protection of fish habitat can help shelter vulnerable life stages [41], while elevated biomass, diversity, and reproductive capacity can help build resilience to the effects of climate change [42,43]. At the same time, protected areas may simply displace fishing effort elsewhere, if the root problem of overcapacity is not addressed [44]. For these reasons, most studies indicate that integrated approaches that account for both objectives can enhance conservation outcomes while maintaining or even increasing fishery productivity [33,34,39]. Overall outcomes depend in large part on strategic planning [34], stakeholder involvement [45] and achieving optimal protected areas coverage, connectivity and placement [33].

Yet, despite these well-founded insights, fisheries and biodiversity conservation measures typically remain disconnected in practice [37, 46] and are often perceived as conflicting rather than complementary [31,47]. Such lack of integration may slow progress and harm sustainability outcomes. We suggest that this disconnect needs to be addressed and alleviated when implementing GBF Targets on a national or regional scale. In this context we note that Target 5 on sustainable exploitation of wild species features an optional Complementary Indicator listed as 'Proportion of terrestrial, freshwater and marine ecological regions which are conserved by protected areas or other effective area-based conservation measures' [14], presumably in recognition that protected areas can support sustainable fisheries management.

3. Progress in achieving fisheries and conservation targets

Despite being global in its ambition, the GBF aims to catalyze transformative action at national and regional scales, involving all sectors of society. To understand relative progress for multiple GBF Targets at the regional scale, we analyzed the current state of protected-area implementation and sustainable fisheries management across all United Nations Food and Agriculture Organization (FAO) major fishing areas [7]. These nineteen areas are used by the FAO to report on the status of 445 aggregated fish stocks accounting for approximately 72% of global marine fisheries production [7].

Using 2024 FAO fish stock status and 2025 World Database on Protected Areas (WDPA) coverage data [7,14], we found a wide range of regional outcomes relative to agreed GBF targets (Fig. 2). Across the nineteen FAO regions, between 33% and 84% of assessed fish stocks were reported at sustainable levels of abundance by FAO [7], and between 2% and 20% of ocean area was reported as protected by the WDPA [14]. Averaged across all nineteen FAO regions, 10% of ocean area was designated as protected (i.e., GBF Target 3 is 33% met, on average) and 62% of stocks were sustainably managed (i.e., GBF Target 5 is 62% met; note that Arctic and Antarctic regions had no stocks assessed, Fig. 2).

Thus, in relative terms, regional progress on biodiversity conservation targets lags substantially behind fisheries management targets adopted under the GBF. We further caution that not all of the protected areas reported to the WDPA are fully implemented and effectively managed and enforced, as envisioned by the GBF [48,49]. Using newly available data that track effective implementation [50] we found that only between 0.1% and 18.9% (3%, on average) of ocean area across the nineteen FAO regions was classified as 'fully' or 'highly' protected (light blue bars in Fig. 2), indicating that the MPA has been implemented, there is a management plan, and no damaging forms of extraction are permitted (see MPA Guide for further detail [51)].

We also caution that the fish stocks assessed by the FAO represent large, commercially important populations that are not necessarily

