BSAI Halibut Abundance-based Management of PSC limits

Chapter 2 Description of Alternatives *(DRAFT)*

NEPA requires that an EIS analyze a reasonable range of alternatives consistent with the purpose and need for the proposed action. The alternatives in this chapter were designed to accomplish the stated purpose and need for the action. All of the alternatives were designed to index PSC limits to abundance. The halibut PSC limits for the trawl Amendment 80 and BSAI trawl limited access sectors are established in the BSAI FMP, along with the total allocation of halibut PSC limit (from trawl and non-trawl) to the CDQ Program. Changing these PSC limits (under Alternatives 2-3), requires an FMP (and regulatory) amendment. The halibut PSC limit for non-trawl fisheries combined is currently only specified in regulation, and only requires a regulatory amendment to change.

There are 3 overarching Alternatives currently under consideration by the Council. These have been developed through multiple discussion papers and Council considerations. These 3 Alternatives range from status quo with fixed halibut PSC limits by sector to a range of gear specific PSC limits indexed to BSAI halibut abundance. Given the number of elements and options under Alternatives 2 and 3 a sub-set of these combinations is proposed for analysis. This subset combines scenarios presented by stakeholders to the Council in February 2019 as well as additional scenarios proposed by analysts to frame the analysis of impacts. The individual sub-alternatives to be analyzed under each main alternative are listed following the general description of each alternative.

Alternative 1: Status Quo. BSAI halibut PSC limits are fixed at 3,515 mt total for all sectors.

Alternative 2: A single index is used to set trawl and/or non-trawl halibut PSC limit. There are two options for selection of an index.

> **Option 1:** NMFS EBS bottom trawl survey index.
>
> **Option 2:** IPHC Area 4 setline survey index.

Alternative 3: Both primary and secondary indices are used to set trawl and/or non-trawl PSC limit. The secondary index modifies the PSC limit after the primary index is applied when the secondary index is in a "high state" or a "low state" (as defined by Element 4 breakpoint options). The extent to which the secondary index influences the PSC limit above or below these breakpoints is determined by selection of options under Element 5. There are two options for specifying which is the primary and secondary index under this alternative.

> **Option 1**: Primary index is EBS trawl survey, secondary index is Area 4 setline survey.
>
> **Option 2**: Primary index is Area 4 setline survey, secondary index is EBS trawl survey.

Under each of the Alternatives 2-3 there are five Elements and Options that must be specified under any alternative formulation. The First three elements address specifying the maximum PSC limit (Element 1 Ceiling), Minimum PSC limit (Element 2 floor), and starting point for the PSC limit (Element 3). Two additional Elements must be selected for the breakpoint for the secondary index (Element 4, Alternative 3 only) and the magnitude of the response (Element 5) of either the primary or secondary index which is applicable to both Alternatives 2 and 3 (note that if Option 5 of Element 5 is selected under Alternative 2 then no breakpoint is necessary under Element 4). An optional provision for responsiveness to abundance changes by limiting the percentage change in PSC limits inter-annually is provided under Element 6. Finally, under Element 7 breakpoints may be optionally specified in a lookup table with options for standardizing each index (note the indices may be equally weighted under this Element).

Element 1 – Starting point for PSC limit

Option 1. 2016 PSC limit (3,515 mt)
Option 2. 2016 use (2,354 mt)
Option 3. 2017 use (1,958 mt)

Element 2 – Maximum PSC limit (ceiling)

Option 1. 2016 PSC limit (3,515 mt)
Option 2. 2015 PSC limit (4,426 mt)

Element 3 – Minimum PSC limit (floor)

Option 1. 2016 use (2,354 mt)
Option 2. ½ of 2016 PSC limit (1,758 mt)
Option 3. ½ of 2016 PSC use (1,177 mt)
Option 4. 1,000 mt

Element 4 – Breakpoint for primary or secondary index (Alternative 3 only[1])

Option 1. Index is 25% below or above average
Option 2. Index is above or below average

Element 5 – Magnitude of the response for the primary or secondary index (*Up to 2 options may be chosen)*

Option 1. Up faster than 1:1
Option 2. Up slower than 1:1
Option 3. Down faster than 1:1
Option 4. Down slower than 1:1
Option 5. 1:1

Element 6: PSC limit responsiveness to abundance changes. (optional)

This option would limit the annual rate of change of PSC limits. This element could be applied to limit the amount of change of the PSC limit on an annual basis.

