INTERNATIONAL PACIFIC HALIBUT COMMISSION

IPHC–2020–IM096–00

96th Session of the IPHC Interim Meeting (IM096) – *Compendium of meeting documents*

18 – 19 November 2020, Seattle, WA, USA

Commissioners

Canada	United States of America
Paul Ryall	Chris Oliver
Neil Davis	Robert Alverson
Peter DeGreef	Richard Yamada

Executive Director

David T. Wilson, Ph.D.

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Report of the 96th Session of the IPHC Interim Meeting (IM096)

Meeting held electronically, 18-19 November 2020

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ACRONYMS

CB	Conference Board
DFO	Department of Fisheries and Ocean (Canada)
DMR	Discard Mortality Rate
FISS	Fishery-Independent Setline Survey
IPHC	International Pacific Halibut Commission
NMFS	National Marine Fisheries Services, of NOAA
NOAA	National Oceanic and Atmospheric Administration
NPFMC	North Pacific Fishery Management Council
PFMC	Pacific Fisheries Management Council
RAB	Research Advisory Board
SB	Spawning Biomass
SRB	Scientific Review Board
SPR	Spawning Potential Ratio
TCEY	Total Constant Exploitation Yield
WPUE	Weight Per Unit Effort

DEFINITIONS

A set of working definitions are provided in the IPHC Glossary of Terms and abbreviations: https://www.iphc.int/the-commission/glossary-of-terms-and-abbreviations

HOW TO INTERPRET TERMINOLOGY CONTAINED IN THIS REPORT

This report has been written using the following terms and associated definitions so as to remove ambiguity surrounding how particular paragraphs should be interpreted.

Level 1: **RECOMMENDED**; **RECOMMENDATION; ADOPTED** (formal); **REQUESTED; ENDORSED** (informal): A conclusion for an action to be undertaken, by a Contracting Party, a subsidiary (advisory) body of the Commission and/or the IPHC Secretariat.

Level 2: **AGREED**: Any point of discussion from a meeting which the Commission considers to be an agreed course of action covered by its mandate, which has not already been dealt with under Level 1 above; a general point of agreement among delegations/participants of a meeting which does not need to be elevated in the Commission's reporting structure.

Level 3: **NOTED/NOTING**; **CONSIDERED**; **URGED**; **ACKNOWLEDGED**: General terms to be used for consistency. Any point of discussion from a meeting which the Commission considers to be important enough to record in a meeting report for future reference. Any other term may be used to highlight to the reader of an IPHC report, the importance of the relevant paragraph. Other terms may be used but will be considered for explanatory/informational purposes only and shall have no higher rating within the reporting terminology hierarchy than Level 3.

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EXECUTIVE SUMMARY

The 96th Session of the International Pacific Halibut Commission (IPHC) Interim Meeting (IM096) was held electronically from 18-19 November 2020. A total of 30 members (6 Commissioners; 24 advisors/experts) attended the Session from the two (2) Contracting Parties, as well as 115 observers. The meeting was opened by the Chairperson, Mr Paul Ryall (Canada), who welcomed participants.

The following are a subset of the complete recommendations and requests for action from the IM096, which are provided at Appendix VII.

FISS redesign discussion

IM096-Rec.01 (para. 35) The Commission **NOTED** some existing opportunities for stakeholder engagement in the FISS design review process and **RECOMMENDED** that additional formalised opportunities should be added to the review timeline for future presentations. An option is to hold the annual RAB meeting in November or December of each year.

FISS design endorsement (2021-23)

IM096-Rec.02 (para. 46) The Commission **RECOMMENDED** that the IPHC 2021 FISS design be considered for decision at the 9th Special Session of the Commission (SS09), at a date and format to be agreed upon intersessionally. The IPHC Secretariat will develop necessary material to support the decision making process.

IM096-Rec.03 (para. 47) The Commission **RECOMMENDED** that the IPHC Secretariat provide the Commission, at AM097, an expanded schematic of the rationalisation of the FISS following the 2014-19 expansion series. The intent is to show all the steps from design to implementation of a FISS.

IPHC Management Strategy Evaluation

IM096-Rec.04 (para. 74) The Commission **RECOMMENDED** that a Special Session of the Commission be held prior to the AM097 meeting in January, to look at potential modifications to existing MPs as part of the IPHC Secretariat's MSE program of work. The IPHC Secretariat will seek to establish agreeable dates, and publish the meeting invitation accordingly, noting that all meetings of the Commission are public unless otherwise decided by the Commission.

IPHC Fishery regulations: Proposals for the 2020-21 process

IM096-Rec.05 (para. 90) The Commission **RECOMMENDED** that interested stakeholders note the deadline for submission of IPHC Fishery Regulation proposals, for consideration at the 97th Session of the Annual Meeting (AM097), of **26 December 2020**. Late proposals will not be considered at AM097.

1. Opening of the Session

1. The 96th Session of the International Pacific Halibut Commission (IPHC) Interim Meeting (IM096) was held electronically from 18-19 November 2020. A total of 30 members (6 Commissioners; 24 advisors/experts) attended the Session from the two (2) Contracting Parties, as well as 115 observers. The list of participants is provided at Appendix I. The meeting was opened by the Chairperson, Mr Paul Ryall (Canada), who welcomed participants.

2. Adoption of the agenda and arrangements for the Session

2. The Commission **ADOPTED** the Agenda as provided at Appendix II. The documents provided to the IM096 are listed in Appendix III.

3. Update on actions arising from the 96th Session of the IPHC Annual Meeting (AM096) and 2020 intersessional decisions

3. The Commission **NOTED** paper IPHC-2020-IM096-03 which provided an opportunity to consider the progress made during the intersessional period in relation to the direct requests for action by the Commission during the 96th Session of the IPHC Annual Meeting (AM096, February 2020), and 2020 intersessional decisions of the Commission.

4. The Commission **AGREED** to consider and revise as necessary, the actions arising, and for these to be combined with any new actions arising from the IM096.

4. Report of the IPHC Secretariat (2020): Draft

5. The Commission **NOTED** paper IPHC-2020-IM096-04 which provided the Commission with a draft update on the activities of the IPHC Secretariat in 2020, not already contained within other papers before the Commission.

IPHC Merit Scholarship

6. The Commission **NOTED** that the IPHC funds several Merit Scholarships to support university, technical college, and other post-secondary education for students from Canada and the USA who are connected to the Pacific halibut fishery, with a single new four-year scholarship valued at US$4,000 per year awarded every two years. In 2020, the IPHC Merit Scholarship was awarded to Mr Hahlen Behnken-Barkhau (Whitman College).

Areas of conservation concern

7. The Commission **NOTED** the continued efforts of the IPHC Secretariat to address gaps in coverage for the IPHC Fishery-Independent Setline Survey (FISS) within Canadian waters of the IPHC Convention Area, due to conservation exclusion zones with objectives that include, but are not limited to "*protecting vulnerable rockfish species and sensitive benthic glass sponge reef habitat.*"

North Pacific Fisheries Management Council (NPFMC)

8. The Commission **NOTED** that the NPFMC's Abundance-Based Management Working Group (ABMWG) continued its work in 2020, with participation of the IPHC Secretariat. The Commission has supported the development of ABM due to its potential effect on the directed Pacific halibut fisheries.

9. The Commission **NOTED** that ABM was a priority agenda at the NPFMC October 2020 meeting. The Scientific and Statistical Committee (SSC) discussed the operating model and results from the simulation analysis.

> *"In reviewing the ABM DEIS, the SSC identified several inconsistencies in the analyses and asked for clarification from authors in preparation for the SSC meeting. On further investigation, errors were found in the estimation of 2019 and 2020 directed halibut fishery catch in the operating model, which affects all outputs from the simulation model. Authors worked diligently to correct these and updated versions of the documents and associated errata were posted before and during the SSC meeting, the most recent and significant of which was made available the afternoon of Wednesday, September 30.*

The SSC recognizes previous support for moving amendment packages to final action with recommendations for minor modifications before release. However, in this case, the nature of the changes impact the baseline from which the alternatives and performance metrics relative to Council objectives are assessed.The SSC was not afforded sufficient time to review the revised model results and their impacts on all aspects of the DEIS, and as such, was not able to comment on the analyses nor determine if the DEIS is acceptable to move forward for final action at this time. In addition, the SSC notes that the public comment period closed before these issues were identified and revised documents were posted. As such, the SSC agreed to focus its discussion on the simulation modeling recommendations provided to the ABM workgroup in October 2019 and the revenue impacts assessment and the DSIA, with the other aspects of the presentation taken as information only. As a result, the SSC did not discuss public comments associated with model outputs, alternatives, or performance metrics."

10. The Commission **NOTED** that the NPFMC discussed the advice and agreed to an initial review of Pacific halibut ABM analysis in April 2021.

Pacific Fisheries Management Council (PFMC)

11. The Commission **RECALLED** its expressed intention to shift responsibility for management of Pacific halibut fisheries in IPHC Regulatory Area 2A from the IPHC to domestic agencies, as is the case in all other IPHC Regulatory Areas. At its June 2019 and March 2020 meetings, the PFMC affirmed its commitment to pursue domestic management of the Pacific halibut fisheries in IPHC Regulatory Area 2A.

12. The Commission **NOTED** that at its September 2020 meeting, the Council further considered the transition of IPHC Regulatory Area 2A Pacific halibut fishery management, and adopted the following final motion:

"*Transition of Area 2A Fishery Management The Council adopted for public review the following as preliminary preferred alternatives:*

1) 4.1.2 - Alternative 2: Consider the directed fishery framework during the CSP process in September and November, including any guidance for vessel limits and inseason changes for NMFS implementation.

2) 4.2.1 Alternative 2: Issue permits for all Area 2A halibut non-Indian fisheries (commercial directed, incidental salmon troll, incidental sablefish, and recreational charter).

3) 4.2.2 Alternative 2: Allow NMFS to determine the appropriate application deadlines for all commercial halibut applications, set to coincide with Council meetings and NMFS processing time.

4) 4.2.5 Alternative 1: Status quo (revised). Require proof of permit to be onboard fishing vessel and made readily available upon request, regardless of the type of permit (e.g., paper or electronic). NMFS to provide access to permit in a printable format or send paper copy directly to the participant."

13. The Commission **NOTED** that the PFMC will further consider the above alternatives during its November Council meeting (13 and 16 November 2020) and that the IPHC Secretariat will provide a summary of those discussions to the Commission intersessionally.

Communications, outreach, and education activities

14. The Commission **CONGRATULATED** the IPHC Secretariat for the extensive communications, outreach, and education activities carried out in 2020, despite the impacts of the COVID-19 pandemic, which ranged from public outreach events, attending conferences and symposia, contributing expertise to the broader scientific community through participation on boards and committees, and seeking further education and training.

5. State of the Fishery (2020): Preliminary statistics

15. The Commission **NOTED** paper IPHC-2020-IM096-05 Rev_1 which provided an overview of the key fishery statistics from fisheries catching Pacific halibut during 2020, including the status of landings compared to fishery limits implemented by the Contracting Parties of the Commission.

16. The Commission **NOTED** the validation tags used in Canada are applied by the independent dockside monitoring program service provider (Archipelago Marine Research Ltd.) to uniquely identify every individual Pacific halibut landed in the directed commercial fishery. This longstanding program is designed to provide a 'chain-of-custody' for these fish and indicate that they were legally harvested, and to assist in marketing Canadian caught Pacific halibut as a distinct and high quality product.

17. The Commission **NOTED** the additional precautions and protocols put in place by the IPHC Secretariat for the 2020 directed commercial fishery and FISS season including such measures as remote skipper interviews and 14-day quarantining to keep both the IPHC Secretariat and stakeholders safe from infection.

6. Stock status of Pacific halibut (2020) and Harvest decision table (2021)

6.1 *IPHC Fishery-Independent Setline Survey (FISS) design, implementation, and implications*

18. The Commission **NOTED** paper IPHC-2020-IM096-06 Rev_1 which provided an overview of the IPHC Fishery-Independent Setline Survey (FISS) design and implementation in 2020.

19. The Commission **RECALLED** that the annual IPHC Fishery-Independent Setline Survey (FISS) of the Pacific halibut stock was augmented from 2014-2019 with expansion stations that filled in gaps in coverage in the annual FISS. Prior to 2020, the standard grid of stations comprised 1,200 stations. Following the completion in 2019, expansion stations were added to the standard grid in all IPHC Regulatory Areas, now totalling 1,890 stations for the full FISS design (Figure 1).

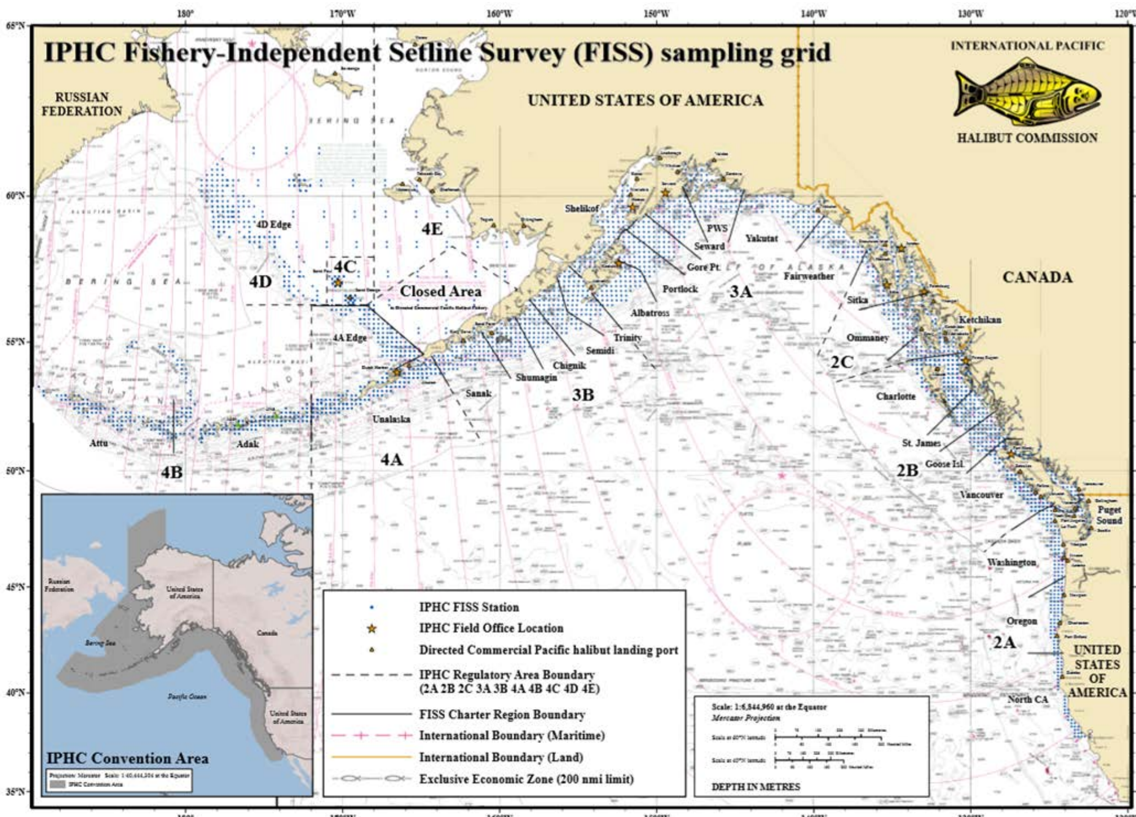

Figure 1. IPHC Fishery-Independent Setline Survey (FISS) with full sampling grid shown.

20. The Commission **RECALLED** that at the 96th Session of the IPHC Annual Meeting (AM096), the Commission recommended an annual FISS design for 2020 that included 1,232 stations coastwide. At the 6th Special Session of the IPHC (SS06), the Commission endorsed a revised annual FISS design for 2020 that included 1,283 stations coastwide. The changes from the previous design included random subsampling of stations in IPHC Regulatory Area 4CDE, 100% sampling in IPHC Regulatory Areas 3A, 2C, and 2B (except waters east of Vancouver island), reduced random sampling in IPHC Regulatory Area 3B, a reduced subarea in IPHC Regulatory Area 2A and a relocation of the snap-fixed gear comparison to 2B.

21. The Commission **RECALLED** that in light of the COVID-19 pandemic and its impacts, on 29 May 2020, the Commission endorsed a further and final modification to the 2020 FISS design that included 100% sampling in IPHC Regulatory Areas 3A, 2C, and 2B (except waters east and west of Vancouver Island), and random subsampling from the eastern half of IPHC Regulatory Area 3B:

    "***ENDORSED** the 2020 FISS design provided in Appendix I (of paper IPHC-2020-ID011-01 - 2020 FISS Decision Paper), which includes 898 stations in a reduced footprint within IPHC Regulatory Areas 2B, 2C, 3A and 3B*" (Figure 2).

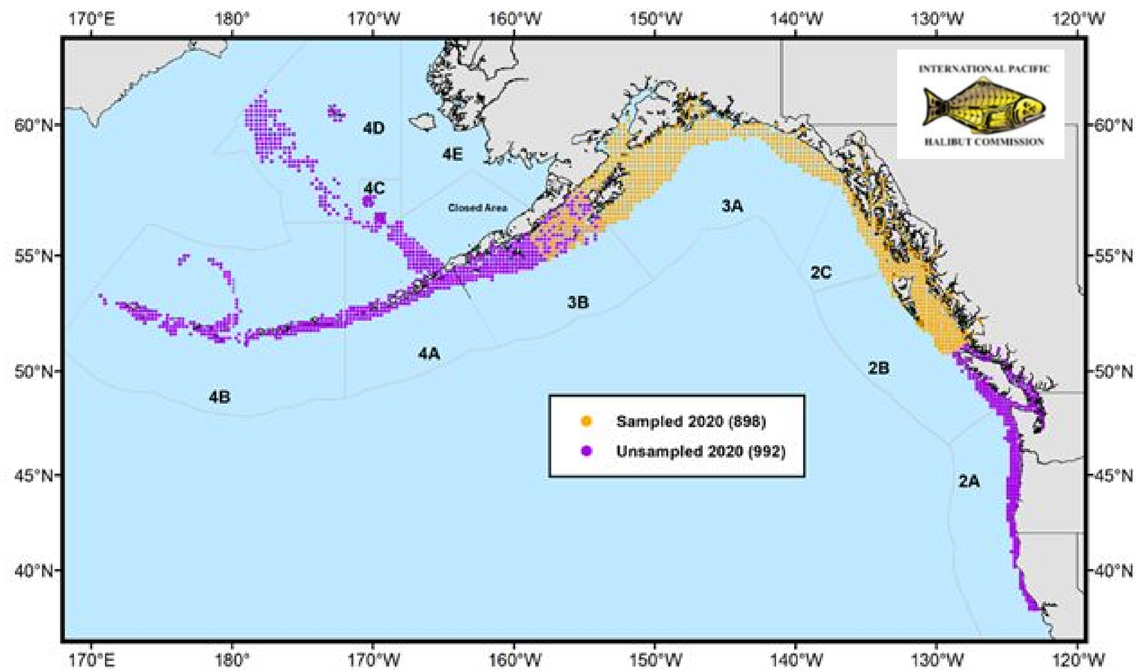

Figure 2. Map of the revised and final 2020 FISS design endorsed by the Commission on 29 May 2020.

22. The Commission **NOTED** that in 2020, a comparison of the use of snap-gear to the use of fixed-gear on the FISS was conducted in the St. James charter region (IPHC Regulatory Area 2B) to expand on data collected in 2019 in IPHC Regulatory Area 2C. The design featured each station being fished twice, once with fixed-gear and once with snap-gear, with randomisation of the order of the two gear types for each station. The comparison will provide additional data to help clarify differences between catch (e.g. Pacific halibut catch rates, age and size distribution, bycatch species) on the two gears. A third and final comparison of the use of snap-gear in the FISS will take place in IPHC Regulatory Area 3A during 2021.

23. The Commission **NOTED** that in 2020, individual Pacific halibut were again weighed at sea throughout the FISS (project commenced in 2019) in order to improve the quality of estimates based on Pacific halibut weight. The use of direct weight measurements will lead to more accurate estimates of WPUE and other quantities based on weights, allow estimation of length-weight curves based on all sizes available to longline gear (whereas collections from directed commercial landings only measure fish greater than or equal to 81.3 cm in length) and provide additional information on biases in the standard curve and spatial differences in the length-weight relationship.

24. The Commission **NOTED** that for the first time in 2020, sub-legal (U32) Pacific halibut that were caught and randomly selected for otolith sampling were also retained and sold to offset costs of the FISS and to

prevent discarding of dead fish. The average coastwide price received for U32 fish in 2020 was US$4.16, which the average coastwide price for O32 fish was US$4.77.

25. The Commission **NOTED** that an estimated 70% of the standing stock biomass of Pacific halibut in the Convention Area was sampled, which places the 2020 FISS on a similar level or better than many previous years. Over the core of the stock distribution, sampling in 2020 produced the most data-rich fishery-independent setline-survey in the IPHC's history. Despite planned gaps in coverage at the northern and southern ends of the distribution, the 2020 FISS has produced a precise and reliable index of the Pacific halibut stock, providing the primary source of trend information for the 2020 stock assessment and the basis for the 2021 management decision making process.
26. The Commission **NOTED** that the interactive views of the 2020 FISS results (including all prior years) were made publically available via the IPHC website on 27 October 2020: https://www.iphc.int/data/setline-survey-catch-per-unit-effort.
27. The Commission **CONGRATULATED** the IPHC Secretariat for delivering the 2020 FISS safely under very difficult circumstances, and that it was a great success, meeting both the Commission's scientific requirements and maintaining our economic goal of long-term revenue neutrality.

6.2 *Space-time modelling of survey data (WPUE; FISS expansion results, etc.)*

28. The Commission **NOTED** paper IPHC-2020-IM096-06 Rev_1 also provided the results of the 2020 space-time modelling of Pacific halibut survey data (which includes data from several fishery-independent surveys), and modelling results from fixed- and snap-gear comparison in IPHC Regulatory Area 2B.
29. The Commission **NOTED** Figure 3 which shows the time series estimates of O32 WPUE (most comparable to directed fishery catch-rates) over the 1993-2020 period included in the 2020 space-time modelling. Overall there was an estimated increase of 6% in the coastwide O32 WPUE index, due largely to a 16% increase in Region 3, offset by a 7% decrease in Region 2.

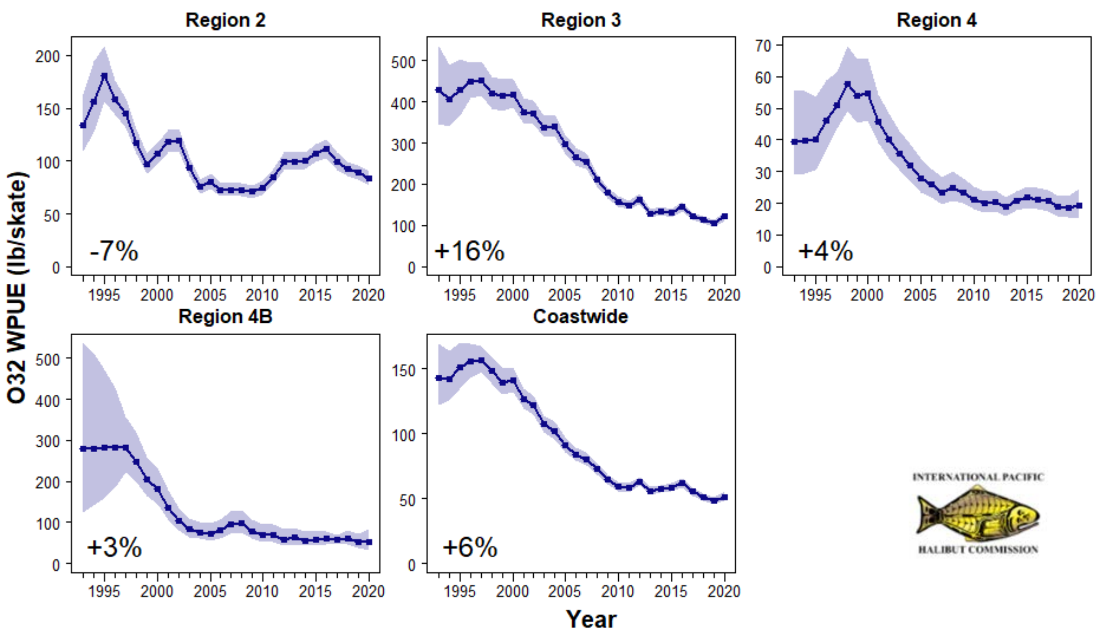

Figure 3. Space-time model output for O32 WPUE for 1993-2020 for Biological Regions. Filled circles denote the posterior means of O32 WPUE for each year. Shaded regions show posterior 95% credible intervals, which provide a measure of uncertainty: the wider the shaded interval, the greater the uncertainty in the estimate. Numeric values in the lower left-hand corners are estimates of the change in mean O32 WPUE from 2019 to 2020.

30. The Commission **NOTED** that the snap to fixed gear comparison in IPHC Regulatory Area 2B produced imprecise estimates of the difference between the catch rates of the two gear types, but that will be

addressed through additional planned comparisons in other IPHC Regulatory Areas and modelling which combines data across all components of this study.

6.3 *FISS rationalization (2021-23)*

31. The Commission **NOTED** paper IPHC-2020-IM096-07 which provided background on, and reviews the methods for the FISS rationalisation following the 2014-19 expansion series, and proposes FISS designs for 2021-23 for endorsement.

6.3.1 FISS redesign discussion

32. The Commission **NOTED** that a full grid design (1,890 stations) is one end of the spectrum, representing a greater source of removals from the stock and infrastructure needs, but providing the maximum scientific return in the form of minimum bias and maximum precision. The full post-expansion design would be costly and logistically difficult to undertake.
33. The Commission **NOTED** that the proposed design for 2021 represents a re-allocation of resources rather than a reduction, compared to the pre-expansion FISS design.
34. The Commission **NOTED** that in its considerations of FISS rationalisation:
    a) that proposed designs beyond the following year (i.e. the 2022-23 proposals for this IPHC meeting cycle) may be subsequently revised due to changes in the understanding of Pacific halibut density and distribution;
    b) the intention is to rotate stations in unfished regions into the design in subsequent years, thereby sampling all stations over time.
35. The Commission **NOTED** some existing opportunities for stakeholder engagement in the FISS design review process and **RECOMMENDED** that additional formalised opportunities should be added to the review timeline for future presentations. An option is to hold the annual RAB meeting in November or December of each year.
36. The Commission **RECALLED** that the priority of a rationalised FISS sampling design is to maintain or enhance data quality (precision and bias) by establishing minimum sampling requirements in terms of station count, station distribution and skates per station. Potential considerations that could add to or modify the design are logistics and cost (secondary design layer), and FISS removals (impact on the stock), data collection assistance for Contracting Party agencies, and IPHC policies (tertiary design layer). These priorities are outlined in Table 1.
37. The Commission **NOTED** that the addition of stations beyond those required to meet minimum bias and maximum variance targets, whether for logistical or cost purposes, also provide a scientific benefit in that year and in subsequent years in the form of increased precision, reduced potential for bias and increased biological sampling.

Table 1. Prioritisation of FISS objectives and corresponding design layers.

Priority	Objective	Design Layer
Primary	Sample Pacific halibut for stock assessment and stock distribution estimation.	Minimum sampling requirements in terms of: • Station distribution; • Station count; • Skates per station.
Secondary	Long-term revenue neutrality.	Logistics and cost: operational feasibility and cost/revenue neutrality.
Tertiary	Minimize removals, and assist others where feasible on a cost-recovery basis.	Removals: minimize impact on the stock while meeting primary priority; Assist: assist others to collect data on a cost-recovery basis; IPHC policies: ad-hoc decisions of the Commission regarding the FISS design.

6.3.2 FISS cost, revenue, and tender considerations

Cost and revenue

38. The Commission **RECALLED** that the Pacific halibut stock is projected to decline by ~5% from 2020 to 2021 (see paper IPHC-2020-IM096-08 Rev_1), and that the IPHC Secretariat estimates that fish prices are expected to be approximately equal to the levels received in 2020, ~US$4.77/lb coastwide, due to the ongoing impacts of the COVID-19 pandemic on the food-supply chain.

39. The Commission **RECALLED** the '*minimum 2021 FISS design*' endorsed by the SRB at its 17th Session in 2020, and proposed by the IPHC Secretariat (prior to cost-revenue optimisation) as follows:

*SRB017–Rec.01 (para. 14) The SRB **RECOMMENDED** that the Commission endorse the final 2021 FISS design as proposed by IPHC Secretariat, and provided at Appendix IVa.*

APPENDIX IVa

IPHC FISHERY-INDEPENDENT SETLINE SURVEY (FISS) DESIGN PROPOSED FOR 2021, AND TENTATIVELY PROPOSED FOR 2022-23

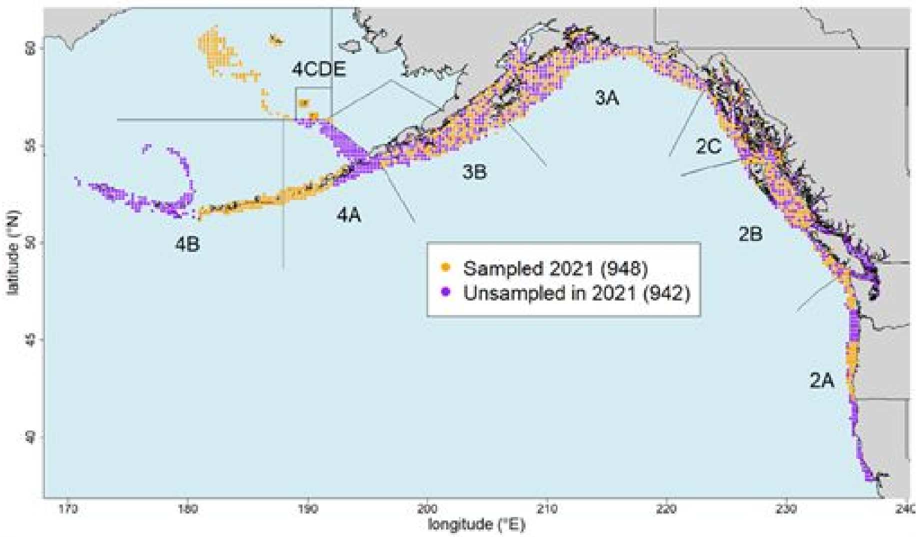

Figure a. *Proposed minimum FISS design in 2021 (orange circles) based on randomized sampling in 2B-3B, and a subarea design elsewhere. Purple circles are optional for meeting data quality criteria.*

40. The Commission **NOTED** the projections of FISS cost and revenue for the '*minimum 2021 FISS design'* (prior to cost-revenue optimisation, i.e. based solely on the primary objective shown in Table 1), would result in a negative revenue of ~US$1,686,384, taking into consideration the ~5% stock decline and fish price assumptions referenced in paragraph 38.

41. The Commission **NOTED** the projections of FISS cost and revenue for the '*optimised 2021 FISS design*' (i.e. the *minimum 2021 FISS design* plus added skates and stations to take into consideration the secondary objective shown in Table 1) would result in a revised revenue figure of negative ~US$226,651.

42. The Commission **NOTED** that the estimated revenue figures should be considered with a +/- of ~$500,000 given stock abundance and price uncertainty.

2021 FISS bid specifications and tenders

43. The Commission **NOTED** that the IPHC Secretariat was intending on soliciting tenders for the 2021 FISS in ~mid-December 2020 (with tenders due by late-January 2021), and that the tender specifications would incorporate the standard wording around amendments that the Commission may make at any time prior to the FISS season commencing. The tender process follows standard U.S. General Services Administration (GSA) guidelines, and is available on the IPHC website for transparency and accountability purposes.

6.3.3 FISS design endorsement (2021-23)

44. The Commission **NOTED** the request by the IPHC Secretariat to approve the '*minimum 2021 FISS design'* as proposed by the IPHC Secretariat, for implementation in 2021 (provided at Appendix IV), and for it to be '*optimised'* to target long-term revenue neutrality.
45. The Commission **NOTED** the '*minimum 2022* and *2023 FISS design'* proposals provided at Appendix Va and b respectively.
46. The Commission **RECOMMENDED** that the IPHC 2021 FISS design be considered for decision at the 9th Special Session of the Commission (SS09), at a date and format to be agreed upon intersessionally. The IPHC Secretariat will develop necessary material to support the decision making process.
47. The Commission **RECOMMENDED** that the IPHC Secretariat provide the Commission, at AM097, an expanded schematic of the rationalisation of the FISS following the 2014-19 expansion series. The intent is to show all the steps from design to implementation of a FISS.

6.4 *Data overview and preliminary stock assessment (2020), and draft harvest decision table (2021)*

48. The Commission **NOTED** paper IPHC-2020-IM096-08 Rev 1 which provided an opportunity to consider the results of the 2020 IPHC stock assessment for Pacific halibut within the Convention Area, including a summary of data sources used, as well as stock projections and the draft harvest decision table for 2021.
49. The Commission **NOTED** that biological data levels were similar to previous years' levels in spite of the COVID-19 pandemic, commending the IPHC Secretariat on their efforts to adapt to the changing environment, for quickly implementing and updating protocols and effectively meeting these targets.
50. The Commission **NOTED** that the 2020 stock assessment represented an update of the 2019 analysis, and produced results that were consistent with recent stock assessments, indicating a declining spawning biomass since 2016. This stock trend is estimated to be a result of low recruitment over the period 2006-2010.
51. The Commission **NOTED** that both modelled FISS trends and commercial logbook records indicated little change at the coastwide level from 2019 to 2020; however, there were increased modelled FISS catch rates in IPHC Regulatory Area 3A and decreased rates in IPHC Regulatory Areas 2C and 2B, which had strong effect on stock distribution and therefore the distribution of the coastwide TCEY within the IPHC's Interim Management Procedure. The 2011 and 2012 year classes were observed to be more important in the 2020 FISS and fishery catches than in previous years.
52. The Commission **NOTED** that due to reduced mortality limits set for 2020, as well as several fishery sectors that did not use the full mortality limits or projections, the fishing intensity in 2020 was estimated to be lower than during the period from 2014-19.
53. The Commission **NOTED** that the reference level of fishing intensity (F43%) adopted in 2020 is estimated to result in a coastwide TCEY of 39.0 million pounds for 2021, slightly above the status quo coastwide TCEY set for 2020 (36.6 million pounds), and also above the TCEY estimated to correspond to the reference level of fishing intensity (F46%) used during the period 2016-20 (35.5 million pounds). All of these harvest levels are projected to result in further spawning biomass declines over the next three years.
54. The Commission **NOTED** that the preliminary detailed mortality projections for 2021 will be updated in January 2021, and included in a revised mortality projection tool for use during AM097. This tool will include all existing agreements and specifications describing the IPHC's current interim management procedure.

6.5 *Size limit review*

55. The Commission **NOTED** paper IPHC-2020-IM096-09 which provided the Commission with a summary of available data and an analysis of: 1) the effects of the current directed commercial fishery minimum

size limit, and 2) the potential effects of a maximum size limit in this fishery. This paper was prepared to meet the Commission request from AM096:

AM096 (para. 157):

"The Commission NOTED the stakeholder questions regarding the current minimum size limit applied to the directed commercial Pacific halibut fishery. In light of the newly available sex-ratio information from the directed commercial fishery, the Commission identified the need for a better understanding of the effects of the minimum size limit on available fishery yield and potential changes from previous analyses. Further, investigation of the use of a maximum size limit has also been a topic on ongoing discussion."

AM096–Req.08 (para. 158):

"The Commission REQUESTED that the IPHC Secretariat prepare an updated discussion of the costs and benefits of removing or adjusting the current minimum size limit and/or adding a maximum size limit. This analysis would be presented during the 2020 Work Meeting and IM096."

56. The Commission **NOTED** that the evaluation provided tactical decision-making information for consideration of removing the current MinSL and/or implementing a MaxSL. The focus is on short-term yield, fishery and stock performance while retaining all other aspects of the IPHC's Interim Management Procedure. It is not intended to provide a comparison of long-term performance of size limits as one part of a comprehensive management procedure. Such a comprehensive analysis may be done via the MSE process. Questions regarding long-term change in spatial distribution and scale of recruitment and spawning biomass require the full 'closed-loop' approach used in the MSE. As such, size limits provide a potential avenue for future MSE analysis.

57. The Commission **NOTED** that the current minimum size limit (32 inches) resulted in an estimated 7% yield loss in 2020, and a fishery value loss for all U32 prices less than 63% of those for O32 Pacific halibut at the coastwide level. The evaluated maximum size limit was estimated to be neutral with regard to fishery yield and value.

58. **NOTING** the indication from some Commissioners that there may be regulatory compliance concerns to be considered, the Commission **REQUESTED** that relevant Contracting Party agencies, led by NOAA and DFO, consider and present those concerns (if applicable) at AM097.

59. The Commission **NOTED** that an evaluation of the impacts of removing the minimum size limit on fishery yield may also be well placed through the Commission's Management Strategy Evaluation process.

7. IPHC SCIENCE AND RESEARCH

7.1 *Report of the 21st Session of the IPHC Research Advisory Board (RAB021)*

60. The Commission **NOTED** the Report of the 21st Session of the IPHC Research Advisory Board (RAB021) (IPHC-2020-RAB021-R).

61. The Commission **NOTED** that the RAB021 did not make any recommendations to the Commission in 2020, but rather, eight (8) requests of the IPHC Secretariat for consideration (Appendix IV of IPHC-2020-RAB021-R).

7.2 *Reports of the IPHC Scientific Review Board*

62. The Commission **NOTED** the Reports of the 16th and 17th Sessions of the IPHC Scientific Review Board (SRB016: IPHC-2020-SRB016-R; SRB017: IPHC-2020-SRB017-R) which were presented by Dr Sean Cox (Chairperson) on behalf of the SRB.

63. The Commission **NOTED** that the SRB017 made eight (8) recommendations to the Commission in 2020 as follows:

IPHC Fishery-independent setline survey (FISS)

*SRB017–Rec.01 (para. 14) The SRB **RECOMMENDED** that the Commission endorse the final 2021 FISS design as proposed by IPHC Secretariat, and provided at Appendix IVa.*

Biological and ecosystem science program research updates

*SRB017–Rec.02 (para. 31) **NOTING** the improved presentation of the research integration plan, the SRB **RECOMMENDED** that the research planning table shown in the meeting presentation for paper IPHC-2020-SRB017-08, be improved by adding clear prioritization of biological research needs for addressing uncertainties in the stock assessment and MSE programs. Ideally, this would be in the form of ranked biological uncertainties/parameters for the stock assessment and MSE operating model along with an explanation for deviations from this ranked list.*

Genetics and Genomics

*SRB017–Rec.03 (para. 49) **NOTING** IPHC Secretariat responses to SRB016-Req. 15 that requested additional methodological detail pertaining to ongoing genomics research, the SRB **RECOMMENDED** that the IPHC Secretariat work with collaborators to develop a series of benchmark summary statistics that characterize the quality of the Pacific halibut genome developed.*

Research integration

*SRB017–Rec.04 (para. 53) The SRB **RECOMMENDED** that the IPHC Secretariat incorporate prioritization of research activities, as well as the timeline of available research outputs as inputs into the stock assessment and MSE processes.*

*SRB017–Rec.05 (para. 54) The SRB **RECOMMENDED** that the IPHC Secretariat identify those research areas with uncertainty and indicate research questions that would require the SRB to provide input and/or decision in future documentation and presentations provided to the SRB.*

Management Strategy Evaluation

*SRB017–Rec.06 (para. 57) The SRB **NOTED** three options for estimation error are available and currently the option of simulating estimation is the most appropriate option to evaluate results in 2020, but **RECOMMENDED** continuing work to incorporate actual estimation models, as in the third option, because that method would best mimic the current assessment process.*

*SRB017–Rec.07 (para. 59) The SRB **RECOMMENDED** using the current MSE results to compare and contrast management procedures incorporating scale and distribution elements, but **NOTED** that, current results are conditional on some parameters and processes that remain uncertain. The uncertainty in applying the untested current approach potentially creates greater risk than adopting a repeatable management procedure that has been simulation tested under a wide range of uncertainties.*

*SRB017–Rec.08 (para. 60) The SRB **RECOMMENDED** that Exceptional Circumstances be defined to determine whether monitoring information has potentially departed from their expected distributions generated by the MSE. Declaration of Exceptional Circumstances may warrant re-opening and revising the operating models and testing procedures used to justify a particular management procedure.*

64. The Commission **NOTED** the preliminary work from the IPHC Secretariat to address the SRB recommendation to increase integration between current and planned biological research activities, as reflected in the IPHC 5-Year Biological and Ecosystem Science Research Plan, and the research priorities for Stock Assessment and the MSE process.

7.3 *IPHC 5-year Biological & Ecosystem Science Research Plan (2017-21): update*

65. The Commission **NOTED** paper IPHC-2020-IM096-10 which provided a description of progress on the IPHC's Biological and Ecosystem Science Research Plan.

66. The Commission **NOTED** the primary biological research activities at the IPHC that follow Commission objectives are identified and described in the IPHC 5-Year Biological and Ecosystem Science Research Plan (2017-21). These activities are summarized in five broad research areas designed to provide inputs into stock assessment and the management strategy evaluation processes, as follows:

    1) **Migration**. Studies are aimed at further understanding reproductive migration and identification of spawning times and locations as well as larval and juvenile dispersal.

    2) **Reproduction**. Studies are aimed at providing information on the sex ratio of the commercial catch and to improve current estimates of maturity.

    3) **Growth and Physiological Condition**. Studies are aimed at describing the role of some of the factors responsible for the observed changes in size-at-age and to provide tools for measuring growth and physiological condition in Pacific halibut.

    4) **Discard Mortality Rates (DMRs) and Survival**. Studies are aimed at providing updated estimates of DMRs in both the longline and the trawl fisheries.

    5) **Genetics and Genomics**. Studies are aimed at describing the genetic structure of the Pacific halibut population and at providing the means to investigate rapid adaptive changes in response to fishery-dependent and fishery-independent influences.

67. The Commission **NOTED** the progress that the IPHC Secretariat has made in the five key research areas contemplated in the IPHC 5-Year Biological and Ecosystem Science Research Plan (2017-21) and, in particular, in the promising use of genomic approaches to address important questions from stock structure and distribution to the genetic basis of key life-history traits.

68. The Commission **NOTED** the efforts of the IPHC Secretariat to publish important scientific results derived from the research areas contemplated in the IPHC 5-Year Biological and Ecosystem Science Research Plan (2017-21) in the peer-reviewed literature.

8. MANAGEMENT STRATEGY EVALUATION

8.1 *IPHC Management Strategy Evaluation: update*

69. The Commission **NOTED** paper IPHC-2020-IM096-11 Rev_1 which provided a description of the International Pacific Halibut Commission (IPHC) Management Strategy Evaluation (MSE) framework and simulations of management procedures for distributing the TCEY.

70. The Commission **NOTED** that the MSE framework to evaluate management procedures incorporating scale and distribution elements can be used to evaluate additional management procedures and hypotheses in the future.

71. The Commission **NOTED** that with a considerable amount of MSE work having been completed and a lot of information presented, it may be prudent to continue to consider and further evaluate the types of management procedures that were identified to perform best given the current primary objectives.

72. The Commission **NOTED** that the current simulations represent a range of assumptions about migration and that the evaluation of management procedures to alternative assumptions would be useful to determine the robustness of the management procedures to migration hypotheses.

73. The Commission **RECALLED** the current reference SPR of 43%, and **NOTED** that increasing fishing intensity to SPR values between 40% and 43% may improve the performance of some management procedures relative to others while still meeting conservation and biomass target objectives.

74. The Commission **RECOMMENDED** that a Special Session of the Commission be held prior to the AM097 meeting in January, to look at potential modifications to existing MPs as part of the IPHC Secretariat's MSE program of work. The IPHC Secretariat will seek to establish agreeable dates, and publish the meeting invitation accordingly, noting that all meetings of the Commission are public unless otherwise decided by the Commission.

8.2 *Independent peer review of the IPHC Management Strategy Evaluation process*

75. The Commission **NOTED** paper IPHC-2020-IM096-17 which provided the Commission with an opportunity to further consider the report of the independent peer review of the IPHC Management Strategy Evaluation process.

76. The Commission **NOTED** the reviewer's key conclusion that the MSE model framework was implemented according to international guidelines and standards for the evaluation of harvest control rules, and comprises a simulated model of truth (the operating model), a simulation of the stock assessment process (estimation model) and a simulation of the catch setting and catch allocation process (the harvest control rule).

77. The Commission **NOTED** the independent peer-reviewer made the following recommendations to ensure the continued success and accuracy of MSE simulations:

    a) decide soon on the future of the MSE process beyond January 2021 and allocate necessary funding;

    b) treat the MSE framework as an ongoing process that will be used over many years alongside the stock assessment, to test the effectiveness of data gathering, stock assessment assumptions, and catch-setting;

    c) require the Commission to codify the rules they used to adjust catch levels within each Regulatory Area after the harvest control rule is applied, so that the MSE framework accurately evaluates risk to the stock and catches within each such Area;

    d) MSAB membership could be expanded to include representatives for crew members, fishing communities, and environmental organizations; and

    e) Complete the documentation of technical details of the IPHC MSE framework (Hicks et al. 2019), which is currently an incomplete working document.

8.3 *Reports of the IPHC Management Strategy Advisory Board*

78. The Commission **NOTED** the Reports of the 15th and 16th Sessions of the IPHC Management Strategy Advisory Board (MSAB015: IPHC-2020-MSAB015-R; MSAB016: IPHC-2020-MSAB016-R) which was presented by Mr Adam Keizer (Canada) and Ms Rachel Baker (U.S.A).

79. The Commission **NOTED** that the MSAB endorsed five management procedures that ranked highest among the eleven when evaluated using the Commission's current primary objectives:

> (MSAB016-R, para. 47) *The MSAB* ***ENDORSED*** *Tier 1 MPs, that were ranked highest in the MSE results using the tools available, for consideration. These MPs are MP-D, MP-H, MP-I, MP-J, MP-K as specified in Appendix V.*

80. The Commission **NOTED** that the MSAB016 made two (2) recommendations to the Commission as follows:

Results investigating fishing intensity and distributing the total constant exploitation yield (TCEY) for Pacific halibut fisheries

> *MSAB016-Rec.1 (para. 35) The MSAB* ***RECOMMENDED*** *that the performance metrics related to the current primary objectives (Appendix VI) be considered when evaluating MPs.*

MSAB Program of work

> *MSAB016-Rec.2 (para. 53) The MSAB* ***RECOMMENDED*** *the following MPs for analysis and consideration in 2021:*
>
> *a) MP-J in combination with a fixed TCEY of 1.65 Mlbs in Regulatory Area 2A, as in paragraph 97 b) of IPHC-2020-AM096-R, with total mortality rebalanced among remaining U.S.A. IPHC Regulatory Areas to maintain a constant SPR;*

> *b) MP-J in combination with a minimum TCEY of 1.65 Mlbs in Regulatory Area 2A which allows the TCEY to exceed 1.65 in IPHC Regulatory Area 2A with total mortality rebalanced among remaining U.S.A. IPHC Regulatory Areas to maintain a constant SPR.*

81. The Commission **NOTED** that:

> (MSAB016-R, para. 57) "*The MSAB AGREED that proposed topics of work beyond the 2021 deliverables include revisiting objectives, MPs, specifications of the MSE framework and operating model, improving estimation models and data generation (e.g. uncertainty), outreach and communication tools, as well as recommendations from the 2020 peer review of the MSE. Some examples include those items described in paragraphs 30 and 31. 58.*
>
> (MSAB016-R, para. 58) "*The MSAB REQUESTED that an MSAB meeting be scheduled to discuss a Program of Work for 2021 and beyond.*"

9. CONTRACTING PARTY NATIONAL REPORTS

9.1 *Canada*

82. The Commission **NOTED** that no national report was provided by Canada for consideration at the IM096.

9.1.1 Fisheries and Oceans Canada (DFO)

83. The Commission **NOTED** that no update on Pacific halibut matters was received from Fisheries and Oceans Canada for consideration at the IM096.

9.2 *United States of America*

84. The Commission **NOTED** that no national report was provided by the United States of America for consideration at the IM096.

9.2.1 National Oceanic and Atmospheric Administration (NOAA) – Fisheries

a) National Marine Fisheries Service (NOAA-Fisheries)

85. The Commission **NOTED** that no update on Pacific halibut matters was received from NOAA-Fisheries for consideration at the IM096.

b) North Pacific Fishery Management Council (NPFMC)

86. The Commission **NOTED** that no update on Pacific halibut matters was received from the NPFMC at IM096.

c) Pacific Fishery Management Council (PFMC)

87. The Commission **NOTED** that no update on Pacific halibut matters was received from the PFMC at IM096.

10. IPHC FISHERY REGULATIONS: PROPOSALS FOR THE 2020-21 PROCESS

88. The Commission **NOTED** paper IPHC-2020-IM096-12, which aimed to provide the Commission with an initial indication of the IPHC Fishery Regulation proposals, which the IPHC Secretariat, Contracting Parties, and other stakeholders have indicated they anticipate submitting, for consideration by the Commission in the 2020-21 regulatory process.

89. The Commission **RECALLED** the IPHC Fishery Regulation proposal submission and review process instituted in 2017, whereby a preliminary indication of the fishery regulation proposals being submitted by the IPHC Secretariat to the Commission are provided at the Interim Meeting. Fishery regulation proposals from the Contracting Parties and other stakeholders are typically received later in the process.

90. The Commission **RECOMMENDED** that interested stakeholders note the deadline for submission of IPHC Fishery Regulation proposals, for consideration at the 97th Session of the Annual Meeting (AM097), of **26 December 2020**. Late proposals will not be considered at AM097.

91. The Commission **NOTED** that the IPHC Secretariat and the relevant Contracting Party agencies intend to coordinate a joint review of regulatory proposals, with the aim of identifying and resolving issues and clarifying draft regulatory language in advance of AM097.

10.1 *IPHC Secretariat fishery regulation proposals*

10.1.1 IPHC Fishery Regulations: Mortality and Fishery Limits (Sect. 5)

92. The Commission **NOTED** paper IPHC-2020-IM096-PropA1, which aimed to improve clarity and transparency of fishery limits within the IPHC Fishery Regulations.

10.1.2 IPHC Fishery Regulations: Commercial Fishing Periods (Sect. 9)

93. The Commission **NOTED** paper IPHC-2020-IM096-PropA2, which proposed fishing periods for the directed commercial Pacific halibut fisheries within the IPHC Fishery Regulations.

10.1.3 IPHC Fishery Regulations: minor amendments

94. The Commission **NOTED** paper IPHC-2020-IM096-PropA3, which proposed amendments to ensure clarity and consistency in the IPHC Fishery Regulations.

10.2 *Contracting Party fishery regulation proposals*

95. The Commission **NOTED** that no Contracting Party regulatory proposals were received for consideration at the IM096.

10.3 *Stakeholder fishery regulation proposals*

96. The Commission **NOTED** that no Stakeholder regulatory proposals were received for consideration at the IM096.

10.4 *Stakeholder statements*

97. The Commission **NOTED** that no Stakeholder statements were received for consideration at the IM096, as part of paper IPHC-2020-IM096-INF01.

11. 2ND IPHC PERFORMANCE REVIEW (PRIPHC02): IMPLEMENTATION OF RECOMMENDATIONS

98. The Commission **NOTED** paper IPHC-2020-IM096-13, which provided the Commission with an update on the implementation of the recommendations arising from the 2nd Performance Review of the IPHC (PRIPHC02).

12. PACIFIC HALIBUT FISHERY ECONOMICS UPDATE

99. The Commission **NOTED** paper IPHC-2020-IM096-14, which provided the Commission with an update on the IPHC economic study, including progress on developing the economic impact assessment model, state of the collection of primary economic data from Pacific halibut dependent sectors, and plan for the year ahead.

100. The Commission **NOTED** that the accuracy of economic impact assessment of the Pacific halibut resource depends on broader stakeholders' active participation in developing the necessary data for analysis.

101. The Commission **NOTED** that adding the subsistence/aboriginal fishing to the economic model would be an interesting extension, but acknowledged the difficulty of this endeavour considering the lack of necessary data.

102. The Commission **NOTED** that increasing the resolution of the assessed economic impacts is conditional on cooperation between Contracting Parties and the IPHC on economic data exchange.

13. Finance and administration

13.1 *FY2021 Budget modifications*

103. The Commission **NOTED** paper IPHC-2020-IM096-15 Rev_2, which provided the Commission with the new Chart of Accounts and reallocated FY2021 budget.

104. The Commission **NOTED** that the new accounting software, Aplos, went live on 15 June 2020 after several months of evaluating options to best meet organizational needs. The IPHC Secretariat immediately began the development and population with FY2020 budgets, expenses and income received for FY2020. The subscription based software allows for organizations to perform fund accounting. Fund accounting provides transparency while separating the accounting of financial transactions by fund. It also allows for the management of grant or fund restrictions and for each fund to have a self-balanced set of accounts. This is especially important when managing and keeping IPHC Fishery-Independent Setline Survey (FISS) accounting separate from our general operations funded through Contracting Party contributions.

105. The Commission **NOTED** that throughout FY2020, the IPHC Secretariat has undertaken an extensive review and reformation of the IPHC accounting system. In doing so, we have also revised the IPHC Chart of Accounts. This has subsequently required a reallocation of the approved budget line items, to newly named or allocated budget lines.

106. The Commission **NOTED** that the prior approved budget from AM096 included a correction to reduce Personnel Related Expenses by $7,700 in the 40-FISS fund previously referred to as the Supplemental Fund, and a correction to reduce Supplies Expense by $150,000 from 20-Research represented as the General Fund.

107. The Commission **NOTED** that an increase of $78,569 in the approved FY2021 budget for fund accounting for income and associated expenses for grant funding for 20-Research, and a $76,000 increase in 40-FISS for heavying shipping as a cost recovery line item in support of our survey assessment program.

108. The Commission **ADOPTED** the revised FY2021 budget (financial period: 1 October 2020 to 30 September 2021) as provided at Appendix VI, noting that there is no change in the Contracting Party contributions due for FY2021.

13.2 *IPHC Rules of Procedure (2021)*

109. The Commission **NOTED** paper IPHC-2020-IM096-16, which proposed amendments to the IPHC Rules of Procedure (2020). The proposed revisions incorporate process and functional amendments intended to further modernise the IPHC's governance procedures for public intersessional meetings of the Commission.

13.3 *Contracting Party contributions – Historical review*

110. The Commission **NOTED** paper IPHC-2020-IM096-18, which provide a response to Commission requests for background information on Contracting Party contributions.

111. The Commission **AGREED** to conduct further discussions regarding rebalancing the Party contributions in support of the annual IPHC budget. Further discussion may be scheduled to take place through intersessional meetings and/or at the 97th Sessions of the Finance and Administration Commission (FAC097), and Commission (AM097) in January 2021 and may also include intergovernmental discussions between the Parties.

14. OTHER BUSINESS

14.1 *Preparation for 97th Session of the IPHC Annual Meeting (AM097) and associated subsidiary bodies*

112. The Commission **NOTED** that the 97th Session of the IPHC Annual Meeting (AM097) will be held via electronic means from 25 to 29 January 2021.

113. The Commission **NOTED** that information concerning the meeting, including electronic versions of documents to be considered, will be published on the meeting webpages as they become available, but no later than 30 days prior to the commencement of each meeting, in accordance with Rule 8.4 of the IPHC Rules of Procedure (2020), as follows:
- 97th Session of the IPHC Finance and Administration Committee (FAC097): Deadline 26 December 2020
- 97th Session of the IPHC Annual Meeting (AM097): Deadline 26 December 2020
- 91st Session of the IPHC Conference Board (CB091): Deadline 27 December 2020
- 26th Session of the IPHC Processor Advisory Board (PAB026): Deadline 27 December 2020

15. REVIEW OF THE DRAFT AND ADOPTION OF THE REPORT OF THE 96TH SESSION OF THE IPHC INTERIM MEETING (IM096)

114. The report of the 96th Session of the IPHC Interim Meeting (IPHC-2020-IM096-R) was **ADOPTED** via correspondence on 2 December 2020, including the consolidated set of recommendations and requests arising from IM096, provided at Appendix VII.

APPENDIX I
LIST OF PARTICIPANTS FOR THE 96TH SESSION OF THE IPHC INTERIM MEETING (IM096)

Commission Officer

Chairperson	Vice-Chairperson
Mr Paul **Ryall** (Canada)	Mr Chris **Oliver** (United States of America)

Commissioners

Canada	United States of America
Mr Paul **Ryall**	Mr Chris **Oliver**
Mr Neil **Davis**	Mr Robert **Alverson**
Mr Peter **DeGreef**	Mr Richard **Yamada**

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Observers

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IPHC Secretariat

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APPENDIX II
AGENDA FOR THE 96TH SESSION OF THE IPHC INTERIM MEETING (IM096)

Date: 18-19 November 2020
Location: Electronic
Venue: Electronic (Go-To-Meeting)
Time: 09:00-17:00 daily
Chairperson: Mr Paul Ryall (Canada)
Vice-Chairperson: Mr Chris Oliver (USA)

1. OPENING OF THE SESSION (Chairperson)

2. ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION (Chairperson)

3. UPDATE ON ACTIONS ARISING FROM THE 96th SESSION OF THE IPHC ANNUAL MEETING (AM096) AND 2020 INTERSESSIONAL DECISIONS (D. Wilson)

4. REPORT OF THE IPHC SECRETARIAT (2020): Draft (D. Wilson)

5. STATE OF THE FISHERY (2020): Preliminary statistics (L. Erikson)

6. STOCK STATUS OF PACIFIC HALIBUT (2020) AND HARVEST DECISION TABLE 2021

- 6.1 IPHC Fishery-Independent Setline Survey (FISS) design, implementation, and implications (L. Erikson)
- 6.2 Space-time modelling of survey data (WPUE; FISS expansion results, etc.) (R. Webster)
- 6.3 FISS Rationalisation (2021-23)
- 6.4 Data overview and preliminary stock assessment (2020), and draft harvest decision table (2021) (I. Stewart)
- 6.5 Size limit review (I. Stewart)

7. IPHC SCIENCE AND RESEARCH

- 7.1 Report of the 21st Session of the IPHC Research Advisory Board (RAB021) (J. Planas)
- 7.2 Reports of the IPHC Scientific Review Board (SRB Chairperson)
- 7.3 IPHC 5-year Biological and Ecosystem Science Research Plan (2017-21): update (J. Planas)

8. MANAGEMENT STRATEGY EVALUATION

- 8.1 IPHC Management Strategy Evaluation: update (A. Hicks)
- 8.2 Independent peer review of the IPHC Management Strategy Evaluation process (T. Branch)
- 8.3 Reports of the IPHC Management Strategy Advisory Board (MSAB Co-Chairpersons)

9. CONTRACTING PARTY NATIONAL REPORTS (Contracting Parties)

- 9.1 Canada
  - 9.1.1 Fisheries and Oceans Canada (DFO)
- 9.2 United States of America
  - 9.2.1 National Oceanic and Atmospheric Administration (NOAA) – Fisheries
    - 9.2.1.1 National Marine Fisheries Service (NOAA-Fisheries)
    - 9.2.1.2 North Pacific Fishery Management Council (NPFMC)
    - 9.2.1.3 Pacific Fishery Management Council (PFMC)

10. IPHC FISHERY REGULATIONS: PROPOSALS FOR THE 2020-21 PROCESS (D. Wilson)

- 10.1 IPHC Secretariat fishery regulation proposals
- 10.2 Contracting Party fishery regulation proposals
- 10.3 Stakeholder fishery regulation proposals
- 10.4 Stakeholder statements

11. 2ND IPHC PERFORMANCE REVIEW (PRIPHC02): IMPLEMENTATION OF RECOMMENDATIONS (D. Wilson)

12. PACIFIC HALIBUT FISHERY ECONOMICS UPDATE (B. Hutncizak)

13. FINANCE AND ADMINISTRATION

13.1 FY2021 Budget modifications (D. Wilson)

13.2 IPHC Rules of Procedure (2021): Draft (D. Wilson)

13.3 Contracting Party contributions – Historical review (D. Wilson)

14. OTHER BUSINESS

14.1 Preparation for the 97th Session of the IPHC Annual Meeting (AM097) and associated subsidiary bodies (D. Wilson)

15. REVIEW OF THE DRAFT AND ADOPTION OF THE REPORT OF THE 96th SESSION OF THE IPHC INTERIM MEETING (IM096) (Chairperson & Executive Director)

APPENDIX III
LIST OF DOCUMENTS FOR THE 96TH SESSION OF THE IPHC INTERIM MEETING (IM096)

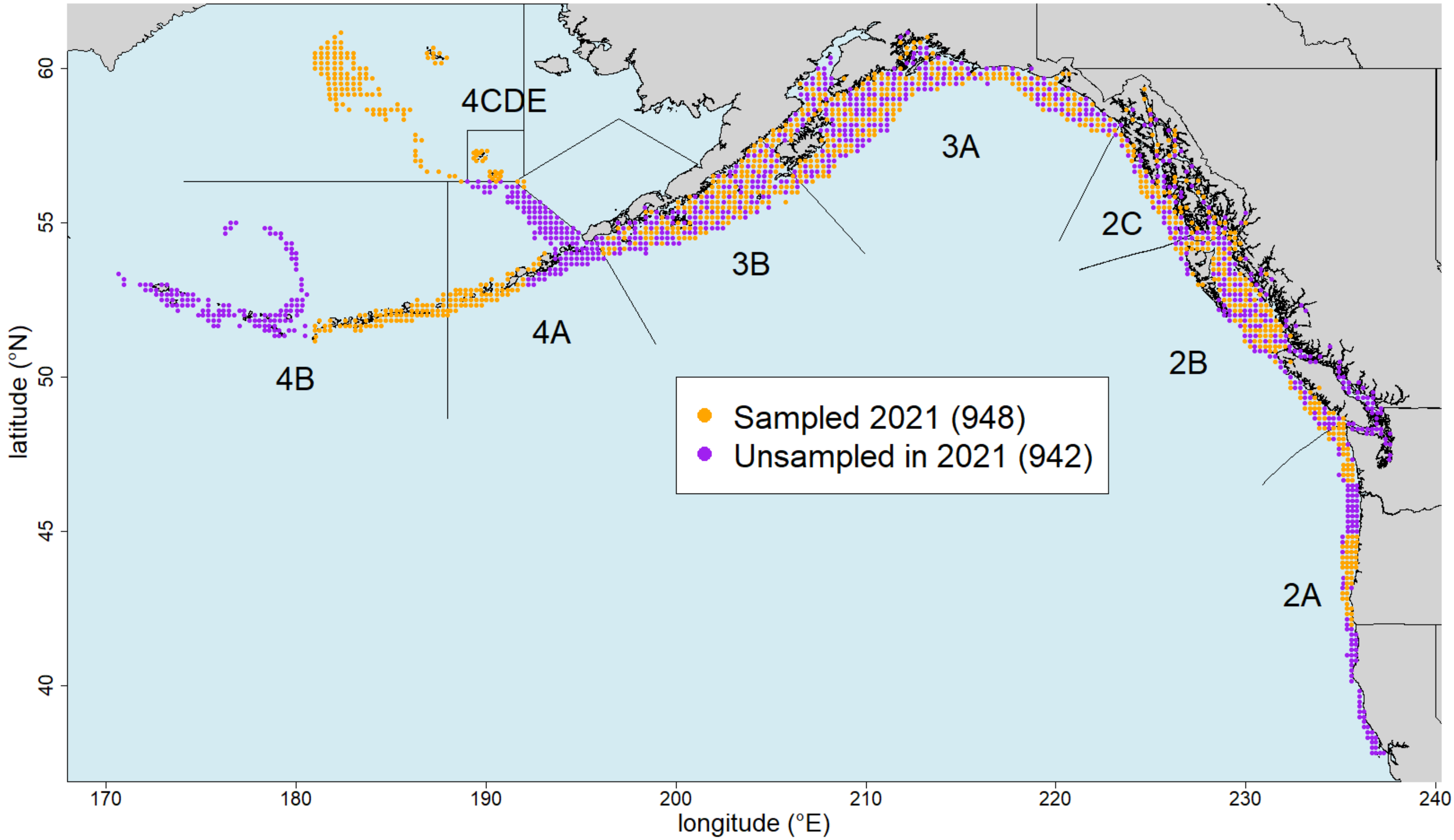
Document	Title	Availability
IPHC-2020-IM096-01	Agenda & Schedule for the 96th Session of the IPHC Interim Meeting (IM096)	✓ 20 Aug 2020 ✓ 15 Oct 2020
IPHC-2020-IM096-02	List of Documents for the 96th Session of the IPHC Interim Meeting (IM096)	✓ 20 Aug 2020 ✓ 18 Nov 2020
IPHC-2020-IM096-03	Update on actions arising from the 96th Session of the IPHC Annual Meeting (AM096) and 2020 Intersessional decisions (D. Wilson)	✓ 13 Oct 2020
IPHC-2020-IM096-04	Report of the IPHC Secretariat (2020): Draft (D. Wilson)	✓ 16 Oct 2020
IPHC-2020-IM096-05 Rev_1	State of the Fishery (2020): Preliminary fishery statistics (L. Erikson & H. Tran)	✓ 15 Oct 2020 ✓ 8 Nov 2020
IPHC-2020-IM096-06 Rev_1	IPHC Fishery-independent setline survey (FISS) design and implementation in 2020 (L. Erikson & R. Webster)	✓ 16 Oct 2020 ✓ 6 Nov 2020
IPHC-2020-IM096-07	Review: Rationalisation of the FISS following the 2014-19 expansion series (R. Webster)	✓ 16 Oct 2020
IPHC-2020-IM096-08 Rev_1	Summary of the data, stock assessment, and harvest decision table for Pacific halibut (*Hippoglossus stenolepis*) at the end of 2020 (I. Stewart, A. Hicks, R. Webster & D. Wilson)	✓ 13 Oct 2020 ✓ 12 Nov 2020
IPHC-2020-IM096-09	Evaluation of directed commercial fishery size limits in 2020 (I. Stewart, A. Hicks & B. Hutniczak)	✓ 25 Sept 2020
IPHC-2020-IM096-10	IPHC 5-year Biological and Ecosystem Science Research Plan (2017-21): Update (J. Planas)	✓ 6 Oct 2020
IPHC-2020-IM096-11 Rev_1	Management Strategy Evaluation results for distribution management procedures (A. Hicks, P. Carpi, S. Berukoff & I. Stewart)	✓ 17 Oct 2020 ✓ 2 Nov 2020
IPHC-2020-IM096-12	IPHC Fishery Regulations: Proposals for the 2020-21 process (D. Wilson & L. Erikson)	✓ 16 Oct 2020
IPHC-2020-IM096-13	Implementation of the recommendations from the 2nd IPHC Performance Review (PRIPHC02) (D. Wilson)	✓ 6 Oct 2020
IPHC-2020-IM096-14	Pacific Halibut Multiregional Economic Impact Assessment (PHMEIA): summary of progress (B. Hutniczak)	✓ 16 Oct 2020
IPHC-2020-IM096-15 Rev_2	FY2021 Budget modifications (D. Wilson & K. Jernigan)	✓ 19 Oct 2020 ✓ 21 Oct 2020 ✓ 6 Nov 2020
IPHC-2020-IM096-16	Draft: IPHC Rules of Procedure (2021) (D. Wilson)	✓ 13 Oct 2020
IPHC-2020-IM096-17	Independent peer review of the IPHC Management Strategy Evaluation process (D. Wilson; T. Branch)	✓ 13 Oct 2020
IPHC-2020-IM096-18	Contracting Party contributions – Historical review (D. Wilson)	✓ 14 Oct 2020

Contracting Party updates		
IPHC-2020-IM096-NR01	**Canada**: Fisheries and Oceans Canada (DFO)	No submission
IPHC-2020-IM096-NR02	**United States of America**: NOAA – National Marine Fisheries Service (NMFS); North Pacific Fishery Management Council (NPFMC); Pacific Fishery Management Council (PFMC)	No submission
IPHC Fishery Regulation proposals for 2021		
IPHC Secretariat Fishery Regulation proposals for 2021		
IPHC-2020-IM096-PropA1	Mortality and Fishery Limits (Sect. 5) (IPHC Secretariat)	✓ 13 Oct 2020
IPHC-2020-IM096-PropA2	Commercial Fishing Periods (Sect. 9) (IPHC Secretariat)	✓ 16 Oct 2020
IPHC-2020-IM096-PropA3	IPHC Fishery Regulations: minor amendments (IPHC Secretariat)	✓ 13 Oct 2020
Contracting Party Fishery Regulation proposals for 2021		
IPHC-2020-IM096-PropB1	Recreational (Sport) Fishing for Pacific Halibut—IPHC Regulatory Area 2B (Sect. 28) (Canada: DFO)	Withdrawn
IPHC-2020-IM096-PropB2	Charter Management Measures in IPHC Regulatory Areas 2C and 3A (Sect. 29) (USA: NOAA-Fisheries)	Deferred to AM097
Other Stakeholder Fishery Regulation proposals for 2021		
IPHC-2020-IM096-PropC1	-	No submissions
Reports from IPHC subsidiary bodies		
IPHC-2020-RAB021-R	Report of the 21st Session of the IPHC Research Advisory Board (RAB021)	✓ 27 Feb 2020
IPHC-2020-SRB016-R	Report of the 16th Session of the IPHC Scientific Review Board (SRB016)	✓ 26 Jun 2020
IPHC-2020-SRB017-R	Report of the 17th Session of the IPHC Scientific Review Board (SRB017)	✓ 25 Sept 2020
IPHC-2020-MSAB015-R	Report of the 15th Session of the IPHC Management Strategy Advisory Board (MSAB015)	✓ 15 May 2020
IPHC-2020-MSAB016-R	Report of the 16th Session of the IPHC Management Strategy Advisory Board (MSAB016)	✓ 23 Oct 2020
IPHC-2020-FAC096-R	Report of the 96th Session of the IPHC Finance and Administration Committee (FAC096)	✓ 4 Feb 2020
IPHC-2020-PAB025-R	Report of the 25th Session of the IPHC Processor Advisory Board (PAB025)	✓ 6 Feb 2020
IPHC-2020-CB090-R	Report of the 90th Session of the IPHC Conference Board (CB090)	✓ 6 Feb 2020
Information papers		
IPHC-2020-IM096-INF01	Stakeholder Statements on IPHC Fishery Regulation proposals	✓ 18 Nov 2020
IPHC-2020-IM096-INF02	Updated Range of Alternatives for the Proposed Transfer of Management Responsibilities for Area 2A Pacific Halibut Fisheries with Focus on the Non-Indian Directed Commercial Fishery (PFMC Secretariat)	✓ 13 Oct 2020

IPHC-2020-IM096-INF03	The IPHC mortality projection tool for 2021 (and 2022) mortality limits (I. Stewart)	✓ 13 Oct 2020
IPHC-2020-IM096-INF04	The IPHC MSE Explorer tool (A. Hicks & P. Carpi)	✓ 10 Nov 2020

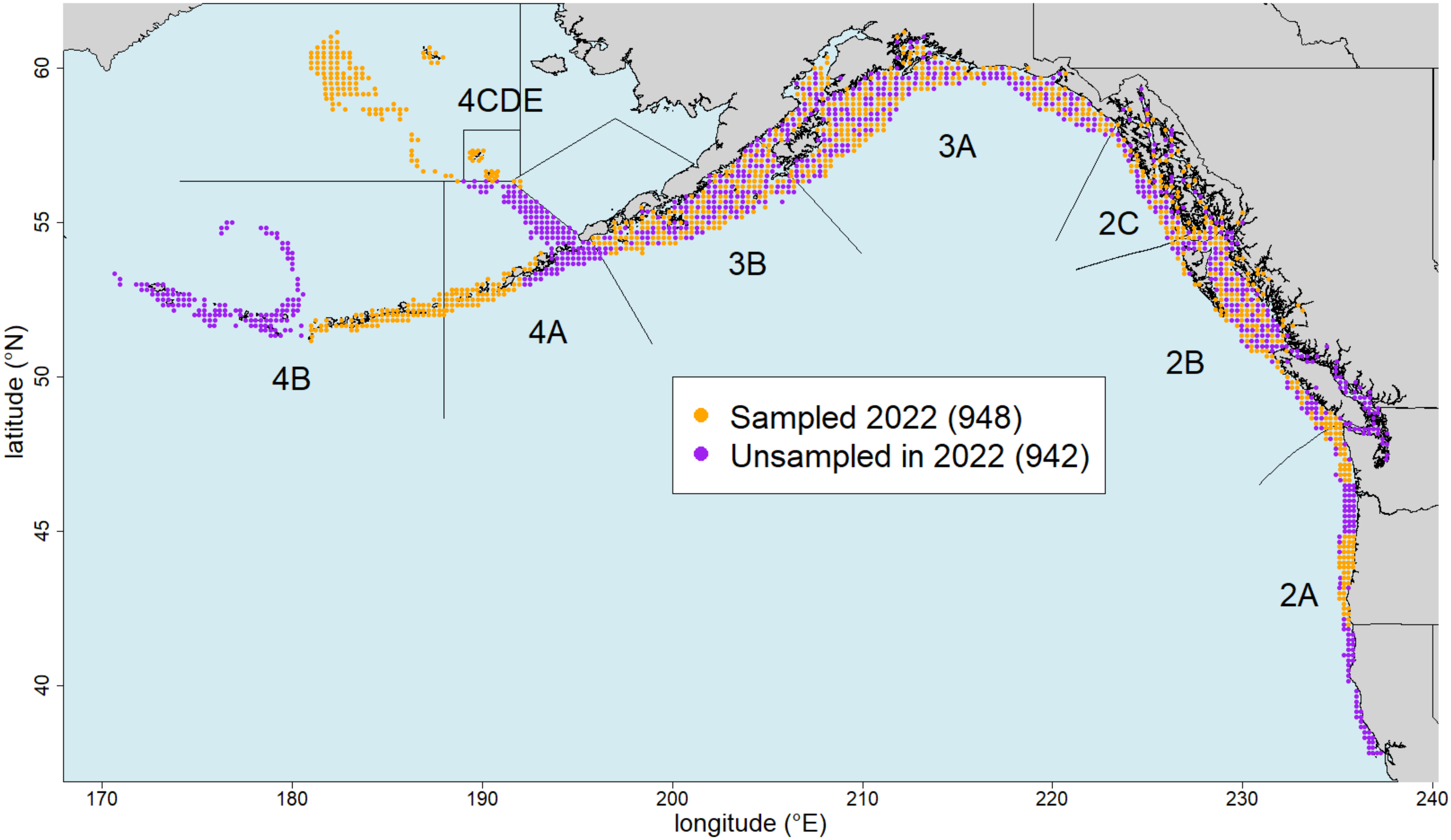
Appendix IV

Minimum FISS design in 2021 (orange circles) based on randomized sampling in 2B-3B, and a subarea design elsewhere. Purple circles are optional for meeting data quality criteria



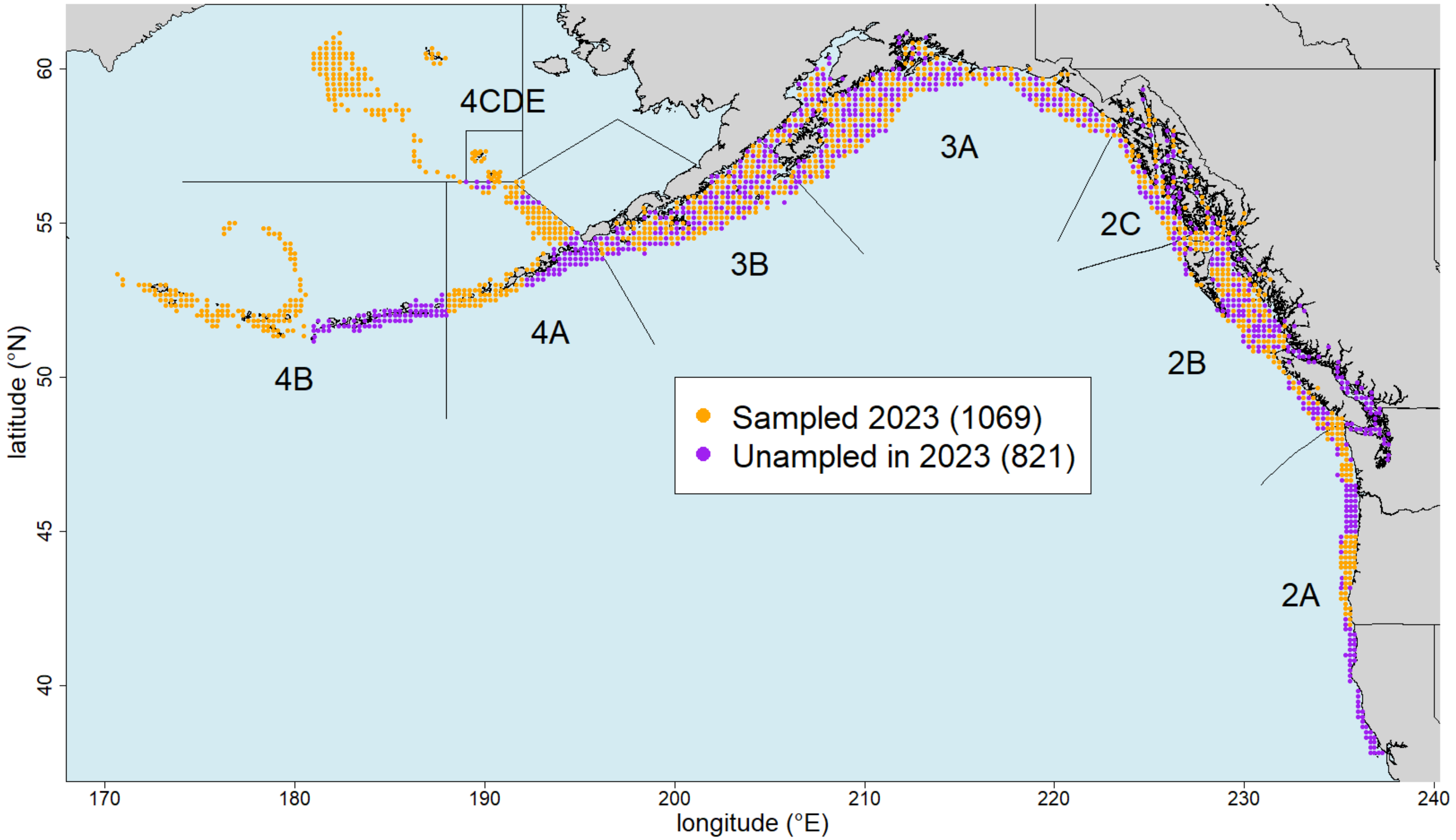
APPENDIX VA

TENTATIVE MINIMUM FISS DESIGN IN 2022 (ORANGE CIRCLES) BASED ON RANDOMIZED SAMPLING IN 2B-3B, AND A SUBAREA DESIGN ELSEWHERE. PURPLE CIRCLES ARE OPTIONAL FOR MEETING DATA QUALITY CRITERIA



APPENDIX VB

TENTATIVE MINIMUM FISS DESIGN IN 2023 (ORANGE CIRCLES) BASED ON RANDOMIZED SAMPLING IN 2B-3B, AND A SUBAREA DESIGN ELSEWHERE. PURPLE CIRCLES ARE OPTIONAL FOR MEETING DATA QUALITY CRITERIA



APPENDIX VI
FY2021 IPHC CHART OF ACCOUNTS AND REALLOCATED FY2021 BUDGET

Account Number	Account Name	FY2021 modified budget (Fund Accounting)	FY2021 modified budget (FISS)
<u>Income</u>			
<u>Income</u>			
40000	**Contracting Party Contributions**		
40000.01	Canada	900,407	
40000.02	United States of America	4,157,760	
40050	**IFC Pension**		
40050.01	IFC Pension - Canada	111,250	
40050.02	IFC Pension - United States of America	139,424	
40055	**Headquarters** (Lease & Maintenance)	470,717	
40060	Other Income		0
40100	Grants, Contracts & Agreements	562,227*	46,400
40200	Interest Income	0	11,000
40350	Fish Sales		
40350.01	Fish Sales - Pacific Halibut		5,210,500
40350.02	Fish Sales - Byproduct		56,000
	Total Income	**6,341,785**	**5,323,900**
<u>Expense</u>			
<u>Personnel Expenses</u>			
50000	Salaries & Wages	3,587,417	455,795
50100	Benefits	1,538,178	14,131
50100.09	Medical Reimbursement - Retiree	97,350	
50200	Training & Education	25,000	52,000
50300	Personnel Related Expenses	10,000	34,644
50300.01	Scholarship Awards	8,000	
	Total Personnel Expenses	5,265,945	556,570
<u>Operational Expenses</u>			
51000	Publications	15,000	
51100	Mailing and Shipping	15,000	76,000
51200	Travel	100,000	111,920
51300	Meeting and Conference Expenses	104,000	
51400	Technology	150,000	
	Total Operational Expenses	384,000	187,920
<u>Fees and Contract Expenses</u>			
52000	Professional Fees	134,750	
52100	Vessel Expenses		
52200	Other Fees and Charges		562,824
52300	Leases and Contracts	374,773	2,312,754
54000	Communications	17,000	82,650
	Total Fees and Contract Expenses	526,523	2,958,228
<u>Facilities and Equipment Expenses</u>			
53000	Equipment Expense	51,010	32,400
53100	Supplies Expense	146,583	889,505

53200	Maintenance and Utilities	161,421	40,000
53300	Facility Rentals	395,580	20,000
	Total Facilities and Equipment Expenses	754,594	981,905
Other Expenses			
55000	Budget Contingency	50,000	
55100	Other Expenses		
55200	Fund Cost Recovery	-639,277	639,277
	Total Other Expenses	-589,277	639,277
	Total Expense	**6,341,785**	**5,323,900**
	Net Income (Loss)	**0**	**0**

* USA - IFQ/CDQ cost recovery for 2021 – Alaska = $478,599.

APPENDIX VII

CONSOLIDATED SET OF RECOMMENDATIONS AND REQUESTS OF THE 96TH SESSION OF THE IPHC INTERIM MEETING (IM096) (18-19 NOVEMBER 2020)

RECOMMENDATIONS

FISS redesign discussion

IM096-Rec.01 (para. 35) The Commission **NOTED** some existing opportunities for stakeholder engagement in the FISS design review process and **RECOMMENDED** that additional formalised opportunities should be added to the review timeline for future presentations. An option is to hold the annual RAB meeting in November or December of each year.

FISS design endorsement (2021-23)

IM096-Rec.02 (para. 46) The Commission **RECOMMENDED** that the IPHC 2021 FISS design be considered for decision at the 9th Special Session of the Commission (SS09), at a date and format to be agreed upon intersessionally. The IPHC Secretariat will develop necessary material to support the decision making process.

IM096-Rec.03 (para. 47) The Commission **RECOMMENDED** that the IPHC Secretariat provide the Commission, at AM097, an expanded schematic of the rationalisation of the FISS following the 2014-19 expansion series. The intent is to show all the steps from design to implementation of a FISS.

IPHC Management Strategy Evaluation

IM096-Rec.04 (para. 74) The Commission **RECOMMENDED** that a Special Session of the Commission be held prior to the AM097 meeting in January, to look at potential modifications to existing MPs as part of the IPHC Secretariat's MSE program of work. The IPHC Secretariat will seek to establish agreeable dates, and publish the meeting invitation accordingly, noting that all meetings of the Commission are public unless otherwise decided by the Commission.

IPHC Fishery regulations: Proposals for the 2020-21 process

IM096-Rec.05 (para. 90) The Commission **RECOMMENDED** that interested stakeholders note the deadline for submission of IPHC Fishery Regulation proposals, for consideration at the 97th Session of the Annual Meeting (AM097), of **26 December 2020**. Late proposals will not be considered at AM097.

REQUESTS

Size limit review

IM096-Req.01 (para. 58) **NOTING** the indication from some Commissioners that there may be regulatory compliance concerns to be considered, the Commission **REQUESTED** that relevant Contracting Party agencies, led by NOAA and DFO, consider and present those concerns (if applicable) at AM097.

DRAFT: AGENDA & SCHEDULE FOR THE 96th SESSION OF THE IPHC INTERIM MEETING (IM096)

Date: 18-19 November 2020
Location: Electronic
Venue: Electronic (Go-To-Meeting)
Time: 09:00-17:00 daily
Chairperson: Mr Paul Ryall (Canada)
Vice-Chairperson: Mr Chris Oliver (USA)

Notes:

- *All sessions are open to Observers and the general public*
- *All sessions will be webcast. Webcast sessions will also take audience comments and questions as directed by the Chairperson of the Commission.*

DRAFT: AGENDA FOR THE 96th SESSION OF THE IPHC INTERIM MEETING (IM096)

1. **OPENING OF THE SESSION** (Chairperson)

2. **ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION** (Chairperson)

3. **UPDATE ON ACTIONS ARISING FROM THE 96th SESSION OF THE IPHC ANNUAL MEETING (AM096) AND 2020 INTERSESSIONAL DECISIONS** (D. Wilson)

4. **REPORT OF THE IPHC SECRETARIAT (2020): Draft** (D. Wilson)

5. **STATE OF THE FISHERY (2020): Preliminary statistics** (L. Erikson)

6. **STOCK STATUS OF PACIFIC HALIBUT (2020) AND HARVEST DECISION TABLE**
    - 6.1 IPHC Fishery-Independent Setline Survey (FISS) design, implementation, and implications (L. Erikson)
    - 6.2 Space-time modelling of survey data (WPUE; FISS expansion results, etc.) (R. Webster)
    - 6.3 FISS Rationalisation (2021-23)
    - 6.4 Data overview and preliminary stock assessment (2020), and draft harvest decision table (2021) (I. Stewart)
    - 6.5 Size limit review (I. Stewart)

7. **IPHC SCIENCE AND RESEARCH**
    - 7.1 Report of the 21st Session of the IPHC Research Advisory Board (RAB021) (J. Planas)

7.2 Reports of the IPHC Scientific Review Board (SRB Chairperson)
7.3 IPHC 5-year Biological and Ecosystem Science Research Plan (2017-21): update (J. Planas)

8. MANAGEMENT STRATEGY EVALUATION

8.1 IPHC Management Strategy Evaluation: update (A. Hicks)
8.2 Independent peer review of the IPHC Management Strategy Evaluation process (T. Branch)
8.3 Reports of the IPHC Management Strategy Advisory Board (MSAB Co-Chairpersons)

9. CONTRACTING PARTY UPDATES (Contracting Parties)

9.1 Canada
  9.1.1 Fisheries and Oceans Canada (DFO)
9.2 United States of America
  9.2.1 National Oceanic and Atmospheric Administration (NOAA) – Fisheries
    a) National Marine Fisheries Service (NOAA-Fisheries)
    b) North Pacific Fishery Management Council (NPFMC)
    c) Pacific Fishery Management Council (PFMC)

10. IPHC FISHERY REGULATIONS: PROPOSALS FOR THE 2020-21 PROCESS (D. Wilson)

10.1 IPHC Secretariat fishery regulation proposals
10.2 Contracting Party fishery regulation proposals
10.3 Stakeholder fishery regulation proposals
10.4 Stakeholder statements

11. 2ND IPHC PERFORMANCE REVIEW (PRIPHC02): IMPLEMENTATION OF RECOMMENDATIONS (D. Wilson)

12. PACIFIC HALIBUT FISHERY ECONOMICS UPDATE (B. Hutncizak)

13. FINANCE AND ADMINISTRATION

13.1 FY2021 Budget modifications (D. Wilson)
13.2 IPHC Rules of Procedure (2021): Draft (D. Wilson)
13.3 Contracting Party contributions – Historical review (D. Wilson)

14. OTHER BUSINESS

14.1 Preparation for the 97th Session of the IPHC Annual Meeting (AM097) and associated subsidiary bodies (D. Wilson)

15. REVIEW OF THE DRAFT AND ADOPTION OF THE REPORT OF THE 96th SESSION OF THE IPHC INTERIM MEETING (IM096) (Chairperson & Executive Director)

DRAFT: SCHEDULE FOR THE 96th SESSION OF THE IPHC INTERIM MEETING (IM096)

Wednesday, 18 November 2020		
Time	**Agenda item**	**Lead**
09:00-09:10	1. Opening of the Session	Chairperson
09:10-09:20	2. Adoption of the agenda and arrangements for the Session	Chairperson
09:20-09:30	3. Update on actions arising from the 96th Session of the IPHC Annual Meeting (AM096) and 2020 intersessional decisions	D. Wilson
09:30-09:45	4. Report of the IPHC Secretariat (2020): Draft	D. Wilson
09:45-10:00	5. State of the Fishery (2020): Preliminary statistics	L. Erikson
10:00-10:30	6. Stock status of Pacific halibut (2020) and harvest decision table 6.1 IPHC Fishery-Independent Setline Survey (FISS) design, implementation, and implications 6.2 Space-time modelling of survey data (WPUE; FISS expansion results; etc.)	L. Erikson R. Webster
10:30-10:45	Break	
10:45-11:00	6.3 FISS Rationalisation (2021-23)	R. Webster
11:00-12:30	6.4 Data overview and preliminary stock assessment (2020), and draft harvest decision table (2020) 6.5 Size limit review *Public comment and questions (Agenda Items 5-6)*	I. Stewart
12:30-13:30	Lunch	
13:30-15:30	7. IPHC science and research 7.1 Report of the 21st Session of the IPHC Research Advisory Board (RAB021) 7.2 Reports of the 16th and 17th Sessions of the IPHC Scientific Review Board (SRB016 and SRB017) 7.3 IPHC 5-year Biological and Ecosystem Science Research Plan (2017-21): update *Public comment and questions (Agenda Item 7)*	J. Planas SRB J. Planas
15:30-15:45	Break	
15:45-17:00	8. Management strategy evaluation 8.1 IPHC Management Strategy Evaluation: update 8.2 Independent peer review of the IPHC Management Strategy Evaluation process 8.3 Reports of the 15th and 16th Sessions of the IPHC Management Strategy Advisory Board (MSAB015 and MSAB016)	A. Hicks T. Branch MSAB Co-Chairpersons

	Public comment and questions (Agenda Item 8)	
Thursday, 19 November 2020		
09:00-09:30	9. Contracting Party (Agency) updates 9.1 Fisheries and Oceans Canada (DFO) 9.2 National Oceanic and Atmospheric Administration (NOAA) – Fisheries • National Marine Fisheries Service (NMFS) • North Pacific Fishery Management Council (NPFMC) • Pacific Fishery Management Council (PFMC) *Public comment and questions (Agenda Item 9)*	TBD TBD TBD TBD TBD
09:30-10:30	10. IPHC Fishery Regulations: Proposals for the 2020-21 process 10.1 IPHC Secretariat fishery regulation proposals 10.2 Contracting Party (Agency) fishery regulation proposals 10.3 Stakeholder fishery regulation proposals 10.4 Stakeholder statements *Public comment and questions (Agenda Item 10)*	D. Wilson Agency staff D. Wilson D. Wilson
10:30-10:45	Break	
11:00-11:15	11. 2nd IPHC Performance review (PRIPHC02): Implementation of recommendations *Public comment and questions (Agenda item 11)*	D. Wilson
11:15-11:45	12. Pacific halibut fishery economics update	B. Hutncizak
11:45-12:30	13. Finance and administration 13.1 FY2021 Budget modifications 13.2 IPHC Rules of Procedure (2021): Draft 13.3 Contracting Party contributions – Historical review	D. Wilson
12:30-13:30	Lunch	
13:30-14:00	14. Other business 14.1 Preparation for the 97th Session of the IPHC Annual Meeting (AM097) and associated subsidiary bodies	D. Wilson
14:00-15:30	Report drafting Session	IPHC Secretariat
15:30-15:45	Break	
15:45-17:00	15. Review of the draft and adoption of the Report of the 96th Session of the IPHC Interim Meeting (IM096)	Chairperson & D. Wilson

INTERNATIONAL PACIFIC HALIBUT COMMISSION

LIST OF DOCUMENTS FOR THE 96th SESSION OF THE IPHC INTERIM MEETING (IM096)

Last updated: 18 November 2020

Document	Title	Availability
IPHC-2020-IM096-01	Agenda & Schedule for the 96th Session of the IPHC Interim Meeting (IM096)	✓ 20 Aug 2020 ✓ 15 Oct 2020
IPHC-2020-IM096-02	List of Documents for the 96th Session of the IPHC Interim Meeting (IM096)	✓ 20 Aug 2020 ✓ 18 Nov 2020
IPHC-2020-IM096-03	Update on actions arising from the 96th Session of the IPHC Annual Meeting (AM096) and 2020 Intersessional decisions (D. Wilson)	✓ 13 Oct 2020
IPHC-2020-IM096-04	Report of the IPHC Secretariat (2020): Draft (D. Wilson)	✓ 16 Oct 2020
IPHC-2020-IM096-05 Rev_1	State of the Fishery (2020): Preliminary fishery statistics (L. Erikson & H. Tran)	✓ 15 Oct 2020 ✓ 8 Nov 2020
IPHC-2020-IM096-06 Rev_1	IPHC Fishery-independent setline survey (FISS) design and implementation in 2020 (L. Erikson & R. Webster)	✓ 16 Oct 2020 ✓ 6 Nov 2020
IPHC-2020-IM096-07	Review: Rationalisation of the FISS following the 2014-19 expansion series (R. Webster)	✓ 16 Oct 2020
IPHC-2020-IM096-08 Rev_1	Summary of the data, stock assessment, and harvest decision table for Pacific halibut (*Hippoglossus stenolepis*) at the end of 2020 (I. Stewart, A. Hicks, R. Webster & D. Wilson)	✓ 13 Oct 2020 ✓ 12 Nov 2020
IPHC-2020-IM096-09	Evaluation of directed commercial fishery size limits in 2020 (I. Stewart, A. Hicks & B. Hutniczak)	✓ 25 Sept 2020
IPHC-2020-IM096-10	IPHC 5-year Biological and Ecosystem Science Research Plan (2017-21): Update (J. Planas)	✓ 6 Oct 2020
IPHC-2020-IM096-11 Rev_1	Management Strategy Evaluation results for distribution management procedures (A. Hicks, P. Carpi, S. Berukoff & I. Stewart)	✓ 17 Oct 2020 ✓ 2 Nov 2020
IPHC-2020-IM096-12	IPHC Fishery Regulations: Proposals for the 2020-21 process (D. Wilson & L. Erikson)	✓ 16 Oct 2020
IPHC-2020-IM096-13	Implementation of the recommendations from the 2nd IPHC Performance Review (PRIPHC02) (D. Wilson)	✓ 6 Oct 2020
IPHC-2020-IM096-14	Pacific Halibut Multiregional Economic Impact Assessment (PHMEIA): summary of progress (B. Hutniczak)	✓ 16 Oct 2020

IPHC-2020-IM096-15 Rev_2	FY2021 Budget modifications (D. Wilson & K. Jernigan)	✓ 19 Oct 2020 ✓ 21 Oct 2020 ✓ 6 Nov 2020
IPHC-2020-IM096-16	Draft: IPHC Rules of Procedure (2021) (D. Wilson)	✓ 13 Oct 2020
IPHC-2020-IM096-17	Independent peer review of the IPHC Management Strategy Evaluation process (D. Wilson; T. Branch)	✓ 13 Oct 2020
IPHC-2020-IM096-18	Contracting Party contributions – Historical review (D. Wilson)	✓ 14 Oct 2020
Contracting Party updates		
IPHC-2020-IM096-NR01	**Canada**: Fisheries and Oceans Canada (DFO)	No submission
IPHC-2020-IM096-NR02	**United States of America**: NOAA – National Marine Fisheries Service (NMFS); North Pacific Fishery Management Council (NPFMC); Pacific Fishery Management Council (PFMC)	No submission
IPHC Fishery Regulation proposals for 2021		
IPHC Secretariat Fishery Regulation proposals for 2021		
IPHC-2020-IM096-PropA1	Mortality and Fishery Limits (Sect. 5) (IPHC Secretariat)	✓ 13 Oct 2020
IPHC-2020-IM096-PropA2	Commercial Fishing Periods (Sect. 9) (IPHC Secretariat)	✓ 16 Oct 2020
IPHC-2020-IM096-PropA3	IPHC Fishery Regulations: minor amendments (IPHC Secretariat)	✓ 13 Oct 2020
Contracting Party Fishery Regulation proposals for 2021		
IPHC-2020-IM096-PropB1	Recreational (Sport) Fishing for Pacific Halibut—IPHC Regulatory Area 2B (Sect. 28) (Canada: DFO)	Deferred to AM097
IPHC-2020-IM096-PropB2	Charter Management Measures in IPHC Regulatory Areas 2C and 3A (Sect. 29) (USA: NOAA-Fisheries)	Deferred to AM097
Other Stakeholder Fishery Regulation proposals for 2021		
IPHC-2020-IM096-PropC1	-	No submissions
Reports from IPHC subsidiary bodies		
IPHC-2020-RAB021-R	Report of the 21st Session of the IPHC Research Advisory Board (RAB021)	✓ 27 Feb 2020
IPHC-2020-SRB016-R	Report of the 16th Session of the IPHC Scientific Review Board (SRB016)	✓ 26 Jun 2020
IPHC-2020-SRB017-R	Report of the 17th Session of the IPHC Scientific Review Board (SRB017)	✓ 25 Sept 2020
IPHC-2020-MSAB015-R	Report of the 15th Session of the IPHC Management Strategy Advisory Board (MSAB015)	✓ 15 May 2020

IPHC-2020-MSAB016-R	Report of the 16th Session of the IPHC Management Strategy Advisory Board (MSAB016)	✓ 23 Oct 2020
IPHC-2020-FAC096-R	Report of the 96th Session of the IPHC Finance and Administration Committee (FAC096)	✓ 4 Feb 2020
IPHC-2020-PAB025-R	Report of the 25th Session of the IPHC Processor Advisory Board (PAB025)	✓ 6 Feb 2020
IPHC-2020-CB090-R	Report of the 90th Session of the IPHC Conference Board (CB090)	✓ 6 Feb 2020
Information papers		
IPHC-2020-IM096-INF01	Stakeholder Statements on IPHC Fishery Regulation proposals	✓ 18 Nov 2020
IPHC-2020-IM096-INF02	Updated Range of Alternatives for the Proposed Transfer of Management Responsibilities for Area 2A Pacific Halibut Fisheries with Focus on the Non-Indian Directed Commercial Fishery (PFMC Secretariat)	✓ 13 Oct 2020
IPHC-2020-IM096-INF03	The IPHC mortality projection tool for 2021 (and 2022) mortality limits (I. Stewart)	✓ 13 Oct 2020

Update on actions arising from the 96th Annual Meeting (AM096) and 2020 Inter-sessional Decisions

PREPARED BY: IPHC SECRETARIAT (D. WILSON; 13 OCTOBER 2020)

PURPOSE

To provide the Commission with an opportunity to consider the progress made during the inter-sessional period in relation to the direct requests for action by the Commission during the 96th Session of the IPHC Annual Meeting (AM096, February 2020), and 2020 inter-sessional decisions of the Commission.

BACKGROUND

At the 96th Session of the IPHC Annual Meeting (AM096), Contracting Parties agreed on a series of actions to be taken by Commissioners, subsidiary bodies, and the IPHC Secretariat on a range of issues as detailed in Appendix A.

In addition, following amendments to the IPHC Rules of Procedure in 2019 and again in 2020, the Commission possesses a clear process for inter-sessional decision making and tracking. Throughout 2020, the Commission made a number of inter-sessional decisions with the aim of improving governance and responsiveness of the organisation, as detailed in Appendix B.

DISCUSSION

Noting that best practice governance requires the prompt delivery of core tasks assigned to the IPHC Secretariat by the Commission, at each subsequent session of the Commission and its subsidiary bodies, attempts will be made to ensure that any recommendations for action are carefully constructed so that each contains the following elements:

1) a specific action to be undertaken (deliverable);
2) clear responsibility for the action to be undertaken (i.e. a specific Contracting Party, the IPHC Secretariat staff, a subsidiary body of the Commission, or the Commission itself);
3) a desired time frame for delivery of the action (i.e. by the next session of a subsidiary body, or other date).

This involves numbering and tracking all action items from the Commission, as well as including clear progress updates and document reference numbers.

RECOMMENDATION/S

That the Commission:

1) **NOTE** paper IPHC-2020-IM096-03, which provided the Commission with an opportunity to consider the progress made during the inter-sessional period, in relation to the direct requests for action by the Commission during its 96th Annual Meeting (AM096, February 2020), and 2020 Inter-sessional decisions of the Commission.

APPENDICES

Appendix A: Update on actions arising from the 96th Annual Meeting (AM096: February 2020).

Appendix B: 2020 Inter-sessional decisions of the Commission

APPENDIX A

Update on actions arising from the 96th Annual Meeting (AM096: February 2020)

96th Session of the IPHC Annual Meeting (AM096)		
Action No.	**Description**	**Update**
	RECOMMENDATIONS	
AM096–Rec.01 (para. 31)	***Space-time modelling of IPHC Fishery-Independent Setline Survey (FISS) data*** The Commission **RECOMMENDED** that for the 2020 FISS season, the IPHC Secretariat shall employ the proposed subarea design for Regulatory Areas 2A, 4A, 4B, 4CDE, and an enhanced randomised subsampling FISS design in Regulatory Areas 2B, 2C, 3A, and 3B to meet the primary design objective, while also considering secondary and tertiary objectives (Table 2). The IPHC Secretariat shall determine the number of skates at each FISS station with the secondary objective in mind (Table 2). A demonstration of this design is provided at Fig. 2.	**Lead**: Lara Erikson **Status/Plan**: Completed See paper **IPHC-2020-IM096-06** *IPHC Fishery-independent setline survey (FISS) (2020): Preliminary update* (L. Erikson, R. Webster) Also note IPHC-2020-ID011 in AppBAppendix B
AM096–Rec.02 (para. 32)	The Commission **RECOMMENDED** the following specific additions to the new 2020 FISS design, on the basis of the tertiary objective specified in Table 2 on a cost recovery basis. Any other tertiary sampling objective shall be at the discretion of the IPHC Secretariat unless specifically directed by the Commission: a) Regulatory Area 2A: Washington Department of Fish and Wildlife - rockfish sampling; b) Regulatory Area 2B: DFO-Canada - rockfish sampling.	**Lead**: Lara Erikson **Status/Plan**: Completed Due to the COVID-19 pandemic, neither of the two tertiary sampling activities were possible in 2020. They will be revisited as options for 2021 on a cost-recovery basis.
	REQUESTS	
AM096–Req.01 (para. 33)	***Space-time modelling of IPHC Fishery-Independent Setline Survey (FISS) data*** The Commission **REQUESTED** the 2020 consultation process in preparation for the 2021 FISS and beyond be enhanced to include input from the IPHC subsidiary bodies, particularly the Research Advisory Board and the Scientific Review Board, as well as from stakeholders who have performed survey work for the IPHC, with a view to finalizing the FISS sampling design for the coming year as early as possible in the annual planning cycle.	**Lead**: Ray Webster **Status/Plan**: Ongoing FISS design work was presented for discussion to both the RAB021 in February, and, in more detail, to the SRB016 in June 2020, and again in more detail at SRB017 in September 2020 (see agenda item 7.2 for the SRB's advice). The IPHC Secretariat intends on further stakeholder engagement at IM096 and again at AM097.
AM096–Req.02 (para. 52)	***Stock Assessment: Data overview and stock assessment (2019), and harvest decision table (2020)*** The Commission **REQUESTED** that the IPHC MSE process continue to evaluate status quo management related to discard mortality for non-directed fisheries (bycatch) under the current program of work for delivery of full MSE results at AM097 in 2021, noting that this source	**Lead**: Allan Hicks **Status/Plan**: Ongoing The current framework continues to model non-directed commercial mortality with a fixed average that is

96th Session of the IPHC Annual Meeting (AM096)		
Action No.	**Description**	**Update**
	of mortality is currently modelled as a fixed component of the total (with variability).	dependent on the total simulated biomass and random variability. See paper **IPHC-2020-IM096-11**.
AM096–Req.03 (para. 89)	***Reports of the 13th and 14th Sessions of the IPHC Management Strategy Advisory Board (MSAB013 and MSAB014)*** The Commission **REQUESTED** the MSAB to confirm the proposed topics of work beyond the 2021 deliverables in time for the Interim Meeting (IM096), including work to investigate and provide advice on approaches for accounting for the impacts of bycatch in one Regulatory Area on harvesting opportunities in other Regulatory Areas.	**Lead**: Allan Hicks **Status/Plan**: Completed The MSAB has expressed interest in data-based approaches (e.g. less reliance on stock assessment models) and multi-year decision-making process as highlighted in the 2nd Performance Review of the IPHC (PRIPCH02). See agenda item 8.2 for the latest MSAB advice arising from MSAB016 (19-22 October 2020)
AM096–Req.04 (para. 110)	***Stakeholder statements*** The Commission **REQUESTED** that the IPHC Secretariat organise and synopsize stakeholder statements by topic, in order to insert the stakeholder written inputs into public comment at appropriate points in the agenda for the Commission's consideration.	**Lead**: David Wilson **Status/Plan**: Pending This action is related to AM097 and work will commence on this request in December 2020. As of the date of this paper, no Stakeholder Comments were received for consideration at IM096.
AM096–Req.05 (para. 113)	***Contracting Party National Reports - United States of America*** The Commission **NOTED** that the NOAA Fisheries Observer Program has increased observer fees and has received increased government funding, and **REQUESTED** that NOAA Fisheries provide a synopsis of observer coverage rates over time and how coverage rates are expected to change in 2020 and beyond.	**Lead**: NOAA-Fisheries **Status/Plan**: Pending No information received to-date from NOAA-Fisheries.
AM096–Req.06 (para. 135)	***IPHC Rules of Procedure (2020)*** The Commission **ADOPTED** the revised IPHC Rules of Procedure (2020) by consensus, and **REQUESTED** that the IPHC Secretariat finalise and publish them accordingly.	**Lead**: David Wilson **Status/Plan**: Completed IPHC Rules of Procedure (2020) was published on 7 February 2020.
AM096–Req.07 (para. 139)	***Report of the 2nd IPHC Performance Review*** The Commission **REQUESTED** that paper IPHC-2020-AM096-14 be reviewed intersessionally by each Contracting Party, with the intention of providing edits/additions, for endorsement. The IPHC Secretariat will facilitate this request by proposing intersessional meeting dates.	**Lead**: David Wilson **Status/Plan**: Completed Intersessional meeting held 17 March 2020 where the Commission endorsed the recommendations. See paper **IPHC-2020-IM096-13** *Update on progress regarding the implementation of the 2nd IPHC*

96th Session of the IPHC Annual Meeting (AM096)		
Action No.	**Description**	**Update**
		Performance Review recommendations (D. Wilson)
AM096–Req.08 (para. 158)	***Size limits*** The Commission **REQUESTED** that the IPHC Secretariat prepare an updated discussion of the costs and benefits of removing or adjusting the current minimum size limit and/or adding a maximum size limit. This analysis would be presented during the 2020 Work Meeting and IM096.	**Lead**: Ian Stewart **Status/Plan**: Completed Draft paper presented at the WM2020 where the Commission requested additional information. See paper **IPHC-2020-IM096-09** *Evaluation of directed commercial fishery size limits in 2020* (I. Stewart, A. Hicks & B. Hutniczak)
AM096–Req.09 (para. 159)	***Review of the draft and adoption of the report of the 96th Session of the IPHC Annual Meeting (AM096)*** The Commission **REQUESTED** that the IPHC Secretariat finalise and publish the IPHC *Pacific Halibut Fishery Regulations (2020)* no later than 28 February 2020, **NOTING** that only minor editorial and formatting changes are permitted beyond the decisions made by the Commission at the AM096.	**Lead**: David Wilson **Status/Plan**: Completed Published on 7 February 2020.

APPENDIX B

2020 Inter-sessional Decisions of the Commission

2020 Inter-sessional decisions		
Action No.	**Description**	**Update**
IPHC-2020-ID001	**Management Strategy Evaluation (MSE)** The Commission **RECOMMENDED** that the primary coastwide and area-specific objectives outlined in Table 1 of Appendix A be used for evaluating MSE results conditional on future consideration of the objectives after preliminary MSE results are presented at MSAB015 in May 2020.	**Lead**: Allan Hicks **Status/Plan**: Completed See agenda item 8.2 for the latest MSAB advice arising from MSAB016 (19-22 October 2020)
IPHC-2020-ID002	The Commission **RECOMMENDED** a reference SPR fishing intensity of 43% with a 30:20 control rule be used as an updated interim harvest policy consistent with MSE results pending delivery of the final MSE results at AM097, noting the additional components intended to apply for a period of 2020 to 2022 as defined in IPHC-2020-AM096-R paragraphs 97 b, c, d, and e. Specifically, these additional components are allocations to 2A and 2B, accounting for some impacts of U26 non-directed discard mortality, and the use of a rolling three-year average for projecting non-directed fishery discard mortality.	**Lead**: Allan Hicks **Status/Plan**: In Progress The reference SPR fishing intensity of 43% with a 30:20 control rule is being used in the 2020 stock assessment and harvest advice for 2021 and will presented at IM096 (see paper IPHC-2020-IM096-11) and AM097 in January 2021.
IPHC-2020-ID003	**IPHC Performance Review: 2nd IPHC Performance Review (PRIPHC02)** The Commission **ENDORSED** the recommendations, priorities, responsibilities, timelines and updates provided at Appendix B, and **AGREED** that these would be reported on at each IPHC meeting.	**Lead**: David Wilson **Status/Plan**: Completed See paper **IPHC-2020-IM096-11** *Update on progress regarding the implementation of the 2nd IPHC Performance Review recommendations* (D. Wilson)
IPHC-2020-ID004	**IPHC Financial Regulations (2020)** The Commission **ADOPTED** by consensus, the IPHC Financial Regulations (2020), and directed the IPHC Secretariat to finalise and publish accordingly.	**Lead**: David Wilson **Status/Plan**: Completed IPHC Financial Regulations (2020) was published on 17 March 2020.
IPHC-2020-ID005	**Fishery-Independent Setline Survey (FISS)** **NOTING** paper IPHC-2020-SS06-INF01 which provided a description of the benefits of selling Pacific halibut less than 32 inches in length that is captured and sampled on the 2020 FISS, the Commission **ENDORSED** the sale of this portion of the FISS catch.	**Lead**: Lara Erikson **Status/Plan**: Completed The sale of U32 fish that could not be returned to the sea alive were landed and sold throughout the 2020 FISS season. As of 12 September 2020, U32 fish sales yielded US$65,669.63 in revenue, at an average price of US$4.15/lb.

2020 Inter-sessional decisions		
Action No.	**Description**	**Update**
IPHC-2020-ID006	**NOTING** paper IPHC-2020-SS06-INF02 which provided details of the 2020 FISS design, including the number of skates to be deployed at each FISS station by IPHC Regulatory Area, the Commission **ENDORSED** the design (Appendix C).	**Lead**: Lara Erikson **Status/Plan**: Completed Note that the design endorsed here, was subsequently amended (see IPHC-2020-ID011 below) following the COVID-19 pandemic outbreak.
IPHC-2020-ID007	**Alaska Charter Sector Allocation – IPHC Regulatory Areas 2c And 3a** The Commission **NOTED** and **ADOPTED** regulatory proposal IPHC-2020-SS07-PropA1, which amends Sect. 29 of the IPHC Pacific Halibut Fishery Regulations: Recreational (Sport) Fishing for Pacific Halibut—IPHC Regulatory Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, 4E. The amendments (provided at Appendix III) are to: a) Regulatory Area 2C - implement a reverse slot limit with a lower limit of 45 inches (increased from 40 inches) for recreational charter anglers for the remainder of the 2020 season; b) Regulatory Area 3A – modify the lower limit from 26 inches to 32 inches; No annual limit and no daily closures, for the remainder of the 2020 season.	**Lead**: David Wilson **Status/Plan**: Completed IPHC Fishery Regulations (2020) was published on 20 May 2020.
IPHC-2020-ID008	**Pacific Halibut Bycatch In The Washington Sablefish Fishery** The Commission **NOTED** and **ADOPTED** regulatory proposal IPHC-2020-SS07-PropA2, which amended the deadline for when a vessel operating in the incidental catch fishery during the sablefish fishery in IPHC Regulatory Area 2A must have submitted its "Application for Vessel License for the Pacific Halibut Fishery" form. The amendments (provided at Appendix IV) modify the deadline for submission from 15 March to 29 May 2020. The extension was made based solely on the potential negative impacts that the COVID-19 pandemic may have had on the licencees and does not set a precedent for future years.	**Lead**: David Wilson **Status/Plan**: Completed IPHC Fishery Regulations (2020) was published on 20 May 2020.
IPHC-2020-ID009	**Intersessional meeting formats** The Commission **REQUESTED** that the IPHC Secretariat prepare draft guidelines for intersessional meetings to compliment those already contained with the IPHC Rules of Procedure (2020), given the potential ongoing COVID-19 impacts.	**Lead**: David Wilson **Status/Plan**: Completed See paper **IPHC-2020-IM096-16** for draft amendments

2020 Inter-sessional decisions		
Action No.	**Description**	**Update**
IPHC-2020-ID010	**Review of the draft and adoption of the Report of the 7th Special Session of the IPHC (SS07)** The Commission **REQUESTED** that the IPHC Secretariat finalise and publish the IPHC *Pacific Halibut Fishery Regulations (2020)* within 24 hours, **NOTING** that only minor editorial and formatting changes are permitted beyond the decisions made by the Commission at the SS07.	**Lead**: David Wilson **Status/Plan**: Completed The Report of the 7th Special Session (IPHC-2020-SS07-R) was published on 20 May 2020. IPHC Fishery Regulations (2020) was published on 20 May 2020.
IPHC-2020-ID011	***Revised 2020 IPHC Fishery-Independent Setline Survey (FISS) design and implementation*** The Commission **ENDORSED** the 2020 FISS design provided in Appendix I, which includes 898 stations in a reduced footprint within IPHC Regulatory Areas 2B, 2C, 3A and 3B.	**Lead**: Lara Erikson **Status/Plan**: Completed See paper **IPHC-2020-IM096-06** *IPHC Fishery-independent setline survey (FISS) (2020): Preliminary update* (L. Erikson, R. Webster)
IPHC-2020-ID012	The Commission **RECOMMENDED** that the 2020 FISS commence on or near 1 July 2020, with a completion target of 31 August 2020.	**Lead**: Lara Erikson **Status/Plan**: Completed The 2020 FISS commenced on 27 June 2020, 4 days ahead of schedule. The FISS was completed on 9 September 2020.
IPHC-2020-ID013	***Independent External Auditor's Report for FY2018 & FY2019*** The Commission **ENDORSED** the Independent External Auditor's Report for FY2018 & FY2019.	**Lead**: David Wilson **Status/Plan**: Completed
IPHC-2020-ID014	***Fishing period extension for the directed commercial fishery in IPHC Regulatory Area 2B*** The Commission **NOTED** and **ADOPTED** regulatory proposal IPHC-2020-SS08-PropA1, which amends Sect. 9, of the IPHC Pacific Halibut Fishery Regulations, by extending the commercial fishing period in IPHC Regulatory Area 2B to 7 December 2020. The amended text shall read as follows: *9. Commercial Fishing Periods* *(3) All commercial fishing for Pacific halibut in all IPHC Regulatory Areas shall cease for the year at 1200 local time on 15 November, with the exception of IPHC Regulatory Area 2B which shall cease at 1200 local time on 7 December 2020.*	**Lead**: David Wilson **Status/Plan**: Completed IPHC Fishery Regulations (2020) was published on 17 September 2020.

INTERNATIONAL PACIFIC
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Updates on actions arising

Agenda Item 3

IPHC-2020-IM096-03

PURPOSE

To provide the Commission with an opportunity to consider the progress made during the intersessional period in relation to the direct requests for action by the Commission during the 96th Session of the IPHC Annual Meeting (AM096, February 2020), and 2020 intersessional decisions of the Commission.

BACKGROUND

At the 96th Session of the IPHC Annual Meeting (AM096), Contracting Parties agreed on a series of actions to be taken by Commissioners, subsidiary bodies, and the IPHC Secretariat on a range of issues as detailed in Appendix A.

- 2 Recommendations
- 9 Requests

In addition, following amendments to the IPHC Rules of Procedure in 2019 and again in 2020, the Commission possesses a clear process for intersessional decision making and tracking. Throughout 2020, the Commission made a number of intersessional decisions with the aim of improving governance and responsiveness of the organisation, as detailed in Appendix B.

- 15 Intersessional decisions

2 RECOMMENDATIONS AM096-Rec.01

Action No.	Description	Update
AM096–Rec.01 (para. 31)	***Space-time modelling of IPHC Fishery-Independent Setline Survey (FISS) data*** The Commission **RECOMMENDED** that for the 2020 FISS season, the IPHC Secretariat shall employ the proposed subarea design for Regulatory Areas 2A, 4A, 4B, 4CDE, and an enhanced randomised subsampling FISS design in Regulatory Areas 2B, 2C, 3A, and 3B to meet the primary design objective, while also considering secondary and tertiary objectives (Table 2). The IPHC Secretariat shall determine the number of skates at each FISS station with the secondary objective in mind (Table 2). A demonstration of this design is provided at Fig. 2.	**Lead**: Lara Erikson **Status/Plan**: Completed See paper **IPHC-2020-IM096-06** *IPHC Fishery-independent setline survey (FISS) (2020): Preliminary update* (L. Erikson, R. Webster) Also note IPHC-2020-ID011 in Appendix B

AM096-Rec.02

Action No.	Description	Update
AM096–Rec.02 (para. 32)	The Commission **RECOMMENDED** the following specific additions to the new 2020 FISS design, on the basis of the tertiary objective specified in Table 2 on a cost recovery basis. Any other tertiary sampling objective shall be at the discretion of the IPHC Secretariat unless specifically directed by the Commission: a) Regulatory Area 2A: Washington Department of Fish and Wildlife - rockfish sampling; b) Regulatory Area 2B: DFO-Canada - rockfish sampling.	**Lead**: Lara Erikson **Status/Plan**: Completed Due to the COVID-19 pandemic, neither of the two tertiary sampling activities were possible in 2020. They will be revisited as options for 2021 on a cost-recovery basis under new Collective Agreements.

REQUESTS: AM096-Req.01

Action No.	Description	Update
AM096–Req.01 (para. 33)	***Space-time modelling of IPHC Fishery-Independent Setline Survey (FISS) data*** The Commission **REQUESTED** the 2020 consultation process in preparation for the 2021 FISS and beyond be enhanced to include input from the IPHC subsidiary bodies, particularly the Research Advisory Board and the Scientific Review Board, as well as from stakeholders who have performed survey work for the IPHC, with a view to finalizing the FISS sampling design for the coming year as early as possible in the annual planning cycle.	**Lead**: Ray Webster **Status/Plan**: Ongoing FISS design work was presented for discussion to both the RAB021 in February, and, in more detail, to the SRB016 in June 2020, and again in more detail at SRB017 in September 2020 (see agenda item 7.2 for the SRB's advice). The IPHC Secretariat intends on further stakeholder engagement at IM096 and again at AM097.

AM096-Req.02

Action No.	Description	Update
AM096–Req.02 (para. 52)	***Stock Assessment: Data overview and stock assessment (2019), and harvest decision table (2020)*** The Commission **REQUESTED** that the IPHC MSE process continue to evaluate status quo management related to discard mortality for non-directed fisheries (bycatch) under the current program of work for delivery of full MSE results at AM097 in 2021, noting that this source of mortality is currently modelled as a fixed component of the total (with variability).	**Lead**: Allan Hicks **Status/Plan**: Ongoing The current framework continues to model non-directed commercial mortality with a fixed average that is dependent on the total simulated biomass and random variability. See paper **IPHC-2020-IM096-11**.

AM096-Req.03

Action No.	Description	Update
AM096–Req.03 (para. 89)	***Reports of the 13th and 14th Sessions of the IPHC Management Strategy Advisory Board (MSAB013 and MSAB014)*** The Commission **REQUESTED** the MSAB to confirm the proposed topics of work beyond the 2021 deliverables in time for the Interim Meeting (IM096), including work to investigate and provide advice on approaches for accounting for the impacts of bycatch in one Regulatory Area on harvesting opportunities in other Regulatory Areas.	**Lead**: Allan Hicks **Status/Plan**: Completed The MSAB has expressed interest in data-based approaches (e.g. less reliance on stock assessment models) and multi-year decision-making process as highlighted in the 2nd Performance Review of the IPHC (PRIPCH02). See agenda item 8.2 for the latest MSAB advice arising from MSAB016 (19-22 October 2020)

AM096-Req.04

Action No.	Description	Update
AM096–Req.04 (para. 110)	***Stakeholder statements*** The Commission **REQUESTED** that the IPHC Secretariat organise and synopsize stakeholder statements by topic, in order to insert the stakeholder written inputs into public comment at appropriate points in the agenda for the Commission's consideration.	**Lead**: David Wilson **Status/Plan**: Pending This action is related to AM097 and work will commence on this request in December 2020. As of the date of this paper, no Stakeholder Comments were received for consideration at IM096.

AM096-Req.05

Action No.	Description	Update
AM096–Req.05 (para. 113)	***Contracting Party National Reports - United States of America*** The Commission **NOTED** that the NOAA Fisheries Observer Program has increased observer fees and has received increased government funding, and **REQUESTED** that NOAA Fisheries provide a synopsis of observer coverage rates over time and how coverage rates are expected to change in 2020 and beyond.	**Lead**: NOAA-Fisheries **Status/Plan**: Pending No information received to-date from NOAA-Fisheries.

AM096-Req.06

Action No.	Description	Update
AM096–Req.06 (para. 135)	***IPHC Rules of Procedure (2020)*** The Commission **ADOPTED** the revised IPHC Rules of Procedure (2020) by consensus, and **REQUESTED** that the IPHC Secretariat finalise and publish them accordingly.	**Lead**: David Wilson **Status/Plan**: Completed IPHC Rules of Procedure (2020) was published on 7 February 2020.

AM096-Req.07

Action No.	Description	Update
AM096–Req.07 (para. 139)	***Report of the 2nd IPHC Performance Review*** The Commission **REQUESTED** that paper IPHC-2020-AM096-14 be reviewed intersessionally by each Contracting Party, with the intention of providing edits/additions, for endorsement. The IPHC Secretariat will facilitate this request by proposing intersessional meeting dates.	**Lead**: David Wilson **Status/Plan**: Completed Intersessional meeting held 17 March 2020 where the Commission endorsed the recommendations. See paper **IPHC-2020-IM096-13** *Update on progress regarding the implementation of the 2nd IPHC Performance Review recommendations* (D. Wilson)

AM096-Req.08

Action No.	Description	Update
AM096–Req.08 (para. 158)	***Size limits*** The Commission **REQUESTED** that the IPHC Secretariat prepare an updated discussion of the costs and benefits of removing or adjusting the current minimum size limit and/or adding a maximum size limit. This analysis would be presented during the 2020 Work Meeting and IM096.	**Lead**: Ian Stewart **Status/Plan**: Completed Draft paper presented at the WM2020 where the Commission requested additional information. See paper **IPHC-2020-IM096-09** *Evaluation of directed commercial fishery size limits in 2020* (I.Stewart, A. Hicks & B. Hutniczak)

AM096-Req.09

Action No.	Description	Update
AM096–Req.09 (para. 159)	***Review of the draft and adoption of the report of the 96th Session of the IPHC Annual Meeting (AM096)*** The Commission **REQUESTED** that the IPHC Secretariat finalise and publish the IPHC *Pacific Halibut Fishery Regulations (2020)* no later than 28 February 2020, **NOTING** that only minor editorial and formatting changes are permitted beyond the decisions made by the Commission at the AM096.	**Lead**: David Wilson **Status/Plan**: Completed Published on 7 February 2020.

