D6: Harvest Control Rule Workshop overview

Diana Stram, NPFMC
Council June 2025

Brief overview of:

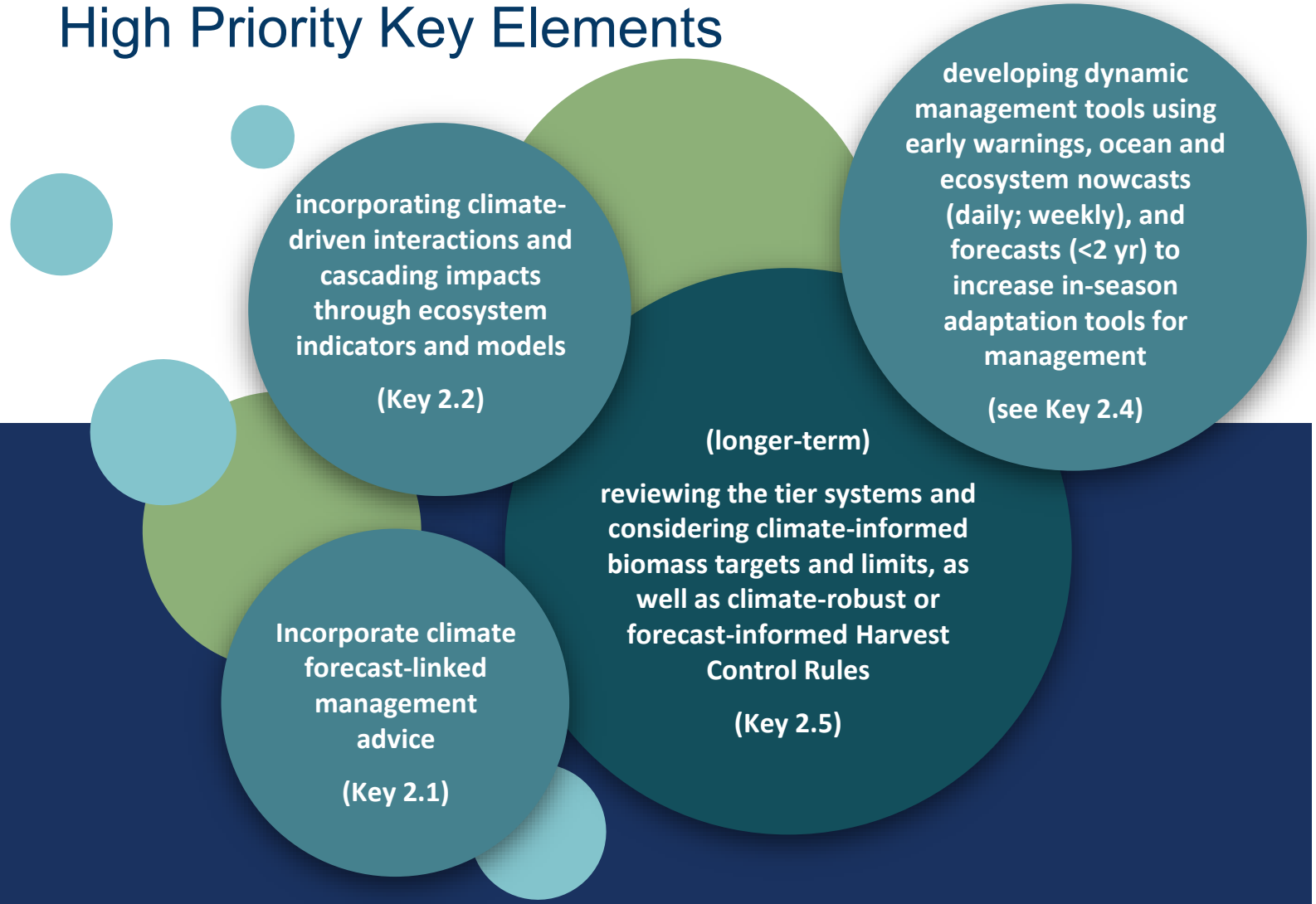
- Progress towards Council's climate work plan
- Workshop schedule
- CEFI on-going work and ACLIM GOACLIM
- Groundfish and crab Tier systems and harvest control rules
- HCRs currently in simulation and workshop presentations

Council’s Climate Work Plan

Key Element 2

Consider management tools & options focused on the inclusion of existing & emergent climate information

High Priority Key Elements



10 Key elements identified, 4 prioritized

Initial items in Council's work plan*

- **Incorporate climate forecast linked management advice (2.1).** Use climate and ecosystem forecasts to improve management advice through assessments and supportive documents:
  a. Incorporate forecasts of climate and ecosystem conditions (+1-2 yrs) in the harvest projections and specifications processes, including through the assessment of maximum allowable catch, ABC and overfishing limit, OFL; as well as climate, ecosystem, and socioeconomic sections of Ecosystem Status Reports (ESRs), and Ecosystem and Species Profiles (ESPs) that are used in the Risk Tables (i.e., for ABC) and in the context of informing the TAC-setting process.
  b. Include climate forecast information and vulnerability assessments in management advice to inform Risk Tables and discussions around ABC or TAC. Climate information on risk could be communicated via updates and expanded climate risk sections of the Annual Community Engagement and Participation Overviews (ACEPOs), through an appendix to ESRs, or as a standalone report or assessment.
  c. Consider climate-forecast linked spatial management measures (e.g., via climate specific species distribution models) to inform apportionments.

- **Incorporate climate-driven interactions and cascading impacts through use of ecosystem indicators and models (2.2).** Develop and use ecological indicators and multi-species, multi-fleet, or ecosystem models that quantify uncertainty, interactions, and risk across multiple fisheries or species. As part of this effort risk table discussions can be aligned around climate buffers/risks.

- **Consider and incorporate dynamic management tools to increase in-season adaptation capacity (2.4).** Examples of these kinds of tools include:
  a. Using nowcasts (daily; weekly) and forecasts (<2 years) to inform spatial in-season and annual management actions
  b. Increase in-season flexibility and responsiveness in harvest measures through incorporation of real-time observations from a broader suite of observations and information

- **Review tier systems, consider climate-informed biomass targets and limits and climate-robust or forecast-informed harvest control rules (2.5)**

*additional longer-term items and priority actions may be considered in the future.

