

Observer paper submitted by The Pew Charitable Trusts
Ecological Objectives in Fisheries Management

To better understand how the ecosystem approach to fisheries management (EAFM) has been implemented globally, Pew conducted a rapid literature review on where operational ecological objectives exist in fisheries policies. This preliminary review found that many EAFM plans do not provide clear operational objectives to achieve their broader policy goals, but some comprehensive policy frameworks have incorporated ecosystem considerations directly into stock management and assessments. As NPFC operationalizes [Performance Review Recommendation 4.5.2](#) to better account for ecosystem-related interactions in its fisheries and based on the insights from this review, Pew recommends that the SC:

- Review existing CMMs and align with [FAO EAFM monitoring tool](#), noting that any identified gaps should be targets for new and/or improved CMMs;
- Consider how a process of ecological objective setting could be developed, including roles and responsibilities of (existing or possible future) committees/subsidiary bodies;
- Focus on small pelagic target species – as well as endangered, threatened and protected species (especially seabirds and sharks) - and ecosystem structure/function (food webs);
- Explore tools, such as management strategy evaluation, to incorporate ecological objectives into harvest strategies, and help ensure ecosystem dynamics and other pressures (e.g. climate change) are accounted for by management; and,
- Discuss how future NPFC objectives could become interoperable with other RFMOs in the North Pacific (e.g., WCPFC, IATTC).

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This is a rapid review of predominantly grey literature (e.g., management plans) to provide case study examples of operational objectives and other means by which governing bodies around the world are advancing or planning to advance ecosystem approaches to fisheries management (EAFM). The goal is to inform regional fisheries bodies on ecological and ecosystem objectives and their associated operational elements (indicators, metrics, etc.) to implement EAFM. This work is not exhaustive, and further efforts are planned.

For simplicity, we use EAFM to refer to ecosystem-based fisheries management approaches broadly, as the reviewed literature used various acronyms (e.g., EBM, EBFM, EAM, EAFM), sometimes interchangeably. Rather than parsing differences between these terms, this review focused on objectives and indicators that advance ecosystem-based management, regardless of the terminology used.

This submission helps provide evidence and facilitate dialogue on approaches to implement EAFM in the North Pacific Fisheries Commission's (NPFC) Convention Area.

DISCLAIMER: *Although this research was fact checked, it has not undergone our full quality review process, and any errors or inaccuracies are the responsibility of the authors. The views expressed herein are those of the authors and do not necessarily reflect the views of The Pew Charitable Trusts.*

1. Approach

This work was time- and effort-constrained, therefore we focused on identifying useful case studies as opposed to a systematic or comprehensive review, and kept the search broad and open-ended (i.e., it did not focus on the North Pacific region or Regional Fisheries Management Organizations (RFMOs)).

While not systematic or comprehensive, this work was a careful 'rapid review' of policy documents and the grey and peer-reviewed literature. Our review of policy documents focused initially on a search of the FAOLEX and EUR-Lex Databases, as well as those from the Australia Fisheries Management Agency from 2020-2025. Simply given time constraints, we were only able to take a cursory look at management documents from the UK House of Commons (Governing the Marine Environment, 2024-2025) and Canada (Advancing an Ecosystem Approach to Fisheries

Management: A discussion document, 2023). We leveraged the AI tool Elicit as well as Google Scholar and EBSCOhost to determine papers from the peer-reviewed literature.

This resulted in 794 documents from the grey literature and 307 in the peer-reviewed literature. Given time constraints, we briefly reviewed summaries or abstracts of these to prioritize which to review first. From there, we searched the document for an EAFM umbrella term (e.g., EBM, EBFM, EAFM) as well as for “ecological” or “ecosystem-based” to determine which to read in full. We recognize this process was somewhat subjective because we made the decision based on searching for terms and not a full read of the documents themselves. However, our goal here was not a comprehensive list of plans, policies, and literature, but case studies we could explore more deeply. Our choices in this process resulted in 17 possible examples from the grey literature and 7 from peer-reviewed research – a manageable set of documents in the time allotted that did provide useful insights, described next.

Please note that the case studies in the ‘Results’ section below are only a selection of those reviewed in this work and chosen as examples. We aim to demonstrate larger patterns from our work thus far.

