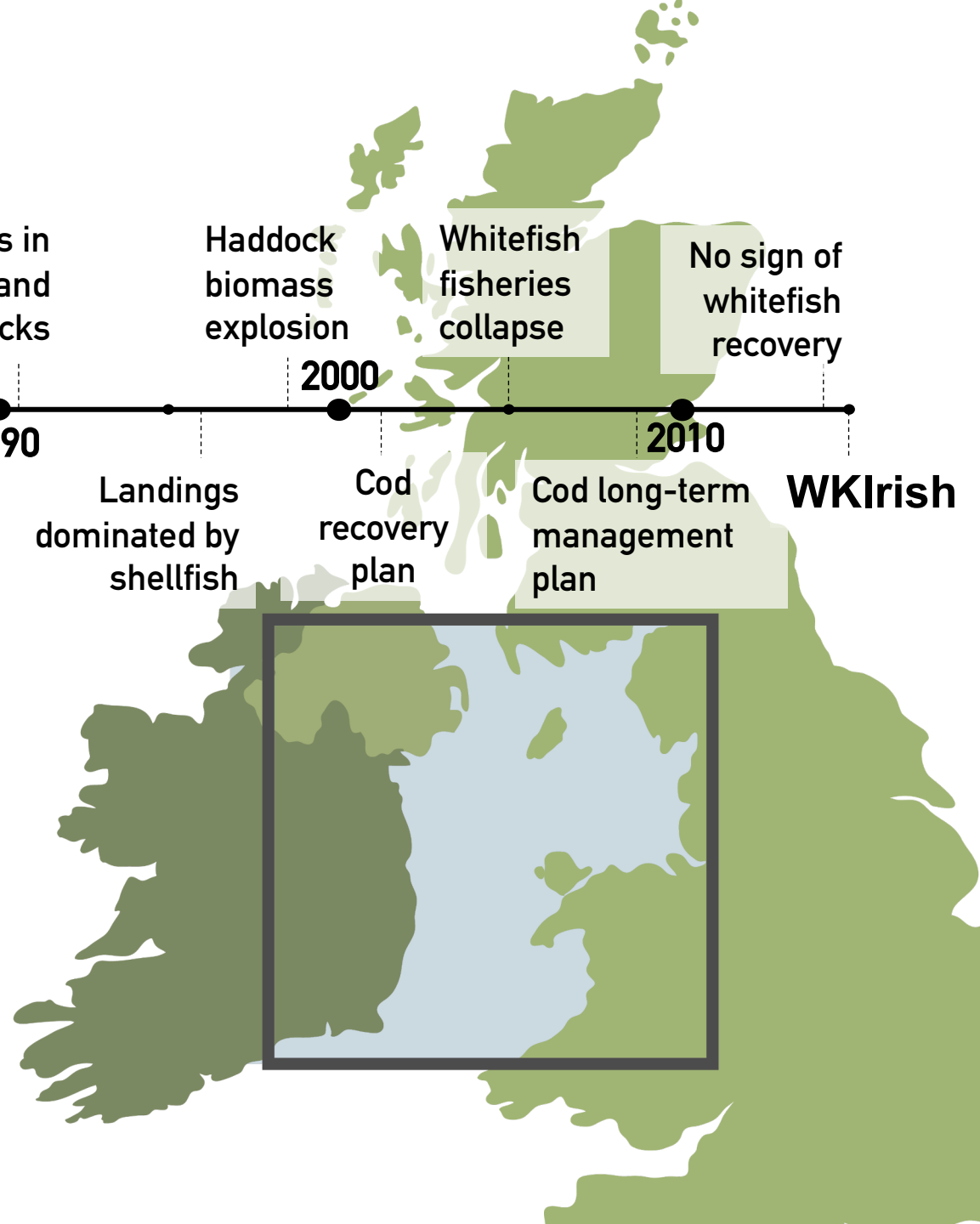
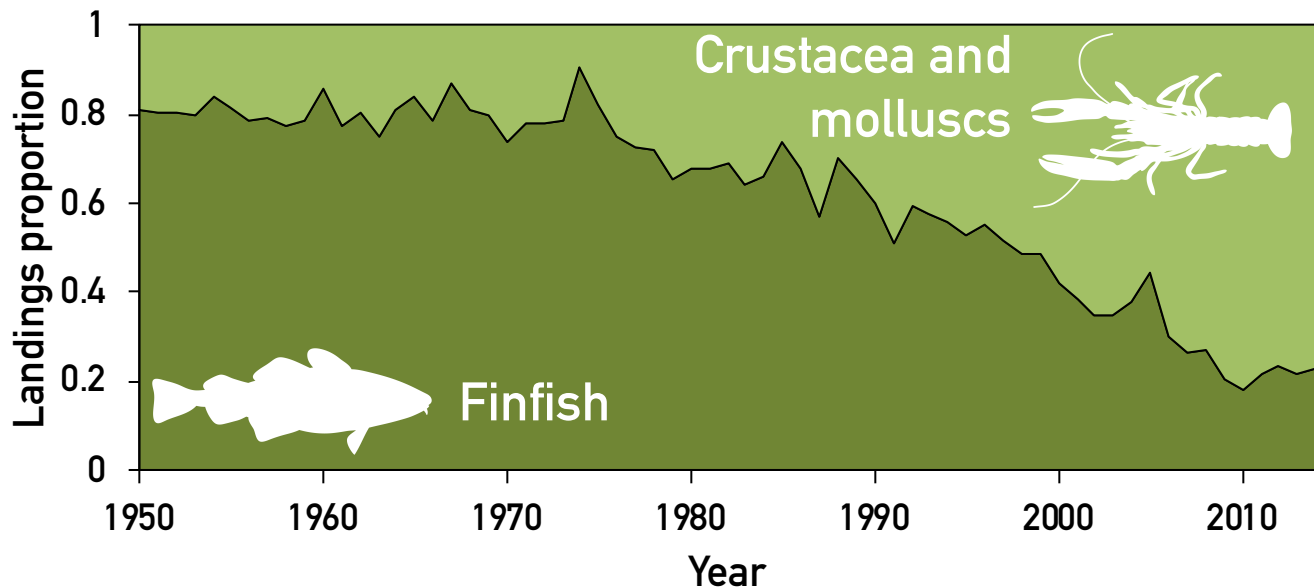
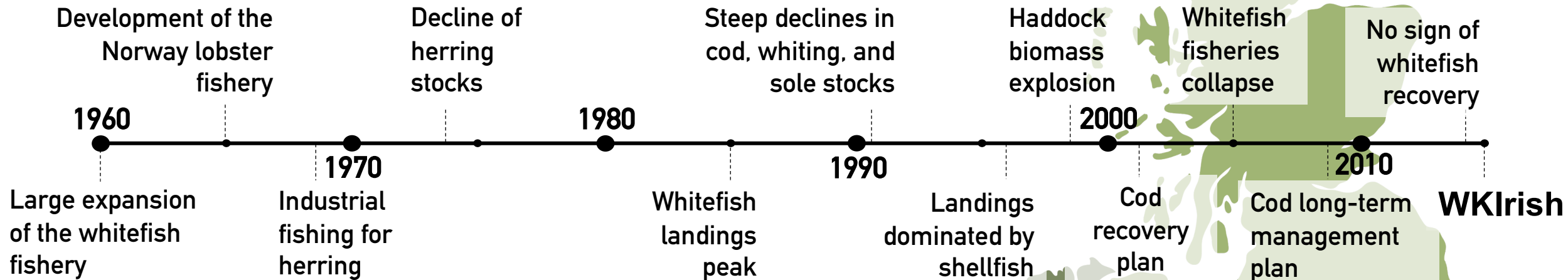