INTERSESSIONAL DECISIONS-ID001

IPHC Circular 2020-007 Intersessional Decisions (1 January - 17 March 2020)

Action No.	Description	Update
ID001	**Management Strategy Evaluation (MSE)** The Commission **RECOMMENDED** that the primary coastwide and area-specific objectives outlined in Table 1 of Appendix A be used for evaluating MSE results conditional on future consideration of the objectives after preliminary MSE results are presented at MSAB015 in May 2020.	**Lead**: Allan Hicks **Status/Plan**: Completed See agenda item 8.2 for the latest MSAB advice arising from MSAB016 (19-22 October 2020)

INTERSESSIONAL DECISIONS-ID002

IPHC Circular 2020-007 Intersessional Decisions (1 January - 17 March 2020)

Action No.	Description	Update
ID002	The Commission **RECOMMENDED** a reference SPR fishing intensity of 43% with a 30:20 control rule be used as an updated interim harvest policy consistent with MSE results pending delivery of the final MSE results at AM097, noting the additional components intended to apply for a period of 2020 to 2022 as defined in IPHC-2020-AM096-R paragraphs 97 b, c, d, and e. Specifically, these additional components are allocations to 2A and 2B, accounting for some impacts of U26 non-directed discard mortality, and the use of a rolling three-year average for projecting non-directed fishery discard mortality.	**Lead**: Allan Hicks **Status/Plan**: In Progress The reference SPR fishing intensity of 43% with a 30:20 control rule is being used in the 2020 stock assessment and harvest advice for 2021 and will presented at IM096 (see paper IPHC-2020-IM096-11) and AM097 in January 2021.

INTERSESSIONAL DECISIONS-ID003

IPHC Circular 2020-007 Intersessional Decisions (1 January - 17 March 2020)

Action No.	Description	Update
ID003	**IPHC Performance Review: 2nd IPHC Performance Review (PRIPHC02)** The Commission **ENDORSED** the recommendations, priorities, responsibilities, timelines and updates provided at Appendix B, and **AGREED** that these would be reported on at each IPHC meeting.	**Lead**: David Wilson **Status/Plan**: Completed See paper **IPHC-2020-IM096-11** *Update on progress regarding the implementation of the 2nd IPHC Performance Review recommendations* (D. Wilson)

INTERSESSIONAL DECISIONS-ID004

IPHC Circular 2020-007 Intersessional Decisions (1 January - 17 March 2020)

Action No.	Description	Update
ID004	**IPHC Financial Regulations (2020)** The Commission **ADOPTED** by consensus, the IPHC Financial Regulations (2020), and directed the IPHC Secretariat to finalise and publish accordingly.	**Lead**: David Wilson **Status/Plan**: Completed IPHC Financial Regulations (2020) was published on 17 March 2020.

INTERSESSIONAL DECISIONS-ID005

IPHC Circular 2020-007 Intersessional Decisions (1 January - 17 March 2020)

Action No.	Description	Update
ID005	**Fishery-Independent Setline Survey (FISS)** **NOTING** paper IPHC-2020-SS06-INF01 which provided a description of the benefits of selling Pacific halibut less than 32 inches in length that is captured and sampled on the 2020 FISS, the Commission **ENDORSED** the sale of this portion of the FISS catch.	**Lead**: Lara Erikson **Status/Plan**: Completed The sale of U32 fish that could not be returned to the sea alive were landed and sold throughout the 2020 FISS season. As of 12 September 2020, U32 fish sales yielded US$65,669.63 in revenue, at an average price of US$4.15/lb.

INTERSESSIONAL DECISIONS-ID006

IPHC Circular 2020-007 Intersessional Decisions (1 January - 17 March 2020)

Action No.	Description	Update
ID006	**NOTING** paper IPHC-2020-SS06-INF02 which provided details of the 2020 FISS design, including the number of skates to be deployed at each FISS station by IPHC Regulatory Area, the Commission **ENDORSED** the design (Appendix C).	**Lead**: Lara Erikson **Status/Plan**: Completed Note that the design endorsed here, was subsequently amended (see IPHC-2020-ID011 below) following the COVID-19 pandemic outbreak.

INTERSESSIONAL DECISIONS-ID007

IPHC Circular 2020-012 Intersessional Decisions (18 March - 21 May 2020)

Action No.	Description	Update
ID007	**Alaska Charter Sector Allocation – IPHC Regulatory Areas 2c And 3a** The Commission **NOTED** and **ADOPTED** regulatory proposal IPHC-2020-SS07-PropA1, which amends Sect. 29 of the IPHC Pacific Halibut Fishery Regulations: Recreational (Sport) Fishing for Pacific Halibut—IPHC Regulatory Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, 4E. The amendments (provided at Appendix III) are to: a) Regulatory Area 2C - implement a reverse slot limit with a lower limit of 45 inches (increased from 40 inches) for recreational charter anglers for the remainder of the 2020 season; b) Regulatory Area 3A – modify the lower limit from 26 inches to 32 inches; No annual limit and no daily closures, for the remainder of the 2020 season.	**Lead**: David Wilson **Status/Plan**: Completed IPHC Fishery Regulations (2020) was published on 20 May 2020.

INTERSESSIONAL DECISIONS-ID008

IPHC Circular 2020-012 Intersessional Decisions (18 March - 21 May 2020)

Action No.	Description	Update
ID008	**Pacific Halibut Bycatch In The Washington Sablefish Fishery** The Commission **NOTED** and **ADOPTED** regulatory proposal IPHC-2020-SS07-PropA2, which amended the deadline for when a vessel operating in the incidental catch fishery during the sablefish fishery in IPHC Regulatory Area 2A must have submitted its "Application for Vessel License for the Pacific Halibut Fishery" form. The amendments (provided at Appendix IV) modify the deadline for submission from 15 March to 29 May 2020. The extension was made based solely on the potential negative impacts that the COVID-19 pandemic may have had on the licencees and does not set a precedent for future years.	**Lead**: David Wilson **Status/Plan**: Completed IPHC Fishery Regulations (2020) was published on 20 May 2020.

INTERSESSIONAL DECISIONS-ID009

IPHC Circular 2020-012 Intersessional Decisions (18 March - 21 May 2020)

Action No.	Description	Update
ID009	**Intersessional meeting formats** The Commission **REQUESTED** that the IPHC Secretariat prepare draft guidelines for intersessional meetings to compliment those already contained with the IPHC Rules of Procedure (2020), given the potential ongoing COVID-19 impacts.	**Lead**: David Wilson **Status/Plan**: Completed See paper **IPHC-2020-IM096-16** for draft amendments

INTERSESSIONAL DECISIONS-ID010

IPHC Circular 2020-012 Intersessional Decisions (18 March - 21 May 2020)

Action No.	Description	Update
ID010	**Review of the draft and adoption of the Report of the 7th Special Session of the IPHC (SS07)** The Commission **REQUESTED** that the IPHC Secretariat finalise and publish the IPHC *Pacific Halibut Fishery Regulations (2020)* within 24 hours, **NOTING** that only minor editorial and formatting changes are permitted beyond the decisions made by the Commission at the SS07.	**Lead**: David Wilson **Status/Plan**: Completed The Report of the 7th Special Session (IPHC-2020-SS07-R) was published on 20 May 2020. IPHC Fishery Regulations (2020) was published on 20 May 2020.

INTERSESSIONAL DECISIONS-ID011

IPHC Circular 2020-013 Intersessional Decisions (22 March - 29 May 2020)

Action No.	Description	Update
ID011	***Revised 2020 IPHC Fishery-Independent Setline Survey (FISS) design and implementation*** The Commission **ENDORSED** the 2020 FISS design provided in Appendix I, which includes 898 stations in a reduced footprint within IPHC Regulatory Areas 2B, 2C, 3A and 3B.	**Lead**: Lara Erikson **Status/Plan**: Completed See paper **IPHC-2020-IM096-06** *IPHC Fishery-independent setline survey (FISS) (2020): Preliminary update* (L. Erikson, R. Webster)

INTERSESSIONAL DECISIONS-ID012

IPHC Circular 2020-013 Intersessional Decisions (22 March - 29 May 2020)

Action No.	Description	Update
ID012	The Commission **RECOMMENDED** that the 2020 FISS commence on or near 1 July 2020, with a completion target of 31 August 2020.	**Lead**: Lara Erikson **Status/Plan**: Completed The 2020 FISS commenced on 27 June 2020, 4 days ahead of schedule. The FISS was completed on 9 September 2020.

INTERSESSIONAL DECISIONS-ID013

IPHC Circular 2020-017 Intersessional Decisions (30 May - 11 Aug 2020)

Action No.	Description	Update
ID013	***Independent External Auditor's Report for FY2018 & FY2019*** The Commission **ENDORSED** the Independent External Auditor's Report for FY2018 & FY2019.	**Lead**: David Wilson & Keith Jernigan **Status/Plan**: Completed

INTERSESSIONAL DECISIONS-ID014

IPHC Circular 2020-020 Intersessional Decisions (12 August - 17 September 2020)

Action No.	Description	Update
ID014	***Fishing period extension for the directed commercial fishery in IPHC Regulatory Area 2B*** The Commission **NOTED** and **ADOPTED** regulatory proposal IPHC-2020-SS08-PropA1, which amends Sect. 9, of the IPHC Pacific Halibut Fishery Regulations, by extending the commercial fishing period in IPHC Regulatory Area 2B to 7 December 2020. The amended text shall read as follows: *9. Commercial Fishing Periods* *(3) All commercial fishing for Pacific halibut in all IPHC Regulatory Areas shall cease for the year at 1200 local time on 15 November, with the exception of IPHC Regulatory Area 2B which shall cease at 1200 local time on 7 December 2020.*	**Lead**: David Wilson **Status/Plan**: Completed IPHC Fishery Regulations (2020) was published on 17 September 2020.

INTERSESSIONAL DECISIONS-ID015

IPHC Circular 2020-024 Intersessional Decisions (18 Sept - 18 Oct 2020)

Action No.	Description	Update
ID015	**External Auditors appointment** The IPHC Finance and Administration Committee (FAC) **RECOMMENDED**, and the Commission **APPOINTED** the external auditor 'Moss Adams' to audit the accounts of the Commission for FY2020, FY2021, and FY2022.	**Lead**: David Wilson **Status/Plan**: Completed The Auditors have been contracted for 3-fiscal years and have commenced the FY2020 Audit, ahead of schedule.

ACTION

That the Commission **NOTE** paper IPHC-2020-IM096-03, which provided the Commission with an opportunity to consider the progress made during the intersessional period in relation to the direct requests for action by the Commission during the 96th Session of the IPHC Annual Meeting (AM096, February 2020), and 2020 intersessional decisions of the Commission.

INTERNATIONAL PACIFIC

HALIBUT COMMISSION

INTERNATIONAL PACIFIC
HALIBUT COMMISSION

Draft: Report of the IPHC Secretariat (2020)

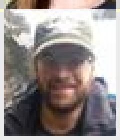
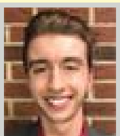
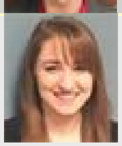
Agenda Item 4

IPHC-2020-IM096-04

PURPOSE

To provide the Commission with an update on the activities of the IPHC Secretariat in 2020, not already contained within other papers before the Commission.

STAFFING IMPROVEMENTS: REGULAR FULL-TIME POSITIONS

	FT Arrivals	Type	Hire Date	Status	Position Title
	Ms Erin Salle	Regular full-time	23 March 2020	Active	Administrative Specialist
	Mr Robert Tynes	Regular full-time	1 April 2020	Active	Information Technology Specialist
	Mr Nicholas Wilson	Regular full-time	8 April 2020	Active	Accounting Specialist
	Ms Tara Coluccio	Regular full-time	26 June 2020	Active	Administrative Specialist
	Ms Taika Gebretsadik	Regular full-time	17 August 2020	Active	Senior Staff Accountant

IPHC INTERNSHIP PROGRAM: 2020

Mr. Adam Ziegler
15 June – 11 August 2020
Stonehill College, MA, U.S.A.

Assisted the IPHC Biological Laboratory in determining the sex ratio in the commercial fishery: Fin clip collection, DNA purification from fin clips and laboratory genotyping assays. Initial tests on otolith DNA extraction and genotyping for sex.

IPHC MERIT SCHOLARSHIP FOR 2020

The IPHC funds several Merit Scholarships to support university, technical college, and other post-secondary education for students from Canada and the USA who are connected to the Pacific halibut fishery.

The 2020 awarded is **Mr Hahlen Behnken-Barkhau** who will attend Whitman College

Name	2018	2019	2020	2021	2022
Kaia Dahl (Petersburg, AK, USA)	$4,000	$4,000	**$4,000**	$4,000	-
Hahlen Behnken-Barkhau (Sitka, AK, USA)	-	-	**$4,000**	$4,000	$4,000

IPHC FISHERY REGULATIONS (2020)

In 2020, the Commission adopted six (6) fishery regulations/amendments in accordance with Article III of the Convention, as follows:

1) Fishery Limits (Section 4)
2) Commercial fishing periods (Sect. 9)
3) Vessel Clearance in IPHC Regulatory Area 4 (Sect. 16)
4) Charter management measures in IPHC Regulatory Areas 2C and 3A
5) Revising definition of IPHC Regulatory Area 2A-1
6) IPHC Fishery Regulations: minor amendments

INTERACTIONS WITH CONTRACTING PARTIES

In 2020, the IPHC Secretariat has engaged agency representatives from both Contracting Parties regarding more comprehensive and timely reporting of all forms of Pacific halibut removals and directed commercial fishery revenue data. The IPHC Secretariat is working to identify and address data gaps in reporting.

INTERACTIONS WITH CONTRACTING PARTIES

CANADA

- The IPHC Secretariat continues to work with Fisheries and Oceans representatives to address gaps in coverage for the IPHC Fishery-Independent Setline Survey (FISS) in the IPHC Convention Area. An application was submitted again in 2020 to fish the FISS stations within the Marine Protected Areas in Canadian waters, which was denied.

INTERACTIONS WITH CONTRACTING PARTIES

UNITED STATES OF AMERICA

1) Areas of conservation concern

- The IPHC Secretariat worked with USA agency staff to address gaps in coverage for the Fishery-Independent Setline Survey (FISS) in IPHC Convention Waters. An application was submitted to fish the FISS stations within the Glacier Bay National Park, which was approved, allowing these stations to be fished.

INTERACTIONS WITH CONTRACTING PARTIES

UNITED STATES OF AMERICA - Abundance-Based Management of Pacific halibut bycatch (ABM)

The NPFMC's Abundance-Based Management Working Group (ABMWG) continued its work, with participation of the IPHC Secretariat. The Commission has supported the development of ABM due to its potential effect on the directed Pacific halibut fisheries.

At its January/February 2020 meeting, the NPFMC revised the ABM motion (Council D4 Motion AM80) for the forthcoming Pacific halibut ABM PSC limit analysis and added a second motion (Council D4 Motion PSC Limits) containing additional options to consider in a discussion paper.

INTERACTIONS WITH CONTRACTING PARTIES

UNITED STATES OF AMERICA* - *Abundance-Based Management of Pacific halibut bycatch (ABM) (cont.)

ABM was a priority agenda at the NPFMC October 2020 meeting. The Scientific and Statistical Committee (SSC) discussed the operating model and results from the simulation analysis. However, a misspecification of directed commercial mortality in the model for the year 2019 was found which likely had an important effect because results for the directed commercial fisheries were presented relative to the 2019 mortality. With little time to review the updated results before the end of the SSC meeting, the SSC unanimously decided to not review the results at that time.

INTERACTIONS WITH CONTRACTING PARTIES

UNITED STATES OF AMERICA - Abundance-Based Management of Pacific halibut bycatch (ABM) (cont.)

The Council discussed the outcomes extensively and moved to a new approach in Council C6 Motion as well as updating the purpose and need. The motion specifies four alternatives for analysis with one being status quo and the other three variations of a lookup table incorporating the two indices calculated from the FISS data and the EBS trawl survey data. Four options were specified that would reduce variability in the annual PSC limits and introduce performance standards that may increase or decrease the PSC limit depending on percent usage of the limit.

The Council's three-meeting outlook notes an initial review of Pacific halibut ABM analysis in April 2021, with an option for a final final action in October 2021.

INTERACTIONS WITH CONTRACTING PARTIES

UNITED STATES OF AMERICA - PACIFIC Fishery Management Council (PFMC)

IPHC Regulatory Area 2A Catch Sharing Plans and in-season management

The IPHC Secretariat collaborated with NOAA Fisheries and State agencies to conduct in-season management of the various fisheries identified in the IPHC Regulatory Area 2A Catch Sharing Plan. Date and possession restrictions were adjusted in season among the various fisheries to meet identified fishery needs while attaining and remaining within the applicable catch limits. Estimates of removals for 2020 will be presented during Agenda Item 5 on fishery statistics.

The IPHC Secretariat noted that the recreational fishery sub-area – California remained open for four additional days when it was determined the fishery limit had been exceeded and against the Secretariat recommendation. This resulted in an over-catch of ~66%.

INTERACTIONS WITH CONTRACTING PARTIES

UNITED STATES OF AMERICA - PACIFIC Fishery Management Council (PFMC)

IPHC Regulatory Area 2A non-tribal directed commercial fishery

At its September 2020 meeting, the Council further considered the transition of IPHC Regulatory Area 2A Fishery Management, with the intention of adopting preliminary preferred alternatives. Reference Council paper and presentation provided in paper IPHC-2020-IM096-INF02. At the September PFMC meeting, the final motion on the matter was as follows:

INTERACTIONS WITH CONTRACTING PARTIES

UNITED STATES OF AMERICA - PACIFIC Fishery Management Council (PFMC)

IPHC Regulatory Area 2A non-tribal directed commercial fishery

Transition of Area 2A Fishery Management The Council adopted for public review the following as preliminary preferred alternatives:

1. *4.1.2 - Alternative 2: Consider the directed fishery framework during the CSP process in September and November, including any guidance for vessel limits and inseason changes for NMFS implementation.*
2. *4.2.1 Alternative 2: Issue permits for all Area 2A halibut non-Indian fisheries (commercial directed, incidental salmon troll, incidental sablefish, and recreational charter).*

INTERACTIONS WITH CONTRACTING PARTIES

UNITED STATES OF AMERICA - PACIFIC Fishery Management Council (PFMC)

IPHC Regulatory Area 2A non-tribal directed commercial fishery

3. *4.2.2 Alternative 2: Allow NMFS to determine the appropriate application deadlines for all commercial halibut applications, set to coincide with Council meetings and NMFS processing time.*
4. *4.2.5 Alternative 1: Status quo (revised). Require proof of permit to be onboard fishing vessel and made readily available upon request, regardless of the type of permit (e.g. paper or electronic). NMFS to provide access to permit in a printable format or send paper copy directly to the participant.*

The PFMC will further consider the above alternatives during its November Council meeting (13 and 16 November 2020).

IPHC COMMUNICATIONS AND OUTREACH

IPHC Website

- Significant enhancement of data availability and visualization

Annual Report

- The 2019 Annual Report (1 January to 31 December 2019) was published on 2 March 2020 and is available for download from the IPHC website at the following link: https://www.iphc.int/uploads/pdf/ar/iphc-2020-ar2019-r.pdf
- Annual Report 2020 on track for publication in the first week of March 2021.

IPHC COMMUNICATIONS AND OUTREACH

IPHC Circulars and Media Releases

- Fully electronic information distribution
- **IPHC Media Releases** are the primary informal communication with all stakeholders. In some cases. https://www.iphc.int/library/documents/category/media-releases
- **IPHC Circulars** serve as the formal inter-sessional communication mechanism for the Commission. Circulars are used to announce meetings of the Commission and its subsidiary bodies, as well as inter-sessional decisions made by the Commission. https://www.iphc.int/library/documents/category/circulars

IPHC COMMUNICATIONS AND OUTREACH

There is a considerable amount of effort put into public outreach, attending conferences and meetings that enhance knowledge, contributing expertise to the broader scientific community through participation on boards and committees, and seeking further education and training. In 2020 this activity was substantially reduced due to the COVID-19 pandemic.

IPHC COMMUNICATIONS AND OUTREACH

Committees and external organisation appointments

North America:

1) *Technical Subcommittee (TSC) of the Canada-United States Groundfish Committee* - Dr. Josep Planas & Ms. Lara Erikson

Canada:

1) *Halibut Advisory Board* (Canada) - Dr. David Wilson

IPHC COMMUNICATIONS AND OUTREACH

Committees and external organisation appointments

United States of America:

1) *Bering Sea/Aleutian Islands Plan Team - Dr. Allan Hicks*
2) *Bering Sea Fishery Ecosystem Plan Team - Dr. Ian Stewart*
3) *North Pacific Fishery Management Council (NPFMC) Abundance-based Management Working Group – Dr. Allan Hicks*
4) *NPFMC Scientific and Statistical Committee - Dr. Ian Stewart*
5) *NPFMC Trawl Electronic Monitoring Committee – Ms. Huyen Tran*
6) *North Pacific Research Board Science Panel - Dr. Josep Planas*
7) *Observer Science Committee (NOAA-Alaska) – Dr. Ray Webster*
8) *Interagency electronic reporting system for commercial fishery landings in Alaska (eLandings) Steering Committee – Ms. Kamala Carroll and Ms. Huyen Tran*
9) *Interagency electronic reporting system for commercial fishery landings in Alaska (eLandings) IT Steering Committee – Ms. Huyen Tran and Mr. Afshin Taheri*
10) *Interagency electronic reporting system for commercial fishery landings in Alaska (eLandings) Interagency Coordination Committee (ICC) – Ms. Lara Erikson and Ms. Huyen Tran*

IPHC COMMUNICATIONS AND OUTREACH

Conferences and symposia (chronological order)

1) *2020 Alaska Marine Science Symposium, 27-31 January, Anchorage, AK, USA – Dr. Josep Planas, Ms. Dana Rudy, Mr. Andy Jasonowicz*
2) *2020 Ocean Sciences Meeting, 16 - 21 February, San Diego, CA, U.S.A – Mrs. Lauri Sadorus*
3) *AFSC 2nd Workshop on Integrating ecosystem and socioeconomic information into the groundfish/crab stock assessments Ecosystem and Socioeconomic Profiles, 10-12 March, Seattle, WA – Dr. Ian Stewart*

IPHC COMMUNICATIONS AND OUTREACH

Outreach

1) **Booth at the Pacific Northwest Sportsman's Show, 5-9 February, Portland, OR, USA** – Caroline Robinson, Kimberly Sawyer, Robert Tobin and Andy Jasonowicz

IPHC COMMUNICATIONS AND OUTREACH

Academic affiliations

Affiliate Faculty:

1) Dr. Allan Hicks - University of Washington School of Aquatic and Fishery Sciences, Seattle, WA, USA
2) Dr. Ian Stewart - University of Washington School of Aquatic and Fishery Sciences, Seattle, WA, USA
3) Dr. Josep Planas - Alaska Pacific University, Anchorage, AK, USA

Graduate student committee member:

1) *Dr. Allan Hicks - University of Massachusetts School for Marine Science & Technology, Dartmouth, MA, USA*
2) *Dr. Allan Hicks - University of Washington School of Aquatic & Fishery Sciences, Seattle, WA, USA*
3) *Dr. Ian Stewart - Alaska Pacific University, Anchorage, AK, USA*
4) *Dr. Ian Stewart - University of Washington School of Aquatic & Fishery Sciences, Seattle, WA, USA*
5) *Dr. Josep Planas - Alaska Pacific University, Anchorage, AK, USA*

IPHC PUBLICATIONS IN 2020

Published peer-reviewed journal articles x 10 (4 primary authored)

- **Hutniczak** B, Meere F (2020) International Co-operation as a Key Tool to Prevent IUU Fishing and Disputes over It. International Community Law Review 22:439–448.
- **Webster RA, Soderlund E, Dykstra CL** and **Stewart IJ** (2020) Monitoring change in a dynamic environment: spatio-temporal modelling of calibrated data from different types of fisheries surveys of Pacific halibut. Can J Fish Aquat Sci 77(8):1421-1432.
- **Sadorus LL**, Goldstein E, **Webster RA**, Stockhausen WT, **Planas JV**, Duffy-Anderson J (*In press*). Multiple life-stage connectivity of Pacific halibut (*Hippoglossus stenolepis*) across the Bering Sea and Gulf of Alaska. *Fisheries Oceanography.* https://onlinelibrary.wiley.com/doi/abs/10.1111/fog.12512
- **Stewart IJ**, **Hicks AC** and **Carpi P** (*In press*) Fully subscribed: evaluating yield trade-offs among fishery sectors utilizing the Pacific halibut resource. *Fisheries Research.*

IPHC PUBLICATIONS IN 2020

Published peer-reviewed journal articles x 10 (6 co-authored)

- Fish T, Wolf N, Harris BP, **Planas JV** (*In press*) A comprehensive description of oocyte developmental stages in Pacific halibut, *Hippoglossus stenolepis*. J Fish Biol. https://doi.org/10.1111/jfb.14551
- Forrest RE, **Stewart IJ**, Monnahan CC, Bannar-Martin KH and Lacko LC (2020) Evidence for rapid avoidance of rockfish habitat under reduced quota and comprehensive at-sea monitoring in the British Columbia Pacific Halibut fishery. Can J Fish Aquat Sci 77:1409-1420.
- Lomeli MJM, Wakefield WW, Herrmann B, **Dykstra CL, Simeon A, Rudy DM, Planas JV** (*In press*) Use of Artificial Illumination to Reduce Pacific Halibut Bycatch in a U.S. West Coast Groundfish Bottom Trawl. *Fisheries Research*. https://doi.org/10.1016/j.fishres.2020.105737
- Nielsen JK, Mueter FJ, Adkison MD, **Loher T**, McDermott SF, Seitz AC (2020) Potential utility of geomagnetic data for geolocation of demersal fishes in the North Pacific Ocean. Animal Biotelemetry. 8:17. https://doi.org/10.1186/s40317-020-00204-0
- Punt, AE, Tuck G, Day J, Canales M, Cope JM, de Moor C, De Oliveira JAA, Dickey-Collas M, Elvarsson B, Haltuch MA, Hamel OS, **Hicks AC**, Legault CM, Lynch PD, Wilberg MJ (2020). When are model-based stock assessments rejected for use in management and what happens then? Fisheries Research 224: https://doi.org/10.1016/j.fishres.2019.105465
- van Helmond ATM, Mortensen LO, Plet-Hansen KS, Ulrich C, Needle CL, Oesterwind D, Kindt-Larsen L, Catchpole T, Mangi S, Zimmermann C, Olesen HK, Bailey N, Bergsson H, Dalskov J, Elson J, Hosken M, Peterson L, McElderry H, Ruiz J, Pierre JP, **Dykstra C**, Poos JJ. (2020). Electronic monitoring in fisheries: Lessons from global experiences and future opportunities. Fish & Fisheries 21:162–189.

IPHC PUBLICATIONS IN 2020

Submitted peer-review journal articles – In revision x 2

- Kroska AC, Wolf N, **Planas JV**, Baker MR, Smeltz TS, Harris BP (*In review*) Controlled experiments to explore the use of a multi-tissue approach to characterizing stress in wild-caught Pacific halibut (*Hippoglossus stenolepis*). *Conservation Physiology.*
- **Stewart IJ**, Scordino JJ, Petersen JR, Wise AW, Svec CI, Buttram RH, Monette JL, Gonzales MR, Svec R, Scordino J, Butterfield K, Parker W and Buzzell LA (*In review*) Out with the new and in with the old: reviving a historical technology to meet modern challenges. *Fisheries.*

2021 IPHC PUBLICATIONS

In preparation peer-reviewed journal articles (x 4 for submission late 2020/early 2021)

- **Planas JV, Simeon A, Jasonowicz A, Rudy D**, Timmins-Schiffman E, Nunn BL, Kroska A, Wolf N, Hurst TP (*In preparation)*. Physiological signatures of temperature-induced growth manipulations in white skeletal muscle of juvenile Pacific halibut (*Hippoglossus stenolepis*). *Physiological Genomics*.
- **Sadorus L, Webster R** and Sullivan M (*In preparation*) Environmental conditions on the Pacific halibut (*Hippoglossus stenolepis*) fishing grounds obtained from a decade of coastwide oceanographic monitoring, and practical applications of the data in a spatio-temporal assessment model. *Fisheries Research.*
- **Simeon A, Stewart IJ, Loher T, Erikson L,** McCarty O, **Dykstra C**, Drinan DP, Hauser L, **Planas JV** (*In preparation*). Sex marking at sea by the directed Pacific halibut fleet. *Fisheries Research.*
- Taylor IG, Doering KL, Johnson KF, Wetzel CR and **Stewart IJ** (*In preparation*) Beyond visualizing catch-at-age models: lessons learned from the r4ss package about software to support stock assessments. *Fisheries Research.*

ACTION

That the Commission **NOTE** paper IPHC-2020-IM096-04 which provides the Commission with a draft update on activities of the IPHC Secretariat in 2020, not detailed in other papers before the Commission.

INTERNATIONAL PACIFIC

HALIBUT COMMISSION

Report of the IPHC Secretariat (2020): Draft

PREPARED BY: IPHC SECRETARIAT (D. WILSON, 16 OCTOBER 2020)

Contents

1. PURPOSE

To provide the Commission with a preliminary update on the activities of the IPHC Secretariat in 2020, not already contained within other papers before the Commission.

2. STAFFING IMPROVEMENTS DURING 2020

2.1. REGULAR FULL-TIME POSITIONS

FT Arrivals	Type	Hire Date	Status	Position Title
Ms Erin **Salle**	Regular full-time	23 Mar 2020	Active	Administrative Specialist
Mr Rob **Tynes**	Regular full-time	01 Apr 2020	Active	Information Technology Specialist
Mr Nicholas **Wilson**	Regular full-time	08 Apr 2020	Active	Accounting Specialist
Ms Tara **Coluccio**	Regular full-time	26 Jun 2020	Active	Administrative Specialist

2.2. TEMPORARY FULL-TIME POSITIONS

Temporary full-time positons				
Temp/contract	**Type**	**Hire Date**	**Status**	**Position Title**
Ms Taika **Gebretsadik**	Temporary full-time	17 Aug 2020	Active	Senior Staff Accountant

2.3. DEPARTURES

FT Departure				
J. Walker	Regular full-time	16 Aug 2006	Departed 02 Mar 2020	Information Technology Specialist
C. Wikowski	Regular full-time	03 Jan 2018	Departed 04 Mar 2020	Setline Survey Specialist
S. Keith	Regular full-time	21 Nov 2011	Departed 31 Mar 2020	Assistant Director

1. IPHC INTERNSHIP PROGRAM: 2020

The IPHC funds one full-time intern each summer. In 2020, Mr Adam Ziegler from Stonehill College, Easton, MA, USA, joined the IPHC. Adam worked on the sex-ratio analysis of 2019 commercial Pacific halibut, *Hippoglossus stenolepis*, in IPHC Convention Waters

2. IPHC MERIT SCHOLARSHIP FOR 2020

The IPHC funds several Merit Scholarships to support university, technical college, and other post-secondary education for students from Canada and the United States of Amercia who are connected to the Pacific halibut fishery. Generally, a single new scholarship valued at US$4,000 per year is awarded every two years. The scholarships are renewable annually for the normal four-year period of undergraduate education, subject to maintenance of satisfactory academic performance.

A four (4) person IPHC Merit Scholarship Panel reviews applications and determines recipients based on academic qualifications, career goals, and relationship to the Pacific halibut industry.

In 2020, the IPHC Merit Scholarship was awarded to Mr Hahlen **Behnken-Barkhau** (Whitman College).

The list of current recipients and their expected years of receipt are provided below. Note that in 2016, the IPHC Merit Scholarship shifted from an award of US$2,000 per year for four years, with a new recipient selected each year, to an award of US$4,000 per year for four years, with a new recipient selected every other year.

Name	2018	2019	2020	2021	2022	2023
Kaia Dahl (Petersburg, AK, USA)	$4,000	$4,000	$4,000	$4,000	-	-
Hahlen Behnken-Barkhau (Sitka, AK, USA)	-	-	$4,000	$4,000	$4,000	$4,000

3. MEETINGS OF THE COMMISSION AND SUBSIDIARY BODIES DURING 2020

Meeting	No.	Date	Location
Annual Meeting (AM)	**96th**	**3-7 Feb**	**Anchorage, USA**
Finance and Administration Committee (FAC)	96th	3 Feb	Anchorage, USA
Conference Board (CB)	90th	4-5 Feb	Anchorage, USA
Processor Advisory Board (PAB)	25th	4-5 Feb	Anchorage, USA
Research Advisory Board (RAB)	21st	26 Feb	Seattle, USA
Management Strategy Advisory Board (MSAB)	15th	11-14 May	Electronic
	16th	19-22 Oct	Electronic
Scientific Review Board (SRB)	16th	23-25 June	Electronic
	17th	22-24 Sept	Electronic
Work Meeting (WM)	--	16-17 Sept	Electronic
Interim Meeting (IM)	**96th**	**18-19 Nov**	**Electronic**

4. IPHC PACIFIC HALIBUT FISHERY REGULATIONS (2020)

4.1. IPHC FISHERY REGULATIONS ADOPTED IN 2020

In 2020, the Commission adopted **six (6)** fishery regulations/amendments in accordance with Article III of the Convention, as follows:

1) ***IPHC Fishery Regulations: Fishery Limits (Sect. 4)***

The Commission **NOTED** and **ADOPTED** regulatory proposal IPHC-2020-AM096-PropA1, which aimed to improve clarity and transparency of fishery limits in the IPHC Fishery

Regulations, and to provide the framework for mortality limits adopted by the Commission. (para. 90)

The Commission **ADOPTED** the distributed mortality limits for each Contracting Party, by IPHC Regulatory Area, (Table 6) and sector, as provided in Appendix IV. [**Canada**: In favour=2, Against=1][**USA**: In favour=2, Against=1] (para. 91)

Table 6. Adopted TCEY mortality limits for 2020

IPHC Regulatory Area	Mortality limit (TCEY) (mlb)	Mortality limit (TCEY) (metric tonnes)
2A	1.65	748
2B	6.83	3,098
2C	5.85	2,654
3A	12.20	5,534
3B	3.12	1,415
4A	1.75	794
4B	1.31	594
4CDE	3.90	1,769
Total (IPHC Convention Area)	**36.60**	**16,601**

The Commission **ADOPTED**: (para. 97)

a) a coastwide mortality limit (TCEY) of 36.6 million pounds; and

b) a fixed TCEY for IPHC Regulatory Area 2A of 1.65 million pounds is intended to apply for a period from 2019-2022, subject to any substantive conservation concerns; and

c) a share-based allocation for IPHC Regulatory Area 2B. The share will be defined based on a weighted average that assigns 30% weight to the current interim management procedure's target TCEY distribution and 70% on 2B's recent historical average share of 20%. This formula for defining IPHC Regulatory Area 2B's annual allocation is intended to apply for a period of 2019 to 2022. For 2020, this equates to a share of 18.2% before accounting for U26; and

d) an accounting for some impacts of U26 non-directed discard mortality from US IPHC Regulatory Areas on available harvest in IPHC Regulatory Area 2B. The accounting increases the 2B TCEY by 50% of the estimated yield lost due to U26 non-directed discard mortality in Alaskan waters and is intended to apply for the period 2020-2022. For 2020 this calculation equates to 0.21 million pounds and reduces all Alaskan IPHC Regulatory Area TCEYs to maintain a coastwide TCEY of 36.6 million pounds; and

e) the use of a rolling three-year average for projecting non-directed fishery discard mortality by IPHC Regulatory Area; this is also intended to apply for a period of 2020 to 2022.

2) *IPHC Fishery Regulations: Commercial fishing periods (Sect. 9)*

The Commission **NOTED** and **ADOPTED** regulatory proposal IPHC-2020-AM096-PropA2, which specified fishing periods for the commercial Pacific halibut fisheries. (para. 98)

Commercial fishing periods

The Commission **ADOPTED** fishing periods for 2020 as provided below, thereby superseding the relevant portions of Section 9 of the IPHC Pacific halibut fishery regulations and specifying that: (para. 100)

f) All commercial fishing for Pacific halibut in all IPHC Regulatory Areas may begin no earlier than 14 March and must cease on 15 November;

g) The IPHC Regulatory Area 2A non-tribal directed commercial fishery may take place during specific fishing periods of 3 days' duration, beginning on the fourth Monday in June, with fishing period limits (vessel quota) to be determined and communicated by the IPHC Secretariat.

3) ***IPHC Fishery Regulations: minor amendments***

The Commission **NOTED** and **ADOPTED** regulatory proposal IPHC-2020-AM096-PropA3, which proposed amendments to ensure clarity and consistency in the IPHC Fishery Regulations, with minor modification as identified during AM096. (para. 101)

4) ***IPHC Fishery Regulations: Vessel Clearance in IPHC Regulatory Area 4 (Sect. 16)***

The Commission **NOTED** and **ADOPTED** regulatory proposal IPHC-2020-AM096-PropA4, which proposed amendments to address the need for clearances when a National Oceanic and Atmospheric Administration (NOAA) Fisheries observer or electronic monitoring device is present. (para. 102)

5) ***Charter management measures in IPHC Regulatory Areas 2C and 3A***

The Commission **NOTED** and **ADOPTED** regulatory proposal IPHC-2020-AM096-PropB1, which proposed IPHC Regulation changes for charter recreational Pacific halibut fisheries in IPHC Regulatory Areas 2C and 3A, in order to achieve the charter Pacific halibut allocation under the North Pacific Fisheries Management Council's (NPFMC) Pacific halibut Catch Sharing Plan. (para. 105)

6) ***Revising definition of IPHC Regulatory Area 2A-1***

The Commission **NOTED** and **ADOPTED** regulatory proposal IPHC-2020-AM096-PropB2, which proposed an update to IPHC regulatory language regarding the usual and accustomed fishing areas of Indian tribes with treaty fishing rights to Pacific halibut, with the addition of the geographic reference for Point Chehalis (46° 53.30' N. lat.). (para. 106)

4.2. DEFERRED REGULATORY PROPOSALS

4.2.1. *IPHC Fishery Regulations: IPHC Closed Area (Sect. 11)*

1) *The* Commission **NOTED** and **DEFERRED** regulatory proposal IPHC-2020-AM096-PropA5, which proposed amendments to consider the intent and purpose of the IPHC Closed Area, as defined in the Pacific Halibut Fishery Regulations (2019) Section 11,, which currently excludes directed Pacific halibut fishing, but allows other forms of mortality such as trawling, and to propose the removal of the IPHC Closed Area from the IPHC Pacific Halibut Fishery Regulations.

5. INTERACTIONS WITH CONTRACTING PARTIES

5.1. *CONTRACTING PARTY REPORTS*

In 2020, the IPHC Secretariat has engaged agency representatives from both Contracting Parties regarding more comprehensive and timely reporting of all forms of Pacific halibut removals and directed commercial fishery revenue data. The IPHC Secretariat is working to identify and address data gaps in reporting.

5.2. *CANADA*

5.2.1. *Fisheries and Oceans Canada (DFO)*

1) *Areas of conservation concern*

The IPHC Secretariat continues to work with Fisheries and Oceans representatives to address gaps in coverage for the IPHC Fishery-Independent Setline Survey (FISS) in the IPHC Convention Area. An application was submitted again in 2020 to fish the FISS stations within the Marine Protected Areas in Canadian waters, which was denied.

5.2.2. *Halibut Advisory Board (HAB)*

a) The Executive Director participates as a HAB member, with other Secretariat staff in support. This relationship is expected to continue into the future given the HAB's contributions to the Canadian decision-making process.

5.3. *UNITED STATES OF AMERICA*

5.3.1. *NORTH Pacific Fishery Management Council (NPFMC)*

1) *Areas of conservation concern*

The IPHC Secretariat worked with USA agency staff to address gaps in coverage for the Fishery-Independent Setline Survey (FISS) in IPHC Convention Waters. An application was submitted to fish the FISS stations within the Glacier Bay National Park, which was approved, allowing these stations to be fished.

2) *Abundance-Based Management of Pacific halibut bycatch (ABM)*

The NPFMC's Abundance-Based Management Working Group (ABMWG) continued its work, with participation of the IPHC Secretariat. The Commission has supported the development of ABM due to its potential effect on the directed Pacific halibut fisheries.

At its January/February 2020 meeting, the NPFMC revised the ABM motion (Council D4 Motion AM80) for the forthcoming Pacific halibut ABM PSC limit analysis and added a second motion (Council D4 Motion PSC Limits) containing additional options to consider in a discussion paper.

ABM was a priority agenda at the NPFMC October 2020 meeting. The Scientific and Statistical Committee (SSC) discussed the operating model and results from the simulation analysis.

However, a misspecification of directed commercial mortality in the model for the year 2019 was found which likely had an important effect because results for the directed commercial fisheries were presented relative to the 2019 mortality. With little time to review the updated results before the end of the SSC meeting, the SSC unanimously decided to not review the results at that time. The SSC did, however, provide advice on improvements to the model assumptions and analysis. The Council discussed the outcomes extensively and moved to a new approach in Council C6 Motion as well as updating the purpose and need. The motion specifies four alternatives for analysis with one being status quo and the other three variations of a lookup table incorporating the two indices calculated from the FISS data and the EBS trawl survey data. Four options were specified that would reduce variability in the annual PSC limits and introduce performance standards that may increase or decrease the PSC limit depending on percent usage of the limit.

The Council's three-meeting outlook notes an initial review of Pacific halibut ABM analysis in April 2021.

5.3.2. *PACIFIC Fishery Management Council (PFMC)*

1) *IPHC Regulatory Area 2A Catch Sharing Plans and in-season management*

The IPHC Secretariat collaborated with NOAA Fisheries and State agencies to conduct in-season management of the various fisheries identified in the IPHC Regulatory Area 2A Catch Sharing Plan. Date and possession restrictions were adjusted in season among the various fisheries to meet identified fishery needs while attaining and remaining within the applicable catch limits. Estimates of removals for 2020 will be presented during Agenda Item 5 on fishery statistics. The IPHC Secretariat noted that the recreational fishery sub-area – California remained open for four additional days when it was determined the fishery limit had been exceeded and against the Secretariat recommendation. This resulted in an over-catch of ~9%.

2) *IPHC Regulatory Area 2A non-tribal directed commercial fishery*

During 2019 and 2020, in response to letters exchanged between the Commission and the PFMC, and the Commission's desires expressed at AM095 and AM096, discussions included shifting responsibility for management of Pacific halibut fisheries in IPHC Regulatory Area 2A from the IPHC to domestic agencies, as is the case in all other IPHC Regulatory Areas.

At its June 2019 and June 2020 meetings, the PFMC affirmed its commitment to pursue domestic management of the Pacific halibut fisheries in IPHC Regulatory Area 2A before the 2021 fishing period. The PFMC may then later investigate other potential management options for the fishery. Further discussion of the way ahead is expected at the PFMC's September 2020 meeting.

The PFMC noted its commitment to the transition of management in its letter to the IPHC of 6 September 2019. The Commission responded in its letter to the PFMC of October 2019, offering to support the transition process and expressing its desire to complete the transition as expeditiously as possible.

2020 Update: At its September 2020 meeting, the Council further considered the transition of IPHC Regulatory Area 2A Fishery Management, with the intention of adopting preliminary preferred alternatives. Reference Council paper and presentation provided in paper IPHC-2020-IM096-INF02. At the September PFMC meeting, the final motion on the matter was as follows:

Transition of Area 2A Fishery Management The Council adopted for public review the following as preliminary preferred alternatives:

1. *4.1.2 - Alternative 2: Consider the directed fishery framework during the CSP process in September and November, including any guidance for vessel limits and inseason changes for NMFS implementation.*
2. *4.2.1 Alternative 2: Issue permits for all Area 2A halibut non-Indian fisheries (commercial directed, incidental salmon troll, incidental sablefish, and recreational charter).*
3. *4.2.2 Alternative 2: Allow NMFS to determine the appropriate application deadlines for all commercial halibut applications, set to coincide with Council meetings and NMFS processing time.*
4. *4.2.5 Alternative 1: Status quo (revised). Require proof of permit to be onboard fishing vessel and made readily available upon request, regardless of the type of permit (e.g., paper or electronic). NMFS to provide access to permit in a printable format or send paper copy directly to the participant.*

The PFMC will further consider the above alternatives during its November Council meeting (13 and 16 November 2020).

6. IPHC Communications and Outreach

6.1. *IPHC Website*

The IPHC Secretariat continues to develop new ways to display data and statistics for our stakeholders and other interested parties, focusing particularly on the addition of timely and useful visual displays such as interactive maps for the IPHC Fishery-Independent Setline Survey (FISS) data, and commercial fishery data pages and catch tables. https://www.iphc.int/www.iphc.int/data

6.2. *Annual Report*

The 2019 Annual Report (1 January to 31 December 2019) was published on 2 March 2020 and is available for download from the IPHC website at the following link: https://www.iphc.int/uploads/pdf/ar/iphc-2020-ar2019-r.pdf

We continue to implement an accelerated production timeline for the IPHC Annual Report, thereby ensuring users of the report receive the summary information as close to the relevant year as possible. Continued feedback on the content, format and presentation of the Annual Report is welcome.

6.3. *IPHC Circulars and Media Releases*

IPHC Circulars continue to serve as the formal inter-sessional communication mechanism for the Commission. Circulars are used to announce meetings of the Commission and its subsidiary bodies, as well as inter-sessional decisions made by the Commission.

https://www.iphc.int/library/documents/category/circulars

IPHC Media Releases are the primary informal communication with all stakeholders. In some cases, these will duplicate the formal communications provided in IPHC Circulars.

https://www.iphc.int/library/documents/category/media-releases

Stakeholders are encouraged to request that their email addresses be added to IPHC distribution lists at the following link: https://www.iphc.int/form/media-and-news

6.4. *IPHC External engagement*

There is a considerable amount of effort put into public outreach, attending conferences and meetings that enhance knowledge, contributing expertise to the broader scientific community through participation on boards and committees, and seeking further education and training. In 2020, much of this engagement took place electronically.

6.4.1. *Committees and external organisation appointments*

North America:

1) *Technical Subcommittee (TSC) of the Canada-United States Groundfish Committee* - Dr. Josep Planas & Ms. Lara Erikson

Canada:

1) *Halibut Advisory Board* (Canada) - Dr. David Wilson

United States of America:

1) *Bering Sea/Aleutian Islands Plan Team* - Dr. Allan Hicks
2) *Bering Sea Fishery Ecosystem Plan Team* - Dr. Ian Stewart
3) *North Pacific Fishery Management Council (NPFMC) Abundance-based Management Working Group* – Dr. Allan Hicks
4) *NPFMC Scientific and Statistical Committee* - Dr. Ian Stewart
5) *NPFMC Trawl Electronic Monitoring Committee* – Ms. Huyen Tran
6) *North Pacific Research Board Science Panel* - Dr. Josep Planas
7) *Observer Science Committee (NOAA-Alaska)* – Dr. Ray Webster
8) *Interagency electronic reporting system for commercial fishery landings in Alaska (eLandings) Steering Committee – Ms. Kamala Carroll and Ms. Huyen Tran*
9) *Interagency electronic reporting system for commercial fishery landings in Alaska (eLandings) IT Steering Committee – Ms. Huyen Tran and Mr. Afshin Taheri*
10) *Interagency electronic reporting system for commercial fishery landings in Alaska (eLandings) Interagency Coordination Committee (ICC) – Ms. Lara Erikson and Ms. Huyen Tran*

6.4.2. *Conferences and symposia (chronological order)*

1) 2020 Alaska Marine Science Symposium, 27-31 January, Anchorage, AK, USA – Dr. Josep Planas, Ms. Dana Rudy, Mr. Andy Jasonowicz
2) 2020 Ocean Sciences Meeting, 16 - 21 February, San Diego, CA, U.S.A – Mrs. Lauri Sadorus
3) AFSC 2nd Workshop on Integrating ecosystem and socioeconomic information into the groundfish/crab stock assessments Ecosystem and Socioeconomic Profiles, 10-12 March, Seattle, WA – Dr. Ian Stewart

6.4.3. *Outreach*

1) **Booth at the Pacific Northwest Sportsman's Show, 5-9 February, Portland, OR, USA** – Caroline Robinson, Kimberly Sawyer, Robert Tobin and Andy Jasonowicz

6.4.4. *Academic affiliations 2020*

Affiliate Faculty:

1) Dr. Allan Hicks - University of Washington School of Aquatic and Fishery Sciences, Seattle, WA, USA
2) Dr. Ian Stewart - University of Washington School of Aquatic and Fishery Sciences, Seattle, WA, USA
3) Dr. Josep Planas - Alaska Pacific University, Anchorage, AK, USA

Graduate student committee member:

1) Dr. Allan Hicks - University of Massachusetts School for Marine Science & Technology, Dartmouth, MA, USA
2) Dr. Allan Hicks - University of Washington School of Aquatic & Fishery Sciences, Seattle, WA, USA
3) Dr. Ian Stewart - Alaska Pacific University, Anchorage, AK, USA
4) Dr. Ian Stewart - University of Washington School of Aquatic & Fishery Sciences, Seattle, WA, USA
5) Dr. Josep Planas - Alaska Pacific University, Anchorage, AK, USA

7. IPHC PUBLICATIONS IN 2020

7.1. *Published peer-reviewed journal papers*

Forrest RE, **Stewart IJ**, Monnahan CC, Bannar-Martin KH and Lacko LC (2020) Evidence for rapid avoidance of rockfish habitat under reduced quota and comprehensive at-sea monitoring in the British Columbia Pacific Halibut fishery. Can J Fish Aquat Sci 77:1409-1420.

Hutniczak B, Meere F (2020) International Co-operation as a Key Tool to Prevent IUU Fishing and Disputes over It. International Community Law Review 22:439–448.

Nielsen JK, Mueter FJ, Adkison MD, **Loher T**, McDermott SF, Seitz AC (2020) Potential utility of geomagnetic data for geolocation of demersal fishes in the North Pacific Ocean. Animal Biotelemetry. 8:17. https://doi.org/10.1186/s40317-020-00204-0

Punt, AE, Tuck G, Day J, Canales M, Cope JM, de Moor C, De Oliveira JAA, Dickey-Collas M, Elvarsson B, Haltuch MA, Hamel OS, **Hicks AC**, Legault CM, Lynch PD, Wilberg MJ (2020). When are model-based stock assessments rejected for use in management and what happens then? Fisheries Research 224: https://doi.org/10.1016/j.fishres.2019.105465

van Helmond ATM, Mortensen LO, Plet-Hansen KS, Ulrich C, Needle CL, Oesterwind D, Kindt-Larsen L, Catchpole T, Mangi S, Zimmermann C, Olesen HK, Bailey N, Bergsson H, Dalskov J, Elson J, Hosken M, Peterson L, McElderry H, Ruiz J, Pierre JP, **Dykstra C**, Poos JJ. (2020). Electronic monitoring in fisheries: Lessons from global experiences and future opportunities. Fish & Fisheries 21:162–189.

Webster RA, Soderlund E, Dykstra CL and **Stewart IJ** (2020) Monitoring change in a dynamic environment: spatio-temporal modelling of calibrated data from different types of fisheries surveys of Pacific halibut. Can J Fish Aquat Sci 77(8):1421-1432.

7.2. ***In press* peer-reviewed journal papers**

Fish T, Wolf N, Harris BP, **Planas JV** (*In press*) A comprehensive description of oocyte developmental stages in Pacific halibut, *Hippoglossus stenolepis*. J Fish Biol. https://doi.org/10.1111/jfb.14551

Lomeli MJM, Wakefield WW, Herrmann B, **Dykstra CL, Simeon A, Rudy DM, Planas JV** (*In press*) Use of Artificial Illumination to Reduce Pacific Halibut Bycatch in a U.S. West Coast Groundfish Bottom Trawl. *Fisheries Research*.

https://doi.org/10.1016/j.fishres.2020.105737

Sadorus LL, Goldstein E, **Webster RA**, Stockhausen WT, **Planas JV**, Duffy-Anderson J (2020). Multiple life-stage connectivity of Pacific halibut (*Hippoglossus stenolepis*) across the Bering Sea and Gulf of Alaska. *Fisheries Oceanography.*

7.3. ***Submitted* peer-review journal papers – In review**

Kroska AC, Wolf N, **Planas JV**, Baker MR, Smeltz TS, Harris BP (*In review*) Controlled experiments to explore the use of a multi-tissue approach to characterizing stress in wild-caught Pacific halibut (*Hippoglossus stenolepis*). *Conservation Physiology.*

Stewart IJ, **Hicks AC** and **Carpi P** (*In review*) Fully subscribed: evaluating yield trade-offs among fishery sectors utilizing the Pacific halibut resource. *Fisheries Research.*

Stewart IJ, Scordino JJ, Petersen JR, Wise AW, Svec CI, Buttram RH, Monette JL, Gonzales MR, Svec R, Scordino J, Butterfield K, Parker W and Buzzell LA (*In review*) Out with the new and in with the old: reviving a historical technology to meet modern challenges. *Fisheries.*

7.4. ***In preparation* peer-reviewed journal articles which are likely to be submitted within the next 2-3 months**

Planas JV, Simeon A, Jasonowicz A, Rudy D, Timmins-Schiffman E, Nunn BL, Kroska A, Wolf N, Hurst TP (*In preparation)*. Physiological signatures of temperature-induced growth manipulations in white skeletal muscle of juvenile Pacific halibut (*Hippoglossus stenolepis*). *Physiological Genomics*.

Sadorus L, Webster R and Sullivan M (*In preparation*) Environmental conditions on the Pacific halibut (*Hippoglossus stenolepis*) fishing grounds obtained from a decade of coastwide oceanographic monitoring, and practical applications of the data in a spatio-temporal assessment model. *Fisheries Research.*

Simeon A, Stewart IJ, Loher T, Erikson L, McCarty O, **Dykstra C**, Drinan DP, Hauser L, **Planas JV** (*In preparation*). Sex marking at sea by the directed Pacific halibut fleet. *Fisheries Research.*

Taylor IG, Doering KL, Johnson KF, Wetzel CR and **Stewart IJ** (*In preparation*) Beyond visualizing catch-at-age models: lessons learned from the r4ss package about software to support stock assessments. *Fisheries Research.*

8. Recommendation

That the Commission:

1) **NOTE** paper IPHC-2020-IM096-04 which provides the Commission with a preliminary update on activities of the IPHC Secretariat in 2020 not detailed in other papers before the Commission.

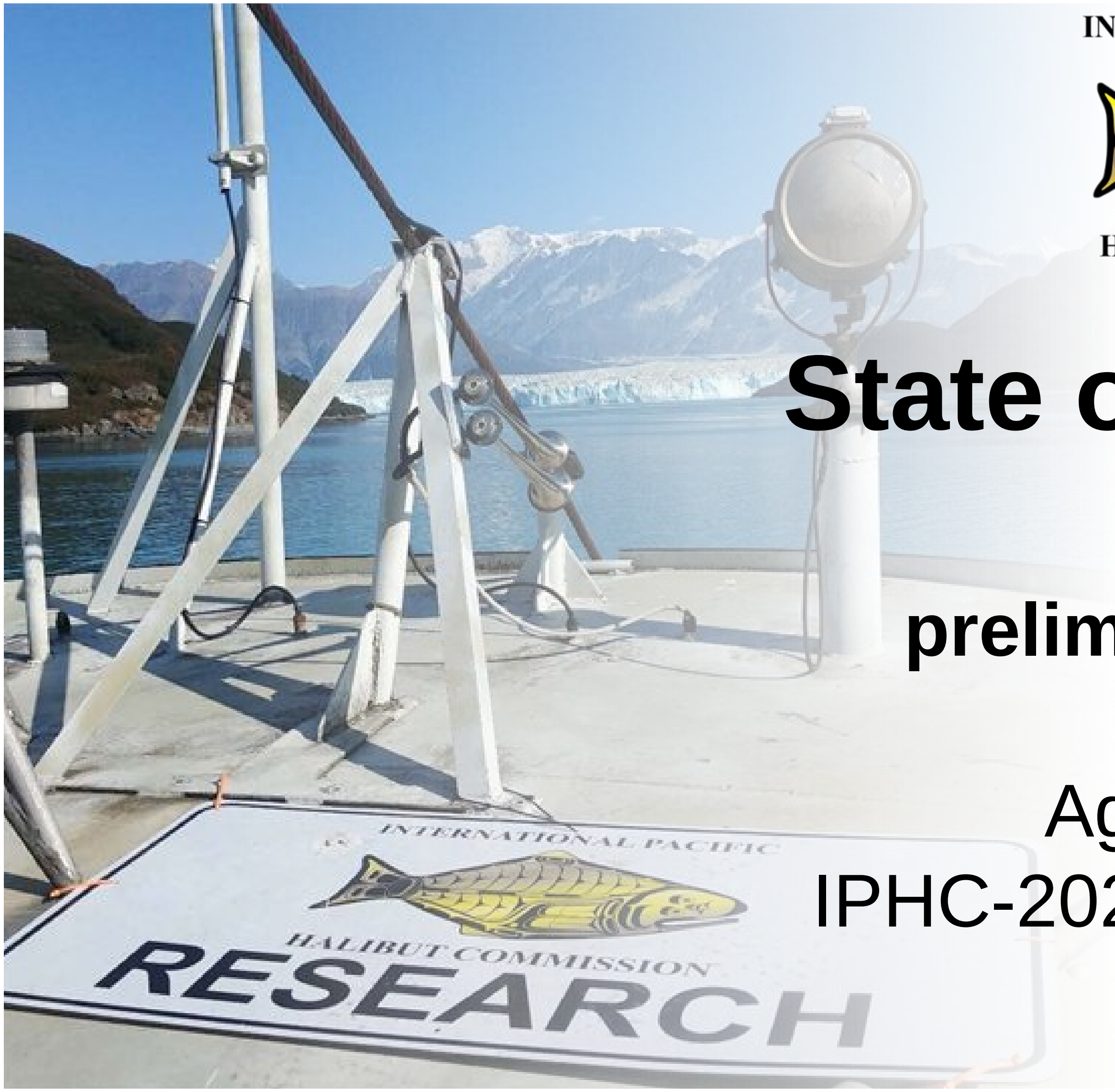
Appendices

Nil.

INTERNATIONAL PACIFIC
HALIBUT COMMISSION

State of the Fishery (2020)

preliminary statistics



Agenda Item 5

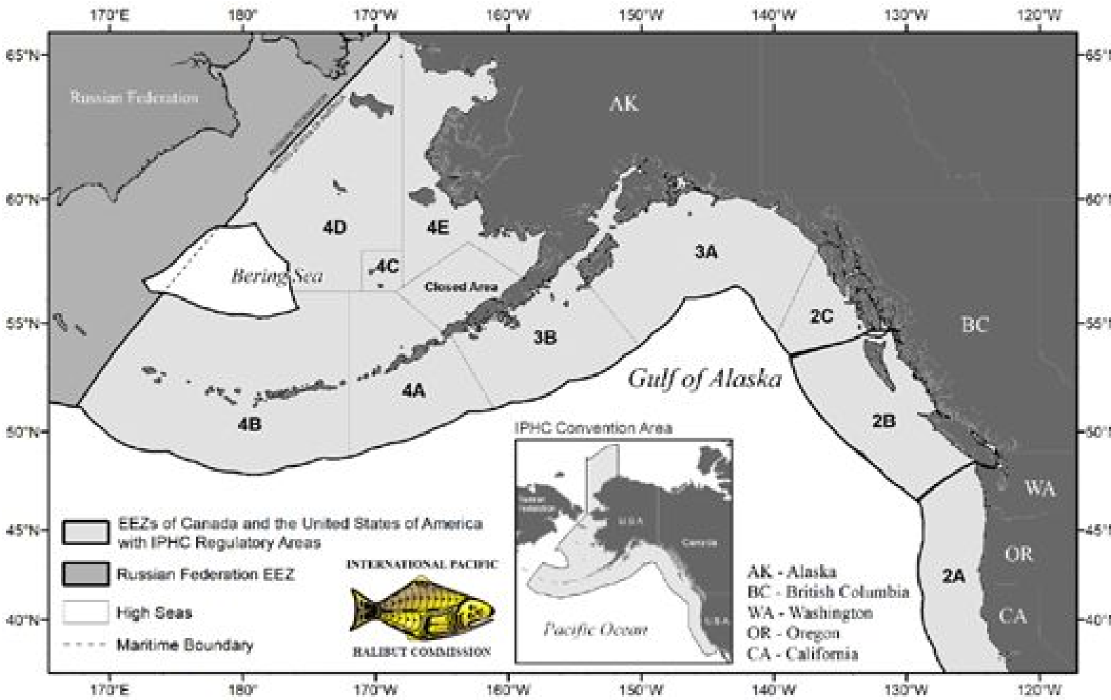
IPHC-2020-IM096-05 Rev_1

Overview

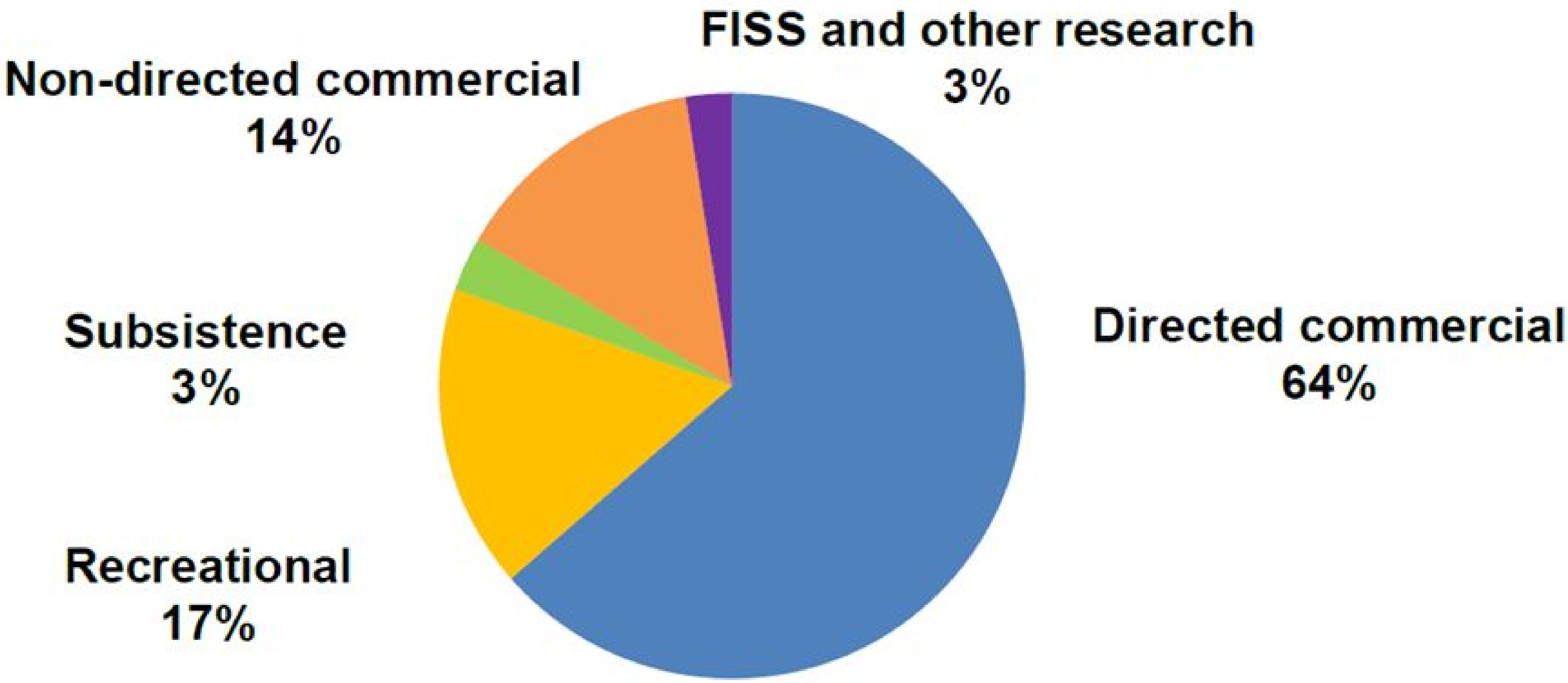
- Preliminary estimates
- Net weight
- Full year projection

2020 TOTAL MORTALITY

16,104 t
35.50 M lb



Total Pacific Halibut Mortality



Total Pacific Halibut Removals

	2019			2020		
	tonnes	pounds	%	tonnes	pounds	%
Directed commercial (landings and discard mortality)	11,036	24,330,382	61*	10,235	22,564,126	64*
Recreational	3,194	7,041,194	18*	2,702	5,957,531	17*
Subsistence	481	1,060,241	3	479	1,055,924	3
Non-directed commercial discard mortality	2,976	6,562,000	16*	2,281	5,029,000	14*
IPHC FISS and research	407	897,417	2	407	896,925	3
Total	18,094	39,891,234	100	16,104	35,503,506	100

*Percentage of total (bottom row) for the given year – indicating shift of relative removals among the directed commercial, recreational and the non-directed commercial discard mortality fishery from 2019 to 2020

2020 Total Pacific Halibut Mortality

Contracting Party	Mortality limits (net weight)		Mortality (net weight)		Percent %
	Tonnes (t)	Pounds (lb)	Tonnes (t)	Pounds (lb)	
Canada - IPHC Regulatory Area 2B	**3,089**	**6,830,000**	**2,994**	**6,601,461**	**97**
United States of America	**13,508**	**29,780,000**	**12,654**	**27,897,045**	**94**
IPHC Regulatory Area 2A	748	1,650,000	640	1,410,153	85
IPHC Regulatory Area 2C	2,654	5,850,000	2,542	5,605,067	96
IPHC Regulatory Area 3A	5,534	12,200,000	5,333	11,758,046	96
IPHC Regulatory Area 3B	1,415	3,120,000	1,297	2,859,655	92
IPHC Regulatory Area 4A	794	1,750,000	696	1,534,568	88
IPHC Regulatory Area 4B	594	1,310,000	474	1,045,905	80
IPHC Regulatory Area 4CDE and Closed Area	1,769	3,900,000	1,671	3,683,651	94
Subtotal (TCEY)	**16,601**	**36,600,000**	**15,648**	**34,498,506**	**94**
Non-directed commercial discard mortality (U26)	none	none	456	1,005,000	n/a
Total	**none**	**none**	**16,104**	**35,503,506**	**n/a**

2020 Directed Commercial – Canada (BC)

14 March to 7 December

Quota Share Fishery

2,322 tonnes landed (5,120,000 pounds)

Projected at the fishery limit

2019: 2,276 tonnes landed, 2% under fishery limit

2020 Directed Commercial – USA (WA, OR, CA)

Treaty Indian directed commercial

- Fishery limit = 224 tonnes (0.49 Mlb)
- Openers by tribe
  - *Unrestricted fishery* (14 Mar to 30 Aug)
    - 55 hours
  - *Restricted fisheries* (14 Mar to 30 Sept)
    - 102 hours
    - 0.2 t (500 lb) per day & 5 landing max
  - *Mop-up fishery* (1 Oct to 18 Oct)
    - 0.36 t (800 lb) per calendar day per vessel
- **<1% below** fishery limit (222 tonnes, 0.49 Mlb)

Directed commercial

- Fishery limit = 115 tonnes (0.25 Mlb)
- Five 58-hr fishing periods (22-24 Jun, 6-8 Jul, 20-22 Jul, 3-5 Aug, 17-19 Aug)
- **5% under** fishery limit (110 tonnes, 0.24 Mlb)

2020 Directed Commercial – USA (WA, OR, CA)

Incidental commercial landings
with salmon troll fishery

- Fishery limit = 20 tonnes (0.04 Mlb)
- Open 15 Apr to 30 Sep (WA), 15 Apr to 31 Oct (OR) and 1 Aug to 30 Sep (CA)
- No in-season action
  - 1:2 plus 1, max 35
- **35% under** fishery limit (13 tonnes, 0.03 Mlb)

Incidental commercial landings
with sablefish fishery

- Fishery limit = 32 tonnes (0.07 Mlb)
- Open 1 Apr – 31 Oct
- One in-season action
  - 200:1000 plus 2 ▸ 250:1000 plus 2 (19 Oct)
- **12% under** fishery limit (28 tonnes, 0.06 Mlb)

2020 Directed Commercial – USA (AK)

14 March to 15 November

Quota Share Fishery

Fishery Limit = 7,761 tonnes (17.1 Mlb)

- **93% landed (7,192 tonnes, 15.9 Mlb)**

2019: 93% of fishery limit (7,945 tonnes; 17.5 Mlb)

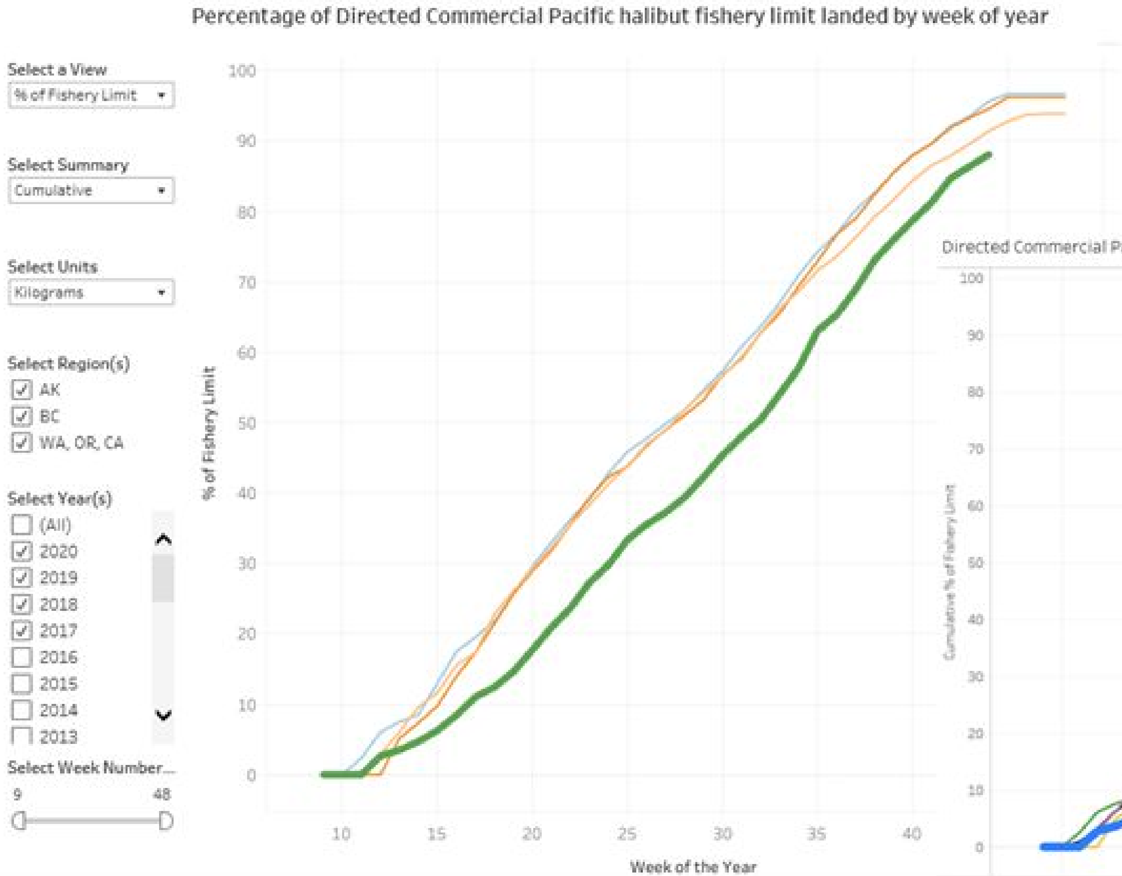
Annette Island Reserve Fishery

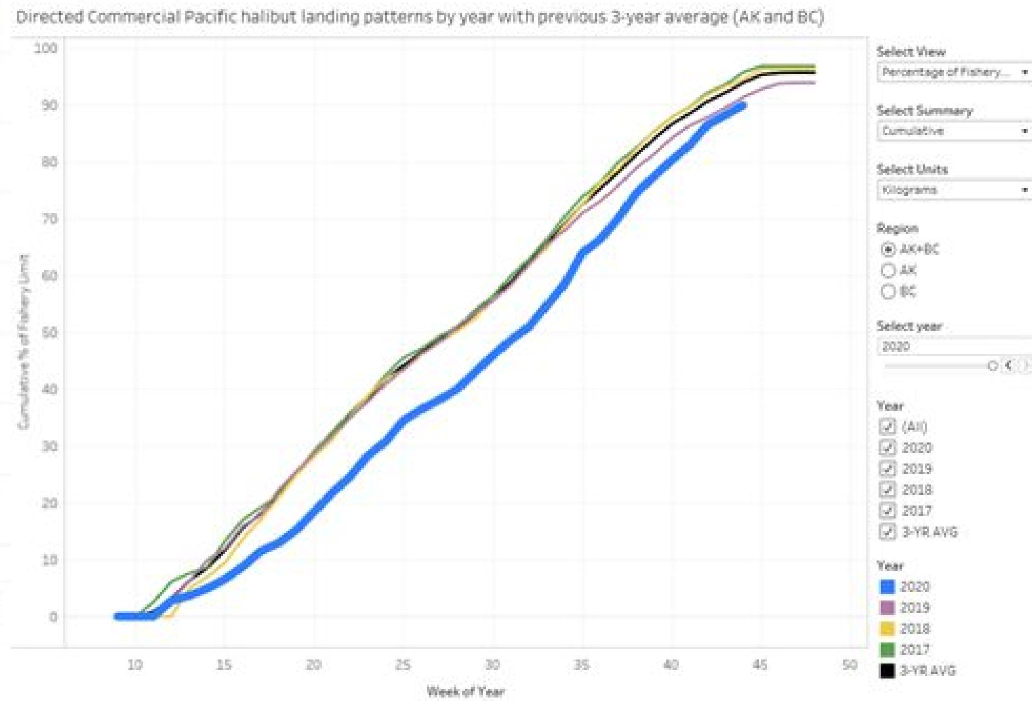
IPHC REGULATORY AREA 2C

- **no fishery limit**
- **11 tonnes (0.02 Mlb) landed**
- 8 two-day openings between 12 June and 20 September

Coastwide

Year to date

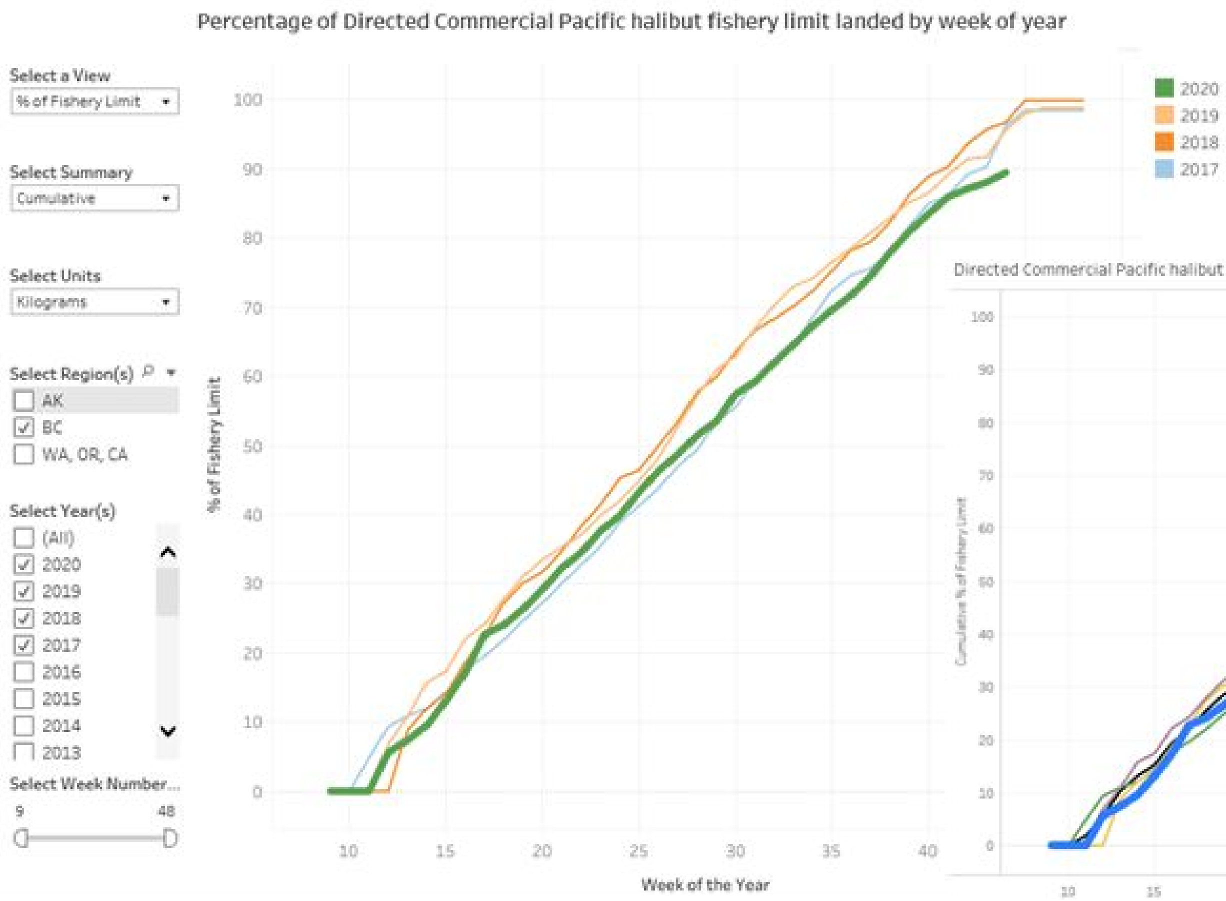




https://www.iphc.int/data/landings-2020

https://www.iphc.int/data/year-to-date-directed-commercial-landing-patterns-ak-and-bc

Canada


Percentage of Directed Commercial Pacific halibut fishery limit landed by week of year
Select a View
% of Fishery Limit
Select Summary
Cumulative
Select Units
Kilograms
Select Region(s)
AK
BC
WA, OR, CA
Select Year(s)
(All)
2020
2019
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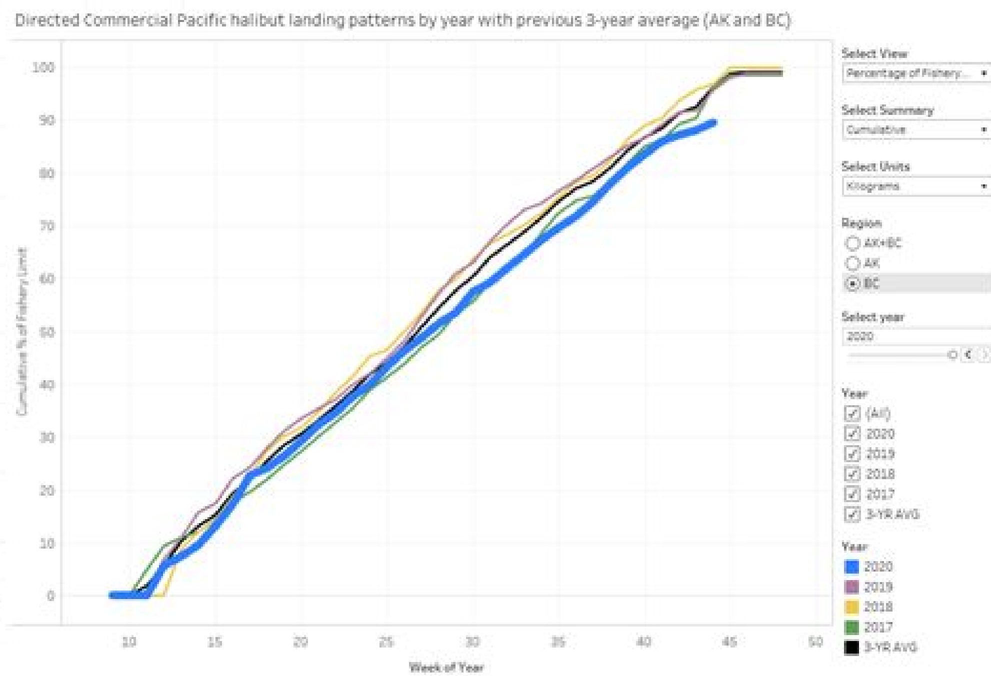
Select Week Number...
9
48
% of Fishery Limit
Week of the Year
2020
2019
2018
2017


Directed Commercial Pacific halibut landing patterns by year with previous 3-year average (AK and BC)
Select View
Select Summary
Select Units
Region
AK+BC
AK
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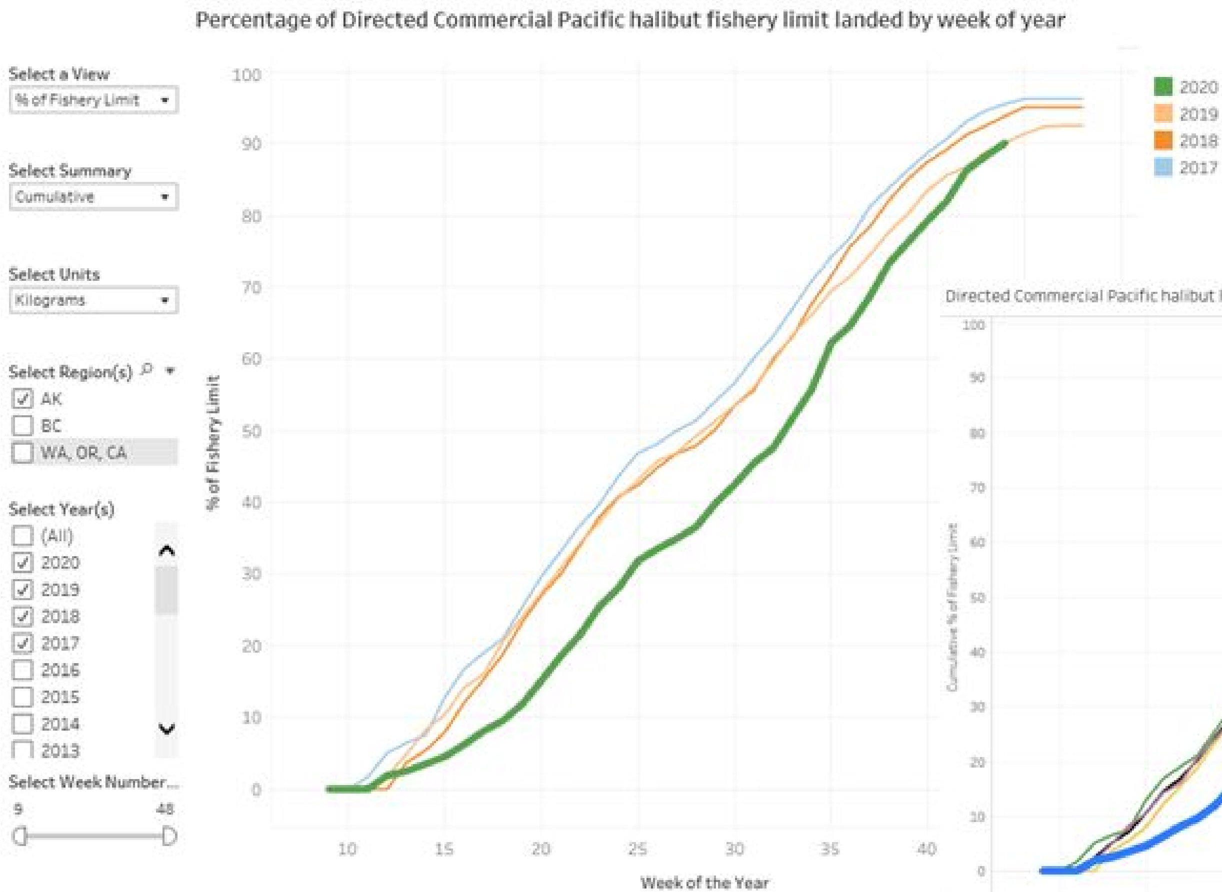
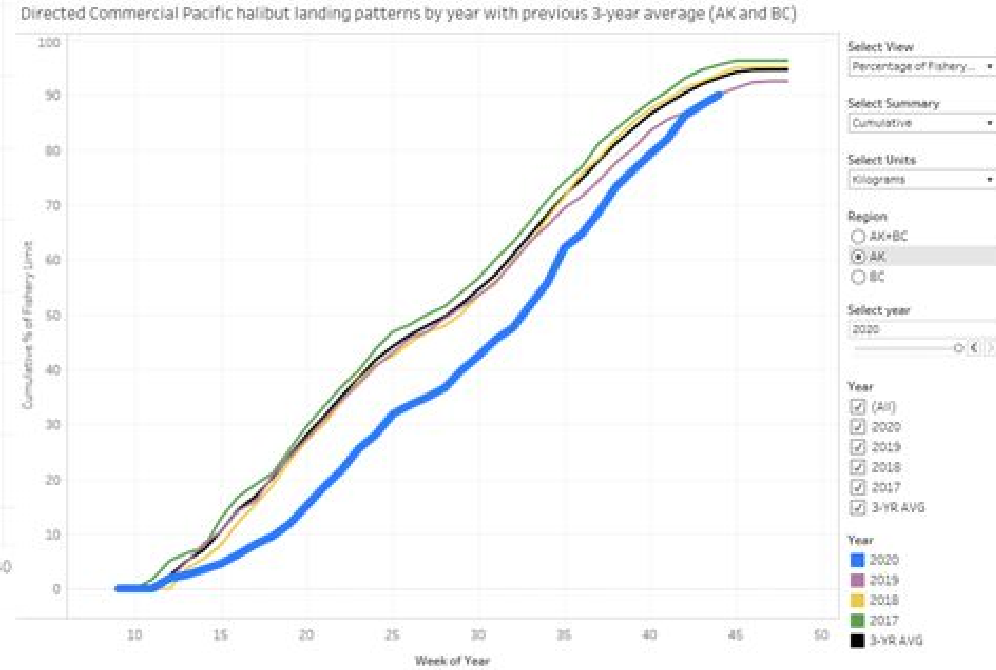
2020
Year
(All)
2020
2019
2018
2017
3-YR AVG
Week of Year

USA: Alaska


Percentage of Directed Commercial Pacific halibut fishery limit landed by week of year
Select a View
% of Fishery Limit
Select Summary
Cumulative
Select Units
Kilograms
Select Region(s)
AK
BC
WA, OR, CA
Select Year(s)
(All)
2020
2019
2018
2017
2016
2015
2014
2013
Select Week Number...
9
48
% of Fishery Limit
Week of the Year
2020
2019
2018
2017


Directed Commercial Pacific halibut landing patterns by year with previous 3-year average (AK and BC)
Cumulative % of Fishery Limit
Week of Year
Select View
Percentage of Fishery...
Select Summary
Cumulative
Select Units
Kilograms
Region
AK+BC
AK
BC
Select year
2020
Year
(All)
2020
2019
2018
2017
3-YR AVG

2020 Recreational – Canada (BC)

Allocation = 399 tonnes (0.88 Mlb)

estimated: **46% under** or 217 tonnes (0.5 Mlb)

Tidal licence fishery (1 Mar):

- Max length of 126 cm
- Daily and possession limit of 1 Pacific halibut 90-126 cm OR 2 Pacific halibut if both under 90 cm
- Annual limit 6 per license holder
- **In-season action (14 Aug)**
  - Matching daily limit to possession limit

Experimental Recreational Quota (XRQ)

- leased from the Commercial Quota Fishery
- Not opened in 2020 (due to COVID-19)

2020 Recreational – USA (WA, OR, CA)

Allocation = 275 tonnes (0.6 Mlb)
189 tonnes (0.4 Mlb, 69%)

California

29 tonnes (0.06 Mlb) – **164%**

Oregon

75 tonnes (0.17 Mlb) – **57%**

Washington

81.0 t (0.18 Mlb) – **64%**

2020 Recreational – USA (AK)

- **All areas open 1 Feb - 31 Dec – projected values**

- **IPHC Regulatory Area 2C - charter sector (guided)**
- Allocation = 354 tonnes t (0.78 Mlb)
- **36% under** fishery limit – 227 tonnes (0.50 Mlb)
- Daily bag limit of 1 fish
- Reverse slot limit
  - Fork length ≤ 45 inches or ≥ 80 inches
  - In-season action: IPHC Regulations updated 20 May
    - From fork length ≤ 40 inches or ≥ 80 inches

- Guided Angler Fish **(**GAF) – leased from the Commercial Quota Fishery
  - 25 tonnes landed (0.06 Mlb)

2020 Recreational – USA (AK)

All areas open 1 Feb - 31 Dec – projected values

IPHC Regulatory Area 3A – charter sector (guided)

- Allocation = 776 tonnes (1.71 Mlb)
- **7% under** fishery limit - 724 tonnes (1.60 Mlb)
- Daily bag limit of 2 fish
- Max size limit for second fish of 32 inches (81.3 cm)
- Each vessel limited to 1 trip per day
- No annual limit
- In-season IPHC Regulations changed 20 May from:
  - Max size limit for second fish of 26 inches (66 cm)
  - Tuesday and Wednesday closures
  - Annual limit of 4 fish

Guided Angler Fish (GAF)

– Leased from the Commercial Quota Fishery

– 1 tonne landed (0.002 Mlb)

2020 Recreational – USA (AK)

All areas open 1 Feb - 31 Dec – projected values

Private anglers (unguided) in all areas

- Removals at 1,310 tonnes (2.89 Mlb) with no fishery limit
  - IPHC Regulatory Area 2C – 526 tonnes (1.16 Mlb)
  - IPHC Regulatory Area 3A – 771 tonnes (1.70 Mlb)
- Possession limit 2 fish daily bag limit
- No size restrictions
- No annual limit

2020 Subsistence Fisheries – All Areas

1 January to 31 December
2007 estimate carried over for Canada
2018 estimates carried over for USA

TOTAL REMOVALS
- **– 479 tonnes** (1.06 Mlb)
- – 529 tonnes (1.17 Mlb) in 2017

CANADA
- **– 184 tonnes** (0.41)
- – 136 tonnes (0.30 Mlb) in 2006

USA – WA, OR AND CA
- **– 15 tonnes** (0.03 Mlb)
- – 13 tonnes (0.03 Mlb) in 2018

USA – AK
- **– 281 tonnes** (0.62 Mlb)
- – 333 tonnes (0.73 Mlb) in 2017

2020 Non-directed Discard Mortality

1 January to 31 December – Preliminary estimates

TOTAL – 2,281 tonnes (5.03 Mlb)
2019: 2,977 tonnes (6.56 Mlb)

CANADA
– 111 tonnes (0.25 Mlb)

USA – WA, OR AND CA
– 49 tonnes (0.11 Mlb)

USA – AK
– 2,121 tonnes (4.68 Mlb)

2020 Fishery-Independent Setline Survey (FISS) and Research

TOTAL – 407 tonnes (0.90 Mlb)

CANADA – BC

– **89 tonnes** (0.20 Mlb)

USA – AK

– **318 tonnes** (0.70 Mlb)

Pacific Halibut Mortality in Excess – Canada

Fishery	Mortality projection		2020 Mortality		
	tonnes	pounds	tonnes	pounds	Percent
Directed commercial discard mortality	59	130,000	75	165,000	**127**

Pacific Halibut Mortality in Excess – USA

Fishery	IPHC Regulatory Area	Mortality limit or projection		2020 Mortality		
		tonnes	pounds	tonnes	pounds	percent
Directed commercial discard mortality	2A – discard mortality	14	30,000	15	33,000	**110**
Recreational	2A – California 2C – Unguided 3A – Unguided 3B 4A	18 522 753 0 5	39,000 1,150,000 1,660,000 0 10,000	29 526 771 5 7	64,107 1,159,541 1,700,199 11,377 16,237	**164** **101** **102** **n/a** **162**

Pacific Halibut Mortality in Excess – USA

Fishery	IPHC Regulatory Area	Mortality limit or projection		2020 Mortality		
		tonnes	pounds	tonnes	pounds	percent
Subsistence	4A 4B	5 0	10,000 0	6 1	13,237 1,684	**132** **n/a**
Non-directed commercial discard mortality (O26)	2C 4A	32 100	70,000 220,000	42 111	93,000 245,000	**133** **111**

Mortality Estimates with Greatest Uncertainty

Directed Commercial Discard Mortality – U.S.A.

- **Alaska**
  - **inaccurate mean fish weight**
  - **No observer coverage for vessels less than 40 feet**
  - **Hook and line observer coverage is low (GOA and Bering Sea)**

Recreational – Canada and U.S.A

- **Self reporting of lodges in BC and AK**

Subsistence – Canada and U.S.A.

- **Estimates not updated**
  - **since 2007 (Canada) and 2018 (U.S.A)**

Non-directed commercial discard mortality – Canada and U.S.A.

- **No update for Canada in 2020**
- **Hook and line observer coverage is low in GOA and Bering Sea**
- **Non-pelagic trawl catcher vessel observer coverage is low in GOA**

2020 Port Highlights

Tissue Sampling Coastwide

- 2019 samples completed and part of assessment

Chalky Pacific halibut

- Regular questionnaire throughout the season for processors – BESB

Economic Pacific halibut survey

https://www.iphc.int/management/science-and-research/economic-research

Canada

- Adding collection of marine mammal details to logbook – agreement with USA logbooks
- Prince Rupert – saw less landings this year than previous years' level as landings shifted to Port Hardy.

2020 Port Highlights

USA

- Reports of low prices
- Kodiak –saw less landings this year than previous years' level.
- Dutch Harbor – saw more landings this year – likely due to community closures for COVID.
- Whales continue to be of concern
  - – Slinky pots use increasing

2020 Updates

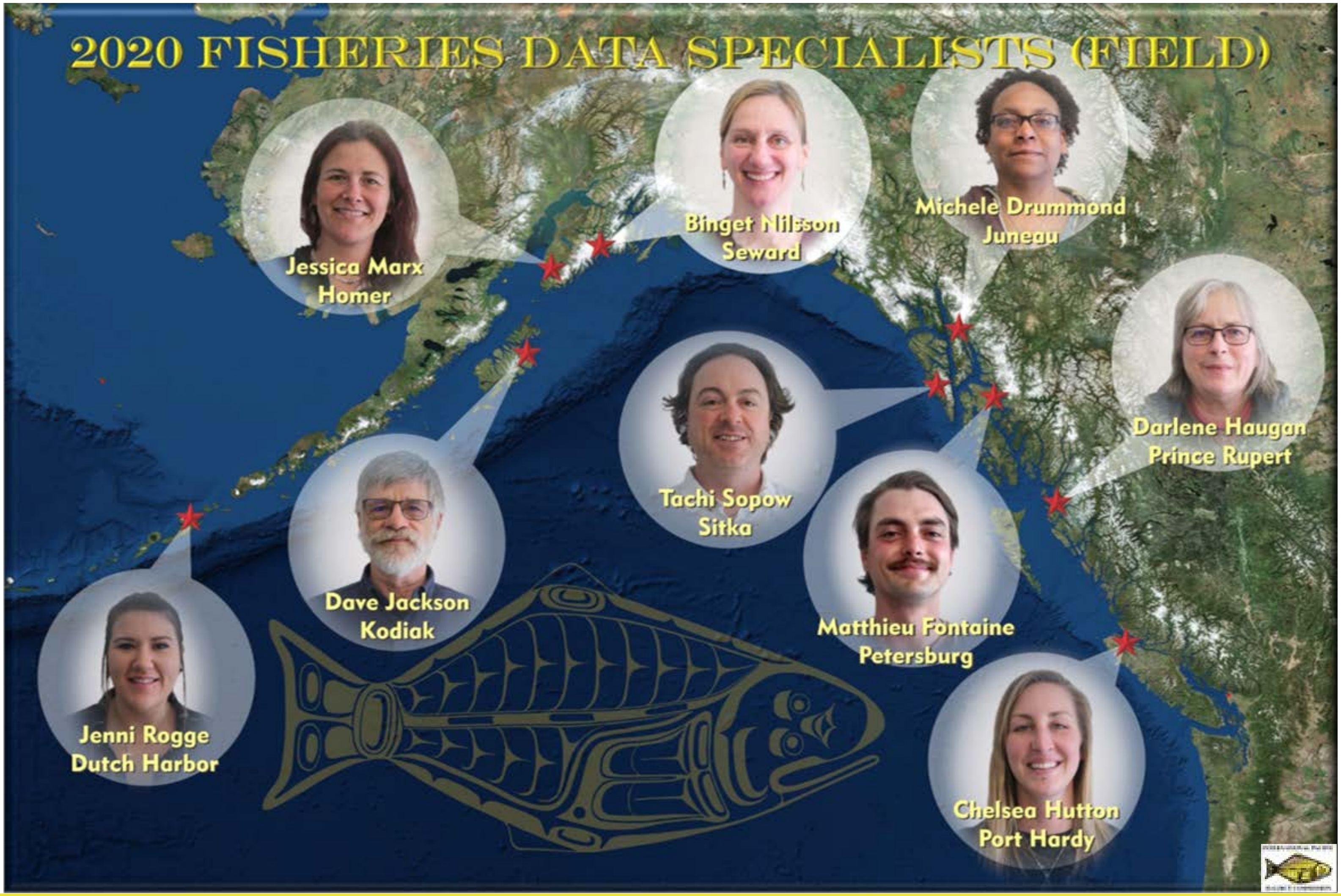
Head-on requirement

- Implemented in 2017
- Fresh landings with head off
  - none in USA
  - Canada
    - **<0.4 tonnes (<1,000 lb or 0.02%) 2020**
    - **10.2 tonnes (22,597 lb or 0.4%) 2019**
    - **5.4 tonnes (11,821 lb or 0.2%) 2018**
    - **2.8 tonnes (6,186 lb or 0.1%) 2017**
- Frozen landings with head off
  - none in USA
  - Canada
    - 21.9 tonnes (48,277 lb or 1%) 2020
    - 24.7 tonnes (54,375 lb or 1%) 2019
    - 41.8 tonnes (92,148 lb or 2%) 2018
    - 35.6 tonnes (78,583 lb or 1%) 2017

2020 Updates

Use of pot gear

- Implemented in USA in 2017
- Landings with pot gear
  - Canada – n/a
  - USA (AK)
    - 32 tonnes (70,310 lb or 0.44%) 2020
    - 29 tonnes (63,726 lb or 0.36%) 2019
    - 23 tonnes (49,995 lb or 0.30%) 2018
    - 12 tonnes (27,025 lb or 0.14%) 2017
- Logs with pot gear
  - Canada
    - 1.2 tonnes (2,648 lb or 0.05%) 2020
    - 4.0 tonnes (8,825 lb or 0.2%) 2019
    - <1.0 tonnes (<100 lb or <0.01%) 2017
  - USA (AK)
    - 27.4 tonnes (60,477 lb or 0.4%) 2020
    - 26.8 tonnes (59.085 lb or 0.4%) 2019
    - 22.4 tonnes (49,308 lb or 0.3%) 2018
    - 12.2 tonnes (26,813 lb or 0.3%) 2017


2020 FISHERIES DATA SPECIALISTS (FIELD)
Jessica Marx
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Binget Nilsson
Seward
Michele Drummond
Juneau
Darlene Haugan
Prince Rupert
Tachi Sopow
Sitka
Dave Jackson
Kodiak
Matthieu Fontaine
Petersburg
Jenni Rogge
Dutch Harbor
Chelsea Hutton
Port Hardy

INTERNATIONAL PACIFIC

HALIBUT COMMISSION

INTERNATIONAL PACIFIC HALIBUT COMMISSION

IPHC-2020-IM096-05 Rev_1

State of the Fishery (2020): Preliminary fishery statistics

PREPARED BY: IPHC SECRETARIAT (L. ERIKSON AND H. TRAN; 15 OCTOBER AND 8 NOVEMBER 2020)

PURPOSE

To provide an overview of the key fishery statistics regarding Pacific halibut removals from fisheries catching Pacific halibut during 2020, including the status of landings compared to fishery limits implemented by the Contracting Parties of the Commission.

BACKGROUND

The International Pacific Halibut Commission (IPHC) estimates all Pacific halibut (*Hippoglossus stenolepis*) removals taken in the IPHC Convention Area and uses this information in its yearly stock assessment (see **IPHC-2020-IM096-08 Rev_1**) and other analyses. The data are compiled by the IPHC Secretariat and include data from Federal and State agencies of each Contracting Party. All 2020 data are in net weight (head-off, dressed, ice and slime deducted) and are considered preliminary at this time.

This paper includes Pacific halibut removals for:

- Directed commercial fisheries, including landings and discard mortality
- Recreational fisheries, including landings and discard mortality
- Subsistence fisheries
- Non-directed commercial discard mortality (e.g. trawl, pot, longline)
- IPHC Fishery-Independent Setline Survey (FISS) and other research

Figure 1 shows the distribution of Pacific halibut removals (mortality) by these fishery sources in 2020. Table 1 and Table 2 provide estimates of total removals by IPHC Regulatory Area (Figure 2).

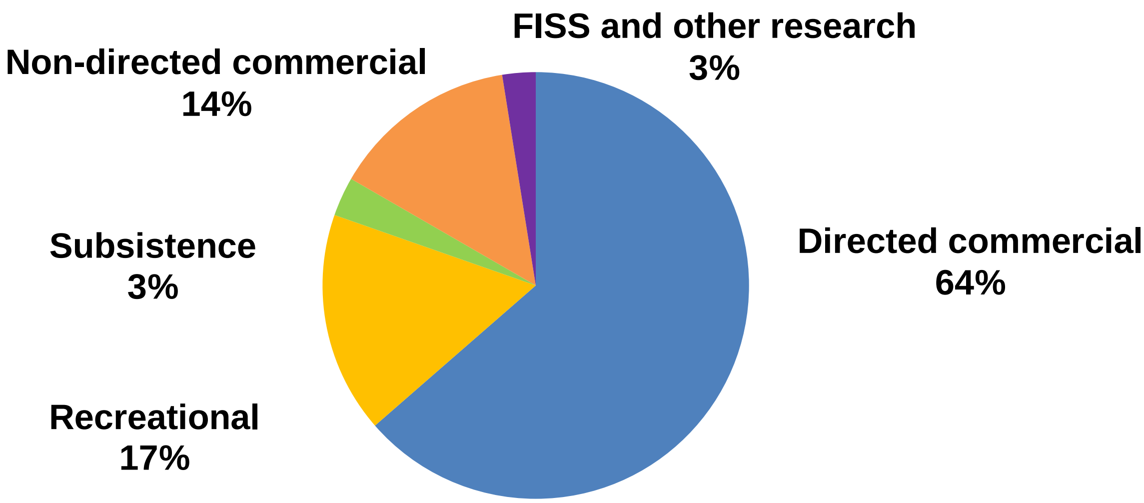

Figure 1. Distribution of Pacific halibut mortality by source in 2020.

Table 1. 2020 Mortality limits (TCEYs) and estimates (TCEYs and U26) by Contracting Party.

Contracting Party	Mortality limits (net weight)		Mortality (net weight)		Percent
	Tonnes (t)	Pounds (lb)	Tonnes (t)	Pounds (lb)	%
Canada	**3,098**	**6,830,000**	**2,994**	**6,601,461**	**97**
United States of America	**13,508**	**29,780,000**	**12,654**	**27,897,045**	**94**
IPHC Regulatory Area 2A	748	1,650,000	640	1,410,153	**85**
IPHC Regulatory Area 2C	2,654	5,850,000	2,542	5,605,067	**96**
IPHC Regulatory Area 3A	5,534	12,200,000	5,333	11,758,046	**96**
IPHC Regulatory Area 3B	1,415	3,120,000	1,297	2,859,655	**92**
IPHC Regulatory Area 4A	794	1,750,000	696	1,534,568	**88**
IPHC Regulatory Area 4B	594	1,310,000	474	1,045,905	**80**
IPHC Regulatory Area 4CDE and Closed Area	1,769	3,900,000	1,671	3,683,651	**94**
Subtotal (TCEY)	**16,601**	**36,600,000**	**15,648**	**34,498,506**	**94**
Non-directed commercial discard mortality (U26)	none	none	456	1,005,000	n/a
Total	**none**	**none**	**16,104**	**35,503,506**	**n/a**

Table 2. 2020 estimates of total removals (net weight), including fishery limits and mortality projections of Pacific halibut by IPHC Regulatory Area.

IPHC Regulatory Area	Fishery limit/mortality projection		Mortality (net weight)		Percent
	Tonnes (t)	Pounds (lb)	Tonnes (t)	Pounds (lb)	%
Canada – Area 2B (British Columbia)	3,098.04	6,830,000	2,994.37	6,601,461	97
Directed commercial fishery landings	2,322.39	5,120,000	2,322.39	5,120,000	100
Directed commercial discard mortality	58.97	130,000	74.84	165,000	127
Recreational fishery	399.16	880,000	217.02	478,438	54
Recreational discard mortality[1]	22.68	50,000	10.15	22,381	45
Subsistence[1]	185.97	410,000	183.70	405,000	99
Non-directed commercial discard mortality (O26)[1]	108.86	240,000	97.07	214,000	89
IPHC fishery-independent setline survey & research[2]	n/a	n/a	89.20	196,642	n/a
Non-directed commercial discard mortality (U26)	9.07	20,000	14.06	31,0000	155
USA – 2A (California, Oregon, and Washington)	748.43	1,650,000	639.63	1,410,153	85
Non-treaty directed commercial	115.41	254,426	110.06	242,647	95
Non-treaty incidental to salmon troll fishery	20.37	44,899	13.16	29,012	65
Non-treaty incidental to sablefish fishery	31.75	70,000	28.01	61,758	88
Treaty Indian directed commercial	223.53	492,800	221.77	488,915	99
Directed commercial discard mortality	13.61	30,000	14.97	33,000	110
Recreational – Washington	125.69	277,100	81.02	178,623	64
Recreational – Oregon	131.35	289,575	74.89	165,094	57
Recreational – California	17.69	39,000	29.08	64,107	164
Recreational discard mortality	n/a	n/a	n/a	8,797	n/a
Treaty Indian ceremonial and subsistence	14.61	32,200	14.61	32,200	100
Non-directed commercial discard mortality (O26)[1]	54.43	120,000	48.08	106,000	88
Non-directed commercial discard mortality (U26)	0.00	0	0.91	2,000	n/a

continued….

Table 2 continued. 2020 estimates of total removals (net weight), including fishery limits and mortality projections of Pacific halibut by IPHC Regulatory Area.

IPHC Regulatory Area	Fishery limit/mortality projection		Mortality (net weight)		Percent
	Tonnes (t)	Pounds (lb)	Tonnes (t)	Pounds (lb)	%
USA – Area 2C (southeastern Alaska)	2,653.51	5,850,000	2,542.42	5,605,067	96
Directed commercial fishery landings	1,546.75	3,410,000	1,434.51	3,162,547	93
Directed commercial discard mortality	31.75	70,000	28.58	63,000	90
Metlakatla (Annette Island Reserve)	n/a	n/a	10.94	24,118	n/a
Guided recreational fishery	353.80	780,000	216.38	477,041	64
Guided recreational discard mortality[3]	n/a	n/a	10.12	22,316	n/a
Guided recreational fishery (GAF)[1]	n/a	n/a	24.98	55,061	n/a
Unguided recreational fishery[1]	521.63	1,150,000	519.09	1,144,401	101
Unguided recreational discard mortality[3]	n/a	n/a	6.87	15,140	n/a
Subsistence[1]	167.83	370,000	166.11	366,214	99
Non-directed commercial discard mortality (O26)[1]	31.75	70,000	42.18	93,000	133
IPHC fishery-independent setline survey & research[2]	n/a	n/a	82.66	182,229	n/a
Non-directed commercial discard mortality (U26)	0	0	0.45	1,000	n/a
USA – Area 3A (central Gulf of Alaska)	5,533.83	12,200,000	5,333.36	11,758,046	96
Directed commercial fishery landings	3,197.83	7,050,000	3,043.16	6,709,026	95
Directed commercial discard mortality	131.54	290,000	85.28	188,000	65
Guided recreational fishery	775.64	1,710,000	717.73	1,582,333	93
Guided recreational discard mortality[3]	n/a	n/a	6.28	13,839	n/a
Guided recreational fishery (GAF)	n/a	n/a	0.97	2,147	n/a
Unguided recreational fishery[1]	752.96	1,660,000	759.52	1,674,445	102
Unguided recreational discard mortality[3]	n/a	n/a	11.68	25,754	n/a
Subsistence[1]	86.18	190,000	85.14	187,698	99
Non-directed commercial discard mortality (O26)[1]	585.13	1,290,000	410.05	904,000	70
IPHC fishery-independent setline survey & research[2]	n/a	n/a	213.55	470,804	n/a
Non-directed commercial discard mortality (U26)	131.54	290,000	119.75	264,000	91
USA – Area 3B (western Gulf of Alaska)	1,415.21	3,120,000	1,297.12	2,859,655	92
Directed commercial fishery landings	1,093.16	2,410,000	1,030.43	2,271,706	94
Directed commercial discard mortality[1]	72.57	160,000	43.54	96,000	60
Recreational fishery[1]	0.00	0	4.97	10,948	n/a
Recreational discard mortality	0.00	0	0.19	429	n/a
Subsistence[1]	9.07	20,000	7.55	16,644	83
Non-directed commercial discard mortality (O26)[1]	240.40	530,000	193.68	427,000	81
IPHC fishery-independent setline survey & research[2]	n/a	n/a	16.75	36,928	n/a
Non-directed commercial discard mortality (U26)	54.43	120,000	24.95	55,000	46
USA – Area 4A (eastern Aleutians)	793.79	1,750,000	696.07	1,534,568	88
Directed commercial fishery landings	639.57	1,410,000	533.92	1,177,094	83
Directed commercial discard mortality[1]	40.82	90,000	37.65	83,000	92
Recreational fishery[1]	4.54	10,000	7.26	16,008	162
Recreational discard mortality	0.00	0	0.10	229	n/a
Subsistence[1]	4.54	10,000	6.00	13,237	132
Non-directed commercial discard mortality (O26)[1]	99.79	220,000	111.13	245,000	111
Non-directed commercial discard mortality (U26)	63.50	140,000	19.50	43,000	31

continued….

Table 2 continued. 2020 estimates of total removals (net weight), including fishery limits and mortality projections of Pacific halibut by IPHC Regulatory Area.

IPHC Regulatory Area	Fishery limit/mortality projection		Mortality (net weight)		Percent
	Tonnes (t)	Pounds (lb)	Tonnes (t)	Pounds (lb)	%
USA – Area 4B (central/western Aleutians)	594.21	1,310,000	474.41	1,045,905	80
Directed commercial fishery landings	498.95	1,100,000	411.36	906,899	82
Directed commercial discard mortality[1]	18.14	40,000	16.33	36,000	90
Recreational fishery[1]	0.00	0	0.00	0	n/a
Recreational discard mortality	0.00	0	0.00	0	n/a
Subsistence[1]	0.00	0	0.76	1,684	n/a
Non-directed commercial discard mortality (O26)[1]	72.57	160,000	41.28	91,000	57
IPHC fishery-independent setline survey & research	n/a	n/a	4.68	10,322	n/a
Non-directed commercial discard mortality (U26)	4.54	10,000	4.54	10,000	100
USA – Area 4CDE and Closed (Bering Sea)	1,769.01	3,900,000	1,670.88	3,683,651	94
Directed commercial fishery landings	784.71	1,730,000	738.18	1,627,404	94
Directed commercial discard mortality[1]	36.29	80,000	35.83	79,000	99
Recreational fishery[1]	0.00	0	0.00	0	n/a
Recreational discard mortality	0.00	0	0.00	0	n/a
Subsistence[1]	18.14	40,000	15.08	33,247	83
Non-directed commercial discard mortality (O26)[1]	934.40	2,060,000	881.78	1,944,000	94
Non-directed commercial discard mortality (U26)	462.66	1,020,000	271.70	599,000	59
Totals	16,601.48	36,600,000	15,648.26	34,498,506	94
Directed commercial fishery landings	10,881.68	23,990,000	10,234.91	22,564,126	94
Recreational fishery	3,111.64	6,860,000	2,702.29	5,957,531	87
Subsistence[1]	480.81	1,060,000	478.96	1,055,924	100
Non-directed commercial discard mortality (O26)[1]	2,127.35	4,690,000	1,825.26	4,024,000	86
IPHC fishery-independent setline survey & research[2]	n/a	n/a	406.84	896,925	n/a
Non-directed commercial discard mortality (U26)	725.75	1,600,000	455.86	1,005,000	63

[1] 'Mortality projection' is the 2019 estimate, which was used in setting the TCEY for the IPHC Regulatory Area.

[2] Includes U32 Pacific halibut landed during FISS

[3] Limit included in limit listed above.

n/a = not available and GAF = Guided Angler Fish (GAF leased from commercial quota).

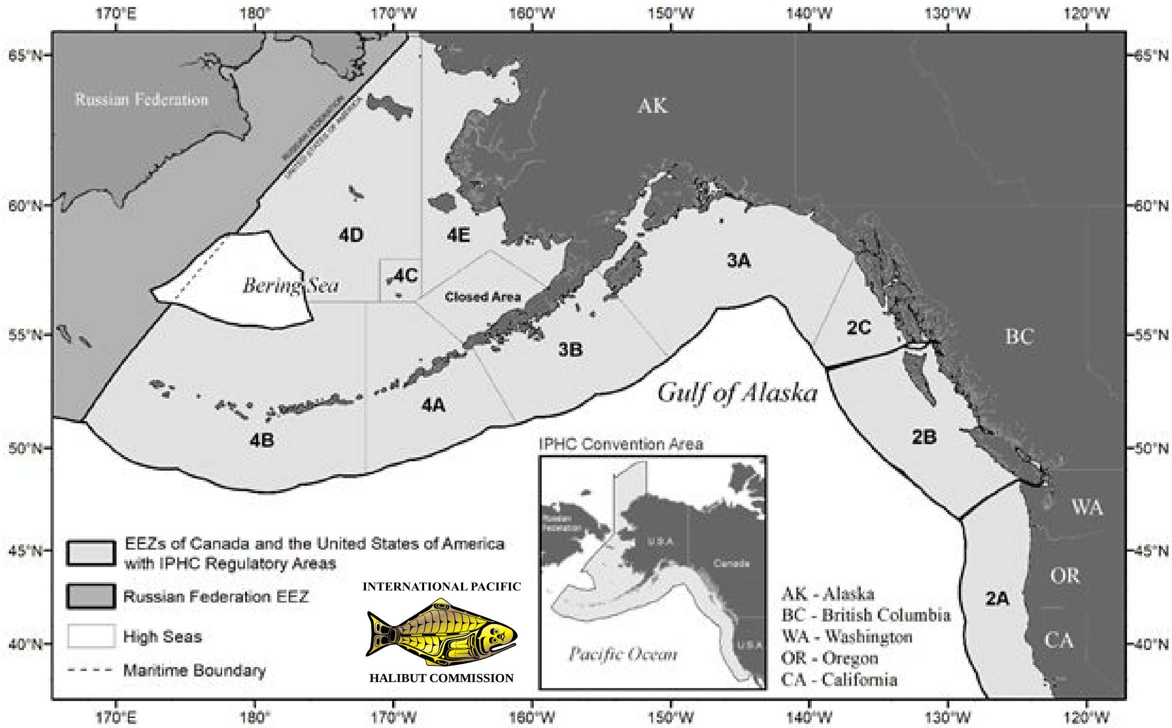

Figure 2. Map of the IPHC Convention Area (insert) and IPHC Regulatory Areas.

DEFINITIONS

Directed commercial fisheries: include commercial landings and discard mortality. Directed commercial discard mortality continues to include estimates of sub-legal Pacific halibut (under 81.3 cm (32 inches), also called U32), fish that die on lost or abandoned fishing gear, and fish discarded for regulatory compliance reasons.

Recreational fisheries: include recreational landings (including landings from commercial leasing) and discard mortality.

Subsistence fisheries (formerly called personal use/subsistence): are non-commercial, customary, and traditional use of Pacific halibut for direct personal, family, or community consumption or sharing as food, or customary trade. Subsistence fisheries include:

i) ceremonial and subsistence (C&S) removals in the IPHC Regulatory Area 2A treaty Indian fishery,
ii) the sanctioned First Nations Food, Social, and Ceremonial (FSC) fishery conducted in British Columbia,
iii) federal subsistence fishery in Alaska, USA that uses Alaska Subsistence Halibut Registration Certificate (SHARC), and
iv) U32 Pacific halibut retained in IPHC Regulatory Areas 4D and 4E by the CDQ fishery for personal use.

Non-directed commercial discard mortality: incidentally caught Pacific halibut by fisheries targeting other species and that cannot legally be retained, e.g. by the trawl fleet. Refers only to those Pacific halibut that subsequently die due to capture.

IPHC FISS and Research: includes Pacific halibut landings and removals as a result of the IPHC fishery-independent setline survey and other research.

DIRECTED COMMERCIAL FISHERIES

The IPHC's directed commercial fisheries span from northern California through to northern and western Alaska in USA and Canadian waters of the northeastern Pacific Ocean. The IPHC sets annual limits for the retention of Pacific halibut in each IPHC Regulatory Area. Participants in these commercial fisheries use longline and pot gear to catch Pacific halibut for sale. The directed commercial Pacific halibut fisheries in IPHC Regulatory Area 2A consisted of the directed commercial fishery with fishing period limits, the incidental Pacific halibut catch during the salmon troll and limited-entry sablefish (*Anoplopoma fimbria*) fisheries, and the treaty Indian fisheries. Farther north, the directed commercial fisheries consisted of the Individual Vessel Quota (IVQ) fishery in IPHC Regulatory Area 2B in British Columbia, Canada; the Individual Fishing Quota (IFQ) system in Alaska, USA; the Community Development Quota (CDQ) fisheries in IPHC Regulatory Areas 4B and 4CDE; and the Metlakatla fishery in IPHC Regulatory Area 2C. All 2020 landing and discard mortality data presented in this document are preliminary.

Directed Commercial Fishing Periods

The Canadian IVQ fishery in IPHC Regulatory Area 2B and the USA IFQ and CDQ fisheries in IPHC Regulatory Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, and 4E commenced at 12 noon local time on 14 March and closed at 12 noon local time on 15 November, with IPHC Regulatory Area 2B only closing on 7 December 2020 (Table 3). The IPHC Regulatory Area 2A directed commercial fisheries, including the treaty Indian commercial fisheries, occurred during the same calendar period (14 March to 15 November 2020). For IPHC Regulatory Area 2A, the potential of 58-hour fishing periods every two weeks beginning on the fourth Monday in June for the non-treaty directed commercial fishery were adopted. All of these fishing periods began on the Monday at 0800 and ended on the Wednesday at 1800 local time (58-hours), were further restricted by fishing period limits, and closed for the remainder of the year after the fifth opening on 19 August when the IPHC Regulatory Area 2A directed commercial non-treaty fishery allocation was estimated to have been reached.

Table 3. Fishing periods for directed commercial Pacific halibut fisheries by IPHC Regulatory Area, 2011-20.

IPHC Regulatory Area	Year									
	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011
Canada: 2B	14 Mar-7 Dec (268)	15 Mar-14 Nov (244)	24 Mar–7 Nov (228)	11 Mar–7 Nov (241)	19 Mar–7 Nov (233)	14 Mar–7 Nov (238)	8 Mar–7 Nov (244)	23 Mar–7 Nov (230)	17 Mar–7 Nov (236)	12 Mar–18 Nov (252)
USA: 2A Treaty Indian	14 Mar-30 Aug (55 h) (Unrestricted) 14 Mar-30 Sep (102 h) (Restricted) 1 Oct-18 Oct (800 lb per calendar day per vessel)	15 Mar-15 May (55 h) (Unrestricted) 15 Mar-15 May (84 h) 20 May-15 Jun (72 h) (Restricted) 11 Jun-24 Jul (~327 lb per tribe)	24 Mar – 28 Apr (36 h) 24 Mar – 28 Apr (37 h) 4 May – 23 May(30 h)	20 Mar, 15-16 Apr 1-2 May 19-20 May, 22-23 May 18-19 Jun 21-22 Jul	19-21 Mar, 20-21 Mar, 21-23 Mar 1-2 Apr 1-2,11-12 May, 18 May-15 Aug, 25 Jul-2 Aug, 12 Sep-7 Nov	16-18 Mar (48 h) 1-2 Apr	11-13 Mar (48 h) 20-21Mar, 8May 8 May	23-25 Mar (48 h) 2-4 Apr, 15-16 Apr, 8 May, 6 Jun, 13 Jul, 20 Jul, 3 Aug	24-26 Mar (2) 1 May (13 h) 17-19 Mar (55 h)	20-22 Mar (2) 1-2 May (19 h) 12-19 Mar 24-28 Mar (13 h)
USA: 2A Commercial Directed	22-24 Jun 6-8 Jul 20-22 Jul 3-5 Aug 17-19 Aug (58 h each)	26 Jun 10 Jul 24 Jul (10 h each)	27 Jun 11 Jul 25 Jul (10 h each)	28 Jun 12 Jul 26 Jul (10 h each)	22 Jun 6 Jul 20 Jul (10 h each)	24 Jun 8 Jul (10 h each)	25 Jun 9 Jul (10 h each)	26 Jun 10 Jul (10 h each)	27 Jun 11 Jul (10 h each)	29 Jun 13 Jul (10 h each)
USA: 2A Commercial Incidental	Salmon 15 Apr–30 Sep (WA – 168) 15 Apr–31 Oct (OR - 199) 1 Aug–30 Sep (CA - 60) Sablefish 1 Apr – 15 Nov (228)	Salmon 20 Apr - 30 Sep (WA, CA - 163) 20 Apr - 31 Oct (OR - 194) Sablefish 1 Apr- 31 Oct (213)	Salmon 24 Mar - 8 Aug (137) Sablefish 24 Mar – 7 Nov (228)	Salmon 1 Apr–3 Aug (124) Sablefish 1 Apr– 31 Oct (213)	Salmon 1 Apr – 31 Oct (213) Sablefish 1 Apr – 31 Oct (213)	Salmon 1 Apr–21 Aug (142) Sablefish 1 Apr– 31 Aug (152)	Salmon 1 Apr–11 Sep (163) Sablefish 1 Apr– 31 Oct (213)	Salmon 1 May–10 Aug (101) Sablefish 1 May– 31 Oct (184)	Salmon 1 May – 3 Jul (64) Sablefish 1 May– 31 Oct (184)	Salmon 1 May–28 May (28) 29 Jul-31 Oct (94) Sablefish No fishery
USA: Alaska (2C, 3A, 3B, 4A, 4B, 4CDE)	14 Mar-15 Nov (246)	15 Mar-14 Nov (244)	24 Mar–7 Nov (228)	11 Mar–7 Nov (241)	19 Mar–7 Nov (233)	14 Mar–7 Nov (238)	8 Mar–7 Nov (244)	23 Mar–7 Nov (230)	17 Mar–7 Nov (236)	12 Mar–18 Nov (252)

Directed Commercial Landings

Directed commercial landings and fishery limits by IPHC Regulatory Area for the 2020 fishing season are shown in Table 2. Directed commercial fishery limit, as referred to here, is the IPHC commercial fishery limit set by the Contracting Parties following the Annual Meeting. The fishery limits with adjustments from the underage and overage programs from the previous year's quota share programs and in IPHC Regulatory Area 2B, the Use of Fish allocation are not presented. Historical landings and fishery limits are available on the IPHC website (https://www.iphc.int/data).

The 2020 directed commercial fishery landings were spread over nine months of the year in the USA and ten months in Canada (Table 4). On a month-to-month comparison, April took the lead as the busiest month for total poundage (18%) landed from IPHC Regulatory Area 2B. On a month-to-month comparison, August was the busiest month for total poundage (20%) from Alaska, USA. A year to date visualization is also available on the IPHC website: https://www.iphc.int/data/year-to-date-directed-commercial-landing-patterns-ak-and-bc

Table 4. 2020 directed commercial landings (tonnes, net weight, preliminary) of Pacific halibut for Alaska, USA and British Columbia, Canada by IPHC Regulatory Area and month.