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HCR Workshop Schedule

8am-12pm June 4

Session 1:

2. Overview of workshop goals and objectives, current groundfish and crab Tiers, and harvest control rules and their potential flexibility under the Council's fishery management plans (FMPs) *(Diana Stram)*
3. Update on HCR considerations and simulations to date, based on ACLIM/GOACLIM work and related analyses *(Kirstin Holsman/Anne Hollowed)*
4. Questions and panel discussion on Session 1

Session 2:

5. Invited issue-specific 'lightning talks' (note titles may change)
    a. MOM6 projections for Bering Sea: *Kelly Kearney (AFSC)*
    b. ~~Application of HCRs under snow crab population decline: *Cody Szuwalski (AFSC)*~~
    c. Stock recruitment influence on HCRs: *Paul Spencer (AFSC)*
    d. Determining productivity related to EBS Pollock: *Jim Ianelli (AFSC)*
    e. Pacific Sardine HCR: *Chris Free (UCSB)*
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Session 3:

7. Cap discussion
    a. GOACLIM 2 modeling tools for exploring HCRs: *Carey McGilliard (AFSC)*
    b. Overview of analyzing OY cap in GOA: *Alberto Rovellini (UW)*
    c. Methodology on TAC modeling to explore cap alternatives: *Alberto Rovellini (UW) and Jim Ianelli (AFSC)*
8. Questions and panel discussion on Session 3

Public comment session

9. Public comment on all sessions

Next steps

10. SSC-only discussion: recommendations on a workplan and terms of reference

Alaska's Changing Ecosystem and Fisheries Initiative

NOAA FISHERIES

IEA INTEGRATED ECOSYSTEM ASSESSMENT

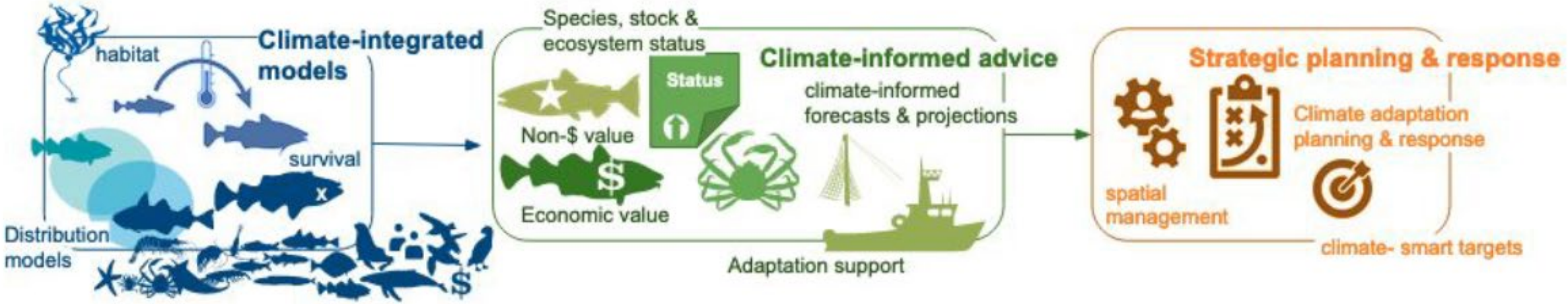
Climate, ocean, & living marine resource forecasts

Teams

Climate-informed ecosystem & fisheries advice

Teams

Engagement & information sharing towards climate-smart decision making



www.fisheries.noaa.gov/science-data/changing-ecosystems-and-fisheries-initiative-regional-activities#alaska

AFSC Integrated Climate Modeling Projects

ACLIM 3 Team

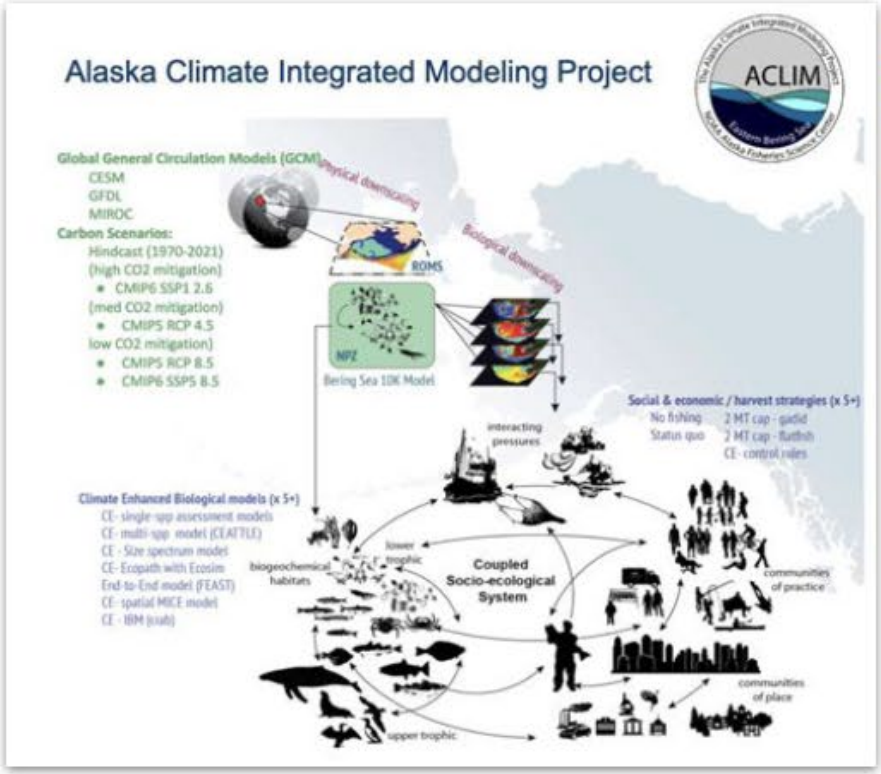
Supporting productive fisheries & resilient communities through climate-informed Ecosystem Based Management advice

