Fisheries and Oceans Canada
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Evaluating the Impact of Age Data on Groundfish Stock Assessment and Management

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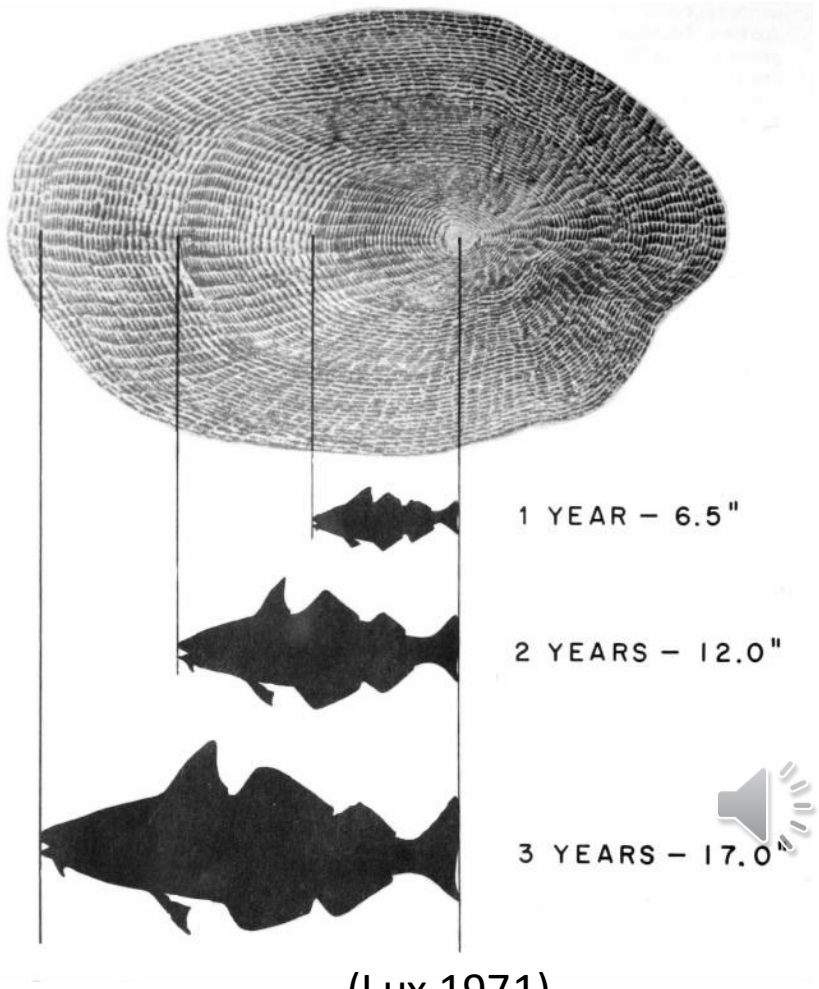
Stock assessment models and age data

- 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?



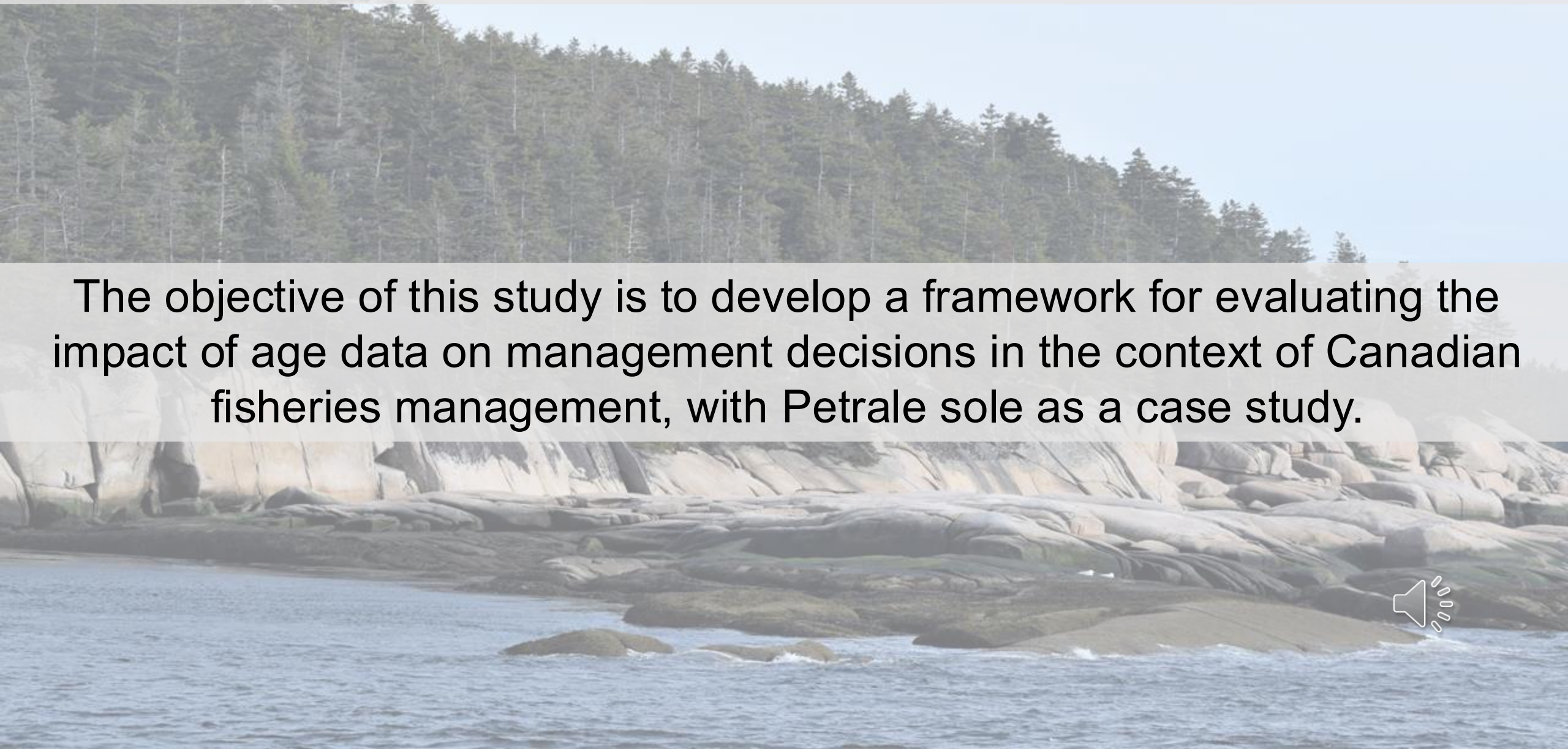
(Lux 1971)