Option 1: PSC limit varies no more than 5% per year
Option 2: PSC limit varies no more than 15% per year
Option 3: PSC limit varies no more than 25% per year
Sub-option: This element could be applied to limit the amount of change between the current PSC limits and the implementation of this action.

Element 7: Look-up Table Breakpoints. (optional[2])

Specify breakpoints in a lookup table with a maximum of 12 breakpoints defined in each dimension, resulting in a maximum 11X11 lookup table. Each index may be standardized using one of the following options:

Option 1: standardize to the average of 1998-2018
Option 2: standardize to the current year

[1] The Council motion indicated that this Element applied only to Alternative 3 however for purposes of analysis the analysts have assumed that this applied equally to Alternative 2.

[2] The Council motion did not indicate this as 'optional' which the analysts are interpreting as an oversight as a continuous control rule rather than a look-up table is still assumed to be an appropriate interpretation of Alternatives 2 and 3.

2.1 Alternative 1, No Action

Under Alternative 1, the No Action or status quo alternative, the BSAI trawl and non-trawl halibut PSC limits are set in regulation as an amount of halibut equivalent to 3,515 mt of halibut mortality for trawl and non-trawl fisheries. A proportion of each of these overall limits is allocated to the CDQ program as a PSQ reserve, which is not apportioned by gear or fishery. A proportion of the trawl PSC limit is specifically allocated to Amendment 80. The remaining trawl and non-trawl PSC limits can then be annually allocated in the harvest specifications process to the fishery categories specified in the regulations, on an annual or seasonal basis. Figure 2-1 illustrates how the PSC limits are currently apportioned. When an annual or seasonal PSC limit is reached, all vessels fishing in that fishery category must stop fishing for the remainder of the year or season, except that NMFS does not have authority to close the pollock and Atka mackerel if the PSC limit for that fishery is reached.

	Current PSC limit
Amendment 80 cooperatives	1,745 mt
BSAI trawl limited access fisheries	745 mt
Longline fisheries	710 mt
CDQ fisheries	315 mt
TOTAL	3,515 mt

