C-1
BSAI Halibut
Abundance Based Management (ABM)
<table>
<thead>
<tr>
<th>Number</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Introduction/Purpose and Need</td>
</tr>
<tr>
<td>2.</td>
<td>Description of Alternatives</td>
</tr>
<tr>
<td>3.</td>
<td>Groundfish stock status and fishery description</td>
</tr>
<tr>
<td>4.</td>
<td>Halibut stock status and fishery description</td>
</tr>
<tr>
<td>5.</td>
<td>Methodology</td>
</tr>
<tr>
<td>6.</td>
<td>Impacts Analysis for Groundfish and Halibut</td>
</tr>
<tr>
<td>7.</td>
<td>Other resource categories</td>
</tr>
<tr>
<td>8.</td>
<td>Preparers</td>
</tr>
<tr>
<td>9.</td>
<td>References</td>
</tr>
<tr>
<td>10.</td>
<td>Appendices including SIA, other indices previously considered, Model validation, model results by alternative, model sensitivity</td>
</tr>
</tbody>
</table>
Key discussions and decision points for the Council meeting

- Review the suite of Alternatives and provide any revisions as desirable. Key considerations include:
  - Do these Alternatives as currently constructed meet the intent of the Council’s action?
  - Could complexity and redundancy be reduced and still address the Council’s intent?
- Review the halibut simulation model, including analytical assumptions and application for purposes of informing the Council’s policy decisions for this analysis.
- Review the suite of draft performance metrics and revise as needed. Revised performance metrics may better characterize results across alternatives to indicate where they address conflicting Council objectives.
Purpose and Need
Objectives derived from purpose and need page 24 to guide alternative management actions

• Halibut PSC limits should be indexed to halibut abundance
• Halibut spawning stock biomass should be protected especially at lower levels of abundance
• There should be flexibility provided to avoid unnecessarily constraining the groundfish fishery particularly when halibut abundance is high
• Provide for directed halibut fishing operations in the Bering Sea.
• Provide for some stability in PSC limits on an inter-annual basis.
HALIBUT PROHIBITED SPECIES CATCH (PSC) MEASURES OVER TIME
TIMELINE OF MANAGEMENT MEASURES TO ADDRESS BSAI HALIBUT PSC 1981–PRESENT

1980
- BSAI FMP (1981)
  - Prohibit halibut retention

1987-1992
- PSC limits (foreign and domestic) established and revised, Zone 1 closure
- NMFS hot spot authority

1990
- 1993 Trawl = 3,775 t
  - Non-Trawl = 900 t
  - (triggers fisheries, not area closures)

1993
- CDQ receives 7.5% PSC apportionment

2000
- Trawl PSC reduced to 3,675 mt

2000
- NMFS hot spot authority
- PSC limits respecified in mortality, not catch

2008
- A80 - 2008
  - A80 PSC limits 2,525 (Steps down)
    - 2009 → 2,475 t
    - 2010 → 2,425 t
    - 2011 → 2,375 t
    - 2012 → 2,325 t

2010
- TLAS 875 t
- CDQ (after 2010) 393 t

2019
- Halibut ABM multiple discussion papers 2016-2019
  - Initial review Oct 2019

2019
- Council signals intent to consider Abundance Based Management (ABM)
  - of BSAI halibut PSC

Foreign to Domestic Fisheries
- Prohibited species defined

Development of AFA, CDQ, & Halibut/Sablefish IFQ programs

Development of A80

Increased emphasis on bycatch reduction programs A91 Chinook & A111 Halibut
Focus of discussion paper reviews

Indices
Control rules
Alternative
Performance metrics
Alternatives
alternative 1: status quo  
halibut psc limits for groundfish sectors

<table>
<thead>
<tr>
<th></th>
<th>PSC limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amendment 80 cooperatives</td>
<td>1,745 t</td>
</tr>
<tr>
<td>BSAI trawl limited access fisheries</td>
<td>745 t</td>
</tr>
<tr>
<td>Non-trawl fisheries</td>
<td>710 t</td>
</tr>
<tr>
<td>CDQ fisheries</td>
<td>315 t</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>3,515 t</strong></td>
</tr>
</tbody>
</table>
Status Quo allocation and apportionment among Groundfish Sectors and targets

Total PSC limit: 3,515

Non-trawl
710

CDQ*
315

*unspecified gear limit

Non-trawl
Cps 648
Non-trawl CVs 13

Cod 93.1%
661

Jan 1 to Jun 10 60%
Jun 10 to Aug 15 25%
Aug 15 to Dec 31 15%

Jan 1 to Jun 10 66%
Jun 10 to Aug 15 20%
Aug 15 to Dec 31 14%

Trawl non-CDQ

A80
1,745

TLAS
745

Fixed in FMP and regulation

Apportioned to target and season in harvest specifications

YFS
150
Rockfish
4
Cod
391
Pollock atka other
200
Indices to make Pacific halibut PSC based on abundance...

for

Alternatives 2 and 3
Estimated abundance (numbers of Pacific halibut) by length category, total biomass (pounds) as estimated by the NMFS Bering Sea Trawl survey data, 1982-2018.
Actual EBS trawl survey index used

Pacific halibut survey biomass (T)

Pacific halibut abundance (Millions)
Figure 1-7 IPHC Setline survey WPUE all Pacific halibut (Total) for IPHC Regulatory Areas in Area 4 standardized to the mean of the time series (1998-2017) for each Area
Figure 1-7 IPHC Setline survey WPUE all Pacific halibut (Total) for IPHC Regulatory Areas in Area 4 standardized to the mean of the time series (1998-2017) for each Area
## Alternatives 2 and 3

