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EDITED BY
Robert Stephenson,
Fisheries and Oceans Canada (DFO), Canada

REVIEWED BY
Ernesto Jardim,
Marine Stewardship Council (MSC), United Kingdom
Bianca Haas,
University of Wollongong, Australia

*CORRESPONDENCE
Ashley R. Wilson
awilson@pewtrusts.org

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Management procedure development in RFMOs offer lessons for strategic and impactful stakeholder engagement and collaboration

Ashley R. Wilson[1]*, Shana K. Miller[2] and Grantly R. Galland[3]

[1]The Pew Charitable Trusts, London, United Kingdom, [2]The Ocean Foundation, Washington, DC, United States, [3]The Pew Charitable Trusts, Washington, DC, United States

International and domestic fisheries management bodies are increasingly embracing a management procedure (MP) approach to managing their living marine resources. An added advantage of an MP approach is the opportunity for strategic and impactful engagement and collaboration among resource managers, user groups, civil society and other stakeholder groups in MP development, adoption, and implementation. We consider examples from four regional fisheries bodies (i.e., RFMOs and a multi-lateral body) where stakeholders are contributing to the development of MPs for several stocks to varying degrees. These case studies highlight differing structures and processes for open and transparent stakeholder engagement in management strategy evaluation (MSE) and MP development. We identify that one important difference between sufficient and insufficient stakeholder engagement in these cases is the presence or absence of formalised structures and processes for inclusive and open stakeholder engagement, where there are key roles for stakeholder inputs and feedback during key stages of MSE and MP development. We highlight the benefits of engaging stakeholders from the outset of the MP development process, including designing processes, agreeing on the timelines and workplan for MSE and providing inputs that can lead to the successful adoption of an appropriate MP. We then consider how stakeholder engagement may be improved in other multi-lateral regional fisheries bodies, such as the NEAFC/Northeast Atlantic coastal States management forums, as well as other relevant RFMOs.

KEYWORDS

marine resource management, management strategy evaluation, regional fisheries management organizations, stakeholder participation, dialogue

1 Introduction

A growing number of international management bodies and domestic agencies are embracing a Management Procedure (MP) approach to managing their living marine resources (Punt et al., 2016; Nakatsuka, 2017; Sharma et al., 2020). In this approach, managers adopt pre-agreed harvest control rules (HCRs) that are used to automatically set fishing opportunities based on indicators of stock status, all with the goal of meeting their pre-agreed objectives for the management of the resource (Butterworth, 2007; Rademeyer et al., 2007; Dowling et al., 2015). Importantly, during the development of a robust management procedure (MP), the HCR and reference points are tested using numerical simulations through the process of management strategy evaluation (MSE) in order to choose and adopt an MP that is likely to be successful in the future, across a range of potential biological (e.g., fecundity, age of maturity, or natural mortality), ecological (e.g., mixing of closely related stocks, or booming/busting predator populations), environmental (e.g., water temperature or primary productivity), and anthropogenic (e.g., illegal fishing, effort creep) parameters (Merino et al., 2019). The pre-agreed nature of this approach reduces the political negotiation in traditional fishery management. Such negotiations have contributed to unambitious, non-scientific, and economically costly decisions in several fora over many decades, and these shortfalls have contributed to the aforementioned shift (Hillary et al., 2015).

An added advantage to the MP approach to fishery management is its opportunity for – and reliance on – stakeholder engagement and inputs during the MP development process (Cox and Kronlund, 2008; Mapstone et al., 2008; Feeney et al., 2019; Goethel et al., 2019; Miller et al., 2019). The definition of a stakeholder has evolved through time (Freeman, 1984; Reed et al., 2018), and the term now features in global standards, such as the AA1000 Stakeholder Engagement Standard, which provides a framework to help businesses, governments, and other organizations demonstrate inclusive sustainability-related stakeholder engagement practices (AccountAbility, 2015). The AA1000 highlights that "*Stakeholders are not just members of communities or non-governmental organisations. They are those individuals, groups of individuals or organisations that affect and/or could be affected by an organisation's activities, products, or services and/or associated performance with regard to the issues to be addressed by the engagement.*" Therefore, in the context of fisheries management, stakeholders may be defined as individuals, groups of individuals or organizations who affect and could be affected by decisions/actions on the use, conservation, or management of fishery resources. There is a growing acceptance that it is important to involve the fishing industry in fisheries science, particularly given the unique knowledge that fishers possess (Stephenson et al., 2016) and the value of fishery-dependent data sources on assessment and MSE results (Steins et al., 2022). But within the MP context, "stakeholders" should be considered more broadly and may include fisheries managers, scientists, and numerous other stakeholders such as commercial, subsistence and recreational fishers, indigenous communities, fish processors, vessel owners, seafood companies, retailers, environmental non-governmental organizations (NGOs), and others who rely on fisheries resources or are affected by fisheries. Each of these groups may have different philosophies for the management of their fisheries; development of MSE and adoption of an MP allow these different philosophies to be defined and quantified (Miller et al., 2019). Various typologies have been proposed to categorize stakeholders and the roles they play in marine policy and science (Newton and Elliott, 2016; Ballesteros and Dickey-Collas, 2023).

