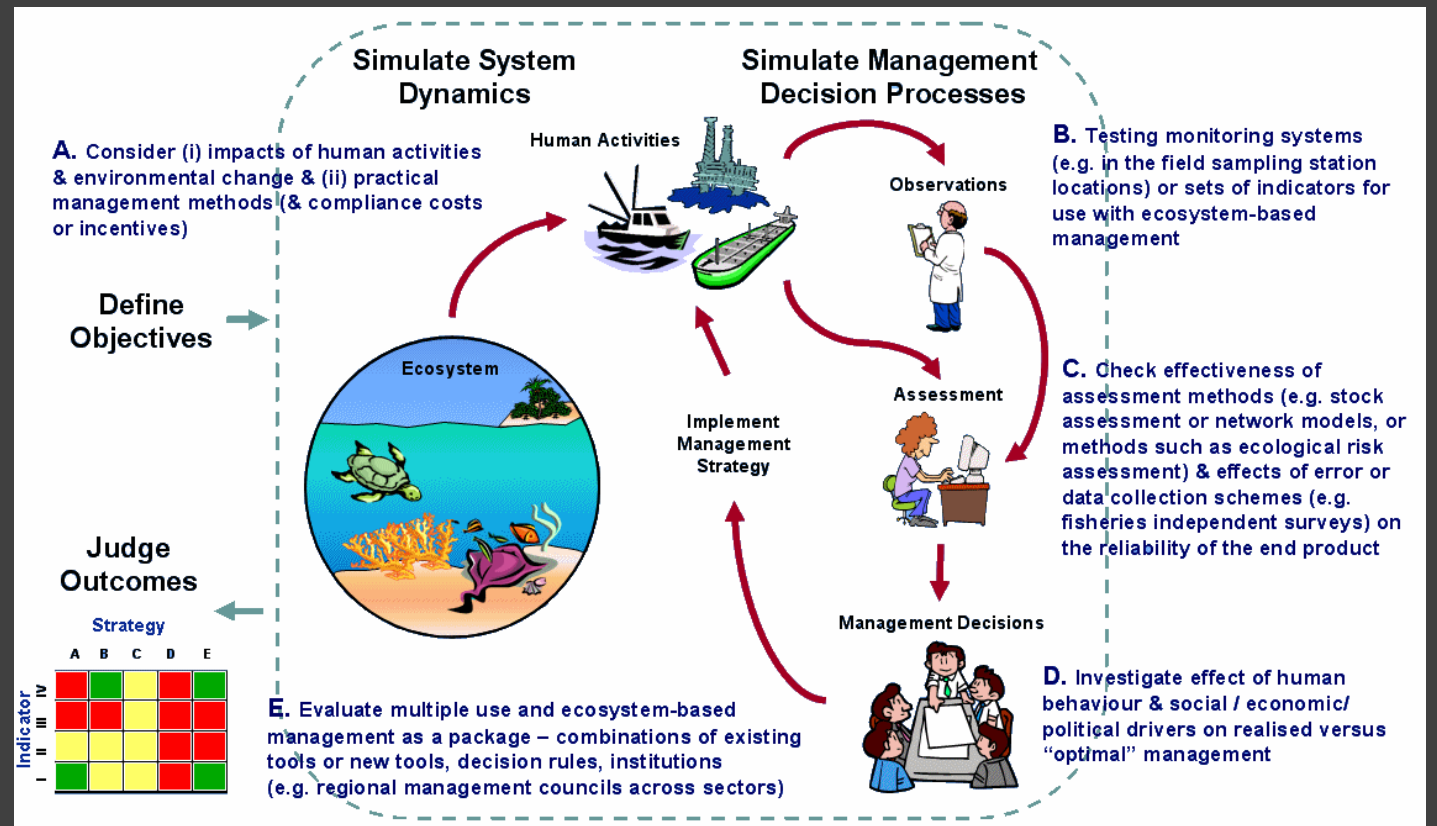


Modelling frameworks for the NE Pacific and how we integrate stakeholders into our decision making framework, including MSEs



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Outline

- Federal Management of USA NE Pacific Fisheries.
- Multispecies models
 - USA West Coast
 - Alaska
- Involving stakeholders (Sardine case study)