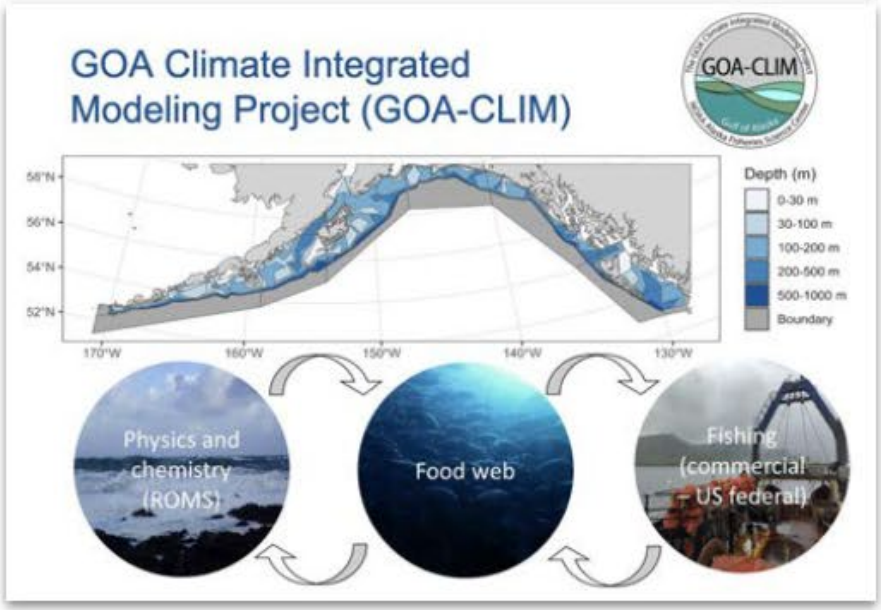
Kirstin Holsman, Sarah Wise, Andre Punt, Albert Hermann, Cheryl Barnes, Cody Szuwalski, Kerim Aydin, Kelly Kearney, Anne Hollowed, Alberto Rovellini, Andrea Havron, Andy Whitehouse, Anna Amalka Sulc, Carey McGilliard, Catherine Moncrieff, Darren Pilcher, Diana Stram, Ed Farley, Elizabeth McHuron, Elizabeth Siddon, Ellen Yasumiishi, Grant Adams, Ingrid Spies, Ivonne Ortiz, James Ianelli, James Thorson, Jean Lee, Jennifer Bigman, Jeremy Sterling, Jodi Pirtle, Jonathan Reum, Kalei Shotwell, Kate Haapala, Kelly Kearney, Lorenzo Ciannelli, Mabel Baldwin-Schaeffer, Maggie Mooney-Seus, Martin Dorn, Maurice Goodman, Meaghan Bryan, Melissa Haltuch, Melissa Parks, Michael Litzow, Mike Dalton, Molly Graham, Patricia Pinto da Silva, Paul Spencer, Sarah Stone, Serena Fitka, Steve Barbeaux, Trond Kristiansen, Wei Cheng, William Stockhausen, Lia Domke, Anne Beaudreau, Justin Hansen, Angela Abolhassani, Matt Callahan, Brett Holycross

GOA-CLIM 2 Team

Supporting productive fisheries & resilient communities through climate-informed Ecosystem Based Management advice

Meaghan Bryan, Carey McGilliard, Marysia Szymkowiak, Cheryl Barnes, André Punt, Beth Fulton, Martin Dorn, Isaac Kaplan, Alberto Rovellini, Bridget Ferriss, Bia Dias, Grant Adams, Szymon Surma, Chang Seung, Elizabeth McHuron, Kirstin Holsman, Melissa Haltuch, Albert Hermann, Kerim Aydin, Brian Fadely, Sara Cleaver, Mike Litzow, Kristin Marshall, Robert Suryan, Marjorie Mooney-Seus, Katie Sweeney





Goal: To address climate & ecosystem information needs with best available science & tools

What to expect?

- Project physical and ecological conditions under alternative levels of global carbon mitigation
- Characterize uncertainty

What can be done?

- Evaluate effectiveness of adaptation actions including those supported by fisheries management

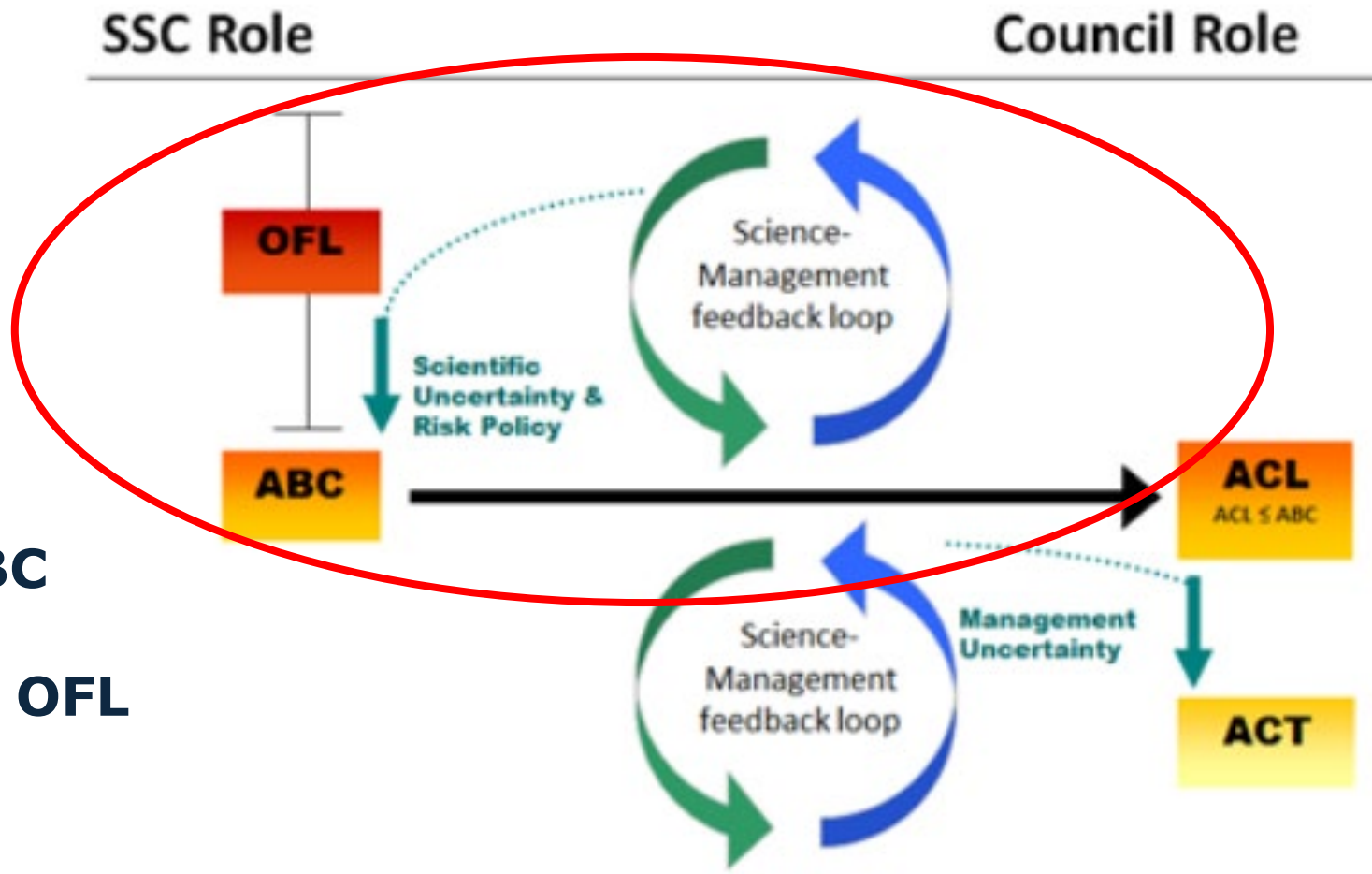
Scenarios form the basis for comparative simulations & Management Strategy Evaluations

Considerations on revising harvest control rules to be more climate resilient

- Identify available flexibility and/or lack thereof in current groundfish and crab tier systems [paper posted to eAgenda]
- Identify recent issues by stock with the application of current system [periodic discussions by Plan Teams and SSC; April 2025 discussion on risk table application]
- Compile existing literature and ACLIM/GOACLIM results to help inform sensitivity of stocks to HCR shapes compared with biological reference points and/or fishing rate modifications
  - Council would need to weigh in on policy objectives (including risk tolerance) in modification of HCRs or reference levels

NPFMC ACL=ABC

For Crab ABC = OFL



Related roles of the regional fishery management councils and their Scientific and Statistical Committees in translating scientific information into recommendations for annual catch limits.

