

Size limit evaluation

Agenda item: 4.0

(Paper: IPHC-2017-SRB11-07)



INTERNATIONAL PACIFIC
HALIBUT COMMISSION

Outline

- Background
- Scope
- Survey analysis
- Observer data
- Yield
- Summary



Background

- 1940: 5 lb MSL
- 1944: 26" MSL
- 1960s: YPR → 26" near-optimal age at entry
- 1973: 32" MSL
- 1974: Supported 32" if discard mortality rates low, DMRs above 25% suggested a lower MSL



Background

- 1995: YPR, SBPR → 32” MSL near optimal
- 1999: YPR → smaller MSL, SBPR → some decrease with smaller MSL; ‘reproductive refuge’ concept.
- 2012: Small reductions in MSL → small yield gain; however, $SBPR_{ratio}$ based on long-term conditions. Spatial dynamics important. ‘Management buffer’ introduced.
- 2015: Equilibrium models → higher yield for reduced MSL. DMRs, selectivity important.



Background

- Historical studies all focused on equilibrium yield rather than short-term yield
- Results have generally tracked size-at-age
- The perceived importance of discard mortality has increased over time
- *Reproductive refuge* and *management buffer* concepts are well documented benefits of an MSL



Reproductive refuge

- Reducing mortality of immature fish may provide for more spawning biomass for a given level of harvest
 - Requires a stock-recruitment relationship to provide a benefit
 - Also depends on fishing intensity, Control Rules, etc.



Management buffer

- Flatter yield curves
 - Errors in stock size and/or fishing intensity estimates have a smaller effect
- Also depends on Control Rules, fishing intensity, etc.



Scope - terms

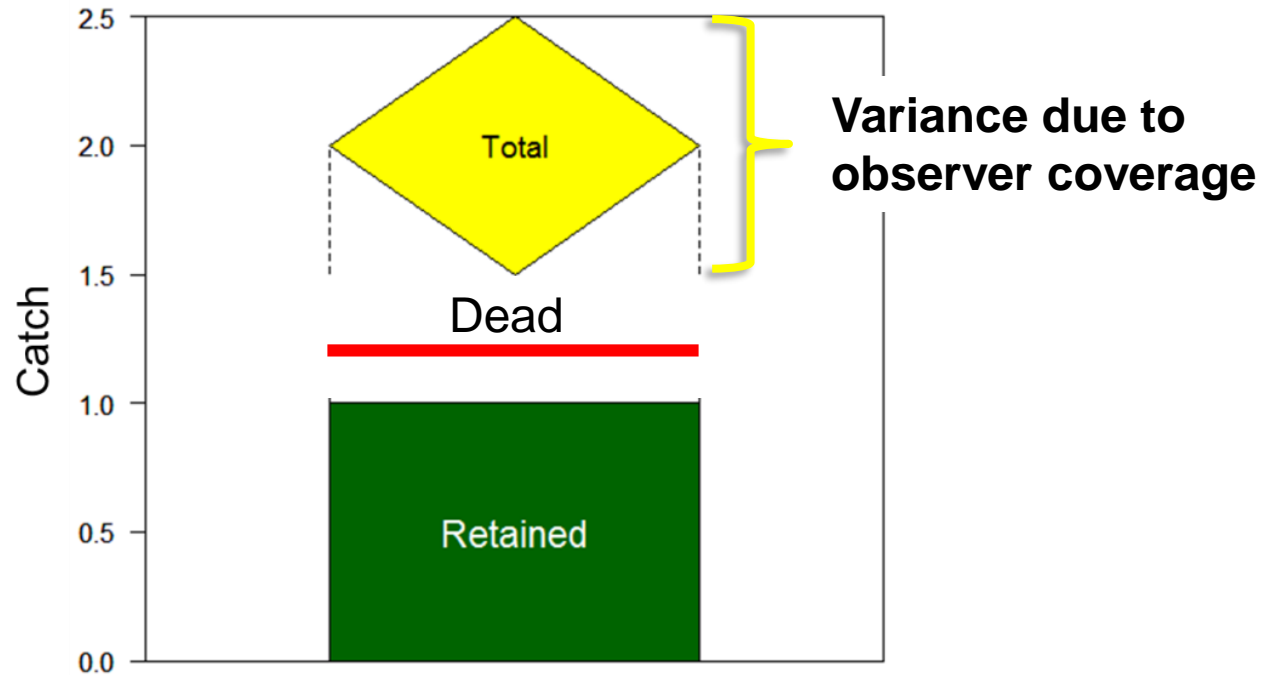
- Catch: All fish that were captured
- Retained catch: All fish landed
- Discards: All fish captured but not retained. Can be either *dead* or *surviving*.
- Mortality: Dead fish. Synonymous with removals.



