The 2012 Halibut Stock Assessment

The Good:
1) Major improvements in the stock assessment:
   - Retrospective bias has been addressed
   - Forecast methods extend recent trends in size
   - Uncertainty included via decision-making table
2) Small increase in 2012 coastwide survey WPUE
3) Stock trend estimated to be relatively stable

The Bad:
1) Stock estimates substantially smaller than those from the biased 2011 assessment
2) 2013 Blue line (current harvest policy) CEYs were ~30% less than the estimated 2012 values.
Recent trends

- **Total catch limit**
- **Assessment estimate**
- **Fishery catch-rate**
- **Survey catch-rate**

Graph showing trends in WPUE or CEY (millions net lb) vs. years from 1996 to 2012.
Historical weight-at-age

Year (1926 to 2011)
Retrospective among recent assessments

![Graph showing spawning biomass over years with arrows indicating significant changes in 2006, 2008, 2010, and 2012.](image)
Retrospective: Solution

![Graph showing spawning biomass (millions net lb) from 1995 to 2010. The graph includes lines for different retrospective periods: Time-varying availability, 1-yr retrospective, 2-yr retrospective, 3-yr retrospective, 4-yr retrospective, and 5-yr retrospective.]
Results: Recruitment

![Graph showing recruitment data over different years.](slide7.png)
Survey: Weight-per-unit-effort (WPUE) index
Results: Comparison to the 2011 model
(Data through 2012)
## Results: Bridging analysis

<table>
<thead>
<tr>
<th>Model</th>
<th>2011 (&quot;wobblesq&quot;)</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>End year</strong></td>
<td>2011</td>
<td>2011</td>
</tr>
<tr>
<td><strong>Data finalized in:</strong></td>
<td>Nov-11</td>
<td>Nov-12</td>
</tr>
<tr>
<td><strong>Quantity</strong> (Biomass in millions lb)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2012 Spawning biomass</td>
<td>319</td>
<td>309</td>
</tr>
<tr>
<td>2012 Relative spawning biomass</td>
<td>42%</td>
<td>41%</td>
</tr>
<tr>
<td>2013 Spawning biomass</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>2013 Relative spawning biomass</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>2012 Exploitable biomass</td>
<td>260</td>
<td>252</td>
</tr>
<tr>
<td>2013 Exploitable biomass</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>2012 Coastwide harvest rate</td>
<td>19.4%</td>
<td>18.9%</td>
</tr>
</tbody>
</table>

(Biomass in millions lb)
Results:

Spawned Biomass (SB) relative to reference levels

SB100% (573 million net lb)

Threshold stock size (172 million net lb)

Minimum stock size (115 million net lb)

Year

2000  2005  2010

35%
### Extended decision-making table

<table>
<thead>
<tr>
<th>Effective coastwide harvest rate</th>
<th>Stock status</th>
<th>Stock trend</th>
<th>Catch trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fishing intensity</td>
<td></td>
<td></td>
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<tr>
<td>Coastwide</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Effective coastwide HR</td>
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<td></td>
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<tr>
<td>2013</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>No removals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0 (0.0)</td>
<td>0%</td>
<td>25%</td>
<td>1%</td>
</tr>
<tr>
<td>0.0 (16.5)</td>
<td>&lt;1%</td>
<td>25%</td>
<td>1%</td>
</tr>
<tr>
<td>3.4 (20.0)</td>
<td>&lt;1%</td>
<td>25%</td>
<td>1%</td>
</tr>
<tr>
<td>12.9 (30.0)</td>
<td>1%</td>
<td>25%</td>
<td>1%</td>
</tr>
<tr>
<td>17.7 (35.0)</td>
<td>23%</td>
<td>25%</td>
<td>1%</td>
</tr>
<tr>
<td>Blue Line</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>22.7 (40.2)</td>
<td>50%</td>
<td>&lt;1%</td>
<td>2%</td>
</tr>
<tr>
<td>27.3 (45.0)</td>
<td>75%</td>
<td>25%</td>
<td>1%</td>
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<tr>
<td>28.1 (45.9)</td>
<td>76%</td>
<td>25%</td>
<td>1%</td>
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<td>Midpoint: 2012 Limit and Blue Line FCEY</td>
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<tr>
<td>29.9 (47.7)</td>
<td>78%</td>
<td>25%</td>
<td>1%</td>
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<tr>
<td>One-third increment: 2012 and Blue Line</td>
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<tr>
<td>31.0 (48.9)</td>
<td>81%</td>
<td>&lt;1%</td>
<td>3%</td>
</tr>
<tr>
<td>32.1 (50.0)</td>
<td>84%</td>
<td>&lt;1%</td>
<td>3%</td>
</tr>
<tr>
<td>33.5 (51.5)</td>
<td>90%</td>
<td>&lt;1%</td>
<td>3%</td>
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<tr>
<td>2011 Model x HR</td>
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<tr>
<td>36.2 (54.3)</td>
<td>97%</td>
<td>&lt;1%</td>
<td>4%</td>
</tr>
<tr>
<td>41.6 (60.0)</td>
<td>&gt;99%</td>
<td>&lt;1%</td>
<td>4%</td>
</tr>
</tbody>
</table>