Successful engagement and collaboration with stakeholders is important because stakeholders can bring additional or unique data and knowledge that is relevant to science and management (Stephenson et al., 2016). How data, knowledge and perceptions are incorporated into science, and how scientific outputs are communicated to stakeholders can impact the relevance, salience, legitimacy, credibility and trust in that science, as well as how that science is overall fed into strategic and potentially impactful management of fisheries (Winter and Hutchings, 2020; Steins et al., 2022).

As demonstrated in several examples across multiple regional fisheries management organizations (RFMOs), including in the four case studies discussed below, the development and adoption of an MP requires substantial stakeholder interaction. Because the dialogue-driven and transparent MSE development process has differed notably from that of political negotiations on fishing opportunities, which are a hallmark of a more traditional approach to management, the shift to the adoption of MPs has indirectly led to new opportunities for stakeholder engagement and collaboration, particularly at the tuna RFMOs (tRFMOs) (Goethel et al., 2019; Miller et al., 2019).

Here, we describe this evolution and provide case studies that highlight examples of good and poor practices in stakeholder engagement and collaboration. By stakeholder engagement we mean the process of involving and seeking stakeholder inputs, including data, knowledge, views, and preferences, into the science and management process. By stakeholder collaboration we mean how scientists, managers and other stakeholders actively work together in the process of MSE and MP development to inform strategic and impactful management decisions. The case studies were chosen based on author involvement in the process, and through these examples we share our experiences as full-time fishery conservationists working on fisheries across the full spectrum of management, from those fisheries still requiring political negotiation to those with MSE-based MPs now being implemented.

2 Stakeholder engagement under traditional management

Under the traditional approach to international fishery management, scientists conduct stock assessments, which they use to recommend catch or effort limits and/or other regulations, and then managers decide whether to strictly follow, modify, or disregard that scientific advice when setting the limits. There is

essentially no formal stakeholder engagement at the multilateral level as part of that process, and the individual members of the relevant management bodies vary widely in outreach to their national stakeholders. For example, the United States' approach to outreach ahead of each meeting of the tRFMOs is comprehensive. It consists of advisory bodies comprising commercial and recreational fishers, academic scientists, and representatives from environmental organizations convening to formally advise the delegations to the relevant meetings. While some other governments have similar processes in place, many have limited their outreach to a small number of representatives of the fishing sector (Aanesen et al., 2014; Yates, 2014; Schwermer et al., 2020). A review of the participant lists from RFMO Commission meetings reveals that most delegations to an international fishery management meeting include commercial fishers or their representatives who have a substantial influence on the process (pers. obs.). For example, the delegation from just the European Union (EU) to the 2019 annual meeting of the International Commission for the Conservation of Atlantic Tunas (ICCAT) included more than 115 representatives of the fishing industry (ICCAT, 2019a). Some delegations to the Inter-American Tropical Tuna Commission (IATTC) offer the microphone to representatives of the industrial fishing sector to speak on behalf of their entire citizenry, even in cases when those individuals are not from the country behind whose flag they speak (pers. obs.). Stakeholder engagement under the traditional approach to international management is often inequitable, inconsistent, and generally reserved for each delegation to do (or not do) on its own. Under this approach, some stakeholders may not be consulted sufficiently, or at all.

3 Stakeholder engagement during management procedure development

Stakeholder engagement is a hallmark of MP development through MSE. Unlike the traditional approach where there is a unidirectional flow of information from scientists to managers, who then seek stakeholder feedback, MP development is meant to fully integrate stakeholder input throughout (Goethel et al., 2019; Miller et al., 2019). This iterative process partners scientists and stakeholders at each step. Managers are considered stakeholders alongside industry and environmental organizations, among other interested parties.

There are several key decision points in the MSE process where stakeholders could provide input (Figure 1). Some steps – like choosing management objectives that set the philosophy for how fisheries are managed – should explicitly include input from fishers, environmental organizations, and other stakeholders. Other steps – like designing candidate management procedures (MPs) – could be undertaken by these groups or their delegates, directly, or it could provide opportunity for stakeholders to comment on their preferred options.

Engaging stakeholders in each of these steps requires additional time and communication, but this investment has multiple benefits. The process is more robust by accounting for the unique knowledge of the various sectors, and these groups become vested in the process, making them more likely to support the outcome. Trust and understanding increase, both within and among stakeholder groups, and the bottom-up approach contributes to inclusivity and transparency in fisheries management (Goethel et al., 2019; Miller et al., 2019).

Different fora engage stakeholders in different ways (e.g., written response consultations, interviews, questionnaires/surveys, in-person dialogue). Whatever form they take, these engagement efforts should be convened at the beginning of the MSE process and meet regularly throughout, and they can be both informal and formal. For example, informal efforts can provide a venue for capacity building, brainstorming, and solicitation of general input, while decision-making can occur at more formal sessions that include managers among other stakeholders. Where an MSE is being developed to identify a preferred MP, there should be clearly defined opportunities for strategic dialogue.

4 Case studies using an MP approach

There are several examples where stakeholders have contributed constructively to the development, adoption, and implementation of an MP for internationally managed stocks (e.g., southern bluefin tuna, Greenland halibut, Atlantic bluefin tuna, Indian ocean skipjack tuna, and Indian ocean bigeye tuna). Below we describe four examples from different RFMOs around the world with different approaches and levels of stakeholder engagement during MP development. Two examples have gone through MP development and are being implemented, and two are still undergoing development.