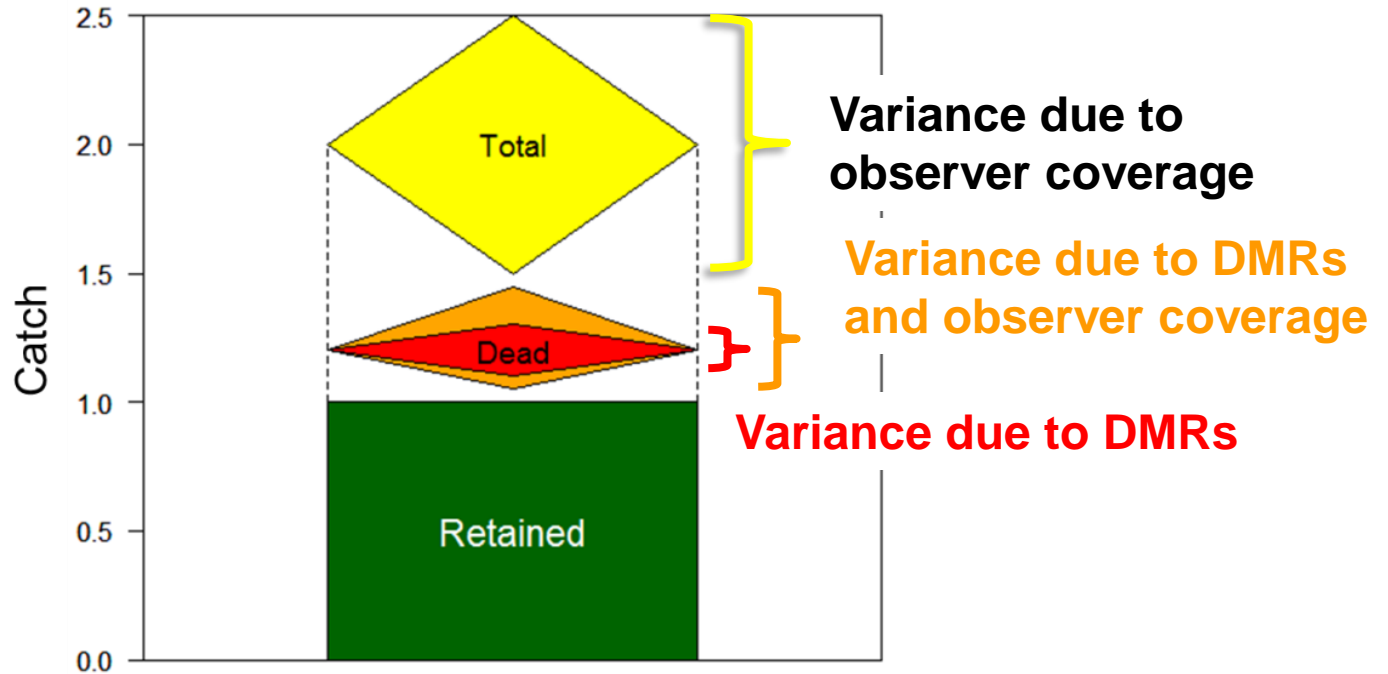
Scope - example



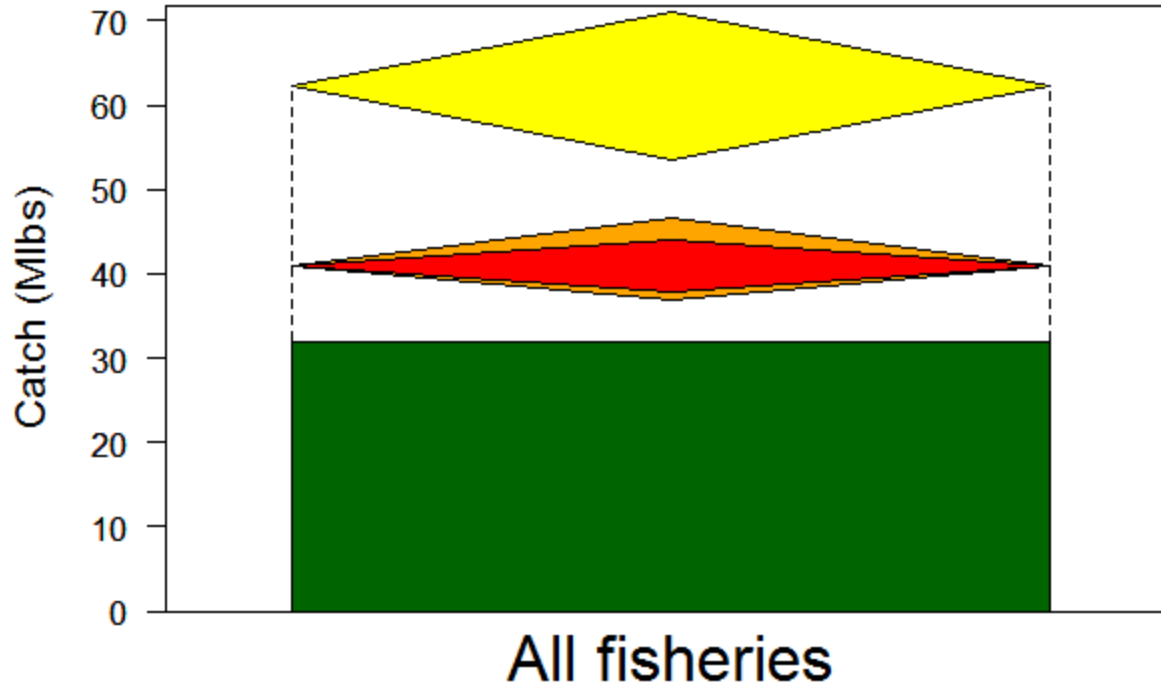
Scope - example



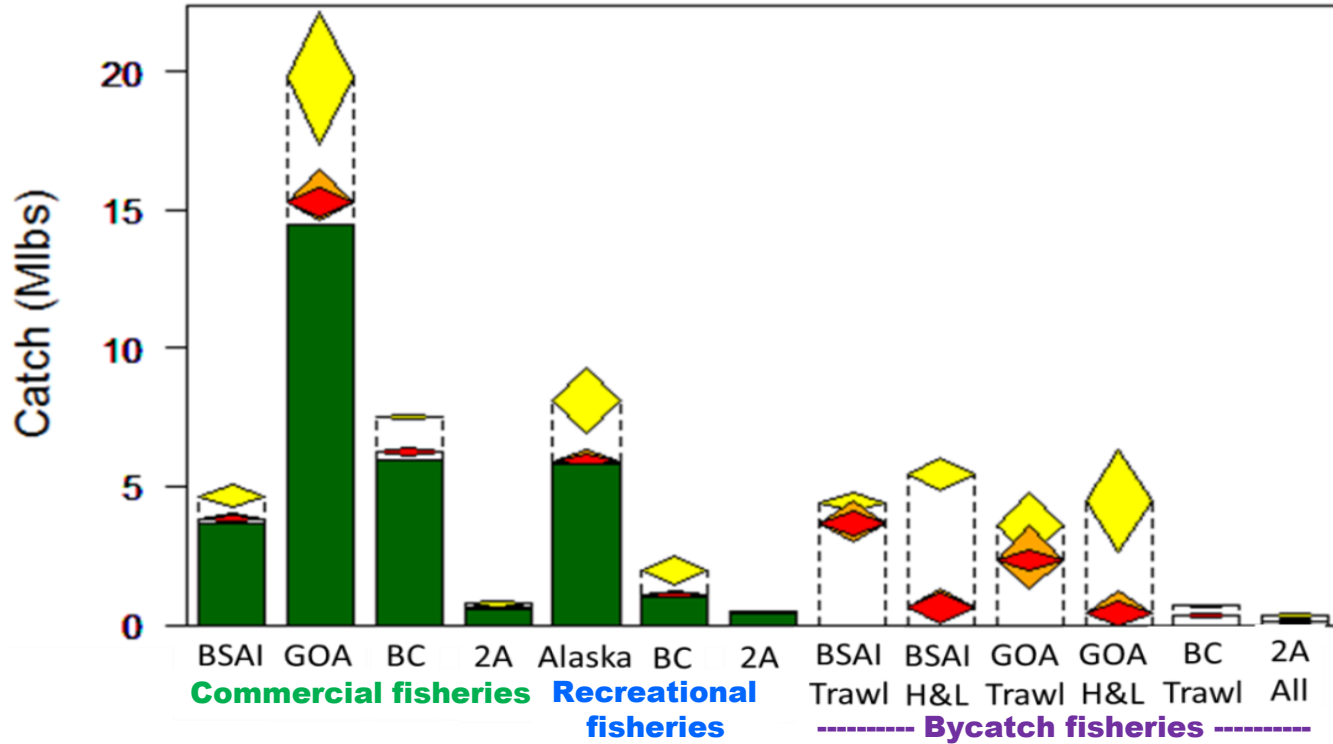
Scope - example



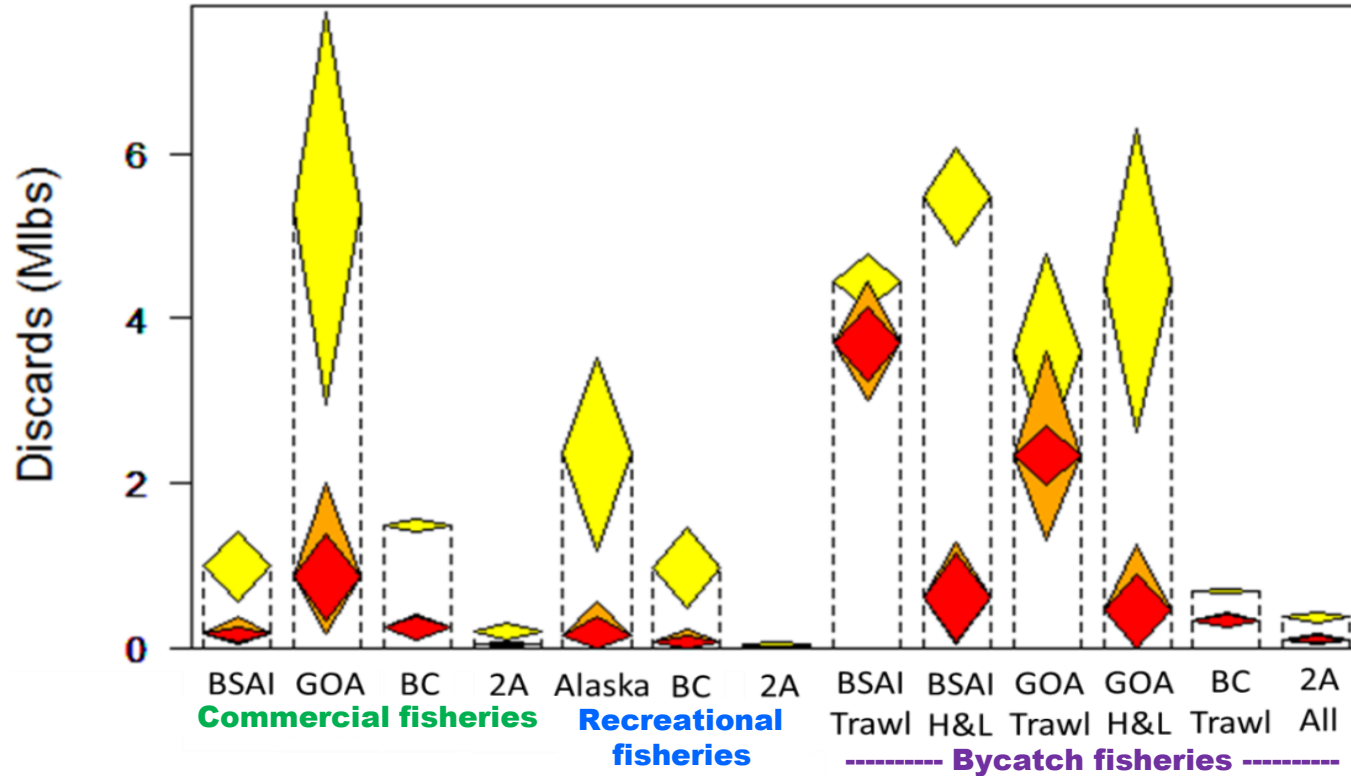
Scope – All catch



Scope – All catch



Scope - Discards



Scope

- Roughly 1 additional pound of halibut is handled for every pound landed
- Directed fisheries (commercial and sport) are handling a substantial quantity of Pacific halibut
- Commercial discard mortality is estimated to be 1.28 out of 8.97 M lb total discard mortality
 - This is generated mainly via the MSL



