Methods for Incorporating Ecosystem Information into Single-Species Stock Assessment Models

TESA Workshop, November 24-27, 2025

Chairs: Andrew Edwards (PAC), Laura Wheeland (NFLD), and Hugues Benoît (QUE).
Northwest Atlantic Fisheries Centre (NAFC), St. John's, NL.

Agenda

Monday November 24 (NAFC Auditorium)	
9:30 am	Welcome, Introductions, Review of workshop objectives
Contributed talks by DFO scientists (available on Teams: **Join the meeting now**)	
10:15	Introduction to the EAFM Methods Toolbox (Hugues Benoît, QC)
10:30	An approach for providing stock advice under ecosystem impacts with data and model limitations (Meghan Burton, PAC)
11:00 – Health Break	
11:15	Using an index of biological condition to inform time varying natural mortality of Atlantic Cod in 3Ps. (Divya Varkey, NL)
11:30	Evaluating the impact of time-varying parameters under varying quantities of age data (Mackenzie Mazur, PAC)
11:45	Developing CSAS advice for Reference Points in Non-Stationary Conditions under the Fish Stocks Provisions and the Precautionary Approach (Catarina Wor, Divya Varkey and Carrie Holt)
12:00 – Lunch (not provided)	
1:00 pm	**Keynote #1:** Recent progress towards EBFM in Europe – and some stumbling blocks. Daniel Howell, Institute of Marine Research, Norway
2:00pm	**Keynote #2:** Myth, mechanism, and misattribution in Ecosystem-Based Fisheries Management. Matt Robertson, Marine Institute, Memorial University of Newfoundland
3:00pm – Health Break	
3:15pm	**Keynote #3:** Environmental Information in Stock Assessments of New England Groundfish. Steve Cadrin, University of Massachusetts, Dartmouth
4:15 pm	Discussion
5:00 pm	End for the day

Keynote seminars by each of the external invited experts will be broadcast Nationally via ZOOM as part of the S. Plourde Memorial EAFM seminar series. A separate advertisement for these seminars will be circulated.

Tuesday November 25	
Morning: NAFC Auditorium Contributed talks by DFO scientists (available on Teams: **Join the meeting now**)	
9:00am	Review of Day 1, Set up Day 2
9:30	salmonMSE: a decision-support tool for Pacific salmon accounting for within-population life-history diversity and environmental drivers (Carrie Holt, PAC)
9:45	Time-varying models for Pacific salmon: estimation, model selection and closed-loop simulations (Catarina Wor, PAC)
10:00	Incorporation of hydroclimate and exploitation impacts into monitoring, assessment and management of anadromous Dolly Varden population productivity (Xinhua Zhu, ARC)
10:15	Modelled reconstructions of marine environmental and ecosystem variables: trends, causal inference, and recent applications in the Pacific Region (Greig Oldford, PAC)
10:30 – Health Break	
10:45	Drivers of Pacific Hake recruitment -- lessons learned from trying to operationalize the research (Andrew Edwards, PAC)
11:00	Exploring environmental effects on fish stock recruitment - tools to bolster EAFM and contributions toward CSAS reports (Travis Tai, PAC)
11:15	The use of ecosystem variables in 2J3KL Capelin assessments (Aaron Adamack, NL)
11:30	Linking Prey and Predators: How Capelin Informs the Northern Cod Stock Assessment (Paul Regular, NL)
11:45	Discussion / breakout logistics
12:00 – Lunch (not provided)	
1:00	Break-out group work. Groups should take a 15 minute health break at a time that suits the group. (Breakout rooms: N20-122, N20-104, N20-108, N20-109)
4:30 pm	Plenary discussion and plan for day 3. (Auditorium)
5:00 pm – End for the day	
Evening – Group Dinner, 6:30pm, Yellowbelly Brewery 288 Water Street, St. John's NL	

Wednesday November 26, 2025 Breakout rooms: N20-122, N20-104, N20-108, N20-109	
Morning	Break-out group work
10:30	Health Break
12:00	Lunch (not provided)
Afternoon	Break-out group work
3:00 pm	Health Break
4:30 pm	Plenary discussion and plan for day 4.
5:00 pm	End for the day

