

## **History and context**

- This discussion paper was requested by the IPHC's Commissioners to explore approaches to accounting for and managing all Pacific halibut removals
- The full document contains considerable detail on historical and current regulatory actions relating to bycatch, wastage, and mortality estimates for sub-legal halibut

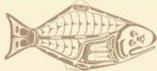


## What is the issue?

- Unlike other fisheries in the north Pacific:
  - The IPHC's current harvest policy does not explicitly include mortality of fish less than 26 inches in length

This leads to questions:

- What is the total mortality and how does it compare to the portion included in the harvest policy?
- How do changes in the mortality of fish less than 26 inches effect current and future stock dynamics?



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## Extended accounting in two parts

- 1) Delineating and reporting all the removals
- 2) Evaluating U26 mortality directly in the annual calculations



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## Recent mortality (Mlb)

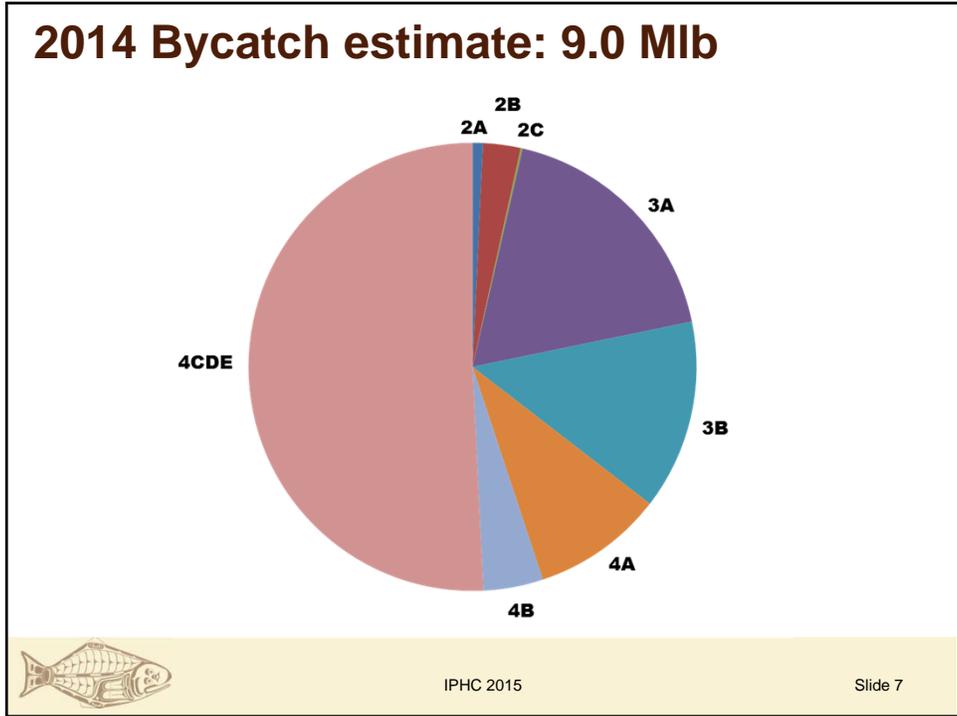
Year	Landings	Wastage	Sport	Pers./ Sub.	Bycatch	Total
2010	49.72	3.21	7.85	1.24	10.30	72.36
2011	39.51	2.46	7.10	1.14	9.42	59.64
2012	31.99	1.67	6.77	1.14	10.10	51.67
2013	29.04	1.43	7.59	1.14	8.84	48.04
2014	23.69	1.29	7.08	1.14	9.00	42.19
	(56%)	(3%)	(17%)	(3%)	(21%)	



## U26 removals: Bycatch and wastage

- Bycatch includes all non-target fisheries (fixed-gear and trawl)
  - **8.8 to 10.3 Mlb** in the last five years, **~36% U26**
- Wastage includes sublegal release mortality, mortality from lost gear, and regulatory discards (2A)
  - **1.3 to 3.2 Mlb** in the last five years, **~6% U26**





