



Data source development

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PURPOSE

To provide the Scientific Review Board (SRB) a summary of anticipated data source development in support of the 2018 and 2019 stock assessment and harvest strategy analyses.

INTRODUCTION

Updates and improvements to the data sources supporting the annual stock assessment and harvest policy analyses are made each year as new information and new processing of older information becomes available. These changes, and their effects on the stock assessment results are routinely presented at both the June and September SRB meetings depending on when the analyses are completed (Stewart 2017a, Stewart 2017b, Stewart and Webster 2018).

During 2017, specific changes included:

- Updating the Fishery-Independent Setline Survey (FISS) time series from the Space-Time (S-T) model to include the years 1993-1997, which had been previously unavailable, and also had a small effect on the rest of the time series.
- Including biological information (age and lengths) from FISS expansion stations sampled since 2014.
- Using the individual halibut weights measured by port samplers in place of weights predicted by the length-weight relationship where available for analysis of commercial fishery data.
- Expanding the reporting of commercial fishery CPUE time-series to facilitate better understanding of fishery and spatial patterns as well as to better describe the consistent bias associated with incomplete records at the time the data sources are closed for the stock assessment in early November each year.

Ongoing avenues of data development, specific changes anticipated for inclusion into 2018 models, and changes planned for 2019 are described in this document.

ONGOING DEVELOPMENT

Measured individual fish weights

As documented during SRB011 (Stewart 2017b), the stock assessment and related analyses based on commercial fishery individual weight data now utilized measured rather than predicted values. During 2017 the IPHC continued to collect length-weight information, and a renewed investigation of the relationship is anticipated in the near future when sufficient data are available to describe the range of spatial and inter-annual variability present in the population.

Continued investigation of historical bycatch estimates and length-frequency data

Although bycatch accounting in Alaska is conducted by the National Marine Fisheries Service (NMFS), historically the IPHC has updated historical mortality estimates with estimated rather than predicted Discard Mortality Rates (DMRs) after all annual data have become available. Efforts have been underway for several years (Stewart 2017b) to investigate the full time-series of estimates currently available for the stock assessment, and to update the mortality estimates where appropriate.

Length-frequency data by Regulatory Area has historically been summarized by the IPHC on an *ad hoc* basis. We currently use a time-series consisting of aggregate estimates with little to no meta-data and likely differing methods of aggregation in different years (e.g., catch weighted, raw length-frequencies, projected values from incomplete data, etc.). These data are currently used in the stock assessment model to inform the selectivity curve describing bycatch removals, but are down-weighted due to these concerns over standardization (Stewart and Martell 2016). Several improvements are needed before the treatment of annually variable bycatch in the assessment models can be made more explicit: 1) identifying raw data sets suitable for inclusion, 2) re-estimating length-frequency distributions using standardized methods for all available years, 3) recording meta-data and results such that they can be recreated if changes to the analysis approach are desired in the future, and 4) updating the stock assessment model inputs to reflect the best available series, potentially increasing the weight on these data, while allowing for an appropriate degree of temporal variability in selectivity to reflect differences among areas, fishing fleets and other factors.

Updated bycatch mortality estimates and appropriately weighted length frequency data would benefit the annual stock assessment, harvest policy and MSE analyses, as well as ongoing support of domestic efforts such as the North Pacific Fisheries Management Council's investigation of Abundance-Based Prohibited Species Catch Limits. Due to continued staffing changes within the IPHC secretariat, there has been no additional progress on this effort since it was identified several years ago. Hiring during 2018 may provide for renewed efforts in the near future.

Effective skate calculations

Recent research comprising a portion of Cole Monnahan's PhD thesis (University of Washington; June, 2017) re-evaluated the hook-spacing/power relationship used to standardize commercial Pacific halibut fishery logbook records (Monnahan and Stewart 2015). This work has now been published (Monnahan and Stewart 2018), and the IPHC Secretariat is in the process of developing a plan for updating the historical relationship currently used for all database calculations. This effort is likely to entail:

1. Creating a development copy of the commercial logbook data.
2. Implementing the new hook-spacing relationship.
3. Re-running all catch-rate summaries.
4. Comparing the results for use in the stock assessment and other potential database artifacts.
5. Replacing the database code for routine use.
6. Updating all existing data sets and summaries and conveying any changes during the annual management process.