Stock assessment models and age data


(Sea Grant)

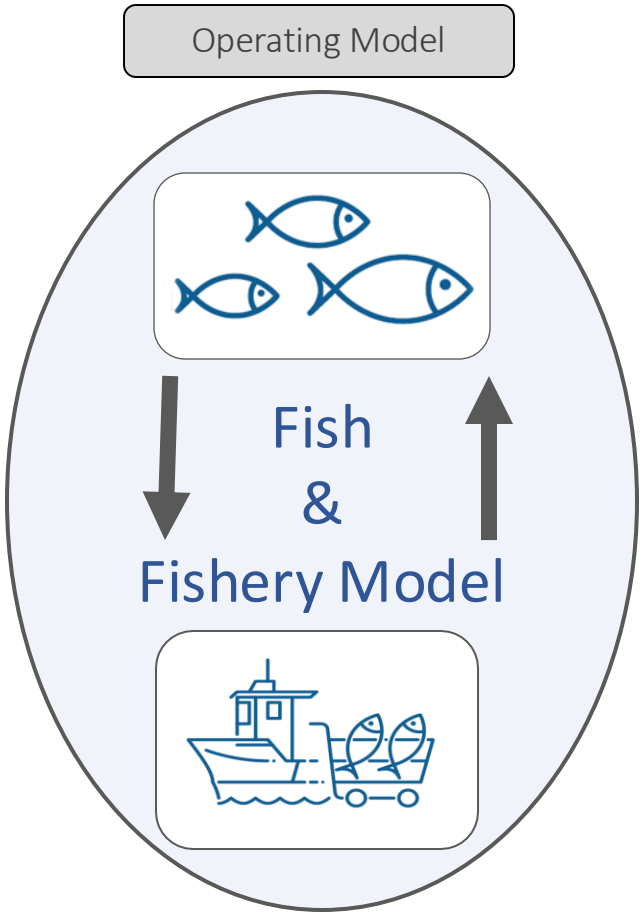
- Often a limited amount of fish ages
- Ono et al. (2014) found that:
  - Age data improved integrated stock assessment performance for flatfish species
  - Historical composition data was less important than recent composition data

Objective



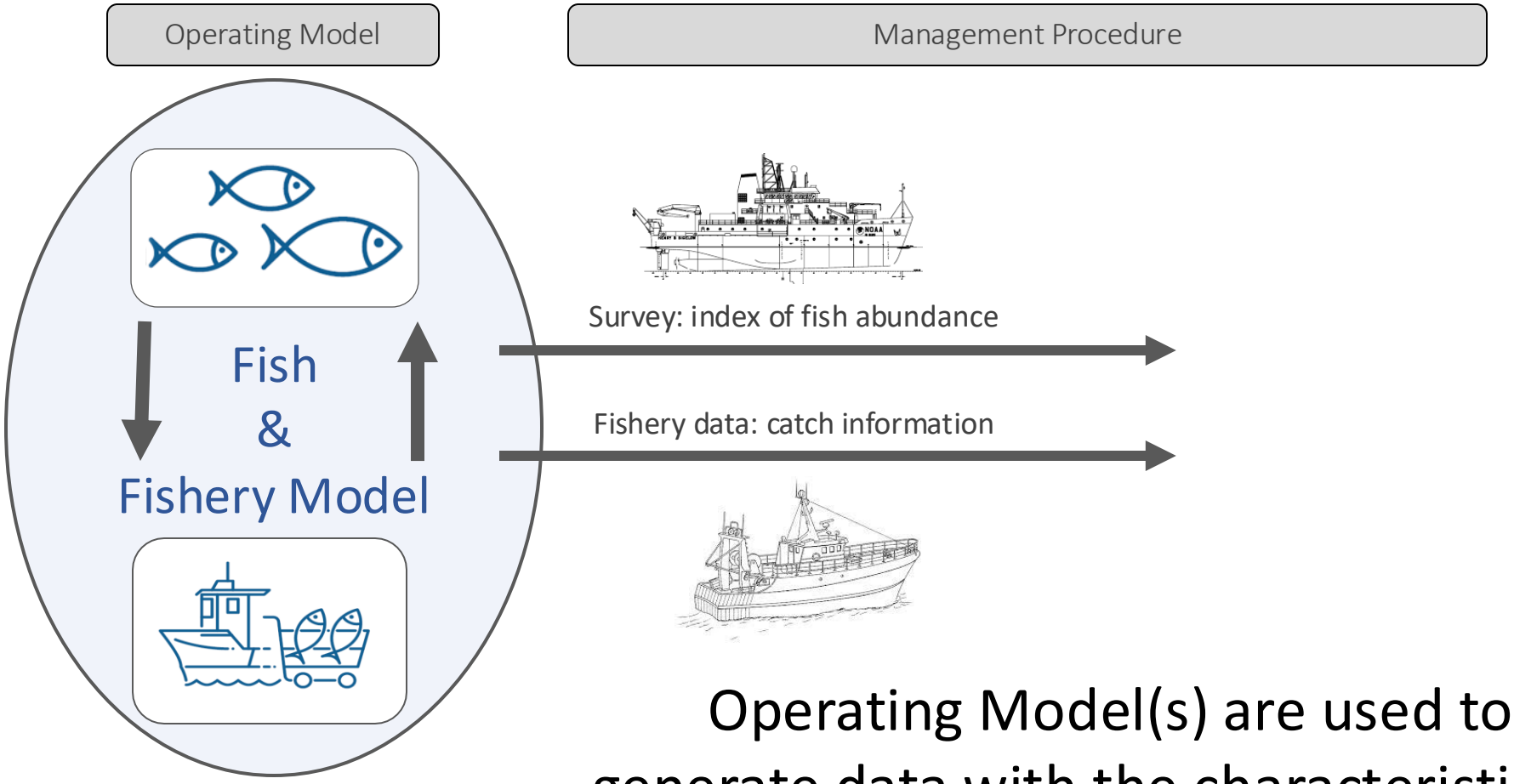
The objective of this study is to develop a framework for evaluating the impact of age data on management decisions in the context of Canadian fisheries management, with Petrale sole as a case study.