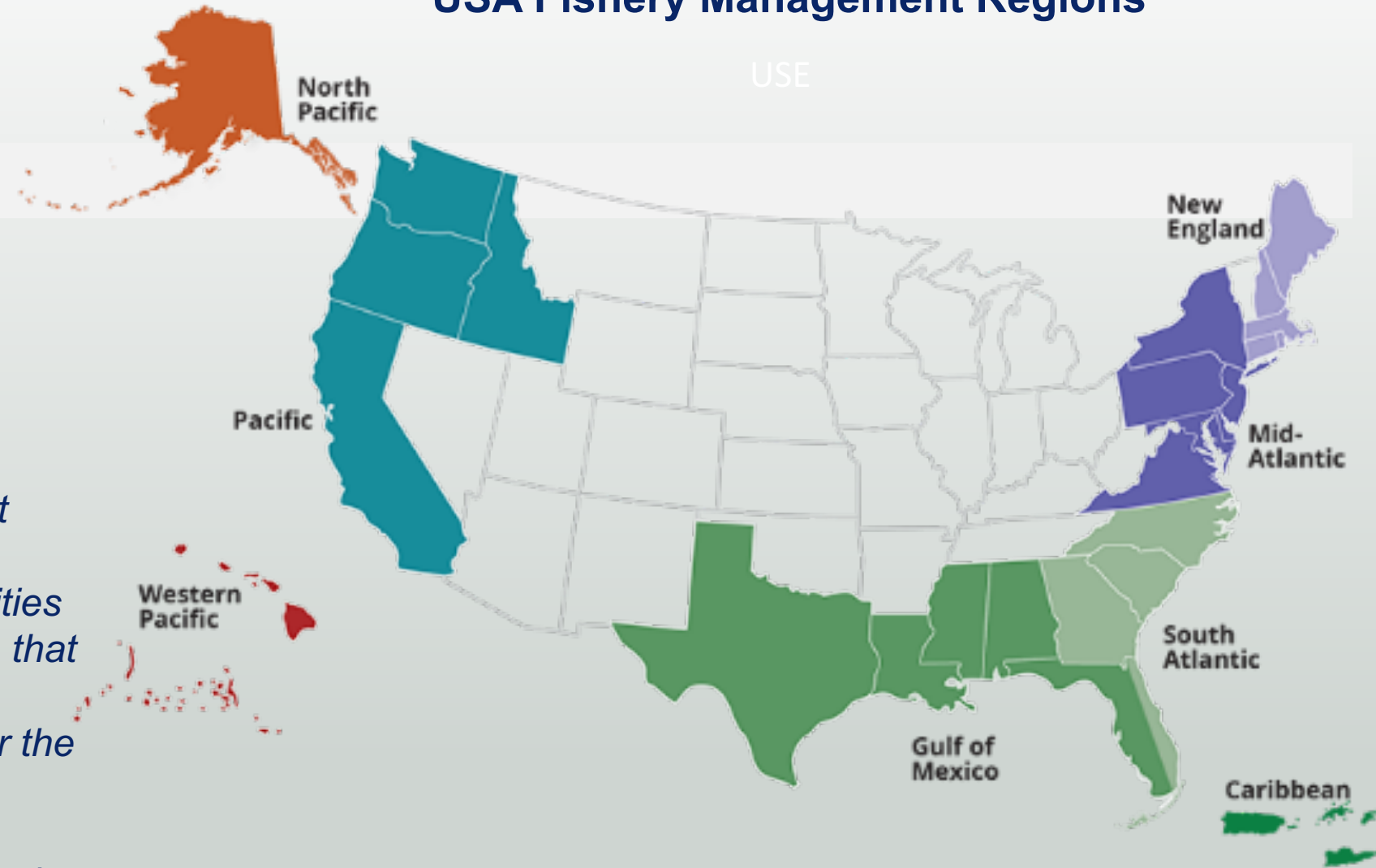
National Standard 1

Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.

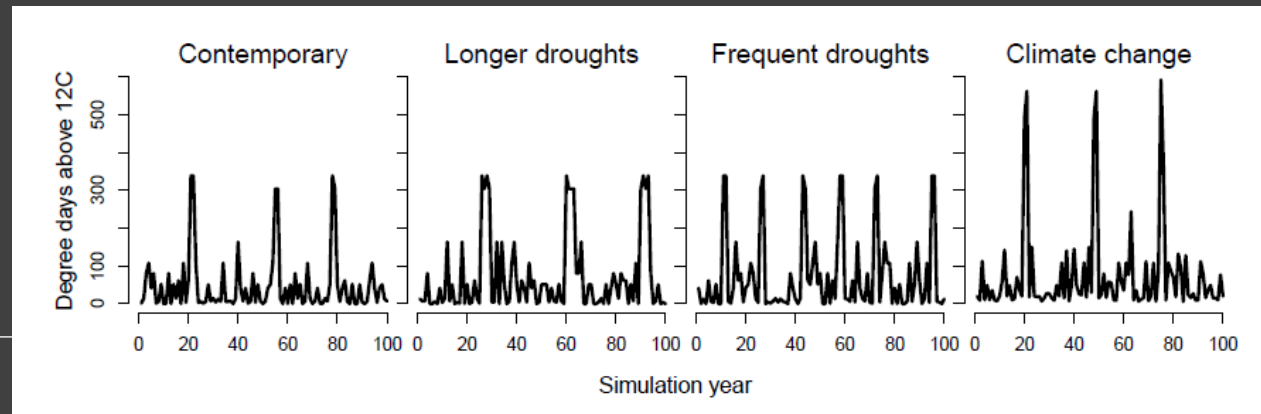
National Standard 8

Conservation and management measures shall, consistent with the conservation requirements of this Act take into account the importance of fishery resources to fishing communities by utilizing economic and social data that meet the requirement of National Standard 2, in order to (a) provide for the sustained participation of such communities, and (b) to the extent practicable, minimize adverse economic impacts on such communities.