Survey data

- The fishery independent setline survey provides the broadest view of size structure across all areas
- It is only a proxy for the fishery which targets areas of high catch-rate, and operates over a much broader portion of the year
- Summarizing survey catch by size-category may still provide a useful population comparison

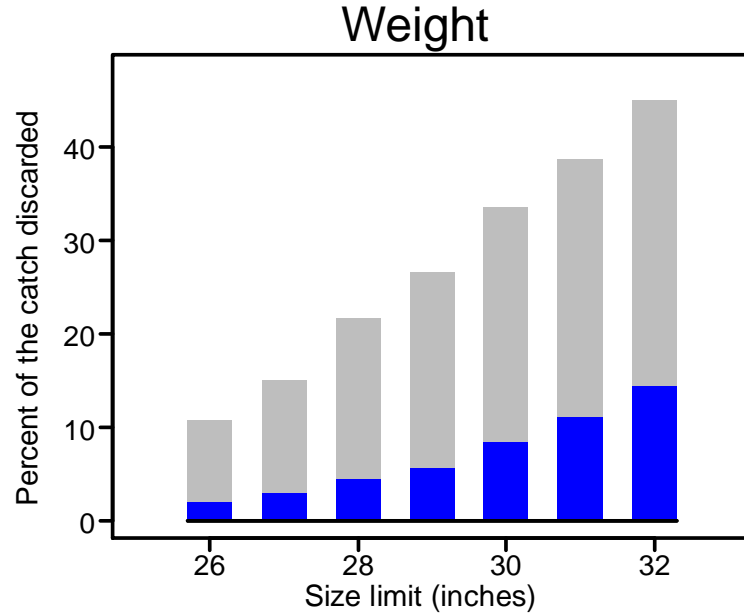
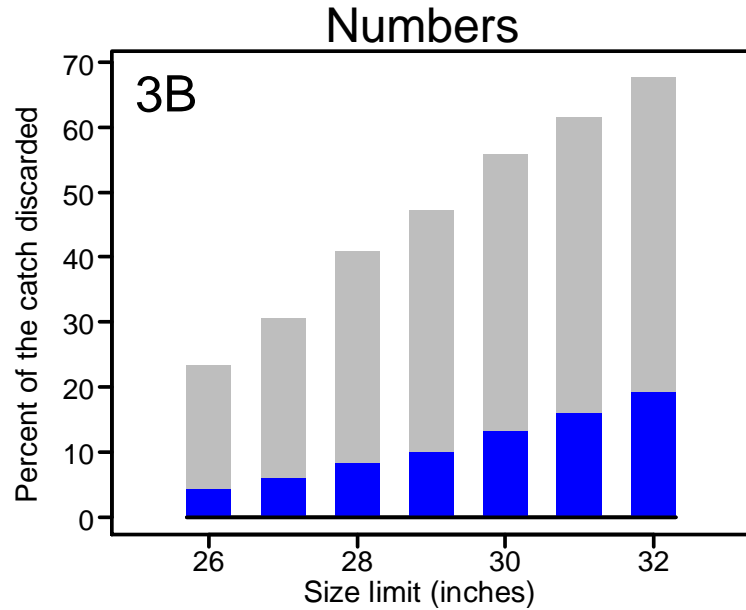


