Operationalising Ecosystem-Based Management for forage species through ICES experience

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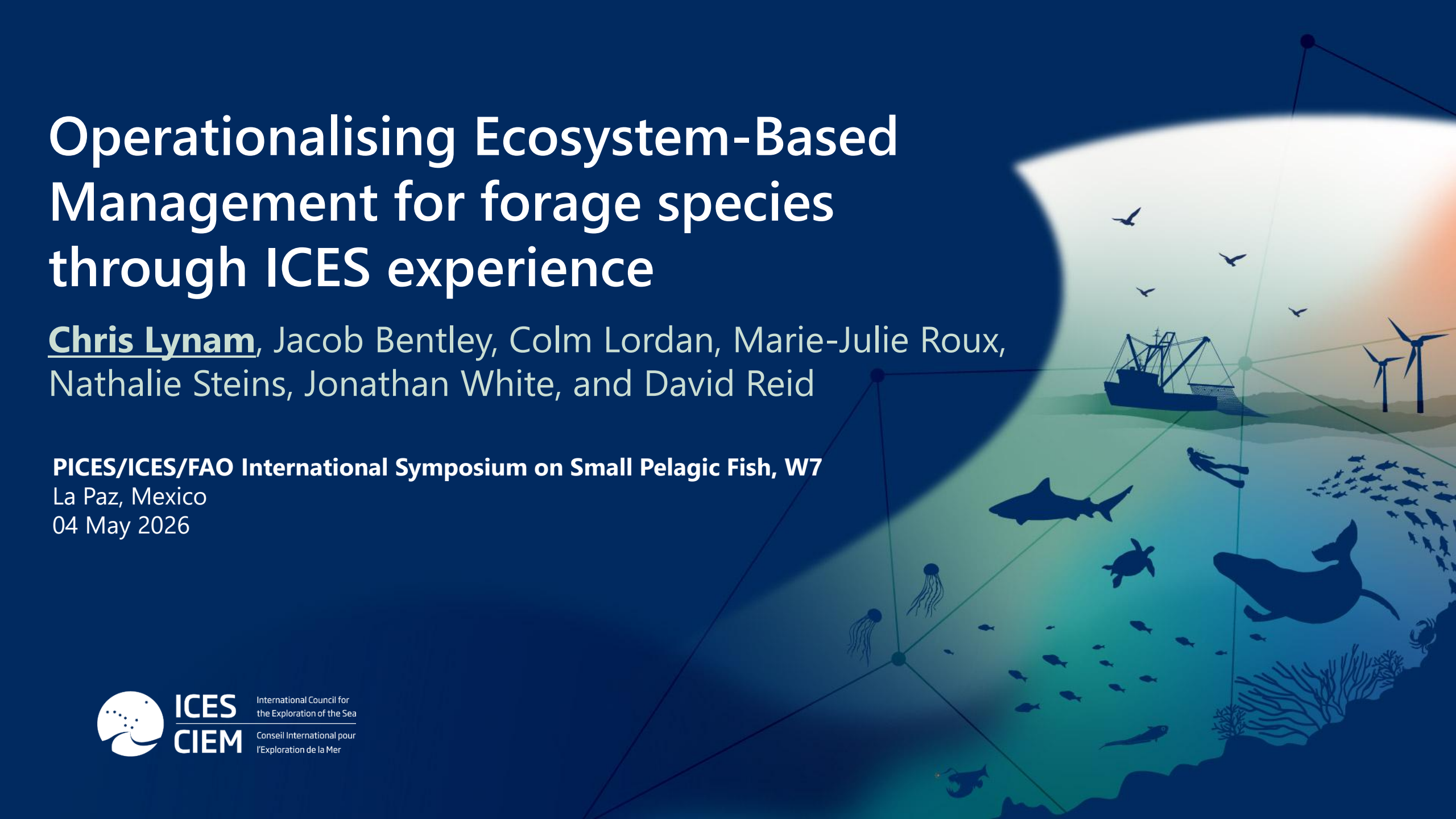

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Ecosystem context is high on the agenda

- How can we adapt fisheries assessments and management advice to account for changing ecosystems, climate, and socioeconomic landscapes?
- How can we account for multispecies and mixed-fisheries interactions?
- How can we account for the needs of forage fish predators?
- How can fisheries management contribute to wider ecosystem recovery?

Requesters in annual fish advice ask for simple point estimates (e.g. for catch, SSB)

Stock productivity and fishing opportunities are influenced by:

- stock status and historical exploitation levels
- environmental variability
- ecosystem interactions
- other sectors (agriculture & industry (eutrophication, dead zones), offshore renewable energy, ..)

