An Overview of Ecosystem Based Fisheries Management

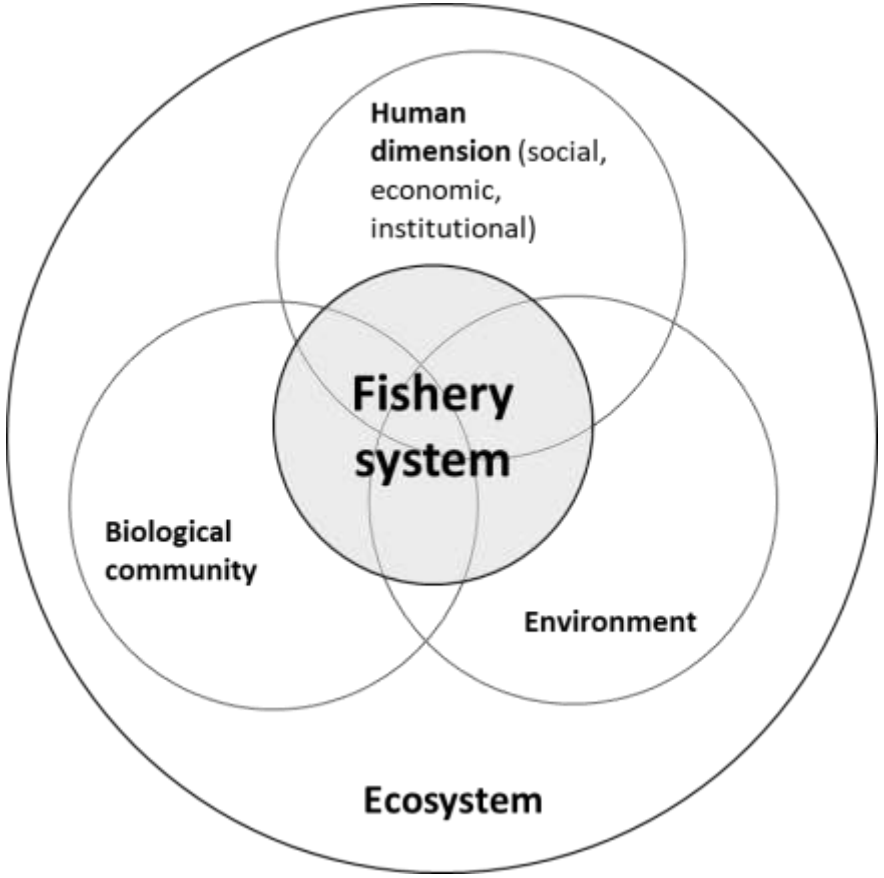
Michael Harte
Oregon State University & SAERI
michael.harte@oregonstate.edu

Questions about EBFM

- Has the concept of EBFM been sufficiently developed to give guidance to fisheries management?
- To what extent are the Falklands already incorporating EBFM standards and concepts?
- What tools are used to effectively implement EBFM?
- What additional steps are needed if EBFM moves from the periphery to a more established place in FI fisheries management?

EBFM and fisheries management

- The concept of EBFM is several decades old and is now ubiquitous.
- It is applied in different ecological, social, economic, institutional and political contexts around world.
- There is no single, unambiguous definition of EBFM.



EBFM and fisheries management

Broadly defined EBFM means:

- *Fisheries management outcomes are placed in a broader ecosystem context, recognizing that ecosystem objectives are socially determined, based on existing scientific knowledge and societal expectations for healthy marine ecosystems*
- The focus is on key elements involved in the practical application of EBFM in ways that bring about tangible benefits to fisheries management.

Establishing objective EBFM standards and benchmarks

- Fisheries management practices consistent with EBFM are well documented and are applied in practice.
- These practices do not change the fundamental objectives of fisheries management.
- Best EBFM practices implemented well lift benchmarks for effective and resilient fisheries management.
- EBFM implemented poorly diverts money and people away from important, legislatively mandated management practices.
- Large, complicated models need not apply!

Ecological and Social Attributes of EBFM Best Practice

Five main EBFM attributes:

1. Defining ecosystems and their boundaries;
2. Managing fishing mortality on target species;
3. Accounting for the footprint of fisheries;
4. Managing for environmental change & climate adaptation; and
5. Integrating economic and social factors into fisheries management advice.