OFL – Overfishing limit
ABC – Acceptable biological catch

ACL – Annual catch limit
ACT – Annual catch target

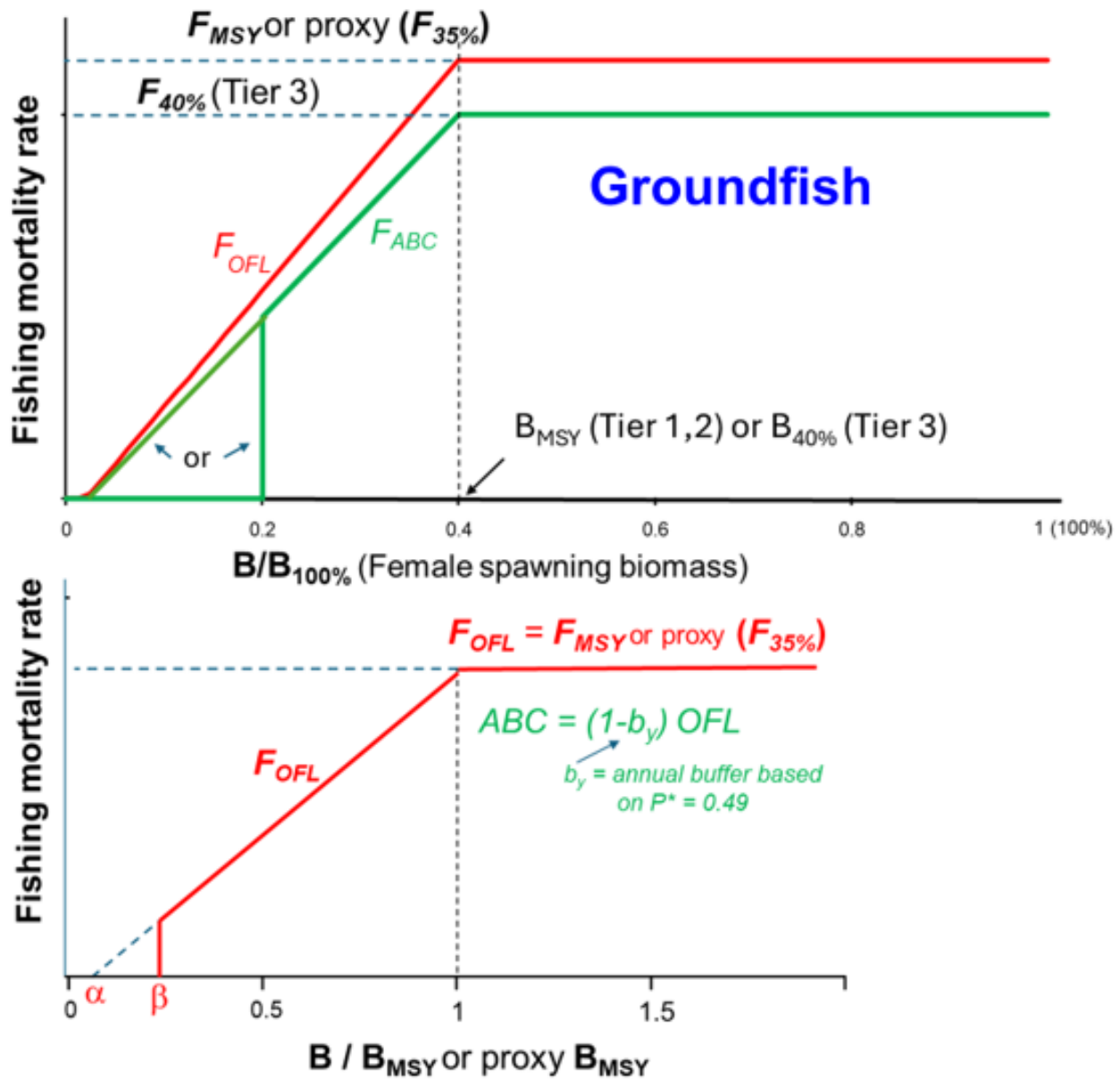
Risk Policy (ABC setting)

For Crab defined during Amd 36 for ABC control rule (P* =0.49)

- Risk policy that ABC = OFL.
  - But practically speaking never used → annually varying buffers
- Should risk policy be reconsidered in light of CPT discussion of buffers and annually varying ABCs?

For groundfish: risk tables and periodic ABC<maxABC

- Risk policy by Council in maxABC HCR superseded by periodic adjustments below maxABC
- Should we consider future revisions to HCRs to be more transparent in adjustments?


