Climate work plan overview and Alternative Harvest Control Rule discussion paper

Diana Stram, NPFMC
Kirstin Holsman, AFSC

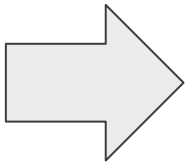
Council June, 2026

1976
2026

Outline of presentation

Climate work plan

4 Initial Elements



Development of Alternative Harvest Control Rules (HCR)

Climate Work Plan overview

Climate work plan

- Development of work plan
- Overview of 4 elements
- Spreadsheet tracking tool
- Coordination with CEFI
- Current Council focus on Element 4

NPFMC Dec. 2024 Motion

D-1 Climate Change Task Force Report
Council Motion
December 8, 2024

The Council acknowledges the final recommendations of the Climate Change Task Force (CCTF) that was established by the Bering Sea FEP and appreciates the extensive contributions of the Task Force members. The Council establishes a climate resilience workplan as recommended by the CCTF, with efforts guided by the principles outlined in the CCTF Key Element 1 (to expand existing inclusive processes, collaborations, and partnerships that facilitate inclusion of multiple knowledge systems in climate planning), and Key Element 2 (to consider management tools and options focused on the inclusion of existing and emergent climate information). The Council requests staff format the workplan, including timeframes, with the intent that it guides near-term actions for enhanced climate resilient management in the GOA and the BSAI. As an initial step, the work plan contains the following items as recommended by the CCTF; additional longer-term items and priority actions may be considered in the future. The Council anticipates that output from the NOAA Climate, Ecosystems and Fisheries Initiative (CEFI) will provide invaluable contributions to these work plan items.

- **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 Socio-economic 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)**

Climate Workplan

A Incorporate climate **forecast** linked management advice

B Incorporate climate-driven interactions and cascading impacts through use of **ecosystem indicators and models**

C Consider and incorporate **dynamic management** tools to increase in-season adaptation capacity

D Review tier systems, consider **climate-informed biomass targets** and limits and climate-robust or **forecast-informed HCRs**

Climate work plan

Climate work plan adopted by the Council December 2024

- Spreadsheet tracking tool developed by staff
- Tracks combined efforts of CEFI, AFSC, AKRO and Council
- **Initial summary focused on 2025-2026 (but overall tool includes 2027 on)**
  - Items planned but not yet started ('potential') not included until they move into the 'new/in development' phase
- Current Council focus at this meeting on Element 4 (HCR work)

Four initial Elements:

A. Incorporate climate-forecast linked management advice
B. Incorporate climate-driven interactions and cascading impacts through use of ecosystem indicators and models
C. Consider and incorporate dynamic management tools to increase in-season adaptation capacity
D. Review tier systems, consider climate-informed biomass targets and limits and climate-robust or forecast-informed harvest control rules

Work plan tracking tool

	Key Element	Council Product *	Product Detail*	New, existing, modified	Relevant FMPs	Lead responsibility: Council staff/ RO/AFSC
Element B: Incorporate climate-driven interactions and cascading impacts through use of ecosystem indicators and models						
B.6	**Link to groundfish, crab, and marine mammal SDMs to MOM6 hindcasts and forecasts for EBS**	EBS ESR	Develop climate informed SDMs and management trajectories based on MOM6 linked assessment models for groundfish and crab - provide contribution to the ESR	Modification to existing	BSAI Crab, BSAI Groundfish	Lead: AFSC, Partners: AKRO, NPFMC
B.7	**Link to ice seal SDMs to MOM6 hindcasts and forecasts for EBS**	EBS ESR (noteworthy or index)	Develop climate informed SDMs and management trajectories based on MOM6 linked assessment models for marine mammals	New/ in development	BSAI Crab, BSAI Groundfish	Lead: AFSC, Partners: AKRO, NPFMC
B.8	**Coordination through SDM 6 month meetings and workshops**	SDM and EFH updates	Coordination through SDM 6 mo meetings and workshops to facilitate cross pollination & tie into deliverables, reports and the dashboard	Existing/ operational	GOA Groundfish, GOA Crab, BSAI Crab, BSAI Groundfish	Lead: AFSC, Partners: AKRO, NPFMC
Element C: Consider and incorporate dynamic management tools to increase in-season adaptation capacity						
C.1	**ACL in-season management authority**	Regulatory impact review (RIR)	Analysis of modifying in-season management authority	New/ in development	BSAI Groundfish, GOA Groundfish	Co-leads NPFMC, AKRO
C.2	**Stock Assessment Prioritization**	ongoing discussions with NPFMC (PT, SSC)	Within typical stock assessment review process, across all stocks as needed	Modification to existing	BSAI Groundfish, GOA Groundfish	Lead: AFSC, Partners: NPFMC
Element D: Review tier systems, consider climate-informed biomass targets and limits and climate-robust or forecast-informed harvest control rules						
D.1		Presentation on Tier systems and flexibility within FMPs cor Groundfish and Crab FMPs	Presentation at SSC workshop	Completed	BSAI Groundfish, BSAI Crab, GOA Groundfish	Lead: NPFMC, Partners AFSC
D.2	**Alternative Harvest Control Rule (HCRs) considerations**	SSC Workshop on HCRs	SSC Workshop June 2025: https://meetings.npfmc.org/Meeting/Details/3093	Completed	BSAI Groundfish, BSAI Crab, GOA Groundfish, GOA Crab	Lead: NPFMC

	Key Element	Council Product *	Product Detail*	New, existing, modified	Relevant FMPs	Lead responsibility: Council staff/ RO/AFSC
Element A: Incorporate climate forecast linked management advice						
A.1	**Create Science Brief; CEFI 1 pager**	Climate Science Brief	Summarize new CEFI products, highlight new climate relevant information for the assessment season	Modification to existing	BSAI Groundfish	Lead: AFSC, Partners: NPFMC
A.4	**Generate MOM6 indices (hindcast + forecast) for annual assessment cycle products**	ESR EBS, Risk tables in stock assessments	Indices of cold pool, BT, SST, etc.	Modification to existing	BSAI Groundfish, BSAI Crab	Lead: AFSC, Partners: NPFMC
A.5		ESR AI, Risk tables in stock assessments	Indices of cold pool, BT, SST, etc.	New/ in development	BSAI Groundfish, BSAI Crab	Lead: AFSC, Partners: NPFMC
A.6		ESR GOA, Risk tables in stock assessments	Indices of cold pool, BT, SST, etc.	New/ in development	GOA Groundfish	Lead: AFSC, Partners: NPFMC
A.7		ESPs for BSAI stock assessments	Indices of cold pool, BT, SST, etc.	New/ in development	BSAI Groundfish, BSAI Crab	Lead: AFSC, Partners: NPFMC

3.0 Details from each 2025-2026 listed Element

Element A

A.1) Climate Science Brief (plus CEFI 1 pager)

A summary of new Changing Ecosystem and Fisheries Initiative (CEFI) products that highlights new climate-relevant information for the assessment season. The Climate Report is delivered annually and informs the groundfish and crab assessment cycles. A pilot version of the report was presented through the Fall 2024 assessment cycle (no report was generated in 2025 due to the government shutdown).

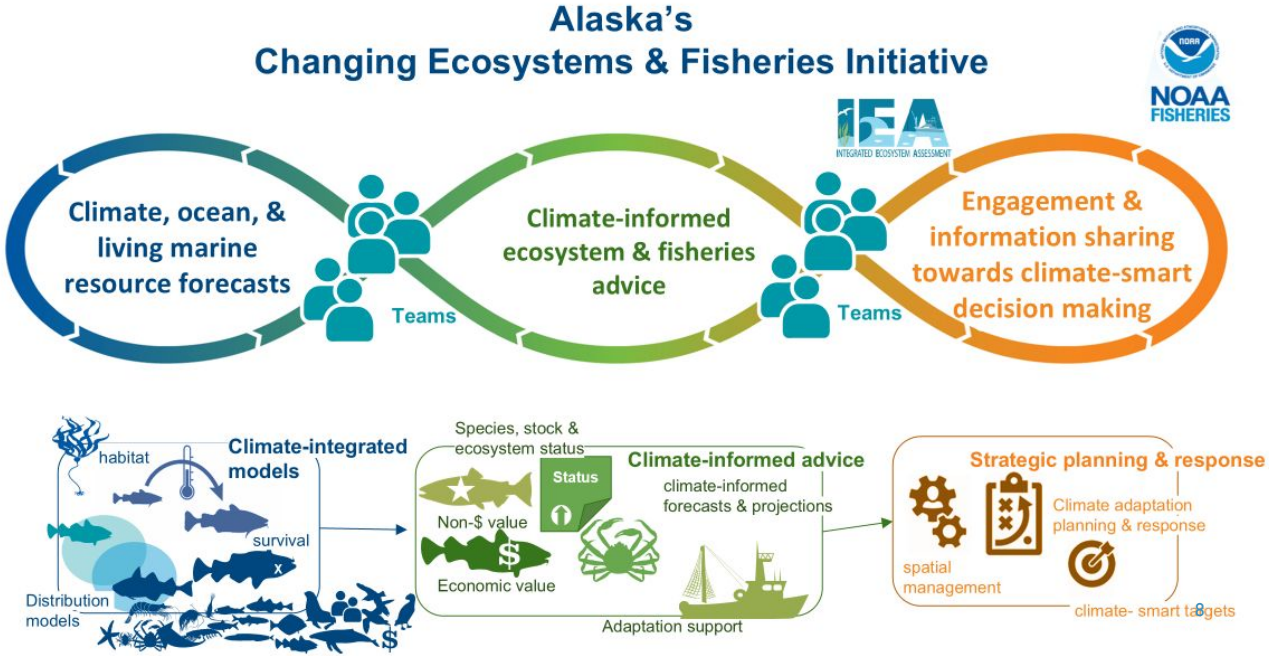
A.4, A.5, A.6, A.7) MOM6-derived indices for ESRs and ESPs:

Alaska regionally-tailored indices of cold pool, bottom temperature, sea surface temperature, mixed layer depth, Ocean Acidification (OA) and Aragonite Saturation rate, and additional variables are being generated from MOM6 hindcasts and forecasts and being provided publicly for use in various decision support tools including the EBS, AI, and GOA ESRs and to the ESPs in EBS and GOA SAFE chapters to support the annual assessment cycle.

Work Plan lists actions by AFSC/CEFI, AKRO and Council actions

As products are available they will be incorporated into the Council process (via assessments, ESRs, analyses, etc)

Council and RO staff also included in CEFI overall as well as Alaska Climate Team (ACT) to coordinate and communicate activities



Harvest Control Rules (HCR): treatment of risk and uncertainty

HCR discussion paper: Outline of presentation

Harvest Control Rules (HCR) discussion paper

- Overview of HCRs (general)
- *NPFMC Groundfish Assessment Tier system and OFL/ABC HCRs*
- *NPFMC BSAI Crab Assessment Tier system and OFL/ABCs HCRs*
- *How risk and/or uncertainty considered in NPFMC:*
  - *Stock Assessments*
  - ABC-setting
  - *TAC-setting*
- Alternative HCRs under development
- Council considerations for moving forward

Considerations for Council at this meeting

Defining objectives:

- suite of objectives defined for refining HCRs and developing performance metrics
- help inform Council's purpose and need for analysis

Scalability of analysis:

- Subset of Tier 3 stocks to move forward

Engagement and Communication Strategy:

- importance of understanding and communicating current process and status quo treatment of risk and uncertainty
- alternative HCRs and why/when/which stocks
- stakeholder involvement in refining performance metrics

Considerations of Risk and Uncertainty

Council consideration of treatment of risk and uncertainty in harvest specifications for BSAI/GOA Groundfish and BSAI crab stocks for potential improvements.

recommend

Overfishing Limit (OFL)
Acceptable Biological Catch (ABC)

SSC

Total Allowable Catch (TAC)

Council (groundfish)
State of Alaska (crab)

