West Coast Examples
Rockfish Rebuilding Revision Rules

• **Issues**: no agreed upon “rebuilding revision rules” for (1) assessing adequacy of progress toward rebuilding and (2) altering rebuilding plans, given a change in stock status.

• **Analyses**: MSE to compare alternative rebuilding revision rules using a suite of performance measures selected to quantify likely PFMC goals for rebuilding.

• **Results**: (1) adjustments to harvest rates occur often, (2) a policy that attempts to maintain the original $P_{MAX}$ tends to be overly responsive to noise, and (3) setting $P_{MAX}$ to a high value provides a buffer against uncertainty.

• **PFMC Applications**: None yet. The SSC has reviewed and endorsed the MSE for use when the Council decides they want to develop a rebuilding revision policy.
Groundfish Rebuilding Strategies

• **Issues**: Diverse life histories among the groundfish species – flatfish, roundfish, and rockfish

• **Analyses**: MSE to evaluate the performance of six alternative rebuilding strategies across different life histories.

• **Results**: (1) trade-off between the reduction of catch during rebuilding vs. the length of rebuilding, (2) maintaining 50% probability of rebuilding is the poorest strategy for all life histories, and (3) a higher initial rebuilding probability (>=60%) resulted in fewer changes to rebuilding plans.

• **PFMC applications**: None yet. The SSC has reviewed and endorsed the MSE for use when the Council decides they want to develop a rebuilding revision policy.
Pacific Hake Harvest Control Rules

• **Issues:** Internationally managed, variable catches and recruitments.

• **Analyses:** Evaluate (1) four harvest control rules and (2) various target fishing mortality rates assuming “perfect information” was provided.

• **Results:**
  • The $F_{40\%}$ harvest rate has rarely been applied in practice
  • Potential for large recruitment events creates a large amount of variability
    • Staying at a target biomass is extremely difficult
  • Catch ceilings seem potentially useful
    • Better long-term fisheries performance
    • Lower conservation risk
  • Catch floor has a risky aspect
    • Higher conservation risk
    • Reduced annual variability in catch

• **Management Application:** MSE used to inform policy in the international Pacific whiting forum.
Sablefish Effects of Climate Changes

- **Issues**: Declining abundance despite 30+ years of reduction in catch.

- **Analysis**: Evaluate how resilient current fishery control rules are to climate changes, consider alternatives.

- **Status**: In progress, report results to PFMC in March 2018.

- **PFMC application**: If endorsed by the SSC, this MSE could be used to inform the next west coast assessment.
Flatfish Performances and trade-offs of alternative control rules

- **Issues**: PFMC updated flatfish control rules by updating the $B_{PROXY}$, $B_{LIMIT}$, and $F_{SPR}$ values in 2009.
- **Analysis**: Use MSE to evaluate the performance of the amended harvest control rules and the proxies.
- **Results**: Trade-offs between higher average catch vs. higher variation in annual catch and decreased probability of biomass within 10% of $B_{PROXY}$.
- **PFMC application**: Not used yet. The SSC has reviewed and endorsed the MSE for use if the SSC and Council decide they want to revisit proxy management reference points for flatfish.
Sardines Evaluation of alternative control rules and new SST dataset

• **Issues**: PFMC requested evaluation of alternate overfishing limit (OFL) and harvest guideline (HG) control rule variants for sardines in 2013.

• **Analysis**: Use MSE to evaluate the performance of the alternate OFL and HG control rules, as well as the effects of changing the source for the sea surface temperature (SST) dataset.

• **Results**: (1) adjusted rule for calculating $E_{MSY}$ to reflect the new temperature-productivity relationship, and (2) the Council changed the max. and min. levels that $E_{MSY}$ can take, given trade-offs achieved by different alternatives.

• **PFMC application**: The SSC has reviewed and endorsed the MSE for use, and the Council adopted a new harvest control rule.
Salmon Alternative control rules

• Issues: PFMC concerns that the previous control rule for Sacramento River Winter Chinook was unnecessarily restrictive (complete closures rather than *de minimis* fishing levels) and that forecast methods may not be sufficiently responsive to changing environment.

• Analysis: Build on previous MSE to evaluate the performance of alternate harvest control rules under different forecast methods compared to (then) current rule.

• Results: Modest differences in extinction risk and impact rates among control rules, but greater differences seen with more variable climate.

• PFMC application: The SSC has reviewed and endorsed the MSE for use, and the Council recommended that NMFS consider use of a new harvest control rule.
Albacore Alternative harvest strategies and Reference Points

- **Issues**: WCPFC and IATTC tasked with examining performance of candidate alternative management strategies and target reference points for North Pacific albacore given uncertainty.

- **Analysis**: MSE in development.

- **Results**: MSE in development.

- **PFMC application**: Not used yet.