F_{MSY} or proxy ($F_{35\%}$)
$F_{40\%}$ (Tier 3)
Groundfish
F_{OFL}
F_{ABC}
or
B_{MSY} (Tier 1,2) or $B_{40\%}$ (Tier 3)
Fishing mortality rate
0
0.2
0.4
0.6
0.8
1 (100%)
B/B100% (Female spawning biomass)
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ABC = (1-b_y) OFL
b_y = annual buffer based on P* = 0.49
F_{OFL}
Fishing mortality rate
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β
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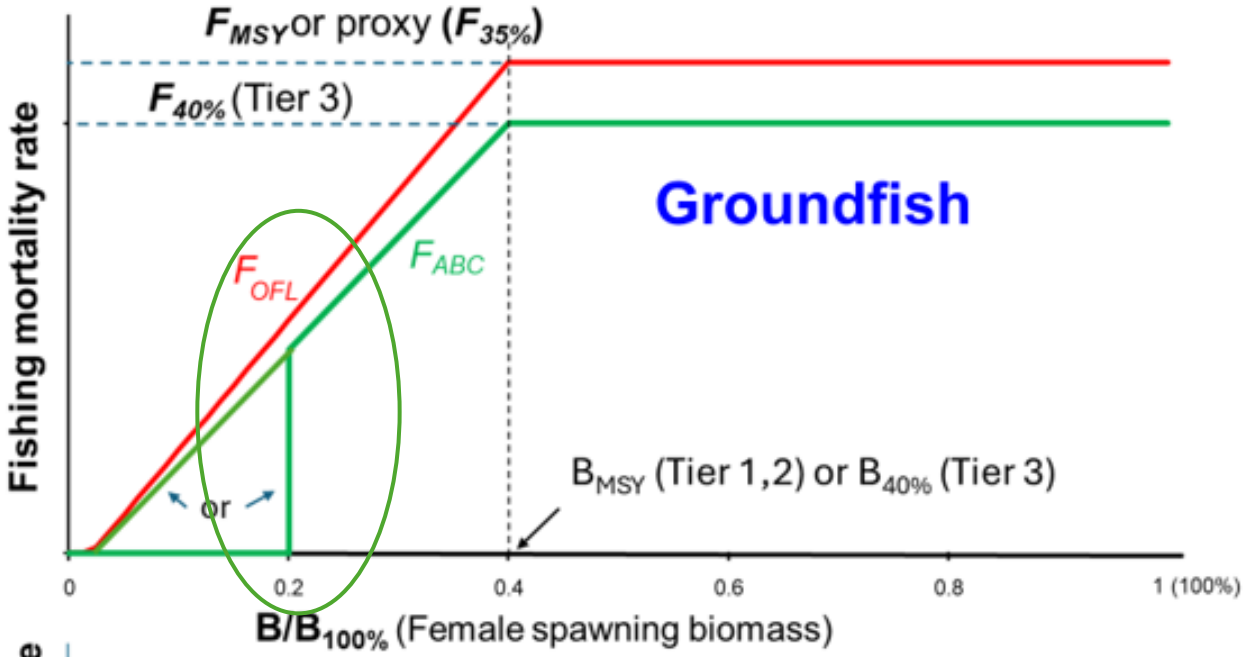