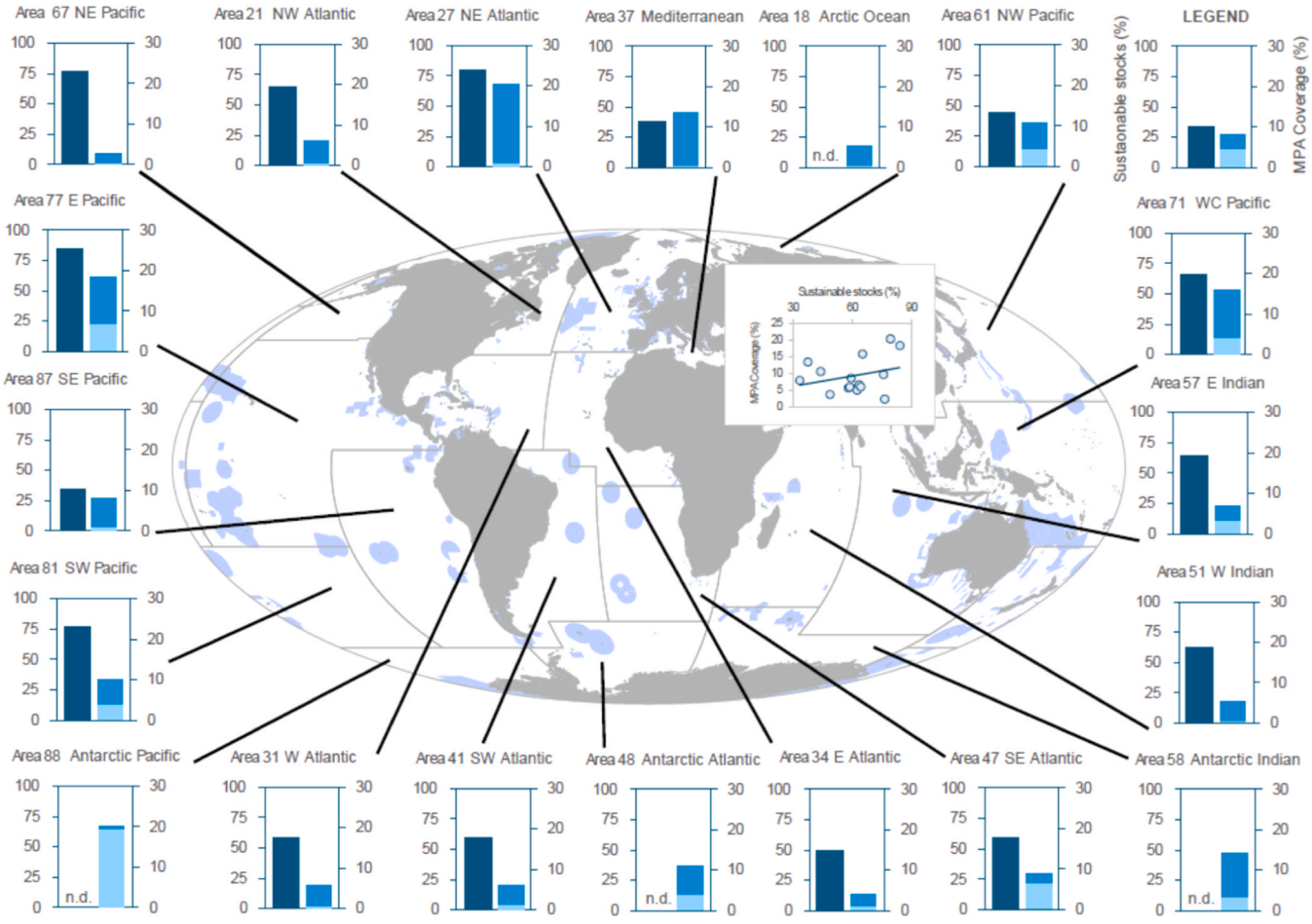

Fig. 2. Progress towards reaching GBF targets at the regional scale. Shown is the proportion of major commercial fish stocks reported to be managed at sustainable biomass (dark blue bars), as well as the proportion of ocean area currently listed as marine protected area or other effective conservation measures (medium blue bars) and the fraction thereof that is highly or fully protected (light blue bars) across 19 United Nations Food and Agriculture Organization (FAO) major fishing areas. Data are displayed relative to the 100% sustainable management and 30% protected areas targets, respectively. The insert shows a non-significant correlation between percentage MPA area coverage and the proportion of fish stocks managed at sustainable biomass in each FAO area ($r = 0.29$, $P > 0.1$). Marine Protected Areas included in the 2025 World Database on Protected Ares are indicated as light purple polygons. Arctic and Antarctic areas had no fish stock data available (n.d.).

representative of all stocks, many of which are much smaller, more coastal, and less well managed [8]. Furthermore, the FAO data typically assesses fisheries sustainability for individual populations and not yet in an ecosystem context. Yet, these data do provide a consistent measure of fisheries management effectiveness for large, industrialized fisheries.

We explored the hypothesis that higher regional protected area coverage correlates with a larger proportion of sustainable fisheries, possibly indicating coordination or co-benefits between marine conservation and fisheries management efforts. We found that this relationship is positive but not statistically significant (see Fig. 2 insert; $r = 0.28$, $P > 0.1$). This pattern is similar when only including highly or fully protected areas (not shown, $r = 0.29$, $P > 0.1$).