IPHC Regulatory Area	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct[1]	Nov[1]	Dec[1]	Total
2B[2]	185	369	274	279	264	259	256	194	195	49	2,322
2C[3]	104	145	239	207	137	245	176	162 31			1,446
3A[3]	95	276	485	449	349	453	424	426 86			3,043
3B[3]	-	30[4]	174	120	122	177	219	141	49		1,030
4A[3]		-	53[4]	46	-	201[4]	140	70	25		534
4B[3]		-	95[4]	84	-	-	156[4]	69	8		411
4CDE[3]			10	23	149	335	212[5]	-	10		738
Alaska, USA Total	199	451	1,054	929	757	1,410	1,326	868	209		7,203
Grand Total	383	820	1,328	1,208	1,020	1,669	1,582	1,062	404	49	9,525

[1] Weigh projected out to the end of the directed commercial season.
[2] Based on landings from DFO Fishery Operations System (FOS).
[3] Based on landings from NOAA Fisheries Restricted Access Management (RAM) Program.
[4] Weight combined with the previous month(s) for confidentiality purposes.
[5] Weight combined with the following month for confidentiality purposes.

Canada – IPHC Regulatory Area 2B (British Columbia)

Under the IVQ fishery in British Columbia, Canada, the number of active Pacific halibut licences (L licences), and First Nations communal commercial licences (FL licences) was 143 in 2020. In addition, Pacific halibut can be landed as incidental catch in other licensed groundfish fisheries. Therefore, Pacific halibut was landed from a total of 203 active licences in 2020, with 60 of these licences from other fisheries. The 2020 directed commercial landings of 2,322 tonnes (5,120,000 pounds) were projected at the fishery limit (2,322 tonnes (5,120,000 pounds)) (Table 2).

Directed commercial trips from IPHC Regulatory Area 2B were delivered into 15 different ports in 2020. The ports of Port Hardy (including Coal Harbour and Port McNeill) and Prince Rupert/Port Edward were the major landing locations, receiving 94% of the commercial landings. Port Hardy received 52% while Prince Rupert received 42% (1,075 and 873 tonnes (2,371,000 and 1,925,000 pounds), respectively) of the directed commercial landings. All of the IVQ landings were landed in IPHC Regulatory Area 2B. Only Canadian vessels landed frozen, head-off Pacific halibut in 2020, and only in Canadian ports: 40 landings (21.9 tonnes; 48,277 net lb) reported frozen-at-sea head-off product from 24 vessels.

In IPHC Regulatory Area 2B, 1.2 tonnes (2,648 pounds) of Pacific halibut were caught with pot gear and landed within the directed commercial fishery representing 0.05% of the total landings for which logs were collected by the IPHC.

USA – IPHC Regulatory Area 2A (Washington, Oregon, California)

The 2020 IPHC Regulatory Area 2A fisheries and respective fishery limits are listed in Table 2. The total IPHC Regulatory Area 2A directed commercial landings of 373 tonnes (822,000 pounds) are 5% below the fishery limit. The total directed commercial non-treaty Indian landings of 110 tonnes (243,000 pounds) were 5% under the fishery limit of 115 tonnes (254,426 pounds) after five 58-hour openers. The fishing period limits by vessel size class for each opening in 2020 are listed in Table 5.

The salmon troll fishery season began on 15 April with an allowable incidental landing ratio of one Pacific halibut per two Chinook (*Oncorhynchus tshawytscha*), plus an "extra" Pacific halibut per landing, and a vessel trip limit of 35 fish. The incidental Pacific halibut retention in Washington and California remained open through 30 September and in Oregon, through 31 October. Total landings of 13 tonnes (29,012 pounds) was 35% under the fishery limit (20 tonnes (44,899 pounds)).

Incidental Pacific halibut retention during the limited-entry sablefish (*Anoplopoma fimbria*) fishery remained open from 1 April to noon on 15 November. Beginning 1 April, the allowable landing ratio was 0.09 tonnes (200 pounds) (net weight) of Pacific halibut to 0.45 tonnes (1,000 pounds) (net weight) of sablefish, and up to two additional Pacific halibut in excess of the ratio limit. Effective 19 October, the landing ratio was modified to 0.11 tonnes (250 pounds) (net weight) of Pacific halibut to 0.45 tonnes (1,000 pounds) (net weight) of sablefish, and up to two additional Pacific halibut in excess of the ratio limit. The total landings of 28 tonnes (61,758 pounds) were 12% under the fishery limit (32 tonnes (70,000 pounds)).

In IPHC Regulatory Area 2A, north of Point Chehalis (46°53.30´ N. latitude), the treaty Indian tribes manage the directed commercial landings for three fisheries under a Memorandum of Understanding among the 13 tribes. These consist of an unrestricted fishery, a restricted fishery with trip limits, and a late season fishery. These fisheries are subject to in-season management. There were one unrestricted, open access fishery 14 March to 30 September, and one restricted fishery opening not to exceed 102 hours, including a vessel per day limit of 0.23 tonnes (500 pounds) and limit of five (5) landings for 14 March to 30 September. A late season fishery was open 1 October to 18 October and included a per calendar day per vessel limit of 0.3 tonnes (800 pounds). Estimated total landings, of 222 tonnes (488,915 pounds), were less than 1% under the fishery limit (224 tonnes (492,800 pounds)).

Table 5. The fishing periods and limits (tonnes, dressed, head-on with ice/slime) by vessel class used in the 2020 directed commercial fishery in IPHC Regulatory Area 2A.

Vessel Class		**Fishing Period (dates) & Limits (t)**		
Letter	**Feet**	**22-24 June**	**6-8 July**	**20-22 July, 3-5 August, 17-19 August**
A	1-25	0.41	0.82	1.03
B	26-30	0.41	0.82	1.03
C	31-35	0.41	0.82	1.03
D	36-40	0.62	1.24	1.55
E	41-45	0.62	1.24	1.55
F	46-50	0.82	1.65	2.06
G	51-55	0.82	1.65	2.06
H	56+	0.93	1.86	2.32

USA – IPHC Regulatory Areas 2C, 3, and 4 (Alaska)

In Alaska, USA, the National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries) Restricted Access Management (RAM) allocated Pacific halibut quota share (QS) to recipients by IPHC Regulatory Area. Quota share transfers were permitted with restrictions on the amount of QS a person could hold and the amount that could be fished per vessel. In 2020, RAM reported that 2,297 persons/entities held QS.

The total 2020 landings from the IFQ/CDQ Pacific halibut fishery for the waters off Alaska, USA were 7,192 tonnes (15,856,000 pounds), 7% under the fishery limit (Table 2). By IPHC Regulatory Area, the landings were under the fishery limit by 7% for Area 2C, 5% for Area 3A, 6% for Area 3B, 17% for Area 4A, 18% for Area 4B and 6% for 4CDE/Closed (Table 2).

Homer received approximately 18% (1,245 tonnes (2,745,000 pounds)) of the directed commercial landings of Alaskan catch making it the port that received the greatest number of pounds thus far in 2020. Dutch Harbor received the second and Kodiak the third largest landing volume at 12% (862 tonnes (1,901,000 pounds)) and 11% (741 tonnes (1,635,000 pounds)) of the Alaskan commercial landings, respectively. In Southeast Alaska, the two largest landing volumes were received in Juneau (559 tonnes (1,232,000 pounds)), and Sitka (481 tonnes (1,062,000 pounds)), and their combined landings represented 15% of the directed commercial Alaskan landings. The Alaskan QS catch that was landed outside of Alaska, USA was 1.5%.

In the IFQ fishery is Alaska, 32 tonnes (70,310 pounds) of Pacific halibut were caught with pot gear and landed within the directed commercial fishery representing 0.4% of the total landings.

The Metlakatla Indian Community (within IPHC Regulatory Area 2C) was authorized by the United States government to conduct a commercial Pacific halibut fishery within the Annette Islands Reserve. There were eight two-day openings between 12 June and 20 September for total landings of 11 tonnes (24,118 pounds) (Table 6). The fishery closed on 1 October.

Table 6. Metlakatla community fishing periods, number of vessels, and preliminary Pacific halibut landings (net weight) in IPHC Regulatory Area 2C, 2020.

Fishing Period Dates	Landings		Number of Vessels
	(Tonnes)	(Pounds)	
12 – 14 June	1.16	2,562	2
26 – 28 June	2.02	4,461	7
10 – 12 July	1.54	3,391	6
24 – 26 July	2.06	4,535	10
07 – 09 August	1.93	4,255	8
21 – 23 August	1.01	2,224	7
04 – 06 September	0.93	2,059	4
18 – 20 September	0.29	631	3
Total	10.94	24,118	8 Openings

n/a = not available

Directed Commercial Discard Mortality

Incidental mortality of Pacific halibut in the directed commercial Pacific halibut fishery is the mortality of all Pacific halibut that do not become part of the landed catch. The three main sources of discard mortality estimate include: 1) fish that are captured and discarded because they are below the legal size limit of 81.3 cm (32 inches), 2) fish that are estimated to die on lost or abandoned fishing gear, and 3) fish that are discarded for regulatory reasons (e.g. the vessels trip limit has been exceeded). The methods that are applied to produce each of these estimates differ due to the amount and quality of information available. Information on lost gear and regulatory discards is collected through logbook interviews and fishing logs received by mail. The ratio of U32 to O32 Pacific halibut (>81.3 cm or 32 inches in length) is determined from the IPHC fisheries-independent setline survey in most areas and by direct observation in the IPHC Regulatory Area 2B fishery. Different mortality rates are applied to each category: released Pacific halibut have a 16% mortality rate and Pacific halibut mortality from lost gear is 100%.

Pacific halibut discard mortality estimates from the commercial Pacific halibut fishery are summarized by IPHC Regulatory Area in Table 2.

RECREATIONAL FISHERIES

The 2020 recreational removals of Pacific halibut, including discard mortality, was estimated at 2,702 tonnes (5,957,531 pounds). Changes in harvests varied across areas; in some cases, in response to changes in size restrictions. Recreational fishery limits and landings are detailed by IPHC Regulatory Area in Table 2. Historical recreational removals are also available at the IPHC website: https://www.iphc.int/data/datatest/pacific-halibut-recreational-fisheries-data

Recreational Landings

Canada – IPHC Regulatory Area 2B (British Columbia)

IPHC Regulatory Area 2B operated under a 126 cm (49.6 inch) maximum size limit and one Pacific halibut had to be between 90 – 126 cm (35.4 - 49.6 inches) or both under 90 cm (35.4 inch) when attaining the two fish possession limit with an annual limit of six per licence holder.

On 14 August the daily limit was matched to the possession limit. The IPHC Regulatory Area 2B fishery remains open.

USA – IPHC Regulatory Area 2A (Washington, Oregon, California)

The 2020 IPHC Regulatory Area 2A recreational allocation was 275 tonnes (605,675 pounds) net weight and based on the Pacific Fishery Management Council's Catch Sharing Plan formula, which divides the overall fishery limit among all sectors. The recreational allocation was further subdivided to seven subareas, after 32 tonnes (70,000 pounds) were allocated to the incidental Pacific halibut catch in the commercial sablefish fishery in Washington. This subdivision resulted in 126 tonnes (277,100 pounds) being allocated to Washington subareas, 131 tonnes (289,575 pounds) to Oregon subareas. In addition, California received an allocation of 18 tonnes (39,000 pounds). The IPHC Regulatory Area 2A recreational harvest totaled 185 tonnes (407,824 pounds), 38% under the recreational allocation.

Recreational fishery harvest seasons by subareas varied and were managed inseason with fisheries opening on 1 May.

IPHC Regulatory Areas 2C, 3, and 4 (USA: Alaska)

A reverse slot limit allowing for the retention of Pacific halibut, if ≤ 114 cm (45 inches) or ≥ 203 cm (80 inches) in total length, was continued by the IPHC for the charter fishery in IPHC Regulatory Area 2C. During the 7^{th} Special Session (SS07) on the 20 May the reverse slot limit was changed to allow retention if ≤ 102 cm (40 inches) or ≥ 203 cm (80 inches) in total length. In IPHC Regulatory Area 3A, charter anglers were allowed to retain two fish, but only one could exceed 66 cm (26 inches) in length, a four fish annual limit with a recording requirement, one trip per calendar day per charter permit, with no charter retention of Pacific halibut on Tuesdays or Wednesdays. During the 7^{th} Special Session (SS07) on the 20 May the maximum length of the second fish was changed to 81 cm (32 inches) and all day closures were removed as well as the annual limit.

The Contracting Party agencies in Alaska (USA) have a program that allow recreational harvesters to land fish that is leased from commercial fishery quota share holders for the current season.

Recreational Discard Mortality

Pacific halibut discarded for any reason suffer some degree of discard mortality, and impacts more of the stock with the increasing use of size restrictions, such as reverse slot limits. Current year estimates from Contracting Parties' agencies of recreational discard mortality have been received from both Contracting Parties and are provided in Table 2.

SUBSISTENCE FISHERIES

Pacific halibut is taken throughout its range as subsistence harvest by several fisheries. Subsistence fisheries are non-commercial, customary, and traditional use of Pacific halibut for direct personal, family, or community consumption or sharing as food, or customary trade. The primary subsistence fisheries are the treaty Indian Ceremonial and Subsistence fishery in IPHC Regulatory Area 2A off northwest Washington State (USA), the First Nations Food, Social, and Ceremonial (FSC) fishery in British Columbia (Canada), and the subsistence fishery by rural residents and federally-recognized native tribes in Alaska (USA) documented via Subsistence Halibut Registration Certificates (SHARC).

The coastwide subsistence estimate for 2020 is 479 tonnes (1,056,000 pounds) (Table 2). Historical subsistence removals are also available at the IPHC website: https://www.iphc.int/datatest/subsistence-fisheries

Estimated subsistence harvests by area

In the commercial Pacific halibut fisheries coastwide, the state and federal regulations require that take-home Pacific halibut caught during commercial fishing be recorded as part of the commercial fishery on the landing records (i.e. State fish tickets or Canadian validation records). This is consistent across areas, including the quota share fisheries in Canada and USA, and as part of fishing period limits and Pacific halibut ratios in the incidental fisheries in IPHC Regulatory Area 2A. Therefore, personal use fish or take-home fish within the commercial fisheries are accounted for as commercial catch and are not included here.

IPHC Regulatory Area 2A (USA: Washington, Oregon, California)

The Pacific Fishery Management Council's Catch Sharing Plan allocates the Pacific halibut fishery limit to commercial, recreational, and treaty Indian users in IPHC Regulatory Area 2A. The treaty tribal fishery limit is further sub-divided into commercial and ceremonial and subsistence (C&S) fisheries. The 2019 final estimate of C&S was 14.6 tonnes (32,200 pounds) and this catch estimate became the 2020 C&S allocation. The estimate of the 2020 removals is not available so it is assumed the treaty tribal C&S allocation was fully harvested.

IPHC Regulatory Area 2B (Canada: British Columbia)

The source of Pacific halibut subsistence harvest in British Columbia is the First Nations FSC fishery. The IPHC receives some logbook and landing data for this harvest from the DFO but those data have not been adequate for the IPHC to make an independent estimate of the FSC fishery harvest. DFO estimated the First Nations FSC harvest to be 136.1 tonnes (300,000 pounds) annually until 2006, and since 2007, the yearly estimate has been provided as 183.7 tonnes (405,000 pounds).

IPHC Regulatory Areas 2C, 3, and 4 (USA: Alaska)

In 2003, the subsistence Pacific halibut fishery off Alaska was formally recognized by the North Pacific Fishery Management Council, and implemented by IPHC and NOAA Fisheries regulations. The fishery allows the customary and traditional use of Pacific halibut by rural residents and members of federally-recognized Alaska, USA native tribes who can retain Pacific halibut for non-commercial use, food, or customary trade. The NOAA Fisheries regulations define legal gear, number of hooks, and daily bag limits, and IPHC regulations set the fishing season. Prior to subsistence fishing, eligible persons registered with NOAA Fisheries Restricted Access Management to obtain a SHARC. The Division of Subsistence at ADF&G was contracted by NOAA Fisheries to estimate the subsistence harvest in Alaska, USA through a data collection program. Yearly reports are available at http://www.fakr.noaa.gov/ram/ subsistence/halibut.htm. Each year, the data collection program included an annual voluntary survey of fishers conducted by mail or phone, with some onsite visits. The 2018 estimate has been carried forward for 2019 and 2020.

In addition to the SHARC harvest, IPHC regulations allow Pacific halibut less than 81.3 cm or 32 inches in fork length (also called U32) to be retained in the IPHC Regulatory Area 4D and 4E commercial Pacific halibut CDQ fishery, under an exemption requested by the North Pacific Fishery Management Council, as long as the fish are not sold or bartered. The exemption originally applied only to CDQ fisheries in IPHC Regulatory Area 4E in 1998 but was expanded in 2002 to also include IPHC Regulatory Area 4D. The CDQ organizations are required to report to the IPHC the amounts retained during their commercial fishing operations. This harvest is not included in the SHARC program estimate and is reported separately.

Reports for 2020 removals were received from three CDQ management organizations: Bristol Bay Economic Development Corporation (BBEDC), Norton Sound Economic Development Corporation (NSEDC) and Coastal Villages Regional Fund (CVRF), with CVRF reporting no removals.

CDQ - Bristol Bay Economic Development Corporation (BBEDC)

BBEDC requires their fishers to record the lengths of retained U32 Pacific halibut in a separate log, which are then tabulated by BBEDC at the conclusion of the season. The lengths were converted to weights using the IPHC length/weight relationship and summed to estimate the total retained U32 weight. Pacific halibut were landed by BBEDC vessels equally at Dillingham and King Salmon, with a small amount landed in Togiak and Naknek. BBEDC reported 13 harvesters landed 91 U32 Pacific halibut (0.45 tonnes; 995 pounds).

CDQ - Coastal Villages Regional Fund (CVRF)

CVRF reported that no Pacific halibut were landed by their fishers or received by their facilities.

CDQ - Norton Sound Economic Development Corporation (NSEDC)

NSEDC required their fishers to offload the U32 Pacific halibut for weighing. The fish were not wash nor was the head removed. The U32 Pacific halibut were then returned to the harvester. NSEDC reported 196 U32 Pacific halibut weighing 0.9 tonnes (1,940 pounds) were caught in the local CDQ fishery and landed at the Nome plant.

NON-DIRECTED COMMERCIAL DISCARD MORTALITY

The IPHC accounts for non-directed commercial discard mortality by IPHC Regulatory Area and sector. All removals for 2020 are yet to be reported and will be available in Table 2. Historical data are also available on the IPHC website: https://www.iphc.int/data/datatest/non-directed-commercial-discard-mortality-fisheries

Estimating Non-Directed Commercial Discard Mortality

Non-directed commercial discard mortality of Pacific halibut is estimated because not all fisheries have 100% monitoring and not all Pacific halibut that are discarded are assumed to die. Agencies estimate the amount of non-directed commercial discard that will not survive, called non-directed commercial discard mortality.

The IPHC relies upon information supplied by observer programs run by Contracting Party agencies for non-directed commercial discard mortality estimates in most fisheries. Non-IPHC research survey information is used to generate estimates of non-directed commercial discard mortality in the few cases where fishery observations are unavailable. Trawl fisheries off Canada British Columbia are comprehensively monitored and non-directed commercial discard mortality information is provided to IPHC by DFO. NOAA Fisheries operates observer programs off the USA West Coast and Alaska, which monitor the major groundfish fisheries. Data collected by those programs are used to estimate non-directed commercial discard mortality. A breakout of these removals by IPHC Regulatory Area and year is available on the IPHC website: https://www.iphc.int/data/datatest/non-directed-commercial-discard-mortality-fisheries.

Non-directed Commercial Discard Mortality by Area

Canada – IPHC Regulatory Area 2B (British Columbia)

In Canada, Pacific halibut non-directed commercial discard mortality in trawl fisheries are capped at 454 tonnes round weight by DFO. Non-trawl non-directed commercial discard mortality is handled under an IFQ system within the directed Pacific halibut fishery cap.

USA – IPHC Regulatory Area 2A (Washington, Oregon, California)

Groundfish fisheries off Washington, Oregon, and California are managed by the NOAA Fisheries, following advice and recommendations developed by the Pacific Fishery Management Council.

USA – IPHC Regulatory Areas 2C, 3, and 4 (Alaska)

Groundfish fisheries in Alaska are managed by NOAA Fisheries, following advice and recommendations developed by the North Pacific Fishery Management Council. Non-directed commercial discard mortality projected estimates for Alaskan areas are provided by NOAA Fisheries.

IPHC Regulatory Area 2C (Southeast Alaska)

For the federal waters of IPHC Regulatory Area 2C, only non-directed commercial discard mortality by hook-and-line vessels fishing in the outside waters were reported by NOAA Fisheries. These vessels are primarily targeting Pacific cod and rockfish (*Sebastes* spp.) in open access fisheries, and sablefish in the IFQ fishery.

Fisheries occurring within state waters and resulting in Pacific halibut non-directed commercial discard mortality include pot fisheries for red and golden king crab, and tanner crab. Information is provided periodically by ADF&G, and the estimate was again rolled forward.

IPHC Regulatory Area 3 (Eastern, Central and Western Gulf of Alaska)

IPHC Regulatory Area 3 is comprised of Areas 3A and 3B. IPHC tracks non-directed commercial discard mortality for each IPHC Regulatory Area due to assessment and stock management needs, while groundfish fisheries operate throughout both areas. Trawl fisheries are responsible for the majority of the non-directed commercial discard mortality in these IPHC Regulatory Areas, with hook-and-line fisheries a distant second. State-managed crab and scallop fisheries are also known to take Pacific halibut as non-directed commercial discard mortality, but at low levels.

IPHC Regulatory Area 3 remains the area where non-directed commercial discard mortality is estimated most poorly. Observer coverage for most fisheries is relatively low. Tendering, loopholes in trip cancelling, and safety considerations likely result in observed trips not being representative of all trips (observed and unobserved) in many regards (e.g. duration, species composition, etc.. This, plus low coverage, lead to increased uncertainty in these non-directed commercial discard mortality estimates and to potential for bias.

IPHC Regulatory Area 4 (Bering Sea and Aleutian Islands)

Pacific cod is the major fishery in this IPHC Regulatory Area with Pacific halibut non-directed commercial discard mortality, which is conducted in the late winter/early spring and late summer. Almost all of the vessels are required to have 100% observer coverage because of the vessel's size and requirements of their fishery cooperative; very few small vessels fish Pacific cod in this IPHC Regulatory Area. Because of this high level of observer coverage, non-directed commercial discard mortality estimates for this and other IPHC Regulatory Area 4 fisheries are considered reliable.

Pots are used to fish for Pacific cod and sablefish and fish very selectively. Non-directed commercial discard mortality rates are quite low and survival is relatively high. Annual non-directed commercial discard mortality estimates are typically low, usually less than 7 tonnes.

Within the Bering Sea, non-directed commercial discard mortality estimates have typically been the highest in IPHC Regulatory Area 4CDE (Table 2). This is due to the groundfish fisheries which operate in the area, i.e., those for flatfish.

IPHC Fishery-independent setline survey and other research

The IPHC's FISS provides catch information and biological data on Pacific halibut (*Hippoglossus stenolepis)* that are independently collected from the commercial fishery. Approximately 407 tonnes (897,000 pounds) of Pacific halibut were landed from the FISS and other research in 2020 with the amount landed from each IPHC Regulatory Area documented in Table 2. For additional information on the FISS see **IPHC-2020-IM096-06**.

Recommendation/s

That the Commission:

1) **NOTE** paper IPHC-2020-IM096-05 Rev_1 which provides preliminary fishery statistics from fisheries catching Pacific halibut during 2020, including the status of removals compared to fishery limits implemented by the Contracting Parties.

Appendices

Nil

IPHC Fishery-Independent Setline Survey (FISS) design and implementation in 2020

PREPARED BY: IPHC SECRETARIAT (L. ERIKSON AND R.WEBSTER; 16 OCTOBER AND 6 NOVEMBER 2020)

PURPOSE

To provide results of the 2020 IPHC Fishery-Independent Setline Survey (FISS).

BACKGROUND

The annual IPHC Fishery-Independent Setline Survey (FISS) of the Pacific halibut stock was augmented from 2014-2019 with expansion stations that filled in gaps in coverage in the annual FISS. Prior to 2020, the standard grid of stations comprised 1,200 stations. Following the completion in 2019, expansion stations were added to the standard grid in all IPHC Regulatory Areas, now totaling 1,890 stations for the full FISS design (Figure 1).

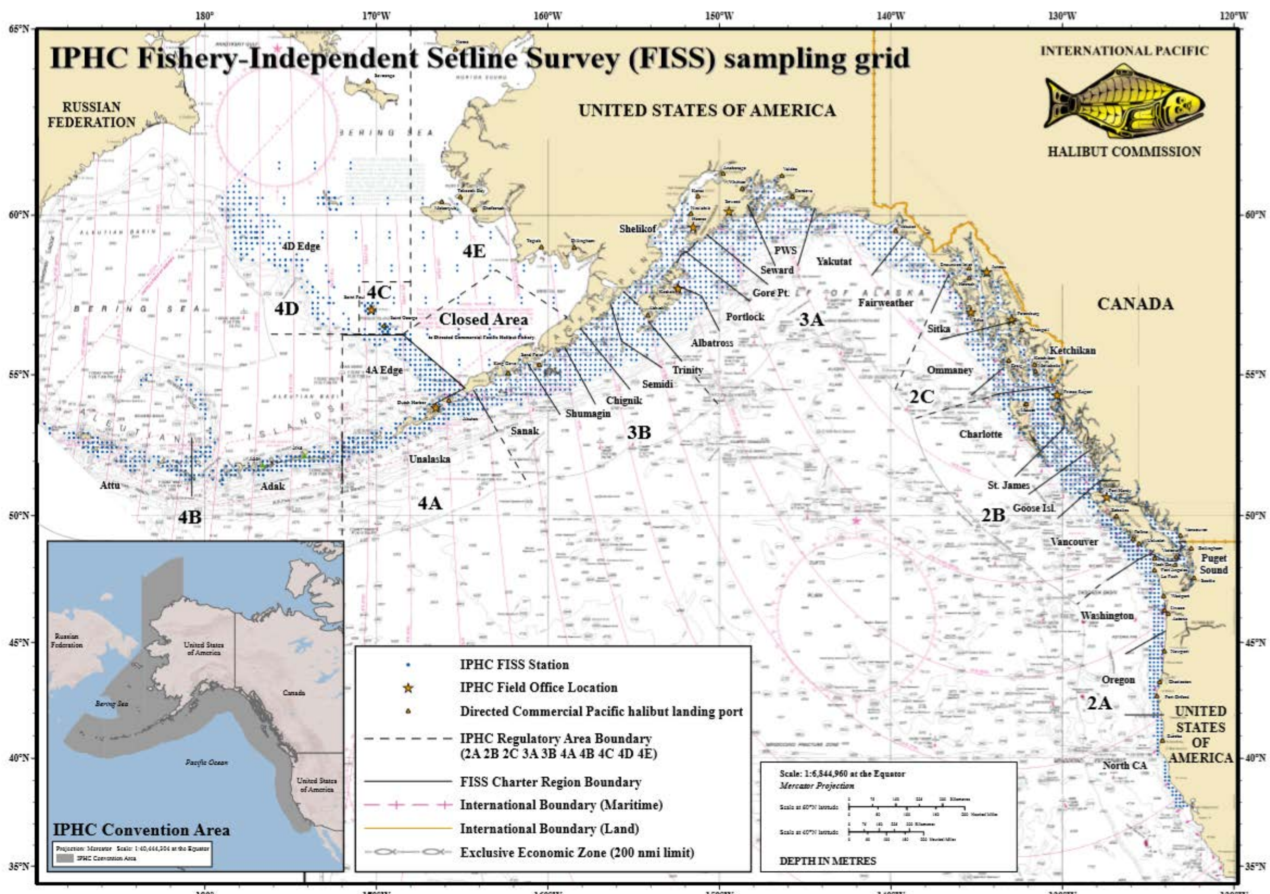

Figure 1. IPHC Fishery-Independent Setline Survey (FISS) with full sampling grid shown.

Prior to 2019, only fixed gear was used to fish FISS sets. With increasing use of snap gear in the commercial fishery, this restriction has limited the number of vessels available for the FISS. Further, any differences between snap and fixed gears (including catch rate differences and differences in fishing locations) may affect our understanding of trends in commercial fishery indices. This has motivated the need for a study comparing the two gear types with this work being done in 2019 and again in 2020.

Beginning in 2019, individual weight data were collected coastwide from Pacific halibut caught on the FISS to eliminate questions that have arisen regarding the accuracy of estimates that depend on these weights, including weight per unit effort (WPUE) indices of density. Data from IPHC collections from commercial landings and other sources had provided evidence that the current standard length-net weight curve used for estimating Pacific halibut weights on the FISS may have been over-estimating weights on average in most IPHC Regulatory Areas, and that the relationship between weight and length may vary spatially.

Interactive views of some of the FISS results were provided via the IPHC website and can be found here:

https://www.iphc.int/data/setline-survey-catch-per-unit-effort

Evolution of the 2020 FISS designs

At the 96th Session of the IPHC Annual Meeting (AM096), the Commission recommended an annual FISS design for 2020 that included 1,232 stations coastwide (Figure 2). That annual design comprised sampling of subareas within IPHC Regulatory Areas 2A, 4A (including a snap-fixed gear comparison), and 4B intended to reduce potential bias (relative to historical observed changes year-to-year) and to achieve a level of precision comparable to or better than recent surveys. Proposed 2020 sampling in IPHC Regulatory Areas 2B (except inside waters), 3A, and 3B in included random subsampling from the full design to provide for unbiased estimates, while increasing precision relative to recent surveys. Proposed sampling in IPHC Regulatory Area 4CDE included 100% of the full FISS design.

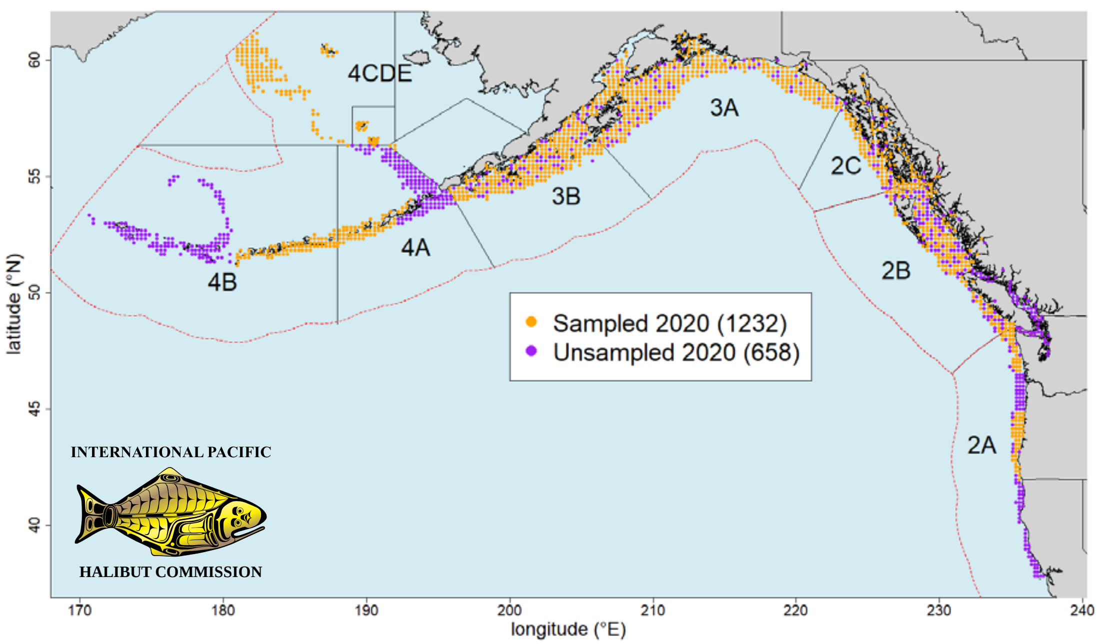

Figure 2. The IPHC Fishery-Independent Setline Survey (FISS) proposed design for 2020 from the 96th Session of the IPHC Annual Meeting (AM096).

At the 6th Special Session of the IPHC (SS06), the Commission endorsed a revised annual FISS design for 2020 that included 1,283 stations coastwide (Figure 3). The changes from the previous design included random subsampling of stations in IPHC Regulatory Area 4CDE, 100% sampling in IPHC Regulatory Areas 3A, 2C, and 2B (except inside waters), reduced random sampling in IPHC Regulatory Area 3B, a reduced subarea in IPHC Regulatory Area 2A and a relocation of the snap-fixed gear comparison to 2B.

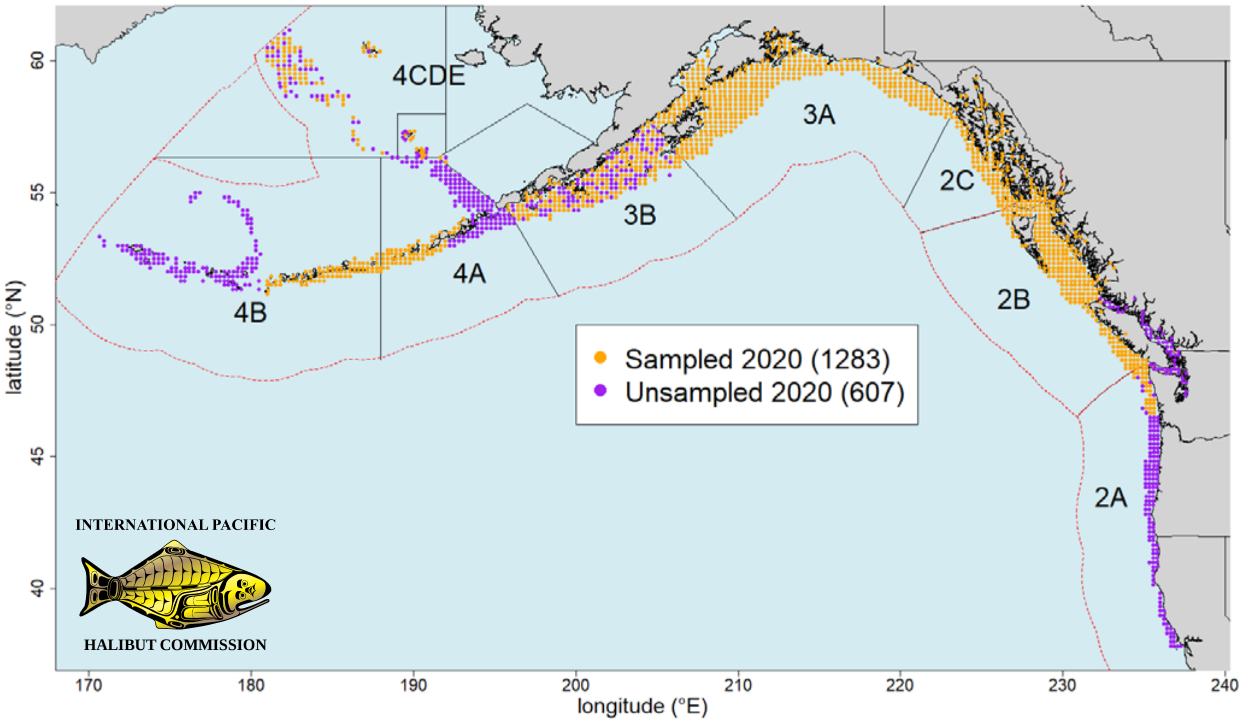

Figure 3. Map of the revised 2020 FISS design endorsed by the Commission at the 6th Special Session of the IPHC (SS06).

In light of the COVID-19 Pandemic and its impacts, on 29 May 2020, the Commission adopted (endorsed) a reduced 2020 FISS design consisting of 898 stations coastwide (Figure 4). This design included 100% sampling in IPHC Regulatory Areas 3A, 2C, and 2B (except inside waters and the outside of Vancouver Island), and random subsampling from the eastern half of IPHC Regulatory Area 3B. Additional details and a more in-depth review of the rationale leading to the evolution of the 2020 FISS designs and their implications may be found in the following document IPHC-2020-IM096-08 – Summary of data and stock assessment.

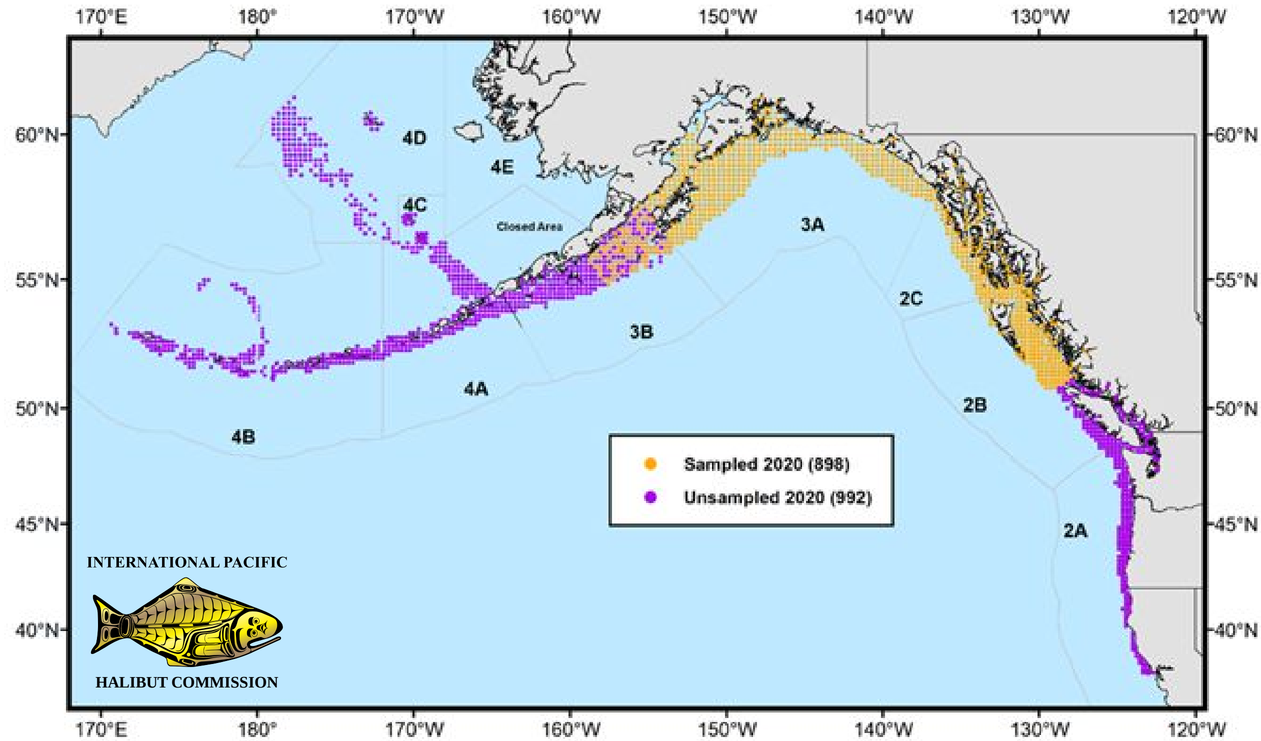

Figure 4. Map of the revised and final 2020 FISS design endorsed by the Commission on 29 May 2020.

INTRODUCTION

In most IPHC Regulatory Areas, the previous (prior to 2020), annual FISS fished waters within the 37-503 m (20-275 fm) depth range. Information from commercial fishery data and other fishery-independent sources showed the presence of Pacific halibut down to depths of 732 m (400 fm) and in waters shallower than 37 m. Further, most IPHC Regulatory Areas had significant gaps in coverage within the standard 37-503 m depth range. The incomplete coverage of Pacific halibut habitat by the FISS had the potential to create bias in estimates of the weight per unit effort and numbers per unit effort (NPUE) density indices used in the stock assessment modelling and for stock distribution estimation. For this reason, the IPHC expanded the FISS to encompass these areas with stations added to cover habitat not previously sampled on the FISS. As a result, the 2020 FISS design was a selection of stations from the full FISS design of 1,890 stations. The 2020 FISS was to comprise a random subsample of 1,232 stations following decisions made at the 96th Session of the IPHC Annual Meeting (AM096). However, due to the impact of COVID-19, a reduced FISS was implemented totaling 898 stations with stations in IPHC Regulatory Areas 2B, 2C, 3A and 3B.

In 2020, a comparison of the use of snap gear to the use of fixed gear on the FISS was conducted in the St. James charter region (IPHC Regulatory Area 2B) to expand on data collected in 2019 in IPHC Regulatory Area 2C. The design featured each station being fished twice, once with fixed gear and once with snap gear, with randomisation of the order of the two gear types for each station. The comparison will provide data on any differences between catch (e.g. Pacific halibut catch rates, age and size distribution, bycatch species) on the two gears.

Beginning in 2019, individual Pacific halibut are weighed at sea throughout the FISS in order to improve the quality of estimates based on Pacific halibut weight. The use of direct weight measurements will lead to more accurate estimates of WPUE and other quantities based on weights, allow estimation of length-weight curves based on all sizes available to longline gear (whereas collections from directed commercial landings only measure fish greater than or equal to 81.3 cm in length) and provide additional information on biases in the standard curve and spatial differences in the length-weight relationship.

MATERIALS AND METHODS

The IPHC's FISS design encompasses nearshore and offshore waters of the IPHC Convention Area (Figure 5). The IPHC Regulatory Areas are divided into 31 regions, each requiring between 10 and 46 charter days to complete. FISS stations are located at the intersections of a 10 nmi by 10 nmi square grid within the depth range occupied by Pacific halibut during summer months (18 – 732 m [10 – 400 fm]). Figure 6 depicts the 2020 FISS station positions, charter region divisions, and IPHC Regulatory Areas.

Fishing vessels are chosen through a competitive bid process each year where up to three (3) regions per vessel may be awarded and typically 10-15 vessels are chosen.

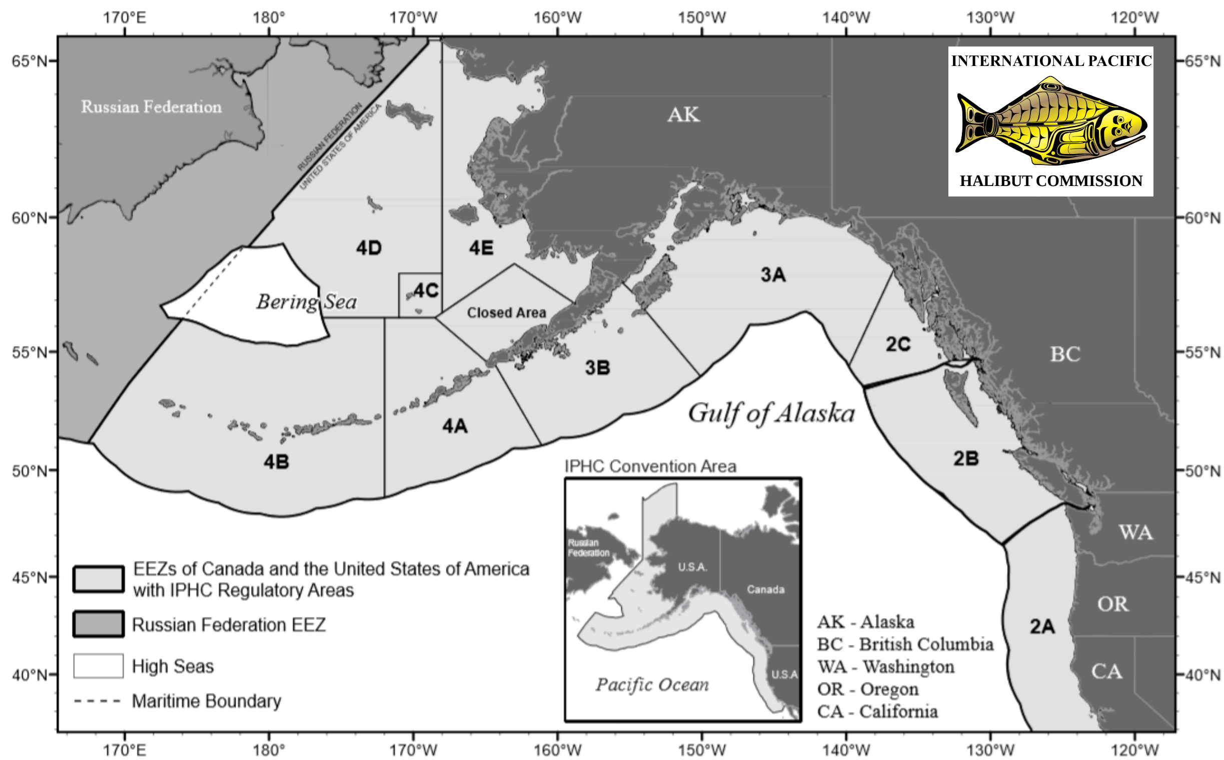

Figure 5. Map of the IPHC Convention Area (insert) and IPHC Regulatory Areas.

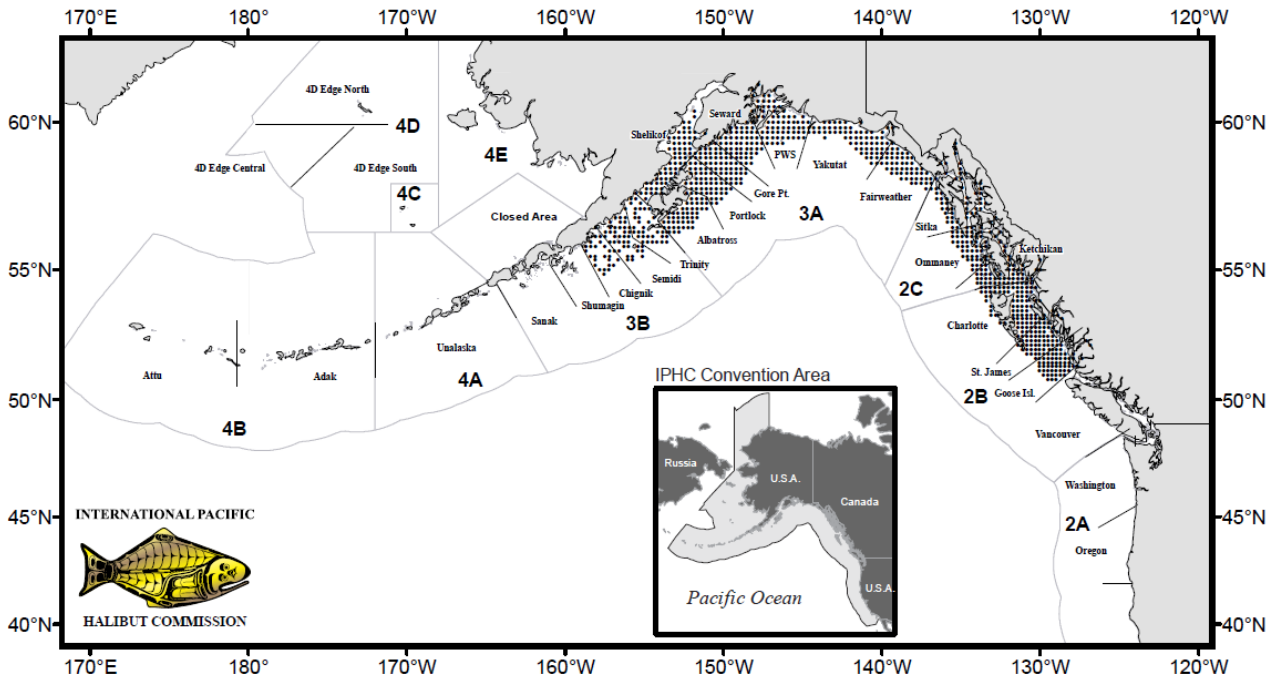

Figure 6. 2020 FISS station positions, charter region divisions, and IPHC Regulatory Areas.

Gear comparison

All stations in the St James charter region in IPHC Regulatory Area 2B were fished twice, once by the FISS standard of fixed-hook gear and once by snap gear. To accomplish this work, this charter region was divided into early and late stations by gear type. The stations for both gear types are shown in Figure 7 with the fixed-gear timing.

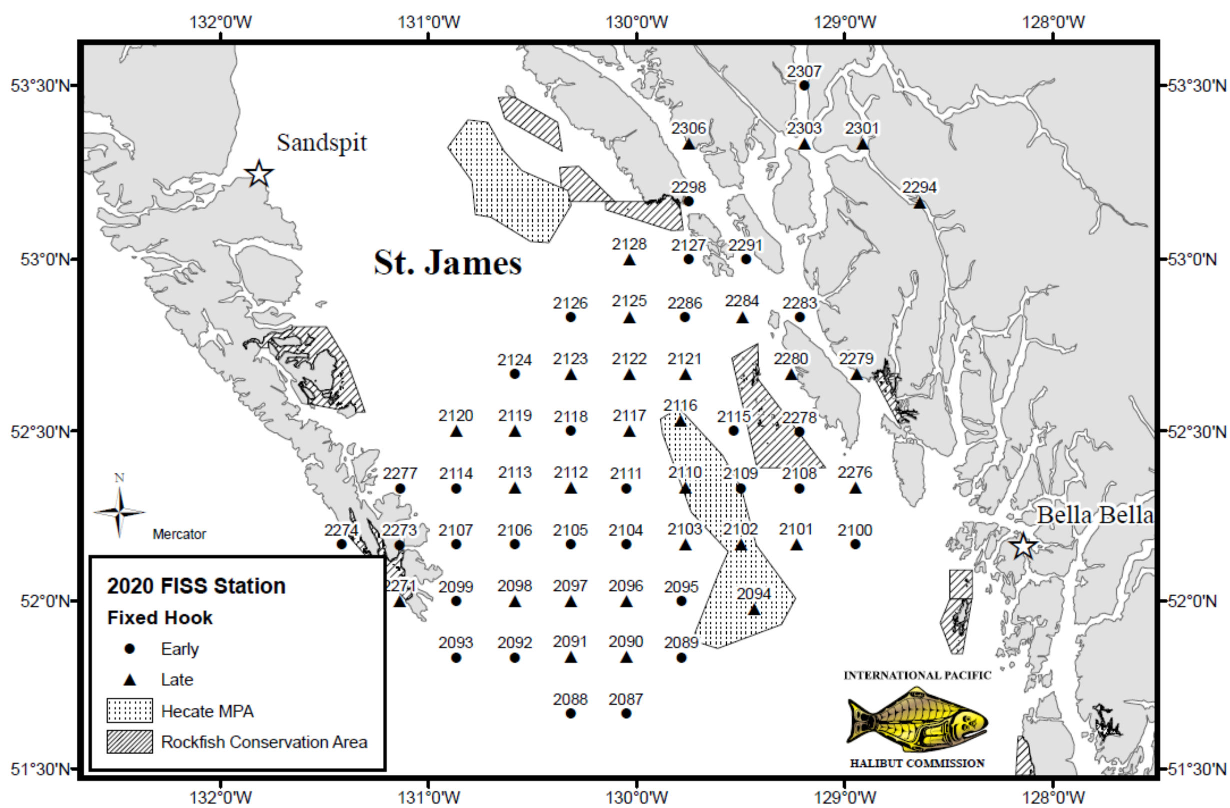

Figure 7. IPHC Regulatory Area 2B St James charter region fixed-hook gear timing.

Sampling protocols

IPHC Setline Survey Specialists collected data according to protocols established in the 2020 FISS Sampling Manual.

Bait purchase

The minimum quality requirement for FISS bait is No. 2 semi-bright (Alaska Seafood Marketing Institute grades A through E), headed and gutted, and individually quick-frozen chum salmon. The IPHC secures most of the bait needed to supply FISS operations at the end of the previous salmon season. In August 2019, staff began arranging bait purchases for the 2020 FISS. Approximately 122 tonnes of chum salmon were utilized from three suppliers in the United States of America. Bait usage is based on 0.17 kilograms per hook resulting in approximately 136 kilograms per eight skate station. Bait quality was monitored and documented throughout the season and found to meet the standard as described above.

RESULTS AND REVENUE

Interactive views of some of the FISS results are provided via the IPHC website and can be found here: https://www.iphc.int/data/setline-survey-catch-per-unit-effort.

As in previous years, legal-sized (O32) Pacific halibut that were caught on FISS stations and sacrificed in order to obtain biological data were retained and sold. In addition, beginning in 2020, sub-legal (U32) Pacific halibut that were caught and randomly selected for otolith sampling were also retained and sold. This helps to offset costs of the FISS. FISS vessels also retained for sale incidentally captured rockfish (*Sebastes spp*.) and Pacific cod (*Gadus macrocephalus*). These species were retained because they rarely survive the barotrauma resulting from capture. Most vessel contracts provided the vessel a lump sum payment, along with a 10% share of the Pacific halibut proceeds and a 50% share of the incidental catch proceeds.

The 2020 FISS chartered 11 commercial longline vessels (five Canadian and six USA) during a combined 62 trips and 558 charter days (Tables 1). Of the 898 FISS stations planned for the 2020 FISS season, excluding the 60 stations fished with snap gear, 872 (97%) were effectively completed. Five stations could not be fished. Twenty-one stations were deemed ineffective due to whale depredation (n=16), pinniped predation (n=1), gear soak time (n=1), shark depredation (n=1), and setting and gear issues (n=2). Otoliths were removed from 11,053 fish coastwide. Approximately 402 tonnes (887,000 pounds) of Pacific halibut, 11 tonnes (23,500 pounds) of Pacific cod, and 39 tonnes (85,600 pounds) of rockfish were landed from the FISS stations.

Table 1a. Effort and landing summary by FISS charter region and vessel for all 2020 stations and all Pacific halibut (sampled U32 and all O32).

IPHC Regulatory Area	Charter Region	Vessel	Vessel Number[1]	Charter Days[2]	Planned Stations	Effective Stations[3]	Pacific halibut Sold (t) [4]	Pacific halibut Sold (lb)[4]	Average Price USD/kg[5]	Average Price USD/lb[5]
2B	Charlotte	Bold Pursuit	20875	51	84	83	26	58,255	$12.60	$5.72
2B	Goose Is.	Bold Pursuit	20875	25	56	56	14	30,294	$13.44	$6.10
2B	St. James	Hanna Lio (Snap)	23162	39	60	58	26	56,979	$12.93	$5.87
2B	St. James	Vanisle	21912	38	60	58	23	51,114	$13.34	$6.05
2C	Ketchikan	Star Wars II	20492	31	48	45	17	37,781	$9.23	$4.19
2C	Ommaney	Star Wars II	20492	37	52	52	35	76,079	$9.88	$4.48
2C	Sitka	Pender Isle	27282	34	52	48	31	68,369	$12.29	$5.57
3A	Albatross	Kema Sue	41033	26	49	49	25	55,114	$9.13	$4.14
3A	Fairweather	Pender Isle	27282	26	51	50	21	45,534	$7.61	$3.45
3A	Gore Pt.	Allstar	55922	27	48	46	21	46,324	$9.36	$4.25
3A	Portlock	Devotion	42892	27	51	47	18	39,268	$8.79	$3.99
3A	PWS	Polaris	19266	33	67	67	33	72,700	$9.28	$4.21
3A	Seward	Saint Nicholas	45399	15	17	17	9	20,491	$9.68	$4.39
3A	Seward	Polaris	19266	16	35	33	21	46,386	$9.93	$4.51
3A	Shelikof	Kema Sue	41033	29	64	63	32	71,505	$10.20	$4.63
3A	Yakutat	Seymour	17530	32	64	59	33	73,482	$10.17	$4.61
3B	Chignik	Devotion	42892	19	26	25	3	6,230	$8.73	$3.96
3B	Semidi	Saint Nicholas	45399	28	39	39	7	15,169	$7.93	$3.60
3B	Trinity	Saint Nicholas	45399	25	35	35	7	15,529	$11.88	$5.39
Total		**11 Vessels**		**558**	**958**	**930**	**402**	**886,603**	**$10.49**	**$4.76**

[1] Canada: Vessel Registration Number and USA: ADF&G vessel number.
[2] Days are estimated - some vessels fished two charter regions in one day.
[3] Stations that did not meet setting parameters or deemed ineffective are excluded.
[4] Net weight (head-off, dressed, washed). May not sum to correct total due to rounding.
[5] Ex-vessel price.

Table 1b. Effort and landing summary by FISS charter region and vessel for all 2020 stations and O32 Pacific halibut.

IPHC Regulatory Area	Charter Region	Vessel	Vessel Number[1]	Charter Days[2]	Planned Stations	Effective Stations[3]	Pacific halibut Sold (t) [4]	Pacific halibut Sold (lb)[4]	Average Price USD/kg[5]	Average Price USD/lb[5]
2B	Charlotte	Bold Pursuit	20875	51	84	83	26	57,064	$12.62	$5.72
2B	Goose Is.	Bold Pursuit	20875	25	56	56	13	29,341	$13.43	$6.09
2B	St. James	Hanna Lio (Snap)	23162	39	60	58	26	56,809	$12.94	$5.87
2B	St. James	Vanisle	21912	38	60	58	23	50,630	$13.35	$6.05
2C	Ketchikan	Star Wars II	20492	31	48	45	17	37,193	$9.23	$4.19
2C	Ommaney	Star Wars II	20492	37	52	52	34	74,794	$9.90	$4.49
2C	Sitka	Pender Isle	27282	34	52	48	36	78,495	$10.67	$4.84
3A	Albatross	Kema Sue	41033	26	49	49	25	54,183	$9.14	$4.15
3A	Fairweather	Pender Isle	27282	26	51	50	16	35,117	$9.86	$4.47
3A	Gore Pt.	Allstar	55922	27	48	46	21	45,406	$9.39	$4.26
3A	Portlock	Devotion	42892	27	51	47	17	36,967	$8.92	$4.04
3A	PWS	Polaris	19266	33	67	67	33	72,128	$9.30	$4.22
3A	Seward	Saint Nicholas	45399	15	17	17	9	20,409	$9.68	$4.39
3A	Seward	Polaris	19266	16	35	33	21	46,060	$9.94	$4.51
3A	Shelikof	Kema Sue	41033	29	64	63	32	69,728	$10.25	$4.65
3A	Yakutat	Seymour	17530	32	64	59	33	73,482	$10.17	$4.61
3B	Chignik	Devotion	42892	19	26	25	2	4,419	$8.40	$3.81
3B	Semidi	Saint Nicholas	45399	28	39	39	5	10,216	$9.87	$4.48
3B	Trinity	Saint Nicholas	45399	25	35	35	8	18,335	$10.04	$4.56
Total		**11 Vessels**		**558**	**958**	**930**	**395**	**870,776**	**$10.51**	**$4.77**

[1] Canada: Vessel Registration Number and USA: ADF&G vessel number.
[2] Days are estimated - some vessels fished two charter regions in one day.
[3] Stations that did not meet setting parameters or deemed ineffective are excluded.
[4] Net weight (head-off, dressed, washed). May not sum to correct total due to rounding.
[5] Ex-vessel price.

Table 1c. Effort and landing summary by FISS charter region and vessel for all 2020 stations and sampled U32 Pacific halibut.

IPHC Regulatory Area	Charter Region	Vessel	Vessel Number[1]	Charter Days[2]	Planned Stations	Effective Stations[3]	Pacific halibut Sold (t) [4]	Pacific halibut Sold (lb)[4]	Average Price USD/kg[5]	Average Price USD/lb[5]
2B	Charlotte	Bold Pursuit	20875	51	84	83	1	1,191	$11.73	$5.32
2B	Goose Is.	Bold Pursuit	20875	25	56	56	0	953	$13.71	$6.22
2B	St. James	Hanna Lio (Snap)	23162	39	60	58	0	170	$11.80	$5.35
2B	St. James	Vanisle	21912	38	60	58	0	484	$12.65	$5.74
2C	Ketchikan	Star Wars II	20492	31	48	45	0	588	$9.27	$4.20
2C	Ommaney	Star Wars II	20492	37	52	52	1	1,285	$8.87	$4.02
2C	Sitka	Pender Isle	27282	34	52	48	0	268	$10.48	$4.75
3A	Albatross	Kema Sue	41033	26	49	49	0	931	$8.53	$3.87
3A	Fairweather	Pender Isle	27282	26	51	50	0	23	$9.48	$4.30
3A	Gore Pt.	Allstar	55922	27	48	46	0	918	$8.02	$3.64
3A	Portlock	Devotion	42892	27	51	47	1	1,865	$8.25	$3.74
3A	PWS	Polaris	19266	33	67	67	0	572	$7.03	$3.19
3A	Seward	Saint Nicholas	45399	15	17	17	0	82	$8.84	$4.01
3A	Seward	Polaris	19266	16	35	33	0	326	$8.82	$4.00
3A	Shelikof	Kema Sue	41033	29	64	63	1	1,777	$8.26	$3.75
3A	Yakutat	Seymour	17530	32	64	59	0	0	$ -	$ -
3B	Chignik	Devotion	42892	19	26	25	1	2,247	$7.68	$3.48
3B	Semidi	Saint Nicholas	45399	28	39	39	1	2,114	$9.19	$4.17
3B	Trinity	Saint Nicholas	45399	25	35	35	0	33	$9.70	$4.40
Total		**11 Vessels**		**558**	**958**	**930**	**7**	**15,827**	**$9.16**	**$4.16**

[1] Canada: Vessel Registration Number and USA: ADF&G vessel number.
[2] Days are estimated - some vessels fished two charter regions in one day.
[3] Stations that did not meet setting parameters or deemed ineffective are excluded.
[4] Net weight (head-off, dressed, washed). May not sum to correct total due to rounding.
[5] Ex-vessel price.

Vessels chartered by the IPHC delivered fish to 12 different ports (Tables 2). Fish sales were awarded based on obtaining a fair market price. When awarding sales, the Commission considered the price offered. The number of years that a buyer had been buying and marketing Pacific halibut, how fish were graded at the dock (including the determination of No. 2 and chalky Pacific halibut), and the promptness of settlements following deliveries were also selection criteria. Individual sales were evaluated after each event to ensure that the buyer was meeting IPHC standards. Average prices decreased from $12.31/kg in 2019 to $10.49/kg in 2020 (Tables 3). This represents a 14.8% drop in price, which is lower than the 25% drop predicted due to COVID-19 constraints.

Table 2a. FISS Pacific halibut landings by port for all Pacific halibut (sampled U32 and all O32), 2020[1,2].

Offload Port	Trips	Tonnes	Pounds	Total USD	Average Price (USD/kg)	Average Price (USD/lb)
Cordova	1	10	21911	$92,217	$9.28	$4.21
Craig	1	9	20,810	$97,053	$10.28	$4.66
Homer	7	36	79,270	$374,549	$10.42	$4.72
Juneau	2	17	37,606	$176,910	$10.37	$4.70
Ketchikan	5	24	52,557	$226,552	$9.50	$4.31
Kodiak	11	75	164,756	$681,845	$9.12	$4.14
Petersburg	2	18	40,493	$175,615	$9.56	$4.34
Port Hardy	12	63	139,377	$834,260	$13.20	$5.99
Prince Rupert	5	39	85,894	$480,254	$12.33	$5.59
Sand Point	1	2	4,590	$15,989	$7.68	$3.48
Seward	8	60	132,938	$579,382	$9.61	$4.36
Sitka	2	16	36,045	$157,815	$9.65	$4.38
Yakutat	5	32	70,356	$325,337	$10.19	$4.62
Grand Total	**62**	**402**	**886,603**	**$4,217,777**	**$10.49**	**$4.76**

[1] Net weight (head-off, dressed, washed).
[2] Prices based on net weight.

Table 2b. FISS Pacific halibut landings by port for O32 Pacific halibut, 2020[1,2].

Offload Port	Trips	Tonnes	Pounds	Total USD	Average Price (USD/kg)	Average Price (USD/lb)
Cordova	1	10	21595	$91,406.68	$9.33	$4.23
Craig	1	9	20430	$95,381.10	$10.29	$4.67
Homer	7	35	77519	$367,810.84	$10.46	$4.74
Juneau	2	17	37606	$176,909.61	$10.37	$4.70
Ketchikan	5	23	51587	$222,399.03	$9.50	$4.31
Kodiak	11	72	159742	$663,100.68	$9.15	$4.15
Petersburg	2	18	39970	$173,798.60	$9.59	$4.35
Port Hardy	12	62	137770	$824,644.49	$13.20	$5.99
Prince Rupert	5	38	84435	$472,645.24	$12.34	$5.60
Sand Point	1	1	2954	$10,426.25	$7.78	$3.53
Seward	8	59	130790	$570,417.13	$9.62	$4.36
Sitka	2	16	36045	$157,814.51	$9.65	$4.38
Yakutat	5	32	70333	$325,238.05	$10.19	$4.62
Grand Total	**62**	**395**	**870,776**	**$4,151,992**	**$10.51**	**$4.77**

[1] Net weight (head-off, dressed, washed).
[2] Prices based on net weight.

Table 2c. FISS Pacific halibut landings by port for sampled U32 Pacific halibut, 2020[1,2].

Offload Port	Trips	Tonnes	Pounds	Total USD	Average Price (USD/kg)	Average Price (USD/lb)
Cordova	1	<1	316	$810.00	$5.65	$2.56
Craig	1	<1	380	$1,672.00	$9.70	$4.40
Homer	7	1	1751	$6,738.54	$8.48	$3.85
Juneau	2	0	0	$ -	$ -	$ -
Ketchikan	5	<1	970	$4,153.20	$9.44	$4.28
Kodiak	11	2	5014	$18,744.77	$8.24	$3.74
Petersburg	2	<1	523	$1,816.50	$7.66	$3.47
Port Hardy	12	1	1607	$9,615.09	$13.19	$5.98
Prince Rupert	5	1	1459	$7,609.08	$11.50	$5.22
Sand Point	1	1	1636	$5,562.40	$7.50	$3.40
Seward	8	1	2148	$8,964.80	$9.20	$4.17
Sitka	2	0	0	$ -	$ -	$ -
Yakutat	5	<1	23	$98.90	$9.48	$4.30
Grand Total	**62**	**7**	**15,827**	**$65,785.28**	**$9.16**	**$4.16**

[1] Net weight (head-off, dressed, washed).
[2] Prices based on net weight.

Table 3a. FISS landings (total pounds and price) of all Pacific halibut (sampled U32 and all O32) by IPHC Regulatory Area in 2020[1].

IPHC Regulatory Area	2B	2C	3A	3B	Combined
Tonnes	89	83	214	17	402
Pounds	196,642	182,229	470,804	36,928	886,603
Price USD/kg	$13.02	$10.07	$9.66	$9.62	$10.49
Price USD/lb	$5.90	$4.57	$4.38	$4.36	$4.76

[1] Net weight (head-off, dressed, washed)

Table 3b. FISS landings (total pounds and price) of O32 Pacific halibut by IPHC Regulatory Area in 2020[1].

IPHC Regulatory Area	2B	2C	3A	3B	Combined
Tonnes	88	82	211	15	395
Pounds	193,844	180,088	464,182	32,662	870,776
Price USD/kg	$13.02	$10.08	$9.68	$9.77	$10.51
Price USD/lb	$5.91	$4.57	$4.39	$4.43	$4.77

[1] Net weight (head-off, dressed, washed)

Table 3c. FISS landings (total pounds and price) of sampled U32 Pacific halibut by IPHC Regulatory Area in 2020[1].

IPHC Regulatory Area	2B	2C	3A	3B	Combined
Tonnes	1	1	3	2	7
Pounds	2,798	2,141	6,622	4,266	15,827
Price USD/kg	$12.57	$9.18	$8.19	$8.43	$9.16
Price USD/lb	$5.70	$4.16	$3.72	$3.82	$4.16

[1] Net weight (head-off, dressed, washed)

FISS timing

Each year, the months of June, July, and August are targeted for FISS fishing. In 2020, this activity took place from 27 June through 9 September. On a coastwide basis, FISS vessel activity was highest in intensity at the beginning of the FISS season and declined early in August as boats finished their charter regions (Figure 8). All FISS activity was completed by early-September.

		Week 22	Week 23	Week 24	Week 25	Week 26	Week 27	Week 28	Week 29	Week 30	Week 31	Week 32	Week 33	Week 34	Week 35	Week 36	Week 37	Week 38	Week 39	Week 40	Week 41
2B	2020					1%	11%	12%	10%	10%	10%	11%	10%	4%	7%	10%	5%				
	2019	8%	8%	8%	2%	4%	8%	18%	11%	8%	11%	9%	5%								
	2018	7%	9%	10%	10%	10%	12%	10%	4%	10%	8%	9%	1%								
	2017	10%	10%	7%	8%	5%	15%	18%	17%	10%											
	2016				5%	9%	7%	9%	15%	20%	15%	11%	11%								
	2015	11%	11%	8%	9%	9%	4%	2%	11%	12%	9%	9%	7%								
	2014	14%	6%	11%	8%	11%		12%	6%	11%	11%	11%									
2C	2020						14%	11%	7%	9%	6%	7%	18%	14%	8%	5%					
	2019	0%	13%	17%	9%	7%	4%		5%	14%	14%	9%	6%	2%							
	2018				1%	10%	18%	13%	13%	8%	8%	7%	8%	9%	4%						
	2017	15%	15%	10%	15%	13%					7%	9%	15%	2%							
	2016		15%	14%	9%	13%	15%	10%	11%	1%	7%	5%									
	2015	15%	5%			19%	12%	13%	17%	20%											
	2014	15%			5%	7%	27%	24%	22%												
3A	2020					0%	13%	11%	12%	16%	12%	11%	7%	5%	4%	5%	3%				
	2019	7%	18%	17%	13%	10%	7%	3%	3%	3%	1%	2%		0%	1%	7%	7%	1%			
	2018	15%	15%	12%	10%	7%	8%	2%	8%	5%	6%	5%	4%	2%	2%						
	2017	14%	9%	11%	11%	9%	10%	9%	8%	6%		3%	3%	2%	3%						
	2016		11%	10%	11%	11%	5%	6%	8%	14%	9%	8%	4%	2%							
	2015	12%	18%	19%	16%	10%	6%	5%	2%	4%	4%	4%									
	2014	4%	12%	11%	7%	10%	7%	6%	7%	8%	7%	7%	5%	4%	4%	1%					
3B	2020						14%	21%	19%	16%	3%	12%	12%	3%							
	2019	5%	5%	10%	9%	3%	4%	7%		6%	4%	6%	12%	12%	9%	6%	2%				
	2018	15%	16%	6%	15%	7%		5%	6%	10%	7%	5%	2%	5%							
	2017	5%	19%	22%	23%	12%	13%	6%													
	2016		1%	26%	19%	18%	18%	9%	7%	2%											
	2015		5%	9%	10%	16%	14%	6%	8%	6%	13%	6%	6%								
	2014	3%	10%	15%	12%	5%	9%	7%	16%	13%	10%										

Select Year Range
2014 to 2020

Percent of a Regulatory Area's stations fished during the week
0% – 32%

Figure 8. Percent of the total FISS stations completed by IPHC Regulatory Area during each week of the year (2014-2020). Week 22 begins in late May or early June depending on the year.

Results of space-time modelling in 2020

Revisions to the data inputs for space-time modelling of survey data included the use of a smoother curve for calibrating NMFS trawl survey data with IPHC FISS data in the Bering Sea, and the inclusion of snap-gear data in IPHC Regulatory Area 2B modelling. The former was a result of recommendations from reviewers of Webster et al. (2020), in which we presented methods for space-time modelling of Bering Sea survey data.

Figures 9 and 10 show time series estimates of O32 WPUE (most comparable to fishery catch-rates) and all sizes NPUE over the 1993-2020 period included in the 2020 space-time modelling. Overall there was an estimated increase of 6% in the coastwide O32 WPUE index, due largely to a 16% increase in Region 3, offset by a 7% decrease in Region 2 (Figure 9). Coastwide all sizes NPUE was stable, with just a 1% estimated decrease (Figure 10). Estimated 1993-20 time series by IPHC Regulatory Area are in Appendix A.

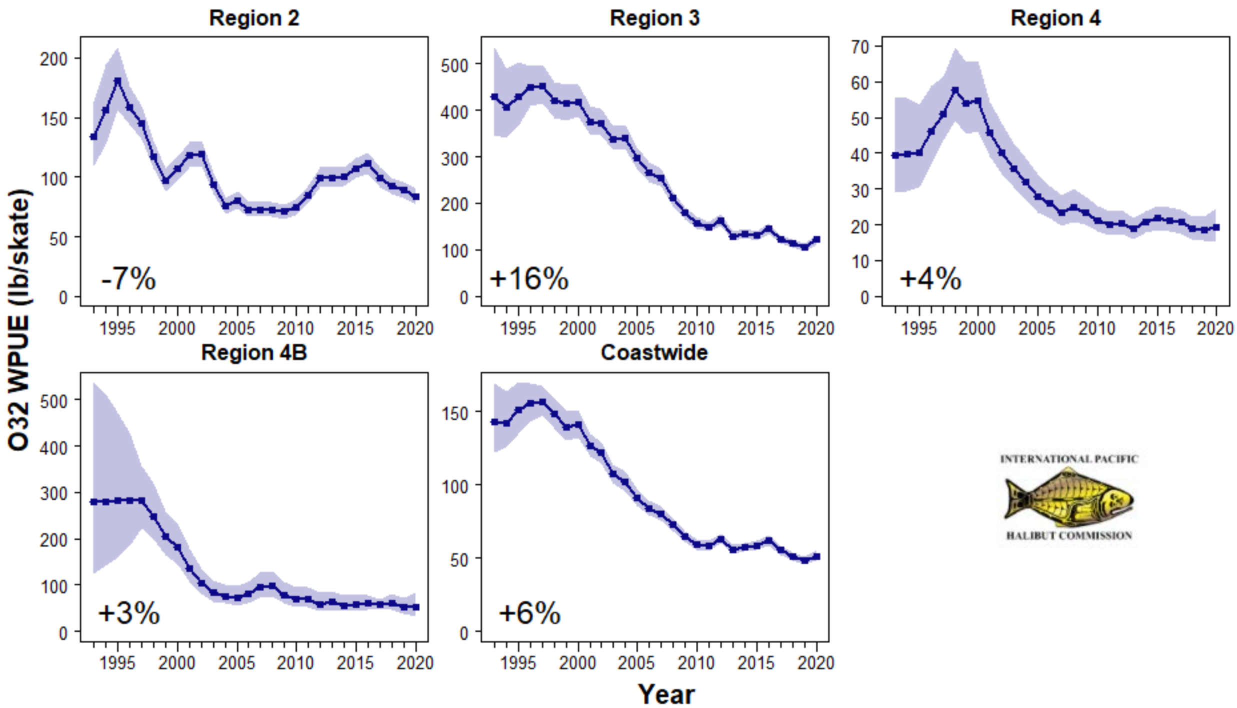

Figure 9. Space-time model output for O32 WPUE for 1993-2020 for Biological Regions. Filled circles denote the posterior means of O32 WPUE for each year. Shaded regions show posterior 95% credible intervals, which provide a measure of uncertainty: the wider the shaded interval, the greater the uncertainty in the estimate. Numeric values in the lower left-hand corners are estimates of the change in mean O32 WPUE from 2019 to 2020.

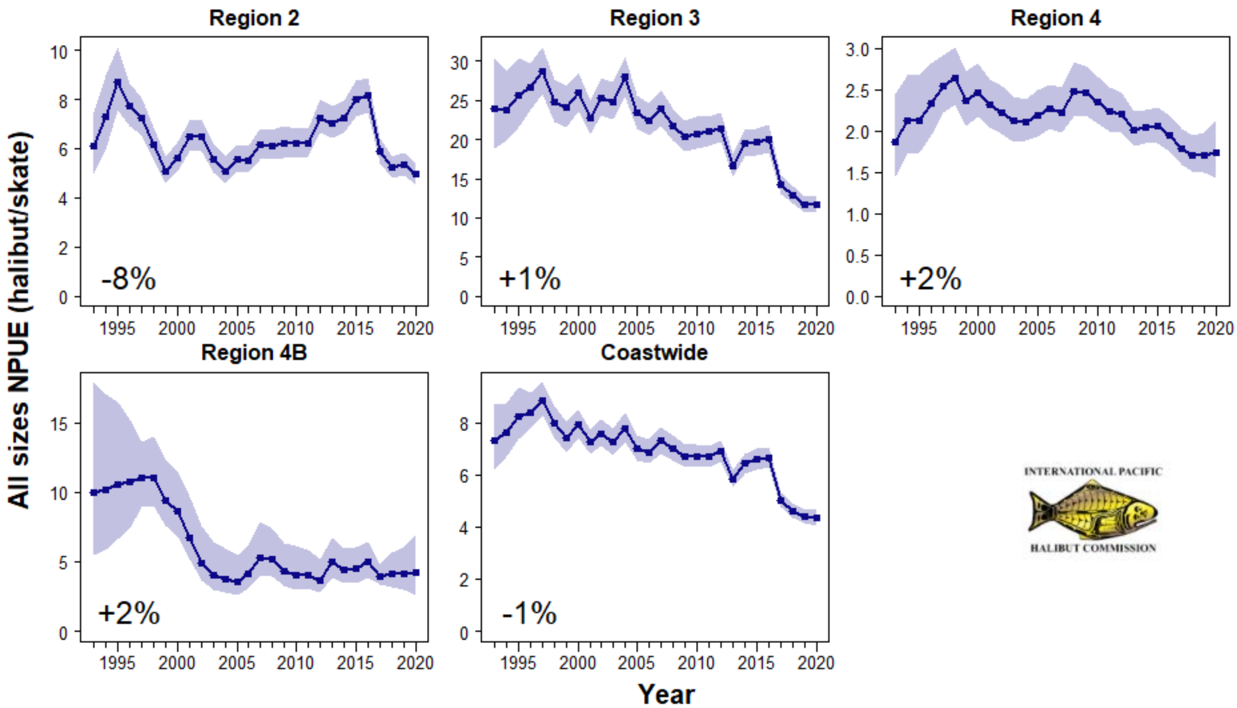

Figure 10. Space-time model output for all sizes NPUE for 1993-2020 for Biological Regions. Filled circles denote the posterior means of all sizes NPUE for each year. Shaded regions show posterior 95% credible intervals, which provide a measure of uncertainty: the wider the shaded interval, the greater the uncertainty in the estimate. Numeric values in the lower left-hand corners are estimates of the change in mean all sizes NPUE from 2019 to 2020.

In Regulatory Area 2B, data from both fixed and snap gears were used in the modelling. Parameters allowing for different catch rates of the two gears were included in the models, and estimates of WPUE and NPUE series were based on model predictions assuming fixed gear to ensure consistency with other Regulatory Areas. Parameter estimates of gear type differences all implied that snap gear catch rates were lower on average (Table 4), with estimated catch rate ratios of 0.72 to 0.83 for the three indices modelled in 2020 (i.e., we estimate snap gear had 72% to 83% of the catch of fixed gear, depending on the index). Posterior 95% credible intervals were all wide, and included the value 1, i.e., no difference in catch rate, meaning that no clear conclusions regarding the relative effectiveness of the two gear types can be drawn from this project on its own. However, the results are generally consistent with those of the much larger gear comparison study in 2019, which estimated a ratio of 0.86 for all three indices. Additional modelling will be used to combine the data from both studies and from future studies to be conducted elsewhere, which will lead to more precise overall estimates of the ratio of catch rates across all IPHC Regulatory Areas.

Table 4. Posterior estimates of the ratio of snap to fixed gear catch rates for O32 and all sizes WPUE, and all sizes NPUE, from space-time modelling of data from the St James charter region in Regulatory Area 2B in 2020.

Variable	**Ratio of snap to fixed catch rate**	
	Posterior mean	**95% credible interval**
O32 WPUE	0.83	0.63 – 1.10
All sizes WPUE	0.79	0.60 – 1.03
All sizes NPUE	0.72	0.60 – 1.17

RECOMMENDATION/S

That the Commission **NOTE** paper IPHC-2020-IM096-06 Rev_1 which provided an overview of the IPHC's FISS design and implementation in 2020 and results of the space-time modelling of Pacific halibut survey data for 1993-2020.

APPENDIX A

Space-time modelling results by IPHC Regulatory Area

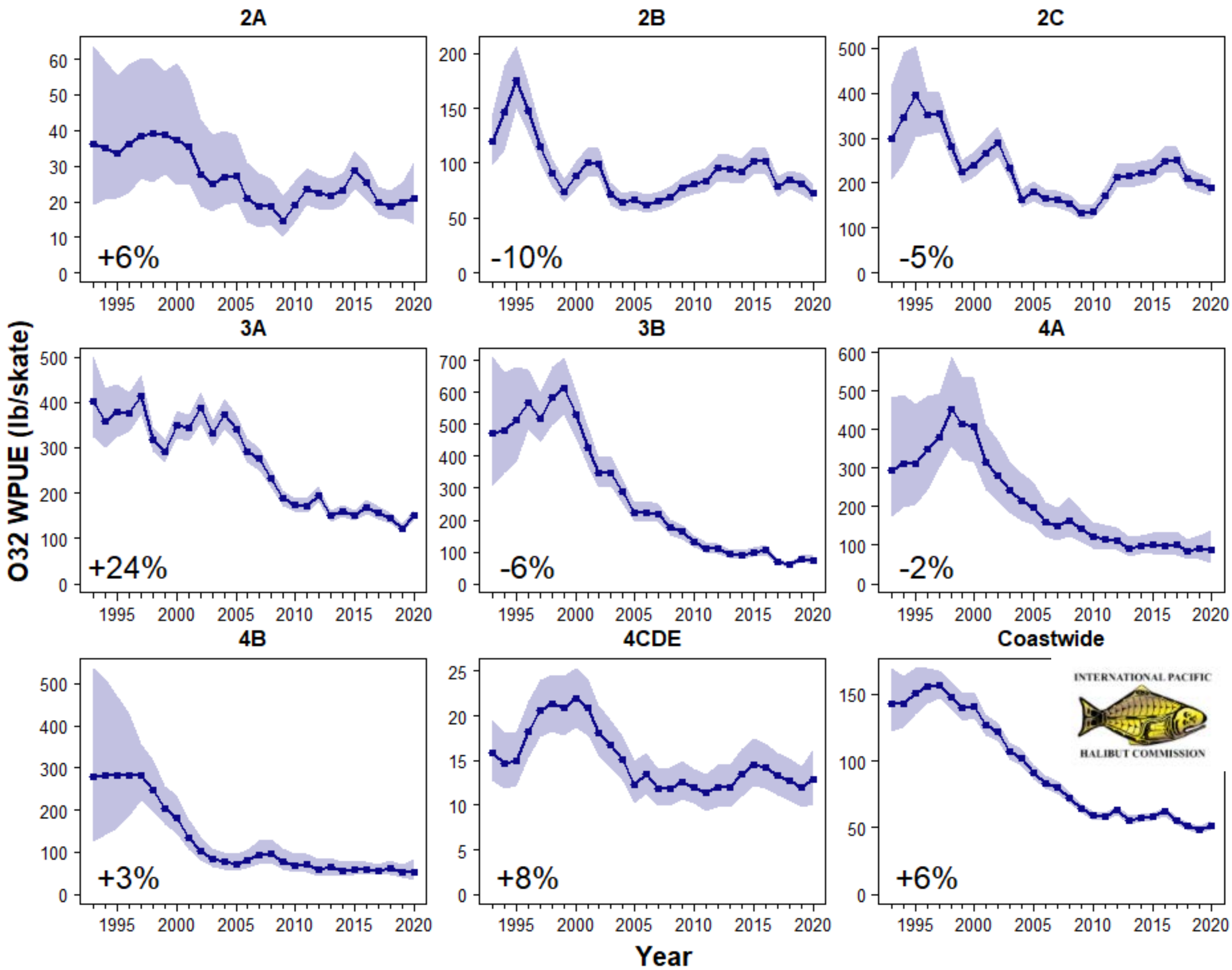

Figure A.1. Space-time model output for O32 WPUE for 1993-2020. Filled circles denote the posterior means of O32 WPUE for each year. Shaded regions show posterior 95% credible intervals, which provide a measure of uncertainty: the wider the shaded interval, the greater the uncertainty in the estimate. Numeric values in the lower left-hand corners are estimates of the change in mean O32 WPUE from 2019 to 2020.

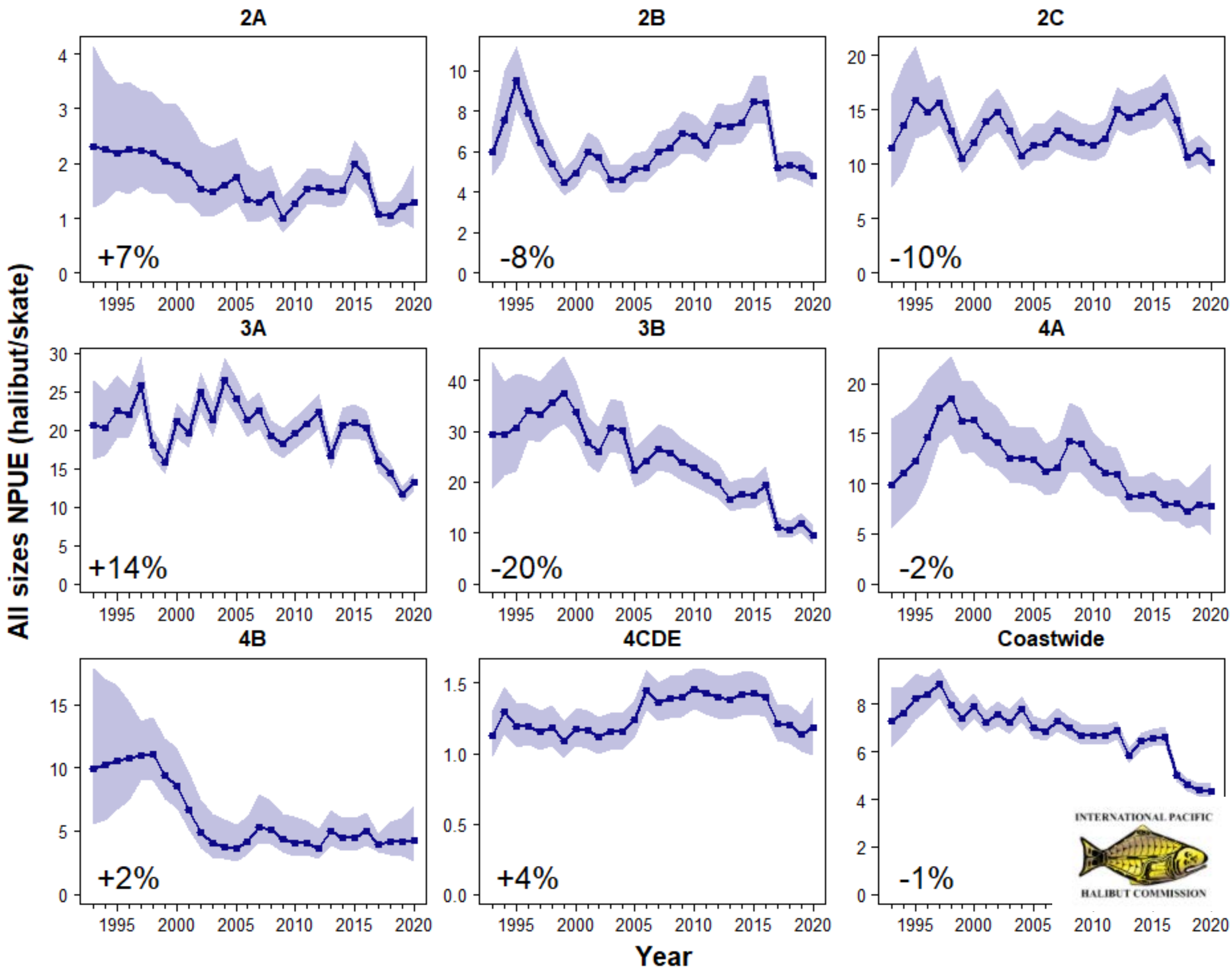

Figure A.2. Space-time model output for all sizes NPUE for 1993-2020. Filled circles denote the posterior means of all sizes NPUE for each year. Shaded regions show posterior 95% credible intervals, which provide a measure of uncertainty: the wider the shaded interval, the greater the uncertainty in the estimate. Numeric values in the lower left-hand corners are estimates of the change in mean total NPUE from 2019 to 2020.

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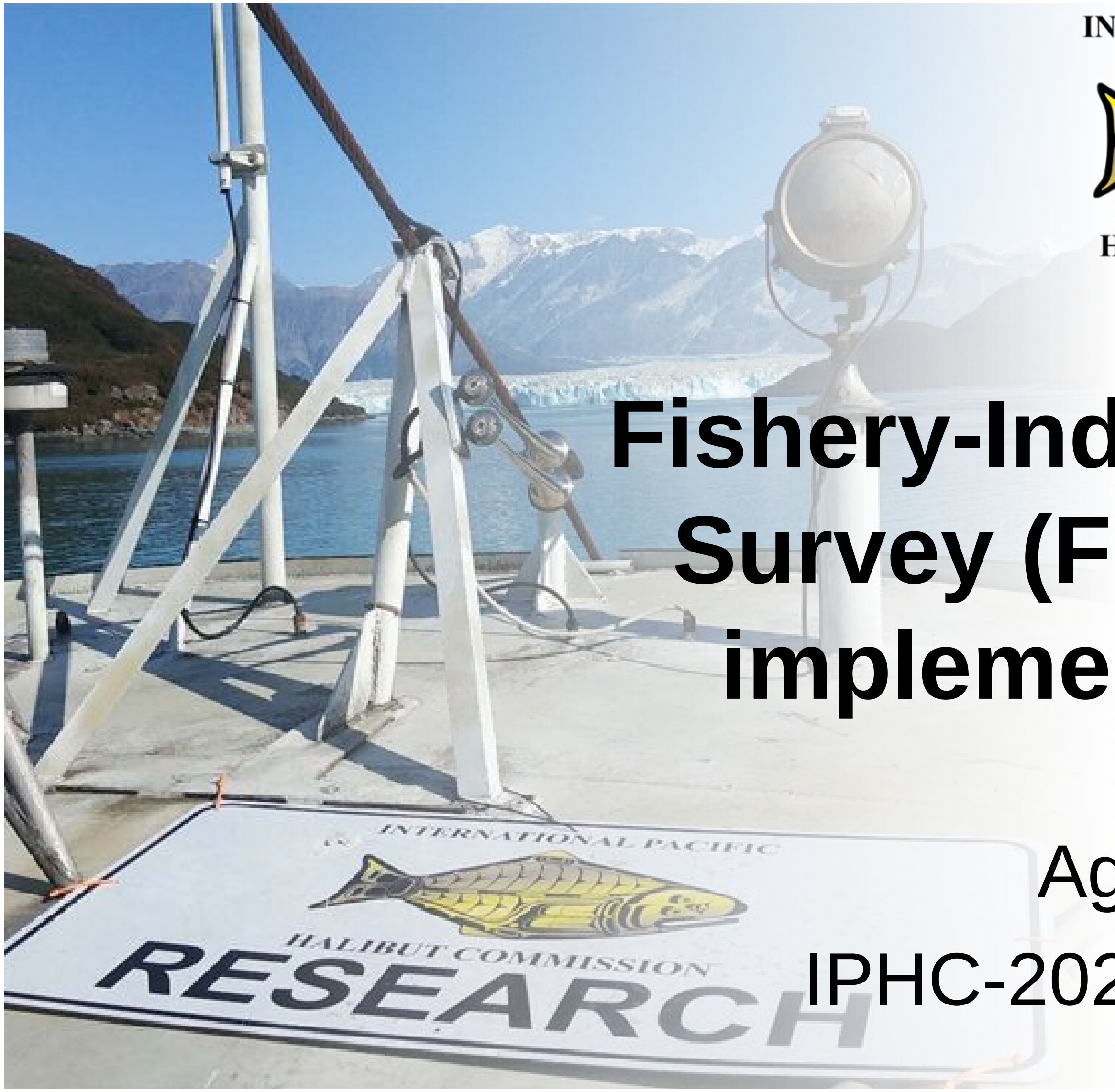


Fishery-Independent Setline Survey (FISS) design and implementation in 2020

Agenda item 6

IPHC-2020-IM096-06 Rev_1

Objective - Primary

Standardised, fishery-independent data collection for the Pacific halibut stock assessment and stock distribution estimation

- Pacific halibut distribution and abundance trends – CPUE
- Collection of biological structures (determining sex, maturity, and age)
- Data from U32 Pacific halibut

Coastwide weights at-sea

- Weights taken at-sea along with lengths on all vessels

Standardisation

Gear

- Fixed gear

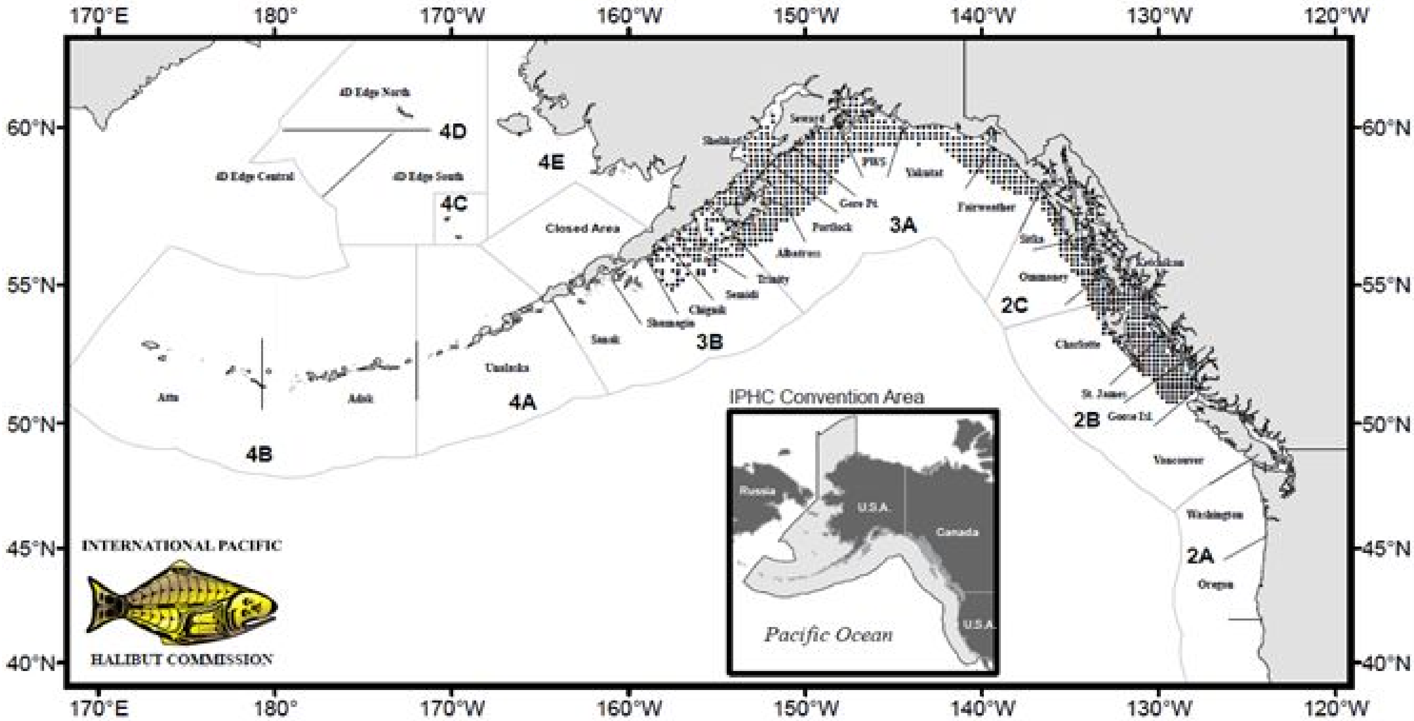
Each skate

- 548.64 metres (1800 feet) with 100 hooks spaced 5.49 metres (18 feet) apart
- No.3 (16/0) circle hooks threaded through the front on 61 to 122 centimetre (24 to 48 inch) gangions
- 3 to 5 kilogram (7-10 pound) weights on each non-anchored skate end

Bait

- Frozen chum salmon
- Number 2 semi-bright or better
- Cut 1/10 to 1/6 kilogram (1/4 to 1/3 pound)
- Captains sign off on bait quality

2020 Fishery-Independent Setline Survey (FISS)



26 June – 09 Sept (26 May to 22 Sept in 2019)

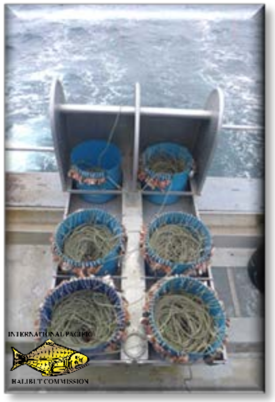
11 vessels (18 in 2019)

951 stations (record 1,531 in 2019)

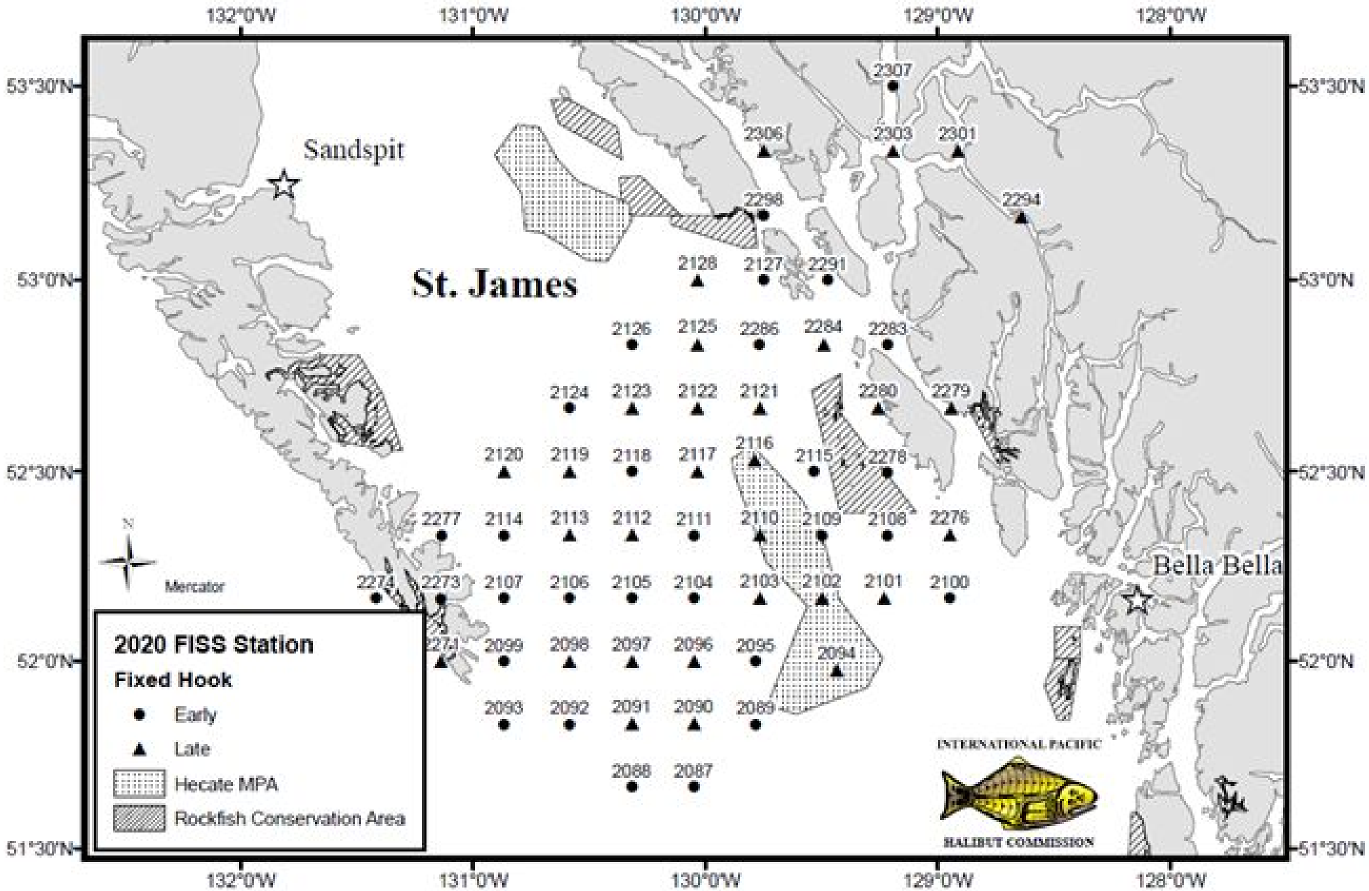
St. James Charter Region (IPHC Regulatory Area 2B) gear comparison

2020 FISS gear comparison - fixed and snap

- IPHC Regulatory Area 2B (St. James charter region)
- Each station fished twice in random order
  - once with fixed-gear
  - once with snap-gear
- More vessels and more comparable

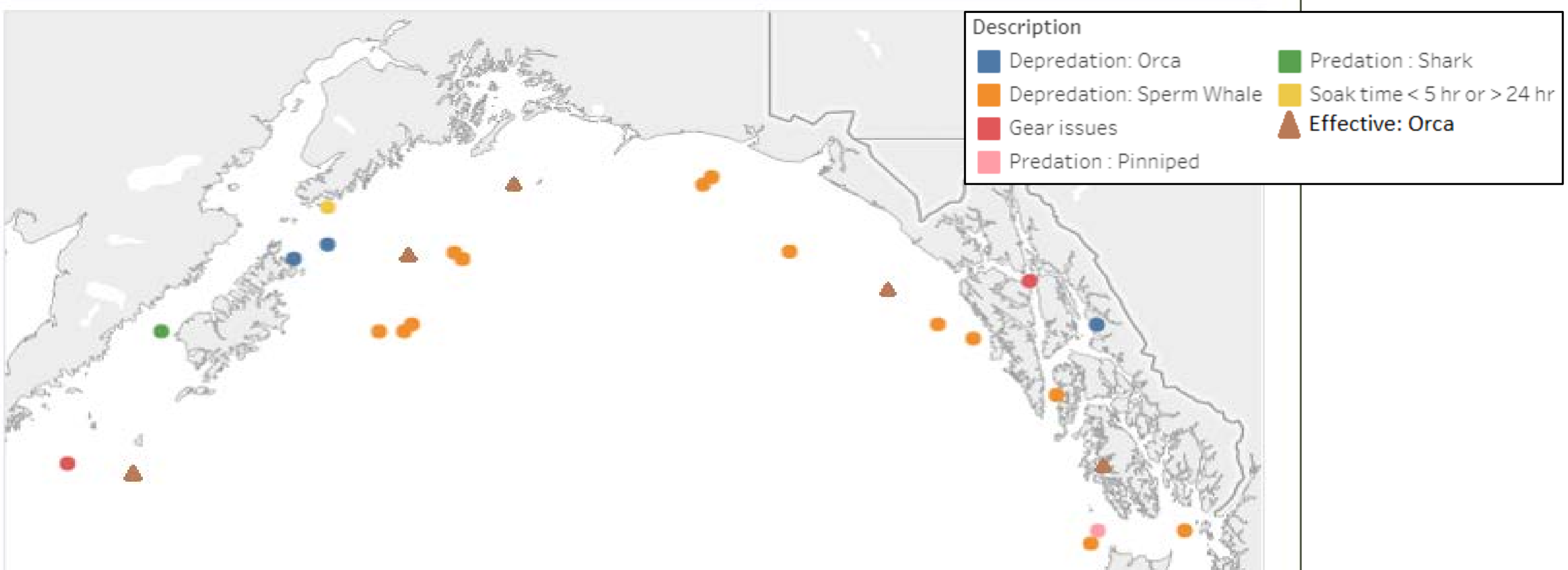


2020 FISS gear comparison



- St. James charter region
- Timing for Fixed gear

Ineffective stations and sightings in 2020



Description	2B	2C	3A	3B	Total
Depredation: Pinniped		1			1
Depredation: Shark			1		1
Depredation: Whale					
Sperm Whale			9	4	13
Orca		1	2		3
Effective Orca	1	1	3	1	6
Gear Issues		1		1	2
Soak Time > 24 hrs			1		1

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Objective - Secondary

- Long-term revenue neutrality
  - Improved fish sale process
    - RFT for each sale
    - Rated against specified criteria
      - Price
    - Established controls for review and approval for each sale
    - Buyers invoiced
  - Charter Agreements
    - RFTs
    - All submissions rated against specified criteria
      - Price

Objective - Secondary

- Sale of sampled U32 Pacific halibut
- Price slightly less

Tertiary objectives

Collaboration

- None conducted in 2020.
- Collaborative agreements in discussion for 2021.

2020 – FISS results

- Explore the website for;
  - *FISS Catch-Per-Unit-Effort (CPUE) data maps and plots*
  - *FISS Performance*
  - *FISS Biologicals*
  - *Data set downloads*

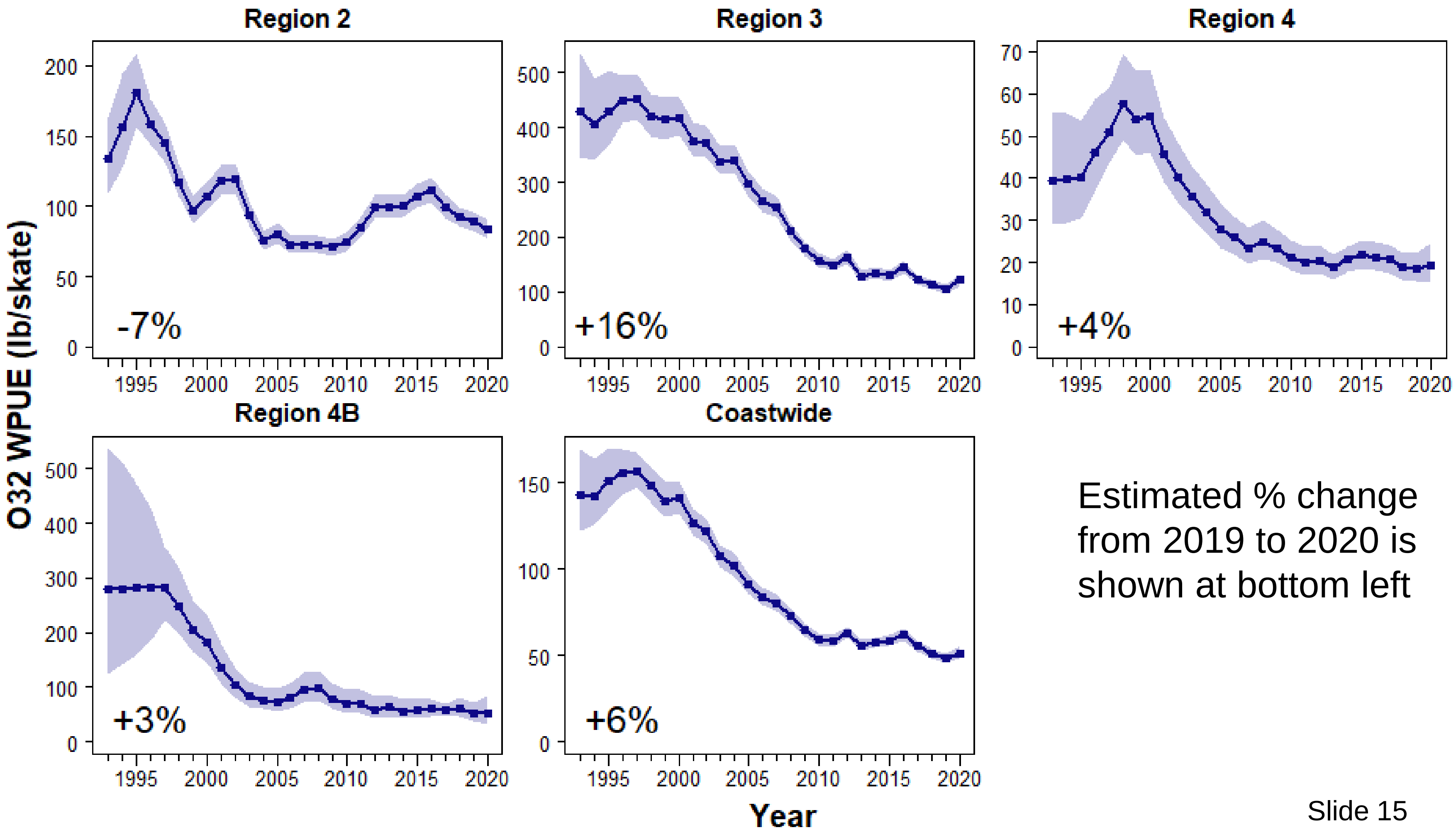
2021 – request for tender process

- Tender specifications
  - Simplified
    - Clear expectations – communication needs
    - Base costs – communications rolled in
  - Online in December.
- Due by 31 January 2021

Space-time model estimates of WPUE and NPUE

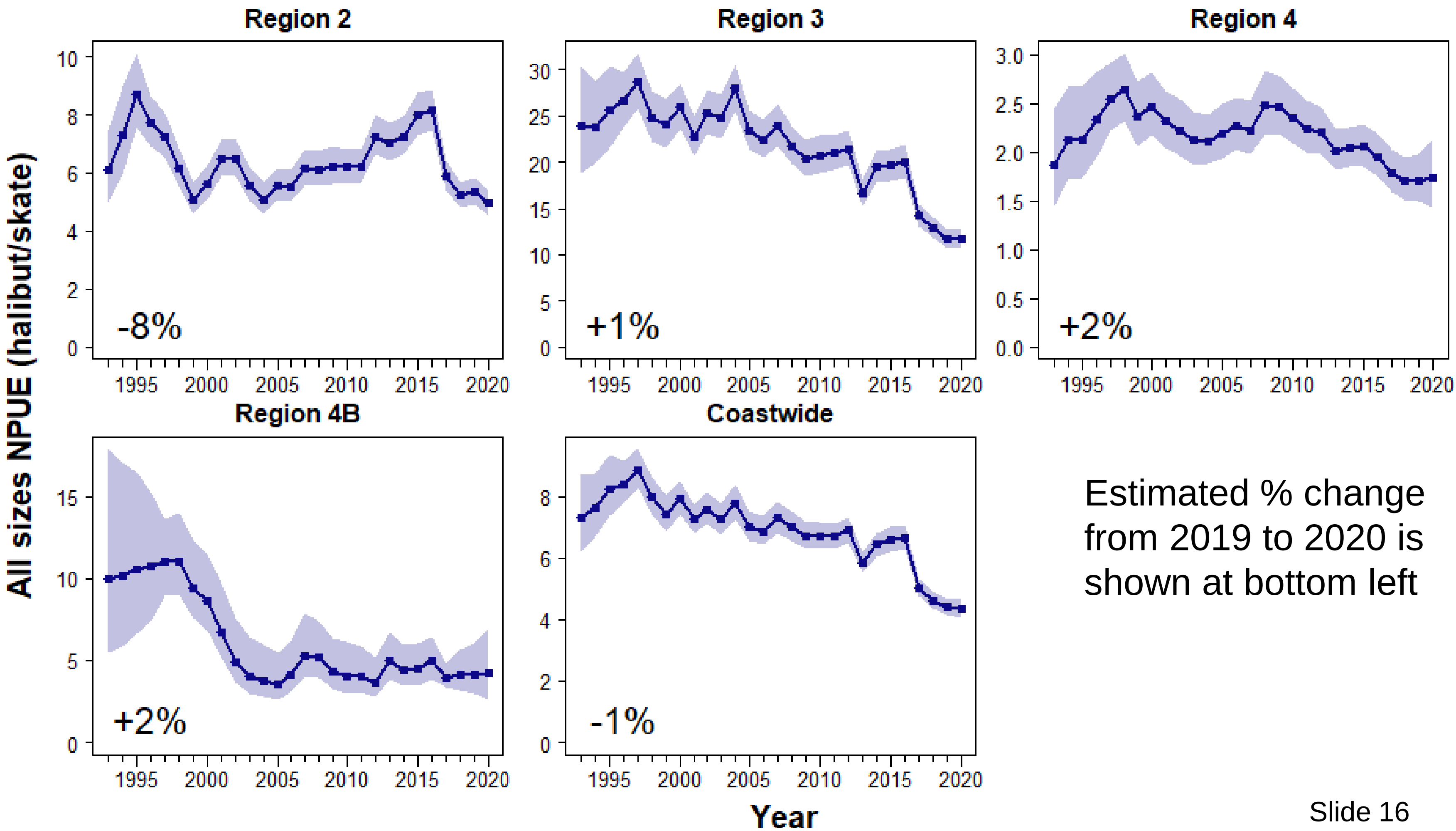
- As in 2016-19, space-time modelling was used to estimate O32 and all sizes WPUE and all sizes NPUE indices from 1993 onwards
- Estimates computed for:
  - Biological Regions
  - IPHC Regulatory Areas
  - Coastwide IPHC Convention waters, from San Francisco Bay to Bering Strait

O32 WPUE by biological region



Estimated % change from 2019 to 2020 is shown at bottom left

All sizes NPUE by biological region



Estimated % change from 2019 to 2020 is shown at bottom left

Gear comparison study in IPHC Regulatory Area 2B

- Space-time modelling included parameters allowing for gear differences in catch rates
- Results were generally consistent with the 2019 study in IPHC Regulatory Area 2C
  - Average WPUE and NPUE lower on snap gear (72-83% of fixed gear average; 86% in 2019)
  - Greater uncertainty in this smaller study: all 95% intervals included 100%, i.e. no gear difference in catch rate
- Further studies are being planned to collect additional data
  - to better understand the relative efficiency of the gears
  - to understand potential variability over time and space
- Future modelling will combine data across multiple Regulatory Areas

INTERNATIONAL PACIFIC

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INTERNATIONAL PACIFIC HALIBUT COMMISSION

Review: Rationalisation of the FISS following the 2014-19 expansion series

PREPARED BY: IPHC SECRETARIAT (R. WEBSTER; 16 OCTOBER 2020)

PURPOSE

To provide background on, and reviews the methods for the IPHC's Fishery-Independent Setline Survey (FISS) rationalisation following the 2014-19 expansion series, and proposes FISS designs for 2021-23 for endorsement.

BACKGROUND

The IPHC's Fishery-Independent Setline Survey (FISS) provides data used to compute indices of Pacific halibut density for use in monitoring stock trends, estimating stock distribution, and as an important input in the stock assessment. Stock distribution estimates are based on the annual mean weight-per-unit effort (WPUE) for each IPHC Regulatory Area, computed as the average of WPUE of all Pacific halibut and for O32 (greater than or equal to 32" or 81.3cm in length) Pacific halibut caught at each station in an area. Mean numbers-per-unit-effort (NPUE) is used to index the trend in Pacific halibut density for use in the stock assessment models.

FISS history 1993-2010

The IPHC has undertaken FISS activity since the 1960s. However, methods were not standardized to a degree (e.g. the bait and gear used) that allows for simple combined analyses until 1993. From 1993 to 1997, the annual design was a modification of a design developed and implemented in the 1960s, and involved fishing triangular clusters of stations, with clusters located on a grid (IPHC 2012). Coverage was limited in most years, and was generally restricted to IPHC Regulatory Areas 2B through 3B. The modern FISS design, based on a grid with 10 nmi (18.5 km) spacing, was introduced in 1998, and over the subsequent two years was expanded to include annual coverage in all IPHC Regulatory Areas within the depth ranges of 20-275 fathoms (37-503 m) in the Gulf of Alaska and Aleutian Islands, and 75-275 fathoms (137-503 m) in the Bering Sea (IPHC 2012). Annually-fished stations were added around islands in the Bering Sea in 2006, and in the same year, a less dense grid of paired stations was fished in shallower waters of the southeastern Bering Sea, providing data for a calibration with data from the annual National Marine Fishery Service (NMFS) trawl survey (Webster et al. 2020).

FISS expansions 2011-19

Examination of commercial logbook data and information from other sources, it became clear by 2010 that the FISS design had gaps in coverage of Pacific halibut habitat that had the potential to lead to bias in estimates derived from its data. These gaps included deep and shallow waters outside the FISS depth range (0-20 fathoms and 275-400 fathoms), and unsurveyed regions within the 20-275 fathom depth range within each IPHC Regulatory Area. The latter included the following notable gaps in coverage:

- Regulatory Area 2A: Salish Sea and northern California
- Regulatory Area 2B: Salish Sea, coastal inlets and fjords, shallow waters east of Haida Gwaii
- Regulatory Area 3A: Cook Inlet, gaps inside and outside Prince William Sound

- Regulatory Area 3B: the waters around the Sanak and Shumagin Islands
- Regulatory Area 4A: western Aleutian region, waters shallower than 75 fathoms on Bering Sea shelf edge
- Regulatory Area 4B: eastern Aleutian region, Bowers Ridge and other waters in central region
- Regulatory Area 4CDE: northern Bering Sea shelf edge

This led the IPHC Secretariat to propose expanding the FISS to provide coverage within the unsurveyed habitat with United States and Canadian waters. In 2011 a pilot expansion was undertaken in IPHC Regulatory Area 2A, with stations on the 10 nmi grid added to deep (275-400 fathoms) and shallow (10-20 fathoms) waters, the Salish Sea, and other, smaller gaps in coverage. (The 10 fathom limit in shallow waters was due to logistical difficulties in fishing longline gear in shallower waters.) A second expansion in IPHC Regulatory Area 2A was completed in 2013, with a pilot California survey between latitudes of 40-42°N.

The full expansion program began in 2014 and continued through 2019, with the goal of sampling the entire FISS design of 1,890 stations in the shortest time logistically possible. Each year included FISS expansions in one or two IPHC Regulatory Areas:

– 2014: IPHC Regulatory Areas 2A and 4A
– 2015: IPHC Regulatory Area 4CDE eastern Bering Sea flats
– 2016: IPHC Regulatory Area 4CDE shelf edge
– 2017: IPHC Regulatory Areas 2A and 4B
– 2018: IPHC Regulatory Areas 2B and 2C
– 2019: IPHC Regulatory Areas 3A and 3B

The FISS expansion program has allowed us to build a consistent and complete picture of Pacific halibut density throughout its range in Convention waters. Sampling the full FISS design has reduced bias as noted above, and, in conjunction with space-time modelling of survey data (see below), has improved precision. This has also allowed the Commission to, for the first time, fully quantify the uncertainty associated with estimates based on partial sampling of the species range. It has also provided us with a complete set of observations over the full FISS design (Figure 1) from which an optimal subset of stations can be selected when devising annual FISS designs. Note that in the Bering Sea, the full FISS design does not provide complete spatial coverage, and FISS data are augmented with calibrated data from National Marine Fisheries Service (NMFS) and Alaska Department of Fish and Game (ADFG) trawl surveys (stations can vary by year – 2019 designs are shown in Figure 1).

Space-time modelling

In 2016, a space-time modelling approach was introduced to estimate time series of weight and numbers-per-unit-effort (WPUE and NPUE), and to estimate the stock distribution of Pacific halibut among IPHC Regulatory Areas. This represented an improvement over the largely empirical approach used previously, as it made use of additional information within the survey data regarding the degree of spatial and temporal of Pacific halibut density, along with information from covariates such as depth (see Webster 2016, 2017). It also allowed a more complete of accounting of uncertainty, for example, prior to the use of space-time modelling, uncertainty due to unsurveyed regions in each year was ignored in the estimation. The IPHC's Scientific Review Board (SRB) has provided supportive reviews of the space-time modelling approach (e.g. IPHC-2018-SRB013-R), and the methods were recently published in a peer-review journal (Webster et al. 2020).

FISS design objectives

The primary purpose of the annual FISS is to sample Pacific halibut to provide data for the stock assessment and estimates of stock distribution for use in the development of an IPHC management procedure. The priority of a rationalised FISS is therefore to maintain or enhance data quality (precision and bias) by establishing baseline sampling requirements in terms of station count, station distribution and skates per station. Potential considerations that could add to or modify the design are logistics and cost (secondary design layer), and FISS removals (impact on the stock), data collection assistance for other agencies, and IPHC policies (tertiary design layer). These priorities are outlined in Table 1.

Table 1. Prioritization of FISS objectives and corresponding design layers.

Priority	**Objective**	**Design Layer**
Primary	Sample Pacific halibut for stock assessment and stock distribution estimation	Minimum sampling requirements in terms of: • Station distribution • Station count • Skates per station
Secondary	Long term revenue neutrality	Logistics and cost: operational feasibility and cost/revenue neutrality
Tertiary	Minimize removals, and assist others where feasible on a cost-recovery basis.	Removals: minimize impact on the stock while meeting primary priority Assist: assist others to collect data on a cost-recovery basis IPHC policies: ad-hoc decisions of the Commission regarding the FISS design

Review process

At the 96th Session of the IPHC Annual Meeting (AM096) in February 2020, alternative designs were presented to IPHC Commissioners that had been evaluated based on scientific criteria (IPHC-2020-AM096-07), in particular, meeting specific precision targets (coefficients of variation, CVs, below 15%) for WPUE and NPUE indices, and ensuring low probability of large bias in estimators of those indices. These evaluation methods had been previously reviewed by the SRB at SRB014 (IPHC-2019-SRB014-05 Rev_1) with application to IPHC Regulatory Areas 4B and (in presentation) 2A, and introduced to Commissioners at IM095 (IPHC-2019-IM095-07 Rev_1). While development of the proposed designs focused on the Primary Objective of the FISS (Table 1), logistics and cost (Secondary Objective) were also considered in developing proposals based on annual sampling of subareas of each IPHC Regulatory Area on a rotating basis. The final design adopted by the IPHC at AM096 (IPHC-2020-AM096-R) combined the proposed subarea design in IPHC Regulatory Areas 2A, 4A and 4B, an enhanced randomized design in the core of the stock (IPHC Regulatory Areas 2B, 2C, 3A and 3B, with sample sizes in excess of those required to meet precision targets), and sampling all standard FISS stations in IPHC Regulatory Area 4CDE (Figure 1).

Following the completion of the coastwide FISS expansion efforts, 2019/2020 was the first year fully rationalised designs could be proposed. It is expected that the design proposal and review process going forward will be as follows:

- The Secretariat present design proposals to SRB for three subsequent years at the June meeting;
- First review of design proposals by Commissioners will occur at the September work meeting, revised if necessary based on June SRB input;
- Presentation of proposed designs at the November Interim Meeting;
- Designs presented and potentially modified at the January/February Annual Meeting given Commissioner direction;
- Adopted AM design for current year modified for cost and logistical reasons prior to summer implementation in FISS (February-April).

Consultation with industry and stakeholders occurs throughout the FISS planning process, and particularly in finalizing design details as part of the FISS charter bid process, when stations can be added to provide for improved logistical efficiency. We also note the opportunities for stakeholder input during public meetings (Interim and Annual Meetings) and through the IPHC's Research Advisory Board.

PROPOSED DESIGNS FOR 2021-23

Due to budgetary constraints and the impact of COVID-19, neither the proposed nor adopted AM096 designs described below were implemented in 2020. Instead, a design with sampling only within the core areas was undertaken for the 2020 FISS (IPHC-2020-CR-013; Figure 2). Because of this, our proposal for 2021-23 is to shift the 2020-22 Secretariat-preferred compromise proposal presented at AM096 (see below) to instead be implemented in 2021-23 (Figures 3-5). This design uses efficient subarea sampling in IPHC Regulatory Areas 2A, 4A and 4B, but incorporates a randomized design in IPHC Regulatory Areas 2B, 2C, 3A and 3B (except for the near-zero catch rate inside waters around Vancouver Island), with a sampling rate chosen to keep the sample size close to 1,000 stations in an average year. Outside the core areas, the subarea design allows for logistically efficient sampling, and therefore accounts for the Secondary Objective discussed above (Table 1). It is likely that this design represents the maximum effort that can be deployed outside the core areas in coming years, while still meeting the Secondary Objective. These designs were reviewed by the SRB at SRB016 (IPHC-2020-SRB016-R), and SRB017 (IPHC-2020-SRB017-R). In the report of the latter meeting, the SRB stated the following:

> *"The SRB RECOMMENDED that the Commission endorse the final 2021 FISS design as proposed by IPHC Secretariat, and provided at Appendix IVa."; and*
>
> *"The SRB provisionally ENDORSED the 2022 and 2023 FISS design proposals provided at Appendix IVb and IVc, recognizing that these will be reviewed again at subsequent SRB meetings."*

FISS DESIGN EVALUATION

Precision targets

Prior to 2019, the IPHC Secretariat had an informal goal of maintaining a coefficient of variation (CV) of no more than 15% for mean WPUE for each IPHC Regulatory Area. Including all expansion data to date, this goal was achieved in all areas beginning in 2011, the year of the first pilot expansion (Table 2), except Regulatory Area 4B in 2011-14 and 2019 for O32 WPUE and 2011-12 and 2019 for all sizes WPUE, and Regulatory Area 4A in 2016-19 (O32 and all sizes WPUE).