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Primary index</th>
<th>Secondary index</th>
<th>Standardization</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2</strong></td>
<td>Trawl or Setline</td>
<td>none</td>
<td>2018 (default); 2 year average</td>
</tr>
</tbody>
</table>
| **3**       | Trawl or Setline | Trawl or Setline | Primary: 2018 (default); 2 year average  
<pre><code>           |                |                               | Secondary: mean or 2018            |
</code></pre>
<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
<th>Range</th>
<th>Optional?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Starting Point</td>
<td>1,958-3,515 t</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>Ceiling</td>
<td>3,515-4,426 t</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>Floor</td>
<td>1,000-2,354 t</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>Breakpoint</td>
<td>Breakpoint occurs when index value is greater than or less than one of the 2 values below: 25% average of index or average value of index</td>
<td>Yes For Alt 2 No for Alt 3 (unless Element 7 selected)</td>
</tr>
<tr>
<td>5</td>
<td>Response</td>
<td>1:1</td>
<td>No (unless Element 7 selected)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;1:1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;1:1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Constraint</td>
<td>5-25%</td>
<td>Yes</td>
</tr>
<tr>
<td>7</td>
<td>Look up Table</td>
<td>Up to 12 breakpoints; standard to mean or 2018</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Subalternatives analyzed (Table 2-4)

- Process for selection of Alternatives 2 and 3:
  - Base Case 2-1, 3-1: same Elements and options selected except for breakpoints (none in 2-1)
  - Change one element:
    - 2-1a, 2-1b; 3-1a, 3-1b, 3-1c, 3-1d
  - Stakeholder submissions:
    - 2-2, 2-3, 2-4; 3-2a, 3-3a
  - Contrasting alternatives for one Element:
    - 3-2b, 3-3b
### Table 2-4

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Source</th>
<th>Indices used</th>
<th>1 Starting point</th>
<th>2 Ceiling</th>
<th>3 Floor</th>
<th>4 Break points</th>
<th>5 Responsiveness</th>
<th>6 Constraint</th>
<th>7 Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Status quo</td>
<td>NA</td>
<td>NA</td>
<td>3,515</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-1</td>
<td>WG</td>
<td>By gear</td>
<td>NA</td>
<td>3,515</td>
<td>4,426</td>
<td>1,758</td>
<td>none</td>
<td>1:1</td>
<td>15% max</td>
</tr>
<tr>
<td>2-1.a</td>
<td>WG</td>
<td>By gear</td>
<td>NA</td>
<td>3,515</td>
<td>4,426</td>
<td>1,758</td>
<td>none</td>
<td>1:1</td>
<td>none</td>
</tr>
<tr>
<td>2-1.b</td>
<td>SSC</td>
<td>By gear</td>
<td>NA</td>
<td>1,958</td>
<td>4,426</td>
<td>1,758</td>
<td>none</td>
<td>1:1</td>
<td>15% max</td>
</tr>
<tr>
<td>2-2</td>
<td>Stakeholder</td>
<td>By gear</td>
<td>NA</td>
<td>3,515</td>
<td>4,426</td>
<td>2,354</td>
<td>specified</td>
<td>Stairsteps</td>
<td>2 yr avg</td>
</tr>
<tr>
<td>2-3</td>
<td>Stakeholder</td>
<td>By gear</td>
<td>NA</td>
<td>2,018</td>
<td>3,515</td>
<td>1,000</td>
<td>Start</td>
<td>1:1</td>
<td>15% max</td>
</tr>
<tr>
<td>3-1</td>
<td>WG</td>
<td>By gear</td>
<td>Other (mean)</td>
<td>3,515</td>
<td>4,426</td>
<td>1,758</td>
<td>±25%</td>
<td>1:1</td>
<td>15% max</td>
</tr>
<tr>
<td>3-1.a</td>
<td>WG</td>
<td>By gear</td>
<td>Other (mean)</td>
<td>3,515</td>
<td>4,426</td>
<td>1,758</td>
<td>±25%</td>
<td>1:1</td>
<td>none</td>
</tr>
<tr>
<td>3-1.b</td>
<td>WG</td>
<td>By gear</td>
<td>Other (mean)</td>
<td>3,515</td>
<td>4,426</td>
<td>1,758</td>
<td>±25%</td>
<td>2nd Index 0.5:1 (low),1.5:1 (high)</td>
<td>15% max</td>
</tr>
<tr>
<td>3-1.c</td>
<td>WG</td>
<td>By gear</td>
<td>Other (mean)</td>
<td>3,515</td>
<td>4,426</td>
<td>1,758</td>
<td>±25%</td>
<td>1:1</td>
<td>15% max</td>
</tr>
<tr>
<td>3-1.d</td>
<td>SSC</td>
<td>By gear</td>
<td>Other (mean)</td>
<td>1,958</td>
<td>4,426</td>
<td>1,758</td>
<td>±25%</td>
<td>1:1</td>
<td>15% max</td>
</tr>
<tr>
<td>3-2.a</td>
<td>Stakeholder</td>
<td>Gear (mean)</td>
<td>Other (mean)</td>
<td>2,941</td>
<td>4,124</td>
<td>1,758</td>
<td>none</td>
<td>Interpolated</td>
<td>15% max</td>
</tr>
<tr>
<td>3-2.b</td>
<td>WG</td>
<td>Gear (mean)</td>
<td>Other (mean)</td>
<td>2,941</td>
<td>4,124</td>
<td>1,758</td>
<td>none</td>
<td>1:1</td>
<td>15% max</td>
</tr>
<tr>
<td>3-3a</td>
<td>Stakeholder</td>
<td>Setline</td>
<td>Trawl (mean)</td>
<td>1,958</td>
<td>3,515</td>
<td>1,000</td>
<td>S.P</td>
<td>Secondary 0.35:1</td>
<td>20% max</td>
</tr>
<tr>
<td>3-3a_update</td>
<td>Stakeholder</td>
<td>Setline</td>
<td>Trawl (2018)</td>
<td>1,958</td>
<td>3,515</td>
<td>1,000</td>
<td>S.P</td>
<td>Secondary 0.35:1</td>
<td>20% max</td>
</tr>
<tr>
<td>3-3b</td>
<td>WG</td>
<td>Trawl</td>
<td>Setline (mean)</td>
<td>1,958</td>
<td>3,515</td>
<td>1,000</td>
<td>S.P</td>
<td>Secondary 0.35:1</td>
<td>20% max</td>
</tr>
</tbody>
</table>
Alternatives analyzed and stakeholder intent