2. Results

This rapid review identified several useful high-level insights. First, given the open-ended and broad search used by the internal research team, we found **many plans with EAFM language (e.g., *ecosystem-based, ecosystem approaches*) across geography and location, governance scope, and even type of plan**, from fisheries management plans to those on Nationally Determined Contributions to the Paris Agreement (NDCs), and from guiding or foundational principles to strategic and tactical objectives. This suggests **the message that such approaches or principles are important has been received by those tasked with managing and protecting the oceans**. It seems effectively translated from academic or research realms into governance, at least in theory.

Second, however, results also indicate that invoking – or not – the language of EAFM and its related acronyms directly does not mean the plan is ecosystem-based *in operation*. In fact, quite a few explicitly reference EAFM in one form or another as a guiding or foundational principle or objective but then offered little or no actions or operational objectives to make that actionable. In fact, some noted EAFM but then were conventional single-species fisheries management in practice and did not consider any ecological or ecosystem elements. Conversely, others did not explicitly reference EAFM in any form but did include actionable ecosystem-based objectives, actions, or indicators. Collectively, then, **the evidence for whether a plan or policy can be operationalized as ecosystem-based is in the indicators, metrics, and/or actions more specifically**.

Finally, given the wide range of plans and policies found, this limited review also shows **the diversity of ways EAFM is actionable**, varying by scale of governance, geographic location, and approach. The case studies chosen as examples to demonstrate this are in Annex 1 - Table 1, with their objective/goal and related indicators outlines, as well as which type of indicator is used. These can also be broadly categorized as:

1. Direct inputs
 - a. Risk assessment
 - b. Ecosystem Impact Assessment
 - c. Reference points or targets
2. Habitat protection or restoration
3. Bycatch considerations
 - a. Gear or fishing modifications or restrictions
4. Spatial measures or temporal closures
5. Stakeholder engagement

Here, the first category, direct inputs, are highlighted in Table 1 (1-3, in blue), with others included to indicate the wider range of ways that EAFM is being implemented or planned globally. Many plans have indicators from one or more categories, including tactical plans that do not explicitly invoke EAFM. The final cases (7 and 8, in green) are more holistic strategic EAFM plans underpinned with actionable objectives and indicators; example (8) is for freshwater fisheries in Malawi but included here to show how unique indicators and actions can be. These holistic yet actionable plans can be considered ideal cases, but do require time, effort, and resources.

We note that our cursory exploration of the peer-reviewed literature found no comprehensive recent assessment of EAFM objectives. Skern-Mauritzen and co-authors (2016) made a similar and far more concerted effort to evaluate tactical EAFM, but this work is almost a decade old. These authors assessed 1250 stocks across 22 international and two national fisheries management bodies and found only 24 examples – or 2% - where ecosystem drivers were included in tactical management advice. Their work offers a valuable benchmark for assessing progress in EAFM, suggesting substantial headway in the last decade: our work identified implementable or implemented EAFM, even with a much more limited review. In addition, while Skern-Mauritzen et al. (2016) focused on tactical advice, which would be included in our “(1) direct input” bucket, results here indicate initial findings of a wider range of ways people are working to advance EAFM around the globe.

Another relevant exploration is Fletcher (2020), which focused on Areas Beyond National Jurisdiction (ABNJ). This work presented results from an ABNJ Deep Seas Project regional overview of approaches related to the FAO EAFM management framework. As of its writing, the work found variability in results for RFMOs across 12 EAFM components. CCAMLR, GFCM, and NEAFC were highest scored for “non-retained species,” with CCAMLR and NEAFC also scoring among the highest for “cumulative ecosystem effects” and “climate.”

3. Conclusion and further work

This was a rapid review and not comprehensive, yet the case studies identified demonstrate that entities, across a range of geographic scales and location, are working to achieve EAFM, suggesting its importance is widely acknowledged. In addition, there is diversity in the how entities are implementing or planning to implement EAFM, illuminating a range of opportunities available to decision-making and management bodies to advance it that can fit their goals, interests, and resources. However, we posit the challenge now is ensuring we advance from recognizing the importance of EAFM, to the development and inclusion of actions and operational objectives to implement it in practice.

Our conclusions here are based on a rapid review and require further work to substantiate and more fully understand. We aim to continue this exploration, examining a wider range of plans and policy documents to confirm these initial findings. Further, we plan to investigate the implementation of examples and other case studies to ascertain their success and any lessons learned. This additional insight would further support guidance on advancing ecosystem-based approaches by not only putting forward options, but also insights into what worked, what did not, and why.