4.1 Atlantic bluefin tuna – good stakeholder engagement

Atlantic bluefin tuna (*Thunnus thynnus*) is one of the most valuable (McKinney et al., 2020), but also controversial and intensely managed, species in the world. It falls under the jurisdiction of ICCAT, a tRFMO that regulates all Atlantic fisheries for tunas, swordfish, billfishes, and pelagic sharks. In 2015, ICCAT committed to developing MPs for eight priority stocks, including Atlantic bluefin (ICCAT, 2015a). The bluefin MSE was already underway at that point, with a dedicated technical steering group established in 2014 (Di Natale, 2015). The development process summarised in Table 1 successfully concluded in 2022 with MP adoption (ICCAT, 2023).

There was considerable stakeholder input in the development process, starting in 2014 with the first meeting of the Standing Working Group to Enhance Dialogue Between Fisheries Scientists and Managers (SWGSM). SWGSM was established as a venue primarily for discussions related to MPs, although ecosystem-based fisheries management has also featured on agendas (ICCAT, 2014; ICCAT, 2015b; ICCAT, 2017; ICCAT, 2018a). There were three SWGSM meetings that covered the bluefin MSE, but since 2018, discussions were moved to meetings of

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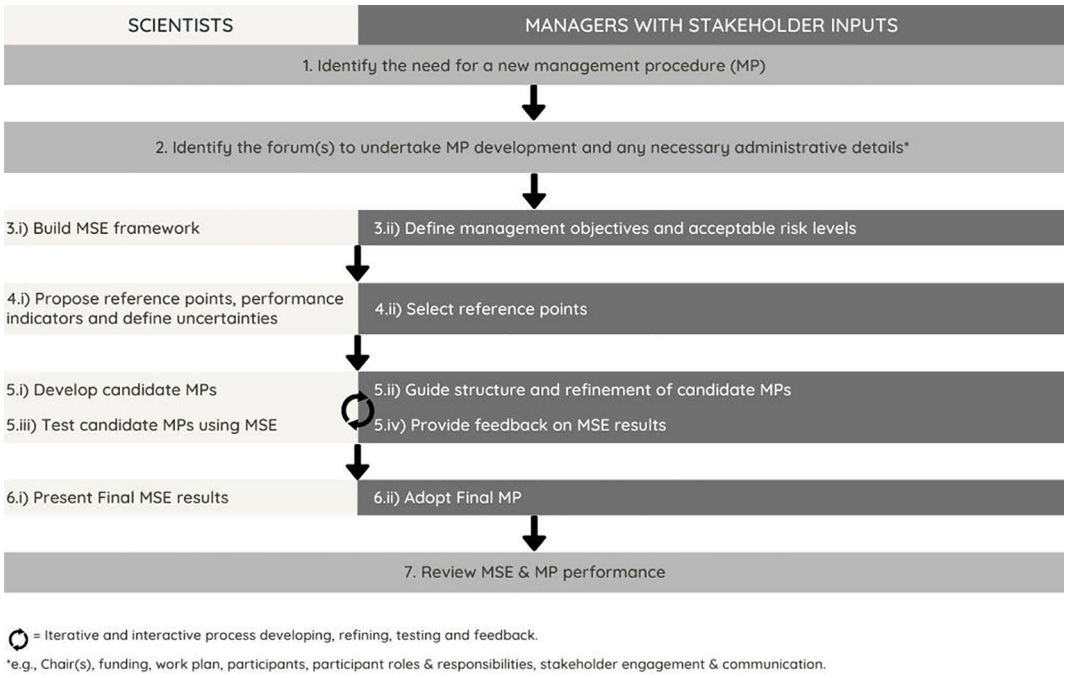

FIGURE 1
Process to develop a management procedure, from idea to adoption, highlighting opportunities for stakeholder input.

Panel 2, the ICCAT species-specific subgroup in charge of Atlantic bluefin. This enabled a more targeted focus on issues pertaining directly to the bluefin MSE. Panel 2 met intersessionally three times in 2021 and four times in 2022 to advance the bluefin MSE toward completion. Stakeholders were encouraged to participate in SWGSM and Panel 2 meetings, either as members of their national delegations or as accredited observers. The most influential stakeholder engagement was in crafting management objectives and setting specifications for the MP, including MP type and management cycle length (ICCAT, 2018b; ICCAT, 2019b; ICCAT, 2022a; ICCAT, 2022b; ICCAT, 2022c).