Decisions made for fisheries have implications for wider ecosystem management objectives (e.g., KM-GBF and Good Environmental Status)

Requesters of advice need to balance differences in risk tolerances for biological, ecological and socioeconomic consequences of fishing activities. So far this has been facilitated by a "one number" approach.

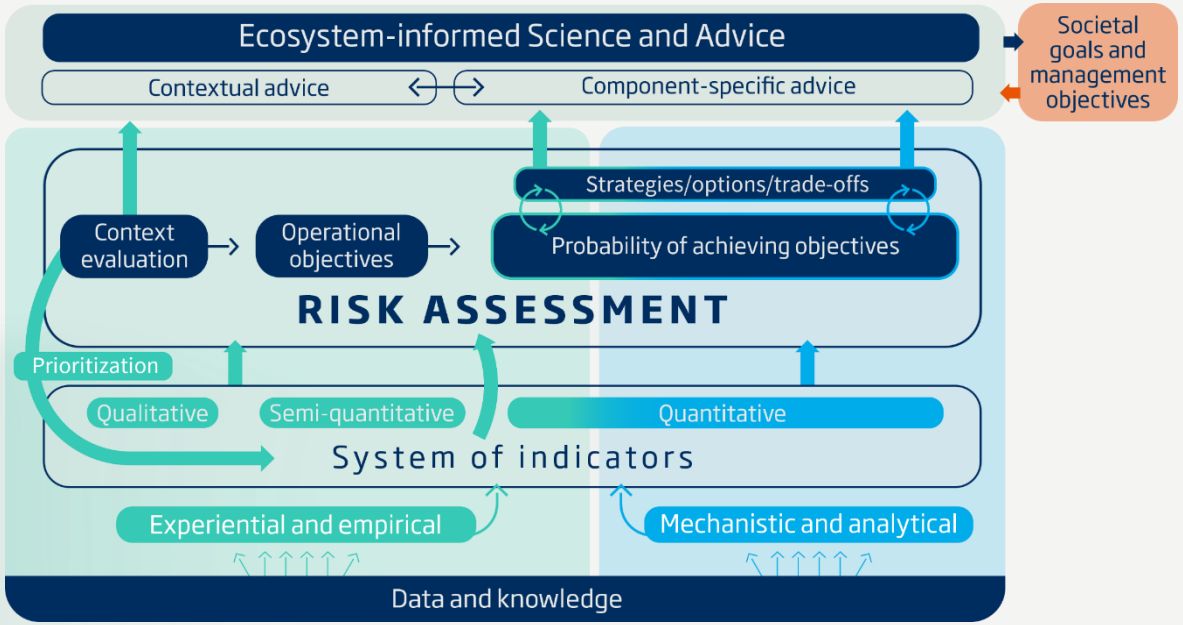
Ecosystem context exists in current advice, but risks are not visible to decision makers

Forage fish fishing opportunities can impact, and be impacted by:

Environmental drivers	Ecosystem function	Multispecies interactions	Non-target impacts	Mixed-fisheries interactions	Economic impacts	Social impacts

EBM framework

Ongoing efforts to make risks more visible, without undermining the usefulness and usability of advice, by operationally applying ICES Framework for Ecosystem-Informed Science and Advice (FEISA)



Integration and evolution of ICES science and advice will support EBFM for forage fish

Integration of ICES science and advice

- Integrating advisory products (e.g., Ecosystem, Fishery, and Aquaculture Overviews) and moving towards a more modular, objective orientated approach
- Creating fora to integrate scientific disciplines for advisory purposes (e.g., WKFISHECO)

