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Evaluating the impact of age data in a Petrale sole stock assessment

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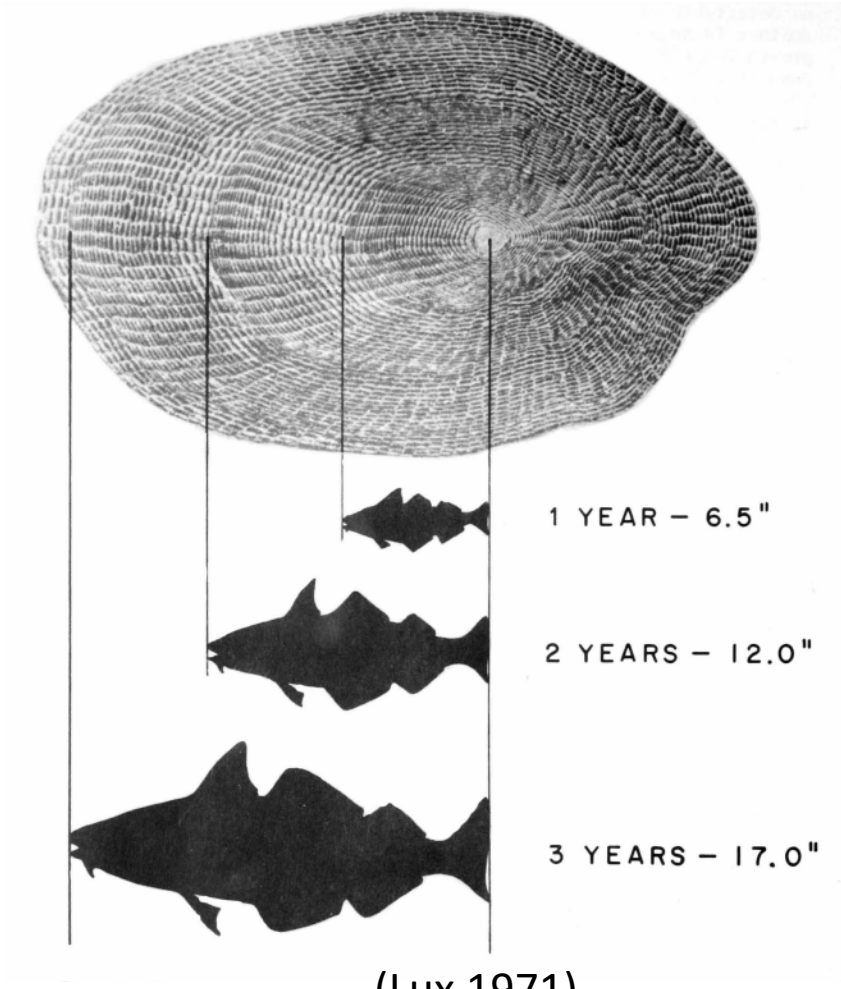
26 April 2023

Western Groundfish Conference

Stock assessment models and age data

- Age structured stock assessment models use age composition data
- Age data quantity and quality can impact model outcomes
- Collection of ageing structures and subsequent age estimation require time and resources; trade-offs required among species

  → How do we make decisions about how to allocate ageing effort among species, years, and data sources?



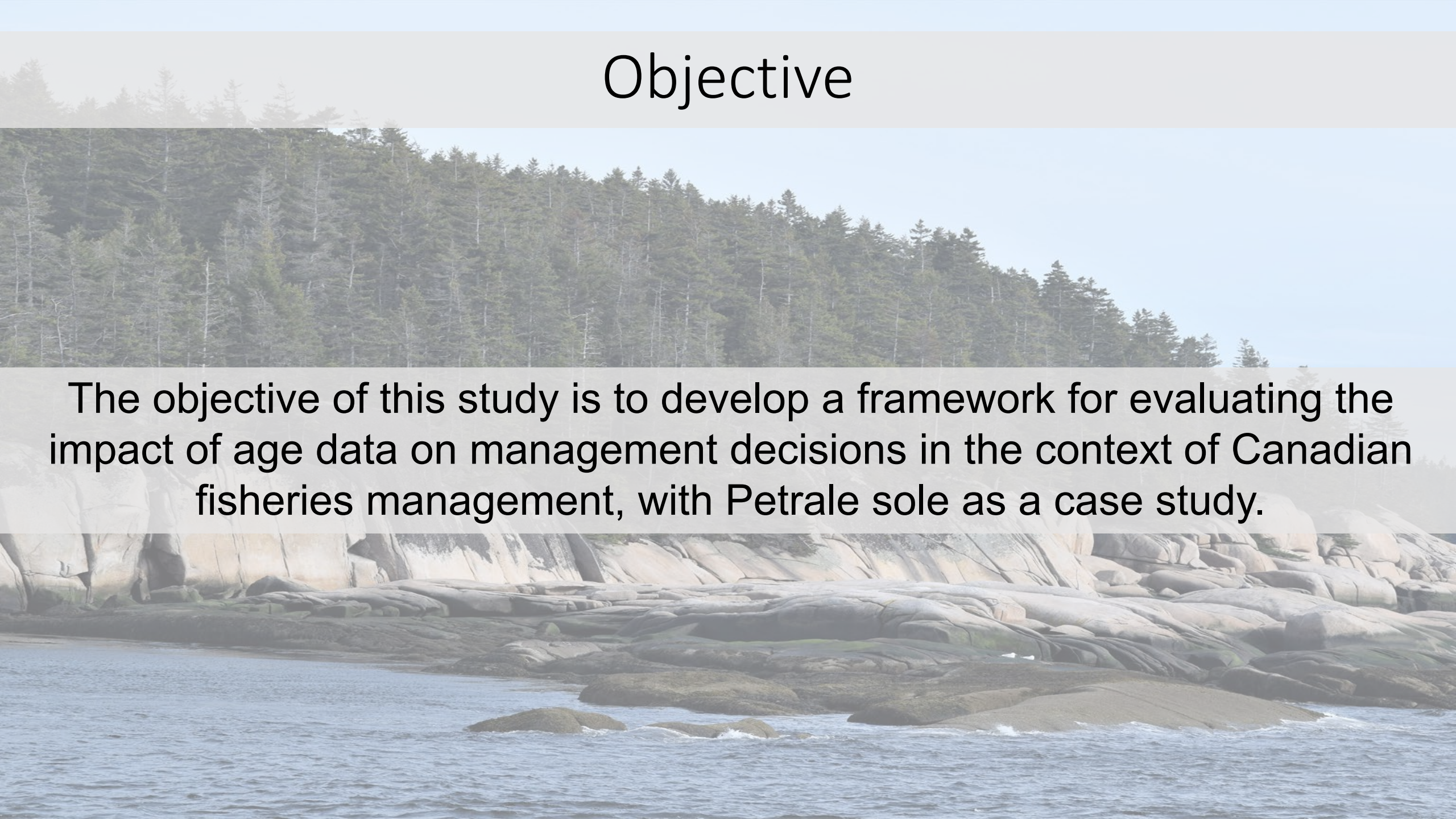
(Lux 1971)