### Full removals accounting: 2014 adopted

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
<b>Q26 Non-FCEY</b>									
Comm. wastage	0.03	0.20	NA	NA	0.24	0.05	0.03	0.04	0.58
Bycatch	0.12	0.19	0.01	0.93	0.62	0.63	0.32	2.23	5.05
Sport (+ wastage)	NA	NA	0.90	1.44	0.02	0.03	0.00	0.00	2.39
Pers./Subs.	NA	0.41	0.40	0.25	0.02	0.01	0.00	0.03	1.11
<b>Total Non-FCEY</b>	<b>0.15</b>	<b>0.79</b>	<b>1.31</b>	<b>2.63</b>	<b>0.90</b>	<b>0.71</b>	<b>0.35</b>	<b>2.29</b>	<b>9.13</b>
<b>Q26 FCEY</b>									
Comm. wastage	NA	NA	0.08	0.33	NA	NA	NA	NA	0.41
CSP Sport (+wastage)	0.42	0.84	0.76	1.78	NA	NA	NA	NA	3.80
Pers./Subs.	0.03	NA	NA	NA	NA	NA	NA	NA	0.03
Comm. Landings	0.51	6.01	3.32	7.32	2.84	0.85	1.14	1.29	23.28
<b>Total FCEY</b>	<b>0.96</b>	<b>6.85</b>	<b>4.16</b>	<b>9.43</b>	<b>2.84</b>	<b>0.85</b>	<b>1.14</b>	<b>1.29</b>	<b>27.52</b>
<b>TCEY</b>	<b>1.11</b>	<b>7.64</b>	<b>5.47</b>	<b>12.06</b>	<b>3.74</b>	<b>1.56</b>	<b>1.49</b>	<b>3.58</b>	<b>36.65</b>


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## How is the mortality of U26 fish treated?

- Included in the coastwide stock assessment, but not in the catch tables.
  - The implication is that these fish are lost from the coastwide productivity, rather than the area-specific biomass.

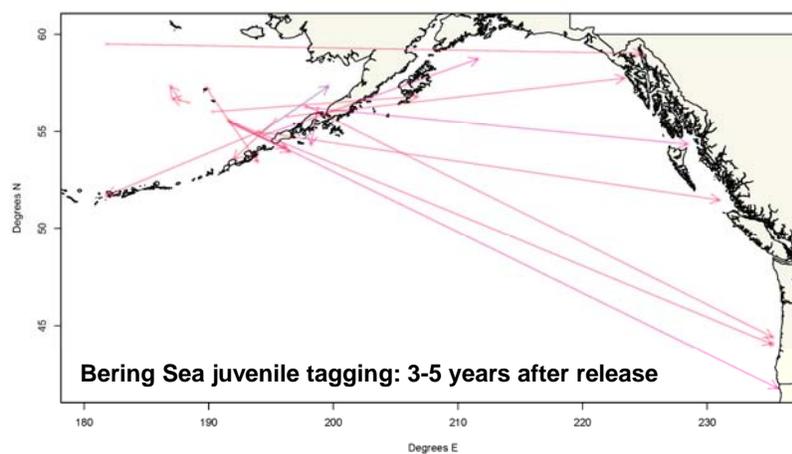
→They move.



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## Juvenile movement



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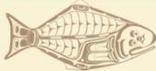
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## Current harvest policy

Problem: The original simulation analysis was conditioned on a fixed quantity of U26 removals.

Changes in the various fisheries result in different levels of O26 mortality.

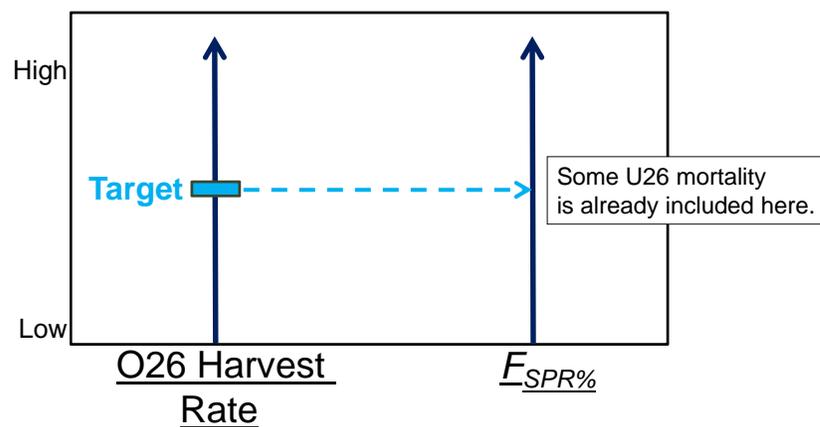
→ Achieving a constant harvest rate does not guarantee a constant level of fishing intensity on the stock.