Both industry and environmental stakeholders also participated in the technical science meetings, again on national or observer delegations. Stakeholders provided input on what uncertainties to include in the MSE, as well as how to weight the likelihood of the various scenarios. This plausibility weighting was achieved via a poll of ICCAT's bluefin tuna species working group, where input from scientists representing stakeholders was considered equally to that

TABLE 1 Number of meetings open to stakeholder input during development and adoption of a management procedure (MP) for Atlantic bluefin tuna by the International Commisison for the Conservation of Atlantic Tunas (ICCAT)

Year	Science Meetings	Standing Working Group to Enhance Dialogue Between Fisheries Scientists and Managers	Panel 2	BFT MSE Ambassador Meetings	Commission Annual Meeting
2014	1	1			
2015	1	1			Adopted measure calling for Atlantic bluefin MP
2016	1		1		
2017	1				
2018	1	1			Adopted conceptual management objectives
2019	4		1		
2020	5				
2021	3		3	1	
2022	4		4	2	Adopted MP

Panel 2 is the ICCAT subidiary body that manages Atlantic bluefin tuna fisheries; BFT MSE, bluefin tuna management strategy evaluaton; BFT MSE Ambassador Meetings were capacity building efforts by ICCAT's scientists to provide information and answer questions about the MSE development.

from government scientists (ICCAT, 2021a). Stakeholders also influenced which abundance indices would be included in the candidate MPs, as well as the general structure of the MPs. Developers consulted regularly with stakeholder groups, and some were funded by stakeholders (e.g., Johnson and Cox, 2021). Stakeholders were welcome to submit candidate MPs for testing, making for a very inclusive process. Careful consideration by the working group's chair ensured that the industry's on-the-water expertise was reflected and stakeholder confidence in the process was secured, while maintaining the scientific integrity of the process.

There was also more informal engagement from stakeholders. In 2021 and 2022, ICCAT scientists selected three "ambassadors," one for each of ICCAT's official languages. These ambassadors hosted open meetings where they provided updates on the process and forthcoming decision points and then fielded questions from the audience. Other stakeholders, including market representatives and elected officials, voiced their views as well through op-eds, webinars, joint statements, and other communication tools.

By the time the bluefin MP was adopted in November 2022, there had been over 20 ICCAT dialogue meetings that brought together scientists, managers, and other stakeholders to discuss and deliberate on the topic. As a result, the MP was adopted and fully implemented immediately without opposition since the stakeholders were familiar with and vested in the approach. This provides a strong example of stakeholder engagement in MP development and is an improvement over the experiences of the previous several decades of traditional management for Atlantic bluefin.

4.2 Greenland halibut – sufficient stakeholder engagement

Greenland halibut (*Reinhardtius hippoglossoides*) is a flatfish with circumpolar distribution in the northern oceans (Chiperzak et al., 1995). In the Atlantic, the Northwest Atlantic Fisheries Organization (NAFO) has jurisdiction over the stock off the coast of the Canadian maritime provinces known as Subarea 2, Division 3KLMNO. The stock has long been depleted (NAFO, 2003), and NAFO adopted a 15-year rebuilding plan in 2003 (NAFO, 2008). Seeing limited recovery success, NAFO scientists opted to develop an MSE for the stock in 2008 to explore an alternate rebuilding strategy (NAFO, 2008).

After the initial MSE framework was developed, NAFO convened a dialogue group to engage managers and other stakeholders in the process, the Working Group on Greenland Halibut Management Strategy Evaluation (WGMSE). The WGMSE met three times in 2010, in January (NAFO, 2010c), May (NAFO, 2010a), and September (NAFO, 2010b), to successfully take the MP to adoption in late September of that year. Stakeholder input in these meetings was considerable, weighing in on MP specifications as well as the workplan for completion. However, stakeholder representation and diversity were deficient. While there were managers and industry representatives present for the iterative exchange with scientists throughout the year, no conservation groups or other stakeholders participated.

In 2013, with expanding MSE initiatives for other stocks, NAFO formed the Joint Fisheries Commission-Scientific Council Working Group on Risk-based Management Strategies (WG-RBMS) to serve as a venue for dialogue on MP development and implementation for all stocks (NAFO, 2013). When the Greenland halibut MP was updated in 2017, it was the WG-RBMS that met rather than the WGMSE. The group convened four times, in February (NAFO, 2017c), April (NAFO, 2017d), July (NAFO, 2017a), and September (NAFO, 2017b), prior to adoption in September 2017, another example of considerable stakeholder engagement. During these meetings, other stocks were discussed in addition to Greenland halibut, given the broader focus of the WG-RBMS as compared to the WGMSE. Nevertheless, the series of meetings enabled the dialogue necessary to finalize the revised MSE. As was the case in 2010, stakeholders were limited to national and regional fishery managers and some industry representatives.

4.3 Northeast Atlantic mackerel – insufficient stakeholder engagement

The management of internationally shared fisheries for three productive widely distributed pelagic stocks in the northeast Atlantic (NEA) – Atlantic mackerel (*Scomber scombrus*), blue whiting (*Micromesistius poutassou*) and Norwegian spring spawning herring (*Clupea harengus*) are the responsibility of several NEA coastal States (the EU, the Faroe Islands, Greenland, Iceland, Norway, Russia, and the United Kingdom), as well as the North East Atlantic Fisheries Commission (NEAFC), an RFMO where these States are Contracting Parties and have joint responsibility for the sustainable management of these fisheries in international waters (i.e., the NEAFC regulatory area) (NEAFC, 2006). The governance regime is a complex patchwork, covering a mixture of domestic and international fisheries legislation and policies (The Pew Charitable Trusts, 2022a). A wide range of stakeholders from multiple countries and jurisdictions have direct and indirect interests in the sustainable management of these fisheries resources.