- Proposals documented before the February Stakeholder Meeting
- A few differences between proposal and alternative
  - May be a clear difference or a necessary interpretation
- Inconsistencies with the motion are not highlighted here
  - Retention of the intent of the proposal was attempted
<table>
<thead>
<tr>
<th>February 2019 Motion</th>
<th>A80 Proposal</th>
<th>Alternative 2-2</th>
<th>UCB Proposal</th>
<th>Alternative 2-4</th>
<th>FLC Proposal</th>
<th>Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applies to</td>
<td>A80 PSC Limit</td>
<td>Trawl</td>
<td>Total PSC Limit</td>
<td>Trawl</td>
<td>Non-trawl PSC limit</td>
<td>Trawl Non-trawl</td>
</tr>
<tr>
<td>Indices</td>
<td>Trawl survey averaged over recent 2 yrs</td>
<td>Trawl survey averaged over recent 2 yrs</td>
<td>Trawl survey for trawl</td>
<td>Trawl survey for trawl</td>
<td>Both</td>
<td>Both</td>
</tr>
<tr>
<td>Alternative 1</td>
<td>Alt 2, Option 1</td>
<td>Alternative 2</td>
<td>Alt 2, Option 1</td>
<td>Alternative 2</td>
<td>Alternative 3</td>
<td>Alternative 3</td>
</tr>
<tr>
<td>Starting point</td>
<td>2016 PSC limit (3,515 t)</td>
<td>3,515 t</td>
<td>2016 use (2,354 t)</td>
<td>2,354 t</td>
<td>2017 use (1,958 t)</td>
<td>1,745 t for A80</td>
</tr>
<tr>
<td></td>
<td>Trawl: 2,805 t</td>
<td>Trawl: 2,805 t</td>
<td>Non-trawl: 710 t</td>
<td>Non-trawl: 710 t</td>
<td>Trawl: 3,515 t</td>
<td>Trawl: 3,515 t</td>
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<tr>
<td></td>
<td>Non-trawl: 710 t</td>
<td>Non-trawl: 710 t</td>
<td>Total: 3,515 t t</td>
<td>Total: 3,515 t t</td>
<td>Non-trawl: 894 t</td>
<td>Non-trawl: 894 t</td>
</tr>
<tr>
<td></td>
<td>Total: 3,515 t</td>
<td>Trawl survey for trawl</td>
<td>Trawl: 3,512 t</td>
<td>Trawl: 3,512 t</td>
<td>Non-trawl: 833 t</td>
<td>Non-trawl: 833 t</td>
</tr>
<tr>
<td></td>
<td>Total: 4,426 t</td>
<td>Non-trawl: 833 t</td>
<td>Trawl: 3,291 t</td>
<td>Trawl: 3,291 t</td>
<td>Total: 4,124 t</td>
<td>Total: 4,124 t</td>
</tr>
<tr>
<td>Ceiling</td>
<td>2,325 t for A80</td>
<td>2,325 t</td>
<td>2015 PSC limit (4,426 t)</td>
<td>4,426 t</td>
<td>2015 PSC limit (4,426 t)</td>
<td>4,124 t</td>
</tr>
<tr>
<td></td>
<td>Trawl: 3,515 t</td>
<td>Trawl: 3,515 t</td>
<td>Non-trawl: 894 t</td>
<td>Non-trawl: 894 t</td>
<td>Trawl: 3,515 t</td>
<td>Trawl: 3,515 t</td>
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<td></td>
<td>Non-trawl: 833 t</td>
<td>Non-trawl: 833 t</td>
<td>Total: 4,124 t</td>
<td>Total: 4,124 t</td>
<td>Non-trawl: 833 t</td>
<td>Non-trawl: 833 t</td>
</tr>
<tr>
<td></td>
<td>Total: 4,124 t</td>
<td>Trawl survey for trawl</td>
<td>Trawl: 3,291 t</td>
<td>Trawl: 3,291 t</td>
<td>Total: 4,124 t</td>
<td>Total: 4,124 t</td>
</tr>
<tr>
<td>Floor</td>
<td>1,412 t for A80</td>
<td>2,354 t</td>
<td>1,000 t</td>
<td>1,000 t</td>
<td>1,000 t</td>
<td>1,000 t</td>
</tr>
<tr>
<td></td>
<td>Trawl: 1,879 t</td>
<td>Trawl: 1,879 t</td>
<td>Non-trawl: 475 t</td>
<td>Non-trawl: 475 t</td>
<td>Trawl: 355 t</td>
<td>Trawl: 355 t</td>
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<td></td>
<td>Non-trawl: 475 t</td>
<td>Non-trawl: 475 t</td>
<td>Total: 2,354 t</td>
<td>Total: 2,354 t</td>
<td>Non-trawl: 355 t</td>
<td>Non-trawl: 355 t</td>
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<td>Total: 2,354 t</td>
<td>Trawl survey for trawl</td>
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<td>Trawl: 2,347 t</td>
<td>Total: 1,758 t</td>
<td>Total: 1,758 t</td>
</tr>
<tr>
<td>Element 4</td>
<td>Breakpoint</td>
<td>A80 Proposal</td>
<td>Alternative 2-2</td>
<td>UCB Proposal</td>
<td>Alternative 2-4</td>
<td>FLC Proposal</td>
</tr>
<tr>
<td>-----------</td>
<td>------------</td>
<td>--------------</td>
<td>-----------------</td>
<td>--------------</td>
<td>-----------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td>1. 25% below/above average</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. above or below average</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Element 5</th>
<th>Responsiveness</th>
<th>A80 Proposal</th>
<th>Alternative 2-2</th>
<th>UCB Proposal</th>
<th>Alternative 2-4</th>
<th>FLC Proposal</th>
<th>Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. Up faster than 1:1</td>
<td>NA</td>
<td>NA</td>
<td>1:1</td>
<td>1:1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Up slower than 1:1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Down faster than 1:1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Down slower than 1:1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. 1:1</td>
<td></td>
<td></td>
<td>1:1</td>
<td>1:1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Element 6</th>
<th>Constraint</th>
<th>A80 Proposal</th>
<th>Alternative 2-2</th>
<th>UCB Proposal</th>
<th>Alternative 2-4</th>
<th>FLC Proposal</th>
<th>Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. 5% constraint</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. 15% constraint</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>3. 25% constraint</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Suboption: limit change from current and implementation</td>
<td>Index is average of recent two years</td>