In order to maintain the quality of the estimates used for the assessment, and for estimating stock distribution, we proposed that FISS designs should meet target CVs below 15% for O32 and all sizes WPUE for all IPHC Regulatory Areas. We also established precision targets of IPHC Biological Regions and a coastwide target (IPHC-2020-AM096-07), but achievement of the Regulatory Area targets is expected to ensure that targets for the larger units will also be met.

Table 2. Range of coefficients of variation for O32 and all sizes WPUE from 2011-19 by Regulatory Area.

Reg Area	O32 WPUE (2011-19)				All sizes WPUE (2011-19)			
	Lowest CV (%)	Year	Highest CV (%)	Year	Lowest CV (%)	Year	Highest CV (%)	Year
2A	10	2014*	13	2019	10	2014*	13	2019
2B	5	2018*	7	2019	5	2018*	7	2012
2C	5	2018*	6	2012	5	2018*	6	2011
3A	4	2017	5	2011	5	2019	5	2011
3B	7	2019*	8	2015	9	2018	10	2015
4A	12	2014*	18	2019	10	2014*	19	2019
4B	10	2017*	16	2012	10	2017*	16	2012
4CDE	10	2017#	11	2013	5	2015*	6	2019

* Year of FISS expansion in Reg. Area. # Year of NMFS trawl expansion in Reg. Area 4CDE.

Reducing the potential for bias

With these targets set, we can proceed to using the space-time modelling to evaluate different FISS designs by IPHC Regulatory Area and Biological Region. However, if stations are not selected randomly, sampling a subset of the full data frame in any area or region brings with it the potential for bias, due to trends in the unsurveyed portion of a management unit (Regulatory Area or Region) potentially differing from those in the surveyed portion. To reduce the potential for bias, we also looked at how frequently part of an area or region (called a "subarea" here; see Appendix A) should be surveyed in order to reduce the likelihood of appreciable bias. For this, we proposed a threshold of a 10% absolute change in biomass percentage: how quickly can a subarea's percent of the biomass of a Regulatory Area or Region's change by at least 10%? By sampling each subarea frequently enough to reduce the chance of its percentage changing by more than 10% between successive surveys of the subarea, we minimize the potential for appreciable bias in the Regulatory Area or Region's indices as a whole.

To illustrate the process applied to each IPHC Regulatory Area, an example of IPHC Regulatory Area 4B, first presented at SRB014, is detailed in Appendix B.

Analytical methods

We examined the effect of subsampling a management unit on precision as follows:

- Where a randomized design is not used, identify logistically feasible subareas within each management unit and select priorities for future sampling;
- Generate simulated data for all FISS stations based on the output from the most recent space-time modelling;
- Fit space-time models to the observed data series augmented with 1 to 3 additional years of simulated data, where the design over those three years reflects the sampling priorities identified above.

Extending the modelling beyond three years was not considered worthwhile, as we expect further evaluation undertaken following collection of data during the one to three-year time period to substantially influence design choices for subsequent years. In this manner, projected designs can be evaluated and then efficiently updated to reflect observed data as they become available.

Ideally, a full simulation study with many replicate data sets would be used, but this is impractical for the computationally time-consuming spatio-temporal modelling. Instead, "simulated" sample data sets for the future years will be taken from the 2000 posterior samples from the most recent year's modelling. Each year's simulated data will have to be added and modelled sequentially, as subsequent data can improve the precision of prior years' estimates, meaning the terminal year is often the least precise (given a consistent design). If time allows, the process can be repeated with several simulated data sets to ensure consistency in results, although with large enough sample sizes (number of stations) in each year, we would expect even a single fit to be sufficiently informative for design development.

SAMPLING DESIGN OPTIONS

The historical sampling, combined with FISS expansions from 2014-2019, established a full sampling design of 1890 stations from California to the Bering Sea shelf edge on a 10 nmi grid from depths of 10 – 400 ftm (Figure 1). Future annual FISS designs will comprise a selection of stations from this frame. Sample design options include the following:

- Full sampling of the 1890 station design (Figure 1).
- Completely randomized sampling of stations within each IPHC Regulatory Area (example in Figure 6).
- Randomized cluster sampling (example in Figure 7), in which clusters of stations are selected that comprise (where possible) 3-4 stations to make an operationally efficient fishing day.
- Subarea sampling, in which IPHC Regulatory Areas are divided into non-overlapping subareas (see Appendix A), and all stations within a selection of these are sampled to allow for more efficient vessel activity on each sampling trip.

The latter two options above are examples that meet primary (statistical) sampling objectives, but also include a consideration of logistics and cost. For designs such as those in Figures 6 and 7, the randomization ensures that resulting estimates (e.g. WPUE, NPUE indices) are unbiased. Designs based on sampling subareas require an evaluation of the potential for bias, as discussed above.

From a scientific perspective, more information is always better; however, sampling the full grid (Figure 1) is unnecessary as the precision target for the index can be maintained with substantial subsampling. While a fully randomized subsampling design (or a randomized cluster subsampling design) with sufficient sample size will still meet scientific needs, in several IPHC Regulatory Areas where Pacific halibut are concentrated in a subset of the available habitat, such a design can be inefficient. For this reason, we considered the subarea design, in which effort is focused in most years on habitat with highest density (which generally contributes most to the overall variance), while sampling other habitat with sufficient frequency to maintain low bias.

‘Core’ areas vs ends of the stock distribution

In considering potential FISS designs, it is helpful to make a distinction between the ‘core’ IPHC Regulatory Areas 2B, 2B, 3A and 3B, and the areas at the southern and northern ends of the stock’s North America range, IPHC Regulatory Areas 2A, 4A, 4B and 4CDE. The former has generally high density throughout, while the latter have relatively high density limited to distinct subareas within each IPHC Regulatory Area. In other words, Pacific halibut distribution tends to become more heterogeneous (‘patchy’) toward the ends of the species range in the IPHC Convention Area. These areas are also much more logistically challenging to sample and generally produce lower catch rates. For these end areas, a fully randomised design would be inefficient, both logistically and statistically, as it would require effort where little is needed for estimation with low variance, while the frequently narrow bathymetric habitat area would result in a sparse randomised design with high vessel running time between selected stations. Provided the sampling rate is sufficient, a randomised design is generally more practical in the core areas, and it also avoids concerns about bias that could arise from a subarea design that omits subareas with relatively high density.

2020-22 Design Proposals and Evaluation

For AM096, the IPHC Secretariat put forward two alternative design proposals, one based on a subarea design in all IPHC Regulatory Areas, and the other on a randomised design in the four core areas, and a subarea design elsewhere (IPHC-2020-AM096-07). The full design and randomised cluster design were also presented, but received little discussion during the meeting.

IPHC Regulatory Area 4CDE was given special attention by staff, with each proposal including sampling of the full 10 nmi grid along the Regulatory Area 4CDE shelf edge in 2020-22 (last fished in 2016). While it may be possible to reduce FISS sampling and still meet precision/bias targets, we noted that ecosystem conditions have been anomalous in the Bering Sea for several years, making the Pacific halibut distribution more difficult to predict in unsurveyed habitat. Indeed, recent NMFS trawl surveys in the northern Bering Sea have shown a generally increasing trend in that region, but over the last three years, deeper waters in the north covered by the FISS grid have been unsampled. The IPHC is interested in better understanding density trends and possible links with Pacific halibut in Russian waters in the Bering Sea, and the data obtained from sampling the full FISS grid would help greatly in achieving these goals. The need to sample these stations in 2021-22 was to have been re-evaluated following the results of the 2020 FISS.

Subarea design

Each of the IPHC Regulatory Areas at the ends of the stock was divided into 3-4 subareas for future sampling, based on a combination of recent Pacific halibut density and geography (Appendix A). Prior to developing a final proposal, several options for each of these IPHC Regulatory Areas were evaluated to help plan which subareas could be sampled in each year while maintaining CVs within targets (Appendix A). For the core areas, rotating sampling of IPHC

FISS charter regions was considered to allow for less than 100% sampling effort while still maintaining a logistically efficient design.

The proposed subarea designs for 2020-22 are shown in Figures 8-10.

Compromise design

The proposed compromise design featured random sampling of stations within each of the core areas, and the subarea design elsewhere. The sampling rate in the core areas was chosen to produce an annual sampling design with approximately 1000 stations, representing a modest reduction of recent years' sample sizes and while still meeting precision targets.

The proposed compromise designs for 2020-22 are shown in Figures 11-13.

All designs were evaluated to ensure that they were projected to meet precision targets for 2020-22, using simulated data to augment the observed time series as described above. Subarea designs in IPHC Regulatory Areas 2A, and 4B were evaluated prior to IM094 based on space-time modelling output from 2018, while evaluation of designs in other IPHC Regulatory Areas was completed prior to AM096. Table 3 shows projected CVs for the proposed compromise design based on fitting models to the FISS data augmented with simulated data for 2020-22. No evaluation was undertaken for IPHC Regulatory Area 4CDE as the full design was proposed in all years.

Table 3. Projected CVs for 2020-22 for the compromise design. Target CV is 15% in all IPHC Regulatory Areas.

	Projected CV (%)		
Regulatory Area	**2020**	**2021**	**2022**
2A	13.0	13.0	14.2
2B	6.2	6.0	6.4
2C	6.4	6.3	6.7
3A	4.8	4.9	5.1
3B	8.2	8.2	8.5
4A	9.6	9.3	9.7
4B	8.7	8.7	14.2

CONSIDERATION OF COST

Both the subarea and compromise design incorporate some consideration of cost by using a logistically efficient design in at least some IPHC Regulatory Areas. The purpose of factoring in cost was to provide a statistically efficient and logistically feasible design for consideration by the Commission. During the Interim and Annual Meetings and subsequent discussions, cost, logistics and tertiary considerations (Table 1) are also factored in developing the final design for implementation in the current year. In particular, the FISS is funded by sales of captured fish and is intended to have long-term revenue neutrality, meaning that any design must also be evaluated in terms of the following factors:

- Expected catch of Pacific halibut;
- Expected Pacific halibut sale price;
- Charter vessel costs, including relative costs per skate and per station;
- Bait costs;
- IPHC Secretariat administrative costs.

Balancing these factors may result in modifications to the design such as increasing sampling effort in high-density regions and decreasing effort in low density regions. At present, with stocks near historic lows and extremely low prices for fish sales, the current funding model may require that some low-density habitat be omitted from the design entirely (as occurred in 2020). This will have implications for data quality (see below), particularly if such reductions in effort relative to proposed designs continue over multiple years.

IMPLICATIONS OF 2020 FISS ON ESTIMATION IN SUBSEQUENT YEARS

The reduced FISS in 2020 has some implications for data quality, not only in the current year, but in subsequent years. IPHC Regulatory Areas 2A, 4A, 4B and 4CDE will have no FISS sampling in 2020, and WPUE and NPUE indices estimated from the space-time modelling is unlikely to meet precision targets. Information for 2020 for these areas comes only from covariate relationships in the space-time model and from prior years' data through the modelled temporal correlation. Not only will the estimates for 2020 be imprecise relative to prior years, but the lack of data on stock trends from 2019 to 2020 means that there is the potential for bias in the estimates. The impact of the reduced FISS design will propagate into subsequent years' estimates. For example, the 2021 estimates will be less precise than they would have been if data had been collected in 2020. However, if the proposed 2021 design is implemented, we expect this to bring the FISS back on track to meet data quality targets in coming years. The high sampling effort in 2020 in IPHC Regulatory Areas 2B, 2C and 3A means that estimates from these areas should meet data quality targets this year. The reduced sampling in IPHC Regulatory Area 3B should be sufficient for precision targets to be met, given that CVs have been well within the 15% target in recent years in this area. There is a chance for some modest bias with the more variable western portion of IPHC Regulatory Area 3B being unsampled, but with some information on stock trend from the eastern region, this is of less concern than the bias potential in areas with no 2020 sampling.

RECOMMENDATION

That the Commission:

1) **NOTE** paper IPHC-2020-IM096-07 that provides background on, and reviews the methods for the IPHC's Fishery-Independent Setline Survey (FISS) rationalisation following the 2014-19 expansion series, and proposes FISS designs for 2021-23 for endorsement.
2) **ENDORSE** the final 2021 FISS design as proposed by the IPHC Secretariat, as recommended by the SRB, and provided at Figure 3.

3) provisionally **ENDORSE** the 2022 and 2023 FISS design proposals provided at Figures 4 and 5 respectively, recognizing that these will be reviewed again in 2021 and 2022 at the SRB, IM and AM meetings.

REFERENCES

IPHC 2020. Report of the 16th Session of the IPHC Scientific Review Board (SRB) IPHC-2020-SRB016-R. 19 p.

IPHC 2020. Report of the 17th Session of the IPHC Scientific Review Board (SRB) IPHC-2020-SRB017-R. 21 p.

IPHC 2020. Report of the 96th Session of the IPHC Annual Meeting (AM096) IPHC-2020-AM096-R. 51 p.

IPHC 2020. IPHC Circular 2020-013: Intersessional Decision (22-29 May 2020). 2 p.

IPHC 2012. (Soderlund E, Randolph D, and Dykstra C) IPHC setline charters 1963 through 2003 IPHC-2012-TR058. 264p.

Webster RA 2016. Space-time modelling of setline survey data using INLA. Int. Pac. Halibut Comm. Report of Assessment and Research Activities 2015: 552-568.

Webster RA 2017. Results of space-time modelling of survey WPUE and NPUE data. Int. Pac. Halibut Comm. Report of Assessment and Research Activities 2016: 241-257.

Webster R 2019a. Methods for spatial survey modelling – Program of work for 2019. IPHC-2020-SRB014-05 Rev_1. 6 p.

Webster R 2019b. Space-time modelling of IPHC Fishery-Independent Setline Survey (FISS) data. IPHC-2020-IM095-07 Rev_1. 19 p.

Webster R 2019c. Space-time modelling of IPHC Fishery-Independent Setline Survey (FISS) data. IPHC-2020-AM096-07. 32 p.

Webster RA, Soderlund E, Dykstra CL, and Stewart IJ (in press). Monitoring change in a dynamic environment: spatio-temporal modelling of calibrated data from different types of fisheries surveys of Pacific halibut. Can. J. Fish. Aquat. Sci

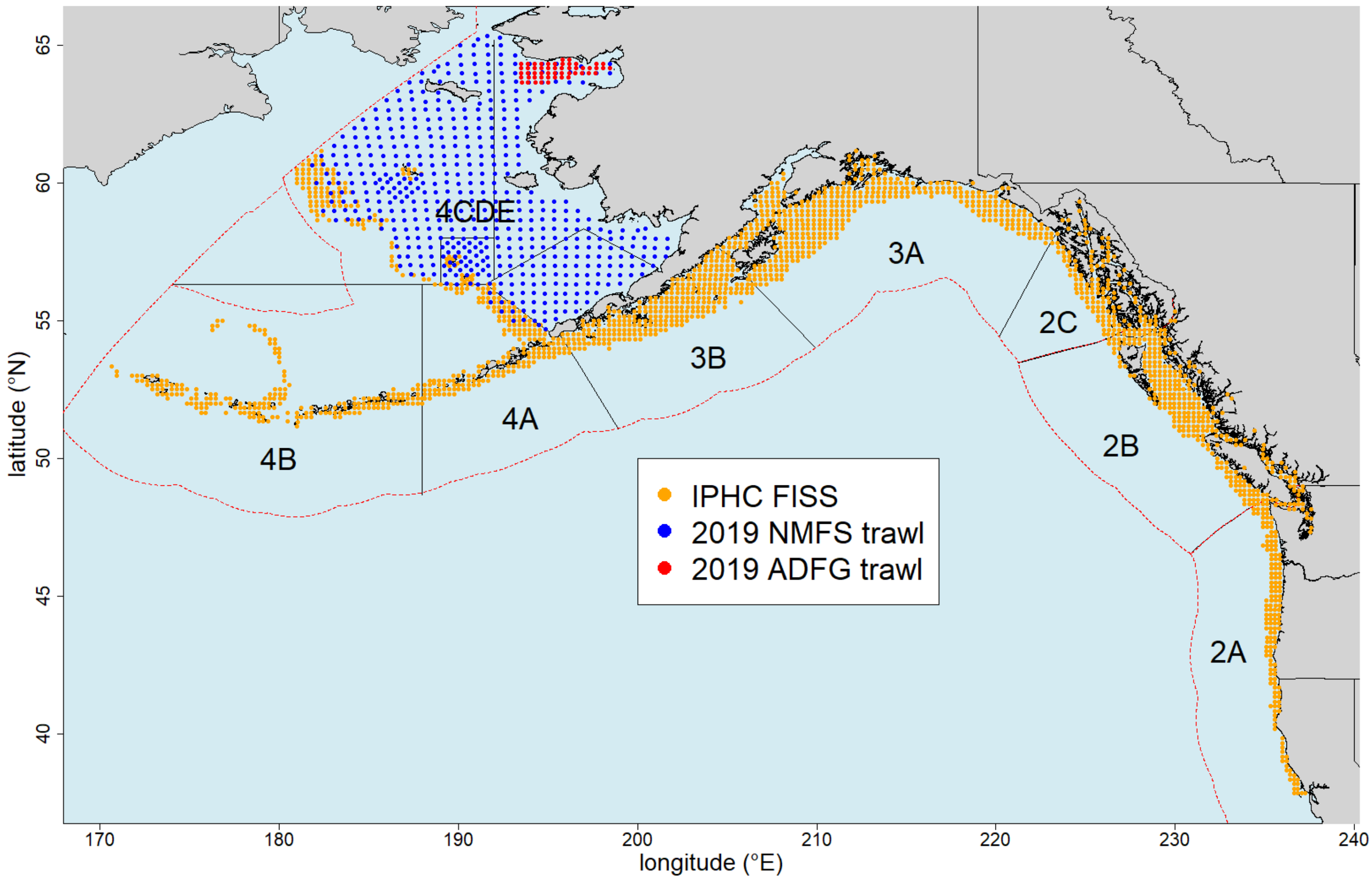


Figure 1. Map of the full 1890 station FISS design, with orange circles representing stations available for inclusion in annual sampling designs, and other colours representing trawl stations from 2019 NMFS and ADFG surveys used to provide complementary data for Bering Sea modelling.

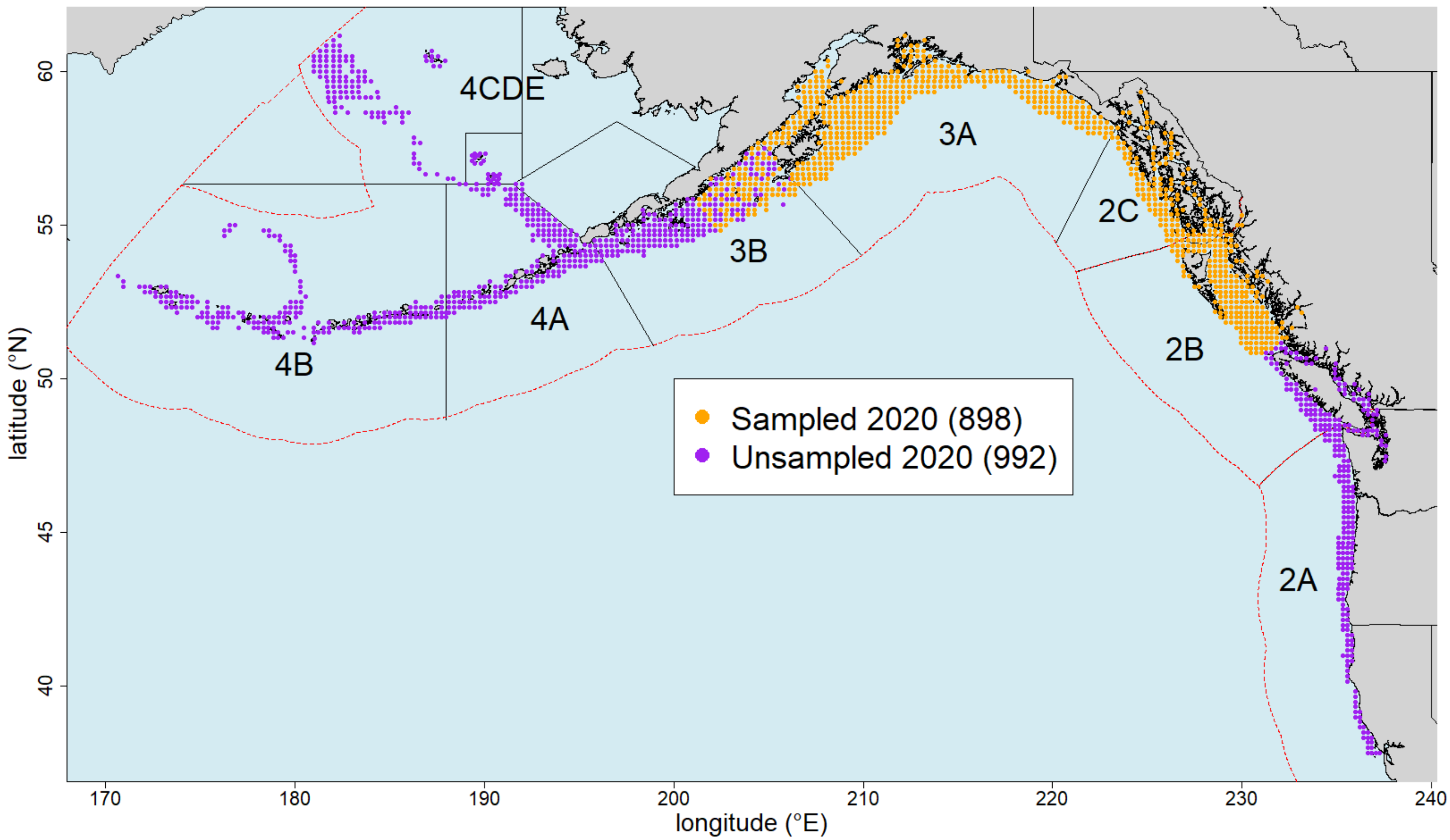


Figure 2. Map of the implemented 2020 FISS design, with orange circles representing those stations to be fished in 2020, and purple circles representing stations to be next fished in subsequent years.

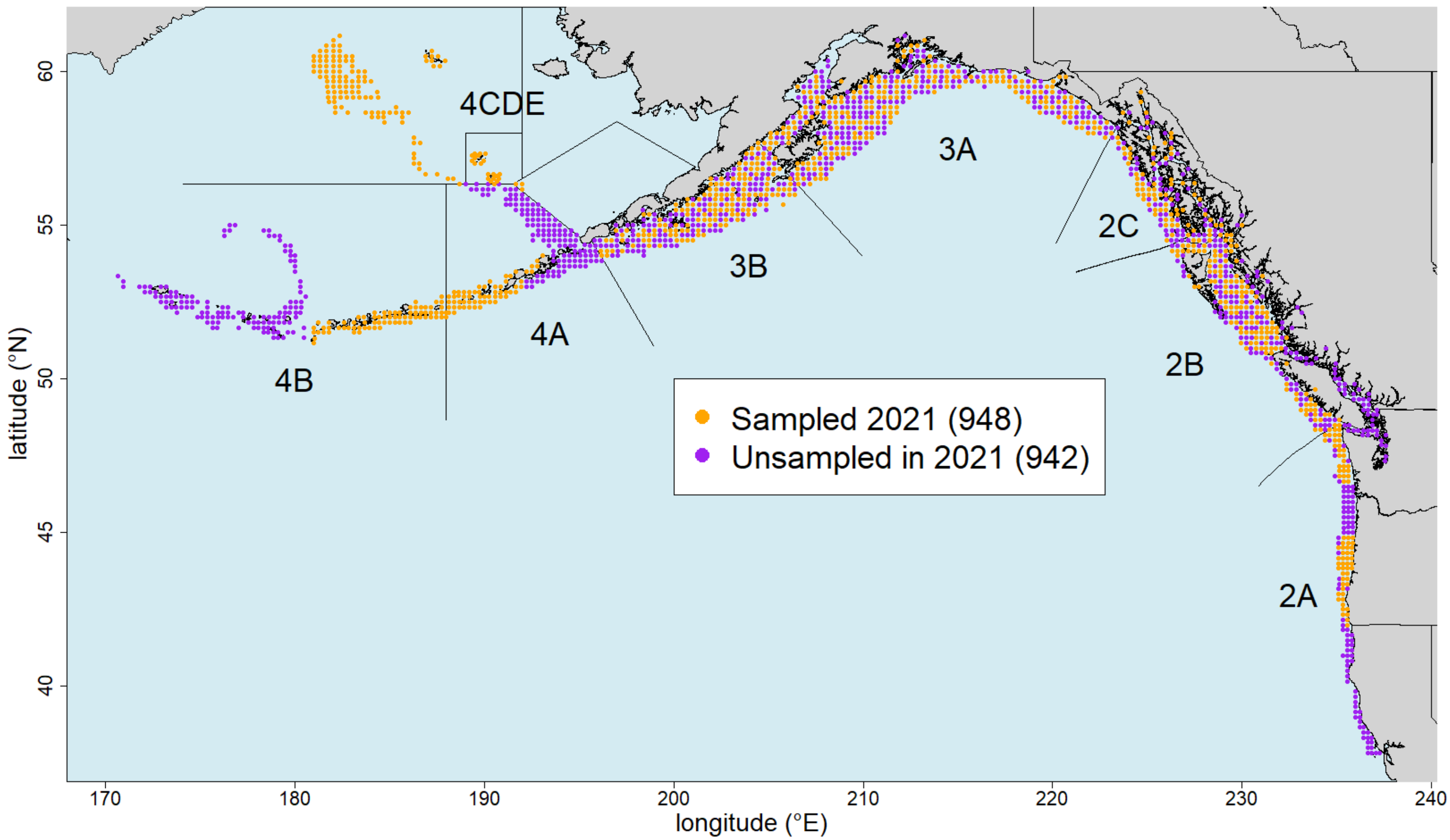


Figure 3. Proposed minimum FISS design in 2021 (orange circles) based on randomized sampling in 2B-3B, and a subarea design elsewhere. Purple circles are optional for meeting data quality criteria.

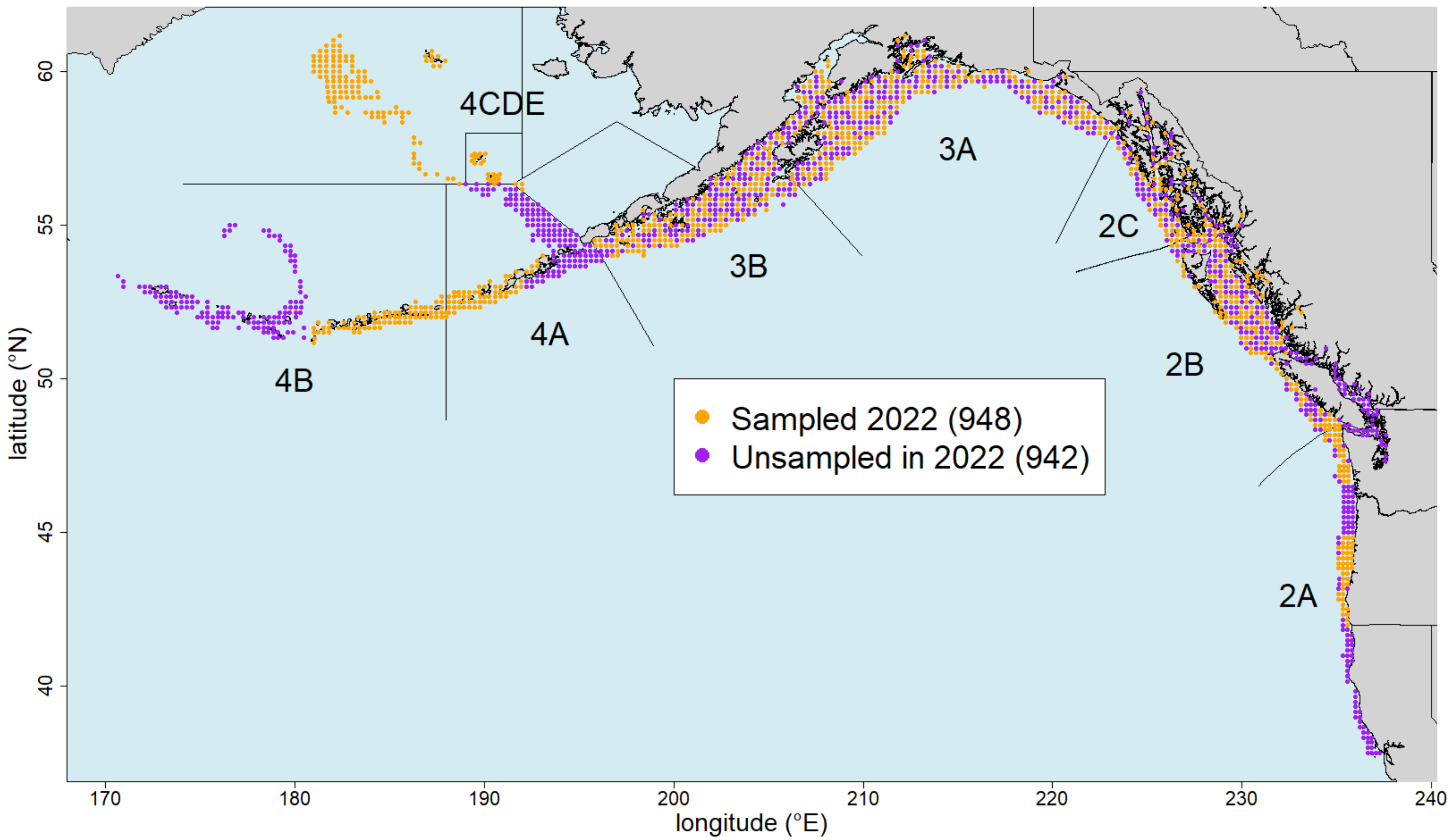


Figure 4. Proposed minimum FISS design in 2022 (orange circles) based on randomized sampling in 2B-3B, and a subarea design elsewhere. Purple circles are optional for meeting data quality criteria.

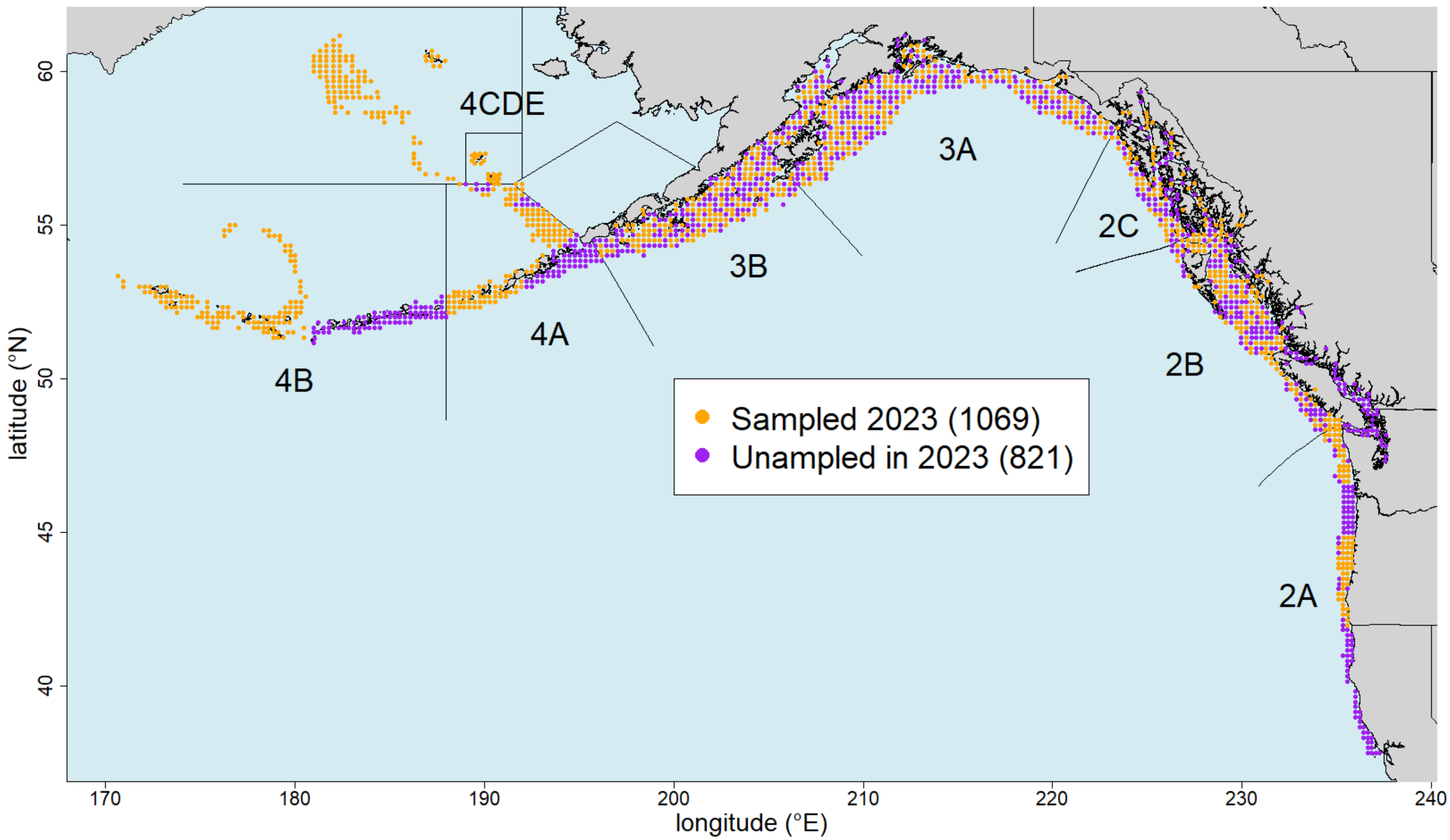


Figure 5. Proposed minimum FISS design in 2023 (orange circles) based on randomized sampling in 2B-3B, and a subarea design elsewhere. Purple circles are optional for meeting data quality criteria.

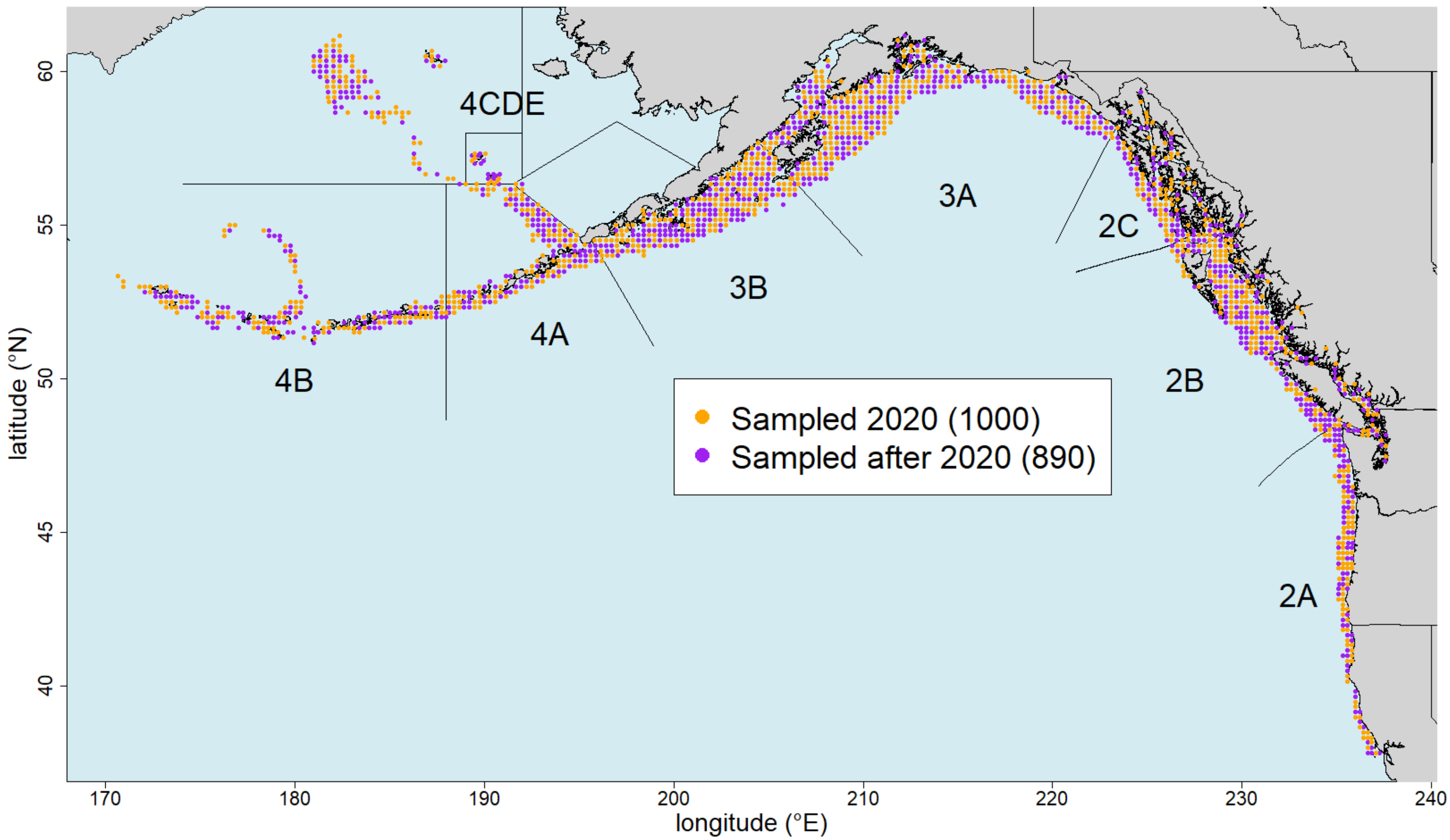


Figure 6. Map of a potential 1000 station FISS design, with completely randomized station selection within each IPHC Regulatory Area. Orange circles represent stations selected for sampling, while purple circles represent stations to be sampled in subsequent years.

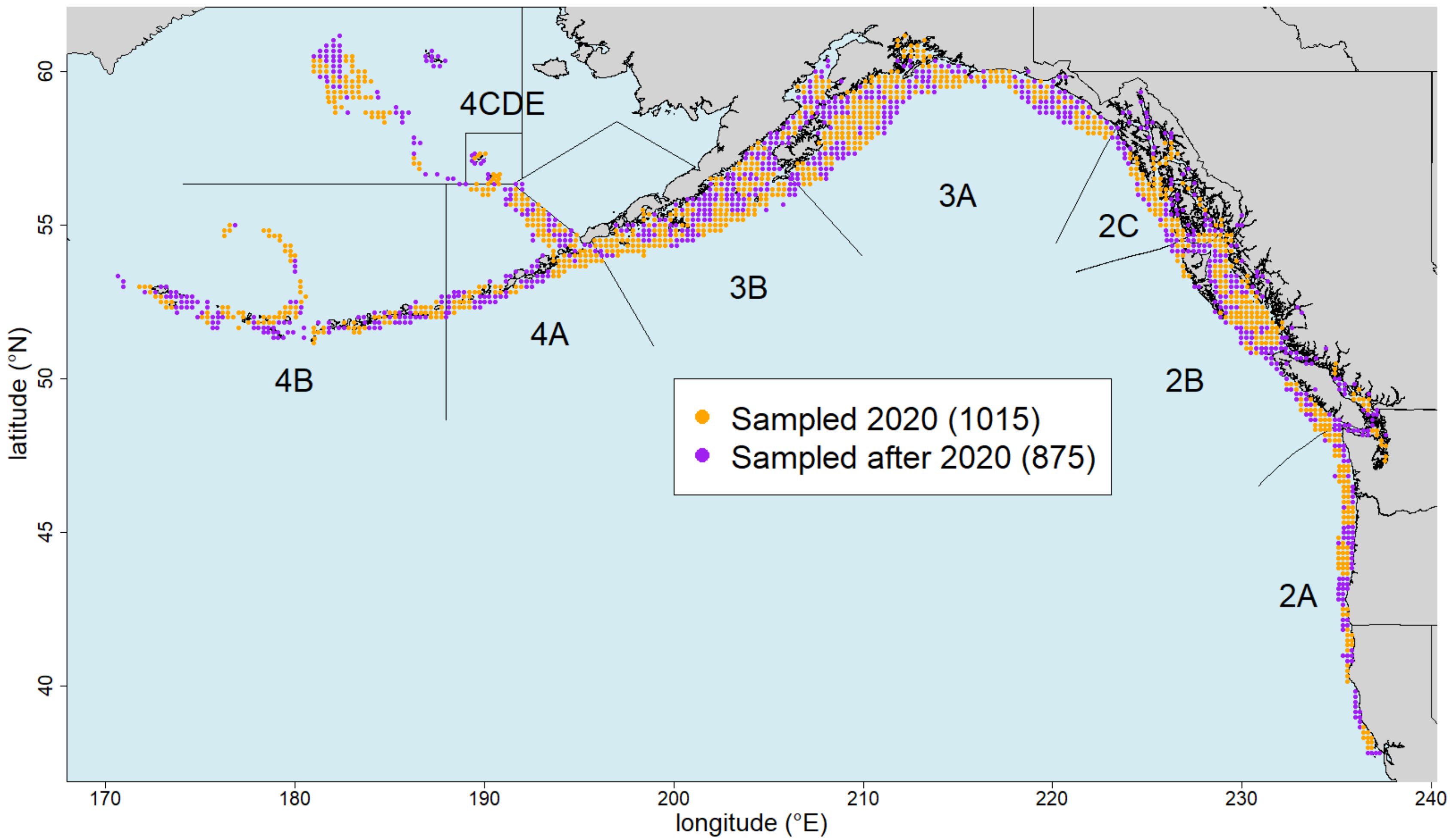


Figure 7. Map of a potential approximately 1000 station FISS design, with randomized selection of clusters of 3-4 stations within each IPHC Regulatory Area. Orange circles represent stations selected for sampling, while purple circles represent stations to be sampled in subsequent years.

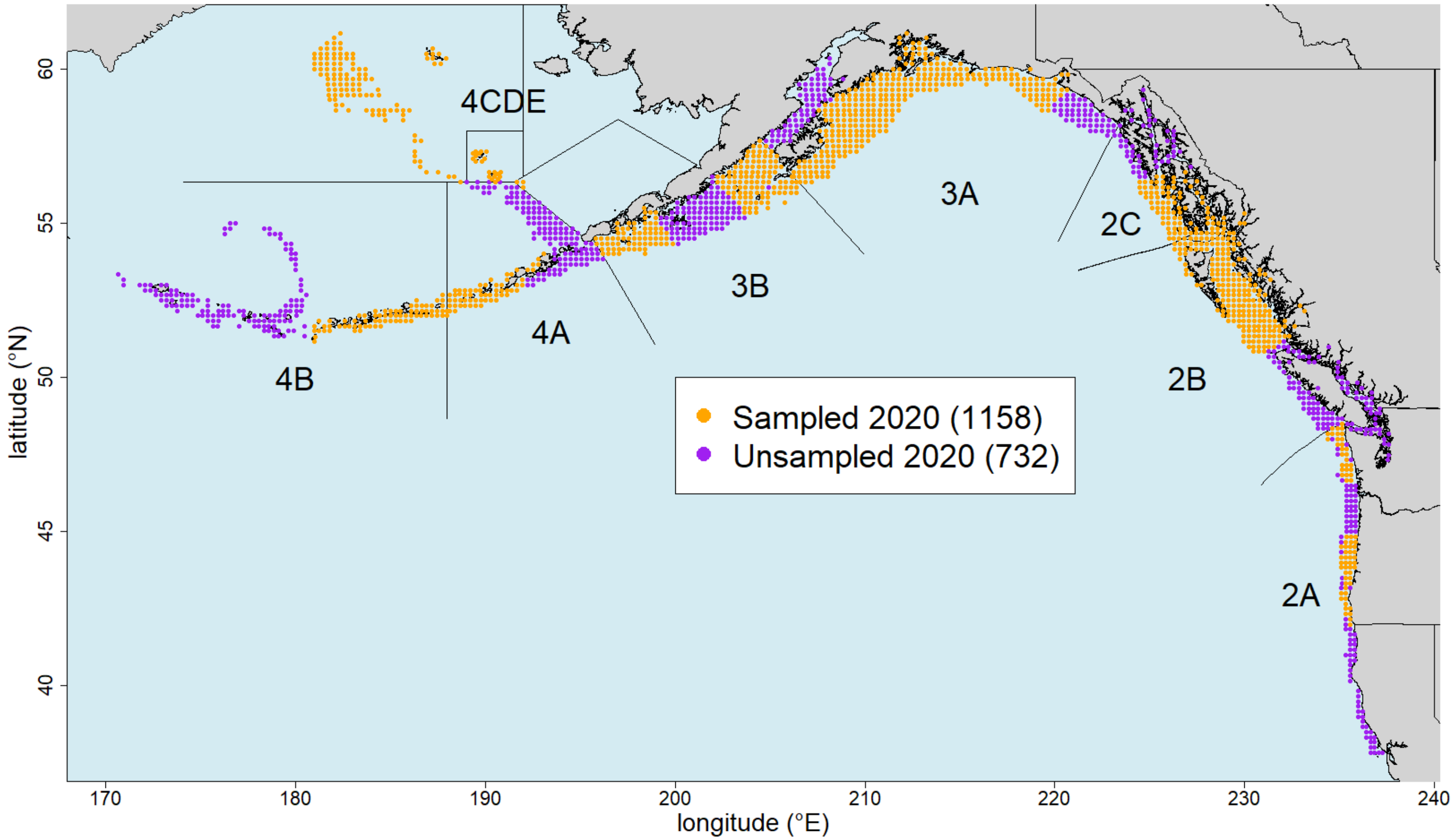


Figure 8. Minimum FISS design for 2020 (orange circles) proposed at AM096 based on subareas. Purple circles are optional for meeting data quality criteria.

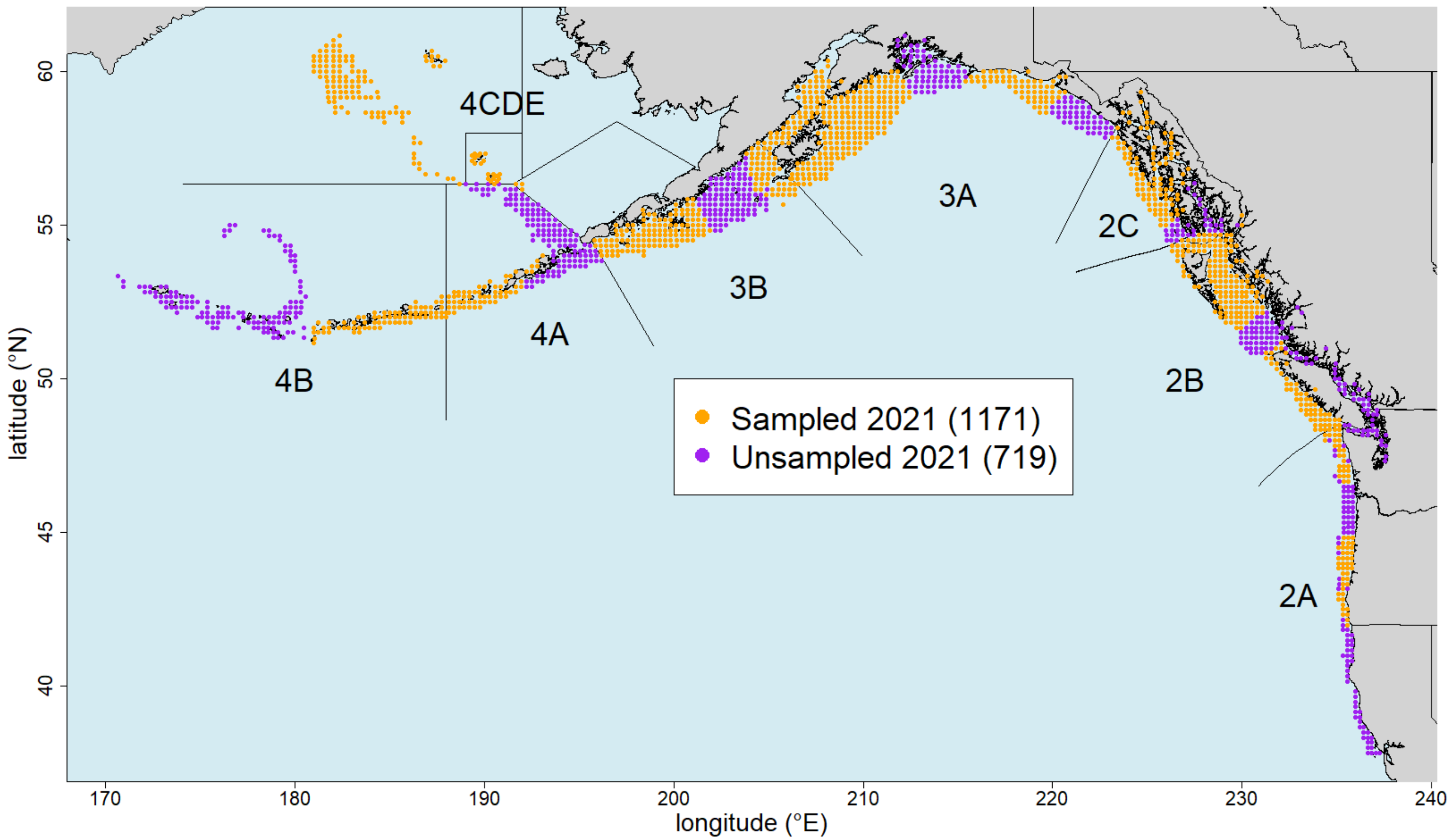


Figure 9. Minimum FISS design for 2021 (orange circles) proposed at AM096 based on subareas. Purple circles are optional for meeting data quality criteria.

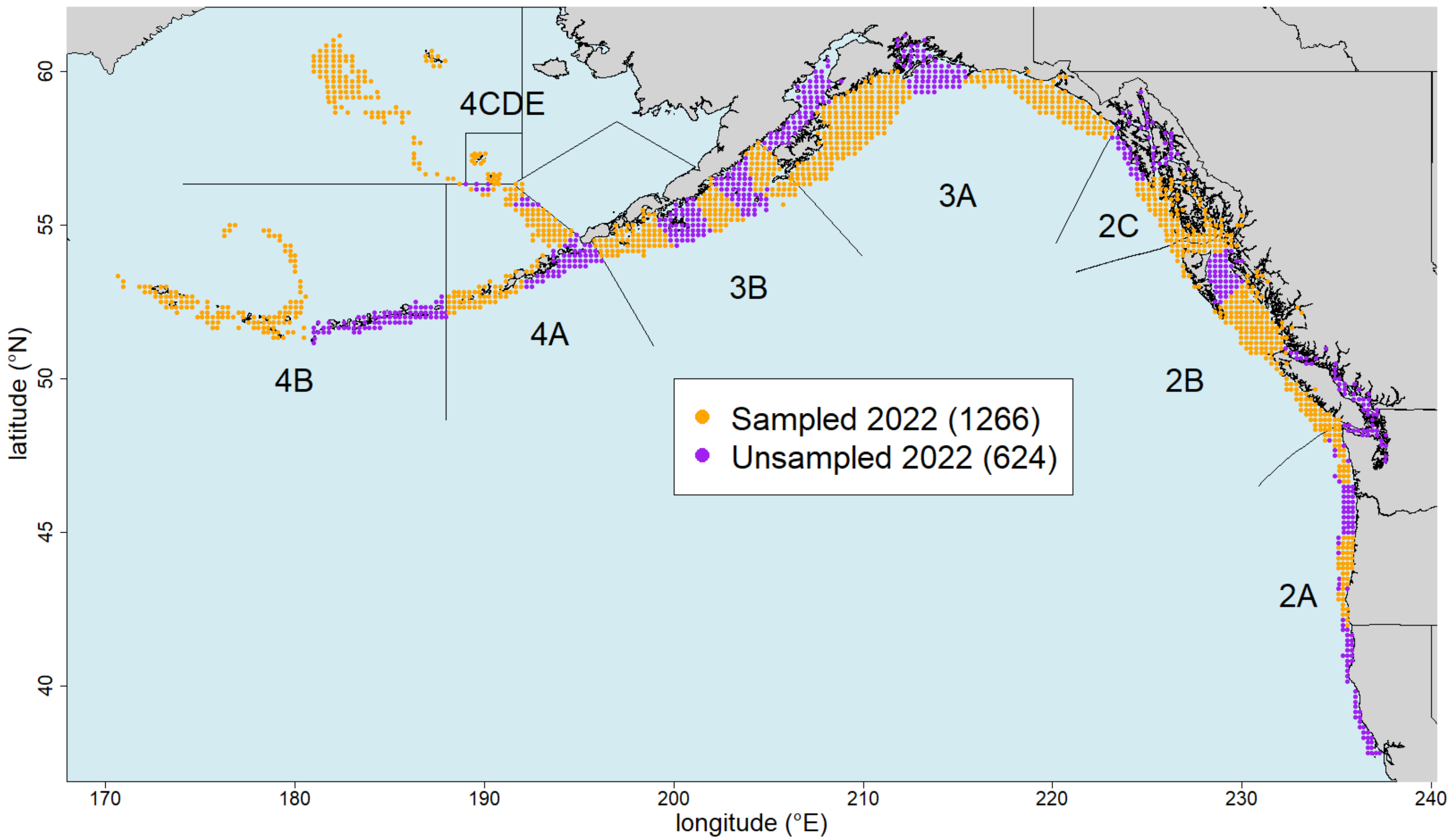


Figure 10. Minimum FISS design for 2022 (orange circles) proposed at AM096 based on subareas. Purple circles are optional for meeting data quality criteria.

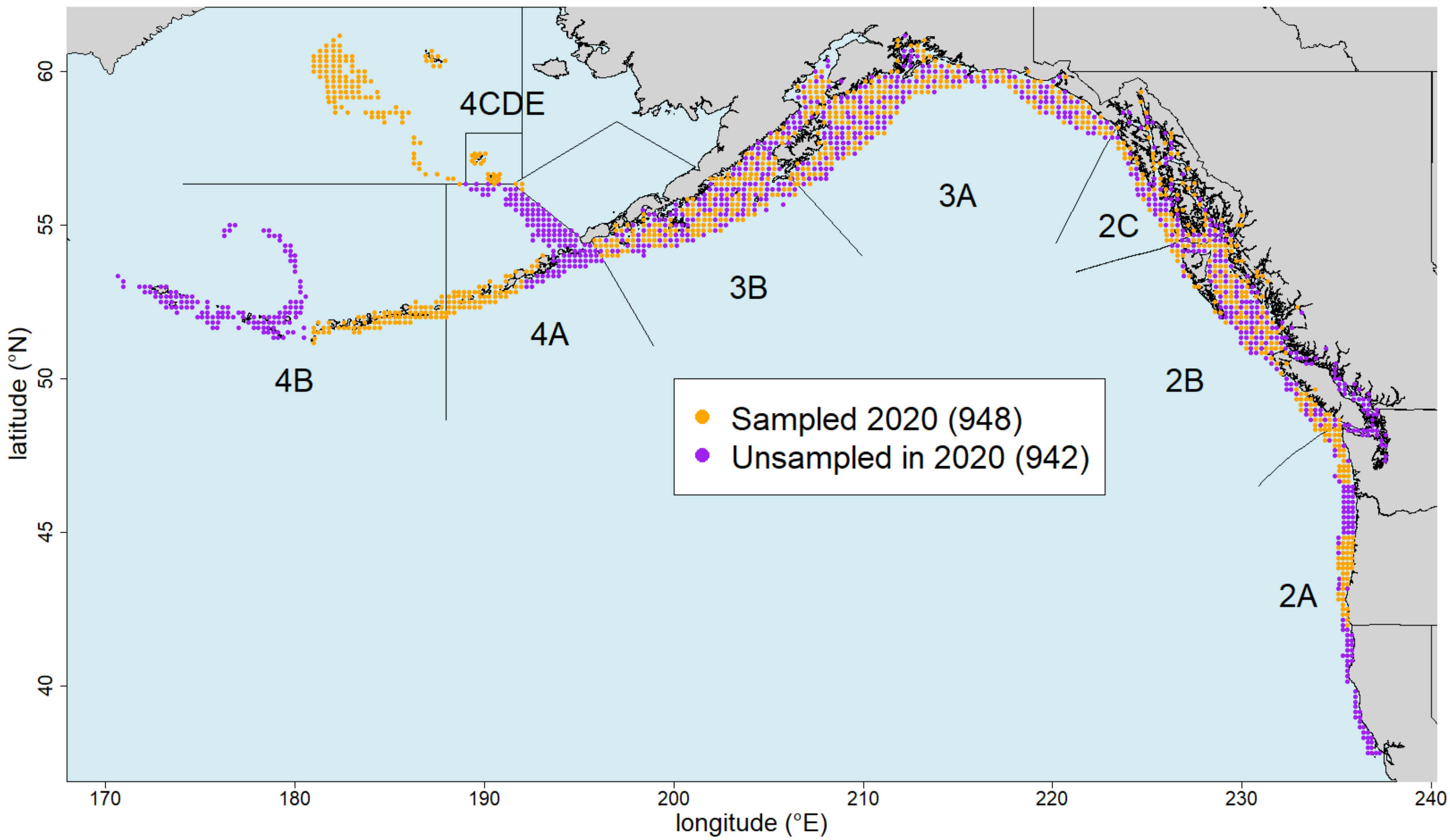


Figure 11. Minimum FISS design for 2020 (orange circles) proposed at AM096 based on randomized sampling in 2B-3B, and a subarea design elsewhere. Purple circles are optional for meeting data quality criteria.

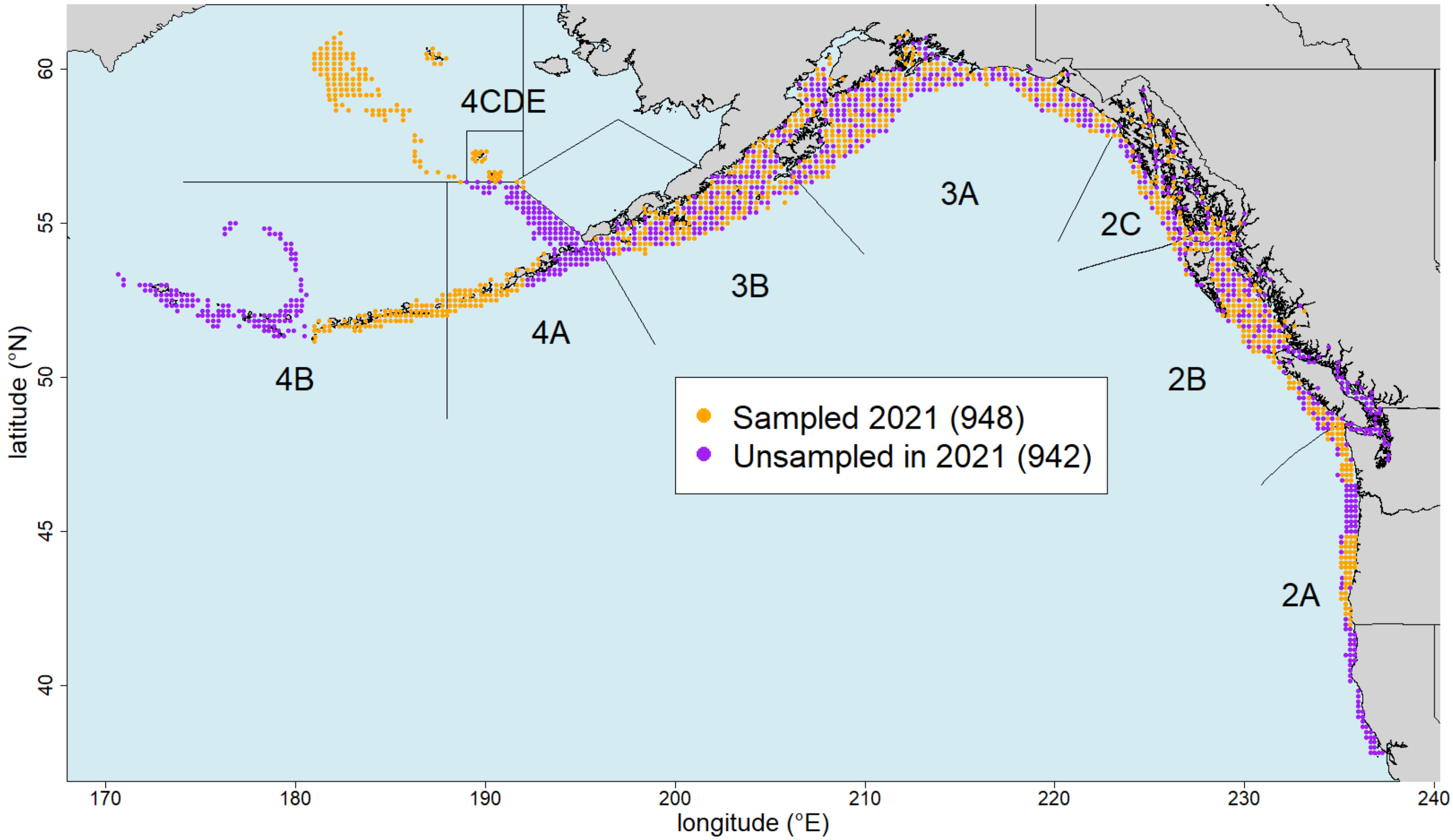


Figure 12. Minimum FISS design for 2021 (orange circles) proposed at AM096 based on randomized sampling in 2B-3B, and a subarea design elsewhere. Purple circles are optional for meeting data quality criteria.

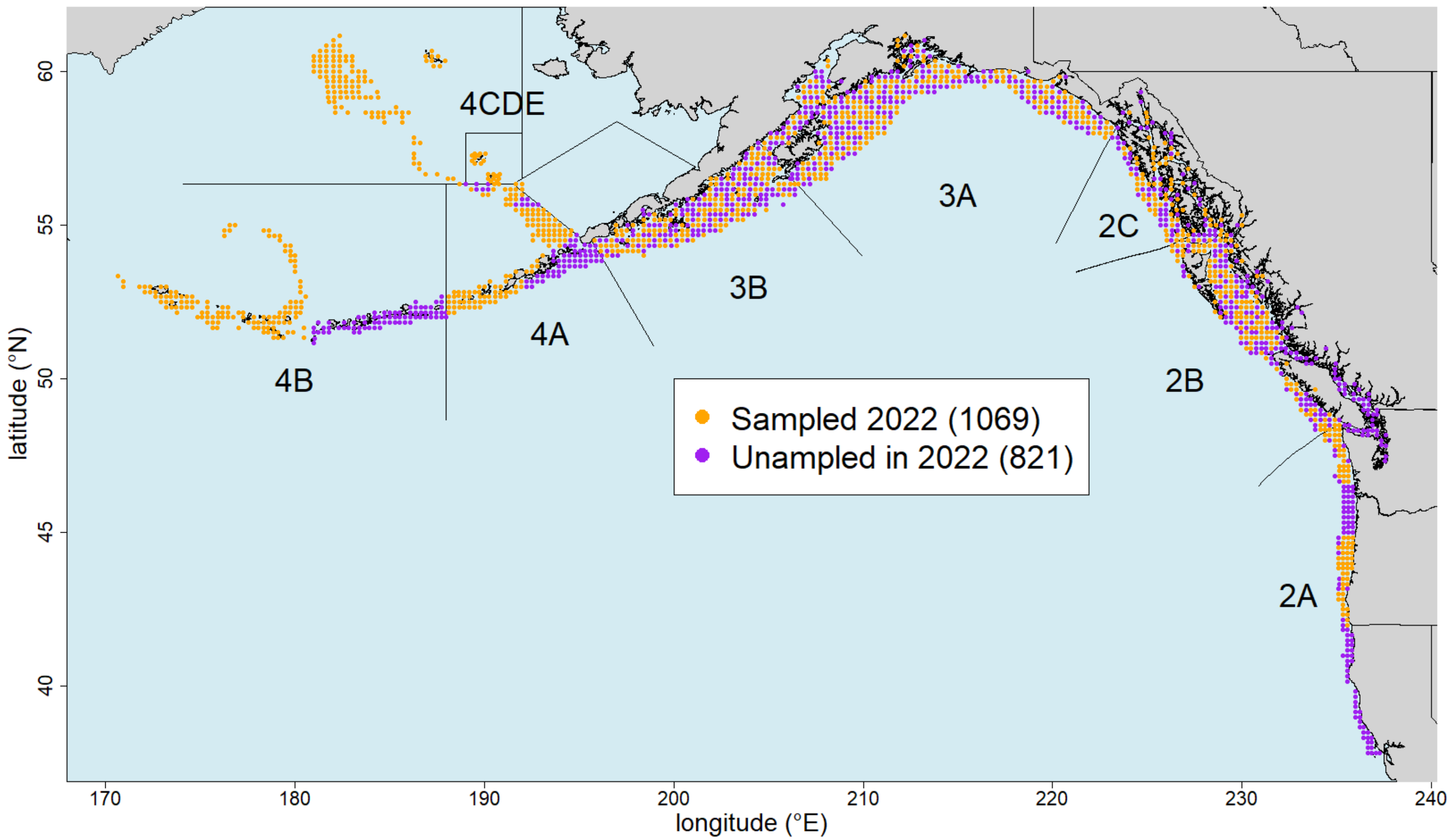


Figure 13. Minimum FISS design for 2022 (orange circles) proposed at AM096 based on randomized sampling in 2B-3B, and a subarea design elsewhere. Purple circles are optional for meeting data quality criteria.

Appendix A

Subareas within IPHC Regulatory Areas

IPHC Regulatory Area 4B

Regulatory Area 4B is a relatively small area, can be divided into fairly distinct subareas based on the 2017 FISS expansion results (Figure A.1):

1. West of Kiska Is. At present, a relatively low density subarea, but one that previously had much higher densities of Pacific halibut. (57 stations)
2. East of Kiska Is, and west of Amchitka Pass, including Bowers Ridge. Also at present a low density subarea, but one largely unsurveyed before 2017. (73 stations)
3. East of Amchitka Pass. Currently, a subarea of relatively high density and stability, although with higher density in the past. (73 stations)

In recent years, the bulk of the 4B stock (70-80%, Figure A.2) is estimated to have been in Subarea 3. With standard deviations typically increasing with the mean for this type of data, focusing FISS effort on this subarea in future surveys should succeed in maintaining target CVs, while reducing net cost. However, additional analysis of the historical WPUE time series shows Subarea 1's percentage of the biomass can also change by relatively large amounts over short time frames, with absolute changes of over 10% over as little as 3-4 years (see Appendix B). This also should be accounted for in a three-year design plan.

We augmented the 1993-2018 data with simulated data sets for 2019-22. For 2019, the planned FISS design was used, while the following designs were considered for subsequent years:

- 2020: Only Subarea 3 fished (73 stations)
- 2021: Only Subarea 3 fished (73 stations)
- 2022a: Only Subarea 3 fished (73 stations)
- 2022b: Only Subarea 1 fished (57 stations)
- 2022c: Subareas 1 and 2 fished (130 stations)

The three options for 2022 allow either a continuation of Subarea 3 only (2022a), Subarea 1 only to reduce the chance of bias due to changes in density in Subarea 1 over the three years since 2019 (2022b), and a third option (2022c) in case 2022b leads to CVs above the 15% target. The third option is also precautionary in that while there is apparent stability in Subarea 2's biomass percentage (Figure 3 and Table 5), most of Subarea 2 has been surveyed just once, in the 2017 expansion.

Fitting space-time models to the augmented data sets showed that fishing only Subarea 3 from 2020-22 is expected to be sufficient to reduce and then maintain CVs to below 15%. Fishing Subarea 1 and 2 in 2022 should also meet the precision target, and would be the preferred minimum design in that year in order to ensure that bias remained low.

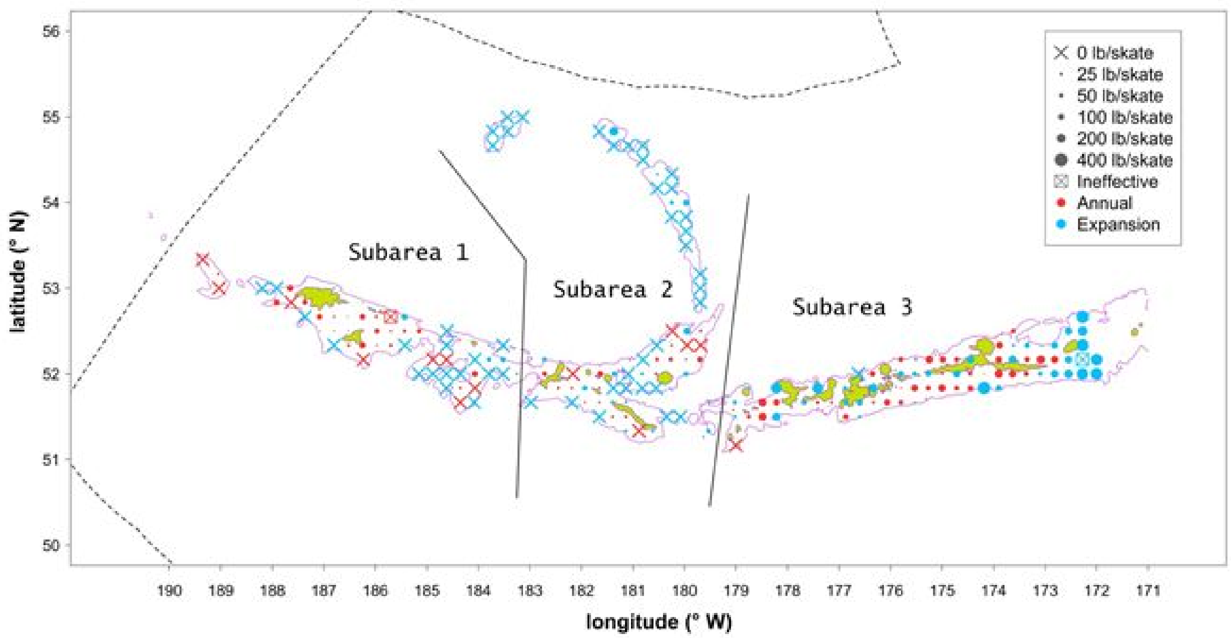


Figure A.1. Map of the 2017 FISS expansion design in IPHC Regulatory Area 4B showing the subareas used in the analysis.

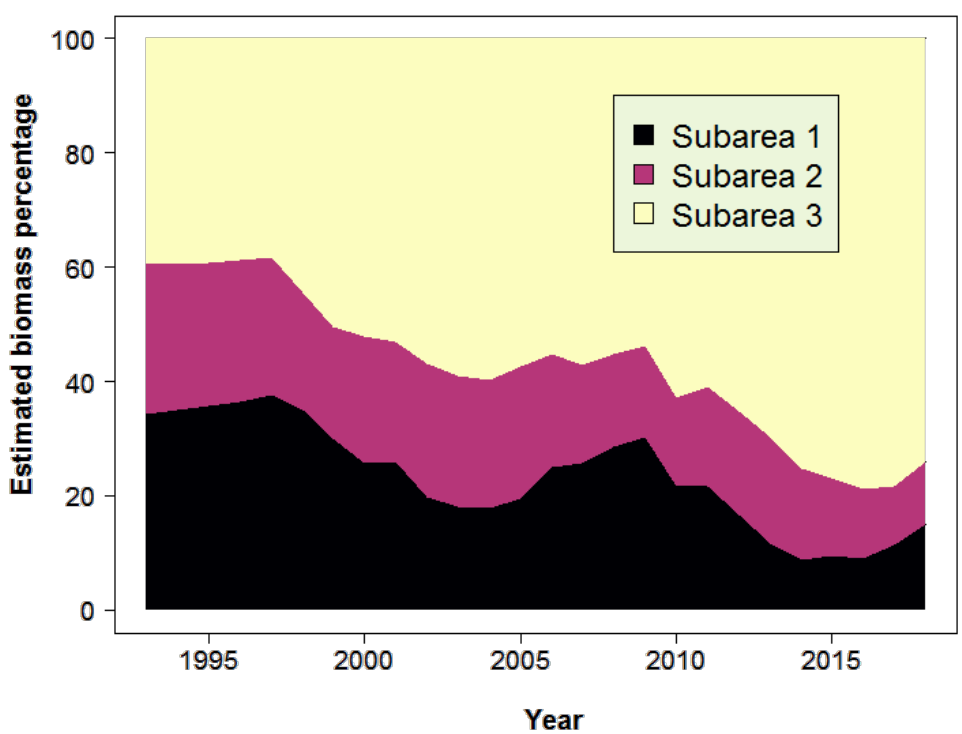


Figure A.2. Estimated IPHC Regulatory Area 4B biomass % by subarea and year.

IPHC Regulatory Area 4A

Like Regulatory Area 4B, we have divided Regulatory Area 4A into geographic subareas (Figure A.3) for use in devising an efficient FISS design. Subarea 1 is a high density subarea, which in recent years has had 65-85% of the biomass, and has been historically variable in terms of its proportion of the biomass (Figure A.4). Subarea 2 is a low-density area with a very stable proportion of the Regulatory Area 4A biomass, while Subarea 3 has had more variable biomass. (The smallest subarea, Subarea 4, is covered by the annual NMFS trawl survey, and we are not proposing to sample it as part of the annual survey.)

Based on this information, the following designs were evaluated for 2020-22:

- 2020: Only Subarea 1 fished (59 stations)
- 2021: Only Subarea 1 fished (59 stations)
- 2022a: Only Subarea 3 fished (63 stations)
- 2022b: Subareas 2 and 3 fished (114 stations)
- 2022c: Subareas 1 and 3 fished (122 stations)

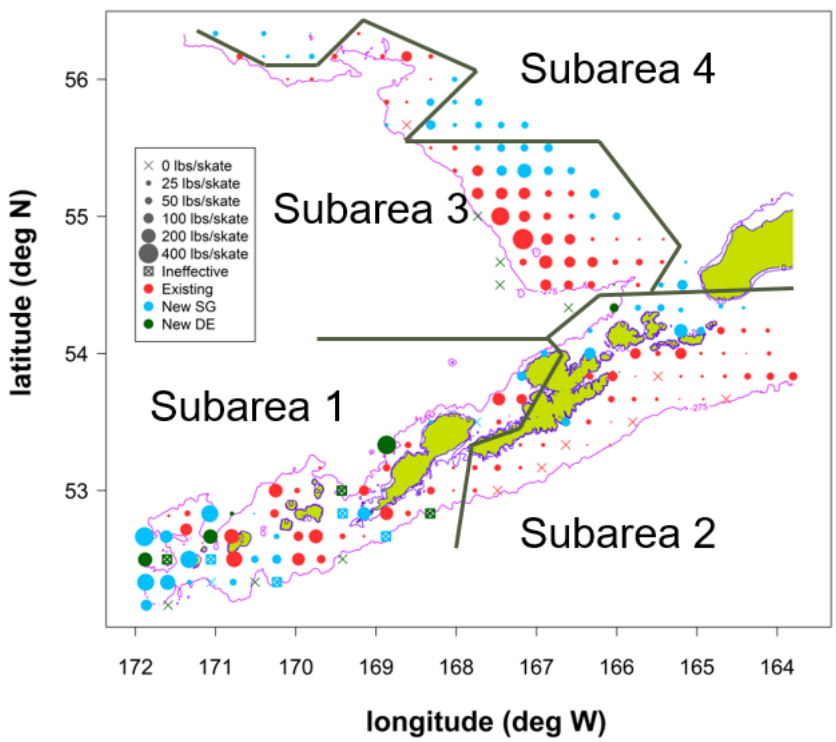


Figure A.3. Map of the 2014 FISS expansion design in IPHC Regulatory Area 4A showing the subareas used in the analysis.

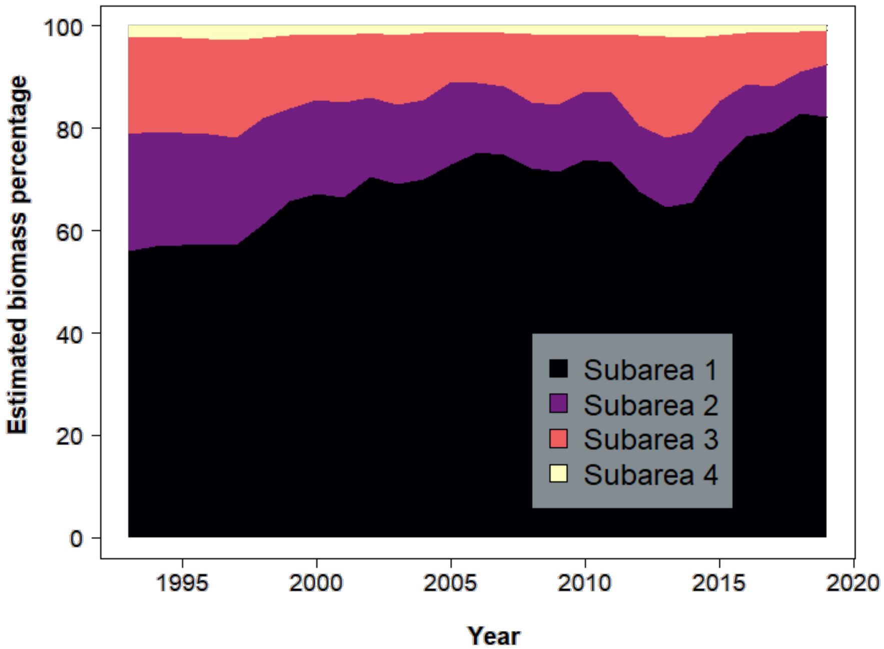


Figure A.4. Estimated Regulatory Area 4A biomass % by subarea and year.

Sampling only Subarea 1 in Regulatory Area 4A was sufficient to meet precision targets in 2020-21. For 2022, designs that omitted Subarea 1 were not expected to meet precision targets, and the minimum proposed design for 2022 is to fish Subareas 1 and 3.

IPHC Regulatory Area 2A

In IPHC Regulatory Area 2A, we again proposed subareas based on density and geography, but these subareas were not contiguous due to the existence of two distinct higher density regions, one off the north Washington coast, and the other of the central Oregon coast (Figure A.5). Thus, we created Subarea 1 to include both of these higher density regions, while Subarea 2 includes the moderate density zone between them, as well as the northern part of California. Subarea 3 includes the remaining low density regions in the Salish Sea, California, and the stations in deep and shallow waters throughout the Regulatory Area. The proportion of biomass in each subarea does not change greatly over periods less than five years (Figure A.6), and this relative stability should allow us to reduce sampling frequency in lower density subareas while maintaining precision targets.

For the 2020-22 period, we evaluated a sampling design in which only Subarea 1 was sampled. This 72-station design was sufficient to maintain CVs for mean WPUE below the 15% target in all years, while having low expected bias due to the stability of the biomass distribution among subareas.

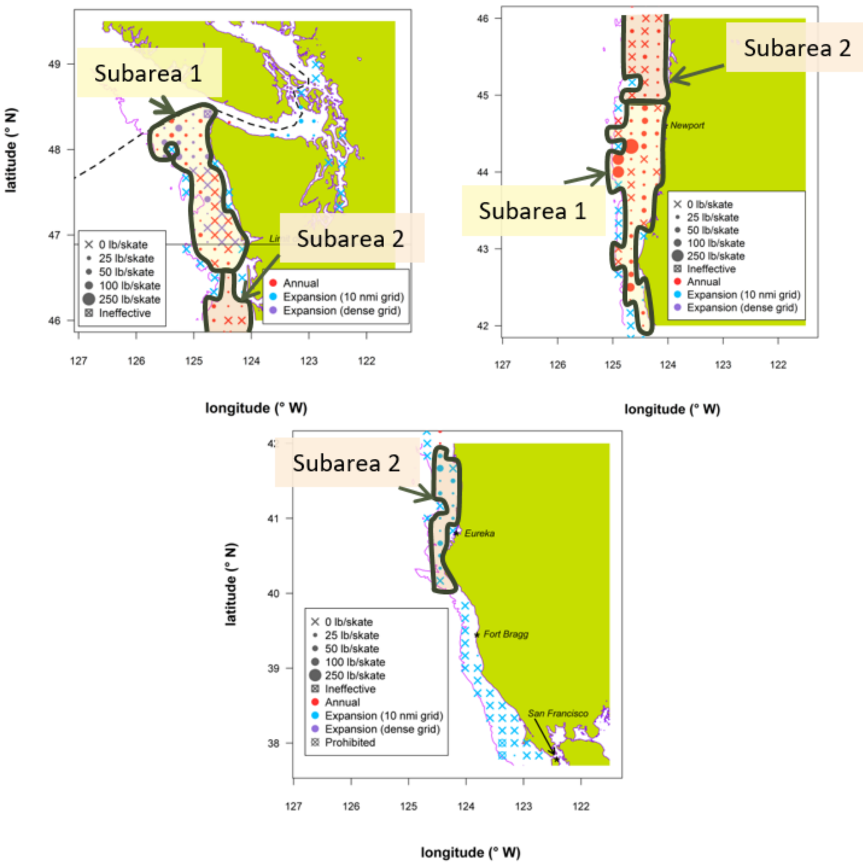


Figure A.5. Map of the 2017 FISS expansion design in IPHC Regulatory Area 2A showing the subareas used in the analysis. Subarea 3 is unlabeled but is comprised of the stations outside of Subareas 1 and 2.

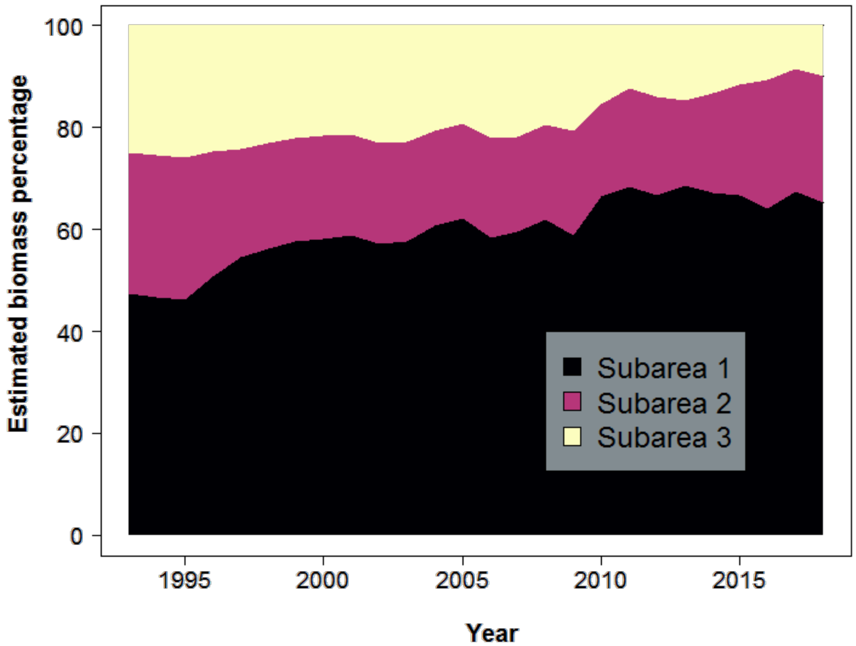


Figure A.6. Estimated IPHC Regulatory Area 2A biomass % by subarea and year.

Appendix B

Example of managing bias when subareas are employed: IPHC Regulatory Area 4B

The division of IPHC Regulatory 4B into subareas was described in Appendix A. Along with Figure A.1, showing trends in biomass proportions within IPHC Regulatory Area 4B, we also considered Table B.1 when determining the frequency with which each subarea should be sampled in order to maintain low bias. This table, derived from the data in Figure A.1, shows how many years until at least a 10% absolute change in estimated biomass proportion is recorded by year and subarea.

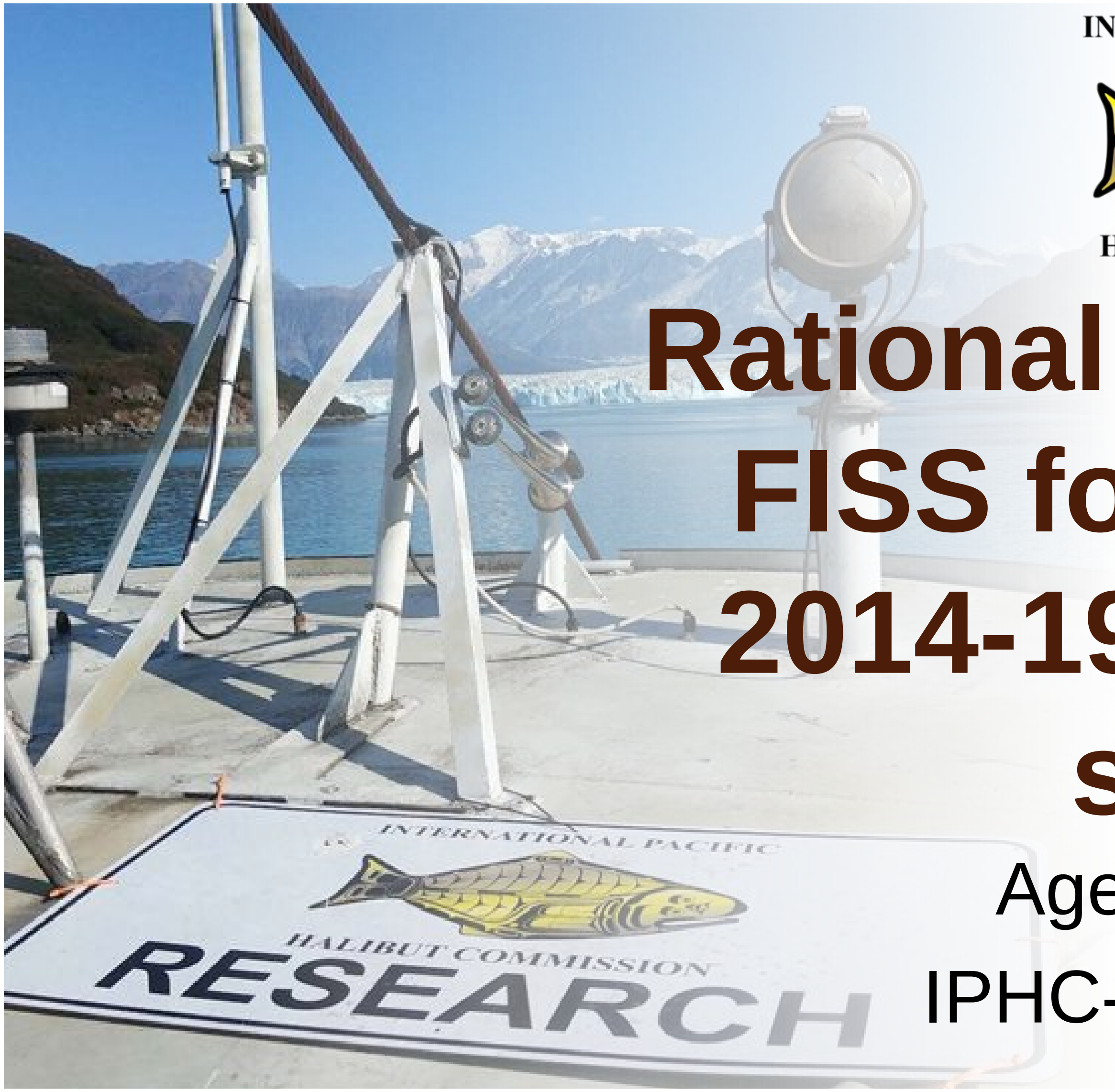
Subarea 1 often sees changes of at least 10% over a 3-4 year period. For example, the value “4” in 1996 in Table B.1 for Subarea 1 means that a 10% absolute change in this subarea’s biomass proportion from the 1996 estimate was first observed four years later, in 2000. Likewise, a change of at least 10% from the 1997 estimate also first observed in 2000, and so on. Table cells with dashes (from 2012 onwards for Subarea 1) mean that a change of at least 10% has yet to be observed.

We interpret the data in Table B.1 to mean that Subareas 1 and 3 should be sampled every 3-4 years to maintain low bias, while Subarea 2 can be sampled less frequently (with the caveat discussed in Appendix A).

Similar tables were referenced when determining sampling priorities for subareas within other IPHC Regulatory Areas for subarea-based designs.

Table B.1 For each year, the number of years until at least a 10% absolute change in estimated biomass share is observed.

Subarea	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
1	9	8	7	4	3	4	3	13	12	7	5	4	4
2	17	21	20	19	18	19	–	16	16	14	13	12	11
3	6	5	4	3	2	4	11	10	11	11	10	9	8
Subarea	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
1	7	6	4	3	4	3	–	–	–	–	–	–	–
2	–	–	–	–	–	–	–	–	–	–	–	–	–
3	6	6	4	3	4	3	3	–	–	–	–	–	–



INTERNATIONAL PACIFIC HALIBUT COMMISSION

Rationalisation of the FISS following the 2014-19 expansion series

Agenda item: 6.3

IPHC-2020-IM096-07

Summary

- Background
  - IPHC history of FISS, 1993-2010
  - FISS expansions 2011-19
  - Space-time modelling
  - FISS design objectives
  - Review process
- Proposed FISS designs for 2021-23
  - Evaluation and revision of designs
- Consideration of cost

IPHC FISS

- Our most important source of data on Pacific halibut
- Provides data for estimating weight and numbers per unit effort (WPUE and NPUE) indices of density and abundance of Pacific halibut
  - Used to estimate stock trends
  - Used to estimate stock distribution
  - Important input in the IPHC stock assessment
- Provides biological data for use in the stock assessment

FISS history 1993-2010

- A standardised FISS has been conducted by the IPHC each year since 1993
  - Standardised for bait and fishing gear
- From 1993-97 coverage was limited and generally restricted to IPHC Regulatory Areas 2B, 2C, 3A and 3B
- The modern FISS design on a 10 nmi grid began in 1998
- By 2001, annual coverage occurred in all IPHC Regulatory Areas
  - Depth range 20-275 fathoms in Gulf of Alaska and Aleutian Islands
  - Depth range 75-275 fathoms along Bering Sea shelf edge

FISS history 2011-2019

- By 2010, data from other sources showed that not all Pacific halibut habitat was covered by the FISS
  - Pacific halibut were present outside the FISS depth range, in both deep and shallow waters
  - All IPHC Regulatory Areas had coverage gaps, even within the standard depth range
- Such unsampled habitat meant there was the potential for bias in estimates derived from FISS data
- This led the IPHC Secretariat to propose expanding FISS coverage to include the unsurveyed habitat

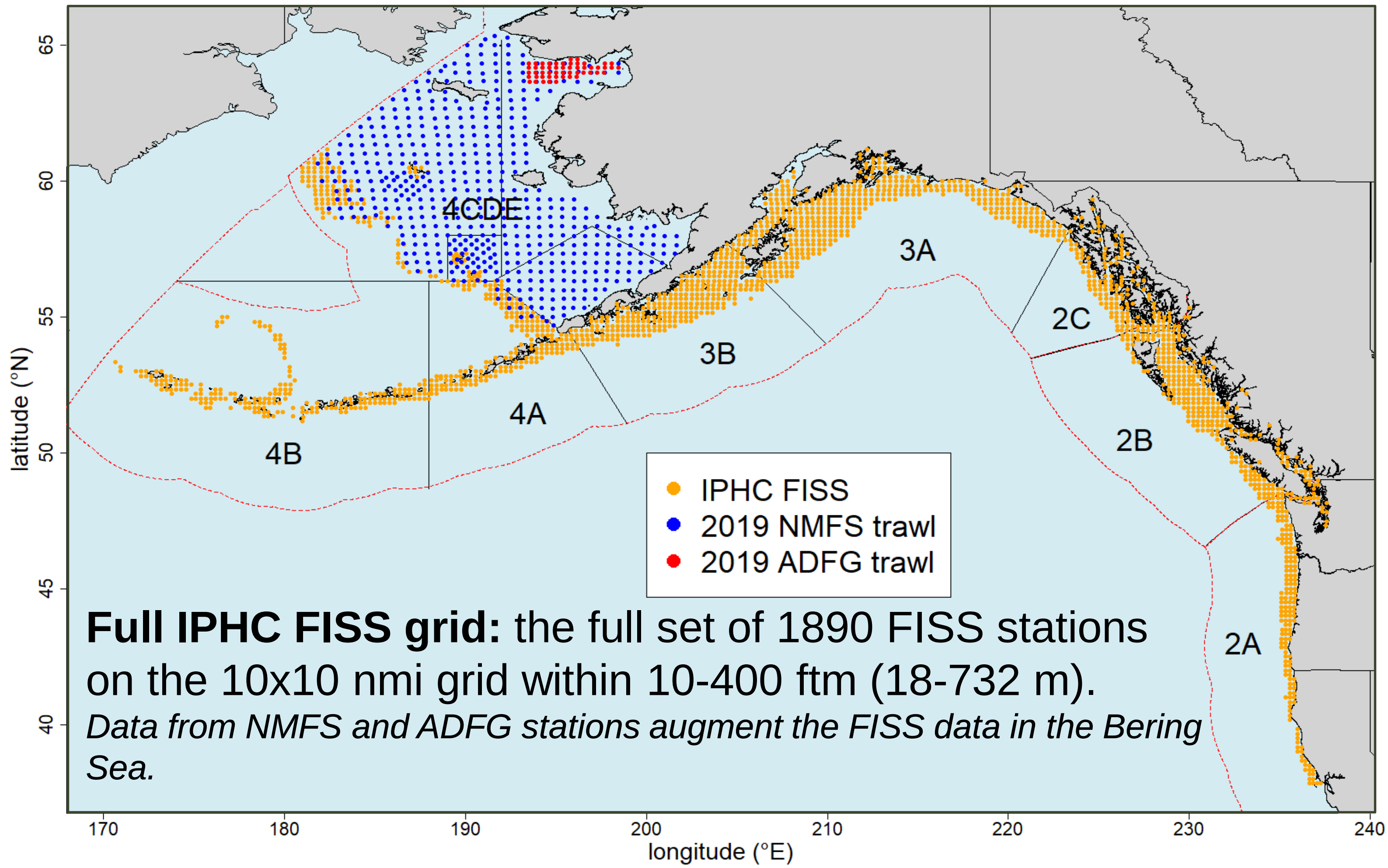
FISS history 2011-2019

- Pilot FISS expansions were undertaken in IPHC Regulatory Area 2A in 2011 (deep, shallow waters, other "missing" stations) and 2013 (northern California)
- From 2014-19, a planned program of FISS expansions took place in all IPHC Regulatory Areas as follows (with previously unsampled % of stations):
  - 2014: Regulatory Areas 2A and 4A (42%)
  - 2015: Regulatory Area 4CDE eastern Bering Sea flats
  - 2016: Regulatory Area 4CDE shelf edge (62%)
  - 2017: Regulatory Areas 2A (46%) and 4B (55%)
  - 2018: Regulatory Areas 2B (42%) and 2C (25%)
  - 2019: Regulatory Areas 3A (18%) and 3B (19%)

FISS history 2011-2019

- During the expansions, the FISS occupied for the first time 34% of the stations on the full 10 nmi FISS grid that had been previously unsampled
- The result was an improved understanding of Pacific halibut density and distribution
  – Bias was reduced, with indices for several Regulatory Areas being revised upwards or downwards
  – Uncertainty in estimates of WPUE and NPUE was reduced in most Regulatory Areas
  – These improvements were apparent throughout the time series, not only in the year of the expansion
- The resulting expanded grid of 1890 stations has provided a full FISS design from which stations can be selected for sampling in each annual FISS

Full FISS grid



Space-time modelling

- Space-time modelling of survey data has been used since 2016 to produce WPUE and NPUE estimates
- The modelling has two key purposes:
  - It smooths the data in time and space
    - Makes use of information on spatial and temporal relationships among survey stations to “sort the signal from the noise”
  - It fills in gaps in survey coverage using model predictions, while accounting for uncertainty
    - Gaps previously filled using ad hoc scaling factors based on ratio of averages in surveyed and unsurveyed habitat

Reviews of space-time modelling methods

- The IPHC's Scientific Review Board (SRB) has repeatedly endorsed the space-time modelling approach, e.g. in 2018:

  IPHC-2018-SRB013-R, Para. 10. *"NOTING that this is the sixth review of the space-time modelling approach, the SRB reiterated its ENDORSEMENT of the approach as cutting-edge and could be widely used.*

- The space-time modelling methods have been published in a peer-reviewed journal:
  - **Webster et al.** (2020) Monitoring change in a dynamic environment: spatio-temporal modelling of calibrated data from different types of fisheries surveys of Pacific halibut. Can. J. Fish. Aquat. Sci 77(8): 1421-1432

FISS objectives and design layers

Priority	Objective	Design Layer
Primary	Sample Pacific halibut for stock assessment and stock distribution estimation	Minimum sampling requirements in terms of: • Station distribution • Station count • Skates per station
Secondary	Long term revenue neutrality	Logistics and cost: operational feasibility and cost/revenue neutrality
Tertiary	Minimize removals, and assist others where feasible on a cost-recovery basis.	Removals: minimize impact on the stock while meeting primary priority Assist: assist others to collect data on a cost-recovery basis IPHC policies: ad-hoc decisions of the Commission regarding the FISS design

Review process

- Based on these objectives, the IPHC Secretariat developed methods for evaluating potential future FISS designs, and presented proposed designs for review:
  - Evaluation methods were reviewed at SRB014, SRB016 and SRB017
  - Design proposals for 2020-22 were presented at IM095 and AM096
  - At AM096, Commissioners adopted an enhanced version of one of the proposed designs

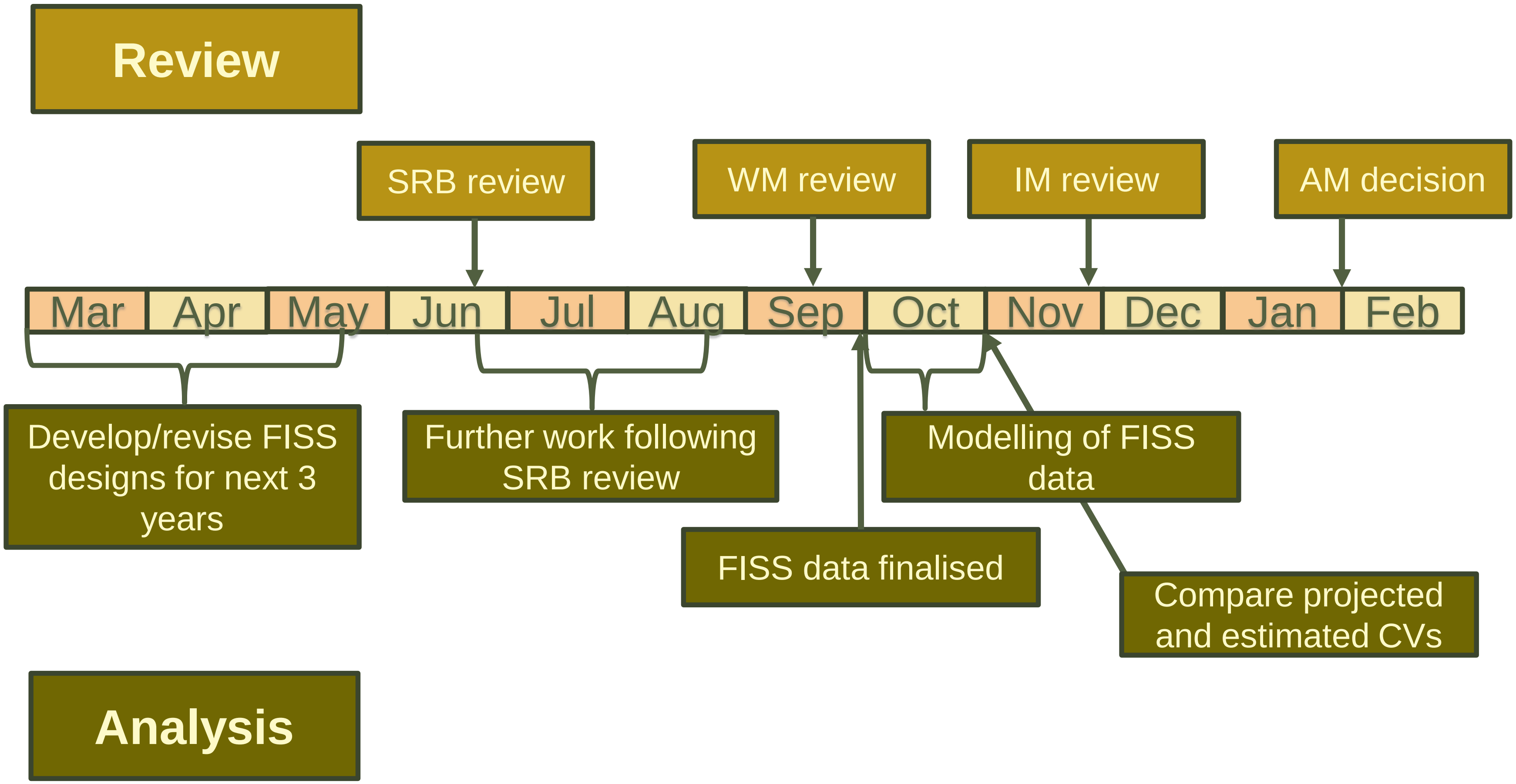
Review process

- Following the completion of the coastwide FISS expansion efforts, 2019/20 was the first year fully rationalised designs could be proposed
- Beginning in 2020, it is expected that the design proposal and review process going forward will be as follows:
  - IPHC Secretariat present design proposals to the SRB for three subsequent years at the June meeting (✔ completed for 2021-23 designs)
  - First review of design proposals by Commissioners at September work meeting, revised if necessary based on SRB input (✔ completed for 2021-23 designs)
  - Presentation of proposed designs at the November Interim Meeting
  - Designs presented and potentially modified at January/February Annual Meeting given Commissioner direction
  - Adopted AM design for current year modified for cost and logistical reasons prior to summer implementation in FISS (February-April)

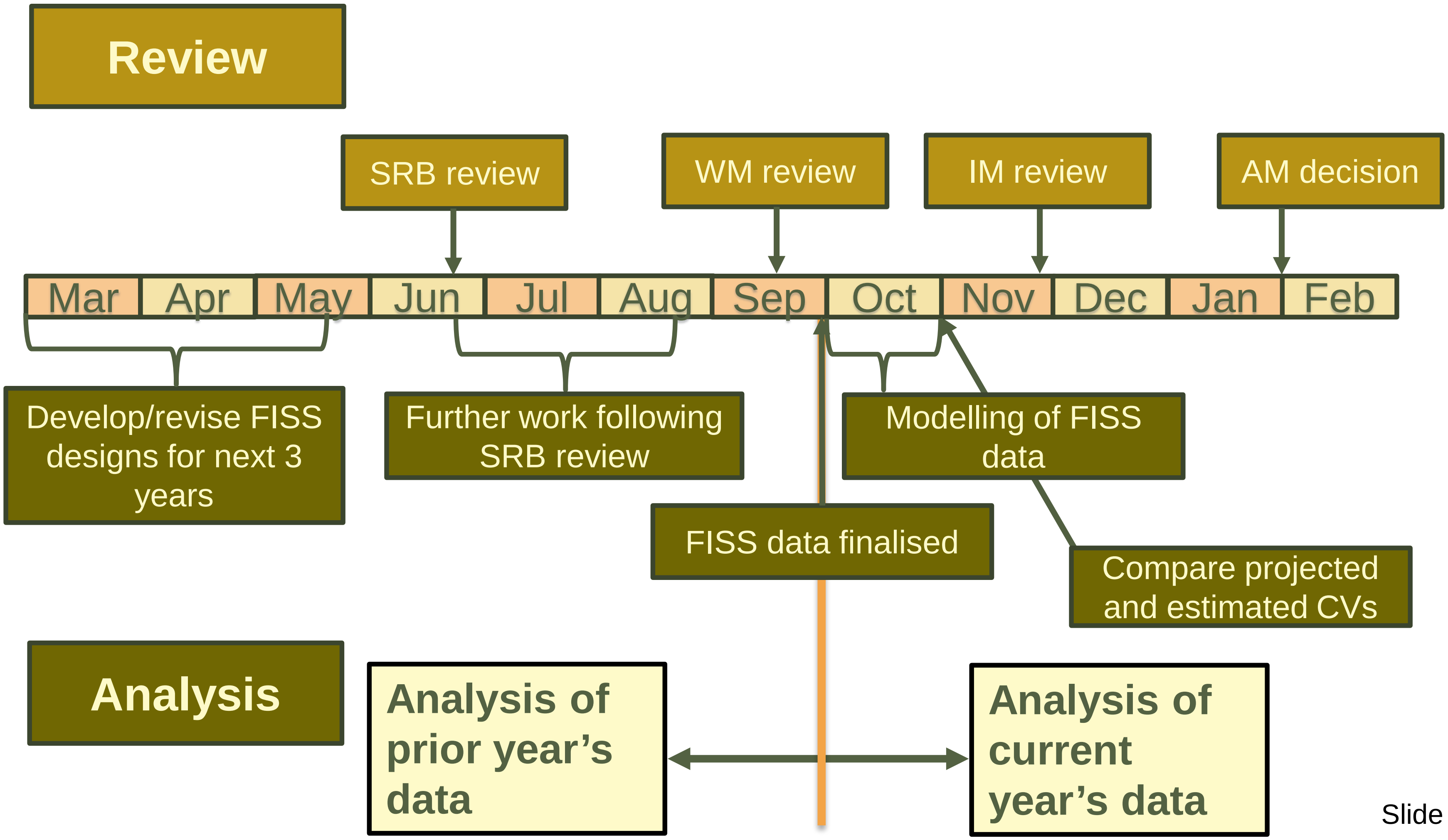
Stakeholder input

- Consultation with industry and stakeholders occurs throughout the FISS planning process
  - Input is particularly valuable in finalizing design details as part of the FISS charter bid process, when stations can be added to provide for improved logistical efficiency.
- We also note the opportunities for stakeholder input during public meetings (Interim and Annual Meetings) and through the IPHC's Research Advisory Board.

Annual FISS design review/analysis timeline



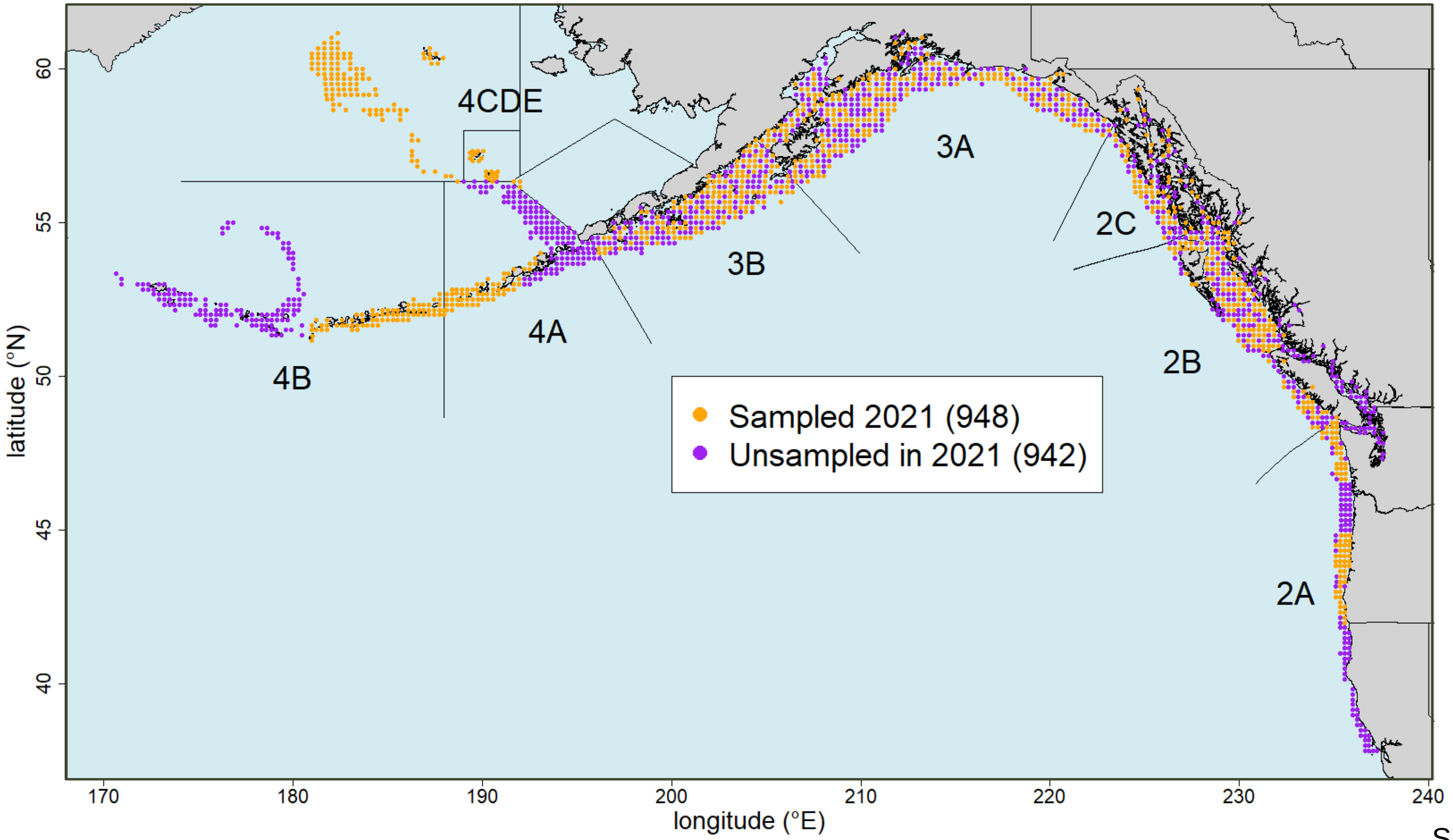
Annual FISS design review/analysis timeline



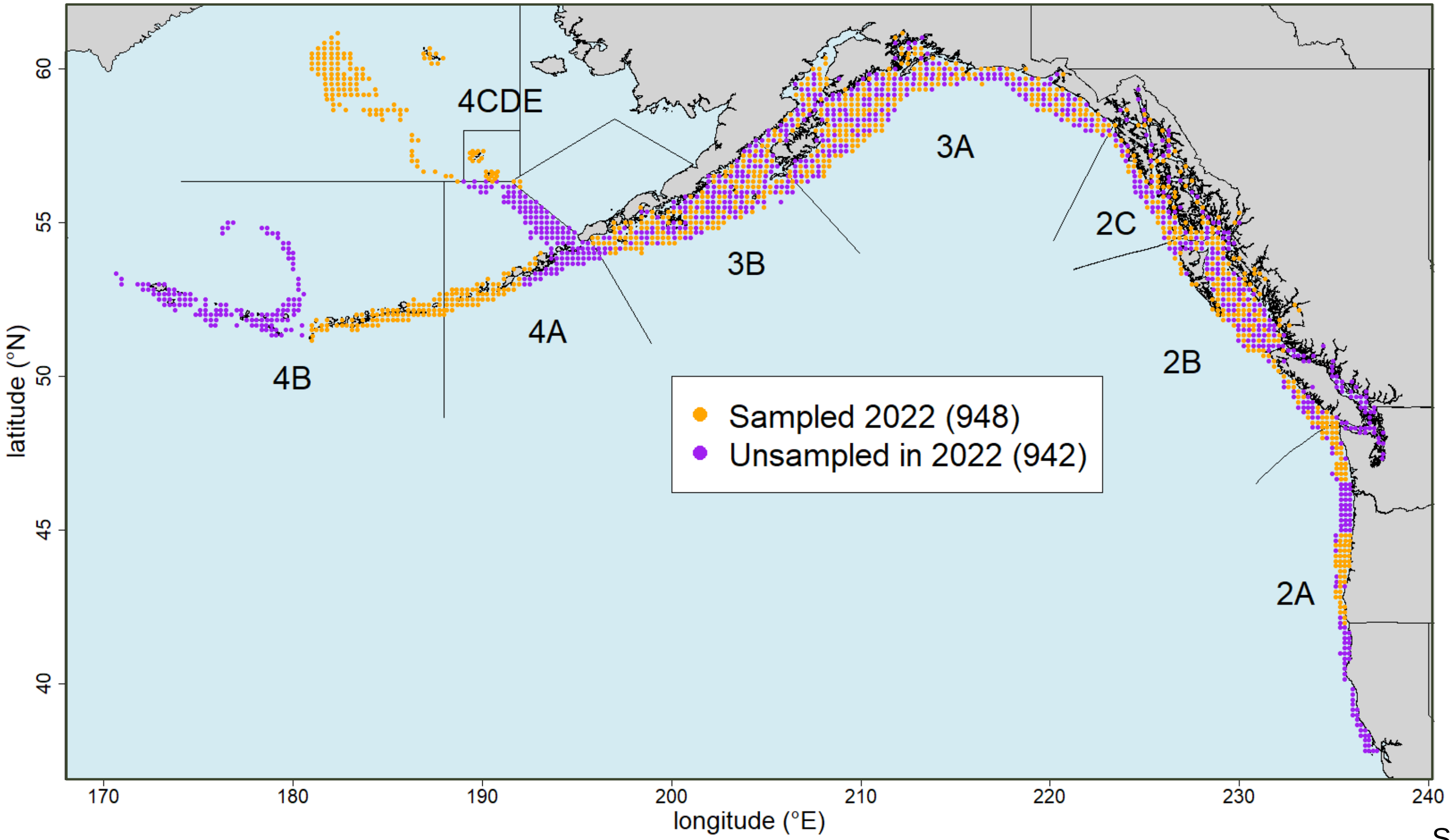
Proposed FISS designs for 2021-23

- Due to budgetary constraints and the impact of COVID-19, neither the proposed nor adopted AM096 designs were implemented in 2020
- Instead, sampling was only conducted within the core areas (2B, 2C, 3A and 3B) for the 2020 FISS
- Because of this, our proposal for 2021-23 is to shift the 2020-22 Secretariat-preferred compromise proposal presented at AM096 to instead be implemented in 2021-23
- This design uses efficient subarea sampling in IPHC Regulatory Areas 2A, 4A and 4B, but incorporates a randomized design in IPHC Regulatory Areas 2B, 2C, 3A; and
- It is likely that this design represents the maximum effort that can be deployed outside the core areas in coming years, while still meeting the Secondary Objective.

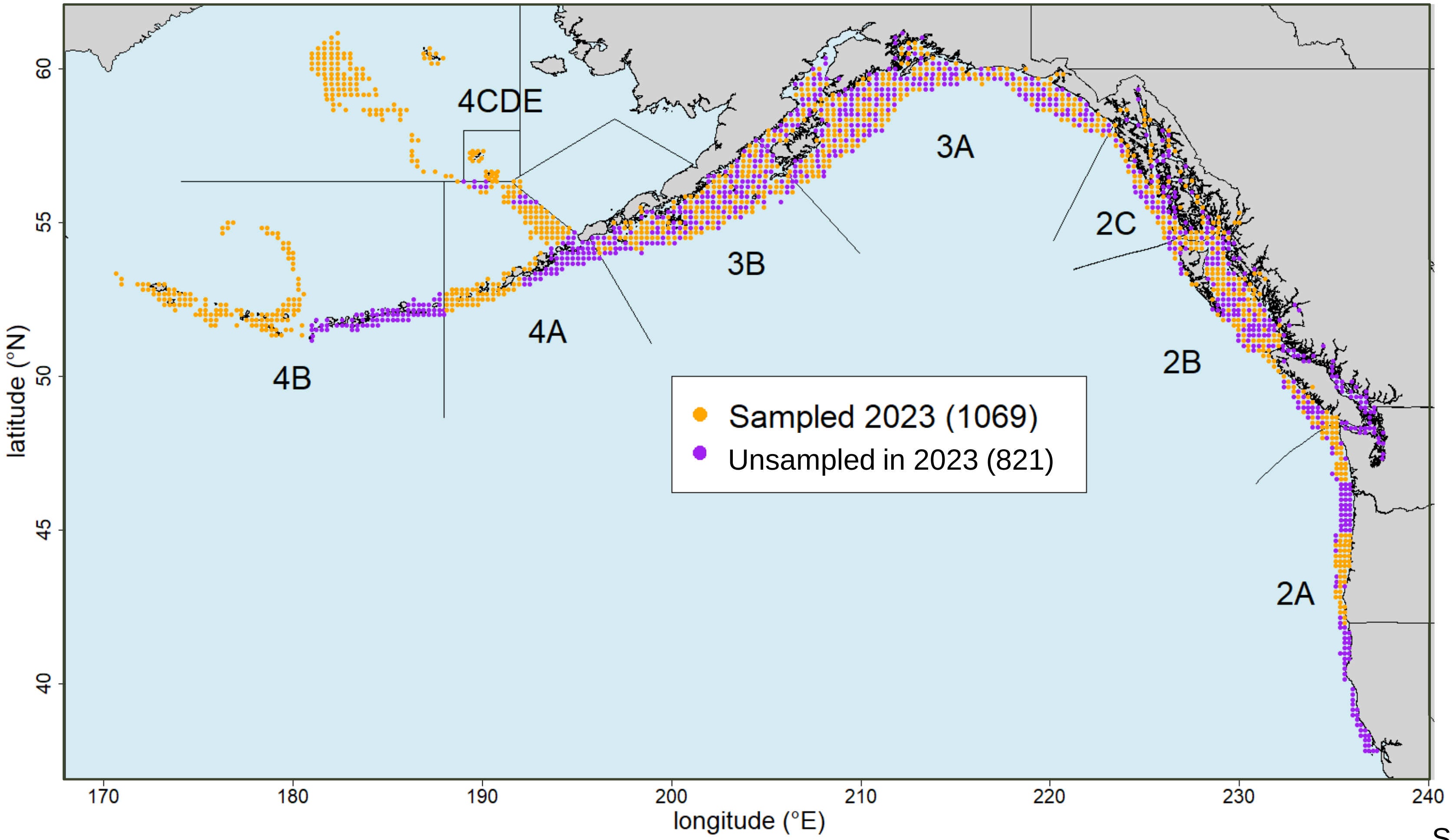
Proposed 2021 FISS design



Proposed 2022 FISS design



Proposed 2023 FISS design



Projected CVs

- The proposed designs have high sampling rates in Regulatory Areas 2B, 2C, 3A, 3B and 4CDE
  - CVs will remain well within limits (15% per Reg. Area)
- Randomised or full sampling designs in these areas will result in unbiased estimation
- In other Reg. Areas we project the following CVs (%) following completion of the 2023 FISS:

Reg. Area	2020	2021	2022	2023
2A	22	13	13	15
4A	16	9	9	10
4B	16	11	10	13

Scientific Review Board comments

- In its report for SRB017, the SRB stated:

"The SRB RECOMMENDED that the Commission endorse the final 2021 FISS design as proposed by IPHC Secretariat, and provided at Appendix IVa.";

and

"The SRB provisionally ENDORSED the 2022 and 2023 FISS design proposals provided at Appendix IVb and IVc, recognizing that these will be reviewed again at subsequent SRB meetings."

Annual revision of FISS design proposals

- As new FISS data come in each year, we revise our understanding of the spatial distribution of Pacific halibut.
- Local contraction or expansion of the distribution, or changes in inter-annual variability in subareas, can lead to revisions in the future frequency of FISS sampling in each subarea that will be incorporated into subsequent design proposals.

Consideration of cost

- The proposed FISS designs for 2021-23 incorporate some consideration of cost
  - Logistically efficient subarea designs are proposed in lower-density IPHC Regulatory Areas.
- The goal here was to provide statistically efficient and logistically feasible designs for consideration by the Commission
- The FISS is funded by sales of captured fish and is intended to have long-term revenue neutrality, meaning that any design must also be evaluated in terms of the following factors:
  - Expected catch of Pacific halibut
  - Expected Pacific halibut sale price
  - Charter vessel costs, including relative costs per skate and per station
  - Bait costs
  - IPHC Secretariat costs

Consideration of cost

- Balancing these factors may result in modifications to the design proposals:
  - e.g. may need to increase sampling effort in high-density regions and decrease effort in low density regions
- At present, with stocks near historic lows and low prices for fish sales, the current funding model may require that some low-density habitat be omitted from the design entirely, as occurred in 2020
- This will have implications for data quality, particularly if such reductions in effort relative to proposed designs continue over multiple years.

Recommendations

That the Commission:

1) **NOTE** paper IPHC-2020-IM096-07 that provides background on and reviews the methods for the IPHC's Fishery-Independent Setline Survey (FISS) rationalisation following the 2014-19 expansion series, and proposes FISS designs for 2021-23 for endorsement;
2) **ENDORSE** the final 2021 FISS design as proposed by the IPHC Secretariat, as recommended by the SRB, and provided at Figure 3 of IPHC-2020-IM096-07;
3) provisionally **ENDORSE** the 2022 and 2023 FISS design proposals provided at Figures 4 and 5 respectively of IPHC-2020-IM096-07, recognizing that these will be reviewed again in 2021 and 2022 at the SRB, Interim and Annual Meetings.

INTERNATIONAL PACIFIC

HALIBUT COMMISSION

INTERNATIONAL PACIFIC

HALIBUT COMMISSION

Summary of the 2020 data and stock assessment, and decision table for 2021

Agenda item 6.4

IPHC-2020-IM096-08 Rev_1

IPHC Secretariat acknowledgement

- Despite the challenges in 2020, data sets are nearly as complete and precise as in recent years
- The extra work at each step from sampling to finalizing these data has allowed for a normal stock assessment process and the calculation of all standard results

Photo credit: D. Jackson

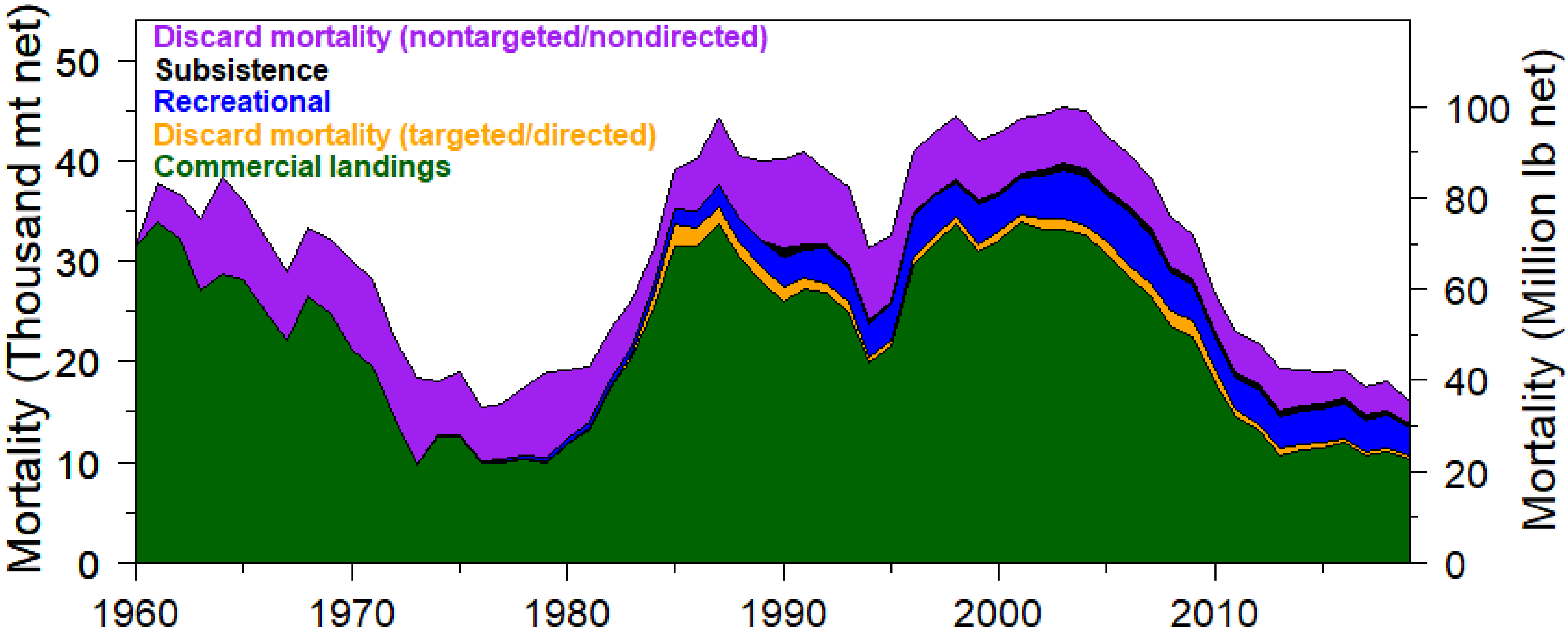
Summary

- 2011-2012 year classes present in both the IPHC Fishery-Independent Setline Survey (FISS) (3rd observation) and fishery (1st observation)
- Strength of these year classes remains uncertain
- Further stock declines projected
- Change in reference level of fishing intensity (to $F_{43\%}$) has buffered the change in the 2021 coastwide reference TCEY
- Stock distribution estimates increased in Biological Region 3 and decreased in Biological Region 2

Outline

- Data sources
- Modelling results
- Projections and decision table
- Interim management procedure results

Historical mortality



Reductions across most sectors in 2020

2020 Mortality

Projected from AM096

Year	Commercial Landings	Commercial discards	Recreational	Subsistence	Non-directed discards	Total
2020	23.11	0.88	6.86	1.06	6.29	38.19

(3-yr avg.)