Scenario Testing Framework



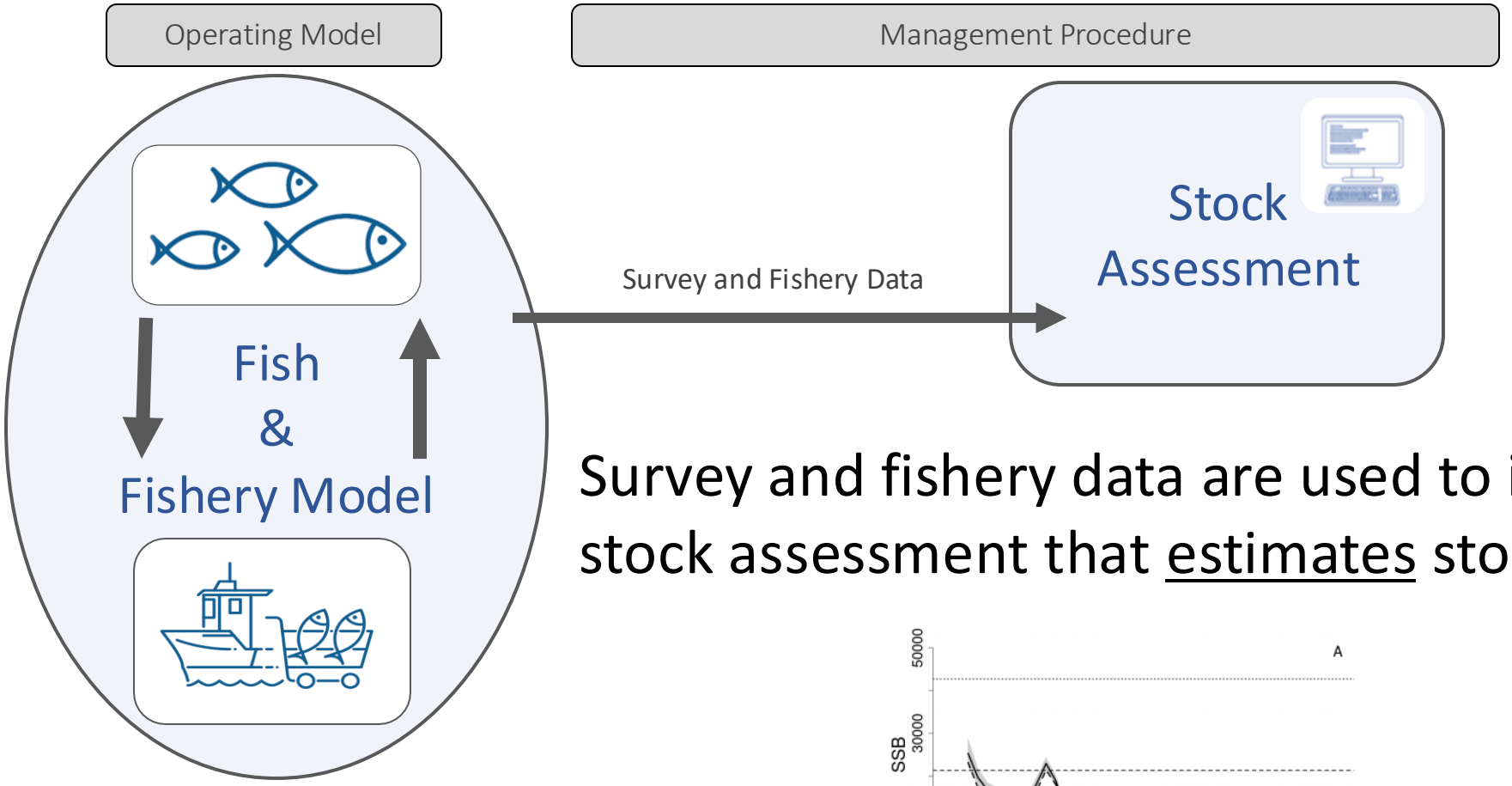
Operating models simulate the “TRUE” fish and fishery dynamics.

Scenario Testing Framework

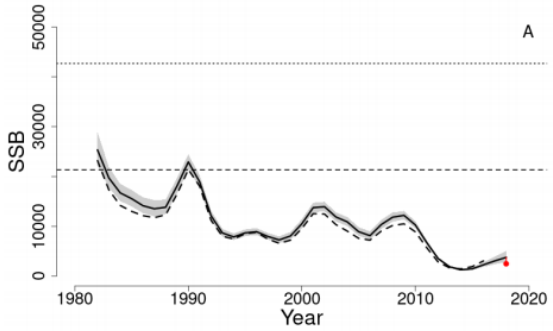


Operating Model(s) are used to generate data with the characteristics of our survey and fishery data collection.