Although the improved estimate is not identical to the *status quo* relationship, it is very similar, and the likely effect on current analysis methods is small (i.e., Figure 4 in Monnahan and Stewart 2018).

DEVELOPMENT FOR 2018

Space-Time modelling improvements

Improvements to the S-T model are anticipated for 2018, and are outlined in a separate document (see IPHC-2018-SRB12-06). Pending SRB review of these changes, if results are available in September, they will be included in stock assessment models for review during SRB13.

Enhanced reporting of commercial fishery Catch-Per-Unit-Effort (CPUE) indices

During 2017, the SRB recommended a method for describing the recurring bias observed in commercial fishery logbook CPUE trends due to incomplete information at the time of the annual stock assessment (IPHC 2017, Stewart and Webster 2018). Several related issues were also discussed, including the partitioning and description of tribal and non-tribal fisheries in Regulatory Area 2A, treatment of differences in CPUE among gear types, as well as the application of model vs the simple analysis method currently employed. The SRB did not prioritize moving forward with a more sophisticated model-based standardization approach such as that provided in Monnahan and Stewart (2015) and later expanded by Cole Monnahan (PhD, University of Washington, June, 2017) to include an explicitly spatial method. The Secretariat has therefore focused subsequent efforts on more effectively reporting commercial catch rate trends.

Historical indices in all Regulatory Areas other than 2A and 2B have included only fixed hook logbook information (Stewart and Webster 2018) due to differential catchability (Clark 2006) and the potential for misconstruing trends in gear usage with trends in the underlying population. This has led to concerns from snap (and other) fishermen that their data are not being considered, and general concern that signals in the fixed hook data may not accurately represent the entire fishery, despite analysis indicating very similar trends when all gear were analyzed simultaneously (Monnahan and Stewart 2015). For 2018, catch rates (and variance) have been summarized and reported by gear type. Observed trends are very similar for most Regulatory Areas (**Appendix A**), and the additional information is anticipated to provide for increased and better informed discussion during the 2019 Interim and Annual Meetings (IM094 and AM095).

Data status and trend summary tools

The IPHC Secretariat is moving forward with the development of presentation tools for use during meetings, as well as through the new website. As the complexity of supporting analyses and the number of diverse data sets considered during the annual management process has increased, it has become more challenging to provide the information in easily accessible and efficient formats. Inspired by approaches first encountered through the North Pacific Fishery Management Council's (NPFMC; <https://www.npfmc.org/>) Ecosystem report and other National Marine Fisheries Service presentations, one potential tool to condense both trend and status

information is to ‘map’ data sources into simple quadrants. This approach will be more fully discussed during SRB12, but a simple example is provided in **Appendix B**.

Routine updates

As is the case each year, all time-series and other annually collected sources of information will be updated for the fall of 2018, following established and documented methods (Stewart and Webster 2018).

Although in previous years, some updated information has been available for the fall SRB meetings (held in October prior to 2017), now that the meetings are held in September, this is generally not possible. Of note in 2018 is that the Commission, during the 2018 Annual Meeting (AM094), agreed to publish the results of the FISS as soon as available in the fall (Para. 8; IPHC 2018), and no later than 1 November. This is anticipated to provide additional time for public consideration of annual survey results prior to the release of the stock assessment results during the Interim Meeting held later in November. It will therefore be important to clearly highlight the delineations among raw survey results, S-T model results, and the population trends estimated in the stock assessment.

DEVELOPMENT PROPOSED FOR 2019

A full assessment analysis and review is planned for 2019 (see discussion in IPHC-2018-SRB12-07), which will allow more in-depth investigation and model-based evaluation of the new and/or revised data outlined below.

Whale depredation during FISS sampling

During 2018, the survey team initiated a review of the criteria used to define whale depredation during routine survey operations. This review led to a revision of the criteria for the 2018 sampling season. During this process, it was noted that although recent levels of depredation are low (<5%) based on the new criteria, there is a need to reclassify all survey activity currently used in the S-T model to ensure comparability throughout the time-series. A summer intern project will assist in recovering the records needed to retrospectively apply the revised criteria, and the time series of effective and ineffective stations will be provided for analysis in 2019.