<td>Index is average of recent standardized two years</td>
<td>15% maximum</td>
<td>15% maximum</td>
<td>15% maximum</td>
<td>15% maximum</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Element 7</th>
<th>Breakpoints</th>
<th>A80 Proposal</th>
<th>Alternative 2-2</th>
<th>UCB Proposal</th>
<th>Alternative 2-4</th>
<th>FLC Proposal</th>
<th>Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Specify breakpoints in a lookup table with a maximum of 12 breakpoints in each dimension. Each index standardized using Option 1: standardize to average of 1998-2018</td>
<td>Breakpoints translated to gear index and standardized to mean</td>
<td>NA</td>
<td>NA</td>
<td>Evenly space breakpoints between floor and ceiling with starting point at 1 and 1. Both indices standardized to mean</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Breakpoints in a single dimension</td>
<td>2018</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Option 2: standardize to current year</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Evenly space breakpoints between floor and ceiling with starting point at 1 and 1. Both indices standardized to mean.
<table>
<thead>
<tr>
<th>February 2019 Motion</th>
<th>Directed Users Proposal</th>
<th>Alternative 2-4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Applies to</strong></td>
<td>Total PSC Limit</td>
<td>Trawl</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-trawl</td>
</tr>
<tr>
<td>1998-2018</td>
<td>Primary standardized to recent year</td>
<td></td>
</tr>
<tr>
<td>1. Secondary to recent year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Primary averaged over recent 2 yrs</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Indices</strong></td>
<td></td>
<td>Setline for total</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Setline for non-trawl</td>
</tr>
<tr>
<td>1. No action</td>
<td></td>
<td>Trawl survey for trawl</td>
</tr>
<tr>
<td>2. Single index</td>
<td></td>
<td>Trawl survey secondary, standardize to mean</td>
</tr>
<tr>
<td>1: EBS bottom trawl survey.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2: IPHC setline survey.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Primary &amp; secondary</td>
<td></td>
<td>Setline Primary, standardize to mean</td>
</tr>
<tr>
<td>1: trawl then setline.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2: setline then trawl</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Alternative</strong></td>
<td></td>
<td>Alt 2, option 2</td>
</tr>
<tr>
<td>1. No action</td>
<td></td>
<td>Alternative 2</td>
</tr>
<tr>
<td>2. Single index</td>
<td></td>
<td>Alt 3: Option 2</td>
</tr>
<tr>
<td>1: EBS bottom trawl survey.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2: IPHC setline survey.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Primary &amp; secondary</td>
<td></td>
<td>Alt 3: Option 2</td>
</tr>
<tr>
<td>1: trawl then setline.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2: setline then trawl</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Element 1</strong></td>
<td></td>
<td>Trawl: 1,610 t</td>
</tr>
<tr>
<td>Starting point</td>
<td></td>
<td>Non-trawl: 408 t</td>
</tr>
<tr>
<td>1. 2016 PSC limit (3,515 t)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. 2016 use (2,354 t)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. 2017 use (1,958 t)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Element 2</td>
<td></td>
<td>Trawl: 2,805 t</td>
</tr>
<tr>
<td>Ceiling</td>
<td></td>
<td>Non-trawl: 710 t</td>
</tr>
<tr>
<td>1. 2016 PSC limit (3,515 t)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. 2015 PSC limit (4,426 t)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Element 3</td>
<td></td>
<td>Trawl: 798 t</td>
</tr>
<tr>
<td>Floor</td>
<td></td>
<td>Non-trawl: 202 t</td>
</tr>
<tr>
<td>1. 2,354 t</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. 1,758 t</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. 1,177 t</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. 1,000 t</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The intent post-meeting was to standardize the secondary index to current year.
<table>
<thead>
<tr>
<th>Element</th>
<th>Breakpoint</th>
<th>FVOA Proposal</th>
<th>Alternative 2-4</th>
<th>Directed Users Proposal</th>
<th>Alternative 2-4</th>
</tr>
</thead>
</table>
| **Element 4** | 1. 25% below/above average  
2. above or below average | Primary: Starting point | Primary: Starting point | | |
| **Element 5** | 1. Up faster than 1:1  
2. Up slower than 1:1  
3. Down faster than 1:1  
4. Down slower than 1:1  
5. 1:1 | slower when above starting point (0.5:1).  
Otherwise 1:1. | slower when above starting point (0.5:1).  
Otherwise 1:1. | 1:1 | 1:1 |
| **Element 6** | 1. 5% constraint  
2. 15% constraint  
3. 25% constraint  
Suboption: limit change from current and implementation | 15% maximum | 15% maximum | 15% maximum | 15% maximum |
| **Element 7** | Specify breakpoints in a lookup table with a maximum of 12 breakpoints in each dimension. Each index standardized using  
Option 1: standardize to average of 1998-2018  
Option 2: standardize to current year | NA | NA | NA | NA |
Alternatives analyzed and stakeholder intent