The NEA coastal States have historically established multi-lateral management agreements between the interested fishing Parties for each stock. These agreements often contain a long-term management strategy (LTMS/MP) with an HCR, set annual catch limits, and establish quota-sharing (allocation) arrangements between the Parties (e.g., EU-FO-IS-NO, 2016). However, there is a long history of disputes over the sharing of these fisheries resources between the Parties, often resulting in incomplete agreements. This has led to management issues, such as total annual catches regularly exceeding scientifically advised levels, that put the long-term precautionary and sustainability management of these stocks at risk (Bjørndal and Ekerhovd, 2014; Østhagen et al., 2020).

Using the recent development of a new LTMS for Atlantic mackerel as a case study, the following paragraphs elaborate on each step in the coastal States' process (Figure 2) for developing and

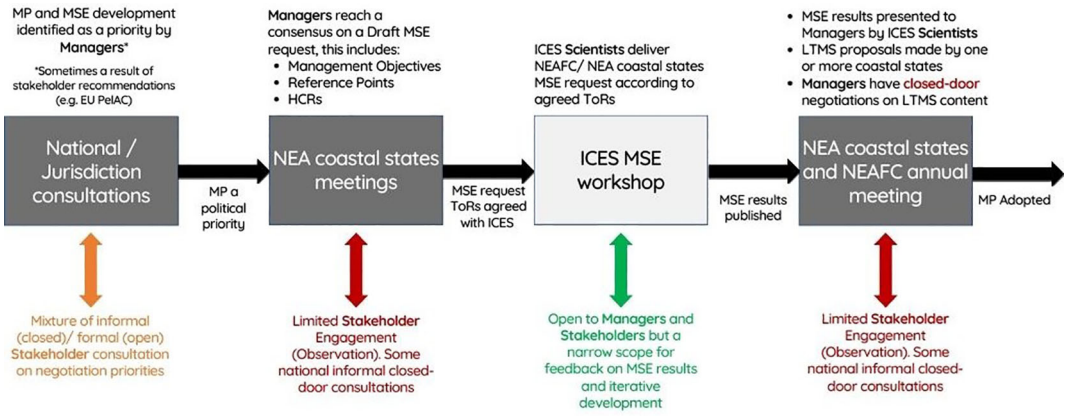

FIGURE 2
The current approach to stakeholder engagement during development of a management procedure (MP)/long-term management strategy (LTMS) by Northeast Atlantic Fisheries Commission (NEAFC) coastal States, color coded by good (green), fair (orange), and poor (red) efforts. MSE, management strategy evaluation; EU PelAC, European Union Pelagic Advisory Council; HCRs, harvest control rules; ToRs, terms of reference; ICES, International Council for the Exploration of the Sea; NEA, northeast Atlantic.

adopting an LTMS, including when and how stakeholders are engaged.

Initiation of a new LTMS usually starts at the national level when a technical imperative arises – for example, a pre-agreed review of an existing LTMS (e.g., every 5 years), or when there are significant changes to the management or the scientific stock assessment that underpins an agreement on an existing LTMS. At the national level, the Parties consult stakeholders in a variety of different ways; openly and officially (formally), and privately (informally) on what priorities and positions to take to coastal States' meetings. In some cases, stakeholder forums such as the EU Pelagic Advisory Council (PelAC) make recommendations to the EU to commission the evaluation of an LTMS (PelAC, 2022). Such recommendations can then be tabled for discussion and decision during coastal States' meetings. In the case of mackerel, the EU, Norway, and the Faroe Islands governments jointly identified the need for a new LTMS and worked to table a joint proposal for an MSE of an LTMS by the International Council for the Exploration of the Sea (ICES) in 2020 (EU-FO-NO, 2019; ICES, 2020b).

Coastal States meetings have historically lacked transparency and comprehensive stakeholder inclusion. Delegations of officials traditionally met privately as a group, with limited stakeholder engagement, to discuss management plans, quota-sharing arrangements, and annual decisions on catch limits. Since 2021 coastal States meetings have slightly improved transparency with stakeholders now officially being able to observe Plenary sessions, but Heads of Delegation meetings still limited to officials for detailed negotiations and decision-making (pers. obs.). However, despite some increased transparency, the scope for active stakeholder engagement and co-production of policy (management objectives, reference points, HCRs, and decisions on trade-offs) as well as scientific requests to ICES remain limited to informal discussions. This contrasts with the above examples, where stakeholder input and feedback in the development of an MP has clearer structures, venues and processes established.

The coastal States and NEAFC do not have an internal scientific advisory structure like some other RFMOs. Instead, they have agreements (Memorandums of Understanding) with ICES, as an external and independent science provider (ICES, 2022). Once politically agreed by coastal States, or NEAFC, ICES receives a request to evaluate an LTMS. An LTMS evaluation is conducted using an MSE framework in accordance with ICES guidelines (ICES, 2013; ICES, 2019; ICES, 2021) and based on the Terms of Reference (ToR) agreed between the requestors and ICES. ICES has clear guidelines for stakeholder engagement in its scientific processes (Dickey-Collas and Ballesteros, 2019; ICES, 2019). According to ICES current guidelines, stakeholders can participate in ICES workshops, including MSEs, by request or invitation.