References

- Fletcher, W. J. (2020). A review of the application of the FAO ecosystem approach to fisheries (EAF) management within the areas beyond national jurisdiction (ABNJ). FAO. <https://doi.org/https://doi.org/10.4060/cb1509en>
- Skern-Mauritzen, M., Ottersen, G., Handegard, N. O., Huse, G., Dingsør, G. E., Stenseth, N. C., & Kjesbu, O. S. (2016). Ecosystem processes are rarely included in tactical fisheries management. *Fish and Fisheries*, 17(1), 165-175. <https://doi.org/https://doi.org/10.1111/faf.12111>

Annex I

Table 1. Select case study examples, highlighting objective/goal and related indicators and actions.

Plan (Country)	Ecological Objective	Indicator type(s)	Indicators and actions	Notes
PLANS WITH INDICATORS IN THE (1) DIRECT INPUTS CATEGORY				
1a. ASMFC: Delaware Bay Horseshoe Crab Harvest Recommendations (United States) ⁱ	Objective: <i>"Manage harvest of horseshoe crabs in the Delaware Bay to maximize harvest but also to maintain ecosystem integrity, provide adequate stopover habitat for migrating shorebirds, and ensure that the abundance of horseshoe crabs is not limiting the red knot stopover population or slowing recovery."</i>	(1) Direct inputs	Annual estimates of red knot abundance are an input into harvest policy functions.	
1b. ASMFC: Amendment 3 to Interstate FMP for Atlantic Menhaden (United States) ⁱⁱ	<i>"...to manage the Atlantic menhaden fishery in a manner which equitably allocates the resource's ecological and economic benefits between all user groups. The primary user groups include those who extract and utilize menhaden for human use, those who extract and utilize predators which rely on menhaden as a source of prey, and those whose livelihood depends on the health of the marine ecosystem."</i>	(1) Direct inputs (4) Spatial or temporal closures	Ecological Reference Points used to set fisheries targets and thresholds: • <i>"ERP target: maximum fishing mortality rate (F) on Atlantic menhaden that sustains Atlantic striped bass at their biomass target when striped bass are fished at their F target"</i> • <i>"ERP threshold: maximum F on Atlantic menhaden that keeps Atlantic striped bass at their biomass threshold when striped bass are fished at their F target"</i> States charged with identifying and protecting critical nursery areas "for estuarine dependent, marine migratory species in general and Atlantic menhaden in particular"	Atlantic menhaden are not overfished and overfishing is not occurring. 2023-2025 TAC was a 20% increase over that for 2021-2022 due to the "positive stock status ecological reference point-based management"
2. NOAA Alaska Geographic	Key Strategy 1.6: <i>"Promote ecosystem-based fishery management"</i>	(1) Direct inputs	• Provide ecosystem indicator data to stock assessments and for management decisions	

Plan (Country)	Ecological Objective	Indicator type(s)	Indicators and actions	Notes
Strategic Plan 2020-2023 (United States) ⁱⁱⁱ		(5) Stakeholder engagement	- Conduct IEAs - Implement and develop Fishery Ecosystem Plans for Aleutians and Bering Sea - Incorporate local and traditional knowledge Parties responsible for each are identified.	
3. AFMA Ecological Risk Assessment & Management (Australia) ^{iv}	Avoid: - Recruitment impairment and negative consequences for bycatch species and EPBC Act-listed spp or sub-components - Reduction in habitat amount, quality - Negative impacts on quality of the environment and composition/function/distribution/structure of the community	(1) Direct inputs	The Ecological Risk Management framework identifies, assesses, and manages risk from fishing for bycatch species, habitats, and the wider ecosystem, with risk assessment results feeding into management actions, including harvest and rebuilding strategies.	
PLANS WITH INDICATORS IN OTHER CATEGORIES				
4. WCPFC CMM 2018-03 ^v	<i>“Commission Members, Cooperating Non-members and participating Territories (CCMs) should, to the greatest extent practical, implement the International Plan of Action for Reducing Incidental Catches of Seabirds in Longline Fisheries (IPOA-Seabirds) if they have not already done so.”</i>	(3) Bycatch	Mitigation measures vary depending on location, vessel size, etc., and include requiring modifications to gear or fishing activities (e.g., weighted branch lines, hook-shielding devices, night setting with minimal deck lighting, dyed bait) CCMs are to describe the measures they require in their fleet in their annual reporting to the Commission, and are encouraged to advance research and development of mitigation measures.	