• A80 proposal
  • Calculated trawl and non-trawl elements from A80-specific elements
    • Starting point, floor, ceiling
  • Standardized index to current year
    • Should not make a difference, being aware of appropriate determination of breakpoints given year standardized to

• FVOA proposal
  • Intent of proposal may have been to use setline survey for trawl and non-trawl
  • Had to pick a floor, thus 1,000 t was used based on discussion during Council meeting in February

• Directed users proposal
  • Post-meeting, intent was to standardize secondary index to current year
**Additional fixed limits analyzed**

- Per SSC request additional fixed lower limits were analyzed
- For model sensitivity 2 additional options included

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Source</th>
<th>Gear</th>
<th>Primary Index</th>
<th>Secondary Index</th>
<th>Non-tryawl</th>
<th>Trawl</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alt. 1</td>
<td>Status quo</td>
<td>Gear</td>
<td>NA</td>
<td>NA</td>
<td>710</td>
<td>2,805</td>
</tr>
<tr>
<td>1.a</td>
<td>SSC</td>
<td>Gear</td>
<td>NA</td>
<td>NA</td>
<td>475</td>
<td>1,879</td>
</tr>
<tr>
<td>1.b</td>
<td>SSC</td>
<td>Gear</td>
<td>NA</td>
<td>NA</td>
<td>395</td>
<td>1,563</td>
</tr>
<tr>
<td>1.c</td>
<td>WG</td>
<td>Gear</td>
<td>NA</td>
<td>NA</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1.d</td>
<td>WG</td>
<td>Gear</td>
<td>NA</td>
<td>NA</td>
<td>10,000</td>
<td>10,000</td>
</tr>
</tbody>
</table>
Halibut simulation model overview
Recruitment, Fishing and Natural Mortality

Movement

Allocate TCEY among sectors within region

Simulate Trawl and Setline Survey Indices

Calculate TCEY and distribute regionally

Approximate IPHC Assessment

Calculate PSC Limits from ABM Control Rules

Two-area Model Schematic
Recruitment, Fishing and Natural Mortality

Movement

Allocate TCEY among sectors within region

Simulate Trawl and Setline Survey Indices

Calculate coastwide TCEY and distribute regionally

Approximate IPHC Assessment

Calculate PSC Limits from ABM Control Rules
Two-area operating Model (OM) overview

- Sex and age-structured
- 2 Areas
  - BSAl region
  - Remaining GOA, BC, West Coast distribution
- Common recruitment
  - Allocated among areas, time-varying
  - Function of Pacific Decadal Oscillation index
- Gear-specific Selectivity
- Age-specific movement between areas

\[ N_{ya} \]

Single-sex Example
Two-area operating Model (OM) overview

- **Sex and age-structured**
- **2 Areas**
  - BSAl region
  - Remaining GOA, BC, West Coast distribution
- **Common recruitment**
  - Allocated among areas, time-varying
  - Function of Pacific Decadal Oscillation index
- **Gear-specific Selectivity**
- **Age-specific movement between areas**

Removals Due to Natural and Fishing Mortality
Two-area operating Model (OM) overview

- Sex and age-structured
- 2 Areas
  - BSAl region
  - Remaining GOA, BC, West Coast distribution
- Common recruitment
  - Allocated among areas, time-varying
  - Function of Pacific Decadal Oscillation index
- Gear-specific Selectivity
- Age-specific movement between areas
Two-area operating Model (OM) overview

- Sex and age-structured
- 2 Areas
  - BSAl region
  - Remaining GOA, BC, West Coast distribution
- Common recruitment
  - Allocated among areas, time-varying
  - Function of Pacific Decadal Oscillation index
- Gear-specific Selectivity
- Age-specific movement between areas
Sector-specific selectivity: uses selectivities from coastwide-long assessment model

- **BSAI Trawl PSC selectivity:**
  - Set equal to trawl survey selectivity
  - Rationale: Best available information on plausible selectivity for trawl PSC alone

- **BSAI Longline PSC selectivity:**
  - Average of the 4ABCDE setline and the BS trawl survey selectivities for most recent year
  - Rationale: % 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.

- **Halibut fishery selectivity (in BSAI and the other area):**
  - Commercial fishery selectivity from the 2018 coastwide long assessment model
  - Rationale: Uses assessment results directly

- **Other area bycatch fishery selectivity**
  - Coastwide gear-aggregated bycatch selectivity from the 2018 coastwide long assessment model
Selectivity

Female Selectivity-at-Age

Male Selectivity-at-Age

- Trawl PSC BSAI
- Non-trawl PSC BSAI
- Bycatch Other Area
- Halibut Fishery BSAI & Other Area
- Bottom Trawl Survey
- Fishery Independent Setline Survey
Modeling weight-at-age: set to 2018 weight-at-age

(Simulations were 20 years long; in a 50-100 year simulation, changing weight-at-age over time would be increasingly important to model)
Movement Among Areas

Area: BSAI

Area: Other

Earlier

N_{Y,a} N_{Y,a} N_{Y,a} N_{Y,a} N_{Y,a}
N_{Y,a} N_{Y,a} N_{Y,a} N_{Y,a} N_{Y,a}
N_{Y,a} N_{Y,a} N_{Y,a} N_{Y,a} N_{Y,a}
N_{Y,a} N_{Y,a} N_{Y,a} N_{Y,a} N_{Y,a}
N_{Y,a} N_{Y,a} N_{Y,a} N_{Y,a} N_{Y,a}

Later

Years

Remaining GOA, BC, West Coast Range
Movement Among Areas

Area: BSAI

Area: Other

Survival

Movement Out of BSAI
Movement Among Areas

Area: BSAI

Earlier

\[ N_{y,a} \]

\[ N_{y,a} \]

\[ N_{y,a} \]

\[ N_{y,a} \]

\[ N_{y,a} \]

\[ N_{y,a} \]

\[ N_{y,a} \]

Later

\[ N_{y,a} \]

\[ N_{y,a} \]

\[ N_{y,a} \]

\[ N_{y,a} \]

\[ N_{y,a} \]

\[ N_{y,a} \]

\[ N_{y,a} \]

Survival

Movement Out of BSAI

Movement Into BSAI
Model Schematic

- **Recruitment, Fishing and Natural Mortality**
  - Allocate TCEY among sectors within region
  - Calculate coastwide TCEY and distribute regionally
  - Approximate IPHC Assessment
  - Calculate PSC Limits from ABM Control Rules

- **Movement**
- **Simulate Trawl and Setline Survey Indices**
  - Lognormal observation error with the 1998-2018 average CVs for each survey:
    - 10% (FISS), 7.3% (BTS)
Calculating PSC Limits for the following year

For each alternative in each year this generates:
- PSC limit for all trawl next year
- PSC limit for non-trawl next year
- Percentage usage of CDQ PSQ by gear type from 2010-2018.