Uncertainty

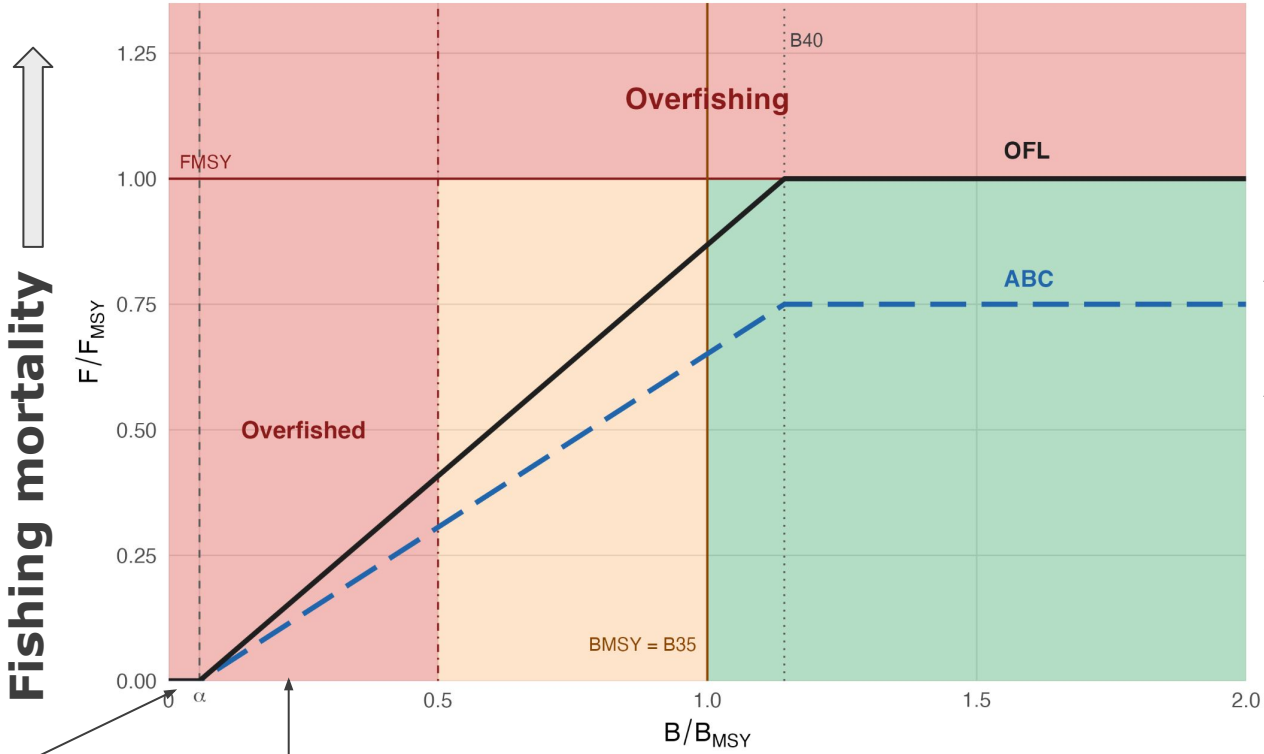
Relative lack of information or confidence in the reliability of that information

Risk

Considering the likelihood of an adverse event and the severity of the consequences

Groundfish and Crab OFL and ABC HCRs (subset of Section 2)

Groundfish OFL and ABC HCRs (modified Fig 4)

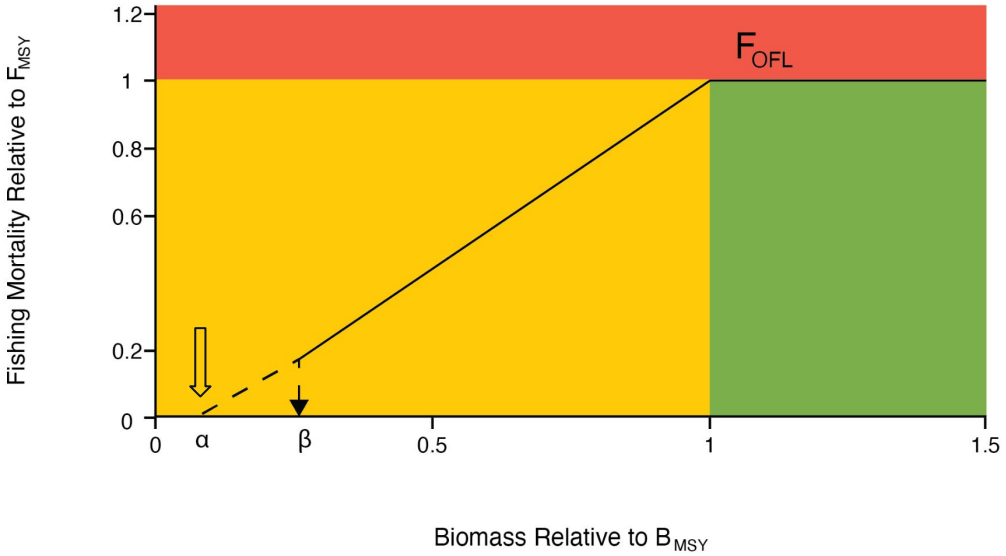


Status Quo Tier 3 OFL and ABC HCR

Automatic rebuilding below $B_{40\%}$

Crab OFL HCR

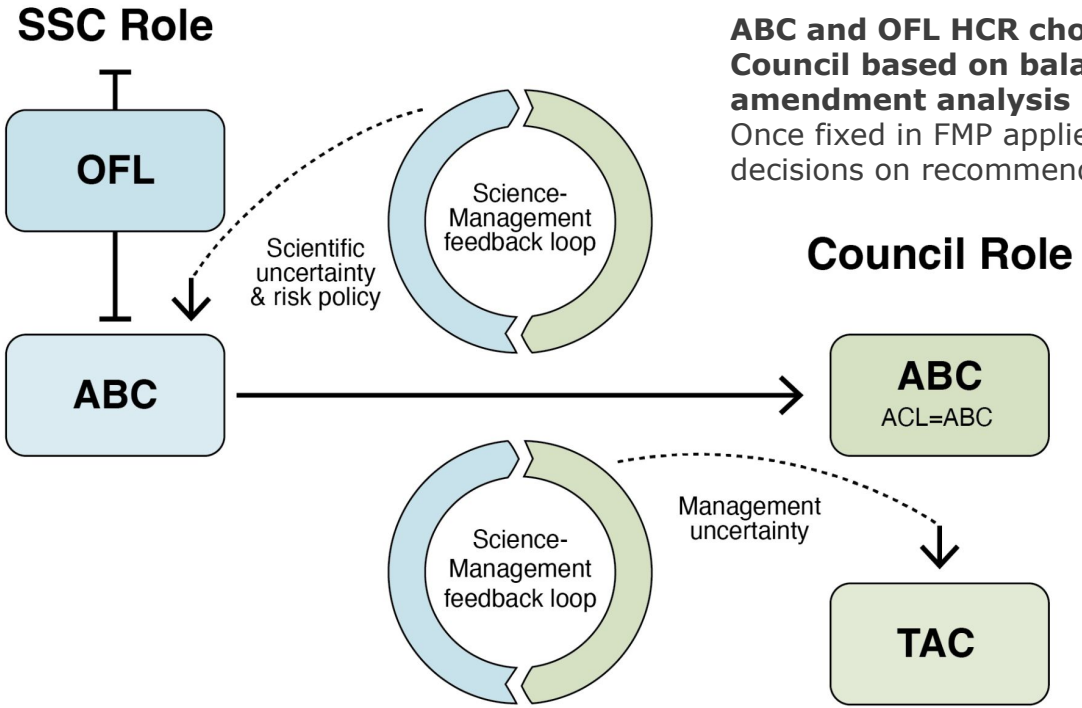
Crab control rule



Risk and Uncertainty: Assessment, ABC-setting, TAC-setting, Alternative HCRs (subset of Section 3)

Science and policy in addressing risk and uncertainty

Scientific uncertainty: uncertainty in OFL



ABC and OFL HCR choice is a policy decision by the Council based on balance of risk and uncertainty in amendment analysis (previous Amd 56/56).
Once fixed in FMP applied in assessment for maxABC, decisions on recommended ABC at or below with SSC

Management uncertainty: uncertainty in ability to constrain catch to ACL (= ABC)

Assessment changes that can impact ABC (Section 3.1)

- Model structure modifications:
  - Approaches reviewed at least Sept/Oct to Nov/Dec before adoption
- Biological reference points/new or revised data:
  - New data, revised time-series, selectivity changes
  - No change to model structure but can impact biological reference points
  - Not always reviewed in Sep/Oct prior to incorporation
- Tier level changes
  - Proposed changes reviewed at least Sept/Oct to Nov/Dec before adoption

Table 3 page 16

Stock	Proposed change/ rationale	Change in resulting maxABC	Time frame from proposal to adoption for use in specifications
EBS Pollock	Change Tier 1 to Tier 3, lack of data at low stock sizes results in uncertain Stock-Recruit relationship (SRR)	-1,666,000 t	Discussion paper reviewed in September/October 2024; Tier level change by SSC in December 2024
BSAI Yellowfin sole	Change Tier 1 to Tier 3,lack of data at low stock sizes results in uncertain SRR	Not yet available	Discussion paper September/October 2025; change pending 2026 assessment cycle
AI Pacific cod	Change from Tier 5 to Tier 3; approved age-structured model	-3,134	Multiple years in development and 2024 approval of age-structured model
BSAI Atka mackerel	Estimate of F_{OFL} and F_{ABC} 25% higher relative to previous year due to changes in the fishery selectivity	+10,290 t	Assessments in 2021 relative to 2020
Various	Revised Tier 3 proxies, age-(or sex) specific schedules updated. E.g., selectivity, weight-age, and maturity	Varies	Generally proposed in September, if approved by SSC, will be included for December meeting

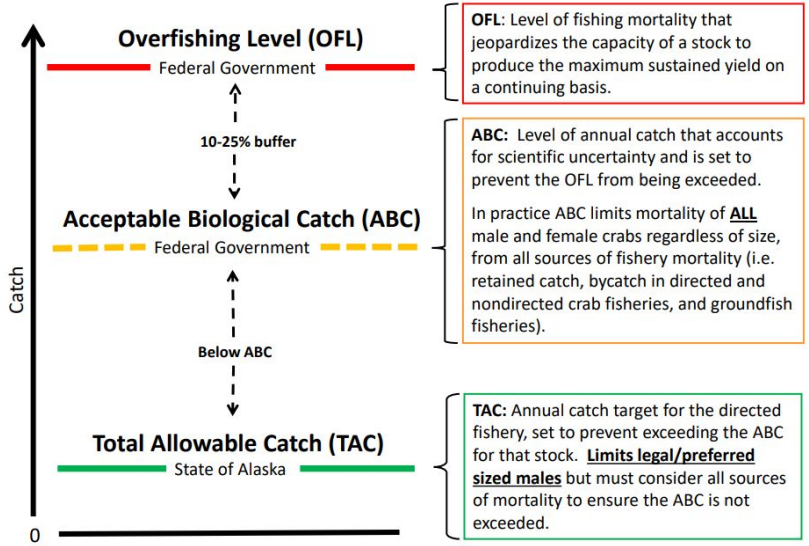
Groundfish Risk Table Reductions

Risk Table reductions Table 6: ABC<maxABC 2018-2024

Note categories and scoring levels have changed between 2018-2022

Stock	Assessment Year(s)	Risk Table Scores > 1	SSC reduction from maxABC
EBS Pollock	2018	P-2, E-2	30%
	2019	P-2, E-2, F-2	43%
	2020	E-2, F-2	30%
	2021	A-2, E-2, F-2	11%
	2022	A-2	43%
	2023	E-2	18%
EBS Pacific cod	2019	E-2	3%
AI Pacific cod	2023	P-2, E-2	10%
AK Sablefish	2018	A-2, P-4, E-2	45%
	2019	A-2, P-3, E-2, F-3	50%
	2020	A-3, P-3, E-2, F-3	44%
BSAI Yellowfin sole	2021	P-2, E-2	24%
BSAI Greenland turbot	2024	A-3, P-2, E-2	25%
BSAI Northern rock sole	2022	A-3	23%
	2023	rollover	23%
BSAI Blackspotted / Rougheye rockfish	2022	A-3, P-2, F-2	11%
	2023	rollover	11%
BSAI Sharks	2022	A-3, P-2	13%
	2023-2024	rollover	13%
GOA Pollock	2023	A-2	18%
GOA Pacific cod	2018	NA*	14%
	2019	A-2, P-2, E-2	NA**
GOA Dusky Rockfish	2020	A-2	24%
	2021	Rollover of stair-step	24%
GOA Rougheye/Blackspotted rockfish	2023	A-2, P-2	20%
	2024	NA***	10%
GOA Demersal shelf rockfish	2021	A-2, P-2, F-2	22%
	2022	A-2, P-2, F-2	15%