Overview on WKIrish process and outcomes

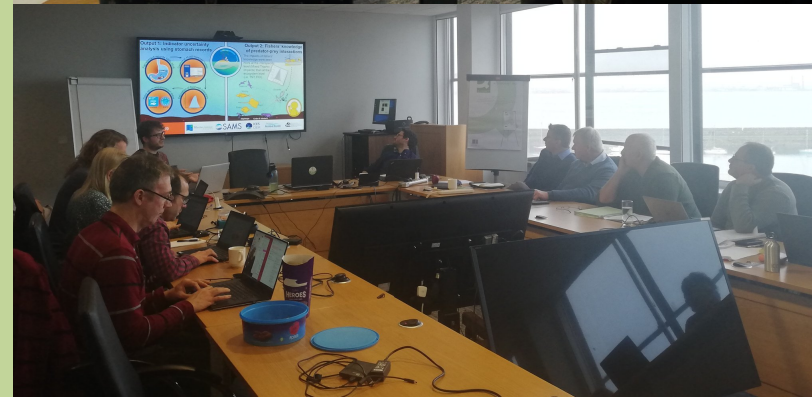
Jacob Bentley, UNEP-WCMC
NWWAC WKIrish webinar
29th April 2021

Irish Sea fisheries

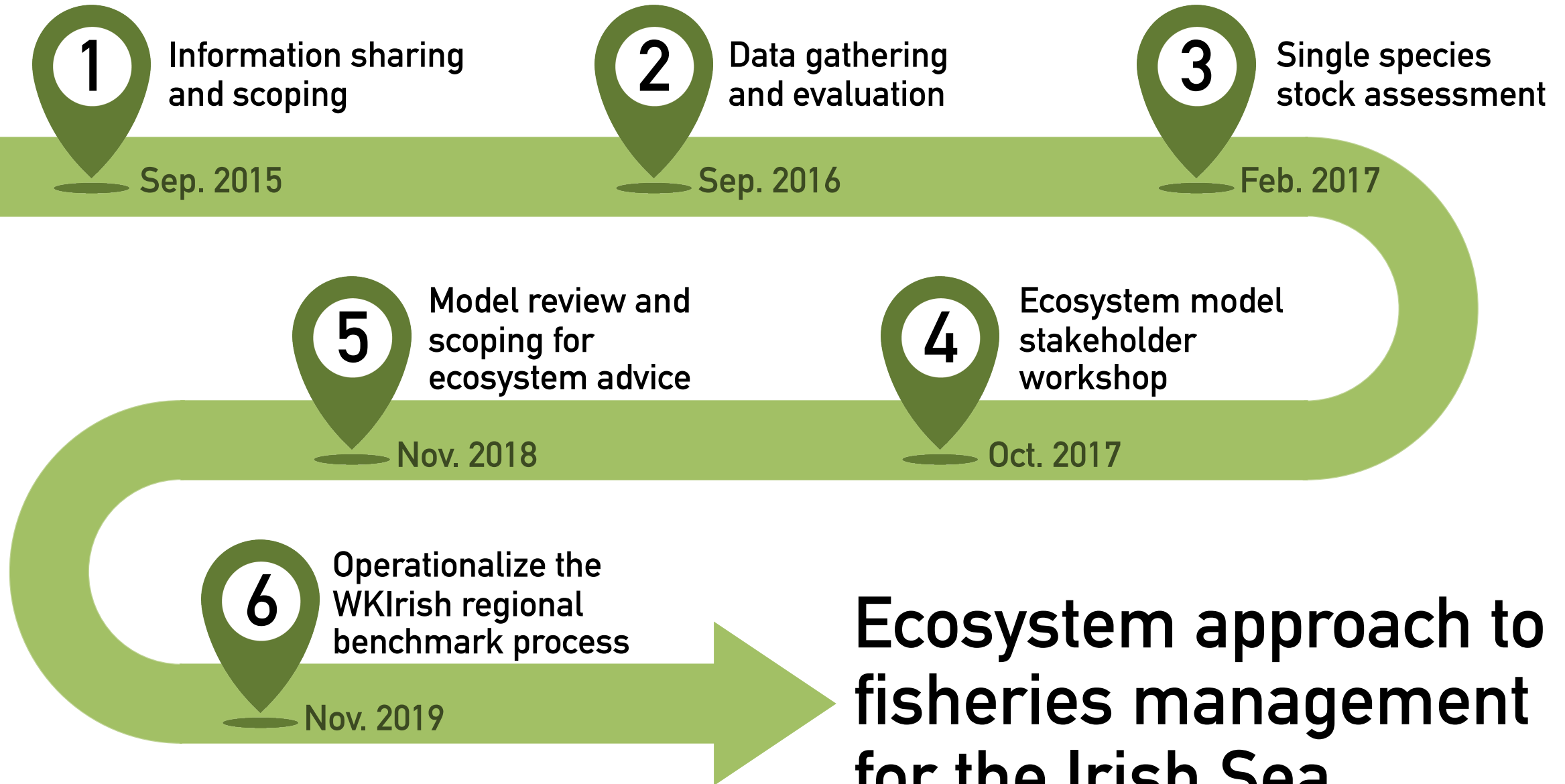


WKIrish

- Whitefish stocks failed to recover