2020 Mortality

Projected from AM096

Year	Commercial Landings	Commercial discards	Recreational	Subsistence	Non-directed discards	Total
2020	23.11	0.88	6.86	1.06	6.29	38.19

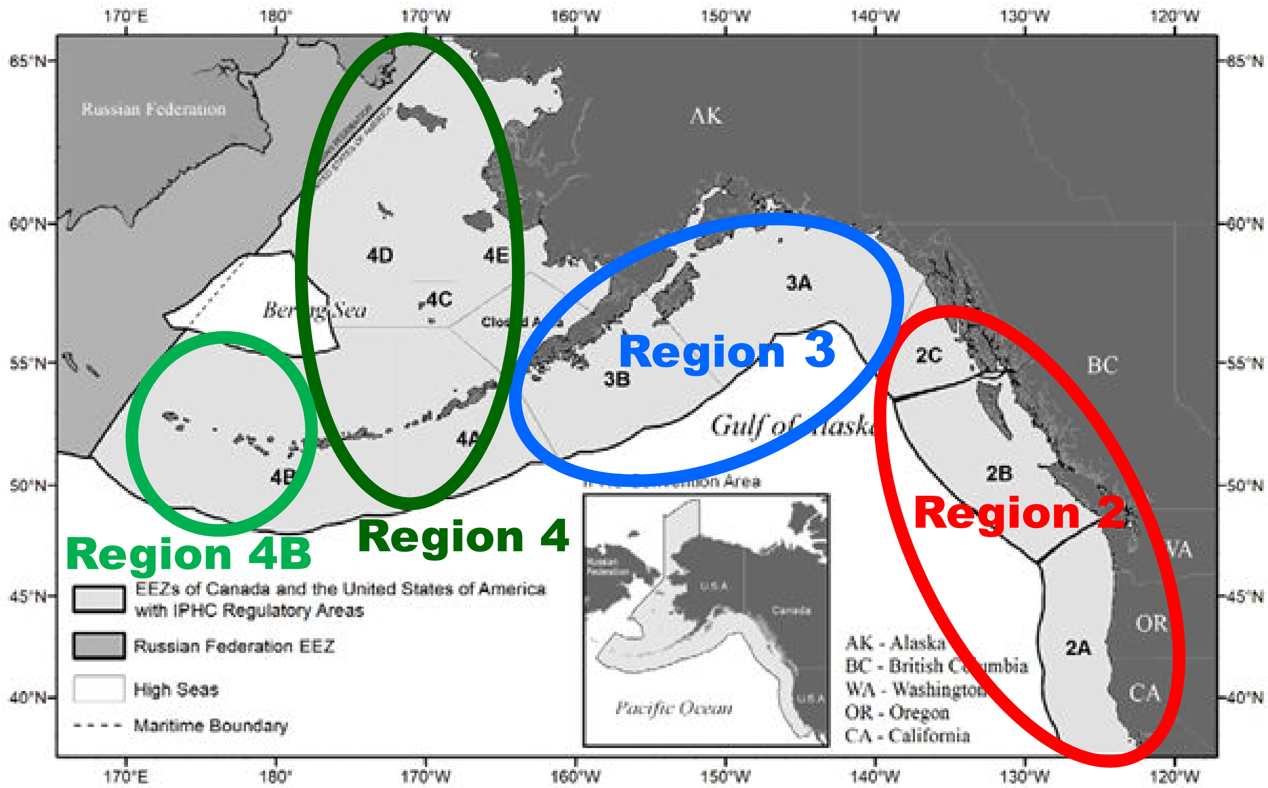
(3-yr avg.)

Estimated this year

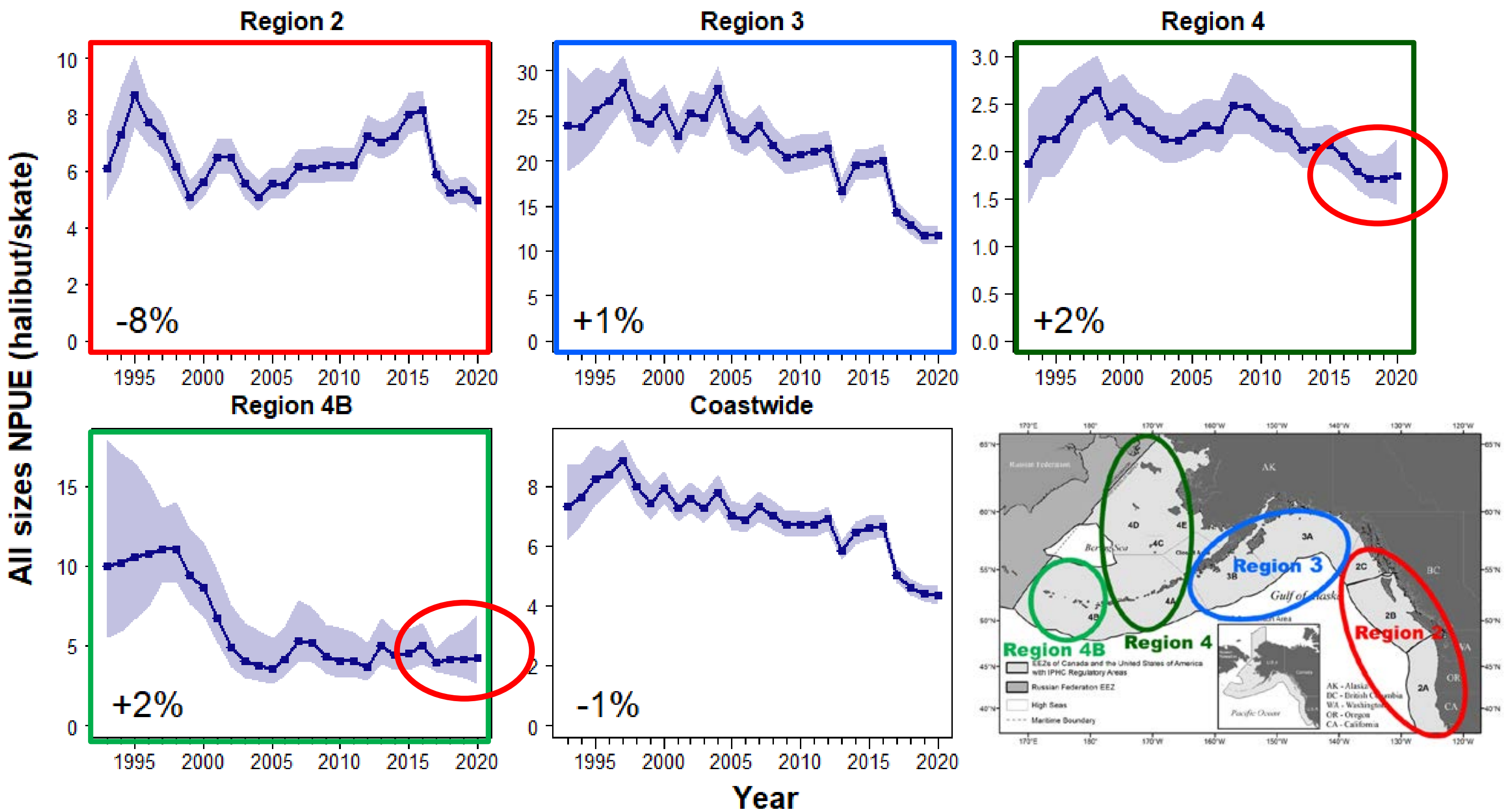
Year	Commercial Landings	Commercial discards	Recreational	Subsistence	Non-directed discards	Total
2020	22.70	0.77	5.96	1.06	5.03	35.50

3-yr avg. = **5.90**

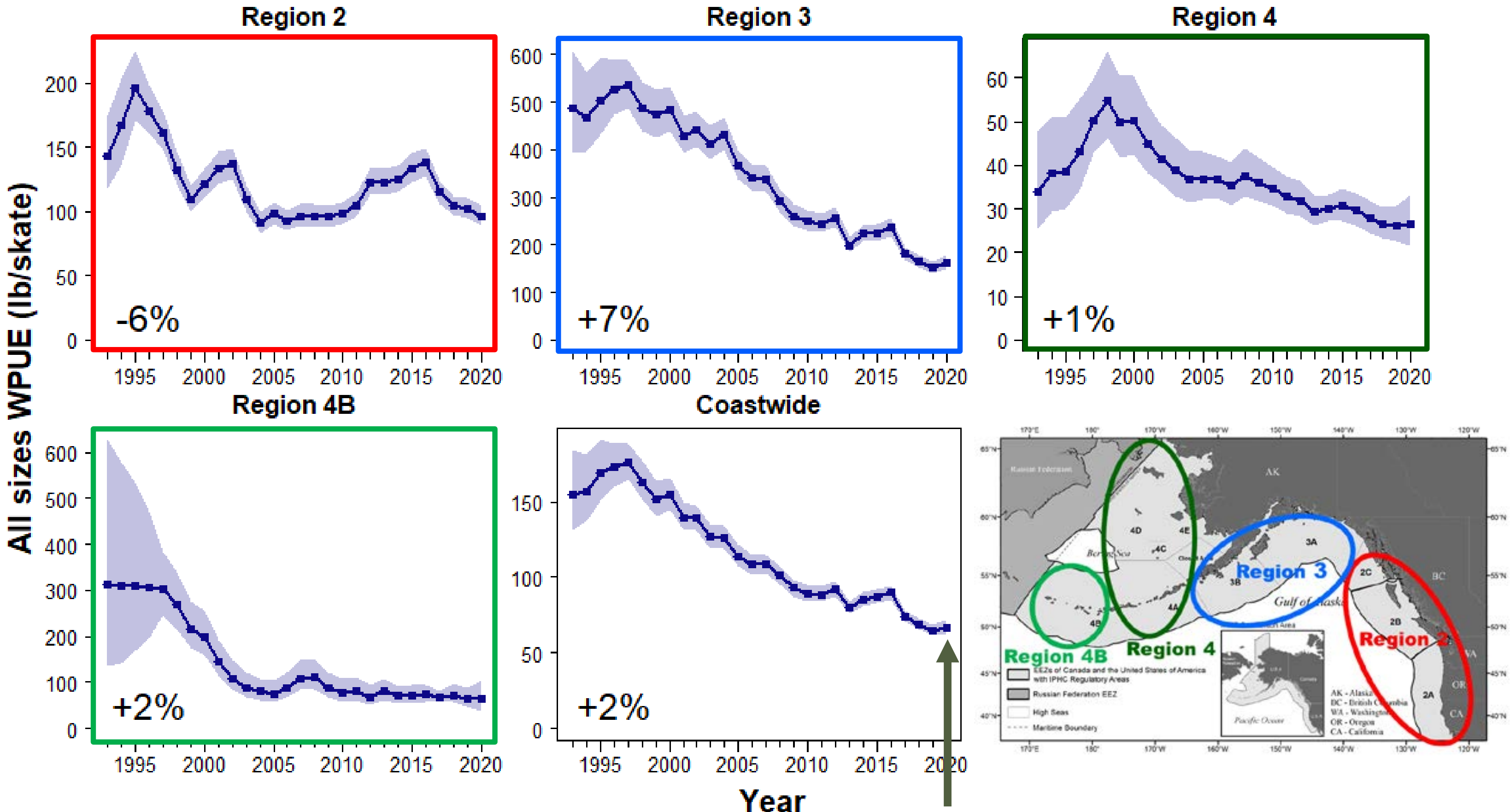
Biological regions



Modelled survey trends (Numbers)

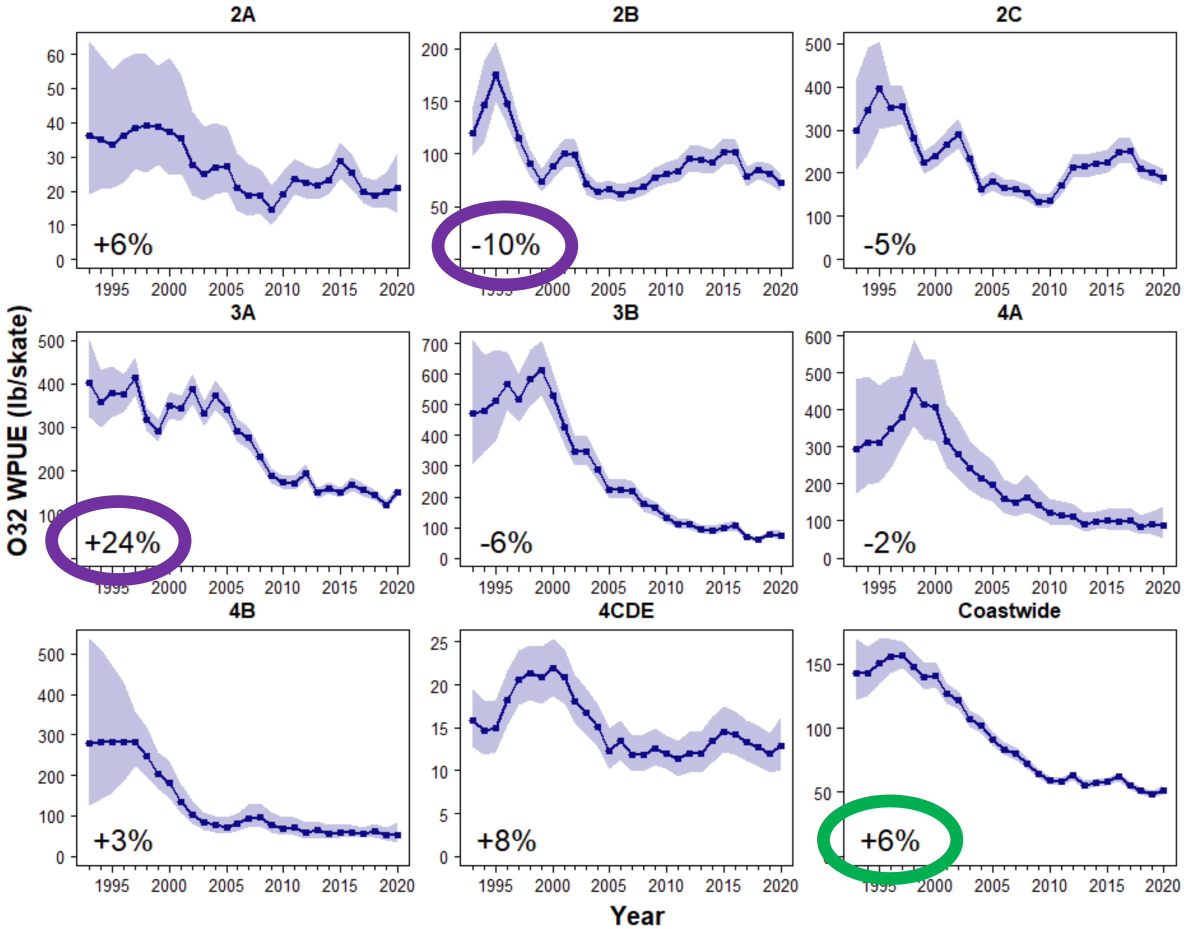


Modelled survey trends (all sizes WPUE)



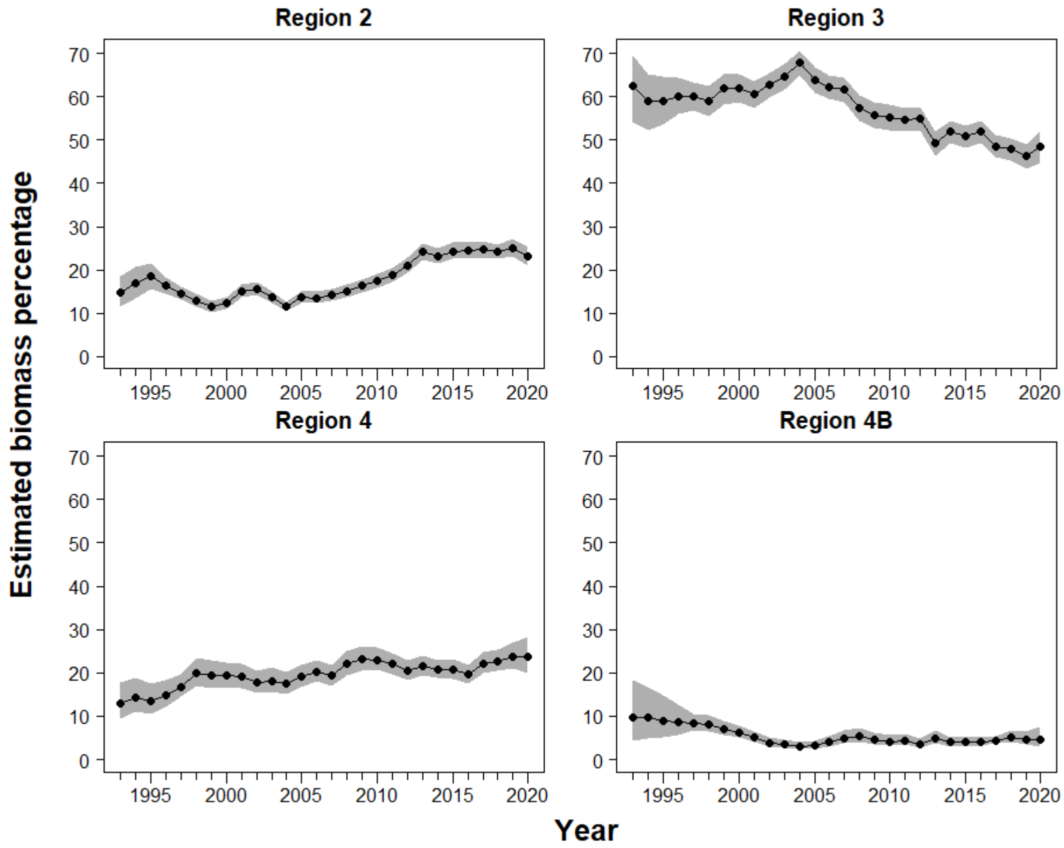
Indicates more productivity from growth than recruitment

Modelled survey trends (O32 WPUE)



Indicates growth productivity is from O32 sizes

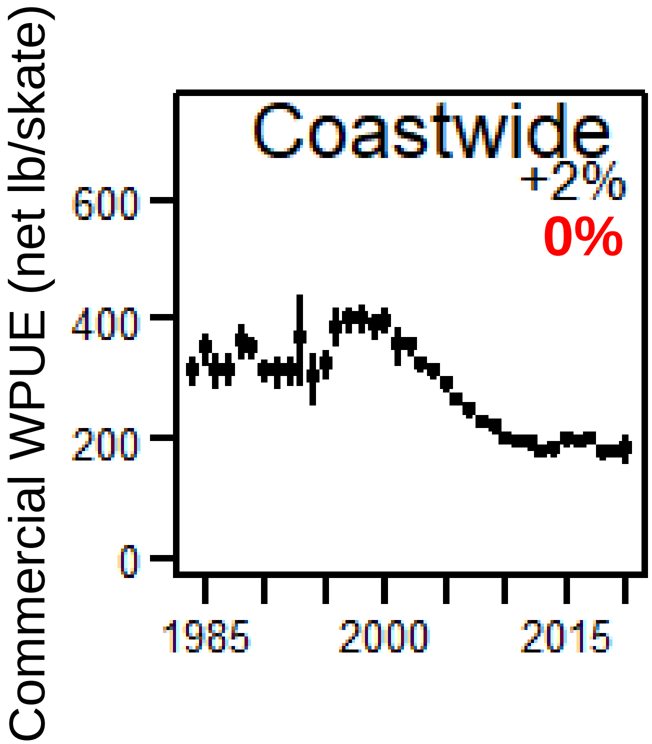
Biological stock distribution (all sizes)



Biological stock distribution (all sizes)

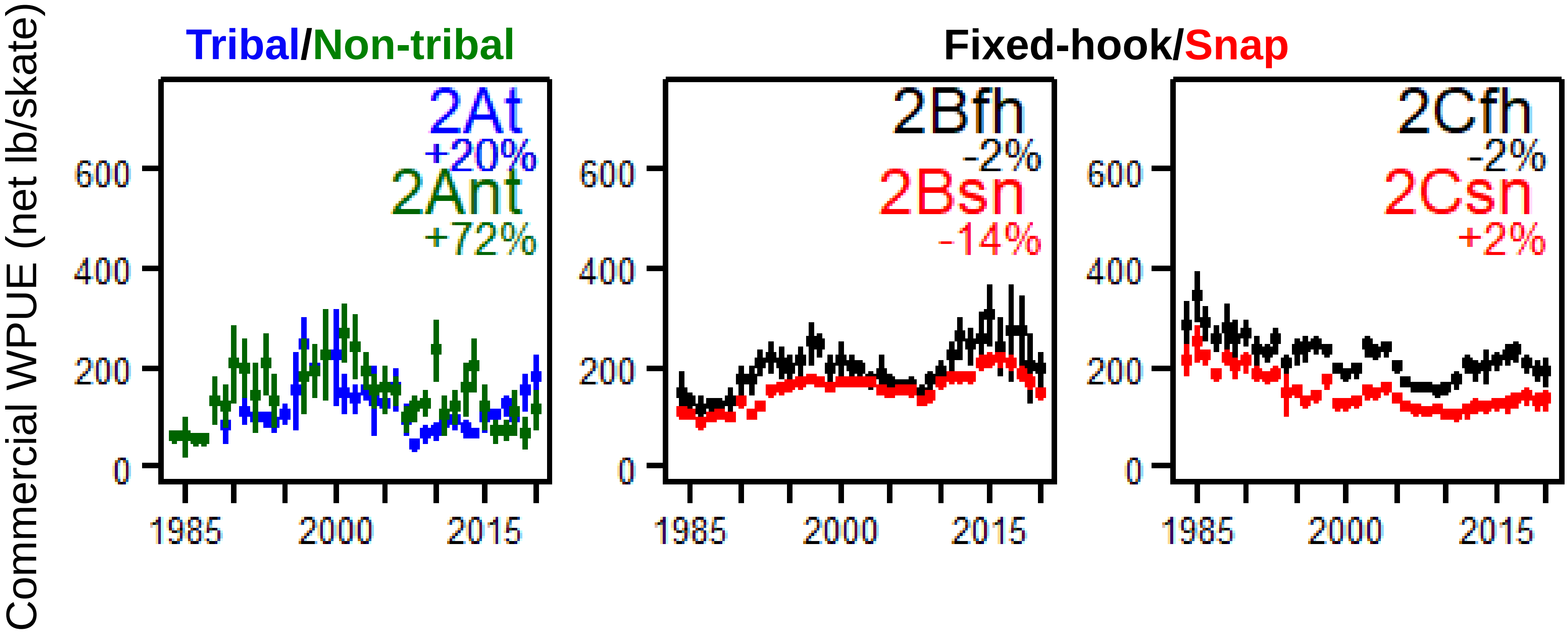
Year	Region 2 (2A, 2B, 2C)	Region 3 (3A, 3B)	Region 4 (4A, 4CDE)	Region 4B
2016	24.4%	51.9%	19.6%	4.1%
2017	24.7%	48.6%	22.3%	4.5%
2018	24.2%	47.9%	22.8%	5.2%
2019	25.0%	46.4%	23.9%	4.7%
2020	23.1%	48.5%	23.6%	4.7%

Fishery trends

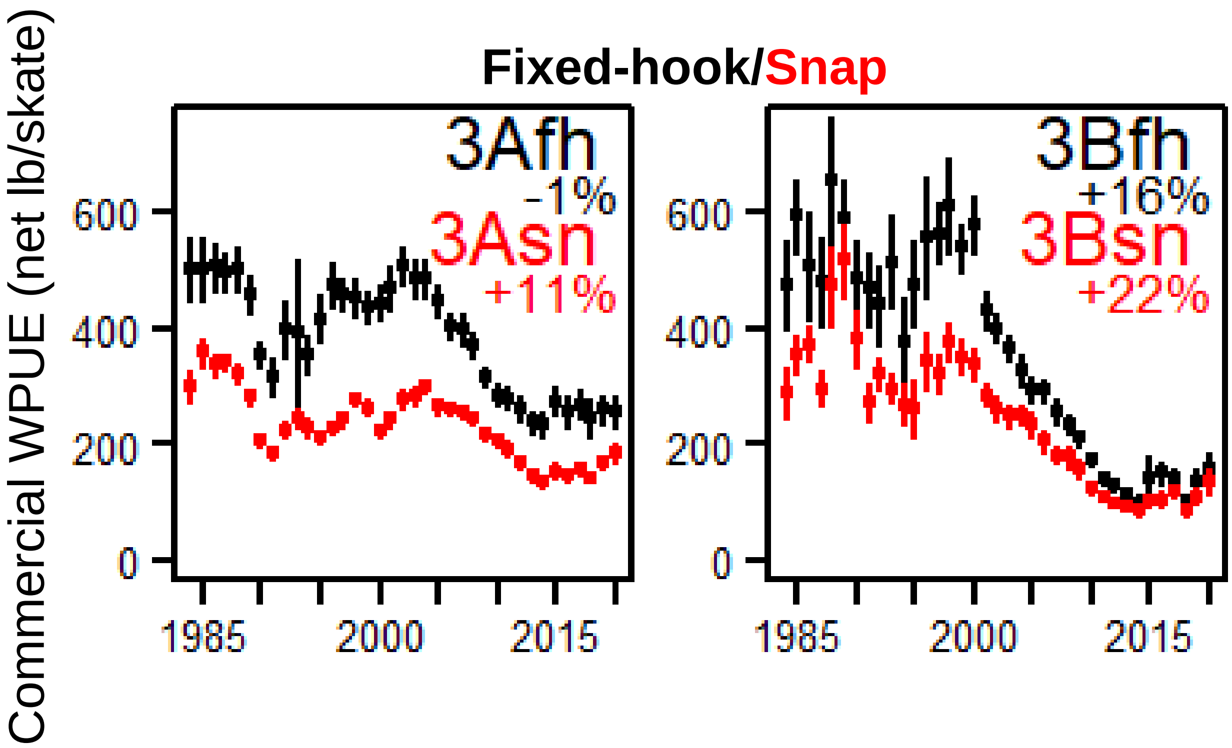


after accounting for logs not yet collected

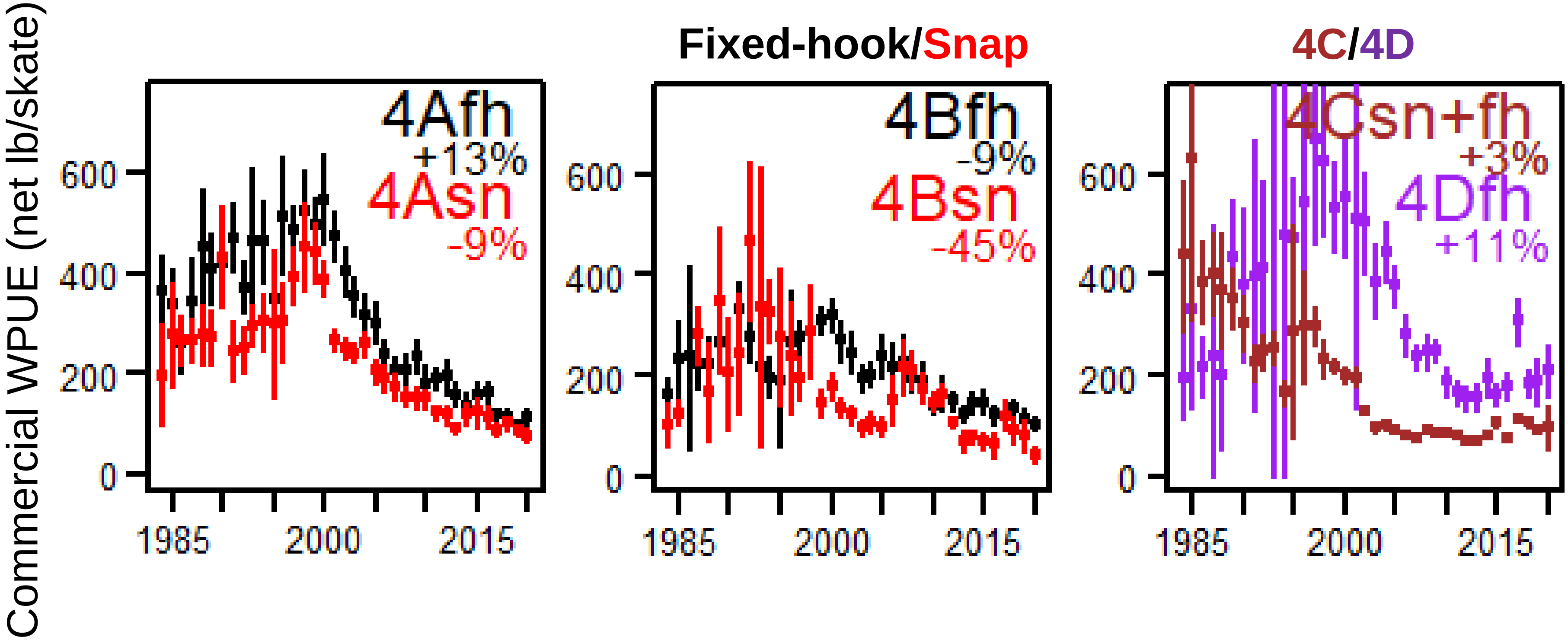
Fishery trends: Region 2



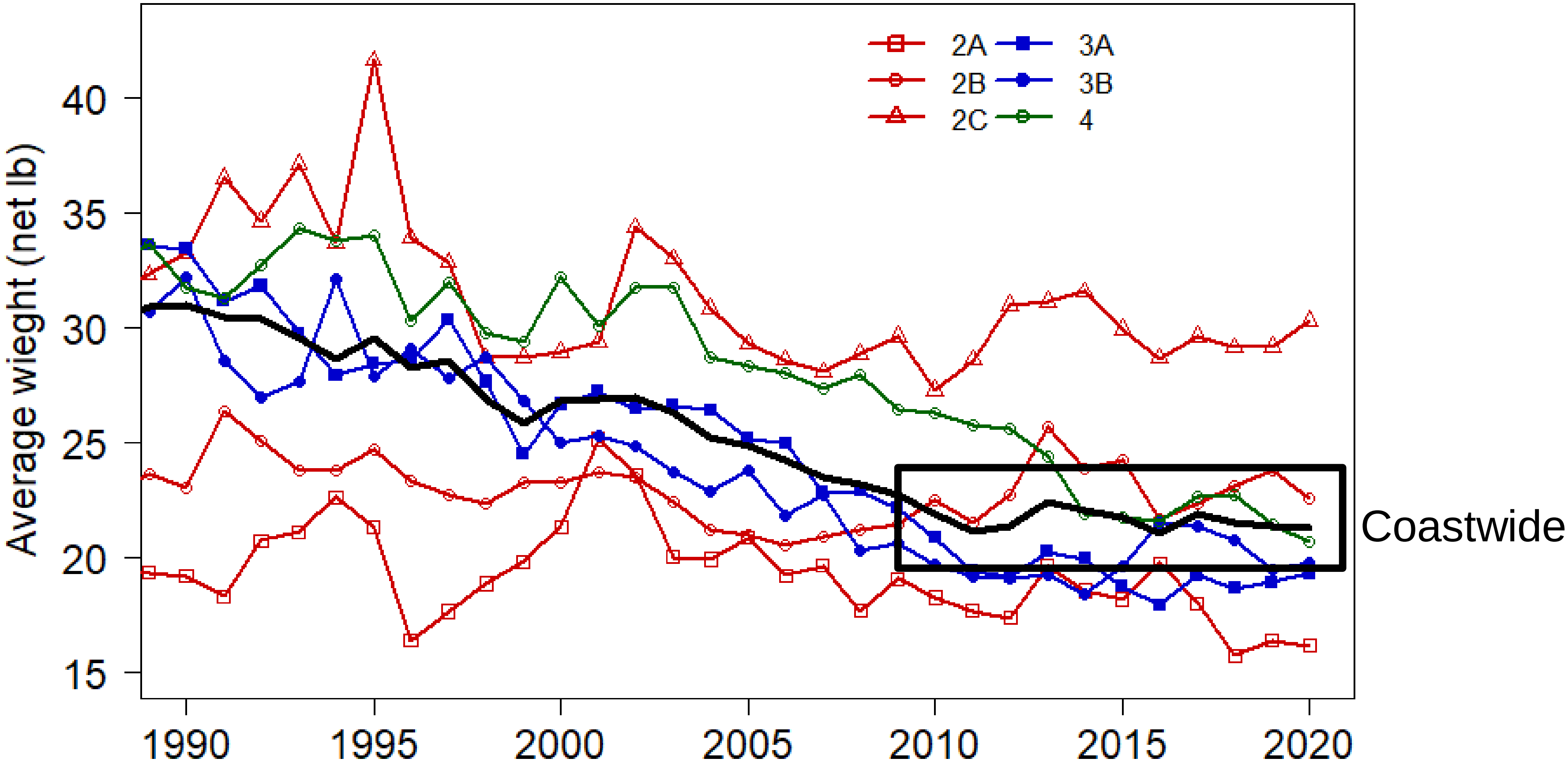
Fishery trends: Region 3



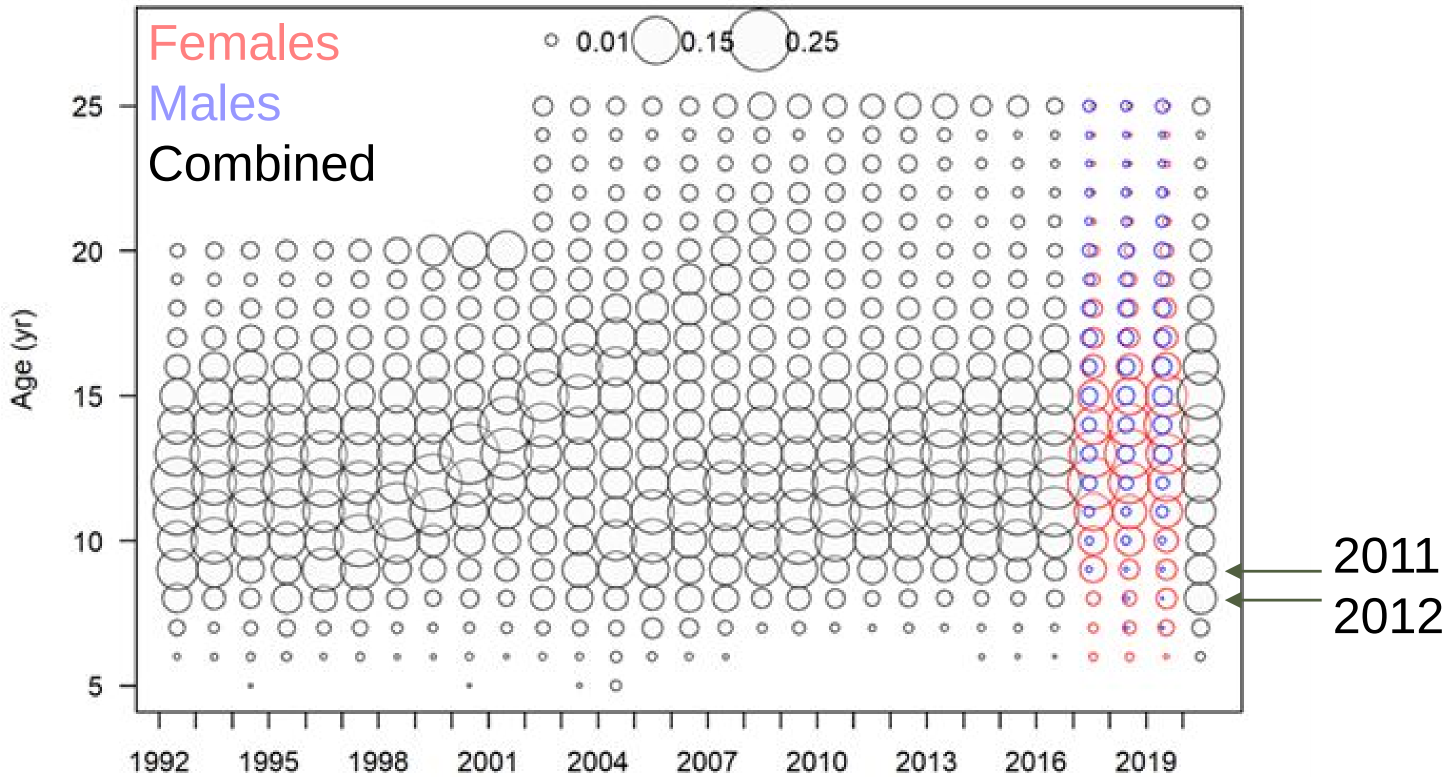
Fishery trends: Region 4



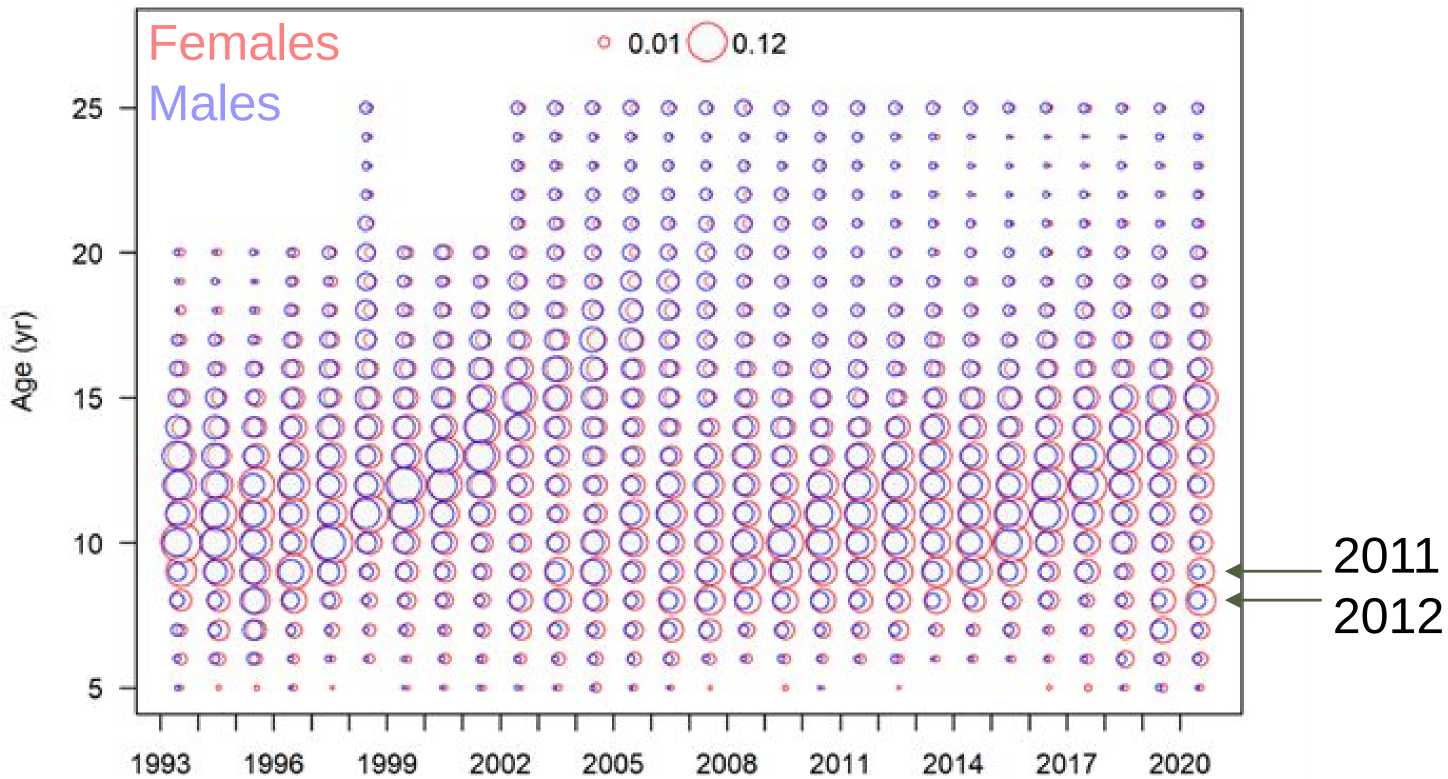
Average weight landed



Recent fishery ages



Recent FISS ages



FISS interactive: Tracking cohorts

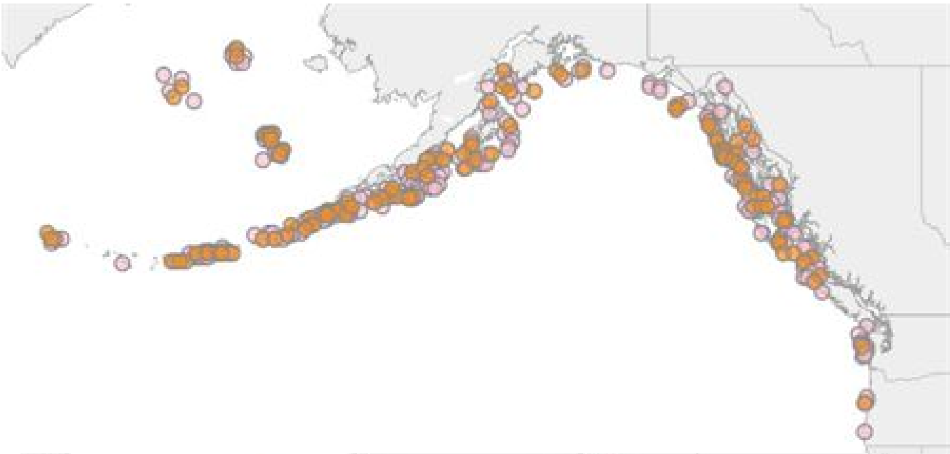
2005 cohort at age 6

2005 cohort at age 9

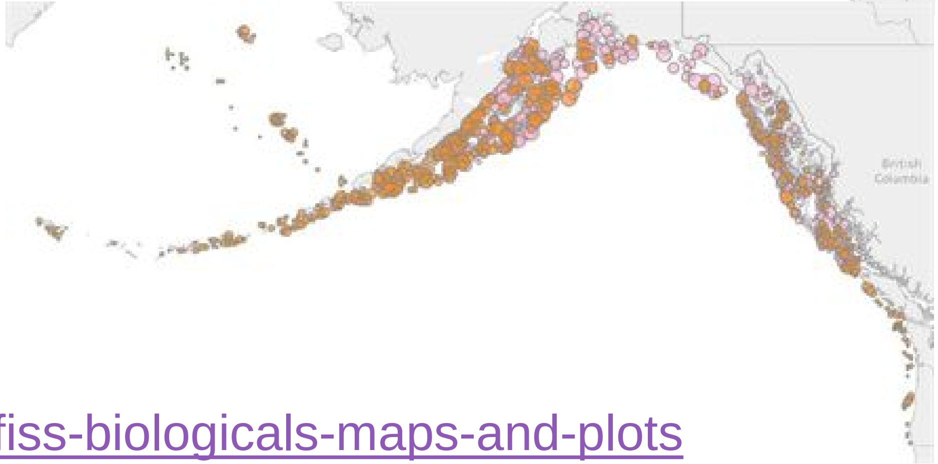
See: https://www.iphc.int/data/fiss-biologicals-maps-and-plots

FISS interactive: Tracking cohorts

2011-2012 cohorts at age 6



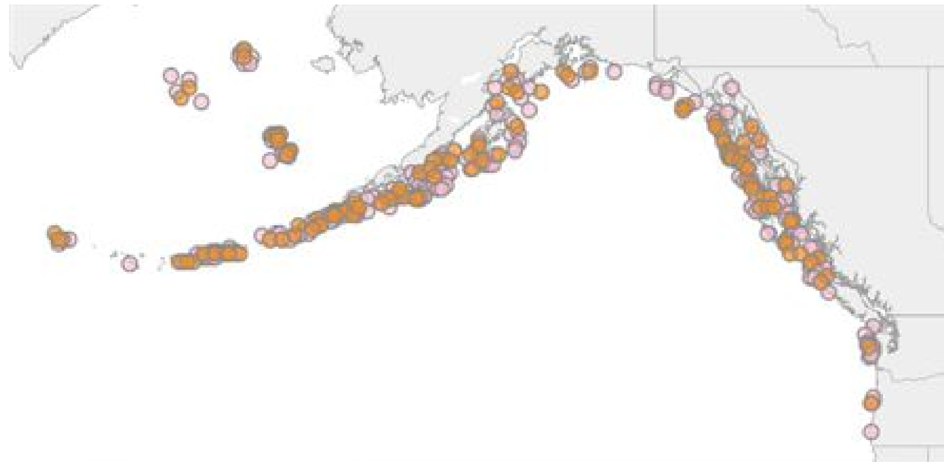
2011-2012 cohorts at age 8



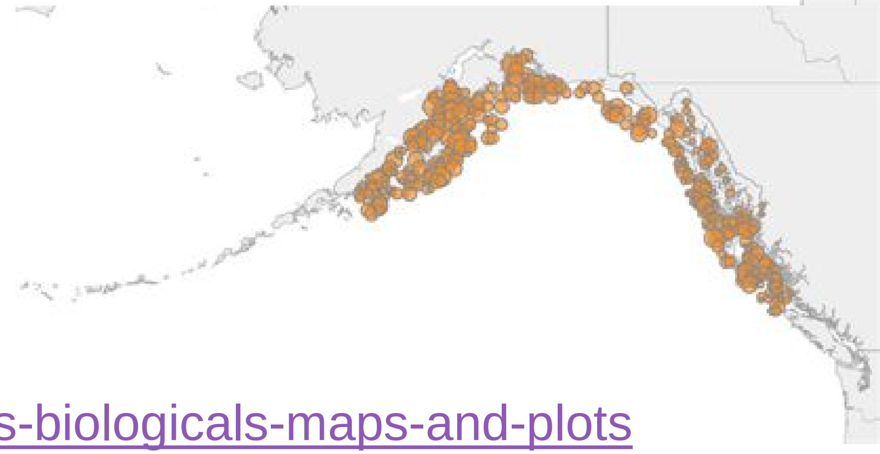
See: https://www.iphc.int/data/fiss-biologicals-maps-and-plots

FISS interactive: Tracking cohorts

2011-2012 cohorts at age 6



2011 cohort at age 9



See: https://www.iphc.int/data/fiss-biologicals-maps-and-plots

FISS interactive: Length-at-age

Female Pacific halibut in 3A:
5-year increasing trend ages <14

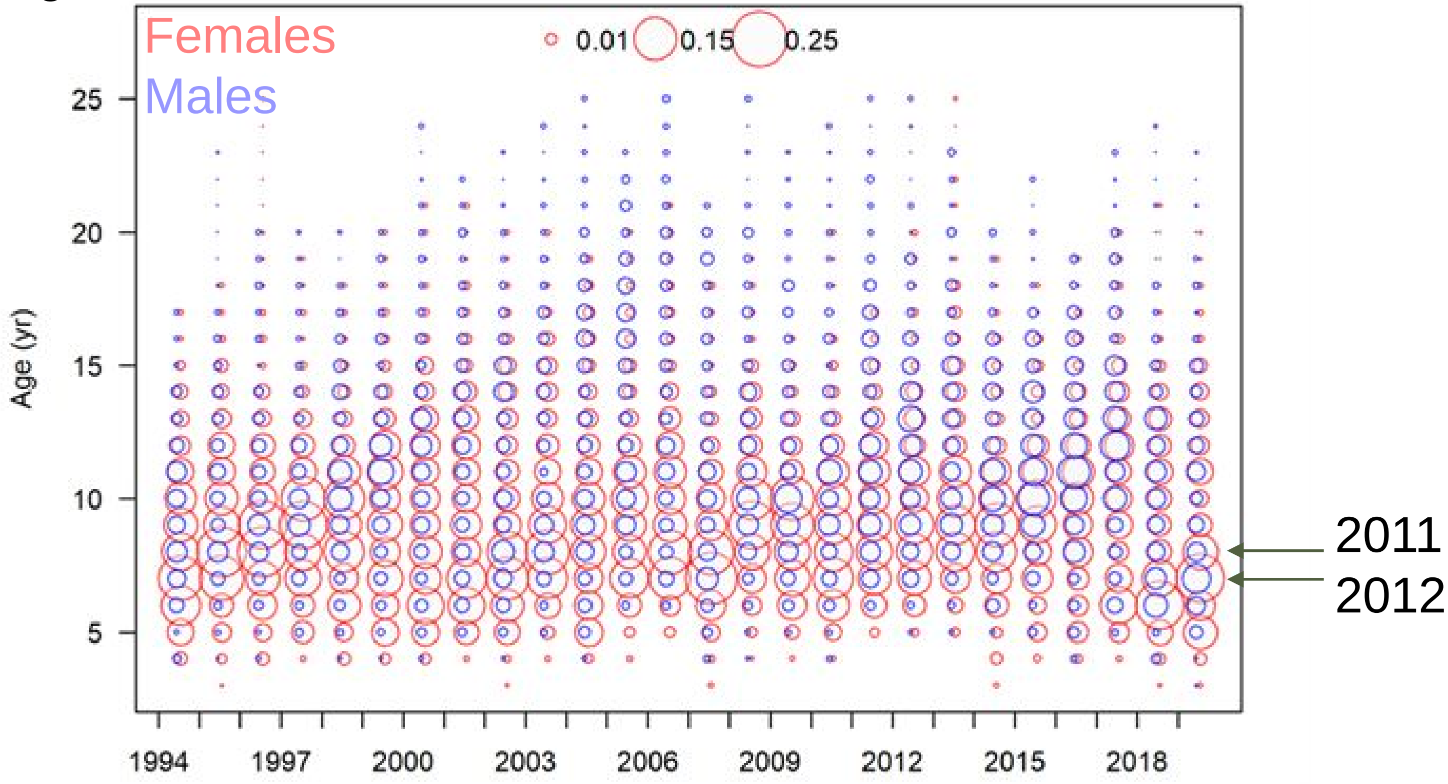
See: https://www.iphc.int/data/fiss-biologicals-maps-and-plots

New biological data for 2020

- Sex-specific age composition information from the recreational fishery in 3A
- Sex-specific age composition information from the 2019 directed commercial fishery

Recreational age data

Average: 72% female



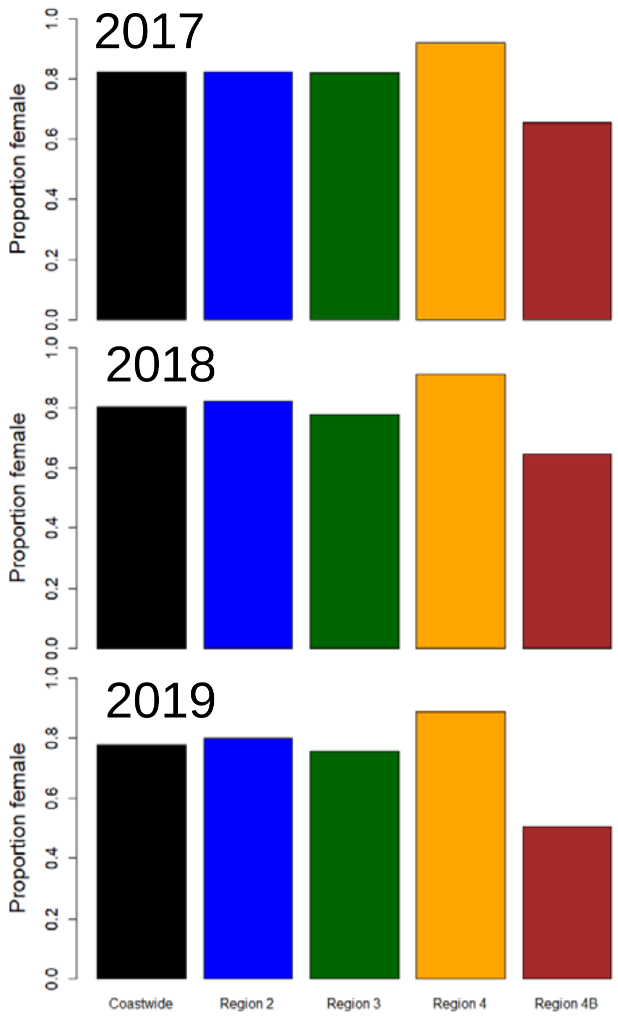
Thanks to Sarah Webster (ADFG)

Directed commercial fishery sex-ratios

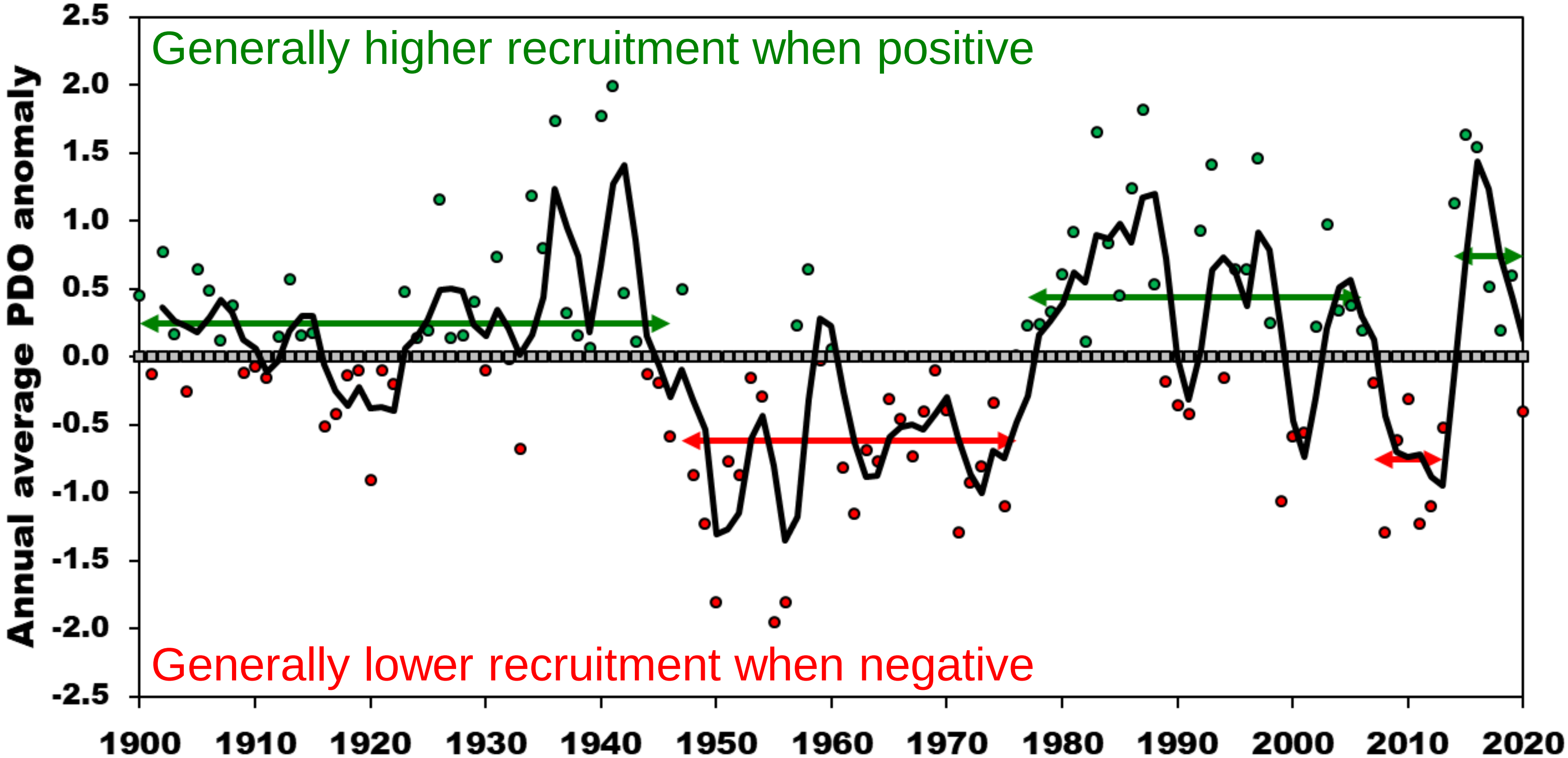
Percent female

	Coastwide	Region 2	Region 3	Region 4	Region 4B
2017	82%	82%	82%	92%	65%
2018	80%	82%	78%	91%	65%
2019	78%	80%	76%	89%	51%

(Note small sample sizes in 4B: ~ 10-17 trips per year)



Ecosystem conditions: Pacific Decadal Oscillation



Ecosystem conditions

- More normal ice conditions in the Bering Sea (2019/20 winter) than 2017/18 & 2018/19
- Intermittent 'heatwave' conditions in the Gulf of Alaska during 2020 summer

Reference

Ecosystem Status report - preview: https://meetings.npfmc.org/Meeting/Details/1566

Data highlights

- 2011 and 2012 year-classes now present throughout the stock, fishery and FISS
- Fishery and FISS trends are consistent with individual growth within these year-classes
- Size-at-age may be starting to improve at younger ages

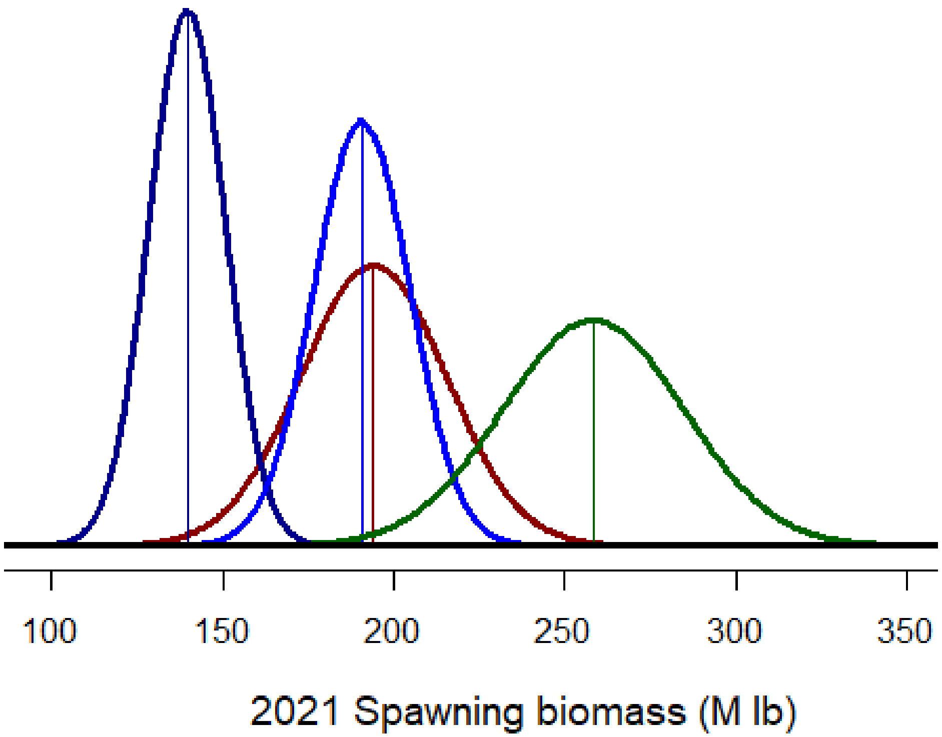
Outline

- Data sources
- Modelling results
- Projections and decision table
- Interim management procedure results

The 2020 assessment

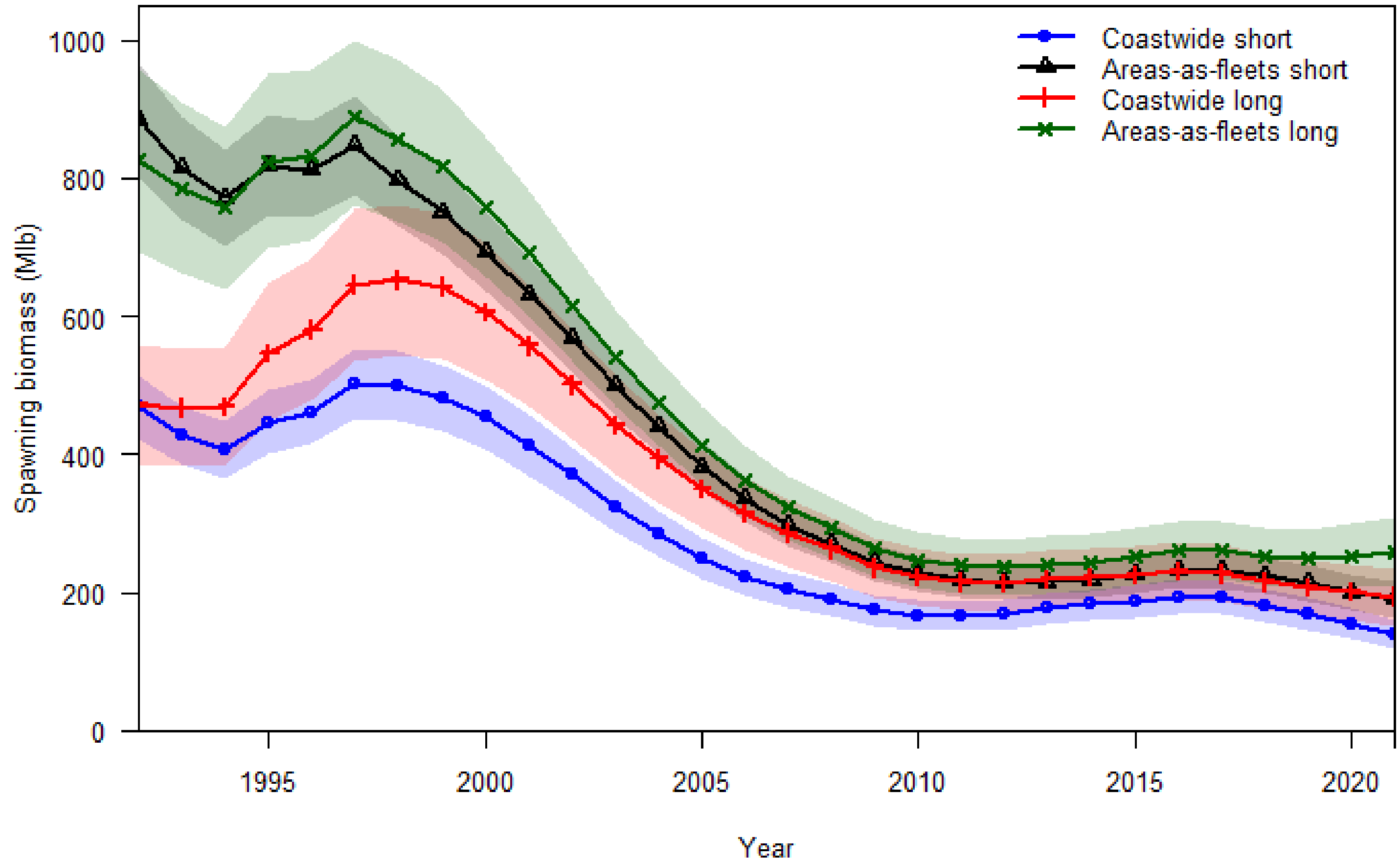
- Update to the full assessment in 2019
- No major changes in structure or methods
- Incremental changes reviewed by the SRB in June and September
- All data updated for 2019 (where needed) and added for 2020

Modelling summary: four individual models

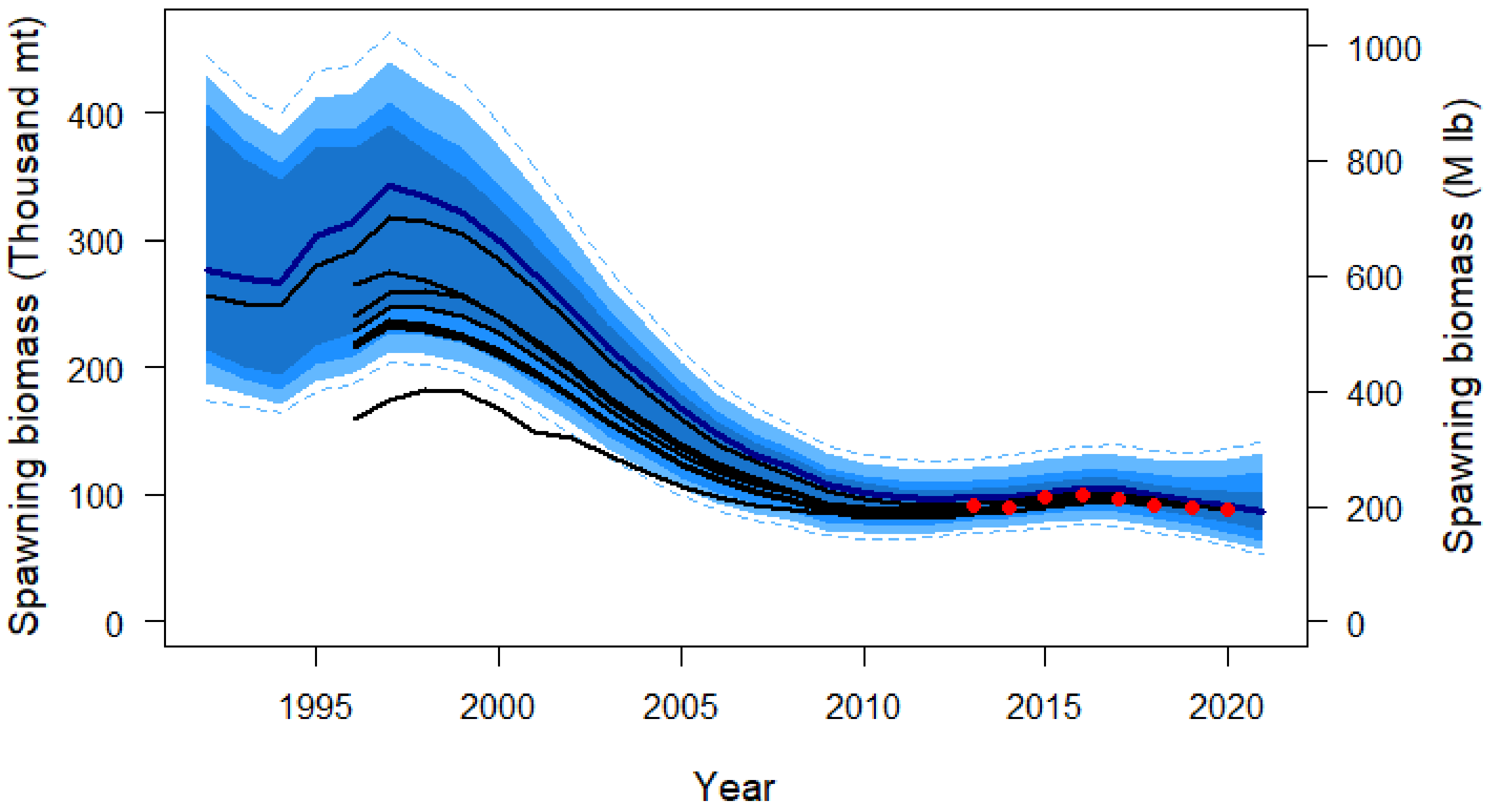


- Four ways to aggregate the data
- Respond differently to trend and age data by Region
- Provide stability from year to year as individual model results change

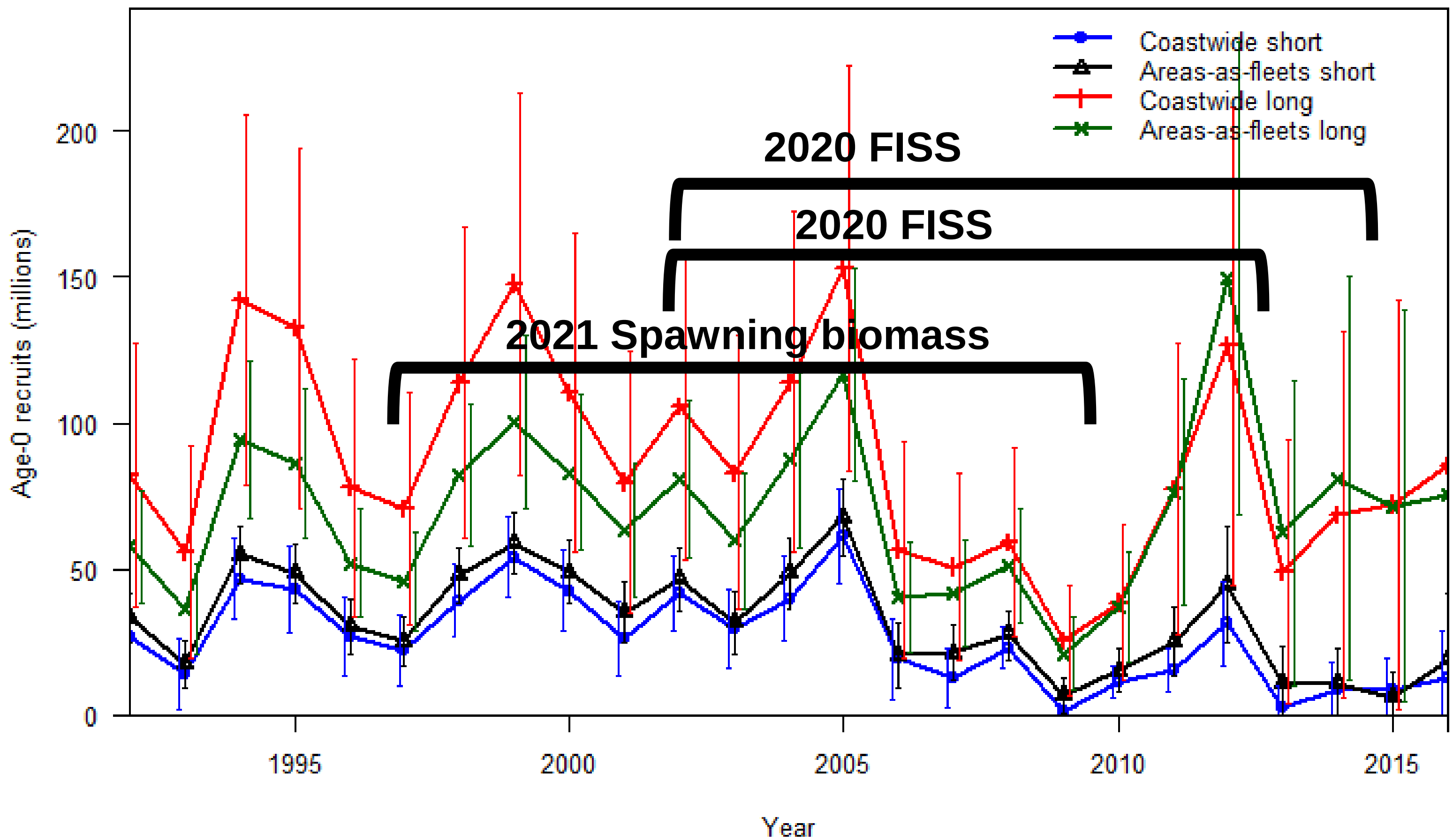
Modelling summary: four individual models



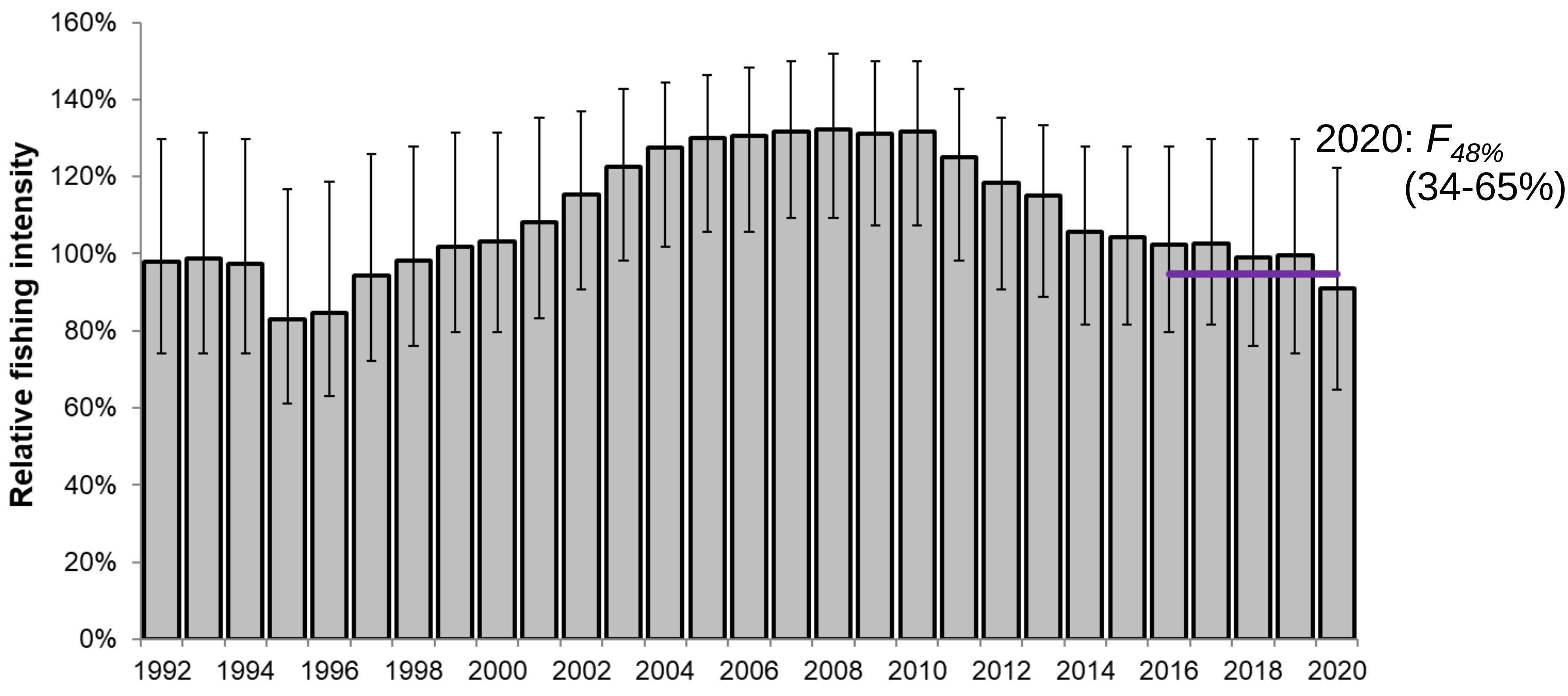
Comparison with previous assessments



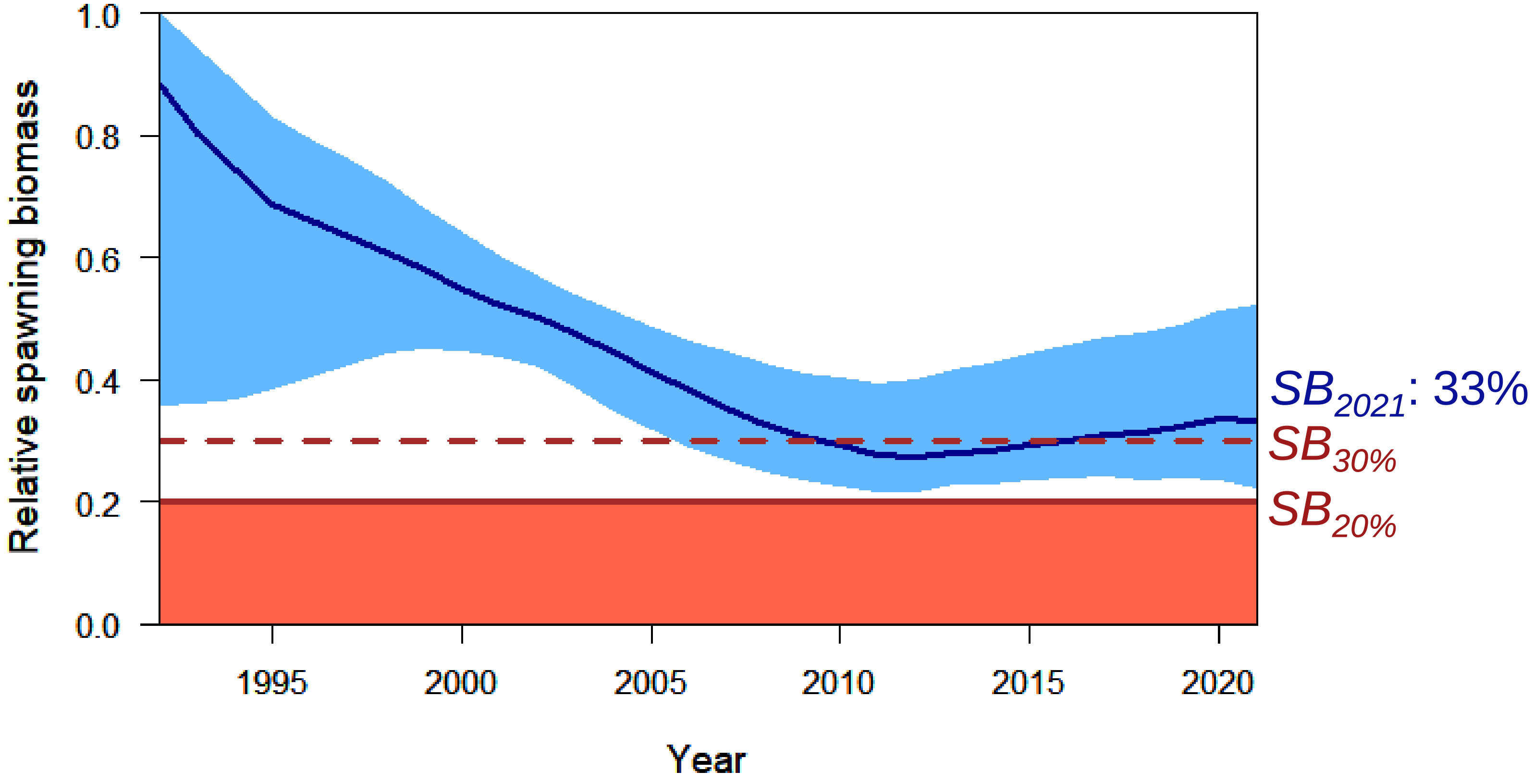
Recruitment estimates



Fishing intensity



Relative spawning biomass



Assessment summary table

Indicators	Values	Trends	Status
Total mortality 2020: Retained catch 2020: Average mortality 2016-20:	35.50 Mlbs, 16,103 t 29.65 Mlbs, 13,449 t 39.59 Mlbs, 17.959 t	Mortality decreased from 2019 to 2020	2020 mortality near 100-year Low
SPR_{2020}: P(SPR<43%): P(SPR<limit):	48% (34-65%) 38% Limit not specified	Fishing intensity decreased from 2019 to 2020	Fishing intensity below reference level
SB_{2021} (Mlb): SB_{2021}/SB_0: $P(SB_{2021}<SB_{30})$: $P(SB_{2021}<SB_{20})$:	192 Mlbs (125–292) 33% (22-52%) 41% <1%	SB decreased 17% from 2016 to 2021	Not overfished
Biological stock distribution:	See Tables and Figures	Region 4 increasing	Region 4 near historical high

Modelling highlights

- Strength of the 2011 and 2012 year-classes remains uncertain
- Reductions in mortality in 2020 resulted in slightly lower levels of fishing intensity than projected

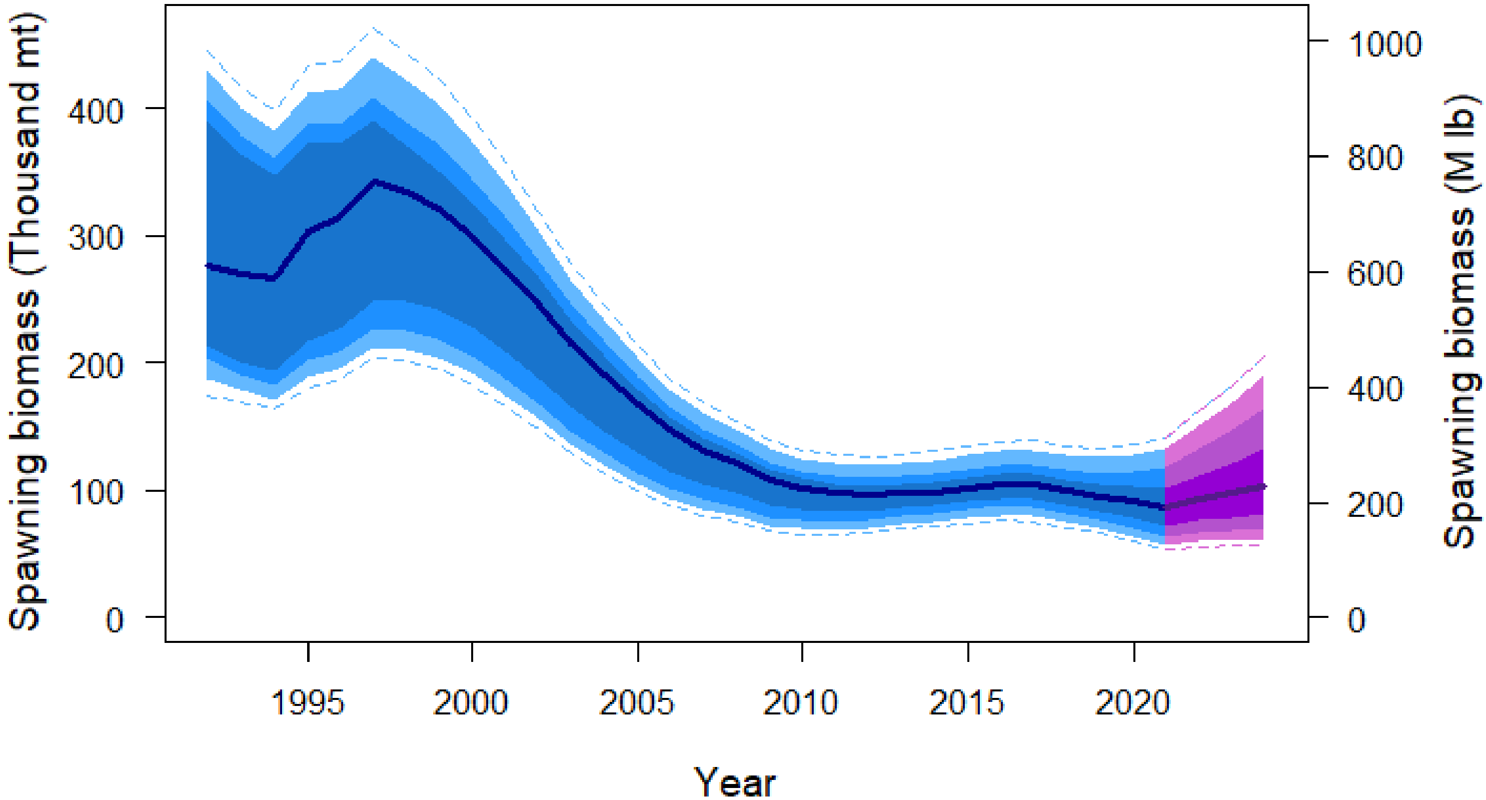
Outline

- Data sources
- Modelling results
- Projections and decision table
- Interim management procedure results

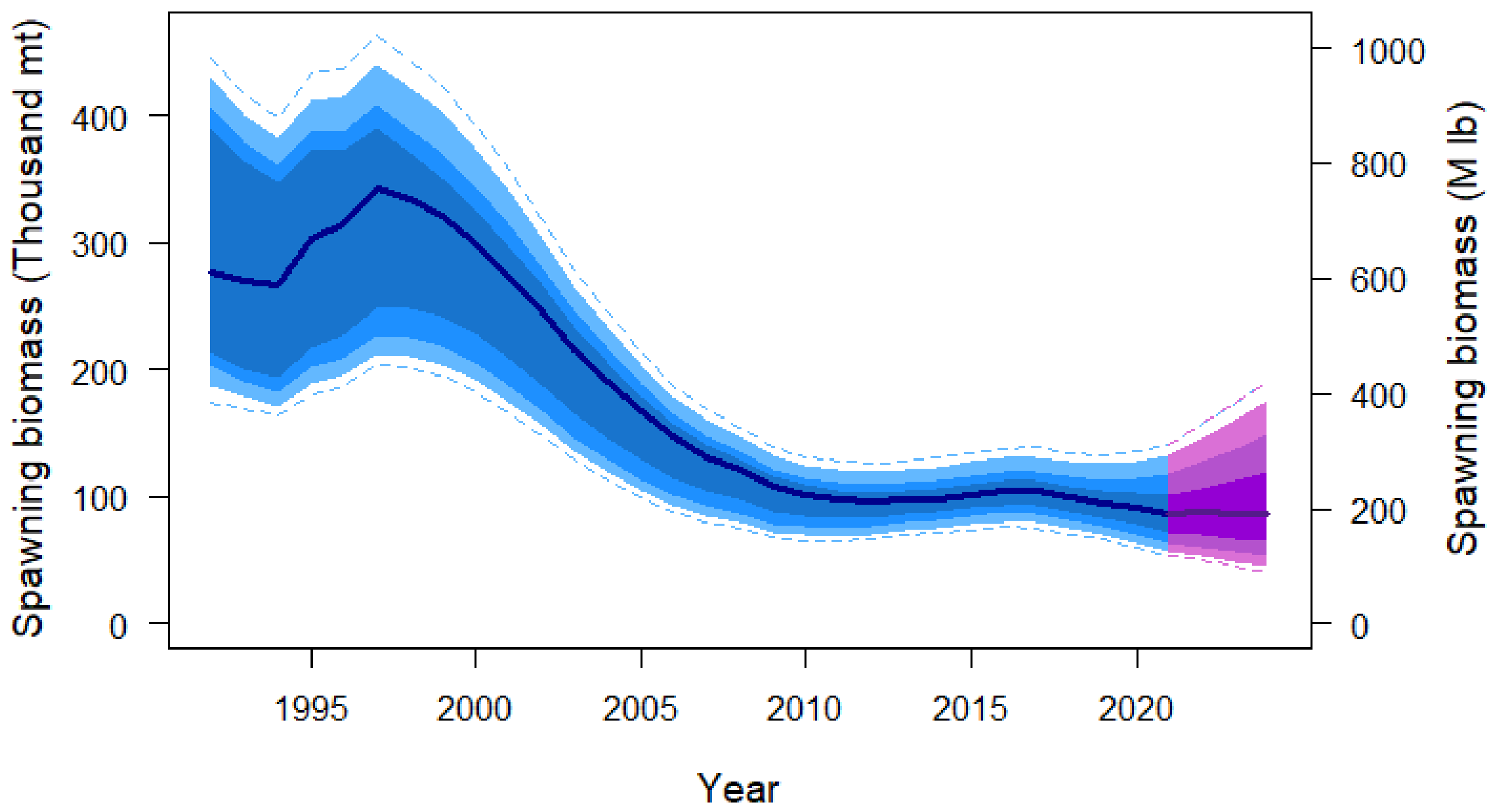
Projections and decision table

- Constant TCEY for the next three years
- Range of mortality, from no fishing mortality to 60 Mlb TCEY, with additional detail from $F_{40\%}$-$F_{46\%}$

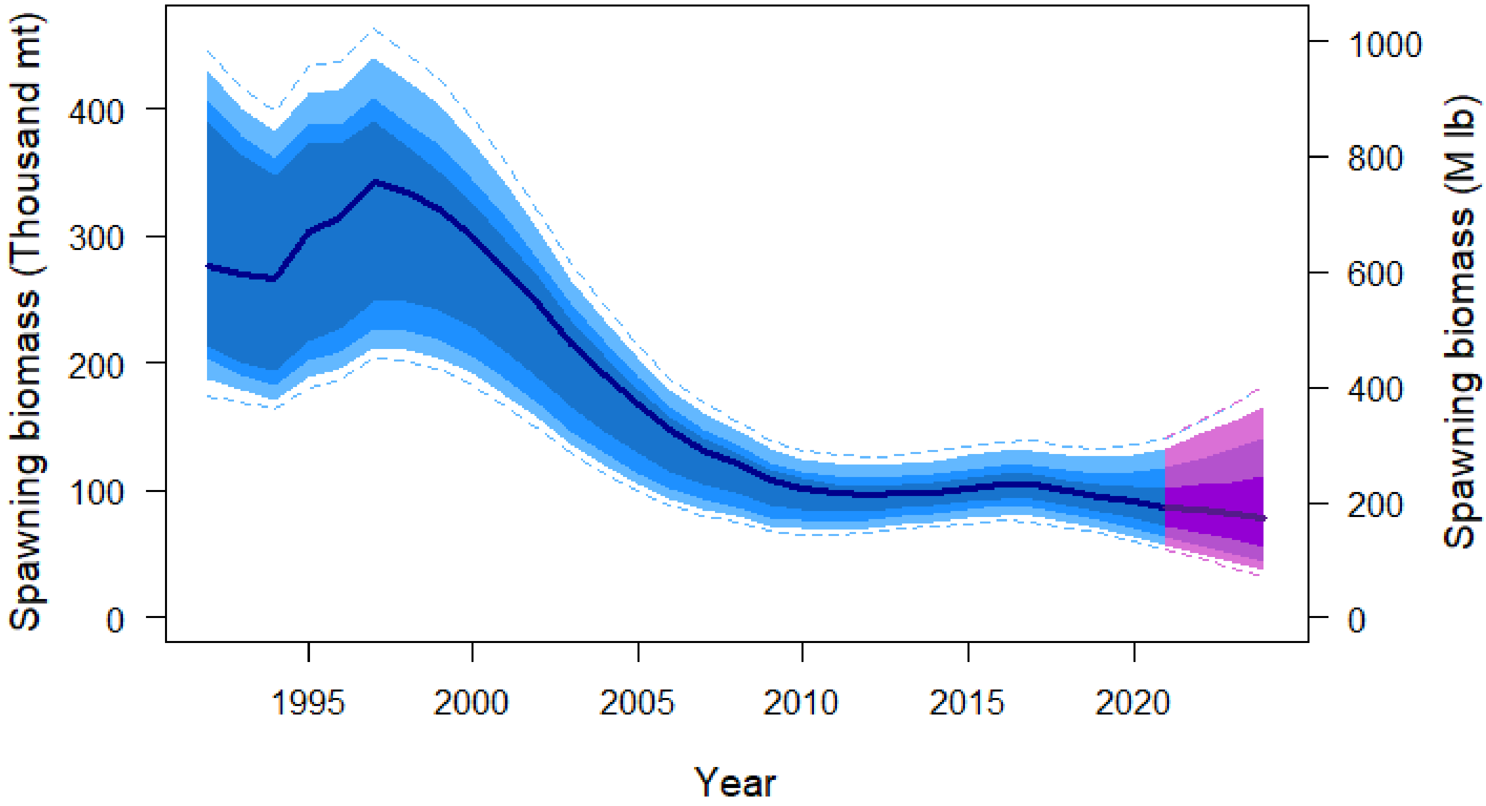
Projections: no fishing mortality



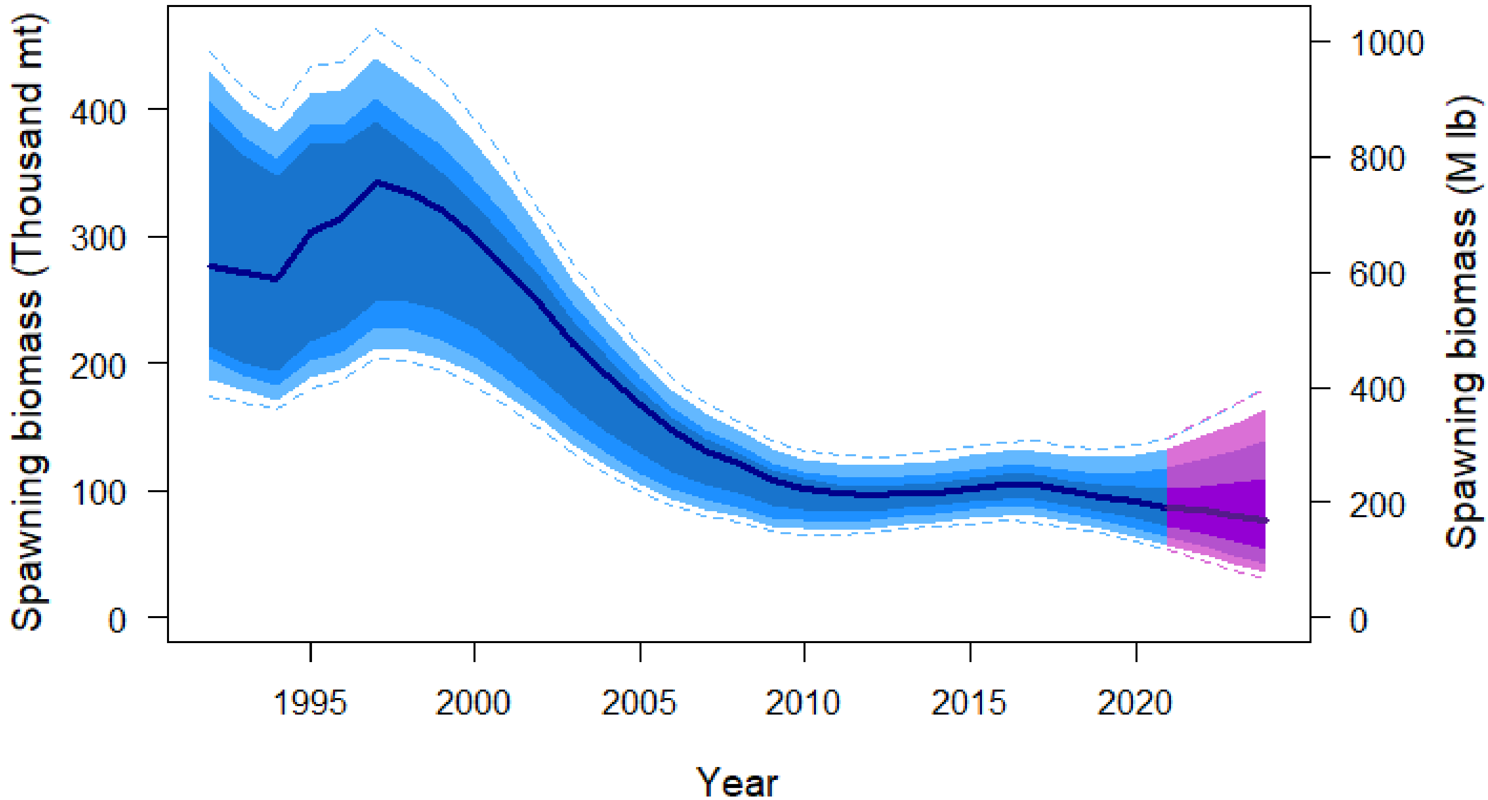
Projections: 3-yr surplus production (24.4. Mlb TCEY)



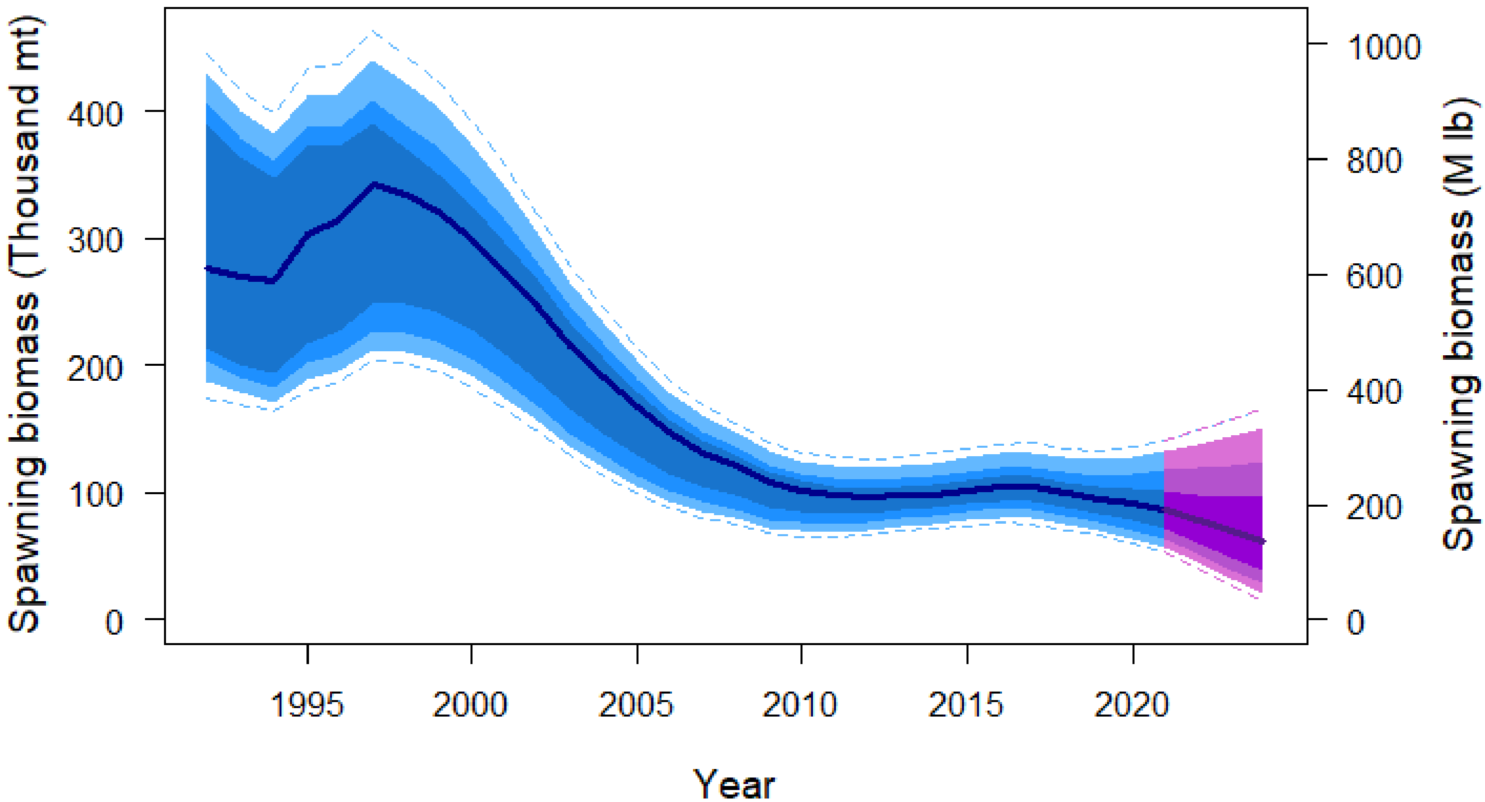
Projections: *status quo* (36.6 Mlb TCEY)



Projections: Reference level (39 Mlb TCEY)



Projections: 60 Mlb TCEY



Decision table

- Risk-benefit trade-offs:
  - Yield vs. probability of stock and fishery trend and status decreases
- Metrics relative to the interim management procedure
  - Now $F_{43\%}$ with 30:20 control rule

Decision table: Yield options

2021 Alternative		3-Year Surplus		Status quo		*Reference $F_{43\%}$*				
Total mortality (M lb)	0.0	25.7	36.8	37.9	39.1	40.3	41.5	42.9	44.1	61.3
TCEY (M lb)	0.0	24.4	35.5	36.6	37.8	39.0	40.3	41.6	42.8	60.0
2021 fishing intensity	$F_{100\%}$	$F_{58\%}$	$F_{46\%}$	$F_{45\%}$	$F_{44\%}$	$F_{43\%}$	$F_{42\%}$	$F_{41\%}$	$F_{40\%}$	$F_{30\%}$
Fishing intensity interval	--	39-76%	29-65%	29-64%	28-63%	27-62%	26-61%	26-60%	25-59%	18-49%

$F_{46\%}$-$F_{40\%}$

No fishing mortality

‘Break-even’ level

60 Mlb

Decision table: Stock trend

2021 Alternative				3-Year Surplus		Status quo		*Reference* $F_{43\%}$					
Total mortality (M lb)			0.0	25.7	36.8	37.9	39.1	40.3	41.5	42.9	44.1	61.3	
TCEY (M lb)			0.0	24.4	35.5	36.6	37.8	39.0	40.3	41.6	42.8	60.0	
2021 fishing intensity			$F_{100\%}$	$F_{58\%}$	$F_{46\%}$	$F_{45\%}$	$F_{44\%}$	$F_{43\%}$	$F_{42\%}$	$F_{41\%}$	$F_{40\%}$	$F_{30\%}$	
Fishing intensity interval			--	39-76%	29-65%	29-64%	28-63%	27-62%	26-61%	26-60%	25-59%	18-49%	
Stock Trend (spawning biomass)	in 2022	is less than 2021	<1	42	61	62	64	65	66	67	69	82	a
		is 5% less than 2021	<1	7	32	34	36	39	41	44	46	66	b
	in 2023	is less than 2021	<1	51	62	63	64	65	66	67	69	81	c
		is 5% less than 2021	<1	32	53	54	55	56	57	59	59	74	d
	in 2024	is less than 2021	<1	50	60	61	62	63	64	66	67	80	e
		is 5% less than 2021	<1	40	55	56	57	57	58	59	60	74	f

Approximately 2/3 chance of further stock decline

Decision table: Stock status

2021 Alternative				3-Year Surplus		Status quo		*Reference* $F_{43\%}$					
Total mortality (M lb)			0.0	25.7	36.8	37.9	39.1	40.3	41.5	42.9	44.1	61.3	
TCEY (M lb)			0.0	24.4	35.5	36.6	37.8	39.0	40.3	41.6	42.8	60.0	
2021 fishing intensity			$F_{100\%}$	$F_{58\%}$	$F_{46\%}$	$F_{45\%}$	$F_{44\%}$	$F_{43\%}$	$F_{42\%}$	$F_{41\%}$	$F_{40\%}$	$F_{30\%}$	
Fishing intensity interval			--	39-76%	29-65%	29-64%	28-63%	27-62%	26-61%	26-60%	25-59%	18-49%	
Stock Status (Spawning biomass)	in 2022	is less than 30%	29	35	39	40	40	41	41	42	42	47	g
		is less than 20%	<1	<1	<1	<1	1	1	1	1	1	4	h
	in 2023	is less than 30%	23	32	39	40	40	41	42	43	43	49	i
		is less than 20%	<1	<1	2	2	3	3	4	5	5	19	j
	in 2024	is less than 30%	12	29	38	39	40	41	42	43	44	50	k
		is less than 20%	<1	<1	4	5	6	8	9	10	12	25	l

Less than a 50/50 chance of dropping below $SB_{30\%}$

Decision table: Fishery trend and status

2021 Alternative				3-Year Surplus		Status quo		*Reference* $F_{43\%}$					
Total mortality (M lb)			0.0	25.7	36.8	37.9	39.1	40.3	41.5	42.9	44.1	61.3	
TCEY (M lb)			0.0	24.4	35.5	36.6	37.8	39.0	40.3	41.6	42.8	60.0	
2021 fishing intensity			$F_{100\%}$	$F_{58\%}$	$F_{46\%}$	$F_{45\%}$	$F_{44\%}$	$F_{43\%}$	$F_{42\%}$	$F_{41\%}$	$F_{40\%}$	$F_{30\%}$	
Fishing intensity interval			--	39-76%	29-65%	29-64%	28-63%	27-62%	26-61%	26-60%	25-59%	18-49%	
Fishery Trend (TCEY)	in 2022	is less than 2021	0	17	48	49	50	50	50	51	51	77	m
		is 10% less than 2021	0	6	41	44	46	48	49	50	50	63	n
	in 2023	is less than 2021	0	21	49	50	50	50	50	51	51	75	o
		is 10% less than 2021	0	11	45	47	48	49	50	50	50	64	p
	in 2024	is less than 2021	0	23	49	50	50	50	50	51	51	74	q
		is 10% less than 2021	0	13	47	48	49	49	50	50	50	64	r
Fishery Status (Fishing intensity)	in 2021	is above $F_{43\%}$	0	15	48	49	50	50	50	51	51	78	s

Approximately a 50/50 chance of further TCEY cuts to remain at $F_{43\%}$

Outline

- Data sources
- Modelling results
- Projections and decision table
- Interim management procedure results

2021 Mortality projection tool

- Interactive tool to explore alternative scale and distribution of mortality for 2021
- Will be finalized in January with post-season 2020 mortality estimates
- Default values include all parts of the current Interim Management Procedure
- 2A and 2B adjustments automatically calculated
- See IPHC-2020-IM096-INF03 for more information

2021-2022 Interim management procedure

- Baseline: $F_{43\%}$, 30:20 control rule, O32 stock distribution, relative harvest rates of 1.0 (2A-3A), 0.75 (3B-4CDE)
- Adjustments:
  - 2A = 1.65 Mlb TCEY
  - Coastwide TCEY % in 2B = 0.7*20% + 0.3*baseline
  - 2B formula (above) +50% of 2B TCEY change due to accounting for U26 non-directed discard mortality in Alaska

(See IPHC-2020-IM096-INF03 for more information)

Interim Management Procedure: baseline

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
O32 Stock Distribution	2.0%	10.5%	13.3%	36.3%	10.7%	8.6%	5.0%	13.6%	100%
HR	1.0	1.0	1.0	1.0	0.75	0.75	0.75	0.75	NA
TCEY Distribution	2.2%	11.6%	14.7%	40.1%	8.9%	7.1%	4.2%	11.3%	100%

Interim Management Procedure: adjustments

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
O32 Stock Distribution	2.0%	10.5%	13.3%	36.3%	10.7%	8.6%	5.0%	13.6%	100%
HR	1.0	1.0	1.0	1.0	0.75	0.75	0.75	0.75	NA
TCEY Distribution	2.2%	11.6%	14.7%	40.1%	8.9%	7.1%	4.2%	11.3%	100%
Adjusted	1.65	17.5%	*Depends on total TCEY*						

Interim Management Procedure: adjustments

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
O32 Stock Distribution	2.0%	10.5%	13.3%	36.3%	10.7%	8.6%	5.0%	13.6%	100%
HR	1.0	1.0	1.0	1.0	0.75	0.75	0.75	0.75	NA
TCEY Distribution	2.2%	11.6%	14.7%	40.1%	8.9%	7.1%	4.2%	11.3%	100%
Adjusted	1.65	17.5%	*Depends on total TCEY*						
Final % from total TCEY	4.2%	17.9%*	13.2%	36.2%	8.0%	6.4%	3.8%	10.2%	100%
TCEYs	1.65	7.00	5.16	14.11	3.12	2.51	1.47	3.98	39.00

*2B includes 0.18 Mlb accounting for U26 non-directed discards in AK

Reference TCEYs (from $F_{46\%}$, then $F_{43\%}$ in 2021)

	Region 2	Region 3	Region 4	Region 4B	Total
2018	10.08	14.63	5.08	1.21	31.00
2019	11.95	19.31	6.80	1.95	40.00
2020	12.41	12.74	5.48	1.27	31.90
2021	13.81	17.24	6.48	1.47	39.00

Adopted TCEYs

2018	14.76	15.81	5.36	1.28	37.21
2019	14.82	16.40	5.94	1.45	38.61
2020	14.33	15.32	5.65	1.31	36.60

Reference TCEYs

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
2018	0.59	3.84	5.65	12.07	2.56	1.69	1.21	3.39	31.00
2019	0.78	4.91	6.26	16.35	2.97	2.21	1.95	4.59	40.00
2020	1.65	5.80	4.97	9.80	2.94	2.26	1.27	3.22	31.90
2021	1.65	7.00	5.16	14.11	3.12	2.51	1.47	3.98	39.00

Adopted TCEYs

2018	1.32	7.10	6.34	12.54	3.27	1.74	1.28	3.62	37.21
2019	1.65	6.83	6.34	13.50	2.90	1.94	1.45	4.00	38.61
2020	1.65	6.83	5.85	12.20	3.12	1.75	1.31	3.90	36.60

Interim Management procedure: detailed results

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
Commercial discards	0.03	0.17	NA	NA	0.11	0.15	0.05	0.08	0.59
O26 Non-directed discards	0.10	0.23	0.09	1.19	0.43	0.24	0.12	2.22	4.63
Recreational	NA	0.04	1.16	1.70	0.01	0.02	0.00	0.00	2.93
Subsistence	NA	0.41	0.37	0.19	0.02	0.01	0.00	0.03	1.02
Total non-FCEY	0.14	0.85	1.61	3.08	0.57	0.42	0.17	2.33	9.18
Commercial discards	NA	NA	0.06	0.24	NA	NA	NA	NA	0.30
Recreational	0.61	0.92	0.65	1.93	NA	NA	NA	NA	4.11
Subsistence	0.03	NA	NA	NA	NA	NA	NA	NA	0.03
Commercial landings	0.87	5.23	2.84	8.86	2.55	2.09	1.29	1.64	25.38
Total FCEY	1.51	6.15	3.55	11.04	2.55	2.09	1.29	1.64	29.82
							4C FCEY	*0.76*	
							4D FCEY	*0.76*	
							4E FCEY	*0.12*	
TCEY	1.65	7.00	5.16	14.11	3.12	2.51	1.47	3.98	39.00
U26 Non-directed discards	0.00	0.03	0.00	0.30	0.06	0.08	0.01	0.78	1.27
Total	1.65	7.03	5.16	14.42	3.18	2.59	1.48	4.76	40.27

INTERNATIONAL PACIFIC

HALIBUT COMMISSION

Summary of the data, stock assessment, and harvest decision table for Pacific halibut (*Hippoglossus stenolepis*) at the end of 2020

PREPARED BY: IPHC SECRETARIAT (I. STEWART, A. HICKS, R. WEBSTER, AND D. WILSON; 12 NOVEMBER 2020)

PURPOSE

To provide the Commission with a summary of the data, stock assessment, and harvest decision table at the end of 2020.

INTRODUCTION

In 2020 the International Pacific Halibut Commission (IPHC) undertook its annual coastwide stock assessment of Pacific halibut (*Hippoglossus stenolepis*). This assessment represents an update to the 2019 stock assessment (Stewart and Hicks 2020), with incremental changes documented through a two-part review by the IPHC's Scientific Review Board (SRB; IPHC-2020-SRB016-R, IPHC-2020-SRB017-R). Changes, new data, and extensions to existing time-series for 2020 include:

1) Update the version of stock synthesis used for the analysis (3.30.15.09).
2) Add sex-specific recreational age composition data from IPHC Regulatory Area 3A (and allow for sex-specific differences in selectivity) where previously only sexes-aggregated age compositions were available.
3) Include newly available sex-ratios-at-age for the 2019 commercial fishery (building on the 2017 and 2018 sex-ratios used in the 2019 stock assessment).
4) New modelled trend information from the 2020 fishery-independent setline survey (FISS) including predictions covering both sampled and unsampled (but informed by covariates and the temporal correlation parameters) IPHC Regulatory Areas.
5) Age, length, individual weight, and average weight-at-age estimates from the 2020 FISS for all sampled IPHC Regulatory Areas.
6) 2020 (and a small amount of 2019) commercial fishery logbook trend information from all IPHC Regulatory Areas.
7) 2020 commercial fishery biological sampling (age, length, individual weight, and average weight-at-age) from all IPHC Regulatory Areas.
8) Biological information (lengths and/or ages) from non-directed discards (all IPHC Regulatory Areas) and the recreational fishery (IPHC Regulatory Area 3A only) from 2019.
9) Updated mortality estimates from all sources for 2019 (where preliminary values were used) and estimates for all sources in 2020.

Overall, model results remain highly consistent with those of recent stock assessments. Spawning biomass trends continue downward, although the 2020 assessment reports less decline than anticipated, partly as a function of mortality reductions in 2020. The 2011 and 2012 year-classes, estimated to be stronger than any since 2005 remain uncertain and are highly important to short-term projections of stock and fishery dynamics.

This document provides an overview of the final data sources available for the 2020 Pacific halibut stock assessment including the population trends and distribution among Regulatory

Areas based on the modelled IPHC FISS, directed commercial fishery data, and results of the stock assessment including all data available through 2020.

STOCK AND MANAGEMENT

The stock assessment reports the status of the Pacific halibut resource in the IPHC Convention Area. As in recent stock assessments, the resource is modelled as a single stock extending from northern California to the Aleutian Islands and Bering Sea, including all inside waters of the Strait of Georgia and the Salish Sea, but excludes known extremities in the western Bering Sea within the Russian Exclusive Economic Zone (Figure 1).

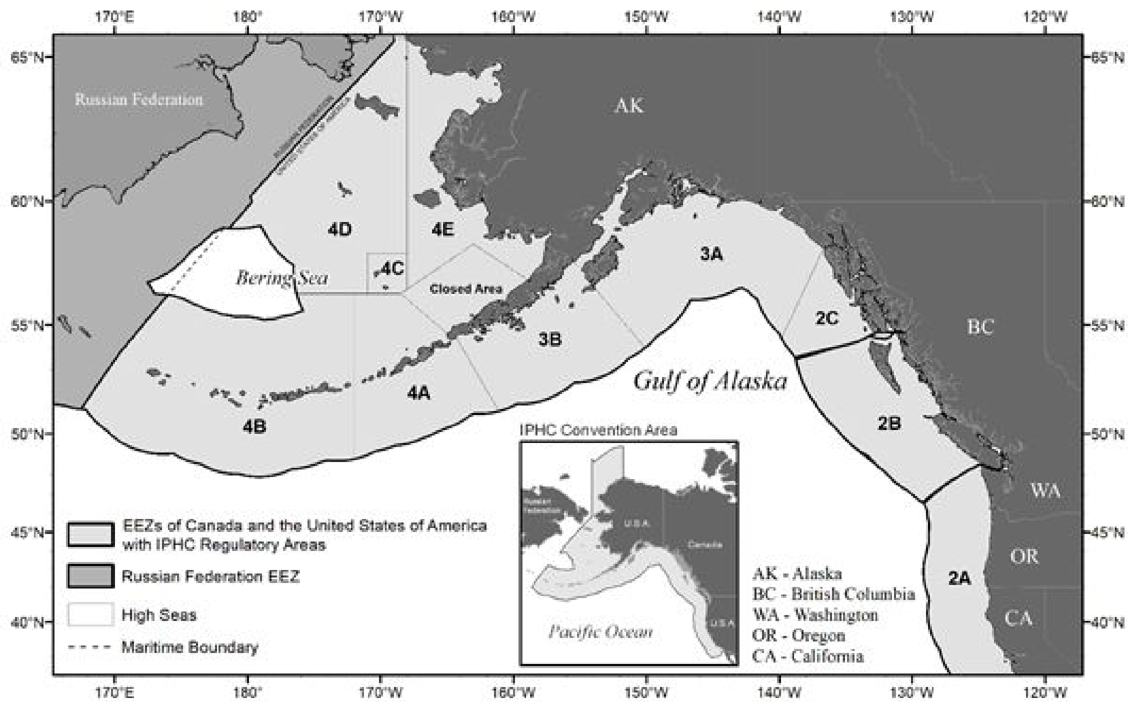


FIGURE 1. IPHC Convention Area (insert) and IPHC Regulatory Areas.

The Pacific halibut fishery has been managed by the IPHC since 1923. Mortality limits for each of eight IPHC Regulatory Areas[1] are set each year by the Commission. The stock assessment provides a summary of recently collected data, and model estimates of stock size and trend. Specific management information is summarized via a decision table reporting the estimated short-term risks associated with alternative management actions. Mortality tables projecting detailed summaries for fisheries in each IPHC Regulatory Area (and reference levels indicated by the IPHC's interim management procedure) can be explored via the IPHC's mortality projection tool.

DATA

Historical mortality

Known Pacific halibut mortality consists of target commercial fishery landings and discard mortality (including research), recreational fisheries, subsistence, and discard mortality in fisheries targeting other species ('non-directed' fisheries where Pacific halibut retention is

[1] The IPHC recognizes sub-Areas 4C, 4D, 4E and the Closed Area for use in domestic catch agreements but manages the combined Area 4CDE.

prohibited). Over the period 1921-2020 mortality has totaled 7.3 billion pounds (~3.3 million metric tons, t), ranging annually from 34 to 100 million pounds (16,000-45,000 t) with an annual average of 63 million pounds (~29,000 t; Figure 2). Annual mortality was above this long-term average from 1985 through 2010, and has averaged 40 million pounds (~18,000 t) from 2016-20.

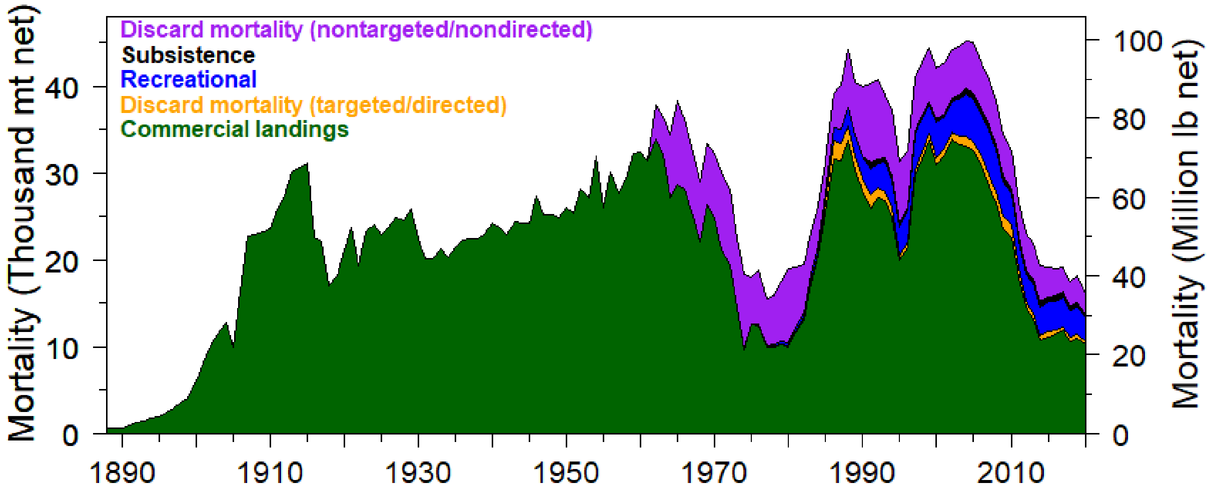


FIGURE 2. Summary of estimated historical mortality by source (colors), 1888-2020.

2020 Fishery and IPHC fishery-independent setline survey (FISS) statistics

All data sources are reprocessed each year to include new information from the terminal year, as well as any additional information for or changes made to the entire time-series. For 2020, the most important information came from the modelled index of abundance reflecting the 2020 FISS, and the associated biological sampling. Sex-ratios at age were available for the first time from: 1) commercial fishery landings in 2019 (building on the data for 2017 and 2018 previously available), and 2) the full time-series (1994-2019) of age data from recreational fisheries in the Gulf of Alaska (IPHC Regulatory Area 3A) provided by Alaska Department of Fish and Game. Routine updates of logbook records from the 2019 (and earlier) directed commercial fishery, as well as age-frequency observations and individual weights from the commercial fishery were also included. Beginning in 2019, individual weights have been collected during FISS operations such that WPUE and stock distribution estimates are calculated directly, without the use of the historical weight-length relationship. All mortality estimates (including changes to the existing time-series where new estimates have become available) were extended to include 2020. All available information was finalized on 31 October 2020 in order to provide adequate time for analysis and modeling. As has been the case in all years, some data are incomplete (i.e. commercial fishery logbook and age information), or include projections for the remainder of the year (i.e. mortality estimates for ongoing fisheries or for fisheries where final estimation is still pending).

Data for stock assessment use are compiled by IPHC Regulatory Area, and then aggregated to four Biological Regions: Region 2 (Areas 2A, 2B, and 2C), Region 3 (Areas 3A, 3B), Region 4 (4A, 4CDE) and Region 4B and then coastwide (Figure 1). In addition to the aggregate mortality (including all sizes of Pacific halibut), the assessment includes data from both fishery dependent and fishery independent sources as well as auxiliary biological information, with the most spatially complete data available since the late-1990s. Primary sources of information for this assessment include mortality estimates from all sources, modelled indices of abundance (IPHC-2020-IM096-06 based on the IPHC's annual fishery-independent setline survey (FISS; in numbers and weight) and other surveys), commercial Catch-Per-Unit-Effort (in weight), and biological summaries from both sources (length-, weight-, and age-composition data).

Coastwide commercial Pacific halibut fishery landings (including research landings) in 2020 were approximately 22.7 million pounds (~11,400 t), down 6% from 2019[2]. Discard mortality in non-directed fisheries was estimated to be 5.0 million pounds in 2020 (~2,280 t)[3], down 23% from 2019 and representing the smallest estimate in the time-series. The total recreational mortality (including estimates of discard mortality) was estimated to be 6.0 million pounds (~2,700 t) down 15% from 2019 due to several sectors not reaching the full regulatory limit or projected level. Mortality from all sources decreased by 11% to an estimated 35.5 million pounds (~16,100 t) in 2020 based on preliminary information available through 31 October 2020.

The 2020 modelled FISS results detailed a coastwide aggregate NPUE which decreased by 1% from 2019 to 2020, the fourth consecutive year of a decreasing trend (Figure 3). Biological Region 2 declined by 8% to the lowest estimate in the time-series, while Biological Region 3 increased by 1%. Although not directly sampled in 2020, Biological Regions 4, and 4B were projected to go up slightly; uncertainty intervals were correspondingly large. The 2019 modelled coastwide WPUE of legal (O32) Pacific halibut, the most comparable metric to observed commercial fishery catch rates, increased by 6% from 2019 to 2020. This positive trend relative to that for NPUE indicates that somatic growth, primarily of O32 Pacific halibut is contributing more to current stock productivity than incoming recruitment. Individual IPHC Regulatory Areas varied from a 24% increase (Regulatory Area 3A) to a 10% decrease (Regulatory Area 2B; Figure 4) in O32 WPUE. Uncertainty was greater in IPHC Regulatory Areas that were not directly sampled in 2020 (2A, 4A, 4B, and 4CDE), but still comparable with the recent time-series due to the spatial and temporal correlations in the data that are captured in the space-time modelling.

[2] The mortality estimates reported in this document are those available at the end of October 2020, and used in the assessment analysis; they include projections through the end of the fishing season.

[3] The IPHC receives preliminary estimates of the current year's non-directed commercial discard mortality in from the NOAA-Fisheries National Marine Fisheries Service Alaska Regional Office, Northwest Fisheries Science Center, and Fisheries and Oceans Canada in late October. Where necessary, projections are added to approximate the total mortality through the end of the calendar year. Further updates are anticipated in January 2021 and will be incorporated into final projections for 2021.

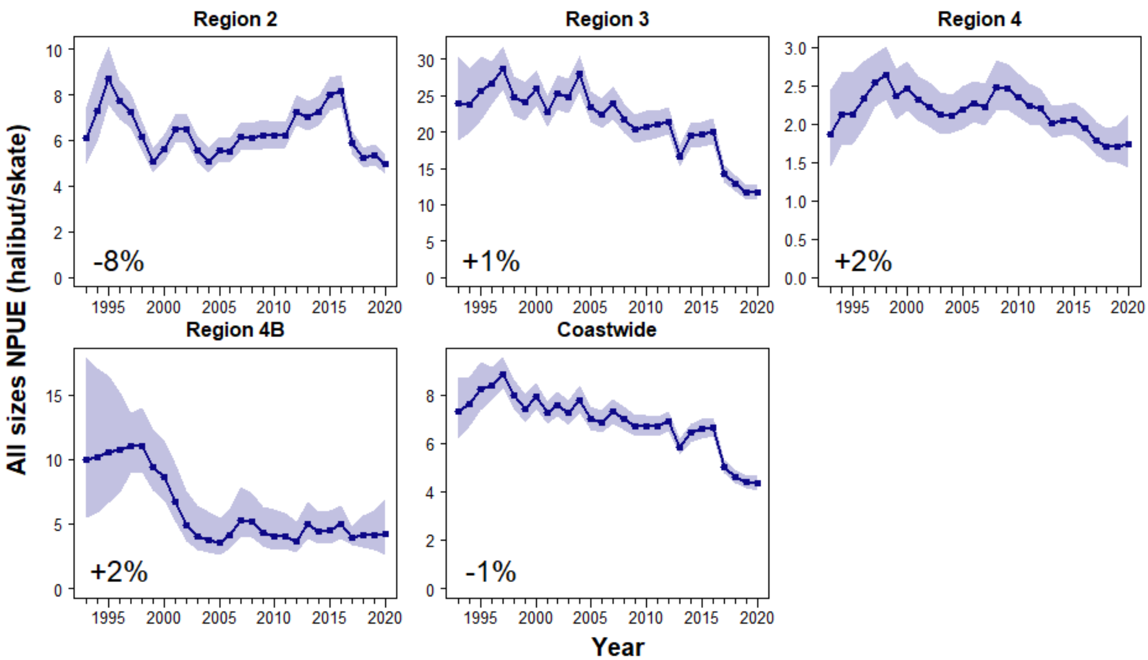


FIGURE 3. Trends in modelled FISS NPUE by Biological Region, 1993-2020. Percentages indicate the change from 2019 to 2020. Shaded zones indicate approximate 95% credible intervals.