ABC setting Crab (Fig 10, Table 4)



Crab Stock	Tier	ABC Buffer by year				
		2021/22	2022/23	2023/24	2024/25	2025/26
EBS Snow Crab	3	25%	25%	50%	65%	40%
Bristol Bay Red King Crab	3	20%	20%	20%	20%	20%
EBS Tanner Crab	3	20%	20%	20%	20%	20%
Pribilof Islands red king crab	4	25%	25%	25%	25%	25%
Pribilof Islands blue king crab	4	25%	25%	25%	25%	25%
St. Matthew blue king crab	4	25%	25%	25%	25%	25%
Norton Sound red king crab	4	40%	40%	30%	30%	30%
Aleutian Islands golden king crab	3	30%	25%	25%	25%	25%
Pribilof Islands golden king crab	5	25%	25%	25%	25%	25%
Western Aleutian Islands red king crab	5	75%	75%	75%	75%	75%

Assessment Changes

Approach	Benefits	Drawbacks	Timing
Assessment changes	Highly targeted; can address stock-specific dynamics; scientific peer review provides quality control	Less transparent to the public; extended development time; changes within scientific purview, Not direct Council action, maxABC HCR fixed	Depends upon scope and scientific concurrence on modifications; can be done within two meetings of Plan Teams and SSC; sometimes may take multiple iterations of changes to eventually get approved (e.g., AI Pacific cod model and resulting Tier level change)

Approach	Benefits	Drawbacks	Timing
ABC changes from maxABC	Can be done within an assessment cycle drawing on information within the assessment (e.g., where recruitment estimates are modified) or with the use of risk table scoring and justifications for out of assessment model uncertainties	Qualitative; scoring and resulting reductions may be inconsistent across assessments; no Council involvement Not possible to recommend an ABC above the maxABC without considering alternative HCRs	Modified by the SSC during their annual stock assessment review and ABC recommendations
TAC adjustments	Flexible and responsive on annual timescales; can draw on a broad range of information; no FMP amendment needed but sum of TACs must fall within the OY range by FMP.	Does not create lasting structural change; ad hoc; may lack analytical basis; subject to annual political dynamics; and structure (e.g., use of HCRs and risk tables)	Modified within a Council meeting cycle without additional analysis

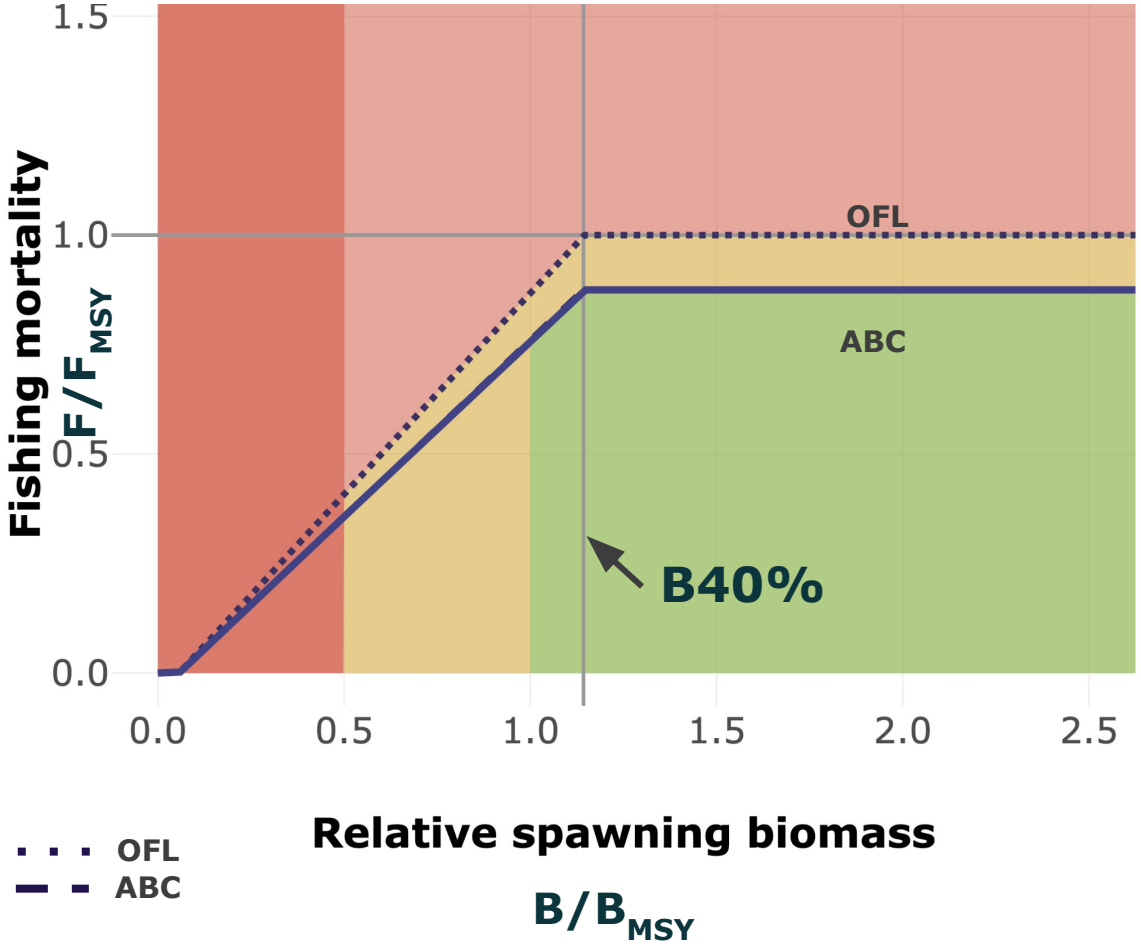
Reasons to consider revised HCRs (Stock Speciifc issues Table 10)

Multiple stocks for which application of the Tier level maxABC HCR has been problematic over the years

Increased reliance on assessment modifications and Risk table ABC adjustments to account for environmental changes

Council policy inherent in modified HCRs to address future ABCs

Key Issues	Stocks
Recruitment variability, especially irregular large recruitment events	Sablefish, rockfish, pollock,
Increased natural mortality: elevated or event driven	GOA cod, AI cod, EBS snow crab
Prolonged recruitment failure	Greenland turbot
Environmental sensitivity of year-class strength	BSAI/GOA Pollock, Bristol Bay red king crab
Long-lived, slow recovery, declining productivity despite large biomass levels	BSAI/GOA Pacific ocean perch