- Industry requested an ICES benchmark (WKIrish)
- Collaboration of scientists, fishermen, industry leaders, and NGOs to model the Irish Sea

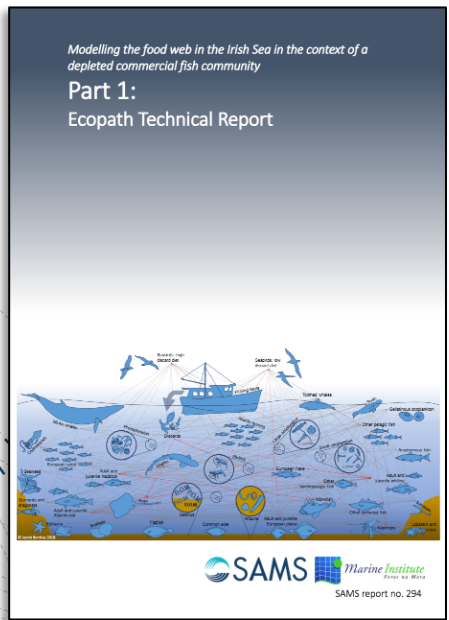
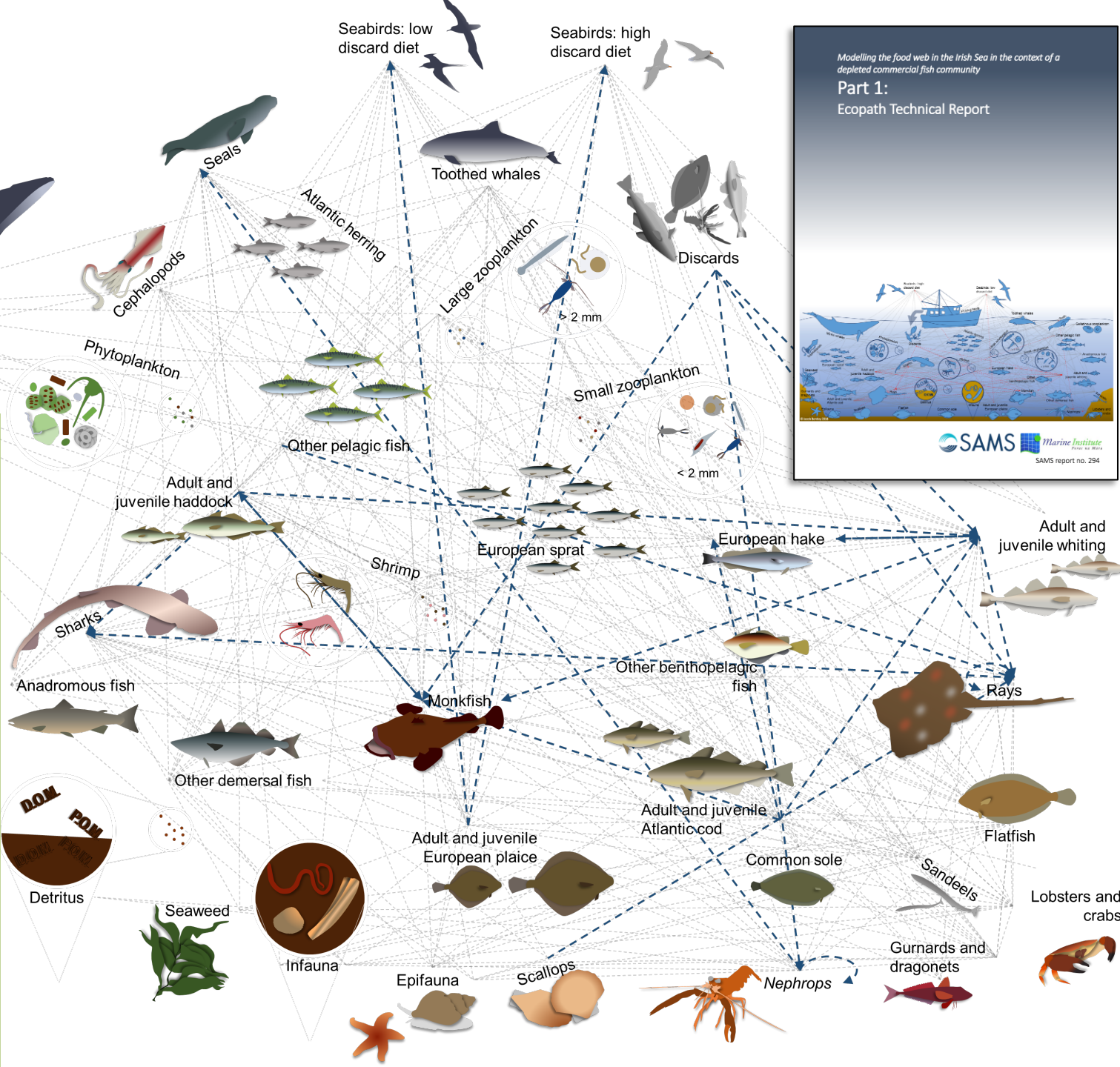
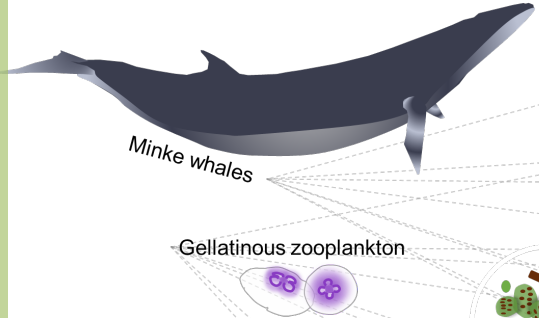