USA Fishery Management Regions



USA West Coast



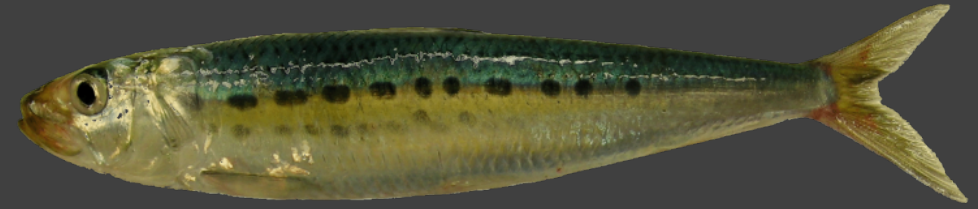
Tasks for multispecies / ecosystem models

- Determine cumulative impacts of single-species management rules (Atlantis)
- Evaluate consequences of the harvest control rule for Pacific sardine in terms of catch and stock risk, and for place-based predators (Ecopath, Atlantis, MICE, etc.)

Recent use of Management Strategy Evaluation approaches:

- Sacramento River winter Chinook salmon
- Pacific sardine
- Pacific hake
- Trawl-caught flatfish (for the Marine Stewardship Council certification)

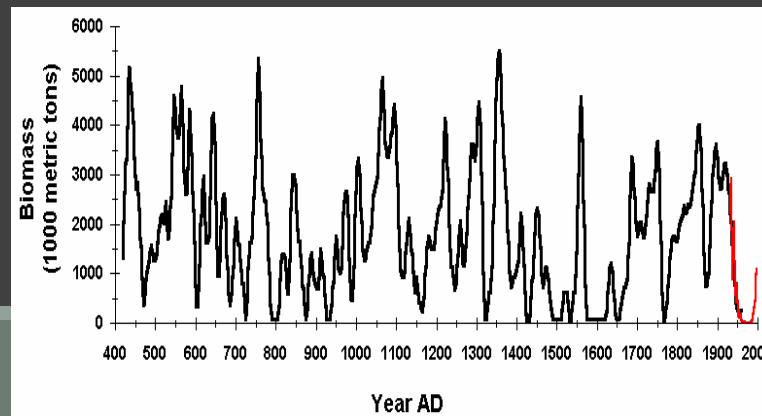
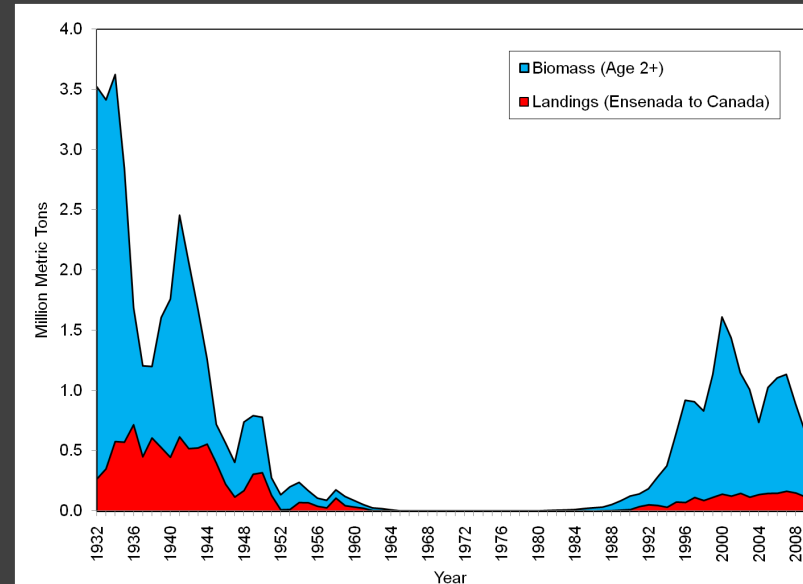
Pacific Sardine (management and modelling)



Peak catch over ~700,000t (largest fishery in the western hemisphere in the 1930s and 1940s), but collapsed in the 1940s and 1950s.

Specific challenges:

- Multinational fishery:
 - US, Mexico, Canada
- Time-varying migration
- Multiple fisheries in the US (Southern California, Central California, Pacific Northwest)
- Environmental-related variation in biomass
- Place-based predator dependence



Pacific Sardine: Management Process

Set by scientists

Overfishing Level
(OFL)

