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► To cite this version:

Lucas Bas, Martin Biuw, Marie Anne Blanchet, Bjarte Bogstad, Elena Eriksen, et al.. A food-web assessment of marine mammals, fish, and fisheries in the Norwegian and Barents seas 1988-2021. ICES Annual Science Conference 2024, Sep 2024, Gateshead, United Kingdom. hal-04727086

HAL Id: hal-04727086

<https://hal.inrae.fr/hal-04727086v1>

Submitted on 9 Oct 2024

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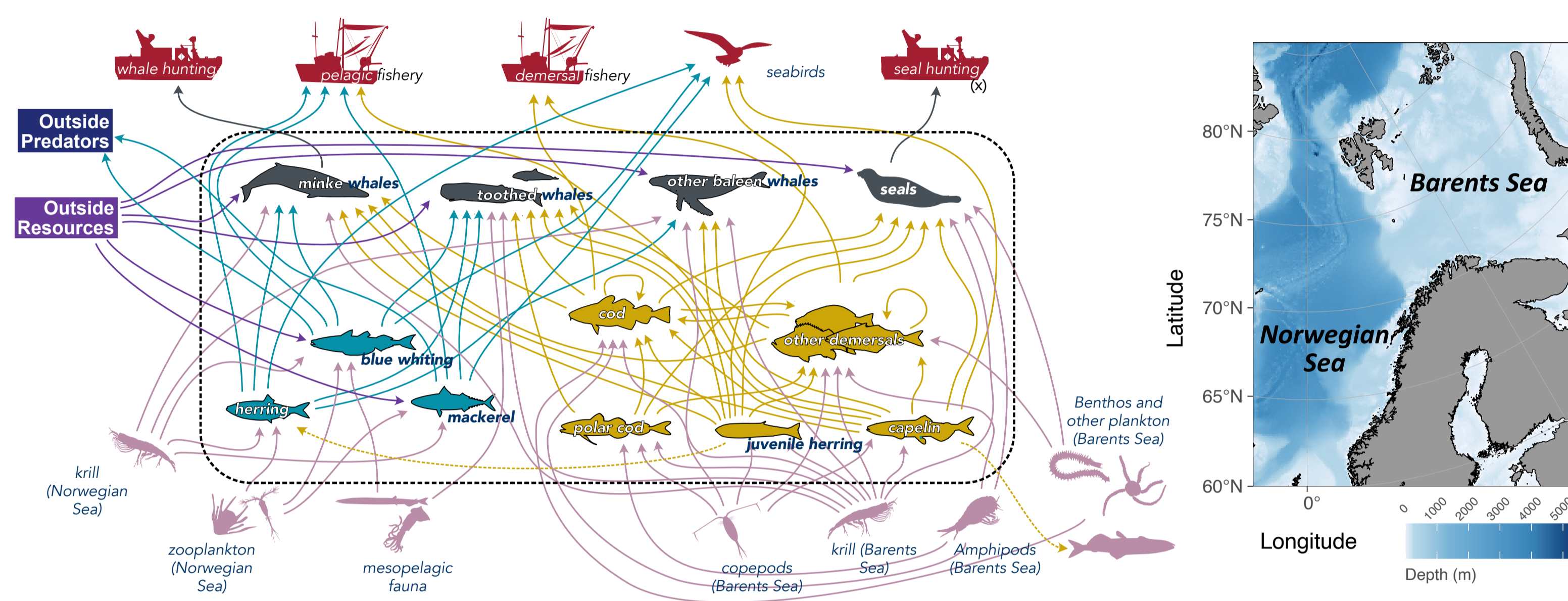
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EBM requires ecosystem assessments

A fundamental principle in ecosystem-based management (EBM) is to recognise and assess trade-offs between multiple ecosystem goods and services. While single stock assessment models have been the backbone of fisheries management for decades, these are rarely suitable to address ecological or management trade-offs that involve complex ecological interactions. Rather, EBM can benefit from food-web assessment models, which can address these trade-offs.

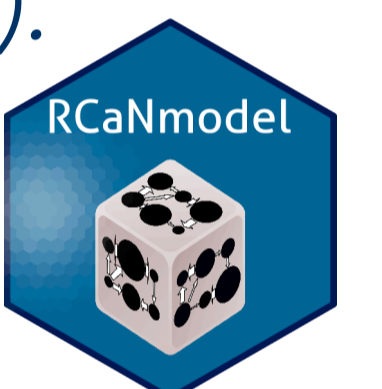
We built a data-driven food-web assessment model...

