

Towards Developing a Policy on Revising Groundfish Rebuilding Plans

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Still More Background...

Option A
 "If the probability of achieving the target biomass within the maximum permissible time period (T_{max}) falls below 50% (the required minimum), then progress will be considered inadequate."

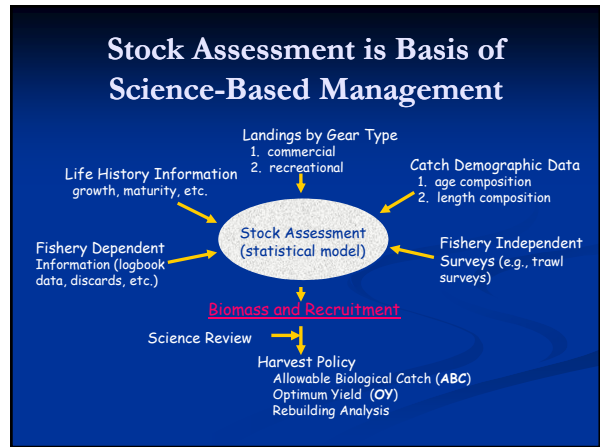
Option B
 "If the probability of achieving the target biomass within the maximum permissible time period (T_{max}) falls below the value identified in the rebuilding plan, then progress will be considered inadequate."

Some Background Basics

Under the Groundfish FMP a review of adequacy of Rebuilding Plan Progress can occur at any time, but must occur at least every two years, even if new approved assessments are not available

Sections 4.5.3.3. through 4.5.3.6 specify process for ... updating key rebuilding parameters, implementation of actions, periodic review of plans

Section 4.5.3.6. states "The Council, in consultation with the SSC and GMT, will determine on a case-by-case basis whether there has been a significant change in a parameter such that the chosen management target must be revised."

