Harvest Control Rule Discussion

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Jan 2026

Brief overview of:

- Recap: Groundfish & Crab Plan Team reviews in September, Nov and Jan and outcomes
- Brief recap of HCRS 1,5/10, and 7 for discussion
- Goal for today: Discuss HCR objectives and triggers to help set up discussions/recommendations for JGPT tomorrow

Recap of Plan Team discussions

- **June 2025 SSC HCR workshop**
  - held in response to CCTF recommendations; reviewed the growing suite of models for evaluating alternative HCRs and ecosystem caps.
  - Four priority HCRs and ecosystem caps identified by the SSC are currently being tested to assess performance under changing climate and ecosystem conditions.
  - HCRs 1, 5 & 10, 7

- **Groundfish Plan Team and Crab Plan Team discussions (Sep 2025, Nov 2025, Jan 2026):**
  - Summarized outcomes from the June SSC HCR workshop and reviewed the suite of models available to evaluate alternative HCRs and ecosystem caps.
  - GPT/CPT discussions focused on
    - HCR 5/10 (fix Catch at high biomass to preserve ecosystem productivity and age class diversity)
    - HCR 7 : quantitative methods to adjust for risk table (CPT) or state ABC buffers (CPT) using environmental forecasts

Discussion Topics

Where and when to adjust for productivity impacts (assessment, HCRs, TAC, or not at all)?

What are the triggers for when to use alternative HCRs?

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- How to implement indicator-based adjustments (e.g., annual covariates vs. 5-year running averages).
- Guidance to avoid double dipping across environmental covariates (e.g., if used in the model, HCR, and TAC).

Discuss governance workplan guidance:

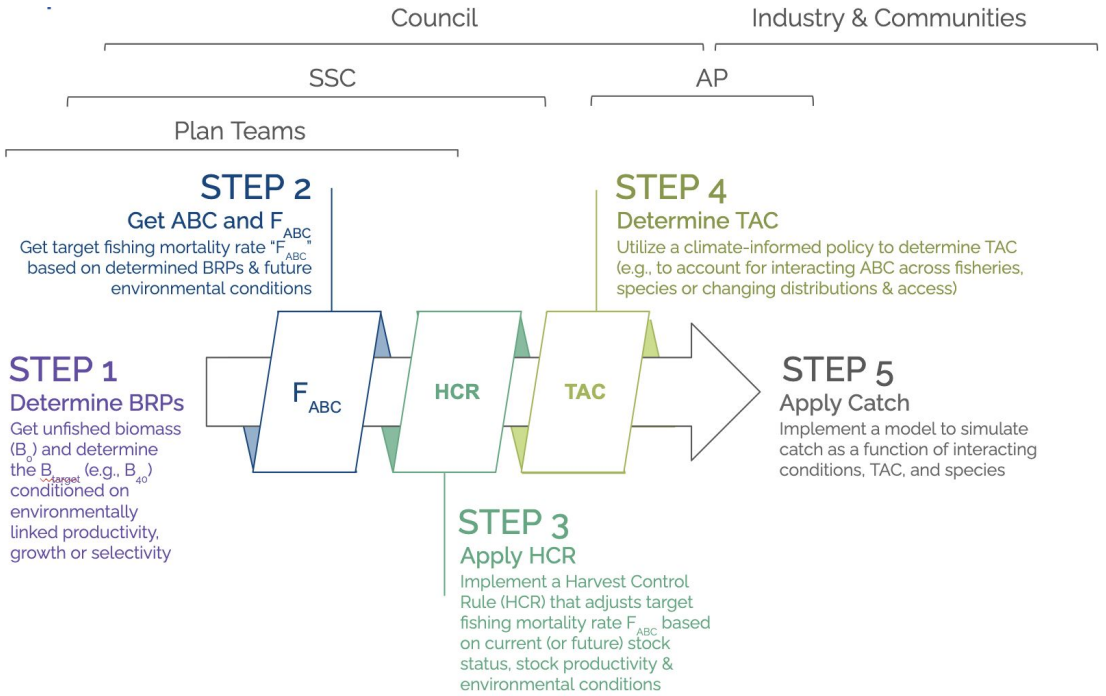
- Evaluate how adjustments and buffers are currently set, and whether environmentally linked HCRs outperform the current or static approaches.
- Assess whether interim steps (e.g., female SSB–based ABC methods) are needed before full implementation.
- Include fallback “meta-rules” for exceptional circumstances.
- Discuss how much certainty in projections is needed to slow fishing or act early when non-fishing mortality may dominate.
- Identify frequency of regular updates: e.g., May update for CPT might include a quick review of how crab demographics are represented across CLIM models.