WKIrish roadmap



Ecosystem approach to fisheries management for the Irish Sea

Irish Sea Ecopath model



Model aim: Attempt to determine the explanatory factors underpinning the recovery failure of commercial stocks in the Irish Sea

Data sources:

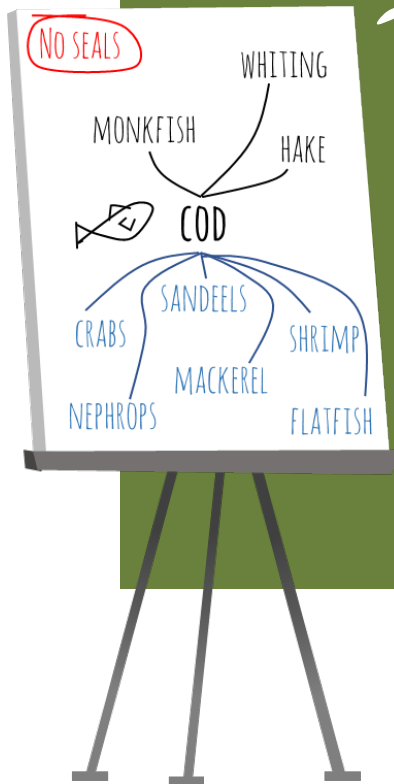


Fishers' knowledge

Fishers knowledge Part 1: Diets of commercial species

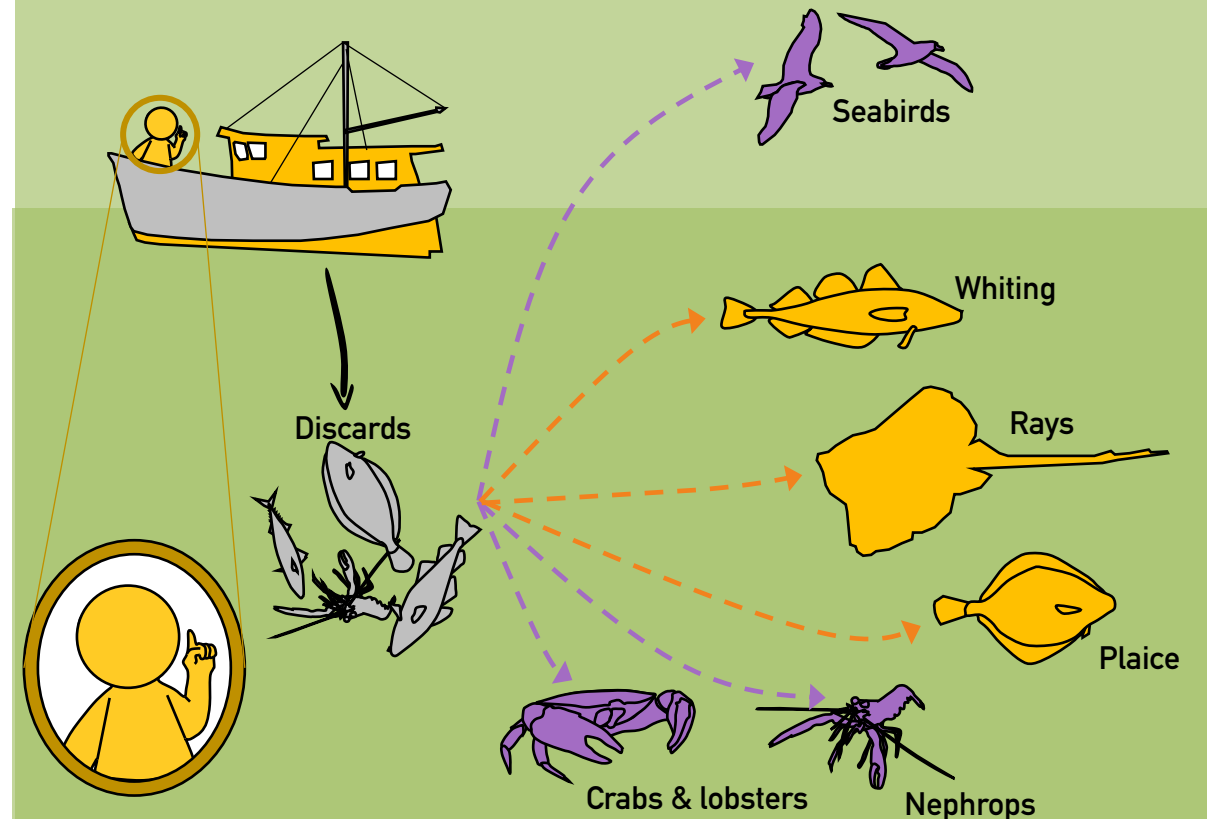
> Using fishers knowledge to support stomach records

> What are the impacts of fishers diet changes on ecosystem structure and function?