Stock assessment models and age data


(Sea Grant)

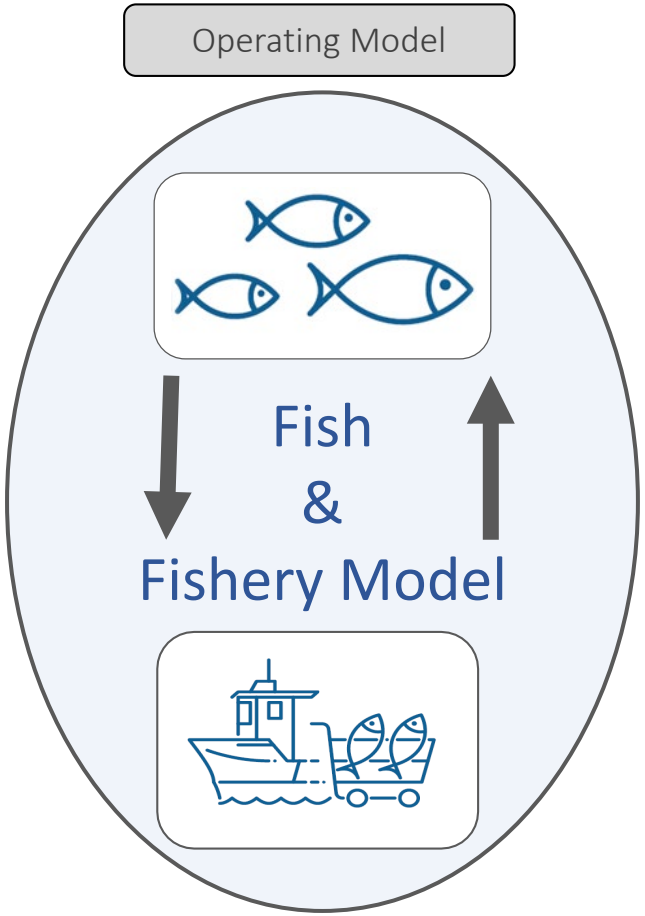
- Often a limited amount of fish ages
- Ono et al. (2014) found that:
  - Age data improved integrated stock assessment performance for flatfish species
  - Historical composition data was less important than recent composition data