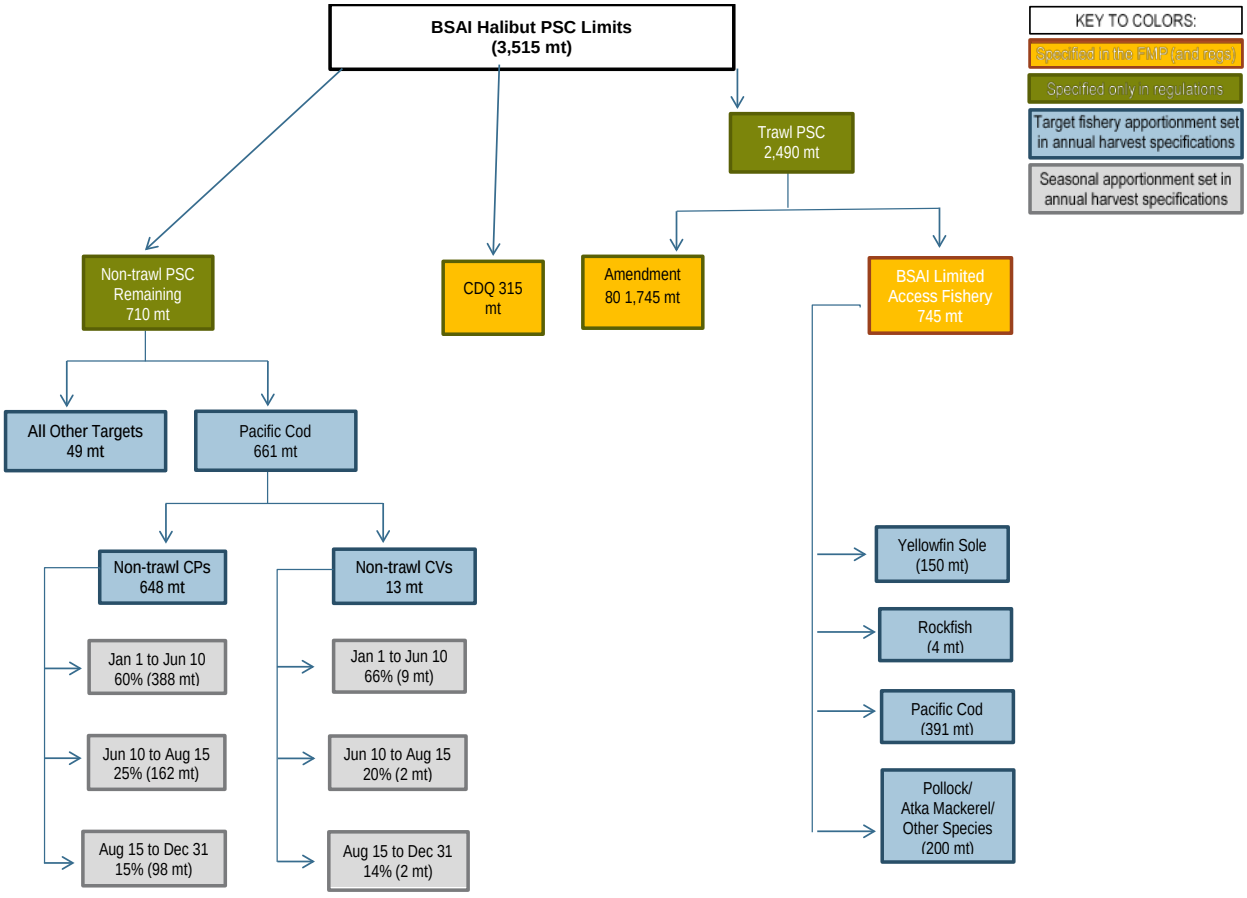

Figure 2-1 Flow Chart of BSAI Halibut PSC Limits for 2017

The regulations establish the current total BSAI non-trawl PSC and authorize NMFS to apportion the remaining non-CDQ halibut PSC to the established fishery categories through the annual harvest specifications process. The regulations do not specify halibut PSC limits for the non-trawl sectors (i.e., hook-and-line Pacific cod CV, hook-and-line Pacific cod CP, and hook-and-line and other target fisheries CV and CP). Establishing the halibut PSC limits for these sectors through the harvest specifications process enables the Council to annually determine the PSC apportionment among these sectors after considering relevant information such as changes in seasonal distribution of halibut or target groundfish species, changes in halibut biomass or groundfish TACs), and variations in fishing effort that could occur during the upcoming year. Under status quo, the BSAI trawl limited access sector's PSC limit is apportioned among target fishery categories during the annual harvest specifications process. Separate halibut PSC limits for the hook-and-line Pacific cod CV, hook-and-line Pacific cod CP, and hook-and-line other target fisheries CV and CP sectors are not be specified in regulations.

For CDQ a single limit is specified which is then apportioned to CDQ entities and is prosecuted by both trawl and non-trawl fishing operations. Table 2-1 shows the proportion of CDQ PSQ usage by gear from 2011-2017. On average, usage over this time is 80% trawl and 20% non-trawl.

Table 2-1 Percentage usage of CDQ PSQ by gear type from 2011-2017.

Year	***Trawl***	***% Total***	***Non-Trawl***	***% Total***	***Total***
2011	173	71%	71	29%	243
2012	215	79%	59	21%	274
2013	207	77%	60	23%	267
2014	206	84%	39	16%	245
2015	108	83%	23	17%	130
2016	149	86%	24	14%	173
2017	135	88%	18	12%	154
Total	*1,192*	*80%*	*294*	*20%*	*1,486*