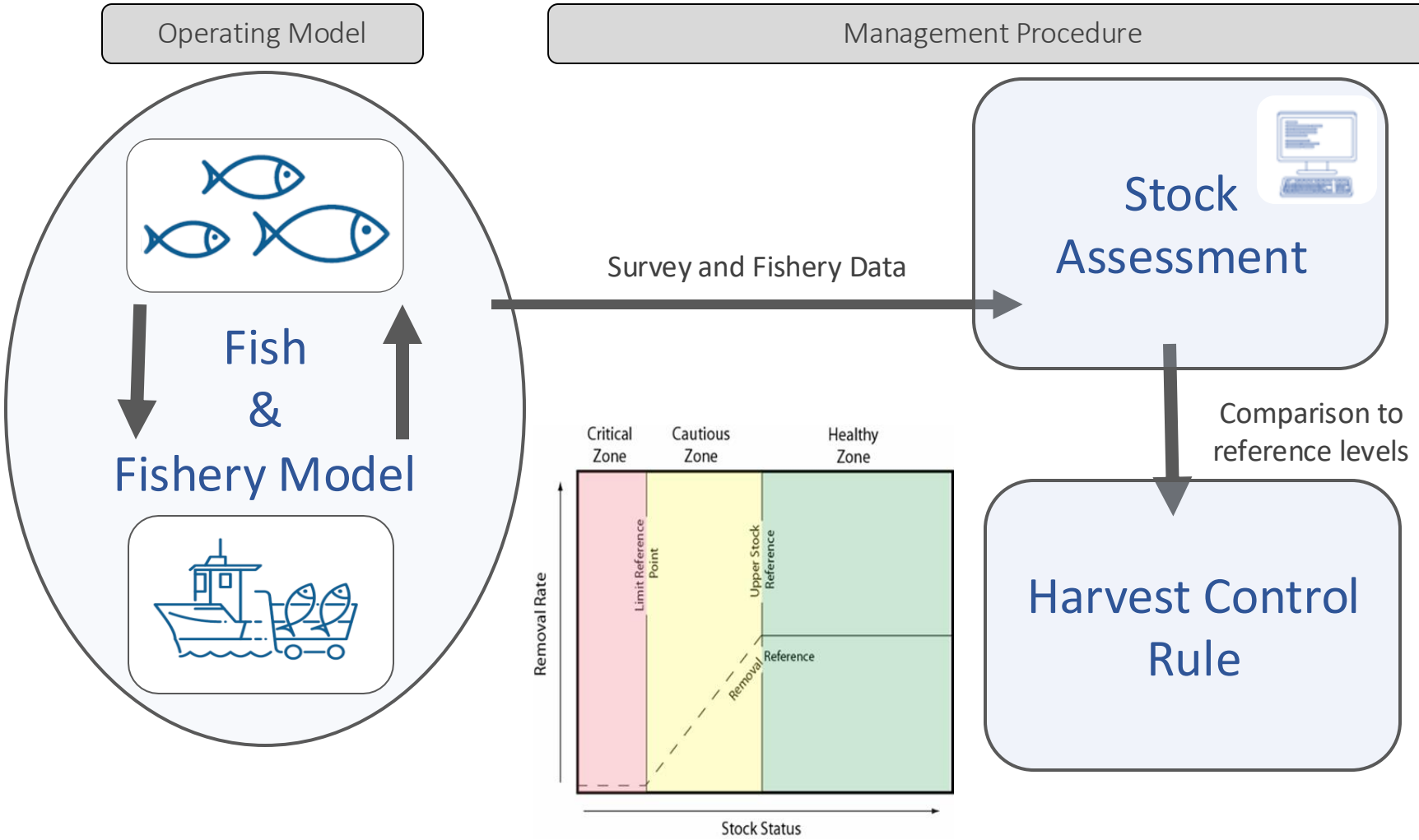
Scenario Testing Framework



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

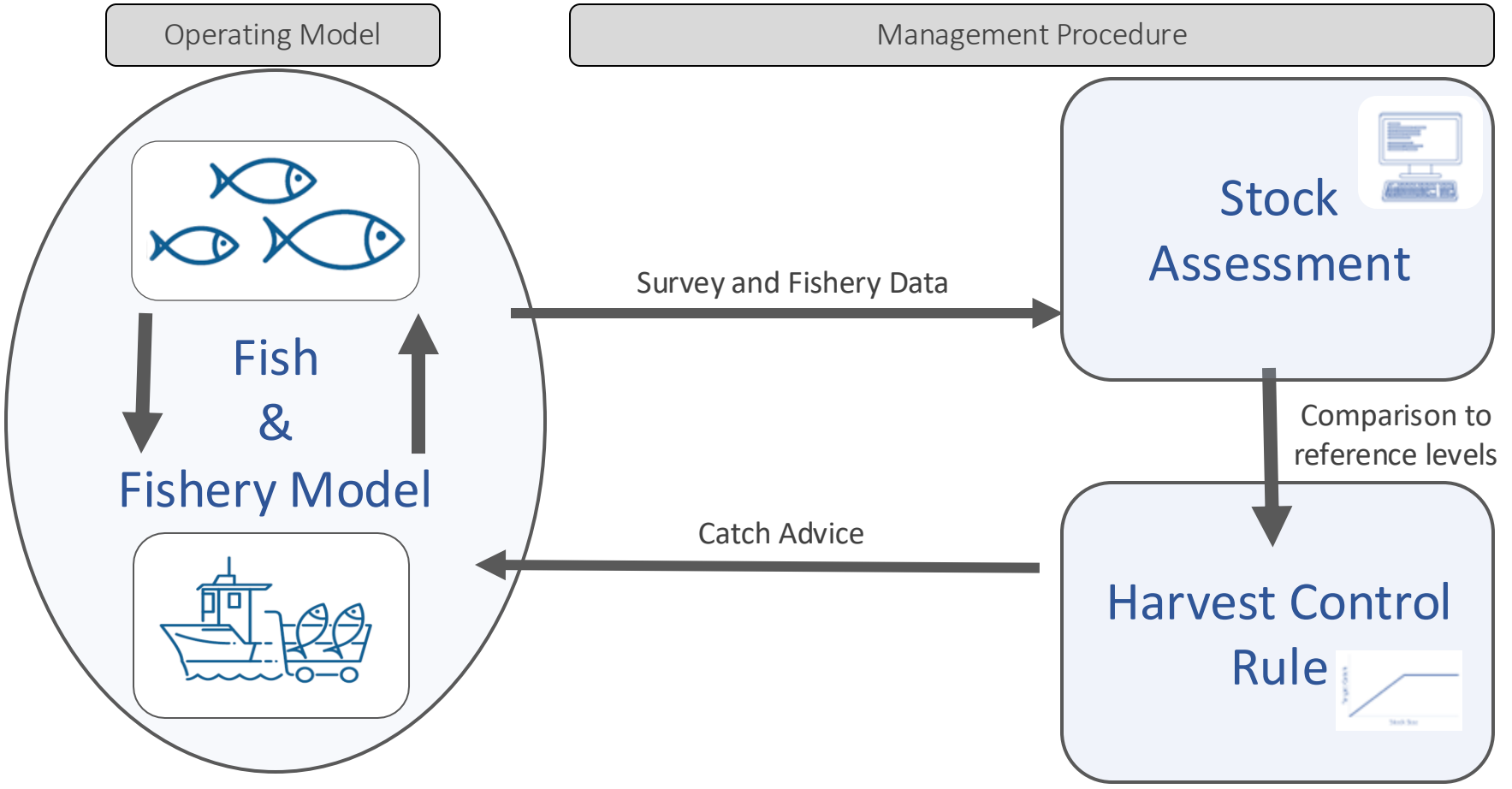


Scenario Testing Framework



(Fisheries and Oceans Canada)

Scenario Testing Framework