Is there addition evaluation criteria and guidance needed?

- Improve realism by including demographic processes beyond recruitment (e.g., growth).
- Use a range of performance indicators.
- Consider outcomes under differing levels of projection uncertainty and environmental coupling (how the environment affects demographics).

Climate Informed Advice

Climate workplan will provide the roadmap



ACLIM GOA-CLIM

Hoslman et al. in prep

Climate Robust Policy & Process

Conceptual Model

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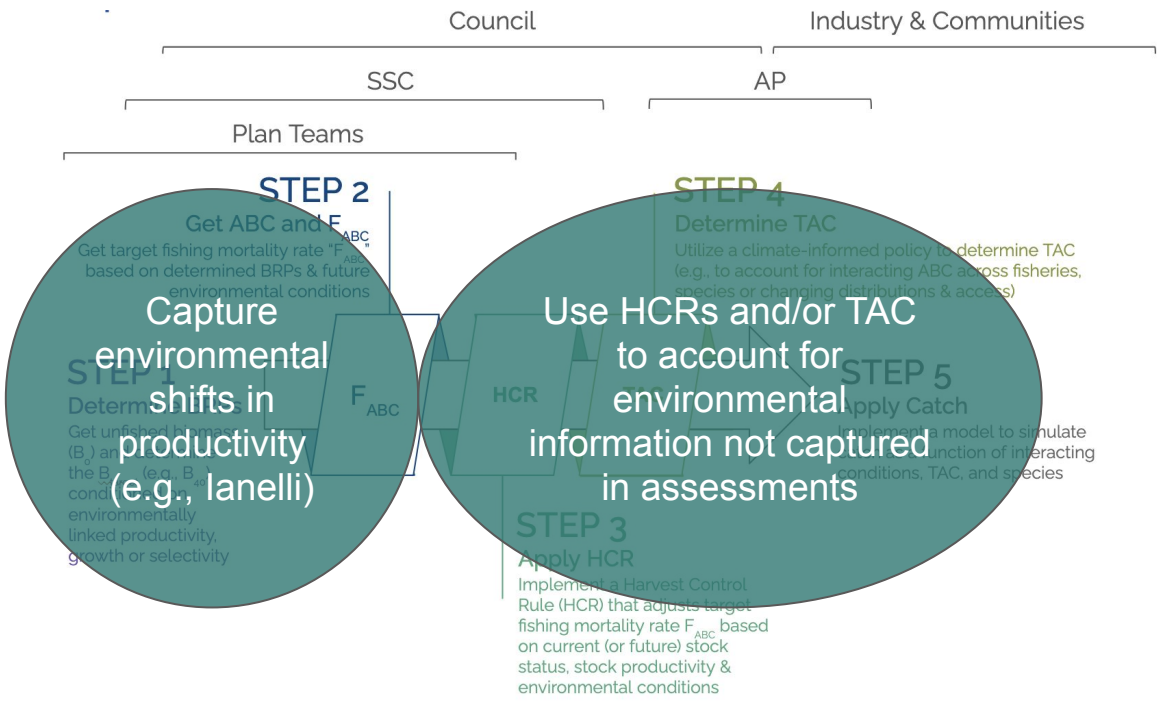