2.2 Alternative 2: Single index used to set trawl and/or non-trawl halibut PSC limit.

Under Alternative 2, the groundfish fishery PSC limit would be calculated by gear type using one of two indices: NMFS EBS bottom trawl survey index (**Option 1**) or IPHC Area 4 ABCDE setline survey index (**Option 2**), based on biomass of halibut indexed by the same gear type. For example, an aggregate trawl fishery PSC limit would be calculated based upon the selected control rule (from amongst the elements and options below) applied to the estimate of halibut biomass from either the EBS trawl survey or the IPHC setline survey in Area 4ABCDE. Likewise, the non-trawl fishery PSC limit (in aggregate) would be calculated based upon the selected control rule (from amongst the elements and options below) applied to the estimated halibut relative biomass from either the IPHC setline survey in Area 4ABCDE or the EBS trawl survey biomass estimate. Once the aggregate limits by gear type are calculated, sectors within those categories (e.g., Amendment 80, trawl limited access, and CDQ fisheries) would be allocated PSC limits proportional to their status quo proportions. As noted previously in the Council's motion, the CDQ limit would be derived from the aggregate trawl PSC limit component.

Elements and options described below relate to the shape of the control rule and the relative responsiveness of the control rule to fluctuations in inter-annual changes in the biomass indices. Of these,

selection of an option under Elements 1-5 are required (Elements 6-7 are optional). As noted in Element 7, if optionally selected it would replace the need to select options under Elements 4 and 5.

2.2.1 Element 1: Starting point for PSC limit

The starting point is the value of the limit prescribed by the control rule when the indices are at their current year value (note additional options for standardization are provided in the Council motion). Three options are provided. One option must be selected in formulating the control rule alternative.

Option 1. 2016 PSC limit (3,515 mt)
Option 2. 2016 use (2,354 mt)
Option 3. 2017 use (1,958 mt)

2.2.2 Element 2: Maximum PSC limit (ceiling)

Element 2 provides the maximum level of the PSC. Under this element the PSC limit would remain static at that level for all values of the index above that which provides for this PSC limit. Two options are provided. One option must be selected in formulating the control rule alternative.

Option 1. 2016 PSC limit (3,515 mt)
Option 2. 2015 PSC limit (4,426 mt)

2.2.3 Element 3: Minimum PSC limit (floor)

Element 3 provides for a minimum level of PSC annually regardless of the control rule prescribing a lower value. Four options are provided under this element. One option must be selected in formulating a control rule alternative.

Option 1. 2016 use (2,354 mt)
Option 2. ½ of 2016 PSC limit (1,758 mt)
Option 3. ½ of 2016 PSC use (1,177 mt)
Option 4. 1,000 mt

2.2.4 Element 4: Breakpoint for index

Two options are considered for setting the breakpoints (for a modification in the response or slope of the control rule). These breakpoints are then associated with the magnitude of the response to be selected under Element 5. One option must be selected in formulating a control rule alternative unless only Element 6 option 5 is selected.

Option 1. Index is 25% below or above average
Option 2. Index is above or below average

2.2.5 Element 5: Magnitude of the response for the index

This element describes the magnitude of the response for the index (i.e. whether the slope is a constant 1:1 as with option 5 or varies at a steeper slope or shallower slope). Up to two options may be selected under this Element which would indicate the modification that occurs when crossing a breakpoint (as specified in Element 4). There are five possible options.

Option 1. Up faster than 1:1
Option 2. Up slower than 1:1

Option 3. Down faster than 1:1
Option 4. Down slower than 1:1
Option 5. 1:1

2.2.6 Element 6: PSC limit responsiveness to abundance changes

This element is optional. Three options are considered to modify how responsive the calculated PSC limit is to inter-annual changes. Options 1-3 may be selected if desirable to decrease the variability of the PSC limit. This is imposed after the PSC limit itself is calculated. A sub-option may be specified to limit the amount of change between the current (status quo) PSC limit and the limit in the first year of newly specified ABM PSC limits as a result of this action to reduce the potential variability in year 1 of implementation.

Option 1: PSC limit varies no more than 5% per year
Option 2: PSC limit varies no more than 15% per year
Option 3: PSC limit varies no more than 25% per year

Sub-option: This element could be applied to limit the amount of change between the current PSC limits and the implementation of this action.