Petrale sole operating model

- Single species, stochastic, and age-structured
- Random large recruitment events
- Recruitment from an empirical distribution function

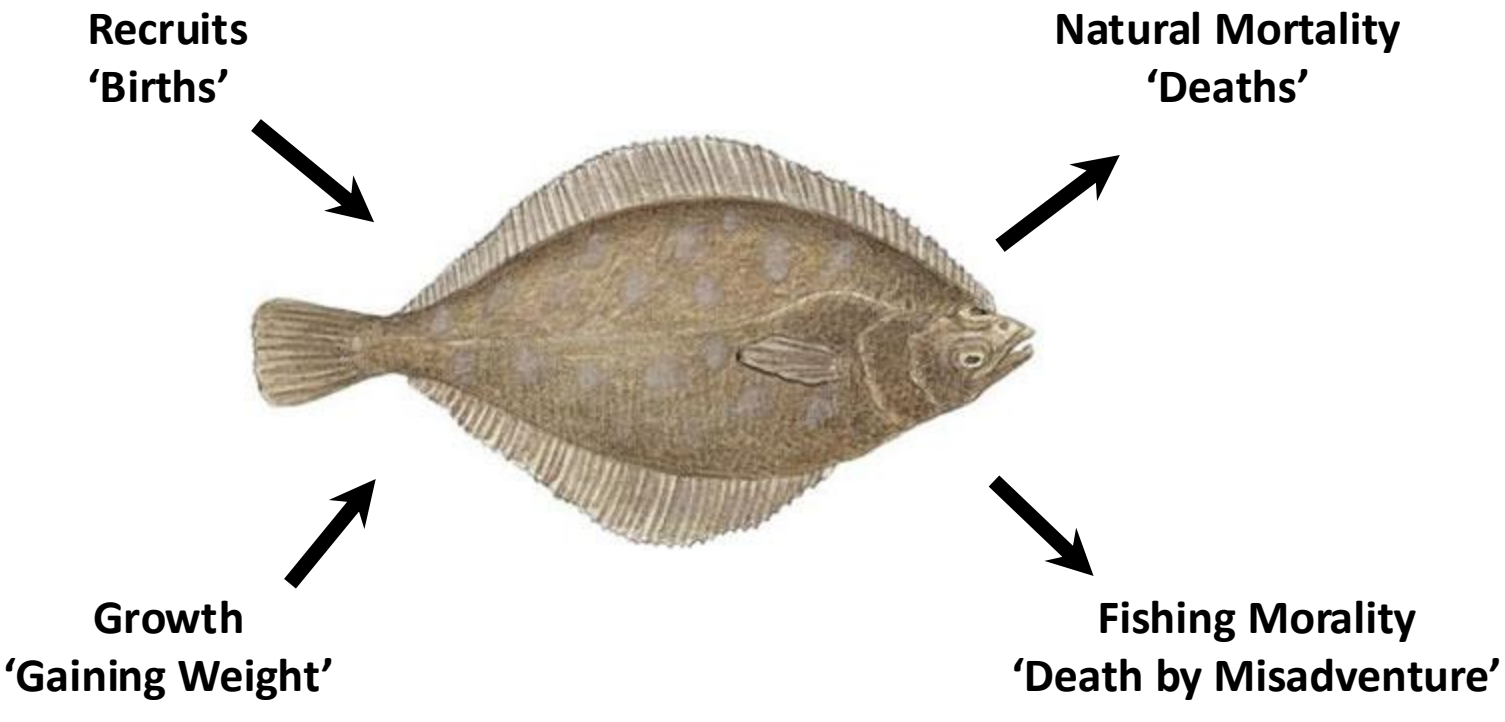
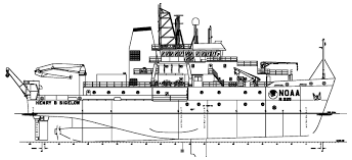