Survey – Catch (weight) discarded by MSL

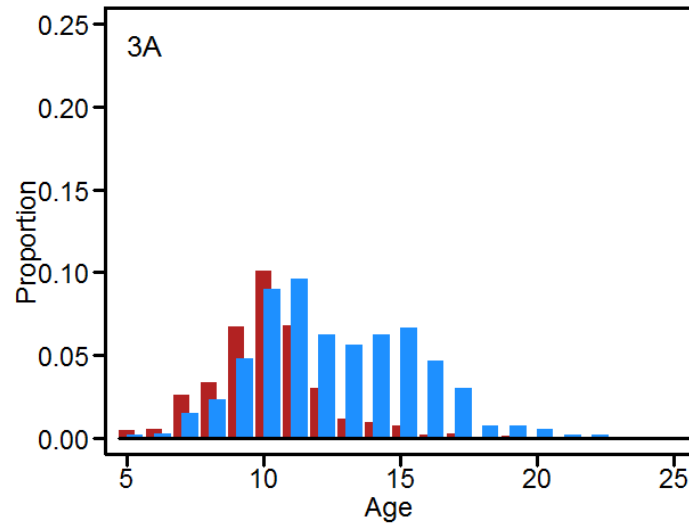
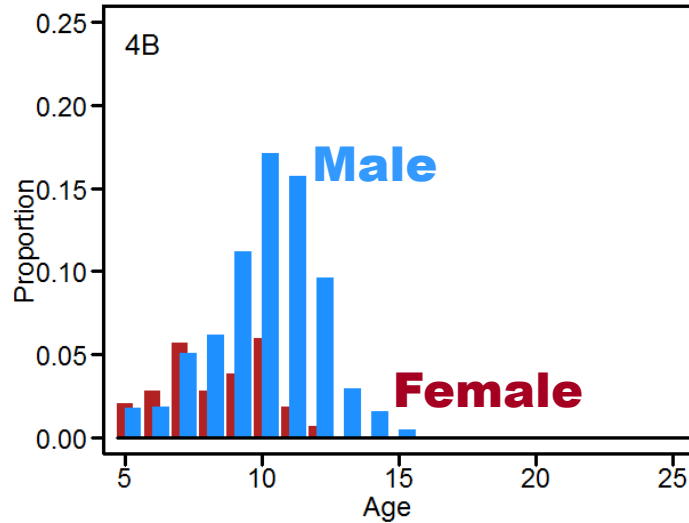
| | Size limit (inches) | | | | | | | |
|------|---------------------|------|------|------|------|------|------|---------|
| | 26 | 27 | 28 | 29 | 30 | 31 | 32 | |
| 2A | 0.3 | 0.9 | 3.0 | 5.1 | 10.4 | 13.9 | 20.4 | |
| 2B | 0.7 | 1.8 | 4.7 | 7.4 | 12.7 | 17.0 | 22.9 | |
| 2C | 0.6 | 1.2 | 2.8 | 4.2 | 6.8 | 9.4 | 13.5 | - 12.9% |
| 3A | 2.5 | 3.9 | 6.9 | 10.5 | 16.9 | 20.6 | 26.7 | |
| 3B | 10.7 | 15.0 | 21.7 | 26.5 | 33.6 | 38.7 | 45.0 | - 34.3% |
| 4A | 6.3 | 8.3 | 11.8 | 14.0 | 18.2 | 21.4 | 26.1 | |
| 4B | 2.5 | 4.0 | 7.4 | 10.4 | 16.4 | 20.7 | 26.0 | |
| 4CDE | 2.4 | 4.1 | 7.6 | 11.0 | 17.3 | 21.2 | 27.3 | |



Survey – Catch discarded by MSL



Age distributions of halibut <32”



(Figures and tables for all Areas in Appendix B)



Survey – Percent female by MSL

| | Size limit (inches) | | | | | | | | |
|-------------|---------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|----------------|
| | None | 26 | 27 | 28 | 29 | 30 | 31 | 32 | |
| 2A | 81.3 | 81.4 | 81.8 | 83.0 | 84.1 | 86.1 | 87.3 | 89.3 | |
| 2B | 75.9 | 76.4 | 76.9 | 78.5 | 79.8 | 82.3 | 83.6 | 85.9 | |
| 2C | 82.9 | 83.3 | 83.6 | 84.3 | 84.9 | 85.7 | 86.2 | 87.2 | - 4.3% |
| 3A | 73.7 | 75.1 | 75.7 | 77.0 | 78.6 | 81.5 | 83.2 | 85.9 | |
| 3B | 58.1 | 62.9 | 64.9 | 68.5 | 71.4 | 74.8 | 76.8 | 79.6 | - 21.5% |
| 4A | 70.3 | 73.3 | 74.2 | 75.7 | 76.5 | 78.1 | 79.1 | 80.9 | |
| 4B | 45.7 | 46.2 | 46.6 | 47.5 | 48.3 | 49.9 | 51.1 | 52.4 | |
| 4CDE | 81.0 | 81.8 | 82.3 | 83.1 | 84.0 | 86.0 | 86.8 | 87.8 | |



Survey

- Important differences among Regulatory Areas
- Aggregate coastwide result depends on the distribution of catch