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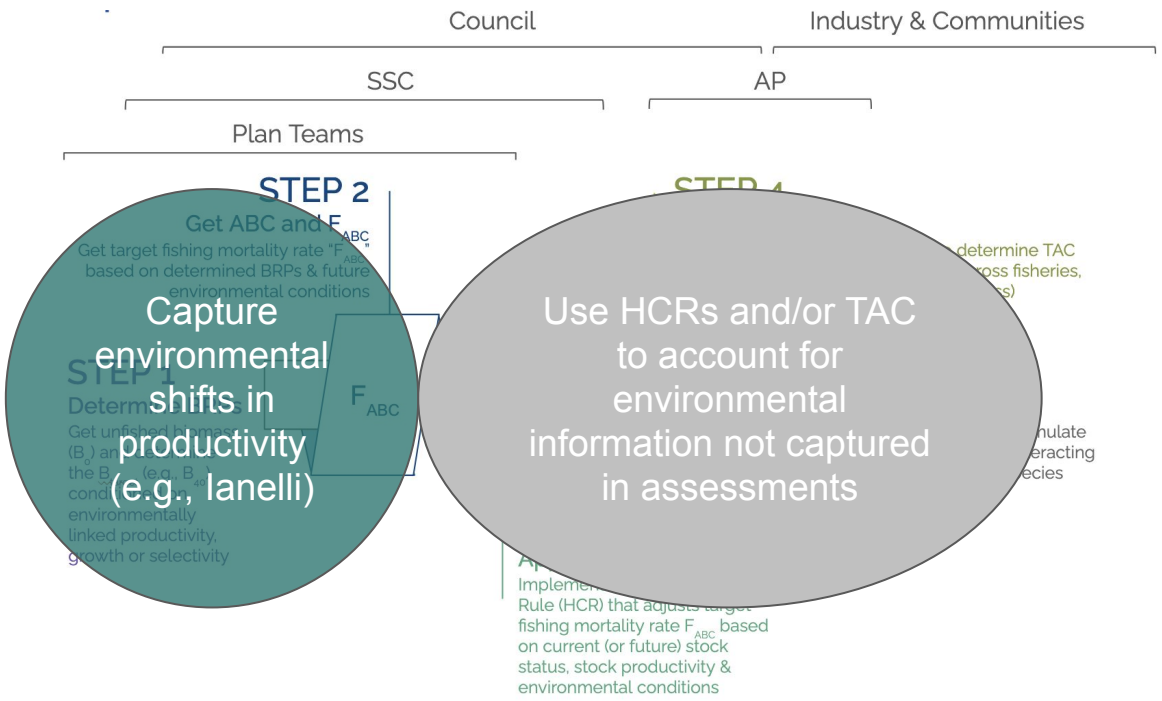

Climate Robust Policy & Process

Hoslman et al. in prep

https://jimianelli.github.io/HCR_eval/pollock_simulation.html#discussion

THIS DOCUMENT IS A DRAFT FOR DISCUSSION PURPOSES ONLY.

Bering Sea Pollock-like Population Simulation test

Comparing Low and High Steepness Scenarios with constant HCR

AUTHOR
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PUBLISHED
January 20, 2026

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1 Introduction

Recruitment productivity under climate change is uncertain, and stock-recruitment steepness (h) is a key parameter that drives sustainable harvest levels. Evidence from climate-ecosystem modeling and recruitment studies suggests steepness and productivity can shift with warming and prey dynamics (Hollowed et al. 2020; Holsman et al. 2020; Spencer et al. 2019; Szuwalski et al. 2023). Because steepness informs reference points and F proxies, mis-specification can change expected yields and risk profiles (Szuwalski and Punt 2025; Punt et al. 2024).

At the same time, there is pressure to incorporate environmental covariates into harvest control rules (HCRs) to improve adaptability. These approaches can help track productivity changes, but they also add interpretive uncertainty and require strong validation (Punt et al. 2024; Szuwalski et al. 2023). In contrast, tier-based HCRs remain transparent and easier to communicate, with clear links from biomass to fishing mortality (North Pacific Fishery Management Council 2024). This study asks whether a simple, transparent HCR can be robust to plausible productivity shifts without relying on covariates.