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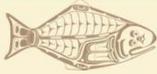
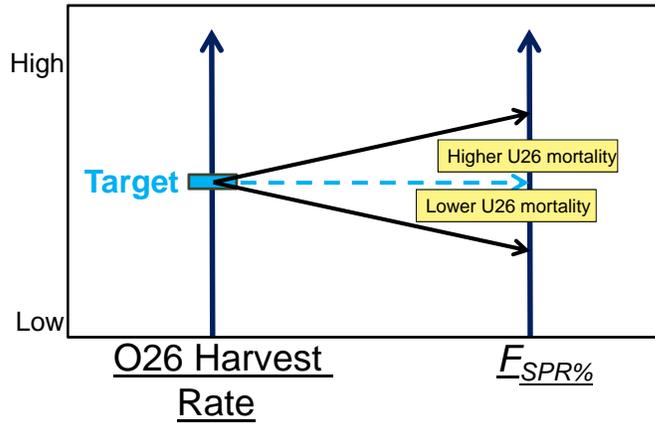
## Current harvest policy



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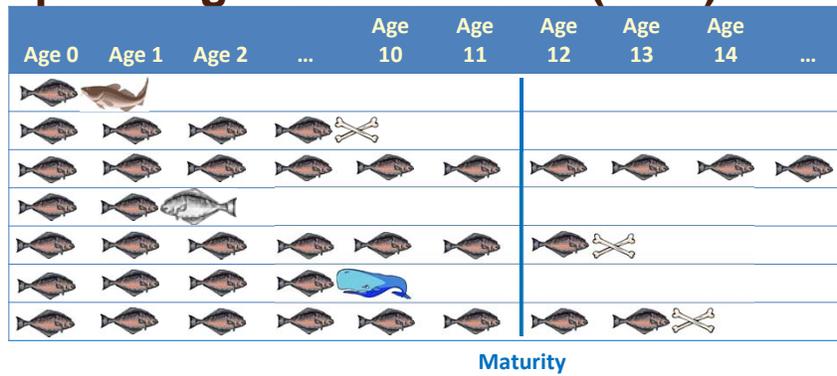
## Current harvest policy



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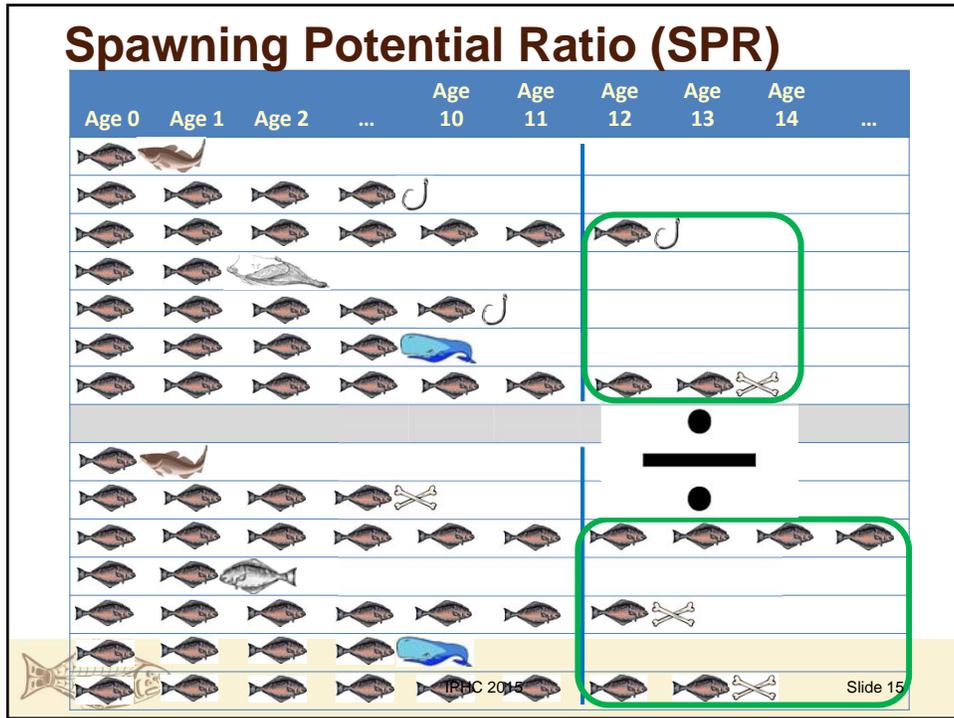
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## Spawning Potential Ratio (SPR)



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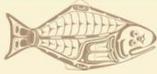
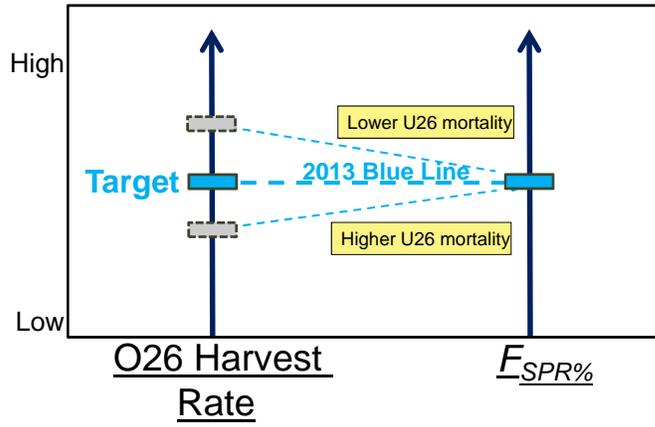