Fishers identified 80 predator-prey links, of which 63% matched stomach record data

The impacts of fishers' knowledge were seen more at the interspecific level than at the ecosystem level



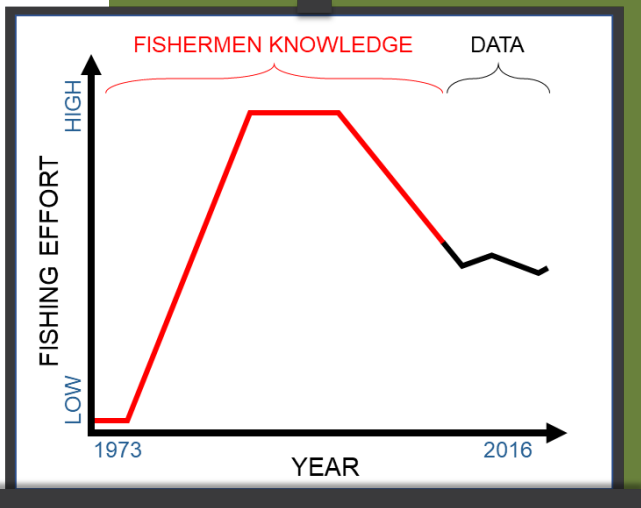
Fishers' knowledge

Fishers knowledge Part 2: Hindcasting historic fishing effort

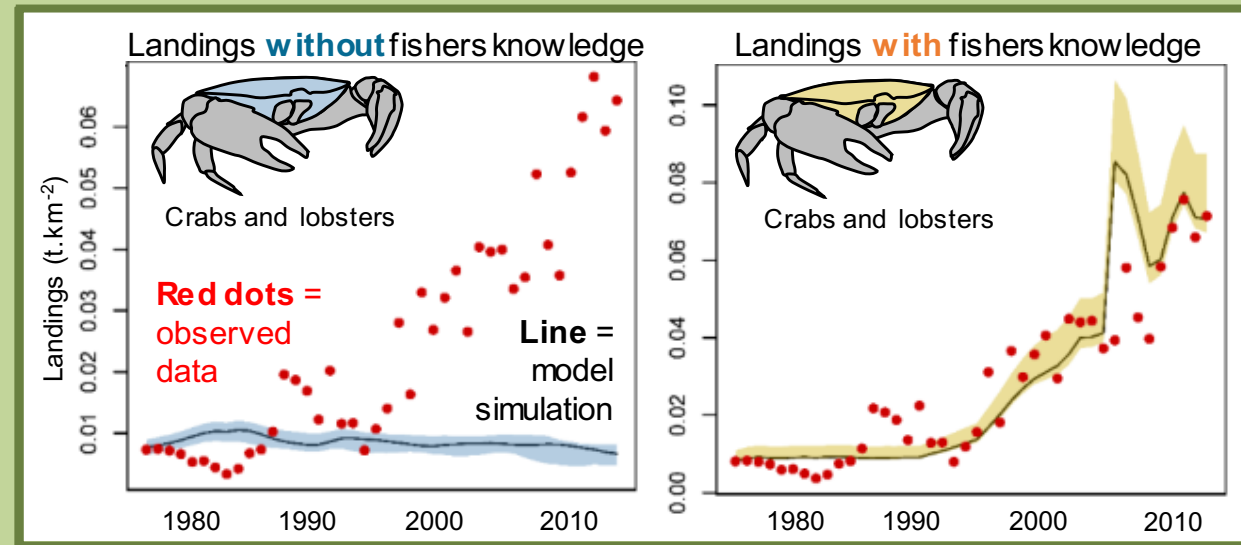
> Using fishers' knowledge to fill

gaps in fishing effort records.

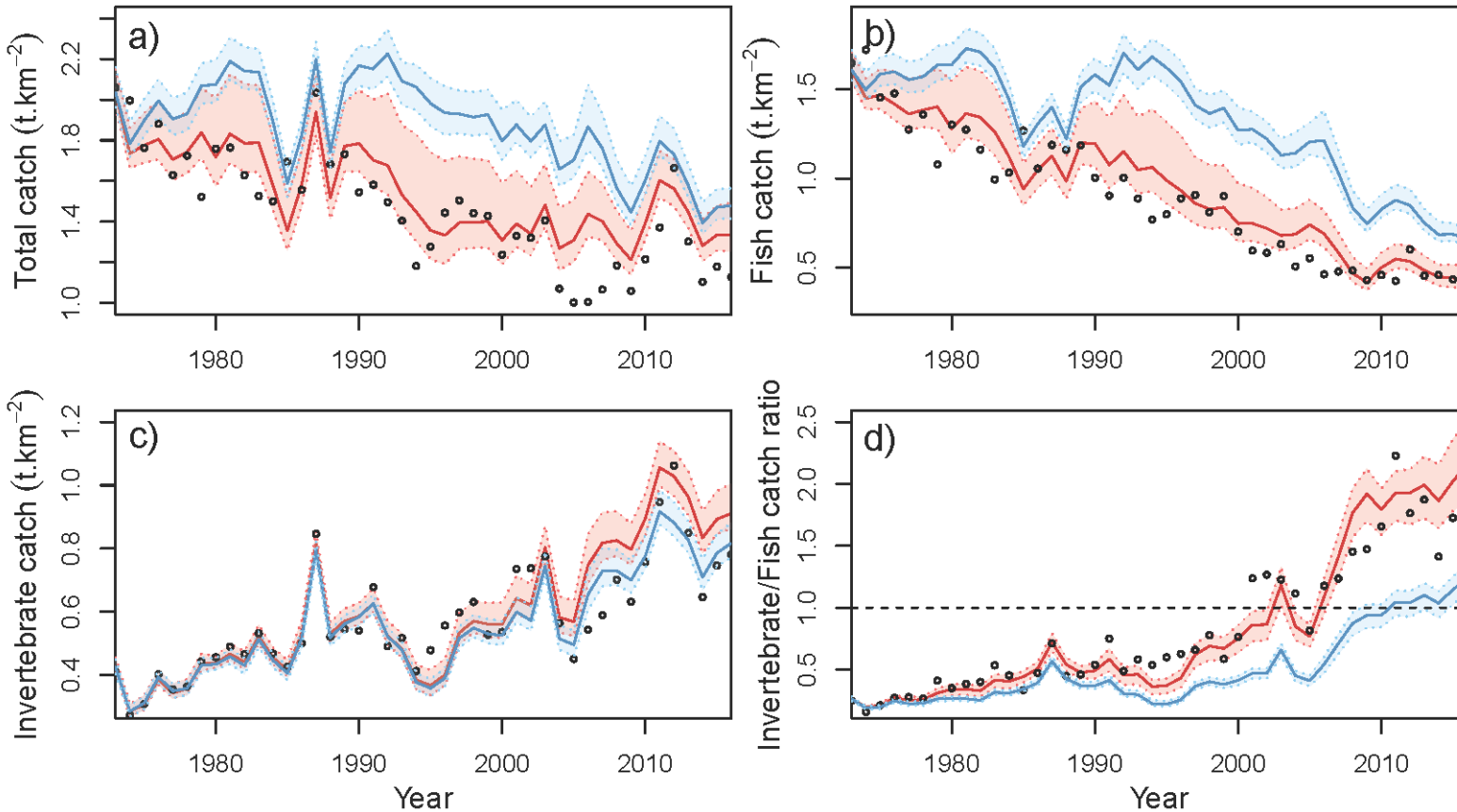
> What are the impacts of fishers effort trends on model predictions?