Thursday November 27, 2025	
Morning	Break-out group work, including drafting of short summary text for the workshop report (N20-122, N20-104, N20-108, N20-109)
10:30	Health Break
12:00 – Lunch (not provided)	
1:00 pm	Break-out group "show and tell" (Memorial Room)
2:45 pm	Health Break
3:00 pm	Plenary discussion (Memorial Room). Recommendations, next steps and future work.
5:00 pm – Workshop close	

Breakout Group topics

The following breakout groups have been identified in advance. The meeting will discuss ideas for additional breakout sessions and the agenda remains fluid to merge, change, or branch these groups based on the direction of discussions. Breakout discussions may focus on theoretical concepts and discussion or may dive into specific coding or implementation challenges. Bring your ideas, bring your data, bring your code!

Use of Simulation testing to evaluate impacts of ecosystem changes on Fisheries management Host: Catarina Wor

Simulation evaluation of estimation models. Use of closed loop simulations. DFO GPHPC - We have cluster computing! How can we make it more accessible.

When M Isn't Constant: Communicating Ecosystem-Driven Mortality and Its Consequences for Management Advice. Host: Paul Regular

Natural mortality is dynamic, but we often lack the data or understanding of stock dynamics needed to estimate changes through time. Introducing ecosystem drivers such as prey availability introduces time-varying natural mortality into stock assessments, adding realism but also complexity. Using Northern cod as an example, this breakout will examine how changes in M linked to ecosystem variability, such as shifts in capelin abundance, affect reference points, rebuilding trajectories and perceptions of risk. Discussion will focus on the dual challenge of capturing ecological realism while maintaining clarity and confidence in management advice, and on effective ways to communicate these dynamics to decision-makers and stakeholders.

Incorporating qualitative ecosystem information into stock assessment models. Host: Mackenzie Mazur

Although the literature has primarily focused on the integration of quantitative ecosystem information into single-species stock assessment, incorporating qualitative ecosystem information (i.e. expert knowledge, traditional knowledge) remains a significant challenge. However, for many stocks, especially those that are data-limited, qualitative information may be the only available source of information on ecosystem impacts. This breakout group will explore approaches for incorporating qualitative ecosystem information into assessment models, which could include testing or simulating a range of ecosystem scenarios informed by qualitative input or using qualitative information to inform priors for key parameters. The goal is to brainstorm novel and transparent approaches for incorporating ecosystem impacts in stock assessments when quantitative ecosystem data are limited.

Approaches for considering the spatial and demographic scale of environmental drivers when including those drivers in assessments. Host: Matt Robertson.

The incorporation of ecosystem information into single-species stock assessment models has often focused on the inclusion of a time-series of some environmental covariate to explain temporal variation in some demographic process. However, we know that environmental effects often differ in strength, magnitude, and direction at relatively fine spatial scales and across an animal's ontogeny. The goal of this breakout group will be to discuss approaches for integrating analyses of environmental effects across spatial and demographic scales with stock assessments.

Workshop description previously circulated:

Methods for Incorporating Ecosystem Information into Single-Species Stock Assessment Models

Description: Fisheries and Oceans Canada continues to move towards an Ecosystem Approach to Fisheries Management. With the upcoming release of an Implementation Plan and a Methods Toolbox, it is timely to have a Technical Expertise on Stock Assessment (TESA) workshop on the experiences of practitioners when including ecosystem information in single-species stock assessment models. Day one will consist of short talks from most participants regarding their own analytical experience and lessons learned, with longer talks from two invited external speakers. Ideas for three breakout groups will be presented on day two, with participants then self-assigning into their group of interest. Breakout group topics may include experiences with specific modelling platforms and custom stock-specific models, with participants requested to identify specific topics of interest in advance of the workshop. On the final day, the large group will discuss lessons learned, make recommendations for further implementation and/or research, and discuss possible updates to the Science Methods Toolbox. This format follows the successful format of several previous TESA workshops.

Objective:

- Share practical technical knowledge across DFO regions (and from external sources), including digging into code in breakout groups, which is often hugely beneficial.

Expected outcomes:

- Identification of collaborative research or product development across the regions.
- Updates to the Science Methods Toolbox
- A short summary of the workshop for the TESA gcpedia site, including main lessons learned and recommendations.