In the Northeast Pacific, for example, FAO Area 67 (bordering Alaska and Western Canada) reports above-average stock status (76.5% sustainable) but has the lowest MPA coverage of all regions (2.3%). The adjacent FAO Area 77 (bordering the Western United States and Mexico), in contrast, reports the largest proportion of sustainable stocks (84.2%) and the second-highest MPA coverage (18.3%). It is interesting to note that larger MPAs in FAO Area 77 (and elsewhere) tend to be placed in remote offshore locations (Fig. 2), where little fishing takes place, likely creating a spatial and operational disconnect between fisheries management and biodiversity conservation measures. This might be a more general observation: marine protected area and fisheries management efforts are largely independent of each other and tend to focus on different areas, perhaps to avoid conflict [52]. But this spatial disconnect also minimizes possible opportunities for the coordination of complementary measures that may achieve co-beneficial outcomes. Ongoing efforts to increase protected area coverage could be directed to reduce this spatial disconnect.

4. Integrating protected area coverage and sustainable fisheries management

We submit that the proper integration of GBF targets for spatial conservation and sustainable fishing requires a coordinated planning and evaluation process that integrates across different targets and policies (Figs. 1, 3). This begins with recognizing common goals. At the most fundamental level, both protected areas and sustainable fisheries management seek to maintain, (or, where necessary, restore) the abundance and diversity of marine species to a level that ensures their productivity and resilience [34]. Both approaches sometimes focus on single species (e.g. target species for fisheries, or endangered species in conservation), but more commonly recognize that management measures must be taken in an ecosystem context, including critical habitats, food web interactions, and other interdependencies [53].

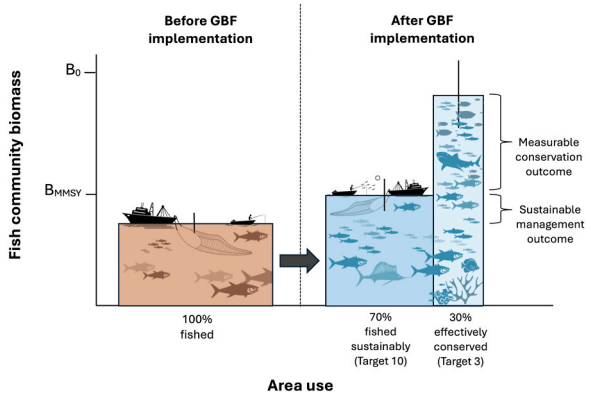

Fig. 3. Anticipated conservation and sustainability outcomes by 2030. Shown is the relative biomass of a hypothetical area before and after implementation of GBF fisheries and protected area targets. Here, fish community biomass is used to assess the effectiveness of sustainable fisheries management (Target 10) and conservation areas (Target 3) alike, but more context-specific indicators can be used instead. Error bars here imply that biomass is estimated from multiple samples. In the example, the target for sustainable fisheries management (Biomass that supports Multispecies Maximum Sustainable Yield B_{MMSY}) is met for 70% of the area, while the remaining 30% are managed primarily for biodiversity conservation aiming to restore unfished biomass (B_0). This can be achieved by using a combination of Marine Protected Areas (MPAs) and Other Effective Conservation Measures (OECMs), while respecting the rights of Indigenous Peoples and local communities over their traditional territories [13].

Where the objectives of fisheries management and protected area implementation differ, is with respect to intended outcomes, specifically the target biomass or abundance of the species or community in question. Fisheries management typically aims to maximize long-term benefits to people while maintaining a productive fish stock and ecosystem. This is usually achieved via managing target species close to the biomass B that supports maximum sustainable yield (B_{MSY}), or multispecies maximum sustainable yield (B_{MMSY}) in an ecosystem context that accounts for the fact that species are interdependent [12,54]. This is different from biodiversity conservation objectives, which aim to restore the abundance and diversity of all species to a level closer to B_0, the biomass achieved in the absence of fisheries exploitation and other industrial uses, indicating substantial or full recovery [11,51]. Multi-use MPAs or OECMs that allow for limited exploitation, such as artisanal fishing, might aim for an intermediate level of abundance, in between B_{MMSY} and B_0 [51].