Combining scientific and fishers' improved the models ability to simulate observed stock trends



Retrospective analysis



With environmental drivers

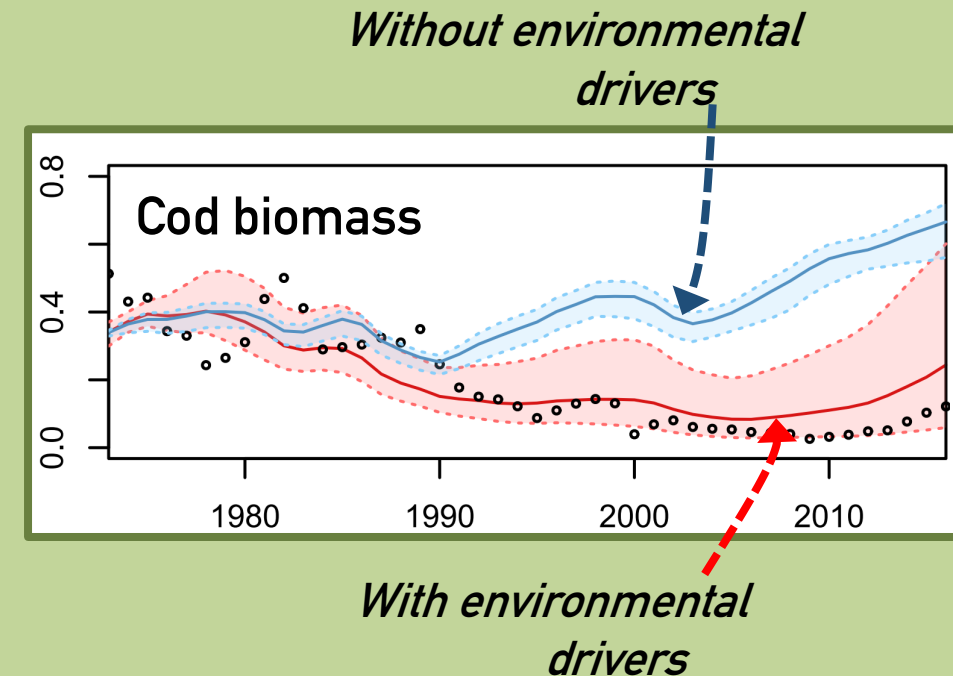
Without environmental drivers

Example...



Irish Sea Cod

Without the influence of environmental drivers, cod biomass increased post 1990 with the reduction of fishing effort