Observer data

- No sex-specific information
- All IFQ fishing included (halibut and sablefish)
- Low observer coverage for >40' LOA, no coverage for < 40' LOA (~ 50% of vessels, 15-18% of catch)
 - Evidence of bias in properties of observer data (larger vessels, shorter trips landing more catch, more species)

→ Also just a proxy for actual fishery catch



Observer data – Catch discarded by MSL

| | Size limit (inches) | | | | | | | Survey |
|-------------|----------------------------|------------|------------|-------------|-------------|-------------|-------------|---------------|
| | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 32 |
| 2A | NA | NA | NA | NA | NA | NA | NA | 20.4 |
| 2B | NA | NA | NA | NA | NA | NA | NA | 22.9 |
| 2C | 0.7 | 1.1 | 2.0 | 2.8 | 4.6 | 5.8 | 9.1 | 13.5 |
| 3A | 1.6 | 2.5 | 4.6 | 6.9 | 11.1 | 14.6 | 21.7 | 26.7 |
| 3B | 4.4 | 5.8 | 9.1 | 11.2 | 15.0 | 17.6 | 22.0 | 45.0 |
| 4A | 2.5 | 3.4 | 5.2 | 6.4 | 8.6 | 10.1 | 13.4 | 26.1 |
| 4B | 0.7 | 1.1 | 2.6 | 3.9 | 6.9 | 8.9 | 12.2 | 26.0 |
| 4CDE | 1.1 | 1.4 | 2.6 | 3.9 | 6.7 | 8.6 | 13.2 | 27.3 |



Yield calculations

- This approach differs from historical analyses, in that it considers current change in yield, not equilibrium performance
- Equilibrium calculations are better addressed via the MSE/MSAB process (but we need data on selectivity)