2.2.7 Element 7: Look-up Table Breakpoints

This element is optional and would replace Elements 5 and 6. Here breakpoints would be defined in a look up table with a maximum of 12 breakpoints (for a maximum of 11X11 lookup table. This would result is different breakpoints and magnitude of response than listed under Elements 5 and 6 thus if Element 7 is selected it would not be necessary to select Elements 5 and 6. Here the index may be specified in one of two ways:

Option 1: standardize to the average of 1998-2018
Option 2: standardize to the current year

2.3 Alternative 3: Primary and secondary indices are used to set trawl and/or non-trawl PSC limit.

Under Alternative 3, the PSC limit is set by gear type and indexed to both EBS trawl survey and setline survey. Here the primary index may be the EBS trawl survey with the secondary index as the Area 4 setline survey (**Option 1**) or the primary index is the Area 4 setline survey and the secondary index is the EBS trawl survey (**Option 2**). The secondary index modifies the final PSC according to values and responsiveness as determined by Elements 4 and 5.

The primary difference between Alternatives 2 and 3 is that in Alternative 3 the PSC limit is still directly indexed to the primary biomass index for that gear type, but when the index for the other gear type ("the secondary index") is above or below a breakpoint value, that index exerts an additional change in the PSC limit. The secondary index modifies the PSC limit after the primary index is applied when the secondary index is in a "high state" or a "low state" (as defined by Element 4 breakpoint options). The extent to which the secondary index influences the PSC limit above or below these breakpoints is determined by selection of options under Element 5. Element 5 is also used in Alternative 3 to define the responsiveness of the primary index when the secondary index is not above or below a breakpoint value. As with Alternative 2, once the aggregate limits by gear type are calculated, sectors within those categories (e.g., Amendment 80, trawl limited access, and CDQ fisheries) would be allocated PSC limits proportional to

their status quo proportions. As noted previously in the Council's motion, the CDQ limit would be derived from the aggregate trawl PSC limit component.

Elements and options described below relate to the shape of the control rule and the relative responsiveness of the control rule to fluctuations in inter-annual changes in the biomass indices. Of these, selection of an option under Elements 1-5 are required (Elements 6-7 are optional). As noted in Element 7, if optionally selected it would replace the need to select options under Elements 4 and 5.

2.3.1 Element 1: Starting point for PSC limit

The starting point is the value of the limit prescribed by the control rule when the indices are at their current year value (note additional options for standardization are provided in the Council motion). Three options are provided. One option must be selected in formulating the control rule alternative.

Option 1. 2016 PSC limit (3,515 mt)
Option 2. 2016 use (2,354 mt)
Option 3. 2017 use (1,958 mt)

2.3.2 Element 2: Maximum PSC limit (ceiling)

Element 2 provides the maximum level of the PSC. Under this element the PSC limit would remain static at that level for all values of the index above that which provides for this PSC limit. Two options are provided. One option must be selected in formulating the control rule alternative.

Option 1. 2016 PSC limit (3,515 mt)
Option 2. 2015 PSC limit (4,426 mt)

2.3.3 Element 3: Minimum PSC limit (floor)

Element 3 provides for a minimum level of PSC annually regardless of the control rule prescribing a lower value. Four options are provided under this element. One option must be selected in formulating a control rule alternative.

Option 1. 2016 use (2,354 mt)
Option 2. ½ of 2016 PSC limit (1,758 mt)
Option 3. ½ of 2016 PSC use (1,177 mt)
Option 4. 1,000 mt

2.3.4 Element 4: Breakpoint for the primary or secondary index

Two options are considered for setting the breakpoints (for a modification in the response or slope of the control rule). These breakpoints are then associated with the magnitude of the response to be selected under Element 5. One option must be selected in formulating a control rule alternative 5

Option 1. Index is 25% below or above average
Option 2. Index is above or below average

2.3.5 Element 5: Magnitude of the response for the index

This element describes the magnitude of the response for the index (i.e. whether the slope is a constant 1:1 as with option 5 or varies at a greater or smaller magnitude). Up to two options may be selected under this Element which would indicate the modification that occurs when crossing a breakpoint (as specified in Element 4). There are five possible options. These options may be applied differently to the primary and secondary indices (i.e., Option 5 only for primary, and another option for the secondary index).