Sex-ratio of the commercial landings

As has been identified in recent analyses, the sex ratio of the commercial fishery catch represents an extremely important source of uncertainty in the annual stock assessment (Stewart and Hicks 2018). Because landed halibut are dressed at sea, this information has been unavailable for sampling in port, but tissue samples have been collected for all halibut selected for biological sampling starting in 2017 (Erikson and Kong 2018). Although the results of the voluntary marking program conducted coastwide during the 2017 fishing season (Loher et al. 2017) are still pending, there is the potential for genetic sex assignment of all commercial samples. The results of the voluntary program in tandem with additional genetically validated

samples, as needed, will be available for use in creating landings by age and sex (from 2017) for use in the 2019 stock assessment.

SUMMARY

This document serves to update the ongoing data improvement efforts by the IPHC Secretariat. Continued refinement of the data sources feeding in to the stock assessment models, the harvest policy analyses, and the management structure remains a priority. Changes for 2018 are anticipated to be small, and primarily related to effective reporting and summary, while changes for 2019 are more likely to have broader implications for the stock assessment and harvest policy analyses (Table 1).

As has been the standard practice since 2015, all changes to data sources will be presented during the fall SRB meeting (SRB13) or reported directly in the stock assessment depending on the completion date of each source. Any questions and/or clarifications will be provided for the SRB during the annual conference call held in December (after the IPHC's Interim Meeting IM094, and before the IPHC's Annual Meeting AM095).

TABLE 1. Summary of data development.

Improvement	Rationale	Timeline
Refinement of the length-weight relationship	The Commission has been routinely collecting length-weight observations since 2016.	Uncertain pending further data collection and analysis prioritization.
Historical bycatch data	Re-analysis of historical mortality and biological data is needed to reconcile observed DMRs and ensure length-frequency data have been summarized consistently.	Potential for inclusion in the 2019 stock assessment analyses depending on IPHC Secretariat staffing.
Effective skate calculations	A revised hook-power relationship was published in 2018.	The newly revised relationship will be evaluated for inclusion in the IPHC's standard database calculations.
Space-time model changes	Continued refinement of modelling methods.	To be included for 2018 pending review.
Commercial fishery CPUE summary by gear type	Trends in fixed hook and snap gear catch rates in the commercial fishery are of interest to participants.	Clearer delineation of this information has been developed for the 2018 process.
Data summary tools	Continued improvement in the summary and accessibility of data sources is important.	To be explored in 2018.
Routine updates	Time-series are extended each year for the annual process.	To be completed in fall 2018.
Revised whale depredation	New criteria adopted for 2018 need to be applied to the entire time-series for	Anticipated to be available for

criteria	consistency	2019.
Genetically identified commercial sex ratios	This information addresses a crucial source of uncertainty in the stock assessment.	Anticipated to be available for 2019.

RECOMMENDATION/S

That the SRB:

1. **NOTE** paper IPHC-2018-SRB012-06 that summarized ongoing, pending and future data source development efforts by the IPHC Secretariat.
2. **RECOMMEND** any suggested changes to the process of updating and improving data for use in the stock assessment and related analyses.
3. **NOTE** any discussion occurring during SRB012, and **RECOMMEND** any improvements to and/or new tools for summarizing and presenting data sources, including recent trends and relative status of all data sources, as well as detailed information on commercial catch rates.
4. **RECOMMEND** any additional specific research avenues to be prioritized for inclusion in the 2019 stock assessment.

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APPENDICES

Appendix A: Expanded reporting of commercial fishery catch-rates.

Appendix B: Example of qualitative data 'mapping'.

APPENDIX A

Expanded reporting of commercial fishery catch-rates.