Preliminary commercial fishery WPUE estimates from 2020 logbooks increased by 2% at the coastwide level (Figure 5). The bias correction to account for additional logbooks compiled after the fishing season resulted in an estimate of no change coastwide. Trends varied among IPHC Regulatory Areas and gears, with generally positive trends observed in IPHC Regulatory Areas 2A, 2C, 3B, 4C and 4D. The largest decreases were observed in IPHC Regulatory Areas 2B and 4B, and these are likely to be even larger when 2020 logbook records are complete.

Biological information (ages and lengths) from the commercial fishery continue to show the 2005 year-class as the largest coastwide contributor (in number) to the fish encountered. In the 2020 fishery, for the first time the 2011 and 2012 year-classes were clearly present, indicating that their individual growth rates have moved them partially above the current 32 inch (81.3 cm) minimum size limit. The age data collected by the FISS observed the 2011 and 2012 cohorts (now 8 and 9 years old), for the third consecutive year. These cohorts represented the largest proportions in the total catch for some IPHC Regulatory Areas. Recognizing that no sampling occurred in IPHC Regulatory Areas 2A, 4A, 4B and 4CDE in 2020, historical cohorts have generally been widely and relatively uniformly distributed by ages 8-10. Individual size-at-age appears to be increasing for younger ages (<14) in some IPHC Regulatory Areas (particularly notable in 3A). Size-at-age trends tend to take years to change appreciably, so it may be some time before strong conclusions can be drawn regarding whether recent observations represent a change in long-term trends or annual variability. Direct estimates of the sex-ratio at age for the directed commercial fishery were first available for 2017 and 2018 in the 2019 stock assessment. For 2020, the 2019 observations (identified via genetic assays of samples from the commercial landings) again indicated a high percentage of female Pacific halibut in the landings (78% coastwide) and a slight downward trend over the three years with data (from 82% in 2017).

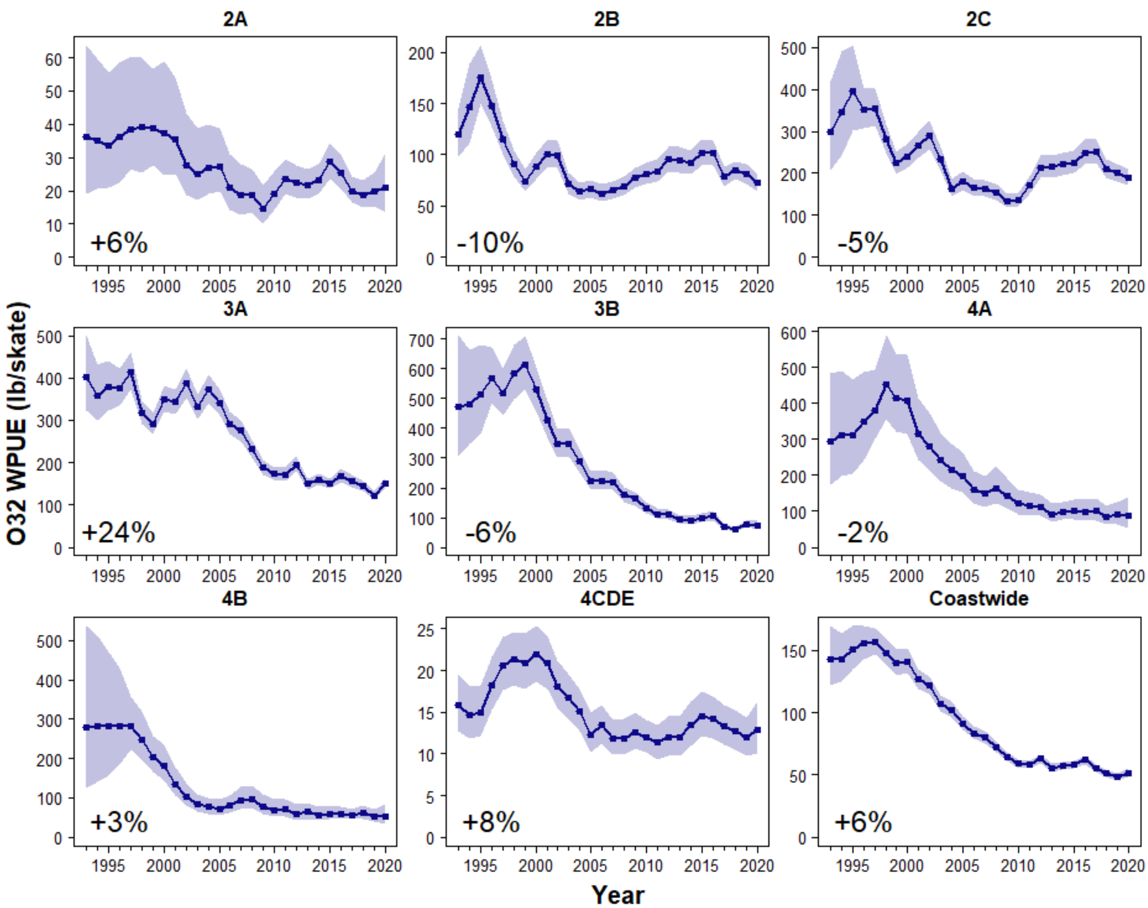


FIGURE 4. Trends in modelled FISS legal (O32) WPUE by IPHC Regulatory Area, 1993-2020. Percentages indicate the change from 2019 to 2020. Shaded zones indicate approximate 95% credible intervals. Note that IPHC Regulatory Areas 2A, 4A, 4B and 4CDE represent projections based on the space-time model in the absence of 2020 sampling.

Biological stock distribution

Updated trends indicate that population distribution (measured via the modelled FISS catch in weight of all Pacific halibut) has largely been decreasing in Biological Region 3 since 2004, and increasing in Biological Regions 2 and 4 (Figure 6; recent years in Table 1). However, in 2020 there was a notable increase in Biological Region 3 and a decrease in Biological Region 2. Biological Region 4 remained near the historical high, with the caveat that the 2020 value represents a space-time model prediction in the absence of direct sampling. Survey data are insufficient to estimate stock distribution prior to 1993. It is therefore unknown how historical distributions or the average distribution in the absence of fishing mortality may compare with recent observations.

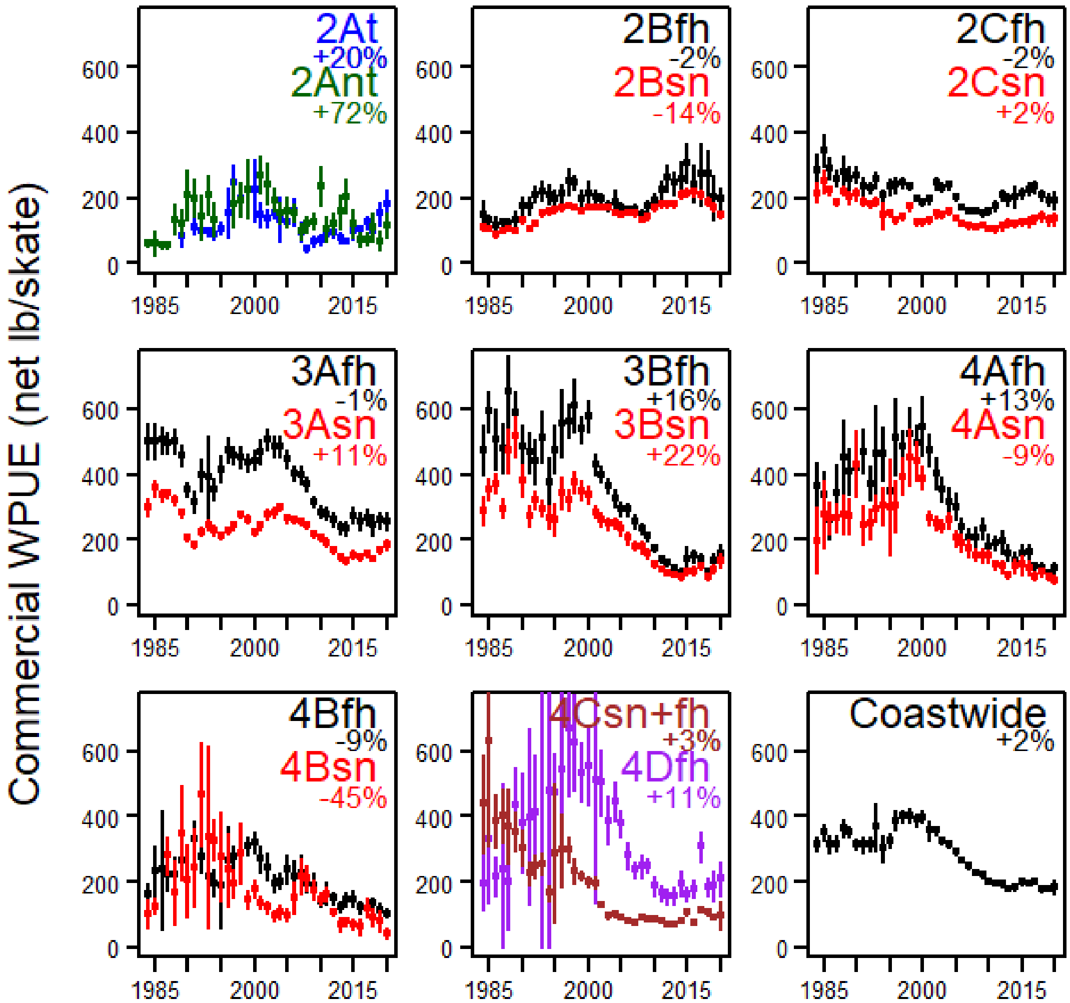


FIGURE 5. Trends in commercial fishery WPUE by IPHC Regulatory Area and fishery or gear, 1984-2020. The tribal fishery in 2A is denoted by "2At", non-tribal by "2Ant", fixed hook catch rates by "fh" and snap gear catch rates by "sn" for IPHC Regulatory Areas 2B-4D. Percentages indicate the change from 2019 to 2020 uncorrected for bias due to incomplete logbooks (see text above). Vertical lines indicate approximate 95% confidence intervals.

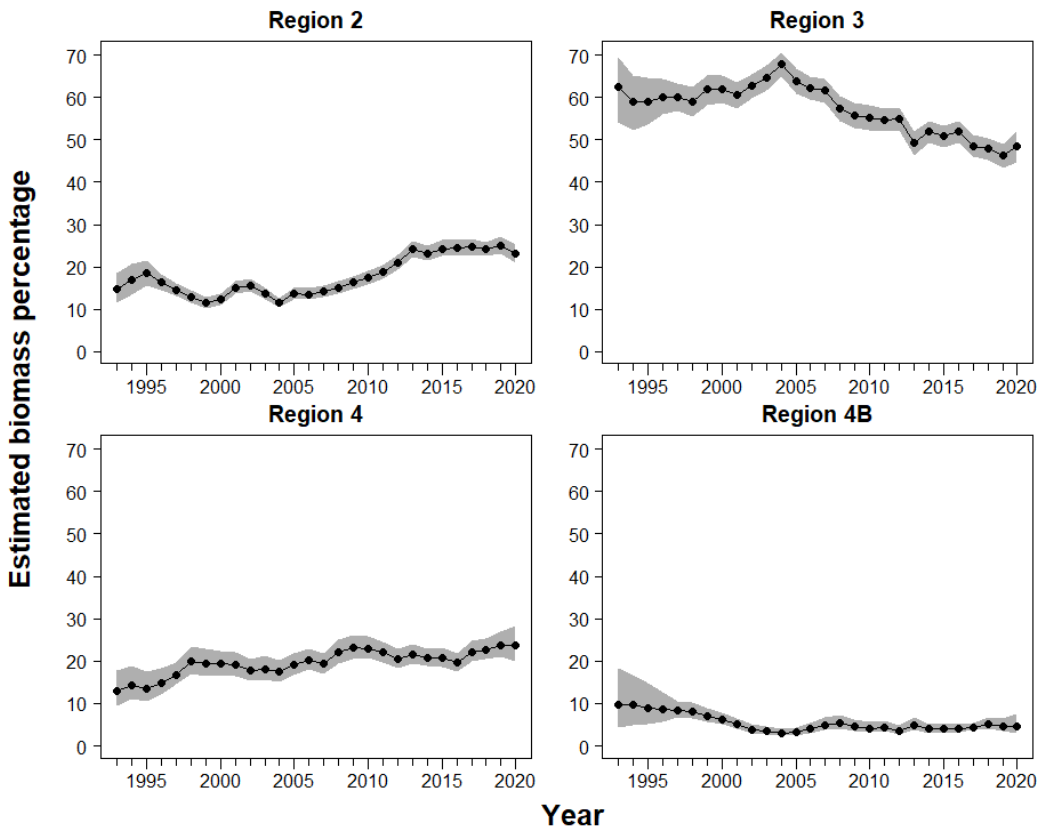


FIGURE 6. Estimated stock distribution (1993-2020) based on modelled survey catch of all sizes of Pacific halibut. Shaded zones indicate approximate 95% credible intervals.

TABLE 1. Recent stock distribution estimates by Biological Region based on modelling of all Pacific halibut captured by the FISS.

Year	Region 2 (2A, 2B, 2C)	Region 3 (3A, 3B)	Region 4 (4A, 4CDE)	Region 4B
2016	24.4%	51.9%	19.6%	4.1%
2017	24.7%	48.6%	22.3%	4.5%
2018	24.2%	47.9%	22.8%	5.2%
2019	25.0%	46.4%	23.9%	4.7%
2020	23.1%	48.5%	23.6%	4.7%

STOCK ASSESSMENT

This stock assessment continues to be implemented using the generalized software stock synthesis (Methot and Wetzel 2013). The analysis consists of an ensemble of four equally weighted models: two long time-series models, reconstructing historical dynamics back to the beginning of the modern fishery, and two short time-series models incorporating data only from 1992 to the present, a time-period for which estimates of all sources of mortality and survey indices are available for all regions. For each time-series length, there are two models: one fitting to coastwide aggregate data, and one fitting to data disaggregated into the four Biological Regions. This combination of models includes uncertainty in the form of alternative hypotheses about several important axes of uncertainty, including: natural mortality rates (estimated in the long time-series models, fixed in the short time-series models), environmental effects on recruitment (estimated in the long time-series models), and other model parameters.

The 2019 stock assessment was a full analysis, including a complete re-evaluation of all data sources and modelling choices, particularly those needed to accommodate the newly available sex-ratio at age data from the commercial fishery. The 2020 stock assessment represents an update to the 2019 analysis, adding data sources where available, but retaining the same basic model structure for each of the four component models. Incremental changes made during 2020 were documented through a two-part review by the IPHC's scientific review process (IPHC-2020-SRB016-R, IPHC-2020-SRB017-R).

The results of this stock assessment are based on the approximate probability distributions derived from the ensemble of models, thereby incorporating the uncertainty within each model (parameter or estimation uncertainty) as well as the uncertainty among models (structural uncertainty). This uncertainty provides a basis for risk assessment and reduces the potential for abrupt changes in management quantities as improvements and additional data are added to individual models. The four models continue to be equally weighted. Within-model uncertainty was propagated through to the ensemble results via the maximum likelihood estimates and an asymptotic approximation to individual model variance estimates. Point estimates in this stock assessment correspond to median values from the ensemble with the simple probabilistic interpretation that there is an equal probability above or below the reported value.

BIOMASS AND RECRUITMENT TRENDS

The results of the 2020 stock assessment indicate that the Pacific halibut stock declined continuously from the late 1990s to around 2012 (Figure 7). That trend is estimated to have been largely a result of decreasing size-at-age, as well as somewhat weaker recruitment strengths than those observed during the 1980s. The spawning biomass (SB) is estimated to have increased gradually to 2016, and then decreased to an estimated 192 million pounds (~87,050 t) at the beginning of 2021, with an approximate 95% credible interval ranging from 125 to 292 million pounds (~56,800-132,600 t; Figure 8). The recent spawning biomass estimates from the 2020 stock assessment are very consistent with previous analyses, back to 2012 (Figure 9). Prior to that period, the current assessment indicates a high probability of larger biomass than estimated prior to the 2019 stock assessment; this is largely the result of the addition of sex-ratio information for the directed commercial landings. All assessments since 2015 have indicated a decreasing spawning biomass in the terminal year.

Average Pacific halibut recruitment is estimated to be higher (70 and 75% for the coastwide and AAF models respectively) during favorable Pacific Decadal Oscillation (PDO) regimes, a widely used indicator of productivity in the north Pacific. Historically, these regimes included positive conditions prior to 1947, poor conditions from 1947-77, positive conditions from 1978-2006, and poor conditions from 2007-13. Annual averages from 2014 through 2019 were positive, with 2020 showing negative average conditions through September. Although strongly correlated with historical recruitments, it is unclear whether recent anomalous conditions in both the Bering Sea and Gulf of Alaska (especially since 2014) are comparable to those observed in previous decades.

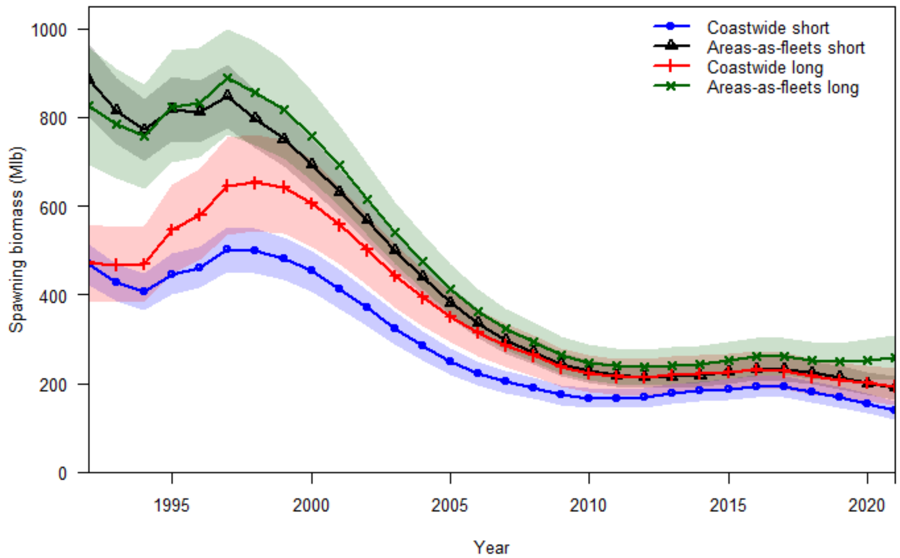


FIGURE 7. Estimated spawning biomass trends (1992-2021) based on the four individual models included in the 2020 stock assessment ensemble. Series indicate the maximum likelihood estimates; shaded intervals indicate approximate 95% credible intervals.

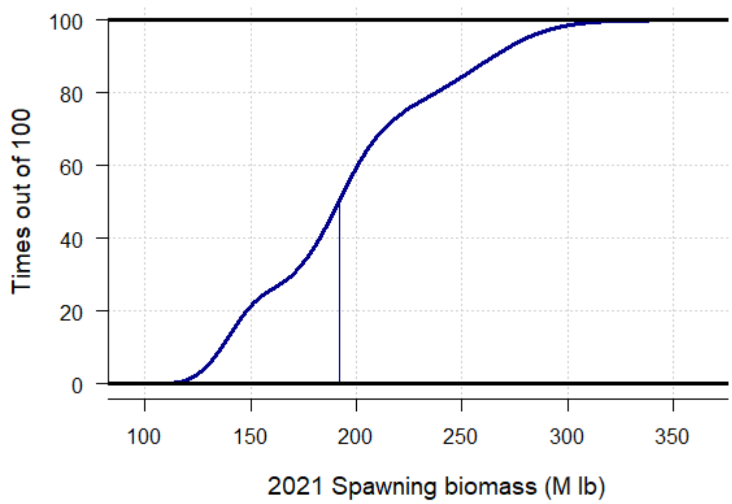


FIGURE 8. Cumulative distribution of the estimated spawning biomass at the beginning of 2020. Curve represents the estimated probability that the biomass is less than or equal to the value on the x-axis; vertical line represents the median (192 million pounds, ~87,050 t).

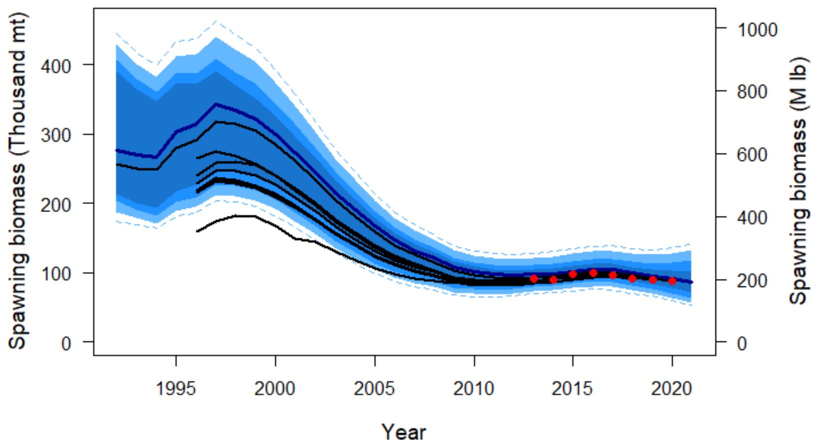


FIGURE 9. Retrospective comparison among recent IPHC stock assessments. Black lines indicate estimates of spawning biomass from assessments conducted in 2012-2019 with the terminal estimate shown as a red point. The shaded distribution denotes the 2020 ensemble: the dark blue line indicates the median (or "50:50 line") with an equal probability of the estimate falling above or below that level; and colored bands moving away from the median indicate the intervals containing 50/100, 75/100, and 95/100 estimates; dashed lines indicating the 99/100 interval.

Pacific halibut recruitment estimates show the large cohorts in 1999 and 2005 (Figure 10). Cohorts from 2006 through 2010 are estimated to be much smaller than those from 1999-2005, which results in a high probability of near-term decline in both the stock and fishery yield as these low recruitments become increasingly important to the age range over which much of the harvest and spawning takes place. Based on age data through 2020, individual models in this assessment produced estimates of the 2011 and 2012 year-classes that ranged extensively: from below to above the magnitude of the 2005 year-class. Even with a third year of observation from the FISS, and now a year from the commercial fishery, these two important year-classes remain uncertain. Some of this uncertainty is due to the relatively flat trends observed which do not clearly identify these cohorts as being above average, despite the strong representation in the age structure of the samples. The projected spawning biomass over the next 3 years includes the effects of these year classes maturing at ages 8-12.

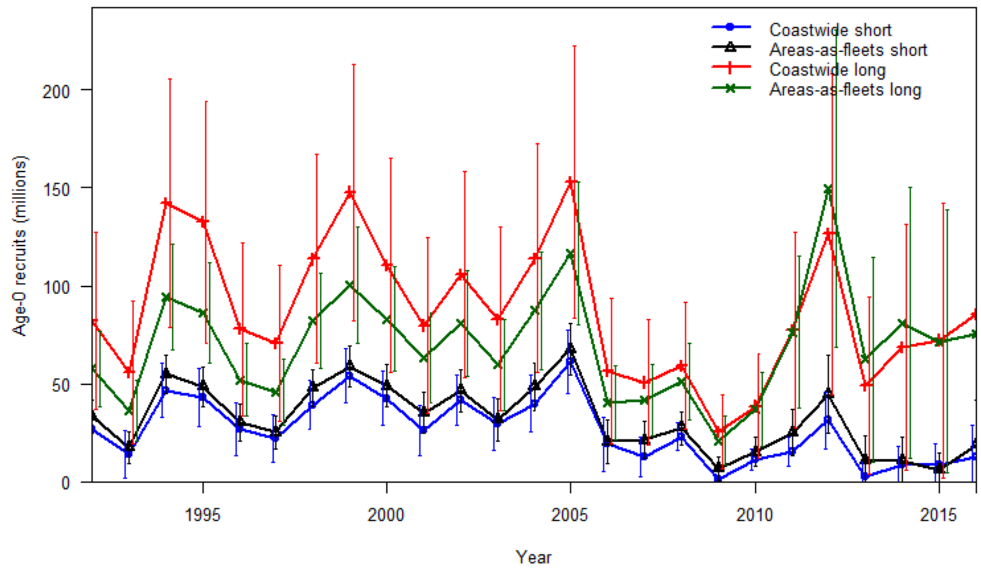


FIGURE 10. Estimated age-0 recruitment trends (1992-2016) based on the four individual models included in the 2020 stock assessment ensemble. Series indicate the maximum likelihood estimates; vertical lines indicate approximate 95% credible intervals.

The IPHC's interim management procedure uses a relative spawning biomass of 30% as a trigger, below which the target fishing intensity is reduced. At a spawning biomass limit of 20%, directed fishing is halted due to the critically low biomass condition. Beginning with the 2019 stock assessment, this calculation has been based on recent biological conditions rather than a long-term static average. By using current weight-at-age and estimated recruitments influencing the current stock only, the 'dynamic' calculation measures the effect of fishing on the spawning biomass. The relative spawning biomass in 2021 was estimated to be 33% (credible interval: 22-52%) down slightly from 34% in 2020, but greater than the values estimated for the previous decade. The probability that the stock is below the $SB_{30\%}$ level is estimated to be 41% at the beginning of 2021, with less than a 1% chance that the stock is below $SB_{20\%}$. The two long time-series models (coastwide and areas-as-fleets) show different results when comparing the current stock size to that estimated at the historical low in the 1970s. The AAF model estimates that recent stock sizes are well below those levels, and the coastwide model above. The relative differences among models reflect both the uncertainty in historical dynamics as well as the importance of spatial patterns in the data and population processes, for which all of the models represent only simple approximations.

The IPHC's current interim management procedure specifies a target level of fishing intensity of a Spawning Potential Ratio (SPR) corresponding to an $F_{43\%}$; this equates to the level of fishing that would reduce the lifetime spawning output per recruit to 43% of the unfished level given current biology, fishery characteristics and demographics. Based on the 2020 assessment, the 2020 fishing intensity is estimated to correspond to an $F_{48\%}$ (credible interval: 34-65%; Table 2), less than values estimated over the previous decade. This drop in fishing intensity corresponds to the reduction in mortality limits adopted for 2020 and the actual mortality of several sectors totaling less than predicted. Comparing the relative spawning biomass and fishing intensity over the recent historical period provides for an evaluation of trends conditioned on the currently defined reference points via a 'phase' plot. The phase plot for Pacific halibut shows that the relative spawning biomass decreased as fishing intensity increased through 2010, then increased as the fishing intensity decreased through 2016, and has been relatively stable since then (Figure 11).

TABLE 2. Status summary of Pacific halibut in the IPHC Convention Area at beginning of 2021.

Indicators	Values	Trends	Status
Total mortality 2020: Retained catch 2020: Average removals 2016–20:	35.50 Mlbs, 16,103 t[1] 29.65 Mlbs, 13,449 t 39.59 Mlbs, 17,959 t	Mortality decreased from 2019 to 2020	**2020 mortality near 100-year low**
SPR_{2020}: P(SPR<43%): P(SPR<limit):	48% (34-65%)[2] 38% Limit not specified	Fishing intensity decreased from 2019 to 2020	**Fishing intensity below reference level[3]**
SB_{2021} (Mlbs): SB_{2021}/SB_0: $P(SB_{2021}<SB_{30})$: $P(SB_{2021}<SB_{20})$:	192 Mlbs (125–292) 33% (22-52%) 41% <1%	SB decreased 17% from 2016 to 2021	**Not overfished[4]**
Biological stock distribution:	See Tables and Figures	Region 4 increasing	**Region 4 near historical high**

[1] Weights in this document are reported as 'net' weights, head and guts removed; this is approximately 75% of the round (wet) weight.
[2] Ranges denote approximate 95% credible intervals from the stock assessment ensemble.
[3] Status determined relative to the IPHC's interim reference Spawning Potential Ratio level of 43%.
[4] Status determined relative to the IPHC's interim management procedure biomass limit of $SB_{20\%}$.

MAJOR SOURCES OF UNCERTAINTY

This stock assessment includes uncertainty associated with estimation of model parameters, treatment of the data sources (e.g. short and long time-series), natural mortality (fixed vs. estimated), approach to spatial structure in the data, and other differences among the models included in the ensemble. Although this is an improvement over the use of a single assessment model, there are important sources of uncertainty that are not included.

The assessment utilized three years (2017-19) of sex-ratio information from the directed commercial fishery landings. However, uncertainty in historical ratios, and the degree of variability likely present in those and future fisheries remains unknown. Additional years of data are likely to further inform selectivity parameters and cumulatively reduce uncertainty in stock size in the future; efforts to better understand historical sex-ratios are underway. The treatment of spatial dynamics and movement rates among Biological Regions, which are represented via the coastwide and AAF approaches, has large implications for the current stock trend, as evidenced by the different results among the four models comprising the stock assessment ensemble. This assessment also does not include mortality, trends or explicit demographic linkages with Russian waters, although such linkages may be increasingly important as warming waters in the Bering Sea allow for potentially important exchange across the international border.

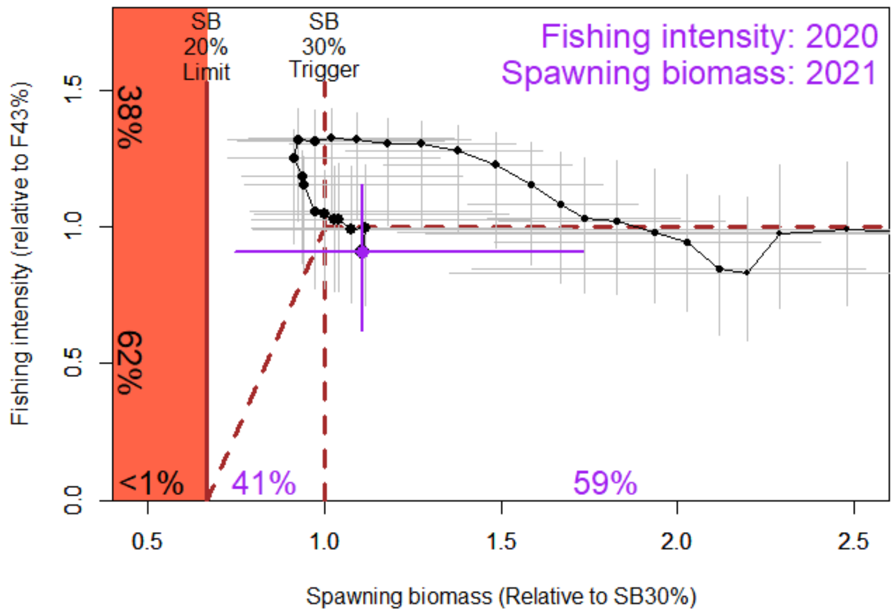


FIGURE 11. Phase plot showing the time-series (1992-2021) of estimated spawning biomass and fishing intensity relative to the reference points specified in the IPHC's interim management procedure. Dashed lines indicate the current $F_{43\%}$ (horizontal) reference fishing intensity, with linear reduction below the $SB_{30\%}$ (vertical) trigger, the red area indicates relative spawning biomass levels below the $SB_{20\%}$ limit. Each year of the time series is denoted by a solid point (credible intervals by horizontal and vertical whiskers), with the relative fishing intensity in 2020 and spawning biomass at the beginning of 2021 shown as the largest point (purple). Percentages along the y-axis indicate the probability of being above and below $F_{43\%}$ in 2020; percentages on the x-axis the probabilities of being below $SB_{20\%}$, between $SB_{20\%}$ and $SB_{30\%}$ and above $SB_{30\%}$ at the beginning of 2021.

Additional important contributors to assessment uncertainty (and potential bias) include factors influencing recruitment, size-at-age, and some estimated components of the fishery removals. The link between Pacific halibut recruitment strengths and environmental conditions remains poorly understood, and although correlation with the Pacific Decadal Oscillation is currently useful, it may not remain so in the future. Therefore, recruitment variability remains a substantial source of uncertainty in current stock estimates due to the lack of mechanistic understanding and the lag between birth year and direct observation in the fishery and survey data (6-10 years). Reduced size-at-age relative to levels observed in the 1970s have been a critically important driver of stock trends, but its cause also remains unknown. Like most stock assessments, mortality estimates are assumed to be accurate. Therefore, uncertainty due to discard mortality estimation (observer sampling and representativeness), discard mortality rates, and any other unreported sources of removals in either directed or non-directed fisheries (e.g., whale depredation) could create bias in this assessment.

Maturation schedules are currently under renewed investigation by the IPHC. Currently used historical values are based on visual field assessments, and the simple assumption that fecundity is proportional to spawning biomass and that Pacific halibut do not experience appreciable skip-spawning (physiologically mature fish which do not actually spawn due to environmental or other conditions). To the degree that maturity, fecundity or skip spawning may be temporally variable, the current approach could result in bias in the stock assessment trends and reference points. New information will be incorporated as it becomes available; however, it may take years to better understand these biological processes at the scale of the entire population.

Due to the many remaining uncertainties in Pacific halibut biology and population dynamics, a high degree of uncertainty in both stock scale and trend will continue to be an integral part of an annual management process. Results of the IPHC's Management Strategy Evaluation (MSE) process can inform management procedures that are robust to estimation uncertainty via the stock assessment, and to a wide range of hypotheses describing population dynamics.

OUTLOOK

Stock projections were conducted using the integrated results from the stock assessment ensemble in tandem with summaries of the 2020 directed and non-directed fisheries. The harvest decision table (Table 3) provides a comparison of the relative risk (in times out of 100), using stock and fishery metrics (rows), against a range of alternative harvest levels for 2021 (columns). The block of rows entitled "Stock Trend" provides for evaluation of the risks to short-term trend in spawning biomass, independent of all harvest policy calculations. The remaining rows portray risks relative to the spawning biomass reference points ("Stock Status") and fishery performance relative to the approach identified in the interim management procedure. The alternatives (columns) provided include several levels of mortality intended for evaluation of stock and management procedure dynamics including:

- No mortality (useful to evaluate the stock trend due solely to population processes)
- The mortality at which there is a 50% chance that the spawning biomass will be smaller in three years than in 2021 ("*3-year surplus*")
- The mortality consistent with repeating the TCEY set for 2019 (36.6 million pounds, 16,600 t; *"status quo"*).
- The mortality consistent with the current "Reference" SPR ($F_{43\%}$) level.
- A 60 million pound (~27,200 t) 2021 TCEY

A grid of alternative TCEY values corresponding to SPR values from 40% to 46% is also provided to allow for finer detail across the range of estimated SPR values identified by the MSE process as performing well with regard to stock and fishery objectives. For each row of the decision table, the mortality (including all sizes and sources), the coastwide TCEY and the associated level of fishing intensity projected for 2021 (median value with the 95% credible interval below) are reported.

The projections for this assessment are slightly more optimistic than in the 2019 assessment; however, a high probability of stock decline (approximately 2/3) is estimated for the entire range of SPR values from 40-46%. The stock is projected to decrease with at least a 51% chance over the period from 2021-23 for all TCEYs greater than the "3-year surplus" of 24.4 million pounds (~11,068 t), corresponding to a projected SPR of 58% (credible interval 39-76%; Table 3, Figure 12). At the *status quo* TCEY (36.6 million lb, (~16,600 t), the probability of spawning biomass declines is 62 and 61% for one and three years respectively. At the reference level (a projected SPR of 43%) the probability of spawning biomass decline to 2022 is 65%, decreasing to 63% in three years, as the 2011 and 2012 cohorts mature. The one-year risk of the stock dropping below

$SB_{30\%}$ ranges from 35% (at the 3-year surplus level) to 41% at the reference TCEY. Over three years these probabilities range from 29% to 44% depending on the level of mortality.

TABLE 3. Harvest decision table for 2021 mortality limits. Columns correspond to yield alternatives and rows to risk metrics. Values in the table represent the probability, in "times out of 100" (or percent chance) of a particular risk.

		2021 Alternative		3-Year Surplus		Status quo		*Reference $F_{43\%}$*					
		Total mortality (M lb)	0.0	25.7	36.8	37.9	39.1	40.3	41.5	42.9	44.1	61.3	
		TCEY (M lb)	0.0	24.4	35.5	36.6	37.8	39.0	40.3	41.6	42.8	60.0	
		2021 fishing intensity	$F_{100\%}$	$F_{58\%}$	$F_{46\%}$	$F_{45\%}$	$F_{44\%}$	$F_{43\%}$	$F_{42\%}$	$F_{41\%}$	$F_{40\%}$	$F_{30\%}$	
		Fishing intensity interval	--	39-76%	29-65%	29-64%	28-63%	27-62%	26-61%	26-60%	25-59%	18-49%	
Stock Trend (spawning biomass)	in 2022	is less than 2021	<1	42	61	62	64	65	66	67	69	82	a
		is 5% less than 2021	<1	7	32	34	36	39	41	44	46	66	b
	in 2023	is less than 2021	<1	51	62	63	64	65	66	67	69	81	c
		is 5% less than 2021	<1	32	53	54	55	56	57	59	59	74	d
	in 2024	is less than 2021	<1	50	60	61	62	63	64	66	67	80	e
		is 5% less than 2021	<1	40	55	56	57	57	58	59	60	74	f
Stock Status (Spawning biomass)	in 2022	is less than 30%	29	35	39	40	40	41	41	42	42	47	g
		is less than 20%	<1	<1	<1	<1	1	1	1	1	1	4	h
	in 2023	is less than 30%	23	32	39	40	40	41	42	43	43	49	i
		is less than 20%	<1	<1	2	2	3	3	4	5	5	19	j
	in 2024	is less than 30%	12	29	38	39	40	41	42	43	44	50	k
		is less than 20%	<1	<1	4	5	6	8	9	10	12	25	l
Fishery Trend (TCEY)	in 2022	is less than 2021	0	17	48	49	50	50	50	51	51	77	m
		is 10% less than 2021	0	6	41	44	46	48	49	50	50	63	n
	in 2023	is less than 2021	0	21	49	50	50	50	50	51	51	75	o
		is 10% less than 2021	0	11	45	47	48	49	50	50	50	64	p
	in 2024	is less than 2021	0	23	49	50	50	50	50	51	51	74	q
		is 10% less than 2021	0	13	47	48	49	49	50	50	50	64	r
Fishery Status (Fishing intensity)	in 2021	is above $F_{43\%}$	0	15	48	49	50	50	50	51	51	78	s

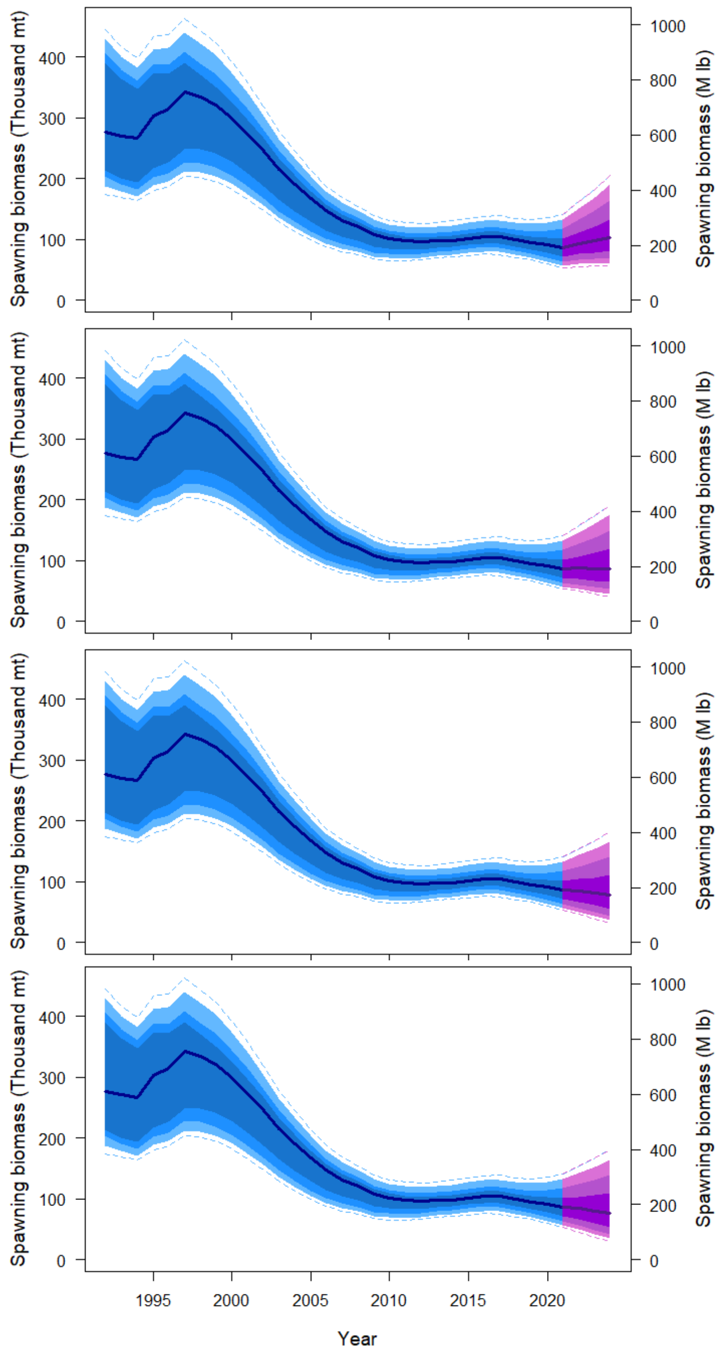


FIGURE 12. Three-year projections of stock trend under alternative levels of mortality: no fishing mortality (upper panel), the 3-year surplus (a TCEY of 24.4 million pounds, ~11,068 t; second panel), the *status quo* TCEY from 2020 of 36.6 million pounds, 16,600 t; third panel), and the TCEY projected for the IPHC's interim management procedure (39.0 million pounds, 17,690 t; lower panel).

SCIENTIFIC ADVICE

Sources of mortality: In 2020, total Pacific mortality due to fishing was down to 35.50 million pounds (16,103 t) from 39.87 million pounds (18,086 t) in 2019 (updated for this assessment). Of that total, 84% comprised the retained catch, up from 81% in 2019 (Table 3).

Fishing intensity: The 2020 mortality corresponded to a point estimate of SPR = 48%; there is a 38% chance that fishing intensity exceeded the IPHC's current reference level of 43% (Table 3). The Commission does not currently have a coastwide fishing intensity limit reference point.

Stock status (spawning biomass): Current (beginning of 2021) female spawning biomass is estimated to be 192 million pounds (87,050 t), which corresponds to an 41% chance of being below the IPHC trigger reference point of $SB_{30\%}$, and less than a 1% chance of being below the IPHC limit reference point of $SB_{20\%}$. The stock is estimated to have declined by 17% since 2016 but is currently at 33% of the unfished state. Therefore, the stock is considered to be '**not overfished**'. Projections indicate that mortality consistent with the interim management procedure reference fishing intensity ($F_{43\%}$) is likely to result in further declining biomass levels in the near future.

Stock distribution: The proportion of the coastwide stock represented by Biological Region 3 has been largely decreasing since 2004 (Figure 6), and increasing in Biological Regions 2 and 4. However, there was an increase in Biological Region 3 in 2020 and a decrease in Biological Region 2. Biological Region 4 is near the historical high estimated for 2019, and has shown an increasing trend since the early 1990s.

RESEARCH PRIORITIES

Research priorities for the stock assessment and related analyses have been consolidated with those for the IPHC's MSE and the Biological Research program and are included in the IPHC's five-year research plan.

DETAILED MANAGEMENT INFORMATION

The IPHC's current interim management procedure, in place for 2021-22, includes setting a coastwide TCEY, and also a method for distributing that TCEY among IPHC Regulatory Areas. The distribution method includes the current estimate of stock distribution, relative harvest rates by IPHC Regulatory Area, specific adjustments to the TCEY in IPHC Regulatory Areas 2A and 2B, as well as an increase in the TCEY in IPHC Regulatory Area 2B accounting for the U26 non-directed discard mortality in Alaska. Details of the calculation framework are provided in IPHC-2020-IM096-INF03. Preliminary results of the distributed TCEYs for 2021 are provided in the presentation accompanying this document. The 2021 mortality projection tool will be produced in early January 2021, and will include any end-of-year revisions to mortality estimates from 2020 that are used as a basis for projection in 2021.

ADDITIONAL INFORMATION

A more detailed description of the data sources and stock assessment results will be available on the IPHC's website stock assessment page prior to the 97th Session of the IPHC's Annual Meeting (AM097). That page also includes recent peer review documents and previous stock assessment documents. Further, the IPHC's website contains many interactive tools for both

FISS and commercial fishery information, as well as historical data series that replace appendices and tables from previous year's documents.

RECOMMENDATION/S

That the Commission:

a) **NOTE** paper IPHC-2020-IM096-08 Rev_1 which provides a summary of data, the 2020 stock assessment and the harvest decision table for 2021.

REFERENCES

Erikson, L., and Webster, R. 2020. IPHC Fishery-Independent Setline Survey (FISS) design and implementation in 2020., IPHC-2020-IM096-06. 12 p.

IPHC. 2020a. Report of the 16th session of the IPHC Scientific Review Board (SRB016). IPHC-2020-SRB016-r. 19 p.

IPHC. 2020b. Report of the 17th Session of the IPHC Scientific Review Board (SRB017). 22-24 September. IPHC-2020-SRB017-R. 21 p.

Methot, R.D., and Wetzel, C.R. 2013. Stock synthesis: A biological and statistical framework for fish stock assessment and fishery management. Fisheries Research **142**(0): 86-99. doi:http://dx.doi.org/10.1016/j.fishres.2012.10.012.

Stewart, I. 2020. The IPHC mortality projection tool for 2021 (and 2022) mortality limits. IPHC-2020-IM096-INF03. 5 p.

Stewart, I., and Hicks, A. 2020. Assessment of the Pacific halibut (*Hippoglossus stenolepis*) stock at the end of 2019. IPHC-2020-SA-01. 32 p.

Evaluation of directed commercial fishery size limits in 2020

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PURPOSE

To provide the Commission with an evaluation of directed commercial fishery size limits in response to the discussion and request from AM096:

AM096 (para. 157):

> *"The Commission **NOTED** the stakeholder questions regarding the current minimum size limit applied to the directed commercial Pacific halibut fishery. In light of the newly available sex-ratio information from the directed commercial fishery, the Commission identified the need for a better understanding of the effects of the minimum size limit on available fishery yield and potential changes from previous analyses. Further, investigation of the use of a maximum size limit has also been a topic on ongoing discussion."*

AM096–Req.08 (para. 158):

> *"The Commission **REQUESTED** that the IPHC Secretariat prepare an updated discussion of the costs and benefits of removing or adjusting the current minimum size limit and/or adding a maximum size limit. This analysis would be presented during the 2020 Work Meeting and IM096."*

SUMMARY

Since 1973, the International Pacific Halibut Commission (IPHC) has restricted the directed commercial fishery for Pacific halibut (*Hippoglossus stenolepis*) with a 32 inch (81.3 cm) Minimum Size Limit (MinSL). We find that in 2020 the MinSL reduced fishery landed yield by 7% at the Spawning Potential Ratio (SPR) projected for the adopted catch limits ($F_{42\%}$; Table 1). This loss in potential yield is due to a projected 0.80 million net pounds (~363 mt) of discard as well as increased harvest of fish larger than would provide the peak yields under current estimated size-at-age and sex-ratios. If the relative price for Pacific halibut less than 32" (U32) is at least 63% of the price of current catch of fish larger than 32" (O32), then the fishery as a whole is projected to achieve equal or increased value if the MinSL is removed. Additional benefits of removing the MinSL include a projected 18% increase in fishery efficiency (landings relative to total catch), improved data on total catch through port sampling, assuming full retention of all legal catch is retained in regulation, and improved public perception of the fishery.

Introduction of a Maximum Size Limit (MaxSL; a regulation prohibiting the retention of all fish larger than a specified length) is projected to result in little net change to fishery yield based on evaluation of a 60 inch (152 cm) MaxSL in place for 2020. However, a MaxSL would create a new (and largely unobserved) source of mortality through discarding of large female Pacific halibut: approximately 0.12 million pounds (~54 mt) at the 2020 adopted mortality limits (based on a 16% discard mortality rate). This discard mortality would be approximately offset by increased yield due to a higher fraction of males in the retained catch and average size closer to the peak yields under current size-at-age. If the relative price of fish larger than 60" (O60) remains slightly lower than the average for fish less than 60" (U60), then the average fish size in the landings is projected to result in no change in aggregate fishery value. Introduction of a MaxSL would provide an increase in the proportion of the Spawning Biomass (SB) comprised of large female Pacific halibut, and increased opportunity to encounter these fish in recreational fisheries in some IPHC Regulatory Areas (e.g. IPHC Regulatory Area 2C). The change in age composition of the SB will depend on future spatial and overall patterns of stock productivity and fishery management. It is unlikely, given the data available at this time on stock-recruitment,

fecundity, and maternal effects, that a MaxSL would increase recruitment. A 60” MaxSL would reduce fishery efficiency by approximately 3%, and also reduce the data quality on fish in the total vs. landed commercial fishery catch.

The effects of removing the MinSL or implementing a MaxSL are not estimated to be uniformly distributed among Biological Regions, IPHC Regulatory Areas, or fishing grounds within Areas. In some places, there is little projected change (e.g., removing the MinSL in IPHC Regulatory Area 2C, or implementing a MaxSL in Area 2A), and in others fishery efficiency and composition of the landings would differ importantly (removing the MinSL in Regulatory Area 3B and 4A). This analysis focuses on short-term effects; long-term changes in stock and fishery distribution and productivity would be best addressed through the Management Strategy Evaluation (MSE) process.

Table 1. Evaluation summary of removal of the current minimum size limit (MinSL) and/or addition of a maximum size limit (MaxSL) of 60” (152 cm) in 2020 relative to the *status quo*.

	Management action	
Response	Remove MinSL	Add MaxSL = 60”
Fishery yield	7% increase	No change
Fishery value	Increased if U32 price >= 63% of O32 price	No change
Discard mortality	Decreased by 0.80 million pounds	Increased by 0.12 million pounds, may increase further over time
Fishery efficiency (landings/catch)	18% increase	3% decrease
Data on total fishery catch and biology	Improved	Degraded
Recreational encounters with large fish	No change	Increased
Abundance/biomass of old females	No change	Increased
Average projected recruitment	No change	No change

BACKGROUND/INTRODUCTION

The IPHC introduced the first MinSL for the directed commercial Pacific halibut fishery in 1940 (Myhre 1973). The 5 pound (2.27 kg) limit was based on “dressed” weight (gilled and gutted), and was converted to length (26”; 66 cm) in 1944 in order to facilitate easier compliance. Due to increases in size-at-age, the quantity of small fish encountered and discarded by the fishery during this time period was likely low and declining from the 1940s through the 1970s, based on contemporary reports (Myhre 1974), and historical age composition data (Stewart and Webster 2020). In 1973, the MinSL was revised to 32” (81.3 cm; Myhre 1973). Yield-Per-Recruit (YPR) analysis in the 1960s indicated that the age of entry to the fishery was near optimal under equilibrium conditions based on the landed catch from the 26” MinSL (IPHC 1960), and very large size at age in the 1970s (relative to the historical record) was not likely resulting in substantial amounts of discard mortality (fish that are captured, discarded, and subsequently die). Therefore, discard mortality was not identified as a significant concern at that time.

After an apparent peak in the late 1970s, Pacific halibut size-at-age declined through approximately 2010, and has been relatively stable since, although trends differ among Biological Regions (Stewart and Webster 2020). The largest declines in size-at-age have been observed in the Gulf of Alaska (GOA), which also represents the geographical and demographic center of the stock. During this period of changing size-at-age, there have been many analyses evaluating the effects of the MinSL on the Pacific halibut stock and fishery. Myhre (1974) found that a 32" (81.3 cm) MinSL was 'optimal' (with regard to fishery yield and value of fish sales) only under the lowest discard mortality rates, and that discard mortality rates above 25% would favor a 29.5" (75 cm) or lower MinSL. Clark and Parma (1995) also used equilibrium methods (YPR and Spawning Biomass Per Recruit, SBPR) to evaluate the MinSL based on sampled landings in 1990-91. Their analysis found that the 32" MinSL was near optimal, but noted that revised analysis was already underway due to observations in the early 1990s of continued decline in size-at-age (and that removing the MinSL in IPHC Regulatory Area 2B would result in no loss in YPR). Parma (1999) provided an update to previous analyses, with similar conclusions: small gains in YPR would occur under smaller MinSLs, but these were slightly offset by losses in SBPR suggesting that retaining the 32" MinSL was still optimal.

Valero and Hare (2012) used a broader suite of analyses, including female maturity-at-age, YPR, SBPR, and a migratory model to evaluate the MinSL. They found that YPR and SBPR would both decrease with greatly reduced size-limits under the assumption that the fishery selectivity would resemble that of the IPHC's Fishery-Independent Setline Survey (FISS). Small reductions (3-12 cm) in the MinSL were found to have a slight positive effect on YPR (<=3%; partially due to increasing the proportion of males in the landings by <10%). Larger reductions in the MinSL were found to reduce both YPR and SBPR. The migratory analysis was the first to clearly identify differential effects of the MinSL among the IPHC Regulatory Areas. Their analysis was based on the Spawning Biomass Per Recruit ratio ($SBPR_{ratio}$); however, their calculation of $SBPR_{ratio}$ used long-term average conditions rather than current size-at-age and selectivity. They identified the precautionary nature of retaining the MinSL, and potential risks to spawning biomass of eliminating it.

The next MinSL analysis occurred in 2014-15 (Martell et al. 2015a; Martell et al. 2015b; presented at AM091), in response to a Commission request to evaluate reducing the MinSL from 32" to 30". That analysis used equilibrium methods to compare Maximum Sustainable Yield (MSY; adjusting the fishing intensity to produce the largest long term-average landed catch) under alternative MinSLs. Fishery yield and efficiency was found to be increased for all reductions in the MinSL down to 26" (the smallest evaluated). However, reducing the MinSL below 30" was found to result in a slight loss in total fishery value due to the reduced price assumed for smaller fish. That study also identified fishery selectivity, discard mortality rates, and bycatch in non-directed commercial fisheries as important contributors to the optimal level of fishing intensity and overall fishery yield.

The IPHC Secretariat most recently evaluated the MinSL in 2018 (IPHC-2018-AM094-14). That analysis found that discard mortality in the directed commercial fishery was an important component of the total, leading to foregone yield, as well as reduced fishery efficiency. Specifically, that study determined that 4% more commercial fishery landings could be achieved at the same level of fishing intensity if the 32" MinSL was removed; a result that was relatively insensitive to potential shifts in fishery selectivity toward targeting of smaller fish (Stewart and Hicks 2018). However, U32 Pacific halibut comprised approximately 25% of the projected commercial landings in the absence of a MinSL. Considerable discussion of potential low prices for these smaller fish led to concern that the fishery as a whole could lose value, even at a slightly higher biological yield. That analysis found no compelling evidence that the current minimum size limit was providing protection of the spawning biomass given slow growth, late maturity, and considerable fishery mortality on juvenile female Pacific halibut, and noted that under the

Commission's interim management procedure using a constant SPR ensured that the lifetime reproductive output was maintained regardless of the demographics of the sources of mortality.

The trend among historical studies has been toward decreasing support for the current MinSL as size-at-age declined and other factors such as discard mortality and fishery efficiency have become more routinely included in annual considerations. A fully re-evaluated and reviewed stock assessment for 2019 (Stewart and Hicks 2020), as well as newly available direct estimates of the sex-ratio of the commercial landings (Stewart and Webster 2020), have led to renewed interest in the topic of size-limits, both the current MinSL and the potential utility of a MaxSL. This document provides a response to the requests from AM096, extending historical analyses with new information and providing a basis for developing short-term IPHC policy on size limits and/or structuring future investigation through the MSE process.

METHODS

This analysis is divided into four components, each utilizing differing data and methods:

1) A description of the data on discard mortality and age-structure of discards associated with the current MinSL.
2) A description of data on encounter rates and age-structure of large Pacific halibut that could be included in a potential MaxSL.
3) An evaluation of removing the MinSL using the 2019 stock assessment models as a tool to simultaneously evaluate the effects of shifting sex-ratio, age composition of the catch (landings plus discards), and allocation among IPHC Regulatory Areas on the available yield.
4) A similar evaluation using the 2019 stock assessment to explore the effects of one potential MaxSL (60", 152 cm).

Data relevant to the current MinSL

Discard mortality in the directed commercial fishery is estimated each year using a combination of fishery-dependent and fishery-independent information along with historically estimated discard mortality rates (Stewart and Webster 2020). Specifically, U32 encounter rates by IPHC Regulatory Area observed during FISS sampling are used to provide an estimate of likely U32 encounter rates in the directed commercial fishery. The exception to this method occurs in IPHC Regulatory Area 2B, where logbooks are required to include U32 discards (in numbers of Pacific halibut) and therefore a direct estimate is available. The average encounter rate for each IPHC Regulatory Area is applied to the total landings (to account for landings that lack a corresponding logbook records) to generate an estimate of total discarded U32 Pacific halibut. A discard mortality rate of 16% (25% in IPHC Regulatory Area 2A where the fishery operates under 'derby' conditions) is applied to total discards to generate an estimate of discard mortality (Stewart and Webster 2020). Finally, sex-specific age distributions were summarized from 2019 FISS catches in order to better understand the biological properties of U32 Pacific halibut.

Data relevant to a MaxSL

A similar approach was taken to summarize large Pacific halibut encountered by the recent (2017-2019) directed commercial fishery (and subsequently sampled as part of the landings). For a range of large sizes (55-70"; 140-178 cm) the average individual fish weight, average age (and distribution of ages), percent female (by weight) and percent of the landings comprising fish larger than the specified size was summarized. For the commercial fishery, weights were derived from measured individual fish sampled by IPHC field staff. Sex-specific information was only available for 2017-2018.

For comparison with fishery observations, the percent of FISS catches comprising the same large fish sizes was also summarized; however, this summary relied on predicted weights derived from the general length-weight relationship (Stewart and Webster 2020), as sampled weights were only available for individual fish captured in 2019 (Erikson 2020).

Removing the MinSL

In order to evaluate the MinSL, the 2019 stock assessment ensemble (including all updated sex-ratio information) was used to compare key management quantities for 2020 mortality limits (last year's decision) in the absence of the MinSL. The specific process for making the yield calculations is outlined in Appendix A. In short, the SPR, which represents the lifetime reproductive output of the stock, is used to measure and balance the effects of removing differing total mortality and demographic components from the population. The results can therefore be interpreted simply, as: How would the mortality limits need to change in order for fishing intensity to remain constant if the MinSL were removed?

In order to characterize the sensitivity of the results to alternative fishery responses, six alternative cases were also investigated: 10, 20 and 30% avoidance, and 10, 20 and 30% targeting of U32 Pacific halibut. For the base analysis and each sensitivity, the change in yield to the directed commercial fishery, the percent of that yield comprised of U32 Pacific halibut and the 'critical price ratio' (see Appendix B for calculation details) were estimated. The critical price ratio indicates the price that would need to be paid for U32 Pacific halibut as a percentage of the price paid for O32 fish in order for the fishery to be of equal or larger value in the absence of the MinSL (assuming no difference in O32 price between the two regulatory setups).

Implementing a MaxSL

Based on the summary of data relevant to a MaxSL, an example MaxSL of 60 inches (152 cm) was selected for further evaluation. This size of fish represents a compromise in that it is large enough to avoid converting a substantial fraction of the current landings to discards, but small enough to represent a demographically meaningful portion of the current spawning biomass. The approach taken for evaluation of potential MaxSLs was similar to that for the MinSL, although slightly more complex as it required additional modeled fleets and partitioning of existing age data in order to approximate the fishery landings and discards under a MaxSL (Appendix A).

RESULTS

Data relevant to the current MinSL

The FISS and mandatory logbook information available in IPHC Regulatory Area 2B provided similar estimates of the fraction of the total catch comprised of U32 Pacific halibut (Figure 1). Not only was a similar scale estimated from both series, but the relative trend was also very similar, including an increase in the proportion of U32 fish in 2019, apparently due to the 2011 and 2012 year-classes which comprised a large proportion of the age distributions observed in the FISS in most IPHC Regulatory Areas (especially for female Pacific halibut (Figure 2). Of note in both data summaries is the variability among IPHC Regulatory Areas. In recent years the percent of the total catch comprised of U32 fish has ranged from near 20% in IPHC Regulatory Area 4B to around 65-70% in IPHC Regulatory Areas 3B and 4A. Similarly, in the age composition information there are male Pacific halibut greater than 15 years old in all IPHC Regulatory Areas; however, Area 3A has a much higher overall fraction of older males than any other Area. A detailed summary of the size structure of U32 FISS catches is provided in Appendix C.

When the FISS and commercial data are used in tandem with discard mortality rates to estimate the total discard mortality of U32 Pacific halibut, there is a clear decreasing trend over the last 10 years, with a notable increase in 2019 (Table 2). The magnitude of discard mortality by IPHC Regulatory Area is a function of both the landings as well as the encounter rate, with considerable differences among Areas. In aggregate, this source of mortality contributes 0.88 (the three-year average) to 1.49 (the ten-year average) million pounds representing 3-5% of the coastwide total (Table 3). These fish are legally required to be discarded, so they provide no value to the fishery, although they are included in all assessment calculations and in the estimate of overall fishing intensity.

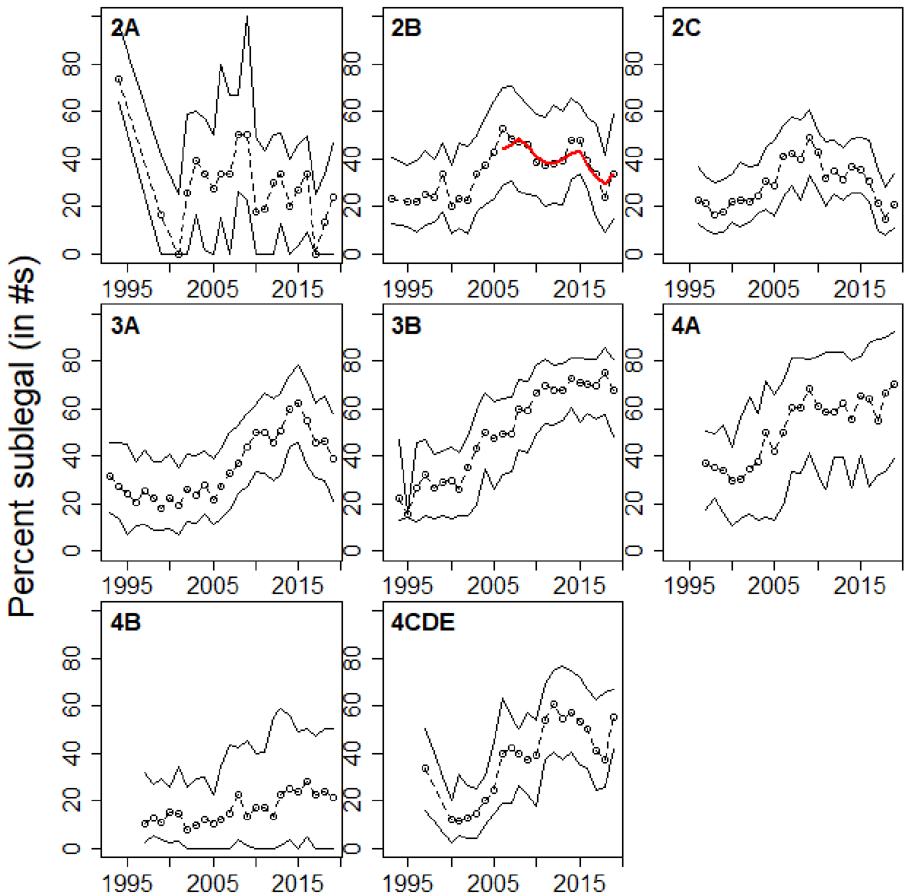

Figure 1. Percent sublegal (U32) in recent (1993-2019) FISS catches (median station value indicated by the connected black circles, 25th and 75th percentiles of station values indicated by solid black lines) and reported commercial fishery logbooks (IPHC Regulatory Area 2B, 2006-2019 average annual value across sets; solid red line).

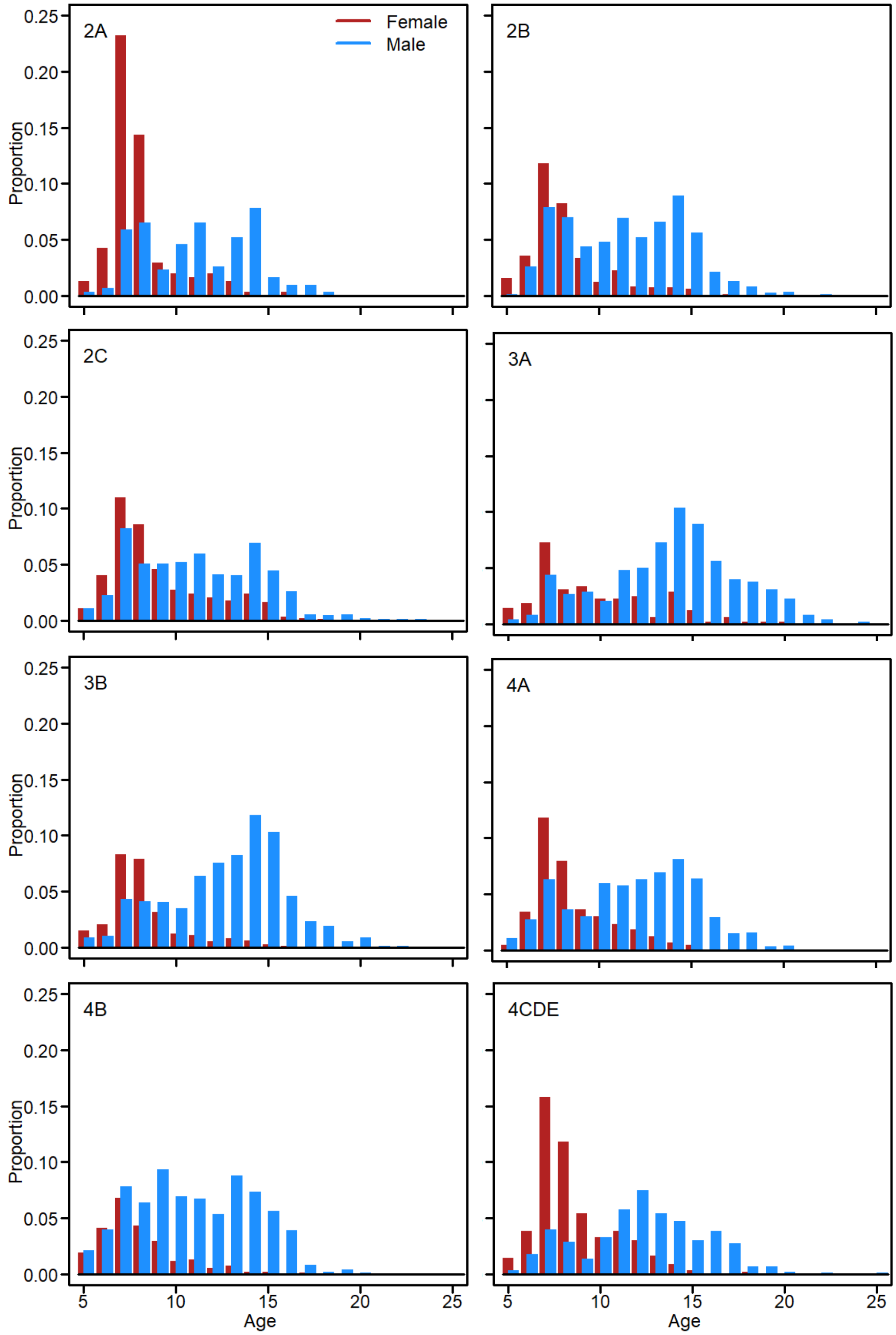

Figure 2. Sex-specific age distributions (by number) for U32 Pacific halibut captured by the 2019 FISS. Females (red bars) and males (blue bars) sum to a value of 1.0 in each panel (IPHC Regulatory Area).

Table 2. Recent discard mortality estimates from the directed commercial fishery for Pacific halibut less than the 32 inch (81.3 cm) minimum size limit length (U32; million net pounds).

Year	2A	2B	2C	3A	3B	4A	4B	4CDE	Coastwide
2010	0.03	0.28	0.26	1.47	0.88	0.13	0.04	0.08	3.16
2011	0.02	0.26	0.08	0.91	0.77	0.14	0.04	0.17	2.39
2012	0.02	0.21	0.09	0.59	0.52	0.09	0.04	0.08	1.62
2013	0.01	0.20	0.09	0.53	0.39	0.06	0.03	0.05	1.37
2014	0.01	0.23	0.12	0.45	0.32	0.03	0.05	0.05	1.26
2015	0.02	0.23	0.12	0.52	0.22	0.07	0.04	0.05	1.26
2016	0.03	0.21	0.12	0.39	0.23	0.05	0.05	0.06	1.15
2017	0.01	0.17	0.08	0.36	0.23	0.06	0.03	0.03	0.97
2018	0.01	0.12	0.05	0.28	0.21	0.07	0.02	0.03	0.78
2019	0.03	0.13	0.07	0.32	0.16	0.09	0.03	0.07	0.90
3-year average	0.02	0.14	0.07	0.32	0.20	0.07	0.03	0.04	0.88
5-year average	0.02	0.17	0.09	0.37	0.21	0.07	0.03	0.05	1.01
10-year average	0.02	0.20	0.11	0.58	0.39	0.08	0.04	0.07	1.49

Table 3. Recent U32 percent mortality (discard mortality/(discard mortality + landings), by weight) from the directed commercial fishery for Pacific halibut.

Year	2A	2B	2C	3A	3B	4A	4B	4CDE	Coastwide
2010	6%	4%	5%	7%	8%	5%	2%	2%	6%
2011	3%	4%	3%	6%	9%	6%	2%	5%	6%
2012	3%	3%	3%	5%	9%	5%	2%	3%	5%
2013	3%	3%	3%	5%	9%	5%	2%	3%	5%
2014	2%	4%	3%	6%	10%	3%	4%	4%	5%
2015	4%	4%	3%	6%	7%	5%	3%	4%	5%
2016	5%	3%	3%	5%	8%	3%	5%	4%	4%
2017	2%	3%	2%	4%	7%	4%	3%	2%	4%
2018	2%	2%	1%	4%	8%	5%	2%	2%	3%
2019	3%	2%	2%	4%	6%	6%	3%	4%	4%
3-year average	2%	2%	2%	4%	7%	5%	3%	3%	3%
5-year average	3%	3%	2%	5%	7%	5%	3%	3%	4%
10-year average	3%	3%	3%	5%	8%	5%	3%	3%	5%

Data relevant to a MaxSL

The relative catch of large Pacific halibut varied substantially across the coast, ranging from <1% for fish greater than 55 inches (140 cm) in IPHC Regulatory Area 2A to 17% in Area 2C (Table 4). A MaxSL of 70 inches (178 cm), would affect less than 2% of the commercial landings in any IPHC Regulatory Area coastwide. Larger potential MaxSLs corresponded to larger average weights of fish above these limits; however, there was again considerable variability among IPHC Regulatory Areas. Although almost all large fish were found to be female (92-100%), there was a considerable range of ages represented even among females larger than 60 inches (152 cm; Figure 3). These fish ranged in age from nine to 42 years, depending on the Area, with the youngest fish on average in IPHC Regulatory Area 2C and the oldest in Area 4B. This pattern illustrates clearly that a MaxSL would not map directly to a maximum age limit, and that even at 70 inches (178 cm) there is the potential for some female Pacific halibut to remain immature. The FISS observed relatively higher catches of large Pacific halibut when compared to the commercial fishery, and showed differing relative patterns among IPHC Regulatory Areas (discussed below).

Table 4. Summary of 2017-2019 commercial fishery landings and FISS catch of large Pacific halibut by IPHC Regulatory area. Values in italics represent only a single fish.

IPHC Regulatory Area	Length greater than (in, cm)	Average net weight (lb, kg)	Average age (range)	% female (weight)[1]	% of Landings (weight)	% of legal FISS catch (weight)[2]
2A	55, 140	66, 30	16 (10-23)	100%	<1%	2%
	60, 152	*109, 49*	*22 (22-22)*	*100%*	*<1%*	<1%
	65, 165	*109, 49*	*22 (22-22)*	*100%*	*<1%*	<1%
	70, 178	NA	NA	NA	0%	0%
2B	55, 140	75, 34	18 (9-39)	100%	8%	16%
	60, 152	92, 42	20 (14-39)	100%	4%	8%
	65, 165	112, 51	22 (15-31)	100%	1%	3%
	70, 178	129, 59	21 (17-25)	100%	<1%	1%
2C	55, 140	71, 32	17 (9-36)	100%	17%	26%
	60, 152	86, 39	17 (9-36)	100%	6%	15%
	65, 165	114, 52	18 (13-36)	100%	2%	8%
	70, 178	148, 67	20 (15-32)	100%	<1%	4%
3A	55, 140	69, 31	16 (11-31)	100%	4%	28%
	60, 152	85, 39	18 (12-31)	100%	2%	18%
	65, 165	119, 54	20 (18-21)	100%	<1%	11%
	70, 178	119, 54	20 (18-21)	100%	<1%	6%
3B	55, 140	70, 32	14 (11-23)	96%	5%	17%
	60, 152	92, 42	16 (13-23)	100%	1%	11%
	65, 165	144, 65	20 (17-23)	100%	<1%	6%
	70, 178	194, 88	23 (23-23)	100%	<1%	3%
4A	55, 140	70, 32	18 (11-39)	100%	5%	10%
	60, 152	100, 45	19 (12-39)	100%	1%	6%
	65, 165	118, 54	23 (14-39)	100%	1%	3%
	70, 178	137, 62	32 (25-39)	100%	<1%	2%
4B	55, 140	80, 36	21 (8-42)	94%	11%	18%
	60, 152	100, 45	23 (12-42)	92%	7%	11%
	65, 165	120, 54	23 (12-40)	100%	4%	6%
	70, 178	147, 67	26 (20-40)	100%	2%	3%
4CDE	55, 140	74, 34	16 (11-24)	100%	9%	14%
	60, 152	88, 40	17 (11-24)	100%	4%	8%
	65, 165	108, 49	18 (11-22)	100%	1%	4%
	70, 178	112, 51	17 (11-20)	100%	<1%	2%

[1]Sex-specific information from the commercial fishery was only available from 2017-2018 for this analysis.
[2]Percent of O32 catch was predicted from individual lengths and the historical length-weight relationship, and therefore may not be comparable with fishery catch percentages.

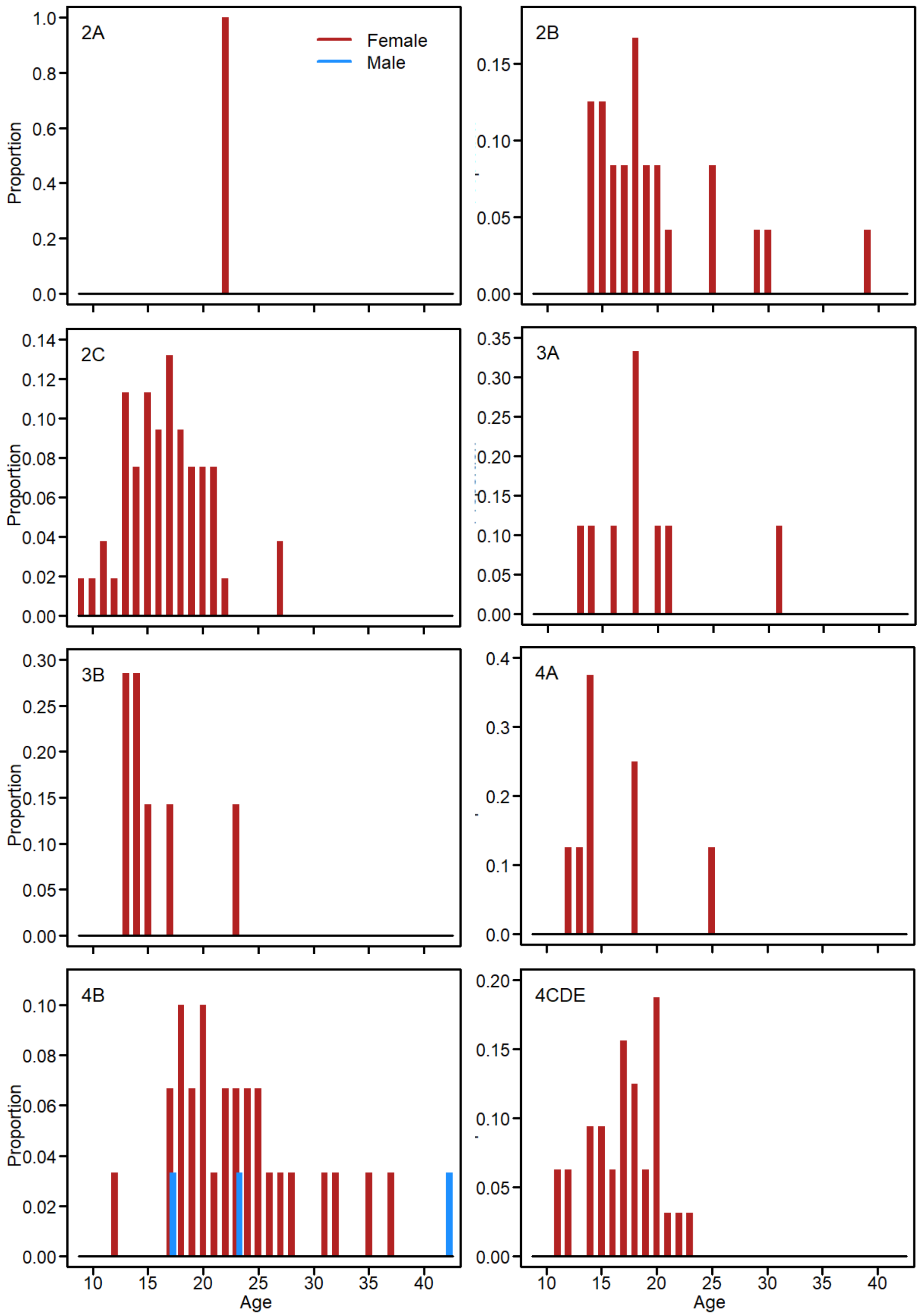

Figure 3. Sex-specific age composition distributions (by number) for Pacific halibut greater than 60 inches (152 cm) in length captured by the commercial fishery in 2017-2018. Females (red bars) and males (blue bars) sum to a value of 1.0 in each panel (IPHC Regulatory Area). Note that the y-axes differ by panel.

Removing the MinSL

If the Commission had removed the MinSL for 2020, the coastwide mortality limit could have been increased to 107% of the adopted limits with the same projected level of fishing intensity (Table 5, Figure 4). This indicates that the additional effects of harvesting smaller and younger Pacific halibut would be more than offset by the reduction in discard mortality (converted to retained catch) and increased yield associated with harvesting fish closer to the ages producing peak yields under current size-at-age and sex-ratios. The additional yield would not be uniformly distributed across the coast, as the proportional increase would depend on the absolute amount of discard mortality converted to landings within the TCEY as well as the distribution of TCEY among Biological Regions and IPHC Regulatory Areas. Not surprisingly, the largest gains would be realized in IPHC Regulatory Areas 3B and 4A, where the highest encounter rates of U32 fish currently occur, even under the same coastwide TCEY distribution (discard mortality currently taken off the TCEY to project commercial landings could be landed in the absence of the MinSL). This general result was found to be largely insensitive to either targeting or avoidance of U32 Pacific halibut: under all alternatives evaluated there was a potential gain in yield by removing the MinSL (Table 5, Figure 4).

Table 5. Yield changes (commercial landings without MinSL/commercial landings with MinSL) for alternatives removing the current commercial fishery minimum size limit.

Fishery	No MinSL	U32 avoidance			U32 targeting		
		10%	**20%**	**30%**	**10%**	**20%**	**30%**
Coastwide	107%	107%	106%	106%	107%	108%	108%
Region 2	105%	105%	105%	104%	106%	106%	107%
2A	106%	106%	106%	105%	107%	107%	108%
2B	106%	106%	105%	105%	106%	107%	107%
2C	105%	105%	104%	104%	106%	106%	106%
Region 3	108%	107%	107%	106%	108%	109%	109%
3A	107%	107%	107%	106%	108%	108%	108%
3B	110%	109%	109%	110%	110%	111%	111%
Region 4	110%	109%	109%	109%	110%	111%	111%
4A	109%	109%	108%	108%	110%	110%	110%
4CDE	108%	107%	107%	107%	108%	109%	109%
Region 4B	106%	106%	106%	105%	107%	107%	108%

The projected coatswide landings would be comprised of 18% U32 Pacific halibut in the absence of the current MinSL, ranging from 13 to 22% under the avoidance and targeting alternatives evaluated (Table 6, Figure 4). As observed in other results, there were important differences among Biological Regions and IPHC Regulatory Areas, spanning 7% U32 fish (Area 2C with 30% avoidance) up to 33% (Area 3B with 30% targeting). Biological Region 2, with the lowest encounter rates for U32 fish was the most insensitive to targeting or avoidance, ranging from 9-15% among alternatives.

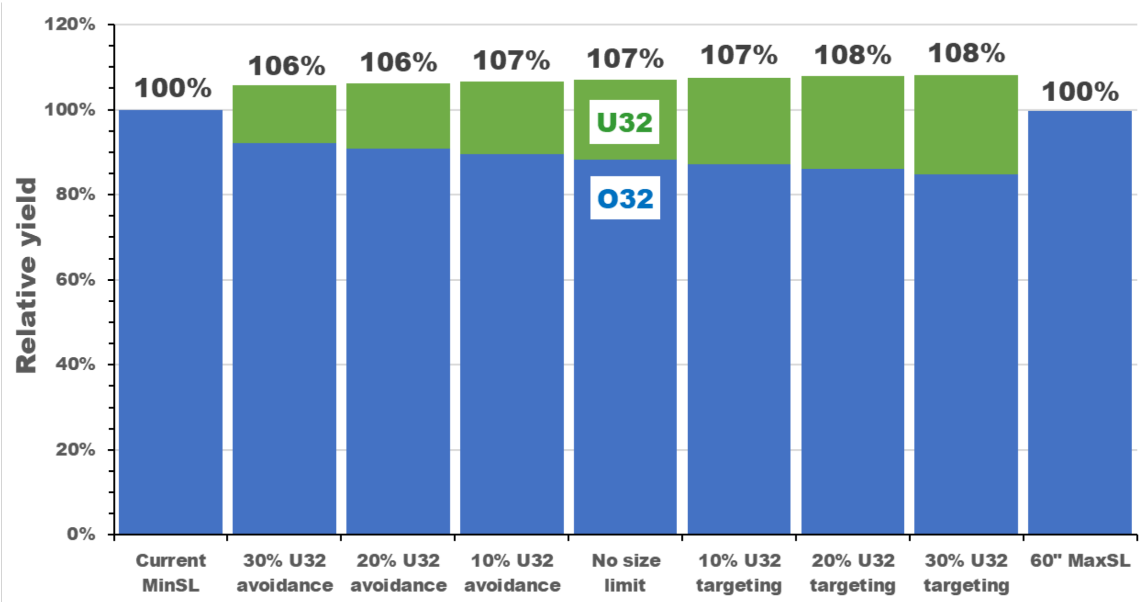

Figure 4. Relative yield (height of bars) for size limit alternatives considered in this analysis, colors indicate the component contributions (O32 and U32) of the total. Refer to Table 6 for percent U32 values.

Table 6. Percent U32 in the landed catch for alternatives removing the current commercial fishery minimum size limit.

Fishery	No MinSL	U32 avoidance			U32 targeting		
		10%	20%	30%	10%	20%	30%
Coastwide	18%	16%	15%	13%	19%	20%	22%
Region 2	12%	11%	10%	9%	13%	14%	15%
2A	15%	14%	13%	11%	17%	18%	19%
2B	13%	12%	11%	10%	14%	15%	16%
2C	9%	8%	7%	7%	10%	11%	12%
Region 3	21%	20%	18%	16%	23%	24%	26%
3A	19%	17%	16%	14%	20%	22%	23%
3B	28%	26%	23%	21%	30%	31%	33%
Region 4	23%	21%	19%	17%	25%	27%	28%
4A	26%	24%	22%	19%	27%	29%	31%
4CDE	21%	19%	17%	16%	23%	24%	26%
Region 4B	16%	15%	13%	12%	18%	19%	20%

The critical price ratio was projected to be 63% coastwide (Table 7); this means that if the price for U32 Pacific halibut is greater than 63% of the price for O32 fish then the fishery will increase in value if the MinSL is removed. Prices are known to vary substantially among IPHC Regulatory Areas, and the critical price ratio was also projected to vary, from a low of 47% in Area 2C (a low price is less important where encounter rates are lowest as U32 fish are projected to comprise a smaller fraction of the total landings) to a high of 68% in IPHC Regulatory Area 3B. Targeting or avoidance further changes the critical price ratio; however, even under the most extreme targeting alternative the fishery value would be equal or larger to that under the current

MinSL in all IPHC Regulatory Areas if the price for U32 Pacific halibut was at least 70% of that for O32 fish.

Table 7. Critical price ratio (price for U32/price for O32; see Appendix B) at which fishery value is unchanged from that under the current MinSL for alternatives removing the current commercial fishery minimum size limit.

Fishery	No MinSL	U32 avoidance			U32 targeting		
		10%	20%	30%	10%	20%	30%
Coastwide	63%	61%	59%	58%	63%	64%	65%
Region 2	57%	55%	54%	53%	57%	57%	58%
2A	61%	59%	57%	56%	62%	62%	63%
2B	58%	56%	54%	53%	58%	59%	59%
2C	47%	45%	43%	43%	47%	48%	49%
Region 3	67%	65%	63%	62%	67%	68%	68%
3A	64%	63%	61%	59%	65%	65%	66%
3B	68%	66%	65%	63%	69%	69%	70%
Region 4	62%	60%	57%	55%	63%	64%	65%
4A	67%	66%	64%	62%	68%	69%	70%
4CDE	66%	64%	62%	60%	66%	67%	68%
Region 4B	62%	60%	58%	57%	62%	63%	64%

Implementing a MaxSL

Implementing a 60 inch (152 cm) MaxSL is projected to result in little net change to fishery yield (Figure 4). However, this MaxSL would create a new (and largely unobserved) source of mortality through discarding of approximately 0.12 million pounds (~54 mt) large female Pacific halibut at the 2020 adopted mortality limits. As this is a one-year calculation, and Pacific halibut can live to at least 55 years of age, it is expected that the level of discard mortality would increase gradually over many years until the abundance of large fish equilibrated with average fishing intensity. At least in the short-term, discard mortality would be approximately offset by increased yield due to a higher fraction of males in the retained catch and average size closer to the peak yields under current size-at-age. If the relative price of fish larger than 60" (O60) remains slightly lower than the average for fish less than 60" (U60), then the average fish size in the landings is projected to result in no change in the aggregate fishery value (Appendix D).

Introduction of a MaxSL would provide an increase in the proportion of the Spawning Biomass (SB) comprised of large female Pacific halibut, and increased opportunity to encounter these fish in recreational fisheries in some IPHC Regulatory Areas (e.g., IPHC Regulatory Area 2C). The long-term change in age composition of the SB and its distribution among Biological Regions and IPHC Regulatory Areas will depend on future spatial patterns and overall levels of stock productivity and fishery management. A 60" MaxSL would reduce fishery efficiency by approximately 3%, and also reduce the data quality on fish in the total vs. landed commercial fishery catch.

DISCUSSION

Summary

This evaluation has provided a general framework for consideration of size limits for Pacific halibut. It includes series of projected responses, both positive and negative to the removal of the MinSL or implementation of a MaxSL (Table 1) as well as detail on the IPHC Regulatory Area specific results likely to be realized. Specific projected results are a key component in informed decision-making and recommended by the IPHC's Scientific Review Board (SRB) during the most recent size limit analysis. That review highlighted the adaptive management aspects of a potential action on the size limit (see Appendix E).

Removing the current MinSL is projected to increase potential yield by 7%, using the 2020 adopted mortality limits for comparison. This yield comes from a combination of reduced discard mortality, as well as harvest of fish sizes closer to the peak yields under current estimated size-at-age and sex-ratios. Building on concerns raised during the previous evaluation of size limits, we explored the relative price at which the fishery would be of equal of greater net value (accounting for the change in size structure of the landings), and found the critical price ratio for U32 Pacific halibut to be 63% of the price for O32 fish. This calculation likely provides a slight (but unknown) underestimate of the fishery value, implying the realized critical price ratio may be somewhat lower (Appendix B). With increased landings and decreased discards, the fishery efficiency (landings relative to total catch) is projected to increase by 18%. Improved efficiency should result in some level of savings to operational costs (fuel, bait, trip duration, etc.); however, such changes will be highly dependent on individual business plans and fishing grounds. Currently, discarding of U32 Pacific halibut creates an important data gap, due to sparse to no sampling at-sea (depending on the IPHC Regulatory Area). Assuming that full retention of all legal catch is retained in regulation, removing the MinSL will result in improved data on total catch through the existing port sampling program.

Introduction of a MaxSL was evaluated based on fishery and survey data over a range of potential maximum sizes. A 60 inch (152 cm) MaxSL was found to result in a very small reduction net fishery yield (rounding to 100% of the 2020 adopted mortality limits). Any MaxSL is projected to result in a new source of discard mortality, almost entirely comprised of female Pacific halibut, but in this example that mortality would be offset through increased yield due to a higher fraction of males in the retained catch and average size closer to the peak yields under current size-at-age. A MaxSL is also projected to result in an increase in older/larger female Pacific halibut in the stock, and therefore available to the recreational fishery. This increase would continue over time, depending on the level of fishing intensity resulting from commission mortality limits, as well as future size-at-age and recruitment levels. A 60" (152 cm) MaxSL is projected to reduce fishery efficiency by approximately 3%, due to the additional handling of large female halibut that would have to be discarded. This handling would also lead to a reduction in data quality as these discards would not be sampled for biological information. The reduction in average fish size in the landings is projected to result in no aggregate change in fishery value. As for the MinSL, the effects of a MaxSL would not be uniformly distributed among IPHC Regulatory Areas; Area 2C would likely see the greatest changes in both the fishery and stock, at least in the short-term, based on recent fishery landings.

Other considerations

A relatively large difference was observed between the fishery and FISS catches of large (primarily female) Pacific halibut. Although the fishery is known to capture a larger proportion of females across all ages (Stewart and Webster 2020), landings of fish larger than 55 inches were consistently estimated to be a greater fraction of the total in the FISS data. There are several potential reasons for this. Commercial fishery effort may be focused on fishing grounds with higher average catch rates, which must comprise smaller fish, as there are far more numerous in the population and may be behaviorally segregated from the largest fish investigated here. This represents potential avoidance of large fish, consistent with the slightly lower price (Appendix D). In addition, some large fish may be either lost from the gear during retrieval, or currently not retained by the directed commercial fishery during normal fishing operations. Finally, the difference may be simply an artifact of the calculation method; the survey catch percentages for large fish are based on individual predicted weights from the historical length-weight relationship (due to only 1 partial year of measured weights being available), and the length-weight relationship is known to over-predict the individual weights of the largest Pacific halibut.

This analysis did not examine trade-offs in yield between the commercial and recreational sectors as would likely occur due to existing domestic catch agreements. However, the results do account for the existing TCEY distribution. This means that estimated potential yield would be available without making major changes to the current distribution of the TCEY among IPHC Regulatory Areas. Removing the current MinSL or introduction of a MaxSL is also likely to affect the contribution of Pacific halibut resource to the economy through the recreational sector. This could be a potential avenue for an economic analysis that is currently under development by the IPHC.

The IPHC's FISS plans to land and sell U32 Pacific halibut that have been sacrificed for scientific data collection as part of the 2020 survey design. These fish, although very limited in number, may provide the first direct information on the price for U32 Pacific halibut for comparison with the critical price ratios found in this analysis. However, it is unclear whether a broader market response would differ if, as projected under the removal of the current MinSL, 13-22% of the coastwide landings comprised U32 fish. Further, it may take several years before a robust market for U32 fish develops and the relative price of U32 vs. other size categories stabilizes. Moreover, the initial assessment may be confounded by highly disrupted market conditions in 2020 (due to COVID-19). As of early 2020, news reports of small (3-8 pound; 1.4-3.6 kg) frozen Pacific halibut from the Russian fishery ("Fish Factor", Laine Welch, March 23, 2020) suggested U32 fish are already present in the global marketplace. Discovering the relative price for U32 Pacific halibut from IPHC Convention waters represents a clear adaptive management component of removing the MinSL.

This evaluation included consideration of both fishery targeting and avoidance of U32 Pacific halibut if the MinSL were removed. There are factors that could lead to both outcomes under the right circumstances. Targeting could occur if there was a small (or no) price differential for U32 fish, as fishery catch rates (efficiency) could be improved via increased effort on fishing grounds that produce smaller fish. Conversely, under a larger price differential there may be very strong economic reasons to avoid fishing grounds with small fish in order to avoid having to retain those fish under current regulation. This has been observed in recent years in the sablefish (*Anoplopoma fimbria*) fishery occurring in the same waters of Alaska as strong recruitment events have resulted in reduced prices for small fish and changes in fishery behavior (Hanselman et al. 2019). Both targeting and avoidance could be affected by future whale depredation; it is unknown whether this is likely to become a greater or lesser problem in the absence of a MinSL.

The previous evaluation of size limits (Stewart and Hicks 2018) considered the potential of a conservation benefit of the MinSL due to creating a ‘reproductive refuge’, where fish were allowed to mature before harvest. Although this concept forms the basis for the use of MinSLs in species from crustaceans to reef fish (e.g., Hilborn and Walters 1992), for Pacific halibut, much of the current fishery landings even with the MinSL in place are juvenile (immature) females. Another well recognized aspect of size-limits reflects the shape of the fishery yield curve: the yield available as a function of varying levels of fishing intensity tends to be a flatter relationship through the use of size limits. This means that a larger range of fishing intensity level (or similarly, of errors in intended fishing intensity) tend to produce more similar yields when a size limit is in place. This buffering of management actions (and errors) was noted in the previous size-limit analysis (Stewart and Hicks 2018). In the extreme, for a species where at least one spawning is ensured through the use of a MinSL (e.g., many crustaceans), there is much less importance of annual quotas or fishing intensity, and in some cases a MinSL may successfully provide the sole source of management. Similarly, a slot limit (a combination of both a MinSL and MaxSL) may provide both a management buffer and reproductive outputs, especially in the presence of very large maternal effects (Ahrens et al. 2020). Due to the wide range of ages represented by a single size of Pacific halibut, as well as the relatively late maturity (approximately 50% between ages 11 and 12), Pacific halibut management does not provide a ready analog for these simpler cases.

There are a variety of policy and procedural implications for a change to the current MinSL or introduction of a MaxSL. This analysis does not address the timeline or logistic aspects of such a change, as these would be primarily domestic management issues. However, with regard to data collection, the IPHC may need to request that domestic at-sea observer programs (either electronic or traditional) begin to identify the reason for discarding in the future so that adequate delineation of sub-legal, legal-regulatory (quota attainment), and supra-legal discards can occur.

Effects on size-at-age

Despite a long history of investigation, the mechanisms behind trends in Pacific halibut size-at-age remain poorly understood. Density dependence (Clark and Hare 2002), temperature (Holsman et al. 2018), dietary overlap (Barnes et al. 2018), and fishing (Sullivan 2016) may all be contributing factors. In the presence of a minimum size limit, fishing mortality can affect size-at-age in at least two ways: 1) by reducing the fastest growing fish in each cohort, such that the observed size-at-age is lower than it would be in the absence of fishing (e.g., Martell et al. 2015b; Taylor and Methot Jr 2013), and 2) cumulative effects over cohorts of removing the fastest growing genetic components of the stock (e.g., Conover and Munch 2002). This reconstructed historical time-series does not seem consistent with either of these, as size-at-age is understood to have increased from the 1930s through the 1970s, a period of high levels of exploitation combined with a (26”) MinSL. However, removing the current MinSL would likely reduce the selective removal of faster growing individuals. Some selectivity for faster growing Pacific halibut would remain even in the absence of a MinSL: hook sizes used by the commercial fishery also select for larger fish (and therefore faster growing fish as younger ages). Although conceptually this aspect of the decision to retain or remove the current MinSL could be considered to be adaptive management, in practice it could be decades before trends in size-at-age were clearly identified and those may be confounded with changes in the stock and ecosystem.

Importance of spatial differences

The detailed results of this evaluation illustrate the spatial variability in effects of removing the MinSL or implementing a MaxSL. This analysis is structured around the current demographic patterns (observed recent distributions of U32 and O60 Pacific halibut), and also the recent distribution of the TCEY. Management decisions to appreciably change the TCEY distribution will have both immediate and delayed effects on both the fishery and stock. Specifically, the net effect of removing the MinSL will depend on the proportion of the TCEY assigned to Areas of higher and lower encounter rates of U32 Pacific halibut. This analysis assumed no changes to the current distribution.

The effects of either removing the MinSL or introducing a MaxSL will not only vary by Biological Region and IPHC Regulatory Area, but will also vary at finer scales. Based on analyses of fine-scale spatial and temporal persistence in size-at-age patterns, broad changes observed over time and IPHC Regulatory Areas mask even more complex patterns among fishing grounds (B. Ritchie, MS Thesis in preparation, Alaska Pacific University). This means that the effects on individual fishermen will differ based on where they choose to fish their quota within the larger Regulatory Areas. Therefore, there is the potential for changes in the selection of fishing grounds to create targeting or avoidance that introduce additional uncertainty in this analysis.

The stock distribution also represents both an important input, and to some degree an output of any decision regarding size limits. Ontogenetic movement patterns observed for Pacific halibut suggest higher relative movement at younger ages/smaller size, but continued movement throughout their life-span, with a clear net movement toward eastern IPHC Regulatory Areas (Webster et al. 2013). This means that large changes in the distribution of the TCEY and/or the size structure of the mortality are likely to have an effect on long-term stock distribution. Evaluation of this feedback requires a spatially-structured simulation model and accounting for all aspects of the management system (see management procedure discussion below).

Spawning biomass and recruitment

The IPHC’s Interim Management procedure relies on a reference SPR, this means that regardless of allocation, selectivity and current age structure of the stock, the long-term reproductive output of the stock is maintained at a constant level. The age-structure of the spawning biomass has been found to be important for some marine species, particularly long-lived rockfishes (e.g., Berkeley et al. 2004), through ‘maternal effects’ or increasing survival/fitness of offspring produced by older females. Some species also show evidence of an increasing relationship between size and fecundity, indicating that eggs produced per unit of body mass may be greater for larger females (Dick 2009). However, for Pacific halibut, there are currently no data that indicate either maternal effects or increasing fecundity with size or age. Both maturity and fecundity are part of the ongoing IPHC research program (Planas 2020).

As part of a broader review of stock-recruitment modelling in the Pacific halibut stock assessment, models have been explored that allow for maternal effects, in order to determine whether they are more consistent with the historical time-series. Although this is not an experimental evaluation with high statistical power, no support was found in the historical age composition and other information available (IPHC-2020-SRB016-07). Therefore, it is unlikely that implementing a MaxSL would increase projected recruitment to the Pacific halibut stock.

Public perception

Globally, in recent decades there has been decrease in discarding of non-target species and sizes (bycatch) in many fisheries (Zeller et al. 2017). In some regions this change has been driven by regulation based ‘full’ retention, including the highly publicized ban on discarding of all quota species in the North Sea in 2014 causing changes in the way many affected fisheries are conducted (e.g., Catchpole et al. 2017). For Pacific halibut, the last decade has seen increasing interest in quantifying the effects of discard mortality both within the directed commercial fishery and in non-directed commercial fisheries. A similar trend has been notable among previous size-limit analyses, ranging from little emphasis on discarding as a decision point in early evaluations, to a major focus on the magnitude and distribution of discards in 2018. There would seem to be some benefit for the directed fishery in public perception, and beyond simple yield calculations, in eliminating all discard mortality by removing the MinSL and requiring the retention of all catch.

Size limits within a comprehensive management procedure

This evaluation provides tactical decision-making information for consideration of removing the current MinSL and/or implementing a MaxSL. The focus is on short-term yield, fishery and stock performance while retaining all other aspects of the IPHC's Interim Management Procedure. It is not intended to provide a comparison of long-term performance of size limits as one part of a comprehensive management procedure. Such a comprehensive analysis is ongoing, via the MSE process. Questions regarding long-term change in spatial distribution and scale of recruitment and spawning biomass require the full 'closed-loop' approach used in the MSE. As such, size limits provide a potential avenue for future MSE analysis depending on prioritization by the Management Strategy Advisory Board.

RECOMMENDATIONS

That the Commission:

a) **NOTE** paper IPHC-2020-IM096-09 which provides an evaluation of directed commercial fishery size limits in response to the discussion and request from AM096.

b) **REQUEST** any changes to this document for presentation at the 97th Session of the IPHC Annual Meeting (AM097).

REFERENCES

Ahrens, R.N.M., Allen, M.S., Walters, C., and Arlinghaus, R. 2020. Saving large fish through harvest slots outperforms the classical minimum-length limit when the aim is to achieve multiple harvest and catch-related fisheries objectives. Fish and Fisheries. doi:10.1111/faf.12442.

Barnes, C.L., Beaudreau, A.H., Hunsicker, M.E., and Ciannelli, L. 2018. Assessing the potential for competition between Pacific Halibut (Hippoglossus stenolepis) and Arrowtooth Flounder (Atheresthes stomias) in the Gulf of Alaska. PLoS One **13**(12): e0209402. doi:10.1371/journal.pone.0209402.

Berkeley, S.A., Hixon, M.A., Larson, R.J., and Love, M.S. 2004. Fisheries sustainability via protection of age structure and spatial distribution of fish populations. Fisheries **29**(8): 23-32.

Catchpole, T.L., Elliott, S., Peach, D., Mangi, S.C., and Gray, T.S. 2017. How to deal with the EU landing obligation: lessons from an English discard ban sea trial. ICES J. Mar. Sci. doi:10.1093/icesjms/fsx119.

Clark, W.G., and Parma, A.M. 1995. Re-evaluation of the 32-inch commercial size limit. International Pacific Halibut Commission Technical Report No. 33. 34 p.

Clark, W.G., and Hare, S.R. 2002. Effects of Climate and Stock Size on Recruitment and Growth of Pacific Halibut. North American Journal of Fisheries Management **22**: 852-862.

Conover, D.O., and Munch, S.B. 2002. Sustaining fisheries yields over evolutionary time scales. Science **297**: 94-96.

Dick, E.J. 2009. Modeling the Reproductive Potential of Rockfishes (Sebastes spp.). Doctoral dissertation. University of California, Santa Cruz.

Erikson, L. 2020. Fishery-independent setline survey (FISS) design and implementation in 2019. IPHC-2020-AM096-06. 11 p.

Hanselman, D.H., Rodgveller, C.J., Fenske, K.H., Shotwell, S.K., Echave, K.B., Malecha, P.W., and Lunsford, C.R. 2019. 3. Assessment of the sablefish stock in Alaska. NPFMC Bering Sea, Aleutian Islands and Gulf of Alaska SAFE. 263 p.

Hilborn, R., and Walters, C.J. 1992. Quantitative fisheries stock assessment: choice, dynamics and uncertainty. Chapman and Hall, London.

Holsman, K.K., Aydin, K., Sullivan, J., Hurst, T., and Kruse, G.H. 2018. Climate effects and bottom-up controls on growth and size-at-age of Pacific halibut (Hippoglossus stenolepis) in Alaska (USA). Fisheries Oceanography. doi:10.1111/fog.12416.

IPHC. 1960. Utilization of Pacific halibut stocks: yield per recruitment. IPHC Sci. Rep. No. 28. 52 p.

IPHC. 2017a. Report of the 10th session of the IPHC Scientific Review Board (SRB10). Seattle, Washington, U.S.A. 14-16 June 2017. IPHC-2017-SRB10-R, 17 p.

IPHC. 2017b. Report of the 11th sesion of the IPHC scientific review board (SRB11). Seattle, WA. IPHC-2017-SRB11-R. 18 p.

IPHC. 2020. Report of the 96th Session of the IPHC Annual Meeting (AM096). Anchorage, Alaska, USA, 3-7 February 2020. IPHC-2020-AM096-R. 51 p.

Martell, S., Leaman, B., and Stewart, I. 2015a. Recent developments in the IPHC Management Strategy Evaluation process and size-limit implications. IPHC Report of Assessment and Research Activities 2014. p. 299-312.

Martell, S., Stewart, I., and Sullivan, J. 2015b. Implications of bycatch, discards, and size limits on reference points in the Pacific halibut fishery. *In* Fisheries bycatch: Global issues and creative solutions. *Edited by* G.H. Kruse and H.C. An and J. DiCosimo and C.A. Eischens and G. Gislason, S. and D.N. McBride and C.S. Rose and C.E. Siddon. Alaska Sea Grant, University of Alaska Fairbanks.

Myhre, R.J. 1973. Setting the new halibut size limit. Western Fisheries. 85(5): 14.

Myhre, R.J. 1974. Minimum size and optimum age of entry for Pacific halibut. IPHC Sci. Rep. No. 55. 15 p.

Parma, A.M. 1999. Effects of imposing a maximum size limit in commercial landings. International Pacific Halibut Commission Annual Meeting Handout.

Planas, J. 2020. IPHC 5-year biological and ecosystem science research plan: Update. IPHC-2020-AM096-11. 14 p.

Stewart, I., and Hicks, A. 2018. Evaluation of the IPHC's 32" minimum size limit. IPHC-2018-AM094-14. 44 p.

Stewart, I., and Webster, R. 2020. Overview of data sources for the Pacific halibut stock assessment, harvest policy, and related analyses. IPHC-2020-SA-02. 53 p.

Stewart, I., and Hicks, A. 2020. Assessment of the Pacific halibut (*Hippoglossus stenolepis*) stock at the end of 2019. IPHC-2020-SA-01. 32 p.

Sullivan, J.Y. 2016. Environmental, ecological, and fishery effects on growth and size-at-age of Pacific halibut (*Hippoglossus stenolepis*). University of Alaska Fairbanks.

Taylor, I.G., and Methot Jr, R.D. 2013. Hiding or dead? A computationally efficient model of selective fisheries mortality. Fish. Res. **142**(0): 75-85. doi:http://dx.doi.org/10.1016/j.fishres.2012.08.021.

Valero, J.L., and Hare, S.R. 2012. Harvest policy considerations for re-evaluating the minimum size limit in the Pacific halibut commercial fishery. 2012 IPHC annual meeting handout. p. 22-58.

Walters, C.J. 1986. Adaptive management of renewable resources. MacMillan, New York, N.Y. 374 p.

Webster, R.A., Clark, W.G., Leaman, B.M., and Forsberg, J.E. 2013. Pacific halibut on the move: a renewed understanding of adult migration from a coastwide tagging study. Can. J. Fish. Aquat. Sci. **70**(4): 642-653. doi:10.1139/cjfas-2012-0371.

Zeller, D., Cashion, T., Palomares, M., and Pauly, D. 2017. Global marine fisheries discards: A synthesis of reconstructed data. Fish and Fisheries. doi:10.1111/faf.12233.

APPENDIX A: CALCULATION OF CHANGE IN FISHERY YIELD

This evaluation is focused on the short-term effects of removing the MinSL and/or adding a MaxSL. Therefore, the approach taken to make yield calculations is based on current conditions and is intended to guide IPHC management in 2021-2022, pending the development and implementation of a comprehensive management procedure through the MSE process.

In order to estimate the change in yield associated with removing the MinSL (as well as the related calculations of the percent of that yield comprising U32 Pacific halibut and the critical price ratio; see Appendix B), the following procedure was applied using the 2019 stock assessment ensemble:

1) Begin with the directed fishery landings equating to the mortality limits adopted for 2020. This level of yield and projected fishing intensity ($F_{42\%}$) provides the baseline for comparisons.
2) Inflate the estimated discard mortality (U32) to reflect a removal of the MinSL, such that all fish captured by the directed commercial Pacific halibut fishery are retained. The magnitude of this source of mortality increases substantially from those fish discarded dead, due to the 16% discard mortality rate (catch = discard mortality/0.16).
3) Because the total mortality is now greater, the directed fishery O32 landings must be scaled downward to achieve the same level of fishing intensity for 2020. However, U32 Pacific halibut are now included in the landed fishery yield.
4) After iteratively finding the scale of the new set of removals that matches the target fishing intensity, the fishery yield by IPHC Regulatory Area, Biological Region, and Coastwide can be compared with the adopted mortality limits for 2020.
5) Because the response of the fishery to removal of the MinSL is unknown, several alternative levels of targeting (10, 20 and 30% more U32 catch) and avoidance (10, 20 and 30% less U32 catch) were also compared with regard to yield and catch characteristics.

A similar, but slightly more complicated approach was required to evaluate the MaxSL:

1) Add another commercial fleet to the assessment models to represent the capture of large (O60) Pacific halibut.
2) Add another fleet to represent the directed fishery ages without the O60 fish included.
3) Add 2017-2018 age composition data (with the appropriate sizes of fish added/removed) to inform the selectivity curve of new fleets.
4) Iteratively fit the assessment model to these data to generate selectivity curves consistent with a change in both the landings and new source of discard mortality under a MaxSL, then fix the selectivity parameters at those estimates allowing the models to be projected to 2020 without any change in the time-series.
5) Use the observed percentages of large Pacific halibut in the landed catch to assign a fraction of the projected catch for 2020 to the new large fish discard fleet. Discount that catch by 84% to account for release survival.
6) Reduce the existing fishery mortality by the amount transferred to the discard fleet and transfer remaining mortality for the fishery to the new fleet where selectivity does not represent O60s.
7) Iterate to find the new fishery yield and discard associated with the MaxSL that satisfies the SPR from the 2020 projection.
8) Compare with the adopted mortality limits for 2020.

APPENDIX B: CALCULATION OF CRITICAL PRICE RATIO

The value of the current fishery can be approximated by:

$$value_{SL} = L_{O32,SL} x P_{O32}$$

Where *L* denotes the landings of legal-size (*O32*) Pacific halibut in the presence of the current size limit (*SL*), and *P* denotes the price.

In the absence of a size-limit (*NSL*) a similar approximation using the same notation is:

$$value_{NSL} = L_{O32,NSL} x P_{O32} + L_{U32,NSL} x P_{U32}$$

Where the additional term reflects the contribution of sublegal (*U32*) Pacific halibut to the overall fishery value. In order to find the point at which the fishery value would be equal with and without the size limit, these two equations can be set equal and re-arranged, yielding a 'critical price ratio':

$$\frac{P_{U32}}{P_{O32}} = \frac{L_{O32,SL} - L_{O32,NSL}}{L_{U32,NSL}}$$

This formulation in convenient for comparisons because it does not require that the price for either O32 or U32 Pacific halibut is known in order to determine if the fishery is likely to gain or lose overall value. Only the relative landings must be known. Further, given important differences in the relative proportions of O32 and U32 in potential fishery landings by IPHC Regulatory Area and Biological Regions, this critical price ratio can be estimated at each scale to provide more information on the likely spatial distribution of effects on the fishery.

An important simplifying assumption in this approach is that the price for O32 Pacific halibut will remain the same regardless of the presence or absence of the MinSL. Theoretically, we might expect an increase in the O32 price in the absence of the MinSL as the supply would be lower and therefore demand may be higher. This would lead to the reported critical price ratio to be conservative relative to the likely outcome: fishery value may actually be higher than predicted, and the critical ratio of U32 to O32 price lower than calculated using this method.

APPENDIX C: SUMMARY OF U32 FISS CATCHES BY SIZE, 2017-2019

The most comprehensive source of size- and sex-delineated information for U32 Pacific halibut comes from the annual catches by the FISS. In order to evaluate the distribution of U32 Pacific halibut by number and biomass, the most recent three years of FISS catches (2017-2019) were summarized in 1-inch (~2.5 cm) increments. Results are provided in the form of alternative potential MinSLs by individual IPHC Regulatory in Figures C.1 to C.8. Across all IPHC Regulatory Areas, the catch of Pacific halibut discarded at alternative potential size limits less than 32 inches decreases rapidly with fish size. Catches of Pacific halibut less than 26 inches (66 cm) are small, corresponding a maximum of 19.8% by number and 7.1% of the catch by weight in IPHC Regulatory Area 4A. This suggests that removing the current MinSL entirely would not likely produce a large amount of catch smaller than 26 inches without significant changes in fishing behavior. In most IPHC Regulatory Areas, male Pacific halibut comprise an increasing percentage of the catch at smaller sizes; this change in sex-ratio is included in the yield analyses reported in this document. Also evident in these results is the broad range of encounter rates among IPHC Regulatory Areas from 2C (the lowest) to 3B (the highest).

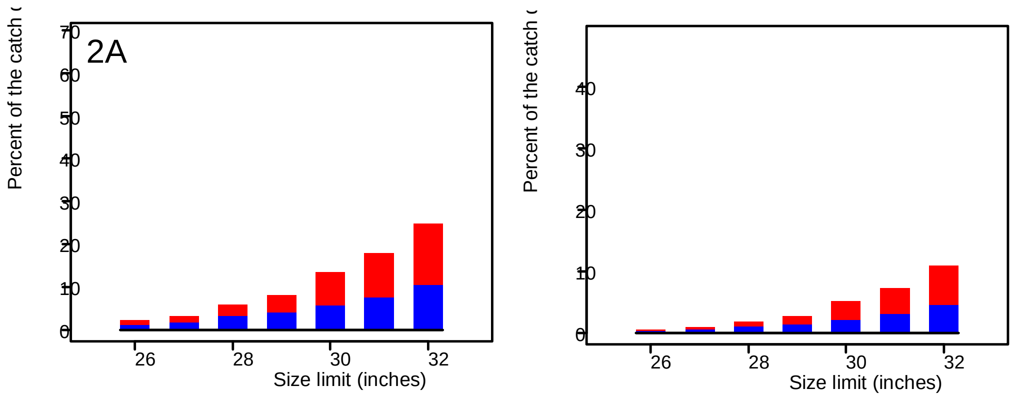

Figure C.1. Percent of the catch discarded (bars) based on alternative potential size limits less than 32 inches for IPHC Regulatory Area 2A. Left panel is based on numbers of fish, right panel is based on estimated weight of the catch. Each bar is divided into the male (blue) and female (red) components of the catch.

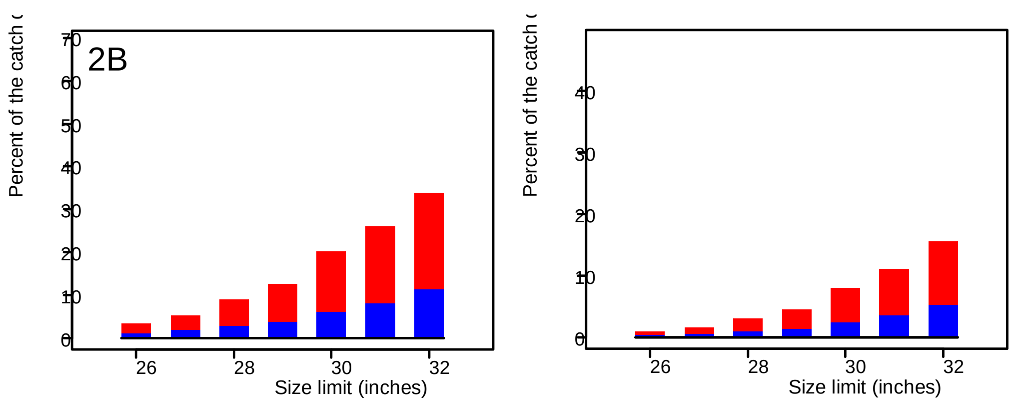

Figure C.2. Percent of the catch discarded (bars) based on alternative potential size limits less than 32 inches for IPHC Regulatory Area 2B. Left panel is based on numbers of fish, right panel is based on estimated weight of the catch. Each bar is divided into the male (blue) and female (red) components of the catch.

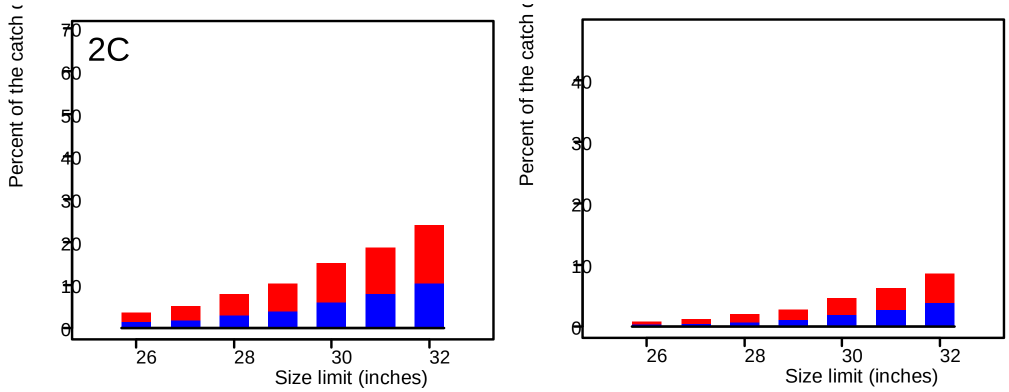

Figure C.3. Percent of the catch discarded (bars) based on alternative potential size limits less than 32 inches for IPHC Regulatory Area 2C. Left panel is based on numbers of fish, right panel is based on estimated weight of the catch. Each bar is divided into the male (blue) and female (red) components of the catch.

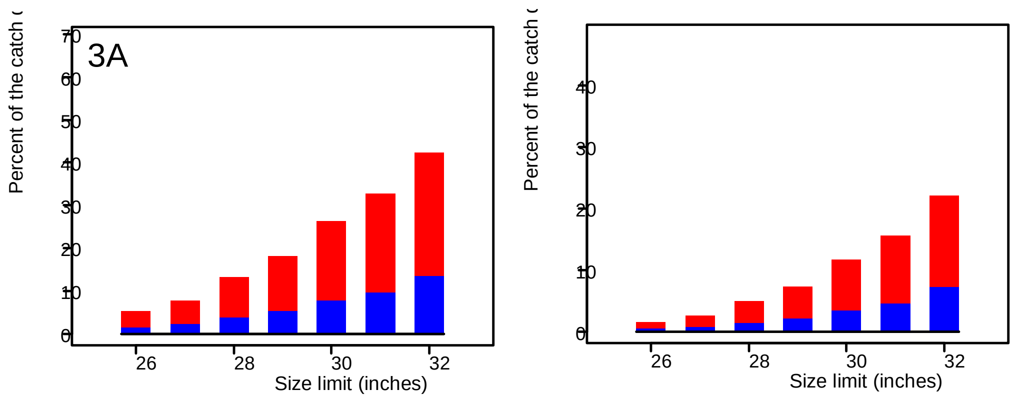

Figure C.4. Percent of the catch discarded (bars) based on alternative potential size limits less than 32 inches for IPHC Regulatory Area 3A. Left panel is based on numbers of fish, right panel is based on estimated weight of the catch. Each bar is divided into the male (blue) and female (red) components of the catch.

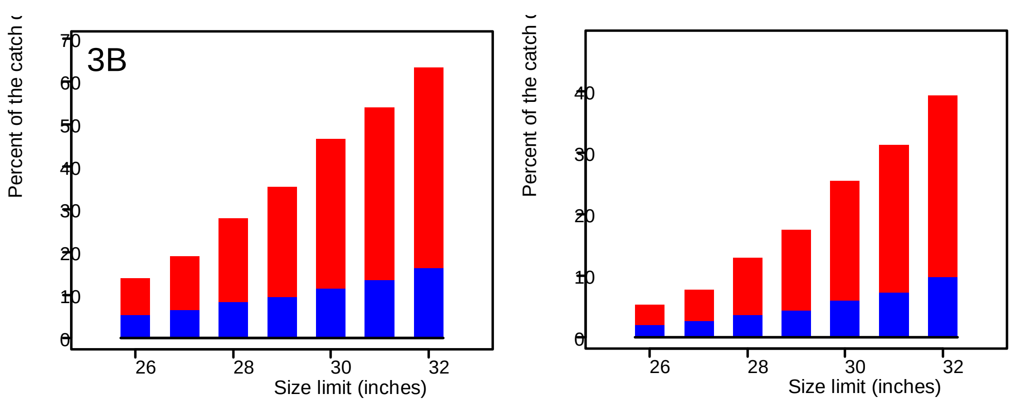

Figure C.5. Percent of the catch discarded (bars) based on alternative potential size limits less than 32 inches for IPHC Regulatory Area 3B. Left panel is based on numbers of fish, right panel is based on estimated weight of the catch. Each bar is divided into the male (blue) and female (red) components of the catch.

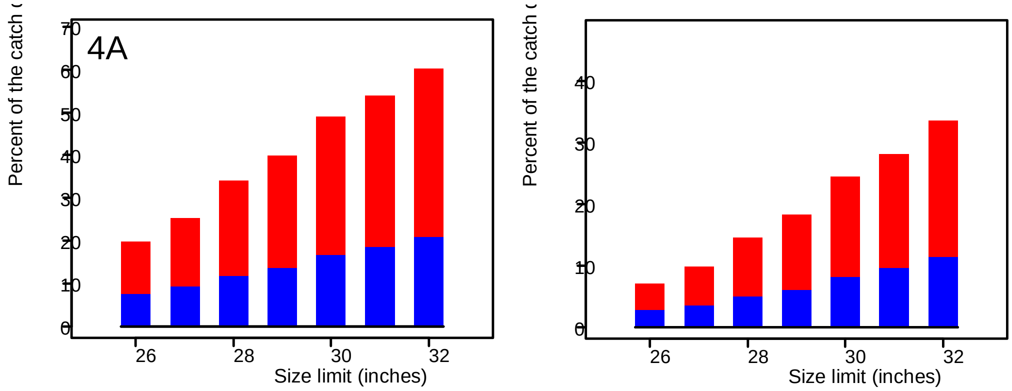

Figure C.6. Percent of the catch discarded (bars) based on alternative potential size limits less than 32 inches for IPHC Regulatory Area 4A. Left panel is based on numbers of fish, right panel is based on estimated weight of the catch. Each bar is divided into the male (blue) and female (red) components of the catch.

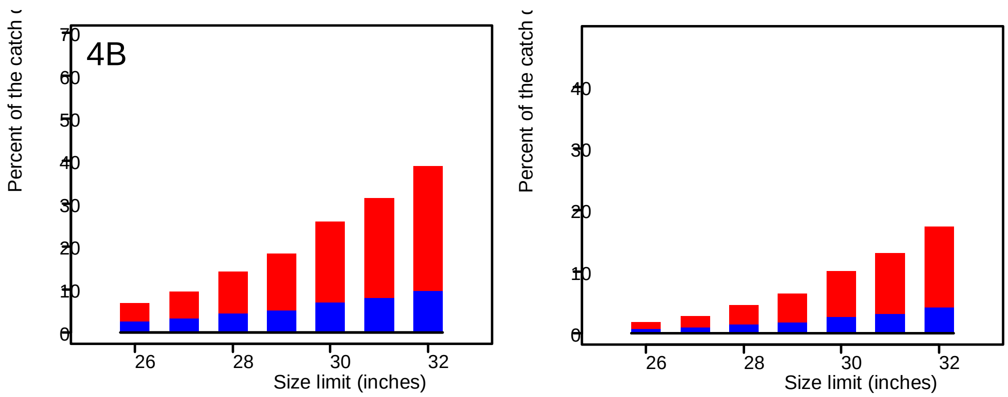

Figure C.7. Percent of the catch discarded (bars) based on alternative potential size limits less than 32 inches for IPHC Regulatory Area 4B. Left panel is based on numbers of fish, right panel is based on estimated weight of the catch. Each bar is divided into the male (blue) and female (red) components of the catch.