#### Stock status
- **is greater than target**
- **is less than 20%**
- **is less than 30%**
- **is less than 2013**
- **is less than 2013**
- **is less than 2013**
- **is less than 2013**
- **is less than 2013**

#### Catch trend
- **Effective coastwide harvest rate**
- **No removals**
- **FCEY = 0**
- **Blue Line**
- **Midpoint: 2012 Limit and Blue Line FCEY**
- **One-third increment: 2012 and Blue Line**

#### Stock trend
- **Spawning biomass**
- **Fishery CEY**

#### Catch limits
- **2013 adopted catch limits**
- **2012 Catch limit**
- **2011 Model x HR**

#### Milestones
- **2013 adopted catch limits**
- **2012 Catch limit**
- **2011 Model x HR**
## Adopted Catch Limit Apportionment

<table>
<thead>
<tr>
<th></th>
<th>2A</th>
<th>2B</th>
<th>2C</th>
<th>3A</th>
<th>3B</th>
<th>4A</th>
<th>4B</th>
<th>4CDE</th>
<th>Total</th>
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<tr>
<td>Exploitable biomass</td>
<td>3.81</td>
<td>24.54</td>
<td>23.28</td>
<td>70.38</td>
<td>26.02</td>
<td>11.97</td>
<td>6.75</td>
<td>19.74</td>
<td>186.49</td>
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<tr>
<td>Percent of total</td>
<td>2.0%</td>
<td>13.2%</td>
<td>12.5%</td>
<td>37.7%</td>
<td>14.0%</td>
<td>6.4%</td>
<td>3.6%</td>
<td>10.6%</td>
<td>100.0</td>
</tr>
<tr>
<td>Harvest rate (%)</td>
<td>29.0%</td>
<td>31.7%</td>
<td>21.6%</td>
<td>24.2%</td>
<td>22.6%</td>
<td>20.3%</td>
<td>28.6%</td>
<td>21.7%</td>
<td>24.4%</td>
</tr>
<tr>
<td>Total CEY</td>
<td>1.11</td>
<td>7.78</td>
<td>5.02</td>
<td>17.07</td>
<td>5.87</td>
<td>2.43</td>
<td>1.93</td>
<td>4.28</td>
<td>45.48</td>
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<tr>
<td>Other removals (O26)</td>
<td>0.11</td>
<td>0.73</td>
<td>2.05</td>
<td>6.04</td>
<td>1.58</td>
<td>1.10</td>
<td>0.48</td>
<td>2.35</td>
<td>14.45</td>
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<tr>
<td>Catch Limits</td>
<td>0.99</td>
<td>7.04</td>
<td>2.97</td>
<td>11.03</td>
<td>4.29</td>
<td>1.33</td>
<td>1.45</td>
<td>1.93</td>
<td>31.03</td>
</tr>
</tbody>
</table>
Results:
Realized and projected Harvest Rates (HRs)
Summary

1) 2012 model:
   - Fixing the retrospective bias means more reliable results
   - The assessment is now consistent with observed trends in abundance

2) 2012 results:
   - Stock trend estimated to be relatively stable
   - Below average recent recruitment
   - Continued poor size-at-age

3) 2013 Adopted coastwide catch limit 7.5% less than in 2012
IPHC Annual Meeting Decisions and Future Directions

• Seasons and regulations
• Future directions
  – Stock assessment
  – Harvest policy evaluation
  – Management Strategy Evaluation and Management Strategy Advisory Board (MSAB)
  – Scientific Review Board (SRB)
  – Bycatch Project Team
  – Survey – South of Humbug Mtn 2013
Management Measures