Plan (Country)	Ecological Objective	Indicator type(s)	Indicators and actions	Notes
5. NEAFC: Recommendation 19:2014 ^{vi}	<i>"1.The objective of this Recommendation is to ensure the implementation by NEAFC of effective measures to prevent significant adverse impacts of bottom fishing activities on vulnerable marine ecosystems known to occur or likely to occur in the NEAFC Regulatory Area based on the best available scientific information provided or endorsed by the International Council for the Exploration of the Sea (ICES).</i> <i>2. This Recommendation takes into account NEAFC's responsibility... on the protection of vulnerable marine ecosystems and to ensure the long-term sustainability of deep sea fish stocks and non-target species..."</i>	(2) Habitat (4) Spatial closures	Article 5 sets out spatial closures prohibiting bottom fishing. Article 6 delineates guidance implementing precautionary principles for exploratory fishing, which include plans to mitigate VME impacts and to identify VMEs in exploratory areas. Reporting and evaluation determined in Article 7. Article 8 establishes that vessels must quantify catch of VME indicators, and when the quantity is beyond a threshold (Article 9), fishing must cease and move on a predetermined distance, and the encounter must be reported to the flag state "without delay", and from there immediately to the Secretary, who will inform all Contracting Parties and ICES.	
6. SPRFMO: Conservation & Management Measure 03-2025 ^{vii}	<i>"The objective of the CMM together with CMM 03a-2025 (Deepwater Species) is, through the application of the pre-cautionary approach and an ecosystem approach to fisheries management, to ensure the long-term conservation and sustainable use of deep sea fishery resources, including target fish stocks as well as non-target or associated and dependent species, and, in doing so, to safeguard the marine ecosystems in which these resources occur, including inter alia the prevention of significant adverse</i>	(2) Habitat (3) Bycatch (4) Spatial or temporal closures	Related actions include: • Minimum 70% protection of suitable habitat for each indicator taxa • Members and CNCPs must require vessels to implement seabird mitigation measures and report bycatch annually to the Commission • Proposed bottom fishing must be evaluated for its impacts on VMEs; precaution is required when the presence of VMEs or adverse impacts cannot be adequately determined • Vessels must cease bottom fishing and move on a set distance when encountering VME	

Plan (Country)	Ecological Objective	Indicator type(s)	Indicators and actions	Notes
	<i>impacts on vulnerable marine ecosystems."</i>		indicator taxa, and report the encounter to the Member or CNCP	
HOLISTIC STRATEGIES WITH UNDERPINNING TACTICAL ACTIONS & INDICATORS				
7a. CCAMLR: Article II of the CAMLR Convention (Antarctica) ^{viii}	<i>"3. Any harvesting and associated activities in the area to which this Convention applies shall be conducted in accordance with the provisions of this Convention and with the following principles of conservation:</i> <i>...(b) maintenance of the ecological relationships between harvested, dependent and related populations of Antarctic marine living resources and the restoration of depleted populations to the levels defined in subparagraph (a) above; and</i> <i>(c) prevention of changes or minimisation of the risk of changes in the marine ecosystem which are not potentially reversible over two or three decades, taking into account the state of available knowledge of the direct and indirect impact of harvesting, the effect of the introduction of alien species, the effects of associated activities on the marine ecosystem and of the effects of environmental changes, with the aim of making possible the sustained conservation of Antarctic marine living resources."</i>			Article IX sets out that "[t]he function of the Commission shall be to give effect to the objective and principles" in Article II. Together, Article II is guiding language operationalized by Article IX.
7b. CCAMLR: Conservation Measure 51-01 ^{ix} (Antarctica)	<i>"...the Scientific Committee agreed a trigger level of 620 000 tonnes, adopts the following measure in accordance with Article IX of its Convention"</i>	(1) Direct inputs (3) Bycatch	- Krill harvest is determined using a population model (Generalized Yield Model, GYM) and decision rules that function as ERPs, to set a "trigger limit" for the fishery that aims to leave krill stock in the water for krill-dependent predators^x. This limit is also to be distributed spatially for further ecosystem protection (see CM 51-04 and 51-07, below). - The krill fishery must minimize bycatch of seabirds and mandates marine mammal exclusion devices to minimize their bycatch.	
7c. CCAMLR: Conservation Measure 51-04 ^{xi} (Antarctica)	<i>"[Exploratory fishing] in any statistical subarea or division shall cease when the reported catch reaches the specified catch limit and that subarea or division shall be closed to fishing for the remainder of the season. No more than 75% of the catch limit shall be</i>	(1) Direct inputs	Similar to CM 51-07 (below), the impetus is to avoid localized depletion and ensure enough available krill remains in the water for krill-dependent and land-based predators.	