1. Defining ecosystems and their boundaries

The appropriate spatial scale and EBFM area boundaries are determined by a combination of:

- The geographical extent of fishing activities to be managed;
- species caught; and
- ecosystem characteristics.

2. Managing fishing mortality on target species

The impacts of fishing on target stocks are managed and take account of impacts on the wider ecosystem as well as to managed target stocks for productivity, size and age structures

3. Accounting for the footprint of fisheries

These impacts include:

- The effects of fishing on habitats and ecological communities on the seabed;
- The incidental (non-targeted) fishing related mortality of other fish; invertebrates, seabirds, and marine mammals; and
- Changes in marine food webs caused by fishing.

4. Managing for environmental change & climate adaptation

- Means looking at the interactions between biological and physical aspects of ecosystems while accounting for the effect of environmental changes on these interactions.

- Changes in environmental variables such as temperature, ocean acidity, and salinity can cause fundamental changes in the species found in a region and their abundance.

5. Integrating economic and social factors into fisheries management advice

- Recognizes that EBFM is a process that takes place in the context of varying government, business and community objectives that reflect various and sometimes competing values, wants, and needs.

Process Attributes of EBFM Best Practice

Three main process-related foundations for EBFM:

1. Science based decision making;
2. Governance that incentivizes action; and
3. Adaptive management

1. Science based decision making

- Management and policy decisions are evidence-based and informed by rigorous, scientific, social and economic information.

- This information is multi-faceted and informs ecological, social, and economic deliberations

2. Governance that incentivizes action

- Recognizes the limits of implementing EBFM without the assistance & support of the fishing industry and broader stakeholders.
- Align management systems and institutions to incentivize fishing companies and stakeholders to engage proactively.
- Co-create knowledge and collaboratively manage fisheries.
- Well-designed ITQ systems together with fisheries accords are very good examples of this approach.

3. Adaptive management

- Adaptive management means realizing that all the factors affecting ecosystems are not known, so some precaution must be exercised together with the flexibility for quick action.

Recap

- EBM is increasingly part of everyday fisheries management and its key attributes well defined.
- EBFM does not change fundamental fishery management objectives.
- EBFM is not about less fishing and managing more. It is about smarter and more informed fishing and management

Questions and discussion?

To what extent is the Falklands incorporating EBFM attributes in Fisheries Management?

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- The Falklands Fisheries Ordinance (2005) does not mention or mandate EBFM.
- Purpose and principles of the Ordinance (sections 8, 9, 10, 11 and 12) are consistent with EBFM principles and attributes.
- Agreed in Principle by ExCo 16/21

To what extent is the Falklands incorporating EBFM attributes in Fisheries Management?

	EBFM Attributes							
				Accounting for footprint of fisheries				
Council	Social & economic integration	Defined ecosystems	Controlling mortality on target species	Habitat	Non-target species catch	Trophic effects	Eco-system Change	
Pacific	XX	XXX	XXX	XXX	XXX	XX	XX	
Mid-Atlantic	X	X	XX	X	X	-	-	
New England	XXX	XXX	XXX	XX	XXX	X	X	

-	Not considered
X	Under discussion
XX	Considered/implementation underway for some fisheries//dimensions
XXX	Comprehensively considered and integrated into management activities and decision making-

1. Defining ecosystems and their boundaries

Current Standing in the Falkland Islands

- - Not considered
- X - Under discussion
- XX - Considered/implementation underway for some fisheries/dimensions
- XXX - Comprehensively considered and integrated into management activities and decision making

Examples?

1. ?
2. ?
3. ?

2. Managing fishing mortality on target species

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Examples?

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3a. Accounting for the footprint of fisheries: Habitat

Current Standing in the Falkland Islands

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X Under discussion
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Examples?

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3b. Accounting for the footprint of fisheries: Non-target species

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Examples?

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3. ?

3c. Accounting for the footprint of fisheries: Trophic effects

Current Standing in the Falkland Islands

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Examples?

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4. Managing for environmental change & climate adaptation

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5. Integrating economic and social factors into fisheries management advice

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Tools to advance EBFM in Fisheries Management

What comes next?