Objective



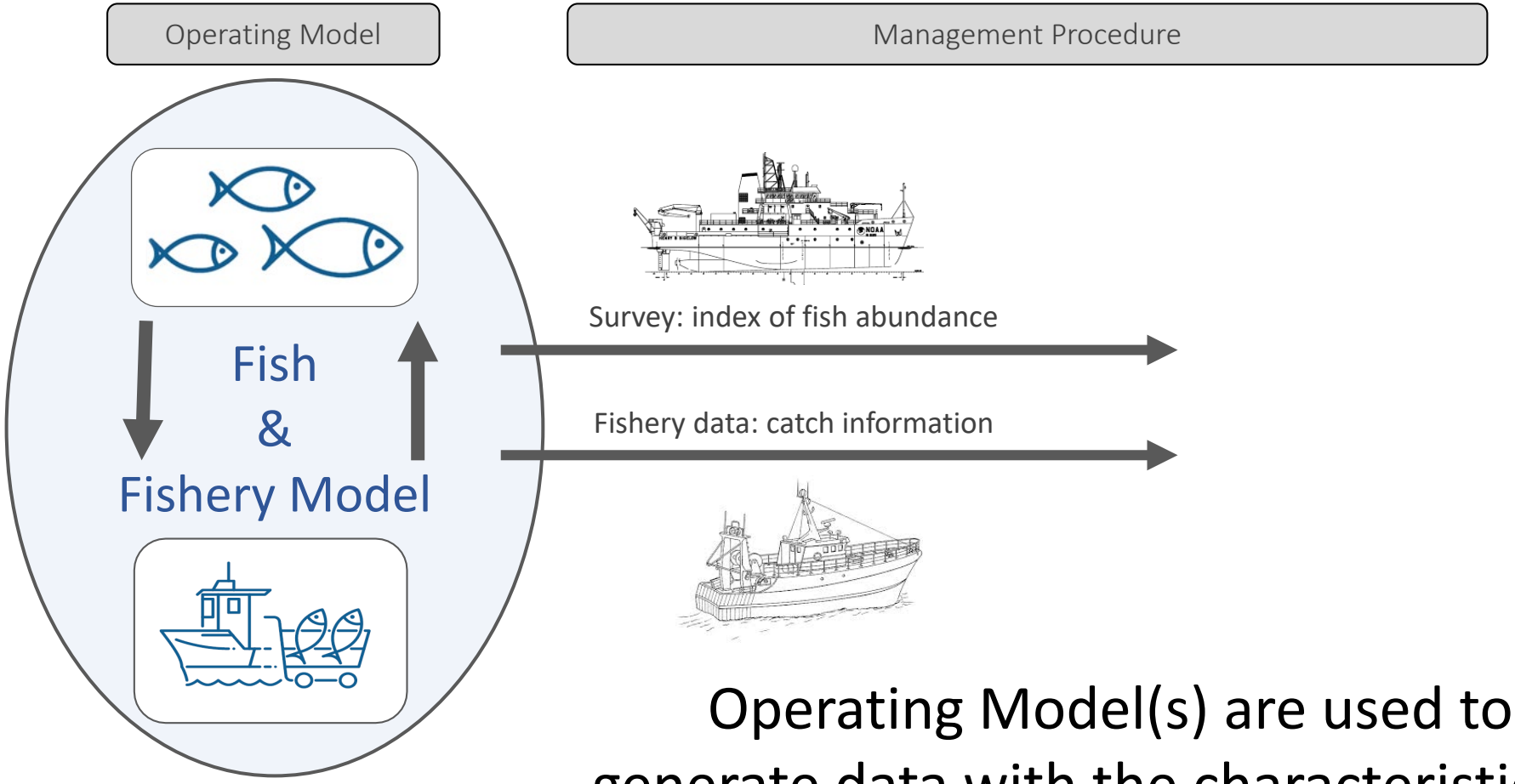
The objective of this study is to develop a framework for evaluating the impact of age data on management decisions in the context of Canadian fisheries management, with Petrale sole as a case study.

Scenario Testing Framework



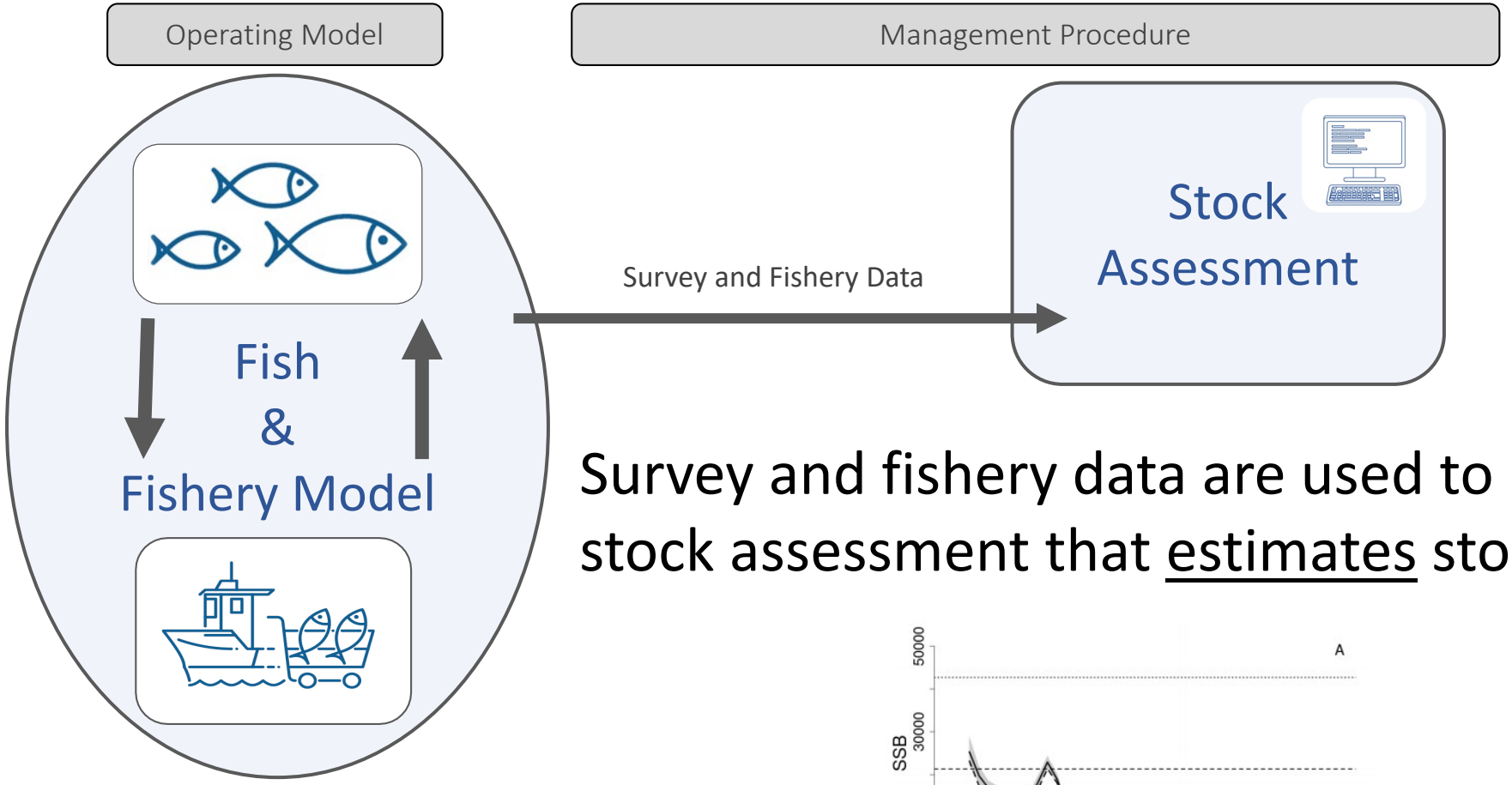
Operating models simulate the “TRUE” fish and fishery dynamics.