After ICES received the Special Request for advice on an LTMS for Northeast Atlantic mackerel in 2019, a scoping workshop between managers and scientists was held in January 2020 and was followed by a series of online meetings to conduct the MSE. Only two scientists affiliated with stakeholder organizations attended the online meetings, and no managers or fishers joined (ICES, 2020b). A second dialogue workshop for managers and scientists was cancelled due to the COVID-19 pandemic (ICES, 2020b), and the advice was published in August 2020 (ICES, 2020a). ICES did communicate the results of the MSE to managers and stakeholder observers at NEAFC (NEAFC, 2020), a coastal States meeting (pers. obs.), and the EU Pelagic Advisory Council (PelAC, 2020). Whilst there was scope for discussion of the MSE results at these venues, there was no scope to actively take on feedback and refine the MSE or candidate MPs.

Since ICES produced its Atlantic mackerel MSE and LTMS advice in 2020, the Faroe Islands have produced a proposal for an LTMS (June 2021) to be negotiated during future coastal States meetings. Multi-lateral discussion and national-level stakeholder consultations remain ongoing as of October 2023.

4.4 Pacific saury – early stages of stakeholder engagement

Pacific saury (*Cololabis saira*) is an important part of culture and cuisine in many east Asian communities and is subject to a massive fishery, landing several hundred thousand tonnes each year. It is also notable as a "forage fish" or a fish that forms an important part of the pelagic trophic system, as it is preyed upon by commercially important fishes (e.g., albacore tuna, yellowtail amberjack, etc.) as well as seabirds and marine mammals (Fuji et al., 2021). Growing exploitation of this species was a catalyst in the establishment of the North Pacific Fisheries Commission (NPFC) - an RFMO that manages species in the North Pacific that are not managed by one of the two Pacific tRFMOs. Based on a preliminary stock assessment, scientists concluded in 2019 that the Pacific saury population had reached concerning levels (NPFC, 2019b), and NPFC moved to limit exploitation for the first time (NPFC, 2019a). At that time, the scientists also recommended - and the managers endorsed - a plan to develop MSE for the species as a means to assess the stock status more accurately and began considering the possibility that the MSE could also be used to develop a simulation-tested MP for the species. In 2021, the Commission took further action to reduce fishing for Pacific saury, with a required 40% reduction in the catch, and formally established the Small Working Group on Management Strategy Evaluation for Pacific Saury (SWG MSE PS) (NPFC, 2021).

The SWG MSE PS is a joint effort of the Scientific Committee, the Technical and Compliance Committee, and the Commission and is the first Commission-level meeting beyond the regular, annual meeting of NPFC since this RFMO's establishment in 2015. In the model of the ICCAT SWGSM described above, it is meant to allow for a dialogue between scientists and managers and to include input from stakeholders. The first meeting of the SWG MSE PS took place in early 2022 and was co-chaired by a scientist and a manager. It has met four more times since its establishment. The combined output of these SWG MSE PS meetings has advanced the MP-development process substantially, and the commitment to holding them regularly demonstrates their value. Stakeholders are welcome to participate in these meetings, either as registered observers or as part of Member delegations in some cases, but NPFC has not conducted a formal stakeholder engagement process beyond the working group. As demonstrated in the above cases, such a process (via domestic outreach workshops, "ambassador" meetings, or other fora) is likely to both shorten the length of the development and improve the likelihood that an MP is adopted within the current timeline, something that has only very rarely happened at an RFMO (Pipernos et al., 2023).

5 Discussion

Stakeholder engagement is not a new concept but is generally acknowledged as important to developing fisheries management procedures and more broadly in the context of ecosystem-based fisheries management (Feeney et al., 2019; Goethel et al., 2019). And in addition to the case studies highlighted above, many well-developed fisheries management systems are moving from a traditional best assessment and advice fisheries management framework to an MP-based approach, providing for new opportunities for stakeholder engagement. For example, an MP-based approach has been adopted in domestically managed fisheries ranging from Atlantic herring in the USA (Feeney et al., 2019) to Atlantic redfish (Deith et al., 2021) and Pacific sablefish in Canada (Cox and Kronlund, 2008; Cox et al., 2013), to a host of fisheries in Australia (Smith et al., 1999; Department of Agriculture and Water Resources, 2018), New Zealand (NZ Gov, 2008; Webber and Starr, 2020), and South Africa (Rademeyer et al., 2007; Ross-Gillespie et al., 2019).

In both domestic and internationally managed fisheries, development of an MP has involved an increased component of stakeholder engagement. And while the MP approach to fishery management was not designed to overhaul and improve the stakeholder engagement processes, it is clear from the above case studies that is occurring. That said, there may be some disadvantages and risks associated with participation by more individuals during MP development, such as the time/resources needed to host meetings to iteratively develop an MP or stakeholders' capacity and capability to engage meaningfully in this process. Having mechanisms to ensure due diligence of management and science processes – including audits and monitoring and evaluation – may become increasingly important to ensure stakeholder engagement is effective and leads to improved outcomes (Winter and Hutchings, 2020). This is where principles and standards for stakeholder engagement are helpful. For example, the AA1000 Standard stresses that it is important to understand the difference between good-quality and poor-quality engagement and provides a framework to help businesses, governments, and other organizations demonstrate inclusive sustainability-related stakeholder engagement practices (AccountAbility, 2015).

Whilst overarching governance and scientific advisory structures and processes vary, good MP development process typically engages managers, scientists, and other stakeholders in an iterative and participatory dialogue – from MP initiation to testing via MSE to adoption (Punt et al., 2016; Miller et al., 2019). The development process is valuable from a collaborative science and management standpoint. It offers a useful mechanism for incorporating stakeholder knowledge and feedback in a strategic, process-orientated and outcome focussed way.