Image: http://identifyfish.blogspot.com/2010/09/petrale-sole-eopsetta-jordani.html

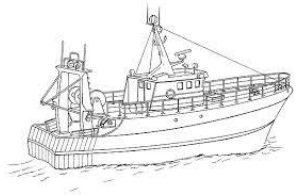
Stock assessment

- Using an age-structured stock assessment model



Survey: index of fish abundance

Fishery data: catch information



NOAA FISHERIES

Woods Hole Assessment Model (WHAM)

Outputs
SSB
R
F
Catch

Data Scenarios

1. Base (age data every year)

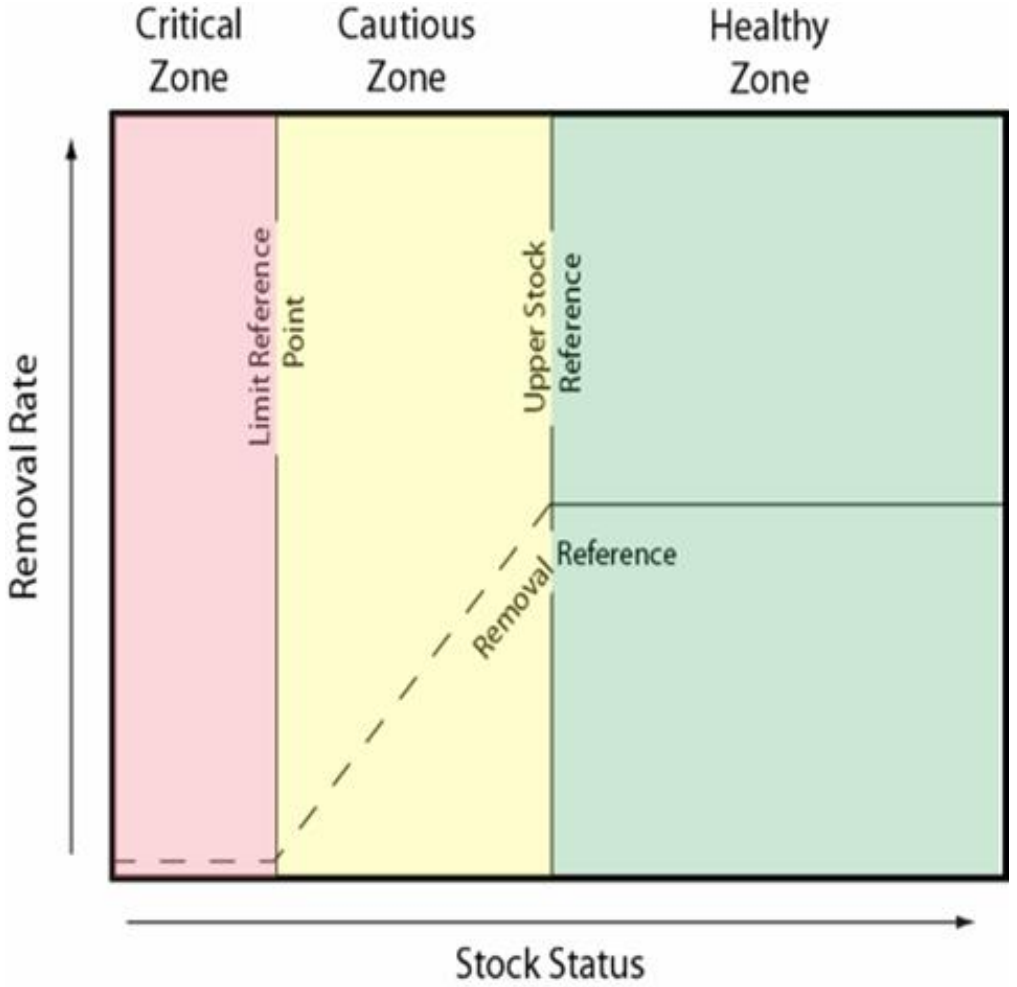
2. No recent age data (no data in the last five years)

3. Gaps in age data (age data once every three years)

4. Less age data (half of the original effective sample size)

Harvest control rule

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



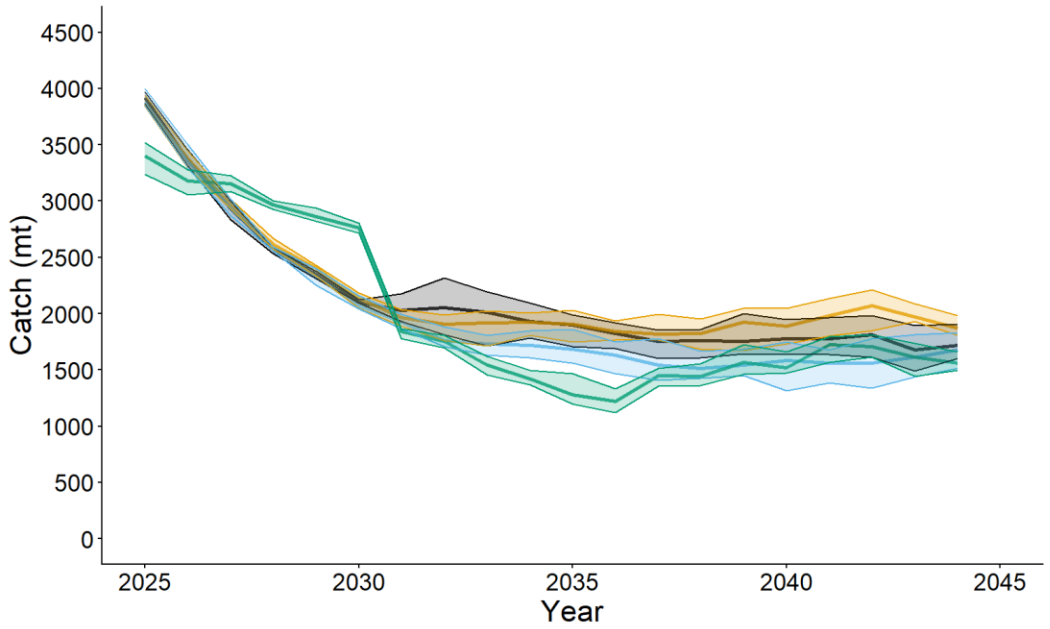
Preliminary results

What was the impact of age data?