Scenario Testing Framework

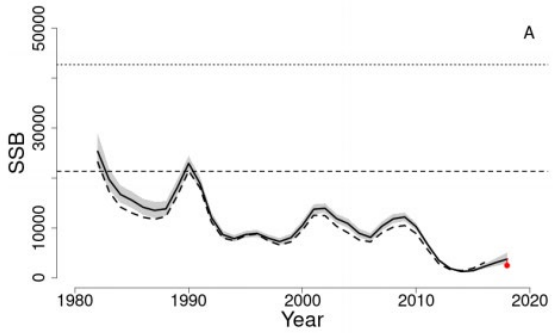


Operating Model(s) are used to generate data with the characteristics of our survey and fishery data collection.

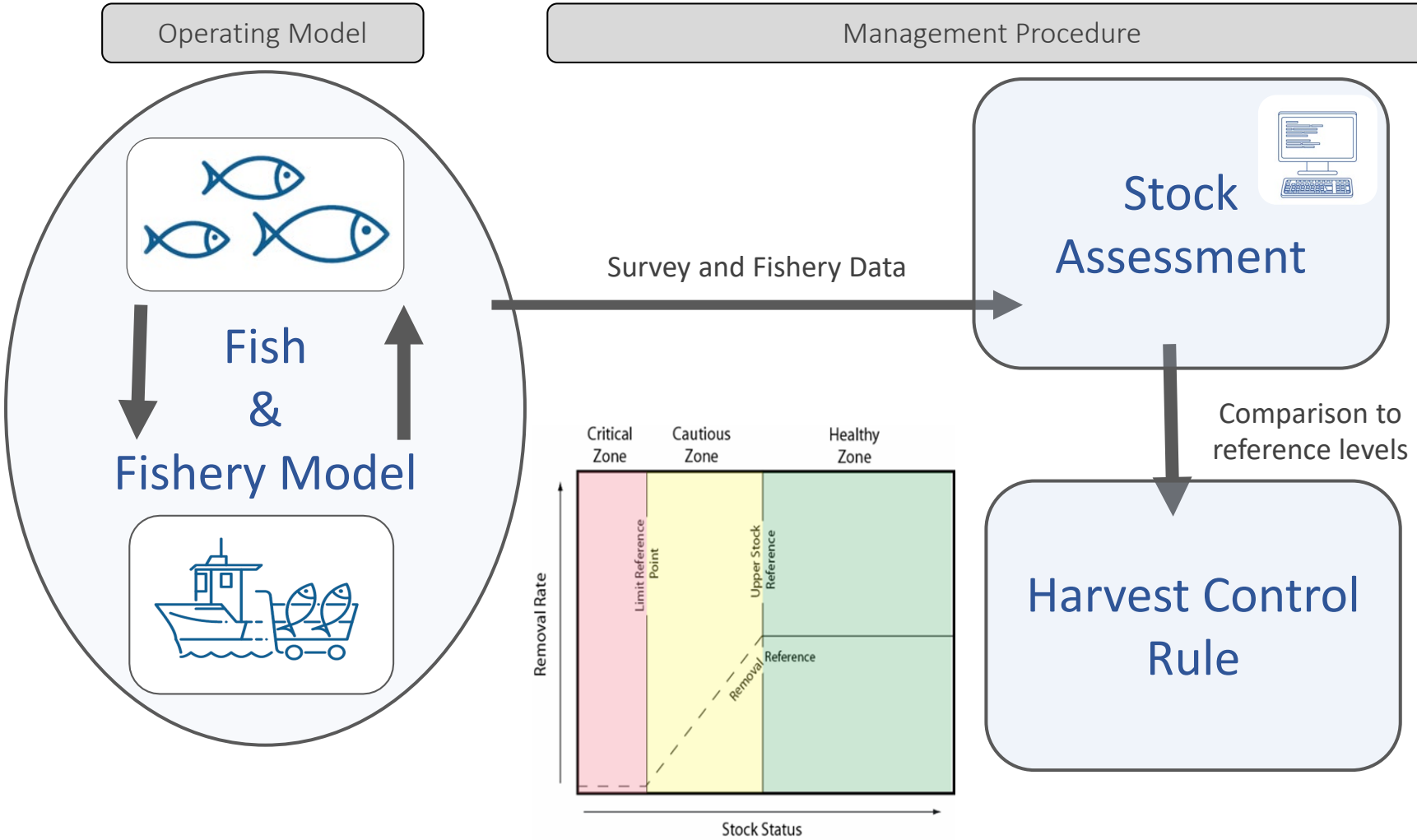
Scenario Testing Framework



Survey and fishery data are used to inform a stock assessment that <u>estimates</u> stock status.