<table>
<thead>
<tr>
<th>Year</th>
<th>Trawl</th>
<th>Non-Trawl</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>85</td>
<td>79</td>
<td>164</td>
</tr>
<tr>
<td>2011</td>
<td>173</td>
<td>70</td>
<td>243</td>
</tr>
<tr>
<td>2012</td>
<td>215</td>
<td>59</td>
<td>274</td>
</tr>
<tr>
<td>2013</td>
<td>207</td>
<td>60</td>
<td>267</td>
</tr>
<tr>
<td>2014</td>
<td>206</td>
<td>39</td>
<td>245</td>
</tr>
<tr>
<td>2015</td>
<td>108</td>
<td>23</td>
<td>130</td>
</tr>
<tr>
<td>2016</td>
<td>149</td>
<td>24</td>
<td>173</td>
</tr>
<tr>
<td>2017</td>
<td>135</td>
<td>18</td>
<td>154</td>
</tr>
<tr>
<td>2018</td>
<td>144</td>
<td>12</td>
<td>156</td>
</tr>
<tr>
<td>Average</td>
<td>158</td>
<td>42.67</td>
<td>200.67</td>
</tr>
</tbody>
</table>
Model Schematic

- **Recruitment, Fishing and Natural Mortality**
  - Allocate TCEY among sectors within region
- **Movement**
- **Simulate Trawl and Setline Survey Indices**
- **Calculate coastwide TCEY and distribute regionally**
- **Approach IPHC Assessment**
  - Accounts for all mortality, including PSC mortality from all sizes
- **Calculate PSC Limits from ABM Control Rules**
Approximate the IPHC Assessment

• True SSB, with lognormal error applied
• Model has the ability to approximate the assessment by considering SSB, estimation error, and the effect of the previous year’s spawning biomass estimate on the current year’s estimate
  • This was not implemented in these model runs but could be in the future
Model Schematic

- Recruitment, Fishing and Natural Mortality
- Movement
- Simulate Trawl and Setline Survey Indices
- Calculate PSC Limits from ABM Control Rules
- Calculate coastwide TCEY and distribute regionally
- Allocate TCEY among sectors within region
- Approximate IPHC Assessment
Modeling Pacific halibut catches
The graph shows the relationship between historical spawning biomass estimates (kg) and total mortality (kg) in millions. The regression line is given by the equation:

\[ y = 0.2291x - 2 \times 10^6 \]

with an R² value of 0.6088.
Model distribution of TCEY proxy between BSAI and the other area

• Distribution between the BSAI and the other area modeled according to that year’s proportion of modeled FISS biomass in the BSAI
  • Allows for responsiveness of TCEY to changes in the distribution of biomass over time
  • Much more realistic assumption than a non-changing proportion, especially in extreme simulations where biomass by area is much different from a set proportion
    • For instance, if only 2% of the biomass were in the BSAI then it is unlikely that decision-makers would assign 50% of the TCEY to this area
Recruitment, Fishing and Natural Mortality

Movement

Simulate Trawl and Setline Survey Indices

Allocate TCEY among sectors within region

Calculate coastwide TCEY and distribute regionally

Approximate IPHC Assessment

Calculate PSC Limits from ABM Control Rules

Subtract O26 bycatch from TCEY proxy for that area

Calculations of distributing TCEY to users and how changes in expected bycatch affect the amount available
Calculating halibut fishery catch from TCEY proxy

• Uses a mean length-at-age relationship to define the age associated with O26 fish
  • A 26 inch fish corresponds to a 7-year old in the model
• The model subtracts over-7-year-old PSC (or bycatch) from the TCEY proxy in each area
• Not modeling lengths
Two-area Model Schematic

- **Recruitment, Fishing and Natural Mortality**
- **Simulate Trawl and Setline Survey Indices**
- **Approximate IPHC Assessment**
- **Calculate PSC Limits from ABM Control Rules**
- **Allocate TCEY among sectors within region**
- **Movement**
- **Calculate coastwide TCEY and distribute regionally**

Halibut Catch limit = Halibut Catch
Two-area Model Schematic

1. Calculate PSC Limits from ABM Control Rules
2. Approximate IPHC Assessment
3. Calculate coastwide TCEY and distribute regionally
4. Allocate TCEY among sectors within region
5. Movement
6. Simulate Trawl and Setline Survey Indices
7. Recruitment, Fishing and Natural Mortality

PSC use = average ratio of PSC use:limit in the BSAI (gear-specific) 2016-2018
PSC usage relative to the limit

- Used the 3-year average proportion of the PSC usage:PSC limit from the data
  - This assumes that the relationship between usage and limit is independent of the abundance of halibut and the PSC limit itself
- Other assumptions were considered, but for initial model results this assumption allows us to see the behavior of each alternative clearly
Model validation
• Ran the model for 25 historical years, starting in 1994
• Entered historical catches aggregated by our 5 modeled gear types
• Entered recruitment deviations from IPHC assessment
• Check if model generally mimics coastwide IPHC assessment results
• More details: Appendix 3
• Ran the model for 25 historical years, starting in 1994
• Entered historical catches aggregated by our 5 modeled gear types
• Entered recruitment deviations from IPHC assessment
• Check if model generally mimics coastwide IPHC assessment results
• More details: Appendix 3
- Ran the model for 25 historical years, starting in 1994
- Entered historical catches aggregated by our 5 modeled gear types
- Entered recruitment deviations from IPHC assessment
- Check if model generally mimics coastwide IPHC assessment results
- More details: Appendix 3
BSAI-specific relative recruitment estimates