Fig. 3 illustrates these expected outcomes for sustainable management and spatial conservation measures under the GBF, respectively. We focus on community biomass as a robust, well-established indicator of abundance that is commonly used to track depletion and recovery of marine life in both a fisheries and conservation context [11,12,28]. More detailed indicators should be used where species- or habitat-specific conservation targets exist. While we apply this framework here with respect to the GBF Targets, we recognize that other policies and fora have helped and continue to improve fisheries and conservation outcomes under national and international frameworks. What is unique to the GBF, in our view, is that it provides a common framework for integrating fisheries and conservation targets under a joint vision to rebuild biodiversity by 2050.

In our illustration, average community biomass is initially below the target for sustainable management within the assessed area (Fig. 3, left side), e.g. due to unregulated fishing, or ineffective management strategies and enforcement. Successful GBF implementation (Fig. 3, right side) would see up to 70% of the assessed area with well-managed fisheries, with the target of achieving sustainable catches across the multi-species community, while maintaining a healthy population size for all species, and accounting for wider ecosystem interactions and processes. This goal requires increasing community biomass to at least B_{MMSY} (see Fig. 3 – sustainable fisheries management outcome).

At the same time, at least 30% of the area will be effectively and equitably managed primarily for the benefit of biodiversity, combining marine protected areas (MPAs) with OECMs, while including and respecting Indigenous and Traditional Territories (ITTs) [13]. These initiatives typically aim at more ambitious conservation objectives, such as population recovery towards pre-exploitation biomass (B_0), and would thus be expected to show enhanced biomass relative to areas subject to sustainable fishing (see Fig. 3 – measurable conservation outcome).

We propose that the effectiveness of area-based conservation measures implemented for Target 3 needs to be considered in the context of expected fishery outcomes under Targets 5 and 10. Fisheries management measures primarily aimed at achieving maximum sustainable yield should not be counted as progress toward Target 3, nor should MPAs or OECMs that fail to achieve recovery outcomes above what is expected under sustainable fisheries management. This assessment framework provides a straightforward avenue for correctly classifying area-based management measures as contributions towards either Target 3 or Target 10, and for verifying their effectiveness relative to each other and

against quantifiable reference points.

Where clear reference points are missing or need to be approximated empirically, effectively managed and fully protected areas may act as reference sites for unexploited biomass [55]. Local, traditional, or historical knowledge of previous abundance and diversity should also be applied in this context [56]. Such comparisons can help insure against the shifting baseline syndrome [57] and are invaluable in determining the real success of protected and sustainably managed areas in halting and reversing biodiversity loss, while also producing tangible benefits for people [22].

Where such comparative work has been undertaken, it has revealed the characteristics of both effective [28] and ineffective [58] conservation measures, which can guide improved policy, implementation, and management [29]. An example is the Reef Life Survey [59] which uses low-cost, standardized methodology (Fig. 4A) and consistent indicators to measure and compare fish biomass and diversity within protected areas across thousands of reference sites on rocky and coral reefs around the world. Counterfactual models that estimate biomass in the absence of protection, based on the environmental context of a given site, can then be used to compare observed biomass under current management with the counterfactual, thus providing a quantitative estimate of management outcomes.

This approach has revealed 'bright spots' of significantly elevated fish biomass and diversity not only in fully protected MPAs, but equally in areas stewarded by Indigenous Peoples and local communities, the military, and certain industrial sectors in both the Global North and South (see Fig. 4B for some examples derived from the Reef Life Survey database). Such work highlights important opportunities for recognizing the conservation benefits of diverse non-MPA areas and reporting them under GBF Target 3. Critically, however, positive outcomes are not guaranteed by any specific area-based approach and therefore need to be assessed individually (e.g. compare different military bases in Fig. 4B; see ref. [22] for further examples from different ecosystems).