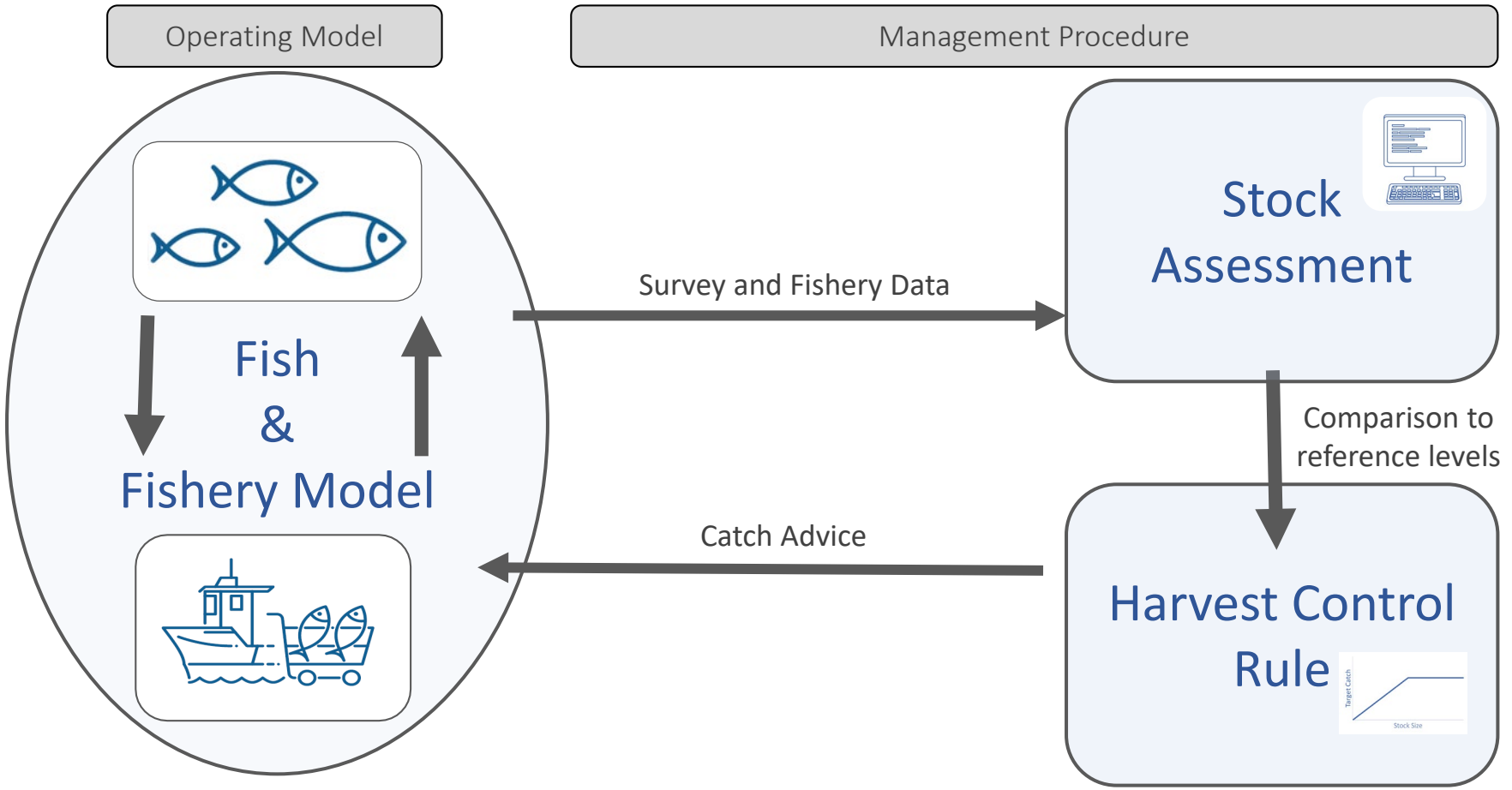


Scenario Testing Framework



(Fisheries and Oceans Canada)

Scenario Testing Framework



Petrale sole operating model

- Single species, stochastic, and age-structured
- No time-varying biological parameters
- Recruitment from an empirical distribution function