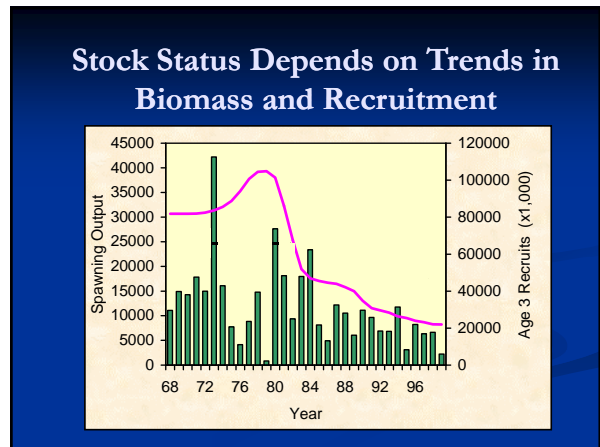


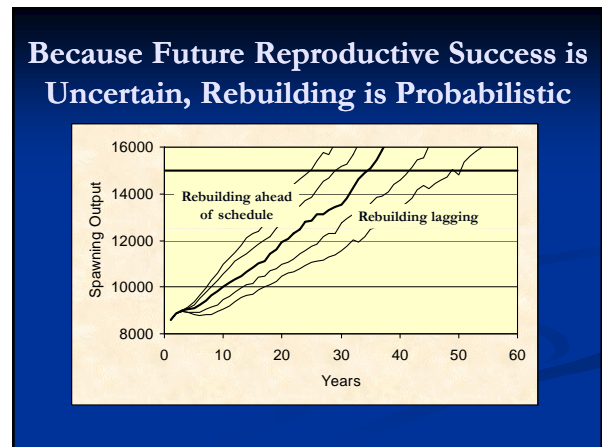
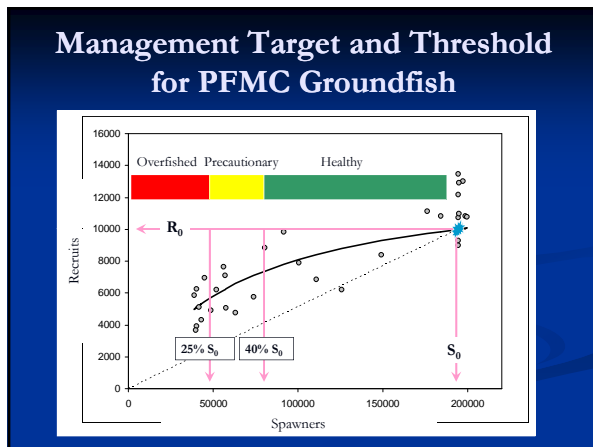
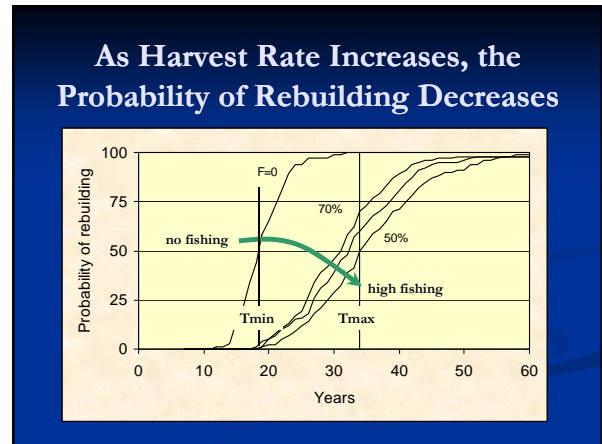
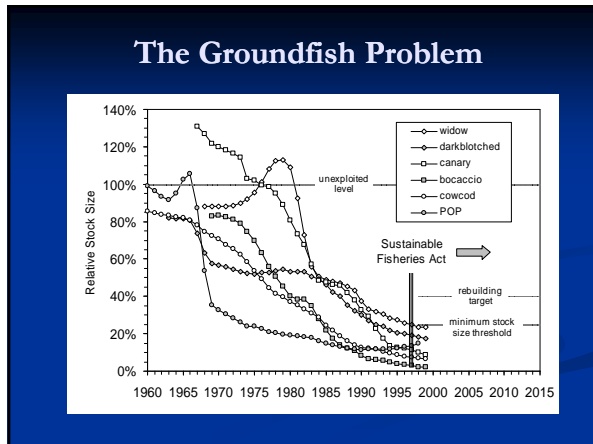
More Background...

To complete an analysis we need to estimate:
 unfished biomass ($B_{unfished}$)
 target biomass (B_{msy})
 year rebuilt if no fishing T_{min}
 year rebuilt in maximum time allowable (T_{max})
 for a given harvest:
 the probability of rebuilding by T_{max} (P_{max})
 the expected year of rebuilding (T_{target})

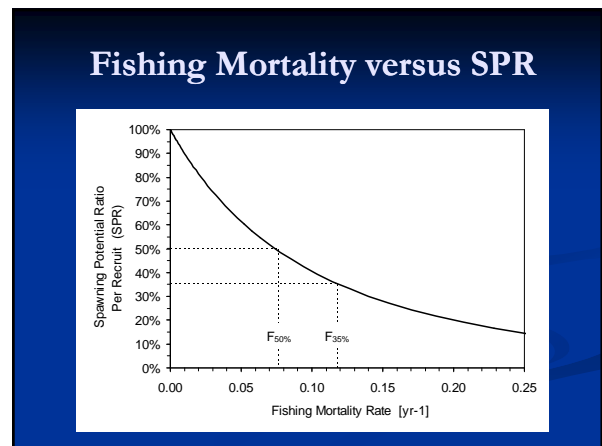
If new information indicates a need to change..., such a change will be accomplished through full (notice and comment) rulemaking...

The FMP need not be amended if new estimates of the values are calculated.

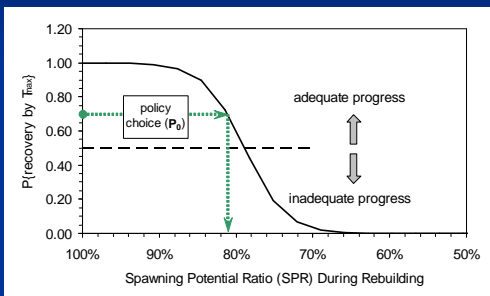




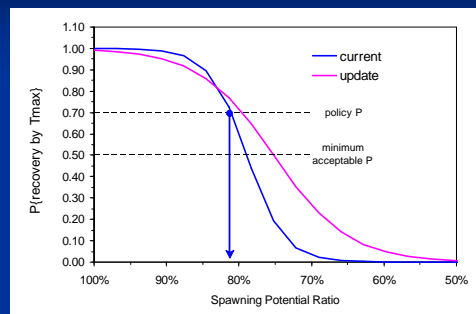
- ### Rules for Rebuilding Analysis
- Project the stock forward assuming there is no fishing and determine how long it takes to recover to the target ($S_{40\%}$)
 - For most groundfish, add one mean generation time: that defines T_{max}
 - Project the stock forward under a variety of harvest rates and determine the probability of recovering to $S_{40\%}$ by T_{max}



The Procedure Thus Far...