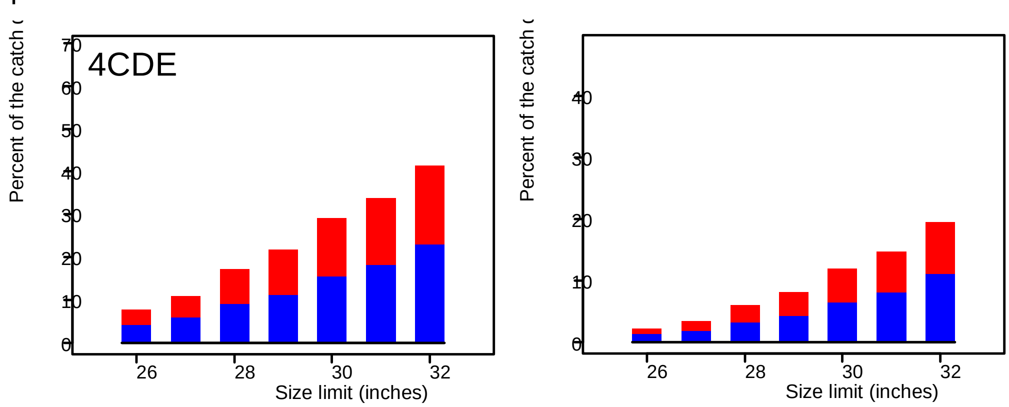

Figure C.8. Percent of the catch discarded (bars) based on alternative potential size limits less than 32 inches for IPHC Regulatory Area 4CDE. Left panel is based on numbers of fish, right panel is based on estimated weight of the catch. Each bar is divided into the male (blue) and female (red) components of the catch.

APPENDIX D: 2019 PACIFIC HALIBUT PRICES IN ALASKA

Recent prices and differences in price among size (weight) categories of the commercial fishery landings differ by year, IPHC Regulatory Area, port and buyer. In order to provide context for the critical price ratio, and the relative importance of different size categories, landings data were summarized from 2019 (Table D.1).

Table D.1: Average reported 2019 landings, revenue and price by aggregated weight category for Pacific halibut landed in Alaska (raw data from the eLandings system).

Aggregated weight category (net lbs)	Reported landings (net lbs)	Revenue ($US)	Price ($US)
<=20	5,397,552	27,350,760	5.07
20-40	4,492,190	24,046,953	5.35
40-60	1,821,392	10,391,435	5.71
60-80	375,098	2,060,299	5.49
80+	209,932	1,135,090	5.41
Unassigned[1]	3,270,674	17,566,759	5.37

[1]Categories reported in recent years have been inconsistent, including various levels of aggregation. The categories assigned here represent those that could be categorized unambiguously; therefore a large fraction of the landings remained unassigned.

APPENDIX E: ADAPTIVE MANAGEMENT CONSIDERATIONS

During the review of the 2018 MinSL evaluation (Stewart and Hicks 2018), the SRB made the following request:

SRB10–Req.02 *(**para. 28**):*

> *"The SRB REQUESTED an evaluation of the potential to try different size limits in different regions given the diversity of impacts on Pacific halibut fishing sectors and areas. MSL [MinSL] changes may need an adaptive management experiment approach that considers the biological, economic, and sociological consequences MSL [MinSL] changes. Indeed, predictions of consequences in each IPHC Regulatory Area should be a pre-requisite to any proposed MSL [MinSL] changes.*"

Adaptive management consists of actions taken in order to learn specific information that will subsequently improve future management (Walters 1986). In some cases, actions may be sub-optimal (or even negative) in the short term, but the information that they generate may facilitate improved performance (e.g., yield), and thus a positive result in the long term. An important aspect of adaptive management is that the focus of the action is on gaining information about the system and not on the specific results of that action.

The 2018 MinSL analysis provided an appendix containing detailed projections of likely effects by IPHC Regulatory Area of a reduced (or no) MinSL. During SRB11 (IPHC 2017b), after reviewing the options developed by the Secretariat, the IPHC's Scientific Review Board made an additional recommendation:

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.*"

Discussion of alternative and potentially adaptive approaches for removing or modifying the MinSL included both the Commission and advisory bodies. One proposal allowed for the MinSL to be removed in a single IPHC Regulatory Area on a voluntary basis in order to learn more about the price for U32 Pacific halibut (and therefore potential change in fishery value). There were no IPHC Regulatory Areas that volunteered to remove the MinSL as an adaptive management measure at that time.

INTERNATIONAL PACIFIC

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Evaluation of directed commercial fishery size limits in 2020

Agenda item 6.5

IPHC-2020-IM096-09

Quick summary

- Removing the minimum size limit in 2020:
  - Would have increased potential yield by 7% and fishery efficiency by 18%, and decreased discard mortality by 0.8 Mlb
  - Would have maintained coastwide aggregate fishery value if average prices for U32 landings were at least 63% of those for O32 fish
  - Would have had substantially different effects among IPHC Regulatory Areas

Quick summary

- Adding a maximum size limit of 60” (152 cm) in 2020:
  - Would have been approximately fishery yield and value neutral
  - Would have increased discard mortality by 0.12 Mlb and decreased fishery efficiency (-3%)
  - Would tend to increase spawning biomass of and recreational encounters with larger fish
  - Would not likely produce a net change in recruitment
  - Would have had substantially different effects among IPHC Regulatory Areas

Document overview

- Summary of historical studies
- Summary of data informing the Minimum Size Limit (MinSL) analysis
- Summary of data informing the Maximum Size Limit (MaxSL) analysis
- Evaluation of the MinSL
- Evaluation of one potential MaxSL (60”)

Historical studies

- Increasing foregone yield estimated over time
  – Roughly tracks declines in size-at-age
- Increasing recognition of the importance of discards and discard mortality rates to the success of a minimum size limit
- The shift to an SPR-based management procedure ensures adequate spawning potential regardless of the demographics of mortality

How much is currently discarded?

U32 discard mortality (Mlb; Table 2)

Year	2A	2B	2C	3A	3B	4A	4B	4CDE	Coastwide
2019	0.03	0.13	0.07	0.32	0.16	0.09	0.03	0.07	0.90
3-year average	0.02	0.14	0.07	0.32	0.20	0.07	0.03	0.04	0.88
5-year average	0.02	0.17	0.09	0.37	0.21	0.07	0.03	0.05	1.01
10-year average	0.02	0.20	0.11	0.58	0.39	0.08	0.04	0.07	1.49

U32 discard mortality (% of total commercial; Table 3)

Year	2A	2B	2C	3A	3B	4A	4B	4CDE	Coastwide
2019	3%	2%	2%	4%	6%	6%	3%	4%	4%
3-year average	2%	2%	2%	4%	7%	5%	3%	3%	3%
5-year average	3%	3%	2%	5%	7%	5%	3%	3%	4%
10-year average	3%	3%	3%	5%	8%	5%	3%	3%	5%

Large fish

(Table 4; abridged)

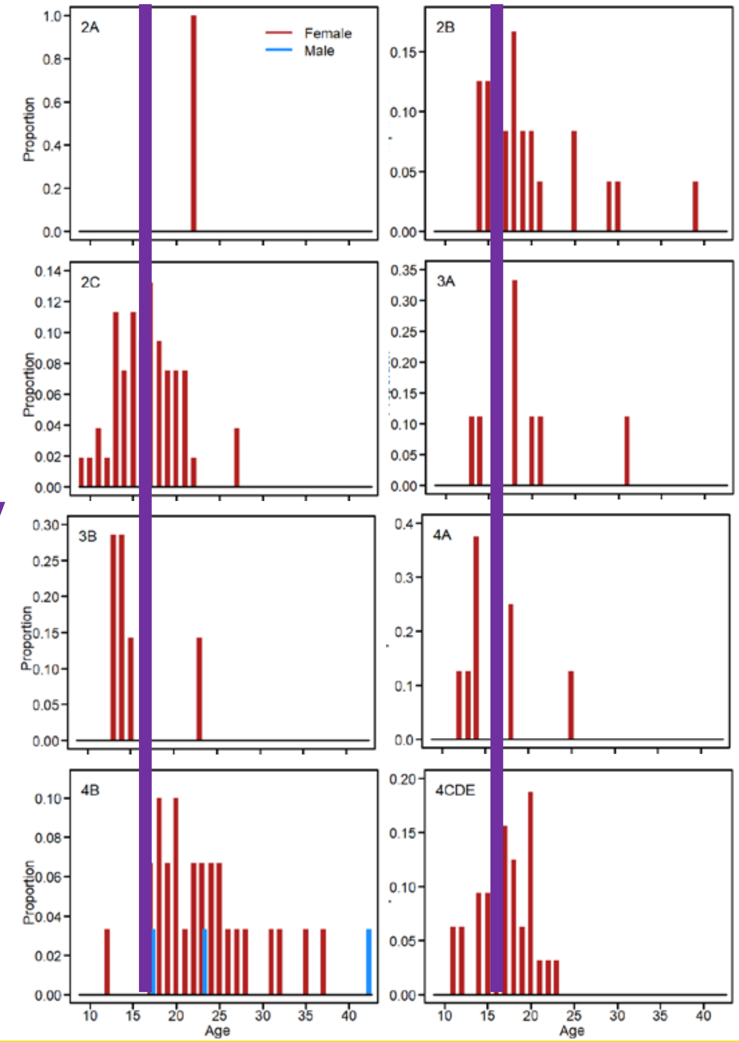
- Essentially all female
- Not necessarily very old
- Contribution to current fishery varies by Regulatory Area

IPHC Regulatory Area	Length greater than (in, cm)	Average net weight (lb, kg)	Average age (range)	% female (weight)[1]	% of Landings (weight)
2A	55, 140	66, 30	16 (10-23)	100%	<1%
	60, 152	109, 49	22 (22-22)	100%	<1%
	65, 165	109, 49	22 (22-22)	100%	<1%
2B	55, 140	75, 34	18 (9-39)	100%	8%
	60, 152	92, 42	20 (14-39)	100%	4%
	65, 165	112, 51	22 (15-31)	100%	1%
2C	55, 140	71, 32	17 (9-36)	100%	17%
	60, 152	86, 39	17 (9-36)	100%	6%
	65, 165	114, 52	18 (13-36)	100%	2%
3A	55, 140	69, 31	16 (11-31)	100%	4%
	60, 152	85, 39	18 (12-31)	100%	2%
	65, 165	119, 54	20 (18-21)	100%	<1%
3B	55, 140	70, 32	14 (11-23)	96%	5%
	60, 152	92, 42	16 (13-23)	100%	1%
	65, 165	144, 65	20 (17-23)	100%	<1%
4A	55, 140	70, 32	18 (11-39)	100%	5%
	60, 152	100, 45	19 (12-39)	100%	1%
	65, 165	118, 54	23 (14-39)	100%	1%
4B	55, 140	80, 36	21 (8-42)	94%	11%
	60, 152	100, 45	23 (12-42)	92%	7%
	65, 165	120, 54	23 (12-40)	100%	4%
4CDE	55, 140	74, 34	16 (11-24)	100%	9%
	60, 152	88, 40	17 (11-24)	100%	4%
	65, 165	108, 49	18 (11-22)	100%	1%

Large fish (60”+)

(Figure 3)

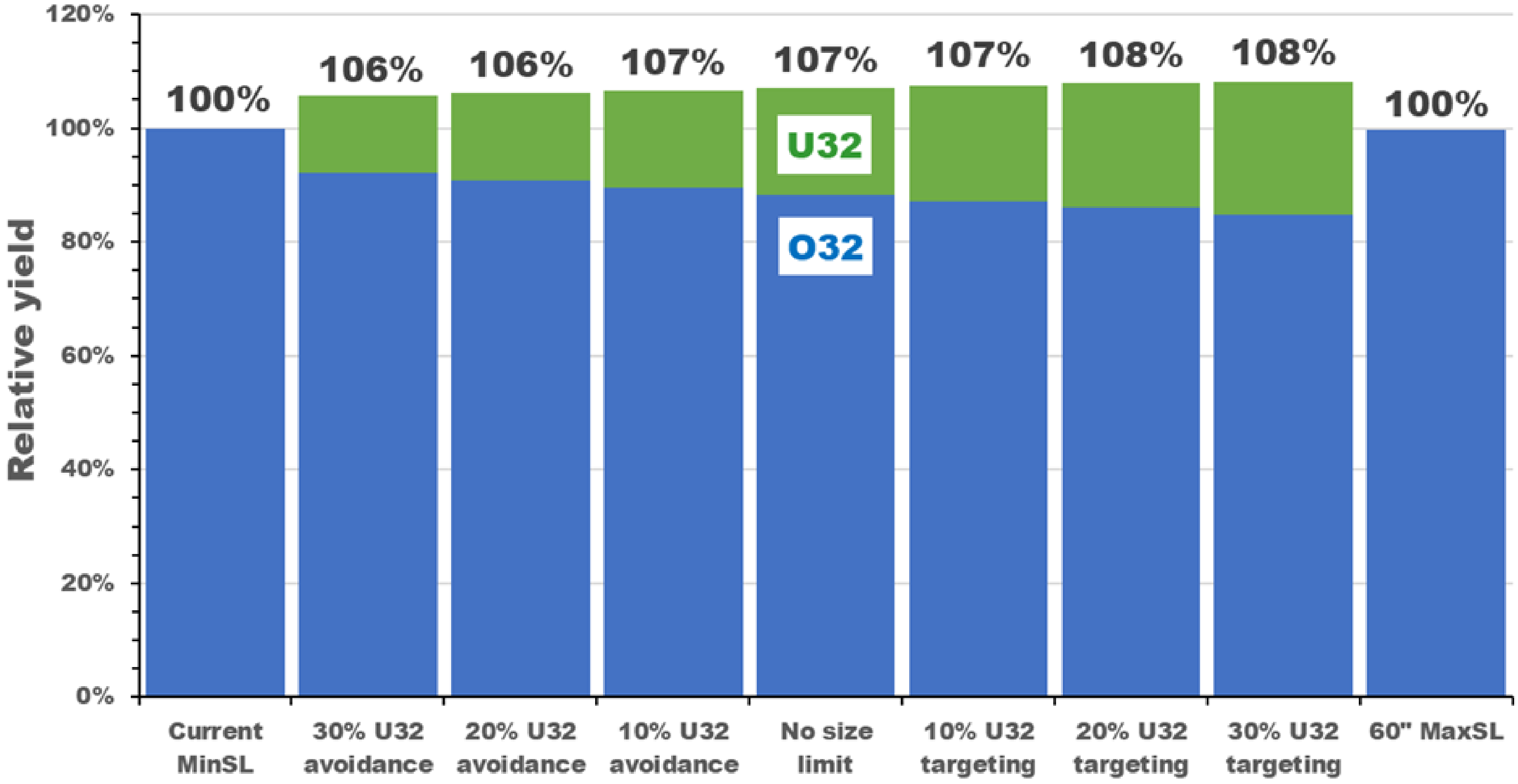
Age 16: relatively common in fishery



Basic methods

- Replay the 2020 mortality limits
  – Remove/add size limit(s)
  – Adjust fishery targeting or avoidance
- Match the same SPR
- Calculate yield, discards, relative proportions of the catch, fishery efficiency, fishery value, etc.

Change in yield (Figure 4)



MinSL Differences by Regulatory Area (Table 6)

Percent U32 in landings

Fishery	No MinSL	U32 avoidance 10%	U32 avoidance 20%	U32 avoidance 30%	U32 targeting 10%	U32 targeting 20%	U32 targeting 30%
Coastwide	18%	16%	15%	13%	19%	20%	22%
Region 2	12%	11%	10%	9%	13%	14%	15%
2A	15%	14%	13%	11%	17%	18%	19%
2B	13%	12%	11%	10%	14%	15%	16%
2C	9%	8%	7%	7%	10%	11%	12%
Region 3	21%	20%	18%	16%	23%	24%	26%
3A	19%	17%	16%	14%	20%	22%	23%
3B	28%	26%	23%	21%	30%	31%	33%
Region 4	23%	21%	19%	17%	25%	27%	28%
4A	26%	24%	22%	19%	27%	29%	31%
4CDE	21%	19%	17%	16%	23%	24%	26%
Region 4B	16%	15%	13%	12%	18%	19%	20%

MinSL Differences by Regulatory Area (Table 7)

Critical price ratio: *what fraction of the O32 price is needed for U32s?*

Fishery	No MinSL	U32 avoidance 10%	U32 avoidance 20%	U32 avoidance 30%	U32 targeting 10%	U32 targeting 20%	U32 targeting 30%
Coastwide	63%	61%	59%	58%	63%	64%	65%
Region 2	57%	55%	54%	53%	57%	57%	58%
2A	61%	59%	57%	56%	62%	62%	63%
2B	58%	56%	54%	53%	58%	59%	59%
2C	47%	45%	43%	43%	47%	48%	49%
Region 3	67%	65%	63%	62%	67%	68%	68%
3A	64%	63%	61%	59%	65%	65%	66%
3B	68%	66%	65%	63%	69%	69%	70%
Region 4	62%	60%	57%	55%	63%	64%	65%
4A	67%	66%	64%	62%	68%	69%	70%
4CDE	66%	64%	62%	60%	66%	67%	68%
Region 4B	62%	60%	58%	57%	62%	63%	64%

→ Improved efficiency could lower this further from a harvester's perspective

Discussion of other considerations

- Difference between fishery and survey encounters with large fish
- Economic value beyond price at landing
- Logistics of implementation
- Effects on size-at-age
- Spatial effects and differences
- Spawning biomass and recruitment
- Public perception
- Testing via MSE

Summary

	Management action	
Response	Remove MinSL	Add MaxSL = 60”
Fishery yield	7% increase	No change
Fishery value	Increased if U32 price >= 63% of O32 price	No change
Discard mortality	Decreased by 0.80 million pounds	Increased by 0.12 million pounds, may increase further over time
Fishery efficiency (landings/catch)	18% increase	3% decrease
Data on total fishery catch and biology	Improved	Degraded
Recreational encounters with large fish	No change	Increased
Abundance/biomass of old females	No change	Increased
Average projected recruitment	No change	No change

Recommendations

That the Commission:

- **NOTE** paper IPHC-2020-IM096-09 which provides a response to requests from AM096.
- **REQUEST** any changes to this document for presentation at the 97th Session of the IPHC Annual Meeting (AM097).

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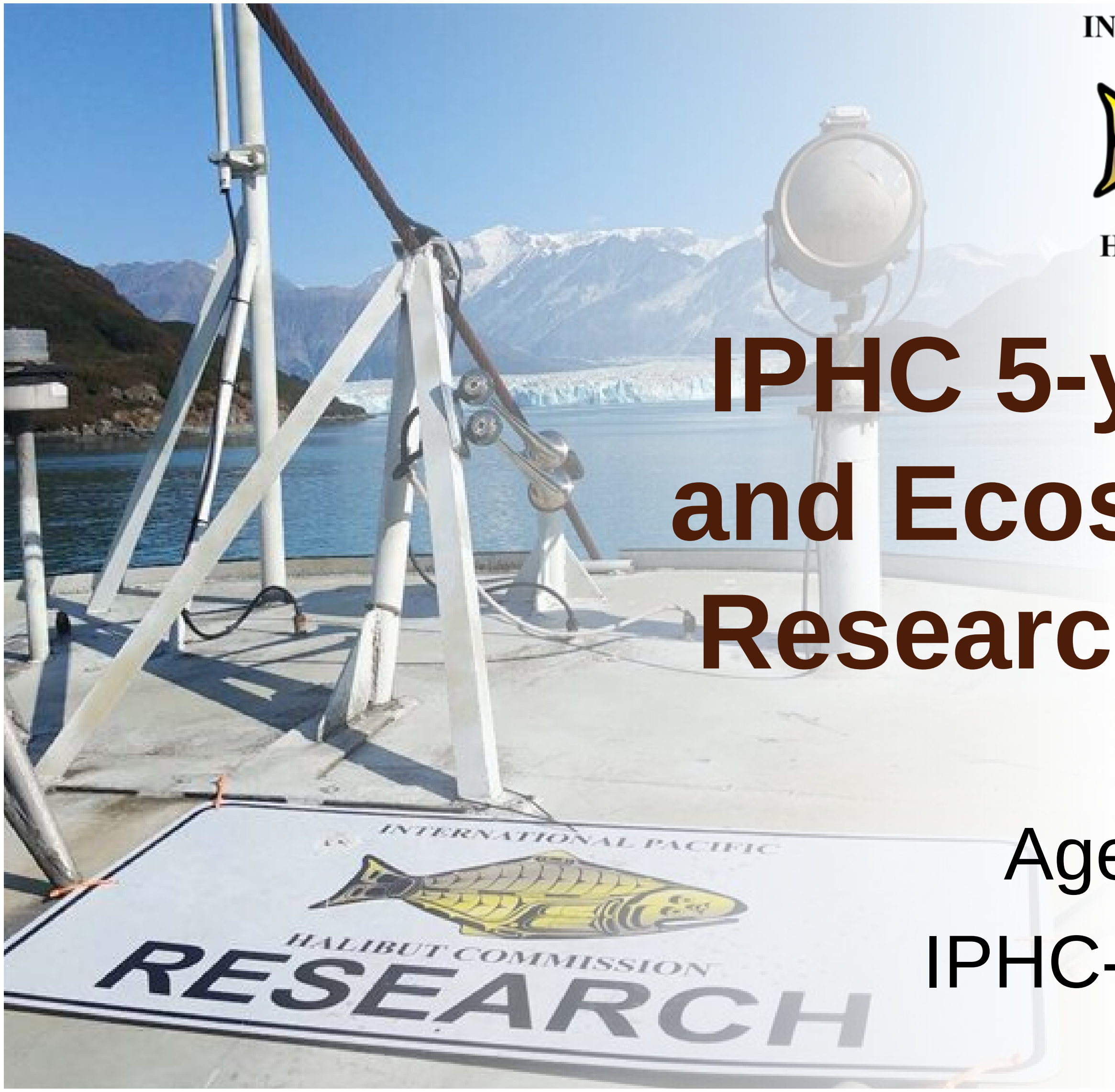

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IPHC 5-year Biological and Ecosystem Science Research Plan: Update

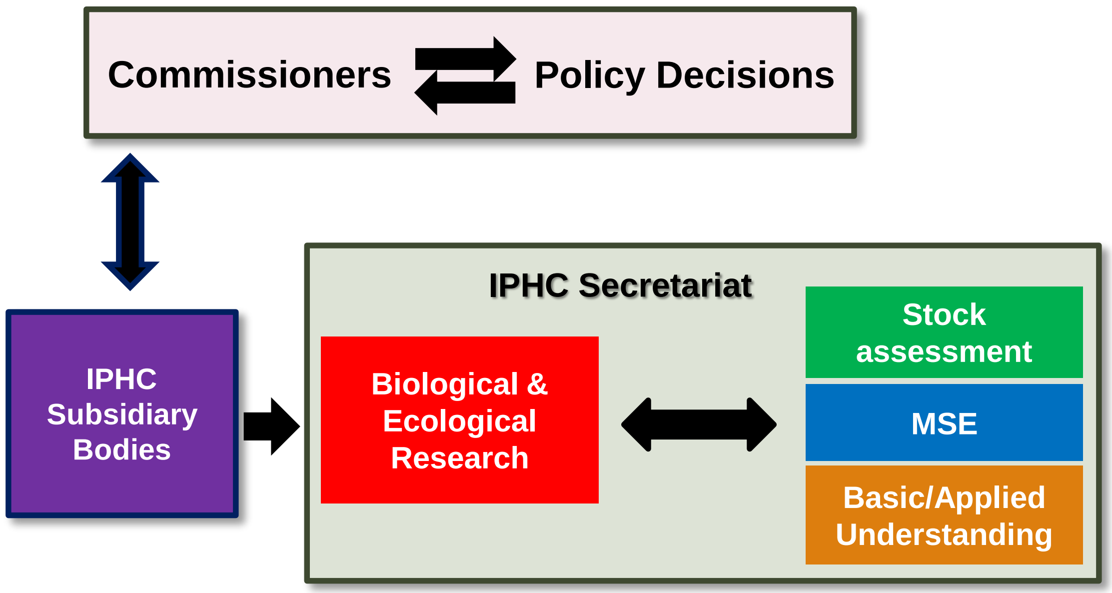
Agenda Item 7.3

IPHC-2020-IM096-10

Outline

- Five-year biological and ecosystem science research program and management implications
- Progress on ongoing research projects
- Externally-funded collaborative research projects

Integration of biological research, stock assessment, and policy



Five-year research program and management implications (2017-2021)

5-Year Biological and Ecosystem Science Research Plan

Primary Research Areas	*Main Objectives*	*Management implications*
Migration	Improve understanding of migration throughout all life stages (larval, juvenile, adult feeding and reproductive migrations)	Stock distribution, regional management
Reproduction	Information on sex ratios of commercial landings and improved maturity estimates	Female stock spawning biomass
Growth	Improve understanding of factors responsible for changes in size-at-age and development of tools for monitoring growth and physiological condition	Biomass estimates
DMRs and discard survival	Improve estimates of DMRs in the directed longline and guided recreational fisheries	Discard mortality estimates
Genetics and genomics	Improve understanding of the genetic structure of the population and create genomic tools (genome)	Stock distribution, local adaptation

Next 5-Year Research Plan (2021-26) in development

Outline

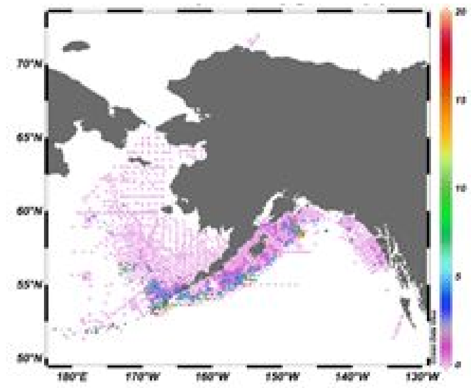
- Five-year research program and management implications
- **Progress on ongoing research projects**

1. **Migration and Distribution**
2. **Reproduction**
3. **Growth**
4. **DMRs and Survival Assessment**
5. **Genetics and Genomics**

1. Migration and Distribution

1. Larval and early juvenile dispersal

- **Key findings:**
  - Aleutian Islands constrain connectivity, but large island passes act as conduits between the GOA and Bering Sea
  - Degree of inter-basin larval connectivity is influenced by spawning location.

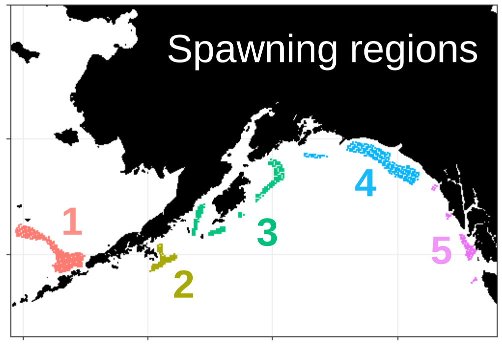


Percentage of model larvae reaching the **Bering Sea** based on IBM:

Spawn region	Year					
	Warm			Cold		
	2003	2004	2005	2009	2010	2011
1	100	100	100	100	100	100
2	58.0	51.1	58.1	52.7	51.5	47.0
3	17.6	19.3	15.2	17.2	17.2	20.5
4	8.6	4.5	8.2	4.5	7.0	6.5
5	0.2	0.04	0.6	0.08	1.6	0.04

BS (region 1)

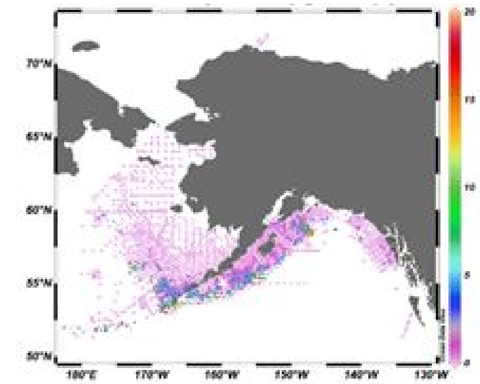
GOA (regions 2–5)

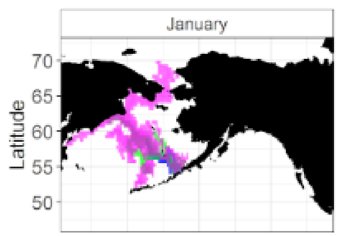


1. Migration and Distribution

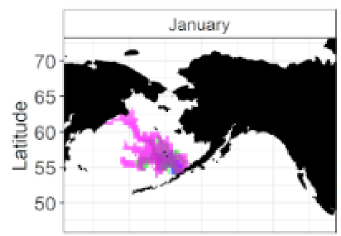
1. Larval and early juvenile dispersal

- **Key findings:**
  - Aleutian Islands constrain connectivity, but large island passes act as conduits between the GOA and Bering Sea
  - Degree of inter-basin larval connectivity is influenced by spawning location
  - Large degree of intra-basin connectivity



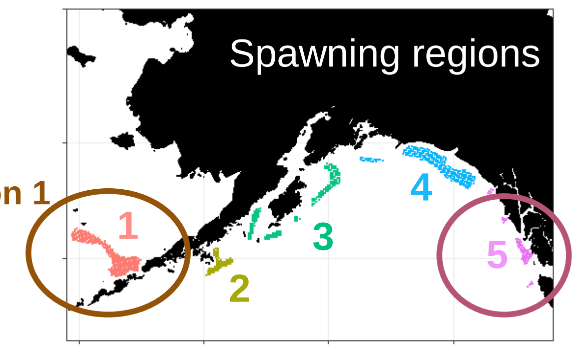


2005



2009

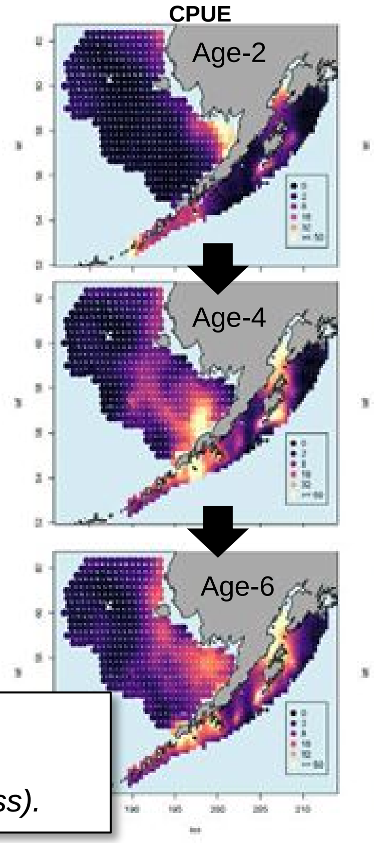
Origin – spawning region 1



1. Migration and Distribution

1. Larval and early juvenile dispersal

- **Key findings:**
  - Aleutian Islands constrain connectivity, but large island passes act as conduits between the GOA and Bering Sea
  - Degree of inter-basin larval connectivity is influenced by spawning location.
  - Large degree of within-basin connectivity
  - Demersal stage fish in the Bering Sea migrate outward from Bristol Bay and reach Unimak Pass by age-4, widely dispersed by age-6



Sadorus, L. L., Goldstein, E., Webster, R. A., Stockhausen, W. T., Planas, J. V., and Duffy-Anderson, J. 2020. **Multiple life-stage connectivity of Pacific halibut (*Hippoglossus stenolepis*) across the Bering Sea and Gulf of Alaska**. *Fisheries Oceanography. (In Press).*

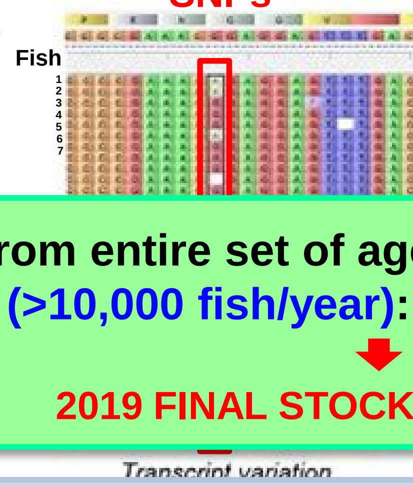
2. Reproduction

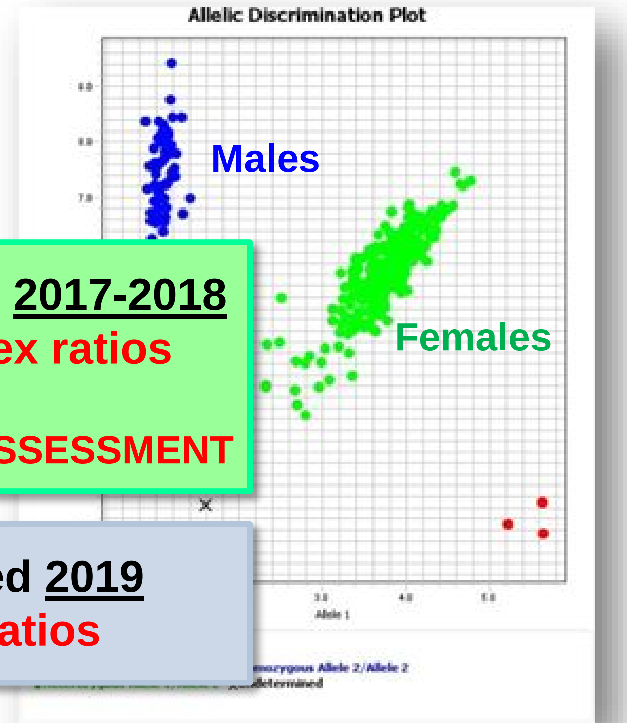
1. Identification of sex in the commercial landings

To generate sex-ratio data for use in assessment and policy analysis

Application of genetic techniques (SNPs)

SNPs





- **Completed**: **Fin clips from entire set of aged <u>2017-2018</u> commercial samples (>10,000 fish/year): sex ratios**

  2019 FINAL STOCK ASSESSMENT

- **Completed**: **Fin clips from entire set of aged <u>2019</u> commercial samples (>10,000 fish) : sex ratios**

2. Reproduction

1. Identification of sex in historical commercial landings

DNA Extraction from Archived Otoliths: Current Progress

Storage Type	**n**	**# Successful Genotypes**
Dry	7	7
Glycerin	10	0

Other potential issues:

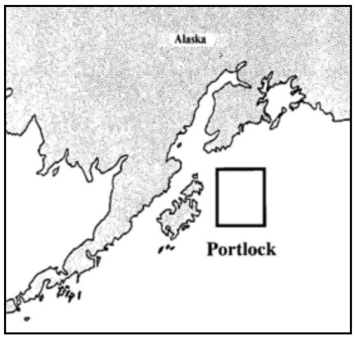
- All otoliths collected prior to 2003 stored in glycerin in batches, not individually
- Glycerin solution sometimes reused
- Some otoliths cleaned in muriatic acid

- Extractions via Qiagen column kits w/ DTT added, low elution volume
- PCR performed w/ BSA, extended cycle number
- No nanodrop signature present for glycerin-stored samples

2. Reproduction

2. Full characterization of the annual reproductive cycle to improve current estimates of maturity

Objective: Revise maturity estimates for male and female Pacific halibut



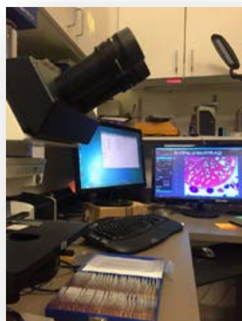
Sept Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug

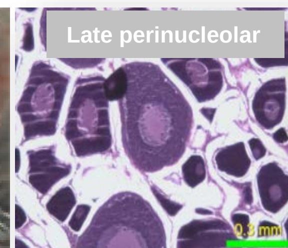
2017 2018

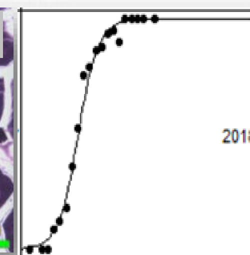
30♀ / 30 ♂

Reproductive cycle

Gonadal growth	Maturation	Spawning





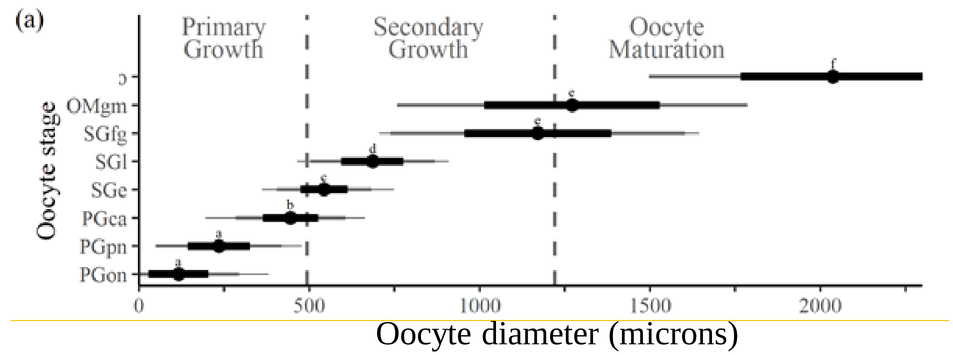


Deliverables:
- **Accurate staging of reproductive status**
- **Updated maturity-at-age estimates**
- **Information on fecundity and skip-spawning**

2. Reproduction

Microscopic maturity staging: Oocyte stage classification by histology

Growth phase (acronym)	Developmental stage (acronym)	Description	Photo
Primary Growth (PG)	One nucleolus (PGon)	Oocytes are small, angular, and compact with a single large nucleolus. Cytoplasm stains dark purple.	
	Perinucleolar (PGpn)	Oocytes are larger and rounder than PGon and nuclei develop and flatten around the nucleus. Cytoplasm stains light purple.	
	Cortical alveolar (PGca)	First cortical alveoli appear as white stain in the periphery of the oocyte.	
Secondary Growth (SG)	Early (SGe)	Yolk globules first appear at the periphery, stain pink, and fill inwards occupying up to 1/3 of the cytoplasm.	
	Late (SG*l*)	Yolk globules transition from only the periphery of the ooplasm and fill inwards to the nucleus.	
	Full Grown (SGfg)	Yolk globules completely fill the ooplasm to the central nucleus and coalesce into larger yolk globules.	
Oocyte Maturation (OM)	Germinal vesicle migration (OMgm)	The nucleus begins to migrate through a cytoplasm fully filled with large yolk globules.	
	Periovulatory (OMpo)	Nucleus no longer visible and the yolk globules coalesce int a central yolk mass. Oocyte is still within the follicle wall.	



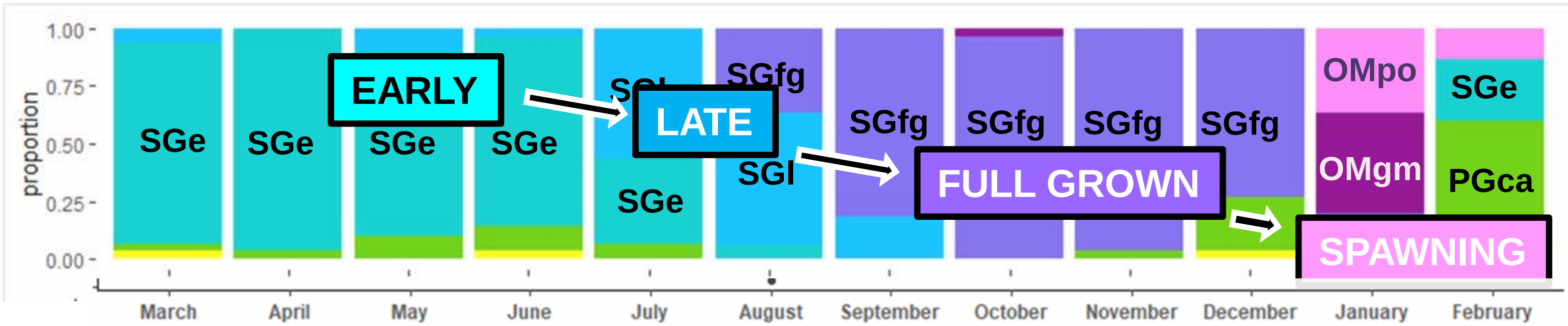
Female reproductive phase determined based on the stage of the most advanced oocytes

- **Pacific halibut is a batch-spawner with a group-synchronous ovarian developmental pattern**

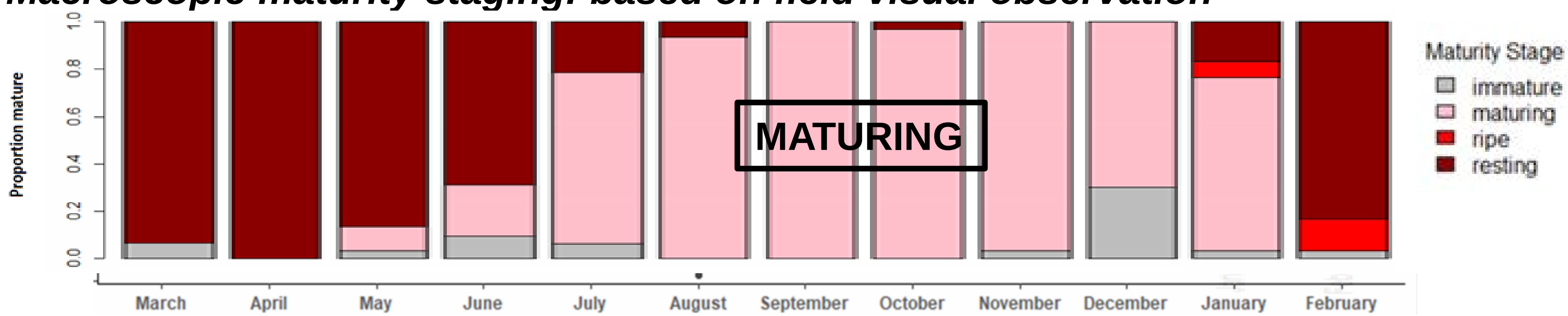
Fish, T., Wolf, N., Harris, B. P. , and Planas, J. V. 2020. **A comprehensive description of oocyte developmental stages in Pacific halibut, *Hippoglossus stenolepis.*** *Journal of Fish Biology. (In Press).*

2. Reproduction

Microscopic maturity staging: based on histological oocyte stages

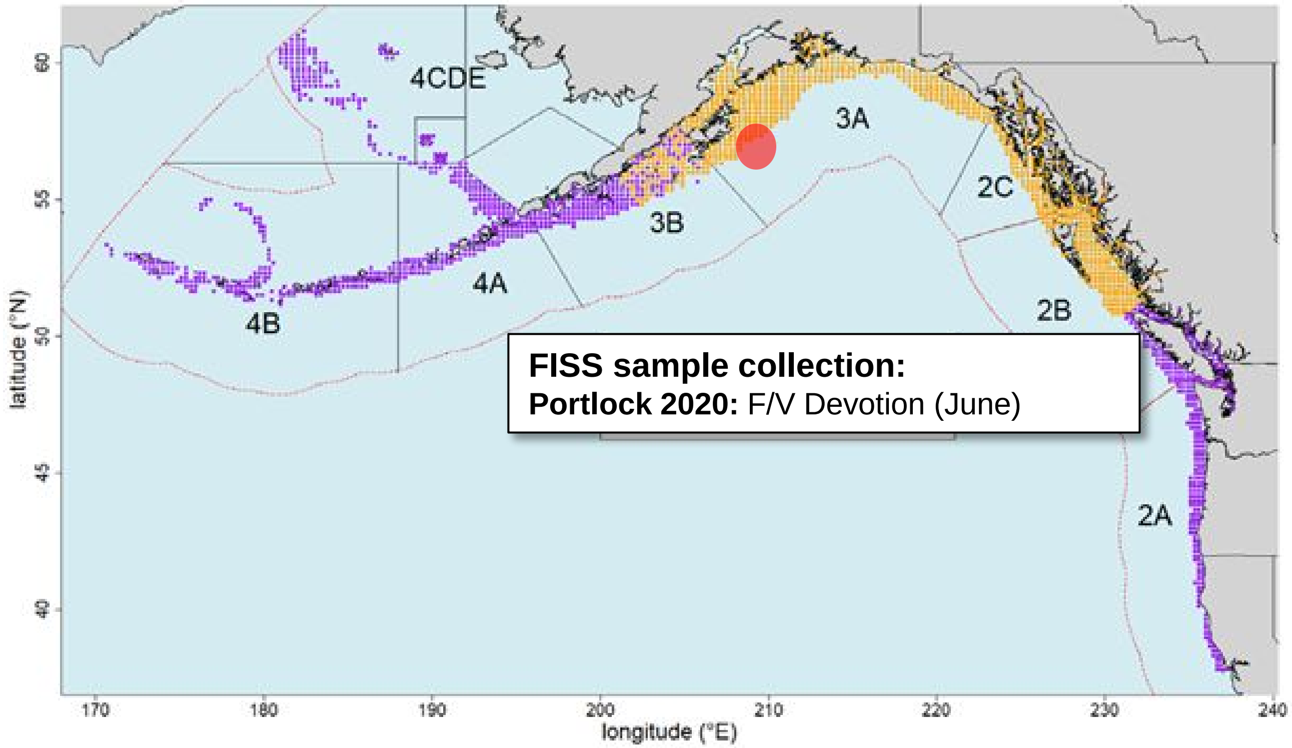


Macroscopic maturity staging: based on field visual observation



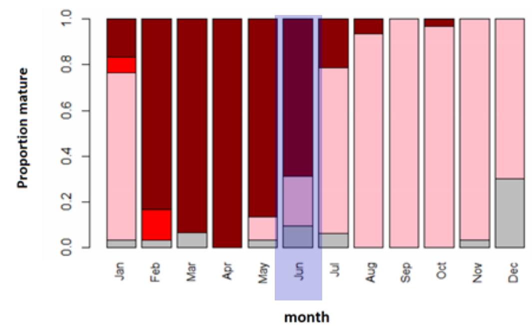
2. Reproduction

2017-2020: Temporal analysis of maturity (Portlock region)



- **Full annual collection (2018)**

Macroscopic maturity staging (♀)

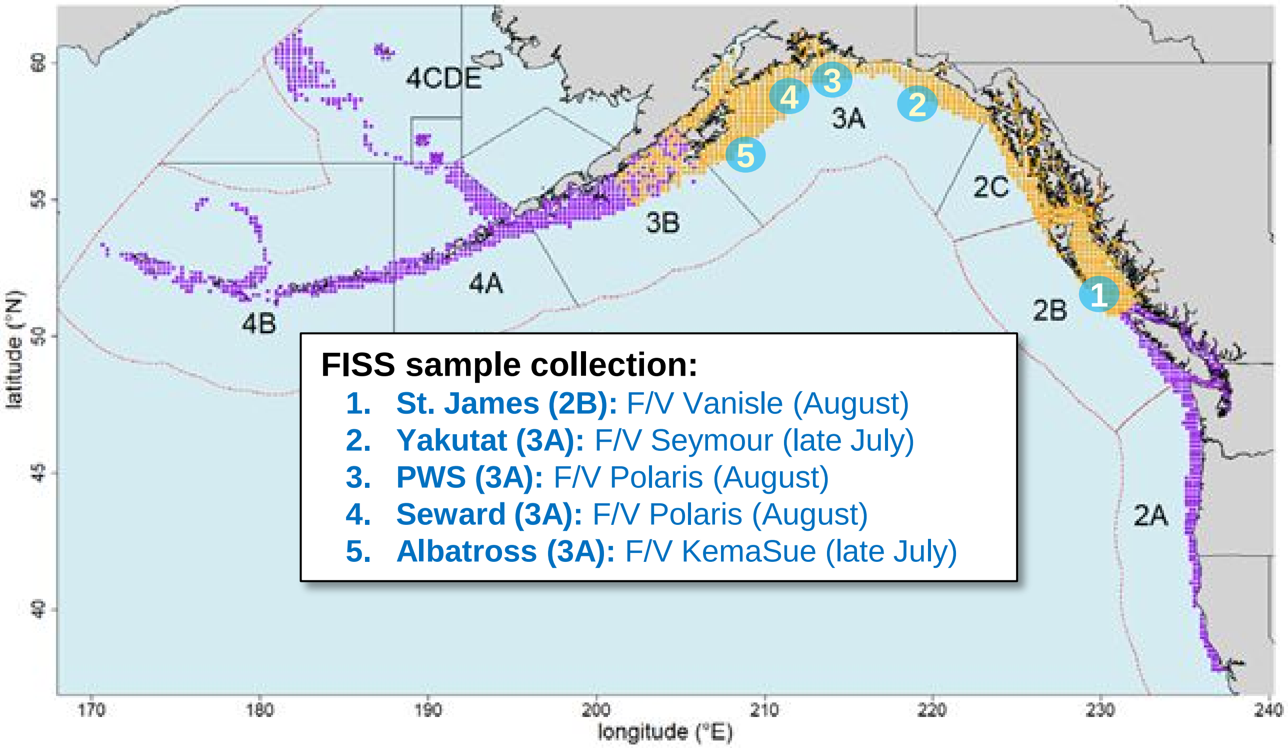


FISS

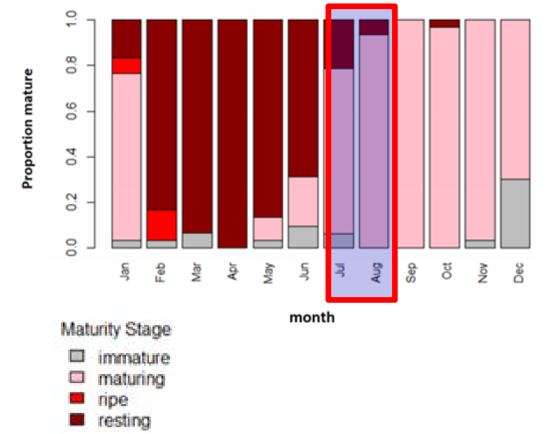
- **Interannual collection June 2017, 2018, 2019, 2020**

2. Reproduction

2020: Spatial analysis of maturity (Gulf of Alaska)



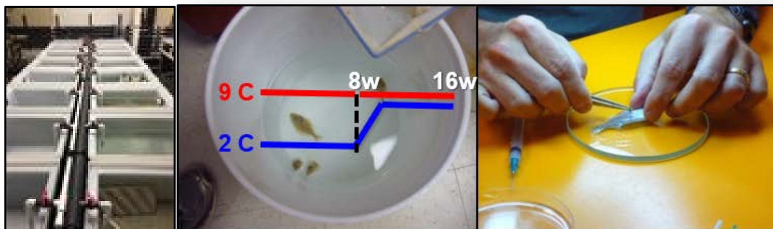
Macroscopic maturity staging (♀)

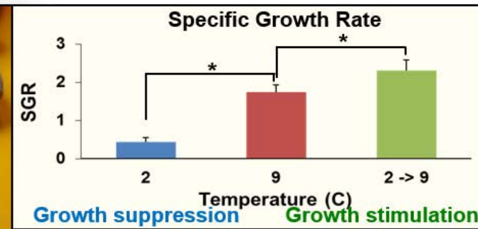


- **July-August collection in FISS: 75-90% maturing (30 females/region)**

3. Growth

1. Identification and validation of physiological markers for growth





White muscle:
- **Transcriptomics**
- **Proteomics**

Temperature | **Population Density** | **Dominance** | **Capture Stress**

Effects on transcriptome and proteome

Identification of physiological growth markers

MUSCLE
LIVER

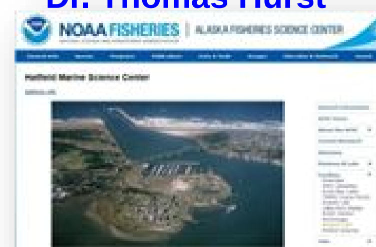
BIOCHEMICAL AND MOLECULAR GROWTH RESPONSES

Application to field studies

IPHC / AFSC-NOAA (Newport, OR)

Dr. Josep Planas (PI)

Dr. Thomas Hurst



NPRB Grant 1704 (2017-2020)

3. Growth

1. Identification and validation of physiological markers for growth

- **Identify common genes and proteins in muscle that change with changes in growth rate**

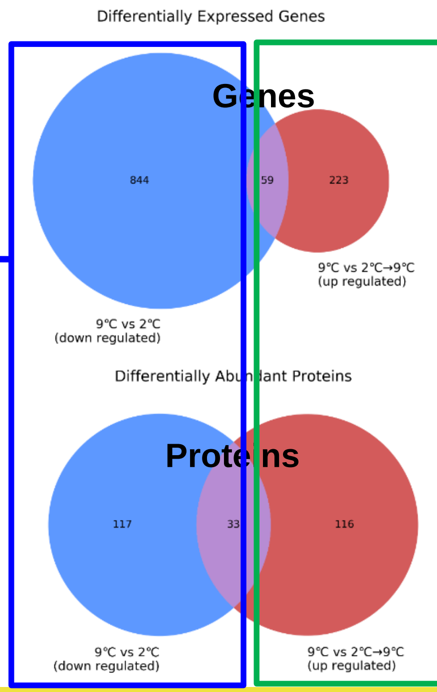
↓ Growth Markers

Arginine--tRNA ligase, cytoplasmic OS=Rattus norvegi
Asparagine synthetase [glutamine-hydrolyzing] OS=Ra
ATP-binding cassette sub-family E member 1 OS=Mus
Carboxypeptidase A5 OS=Mus musculus GN=Cpa5 PE=
Collagen alpha-1(V) chain OS=Mus musculus GN=Col5a
Collagen alpha-2(I) chain (Fragments) OS=Gallus gallus
Collagen alpha-6(VI) chain OS=Homo sapiens GN=COL
Coronin-1A OS=Homo sapiens GN=CORO1A PE=1 SV=4
Elongation factor 1-delta OS=Xenopus laevis GN=eef1
Eukaryotic translation initiation factor 2 subunit 2 OS=
Eukaryotic translation initiation factor 3 subunit J-A OS
Eukaryotic translation initiation factor 4 gamma 2 OS=
Glycine--tRNA ligase OS=Homo sapiens GN=GARS PE=
Heat shock 70 kDa protein 4 OS=Canis lupus familiaris
Heat shock protein beta-11 OS=Danio rerio GN=hspb1
Histone-lysine N-methyltransferase SETD7 OS=Danio
Importin-13 OS=Pongo abelii GN=IPO13 PE=2 SV=1
Influenza virus NS1A-binding protein homolog A OS=D
Kelch-like protein 10 OS=Homo sapiens GN=KLHL10 PE
Myozenin-2 OS=Pongo abelii GN=MYOZ2 PE=2 SV=1
N-alpha-acetyltransferase 38, NatC auxiliary subunit C
Ornithine carbamoyltransferase, mitochondrial OS=H
Peptidyl-prolyl cis-trans isomerase FKBP7 OS=Mus mu
Phenylalanine--tRNA ligase alpha subunit OS=Danio re
Phosphoserine aminotransferase OS=Mus musculus G
Protein BCCIP homolog OS=Danio rerio GN=bccip PE=2
Troponin I, fast skeletal muscle OS=Oryctolagus cunicu
Ubiquitin carboxyl-terminal hydrolase isozyme L1 OS=
Unconventional myosin-VI OS=Homo sapiens GN=MYO

23

Decreased growth rate

Increased growth rate



10

↑ Growth Markers

60S ribosomal protein L22 OS=Ictalurus punctatus GN=rpl22 PE=2 SV=3
Asparagine synthetase [glutamine-hydrolyzing] OS=Gallus gallus GN=ASNS
Collagen alpha-3(VI) chain OS=Gallus gallus GN=COL6A3 PE=2 SV=2
Immunoglobulin-like and fibronectin type III domain-containing protein 1
Leucine-rich repeat-containing protein 2 OS=Homo sapiens GN=LRRC2 PE=2
Methionine aminopeptidase 2 OS=Homo sapiens GN=METAP2 PE=1 SV=1
Ornithine carbamoyltransferase, mitochondrial OS=Homo sapiens GN=OTC
Prolyl 4-hydroxylase subunit alpha-2 OS=Caenorhabditis elegans GN=phy-2
Titin OS=Homo sapiens GN=TTN PE=1 SV=4
Ubiquitin carboxyl-terminal hydrolase 25 OS=Homo sapiens GN=USP25 PE=

3. Growth

Physiological growth markers → Application to field studies

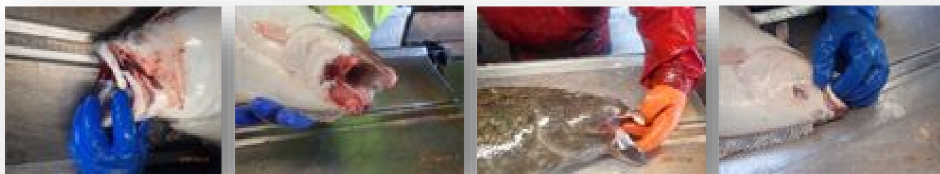
1. Identification and validation of physiological growth markers for adult Pacific halibut

- **44 adult Pacific halibut in captivity in Seward, AK (collaboration with Alaska Pacific University)**
- **Establishment of different growth rates through dietary manipulation**
- **Validation of physiological growth markers to infer growth patterns (slow versus fast growth) in adult Pacific halibut**

4. DMRs and Survival Assessment

1. <u>Directed longline fishery</u>: A. Relationship between handling practices and injury levels and physiological condition of released Pacific halibut

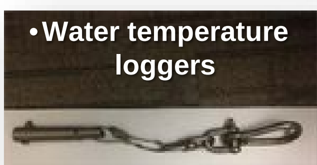
- Assessed *injuries* and *release condition* associated with release techniques (careful shake, gangion cut, hook stripping).
  - Injury evaluation



- *Physiological condition* of released fish
  - Condition factor indices

- *Capture conditions*

•Time



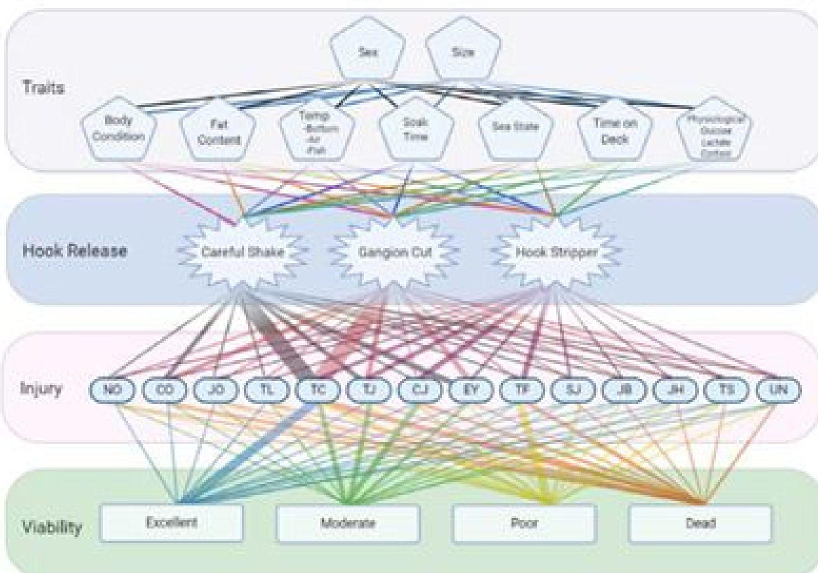
NOAA FISHERIES Saltonstall – Kennedy Grant NA17NMF4270240

ALASKA PACIFIC UNIVERSITY

4. DMRs and Survival Assessment

1. <u>Directed longline fishery</u>: A. Relationship between handling practices and injury levels and physiological condition of released Pacific halibut

- *Continuing Analysis:* **Relationships of individual (physiological, fitness) and environmental (time out of water, soak time, temperature differences etc.) traits on release viability**



4. DMRs and Survival Assessment

2. *Guided recreational fishery: Estimation of DMRs*

Objectives:

2019 1. **Collect information on hook types and sizes and handling practices**

➡ **Survey: Dock-side interviews (n=51)**
- Reg. Area 2C: Sitka (n=16), Juneau (n=8)
- Reg. Area 3A: Homer (n=12), Seward (n=15)

Results:

1. **75% Circle Hooks / 25% Jigs (J-hook)**
2. **Hook removal: 54% reverse the hook**
   40% twist with gaff
3. **Fish Handling upon release:**
   a) **Body and tail supported (65%)**
   b) **Operculum (10%**
   c) **Tail only (10%)**

Guided recreational

Captured Pacific halibut

NFWF **National Fish and Wildlife Foundation**

UAF University of Alaska Fairbanks | Alaska Pacific University | ACA

4. DMRs and Survival Assessment

2. ***Guided recreational fishery*: Estimation of DMRs**

- **Project initiated in 2019**

Objectives (cont'd):

2021
Field Experiment

1. **Investigate the relationship between gear types and capture conditions and size composition of captured fish**
2. **Injury profiles and physiological stress levels of captured fish**
3. **Assessment of mortality of discarded fish**

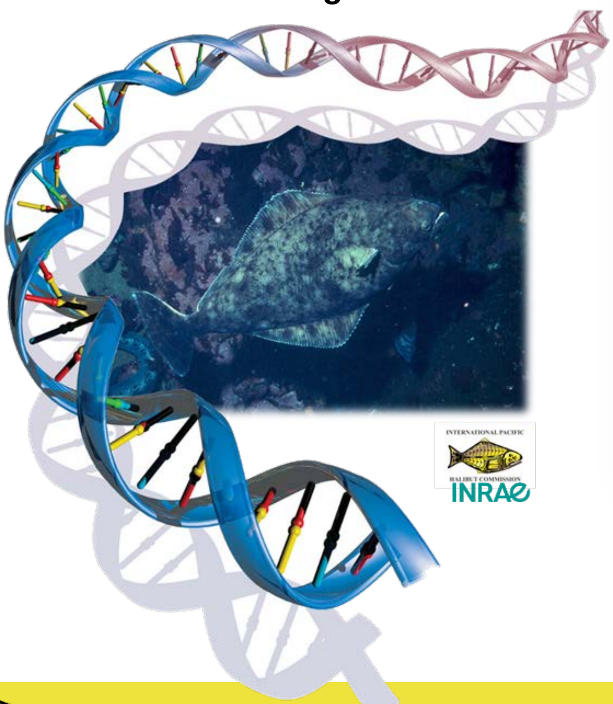
Hook injury assessment

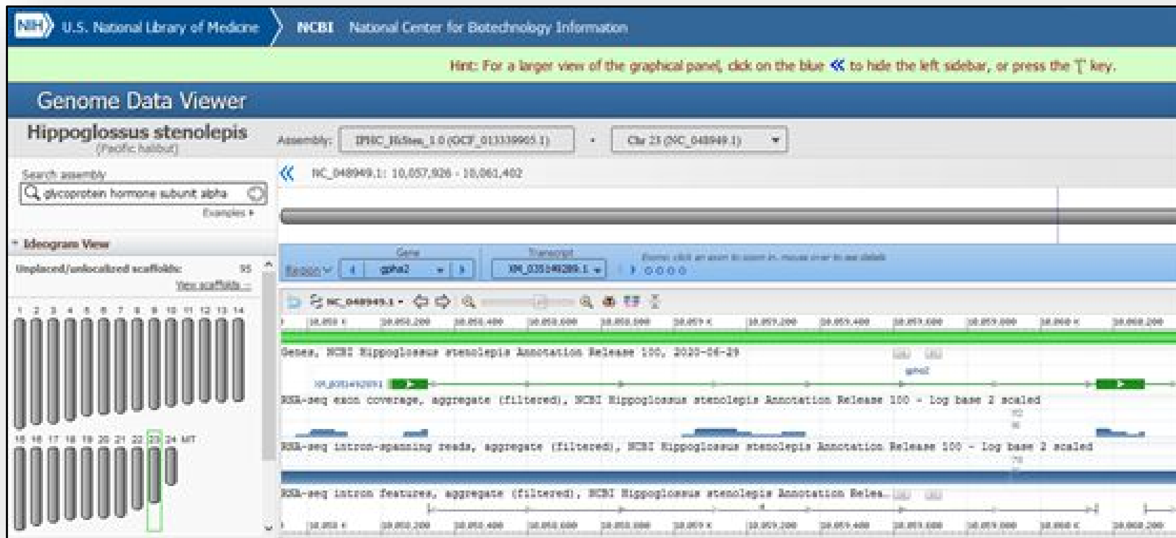
National Fish and Wildlife Foundation

5. Genetics and Genomics

Completed sequence of the Pacific halibut genome

- Size: 594 million base pairs
- 24 chromosomes
- 27,422 genes
- 91 X coverage



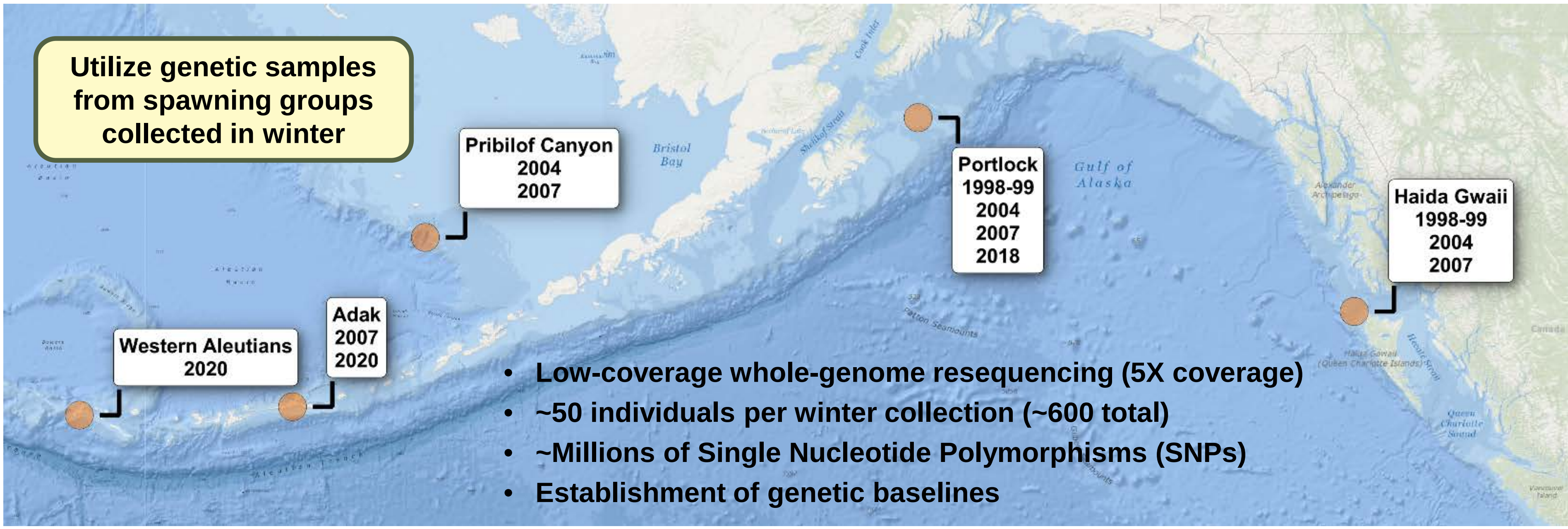


https://www.ncbi.nlm.nih.gov/assembly/GCA_013339905.1

5. Genetics and Genomics

Revise our understanding of genetic structure of the Pacific halibut population in the North-eastern Pacific Ocean

Analysis of structure in IPHC Regulatory Area 4B

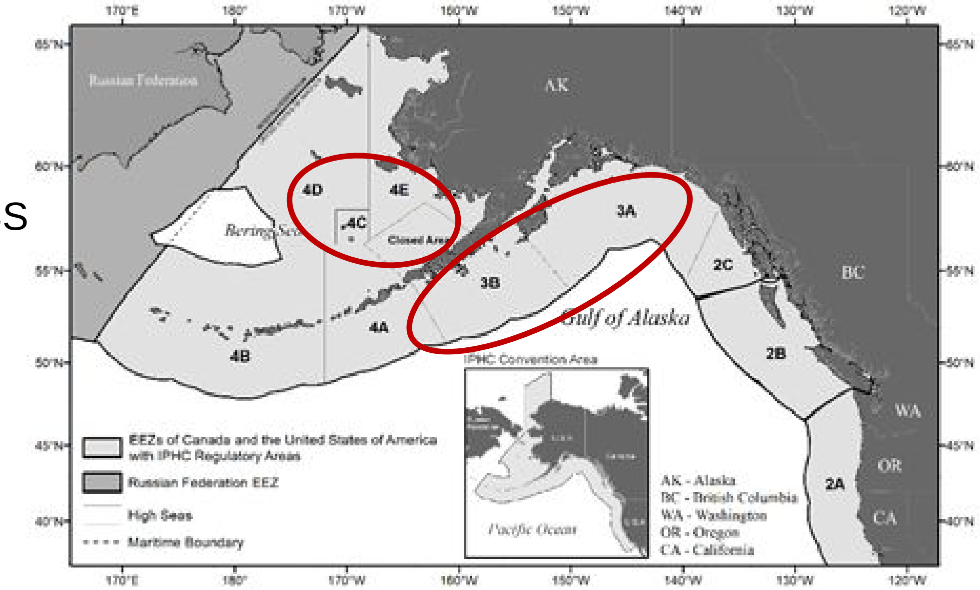


- **Low-coverage whole-genome resequencing (5X coverage)**
- **~50 individuals per winter collection (~600 total)**
- **~Millions of Single Nucleotide Polymorphisms (SNPs)**
- **Establishment of genetic baselines**

5. Genetics and Genomics

Analysis of genetic variability among juvenile Pacific halibut in the Bering Sea and the Gulf of Alaska

- ***Infer the potential contribution of fish spawned in different areas to the Gulf of Alaska (GOA) and Bering Sea (BS)***
- Fin clips collected during NMFS trawl surveys
  - Gulf of Alaska (2015, 2017, 2019)
  - Bering Sea (2015-2019)
- Compare genetic diversity metrics between GOA & BS
- Estimate admixture proportions



Outline

- Five-year research program and management implications
- Progress on ongoing research projects
- **Externally-funded collaborative research projects**

Externally-funded collaborative research

Project #	Grant agency	Project name	PI	Partners	IPHC Budget ($US)	Management implications	Grant period
1	Saltonstall-Kennedy NOAA	**Improving discard mortality rate estimates in the Pacific halibut by integrating handling practices, physiological condition and post-release survival (*Award No. NA17NMF4270240*)**	**IPHC**	Alaska Pacific University	$286,121	Discard estimates	September 2017 – August 2020
2	North Pacific Research Board	**Somatic growth processes in the Pacific halibut (*Hippoglossus stenolepis*) and their response to temperature, density and stress manipulation effects (*NPRB Award No. 1704*)**	**IPHC**	AFSC-NOAA-Newport, OR	$131,891	Changes in biomass/size-at-age	September 2017 – February 2020
3	National Fish and Wildlife Foundation	**Discard mortality rate characterization in the Pacific halibut recreational fishery (*NFWF Award No. 61484)***	**IPHC**	UA Fairbanks, APU, Grey Light Fisheries, Alaska Charter Association	$98,901	Discard estimates	April 2019 - June 2021
				Total awarded ($)	**$516,913**		

INTERNATIONAL PACIFIC

HALIBUT COMMISSION

INTERNATIONAL PACIFIC HALIBUT COMMISSION

IPHC 5-year Biological and Ecosystem Science Research Plan (2017-21): Update

PREPARED BY: IPHC SECRETARIAT (J. PLANAS, 6 OCTOBER 2020)

PURPOSE

To provide the Commission with a description of progress on the IPHC 5-year Biological and Ecosystem Science Research Plan (2017-21).

BACKGROUND

The main objectives of the Biological and Ecosystem Science Research at the IPHC are to:

1) identify and assess critical knowledge gaps in the biology of the Pacific halibut;
2) understand the influence of environmental conditions; and
3) apply the resulting knowledge to reduce uncertainty in current stock assessment models.

The primary biological research activities at IPHC that follow Commission objectives are identified and described in the IPHC Five-Year Biological and Ecosystem Science Research Plan (2017-21). These activities are summarized in five broad research areas designed to provide inputs into stock assessment and the management strategy evaluation processes (Appendix I), as follows:

1) Migration. Studies are aimed at further understanding reproductive migration and identification of spawning times and locations as well as larval and juvenile dispersal.
2) Reproduction. Studies are aimed at providing information on the sex ratio of the commercial catch and to improve current estimates of maturity.
3) Growth and Physiological Condition. Studies are aimed at describing the role of some of the factors responsible for the observed changes in size-at-age and to provide tools for measuring growth and physiological condition in Pacific halibut.
4) Discard Mortality Rates (DMRs) and Survival. Studies are aimed at providing updated estimates of DMRs in both the longline and the trawl fisheries.
5) Genetics and Genomics. Studies are aimed at describing the genetic structure of the Pacific halibut population and at providing the means to investigate rapid adaptive changes in response to fishery-dependent and fishery-independent influences.

UPDATE ON PROGRESS ON THE MAIN RESEARCH ACTIVITIES

1. Migration.

Knowledge of Pacific halibut migration throughout all life stages is necessary in order to gain a complete understanding of stock distribution and the factors that influence it.

1.1. Larval distribution and connectivity between the Gulf of Alaska and Bering Sea.
Principal Investigator: Lauri Sadorus (M.Sc.)
Objective: To investigate larval and juvenile connectivity of Pacific halibut within and between the Gulf of Alaska and the Bering Sea.

Knowledge of the dispersal of Pacific halibut larvae and subsequent migration of young juveniles has remained elusive because traditional tagging methods are not effective on these life stages due to the small size of the fish. This larval connectivity project, in cooperation with NOAA EcoFOCI, used two recently developed modeling approaches to estimate dispersal and migration pathways in order to better understand the connectivity of populations both within and between the Gulf of Alaska (GOA) and Bering Sea (BS). A manuscript of the results has been accepted for publication in the journal *Fisheries Oceanography* (Sadorus et al., 2020). In brief, to improve current understanding of larval dispersal pathways and migrations of young fish within and between GOA and BS, investigations were conducted to (1) examine pelagic larval dispersal and connectivity between the two basins using an individual-based biophysical model (IBM), and (2) track movement of fish up to age-6 years using annual age-based distributions and a spatio-temporal modeling approach. IBM results indicate that the Aleutian Islands constrain connectivity between GOA and BS, but that large island passes serve as pathways between these ecosystems. The degree of connectivity between GOA and BS is influenced by spawning location such that up to 50-60% of simulated larvae from the westernmost GOA spawning location arrive in the BS with progressively fewer larvae arriving proportional to distance from spawning grounds further east. There is also a large degree of connectivity between eastern and western GOA and between eastern and western BS. Spatial modeling of 2-6 year old fish shows ontogenetic migration from the inshore settlement areas of eastern BS towards Unimak Pass and GOA by age 4. The pattern of larval dispersal from GOA to BS, and subsequent post-settlement migrations back from BS toward GOA, provides evidence of circular, multiple life-stage, connectivity between these ecosystems, regardless of temperature stanza or year class strength. The results of these studies will improve estimates of productivity by contributing to the generation of potential recruitment covariates and by informing minimum spawning biomass targets by Biological Region. In addition, these results will assist in the biological parameterization and validation of movement estimates in the MSE Operating Model (Appendix I).

1.2. Wire tagging of U32 Pacific halibut.
Principal Investigator: Joan Forsberg (B.Sc.)
Objective: To investigate the migratory patterns of young Pacific halibut.

The patterns of movement of Pacific halibut among IPHC Regulatory Areas have important implications for management of the Pacific halibut fishery. The IPHC Secretariat has undertaken a long-term study of the migratory behavior of Pacific halibut through the use of externally visible tags (wire tags) on captured and released fish that must be retrieved and returned by workers in the fishing industry. In 2015, with the goal of gaining additional insight into movement and growth of young Pacific halibut (less than 32 inches [82 cm]; U32), the IPHC began wire-tagging small Pacific halibut encountered on the NOAA-Fisheries groundfish trawl survey and, beginning in 2016, on the IPHC Fishery-Independent Setline Survey (FISS). In 2019, a total of 821 Pacific halibut were tagged and released during the GOA trawl survey and 885 tags were released during the BS trawl survey. Through 2019, a total of 6,536 tags have been released in the NOAA-Fisheries groundfish trawl survey and, to date, 52 tags have been recovered. No U32 tagging on the NOAA-Fisheries groundfish trawl survey occurred in 2020 due its cancellation as a result of COVID-19. On the IPHC FISS, a total of 3,980 U32 Pacific halibut have been wire tagged are released and 74 of those have been recovered to date. In 2020, 868 U32 fish were wire-tagged and released: 321 fish in Regulatory Area 2B and 547 fish in Regulatory Area 3A. The points of release and recovery of wire-tagged Pacific halibut are shown in Figure 1 and the distance traveled from the release location for recaptured Pacific halibut from recent U32 wire tagging efforts is shown in Table 1. In addition, recoveries by release and recovery Regulatory Area are reported in Table 2 and the number of tagged Pacific halibut recovered by release Regulatory Area and years at liberty are shown in Table 3.

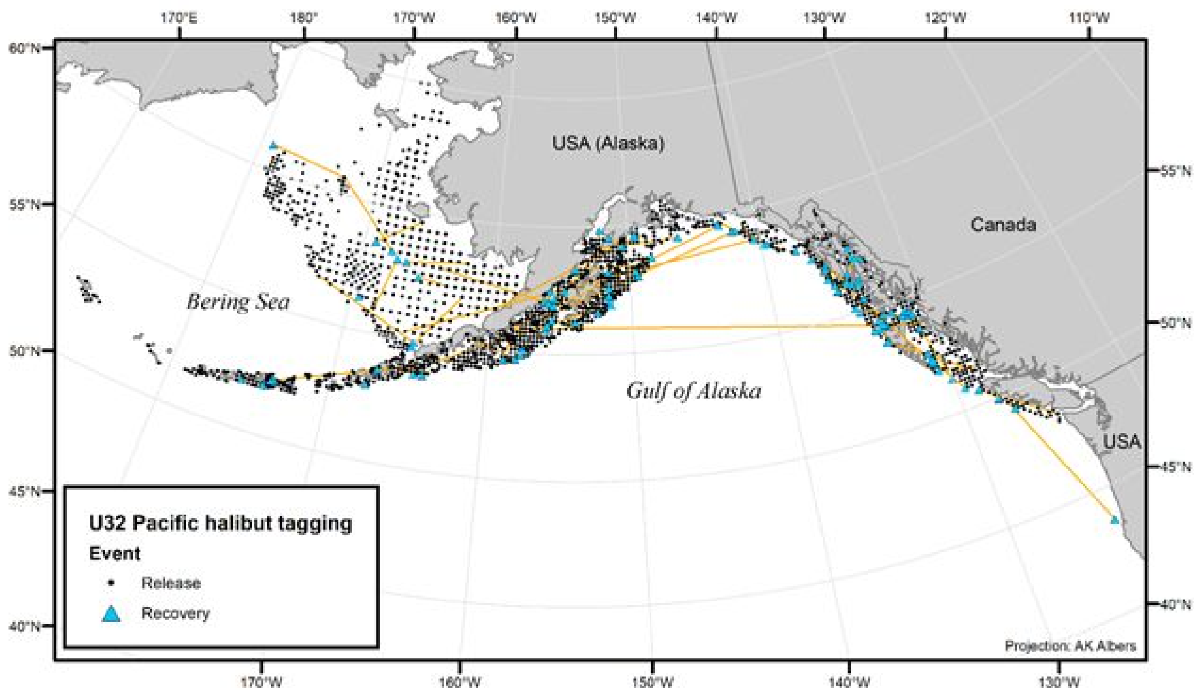


Figure 1. Geographic location of released and recovered wire-tagged fish since 2015. Yellow lines indicate the straight distance between the points of release and recovery of tagged fish.

Table 1. Distance traveled (in nautical miles; nm) from release location for recaptured Pacific halibut from recent U32 wire tagging efforts.

Distance traveled (nm)	Number recovered	%
0 - 10	45	35%
11 - 50	33	25%
51 - 100	17	13%
101 - 200	17	13%
201 - 300	5	4%
301 - 500	6	5%
501 - 700	4	3%
701 - 900	3	2%

Table 2. Recoveries of tagged Pacific halibut from U32 wire tagging conducted between 2015 and 2019 by release and recovery Regulatory Area.

Release Reg. Area	Total Releases	Recovery Regulatory Area										
		2A	**2B**	**2C**	**3A**	**3B**	**4A**	**4B**	**4D**	**4E**	**CLS**	**Total**
2A	34	1	3									**4**
2B	636	1	27									**28**
2C	747		8	22	1							**31**
3A	2,005				31	1						**32**
3B	2,309		1		3	25	1			1	1	**32**
4A	1,096				2		6	1		1		**10**
4B	369							5				**5**
4C	244						1					**1**
4D	469						1		2	1		**4**
4E	1,420								1	2	3	**5**
CLS	544				2	1	1			1		**5**
Total	**9,873**	**2**	**12**	**6**	**29**	**6**	**8**	**1**	**2**	**4**	**4**	**158**

Table 3. Number of Pacific halibut recovered by years at liberty and by release Regulatory Area from U32 wire tagging conducted between 2015 and 2019 (includes recoveries for which recovery area is not known).

Years at liberty	**Number recovered by release Regulatory Area**											
	2A	**2B**	**2C**	**3A**	**3B**	**4A**	**4B**	**4C**	**4D**	**4E**	**CLS**	**Total**
0		7	2	3	1	1	1	1	1	1		**18**
1	2	14	17	14	12	3	2		1	4	2	**71**
2	2	7	9	7	12	3	2		1	1		**44**
3		1	3	7	5	2	1		1		1	**21**
4			1	1	3	1					2	**8**
5				1								**1**
Total	**4**	**29**	**32**	**33**	**33**	**10**	**6**	**1**	**4**	**6**	**5**	**163**

2. Reproduction.

Efforts at IPHC are currently underway to address two critical issues in stock assessment for estimating the female spawning biomass: the sex ratio of the commercial landings and maturity estimations.

2.1. Sex ratio of the commercial landings.

Principal Investigator: Anna Simeon (M.Sc.)

Objective: To provide information on the sex ratio of the commercial landings.

The sex ratio of the commercial fishery catch represents an extremely important source of uncertainty in the annual stock assessment (Stewart and Hicks, 2020). The IPHC has generated sex information of the entire set of aged commercial fishery samples collected in 2017 and in 2018 (>10,000 fin clips per year) using genetic techniques based on the identification of sex-specific single nucleotide polymorphisms (SNPs) (Drinan et al., 2018) using TaqMan qPCR assays conducted at the IPHC's Biological Laboratory. Therefore, for the first time, direct estimates of the sex-ratio at age for the directed commercial fishery have been available for stock assessment. Genetic analyses of commercial samples from 2017 showed that the proportion of females coastwide was high (82%), ranging from 65% to 92% depending on the biological region. Data from the 2018 commercial samples showed almost identical patterns, with females comprising 80% of the coastwide commercial landings (by number). Given that the sex-ratio data constitutes one of the two most important contributors to estimates of both population trend and scale, the inclusion of this information in the 2019 stock assessment resulted in higher spawning biomass. The IPHC Secretariat has recently completed the processing of genetic samples from the 2019 commercial landings and the results indicate that the percentage of females coastwide in the commercial catch is 78%, showing a continuous decline since 2017. Additional years of sex-ratio information of the commercial catch are likely to further inform selectivity parameters and cumulatively reduce uncertainty in future estimates of stock size, in addition to improving simulation of spawning biomass in the MSE Operating Model (Appendix I).

The IPHC Secretariat is also working towards providing information on sex ratios in years previous to 2017 through the use of genotyping techniques using historical samples of otoliths. The IPHC Secretariat has recently tested whether DNA can be extracted from otoliths and whether the extracted DNA is of sufficient quantity and quality to be used in the genotyping assays currently used with DNA derived from fin clips. The results obtained indicate that DNA can be extracted from otoliths, albeit at low concentration, and that the genotyping assays can correctly identify the sex of the individual fish. Additional studies are underway to determine whether clean archived otoliths can also be used as a historical source of DNA for genotyping.

2.2. Maturity estimations.

Principal Investigator: Josep Planas (Ph.D.)

Objective: To characterize maturity and fecundity in female Pacific halibut.

Recent sensitivity analyses have shown the importance of changes in spawning output due to skip spawning and/or changes in maturity schedules for stock assessment (Stewart and Hicks, 2020). These results highlight the need for a better understanding of factors influencing reproductive biology and success for Pacific halibut. In order to fill existing knowledge gaps related to the reproductive biology of female Pacific halibut, research efforts are devoted to characterize female maturity in this species. Specific objectives of current studies include: 1) accurate description of oocyte developmental stages and their use to classify female maturity stages; 2) comparison of macroscopic (based on field observations) and microscopic (based on histological assessment) maturity stages and revision of maturity criteria; 3) revision of current estimates of female age-at-maturity; and 4) investigation of fecundity and skip-spawning in females.

The IPHC Secretariat has described for the first time the different oocyte stages that are present in the ovary of female Pacific halibut and how these are used to classify females histologically to specific maturity stages. This information is contained in a manuscript that has been accepted for publication in the *Journal of Fish Biology* (Fish et al., 2020). In brief, 8 different oocyte developmental stages have been described, from early primary growth oocytes until preovulatory oocytes, and their size (Figure 2) and morphological characteristics established. Maturity classification was determined by assigning maturity status to the most advanced oocyte developmental stage present in ovarian tissue sections and 7 different microscopic maturity stages were established. Analysis of oocyte size frequency distribution among the seven different maturity stages provided evidence for the group-synchronous pattern of oocyte development and for the determinate fecundity reproductive strategy in female Pacific halibut. The results of this study will allow us to establish a comparison of the microscopic/histological and macroscopic/field classification criteria that are currently used to assign the maturity status of females that is used in stock assessment. The results of this study set the stage for and in-depth study on temporal changes in maturity, as assessed by microscopic observations of ovarian samples collected throughout an entire annual reproductive cycle, that is currently underway. Furthermore, the IPHC Secretariat is also establishing a comparison of the microscopic (e.g. histological) and macroscopic (e.g. visual) maturity classification criteria to determine whether field classification criteria that are currently used to assign the maturity status of females that is used in stock assessment needs to be revised in light of the improved knowledge on ovarian development.

In addition, the IPHC Secretariat is conducting temporal and spatial analyses of female maturity schedules through the collection of ovarian samples in FISS. For the temporal analysis of maturity, ovarian samples have been collected in the Portlock region (central Gulf of Alaska) during the same period (June-July) for 30 females (>90 cm length) for four consecutive years: 2017, 2018, 2019 and 2020. These ovarian samples are being processed for histology and microscopic maturity staging will be conducted to compare the maturity status over time. Furthermore, for the spatial analysis of maturity, ovarian samples from 30 females (>90 cm length) have collected in the FISS in 5 different regions in the Gulf of Alaska in order to obtain preliminary information on potential spatial differences in maturity.

The results of these studies will be important for scaling biomass and reference point estimates and to improve simulation of spawning biomass in the MSE Operating Model (Appendix I).

3. Growth.
   Principal Investigator: Josep Planas (Ph.D.)
   Objective: To investigate somatic growth variation as a driver for changes in size-at-age.

   Recent stock assessments conducted by the IPHC Secretariat have indicated that the Pacific halibut stock experienced a continuous coastwide decline from the late 1990s until approximately 2012 largely due to a decrease in size-at-age (SAA) (Stewart and Hicks, 2020). Current low values of SAA combined with low recruitment of cohorts spawned at the time of the initial decrease in SAA in the 1990s have contributed to a decrease in exploitable Pacific halibut biomass. Although the decrease in SAA has been hypothesized as being attributed to several potential causes, including environmental effects such as temperature or food availability, as well as ecological or fishery effects, our knowledge on the actual factors that influence SAA of Pacific halibut is still scarce. The IPHC Secretariat has conducted studies aimed at elucidating the drivers of somatic growth leading to the decline in SAA by investigating the physiological mechanisms that contribute to growth changes in the Pacific halibut. The two main objectives of these studies are: 1) the identification and validation of physiological markers for somatic growth; and 2) the use of growth markers for evaluating growth patterns in the Pacific halibut population and the effects of environmental factors on somatic growth. In order to pursue these objectives, the IPHC Secretariat has investigate on the effects of temperature variation on growth performance, as well as on the effects of density, hierarchical dominance and handling stress on growth in juvenile Pacific halibut in captivity. These studies have been funded by a grant from the North Pacific Research Board to the IPHC (NPRB 1704; 2017-2020) (Appendix II).

The results on the effects of temperature on growth physiological indicators are being prepared for publication in a peer-reviewed journal (Planas et al., in preparation). In brief, juvenile Pacific halibut were subjected to temperature-induced growth manipulations, whereby somatic growth was suppressed by low temperature acclimation and stimulated by temperature-induced compensatory growth. Physiological signatures of growth suppression and growth stimulation were identified by a comparative transcriptomics and proteomics approach that identified genes and proteins, respectively, that experienced expression changes in response to the two growth manipulations. The identified genes and proteins could potentially represent useful markers for growth in skeletal muscle. Currently, assays are being developed to test the validity of the identified molecular markers for growth on skeletal muscle samples from age-matched adult Pacific halibut of different sizes.

In addition to temperature-induced growth manipulations, the IPHC Secretariat is conducting similar studies to identify physiological growth markers that respond to density and stress-induced growth manipulations. On one hand, changes in SAA in Pacific halibut have been hypothesized, among other potential causes, to be the result of changes in population dynamics of the Pacific halibut stock due to a density effect, whereby high population densities would negatively affect growth. On the other hand, we hypothesize that stress responses associated with capture and release of discarded Pacific halibut may affect feeding and growth in the wild, therefore, addressing potential growth consequences related to capture and handling stress. Investigations related to the effects of density and stress exposure are currently underway.

The results of these studies will inform scale stock productivity and reference point estimates, in addition to contributing to improve simulation of variability and allow for scenarios investigating climate change (Appendix I).

4. Discard Mortality Rates (DMRs) and Survival Assessment.
Information on all Pacific halibut removals is integrated by the IPHC Secretariat, providing annual estimates of total mortality from all sources for its stock assessment. Bycatch and wastage of Pacific halibut, as defined by the incidental catch of fish in non-target fisheries and by the mortality that occurs in the directed fishery (i.e. fish discarded for sublegal size or for regulatory reasons), respectively, represent important sources of mortality that can result in significant reductions in exploitable yield in the directed fishery. Given that the incidental mortality from the commercial Pacific halibut fisheries and bycatch fisheries is included as part of the total removals that are accounted for in stock assessment, changes in the estimates of incidental mortality will influence the output of the stock assessment and, consequently, the catch levels of the directed fishery. For this reason, the IPHC Secretariat is conducting investigations on the effects of capture and release on survival and on providing experimentally-derived estimates of DMRs in the directed longline and guided recreational Pacific halibut fisheries that will improve trends in unobserved mortality in stock assessment and that will be important for fishery parametrization (Appendix I):

4.1. Evaluation of the effects of hook release techniques on injury levels and association with the physiological condition of captured Pacific halibut and estimation of discard mortality using remote-sensing techniques in the directed longline fishery.
Principal Investigator: Claude Dykstra (B.Sc.)
Objective: To provide estimates of discard mortality and best-handling practices in the Pacific halibut directed fishery.

In order to better estimate post-release survival of Pacific halibut caught incidentally in the directed longline fishery, the IPHC Secretariat is conducting investigations to understand the relationship between fish handling practices and fish physical and physiological condition and survival post-capture as assessed by electronic archival tagging. Currently, the IPHC assigns a 3.5% DMR to Pacific halibut released from longline gear with only minor injuries and a 16% DMR to the total estimated volume of U32 discards generated by the target fishery. The former was experimentally derived between 1958 and 1961, and the latter is a result of tagging studies in which the baseline DMR was used as a parameter in tag-recovery models that were used to estimate DMRs for fish returned to the water in relatively poorer condition than “minor”. As such, if the 3.5% is mis-specified, the subsequent rates that rest upon that value will be inaccurate, as will be our estimates of total discard mortality within the fishery. The baseline rate was generated from at-sea captive holding studies that reported that observed mortality patterns were, at least in part, due to fluctuating environmental conditions from which the fish could not escape, and for which they attempted to compensate analytically. Ambiguity therefore exists regarding the degree to which the baseline rate is accurate, necessitating additional studies in order to resolve this issue. For this reason, the IPHC Secretariat, with partial funding by a grant from the Saltonstall-Kennedy Grant Program NOAA (Appendix II), conducted studies to evaluate the effects of hook release techniques on injury levels, their association with the physiological condition of captured Pacific halibut and, importantly, generated experimentally-derived estimates of DMR in the directed longline fishery.

As part of this study, injury profiles and release viabilities for different release techniques (careful shake, gangion cutting, and hook stripping) have been developed. The results obtained indicate that injury patterns were similar for careful shake and gangion cutting, with most injuries being a small puncture to the cheek, and greater than 70% of the released fish were classified to be in excellent viability. The hook stripper produced more severe physical injuries with significantly greater numbers of fish classified as moderate or poor in viability condition upon release.

Blood glucose, lactate, and cortisol levels from all fish released have been determined using specific assays in the Biological Laboratory. Results are suggestive of a trend towards lower glucose and higher lactate blood levels in fish classified as dead in terms of the release condition. Cortisol levels do not show a significant trend across the release condition categories. Results on glucose, lactate, and cortisol plasma levels in fish according to physical injury code show a fair amount of variation within groups. The relationship of blood glucose, lactate, and cortisol levels to other measured parameters in discarded fish (fat levels, condition index, time out of water, temperature exposure, etc.) are under ongoing investigation.

Electronic monitoring (EM) systems were proven to be effective at accurately capturing the release method applied to each animal. Footage is now being reviewed to determine the ability of EM systems to provide length estimates of captured fish from the existing footage, and additional in season work on a FISS vessel is proposed.

4.2. Discard mortality rates of Pacific halibut in the charter recreational fishery.
Principal Investigator: Claude Dykstra (B.Sc.)
Objective: To provide estimates of discard mortality and best-handling practices in the Pacific halibut guided recreational fishery.

The IPHC has begun a research project to better characterize the nature of charter recreational fisheries with the ultimate goal of better understanding discard practices relative to that which is employed in the directed longline fishery. This project has received funding from the National Fish and Wildlife Foundation (Appendix II). As an initial step in this project, information from the charter fleet on types of gear and fish handling practices used was collected through stakeholder meetings and on dock interviews with charter captains and operators. Results show that the guided recreational fleet predominantly uses circle hooks (75-100%), followed by jigs. Predominant hook release methods included reversing the hook (54%), or twisting the hook out with a gaff (40%), and the fish were generally handled by supporting both the head and tail (65%), while other common techniques included handling by the operculum (10%) or by the tail alone (10%). This information will inform the design of the experimental test fishing that is expected to take place in Spring/Summer of 2021 and in which fish condition and stress will be evaluated to identify best practices intended to minimize discard mortality in this fishery and to provide direct estimates of discard survival.

5. Genetics and genomics. The IPHC Secretariat is exploring avenues for incorporating genetic approaches for a better understanding of population structure and distribution and is also building genomic resources to assist in genetics and molecular studies on Pacific halibut.

5.1. Genetics.
Principal Investigator: Andy Jasonowicz (M.Sc.)
Objective: To investigate the genetic structure of the Pacific halibut population and to conduct genetic analyses to inform on Pacific halibut movement and distribution in the eastern North Pacific Ocean. Two specific objectives are being pursued as follows:

5.1.1. Determine the genetic structure of the Pacific halibut population in the North-eastern Pacific Ocean. Understanding population structure is imperative for sound management and conservation of natural resources (Hauser, 2008). Pacific halibut in Canadian and USA waters are managed by the International Pacific Halibut Commission (IPHC) as a single coastwide unit stock since 2006. The rationale behind this management approach is based on our current knowledge of the highly migratory nature of Pacific halibut as assessed by tagging studies (Webster et al., 2013) and of past analyses of genetic population structure that failed to demonstrate significant differentiation in the North-eastern Pacific Ocean population of Pacific halibut by allozyme (Grant, 1984) and small-scale microsatellite analyses (Bentzen, 1998; Nielsen *et al.*, 2010). However, more recent studies have reported slight genetic population structure on the basis of genetic analysis conducted with larger sets of microsatellites suggesting that Pacific halibut captured in the Aleutian Islands may be genetically distinct from other areas (Drinan et al., 2016). These findings of subtle genetic structure in the Aleutian Island chain area are attributed to limited movement of adults and exchange of larvae between this area and the rest of the stock due to the presence of oceanographic barriers to larval and adult dispersal (i.e. Amchitka Pass) that could represent barriers to gene flow. Unfortunately, genetic studies suggesting subtle genetic structure (Drinan et al., 2016) were conducted based on a relatively limited set of microsatellite markers and, importantly, using genetic samples collected in the summer (i.e. non-spawning season) that may not be representative of the local spawning population. With the collection of winter (i.e. spawning season) genetic samples in the Aleutian Islands by the IPHC in early 2020, a collection of winter samples from 5 different geographic areas across the North-eastern Pacific Ocean (i.e. British Columbia, Central Gulf of Alaska, Bering Sea, Central and Western Aleutian Islands) is now available to re-examine the genetic structure of the Pacific halibut population. Importantly, novel, high-throughput and high-resolution genomics approaches are now available for use, such as low-coverage whole genome resequencing, in order to describe with unprecedented detail the genetic structure of the Pacific halibut population. The recently sequenced Pacific halibut genome (deposited at DDBJ/ENA/GenBank under the accession JABBIT000000000) will constitute an essential resource for the success of the whole genome resequencing approach. The results from the proposed genomic studies will provide important information on spawning structure and, consequently, on the genetic baselines of source populations. Importantly, the results from these studies will provide management advice regarding the relative justifiability for considering the western Aleutians as a genetically-distinct substock. These research outcomes will represent important avenues for improving estimates of productivity and parametrization of the MSE Operating Model (Appendix I).

5.1.2. Analysis of genetic variability among juvenile Pacific halibut in the Bering Sea and the Gulf of Alaska. The aim of this objective is to evaluate the genetic variability or genetic diversity among juvenile Pacific halibut in a given ocean basin in order to infer information on the potential contribution from fish spawned in different areas to that particular ocean basin. We hypothesize that genetic variability among juvenile Pacific halibut captured in one particular ocean basin (e.g. eastern Bering Sea) may be indicative of mixing of individuals originating in different spawning grounds and, therefore, of movement. By comparing the genetic variability of fish between two ocean basins (i.e. eastern Bering Sea and Gulf of Alaska), we will be able to evaluate the extent of the potential contribution from different sources (e.g. spawning groups) in each of the ocean basins and provide indications of relative movement of fish to these two different ocean basins. The use of genetic samples from juvenile Pacific halibut collected in the National Marine Fisheries Service trawl survey in the eastern Bering Sea and in the Gulf of Alaska, aged directly by otolith reading or indirectly through a length-age key, will allow us to provide information on genetic variability among fish that are at or near their settlement or nursery grounds. These studies will provide the ability to assign individual juvenile Pacific halibut to source populations (as established in 5.1.1) and genetic information on movement and distribution of juvenile Pacific halibut. These research outcomes will improve estimates of productivity and biological parametrization and validation of movement estimates and recruitment distribution in the MSE Operating Model (Appendix I).

5.2. Genomics.
Principal Investigator: Josep Planas (Ph.D.)
Objective: To sequence the Pacific halibut genome as a key resource for genomic studies.

The IPHC Secretariat has recently completed conducting a project aimed at generating a first draft sequence of the Pacific halibut genome, the blueprint for all the genetic characteristics of the species. This project was conducted in collaboration with the French National Institute for Agricultural Research (INRA, Rennes, France). Briefly, the Pacific halibut genome has a size of 586 Mb and contains 24 chromosomes- covering 98.6% of the complete assembly with a N50 scaffold length of 25 Mb at a coverage of 91x. The Pacific halibut genome sequence has been submitted to the National Center for Biological Information (NCBI) with submission number SUB7094550 and with accession number JABBIT000000000. Furthermore, the Pacific halibut genome has been annotated and is available in NCBI as NCBI *Hippoglossus stenolepis* Annotation Release 100. The generated genomic resources will greatly assist current studies on the genetic structure of the Pacific halibut population, on the application of genetic signatures for assigning individuals to spawning populations and for a thorough characterization of regions of the genome or genes responsible for important traits of the species.

RECOMMENDATIONS

That the Commission **NOTE** paper IPHC-2020-IM096-10 which outlines progress on the IPHC 5-year Biological and Ecosystem Science Research Plan.

References

Bentzen, P., Britt, J., and Kwon, J., 1998. Genetic variation in Pacific halibut (*Hippoglossus stenolepis*) detected with novel microsatellite markers. Report of Assessment and Research Activities. International Pacific Halibut Commission, Seattle, WA, pp. 229–241.

Drinan, D.P., Galindo, H.M., Loher, T., and Hauser, L., 2016. Subtle genetic population structure in Pacific halibut *Hippoglossus stenolepis*. Journal of Fish Biology 89, 2571-2594.

Drinan, D.P., Loher, T., and Hauser, L., 2018. Identification of Genomic Regions Associated With Sex in Pacific Halibut. Journal of Heredity 109, 326-332.

Fish, T., Wolf, N., Harris, B. P., and Planas, J. V. 2020. A comprehensive description of oocyte developmental stages in Pacific halibut, *Hippoglossus stenolepis*. Journal of Fish Biology (In press). Accepted article available at: http://dx.doi.org/10.1111/jfb.14551.

Grant, W.S., Teel, D. J., and Kobayashi, T., 1984. Biochemical Population Genetics of Pacific Halibut (*Hippoglossus stenolepis*) and Comparison with Atlantic Halibut (*Hippoglossus hippoglossus*). Canadian Journal of Fisheries and Aquatic Sciences 41, 1083-1088.

Hauser, L., and Carvalho, G. R., 2008. Paradigm shifts in marine fisheries genetics: ugly hypotheses slain by beautiful facts. Fish and Fisheries 9, 333-362.

Nielsen, J.L., Graziano, S.L., Seitz, A.C., 2010. Fine-scale population genetic structure in Alaskan Pacific halibut (*Hippoglossus stenolepis*). Conservation Genetics 11, 999-1012.

Planas, J.V., Jasonowicz, A., Simeon, A., Rudy, D., Timmins-Schiffman, E., Nunn, B.L., Kroska, A., Wolf, N., and Hurst, T.P. Physiological signatures of temperature-induced growth manipulations in white skeletal muscle of juvenile Pacific halibut (*Hippoglossus stenolepis*). (In Preparation).

Sadorus, L.; Goldstein, E.; Webster, R.; Stockhausen, W.; Planas, J.V.; Duffy-Anderson, J. 2020. Multiple life-stage connectivity of Pacific halibut (*Hippoglossus stenolepis*) across the Bering Sea and Gulf of Alaska. Fisheries Oceanography (In press).

Stewart, I.J., and Hicks, A. 2020. Assessment of the Pacific halibut (Hippoglossus stenolepis) stock at the end of 2019. Int. Pac. Halibut Comm. Annual Meeting Report: IPHC-2020-SA-01.

Webster, R.A., Clark, W.G., Leaman, B.M., Forsberg, J.E., Hilborn, R., 2013. Pacific halibut on the move: a renewed understanding of adult migration from a coastwide tagging study. Canadian Journal of Fisheries and Aquatic Sciences 70, 642-653.

APPENDICES

Appendix I: Integration of ongoing biological research activities, stock assessment and management strategy evaluation.

Appendix II: Summary of awarded research grants in 2020

APPENDIX I

Integration of ongoing biological research activities, stock assessment and management strategy evaluation

Research areas	Research activities	Research outcomes	Relevance for stock assessment	Relevance for MSE	Specific analysis input	SA Rank (Top 3)	MSE Rank (Top 3)
Migration	Larval and juvenile connectivity and early life history studies	Improved understanding of larval and juvenile distribution	Improve estimates of productivity	Improve parametization of the Operating Model	Will be used to generate potential recruitment covariates and to inform minimum spawning biomass targets by Biological Region	3. Biological input	1. Biological parameterization and validation of movement estimates
Reproduction	Histological maturity assessment	Updated maturity schedule	Scale biomass and reference point estimates	Improve simulation of spawning biomass in the Operating Model	Will be included in the stock assessment, replacing the current schedule last updated in 2006	1. Biological input	
	Examination of potential skip spawning	Incidence of skip spawning			Will be used to adjust the asymptote of the maturity schedule, if/when a time-series is available this will be used as a direct input to the stock assessment		
	Fecundity assessment	Fecundity-at-age and -size information			Will be used to move from spawning biomass to egg-output as the metric of reproductive capability in the stock assessment and management reference points		
	Examination of accuracy of current field macroscopic maturity classification	Revised field maturity classification			Revised time-series of historical (and future) maturity for input to the stock assessment		
	Sex ratio of current commercial landings	Sex ratio-at-age	Scale biomass and fishing intensity		Annual sex-ratio at age for the commercial fishery fit by the stock assessment	1. Assessment data collection and processing	
	Historical sex ratios based on archived otolith DNA analyses	Historical sex ratio-at-age			Annual sex-ratio at age for the commercial fishery fit by the stock assessment		
	Recruitment strength and variability	Establishment of temporal and spatial maturity and spawning patterns	Improve stock-recruitment curve for more precise assessment	Improve simulation of recruitment variability and parametization of recruitment distribution in the Operating Model	May be used to provide a weighted spawning biomass calculation and or inform targets for minimum spawning biomass by Biological Region		2. Biological parameterization and validation of recruitment variability and distribution
Growth	Evaluation of somatic growth variation as a driver for changes in size-at-age	Identification and application of markers for growth pattern evaluation	Scale stock productivity and reference point estimates	Improve simulation of variability and allow for scenarios investigating climate change	May inform yield-per-recruit and other spatial evaluations of productivity that support mortality limit-setting		3. Biological parameterization and validation for growth projections
		Environmental influences on growth patterns			May provide covariates for projecting short-term size-at-age. May help to delineate between effects due to fishing and those due to environment, thereby informing appropriate management response		
Mortality and survival assessment	Discard mortality rate estimate: longline fishery	Experimentally-derived DMR	Improve trends in unobserved mortality	Improve estimates of stock productivity	Will improve estimates of discard mortality, reducing potential bias in stock assessment results and management of mortality limits		1. Fishery parameterization
	Discard mortality rate estimate: recreational fishery				Will improve estimates of discard mortality, reducing potential bias in stock assessment results and management of mortality limits		2. Fishery parameterization
	Best handling practices: longline fishery	Guidelines for reducing discard mortality			May reduce discard mortality, thereby increasing available yield for directed fisheries		
	Best handling practices: recreational fishery	Guidelines for reducing discard mortality			May reduce discard mortality, thereby increasing available yield for directed fisheries		
Genetics and genomics	Population structure	Stock structure of IPHC Regulatory Area 4B relative to the rest of the Convention Area	Altered structure of future stock assessments	Improve parametization of the Operating Model	If 4B is found to be functionally isolated, a separate assessment may be constructed for that IPHC Regulatory Area	2. Biological input	1. Biological parameterization and validation of movement estimates.
	Distribution	Assignment of individuals to source populations and assessment of distribution changes			Will be used to define management targets for minimum spawning biomass by Biological Region	3. Biological input	2. Biological parameterization and validation of recruitment distribution

APPENDIX II

Summary of awarded research grants in 2020

Project #	Funding agency	Project title	PI	Partners	IPHC Budget ($US)	Management implications	Grant period
1	**Saltonstall-Kennedy NOAA**	Improving discard mortality rate estimates in the Pacific halibut by integrating handling practices, physiological condition and post-release survival (Award No. NA17NMF4270240)	IPHC	Alaska Pacific University	$286,121	Bycatch estimates	September 2017 – August 2020 (Finalized)
2	**North Pacific Research Board**	Somatic growth processes in the Pacific halibut (*Hippoglossus stenolepis*) and their response to temperature, density and stress manipulation effects (Award No. 1704)	IPHC	AFSC-NOAA-Newport, OR	$131,891	Changes in biomass/size-at-age	September 2017 – February 2020 (Finalized)
3	**National Fish & Wildlife Foundation**	Improving the characterization of discard mortality of Pacific halibut in the recreational fisheries (Award No. 61484)	IPHC	Alaska Pacific University, U of A Fairbanks, charter industry	$98,902	Bycatch estimates	April 2019 – June 2021
Total awarded ($)					**$516,914**		

INTERNATIONAL PACIFIC

HALIBUT COMMISSION

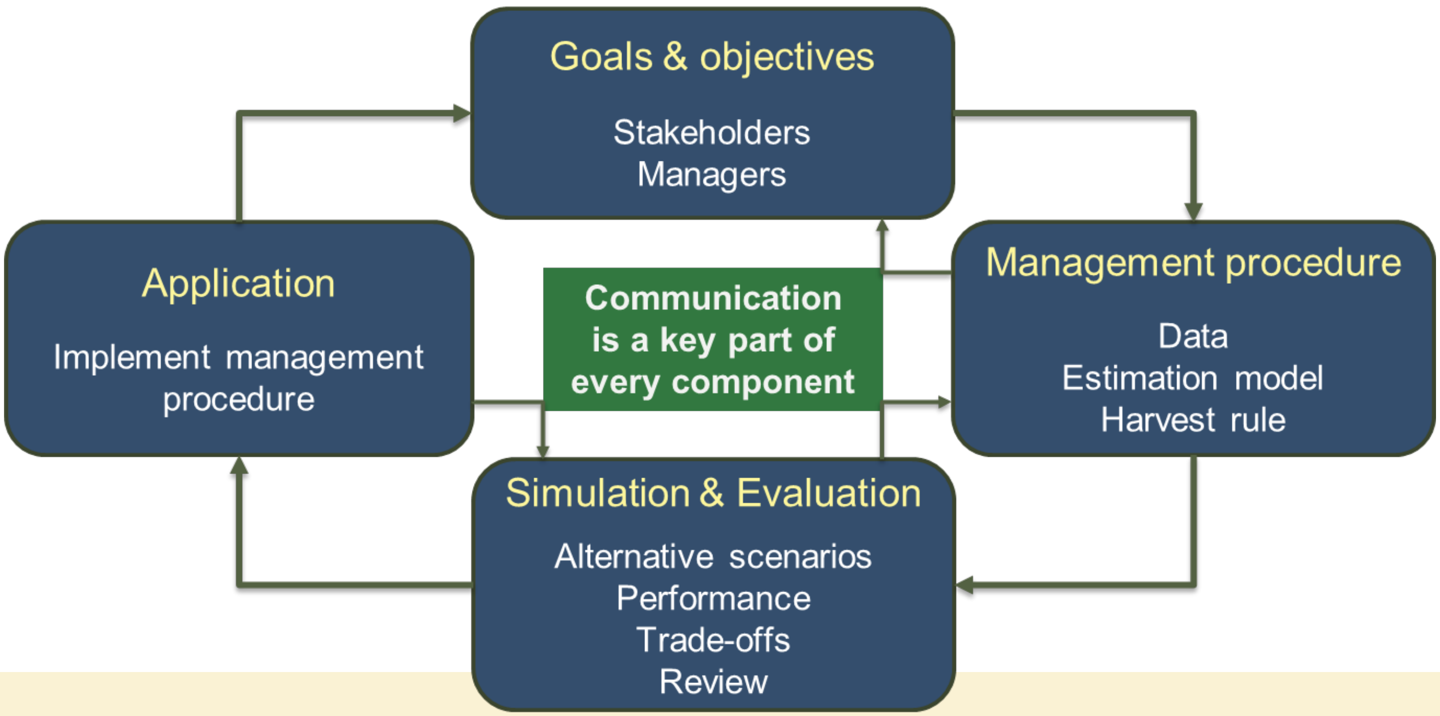
Management Strategy Evaluation: Results

Agenda Item 8.1

IPHC-2020-IM096-11 Rev_1

Management Strategy Evaluation (MSE)

a process to evaluate harvest strategies and develop a management procedure that is robust to uncertainty and meets defined objectives



1.1. Primary biological objectives

Measurable Objective	Performance Metric	Time-frame	Tolerance
Maintain a female spawning stock biomass above a biomass limit reference point at least 95% of the time	$P(SB < 20\%\ B0)$	Long-term	0.05
Maintain a defined minimum proportion of female spawning biomass in each Biological Region	$P(p_{SB,2} < 5\%)$ $P(p_{SB,3} < 33\%)$ $P(p_{SB,4} < 10\%)$ $P(p_{SB,4\mathrm{B}} < 2\%)$	Long-term	0.05

2.1. Primary fishery objective (target SB)

MEASURABLE OBJECTIVE	PERFORMANCE METRIC	TIME-FRAME	TOLERANCE
Maintain the coastwide female spawning biomass above a biomass target reference point at least 50% of the time	$P(SB < 36\%\ B0)$	Long-term	0.50

2.2. Primary fishery objectives (stability)

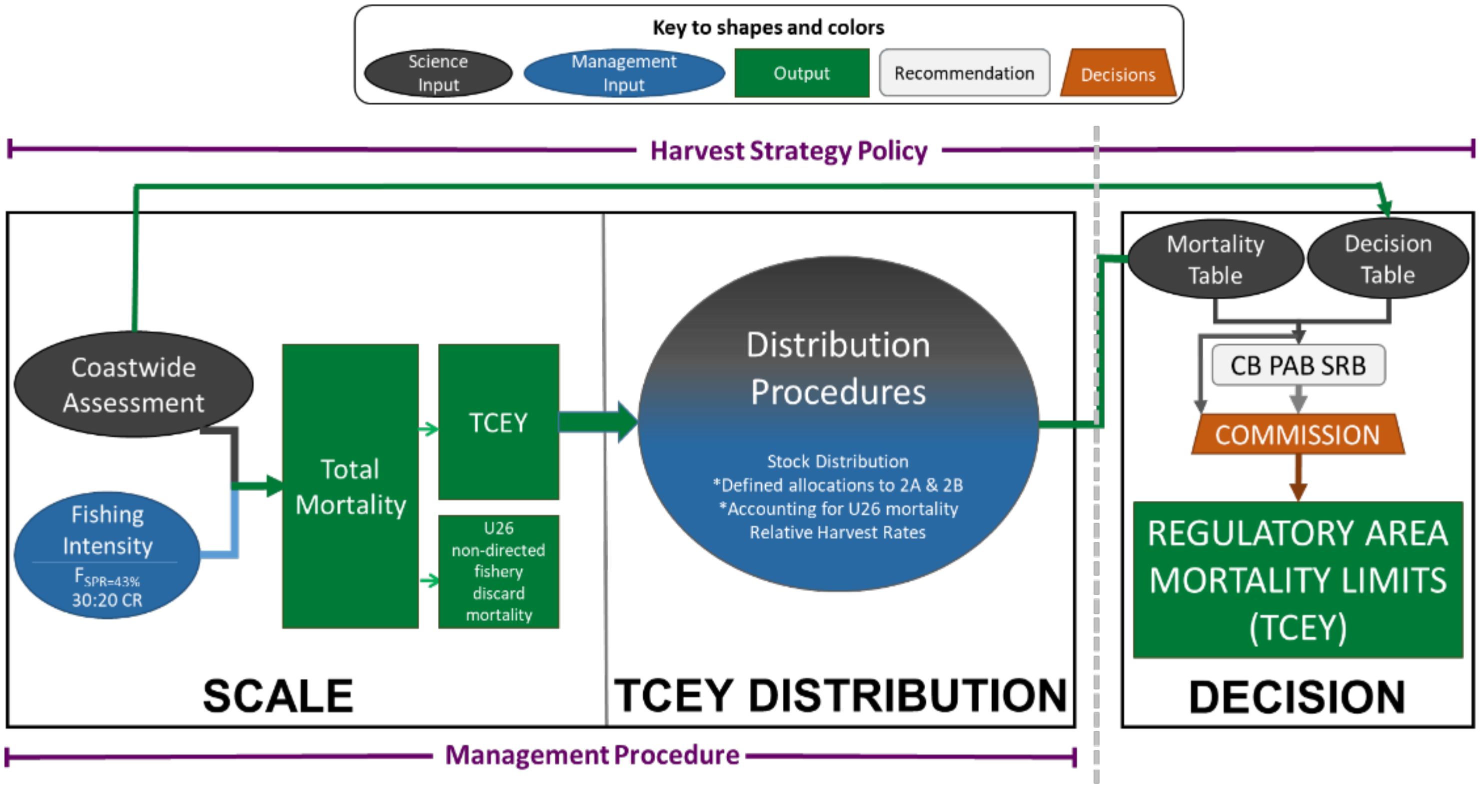
MEASURABLE OBJECTIVE	PERFORMANCE METRIC	TIME-FRAME	TOLERANCE
Limit annual changes in the coastwide TCEY	$P(AC > 15\%\text{ in any 3 years of 10})$	Short-term	
	Coastwide Average Annual Variability (AAV)	Short-term	
Limit annual changes in the Regulatory Area TCEY	$P(AC_A > 15\%\text{ in any 3 years of 10})$	Short-term	
	AAV by Regulatory Area (AAV_A)	Short-term	

- AC: actual Annual Change in TCEY from one year to next
- AAV: The average percent variability over a 10-year period

2.3. Primary fishery objectives (yield)

MEASURABLE OBJECTIVE	PERFORMANCE METRIC	TIME-FRAME	TOLERANCE
Optimize average coastwide TCEY	Average coastwide TCEY	Short-term	
Optimize TCEY among Regulatory Areas	Average TCEY in each IPHC Regulatory Area	Short-term	
Optimize the percentage of the coastwide TCEY among Regulatory Areas	Average %TCEY in each IPHC Regulatory Area	Short-term	
Maintain a minimum TCEY for each Regulatory Area	Minimum TCEY in each IPHC Regulatory Area	Short-term	
Maintain a percentage of the coastwide TCEY for each Regulatory Area	Minimum %TCEY in each IPHC Regulatory Area	Short-term	

IPHC Harvest Strategy Process



Elements of the Management Procedure

SCALE	TCEY DISTRIBUTION
• Coastwide target fishing intensity – SPR – Control Rule – Constraints	• Regional Stock Distribution • Regulatory Area Allocation – FISS-based distribution – Relative harvest rates – Agreements

MPs for evaluation in 2020

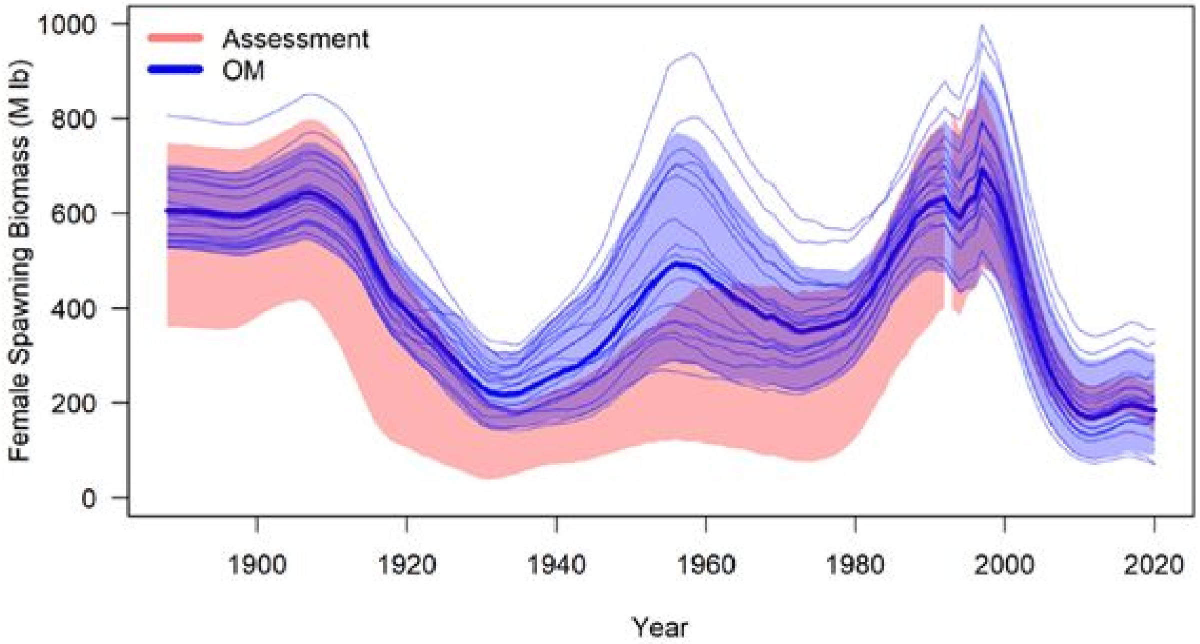
MP	Coastwide	Regional	IPHC Regulatory Area	Priority
MP 15-A	SPR 30:20		• O32 stock distribution • Proportional relative harvest rates (1.0 for 2-3A, 0.75 for 3B-4) • 1.65 Mlbs floor in 2A • Formula percentage for 2B	1
MP 15-B	SPR 30:20 MaxChange15 %		• O32 stock distribution • Proportional relative harvest rates (1.0 for 2-3A, 0.75 for 3B-4) • 1.65 Mlbs floor in 2A • Formula percentage for 2B	1
MP 15-C	SPR 30:20 MaxChange15 %	O32 stock distn Rel HRs: R2, R3=1, R4, R4B=0.75,	• O32 stock distribution • Relative harvest rates not applied • 1.65 Mlbs floor in 2A • Formula percentage for 2B	2
… K				

Management Procedures for evaluation

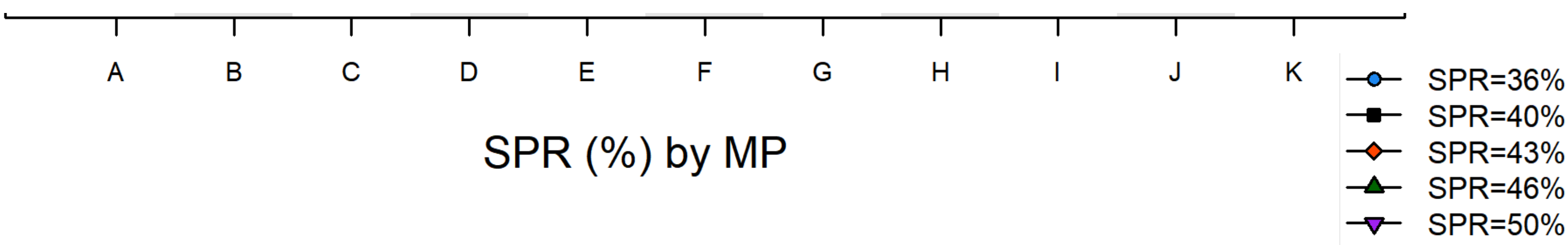
Element	MP-A	MP-B	MP-C	MP-D	MP-E	MP-F	MP-G	MP-H	MP-I	MP-J	MP-K
TCEY constraint of 15%											
Max Fishing Intensity buffer 36%											
O32 stock distribution											
O32 stock distribution (5-year moving average)											
All sizes stock distribution											
Fixed shares updated in 5th year from O32 stock distribution											
Relative harvest rates of 1.0 for 2-3A, and 0.75 for 3B-4											
Relative harvest rates of 1.0 for 2-3, 4A, 4CDE, and 0.75 for 4B											
Relative harvest rates by Region: R2=1, R3=1, R4=0.75, R4B=0.75											
1.65 Mlbs fixed TCEY in 2A											
Formula percentage for 2B											
National Shares (2B=20%)											

Conditioned Operating Model

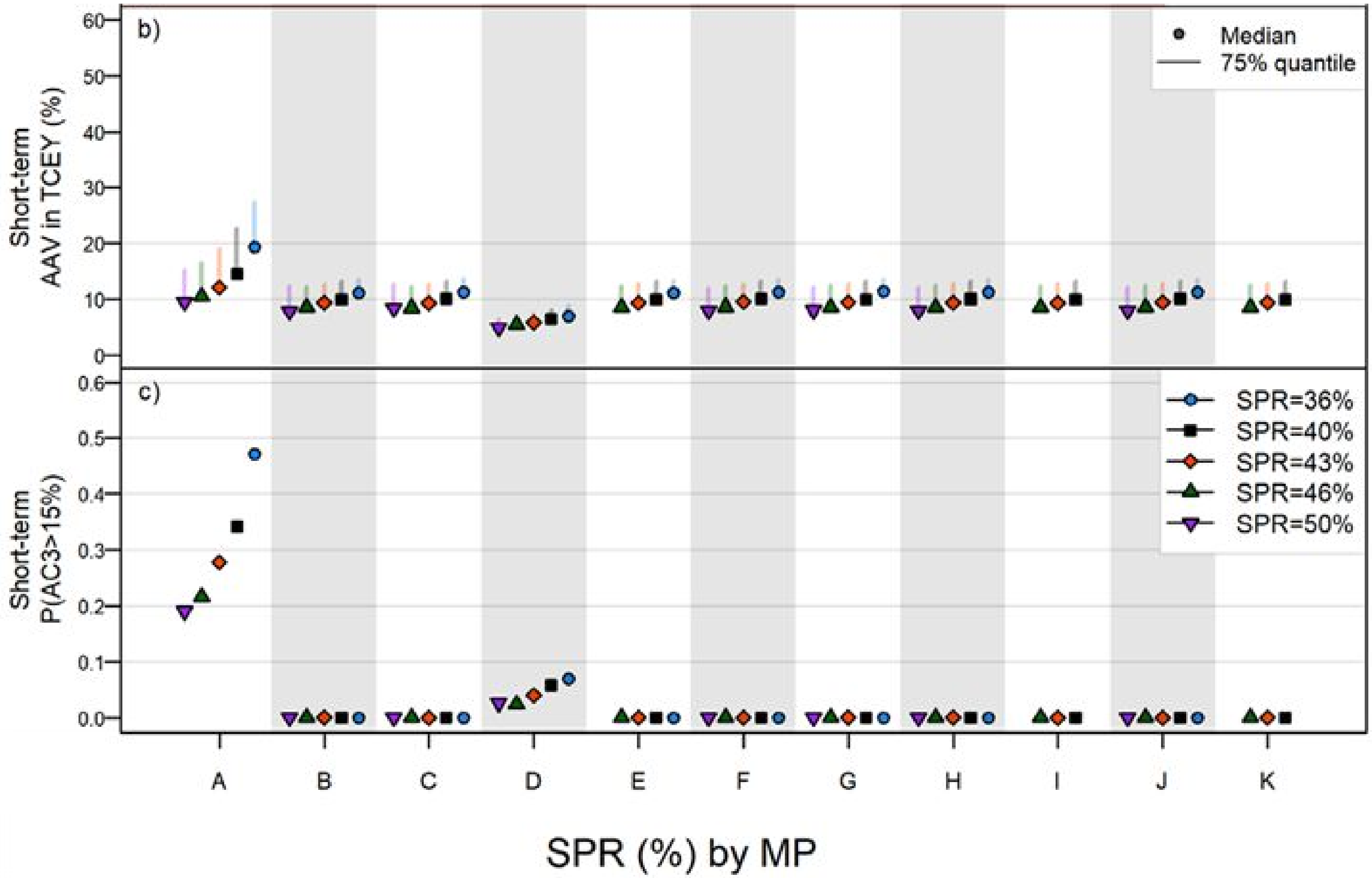
- Four Biological Regions
- 33 fisheries
- Fit to multiple sources of information



Coastwide sustainability metrics



Coastwide stability performance metrics



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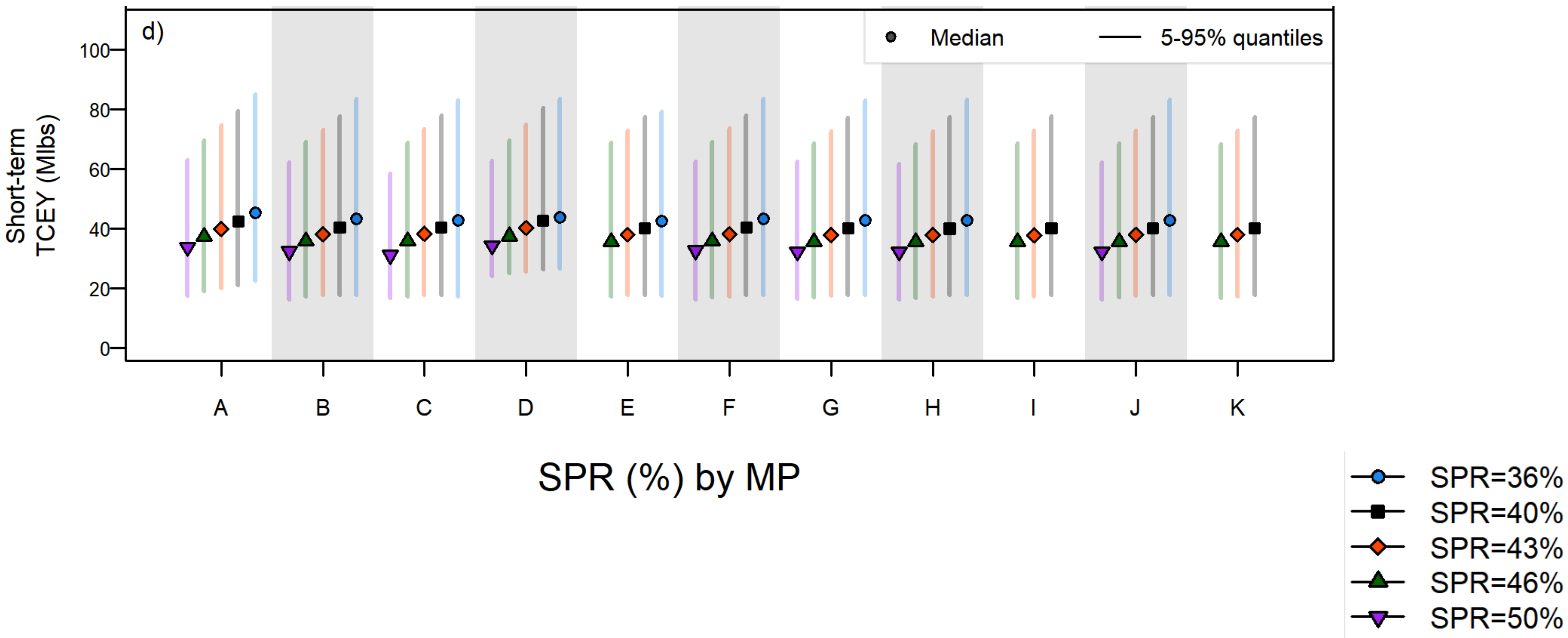
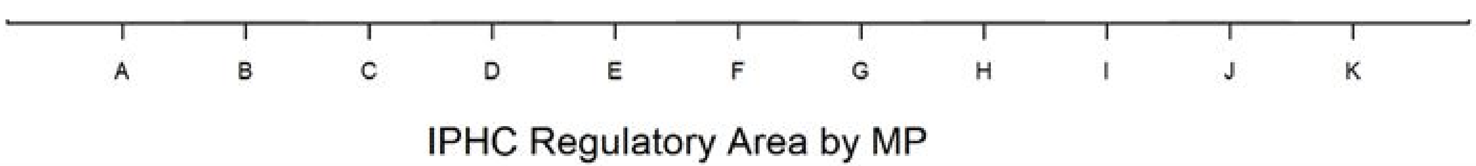
Coastwide Yield performance metrics

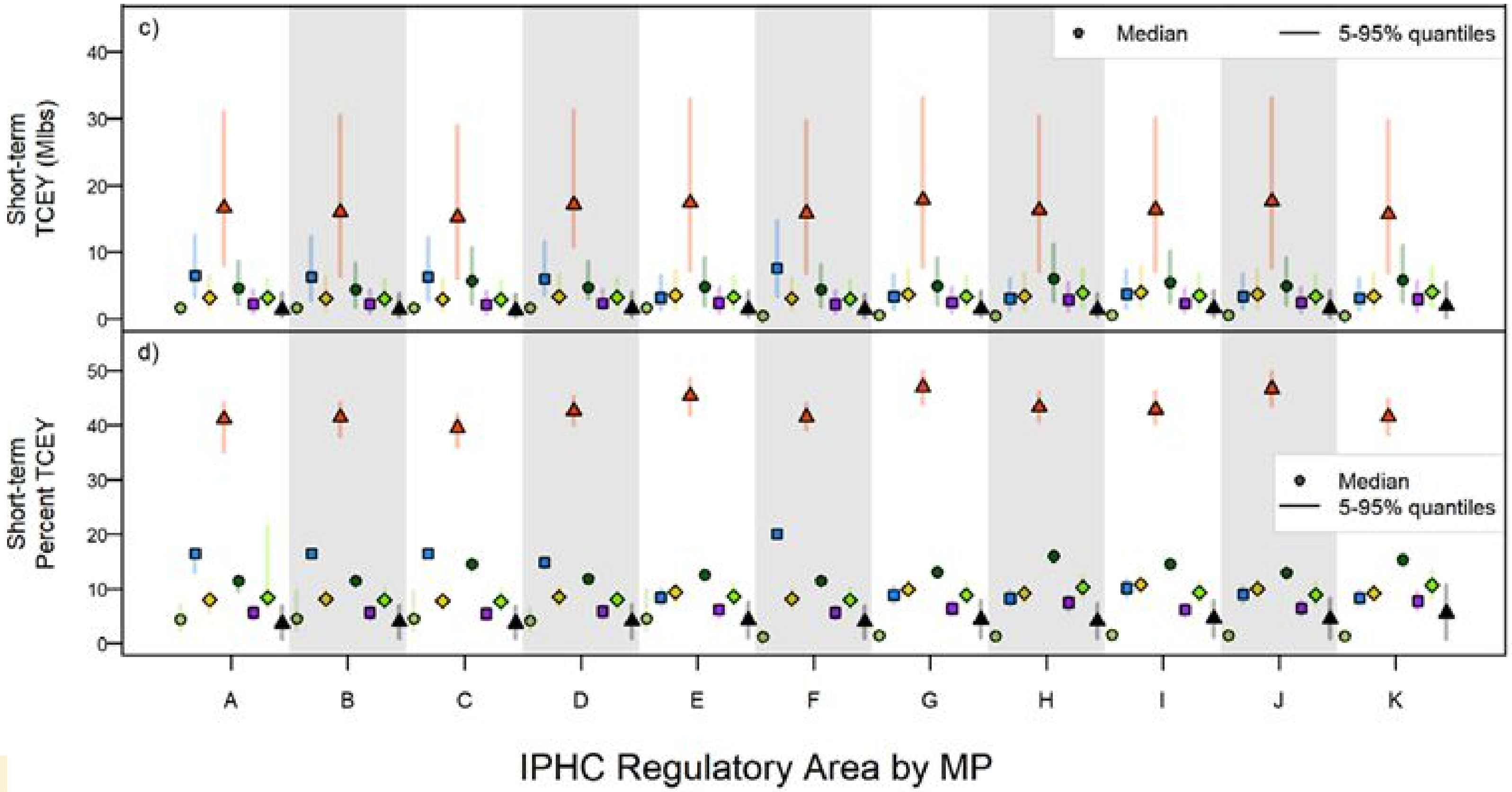


Stability metrics by IPHC Regulatory Area



SPR=43%

Yield metrics by IPHC Regulatory Area



SPR=43%

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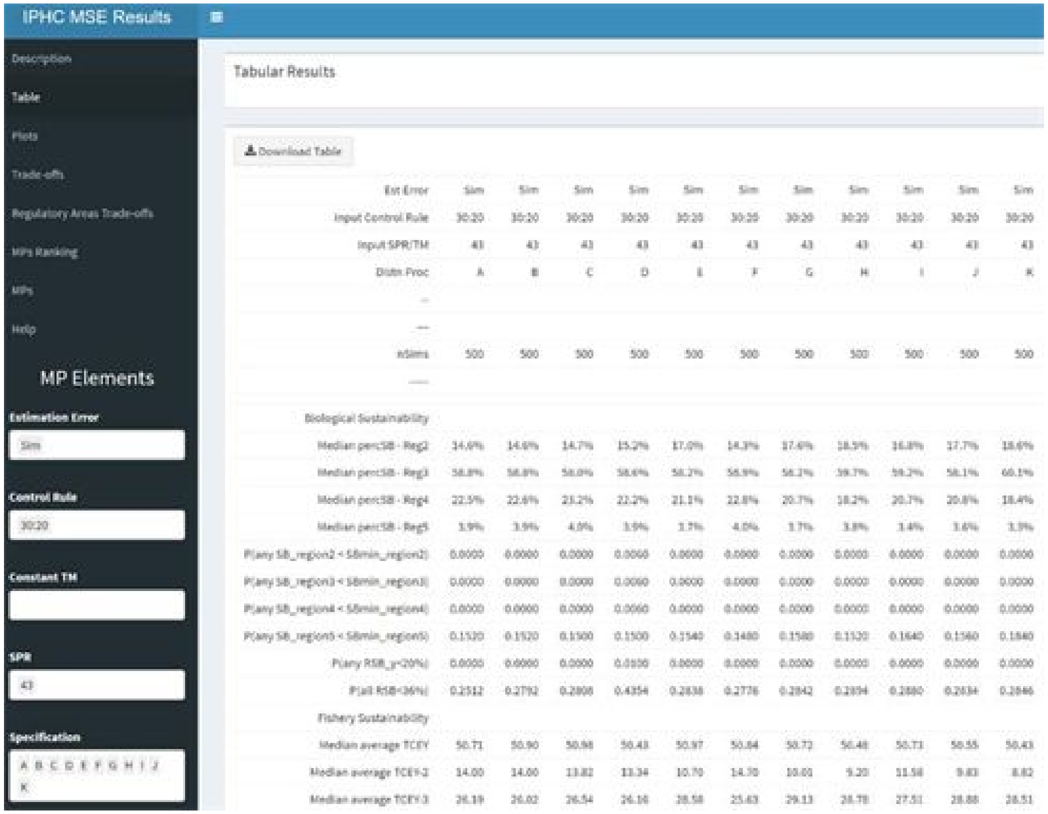
MSE Explorer

- Interactive tool
- All results
- Additional MPs
- Additional Metrics
- Table, plots, ranks



http://shiny.westus.cloudapp.azure.com/shiny/sample-apps/MSE-Explorer/

Are Sustainability objectives met?