Similarly rich data have been collected for some time in the context of fisheries management, where scientific surveys of fished ecosystems are a common requirement for setting science-based quotes and rebuilding depleted resources [12]. Scientific trawl surveys, for example, have been conducted across many of the world's coastal shelves for the past 20–60 years, amassing large-scale abundance and biodiversity data, that were recently compiled in a globally integrated database [60]. This wealth of standardized information has only sporadically been used to assess biodiversity outcomes across jurisdictions [61], and could be utilized more fully under the GBF for both planning purposes and the evaluation of implemented MPAs and OECMs. In addition to these proven but biologically destructive survey techniques, low-impact molecular tools, such as eDNA metabarcoding, have been developed to augment traditional field sampling approaches [62]. The evidence to date suggests that these methods have significant potential as a non-invasive, comprehensive, and scalable biodiversity monitoring tool supporting marine conservation programs [62] [63].

One open question is how to adapt these approaches in regions where technical capacity is sparse or lacking. Here, collaborations may be built around developing community-based monitoring programs [64] that empower local stakeholders to collect relevant data and participate in assessment and decision-making processes. Such co-management approaches have had good success in improving outcomes for small-scale fisheries [65] and marine protected area networks [66], sometimes integrating fisheries and protected area management at the local scale. In the Pacific region, for example, a rich tradition exists that integrates traditionally closed areas with small-scale fisheries management [67], often leading to positive ecological and socioeconomic outcomes [68].

In summary, our suggested evaluation framework explicitly links areas managed for sustainable fishing with those protected to benefit biodiversity and incentivizes a data-driven integrated focus on measuring community-level outcomes. Such an approach will not only help detect and improve ineffective MPAs [69] and OECMs [70], but will also help ensure new designations are complementary and impactful. As such, it will help alleviate concerns that OECMs could be misused to quickly reach GBF protected-area goals simply by re-classifying fishery management measures without improving the status quo [71,72]. Countering such misuse, we emphasize that real conservation benefits of both MPAs and OECMs (Target 3) should be demonstrable relative to the background outcomes of areas managed primarily for sustainable fisheries (Targets 5 and 10). While the aim of full recovery (B_0 in Fig. 3) may not always be feasible, particularly in areas with high resource dependance or severe climate impacts, an outcome substantially better than that of sustainably fished areas is realistic and consistent with the intent to restore global biodiversity more broadly [11,13,51].

5. Challenges and opportunities for implementation

How can better integration and comparative assessment of sustainable fisheries and biodiversity conservation targets be achieved in practice? In most jurisdictions, a fundamental challenge lies in the institutional disconnect between agencies tasked with assessing and protecting biodiversity and those that assess and manage fisheries, often leading to poor coordination or conflict over the designation of protected areas [46]. The GBF, however, integrates across these goals and does not envision a narrow sectoral approach to implementation. It states explicitly that it applies to "the whole of government and the whole of society" [13]. Encouragingly, there are some signs that such integration is underway at multiple scales.

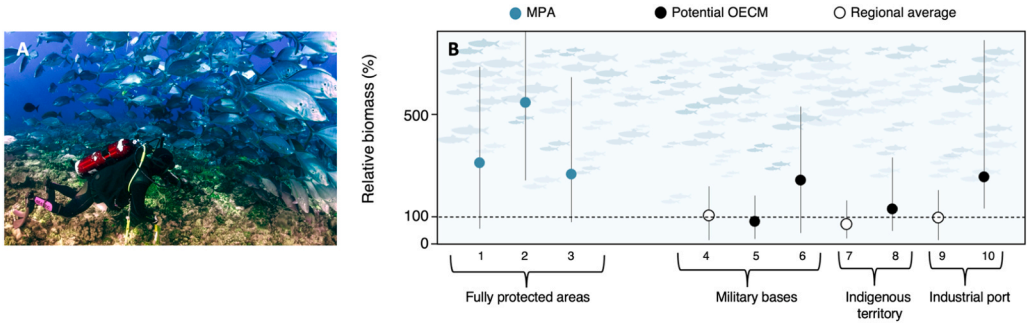

Fig. 4. Evaluating conservation outcomes in practice. (A) Diver assessing fish biomass at Middleton Reef, Lord Howe Marine Park, Australia. (B) Examples from the Reef Life Survey Database [59]. Fish community biomass expressed as percent difference (mean and 95% C.I.) relative to expected biomass outcomes (dashed line). Seen are examples of conservation gains from three fully protected MPAs where fishing is prohibited (blue dots) as well as potential OECM sites (black) compared to the average biomass in their respective ecoregion (white). Sites: 1 = Middleton Reef (Australia); 2 = Kermadec Islands Marine Reserve (New Zealand), 3 = Cerbère-Banyuls Marine Reserve (France); 4 = Alboran Sea ecoregion, 5 =Velez military base, and 6 = Alhucemas military base (Spain); 7 = Arnhem Coast to Gulf of Carpenteria ecoregion and 8 = Mornington Island Indigenous community (Australia); 9 = Exmouth to Broome ecoregion and 10 = Barrow Island port facility (Australia). See Supplementary Materials for details.