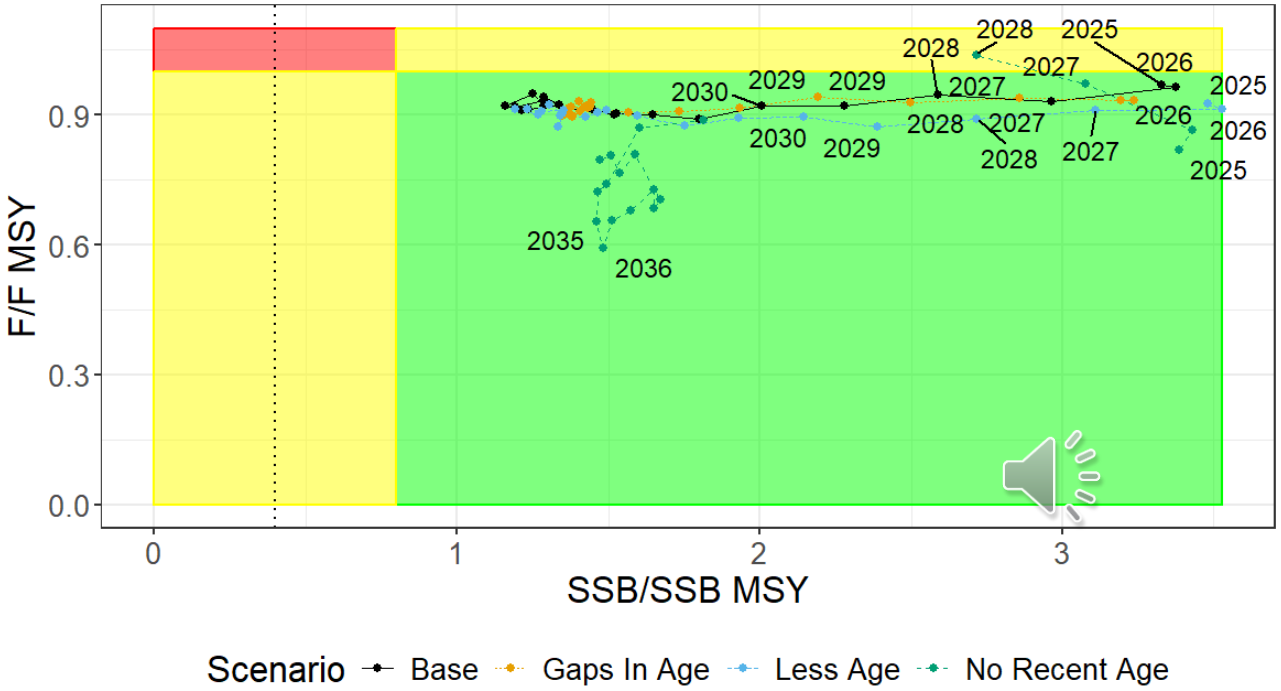
Gaps in age and less age data did not have a large impact.

No recent age data had a large impact, resulting in higher SSB and lower catch in the medium- and long-term.