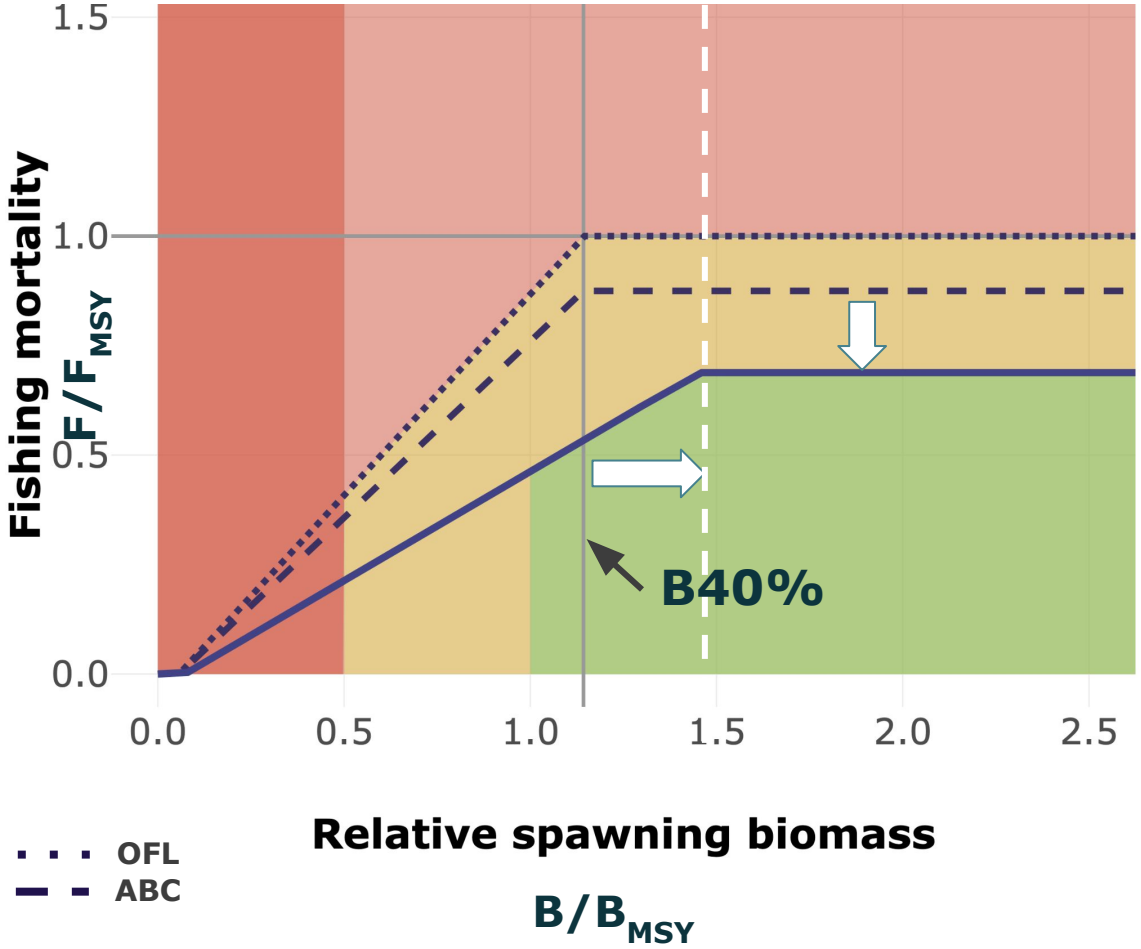


HCR 1

Status Quo Tier 3 OFL and ABC HCR

Automatic rebuilding below $B_{40\%}$

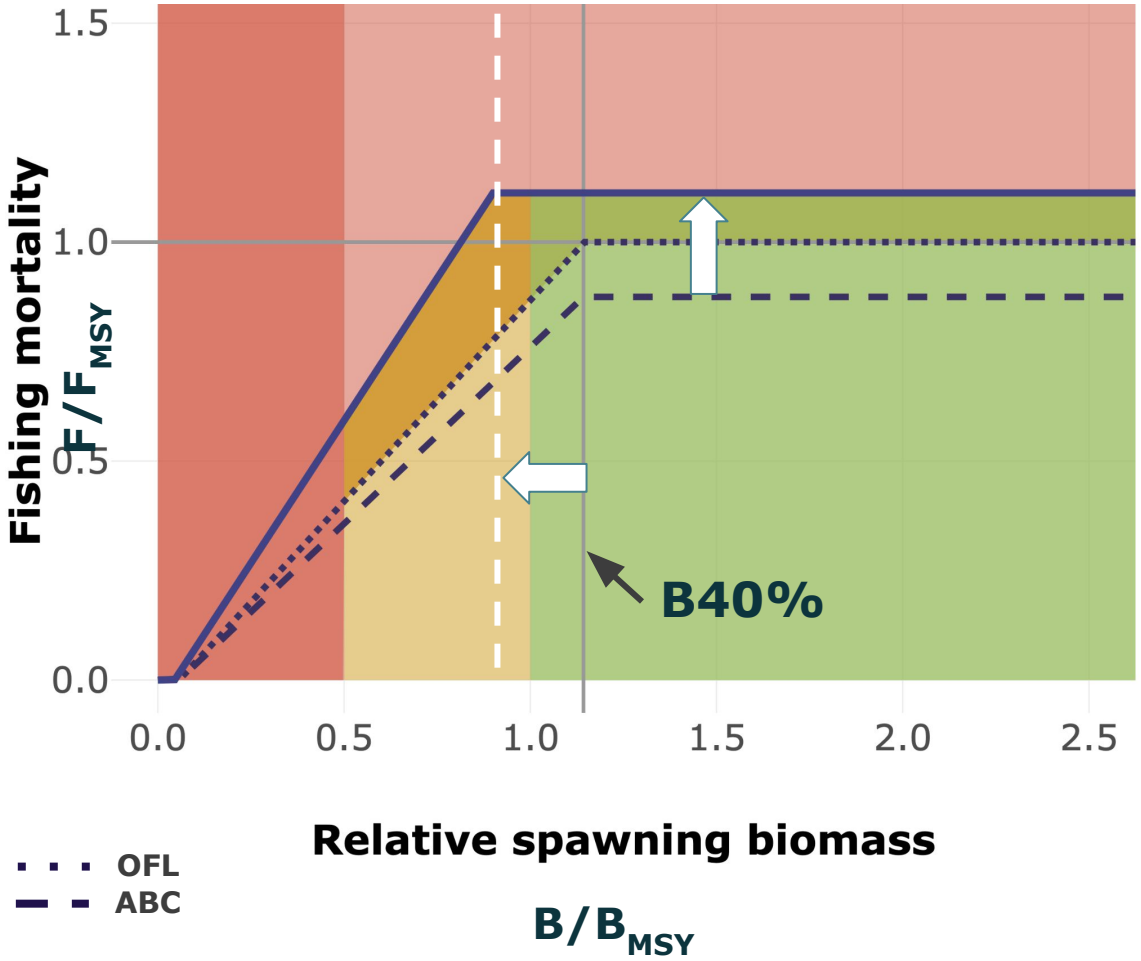
Alternative HCRs



HCR 7
analytical approach for variability based on species whose productivity is known to vary with environmental conditions.

Example shows a negative correlation in productivity with expected environmental conditions

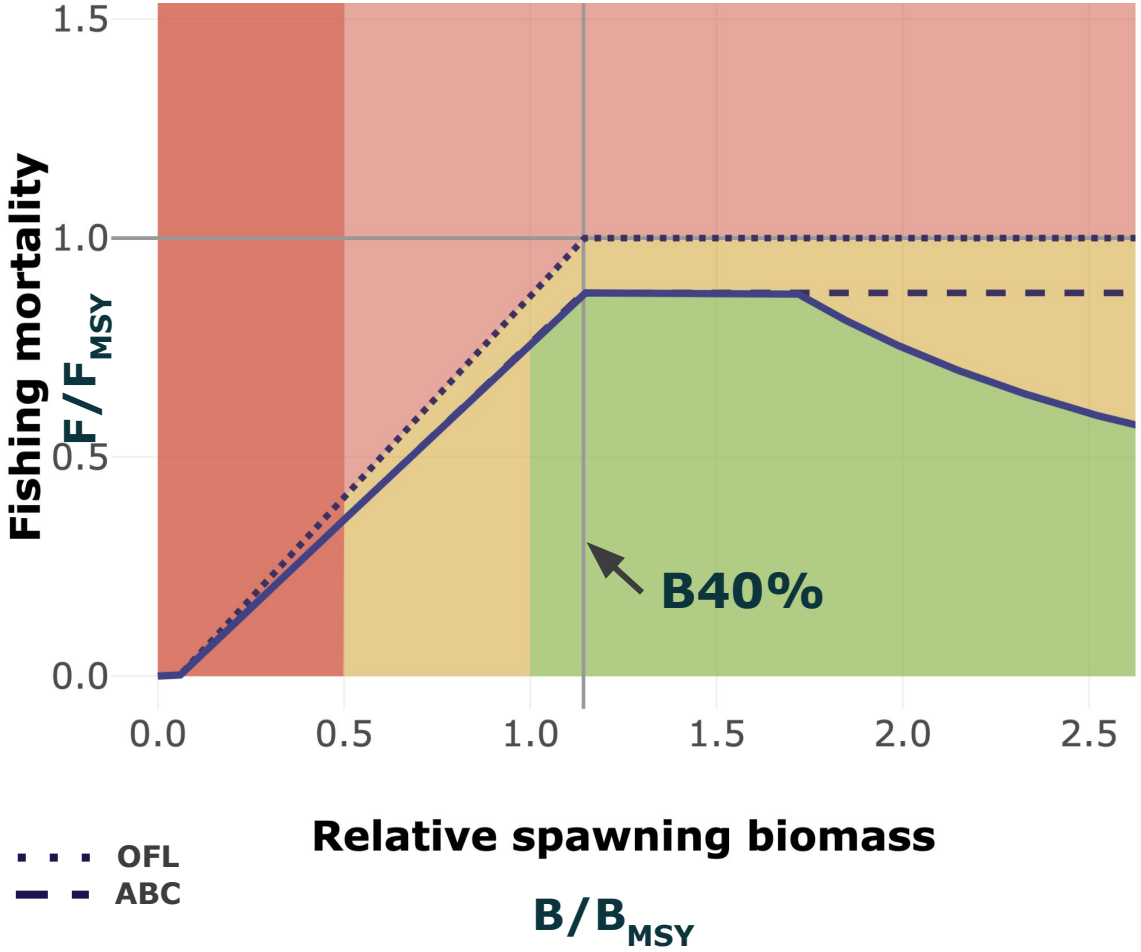
Alternative HCRs



HCR 7
analytical approach for variability based on species whose productivity is known to vary with environmental conditions.

Example shows a positive correlation in productivity with expected environmental conditions

Alternative HCRs

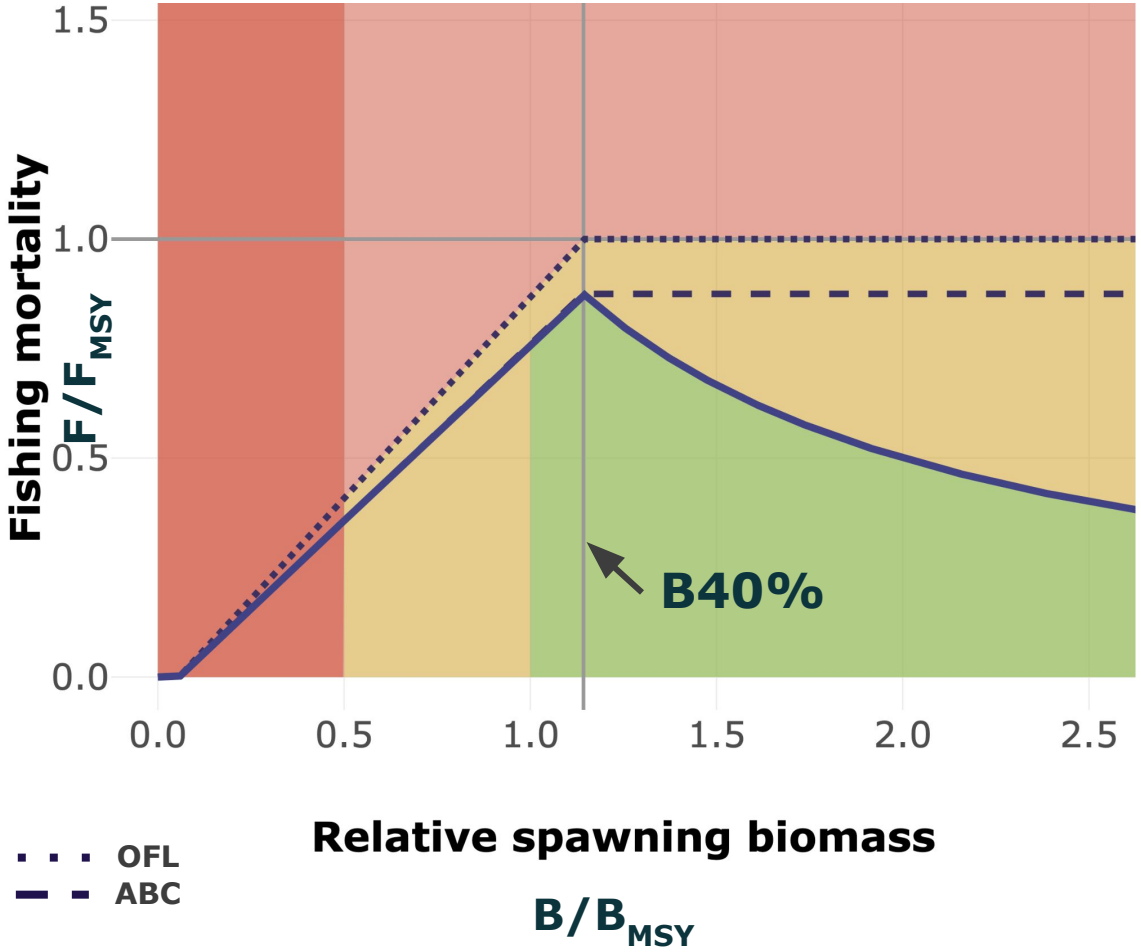


HCR 10
buffer against environmental shocks with biomass reserve at high stock sizes

Similar to realized F for EBS pollock (2MT cap effect).

Example shows offset with catch capped at Catch corresponding to Catch at B60%.

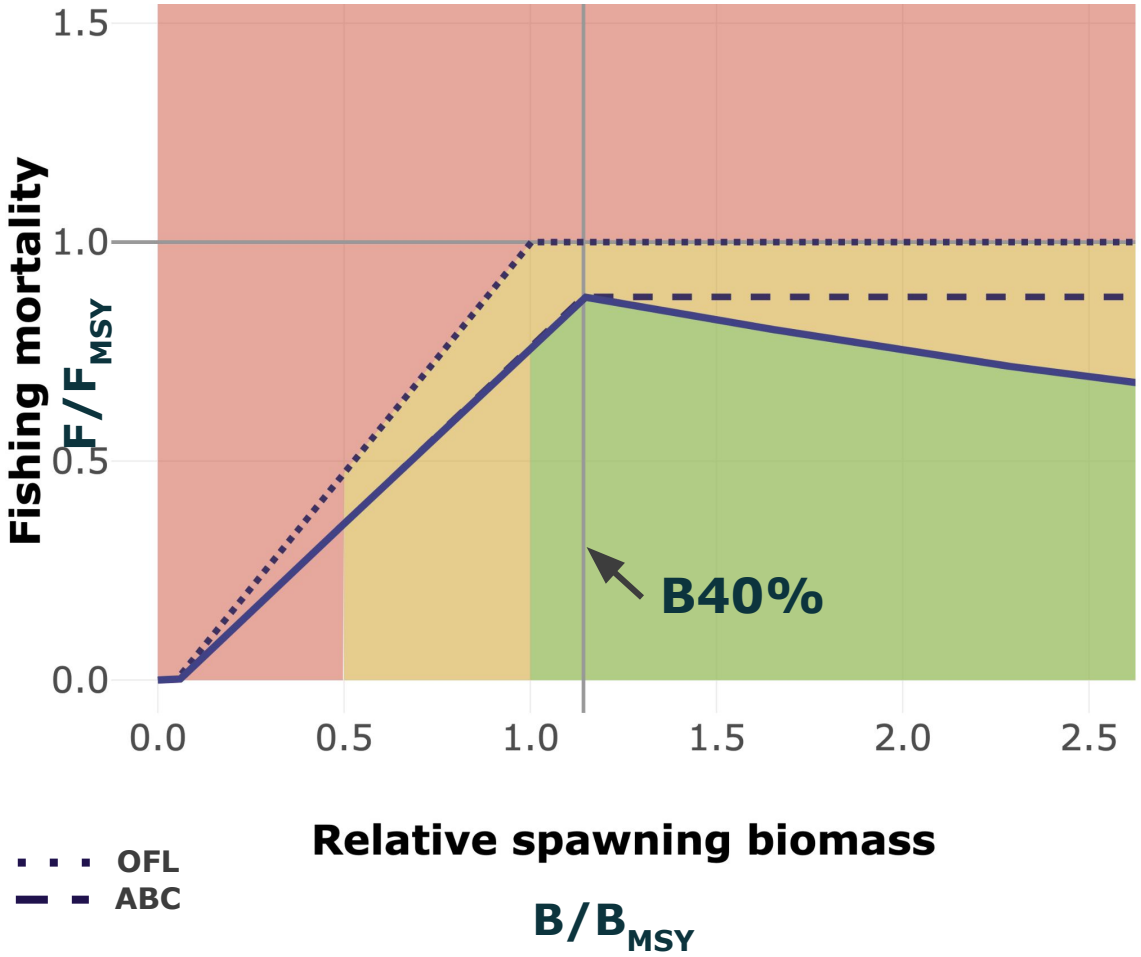
Alternative HCRs



HCR 10
buffer against environmental shocks with biomass reserve at high stock sizes.