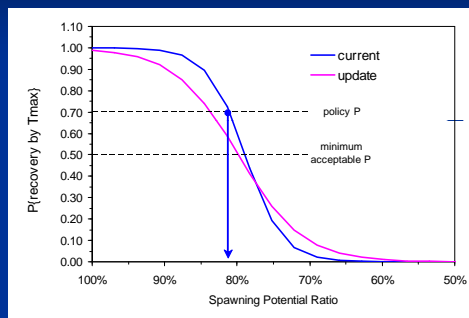
Faster Than Originally Projected



Different Stocks have had Different Rebuilding Criteria Applied

- Bocaccio 70%
- Canary Rockfish 60%
- Widow Rockfish 60%
- Pacific Ocean Perch 70%
- Darkblotched Rockfish >90%
- Yelloweye Rockfish 92%
- Cowcod 60%

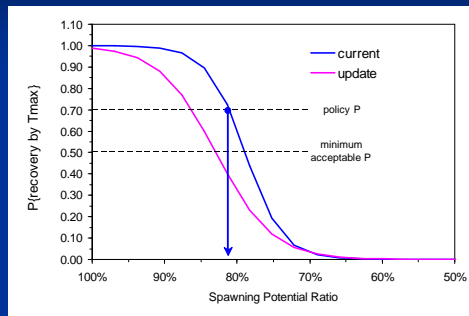
Slower Than Thought But More Likely Than Not



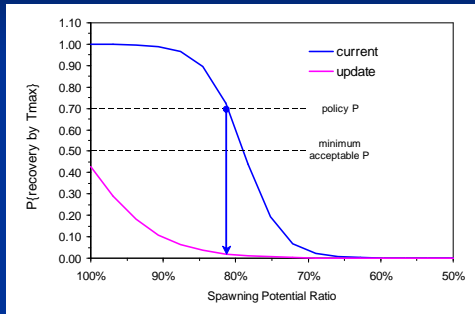
Four Possibilities to Consider During an Update

- Rebuilding is occurring faster than originally projected
- Rebuilding is slower than originally projected, but is still more likely than not (> 50%)
- Rebuilding is slower than originally projected and is unlikely to occur by T_{max} at the prevailing harvest rate
- Rebuilding is unlikely to occur by T_{max} even if fishing is stopped altogether

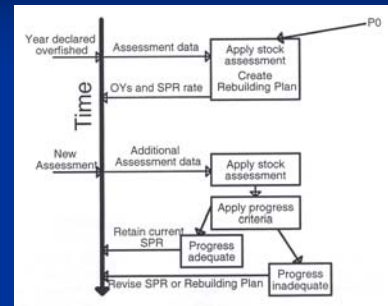
Slower Than Thought and Less Likely Than Not



Unlikely, Even if Fishing is Stopped Altogether



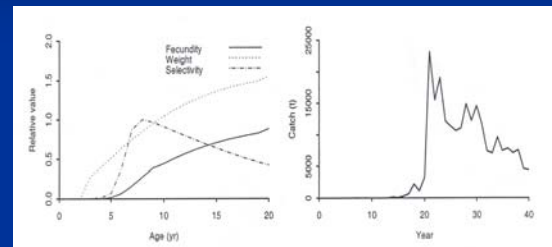
Flow Chart for the Management Strategy Evaluation



What to do?

- Case 1: rebuilding faster than projected ☞ maintain current harvest rate
- Case 2: rebuilding slower than projected, but still likely ☞ ? (P_{crit})
- Case 3: rebuilding slower than projected and unlikely ☞ reduce harvest rate (raise SPR) to achieve what?
- Case 4: rebuilding unlikely even with no fishing ☞ recalculate everything, including T_{max} , and start over -- use the same P ?

