Turning Aspiration to Action: Challenges of Making the Ecosystem Approach Operational in Fisheries

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Introduction

Fisheries are a major impactor on the marine system and also a major provider of wealth, security, identity, and food to humanity. At its core, the ecosystem approach acknowledges that these two axes (impact and services) need to be reconciled. This should be done through informed management that explores the space between these axes in an equitable manner following what have been described as 'fuzzy' principles. The ecosystem approach to fisheries management is an accepted societal objective. Many around the world are working to make this aspiration a reality through iterative steps; an evolution of ideas, processes, and structures. These steps have highlighted challenges and some of these are explored here.

Many natural scientists see ecosystem based management as a rationale to demand more resources for their science. The idea that more knowledge automatically means better management is prevalent, ‘we just need to know more to manage better’. In the fisheries realm this seems to be about knowing more about energy flow and trophic interactions. The problem is that an understanding of the entire fisheries system is an afterthought. Policy development, institutional change, and reconciling economic and social objectives in an equitable manner all require something different than just more knowledge of whom eats whom. This is clear from the principles of the ecosystem approach described by the Convention on Biological Diversity and the advice on operational implementation in fisheries by the Fisheries and Agriculture Organization of the United Nations.

1 S.M. Garcia and K.L. Cochrane, “Ecosystem Approach to Fisheries: A Review of Implementation Guidelines,” *ICES Journal of Marine Science* 62 (2005): 311–318.
2 K.J. Sainsbury, P. Gullestad and J. Rice, “Design of Operational Management Strategies for Achieving Fishery Ecosystem Objectives,” *ICES Journal of Marine Science* 57 (2000): 731–741; J. Rice, “Evolution of International Commitments for Fisheries Sustainability,” *ICES Journal of Marine Science* 71 (2014): 157–165.
But are we developing a fisheries system that can deliver these principles by adjusting existing management and governance structures to achieve the ecosystem approach? An analysis of the European Union (EU) fisheries management system found an institutional gap between fisheries and environmental policy frameworks. This gap results in limited integration of broader environmental concerns leading to a standoff between decision-makers, creating frustration for the involved agencies. When executing ecosystem based fisheries management, some of the anthropogenic pressures from fishing may not be managed by the fisheries agencies, and conversely the consequences for the environment of fishing may fall under the remit of non-fisheries agencies. The need for co-ordination in management and governance structures is clear.

Further, policy developers and regional managers are generally reluctant to acknowledge the need to reconcile multiple objectives across multiple interests, as found in a range of local, national, and regional legislation. An example is the ‘horrendogram’ of United Kingdom marine legislation. Implications of this for implementing the ecosystem approach arise in terms of the tools to inform management, including management strategy evaluations, trade-off tools, and decision-support tools. In many of these, there is an underlying assumption of a central decision-making body, or event, where independently derived evidence can be weighed up and consequences explored, leading to an agreed prioritization of management objectives. In reality, though, many knowledge brokers are unaware of the dynamics in governance frameworks and are not ready for the diplomatic role of working with agencies with their own differing power, objectives, and rationales. There is an assumption by tool developers that the governance system likes making decisions, that the decision-making process is linear, and consensus building is part of the knowledge provision process.

A further challenge in implementing the ecosystem approach lies in the inertia of many existing fisheries management frameworks. They use quantitative engineered evidence for decision-making, applying decision frameworks

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3 P. Ramírez-Monsalve et al., “Institutional Challenges for Policy-making and Fisheries Advice to Move to a Full eAFM Approach Within the Current Governance Structures for Marine Policies,” *Marine Policy* 69 (2016): 1–12.

4 R.L. Stephenson et al. “Practical Steps toward Integrating Economic, Social and Institutional Elements in Fisheries Policy and Management,” *ICES Journal of Marine Science* 74 (2017): 1981–1989; A. Rindorf et al., “Moving beyond the MSY Concept to Reflect Multidimensional Fisheries Management Objectives,” *Marine Policy* 85 (2017): 33–41.

5 S.J. Boyes and M. Elliott, “Marine Legislation—The Ultimate ‘Horrendogram’: International Law, European Directives and National Implementation,” *Marine Pollution Bulletin* 86 (2014): 39–47.
and risk thresholds, with the consequences of actions explored in relation to targets or limits. Ecosystem based fisheries management, representing the convergence of resource exploitation and conservation policies, challenges this well-oiled machine. In considering socio-ecological trade-offs, often a clear decision framework with targets and limits is yet to be established, and options with likely consequences are explored in a less structured manner. Practitioners in this system, building on the integrated ecosystem assessment cycles, acknowledge the need for participatory tool development to inform management, for an iterative and consultative process, and for monitoring and adaption. This challenges the roles played by actors in the system with demands to maintain saliency, credibility, and legitimacy in an evolving framework.

Faced with the above set of challenges, where are we now in terms of turning aspiration into action? If we take three issues—maintaining biodiversity, provision of knowledge, and reference points (approaches to optimize catch)—are management systems delivering?

**Biodiversity**

In considering biodiversity, both in terms of habitat and species, management plans tend to be as a result of local concerns (with the exception of the Commission for the Conservation of Antarctic Marine Living Resources), resulting in few generic frameworks for fisheries management plans that account for biodiversity. Certainly, fishing at traditional maximum sustainable yield (msy) will not deliver objectives in terms of securing biodiversity. There are good examples in some locations, such as successful local and fleet-based approaches in Australia, and the use of a cap on total removals of fish, as an ecosystem conservation method, as in Alaska.