At the global scale, the United Nations Food and Agriculture Organization (FAO) is a key stakeholder and convenor of knowledge, deeply involved in the assessment of fisheries and the development of standards and guidelines for fisheries management. FAOs 'Blue Transformation' Strategy aligns well with GBF objectives in promoting the implementation of sustainable fisheries management measures that promote stock health and productivity, while supporting biodiversity, facilitating ecosystem restoration, strengthening climate change adaptation and building resilience [73]. Furthermore, FAO published a series of documents specifically related to implementation of the GBF, including how to utilize survey and monitoring data to measure biodiversity outcomes [74], mostly in the context of other effective area-based conservation measures (OECMs) [75]. It also developed a new Biodiversity Knowledge Hub, making data available to assess progress under various GBF Targets, including those related to fisheries (https://www.fao.org/biodiversity/knowledge-hub/en). Other international institutions that can provide expertise, data, and capacity include GEO BON (Group on Earth Observations Biodiversity Observation Network), GOOS (Global Ocean Observing System), and IIFB (International Indigenous Forum on Biodiversity) focusing on traditional knowledge and wisdom.

At the ocean-basin scale, the United Nations Treaty on Biodiversity Beyond National Jurisdiction (BBNJ) was agreed in 2023 and entered into force in 2026. The primary objective of this international agreement is the conservation and sustainable use of biodiversity in the high seas, and a key pillar toward achieving this aim is the establishment of protected areas. While this treaty was specifically designed to avoid undermining the mandate of existing regulatory bodies, it will nonetheless require integration with all Regional Fisheries Management Organizations (RFMOs) that govern transboundary fisheries operating in international waters. Although some RFMOs have used closed areas as effective fisheries management measures, these remain largely disconnected from large-scale MPAs in the same regions [37] and the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR) is currently the only RFMO that has established long-term protected areas in the high seas. In 2025, two of the world's five tuna-specific RFMOs formally acknowledged the commitment of their member states to collaborate with the BBNJ Agreement [76,77], yet there remains ambiguity and uncertainty around what specifically this relationship will entail [78]. At a functional level, it will be imperative that there is sustained dialogue and knowledge sharing between delegations attending RMFO and BBNJ meetings, respectively. For example, the provision of fisheries and observer data collected by RFMO members and used by RFMO science providers for stock assessments could be useful for biodiversity monitoring [79] and trend assessment [80] following the establishment of high seas MPAs under the BBNJ.

At the regional scale, inter-governmental organizations such as the International Council for the Exploration of the Sea (ICES) in the Atlantic, and The North Pacific Marine Science Organization (PICES) in the Pacific have coordinated long-running fisheries assessment and monitoring programs that are increasingly used for ecosystem management and biodiversity assessments. ICES, for example, is coordinating its efforts through several expert and steering groups, such as the Integrated Ecosystem Assessment Steering Group and the Working Group on Biodiversity Science. While these groups have largely focused on enabling the sustainable (Target 5) and ecosystem-based management of fisheries (Target 10), further integration with activities under Target 3 certainly appears beneficial under the GBF framework.

Another key challenge in aligning fisheries management with biodiversity conservation is the mismatch in time horizons—fisheries decisions have often prioritized short-term yields and economic returns, while area-based conservation requires a long-term perspective to sustain and rebuild entire ecosystems [81]. To bridge this gap, the concept of intergenerational discounting, which explicitly values the well-being of future generations, can offer a way forward [81,82]. Unfortunately, this concept has found limited uptake in practice [6], in part because many economists tend to see all capital, natural and human-made, to be substitutable, which undermines a long-term view [83]. Alternatively, better alignment in time horizons can occur where fisheries management develops a longer-term focus on sustainability in the face of environmental change and uncertainty; this typically requires the preservation of biodiversity to maintain response diversity [84,85] and resilient fisheries [86,87].