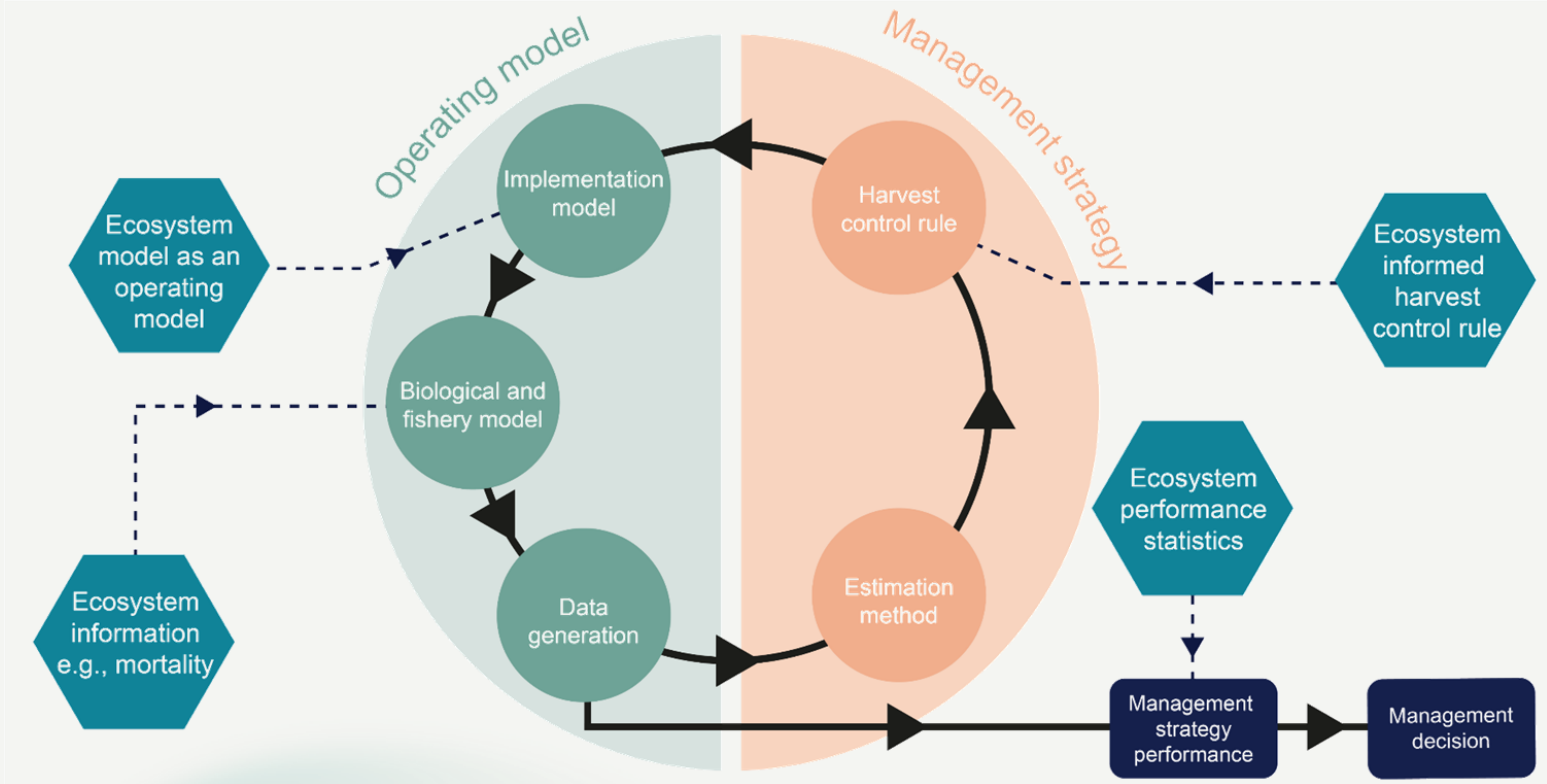
Fourth generation Ecosystem Overviews

- Building around the priorities of advice requesters and stakeholders
- Identifying links between ecosystem information, management objectives, and management levers

MSE offers a route to EBFM for forage fish, but current ICES applications only go so far

MSEs are used within ICES, and **environmental variability is increasingly being brought into Operating Models (OMs)**, but we are still scratching the surface in terms of their potential to address wider objectives:

- Most MSEs still focus on single-species questions, using single-species OMs
- Wider ecosystem objectives and performance statistics, including social and economic dimensions, are less developed than catch and stock metrics