A useful distinction can be drawn between core and extended EBFM.

Core EBFM refers to those aspects that can, and should, be incorporated into everyday fisheries management practices.

Core EBFM activities include:

- Determining ecosystem boundaries;
- Controlling the fishing mortality on target species;
- Fishing impacts on benthic habitats; and
- Accounting for social and economic impacts on communities

What comes next?

Extended attributes pose important research and management questions & challenges, either because of the state of science, complexity of issue, expense of research, &/or complexity & cost of changes needed for fisheries management systems and processes.

- Extended EBFM activities include:
- Accounting for the impacts of fishing on trophic levels; and
- Managing for ecological change.

What comes next?

Managing marine biological resources in shifting conditions		
	Description	**Tools**
Detecting changes in the ecosystem	Detecting changes in the ecosystem prevailing conditions.	Ecosystem indicators (Individuals, population & community indicators; System level indicators), reference points, trend analysis and shiftograms.
Understanding species responses	Describing and predicting ecosystem and/or species responses to different pressures.	Ecosystem models (table 1), species distribution models, game theory approaches and biodiversity models.
Incorporating this information into the decision-making process	Implementing frameworks that allows to incorporate ecosystem realism into the advice-giving process (e.g., Integrated ecosystem plans, fisheries ecosystem plans, ecosystem overview reports) as well as tools to decide on a management action.	Using ecosystem models as operational models in the MSE. Adjusting single species reference points with ecosystem information. Incorporating environmental effects explicitly in the MSE. Risk-equivalent approaches.

FIGURE 1 Guideline for managing marine biological resources in shifting conditions

Ruiz- Díaz 2022

Tools to progress EBFM Practices: Ecological Modeling

Ecological modeling address the dynamics of marine food webs and explore variability in ecosystems.

1. Conceptual models help understand ecosystem processes;
2. Strategic models explore broad scale ecosystem; and
3. Tactical models supporting the day-to-day fisheries management including setting harvest control rules.

Models of Intermediate Complexity for Ecosystem assessments are amenable to tactical decision-making, complementing existing single species models already common place in fisheries management procedures.

Tools to progress EBFM Practices: Indicators and thresholds

- Indicators allow the evaluation of an ecosystem's status and the identification of changes in the prevailing conditions.
- A good indicator has a theoretical foundation, is sensitive to change, is easily quantifiable, cost- effective, and straightforward to understand.
- Indicators connect between management and science serving as a the foundation for determining management actions.
- Thresholds allow indicators to be linked to management procedures and decision-making.

Tools to progress EBFM Practices: Risk assessment

- Risk assessment acknowledges that some components of an ecosystem are more vulnerable to fisheries pressure than other components. Identifying and quantifying the risk these components face helps to focus management attention and scientific resources.
- Often time & resources are devoted to the consideration of uncertainty and the use of the precautionary principle.
- The challenge with this approach is that uncertainty does not always matter.

Tools to progress EBFM Practices: Risk assessment

- Devoting scientific resources and management attention wherever uncertainty is present is wasteful and can result in poor prioritization.
- Uncertainty is a component of risk, but risk also incorporates the consideration of consequences.
- A decision can have a large degree of uncertainty but have little to no adverse consequences
- EBFM encourages managers, scientists, and stakeholders to approach policy questions through a risk-management lens rather than an uncertainty lens.

Questions and discussion?

Where should we put our time and effort?

1. Defining ecosystems and their boundaries

Future work:

- Less
0 About the same
+ More

Examples of maintained /changed work streams and reasons?

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2. ?
3. ?

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2. Managing fishing mortality on target species

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3a. Accounting for the footprint of fisheries: Habitat

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3b. Accounting for the footprint of fisheries: Non-target species

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Examples of maintained /changed work streams and reasons?

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3c. Accounting for the footprint of fisheries: Trophic effects

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4. Managing for environmental change & climate adaptation

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5. Integrating economic and social factors into fisheries management advice

Future work:

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Examples of maintained /changed work streams and reasons?

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Wrap up discussion

Can EBFM help the Falkland establish ecosystem/change climate- smart adaptation plans that strengthen the fishing industry's resilience in the medium and long term?