

# **Theme Session 3: Methods for analysing and modelling stock recovery**

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# **Do we have the right tools and methods for analysing and modeling stock recovery?**

Uncertainty, the unifying theme

- Which uncertainties matter?
- How do we address them in the formulation and evaluation of rebuilding plans?
- How do we track progress?
- What to do when data are poor?

## Good data is often lacking

- explore the use of new indicators (e.g. SSB from egg surveys)
- consider possible biases in the indicators (e.g. cpue in SBT)
- borrow information from your “relatives” (meta-analyses)

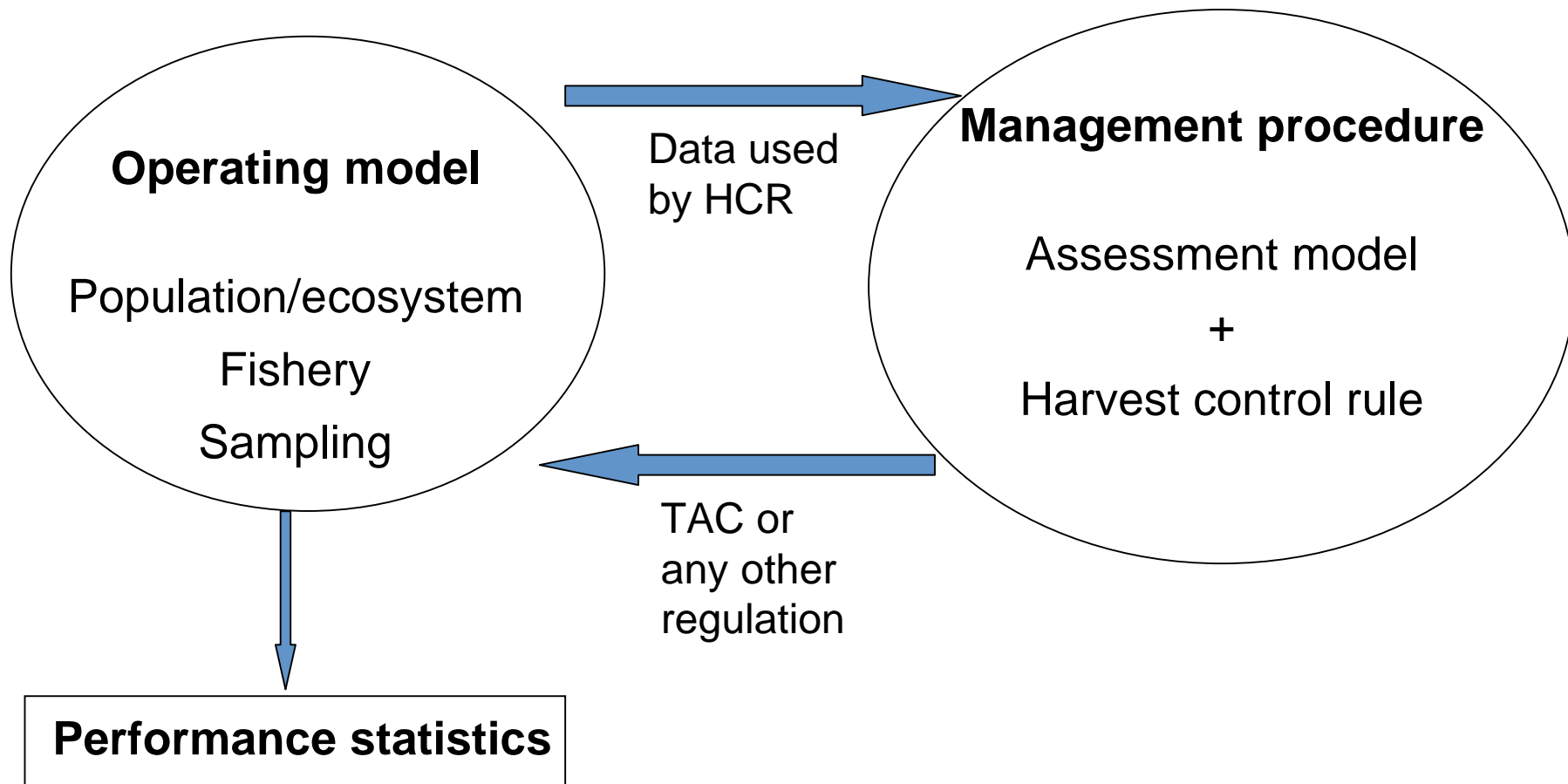
# Do the uncertainties matter in management?

Different approaches to identifying critical uncertainties

- Biological Ensemble Model Approach: compare predictions from several existing models to look for "robust advice" or divergent predictions
- Sensitivity to alternative model assumptions within the same model framework

# How do we address uncertainties in the formulation of management advice?

## Management strategy evaluations



# Management Strategy Evaluation

- The operating models can integrate knowledge gathered through different kinds of process-oriented research
- The framework allows to use that knowledge in the provision of management support
- Allows for evaluating the effects of all kinds of uncertainties on performance of any harvest control rule
- Can identify relevant gaps of information and data needs for improving performance

# **Different case studies explored different problems and uncertainty axes**

- Issues about input data
- Stock-recruitment functions
- Productivity levels
- Environmental variability and regimes shifts
- Coupled bio-physical models- IBM
- Alternative time series of indicators used to conditioned the models
- Fleet dynamics in response to management actions
- Multispecies interactions

# Conclusions

- Most of the processes/uncertainties examined do matter (i.e. impact conclusions about management performance):
  - Interactions between management of a single stock and the multi-species dynamics
  - Interactions amongs different sources of uncertainties
  - Accounting for fishermen reactions
  - Circulation patterns, environmental variables
  - etc

# Conclusions- processes

- MSE framework facilitates communication between managers, scientists and stakeholders
- Input from all is needed at all stages
- Iterations are needed: Operational objectives cannot be set in the abstract because of the many trade-offs involved that are only quantifiable through the MSE.
- Once a rebuilding plan is implemented, need to track progress towards meeting objectives
- Need adequate tools to communicate trends in complex systems: integration of indicators, visual tools

# Main questions

- Do we have the right tools and methods for analysing and modeling stock recovery?

Yes

- Does this mean that we can trust our forecasts?

No

- But we can still provide advice!
- use the tools not to forecast what will happen but to design harvest control rules that will respond well to whatever happens
- **Adequate feedback** + harvest control rules that are able to react
- But for this we need good indicators of population trends

# Some open questions

- How much uncertainty to represent?
  - Too much: impractical, will erode stakeholder support for rebuilding plan
  - Too little: erodes credibility of science (e.g. overly optimistic predictions may turn out to be wrong)
- The available tools allow us to integrate existing knowledge, and turn scientific production into the delivery of management support service (Denis Baily). Have we done that level of integration?