

BSAI Halibut Abundance-based Management of PSC limits: SSC review

Halibut Operating Model parameters

Region Selectivities	Fleet	Value or Methodology Used	Rationale
BSAI	Directed	Adding current fishing-mortality-at-age from long coastwide halibut assessment model for commercial, discard, sport, and subsistence directed fishery sectors	Uses results from the assessment to inform the operating model.
BSAI	PSC - Fixed Gear	Average of the 4ABCDE setline and the EBS trawl survey selectivities	The percentage of O32 fish in the longline-caught PSC is much lower than for the setline survey, but higher than for trawl PSC. Hooks for Pacific cod are smaller than for the halibut setline survey.
BSAI	Bycatch - Trawl	EBS trawl survey selectivity	Best available information on what halibut are caught by trawl; assessment estimates one selectivity curve for all bycatch (trawl + longline combined), resulting in an asymptotic curve that is not a reasonable assumption for trawl PSC only.
GOA	Directed	Same as for the BSAI directed fishery	As for BSAI
All	Survey - Setline	Setline survey selectivity from long coastwide model, most recent year	Uses results from the assessment to inform the operating model
All	Survey - Trawl	EBS trawl survey selectivity from long coastwide model	Uses results from the assessment to inform the operating model
Observation Error			
BSAI	Survey - Setline	Fix CV at 10%	Average setline survey CV for 1998-2018 for Area 4 (excluding 4B) is 6%; average setline survey CV for 1998-2018 for 4B is 16%
BSAI	Survey - Trawl	Fix CV at 7.3%	Average EBS shelf trawl survey CV for 1998-2018
Autocorrelation in survey indices and SSB			
BSAI	Survey-Setline	0.767	Lag 1 Autocorrelation of All.sizes 4ABCDE 1998 - 2018
BSAI	Survey-Trawl	0.69	Lag 1 Autocorrelation of EBS trawl total biomass 1998 - 2018
All	Assessment autocorrelation (coastwide long SSB)	0.862	Lag 1 Autocorrelation of 2018 SSB time series

Parameter Recruitment	Value	Origin	Rationale
Sigma_r	0.49 (0.85 when rho=0)	Coastwide long	1977+ Estimated from Coastwide Long model (using typical groundfish regime)
Autocorrelation (rho)	0.206	Based on historical recruit pattern (not rec devs)	1977+ Estimated from Coastwide Long model (using typical groundfish regime)
Steepness	0.75	Coastwide long	Fixed in the coastwide long assessment
log(r0) to age-0	10.9337	Coastwide long	Encompasses a long-time frame of recruitment observations
Natural Mortality (Estimated in Long Models)			
Female	0.22	Coastwide long	Natural mortality is estimated for females in the coastwide long model
Male	0.17	Coastwide long	Natural mortality is estimated for males in the coastwide long model

Other analytical assumptions

Modeling Fisheries Management: Decision Points	Working Group Recommendations	Rationale
PSC mortality (under alternatives 2 and 3)	Based on recent three years proportion of average use (2016-2018) to PSC limit	Behavioral changes occur over time in the fishery and so the most recent years are thought to be the best reflection of what may happen in the near future. This decision assumes that the groundfish fishery is currently constrained by halibut PSC, and that their targeting decisions will always lead to usage that is slightly under the PSC limit. Another way to do this would be to have a function that makes usage equal to the limit when the limit falls below the range observed previously
CDQ allocation from trawl PSC limit (under alternatives 2 and 3)	CDQ 9%; A80 remainder 63.7 (or round to 64%); TLAS 27.3 (or round to 27%)	Council direction that allocations to be proportional to status quo. CDQ under SQ is 9% therefore 9% to CDQ from trawl (for IR analysis) with remaining 91% split 70/30 to A80 and TLAS per SQ
Proportional allocations (by season and sector) within trawl and fixed gear PSC limits (e.g. TLAS, AM80)	Based on 2019 harvest specifications (most recent year of prosecution) or a 3 year average	Harvest specifications from the most recent years may best reflect the decisions and process of the Council.
Calculation of coastwide TCEY	Random draw for F_spr~Uniform(40%-46%), apply 30:20 control rule, assume directed fishery selectivity to find F_spr	The IPHC Management Strategy Advisory Board recommended a harvest policy aiming for a coastwide SPR rate between 40-46%, applied with a 30:20 control rule in future years

Modeling Fisheries Management: Decision Points	Working Group Recommendations	Rationale
Distribution of coastwide TCEY to regions (BSAI and elsewhere)	According to proportion of TCEY allocated to Area 4 in 2019	Methods for distributing of TCEY among regulatory areas has changed in recent years. The 2019 agreement for TCEY by regulatory area uses a new interim harvest policy that is meant to be in place for the next four years. Therefore, the 2019 distribution of TCEY to regulatory areas is more likely to be representative of future decisions than other historical years. This method may need some adjustment for scenarios assuming high vs. low stock distribution in the BSAI relative to other areas.
Empirically assess impacts to groundfish populations	Evaluate groundfish/halibut encounter rates changes due to the environment, population trends, and PSC limits that have been observed in the past.	The two-area halibut model will output trajectories of halibut abundance, biomass, PSC limits, and PSC usage under model assumptions and harvest alternatives. Pairing this information with auxiliary data on encounter rates under various conditions will help inform an analysis of impacts to the groundfish fishery for PSC limits and usage within the range that has been observed previously.
Assess impacts of changes in groundfish population trends on halibut population, PSC usage, performance of alternatives (especially for flatfish, Pacific cod)	Run the Technical Interactions Model for several particular scenarios to demonstrate factors affecting outcomes for groundfish species under each alternative; for instance, what if Pacific cod declines by 50% or 75%, what if flathead sole increases by 50% (e.g. due to lack of sea ice/expanding habitat)	Using the technical interactions model to explore particular groundfish population scenarios will supplement the two-area model and encounter rate calculations by accounting for the management constraints of the two-million-ton cap, halibut PSC, and trawl-caught Pacific cod, as well as some constraints to the fishery. This model can capture the fact that the percent of the PSC limit that is caught is not constant and is driven by management and fleet behavior. It is not an assessment model and is not used for predictive purposes, but simply to show contrast in scenarios and harvest alternatives and to understand what in the model leads to contrast in outcomes.