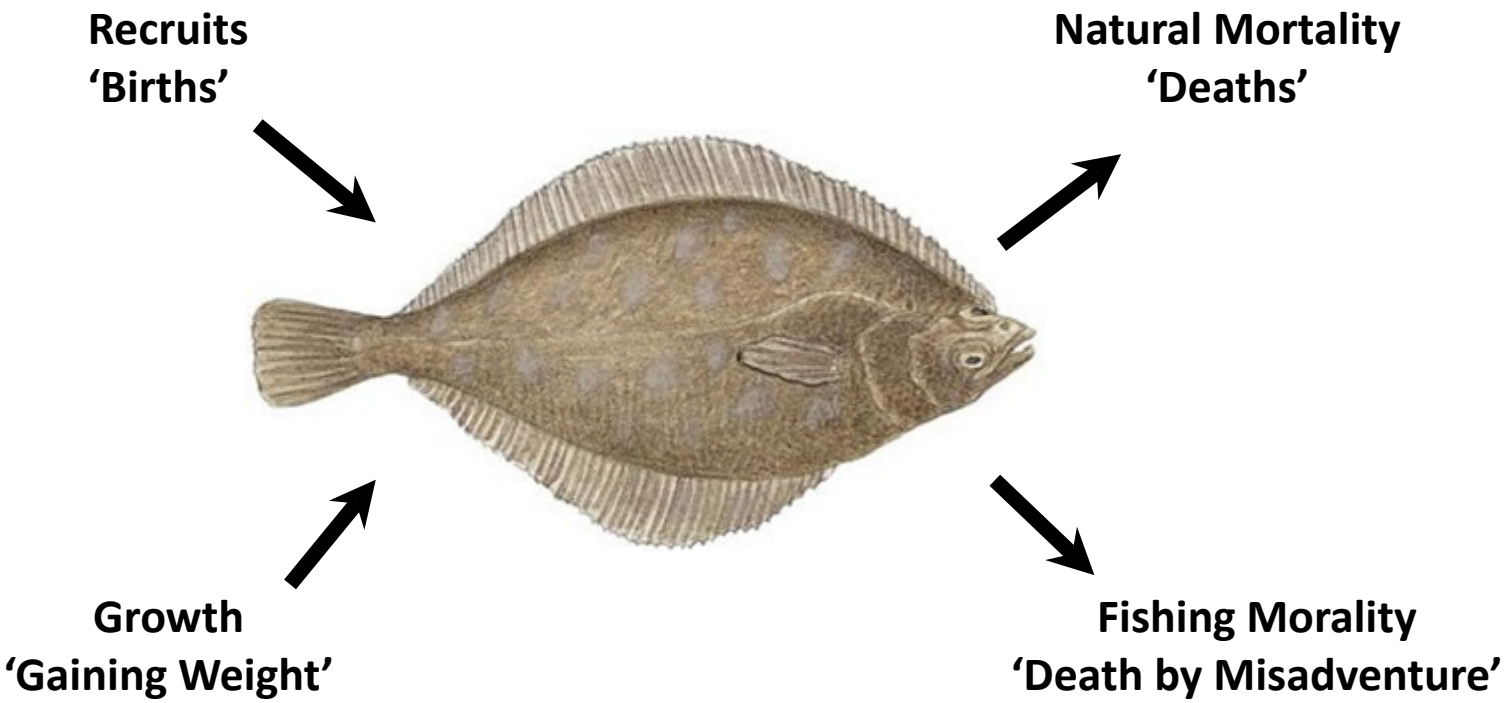
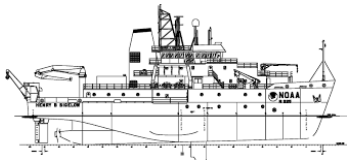


Image: http://identifyfish.blogspot.com/2010/09/petrale-sole-eopsetta-jordani.html

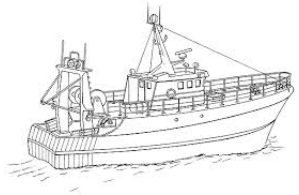
Stock assessment

- Using an age-structured stock assessment model



Survey: index of fish abundance

Fishery data: catch information



NOAA FISHERIES

Age Structured Assessment Program

Outputs
SSB
R
F
Catch

Data & Assessment Scenarios

Data Scenarios

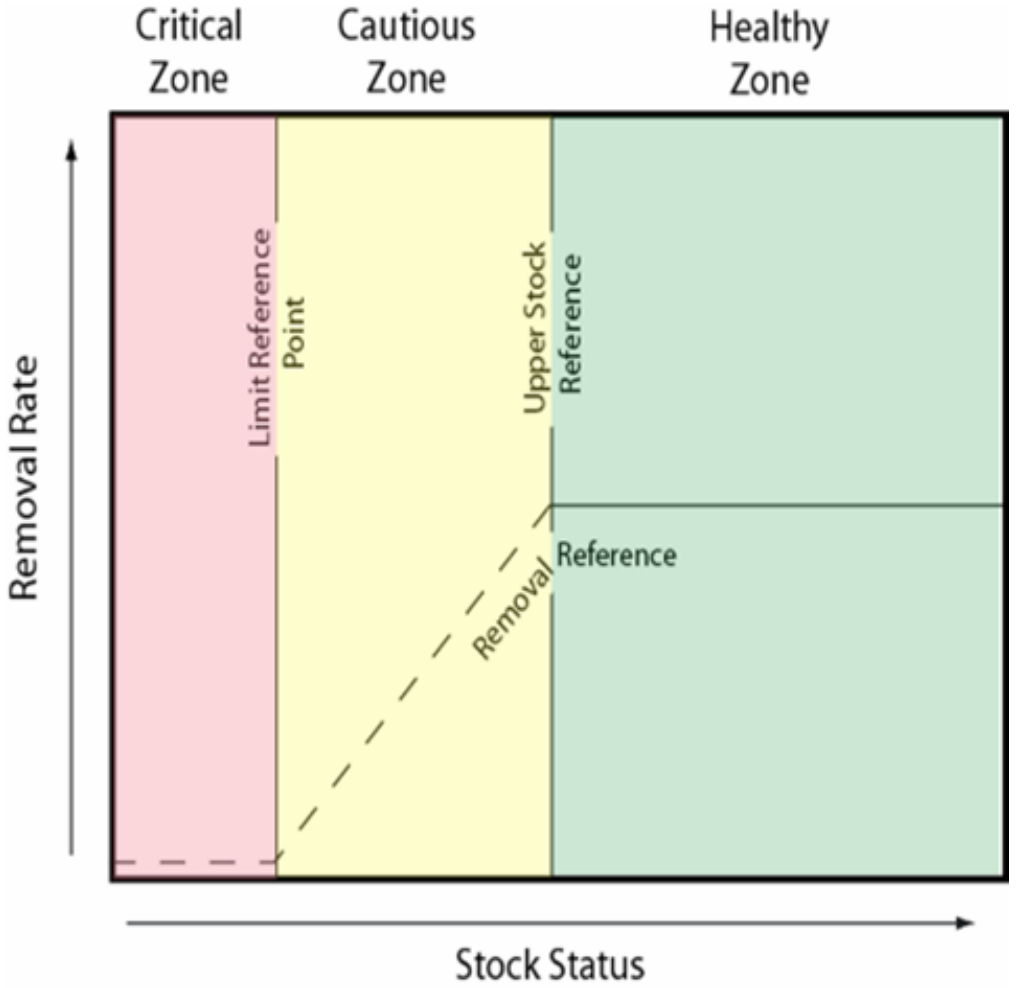
1. Low uncertainty in age composition
2. Higher uncertainty in age composition: half of the original effective sample size
3. Higher uncertainty and gaps in age composition: half of the original effective sample size and age composition data provided once every five years