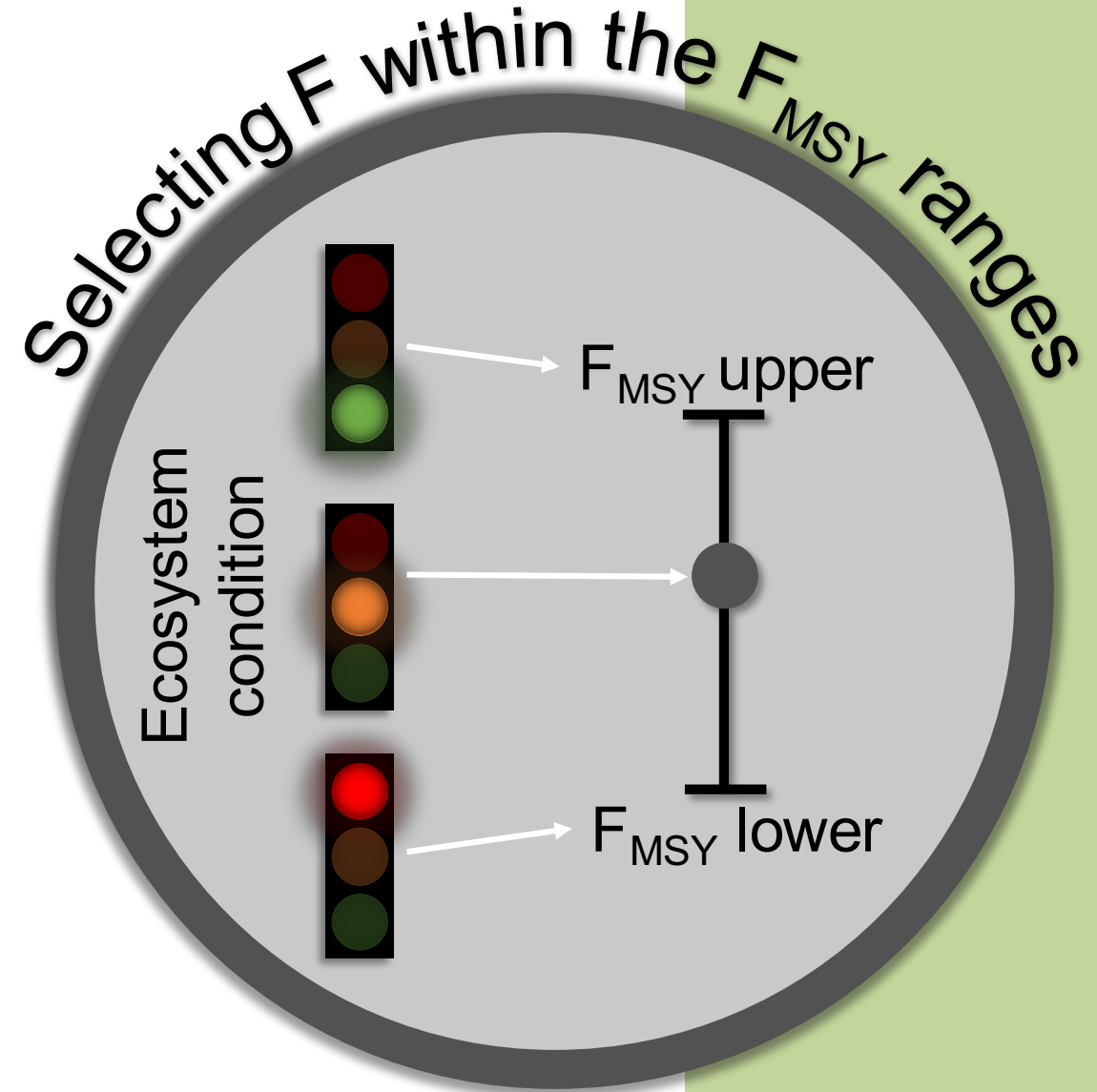
ICES key-run

The model was peer reviewed by WGSAM
(Working Group on
Multispecies
Assessment Methods)



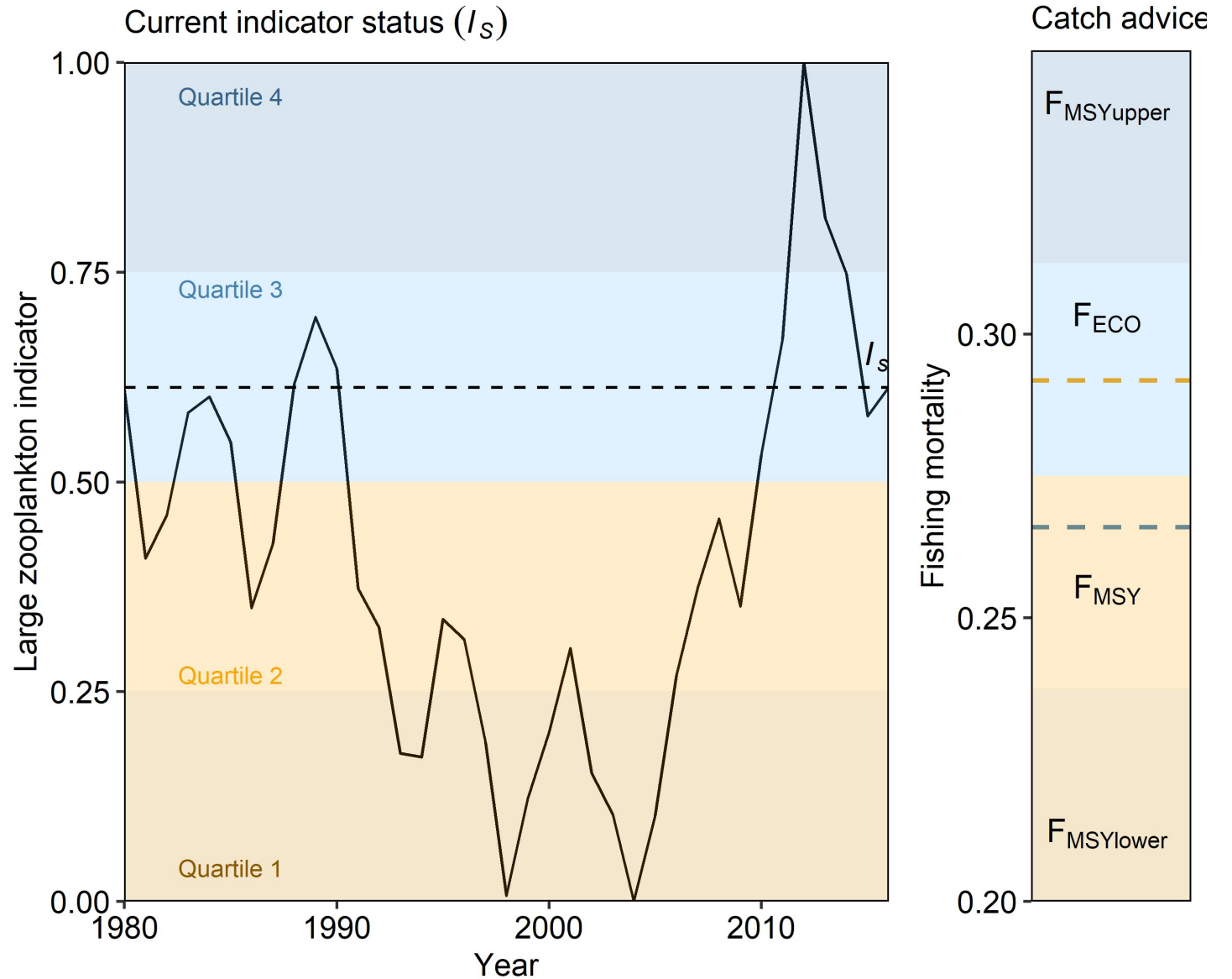
Adding ecosystem information to ICES catch advice

- Our approach uses ecosystem indicators to provide ecosystem-based fishing mortality reference points (F_{ECO}) within ICES F_{MSY} ranges



F_{ECO} concept

- Recommendations for target F within the pretty-good-yield ranges are made based on the condition of the indicator within its historical range.
- F_{ECO} scales fishing mortality down when the ecosystem conditions for the stock are poor and up when conditions are good.