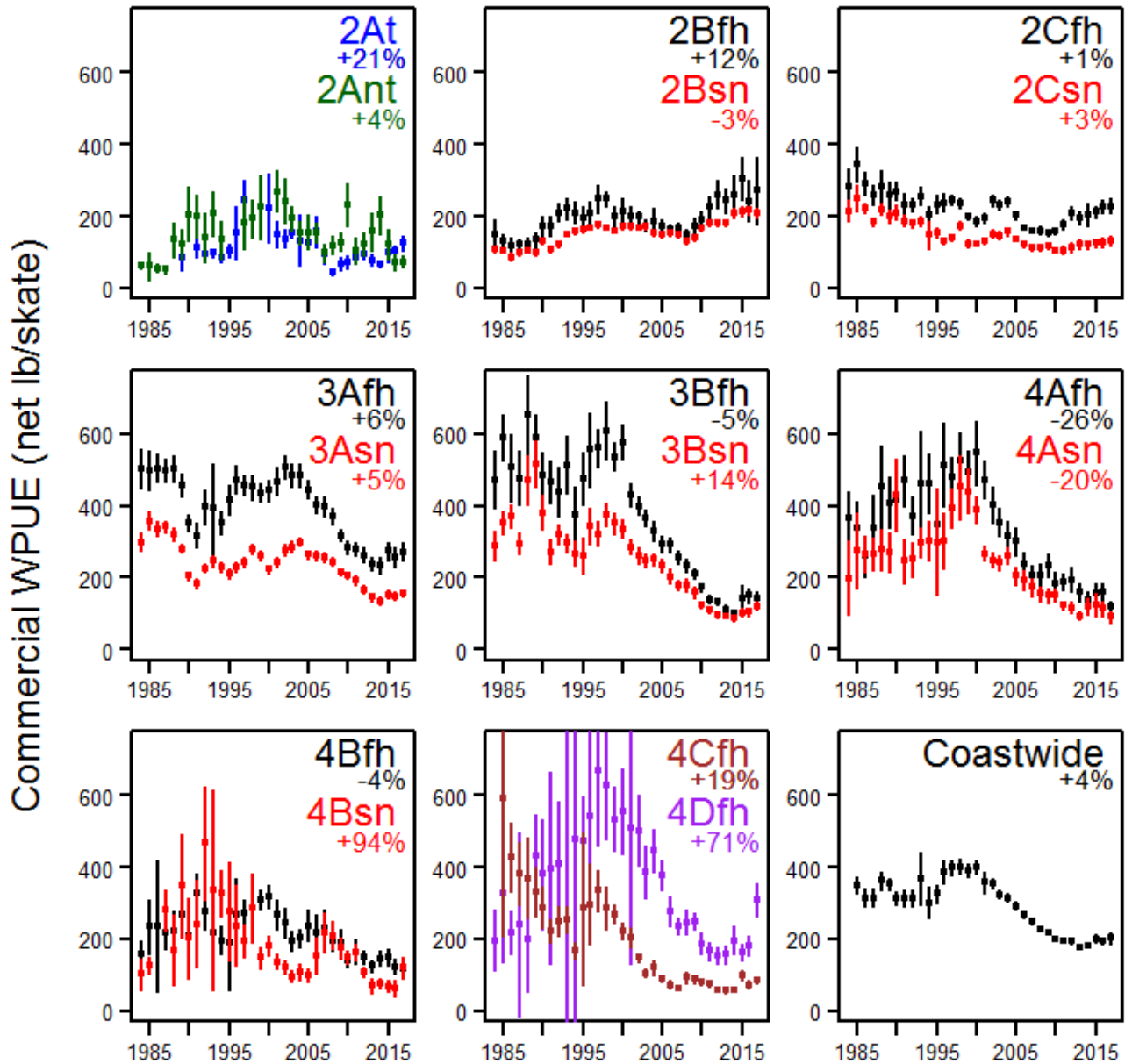


Figure A1. Commercial WPUE: Area 2A delineated by fishery (t = tribal, nt = non-tribal), Areas 2B-4B delineated by gear type (fh = fixed-hook, sn = snap gear) and Area 4CDE delineated by Area (4C, 4D; too few snap gear data to summarize). Percentages indicate the change from 2016-2017; vertical bars an approximate 95% confidence interval based only on between-set variability.

APPENDIX B

Example of qualitative data mapping where “status” is determined relative to the time-series mean, and recent trend is relative to the most recent five years. It may be desirable to provide a small set of panels, or perhaps colored series (by data type) on a single panel reporting trends across a variety of data sources for simultaneous evaluation. Provided below is a single example, where the FISS catch rate estimates from the S-T model (Figure B1) are ‘mapped’ ad labelled (Figure B2).