### Example

- Based on the 2013 assessment
- Uses change in bycatch vs. change in FCEY
  - Any other source of removal (e.g. wastage) could also be evaluated in the same manner



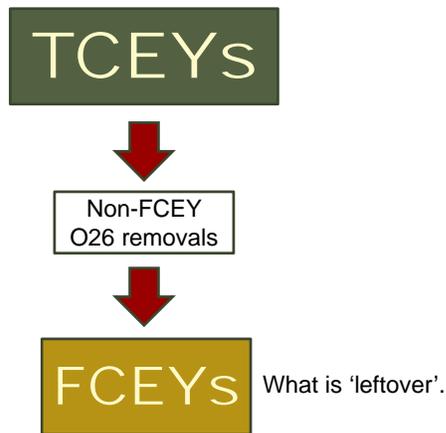
## Extended accounting



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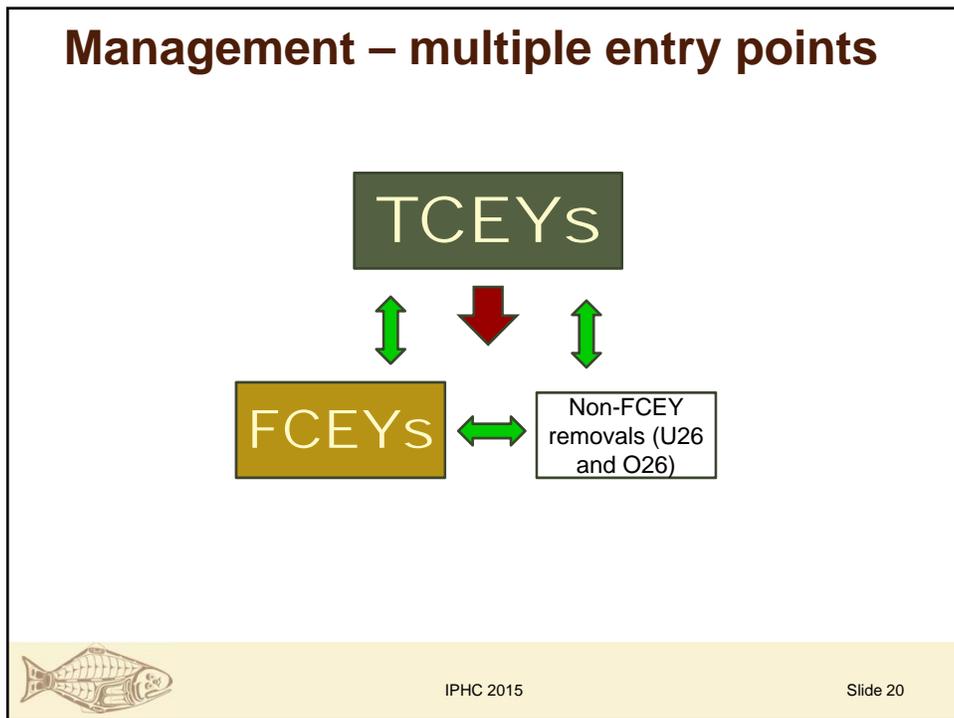
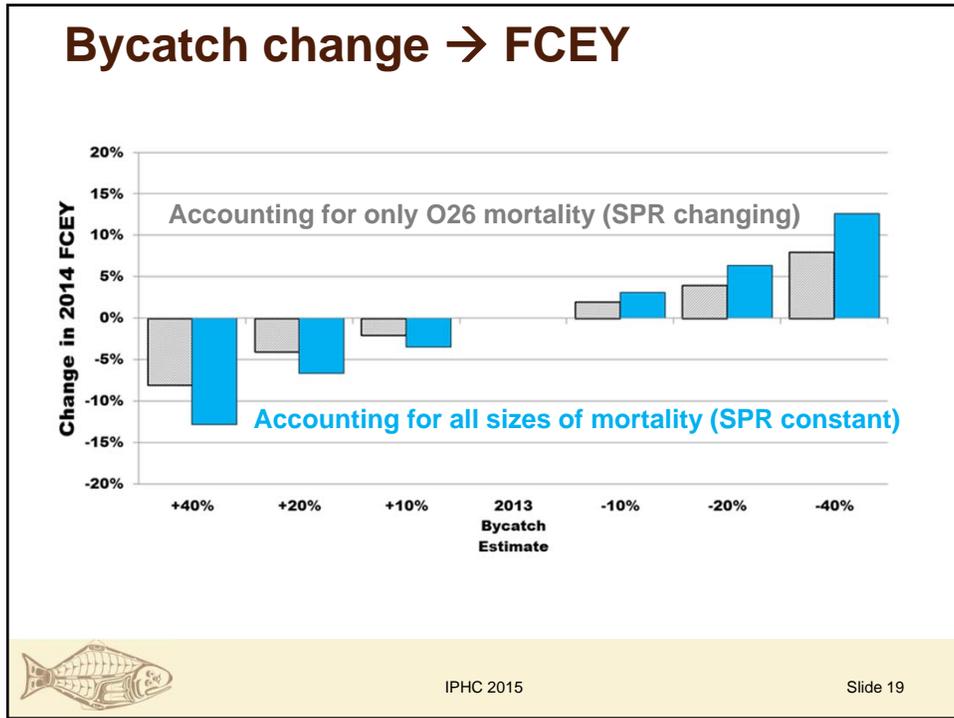
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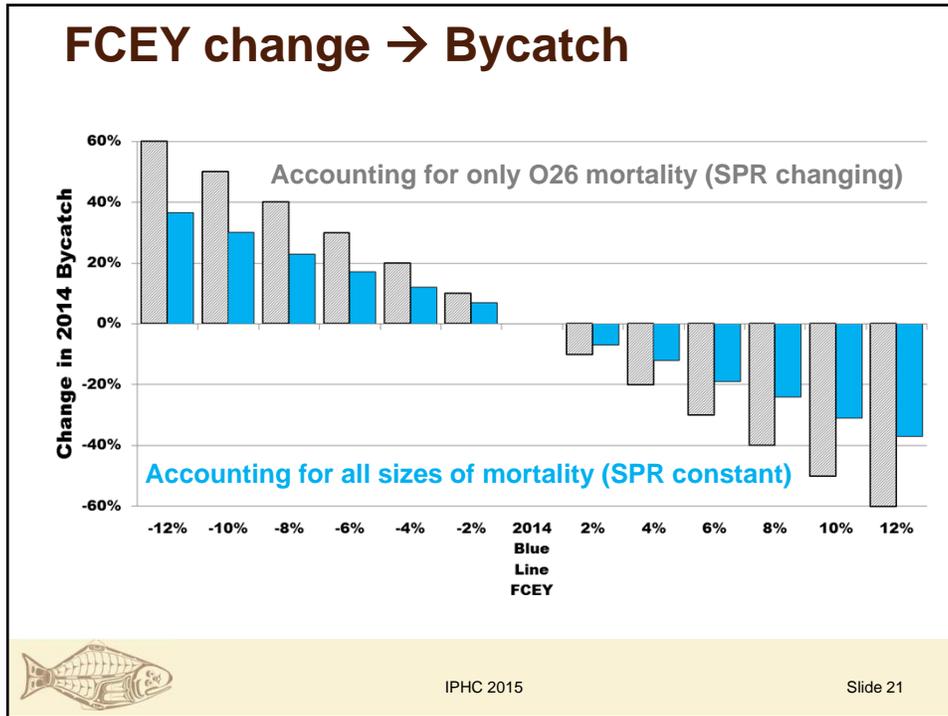
## Current harvest policy



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- ### Trade-offs
- O26 removals exchange directly (1:1), and effects are contained within regulatory areas
  - Bycatch (all sizes) and FCEY are exchangeable at ~pound-for-pound
    - As a percentage change, this is very important for 4CDE
    - Differs from some previous IPHC summaries because “savings” are still subject to fishing mortality
  - U26 effects are distributed across the stock (via the assessment) in proportion area-specific biomass (no change from the *status quo*)
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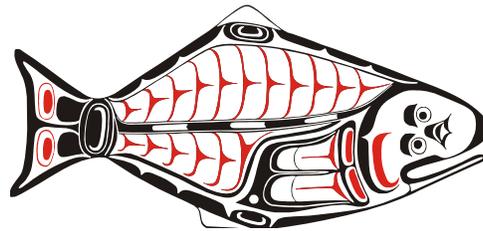
## Summary

- The current IPHC harvest policy lacks a framework for comparing all sources of removals during the annual process.
- This analysis provides a logical extension of previous policy evolution; the results are consistent with those from the last 20 years of research.
- Trade-offs among resource users can be directly evaluated.
- SPR also provides a metric for direct comparison with other fisheries and MSE analyses.



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