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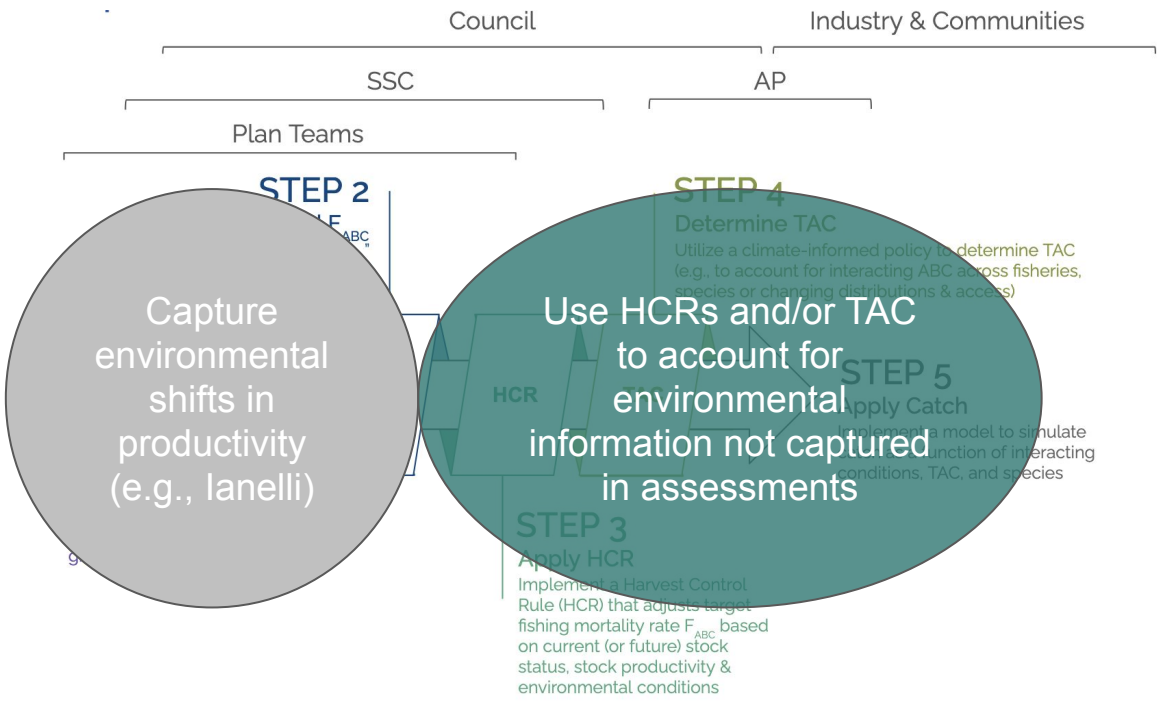

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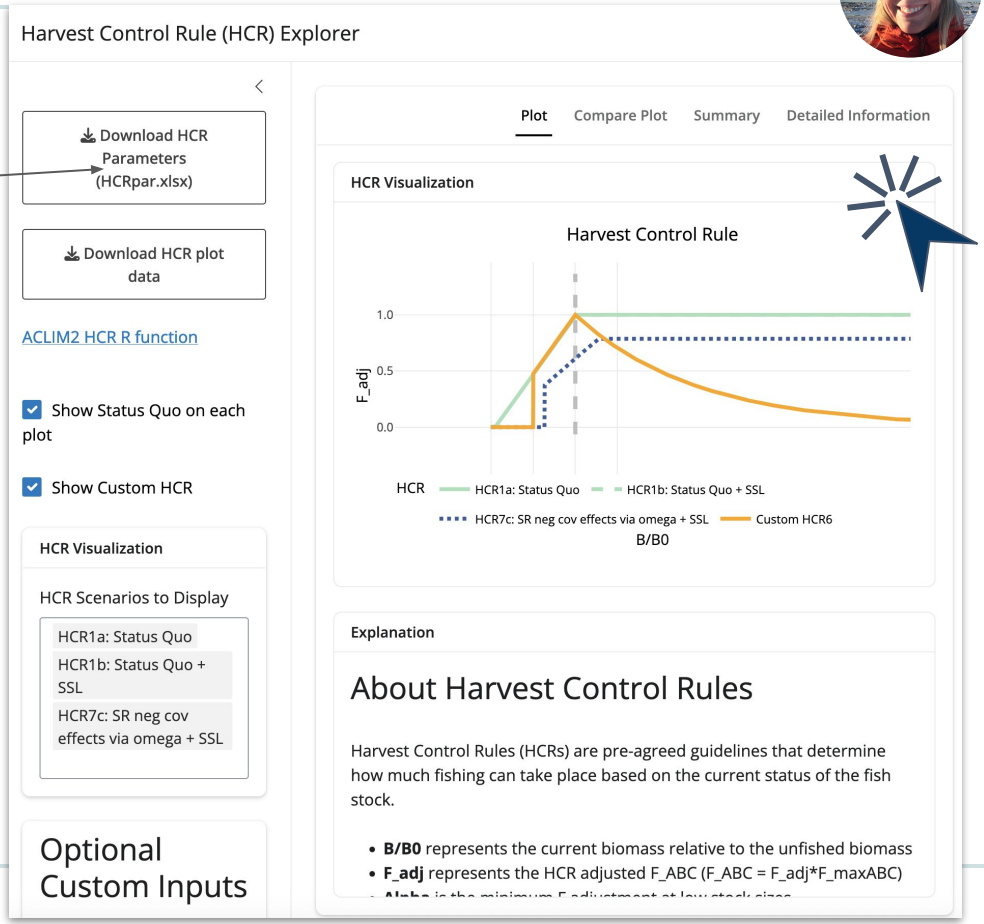
Interactive HCR explorer tool