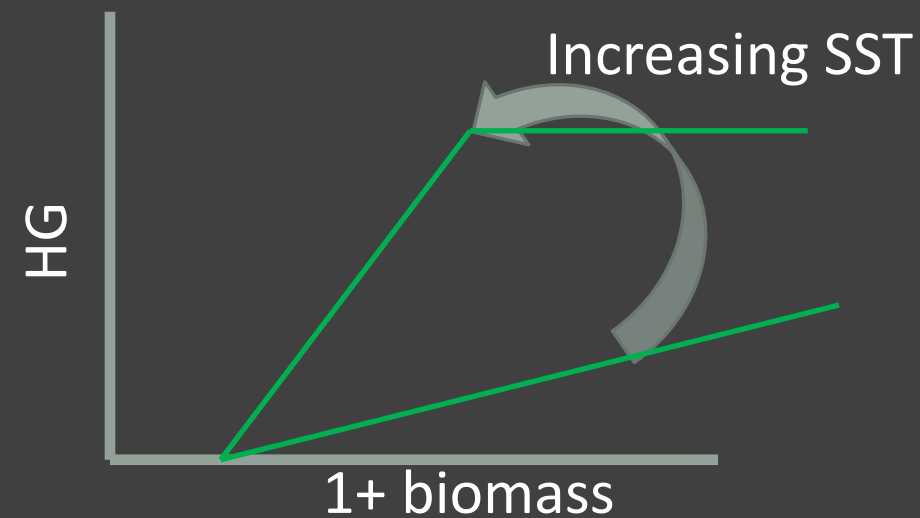
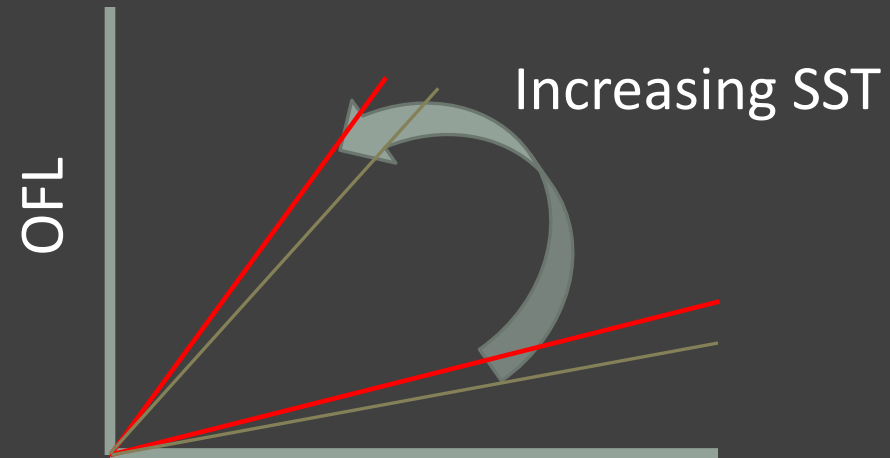
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Set by the Council with advice from scientists

Acceptable Biological Catch (ABC)

Set by the Council by $HG < ABC < OFL$

Harvest Guideline
(HG)



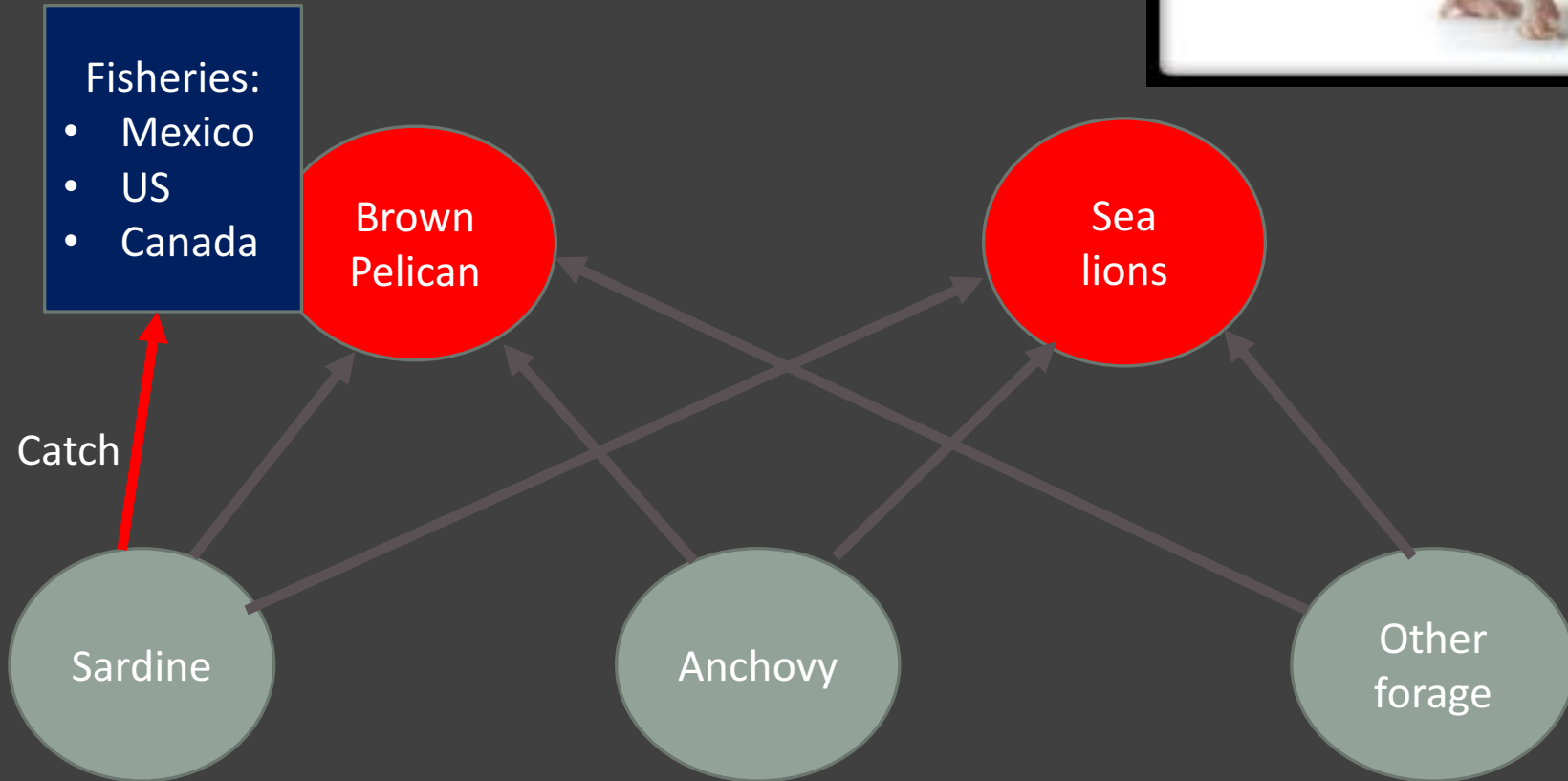
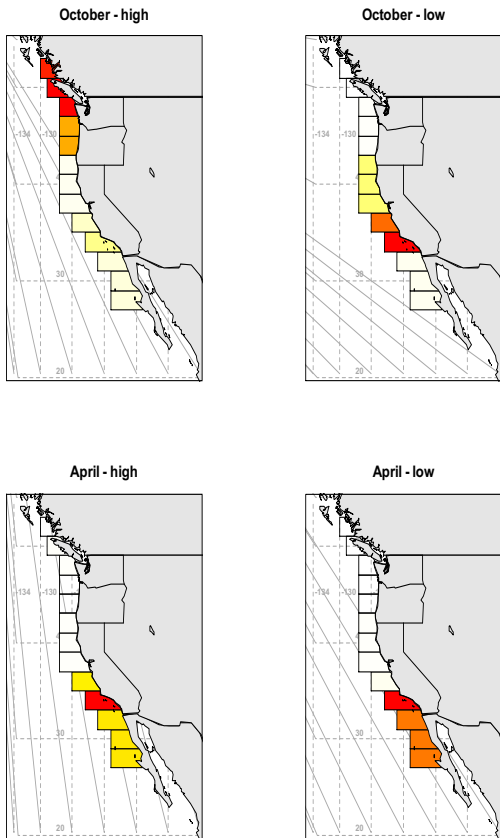
Pacific Sardine (alternative models)