Assessment Scenarios

1. No model misspecification: correct stock assessment model assumptions
2. Misspecification of catchability: catchability is increasing but the stock assessment model assumes it is constant

Harvest control rule

- Simulating DFO's 'Fishery Decision-making Framework Incorporating the Precautionary Approach'

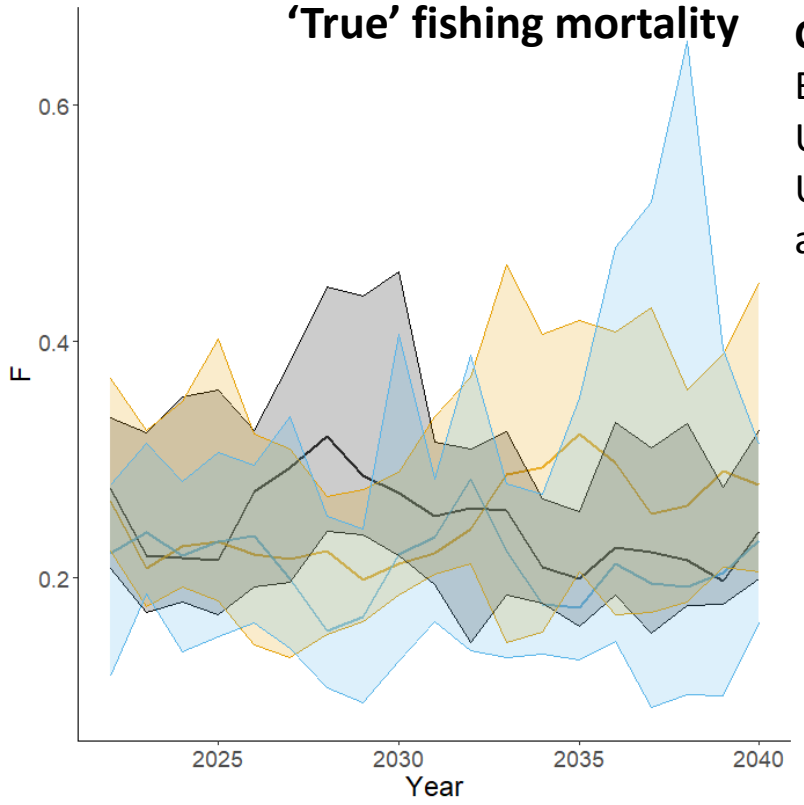


Preliminary results

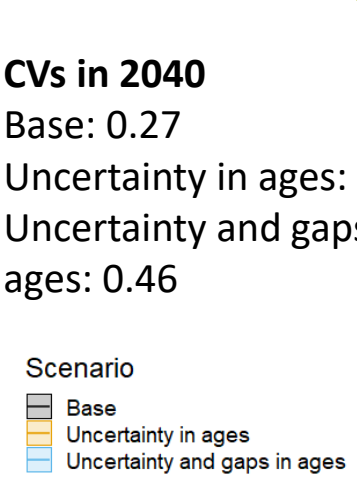
What is the impact of age data when the stock assessment makes correct assumptions?

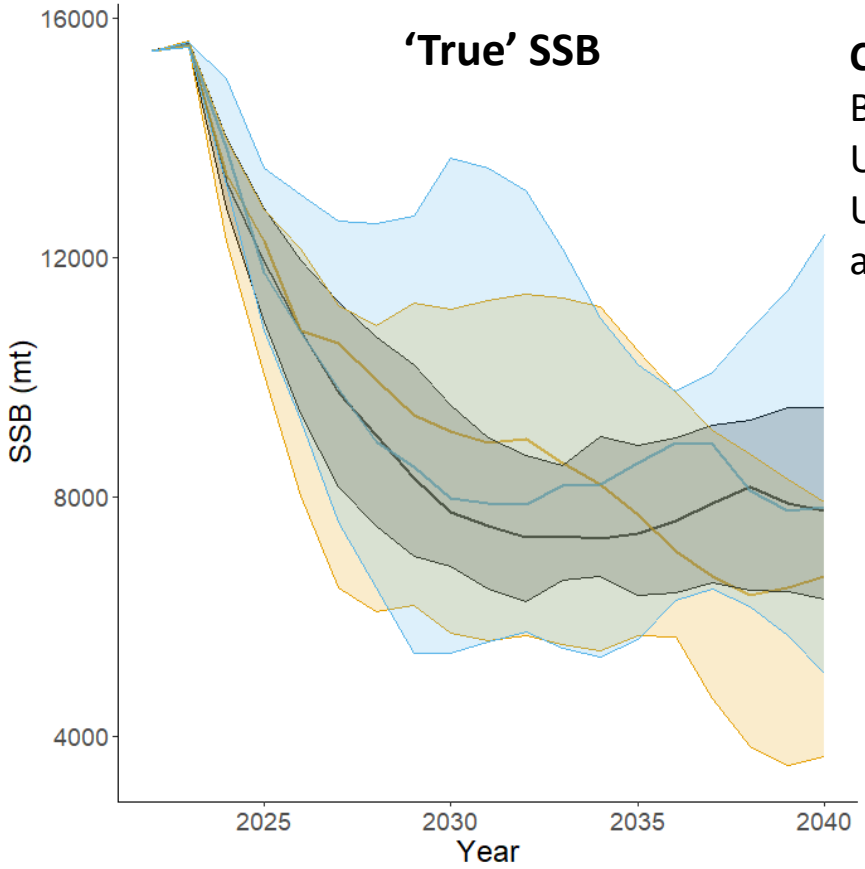
Uncertain age composition and gaps in age data did not have a large impact.