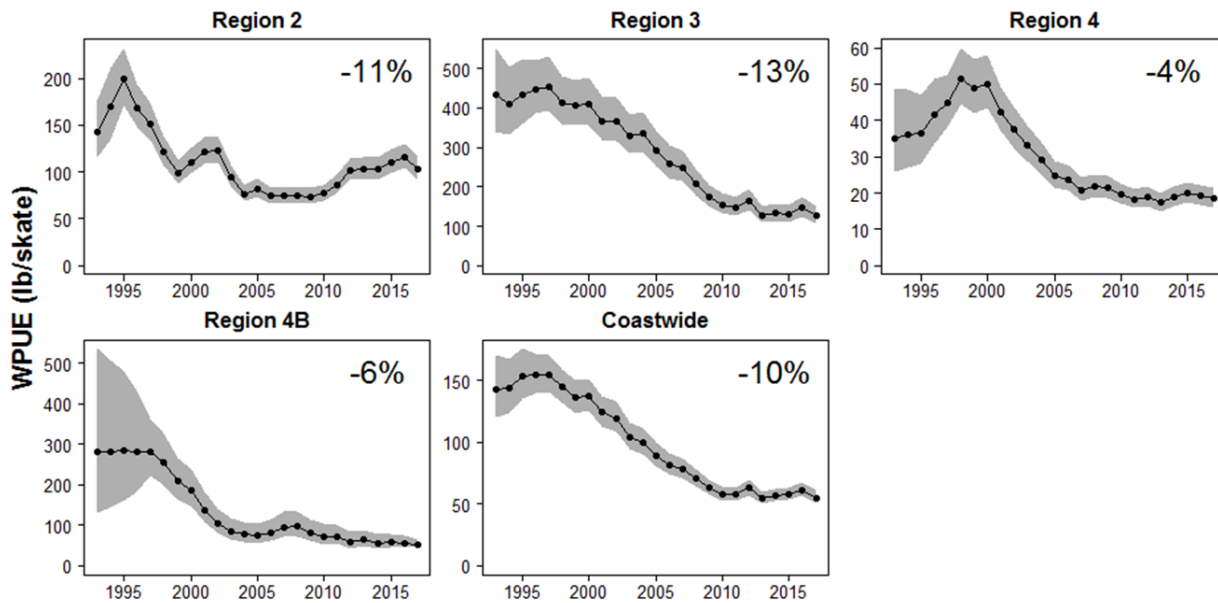


Figure B1. Survey WPUE by Region. Percentages indicate the change from 2016-2017; shaded area indicates an approximate 95% credible interval.

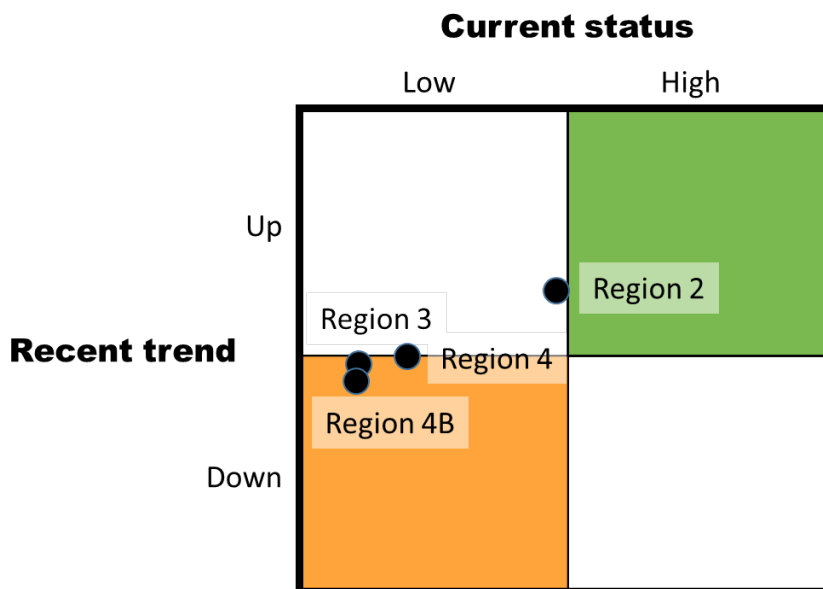


Figure B2. Survey WPUE by Region (From Figure B1) ‘mapped’ to provide an alternative vehicle for presentation.