Figure A3-4. Age-1 Recruitment estimates from the BSAI sub-model. These relative values were used to evaluate the process error component of the BTS in OM projections relative to the OM conditioned to mimic the 2018 coastwide long assessment by the IPHC.
• Used estimated BSAI age-2 recruitment
• Other area recruitment = coastwide – BSAI
• Better match to both surveys indices that likely proportion of recruitment to the BSAI varies over time
Optimized most uncertain parameters (mean proportion of recruitment to the BSAI and juvenile movement) to best match observed proportion of survey biomass in the BSAI.
Overview of Alternative results

General Trends
Conclusions on major features of control rules
Effects of Elements and options
Sector specific PSC limits under Alternatives
Performance metrics
General trends
• Revised Table 6-1
• Projected median % change from status quo alternative

Spawning biomass

Halibut fishery catch

Percent change v SQ

BSAI SSB

Halibut fishery catch

Year

PSC limit

PSC usage
- BSAI PSC limits relative to 2018 value in 2025 and 2035
- **Compare across alternatives**
- Thick and thin horizontal bars: median and mean
- Thickness of vertical lines show number of simulations at a particular % change
• Halibut fishery catch relative to 2018 value in 2025 and 2035
• Compare across alternatives
• Thick and thin horizontal bars: median and mean
• Thickness of vertical lines show number of simulations at a particular % change
Conclusions on major features of control rules
PSC limit most sensitive to starting point

Average = last 5 year’s average PSC limit
PSC limits are (mostly) correlated to halibut biomass

Figure 6-8. Correlations of PSC limits with their respective gear type indices across alternatives for the trawl fishery (left) and the non-trawl fishery (right).
PSC limits are (mostly) correlated to halibut biomass

Figure 6-10. Correlations of PSC limits with halibut total biomass across alternatives for the trawl fishery (left) and the non-trawl fishery (right).
How do they correlate to the opposite survey?
How do they correlate to the opposite survey?
Some alternative PSC limits often stuck on floors and ceilings

Figure 6-11. Occurrence of median trawl PSC limits reaching a floor (F, pink) or a ceiling (C, blue) for each alternative and year in the simulation.

Figure 6-12. Occurrence of median non-trawl PSC limits reaching a floor (F, pink) or a ceiling (C, blue) for each alternative and year in the simulation.
Examples
Examining effects of Elements and options:

15% constraint (Alt 2.1) compared with staiirstep (Alt 2.2)

Figure 6-16. A comparison of projected PSC limits, usage, spawning biomass (SSB), and halibut fishery catch for the status quo (Alternative 1), Alternative 2.1, and Alternative 2.1 is continuous with a maximum 15% constraint on the change in PSC limit from the previous year, while Alternative 2.2 uses a stair-step approach to changes in PSC limits, but does not apply a maximum 15% constraint on changes from the previous year.
Examining effects of Elements and options (2.1 and 3.1):

Addition of secondary index (3.1) for similar stock status trajectory.

Figure 6-17. A comparison of projected PSC limits, usage, spawning biomass (SSB), and directed halibut fishery catch for Alternative 2.1 and Alternative 3.1.
Examining effects of Elements and options (3.2a, 3.2b):

Change in responsiveness

Figure 6-18. A comparison of projected PSC limits, usage, spawning biomass (SSB), and directed halibut fishery catch for Alternatives 3.2a and 3.2b.
Examining effects of Elements and options (3.3a and 3.3b):

Using the same primary index for both gear types
How and where are U26 fish taken into account?

All ages (and implicitly all lengths) are included in the model.
How and where are U26 fish taken into account?

TCEY determination accounts for U26 on average, to the extent that it was taken into account historically.
How and where are U26 fish taken into account?

• Previous year’s O26 realized PSC usage is subtracted from current year’s BSAI TCEY to arrive at BSAI directed halibut fishery catch limit, as is the practice at IPHC

• Average length-at-age relationship to define ages at 26 year old fish

• 26-inch fish is on average a 7 yo

• Forward simulations currently assume 2018 weight-at-age in all years
How and where are U26 fish taken into account?

- We did not model an operating model scenario with TCEY determination as a function of spawning potential ratio.

- Application of an SPR-based fishing intensity would take into account yearly fluctuations in U26 fish
Potential operating model scenarios

• Alternative initial spawning biomass scenarios

• Assume IPHC’s harvest policy is followed exactly
  • Reference SPR of 46%
  • 30:20 harvest control rule
  • This would reflect 2 hypotheses on IPHC management scenarios:
    • (1) average historical and
    • (2) perfectly-followed reference harvest policy;
    • Reality likely somewhere in-between
Sector specific PSC limits under Alternatives
### Table 6-8
Comparison of sector allocation of Pacific halibut PSC limits (t) by alternative for median values of the projection simulations to 2024 (top section) and 2030 (bottom section)