We recognize the challenge that CBD member states face in racing to triple marine spatial protection worldwide in under a decade. The political pressure to show progress on GBF coverage targets could incentivize a lax approach to what counts, undermining the underlying goals of effective biodiversity conservation and sustainable use. A twin focus on assessing both biodiversity and fisheries outcomes would help ensure there is real progress, while also supporting adaptive management and facilitating improved dialogue and rapid learning about the most effective conservation and management solutions. Ideally, fisheries and conservation agencies would apply a common assessment framework as seen in Fig. 3 to all area-based measures, including MPAs, OECMs, ITTs, and fisheries management strategies included under the GBF. Such a framework would build on the leading efforts undertaken by the Ad Hoc Technical Expert Group on Indicators under the CBD, by leveraging specific indicators to assess progress across multiple GBF Targets. It would further build on the data and assessment tools developed by the FAO [70] and regional stakeholders such as ICES.

6. Conclusion

Overcoming the long-standing disconnect between fisheries management and biodiversity conservation agendas will take time, but the GBF provides an opportunity to do so, given that it provides clear expectations for both sets of objectives (Fig. 1) and already engages both fisheries and conservation organizations at multiple levels of governance. The GBF Target of 30% protected area coverage is roughly congruent with optimal fisheries and conservation benefits in multiple meta-analyses [33,35,88], and suggests that significant co-benefits can be achieved when coordinating these efforts through a clearly defined process. The biomass-based assessment framework suggested here (Figs. 3–4) could provide a practical, evidence-based starting point on which to build common ground. The proposed framework is inherently flexible and can be expanded to integrate social outcomes such as measures of food security and sovereignty, or the inclusion of cultural practices, and ecosystem services identified as outcomes under GBF Target 10 [13]. In addition, implementation strategies need to be tracked to ensure areas are equitably governed and that management regimes respect human rights, consistent with overarching GBF objectives [13,89].

A transparent assessment and accounting framework will also be imperative for driving impact investments into conservation and building public support [90]; if improvements are not observable or quantifiable, potential investors may be less likely to engage, and stakeholders are less likely to support new protection measures. Building and implementing an integrated and comprehensive assessment framework could thus spur an innovative research agenda and unlock public and private investment into measuring and improving the state of our planet's marine biodiversity.

CRediT authorship contribution statement

Boris Worm: Writing – original draft, Writing – review & editing, Visualization, Validation, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization. **Ella Clausius:** Writing – review & editing, Visualization, Methodology, Formal analysis, Data curation. **Kirsten Grorud-Colvert:** Writing – review & editing, Resources, Investigation, Conceptualization. **James Palardy:** Writing – review & editing, Project administration, Conceptualization. **Daniel Pauly:** Writing – review & editing, Conceptualization. **Elizabeth Pike:** Writing – review & editing, Formal analysis, Data

curation. **Ellen Pikitch:** Writing – review & editing, Conceptualization. **Callum Roberts:** Writing – review & editing, Conceptualization. **Guinnevere Roberts:** Writing – review & editing, Investigation, Conceptualization. **Robert Richmond:** Writing – review & editing, Conceptualization. **Laurenne Schiller:** Writing – review & editing, Visualization, Methodology, Investigation. **Rick Stuart-Smith:** Writing – review & editing, Methodology, Formal analysis, Data curation, Conceptualization. **Rashid Sumaila:** Writing – review & editing, Conceptualization.

Funding

This study was supported by grants from the Pew Charitable Trusts and the Natural Science and Engineering Research Council of Canada.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

The authors acknowledge helpful discussion and input from J. Briggs and S. Mangubhai. G. Edgar, J. Fernández, N. Lazzari, T. Cooper, S. Griffiths, P. Day, K. Smith, S. Ling and others contributed survey data, accessed through Australia's Integrated Marine Observing System (IMOS), and enabled by the National Collaborative Research Infrastructure Strategy (NCRIS). J. Strang provided GIS mapping services.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.marpol.2026.107152.

Data availability

Data will be made available on request.

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