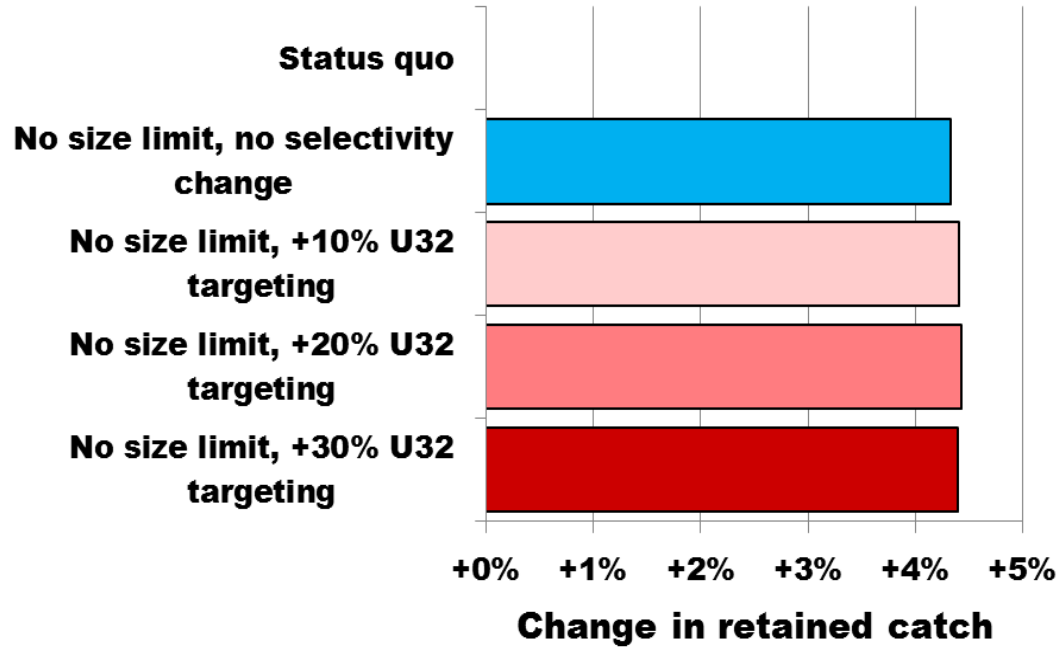


Yield

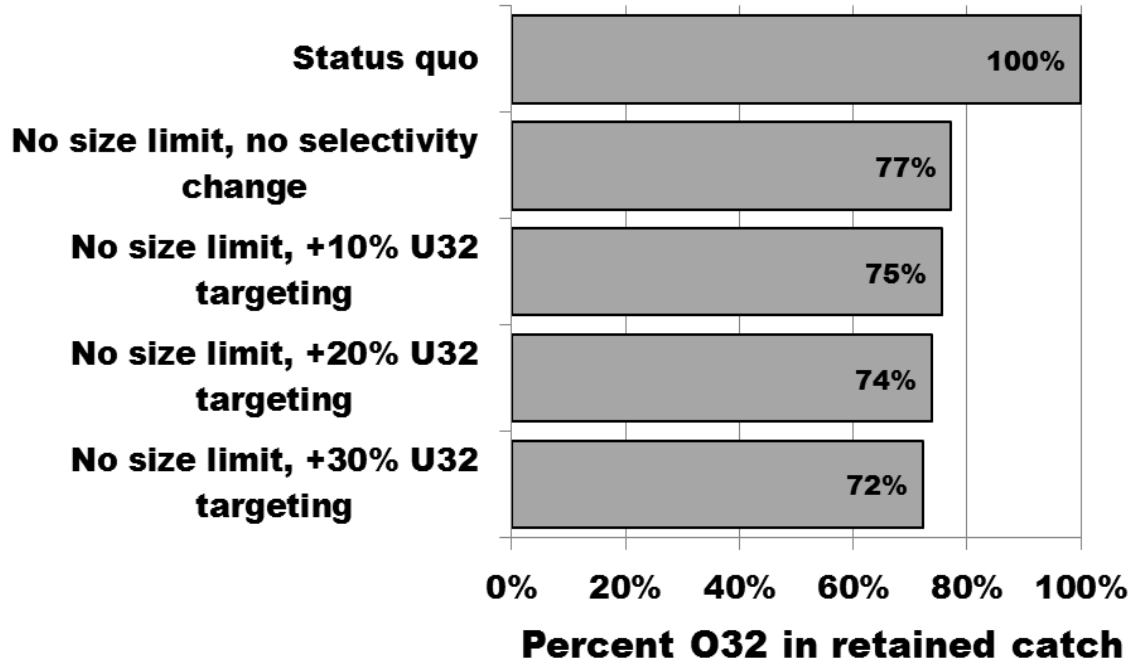
- The change to an SPR-based harvest policy for 2017 provides the basis for yield comparisons:
 - SPR_{46%} 2017 yield as baseline
 - Compare to no size limit
 - Repeat for 10, 20, 30% increases in removals of halibut less than 32” to mimic additional targeting



Yield – Net change



Yield – Catch composition



Summary

- Biological considerations
 - Management robustness
 - Recruitment refuge
- Operational considerations
 - Fishery efficiency (retained catch-rate)
 - Price for fish < 32”
 - Fishery value

(Full list in Table 5)



Summary of MSL considerations

| | Reduced MSL |
|---|-------------------------|
| Discard mortality | unknown |
| Total yield | Up |
| Harvest of males | Up |
| Selectivity | unknown |
| Biological data on total catch | Incomplete |
| Management robustness | Down |
| Recruitment refuge | Down |
| Fishery efficiency (retained catch-rate) | Up |
| Price | Emergent |
| Fishery value | Depends on price |



Summary of MSL considerations

| | No MSL | |
|---|-------------------------|---|
| Discard mortality | Down | |
| Total yield | Up | |
| Harvest of males | Up | |
| Selectivity | unknown | |
| Biological data on total catch | Sampled in port | ← |
| Management robustness | Down | |
| Recruitment refuge | Down | |
| Fishery efficiency (retained catch-rate) | Up | |
| Price | Emergent | ← |
| Fishery value | Depends on price | ← |



Adaptive management approach

- A decision that is made in order to learn specific information that will improve future management.
 - Approach recommended for evaluation by the SRB in June
 - Draft options in Appendix E

“SRB11–Req.05 (para. 21) NOTING the thoughtful and detailed presentation on the potential impacts of changing the minimum size limit presented in Appendix E (Evaluation of adaptive management approaches) of paper IPHC-2017-SRB11-07, the SRB REQUESTED that the IPHC Secretariat, between now and SRB12, seek feedback from the Commissioners, Conference Board, Processors Advisory Board, and the Management Strategy Advisory Board, on a modified version of Appendix E. In particular, a modified version would include (i) a process for starting and possibly ending an experiment, (ii) performance metrics, and (iii) criteria for making conclusions based on the experimental outcomes.”



Moving forward

- Consideration of this report at the IM and AM
- *AM*: Recommendation to the secretariat whether there is a need for further evaluation of the MSL