Example shows catch capped at Catch corresponding to Catch at B40% (resulting exponential slope in F).

Alternative HCRs



HCR 5
buffer against environmental shocks with biomass reserve at high stock sizes.

Catch increases at a slower rate above B40% than below.

Example shows a biomass reserve for a species sensitive to env. variability e.g., Pacific cod

Potential outcomes of use of alternative HCRs (5, 10, 7)

Preliminary results indicate these HCRs may promote:

- increases age class diversity,
- higher productivity state in fished biomass,
- increase larger fish,
- increased ecosystem and therefore fishery productivity

Analysis of HCRs in conjunction with stated Council objectives and performance metrics derived from those objectives will show the degree towards which each Alternative HCR addresses these objectives

Goals and Objectives (pg 28-29) - Council Considerations

Overarching goal (draft)

- Increased resilience for long-term sustainability of fish and crab stocks

Objectives (draft)

- Sustainable biomass for groundfish and crab stocks
- Prevent overfishing
- Transition from use of risk tables to analytical approach (species whose productivity known to vary with environmental conditions)
- Increased buffering against environmental shocks
- Socio-economic sustainability
- Community-level objectives (to be defined)
- Transparency in the ABC –setting process

Once objectives defined - performance metrics developed (e.g., Appx 3)

Key Decision points:

- Priority management objectives identified
- Objectives stated in a clear and specific manner
- Time frame determined over which performance metrics evaluated

Table A3.1 page 46

Category	Description	Quantity of interest	Metric
Yield	Maintain average/ median/minimum catch	Catch	P(Catch > min(Catch) > 0.5 [b] Average catch last five projection years [b] Average catch by fishery for various time frames[d]
	Maximize catch	Catch	Total catch P(Catch > min viable catch)[a]
	Minimize catch variability over time	Variation in catch	Median across replicates of average absolute annual change in landed catch[a] P(AAV ≤ 0.15)[b]
		Variation in output or input control (e.g., ABC or FABC)	P(Change in TCEY > 15%)
Stability	Maintain age structure or size structure	Age Size (length or weight)	Change in mean age or size
Societal	Maximize long term profitability	Size (length or weight) Revenue	Mean size of directed fishery[b] Mean revenue (by fishery or region)[e]
	Maintain employment	Regional employment (number of jobs)	Mean percent change in the number of jobs[e]

Stocks and models that are currently developed for Fall 2026 vs 2027-2028

Fall 2026

Forward looking ACLIM and GOA-CLIM HCR analysis plan

As appropriate, preliminary findings from Bering Sea ACLIM Phase 2 HCR simulations

- Pollock
- Pacific cod
- *Arrowtooth*
- *Northern rock sole*

Alaska sablefish (MSE results)

Fall 2027-2028

- Iterative discussions of results from more complete CLIMs performance metric evaluations (including EBM metrics, and when ready, social/econ metrics)

- CLIMs model syntheses to date, including quantification of sensitivity and uncertainty/confidence in HCR performance under future scenarios

Decision points/Considerations for the Council

Defining goals and objectives

- Identify overarching goal and associated objectives for this analysis to move toward a draft a Purpose and Need statement and alternatives (currently under development) at an appropriate time
- Objectives might be competing analysis of performance against these objectives for different HCRs will indicate the degree to which different HCRs address objectives

Engagement and Communication

- Complex concepts and analyses may benefit from a targeted communication strategy. This may include:
  - Additional primer materials/presentations on status quo considerations of risk and uncertainty in harvest specifications
  - Infographics on process and simulation testing/MSE of HCRs under development
  - Development of performance metrics and social indicators

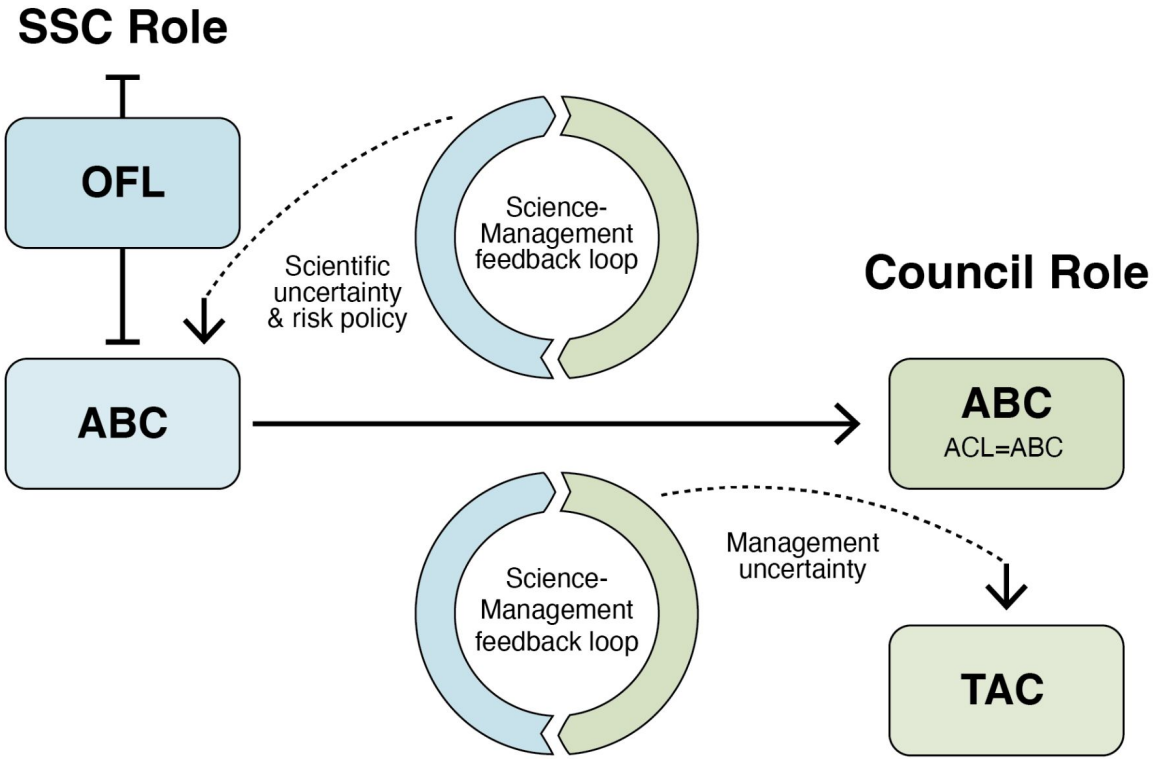
Scalability of analysis

- Start with smaller group of stocks: BSAI/GOA Pollock, P. cod, Sablefish
- Continue to consider stock groupings and application of HCRs to subset of managed species

Thank you!

Council HCR webpage: https://www.npfmc.org/hcr-project-overview/

Extra Slides


SSC Role
OFL
ABC
Scientific uncertainty & risk policy
Science-Management feedback loop
Council Role
ABC
ACL=ABC
Management uncertainty
Science-Management feedback loop
TAC

General sloping HCR (Fig 1)

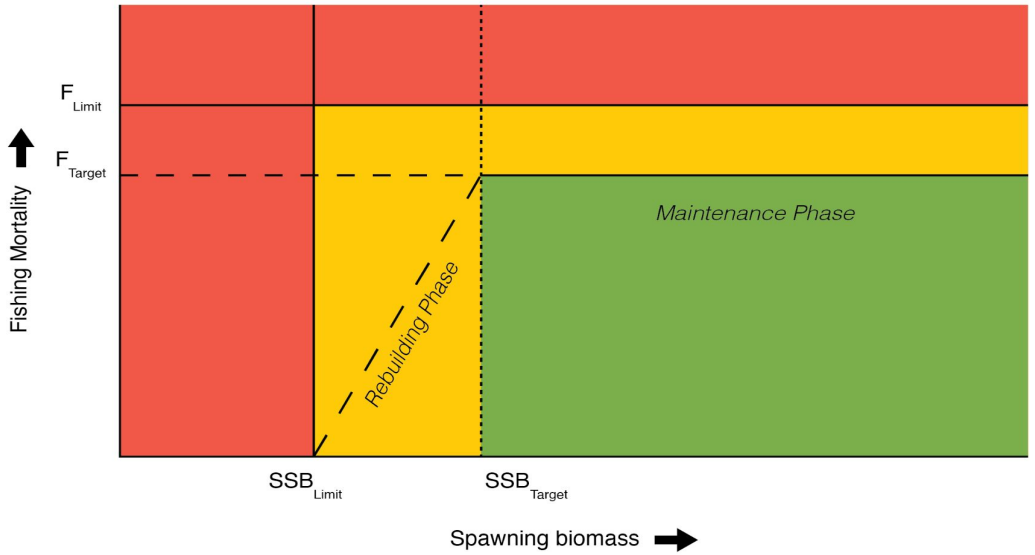
Concepts

HCR: guideline for how much fishing can take place based upon an estimate of stock status

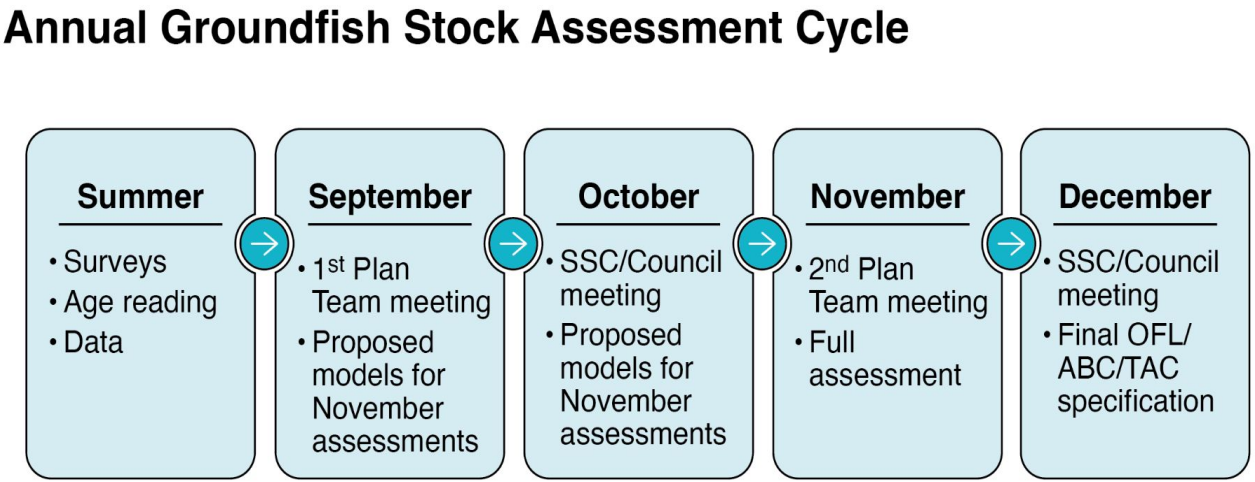
Spawning stock biomass (SSB): Best estimate of sexually mature biomass capable of reproducing
SSB_{LIMIT} SSB_{TARGET}

Fishing mortality rate (F): rate applied to SSB to determine catch. F_{LIMIT} F_{TARGET}

HCR



Groundfish Stock Assessment cycle (Fig 2)