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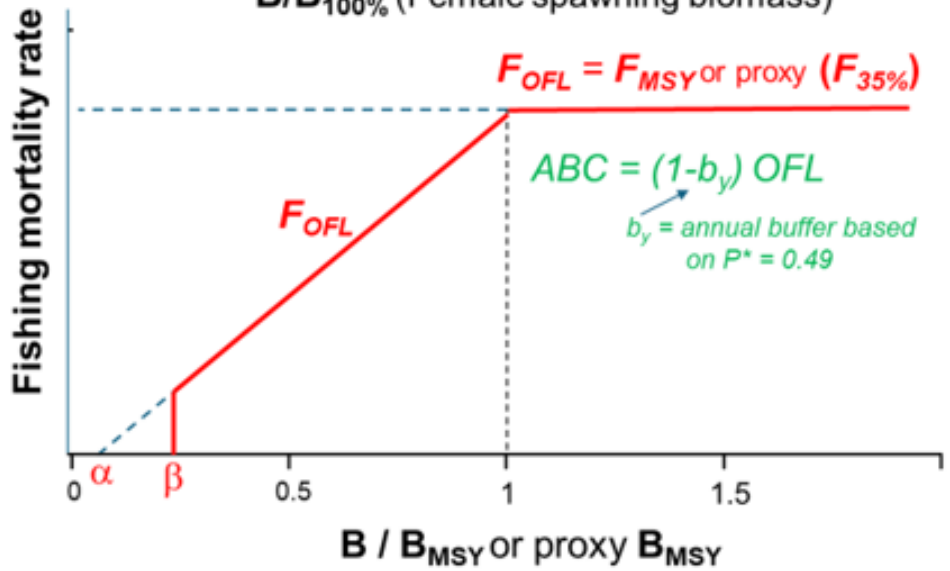
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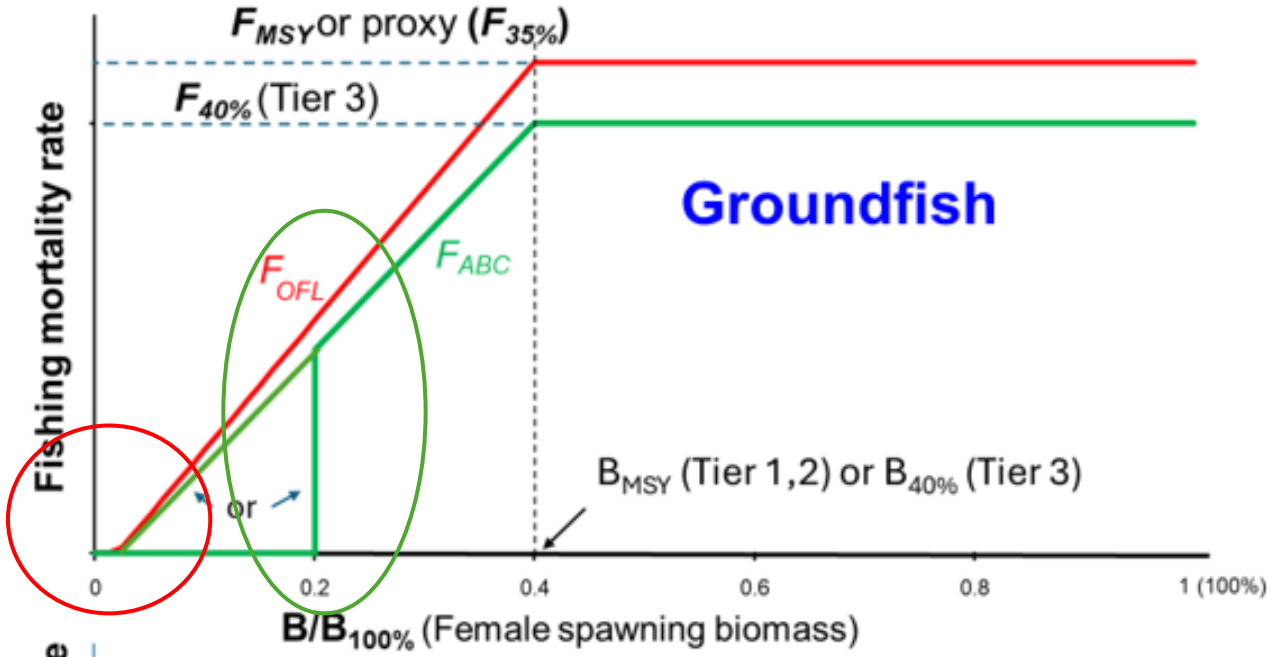
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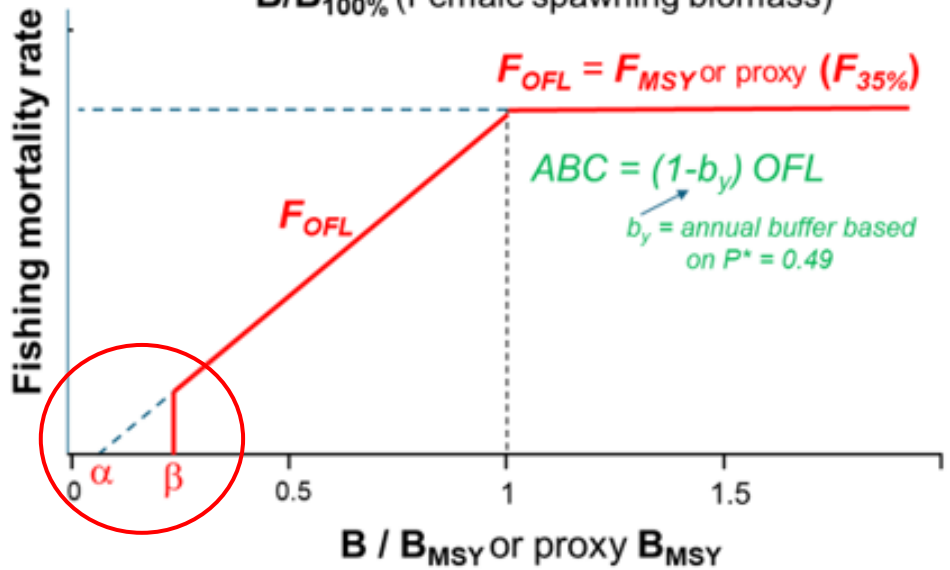
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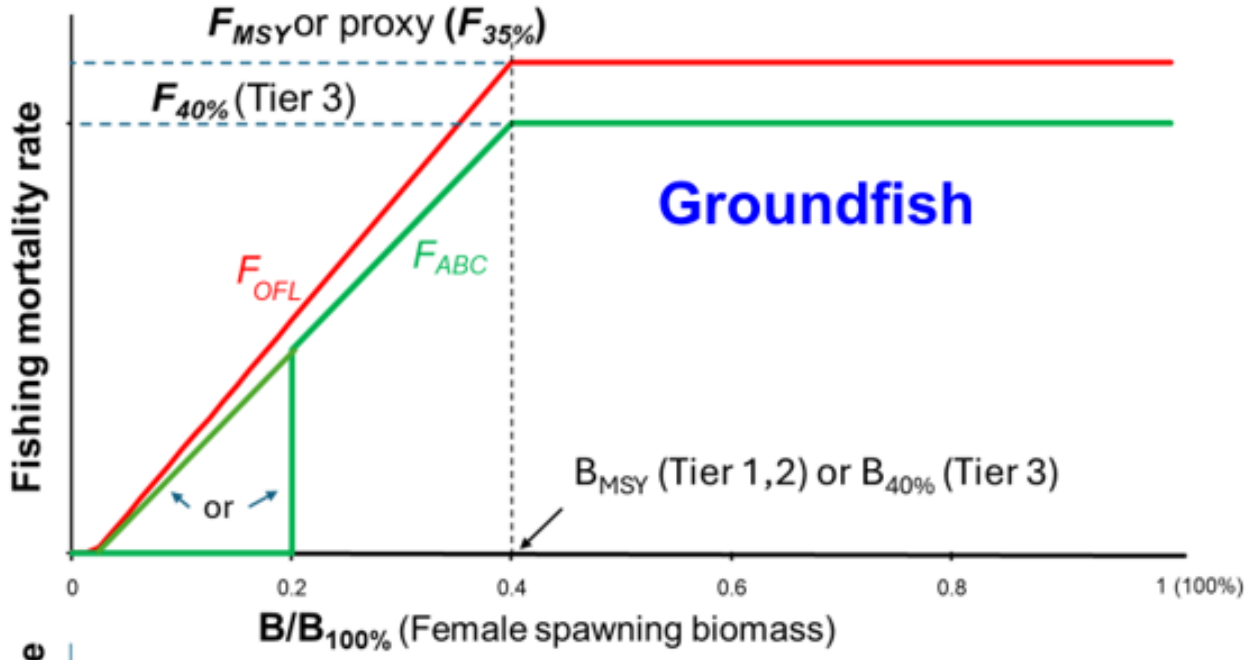
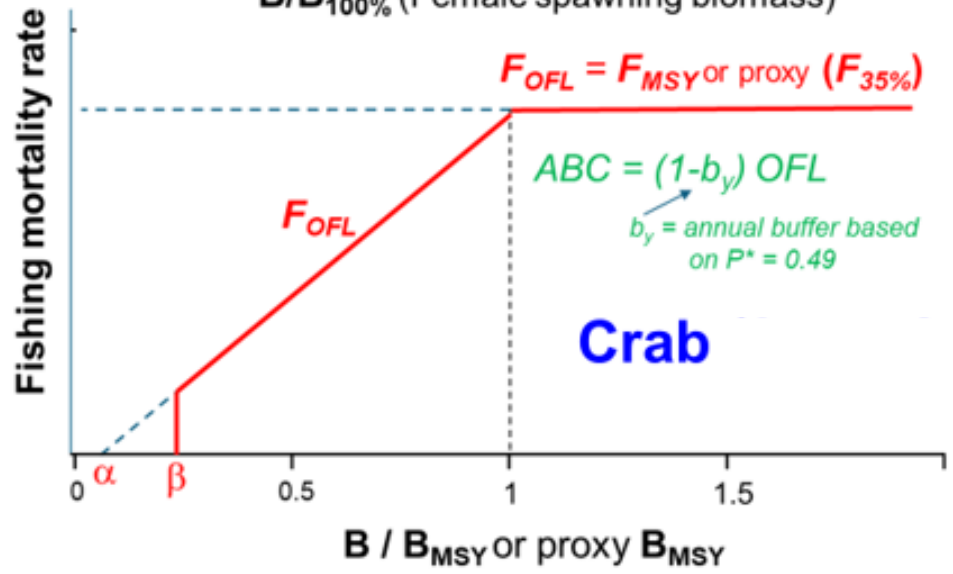