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

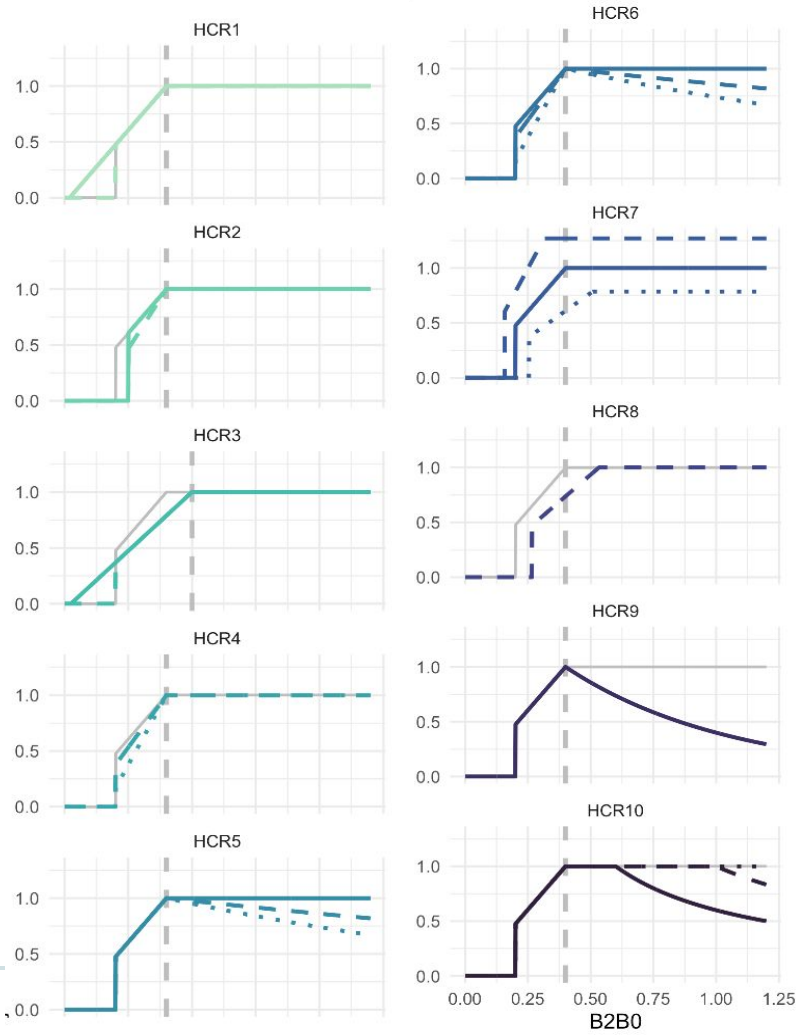
Research question:
Are there alternative HCRs that can perform better than status quo under alternative future scenarios?