However, while many systems around the world manage through impacts on assessed fish stocks, experience shows us that biodiversity concerns are

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6 J. Rice and P. Mace, “Bio-ecological Dimensions of Fisheries Management, Biodiversity and Governance,” in *Governance of Marine Fisheries and Biodiversity Conservation: Interaction and Coevolution*, eds., S.M. Garcia, J. Rice and A. Charles (Chichester: John Wiley & Sons Ltd., 2014), 55–67.

7 M. Dickey-Collas, “Why the Complex Nature of Integrated Ecosystem Assessments Requires a Flexible and Adaptive Approach,” *ICES Journal of Marine Science* 71 (2014): 1174–1182.

8 C. Röckmann et al., “The Interaction Triangle as a Tool for Understanding Stakeholder Interactions in Marine Ecosystem Based Management,” *Marine Policy* 52 (2015): 155–162.

9 B. Worm et al., “Rebuilding Global Fisheries,” *Science* 325, no. 5940 (2009): 578–585.
often related to specific fleets or gears, rather than impacts on stocks. Yet, in the EU, where some types of gear are associated with fleets from specific countries (e.g., demersal and pelagic fisheries in the Baltic Sea, beam trawling in the North Sea), the idea of differentially managing gear types or fleets would suggest preferential treatment of certain countries, and also challenge relative stability (the system of allotting catch shares between member states of the EU).

In the Northwest Atlantic Fisheries Organization and North East Atlantic Fisheries Commission (NEAFC) areas of the North Atlantic, we see an evidence-based approach to spatially define and conserve vulnerable marine ecosystems (VMES) from fishing impact that is transparent and accepted by stakeholders. The NEAFC VMES provide a rare example of fisheries and environment agencies working together as they have been established in partnership with the OSPAR Commission to protect the environment of the North-East Atlantic. The European Commission recently asked the International Council for the Exploration of the Sea to examine the trade-offs between benthic impact of fishing gear with weight and value of the catch, which occurred with stakeholder engagement and consultation with regional sea environmental conventions.

**Knowledge**

The knowledge being used in fisheries management is also changing. Concerns about the impact of fishing on food web dynamics and bycatch of sensitive species has hit the headlines in locations such as Australia, South Africa, the Americas, and Europe, which has led to questions about the social license of fisheries to operate. It has also led to a great improvement in the quantity and quality of the science being made available to decision-makers. While that improvement in the credible knowledge base has not necessarily resulted in an informed decision process, it has improved the awareness of knowledge brokers of the arena into which their evidence flows. This is accompanied by the realization that feelings and lobbying are as powerful a tool in fisheries management as the science, and despite best efforts, the lobbying and science often become intertwined.

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10 International Council for the Exploration of the Sea, “EU request on indicators of the pressure and impact of bottom-contacting fishing gear on the seabed, and of trade-offs in the catch and the value of landings,” *ICES Special Request Advice sr.2017.13*, http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2017/Special_requests/eu.2017.13.pdf.
There is also momentum to increase the knowledge base using traditional knowledge, fishers’ knowledge, or citizen science. Local and regional initiatives have illustrated the value of a range of approaches. The boundaries of what is credible information are changing. Knowledge brokers, however, need to ensure credibility of knowledge provision emphasizing that all actors act responsibly and in good faith. They should not be naïve to the influence of interest or the need to show the data trails leading to transparent decision-making.

**Reference Points**

The nature of MSY is also changing. Starting as a tool for United States' foreign policy, it has encountered difficulties. While driving necessary reductions in fishing mortality around the world, the idea that biomasses can be fixed independently and managed on an individual stock-by-stock basis has been discredited. The need for variable reference points that respond to environmental variability is widely recognized. Likewise a recognition that not all fish stocks can be fished at MSY simultaneously due to species interactions and mixed targeting by fleets has led to the concept of ‘pretty good yield’, where yield can be forfeited to ensure that more stocks are fished closer to MSY than previously. This concept is now at the center of the EU multi-annual plans for the Baltic and North Seas.

In Europe, MSY is being further adapted, with target fishing mortality (Fmsy) now being assessed for impact on biomass; the Fmsy reference points include consideration of preventing biomass falling below limit reference points. In the future, the discussions about evolutionary effects of fishing, size of fish in populations, and balanced harvesting are likely to have consequences for fishing targets.

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11 B. Mesnil, “The Hesitant Emergence of Maximum Sustainable Yield (MSY) in Fisheries Policies in Europe,” *Marine Policy* 36 (2012): 473–480.
12 National Research Council, Committee on Evaluating the Effectiveness of Stock Rebuilding Plans of the 2008 Fishery Conservation and Management Reauthorization, *Evaluating the Effectiveness of Fish Stock Rebuilding Plans in the United States* (Washington, DC: National Academies Press, 2014).
13 A. Rindorf et al., “Food for Thought: Pretty Good Multispecies Yield,” *ICES Journal of Marine Science* 74 (2017): 475–486.
Summary

In summary, despite not all the developments being labeled as the ecosystem approach to fisheries management, the aspiration is turning into action, and beginning to deliver. Fisheries management approaches need to incorporate fleet management in addition to stock-focused approaches as it is the way that fisheries operate that determines their impact on the ecosystem. Actors across the system also need to appreciate that multiple objectives and interests need to be reconciled. The dominance of the biology focus in fisheries needs to be tempered to address community, institutional, and governance challenges. The evidence base should encompass multiple forms of available knowledge, and the operational gap between fisheries and environmental policy frameworks needs to be addressed.