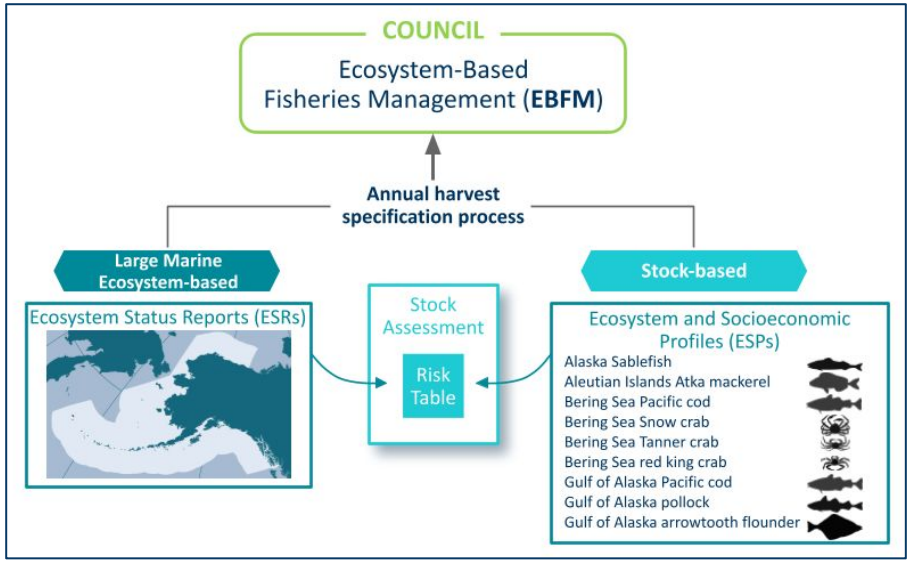


Annual assessment review and recommendations process for BSAI and GOA groundfish

Ecosystem Status Reports (ESRs) & Ecosystem and Socioeconomic Profiles (ESPs)

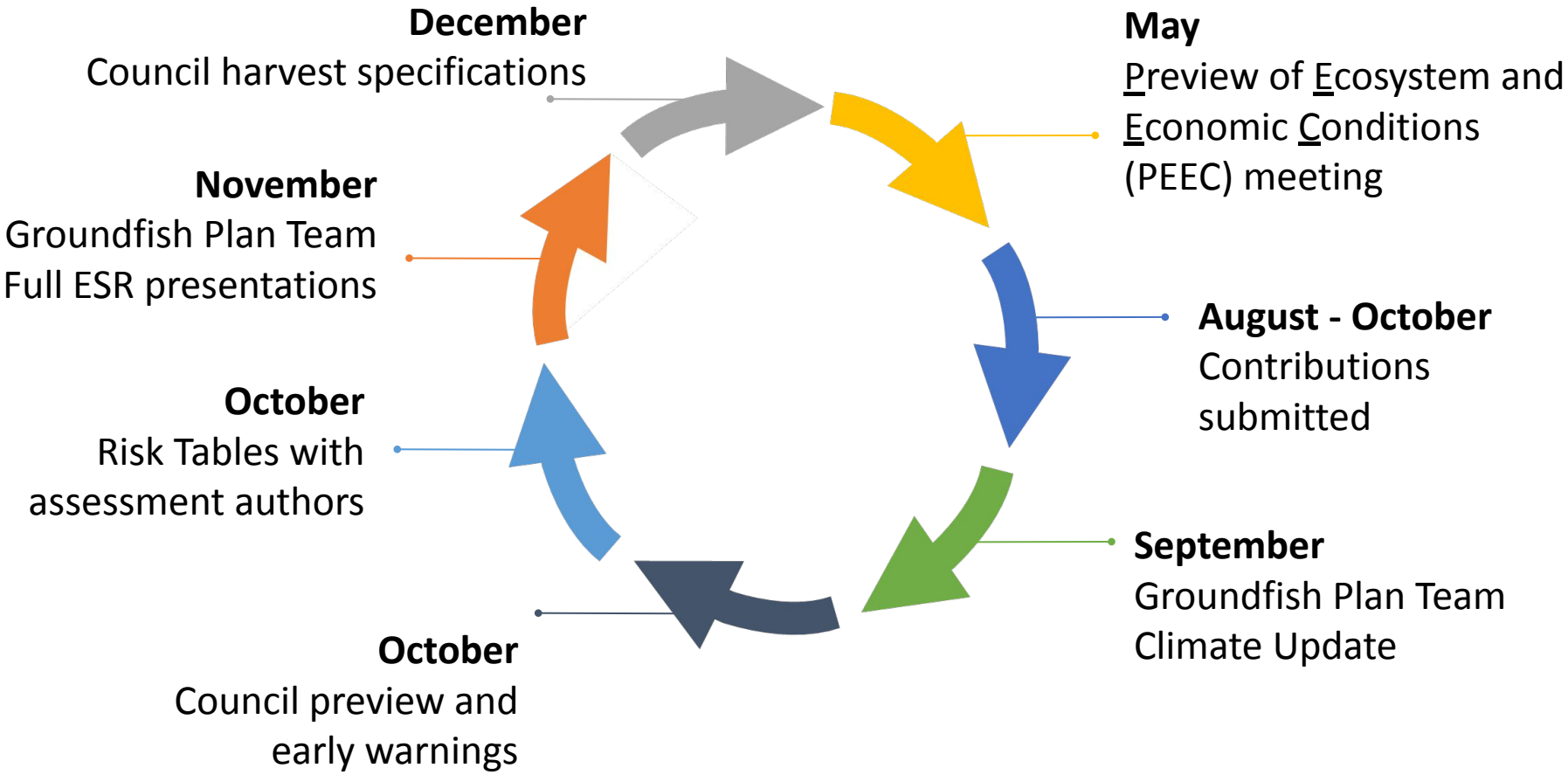
Both ESRs and ESPs allow for incorporating ecosystem information into management decisions. They inform the SSC's ABC and OFL recommendations, as well as final TAC determination.

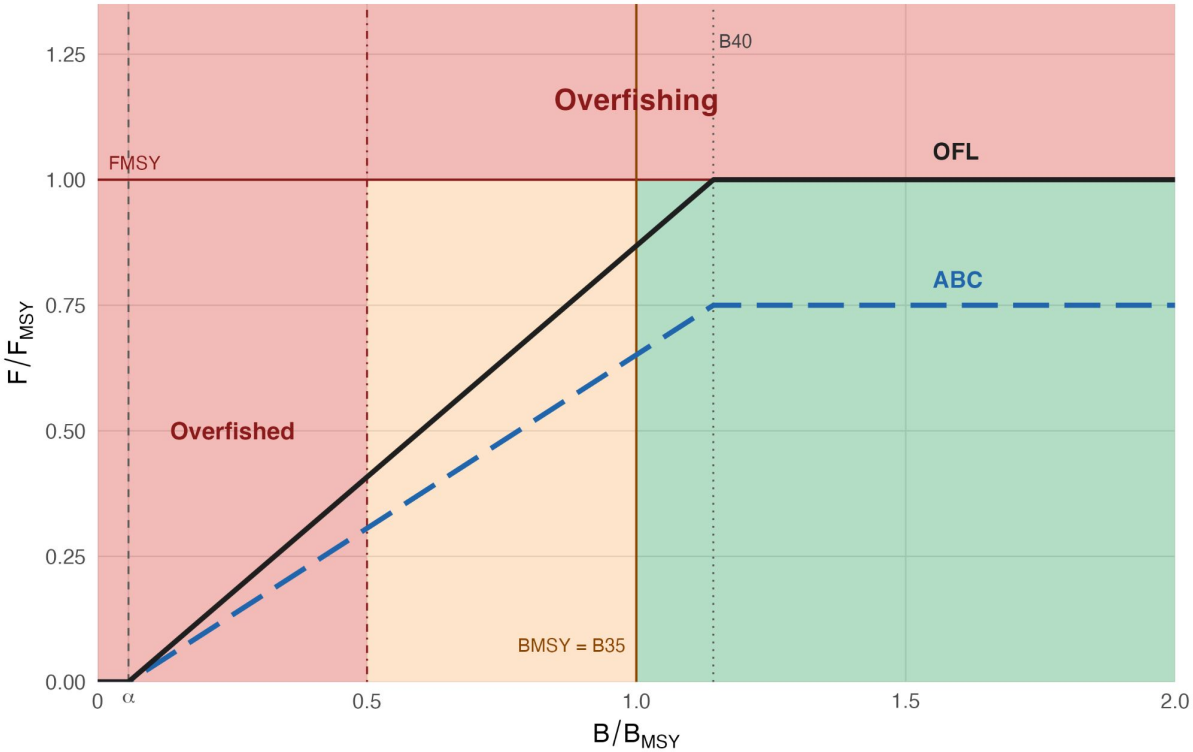
- ESRs provide Large Marine Ecosystem scale status and trends
- ESRs provide contextual assessments that reflect ecosystem components ranging from physical oceanography up through the food web



- ESPs are stock-specific and appended to stock assessments
- ESPs identify key ecosystem and socioeconomic indicators relevant to the stock assessment model

How are Ecosystem Status Reports used in fisheries management





Note: FMSY is plotted in place of F35, and BMSY = B35. The low-biomass red region is B/B35 < 0.5.

Status Quo Tier 3 OFL and ABC HCR

Automatic rebuilding below $B_{40\%}$

BSAI and GOA stocks by Tiers (Tables 1 and 2)

Stock BSAI	Assessment Region	Tier
Pollock	BS	3
	AI	3
	Bogoslof	5
Pacific cod	BS	3
	AI	3
Sablefish	BSAI/GOA	3
Yellowfin sole	BSAI	1
Greenland turbot	BSAI	3
Arrowtooth flounder	BSAI	3
Kamchatka flounder	BSAI	3
Northern rock sole	BSAI	1
Flathead sole	BSAI	3
Alaska plaice	BSAI	3
Other flatfish	BSAI	5
Pacific Ocean perch	BSAI	3
Northern rockfish	BSAI	3
Blackspotted/Rougheye rockfish	BSAI	3
Shortraker rockfish	BSAI	5
Other rockfish	BSAI	5
Atka mackerel	BSAI	3
Skates	BSAI	3,5[1]
Sharks	BSAI	6
Octopuses	BSAI	6

Stock GOA	Assessment Region	Tier
Pollock	W/C/WYAK	3
	SEO	5
Pacific cod	GOA	3
Sablefish	BSAI/GOA	3
Shallow-Water flatfish	GOA	3,5[1]
Deep-Water flatfish	GOA	3,6 [2]
Rex sole	GOA	3
Arrowtooth flounder	GOA	3
Flathead sole	GOA	3
Pacific Ocean perch	GOA	3
Northern rockfish	GOA	3
Shortraker rockfish	GOA	5
Dusky rockfish	GOA	3
Rougheye and Blackspotted rockfish	GOA	3
Demersal Shelf rockfish	W/C/WYAK	6
	SEO	5,6[3]
Thornyhead rockfish	GOA	5
Other rockfish	GOA	4,5,6[4]
Atka mackerel	GOA	6
Big Skate	GOA	5
Longnose Skate	GOA	5
Other Skates	GOA	5
Sharks	GOA	5,6 [5]
Octopuses	GOA	6

BSAI and GOA stocks by Tiers (Tables 1 and 2)

Stock	Assessment Region	Tier
BSAI		
Pollock	BS	3
	AI	3
	Bogoslof	5
Pacific cod	BS	3
	AI	3
Sablefish		
Yellowfin sole		
Greenland turbot		
Arrowtooth flounder		
Kamchatka flounder		
Northern rock sole	BSAI	1
Flathead sole	BSAI	3
Alaska plaice	BSAI	3
Other flatfish	BSAI	5
Pacific Ocean perch	BSAI	3
Northern rockfish	BSAI	3
Blackspotted/Rougheye rockfish	BSAI	3
Shortraker rockfish	BSAI	5
Other rockfish	BSAI	5
Atka mackerel	BSAI	3
Skates	BSAI	3,5[1]
Sharks	BSAI	6
Octopuses	BSAI	6