HCR Scenarios

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



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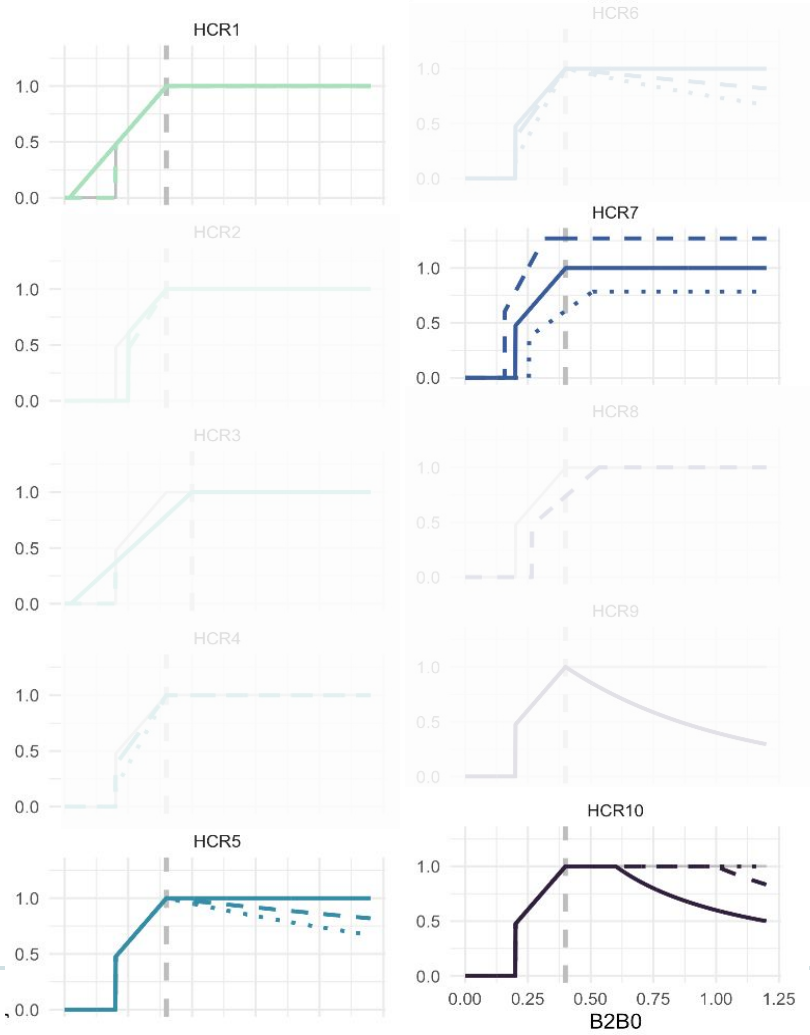
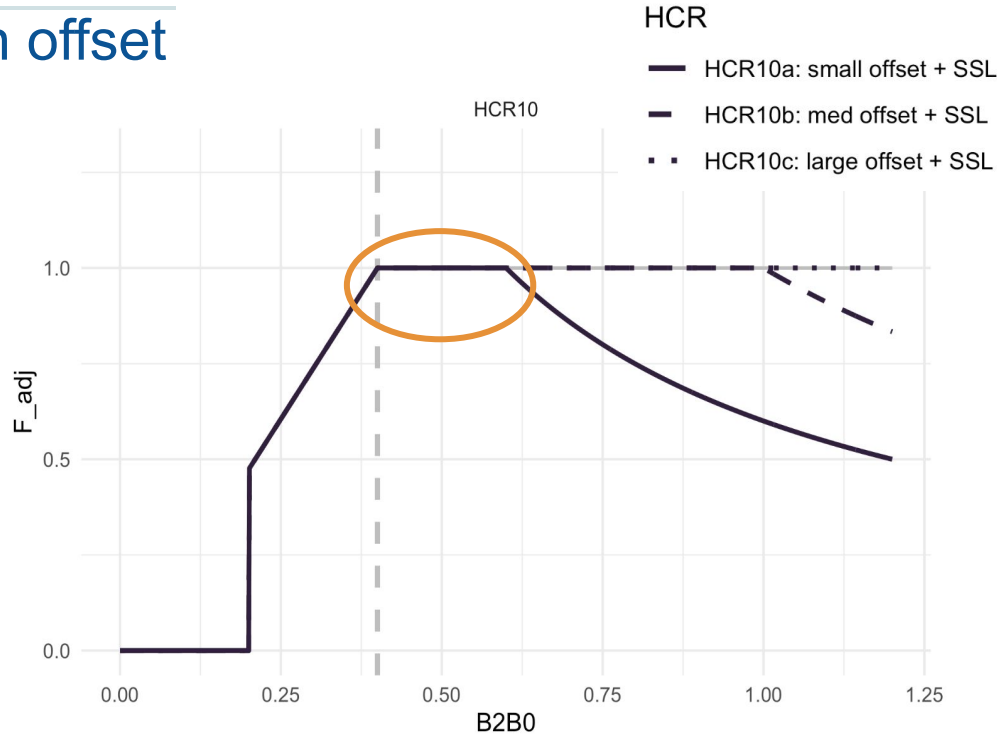


HCR 10: Maximize productivity/increased reserve; linear version (1/ B_target) with offset