Characteristics of the Simulated "Widow Rockfish" Stock



Management Strategy Evaluation

- Simulate a fish population (widow rockfish)
- Generate simulated data with observational error
- Apply a standard stock assessment to the simulated data
- Apply a harvest control rule (which may include a rebuilding analysis) based on results of the assessment
- Repeat and evaluate the effectiveness of the harvest control rule relative to

Simulated "States of Nature"

- Base case: 10% depletion, low productivity, moderate natural mortality
- Less depletion (15% and 20%)
- More productive (steepness = 0.7)
- Correlated recruitments (regime like)
- Higher or lower natural mortality

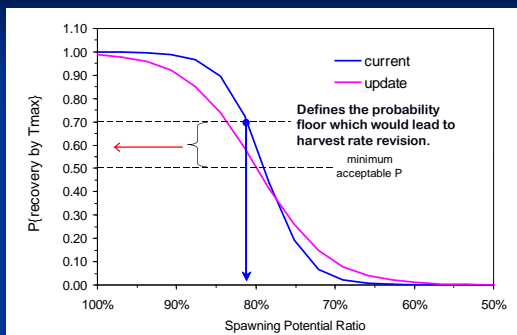
Example Control Rule

- What was the initial probability of rebuilding by T_{max} selected by the Council (e.g., for canary rockfish $P_0 = 0.60$)
- Use this value as a standard to gauge adequacy of progress towards rebuilding
- If $P_{current} > P_0$ progress is adequate
- If $P_{current} < 0.50$ progress is inadequate and a new harvest rate (SPR) needs to be defined
- If $0.50 < P_{current} < P_0$ there is a new policy decision governed by P_{crit}

Revision Policies Considered

- Base case: $P_0 = 0.60$, $P_{crit} = 0.50$ (simplest adjustment policy)
- No change: maintain the same SPR harvest rate throughout (“no action”??)
- Track P_0 : constantly adjust SPR to attain the original P_0 (“status quo”?)
- Higher certainty: $P_0 = 0.80$
- At least P_0 : $P_0 = 0.60$, $P_{crit} = P_0$

What is P_{crit} ?



Performance Measures for Different Policy Options

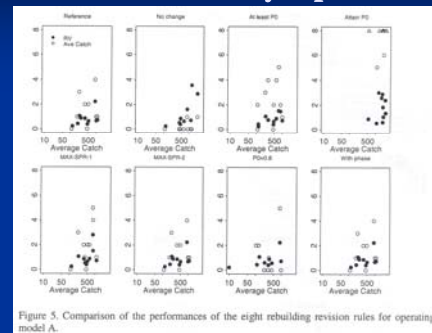


Figure 5. Comparison of the performances of eight rebuilding revision rules for operating model A.

Performance Criteria To Evaluate Revision Rules

- Average catch during rebuilding
- Variability in catch during rebuilding
- Frequency of harvest rate revisions
- Probability of recovery by the original T_{Target} (years to rebuild / predicted years to rebuild)

Some Conclusions

- There were no obvious problems with the base case
- As expected, the no change option led to longer rebuilding times suggesting there is a need for some form of Rebuilding Revision Rule
- Tracking P_0 leads to many revisions to the rebuilding harvest rate
- Performance is better for a productive stock

Some Parting Thoughts

- The Council will be presented with updated rebuilding information for 8 overfished stocks
- A consistent policy is desired on
 - how to evaluate progress towards rebuilding
 - how to respond to inadequate progress
- A variety of policy options can be simulated
- Performance criteria frequently contradict one another (high catch conflicts with management stability)

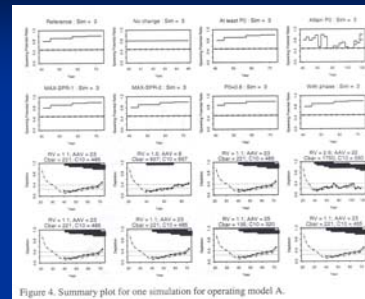


Figure 4. Summary plot for one simulation for operating model A.

What's Next?

- The Council, GAP, and GMT should discuss these issues and provide direction on establishing revision policy
 - Options for “adequacy of progress” (e.g. P_{crit})
 - Options for “how to respond to adequate / inadequate progress”.
- Policy determination regarding is required for STAT teams to conduct rebuilding analyses for overfished stocks (reviewed in late September by the SSC)
- Preliminary direction and/or range of options should be discussed at this meeting
- Create a working group with members from advisory bodies to evaluate options for