Option 1. Up faster than 1:1
Option 2. Up slower than 1:1
Option 3. Down faster than 1:1
Option 4. Down slower than 1:1
Option 5. 1:1

2.3.6 Element 6: PSC limit responsiveness to abundance changes

Three options are considered to modify how responsive the calculated PSC limit is to inter-annual changes. Options 1-3 may be selected if desirable to reduce the variability of the PSC limit. This is imposed after the PSC limit itself is calculated. A sub-option may be specified to limit the amount of change between the current (status quo) PSC limit and the limit in the first year of newly specified ABM PSC limits as a result of this action to reduce the potential variability in year 1 of implementation.

Option 1: PSC limit varies no more than 5% per year
Option 2: PSC limit varies no more than 15% per year
Option 3: PSC limit varies no more than 25% per year

Sub-option: This element could be applied to limit the amount of change between the current PSC limits and the implementation of this action.

2.3.7 Element 7: Look-up Table Breakpoints

This element is optional and would replace Elements 5 and 6. Here, breakpoints would be defined in a look up table with a maximum of 12 breakpoints (for a maximum of 11X11 lookup table. This would result is different breakpoints and magnitude of response than listed under Elements 5 and 6 thus if Element 7 is selected it would not be necessary to select Elements 5 and 6. Here each index may be specified in one of two ways[3]:

Option 1: standardize to the average of 1998-2018
Option 2: standardize to the current year

2.4 Alternatives for analysis

Several candidate alternatives have been selected from the myriad combinations of Elements and Options contained in Alternatives 2 and 3 to demonstrate the behavior of different elements and options and display contrast to best understand the nature of the possible combinations. First is a ‘base case’ alternative by gear type (Alternative 2-1 and Alternative 3-1) as listed in Table 2-2. Each base case contains the 1:1 option under Element 5 for comparative purposes and a default (and identical) set of selections under all of the other Elements and options. Next are a series of ‘one change only’ modifications to each ‘base case’ by selecting a different option under one Element only in succession for Alternative 3. Hence Alternative 3-1a is equivalent to Alternative 3-1 in Elements 1-4 and Element 6 but selects a different option for Element 5. Likewise, Alternative 3-1b is equivalent to 3-1 but does not include Element 6. Alternative 2-2 through 2-4 have specific selections of Elements and options as presented to the Council by stakeholder groups as proposed combinations and are thus presented separately without ‘one change only’ additional alternatives. Similarly, Alternatives 3-2 and 3-3 were presented to the Council by stakeholder groups.

[3] Note that equally weighting the indices in a lookup table was also considered by analysts to be consistent with the intent of this element.

Table 2-2 Subset of workgroup proposed alternatives for analysis

	Source	**Indices**	**Element 1 (longline)**	**Element 1 (trawl)**	**Element 2 (longline)**	**Element 2 (trawl)**	**Element 3 (longline)**	**Element 3 (trawl)**	**Element 4**	**Element 5**	**Element 6**	**Element 7**
Description	Sub-option		Starting point	Starting point	Ceiling	Ceiling	Floor	Floor	Breakpoints	Responsiveness	% constraint	
Alternative 1	Status quo											
Alternative 2-1	Base	Gear to gear	710	2,805	894	3,532	355	1,403	25%	1:1	15% max	continuous
2-2	A80	Gear to gear	710	2,805	894	3,532	475	1,879	specified values		2 yr avg index	continuous
2-3	UCB	Gear to gear	710	2,805	894	3,532			none		15% max	continuous
2-4	FVOA	Gear to gear	408	1,610	710	2,805	202	798	Starting point	.5 above, 1 below	15% max	continuous
Alternative 3	Base	Primary by gear	710	2,805	894	3,532	355	1,403	25%	1:1	15% max	continuous
3-1.a		Primary by gear	710	2,805					25%	Fast up, slow down	15% max	continuous
3-1.b		Primary by gear	710	2,805					25%	1:1	none	continuous
3-1.c		Primary by gear	710	2,805					25%	1:1	15% max	Lookup table
3-2	FLC	Primary by gear	594	2,347	833	3,291	355	1,403	none	1:1 for both indices	15% max	Lookup table
3-3	Directed	Primary by gear	395	1563	710	2805	202	798	Mean	0.35 * linear	20% max	continuous