Fishing periods and catch sharing

- Commission adopted March 23 - November 7 for quota share fisheries.
- Area 2A commercial and treaty Indian fisheries should fall within adopted season.
- In 2A, a series of 10-h periods for the directed fishery starting June 26, at two-week intervals.
- Endorsed Management Councils’ catch sharing plans for Areas 2A and 4CDE.
- Endorsed combined commercial/recreational catch limit for Area 2B which will be allocated to sector by DFO.
Stock assessment

• Over the next year+ Dr. Stewart will be examining alternative ways of assessing the stock, using different assumptions about stock behaviour
• Will examine coastwide, implicit spatial, and explicit spatial methods
• Explore alternative selectivity functions
• Integrate other survey information and more historical data
Harvest policy evaluation

• Dr. Martell will be reviewing over the next year
• In conjunction with MSE process
• Will examine alternative assumptions about stock distribution, movement, and dynamics
• Continue to examine issues of size limits and control rules
• Size at age research continuing
Management Strategy Advisory Board (MSAB)

- Management Strategy Evaluation (MSE) aims to evaluate candidate management procedures against a realistic background model of stock and fishery behaviour.
- Identifying the candidate procedures and management objectives is a very important part of MSE.
- The MSAB will help the staff in this identification and testing them against the objectives.
- Relatively small group (~15) needed to commit to a process over about two years.
- Expenses will be paid by the Commission.
- Accepting nominations until March 15; finalize by end of March.
Scientific Review Board (SRB)

• Technical team made up of experts to act as peer reviewers of Commission science
• Fixed, staggered terms
• Advises Commission on staff scientific results, research plans, and management
• Will be permanent part of IPHC process
Bycatch

• Commission’s Bycatch Project Team will continue its work on:
  - Quantifying bycatch
  - Documenting impacts of bycatch on the fishery and the resource
  - Exploring options to mitigate impacts
  - Identifying options to reduce bycatch

• A progress report and implementation plan from the Project Team is anticipated by mid-summer 2013
2013 Survey extension into northern California
Questions?
Extra Slides
Historical perspective on removals

Total removals (all sources; million net lb)


64.0 million lb
Retrospective: Solution

![Graph showing Age-6 recruits (millions) from 1995 to 2010, comparing 2011 Model and Time-varying availability.]
Exploitable Biomass
(based on apportioned coastwide estimated biomass)

Harvest rates
**Terms: Harvest policy**

Harvest Rate (HR) - fraction removed each year

Harvest rate targets - 21.5% (2A, 2B, 2C, 3A) or 16.125% (3B, 4A, 4B, 4CDE)

Effective coastwide harvest rate (ECHR) target -
Removals from areas-specific HRs compared to coastwide exploitable biomass

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**Diagram:**

1. **Coastwide assessment**
2. **Exploitable biomass estimate**
   - x 21.5%
   - x 16.125%
   - ... (Ellipses indicate additional calculations)
3. **Catch limit**
4. **Catch**

---

*Apportionment*

2013 IPHC Annual Meeting

BB p. 104
<table>
<thead>
<tr>
<th>Regulatory Area</th>
<th>2012 Catch Limit</th>
<th>Blue Line</th>
<th>CB (Millions of Pounds)</th>
<th>PAG Approved</th>
<th>IPHC Approved</th>
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</thead>
<tbody>
<tr>
<td>2A 1</td>
<td>0.989</td>
<td>0.71</td>
<td>0.99</td>
<td>0.90</td>
<td>0.99</td>
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<td>2B 1,2</td>
<td>7.038</td>
<td>4.58</td>
<td>7.04</td>
<td>6.22</td>
<td>7.04</td>
</tr>
<tr>
<td>2C 2</td>
<td>2.624</td>
<td>2.97</td>
<td>3.12</td>
<td>3.76</td>
<td>2.97</td>
</tr>
<tr>
<td>3A 2</td>
<td>11.918</td>
<td>9.24</td>
<td>11.03</td>
<td>9.24</td>
<td>11.03</td>
</tr>
<tr>
<td>3B</td>
<td>5.070</td>
<td>2.73</td>
<td>4.29</td>
<td>2.73</td>
<td>4.29</td>
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<tr>
<td>4A</td>
<td>1.567</td>
<td>0.85</td>
<td>1.33</td>
<td>1.33</td>
<td>1.33</td>
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<tr>
<td>4B</td>
<td>1.869</td>
<td>0.62</td>
<td>1.45</td>
<td>1.45</td>
<td>1.45</td>
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<td>4CDE 3</td>
<td>2.465</td>
<td>0.85</td>
<td>1.93</td>
<td>1.93</td>
<td>1.93</td>
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<tr>
<td>4C 4</td>
<td>1.690</td>
<td>0.358</td>
<td>0.859</td>
<td>0.859</td>
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<tr>
<td>4D 4</td>
<td>1.690</td>
<td>0.358</td>
<td>0.859</td>
<td>0.859</td>
<td>0.859</td>
</tr>
<tr>
<td>4E 4</td>
<td>0.340</td>
<td>0.135</td>
<td>0.212</td>
<td>0.212</td>
<td>0.212</td>
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<tr>
<td>Total</td>
<td>33.540</td>
<td>22.550</td>
<td>31.180</td>
<td>27.560</td>
<td>31.028</td>
</tr>
</tbody>
</table>