We consider that the four case studies discussed above and summarised in Table 2 offer instructive insights and lessons from the different processes of stakeholder engagement used to successfully develop and adopt MPs. Further research using qualitative and quantitative social research methods could be conducted by RFMOs or independent researchers to systematically monitor and evaluate stakeholder engagement in MP development and implementation. Such research could also be used to monitor, evaluate, and compare RFMO governance performance more generally in the future.

The RFMO case studies do, however, highlight that many regional fisheries bodies actively engage and communicate with stakeholders during MSE development and MP adoption.

TABLE 2 Comparison of opportunities to provide stakeholder input at key stages of management procedure development for the four case studies provided here.

Case Study	Stakeholder input opportunities							
	Define management objectives	Determine acceptable levels of risk	Select reference points/ indicators	Define uncertainties	Develop and test candidate MPs	Provide feedback on MSE results	MP adoption	Review MSE and MP performance
Atlantic bluefin tuna ICCAT	Input on conceptual objectives during SWGSM and ICCAT annual meeting. Discussion also during Panel 2 meetings	Inputs during SWGSM meetings Science meetings and ICCAT Panel 2 meetings	Input at Intersessional Science meetings	Inputs on uncertainties and plausibility weighting at Intersessional Science meetings	Inputs provided on CMP structure. Some CMP research & development funded	Inputs provided during Panel 2 meetings - reaction and narrowing CMPs	Inputs via national meetings and ICCAT annual meeting	*x*
Greenland halibut NAFO	Inputs provided during WGMSE & WGRBMS	Inputs provided during WGMSE & WGRBMS	Inputs provided during WGMSE & WGRBMS	Inputs provided during WGMSE & WGRBMS	Inputs provided during WGMSE & WGRBMS	Inputs provided during WGMSE & WGRBMS but limited diversity of stakeholder attendance	Inputs via national meetings and NAFO annual meeting	Scientist only - Review/Evaluation of the MP
Atlantic mackerel NEAFC	No formal input - Defined by managers in MSE request to ICES	No formal input -Defined by scientists - ICES precautionary approach	No formal input -Defined by managers in MSE request to ICES	No formal input - Defined by scientists during ICES MSE workshop (2020)	No formal input - Predefined by managers and ICES in MSE Request	No formal input - MSE open to stakeholders but no feedback loop (iteration)	*x*	*x*
Pacific saury NPFC	Ongoing - Stakeholder input during SWG MSE PS and Commission meetings	Ongoing -Stakeholder contributions made during SWG MSE PS	Ongoing - Stakeholder input during SWG MSE PS and Commission meetings	Ongoing - Stakeholder discussion during SWG MSE PS	Ongoing - Stakeholder feedback on HCRs during SWG MSE PS	*x*	*x*	*x*

Acronyms for working groups are as defined in the text of each case study; x = not yet completed.

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In some RFMOs (e.g., NAFO and ICCAT), formal dialogue groups have been established as a vehicle for MP development and for conducting MSEs (The Pew Charitable Trusts, 2022b). We observe that the ICCAT (Atlantic bluefin) and NAFO (Greenland halibut) case studies demonstrate both notable and iterative progress towards the adoption of comprehensive MPs for those stocks using formal working groups. NPFC is similarly positioning itself to have an efficient process with the early establishment of a working group where scientists, managers, and stakeholders can jointly discuss Pacific saury. Whereas for NEAFC, there have been fewer opportunities for formal engagement.

It is notable that dialogue among stakeholder groups, including managers, also provides opportunities to address other outstanding issues that may delay transition to MP-based management. Management of yellowfin tuna in the Indian Ocean Tuna Commission (IOTC) suffers from a long allocation dispute (Holmes and Miller, 2022), and stakeholder engagement will be required to address this issue. Holmes and Miller (2022) argue there can still be benefits of adopting MPs, even without agreed quota allocations, but certainly dealing with both issues simultaneously is difficult. Robustness testing MPs is one mechanism to increase the likelihood that they can still achieve desired management objectives whilst remaining robust to plausible implementation issues like excess catches (Sharma et al., 2020), and designing appropriate robustness tests can be accomplished via two-way dialogue during the MSE process, something that was evident in the case of the Atlantic bluefin (ICCAT, 2021b). Furthermore, having an MP in place to automate the setting of long-term sustainable fishing opportunities should in theory free up negotiation time at decision-making meetings for other fisheries management topics, like addressing sharing/allocation agreements and development of other management measures (Holmes and Miller, 2022).

The Atlantic mackerel case study highlights an example where existing governance structures and processes keep management and scientific interaction in MP development siloed (Figure 2). In the NEA, stakeholder input in MP development, MSE requests, and feedback on MSE results are constrained due to transparency and accessibility barriers at the policy-science interface, where coastal States and ICES interact. Taking lessons from other RFMOs there are a few easy ways to improve stakeholder engagement by augmenting the current management and science processes and introducing formal dialogue groups in the NEAFC/coastal States forums that increase the opportunities for stakeholder engagement. It continues to be important that each coastal State has inclusive and open stakeholder consultations at the national level, while new efforts should additionally be taken at the multi-lateral level to create a more interactive space for active stakeholder input in MSE development and MP adoption.