<table>
<thead>
<tr>
<th>Sector Allocation</th>
<th>2024</th>
<th></th>
<th></th>
<th></th>
<th>2030</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A80</td>
<td>TLAS</td>
<td>CDQ</td>
<td>Trawl Total</td>
<td>Cod</td>
<td>Other</td>
<td>NT Total</td>
<td></td>
</tr>
<tr>
<td>Status quo limit</td>
<td>1,745</td>
<td>745</td>
<td>315</td>
<td>2,805</td>
<td>661</td>
<td>49</td>
<td>710</td>
<td></td>
</tr>
<tr>
<td>Avg. usage (2016-18)</td>
<td>1,307</td>
<td>431</td>
<td>153</td>
<td>1,892</td>
<td>476</td>
<td>35</td>
<td>511</td>
<td></td>
</tr>
<tr>
<td><strong>Trawl</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternative 1</td>
<td>1,745</td>
<td>745</td>
<td>315</td>
<td>2,805</td>
<td>661</td>
<td>49</td>
<td>710</td>
<td></td>
</tr>
<tr>
<td>Alternative 2.1</td>
<td>2,080</td>
<td>890</td>
<td>371</td>
<td>3,341</td>
<td>473</td>
<td>35</td>
<td>508</td>
<td></td>
</tr>
<tr>
<td>Alternative 2.1a</td>
<td>2,116</td>
<td>905</td>
<td>379</td>
<td>3,398</td>
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| Non-trawl (NT) | | | | | | | | |
| | A80 | TLAS | CDQ | Trawl limit | Cod | Other | NT limit |
| Status quo limit | 93.1% | 6.9% | 100% | 661 | 49 | 710 |
| Avg. usage (2016-18) | 92% | 8% | 100% | 476 | 35 | 511 |
| **Alternative 1** | 93.1% | 6.9% | 100% | 661 | 49 | 710 |
| **Alternative 2.1** | 93.1% | 6.9% | 100% | 661 | 49 | 710 |
| **Alternative 2.1a** | 93.1% | 6.9% | 100% | 661 | 49 | 710 |
| **Alternative 2.1b** | 93.1% | 6.9% | 100% | 661 | 49 | 710 |
| **Alternative 2.2** | 93.1% | 6.9% | 100% | 661 | 49 | 710 |
| **Alternative 2.3** | 93.1% | 6.9% | 100% | 661 | 49 | 710 |
| **Alternative 2.4** | 93.1% | 6.9% | 100% | 661 | 49 | 710 |
| **Alternative 3.1** | 93.1% | 6.9% | 100% | 661 | 49 | 710 |
| **Alternative 3.1a** | 93.1% | 6.9% | 100% | 661 | 49 | 710 |
| **Alternative 3.1b** | 93.1% | 6.9% | 100% | 661 | 49 | 710 |
| **Alternative 3.1c** | 93.1% | 6.9% | 100% | 661 | 49 | 710 |
| **Alternative 3.1d** | 93.1% | 6.9% | 100% | 661 | 49 | 710 |
| **Alternative 3.2a** | 93.1% | 6.9% | 100% | 661 | 49 | 710 |
| **Alternative 3.2b** | 93.1% | 6.9% | 100% | 661 | 49 | 710 |
| **Alternative 3.3a update** | 93.1% | 6.9% | 100% | 661 | 49 | 710 |
| **Alternative 3.3b update** | 93.1% | 6.9% | 100% | 661 | 49 | 710 |

Notes:
- *The 2016-2018 average usage for non-trawl includes both the HALCP and HALCV sectors. Error! Reference source not found.*
- Error! Reference source not found.
- Through not shown in this table, the non-trawl Pacific cod fishery PSC limit (status quo = 661 t) is further divided through harvest specifications between non-trawl CPs (status quo = 648 t) and non-trawl CVs (status quo = 13 t).
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<th>TLAS</th>
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<th>Trawl Total (100%)</th>
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<td>Less than Avg. usage (2016-18)</td>
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Performance metrics relative to Council objectives
Overall performance metrics: Evaluate how alternatives meet Council’s objectives

- Halibut PSC limits should be indexed to halibut abundance
- There should be flexibility provided to avoid unnecessarily constraining the groundfish fishery particularly when halibut abundance is high
- Provide for some stability in PSC limits on an inter-annual basis.
- Provide for directed halibut fishing operations in the Bering Sea.
- Halibut spawning stock biomass should be protected especially at lower levels of abundance
General trends summarized for 20 year simulations

Detailed results are contained in Table 6-2 through Table 6-4.
General results

- PSC and directed halibut fishery catch are most sensitive to the starting point value.
- The additional constraint of Element 6 = slow trajectory to low starting point values when starting at the 2018 value.
- Floors and ceilings further dampen variability
  - some of the Alternatives result in control rules which are stuck on floors and ceilings.
**General results (ctd.)**

- Most trawl and non-trawl PSC limits are highly correlated with the indices that were used as the primary index for those limits.
  - Where PSC limits do not track abundance closely due to additional constraints that limit variability
- Impacts to spawning stock biomass (SSB) in the BSAI is minimal across all alternatives
- SSB does decline when very high PSC levels (10,000 t)
- Limited impact on the overall performance from the addition of a secondary index but adds variability in PSC limits and usage.
- Features of the control rules are more influential than combining two indices under the current trajectory of SSB simulated.
General results (ctd.)

• Trade-off between PSC usage and halibut fishery catch
  • mortality limit of over 26” (O26) halibut (TCEY) is composed of halibut fishery catch and O26 PSC usage.

• Halibut fishery catch limits are reduced from 2018 levels due to declines in the SSB trajectory.

• Different model validation scenario with increase in SSB may show an increase in halibut fishery catch relative to 2018 levels.
• Non-Trawl PSC limits for 2024 and 2030 are reduced from current limits
  • reductions from current PSC limits, not represent reductions from recent PSC use.
• Trawl fishery receives reductions in PSC limits under 7 of the 15 calculated alternatives
• The 2030 non-trawl PSC limits are generally larger than those in 2024
  • spawning biomass (and thus the setline trend) stabilizes in the BSAI and show a very slight increase between 2025 and 2030.
Key discussions and decision points for the Council meeting:

- Review the suite of Alternatives and provide any revisions as desirable. Key considerations include:
  - Do these Alternatives as currently constructed meet the intent of the Council’s action?
  - Could complexity and redundancy be reduced and still address the Council’s intent?
- Review the halibut simulation model, including analytical assumptions and application for purposes of informing the Council’s policy decisions for this analysis.
- Review the suite of draft performance metrics and revise as needed. Revised performance metrics may better characterize results across alternatives to indicate where they address conflicting Council objectives.
Additional questions?
Results of simulation modeling (Appendix)
Figure A3-2. The BSAI sub-model (thick blue line) conditioned to fit to the observed BTS biomass index (red dots). Vertical lines show 95% asymptotic intervals about the observed BTS biomass index point estimates.
Figure A3-3. The BSAI sub-model conditioned to fit the available yearly BTS age composition data (data are shown as the multi-color frequency histogram, model fits to data are indicated by black dots and line).