May help

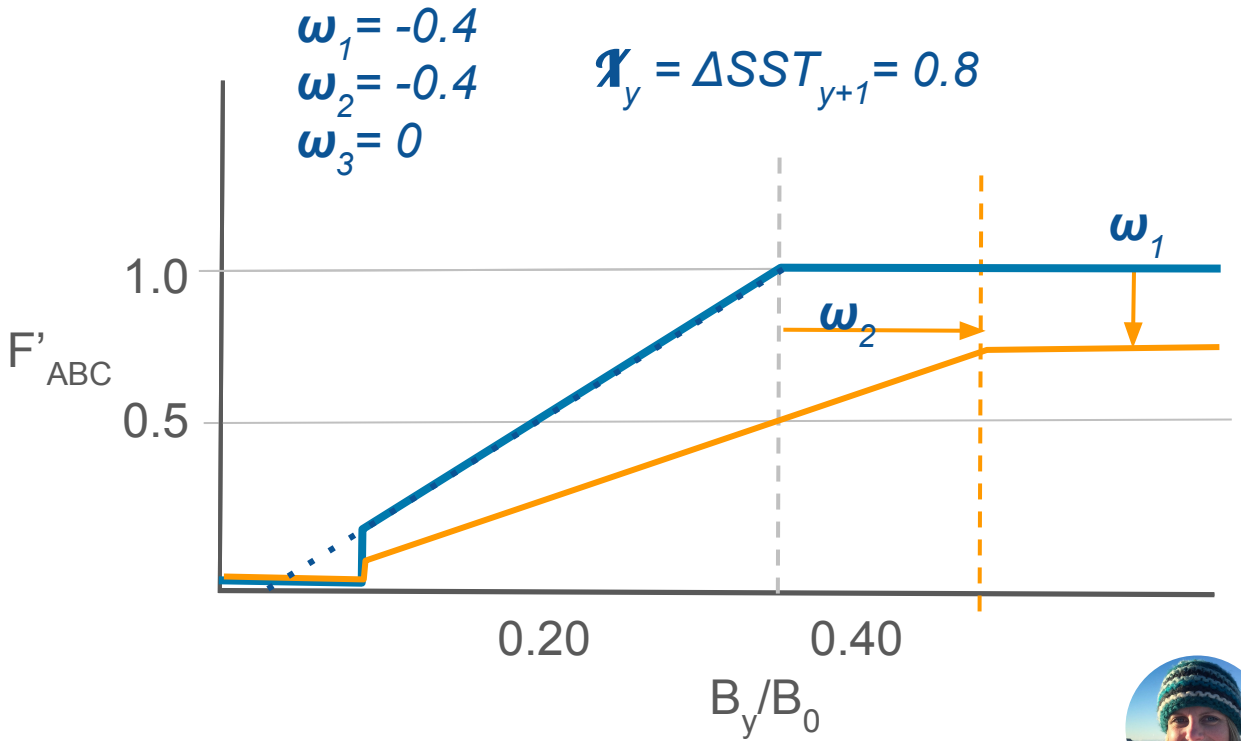
- preserve ecosystem productivity
- conserve age class diversity
- stabilize catch and markets



HCR 7: Add covariate-linked buffers

HCR7 (quantitative adjustment to HCR shape):

- Shows promise and may better justify buffers and risk-table adjustments.
- Emphasizes a transparent approach using information predictable to fishers and the public.
- Key questions remain about estimating omega (ω), whether it should be stock-specific or generic, and what information is needed to apply it.



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

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Course corrections responding to climate impacts produce divergent effects on population biomass and harvest in fisheries

Table 1

Summary of outcomes for population biomass and cumulative harvest under a climate adaptive versus fixed fishery management strategy.

Climate scenario	Effect on *Umsy,t*	Effect on *Bmsy,t*	Population biomass	Cumulative harvest
$r\downarrow$ $K\uparrow$	– 0	0 +	climate adaptive > fixed	fixed > climate adaptive
$r\uparrow$ $K\downarrow$	+ 0	0 –	fixed > climate adaptive	climate adaptive > fixed
$r\downarrow K\downarrow$ together	–	–	climate adaptive ~ fixed	fixed ~ climate adaptive
$r\uparrow K\uparrow$ together	+	+	fixed > climate adaptive	climate adaptive > fixed

Summary comparison of outcomes for population biomass and cumulative harvest under a climate adaptive versus fixed fishery management strategy, including how harvest and biomass reference points are modified under climate adaptive management. Down/up arrow indicates a decline/increase in the associated demographic parameter due to a climate impact, while a negative/positive/0 sign indicates a decline/increase/no change in the reference point.

https://doi.org/10.1371/journal.pclm.0000624.t001

doi: https://doi.org/10.1371/journal.pclm.0000624.t001

https://journals.plos.org/climate/article/figure?id=10.1371/journal.pclm.0000624.t001 *Samhouri et al. 2025*