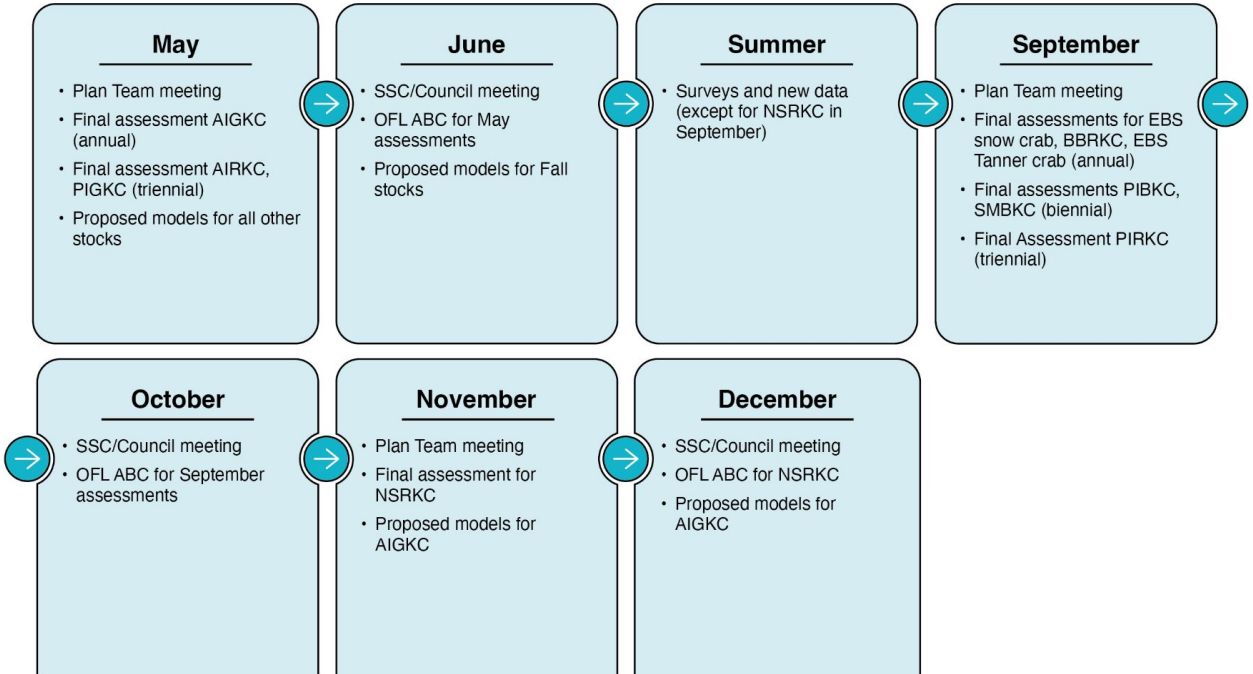
Stock	Assessment Region	Tier
GOA		
Pollock	W/C/WYAK	3
	SEO	5
Pacific cod	GOA	3
Sablefish	BSAI/GOA	3
Shallow-Water flatfish	GOA	3,5[1]
	GOA	3,6 [2]
	GOA	3
	GOA	3
	GOA	3
	GOA	3
Northern rockfish	GOA	3
Shortraker rockfish	GOA	5
Dusky rockfish	GOA	3
Rougheye and Blackspotted rockfish	GOA	3
Demersal Shelf rockfish	W/C/WYAK	6
	SEO	5,6[3]
Thornyhead rockfish	GOA	5
Other rockfish	GOA	4,5,6[4]
Atka mackerel	GOA	6
Big Skate	GOA	5
Longnose Skate	GOA	5
Other Skates	GOA	5
Sharks	GOA	5,6 [5]
Octopuses	GOA	6

Majority of groundfish stocks in Tier 3

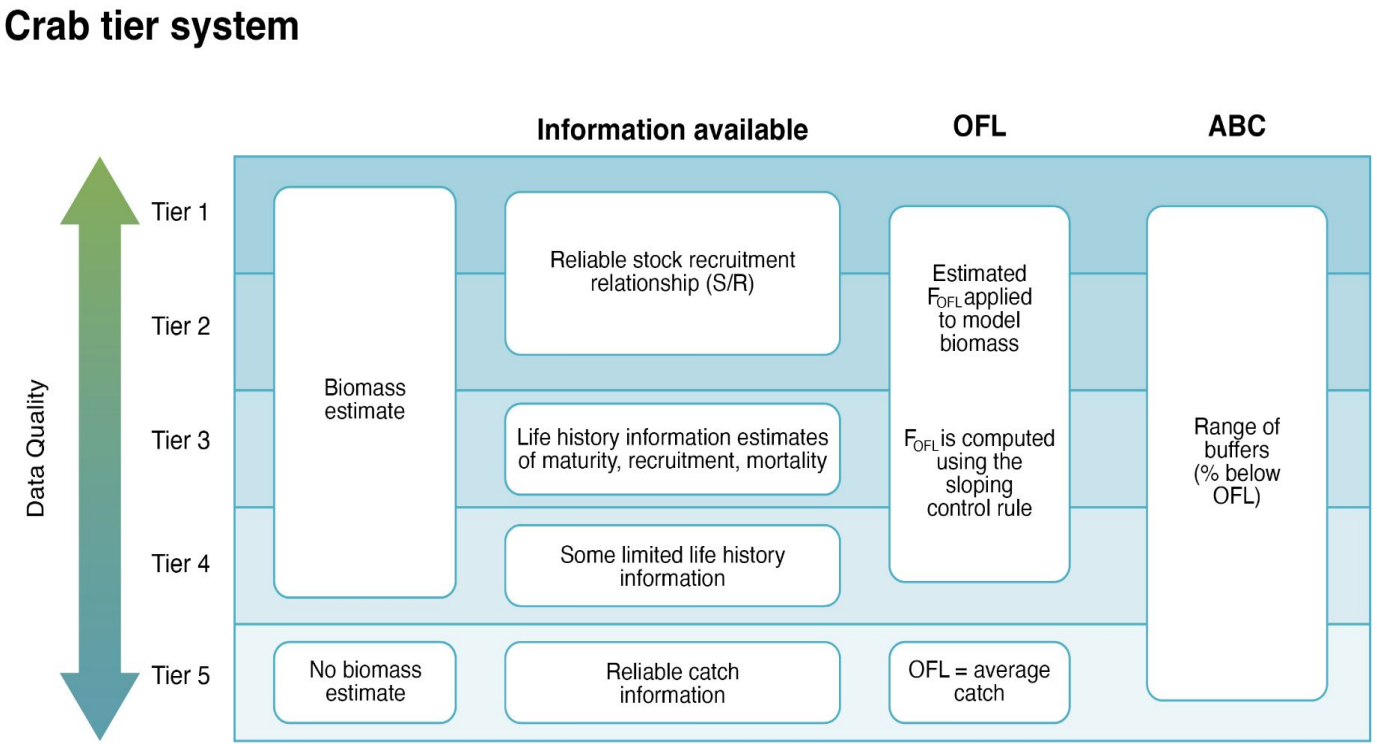
BSAI Crab Tier System and current OFL and ABC control rules (Section 2.4)

Crab Assessment and Review/Recommendations Cycle (Fig 6)

Annual Crab Stock Assessment Cycle



Crab Tier System (Fig 5)



ABC setting [Groundfish] Section 3.2

Tier specific HCR = maximum permissible ABC (maxABC)

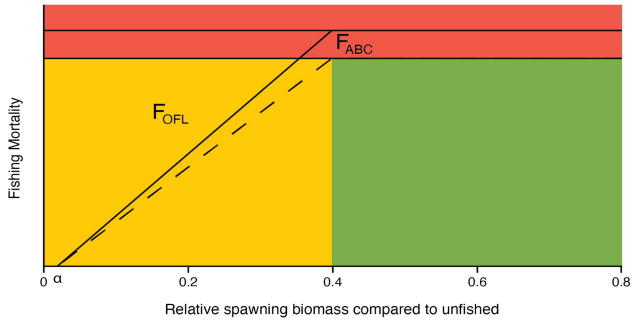
maxABC is the upper bound on ABC but the SSC may recommend an ABC below the maxABC
No flexibility to recommend ABC >maxABC

Process in general:
Assessment author develops a recommendation for ABC<maxABC
Review by Plan Team and subsequent recommendation
Final recommendation by SSC

Reduction per FMP and NS1 Guidelines is based upon “whether conditions exist that warrant setting ABC at a value lower than the maximum permissible value” and accounts for “any other scientific uncertainty”

Reductions from maxABC have been documented recently through the use of risk tables

Groundfish Control Rule



Risk tables: Scientific uncertainty not directly captured in the stock assessments

Categories of concern

1. Assessment-related considerations
2. Population dynamics considerations
3. Ecosystem considerations
4. Fishery-related stock considerations

- Risk table categories describe scientific uncertainty not directly captured in the stock assessments
- Ranked 1-3 based on relative level of concern
  - Normal (1)
  - Increased concern (2)
  - Extreme concern (3)

- Can be used to document recommendations of ABC<maxABC

TAC setting

Groundfish

- Annually recommends final harvest specifications to the Secretary of Commerce
- SUM of the recommended TACs must fall within the Optimum Yield (OY) range by FMP (specified in FMPs and implementing regs):
  - BSAI = 1.4 – 2.0 million mt
  - GOA 116,000 – 800,000 mt
- TAC must be set = or < ABC.
- The Council retains broad latitude to recommend TAC below ABC on an annual basis, consistent with the Groundfish FMPs and implementing regulations
  - drawing on socioeconomic information and concerns not addressed in the ABC-setting process provided the sum of the TACs is within the ranges specified in the respective FMPs

BSAI Crab

- State of Alaska as a Category 2 measure under the Crab FMP (framework management measures)

Considerations for revising treatment of risk and uncertainty

Status quo

- Framework in place for many years
- BRP and ABC can change within individual assessments in response to:
  - New information
  - Shifts in information availability and Tiers
  - Changes in spatial distributions that may influence availability and/or catchability
  - Changes in selectivity and catchability (critical to assessment):
    - Gear changes
    - Time-area-gear regs influencing selectivity
    - Other factors impacting harvest practices (PSC caps, Discard mortality regs etc)

Concerns regarding population impacts to fish and crab under future environmental conditions lead to consideration of more adaptive HCRs

- Selectivity: probability fish is captured by gear (based on size, age, species)
- Catchability: efficiency of gear (how many fish are caught relative to population size)

Stock specific issues (Table 10)

Key Issues	Stocks	Potential HCR approaches
Recruitment variability, especially irregular large recruitment events	Sablefish, rockfish, pollock,	HCR5 or 10, sablefish HCRs under MSE
Increased natural mortality: elevated or event driven	GOA cod, AI cod, EBS snow crab	HCR with environmental covariates (HCR7), HCR5 or 10?
Prolonged recruitment failure	Greenland turbot	HCR7
Environmental sensitivity of year-class strength	BSAI/GOA Pollock, Bristol Bay red king crab	HCR with environmental covariates (HCR7), HCR5 or 10?
Long-lived, slow recovery, declining productivity despite large biomass levels	BSAI/GOA Pacific ocean perch	Dynamic HCRs that adjusts reference points to reflect trends in stock productivity (variant of HCR 7)

Modified HCRS (Table 9, Fig 11)

HCR	GOAL
Status Quo (HCR #1)	Automatic rebuilding below target stock size (Status Quo baseline sloping CR used for BSAI and GOA Groundfish)
Lower fishing mortality at high stock size (HCR #5)	Maximize ecosystem biomass and SSB (intent to increase reserves, buffer against environmental shocks, and enhance long-term sustainability with lower fishing mortality)
Lower fishing mortality at high stock size (HCR #10)	Similar objectives as with HCR 5 (intent to provide increased buffering against environmental shocks through proportional reductions in fishing mortality)
Dynamic HCRs that respond to time-varying stock productivity (HCR #7)	Transition from qualitative risk tables to an explicit analytical approach in which recommended harvest rates respond to estimated temporal changes in stock productivity (obtained from population models with time-varying parameters, linkages with environmental covariates or other methods)