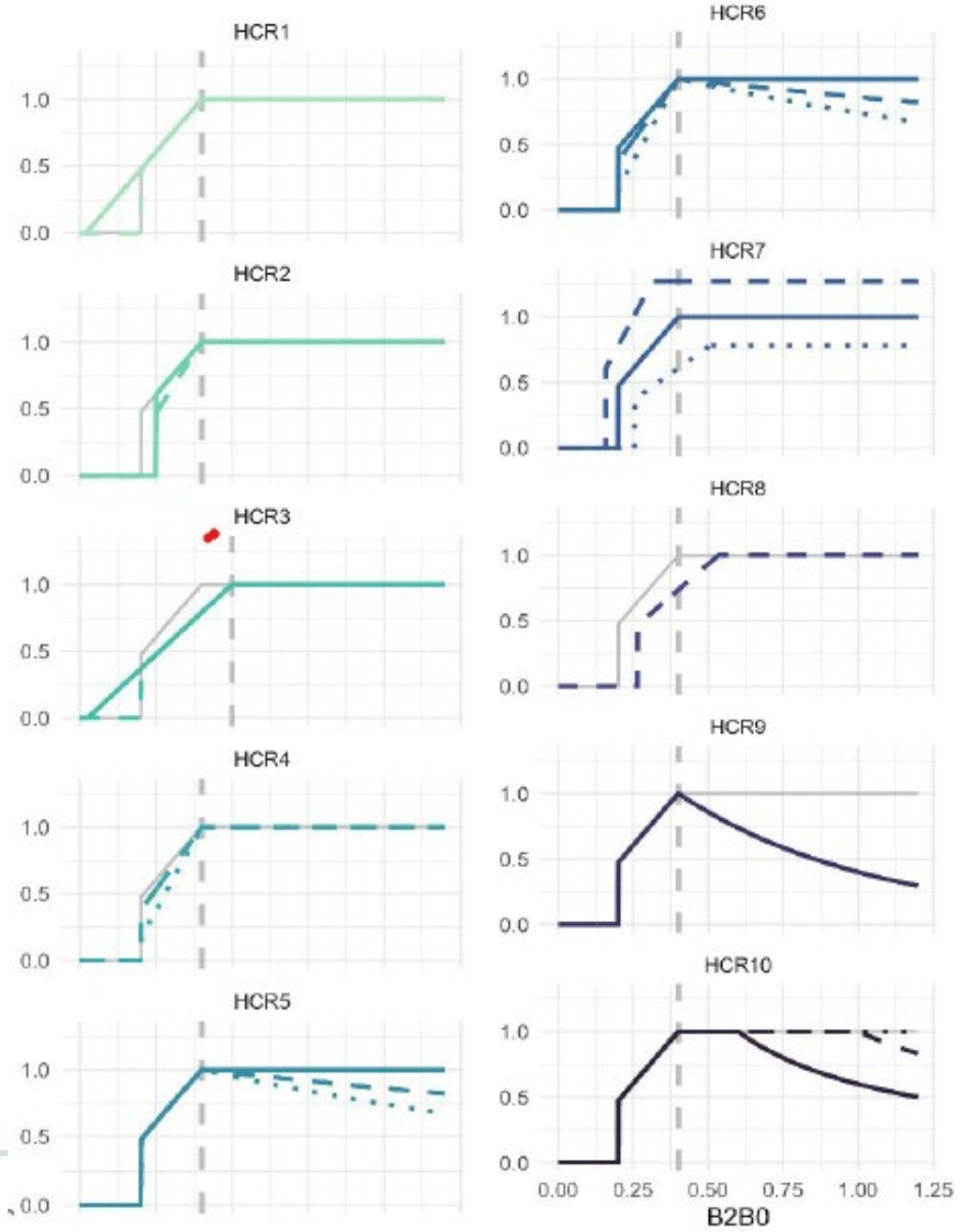


Inherent flexibility in setting ABC below maxABC Control rule.

Limited flexibility in OFL control rule

ACLIM2

HCR	Name
ABC+HCR 1	Status quo
ABC+HCR 2	Lagged recovery to estimate emergency relief financing needs
ABC+HCR 3	Long-term resilience (stronger reserve) B_target
ABC+HCR 4	Environmental index informed sloping rate, e.g., MHW category alpha
ABC+HCR 5	Maximize productivity/ increased reserve (buffer shocks)
ABC+HCR 6	Combination of MHW (HCR4) + Maximize productivity (HCR5)
ABC+HCR 7	Risk Table Bridging, R/S variability covariate adjusted HCR
ABC+HCR 8	Adjust effective spawning biomass (simulate adjusted B_target)
ABC+HCR 9	Forecast informed version of HCR 5
ABC+HCR 10	Maximize productivity/increased reserve (HCR5), linear version (1/ B_target) with offset