Plan (Country)	Ecological Objective	Indicator type(s)	Indicators and actions	Notes
	<i>taken within 60 n miles of known breeding colonies of land-based krill-dependent predators."</i>			
7d. CCAMLR: Conservation Measure 51-07 ^{xii} (Antarctica)	<i>"Noting the need to distribute the krill catch in Statistical Area 48 in such a way that predator populations, particularly land-based predators, would not be inadvertently and disproportionately affected by fishing activity..."</i>	(1) Direct inputs	Distributed the 'trigger limit', at which the krill fishery would close for the season, across space by allowing only pre-agreed percentages of that limit to be landed in smaller subareas. The goal was to avoid localized depletion and ensure krill was available for krill-dependent predators.	CM 51-07 is no longer in force.
8. National Plan of Action for Small-Scale Fisheries (Malawi) ^{xiii}	Output 1.2: <i>"Ecosystem-based management and biodiversity practices among all small-scale fisheries (SSF) stakeholders promoted."</i>	(2) Habitat (4) Spatial closures (5) Stakeholder engagement	• # of catchment MPs developed collaboratively^{xiv} • # of fruit tree seedlings and tree survival^{xv} • # of fish sanctuaries established • # of SSF communities with recycling systems • # of functional WASH (Water, Sanitation, and Hygiene) beach communities • # of SSF groups trained in Ecosystems and Fisheries Management • # of landing sites w/co-management plans All indicators have a "means of verification"; plan also outlines risk, assumptions, time frame, potential partners, budget and lead agency.	Plan developed with extensive stakeholder engagement; it was initiated in April 2021 and launched September 2023.

ⁱ Source: https://asmfc.org/wp-content/uploads/2025/02/DBETC_ARM_HSC_2024_HarvestRecommendationMemo.pdf

ⁱⁱ Sources: [Atlantic Menhaden Amendment 3 - Atlantic States Marine Fisheries Commission](#) and [ASMFC Menhaden FMP Update 2025](#)

ⁱⁱⁱ Source: <https://www.fao.org/faolex/results/details/en/c/LEX-FAOC223982/>

^{iv} Source: [Ecological risk management strategies | Australian Fisheries Management Authority](#)

^v Source: [CMM 2018-03 - Conservation and Management Measure to mitigate the impact of fishing for highly migratory fish stocks on seabirds](#)

^{vi} Source: [Current Measures | North-East Atlantic Fisheries Commission](#)

^{vii} Source: [CMM 03 Bottom fishing » SPRFMO](#)

^{viii} Source: [CAMLRL Convention text | CCAMLRL](#)

^{ix} Source: [Schedule of Conservation Measures in Force 2024/25 | CCAMLRL](#)

^x Source: https://fishdocs.ccamlr.org/SAreport_48_KRI_2022.pdf

^{xi} Source: [Schedule of Conservation Measures in Force 2024/25 | CCAMLRL](#)

^{xii} Source: [Schedule of Conservation Measures in Force 2021/22 | CCAMLRL](#)

^{xiii} Source: <https://www.fao.org/faolex/results/details/en/c/LEX-FAOC228247/> - note this plan, although for freshwater, is included given the unique range of indicators rolling up to a holistic strategy.

^{xiv} Collaboration between Beach Village Committees (BVCs)/River Village Committees (RVCs) and Village Natural Resource Management Committees (VNRMCs)

^{xv} Fruit tree seedlings improve catchment management (including restoring degraded areas and better soil and water conservation), diversify livelihoods, and encourage better agricultural and regeneration practices as well as community engagement among SSF households in Malawi.