'True' Catch



'True' stock status

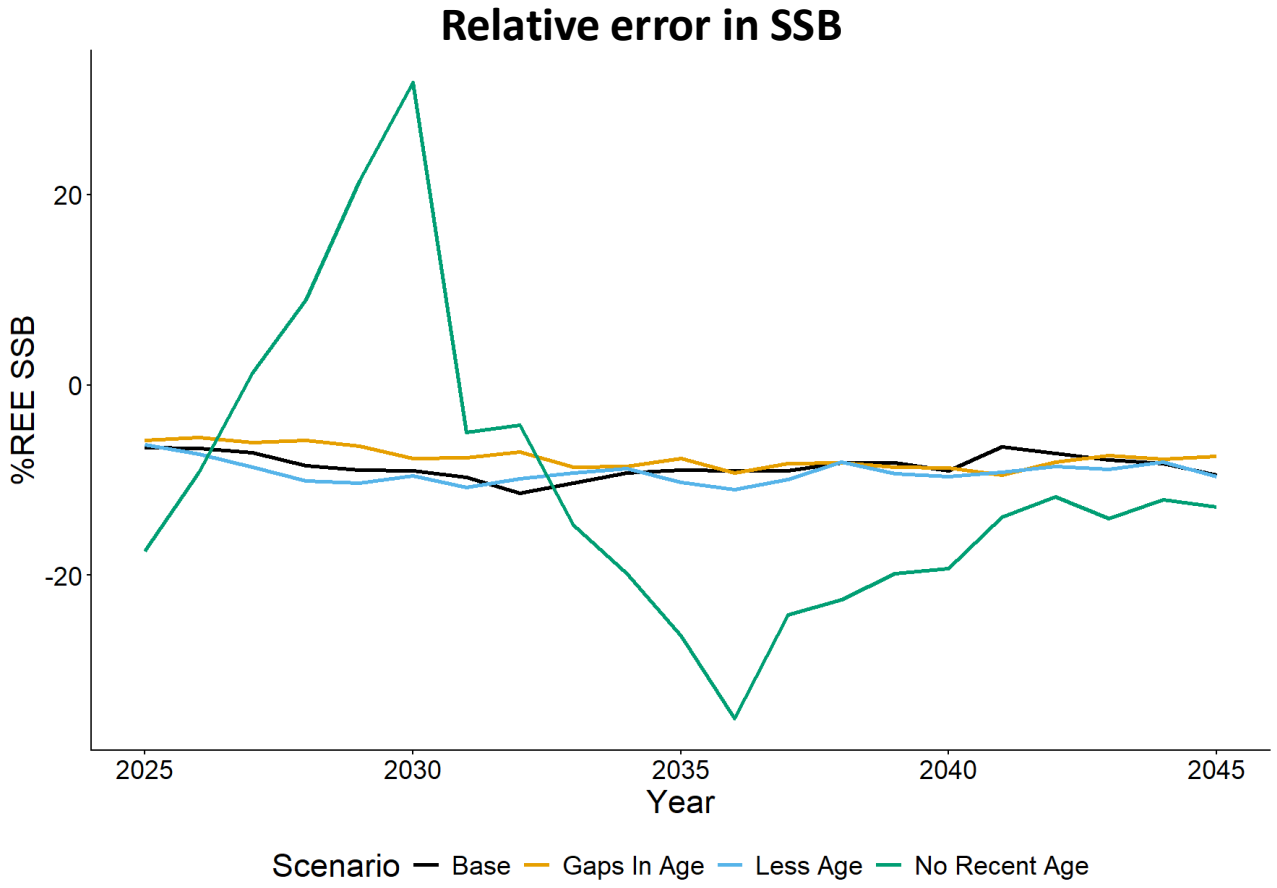


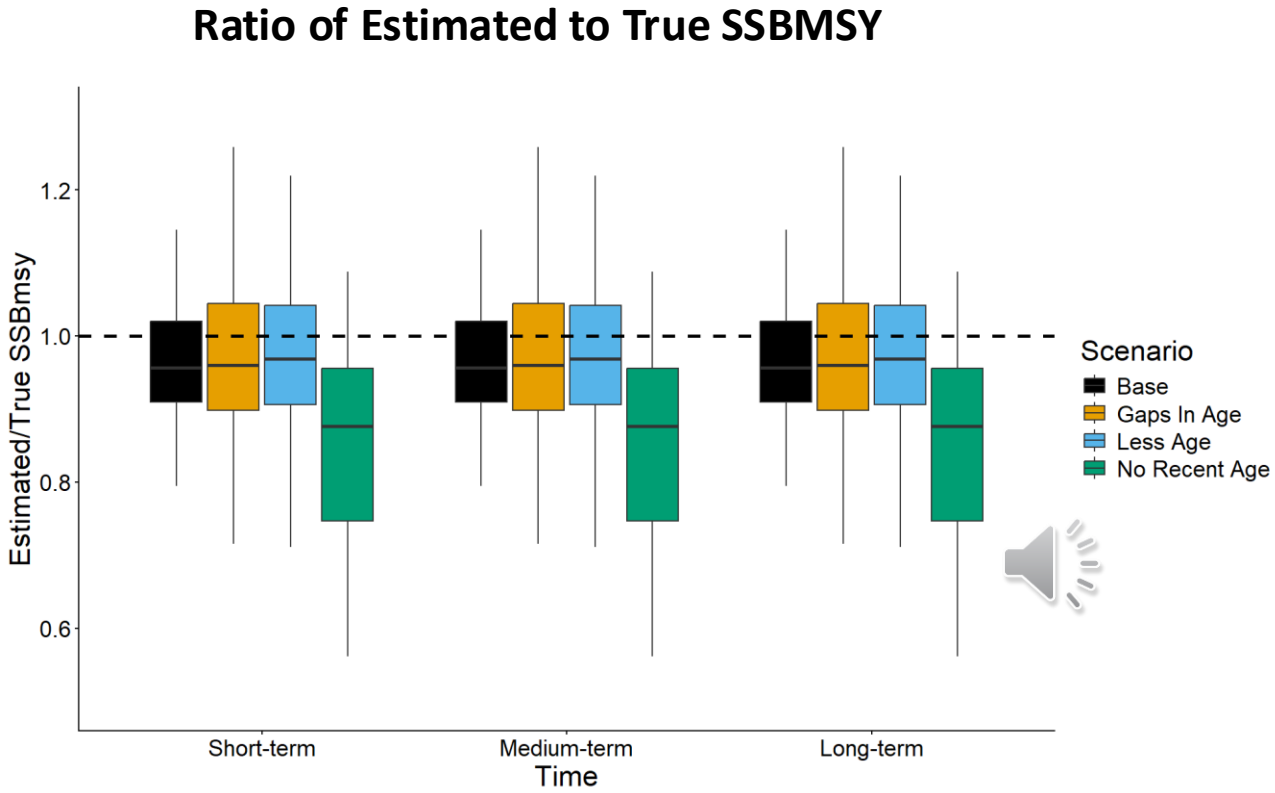
Preliminary results

Why did no recent age data have the largest impact?

No recent age data resulted in stock assessment bias.

The stock assessment bias resulted in estimated BMSY being lower than true BMSY, which led to conservative advice.





Discussion and next steps

- No recent age data resulted in stock assessment bias and in this case, conservative advice.
- A management strategy evaluation approach can be used to help understand the impact of age data on management performance.

Next steps:

- Simulate scenarios with increasing frequency of large recruitment events and increasing natural mortality.
- Simulate scenarios with random effects on recruitment and mortality in the estimation model (WHAM) to see the impact of random effects with different scenarios of age data and time-varying life histories.

Acknowledgements

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