Uncertainty in age composition and gaps in age data resulted in higher uncertainty.

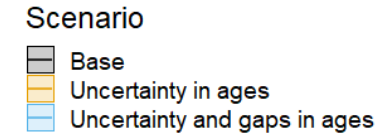


CVs in 2040
Base: 0.27
Uncertainty in ages: 0.41
Uncertainty and gaps in ages: 0.46





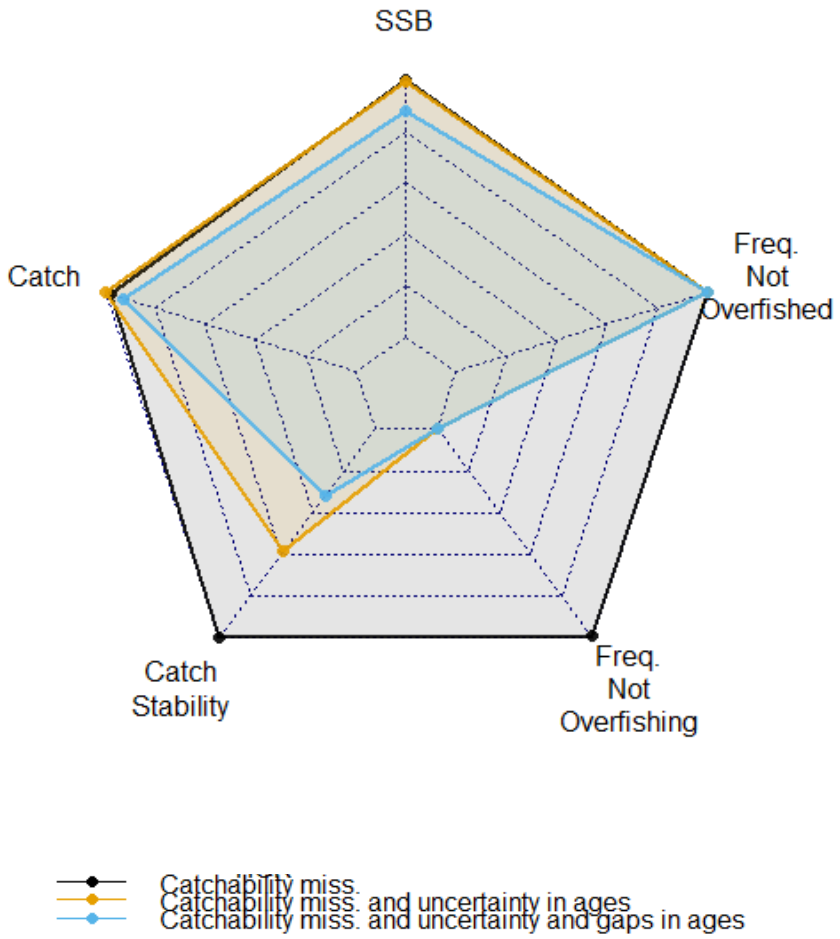
CVs in 2040
Base: 0.18
Uncertainty in ages: 0.27
Uncertainty and gaps in ages: 0.37



Preliminary results

What is the impact of age data when there is a stock assessment misspecification?

The impact of uncertain age composition and gaps in age data is larger with a stock assessment misspecification.



Uncertainty in age composition and gaps in age data resulted in more overfishing and a lower SSB.

Discussion and next steps

- Uncertain age composition data and gaps in age data resulted in more uncertain output but no differences in trends in stock dynamics.
- When there was a stock assessment misspecification, age data had a larger impact on stock dynamics.
- A management strategy evaluation approach can be used to help understand the impact of age data on management performance with and without stock assessment misspecifications.

Next steps:

- Simulate additional age data scenarios (i.e. fishery age data only, survey age data only)
- Simulate different levels of a catchability misspecification and other relevant misspecifications

Acknowledgements

- Sean Anderson, Brian Mose, Dana Haggarty, Rowan Haigh, Paul Starr, and Bruce Turris for feedback on the Petrale sole stock assessment
- Maria Cornthwaite, Lorri Granum, Chris Rooper, Ian Taylor, and Vladlena Gertseva for help with Petrale sole data
- Lisa Kerr, Steve Cadrin, Jerelle Jesse, Samuel Truesdell, Andrew Pershing, Ashley Weston, Gavin Fay, Jonathan Cummings, Sarah Gaichas, Min-Yang Lee, and Anna Birkenbach for development of the MSE modeling architecture.

Thank you and any questions?
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