1 Combined sport and commercial allocation (2A includes tribal)  
2 Presumes adherence to sport management targets  
3 Allocation for combined Areas 4C, 4D, 4E  
4 NPFMC Plan: 4C, 4D: 46.43% of 80K less than 4CDE quota, 4E: 7.14% + 80K
Fishery limits (millions net lb)

<table>
<thead>
<tr>
<th>Year</th>
<th>2A</th>
<th>2B</th>
<th>2C</th>
<th>3A</th>
<th>3B</th>
<th>4A</th>
<th>4B</th>
<th>4CDE</th>
<th>Total</th>
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<tbody>
<tr>
<td>2012</td>
<td>0.99</td>
<td>7.04</td>
<td>2.62</td>
<td>11.92</td>
<td>5.07</td>
<td>1.57</td>
<td>1.87</td>
<td>2.47</td>
<td>33.54</td>
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<tr>
<td>2013</td>
<td>0.99</td>
<td>7.04</td>
<td>2.97</td>
<td>11.03</td>
<td>4.29</td>
<td>1.33</td>
<td>1.45</td>
<td>1.93</td>
<td>31.03</td>
</tr>
</tbody>
</table>

Recreational catches included
Charter catches based on Guideline Harvest Levels (GHLs)
- No change from 2012 -
Area 2A allocations

Area 2A Allocations

- Sport Puget Sound
- Tribal C&S
- Tribal Commercial
- Sport WA North Coast
- Sport WA South Coast
- Sport Columbia River
- Sport OR Central Coast
- Non-Tribal Incidental
- Salmon Troll
- Non-Tribal Commercial Directed
- Sport South of Humbug Mtn.
IPHC Assessment Survey

• A systematic, standardized design initiated in 1998
  – 10 x 10 nm grid
  – ~1,250 stations fished annually
  – 20-275 fathoms
  – Coastwide, northern Bering Sea to the OR/CA border (currently)

• Standard gear configuration is used in all areas
  – 6-8 skates of fixed-hook setline gear
  – 18-ft spacing, 100 hooks/skate, 16/0 (#3) circle hooks

• Fixed setting and hauling schedules; standardized bait

• IPHC charters commercial longline vessels, placing 1-3 staff on board to sample the catch

• Results used for stock assessment and biomass apportionment
## Northern California Stations (15)

<table>
<thead>
<tr>
<th>Station Number</th>
<th>Stat Area</th>
<th>North Latitude</th>
<th>West Longitude</th>
<th>Depth (F)</th>
<th>Purpose Code</th>
<th>ADFG Area</th>
<th>Date Fished</th>
<th>Skates Hauled</th>
<th>Halibut (lbs)</th>
<th>Halibut (Pcs)</th>
<th>Bycatch (Pcs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>951</td>
<td>6</td>
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<td>124° 27'</td>
<td>254</td>
<td>SG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
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<td>40° 20'</td>
<td>124° 27'</td>
<td>57</td>
<td>SG</td>
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<td>124° 14'</td>
<td>27</td>
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<td>963</td>
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<td>124° 27'</td>
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<td>SG</td>
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<td></td>
<td></td>
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</tr>
</tbody>
</table>

If station is shallower than 20 fm do not fish.

New!