- Ecopath (specifications for key linkages among ecosystem components).
- The PREP equation (approximates the outcomes from Ecopath).
- MICE (Model of Intermediate Complexity for Ecosystem Assessment)
- Atlantis

Each model has advantages and disadvantages.

- Taxonomic and spatio-temporal resolution
- Ability to fit the model to data and explore sensitivity to assumptions
- How management is represented.

The California Current MICE



Reproductive success / survival depends on prey abundance.

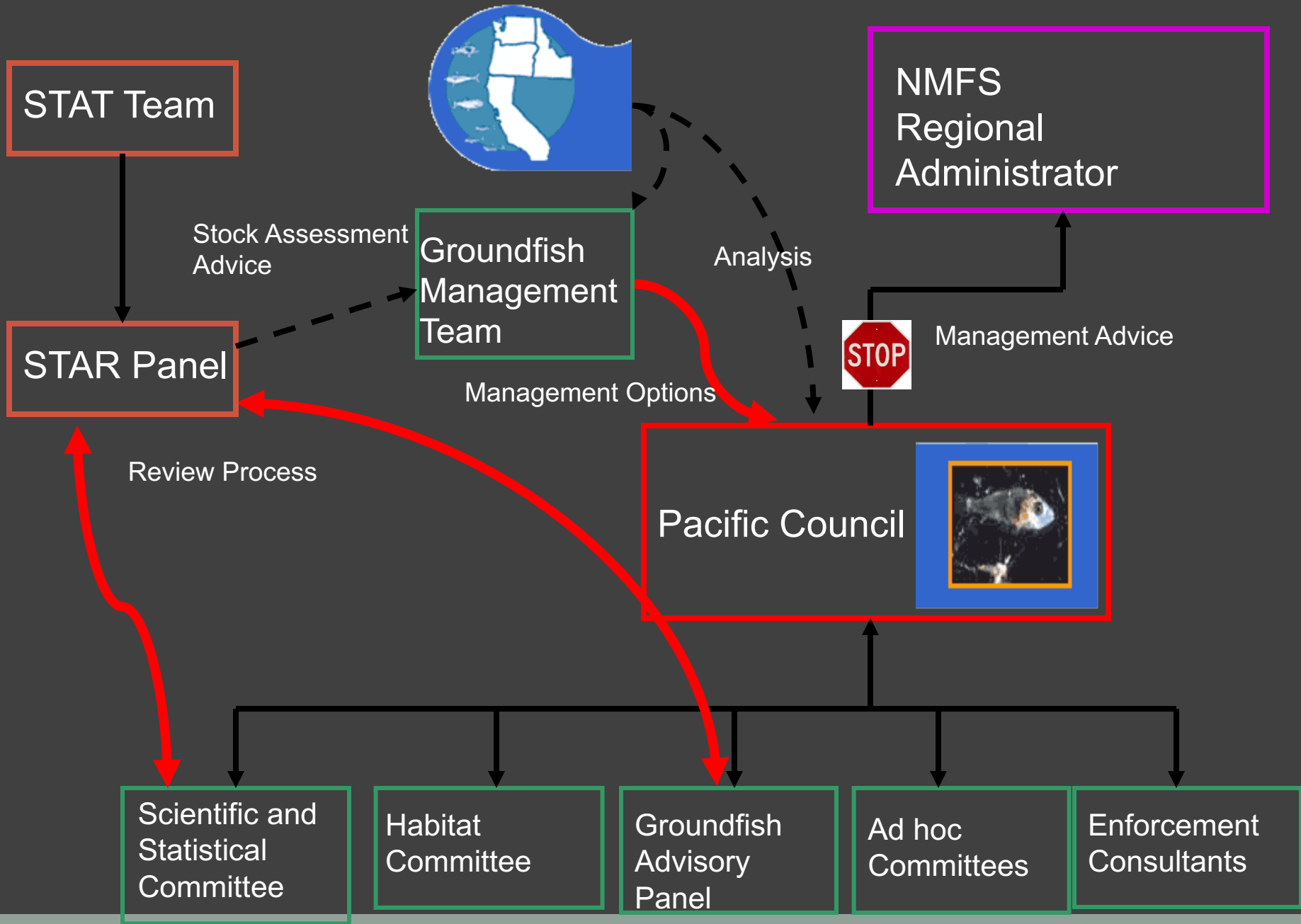
MSEs and Stakeholders

The primary avenue for input into MSEs is through the Pacific Fishery Management Council Process.

- Scientific and Statistical Committee:
 - Provides peer-review for MSE analyses
 - Selects the OFL control rule component of the management system.
- Advisory subpanels and the Council
 - Provide (formal) stakeholder input into decision making

“Thus, of the Control Rules in the SRWCW report, CR 5 is our preferred alternative, offering what seems to the SAS, the appropriate balance of protection and opportunity, followed by CR 4. ”

- The general public



Stakeholder fatigue?

- A disaster where people have had enough with boring meetings
- A victory that you have achieved some form of buy-in?



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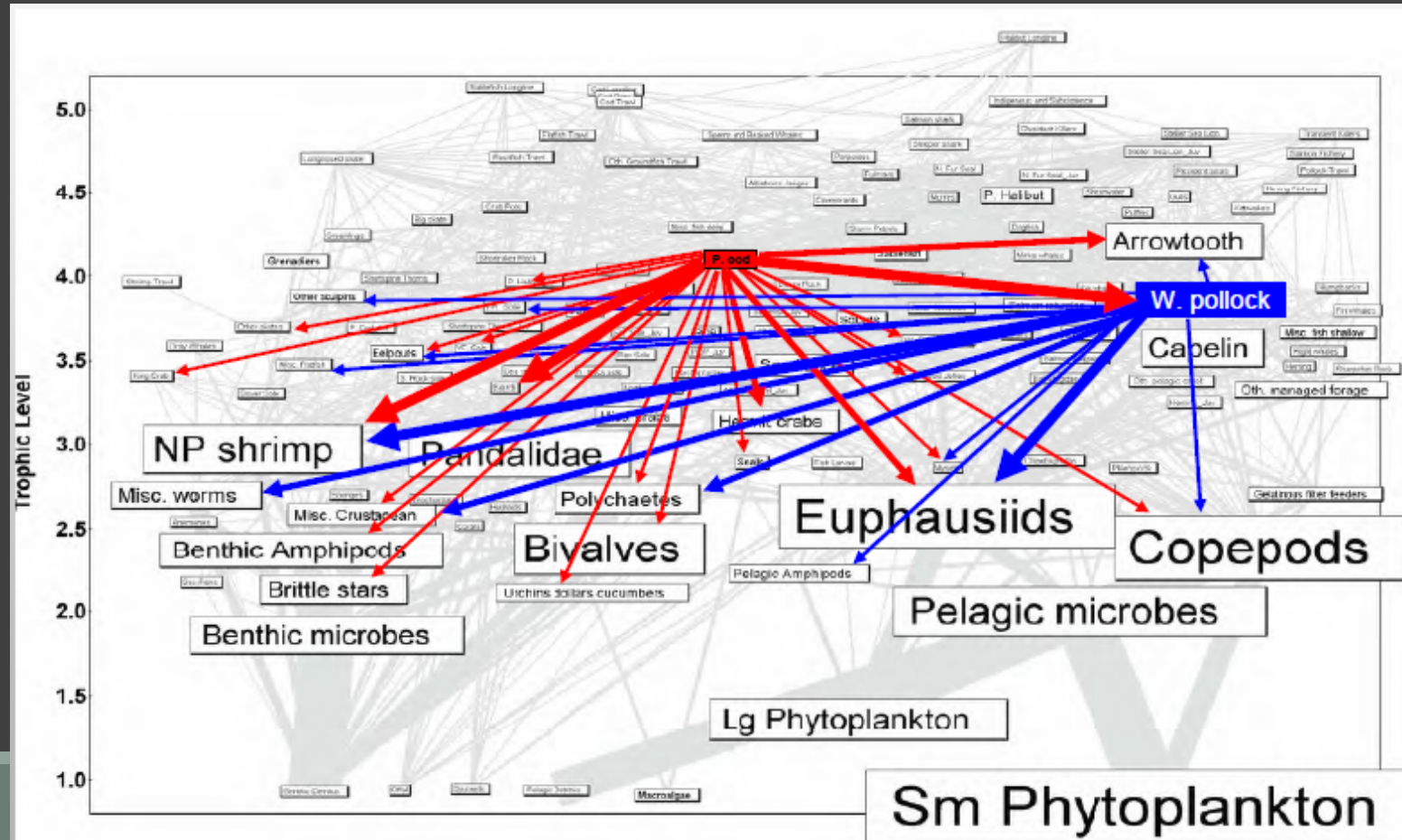
USA North Pacific (Eastern Bering Sea)