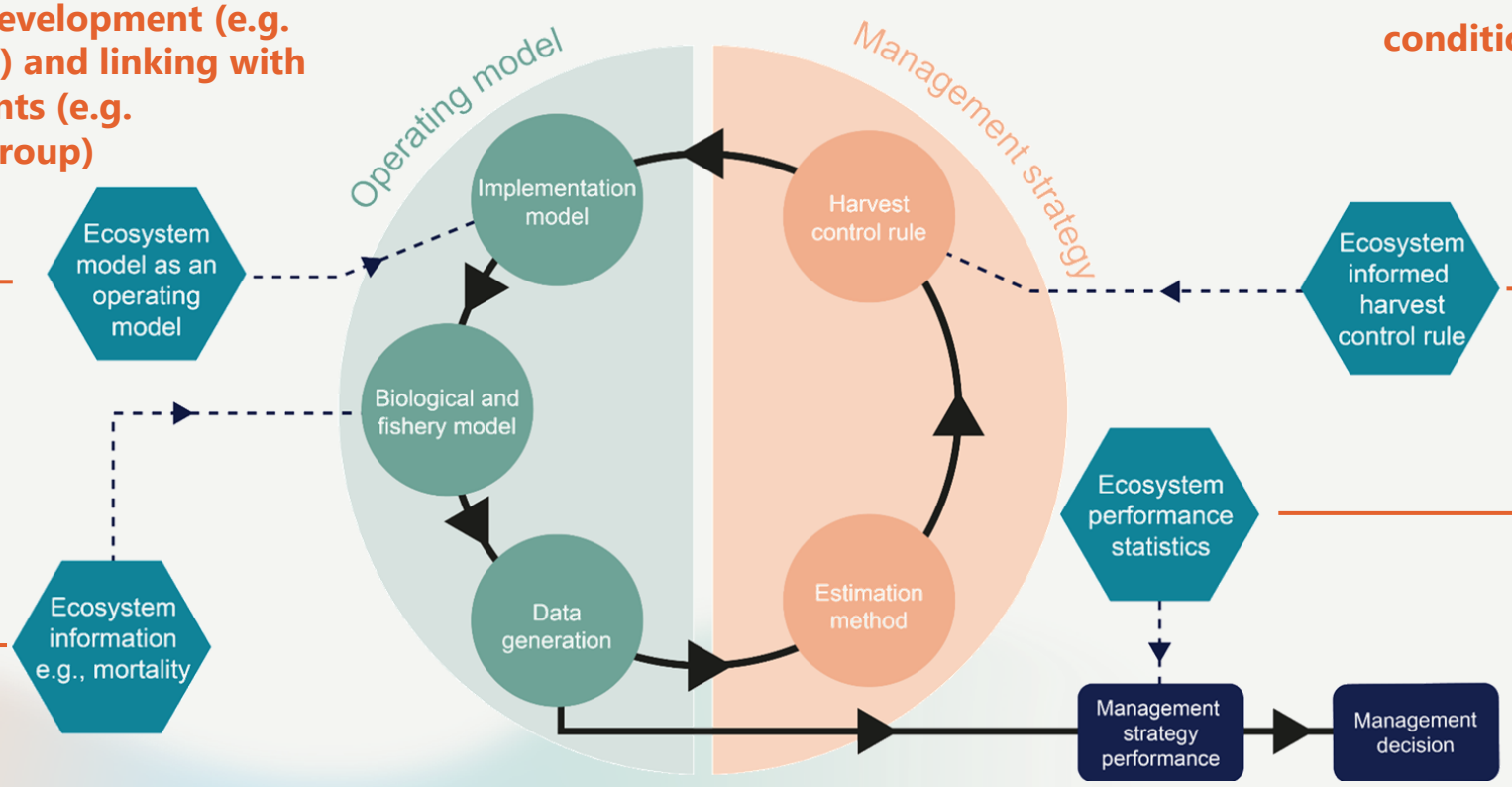


MSE offers a route to EBFM for forage fish, but current ICES applications only go so far

How are we making progress?

Strengthening processes for multispecies and ecosystem model development (e.g. WGSAM, WGFOODWEB) and linking with single species assessments (e.g. Benchmark Oversight Group)

Developing Ecological Reference Points and catch options conditioned on ecosystem effects (e.g. ICES F_{eco})



Management Objectives workshop (led by WGBESEO) and strategic initiative on biodiversity

Identifying links between oceanography and stock productivity (e.g. WGOOFE, WKFISHECO)

EBFM for forage fish requires ecosystem risk and objectives to be explicit in advice

During a workshop with requesters of ICES advice and stakeholders, participants prioritised the stages through which they would like to see EBFM incrementally progress

Priority 1
Strengthen parallel strategic ecosystem information (e.g., alongside catch opportunities but not impacting them directly)

Priority 2
Develop and implement robust methods to integrate ecosystem drivers and develop dynamic reference points

Priority 3
Long-term scenarios (e.g., climate) to help contextualise advice and improve sustainability planning

Now → Future

Next steps

- Identify opportunities for the integration of ecosystem information into advice through FEISA and advisory product alignment
- Support integration by linking components of the ICES community (e.g,. WKFISHECO)
- Work closely with requesters of advice to determine core management objectives and levers for operational EBFM objectives

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Thank you

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