To quantify interactions between marine mammals, fish and fisheries in the Norwegian and Barents Seas, we have built a food-web assessment model. It includes 12 main species groups and 14 interacting components.

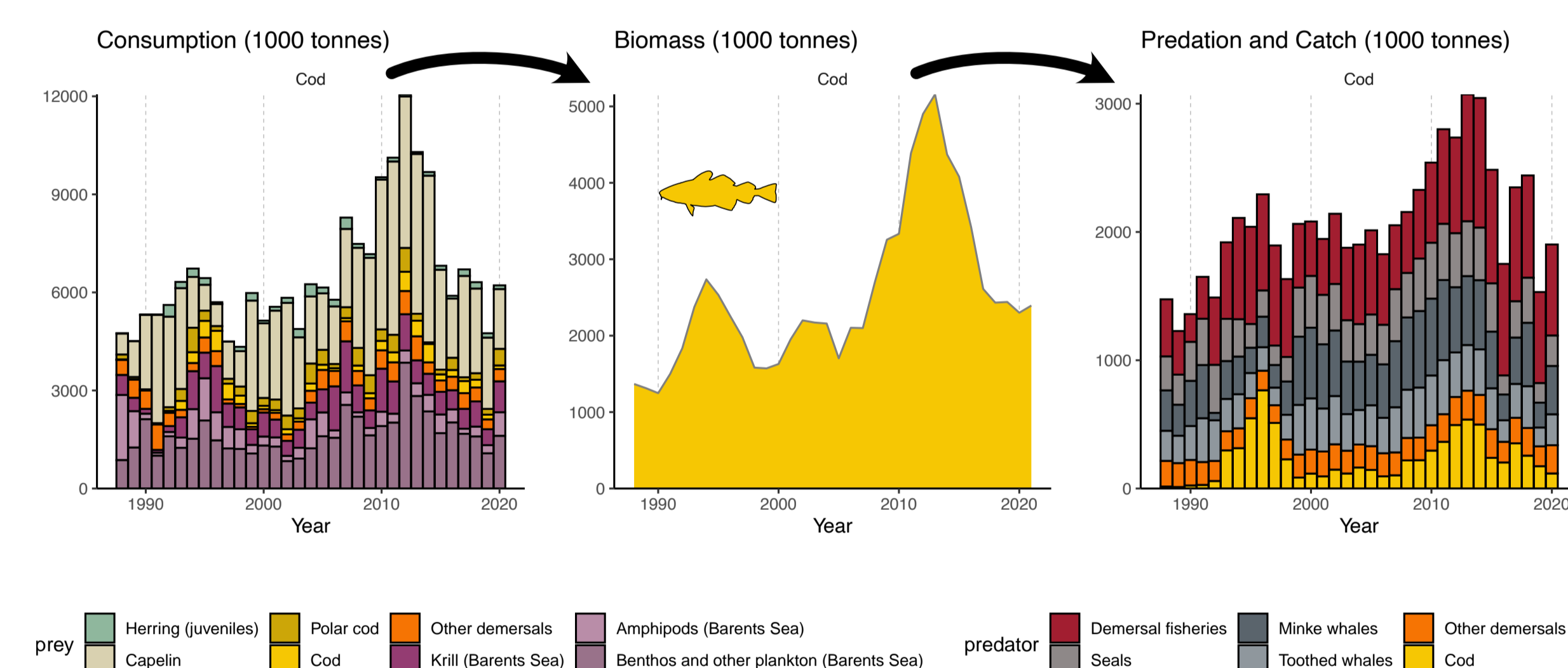


The food-web assessment model is based on linear inverse modelling. It is data-driven and explicitly considers uncertainties.

We have used the modelling platform RCaN-Model (modelling Chance and Necessity in R).