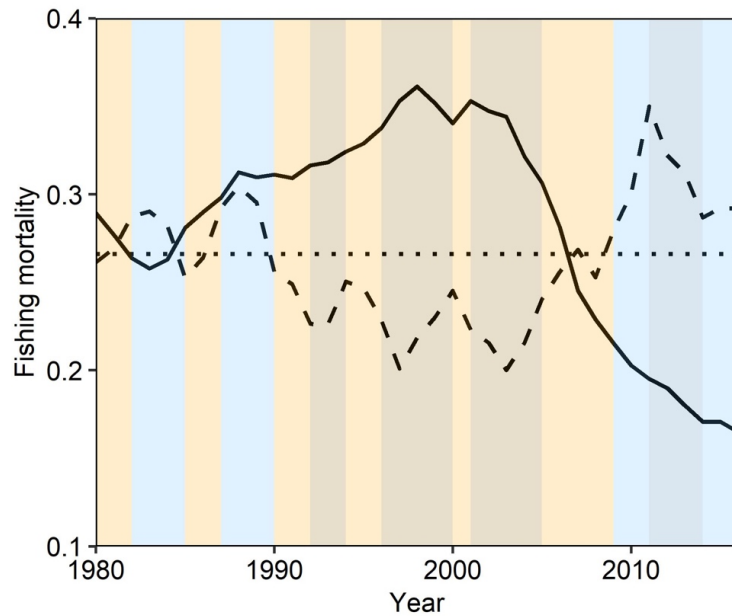


Howell, D., Schueller, A.M., Bentley, J.W., Buchheister, A., Chagaris, D., Cieri, M., Drew, K., Lundy, M.G., Pedreschi, D., Reid, D.G. and Townsend, H., 2021. Combining Ecosystem and Single-Species Modeling to Provide Ecosystem-Based Fisheries Management Advice Within Current Management Systems. *Frontiers in Marine Science*.

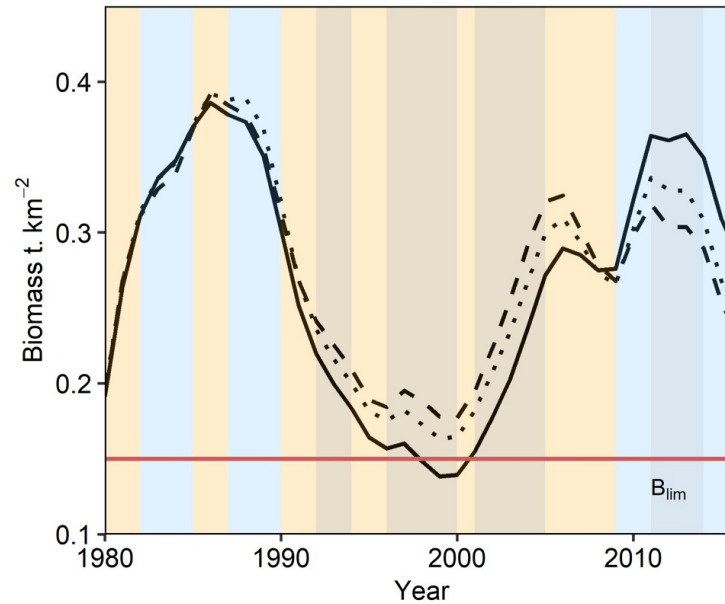
Bentley, J. W., Lundy, M. G., Howell, D., Beggs, S. E., Bundy, A., De Castro, F., Fox, C., Heymans, J. J., Lynam, C. P., Pedreschi, D., Schuchert, P., Serpetti, N., Woodlock, J., and Reid, D. G. 2021, Refining fisheries advice with stock-specific ecosystem information, *Frontiers in Marine Science*

F_{ECO} retrospective simulation

Herring (her.27.nirs)

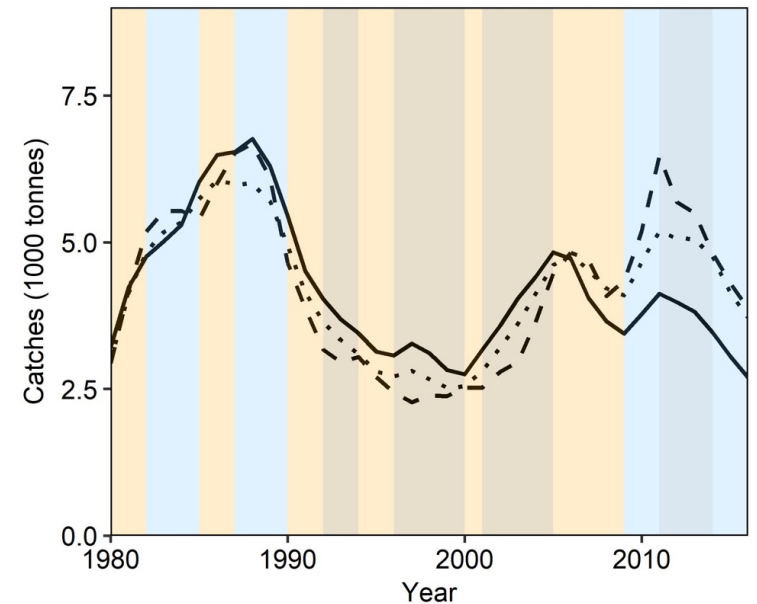


Encourage precautionary harvest during poor productivity phases and prevent overly cautious yields during high productivity phases



Higher biomass maintained during poor productivity phases

Greater yield during high productivity phases



Legend

Fishing mortality scenario

- Actual F (solid line)
- F_{ECO} (dashed line)
- F_{MSY} (dotted line)

Indicator status

- Quartile 1 (light blue)
- Quartile 2 (light orange)
- Quartile 3 (light grey)
- Quartile 4 (light blue)

F_{ECO} : pros and cons

PROS:

- Ecosystem understanding can be incorporated within the existing precautionary framework.
- Simulations suggest F_{ECO} could act as a biomass buffer during periods of poor productivity.
- Operational use of EwE strategic advice.
- Achieves EAFM and moves towards EBFM.

CONS:

- How to select environmental indicators, separating trend from noise and identifying mechanistic links.
- F_{ECO} is a relatively small step in comparison to advances such as multi-species MSY and still relies on single-species assessments.
- High data requirements (60% of ICES stocks have insufficient data for F_{MSY} ranges).

Ecosystem-based
Fisheries Management