Multispecies models:

- Ecopath / Ecosim
- MSMt / CEATTLE
- FEAST
- Technical interactions model

MSE Approaches

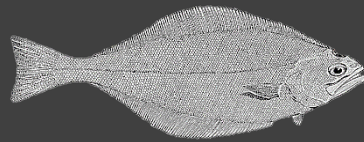
- Pollock
- Snow crab



CEATTLE



Pacific cod

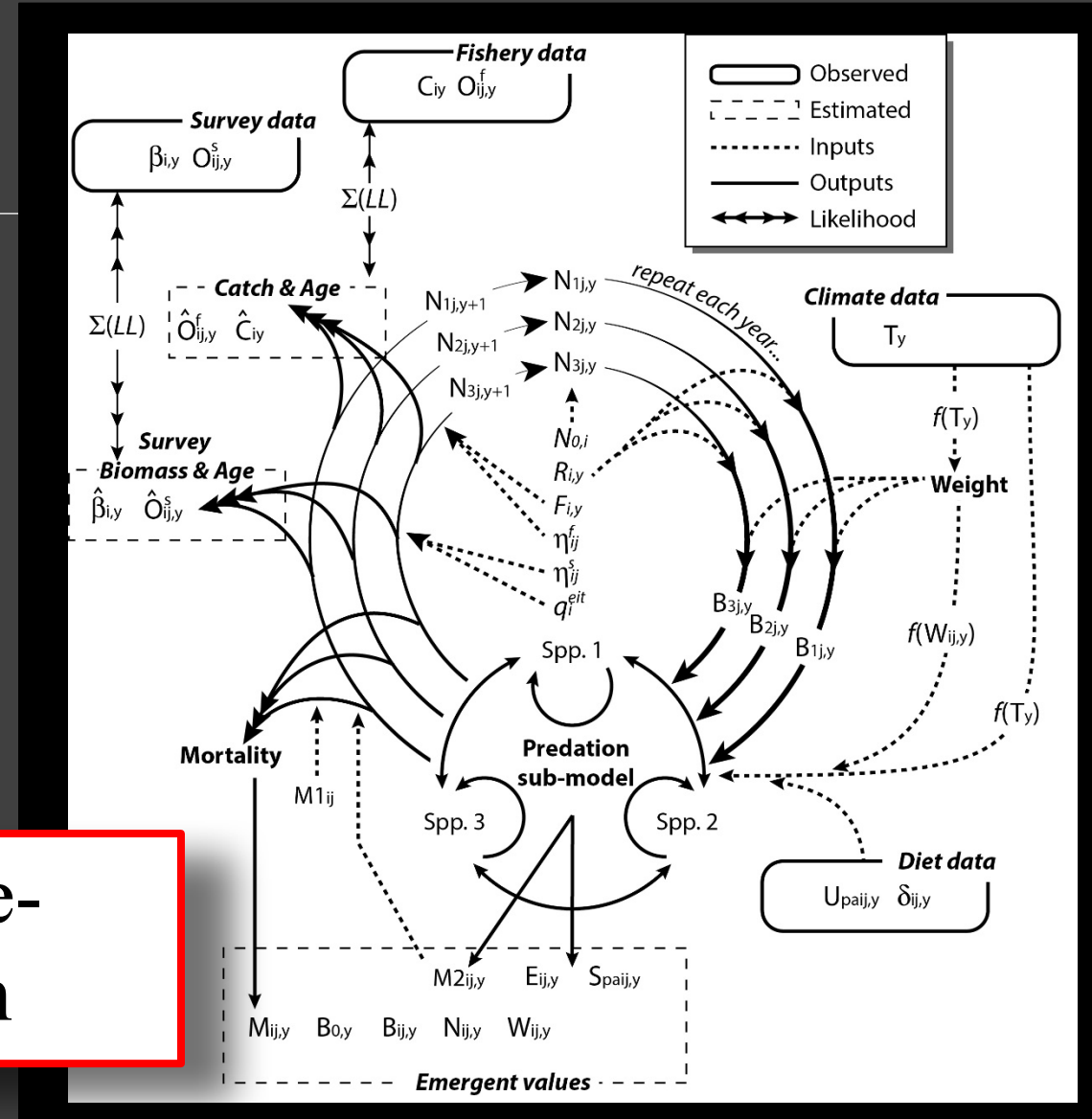


Arrowtooth flounder



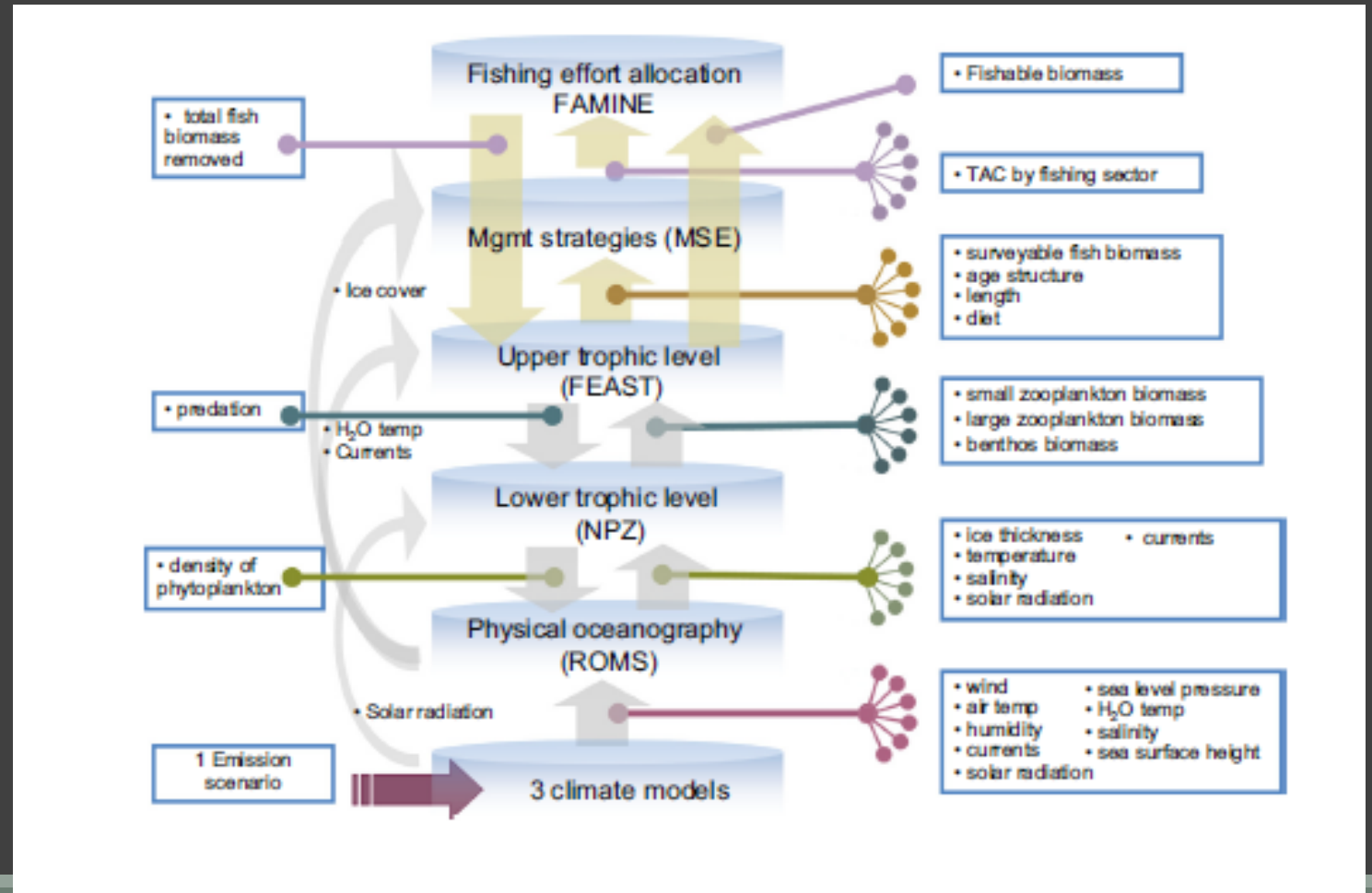
Walleye pollock

Size- and Temperature-specific annual ration



10K ROMS-NPZD-FEAST-FAMINE

Full end-to-end model that is implemented in ROMS (and on multiple cores), which links specifically-developed models, including models on which assessments are conducted and the associated harvest control rules.



Overall trends and conclusions-I

Both regions (and to a lesser extent to the Gulf of Alaska) have adopted a multi-model approach to providing advice:

- ❑ A single-species focus for tactical management advice (setting of Overfishing Levels and Acceptable Biological Catches).
- ❑ Use of a mass-balance model to understand the structure of the ecosystem and help identify which species to include in MICE-like models.
- ❑ Use of MICE-like models (of which CEATTLE is one) as expanded stock assessments (few species, but fitted to data / many sensitivity tests).
- ❑ End-to-End models (Atlantis / FEAST) to provide strategic advice.

Overall trends and conclusions-II

- ❑ MSE is considered state-of-the-art for testing harvest control rules / checking harvest control rules perform adequately.
- ❑ “Management Procedures” (“clockwork management”) are not / cannot be adopted easily as each management decision needs peer-review.
- ❑ There is a strong focus on climate and predation in MSE work.
- ❑ Technical review of MSE is through Fishery Management Council Scientific and Statistical Committees (perhaps augmented by outside experts).
- ❑ Input into MSE (which uncertainties to consider; which performance metrics to report; which strategies to evaluation) are a decision by the Council, but with input from formal Advisory Bodies / the General Public.



Questions?