HCR Scenarios

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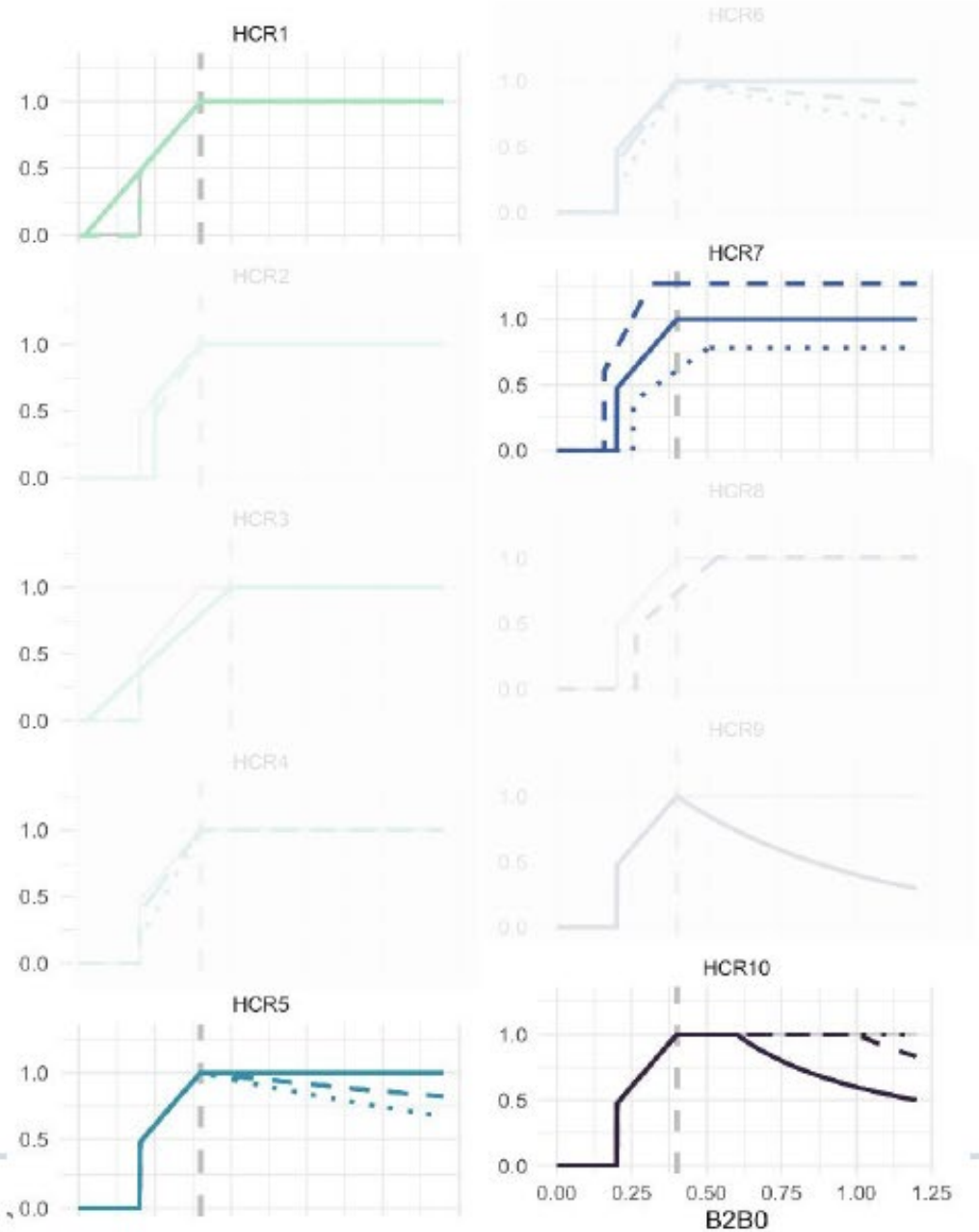
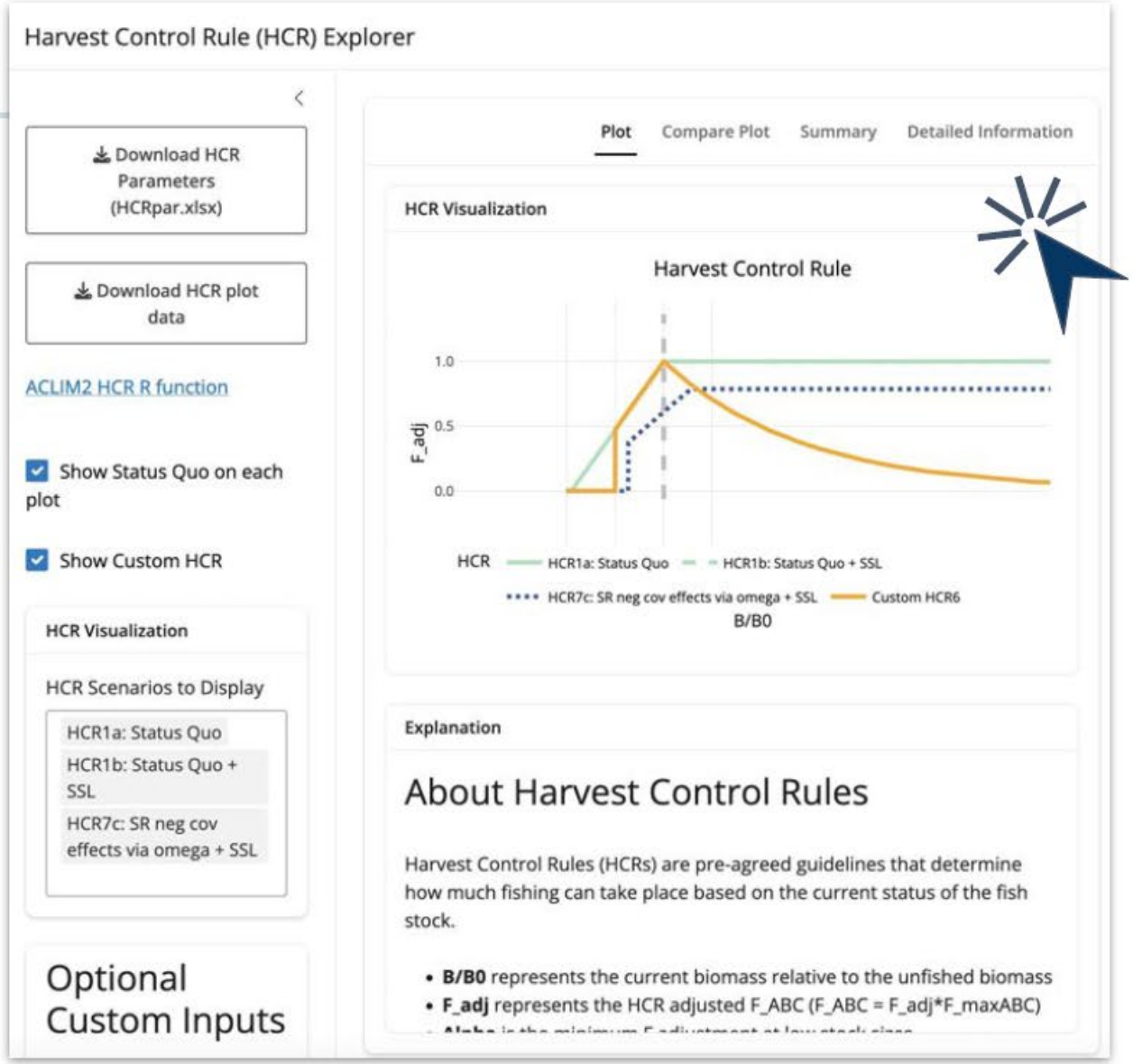


Interactive HCR explorer tool

https://kholsman.shinyapps.io/HCRshiny/

Are there alternative HCRs that can perform better than status quo under alternative future scenarios?



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Next steps

- Discussion paper for Plan Team review: Crab and Joint Groundfish Teams September
  - Overview of all considered HCRs
  - Candidate HCR and their stated objectives
  - Potential review opportunities:
    - SSC
    - CIE

- Council feedback:
  - Policy objectives to consider in HCR revisions
  - Performance criteria

Thank You!

Extra Slides

Initial items in Council's work plan*

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Performance criteria

- ❑ %time below B20
- ❑ Number of F = 0, closures
- ❑ Diversity of age classes (sensu Ianelli et al.)
- ❑ Total Catch
- ❑ Total $ Yield
- ❑ Stability of Catch over time
- ❑ Mean age
- ❑ R/S or other product. indices
- ❑ Mean trophic level

TABLE 6 | Suite of candidate performance indicators for ACLIM.

Name	Derivation	Purpose
Core species abundance	Mean and variance for time block	Sustainable fishing index
Core species recruitment	Mean and variance for time block	Sustainable fishing index
Core species average size and age at maturity	Mean and variance for time block	Sustainable fishing index
Core species exploitation	Annual time trend F/F_{MSY}	Sustainable fishing index
Core species crab status	Annual time trend reproductive potential vs. target reproductive potential.	Sustainable fishing index
Core species crab catch	Mean and variance for time block	Sustainable fishing index
Centroid of distribution for core species	Annual time trend	Index distribution
Euphausiid biomass	Mean and variance for time block	Ecosystem stability index
Motile epifauna biomass	Mean and variance for time block	Trophic structure index
Benthic forager biomass	Mean and variance for time block	Trophic structure index
Pelagic forager biomass	Mean and variance for time block	Trophic structure index
Apex predator biomass	Mean and variance for time block	Trophic structure index
Species diversity index	Alpha and beta diversity indices	Ecosystem stability index
Mean trophic level of the catch	Mean and variance for time block	Ecosystem Based Fishery Management index
Number of fishery closures by core species	Average for time block	Fishery efficiency index
Core species and fleet CPUE	Annual time trend of CPUE by species and fleet	Fishery catchability index
Fishing effort by fleet	Annual time trend of fishing effort	Fisheries participation and employment
Core species first-wholesale revenue index	Annual time trend	Economic index
Core species percent TAC utilization	Percentage of total allowable catch landed	Management index
Fleet species diversity index	Annual measure of diversity of target species revenues	Measure of fishery portfolio by sector
Fleet revenue variability	Coefficient of variations of fisheries revenue by sector	Financial risk index

Hollowed et al. 2020