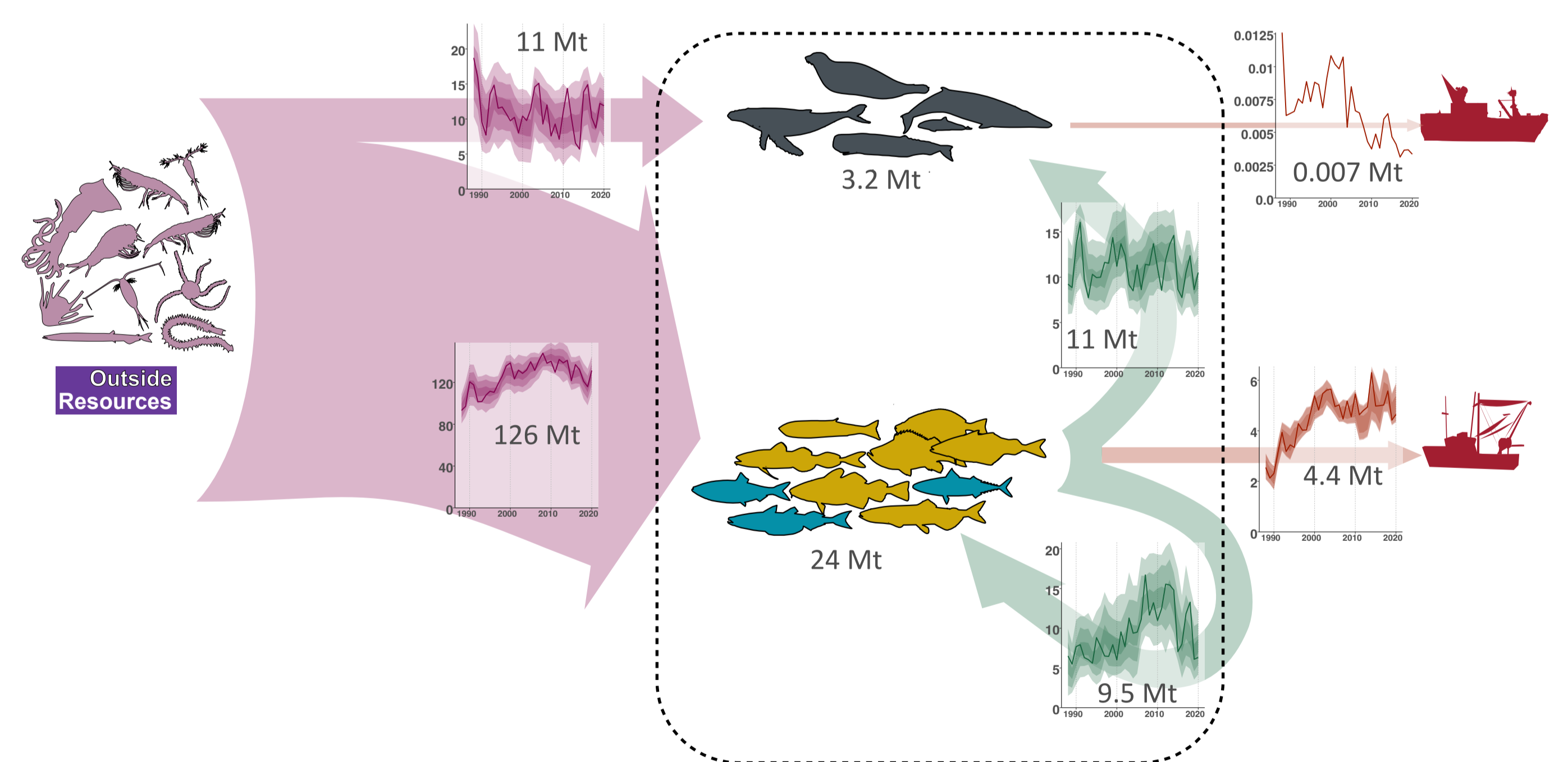


...to produce consistent reconstructions of marine mammals, fish, and fisheries dynamics over 3+ decades



For each species group, we reconstructed changes in biomass over time, jointly with the corresponding consumption and diets, predation and catches. This way, the dynamics of each species group is tied to the dynamics of all the others groups and to historical fisheries catch.

The assessment highlights that consumption of low trophic levels (LTL) by fish has been ~10x greater than consumption of LTL by marine mammals. Predation pressure on fish has been driven by fish eating fish (~9.5 million tonnes annually), marine mammals (11Mt) and fisheries (4.4 Mt). Uncertainties in biomass transfer between LTL, fish, and marine mammals remain high, because of highly uncertain data inputs.



This provides a quantitative basis to support IEAs in the Norwegian and Barents seas

This food-web assessment was built through an iterative process that involved multiple experts and which allowed to confront, discuss, and resolve multiple issues as well as to recognise uncertainties in expert knowledge, data, and input parameters. This assessment is transparent (all data and code available) and can be updated annually to support integrated ecosystem assessments (IEAs) in the Norwegian and Barents seas.



ICES Annual Science Conference - September 2024 - Gateshead, UK



RCaNModel and RCaNConstructor tools are freely available from <https://github.com/inrae/RCaNmodel>