The addition of a formal working group to serve this purpose for LTMS development could be used to bridge the NEAFC/coastal States management forum, including improved consultation between coastal States managers and ICES scientists. Moreover, this could provide a space for scientists, managers, and other stakeholders to openly discuss the trade-offs associated with different management objectives and decisions once ICES issues its scientific advice. There may also be benefits in terms of improved attendance of ICES MSE workshops if stakeholders are aware and bought into the MSE process from the start – recognizing that ICES MSE guidelines ideally utilize their workshops to collect feedback from managers and other stakeholders on preliminary MSE results (ICES, 2019). It may also help ICES improve the implementation of its stakeholder engagement strategy (ICES, 2023). Figure 3 presents one possible change to the current process via the introduction of a new working group, but further work, utilizing practical examples and guidelines (Goethel et al., 2019; Miller et al., 2019; The Pew Charitable Trusts, 2022b) would be required by managers, scientists and stakeholders to establish a relevant and workable practice.

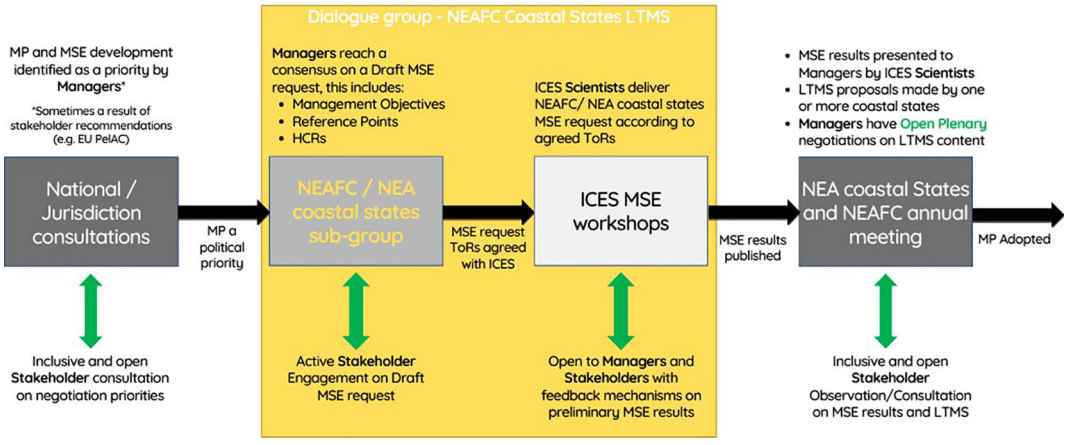

FIGURE 3
A conceptual model for how Northeast Atlantic Fisheries Commission (NEAFC)/ coastal States could improve stakeholder engagement during development of a management procedure (MP)/long-term management strategy (LTMS), via the establishment of a working group to increase dialogue among scientists, managers, and stakeholders. MSE, management strategy evaluation; EU PelAC, European Union Pelagic Advisory Council; HCRs, harvest control rules; ToRs, terms of reference; ICES, International Council for the Exploration of the Sea; NEA, northeast Atlantic.

This is just one example where development of MPs provides an opportunity for improved stakeholder engagement. Other RFMOs are even closer to harnessing these benefits. IATTC and the WCPFC both have fora for discussions among scientists, managers, and stakeholders. IATTC has occasional workshops to discuss its MSE for bigeye tuna, while WCPFC hosted a formal science-management dialogue meeting for the first time in 2022 to review its MSEs for the tropical tunas and South Pacific albacore (WCPFC, 2022). However, neither of these groups is formally established, so they lack the benefits of meeting consistently and having a formal, long-term workplan.

Although the movement toward the use of MSE to develop MPs produces several more touchpoints to engage stakeholders than the traditional approach to fisheries management, these opportunities are not always embraced by RFMOs. In our experience, the main reason for this is almost always capacity. RFMO meeting schedules are already full, so members may reject the addition of new working groups, capacity building efforts, or informal outreach. Extra meetings equate to more time, money and coordination, so some RFMOs have chosen to try to address MP matters within the confines of business as usual. However, due to the specific needs of MP development, specifically related to the iterative dialogue among scientists, managers and other stakeholders, the benefits of stakeholder engagement outweigh the costs – efficiently and consistently gathering the information needed to develop and adopt robust MPs can be less costly than a piecemeal process tacked on to existing meetings with already extensive agendas.

Adoption of MPs that set fishing opportunities has proven to be an improvement in the way that managers and scientists engage a variety of stakeholders in fisheries around the world. Where RFMOs follow the good practices identified above, they are likely to be successful in achieving the buy-in of stakeholders and therefore achieving adoption and implementation of long-term, sustainable management of the fisheries for which they are responsible. And in most cases, this will offer a system with more trust and better results than the regular political negotiation of fishing opportunities.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material. Further inquiries can be directed to the corresponding author.

Author contributions

All authors conceptualized the article and produced the original draft. AW conceptualized and produced the figures. SM drafted the Atlantic bluefin and Greenland halibut case studies. AW drafted the northeast Atlantic mackerel case study. GG drafted the Pacific saury case study. All authors contributed to the article and approved the submitted version.

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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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