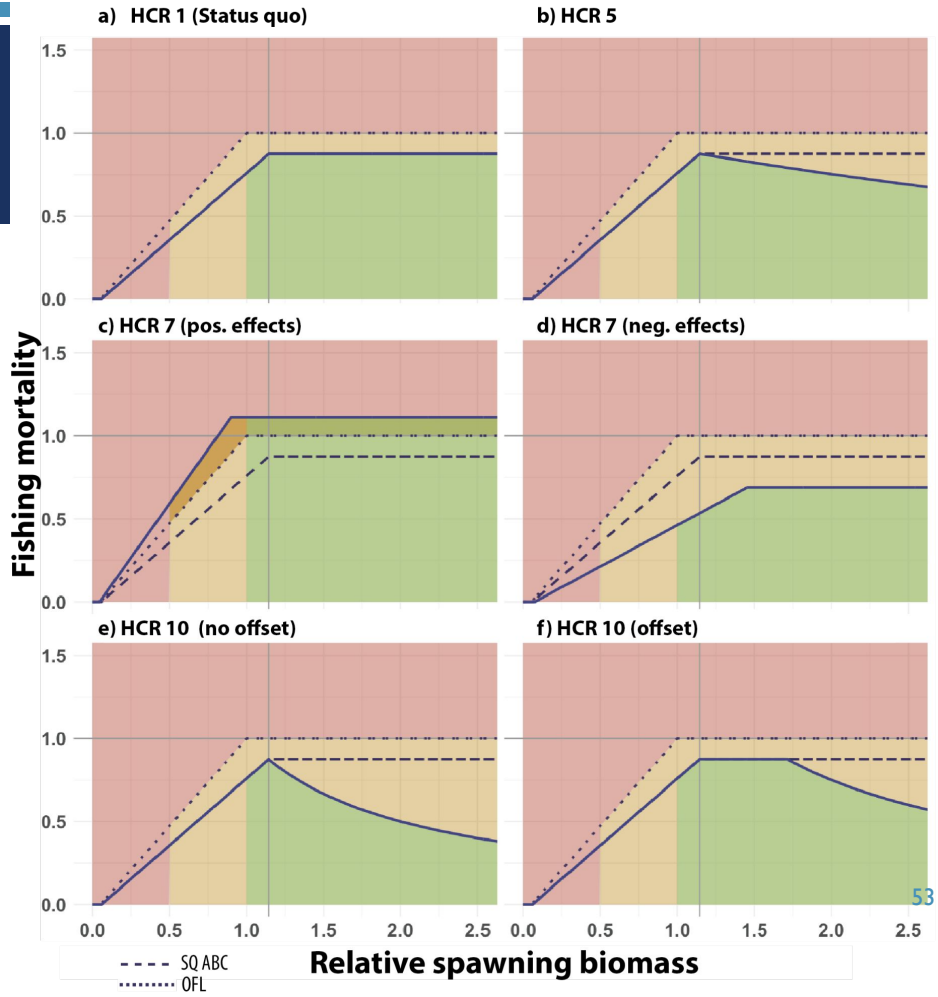
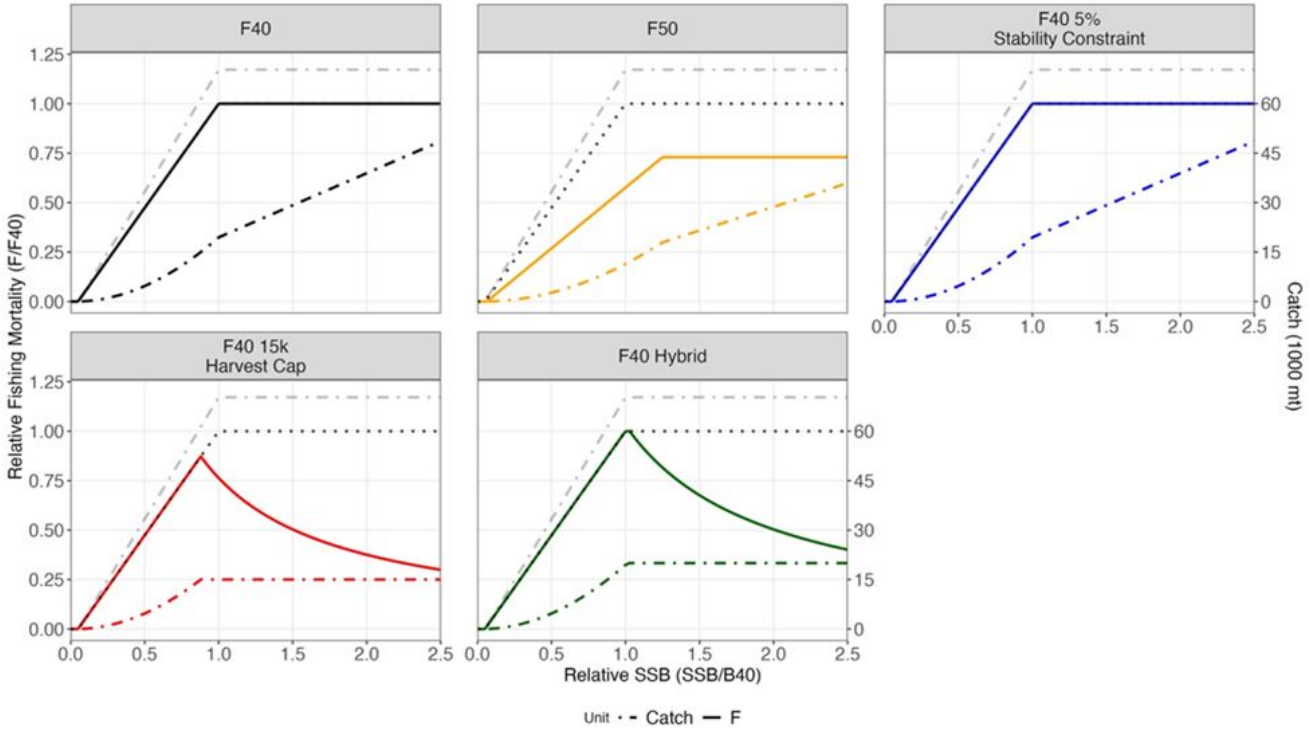


Figure A4.2 HCRs considered in Sablefish MSE as compared to Tier 3 ABC HCR



Bookended climate complexity in Sablefish vs CLIM methodology

Sablefish ('simple' climate)

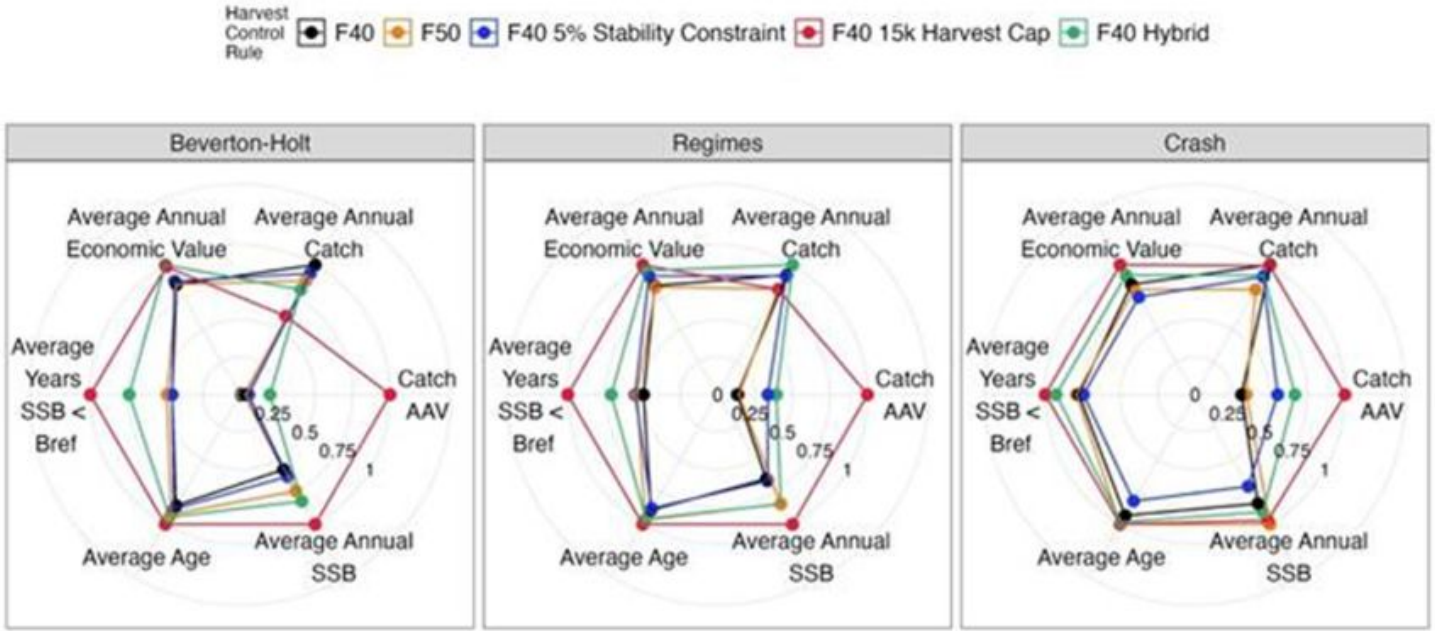
- 'Quasi-climate' scenarios simulated via alternative future recruitment scenarios (cyclical, recruitment crash)
- No explicit climate linkages included in simulations
- Spatial model includes simple 'climate movement' scenario (poleward distributional shift)
- Goal was to explore 'climate robust' HCRs, especially to extreme events (recruitment crashes, redistribution across management units)
- Climate is implicit in the simulation modeling, not explicit as in ACLIM simulations

CLIM examples (more complex climate)

- Regionally tailored climate scenarios (based on globally standardized projections) provide plausible bounds on future environmental conditions
- Alternative hypotheses regarding environmental drivers of growth, recruitment, mortality, distribution & productivity are specifically incorporated into simulations and contrasts
- Structural uncertainty is represented and quantified through alternative model formulations
- Performance is measured against multiple Ecosystem Based Management metrics (from ecological to social & economic)
- Simulations quantify alternative HCR robustness to: (a) Structural Uncertainty; (b) Process Uncertainty(climate & ecosystem) ; (c) Observation Uncertainty; (d) Management Implementation Uncertainty

xample performance metrics from sablefish MSE (appx 4; 4.7.1 pgs 2-59)

5 HCRs, 6 performance metrics shown in radar plot (Figure A4.4)



	Key Element	Council Product *	Product Detail*	New, existing, modified	Relevant FMPs	Lead responsibility: Council staff/ RO/ AFSC
			reports and the dashboard			
	Element C: Consider and incorporate dynamic management tools to increase in-season adaptation capacity					
C.1	ACL in-season management authority	Regulatory impact review (RIR)	Analysis of modifying in-season management authority	New/ in development	BSAI Groundfish, GOA Groundfish	Co-leads NPFMC, AKRO
C.2	Stock Assessment Prioritization	ongoing discussions with NPFMC (PT, SSC)	Within typical stock assessment review process, across all stocks as needed	Modification to existing	BSAI Groundfish, GOA Groundfish	Lead: AFSC, Partners: NPFMC
	Element D: Review tier systems, consider climate-informed biomass targets and limits and climate-robust or forecast-informed harvest control rules					
D.1	Alternative Harvest Control Rule (HCRs) considerations	Presentation on Tier systems and flexibility within FMPs cor Groundfish and Crab FMPs	Presentation at SSC workshop	Completed	BSAI Groundfish, BSAI Crab, GOA Groundfish	Lead: NPFMC, Partners AFSC
D.2		SSC Workshop on HCRs	SSC Workshop June 2025: https://meetings.npfmc.org/Meeting/Details/3093	Completed	BSAI Groundfish, BSAI Crab, GOA Groundfish, GOA Crab	Lead: NPFMC
D.3		Comprehensive discussion paper on risk and uncertainty in Harvest specifications process and considerations for alternative climate-robust HCRs	Discussion paper to be posted May 1 for Ecosystem Committee Review MAy 8 and SSC/AP/Council in June 2025	Completed	BSAI Groundfish, BSAI Crab, GOA Groundfish	Lead: NPFMC, Partners AFSC

C.1) ACL -in-season management authority:

The Council has initiated a regulatory analysis to provide increased in-season management authority to the National Marine Fisheries Service to prevent overfishing of groundfish stocks. This analysis is scheduled for initial review at the October 2026 Council meeting.