Objectives	PMs	Sim 30:2043 MPA	Sim 30:2043 MPB	Sim 30:2043 MPC	Sim 30:2043 MPD	Sim 30:2043 MPE	Sim 30:2043 MPF	Sim 30:2043 MPG	Sim 30:2043 MPH	Sim 30:2043 MPI	Sim 30:2043 MPJ	Sim 30:2043 MPK
Maintain a min prop of female SB	$P(p_{sb,r=2} > 5\%)$	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maintain a min prop of female SB	$P(p_{sb,r=3} > 33\%)$	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maintain a min prop of female SB	$P(p_{sb,r=4} > 10\%)$	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maintain a min prop of female SB	$P(p_{sb,r=4B} > 2\%)$	0.15	0.15	0.15	0.15	0.15	0.15	0.16	0.15	0.16	0.16	0.18
Maintain a female SB above a biomass limit reference point 95% of the time	$P(SB < SB_{Lim})$	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Ranking Management Procedures

- Fishery objectives can be ranked using metrics
- Provides a quick evaluation of many MPs

	A	B	C	D	E	F	G	H	I	J	K
Median TCEY	39.9	38.2	38.3	40.2	38.0	38.2	37.9	37.9	37.9	37.9	38.0
Rank	2	4	3	1	6	4	8	8	8	8	6

Summary Ranks over Regulatory Areas

Objective	Performance Metric	A	B	C	D	E	F	G	H	I	J	K
Maintain the coastwide female SB above a target	$P(SB < SB_{36\%})$	11	4	4	1	4	4	4	2	2	4	4
Limit AC in coastwide TCEY	$P(AC_3 > 15\%)$	11	1	1	10	1	1	1	1	1	1	1
Limit AAV in coastwide TCEY	Median AAV TCEY	11	3	2	1	3	8	8	3	3	8	3
Optimize average coastwide TCEY	Median TCEY	9.75	7.25	6.75	1.75	7	5.62	6	5.88	5.75	2.5	3.5
Limit AC in Reg Areas TCEY	$P(AC_3 > 15\%)$ Reg Areas	8.62	7	7.12	1.75	7.38	6.38	6	5.12	6.25	3.5	4
Limit AAV in Reg Areas TCEY	Median AAV TCEY Reg Areas	1	3	3	1	3	3	3	3	3	3	3
Optimize Reg Areas TCEY	Median TCEY Reg Areas	8.5	6.62	7.5	6.12	5.25	7.62	4.88	5.38	4.25	3.62	4.12
Optimize TCEY % among Reg Areas	Median % TCEY Reg Areas	6.38	4	3.75	1.75	2.62	4.5	3.25	3	2.88	2.5	3.12
Maintain minimum TCEY by Reg Areas	Median Min(TCEY) Reg Areas	3.62	4.75	4.25	3.12	3.75	5.5	3.5	4.5	3.12	3.5	3.88
Maintain minimum % TCEY by Reg Areas	Median Min(% TCEY) Reg Areas	8.25	6.75	7.62	6.5	5	7.5	4.38	4.88	4	4.25	4.5

Summary ranks by general objective

Objective	Performance Metric	A	B	C	D	E	F	G	H	I	J	K
2.1 Maintain the coastwide female SB above a target	$P(SB < SB_{Targ})$	11	4	4	1	4	4	4	2	2	4	4
2.2 Limit catch variability	Limit annual change	10.1	4.56	4.22	3.62	4.59	5.25	5.25	3.75	4	3.75	2.88
2.3 Provide directed fishing yield	Optimize TCEY and maintain minimum TCEY in Reg Areas	5.55	5.02	5.22	3.7	3.92	5.62	3.8	4.15	3.45	3.37	3.72

MP elements: Fishing Intensity

- SPR
  - Large effect on coastwide and population metrics
  - Therefore, affects all IPHC Regulatory Areas
- Constraints
  - Reduces variability in TCEY
  - Different constraints have slightly different effects

MP elements: Stock distribution

- O32
  - Averaging reduces variability (especially 4B)
- All sizes
  - Small differences for each Regulatory Area
- Regional distribution
  - Small differences for each Regulatory Area
  - Many possibilities for distribution within a Region

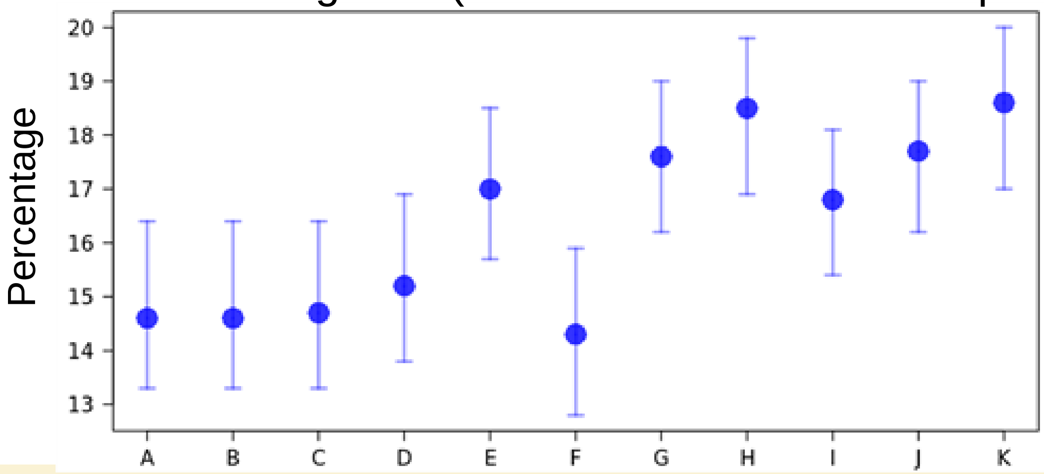
MP elements: Relative harvest rates

- Relative harvest rates (0.75 or 1 in 3B, 4A, 4CDE)
  - Slight reduction in coastwide TCEY and AAV
  - Increased TCEY in Regulatory Areas with increased relative HR
  - Decrease TCEY in Regulatory Areas with decreased relative HR
- Effect of migration assumptions
  - Would be worth examining alternative assumptions

MP elements: 2A & 2B agreements

- Overall
  - Tradeoffs between these regulatory areas and others
  - Affects percentage of Spawning Biomass in Region 2

Percent SB in Region 2 (Median with 25th and 75th percentiles)



MP with SPR=46%

General Conclusions: coastwide

- Coastwide TCEY was mainly affected by SPR
  - SPR=43% performs well
  - SPR=40% drops below target more than 50% of sims
- 30:20 control rule keeps SB above limit of 20%
- Constraints maintain stability in TCEY

General Conclusions: Areas

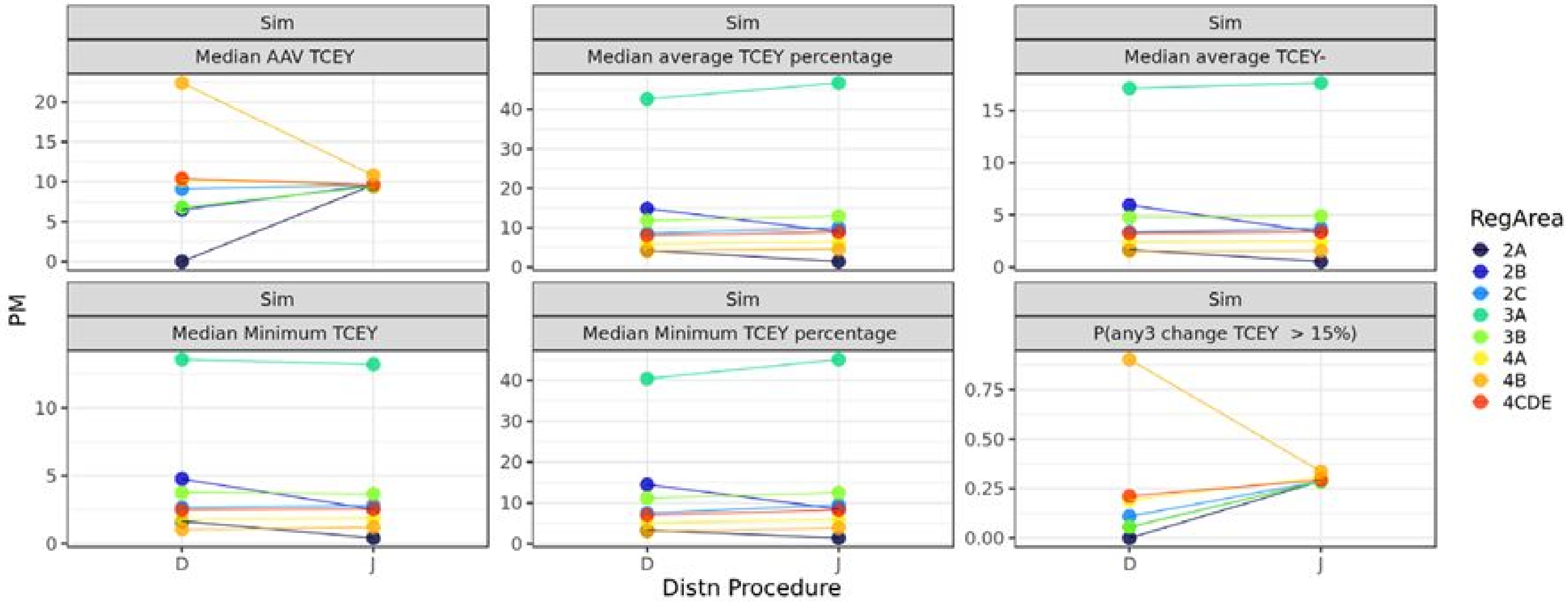
- There are many trade-offs between areas
- MPs without the agreements tended to perform better when considering all IPHC Regulatory Areas
- **MP-D** performed well because it allowed the coastwide TCEY to increase to accommodate agreements
  - A trade-off between coastwide and area stability,
  - A higher fishing intensity that is variable
- Variability in stock distribution has a large effect on stability
- Different metrics would be useful for MP elements that are fixed for a period of years

Best performing MPs

- **MP-D** and **MP-J** were overall ranked best

MP-D	MP-J
• More variability in coastwide TCEY – Flexibility for agreements • SPR is variable and not known exactly – Rarely lower than 40%	• More stable coastwide TCEY • Higher TCEY in areas other than 2A and 2B • Could use lower SPR for slightly more yield without exceeding target tolerance

Compare MP-D and MP-J short-term



- Medium-term shows improved stability for MP-J

Elements

MP-D	MP-J
• *SPR-buffer* allows the TCEY to increase by increasing the fishing intensity • Agreements for 2A and 2B	• 5-year average for stock distribution

- Smoothing stock distribution improved stability in yield
- SPR-buffer allowed for agreements, but with increased risk to stock
- SPR could possibly be reduced slightly for MP-J
  - increase coastwide fishing intensity

Possible work between IM096 and AM097

1) IPHC Secretariat to further improve the operating model, and test the two 'optimal' MPs **D** and **J**, based on direction from IM096.

2) IPHC Secretariat to create a new MP for evaluation from best performing elements and directives at IM096.

Recommendations

a) **NOTE** paper IPHC-2020-IM096-11 Rev_1 which provides a description of the IPHC MSE framework and simulations of management procedures for distributing the TCEY.

b) **RECOMMEND** the use of the MSE framework to evaluate management procedures incorporating scale and distribution elements.

c) **RECOMMEND** a management procedure that best meets Commission objectives and accounts for trade-offs between yield and yield stability, in IPHC Regulatory Areas.

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Management Strategy Evaluation results for distribution management procedures

PREPARED BY: IPHC SECRETARIAT (A. HICKS, P. CARPI, S. BERUKOFF, & I. STEWART; 17 & 30 OCTOBER 2020)

PURPOSE

To provide a description of the International Pacific Halibut Commission (IPHC) Management Strategy Evaluation (MSE) framework and simulations of management procedures for distributing the TCEY.

SUMMARY

The Management Strategy Evaluation (MSE) at the International Pacific Halibut Commission (IPHC) has completed an evaluation of management procedures (MPs) relative to the coastwide scale of the Pacific halibut stock and fishery, and has developed a framework to investigate MPs related to distributing the Total Constant Exploitation Yield (TCEY) to IPHC Regulatory Areas. A MSE framework has been developed containing the Operating Model (OM) that simulates the Pacific halibut population and fisheries, and the Management Procedure (MP) with a closed-loop feedback. A four-region operating model was conditioned to match historical data and then simulated forward in time with uncertainty and using eleven MPs, defined at the 15th Session of the IPHC Management Strategy Evaluation Board (MSAB015), to determine distributed mortality limits. There are many trade-offs between objectives and between IPHC Regulatory Areas that must be considered in the evaluation. Biological sustainability objectives were met for all MPs, except that the percentage of spawning biomass in IPHC Regulatory Area 4B was less than 2% in more than 5% of the simulations for all MPs. This particular result may be due to a number of factors, including a misspecification of the population dynamics in that Biological Region. Yield objectives were similar for coastwide performance metrics, but varied across IPHC Regulatory Areas depending on the elements of the MPs. Stability objectives were ranked higher when methods to dampen variability, such as constraints on the annual change in the TCEY and averaging of stock distribution estimates, were included in the MP. The full set of MSE results and visualizations to evaluate the MPs are available on the MSE Explorer online tool.

1 INTRODUCTION

The Management Strategy Evaluation (MSE) at the International Pacific Halibut Commission (IPHC) has completed an evaluation of management procedures (MPs) relative to the coastwide scale of the Pacific halibut stock and fishery, and has developed a framework to investigate MPs related to distributing the Total Constant Exploitation Yield (TCEY) to IPHC Regulatory Areas. The TCEY is the mortality limit composed of mortality from all sources except under-26-inch (66.0 cm, U26) non-directed commercial discard mortality, and is determined by the Commission at each Annual Meeting for each IPHC Regulatory Area (Figure 1).

The development of this MSE framework aimed to support the scientific, forecast-driven study of the trade-offs between fisheries management scenarios. Crafting this tool required:

- the definition and specification of a multi-area operating model (OM);

- an ability to condition operating model parameters using historical catch and IPHC Fishery-Independent Setline FISS (FISS) data and other observations;
- identification and development of management procedures with closed-loop feedback into the operating model;
- definition and calculation of performance metrics and statistics based on defined objectives to evaluate the efficacy of applied management procedures relative to pre-defined objectives.

The MSE framework is briefly described below, followed by a description of the management procedures being evaluated that distribute the TCEY to IPHC Regulatory Areas, and then the presentation of simulation results.

2 Framework Elements

The MSE framework includes elements that simulate the Pacific halibut population and fishery (OM) and management procedures (MPs) with a closed-loop feedback (Figure 2). Specifications of some elements are described below, with additional technical details in document IPHC-2020-MSAB016-INF01.

2.1 Multi-area operating model

The generalized operating model is able to model multiple spatial components, which is necessary because mortality limits are set at the IPHC Regulatory Area level (Figure 1) and some objectives (Appendix I) are defined at that level. The OM is flexible, fast, modular, and easily adapted to many different assumptions. It will be a useful tool for many investigations of the Pacific halibut fishery in the future.

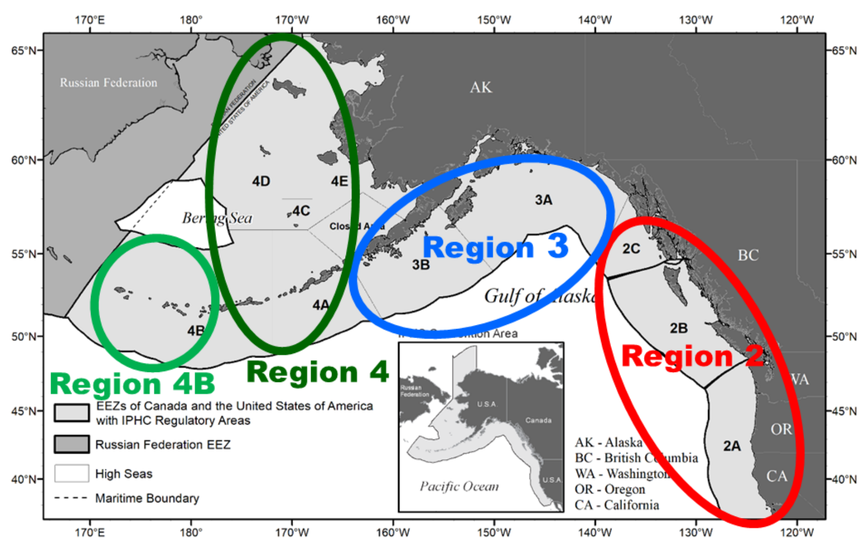


Figure 1: Biological Regions overlaid on IPHC Regulatory Areas. Region 2 comprises 2A, 2B, and 2C, Region 3 comprises 3A and 3B, Region 4 comprises 4A and 4CDE, and Region 4B comprises solely 4B.

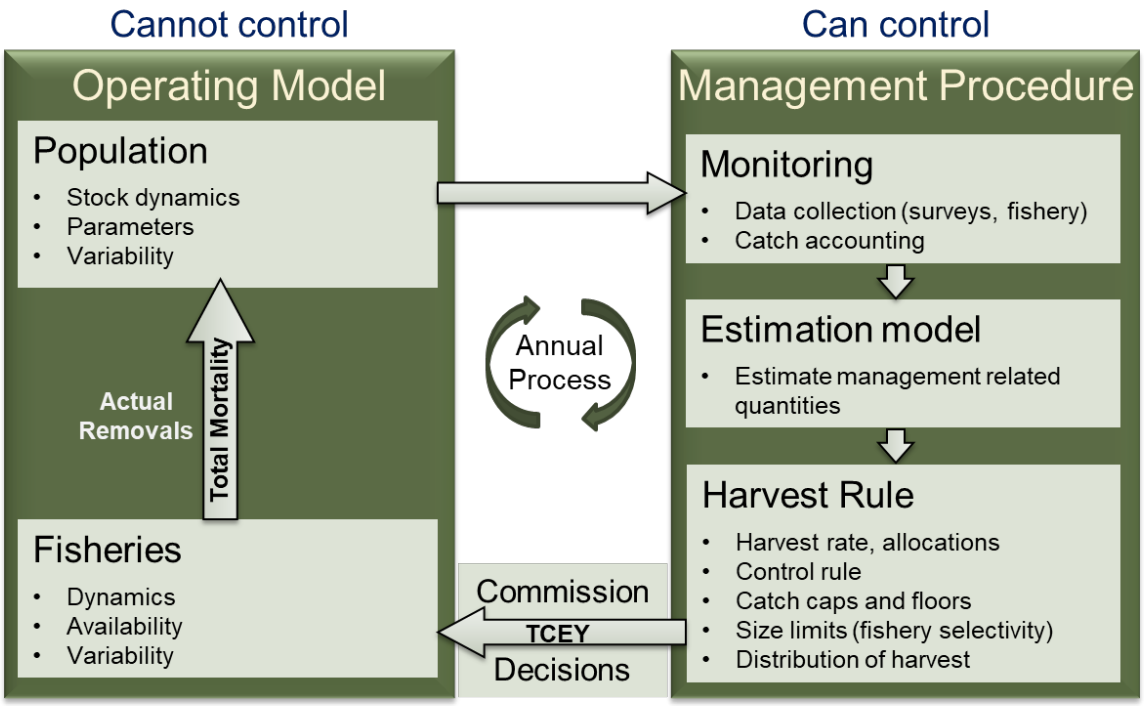


Figure 2. Illustration of the closed-loop simulation framework with the operating model (OM) and the Management Procedure (MP). This is the annual process on a yearly timescale.

2.1.1 Population and fishery spatial specification

The emerging understanding of Pacific halibut diversity across the geographic range of its stock indicates that IPHC Regulatory Areas should be only considered as management units and do not represent relevant sub-populations (Seitz et al. 2017). Therefore, four Biological Regions (Figure 1) were defined with boundaries that matched some of the IPHC Regulatory Area boundaries for the following reasons. First, data for stock assessment and other analyses are most often reported at the IPHC Regulatory Area scale and are largely unavailable for sub-Regulatory Area evaluation. Particularly for historical sources, there is little information to partition data to a portion of a Regulatory Area. Second, it is necessary to distribute TCEY to IPHC Regulatory Areas for quota management. If a Region is not defined by boundaries of IPHC Regulatory Areas (i.e. a single IPHC Regulatory Area is in multiple Regions) it will be difficult to create a distribution procedure that accounts for biological stock distribution and distribution of the TCEY to Regulatory Areas for management purposes. Further, the structure of the current directed fisheries does not delineate fishing zones inside individual IPHC Regulatory Areas, so there would be no way to introduce management at that spatial resolution.

To a certain degree, Pacific halibut within the same Biological Region share common biological traits different from adjacent Biological Regions. These traits include sex ratios, age composition, and size-at-age, and historical trends in these data may be indicative of biological diversity within the greater Pacific halibut population. Furthermore, tagging studies have indicated that within a year, larger Pacific halibut tend to undertake feeding and spawning migrations within a Biological

Region, and movement between Biological Regions typically occurs between years (Seitz et al. 2007; Webster et al. 2013).

Given the goals to divide the Pacific halibut stock into somewhat biologically distinct regions and preserve biocomplexity across the entire range of the Pacific halibut stock, Biological Regions are considered by the IPHC Secretariat, and supported by the SRB (paragraph 31 IPHC-2018-SRB012-R), to be the best option for biologically-based areas to meet management needs. They also offer a parsimonious spatial separation for modeling inter-annual population dynamics.

However, as mentioned earlier, mortality limits are set for IPHC Regulatory Areas and thus directed fisheries operate at that spatial scale. Furthermore, since some fishery objectives have been defined at the IPHC Regulatory Area level (Appendix I), the TCEY will need to be distributed to that scale. Even though the population is modelled at the Biological Region scale, fisheries can be modelled at the IPHC Regulatory Area scale by using an areas-as-fleets approach within Biological Regions. This requires modelling each fleet with separate selectivity and harvest rates that operate on the biomass occurring in the entire Biological Region in each year. The following is a discussion of the pros and cons of this method.

First, modelling the population dynamics at the IPHC Regulatory Area scale would require intra-annual dynamics to be modelled, dividing the year into seasons to model movement between IPHC Regulatory Areas. There is evidence that such intra-annual movements occur and fisheries in adjacent IPHC Regulatory Areas may intercept the same pool of fish. Using Biological Regions assumes that all fisheries within a Region have access to the pool of Pacific halibut in that Region in that year. This greatly simplifies the calculations and eliminates the need to parameterize intra-annual movement.

Additionally, calculating statistics specific to IPHC Regulatory Areas requires assumptions about mechanisms determining future distribution of biomass within each Biological Region. For example, simulating the observed proportion of biomass in each IPHC Regulatory Area (e.g. to mimic the current interim management procedure) requires simulating a survey biomass for each IPHC Regulatory Area that represents the observations from FISS . Likewise, determining some performance metrics related to IPHC Regulatory Area objectives may be difficult to calculate (such as the proportion of O26 fish in each IPHC Regulatory Area). The distribution of the population within a Biological Region is currently approximated assuming specified proportions of the population in each IPHC Regulatory Area within a Biological Region that are based on historical observations. These proportions are constant over ages and allow for the calculation of statistics specific to IPHC Regulatory Areas. Future improvements to the framework will allow for different options such as modelling proportions based on population attributes and accounting for year to year variability.

2.1.1.1 Recruitment

Recruitment at age 0 to the population is determined at the coastwide level and is a function of the coastwide spawning biomass using a Beverton-Holt spawner-recruit relationship with a steepness of 0.75. The recruitment to each Biological Region is simply a proportion of the coastwide recruitment and those proportions (constrained to sum to 1) are time-invariant.

2.1.1.2 Fisheries

Fisheries were defined by IPHC Regulatory Areas (or combinations of areas if fishing mortality in that area was small) and for five general sectors consistent with the definitions in the recent IPHC stock assessment (IPHC-2020-AM096-09 Rev_2):

- **directed commercial** representing the O32 mortality from the directed commercial fisheries including O32 discard mortality;
- **directed commercial discard** representing the U32 discard mortality from the directed commercial fisheries, comprised of Pacific halibut that die on lost or abandoned fishing gear, and Pacific halibut discarded for regulatory compliance reasons;
- **non-directed commercial discard** representing the mortality from incidentally caught Pacific halibut in non-directed commercial fisheries;
- **recreational** representing recreational landings (including landings from commercial leasing) and recreational discard mortality; and
- **subsistence** representing non-commercial, customary, and traditional use of Pacific halibut for direct personal, family, or community consumption or sharing as food, or customary trade.

Table 1 shows the summed mortality realized from 1992 through 2019 for each of these sectors by IPHC Regulatory Area or Biological Region. Thirty-three (33) fisheries were defined as a sector/area combination based on the amount of mortality in the combination, data availability, and MSAB recommendations (Table 2).

The FISS is included as a fishery with no mortality to output summaries of observations such as indices and observed proportions-at-age in the population available to the FISS at a specific time and in a specific region. Mortality from the FISS is included with the directed commercial fishery mortality, although it could be kept separate. The survey sector mimicking the FISS is simply referred to as ‘survey’ here to avoid confusion with actual FISS observations.

Table 1: Summed mortality (millions of net pounds) from 1992 through 2019 by fisheries and IPHC Regulatory Area or Biological Region.

Year	2A	2B	2C	3A	3B	4A	4CDE	4B
Directed commercial	17.5	259.8	205.5	551.2	252.4	78.2	72.5	62.8
Directed commercial discard mortality	0.5	7.1	5.2	16.7	10.7	2.1	1.3	0.8
Non-directed commercial discard mortality	11.8	12.0	4.5	73.6	36.2	39.2	16.2	128.6
Recreational	13.7	31.8	71.1	152.2	0.5	1.4	<0.1	<0.1
Subsistence	0.7	9.6	10.3	7.6	1.0	0.6	<0.1	2.4

Selectivity determines the age composition of fishery mortality and ensures the removal of appropriate numbers-at-age from the population when mortality occurs in the annual time-step. Selectivity in this OM represents the proportion at each age that is captured and retained (i.e., landed) by the gear. Directed commercial discard mortality is modelled as a separate sector with its own selectivity, and discard mortality for other sectors is included in the total mortality for those sectors. Parameters for selectivity when conditioning models were determined from the estimated parameters from the long Areas-As-Fleets (AAF) model in the recent stock assessment (IPHC-2020-SA-01) including annual deviations in selectivity for the directed fisheries and the survey. These parameters were modified to make the selectivity curves for directed commercial fisheries and the survey asymptotic (i.e., no descending limb) because movement should account for implied availability of a spatially explicit model compared to the coastwide stock assessment. Selectivity could be further modified as necessary to improve fits to data.

2.1.1.3 Weight-at-age

Empirical weight-at-age by region for the population, fisheries, and survey are determined using observations from the FISS and the fisheries, as is done with the stock assessment models (IPHC-2020-SA-02) and as described in detail in Stewart and Martell (2016). Smoothed observations of weight-at-age from NMFS trawl surveys were used to augment weight-at-age for ages 1–6 in the fishery sectors and survey. Population weight-at-age is smoothed across years to reduce observation error. Finally, survey and population weight-at-age prior to 1997 is scaled to fishery data because survey observations are limited if present at all.

2.1.1.4 Movement

Many data sources are available to inform Pacific halibut movement. Decades of tagging studies and observations have shown that important migrations characterize both the juvenile and adult stages and apply across all regulatory areas. The conceptual model of halibut ontogenetic and seasonal migration, including main spawning and nursery grounds, as per the most current knowledge, was presented in IPHC-2019-MSAB014-08 and was used to assist in parameterizing movement rates in the OM.

In 2015, the many sources of information were assembled into a single framework representing the IPHC's best available information regarding movement-at-age among Biological Regions. Key assumptions in constructing this hypothesis included:

- ages 0-1 do not move (most of the young Pacific halibut reported in Hilborn et al. (1995) were aged 2-4),
- movement generally increases from ages 2-4,
- age-2 Pacific halibut cannot move from Region 4 to Region 2 in a single year, and
- relative movement rates of Pacific halibut of age 2-4 to/from Region 4 are similar to those observed for 2-4-year-old Pacific halibut in Region 3, relative to older Pacific halibut.

Table 2: The thirty-three fisheries in the OM, the IPHC Regulatory Areas they are composed of, and the 2019 mortality (millions of net pounds and tonnes) for each.

Fishery	IPHC Regulatory Areas	2019 Mortality Mlbs	2019 Mortality tonnes
Directed Commercial 2A	2A	0.89	404
Directed Commercial 2B	2B	5.22	2,368
Directed Commercial 2C	2C	3.67	1,665
Directed Commercial 3A	3A	8.16	3,701
Directed Commercial 3B	3B	2.31	1,048
Directed Commercial 4A	4A	1.45	658
Directed Commercial 4B*	4B	1.00	454
Directed Commercial 4CDE	4CDE	1.65	748
Directed Commercial Discards 2A	2A	0.03	14
Directed Commercial Discards 2B	2B	0.13	59
Directed Commercial Discards 2C	2C	0.06	27
Directed Commercial Discards 3A	3A	0.32	145
Directed Commercial Discards 3B	3B	0.15	68
Directed Commercial Discards 4A	4A	0.09	41
Directed Commercial Discards 4B	4B	0.03	14
Directed Commercial Discards 4CDE	4CDE	0.07	32
Non-directed Commercial Discards 2A	2A	0.13	59
Non-directed Commercial Discards 2B	2B	0.24	109
Non-directed Commercial Discards 2C	2C	0.09	41
Non-directed Commercial Discards 3A	3A	1.65	748
Non-directed Commercial Discards 3B	3B	0.48	218
Non-directed Commercial Discards 4A	4A	0.35	159
Non-directed Commercial Discards 4CDE	4CDE	3.50	1,588
Non-directed Commercial Discards 4B	4B	0.15	68
Recreational 2B	2B	0.86	390
Recreational 2C	2C	1.89	857
Recreational 3A	3A	3.69	1,674
Subsistence 2B	2B	0.41	186
Subsistence 2C	2C	0.37	168
Subsistence 3A	3A	0.19	86
Recreational/Subsistence 2A	2A	0.48	218
Recreational/Subsistence 3B	3B	0.02	9
Recreational/Subsistence 4	4A, 4CDE	0.06	27

*The small amount of recreational and subsistence mortality from IPHC Regulatory Area 4B is included in Directed Commercial 4B

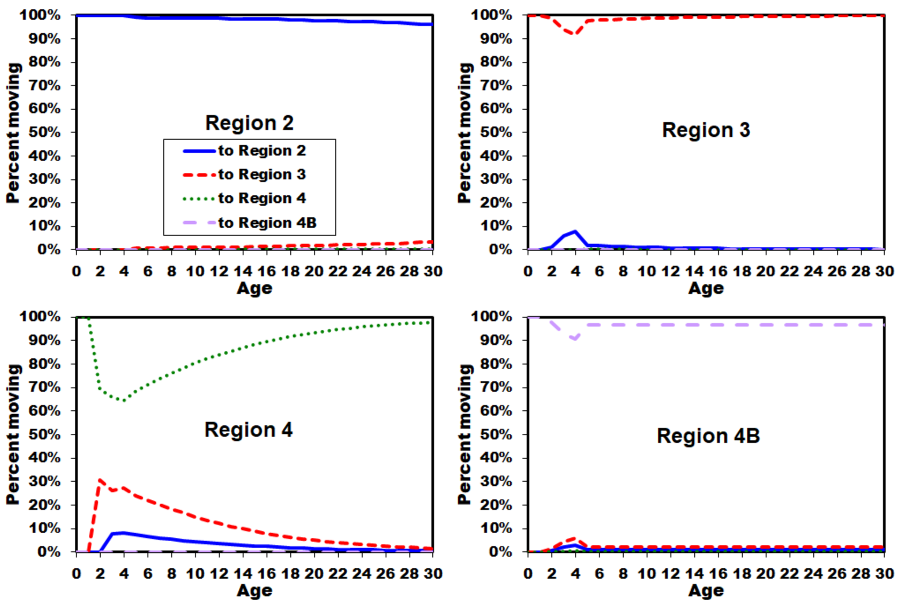


Figure 3: Estimated aggregate annual movement rates by age from Biological Regions (panels) based on currently available data (from IPHC-2019-AM095-08).

Based on these assumptions, appreciable emigration is estimated to occur from Region 4, decreasing with age. Pacific halibut age-2 to age-4 move from Region 3 to Region 2 and from Region 4B to Regions 3 and 2, and some movement of older Pacific halibut is estimated to occur from Region 2 back to Region 3 (Figure 3).

The conceptual model and assembled movement rates were used to inform the development of the MSE operating model framework and were used as a starting point to incorporate variability and alternative movement hypotheses in Pacific halibut movement dynamics. Movement in the OM is modelled using a transition matrix as the proportion of individuals that move from one Biological Region to another for each age class in each year.

The transition matrix with movement probabilities from one region to another (including staying in the region of origin) can either be entered directly or parameterized using several functional forms, which allows for uncertainty and variability to be easily applied.

2.1.1.5 Maturity

Spawning biomass for Pacific halibut is currently calculated from annual weight-at-age and a maturity-at-age ogive that is assumed to be constant over years. There is currently no evidence (IPHC-2020-SA-02) for skip spawning or maternal effects (increased reproductive output or offspring survival for larger/older females) and therefore are not modelled, but could be added. Stewart & Hicks (2017) examined the sensitivity of the estimated biomass to a trend in declining spawning potential (caused by a shift in maturity or increased skip spawning) and found that under that condition there was a bias in both scale and trend of recent estimated spawning biomass. The SRB document IPHC-2020-SRB016-07 tested maternal effects on estimates of recruitment and concluded "there appears to be no evidence in the current data that the addition of a simple age-based maternal effects relationship improves the ability of the current stock assessment models to explain the time-series of estimated recruitments." Ongoing research on maturity and skip spawning will help to inform future implementations of the basis for and variability in the determination of spawning output.

2.1.2 Uncertainty and variability in the operating model

Uncertainty and variability are important to consider, as the goal of an MSE is to develop management procedures that are robust to both. The OM should simulate potential states of the population in the future, uncertainties within the management procedure, and variability when implementing the management procedure.

2.1.2.1 Uncertainty in the conditioned OM

The conditioned OM is a representation of the Pacific halibut population and matches observations from the fishery, FISS, and research. Uncertainty in these observations are included in the OM by varying parameters in two different ways. First, parameters vary between simulated trajectories and are drawn from correlated probability distributions that are derived from estimation procedures (e.g. the stock assessment). Second, specific parameters are fixed at different values representing potential states. Trajectories may be simulated using both methods and then integrated appropriately to produce distributions of potential outcomes. At this time, the second method of fixing specific parameters at alternative values is not being used but can easily be implemented in the future.

Table 3: Major sources of parameter uncertainty and variability in the conditioned operating model (OM).

Process	**Uncertainty**
Natural Mortality (*M*)	Uncertainty determined from assessment
Average recruitment (R_0)	Effect of the coastwide environmental regime shift based on the PDO and variability determined from conditioning
Recruitment	Random lognormal deviations. Variability on distribution to Biological Regions determined from conditioning
Movement	Uncertainty estimated when conditioning.

2.1.2.2 Projected population variability

Variability in the projected population is a result of initializing the population with a range of parameters to recreate a range of historical trajectories and including additional variability in certain population processes in the projection. The major sources of variability in the projections are shown in Table 4 and some are described in more detail below.

2.1.2.3 Linkage between average coastwide recruitment and environmental conditions

The average recruitment (R_0) is related to the Pacific Decadal Oscillation index[1], expressed as a positive or negative regime (IPHC-2020-SA-02). The regime was simulated in the MSE by

[1] https://oceanview.pfeg.noaa.gov/erddap/tabledap/cciea_OC_PDO.htmlTable?time,PDO

generating a 0 or 1 to indicate the regime of each future year, as described in IPHC-2018-MSAB011-08. To encourage regimes between 15 and 30 years in length (assuming a common periodicity, although recent years have suggested less), the environmental index was simulated as a semi-Markov process, where each subsequent year depends on recent years. However, the probability of changing to the opposite regime was a function of the length of the current regime, with a change probability equal to 0.5 at 30 years, and a probability near 1 at 40 or greater years. This default parameterization results in simulated regime lengths most often between 20 and 30 years, with occasional runs between 5 and 20 years or greater than 30 years. However, this can be modified to test other scenarios.

Table 4. Major sources of projected variability in the operating model (OM).

Process	Variability
Average recruitment (R_0)	Effect of the coastwide environmental regime shift, modelled as an autocorrelated indicator based on properties of the PDO
Recruitment	Random lognormal deviations. Variability on distribution to Biological Regions.
Size-at-age	Annual and cohort deviations in weight-at-age by Biological Region, with approximate historical bounds
Sector mortality	Sector mortality allocation variability on non-directed commercial discard mortality, directed discard mortality, and unguided recreational mortality within an area
Movement (uncertainty)	Variability on movement parameters determined from conditioning process
Movement (variability)	Change in parameters synchronized with simulated PDO-linked regime shift

2.1.2.4 Projected weight-at-age

Weight-at-age varies over time historically, and the projections capture that variation using a random walk from the previous year. It is important to simulate time-varying weight-at-age because it is an influential contributor to the yield and scale of the Pacific halibut stock. This variability was implemented using the same ideas as in the coastwide MSE (IPHC-2018-MSAB011-08), but was modified to incorporate autocorrelation in a more straightforward manner, and allow for slight departures between regions and fisheries.

The method used to simulate weight-at-age was described in IPHC-2020-SRB016-08 Rev1. Two example projections are shown in Figure 4.

2.2 Conditioned four-region operating model

A multi-region OM was specified with four Biological Regions (2, 3, 4, and 4B; Figure 1), thirty-three (33) fisheries (Table 2), and four (4) survey. The model was initiated in 1888 and initially parameterized using estimates from the long AAF assessment model.

Parameters for R0, the proportion of recruitment to each Biological Region, movement from 2 to 3, 3 to 2, and 4 to 3 were estimated by minimizing an objective function based on lognormal likelihoods for spawning biomass predictions and region-specific modelled FISS indices, robustified multivariate normal likelihoods for the proportion of FISS biomass in each region, and observed proportions at age from the FISS. Other movement parameters were fixed to estimates from data (Figure 3) except that movement probabilities from 4 to 2, 2 to 4, 4B to 2, and 2 to 4B were set to zero for all ages. This makes the assumption that a Pacific halibut cannot travel between these areas in an annual time step even though significant probabilities of movement-at-age from 4 to 2 are predicted to occur from the data (Figure 3).

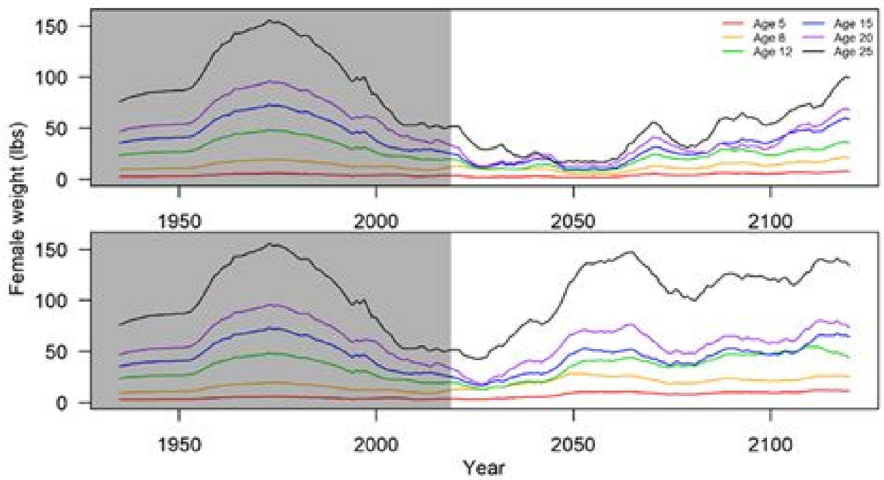


Figure 4: Past observed (shaded area) and two examples of possible one-hundred-year projections of weight at ages 5, 8, 12, 15, 20, and 25.

The OM was conditioned using five sets of observations: the average predicted spawning biomass from the long AAF and long coastwide stock assessment models (1888–1992), predicted spawning biomass from the stock assessment ensemble (1993–2019), FISS indices of abundance for each Biological Region, FISS proportions-at-age for each Biological Region, and the proportion of "all selected sizes" modelled FISS biomass in each Biological Region (stock distribution). The subset of parameters estimated during the conditioning process are listed in Table 5.

The predicted spawning biomass from the conditioned OM fell mostly within the range of estimated spawning biomass from the four stock assessment models in the ensemble (Figure 5). The multi-region operating model predicted a female spawning biomass at the upper part and slightly above the 90% credible interval from about 1930 to 1960 for the long assessment models due to a large amount of predicted total biomass in Biological Regions 3 and 4. The predicted stock distribution matched closely for most years, although the end of the time-series in Biological Regions 2 and 3 and beginning of the time-series in Biological Regions 4 and 4B showed departures. These departures from the observed stock distribution were consistent for all models examined and suggest that the current structural specifications cannot capture these trends.

Table 5: Descriptions of the parameters estimated when conditioning the OM. Separate sets of parameters were estimated for movement in poor and good PDO regimes.

Parameters	# parameters	Description
$\ln(R_0)$	1	Natural log of unfished equilibrium recruitment. Determines the scale of the population trajectory.
$p_{y,r}^{R}$	3	Proportion of R_0 distributed to each Biological Region. Only three of the four parameters need to be estimated to sum to 1.
$\Psi_{2\rightarrow3}$	5 + 5	Probability of movement-at-age from Region 2 to Region 3, modelled using a double exponential function (equation 3). The left and right λs, left maximum probability, right maximum probability, and right asymptote were estimated.
$\Psi_{3\rightarrow2}$	5 + 5	Probability of movement-at-age from Region 3 to Region 2, modelled using a double-exponential function (equation 3). The left and right λs, left maximum probability, right maximum probability, and right asymptote were estimated.
$\Psi_{4\rightarrow3}$	5 + 5	Probability of movement-at-age from Region 4 to Region 3, modelled using a double-exponential function (equation 3). The left and right λs, left maximum probability, right maximum probability, and right asymptote were estimated.

Fits to the modelled FISS index were reasonable for all Biological Regions, but showed some patterns in residuals in Biological Region 2 (Figure 6). Few models that were examined were able to fit the time-series in Biological Region 2 much better, and those that did show an improved fit had poor fits to stock distribution.

Estimated and assumed movement probabilities-at-age from one Biological Region to another are shown in Figure 7. Movement from 2 to 3 is estimated to be much greater than the data suggest with higher movement of very young fish and lower movement rates of older fish during high PDO regimes. The generally higher movement of older fish from 2 to 3 may be to counter-balance the high movement rates of young fish from 3 to 2. The OM has movement rates near 5% for movement of older fish from 3 to 2. Younger fish tend to move at higher rates from 4 to 3 with little movement once they are age 8 and older. The OM assumes that this is a closed population with no movement in or out of the four Biological Regions, which may explain some of the differences observed from the movement rates based on observations.

The final OM shown here is a reasonable representation of the Pacific halibut population but has some shortcomings. For example, the lack of fit to the 2019 stock distribution in Biological Regions 2 and 3 (Figure 5) and the high predictions of young fish in Biological Region 2 in 2019 (Figure 6). The lack of fit to the proportions-at-age in 2019 are balanced by better fits in previous years (not shown). There are many changes to the model and conditioning process that could be made to potentially improve these fits. For example, movement may be sex-specific, but tagging data are lacking this information.

Overall, the conditioned multi-region model represents the general trends of the Pacific halibut population and is a useful model to simulate the population forward in time and test management strategies.

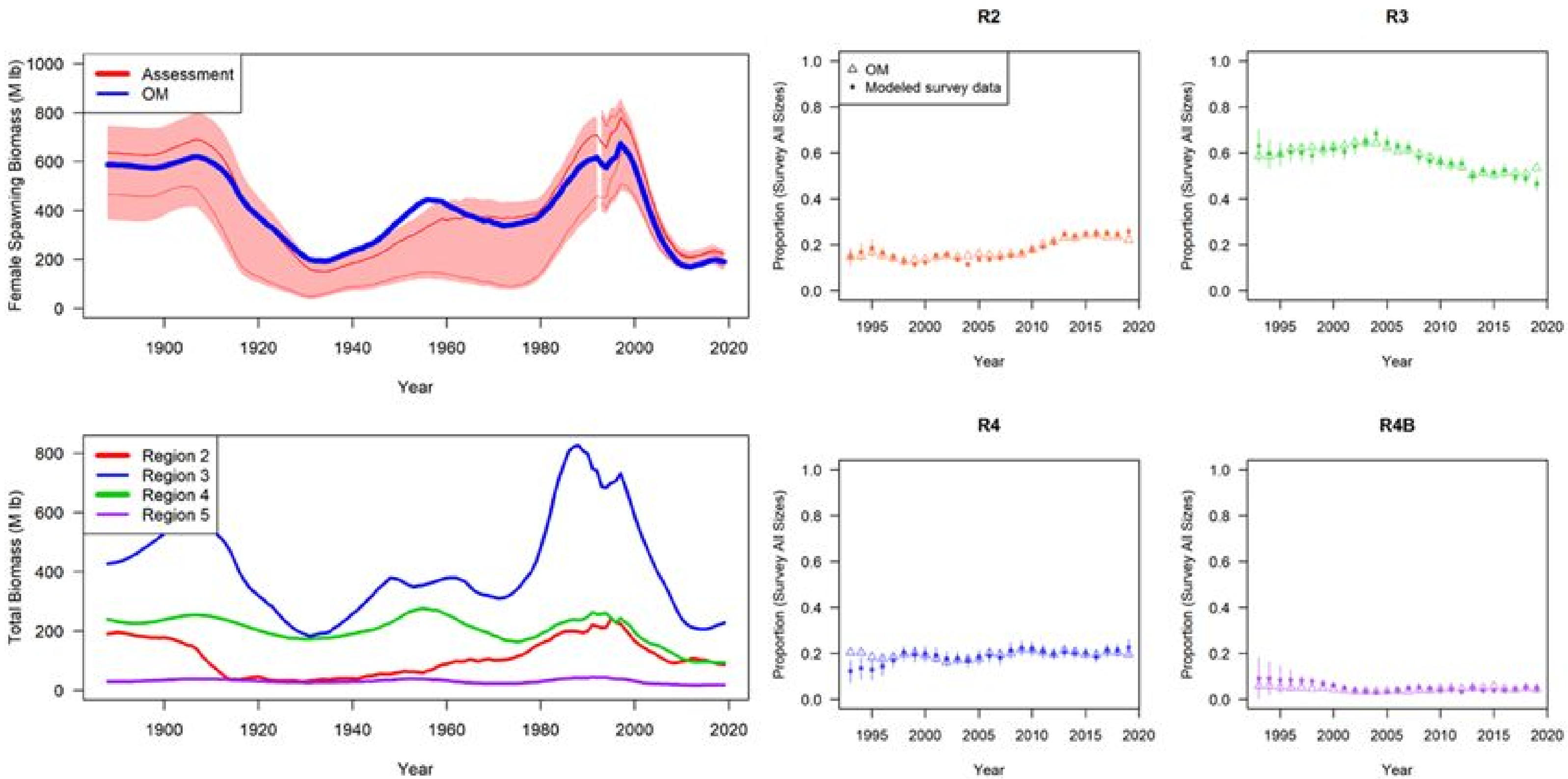


Figure 5: Predicted coastwide spawning biomass (top left) where the blue line is the predicted spawning biomass from the OM, the red lines are the predicted spawning biomass from each model in the stock assessment ensemble, and the red shaded area is the 90% credible interval from the ensemble stock assessment. Total biomass by Biological Region in millions of pounds (bottom left) where Region 4B is denoted by "Region 5". Predicted annual proportions of biomass in each Biological Region (right plots) from the conditioned OM (unfilled symbols) compared to the modelled FISS results (filled circles) with 95% credible intervals.

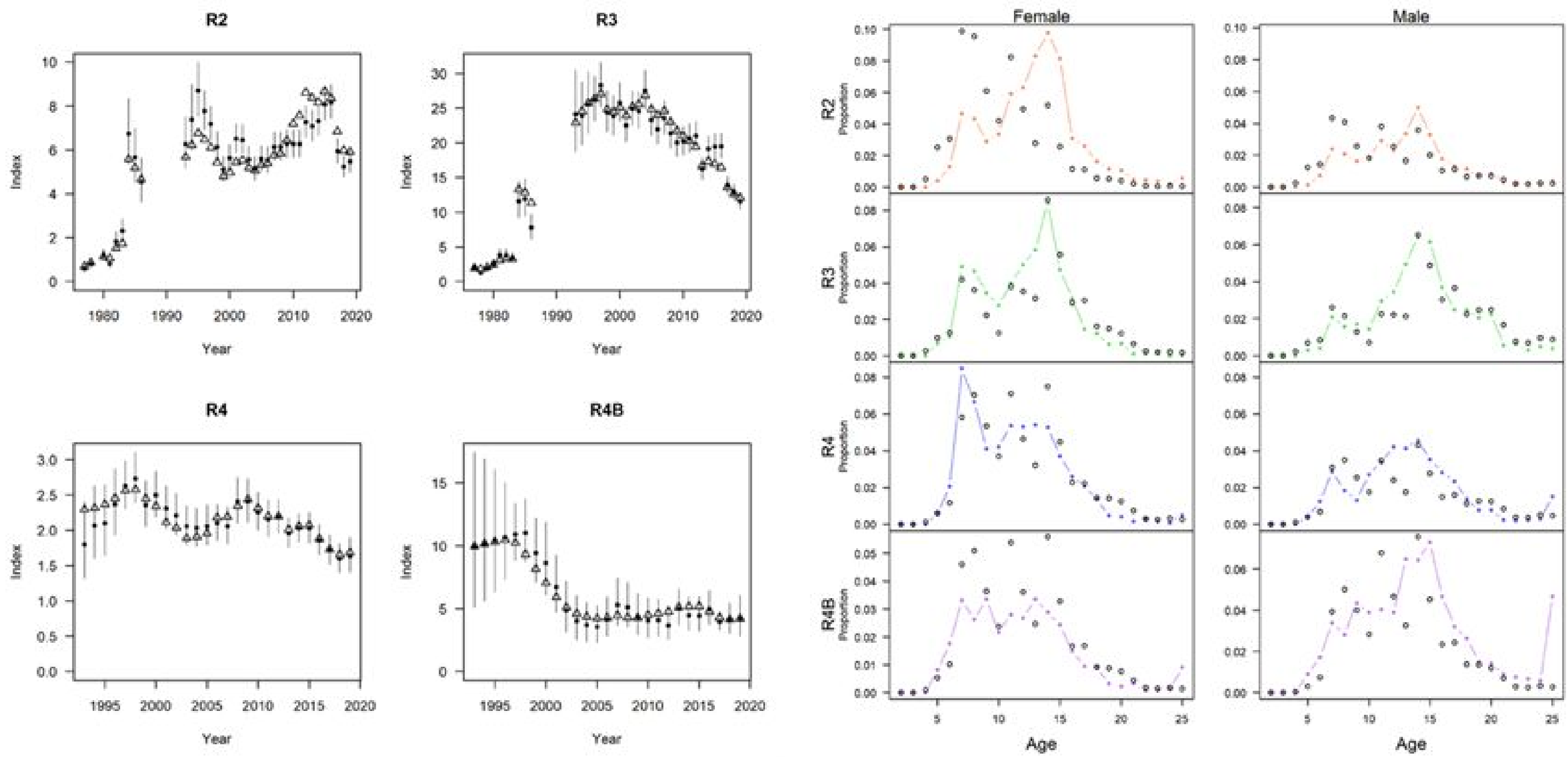


Figure 6: Fits to modelled FISS NPUE index data (four panels on the left) where filled circles are modelled FISS NPUE with 95% credible intervals and the open triangles are predictions from the conditioned OM. Fits to proportions-at-age by sex and Biological Region from the year 2019 (eight panels on the right) with filled circles connected by lines showing the proportions-at-age determined from FISS data and the open circles showing predictions from the conditioned OM.

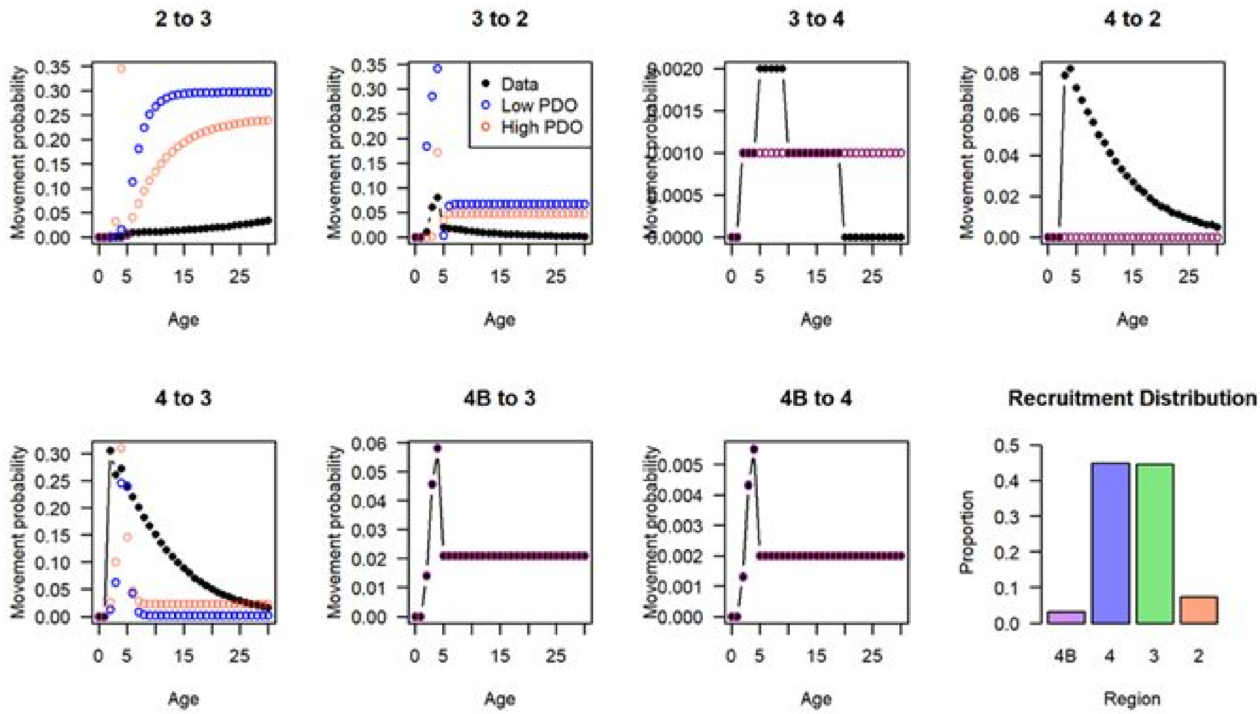


Figure 7: Probabilities of movement-at-age from the data and assumptions (Figure 3) and the conditioned OM (blue and red circles for low and high PDO regimes, respectively). The proportion of recruitment distributed to each Biological Region is shown in the lower right.

2.2.1 Uncertainty in the four-region operating model

Uncertainty in population trajectories was captured by adding variability to the parameters of the operating model as specified in Table 3 with correlations between these parameters taken into account. Extremely different hypotheses of specific parameterizations (e.g. movement or steepness) may be investigated through sensitivities and robustness tests.

Fifty trajectories of the OM with parameter variability show a wider range than the 90% credible interval from the ensemble stock assessment (Figure 8). Prior to 1993, the trajectories are in and above the upper portion of the ensemble assessment 90% credible interval, but from 1993 to 2019 the trajectories encompass and extend beyond the credible interval. Therefore, the OM is a reasonable representation of the Pacific halibut population in recent decades and is modelled with variability that will allow for the robust testing of MPs.

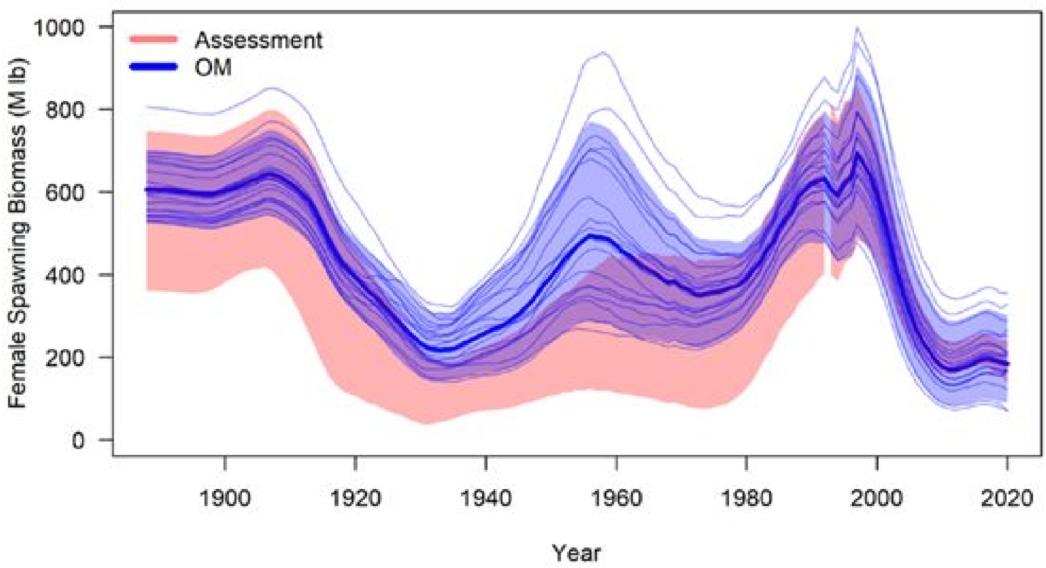


Figure 8: The 90% credible interval from six-hundred trajectories of the OM with parameter variability included (blue shaded area), shown against the 90% credible interval of the ensemble stock assessment (two models before 1993 and four models for 1993–2019, red shaded area). An example twenty trajectories are shown (thin blue lines) along with the median of all 600 trajectories (thick blue line).

The stock distribution with variability does not show a large departure from the observed stock distribution (Figure 9). The variability is consistent with the observations except at the beginning of the time-series in Biological Region 4 and in 2019 for Biological Regions 2 and 3. The beginning of the time-series in Biological Region 4 was estimated with few data. The recent year may have seen a shift in movement that is not explained by the OM.

Projections with the OM incorporated parameter variability (Table 3) and projection variability (Table 4) produced a wide range of trajectories. Figure 10: Six hundred 100-year simulations without fishing mortality. The dark blue line is the median and the blue shaded area shows the interval between the 5th and 95th percentiles. The thin blue lines are the first 20 individual trajectories. shows the median of six-hundred simulations to 2119 without mortality due to fishing along with the interval between the 5th and 95th percentiles. Individual trajectories show that a single trajectory may cover a wide range of that interval in this one-hundred year period.

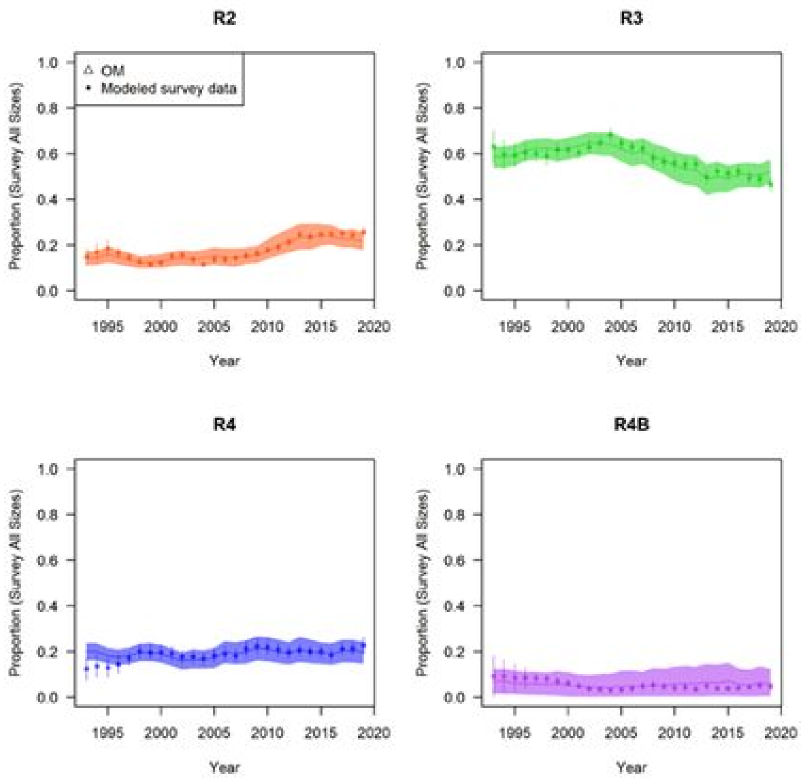


Figure 9: Stock distribution determined from FISS observations (points) and from the OM with variability (shaded areas).

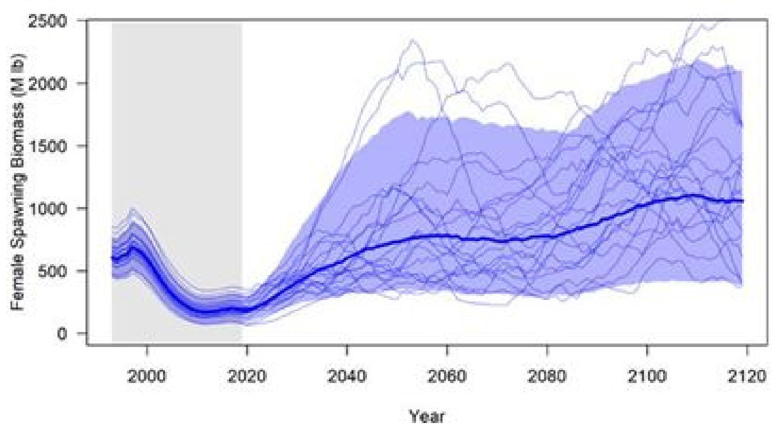


Figure 10: Six hundred 100-year simulations without fishing mortality. The dark blue line is the median and the blue shaded area shows the interval between the 5th and 95th percentiles. The thin blue lines are the first 20 individual trajectories.

2.3 Management Procedures for coastwide scale and distribution of the TCEY

The management procedure consists of three elements (Figure 2): monitoring, estimation, and the harvest rule. Monitoring (data generation) is the code that simulates the data from the operating model that are used by the estimation model (estimation) as well as O32 or all-sizes stock distribution, which is then passed to the harvest rule to determine the total mortality, the distribution of the TCEY to IPHC Regulatory Areas, and subsequent allocation to sectors.

2.3.1 Monitoring (data generation)

The MSE framework generates data by simulating the sampling process and can incorporate variability, bias, and any other properties that are desired. Fishery data are generated as needed by the estimation model (e.g., age compositions and CPUE). Data are generated from the survey in the OM (NPUE, WPUE, age compositions, and stock distribution) that are used by the estimation model and management procedures.

2.3.2 Estimation model

The Estimation Model (EM) is analogous to the stock assessment and introduces estimation error in the simulations. Three approaches to introduce and investigate estimation error were included in the MSE framework.

2.3.2.1 No estimation error

The estimates and predictions needed for the harvest rule are taken directly from the operating model and do not include estimation error. This provides an indication of the best possible outcome given the natural variability in the population, although is unrealistic because the population quantities are never known without error.

2.3.2.2 Simulate estimation error

This approach simulated the error in estimates and predictions needed for the harvest rule using random number generation from probability distributions, as was done in the coastwide MSE. The OM determines the stock status and the TM consistent with the input fishing intensity (i.e., F_{SPR}). Correlated deviates randomly generated with a bivariate normal distribution including an autocorrelation of 0.4 with previous deviates were applied to the stock status and TM. Details can be found in Section 4.2.2. of IPHC-2018-SRB012-08. This method is useful to provide a reasonable approximation of the assessment process while speeding up the simulation process and allowing of investigation of specific levels of bias and variability.

2.3.2.3 Model estimation error

This method uses a model similar to the stock assessment (i.e., stock synthesis) with generated data to determine the estimates and predictions needed for the harvest rule. The assessment models that this EM was based on are complex and developed for short-term forecasts using currently available data. Increasing the number of years of data in the models, possibly not simulated with the exact processes that the assessment was tuned to, can cause the models to perform less than optimal. However, the use of an EM based on the assessment models provides a more accurate representation of the assessment process and of the bias associated with it. This method is currently in development and will be available for future iterations of the

MSE. Some results using only one of the four assessment models used in the ensemble are available for preliminary comparison to the other methods.

2.3.3 Harvest Rule

The Harvest Rule contains additional procedures when determining the mortality limits, such as the application of a control rule and distribution of the limits to IPHC Regulatory Areas. The harvest rule for distributing the TCEY begins with the coastwide TCEY determined from the stock assessment and fishing intensity defined by the reference SPR (with application of the control rule). Figure 11 is an illustration of the current interim harvest strategy policy at IPHC, which includes the harvest rule as part of the management procedure. The TCEY may be distributed to Biological Regions first and then to IPHC Regulatory Areas, or directly to IPHC Regulatory Areas. Relative adjustments can be applied in each step of the distribution process. Typically, the distribution procedure does not appreciably alter the coastwide fishing intensity (although a slight change may occur due to different selectivity patterns accessing the population), however there is interest in management procedures that are only limited to being less than a maximum fishing intensity (i.e., above a minimum SPR) that would account for modifications in the TM during the distribution procedures.

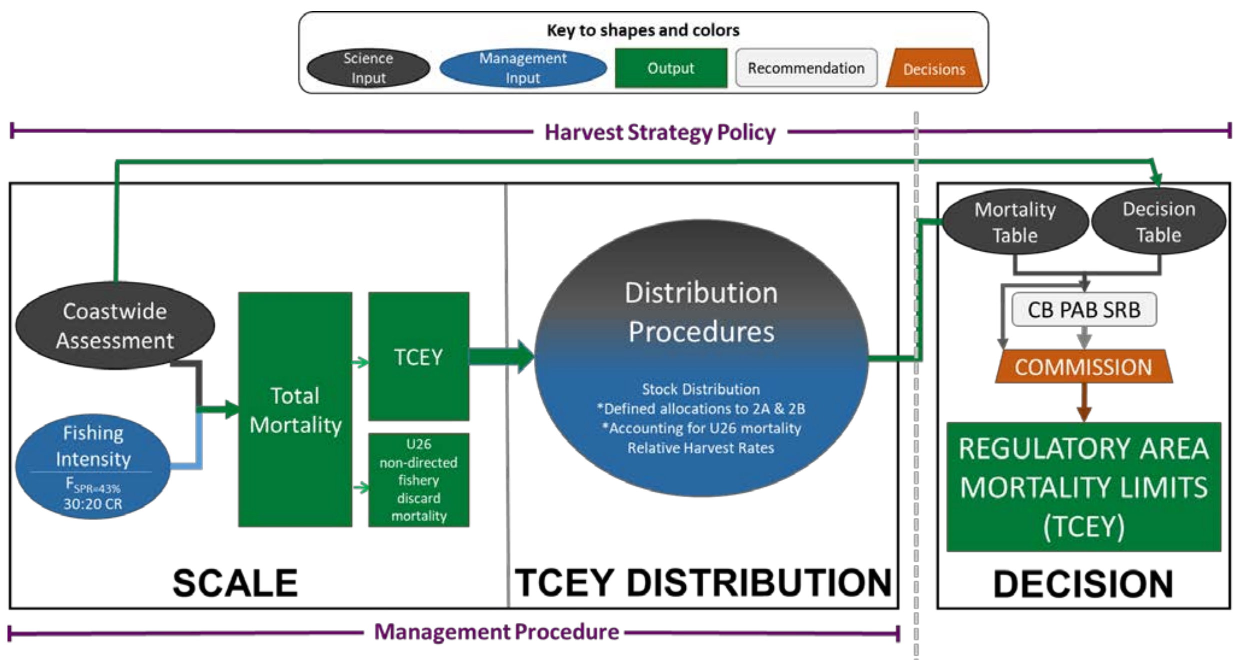


Figure 11: Illustration of the Commission interim IPHC harvest strategy policy (reflecting paragraph ID002 in IPHC CIRCULAR 2020-007) showing the coastwide scale and TCEY distribution components that comprise the management procedure. Items with an asterisk are three-year interim agreements to 2022. The decision component is the Commission decision-making procedure, which considers inputs from many sources.

The Coastwide TCEY is calculated from the TM by removing the U26 portion of the non-directed discard mortality, which is approximated in the MSE framework by a fixed length-at-age key determined from historical observations applied to non-directed discard mortality observed the previous year.

The outputs of the management procedure are TCEY limits for each IPHC Regulatory Area, which then need to be allocated to the different sectors specific to the IPHC Regulatory Area. See Table 2 for a complete list of the fishing sectors by IPHC Regulatory Area.

There are two parts to the allocation procedure: the calculation of the upcoming mortality limits by sector, and the calculation of the realized mortality by sector. The calculation of mortality limits is necessary because some sector's mortality limits are determined from the limits for other sectors. In the current framework, the calculation of the realized mortality differs from the calculation of the mortality limits for the non-directed discard, directed discard, subsistence, and unguided recreational mortalities (i.e., implementation error). Mortality limits and realized mortality are equal for the various recreational and directed commercial sectors (i.e, no implementation error for these sectors).

The allocation procedure begins by subtracting the non-directed commercial O26 discard mortality by IPHC Regulatory Area from the corresponding IPHC Regulatory Area TCEY, and the remainder is then allocated to directed fishery sectors. Each IPHC Regulatory Area has a unique catch-sharing plan (CSP) or allocation procedure, and these CSPs were mimicked as closely as possible in the MSE framework. When the TCEY for an IPHC Regulatory Area is very low, the CSP may no longer be applicable and alternative decisions may be necessary. It is unknown what the allocation procedure may be at very low TCEYs (far below levels actually observed in the historical time-series), so working with MSAB members, a simple assumption was to assume that the sum of the directed non-FCEY components would not exceed the TCEY without non-directed commercial O26 discard mortality, and the FCEY components would be set to zero.

Overall, the estimated values from the data generation and estimation model/estimation error steps are used in the application of the harvest rule to determine mortality limits by IPHC Regulatory Area. The simulated application of the harvest rule will therefore include errors in stock status as well as the size of the population, both of which are propagated into management quantities.

2.3.4 Management procedures for evaluation

The MSAB has defined coastwide and distribution elements of management procedures that are important for future evaluation, including the following listed in paragraph 42 of IPHC-2020-MSAB015-R.

> ***IPHC-2020-MSAB015-R, para. 42****.The MSAB* ***AGREED*** *that the following elements of interest for defining constraints on changes in the TCEY, and distribution procedures be considered for the Program of Work in 2020:*
>
> a) *constraints on the change in the TCEY can be applied annually or over multiple years at the coastwide or IPHC Regulatory Area level. Constraints on the change in TCEY currently considered include a maximum annual change in the TCEY of 15%, a slow-up fast down approach, multi-year mortality limits, and multi-year averages on abundance indices;*
>
> b) *indices of abundance in Biological Regions or IPHC Regulatory Area (e.g. O32 or All sizes from modelled survey results);*
>
> c) *a minimum TCEY for an IPHC Regulatory Area;*
>
> d) *defined shares by Biological Region, Management Zone, or IPHC Regulatory Area;*
>
> e) *maximum coastwide fishing intensity (e.g. SPR equal to 36% or 40%) not to be exceeded when distributing the TCEY;*
>
> f) *relative harvest rates between Biological Regions or IPHC Regulatory Areas.*

At MSAB014 and MSAB015, elements specifying candidate management procedures were defined for simulation and subsequent evaluation (Table II.1 in Appendix II, reproduced from IPHC-2020-MSAB015-R).

Table 6: A comparison of management procedures (MPs) showing the elements included in defined MPs. See Appendix II and Appendix III for additional details of the MPs.

Element	MP-A	MP-B	MP-C	MP-D	MP-E	MP-F	MP-G	MP-H	MP-I	MP-J	MP-K
Maximum coastwide TCEY change of 15%		■	■	■	■	■	■	■	■	■	■
Maximum Fishing Intensity buffer (SPR=36%)				■							
O32 stock distribution	■	■	■	■	■	■	■	■			
O32 stock distribution (5-year moving average)										■	
All sizes stock distribution									■		
Fixed shares updated in 5th year from O32 stock distribution											■
Relative harvest rates of 1.0 for 2-3A, and 0.75 for 3B-4	■	■		■	■	■	■		■	■	
Relative harvest rates of 1.0 for 2-3, 4A, 4CDE, and 0.75 for 4B								■			
Relative harvest rates by Region: R2=1, R3=1, R4=0.75, R4B=0.75			■								
1.65 Mlbs fixed TCEY in 2A	■	■	■	■	■						
Formula percentage for 2B	■	■	■	■							
National Shares (2B=20%)						■					

3 CLOSED-LOOP SIMULATION RESULTS

For brevity, only the simulated estimation error (EE) results are reported to compare across SPR values and some figures and tables only present results using an SPR of 43%. Simulations with alternative estimation error methods and additional SPR values are available on the interactive MSE Explorer for MSAB016 website. Pertinent results with these additional values are discussed below.

Figure 12 shows coastwide performance metrics linked to the primary coastwide objectives. The relative spawning biomass (RSB) is similar across all management procedures, but varies with SPR. No MP exceeds the 10% tolerance for RSB dropping below 20% SPR (Table 7), and the median RSB resulting from an SPR of 40% is slightly less than 36%. Table 7 shows that the probability of being below 36% is slightly less for MP-A compared to all other MPs. The AAV was higher for MP-A as well, especially at lower SPR values, because MP-A was the only MP without an annual constraint of 15% on the TCEY. For the same reason, the probability that the annual change (AC) was greater than 15% was greater than zero for MP-A and zero for all other MPs, except MP-D which allowed the coastwide TCEY to accommodate agreements in 2A and 2B. Short-term median TCEY was near 40 Mlbs for all MPs and SPR values, with larger values for lower SPR values (higher fishing intensity) and slight variations between MPs. The difference in the short-term median TCEY was less than 2.5 Mlbs between MPs for an SPR of 43% (Table 7).

Short-term performance metrics for the TCEY in each IPHC Regulatory Area are shown in Figure 13 as well as Table 8, Table 9, and Table 10. These are the median-minimum and median-average TCEY over a ten-year period and the median-minimum and median-average percentage of TCEY in each IPHC Regulatory Area over a ten-year period (short-term). MPs F–K show decreased TCEY in 2A and MPs E and G–K show decreased TCEY in 2B along with increased TCEY in all other IPHC Regulatory Areas because the current agreements from 2A and 2B, or national shares for 2B, are not included in those MPs. The TCEY increases in 3B, 4A, and 4B with the increased relative harvest rate included in MP-H and MP-K, while it decreases in other IPHC Regulatory Areas. MP-J, which uses a 5-year average of stock distribution, shows similar TCEY values as MP-G, but with lower AAV for most IPHC Regulatory Areas (Table 10). Stability related performance metrics differences are evident at the IPHC Regulatory Area level with MP-J, even though stability was not much different than MP-G at the coastwide level (e.g., median AAV). Additional performance metrics presented in the MSE Explorer may assist in the evaluation of the MPs.

Overall, the eleven MPs show minor differences at the coastwide level but showed some important differences at the IPHC Regulatory Area level. Trade-offs between IPHC Regulatory Areas are an important consideration when evaluating the MSE results. Ranking the performance metrics across management procedures and then averaging group of ranks (e.g., over IPHC Regulatory Areas) can assist in identify MPs that perform best overall.

The Biological Sustainability objectives have a tolerance defined, thus it can be determined if the objective is met by a management procedure. All management procedures met the Biological Sustainability objectives, except for the objective to maintain a minimum percentage of female spawning biomass above 2% in IPHC Regulatory Area 4B with a tolerance of 0.05 (Table 11). This distribution of the projected percentage of spawning biomass in Biological Region 4B has a probability of 0.19 to be less than 2% with no fishing mortality (Figure 14). This probability is slightly less with fishing mortality (Table 11) because the spawning biomass is less variable with fishing. The fact that this objective is not met without fishing or with any of the management procedures suggests two things: 1) the objective should be revisited and/or 2) the operating model is possibly mischaracterizing the population in Biological Region 4B, and thus the distribution of the population in this Biological Region.

The operating model was conditioned to the observed stock distribution and the predicted range of historical stock distribution from the operating model for Biological Region 4B is wider than the confidence intervals for the observed stock distribution (Figure 8 in IPHC-2020-MSAB016-08). Biological Region 4B is a unique region in the IPHC convention area, possibly with a separate stock (genetic research is ongoing to better understand the connectivity of 4B with the rest of the stock), and the operating model may not be completely capturing the stock dynamics in that area. Additionally, with mostly out-migration from 4B and little recruitment distributed to that area, large increases in spawning biomass in the other Biological Regions may result in Biological Region 4B containing a small percentage of the spawning biomass even though the absolute spawning biomass is at a high level. Regardless, the spawning biomass persists in that Biological Region and in addition to revisiting the assumptions in the operating model, it would be prudent to revisit the regional spawning biomass objective.

The ranking of short-term performance metrics for the Fishery Sustainability objectives are shown in Table 12, Table 13, Table 14, and Table 15. Higher ranks generally occurred for MPs D, I, J, and K, although not necessarily for IPHC Regulatory Areas 2A and 2B when compared to MPs where agreements for those areas are in place. The general objectives were averaged over IPHC Regulatory Areas to produce a summary of ranks as shown in Table 16. This summary shows that MPs D and J generally have higher ranks for stability and yield objectives specific to IPHC Regulatory Areas, although better stability at the IPHC Regulatory Area level does not imply stability at the coastwide level. Further summarizing the ranks to general objectives are shown in Table 17, with better averaged performance for MPs D, I, J, and K, in general.

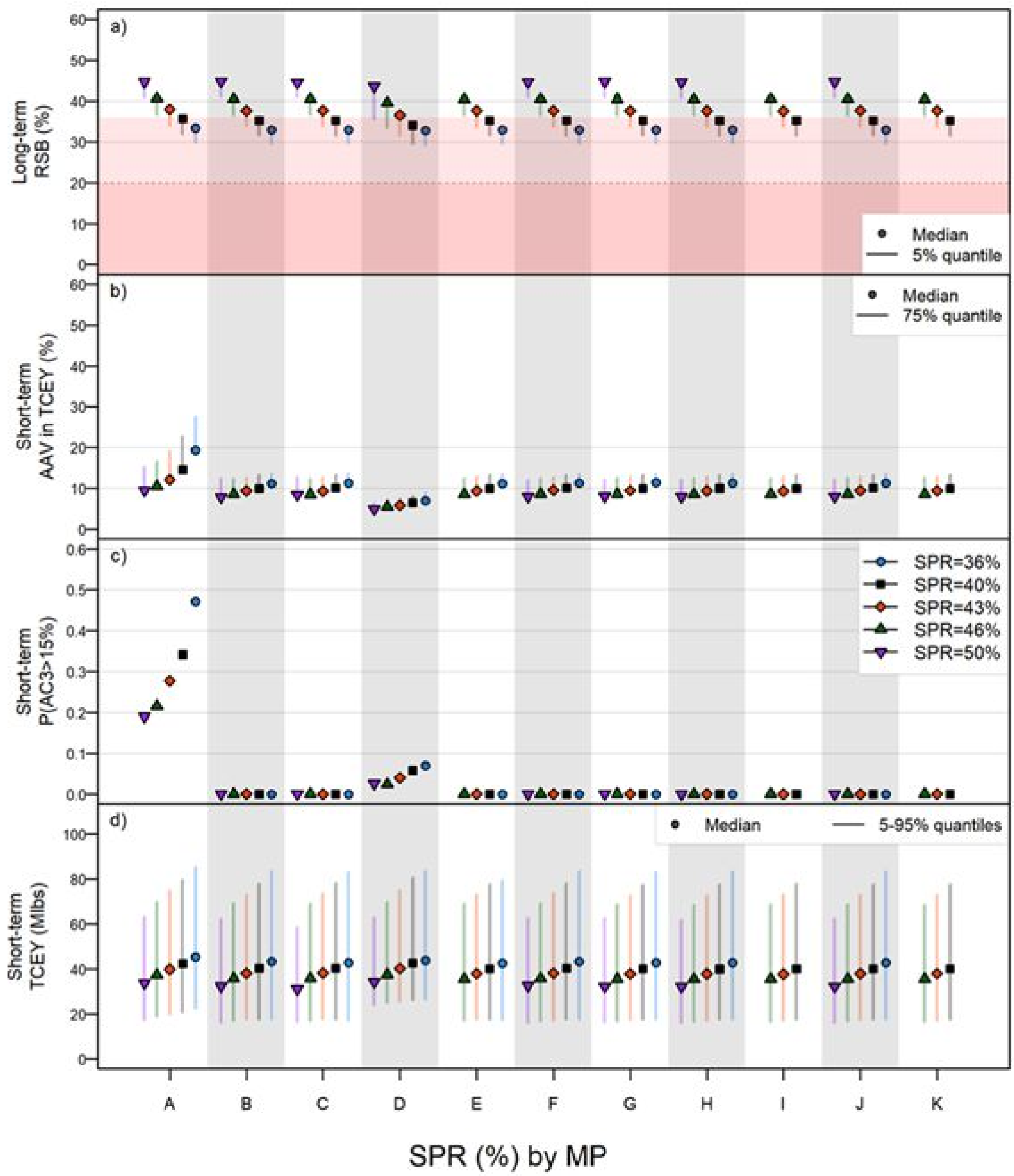


Figure 12: Coastwide performance metrics for MPs A through K using simulated estimation error with SPR values of 40%, 43%, and 46% for all and 36% and 50% for some. The relative spawning biomass and the thresholds of 20% and 36% are shown in a). The AAV for TCEY is shown in b). The probability that the annual change exceeds 15% in 3 or more years is shown in c). The median TCEY with 5th and 95th quantiles is shown in d).

Table 7: Coastwide long-term performance metrics for the biological sustainability objective and P(all RSB<36%) and short-term performance metrics for the remaining fishery sustainability objectives for MPs A through K for an SPR value of 43% using simulated estimation error.

Input SPR/TM	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**
Management Procedure	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**
Number of Simulations	500	500	500	500	500	500	500	500	500	500	500
Biological Sustainability											
P(any RSB_y<20%)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fishery Sustainability											
P(all RSB<36%)	0.25	0.28	0.28	0.44	0.28	0.28	0.28	0.29	0.29	0.28	0.28
Median average TCEY	39.92	38.17	38.32	40.22	38.01	38.18	37.89	37.87	37.86	37.90	37.95
P(any3 change TCEY > 15%)	0.44	0	0	0.10	0	0	0	0	0	0	0
Median AAV TCEY	12.1%	9.4%	9.3%	5.9%	9.4%	9.5%	9.5%	9.4%	9.4%	9.5%	9.4%

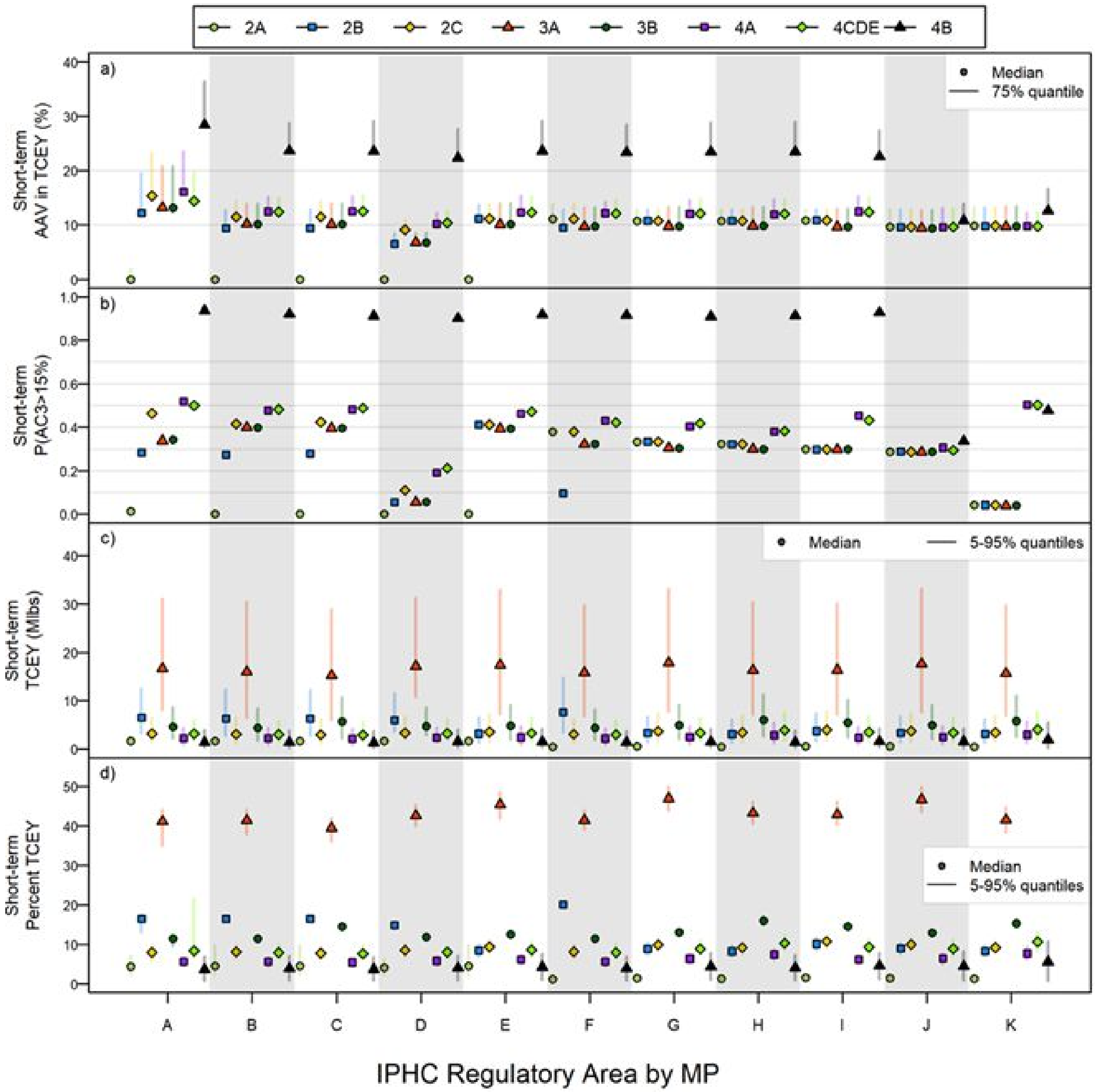


Figure 13: Performance metrics by IPHC Regulatory Areas for MPs A through K using simulated estimation error with an SPR value of 43%. The AAV for TCEY is shown in a). The probability that the annual change exceeds 15% in 3 or more years is shown in b). The median TCEY with 5th and 95th quantiles is shown in c). The median percentage of the TCEY in each IPHC Regulatory Area is shown in d).

Table 8: Long-term spawning biomass performance metrics by Biological Region and TCEY short-term performance metrics by IPHC Regulatory Areas for MPs A through K with an SPR value of 43% using simulated estimation error.

Input SPR/TM **Distribution Procedure**	**43%** **A**	**43%** **B**	**43%** **C**	**43%** **D**	**43%** **E**	**43%** **F**	**43%** **G**	**43%** **H**	**43%** **I**	**43%** **J**	**43%** **K**
Number of Simulations	500	500	500	500	500	500	500	500	500	500	500
Biological Sustainability											
P(%$SB_{R=2}$ < 5%)	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
P(%$SB_{R=3}$ < 33%)	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
P(%$SB_{R=4}$ < 10%)	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
P(%$SB_{R=4B}$ < 2%)	0.15	0.15	0.15	0.15	0.15	0.15	0.16	0.15	0.16	0.16	0.18
Fishery Sustainability											
Median Minimum TCEY 2A	1.65	1.65	1.65	1.65	1.65	0.33	0.39	0.36	0.44	0.40	0.38
Median Minimum TCEY 2B	3.76	4.79	4.75	4.76	2.34	5.78	2.48	2.28	2.84	2.52	2.37
Median Minimum TCEY 2C	1.79	2.27	2.18	2.65	2.61	2.30	2.76	2.53	3.03	2.80	2.64
Median Minimum TCEY 3A	9.06	11.67	11.16	13.57	12.81	11.81	13.34	12.19	12.18	13.20	11.50
Median Minimum TCEY 3B	2.51	3.24	4.13	3.76	3.55	3.28	3.70	4.51	4.10	3.66	4.25
Median Minimum TCEY 4A	1.23	1.62	1.56	1.81	1.76	1.62	1.82	2.11	1.72	1.86	2.25
Median Minimum TCEY 4CDE	1.74	2.21	2.12	2.48	2.41	2.22	2.49	2.88	2.56	2.53	3.08
Median Minimum TCEY 4B	0.65	0.90	0.85	1.04	0.97	0.89	1.00	0.92	1.02	1.20	1.42
Median average TCEY 2A	1.65	1.65	1.65	1.65	1.65	0.44	0.53	0.49	0.58	0.53	0.49
Median average TCEY 2B	6.55	6.32	6.31	5.94	3.18	7.64	3.33	3.08	3.73	3.34	3.09
Median average TCEY 2C	3.19	3.08	2.94	3.35	3.54	3.08	3.71	3.43	3.98	3.71	3.44
Median average TCEY 3A	16.68	15.99	15.24	17.15	17.42	15.84	17.83	16.34	16.39	17.67	15.71
Median average TCEY 3B	4.63	4.43	5.64	4.76	4.83	4.40	4.95	6.04	5.52	4.90	5.81
Median average TCEY 4A	2.30	2.22	2.15	2.37	2.41	2.21	2.46	2.86	2.37	2.47	2.96
Median average TCEY 4CDE	3.15	3.04	2.94	3.25	3.30	3.02	3.37	3.92	3.52	3.38	4.05
Median average TCEY 4B	1.41	1.36	1.31	1.55	1.48	1.37	1.52	1.41	1.59	1.57	1.93

Table 9: Percentage of TCEY short-term performance metrics by IPHC Regulatory Areas for MPs A through K with an SPR value of 43% using simulated estimation error.

Input SPR/TM	**43%**	**43%**	**43%**	**43%**	**43%**	**43%**	**43%**	**43%**	**43%**	**43%**	**43%**
Distribution Procedure	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**
Number of Simulations	500	500	500	500	500	500	500	500	500	500	500
Fishery Sustainability											
Median Minimum % TCEY 2A	2.9%	3.4%	3.4%	3.3%	3.4%	1.0%	1.3%	1.2%	1.4%	1.4%	1.3%
Median Minimum % TCEY 2B	16.1%	16.2%	16.1%	14.5%	7.6%	20.0%	8.0%	7.5%	9.1%	8.5%	7.9%
Median Minimum % TCEY 2C	6.9%	7.2%	6.9%	7.5%	8.5%	7.2%	8.9%	8.3%	9.7%	9.5%	8.8%
Median Minimum % TCEY 3A	37.9%	39.2%	37.4%	40.4%	42.8%	39.4%	44.4%	40.8%	40.4%	45.1%	39.8%
Median Minimum % TCEY 3B	10.5%	10.9%	13.8%	11.2%	11.9%	10.9%	12.3%	15.1%	13.6%	12.5%	14.7%
Median Minimum % TCEY 4A	4.9%	5.0%	4.8%	5.1%	5.4%	5.0%	5.6%	6.5%	5.4%	6.0%	6.9%
Median Minimum % TCEY 4CDE	6.9%	6.9%	6.7%	7.0%	7.5%	6.9%	7.7%	8.9%	8.1%	8.3%	9.5%
Median Minimum % TCEY 4B	2.5%	2.8%	2.7%	3.0%	3.1%	2.8%	3.2%	2.9%	3.2%	3.9%	4.5%
Median average % TCEY 2A	4.4%	4.5%	4.5%	4.2%	4.5%	1.2%	1.4%	1.3%	1.6%	1.4%	1.3%
Median average % TCEY 2B	16.4%	16.5%	16.4%	14.8%	8.4%	20.0%	8.9%	8.3%	10.1%	9.0%	8.3%
Median average % TCEY 2C	8.0%	8.1%	7.8%	8.5%	9.4%	8.2%	9.9%	9.2%	10.8%	10.0%	9.2%
Median average % TCEY 3A	41.2%	41.4%	39.4%	42.6%	45.4%	41.5%	46.9%	43.2%	42.9%	46.7%	41.5%
Median average % TCEY 3B	11.4%	11.5%	14.6%	11.8%	12.6%	11.5%	13.0%	16.0%	14.5%	12.9%	15.4%
Median average % TCEY 4A	5.6%	5.7%	5.5%	5.9%	6.2%	5.7%	6.4%	7.5%	6.2%	6.4%	7.7%
Median average % TCEY 4CDE	8.3%	8.0%	7.7%	8.0%	8.6%	8.0%	8.9%	10.3%	9.3%	8.9%	10.7%
Median average % TCEY 4B	3.7%	3.9%	3.8%	4.1%	4.3%	3.9%	4.4%	4.1%	4.6%	4.5%	5.6%

Table 10: Short-term fishery stability performance metrics by IPHC Regulatory Areas for MPs A through K with an SPR value of 43% using simulated estimation error.

Input SPR/TM **Distribution Procedure**	**43%** **A**	**43%** **B**	**43%** **C**	**43%** **D**	**43%** **E**	**43%** **F**	**43%** **G**	**43%** **H**	**43%** **I**	**43%** **J**	**43%** **K**
Number of Simulations	500	500	500	500	500	500	500	500	500	500	500
Fishery Sustainability											
P(any3 change TCEY 2A > 15%)	0.012	0.000	0.000	0.000	0.000	0.380	0.334	0.322	0.298	0.288	0.042
P(any3 change TCEY 2B > 15%)	0.284	0.274	0.278	0.056	0.412	0.096	0.334	0.322	0.298	0.288	0.042
P(any3 change TCEY 2C > 15%)	0.464	0.414	0.424	0.110	0.412	0.380	0.334	0.322	0.298	0.288	0.042
P(any3 change TCEY 3A > 15%)	0.338	0.400	0.396	0.056	0.394	0.322	0.306	0.300	0.298	0.286	0.038
P(any3 change TCEY 3B > 15%)	0.342	0.398	0.396	0.056	0.394	0.322	0.304	0.298	0.298	0.288	0.040
P(any3 change TCEY 4A > 15%)	0.518	0.476	0.482	0.192	0.462	0.430	0.404	0.380	0.452	0.306	0.504
P(any3 change TCEY 4CDE > 15%)	0.500	0.482	0.488	0.212	0.472	0.422	0.418	0.382	0.432	0.294	0.502
P(any3 change TCEY 4B > 15%)	0.936	0.920	0.912	0.902	0.918	0.916	0.910	0.914	0.928	0.336	0.478
Median AAV TCEY 2A	0.0%	0.0%	0.0%	0.0%	0.0%	11.2%	10.8%	10.7%	10.8%	9.6%	9.8%
Median AAV TCEY 2B	12.2%	9.4%	9.4%	6.5%	11.1%	9.5%	10.8%	10.8%	10.8%	9.6%	9.8%
Median AAV TCEY 2C	15.3%	11.5%	11.5%	9.1%	11.1%	11.2%	10.8%	10.8%	10.8%	9.6%	9.8%
Median AAV TCEY 3A	13.2%	10.2%	10.1%	6.8%	10.1%	9.7%	9.8%	9.9%	9.7%	9.4%	9.7%
Median AAV TCEY 3B	13.2%	10.2%	10.1%	6.8%	10.1%	9.7%	9.8%	9.9%	9.7%	9.4%	9.7%
Median AAV TCEY 4A	16.1%	12.5%	12.5%	10.2%	12.3%	12.2%	12.1%	12.0%	12.5%	9.6%	9.8%
Median AAV TCEY 4CDE	14.4%	12.4%	12.5%	10.4%	12.3%	12.1%	12.1%	12.0%	12.4%	9.6%	9.8%
Median AAV TCEY 4B	28.4%	23.7%	23.6%	22.4%	23.6%	23.4%	23.5%	23.5%	22.6%	10.8%	12.6%

Table 11: Long-term performance metrics for biological sustainability objectives for MPs A through K with an SPR value of 43% using simulated estimation error. Red shading indicates that the currently defined objective is not met, and green shading indicates that the objective is met. Values in the cells are the calculated probability.

Objective	Performance Metric	A	B	C	D	E	F	G	H	I	J	K
Maintain a coastwide female SB above a biomass limit reference point 95% of the time	$P(SB < SB_{Lim})$	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maintain a minimum proportion of female SB	$P(\%SB_{R=2} < 5\%)$	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maintain a minimum proportion of female SB	$P(\%SB_{R=3} < 33\%)$	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maintain a minimum proportion of female SB	$P(\%SB_{R=4} < 10\%)$	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maintain a minimum proportion of female SB	$P(\%SB_{R=4B} < 2\%)$	0.15	0.15	0.15	0.15	0.15	0.15	0.16	0.15	0.16	0.16	0.18

Table 12: Long-term performance metrics for fishery objective 2.1 for MPs A through K with an SPR value of 43% using simulated estimation error. The ranks are determined by how close the long-term probability is to 0.5 after rounding to two decimal places. Blue shading represents the ranking with light coloring indicating the objective is better met compared to other management procedures.

Objective	Performance Metric	A	B	C	D	E	F	G	H	I	J	K
Maintain the coastwide female SB above a target at least 50% of the time	$P(SB < SB_{36\%})$	11	4	4	1	4	4	4	2	2	4	4

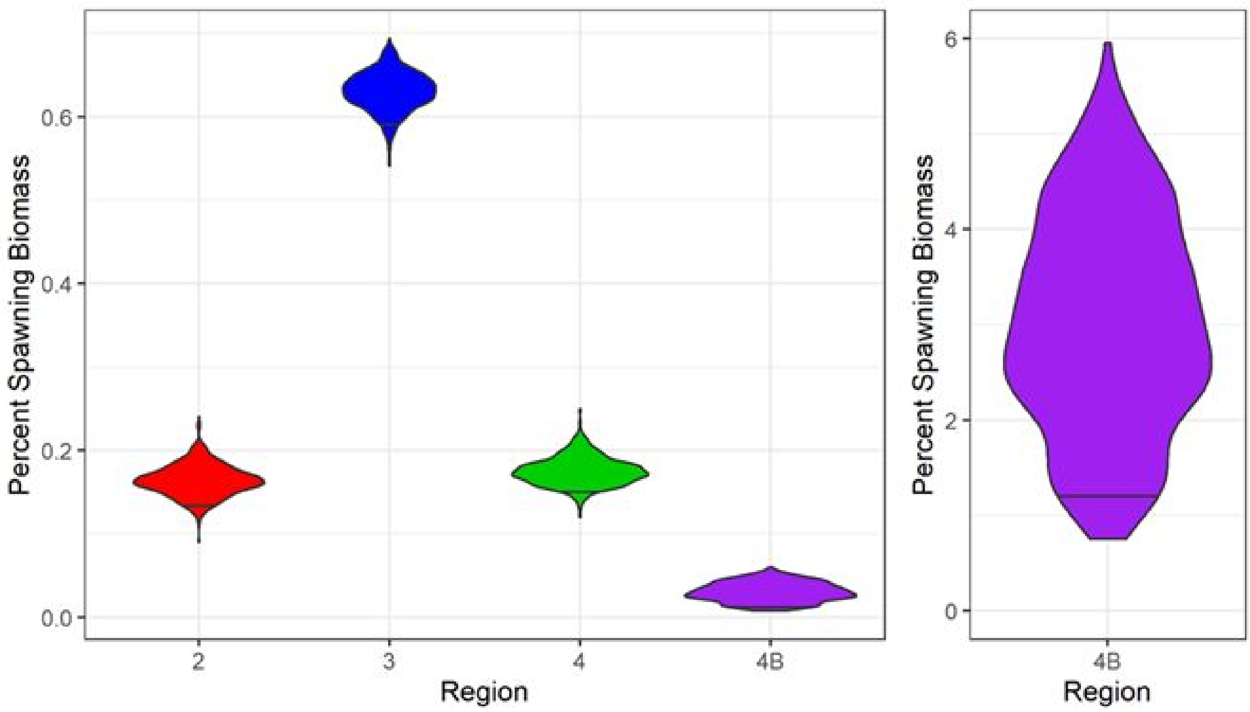


Figure 14: Distribution of the percentage of spawning biomass in each Biological Region after 60 years of projections with no fishing mortality. The right panel is zoomed in on Biological Region 4B. A horizontal line shows the 5% quantile in each plot.

Table 13: Short-term performance metrics for fishery stability objectives for MPs A through K with an SPR value of 43% using simulated estimation error. Blue shading represents the ranking with light coloring indicating the objective is better met compared to other management procedures. Ranks were determined after rounding probabilities (i.e. P(AC_3>15%)) to two decimals and percentages (i.e. AAV) to one decimal.

Objective	Performance Metric	A	B	C	D	E	F	G	H	I	J	K
Limit TCEY AC	P(AC_3 > 15%)	11	1	1	10	1	1	1	1	1	1	1
Limit TCEY AAV	Median AAV TCEY	11	3	2	1	3	8	8	3	3	8	3
Limit AC in Reg Areas TCEY	P(AC_3 2A > 15%)	5	1	1	1	1	11	10	9	8	7	6
	P(AC_3 2B > 15%)	5	4	5	2	11	3	10	9	8	7	1
	P(AC_3 2C > 15%)	11	8	10	2	8	7	6	5	4	3	1
	P(AC_3 3A > 15%)	8	10	10	2	9	7	6	4	4	3	1
	P(AC_3 3B > 15%)	8	10	10	2	9	7	4	4	4	3	1
	P(AC_3 4A > 15%)	11	8	8	1	7	5	4	3	6	2	10
	P(AC_3 4CDE > 15%)	10	8	9	1	7	4	4	3	6	2	10
	P(AC_3 4B > 15%)	11	7	4	3	7	7	4	4	10	1	2
Limit AAV in Reg Areas TCEY	Median AAV 2A	1	1	1	1	1	11	9	8	9	6	7
	Median AAV 2B	11	2	2	1	10	4	7	7	7	5	6
	Median AAV 2C	11	9	9	1	7	8	4	4	4	2	3
	Median AAV 3A	11	10	8	1	8	3	6	7	3	2	3
	Median AAV 3B	11	10	8	1	8	3	6	7	3	2	3
	Median AAV 4A	11	8	8	3	7	6	5	4	8	1	2
	Median AAV 4CDE	11	8	10	3	7	5	5	4	8	1	2
	Median AAV 4B	11	10	8	3	8	5	6	6	4	1	2

Table 14: Short-term performance metrics for fishery yield objectives related to the TCEY for MPs A through K with an SPR value of 43% using simulated estimation error. Blue shading represents the ranking with light coloring indicating the objective is better met compared to other management procedures. Ranks were determined after rounding to the nearest one million pound.

Objective	Performance Metric	A	B	C	D	E	F	G	H	I	J	K
Optimize TCEY	Median TCEY	1	3	3	1	3	3	3	3	3	3	3
Maintain minimum TCEY by Reg Areas	Median Min 2A	1	1	1	1	1	6	6	6	6	6	6
	Median Min 2B	5	2	2	2	8	1	8	8	6	6	8
	Median Min 2C	8	8	8	1	1	8	1	1	1	1	1
	Median Min 3A	11	5	10	1	2	5	2	5	5	2	5
	Median Min 3B	9	9	2	2	2	9	2	1	2	2	2
	Median Min 4A	11	1	1	1	1	1	1	1	1	1	1
	Median Min 4CDE	5	5	5	5	5	5	5	1	1	1	1
	Median Min 4B	1	1	1	1	1	1	1	1	1	1	1
Optimize Reg Areas TCEY	Median TCEY 2A	1	1	1	1	1	9	6	9	6	6	9
	Median TCEY 2B	2	3	3	3	7	1	7	7	6	7	7
	Median TCEY 2C	5	5	5	5	1	5	1	5	1	1	5
	Median TCEY 3A	3	6	11	3	3	6	1	6	6	1	6
	Median TCEY 3B	5	10	1	5	5	10	5	1	1	5	1
	Median TCEY 4A	3	3	3	3	3	3	3	1	3	3	1
	Median TCEY 4CDE	4	4	4	4	4	4	4	1	1	4	1
	Median TCEY 4B	6	6	6	1	6	6	1	6	1	1	1

Table 15: Short-term performance metrics for fishery yield objectives related to the percentage of TCEY in each IPHC Regulatory Area for MPs A through K with an SPR value of 43% using simulated estimation error. Blue shading represents the ranking with light coloring indicating the objective is better met compared to other management procedures. Ranks were determined after rounding to two decimals.

Objective	Performance Metric	A	B	C	D	E	F	G	H	I	J	K
Maintain minimum % TCEY by Reg Areas	Median Min % 2A	5	1	1	4	1	11	8	10	6	6	8
	Median Min % 2B	3	2	3	5	10	1	8	11	6	7	9
	Median Min % 2C	10	8	10	7	5	8	3	6	1	2	4
	Median Min % 3A	10	9	11	5	3	8	2	4	5	1	7
	Median Min % 3B	11	9	3	8	7	9	6	1	4	5	2
	Median Min % 4A	10	8	11	7	5	8	4	2	5	3	1
	Median Min % 4CDE	8	8	11	7	6	8	5	2	4	3	1
	Median Min % 4B	11	8	10	6	5	8	3	7	3	2	1
Optimize TCEY percentage among Reg Areas	Median % TCEY 2A	4	1	1	5	1	11	7	9	6	7	9
	Median % TCEY 2B	3	2	3	5	9	1	8	10	6	7	10
	Median % TCEY 2C	10	9	11	7	4	8	3	5	1	2	5
	Median % TCEY 3A	10	9	11	6	3	7	1	4	5	2	7
	Median % TCEY 3B	11	9	3	8	7	9	5	1	4	6	2
	Median % TCEY 4A	10	8	11	7	5	8	3	2	5	3	1
	Median % TCEY 4CDE	7	8	11	8	6	8	4	2	3	4	1
	Median % TCEY 4B	11	8	10	6	5	8	4	6	2	3	1

Table 16: Ranks for the target biomass, fishery yield, and stability short-term performance metrics averaged with equal weighting over IPHC Regulatory Areas for those that are reported by IPHC Regulatory Areas (Tables 13–15). Blue shading represents the ranking with light coloring indicating the objective is better met compared to other management procedures.

Objective	Performance Metric	A	B	C	D	E	F	G	H	I	J	K
Maintain the coastwide female SB above a target	$P(SB < SB_{36\%})$	11	4	4	1	4	4	4	2	2	4	4
Limit AC in coastwide TCEY	$P(AC_3 > 15\%)$	11	1	1	10	1	1	1	1	1	1	1
Limit AAV in coastwide TCEY	Median AAV TCEY	11	3	2	1	3	8	8	3	3	8	3
Optimize average coastwide TCEY	Median TCEY	9.75	7.25	6.75	1.75	7	5.62	6	5.88	5.75	2.5	3.5
Limit AC in Reg Areas TCEY	$P(AC_3 > 15\%)$ Reg Areas	8.62	7	7.12	1.75	7.38	6.38	6	5.12	6.25	3.5	4
Limit AAV in Reg Areas TCEY	Median AAV TCEY Reg Areas	1	3	3	1	3	3	3	3	3	3	3
Optimize Reg Areas TCEY	Median TCEY Reg Areas	8.5	6.62	7.5	6.12	5.25	7.62	4.88	5.38	4.25	3.62	4.12
Optimize TCEY % among Reg Areas	Median % TCEY Reg Areas	6.38	4	3.75	1.75	2.62	4.5	3.25	3	2.88	2.5	3.12
Maintain minimum TCEY by Reg Areas	Median Min(TCEY) Reg Areas	3.62	4.75	4.25	3.12	3.75	5.5	3.5	4.5	3.12	3.5	3.88
Maintain minimum % TCEY by Reg Areas	Median Min(% TCEY) Reg Areas	8.25	6.75	7.62	6.5	5	7.5	4.38	4.88	4	4.25	4.5

SB: Spawning Biomass
AC: Annual Change
AAV: Average Annual Variability
Regulatory Areas: IPHC Regulatory Areas
TCEY: Total mortality minus under 26" (U26) non-directed commercial discard mortality

Table 17: Ranks for the target biomass, fishery yield, and stability short-term performance metrics averaged with equal weighting over IPHC Regulatory Areas for those that are reported by IPHC Regulatory Areas (Tables 13–15) and equally over objectives within each general category. Blue shading represents the ranking with light coloring indicating the objective is better met compared to other management procedures.

Objective	Performance Metric	A	B	C	D	E	F	G	H	I	J	K
2.1 Maintain the coastwide female SB above a target	$P(SB < SB_{Targ})$	11	4	4	1	4	4	4	2	2	4	4
2.2 Limit catch variability	Limit annual change	10.09	4.56	4.22	3.62	4.59	5.25	5.25	3.75	4	3.75	2.88
2.3 Provide directed fishing yield	Optimize TCEY and maintain minimum TCEY in Regulatory Areas	5.55	5.02	5.22	3.7	3.92	5.62	3.8	4.15	3.45	3.37	3.72

4 Program of work

Many important MSE tasks have already been completed; past accomplishments include the following:

1. Familiarization with the MSE process.
2. Defining conservation and fishery goals.
3. Defining objectives and performance metrics for those goals.
4. Developing coast-wide (single-area) and spatial (multiple-area) operating models.
5. Identifying management procedures for the coastwide fishing intensity and distributing the TCEY to IPHC Regulatory Areas.
6. Presentation of results investigating coastwide fishing intensity.
7. Development of an MSE framework to investigate coastwide scale and distribution components of the harvest strategy.

Management Strategy Evaluation is a process that can develop over many years with many iterations. It is also a process that needs monitoring and adjustments to make sure that management procedures are performing adequately. Therefore, the MSE for Pacific halibut fisheries could continue with new objectives being defined, more complex models being built with improved understanding of the Pacific halibut population, and the development of new management procedures to evaluate. Consultation with stakeholders and managers would be continued. Along the way, there will be useful outcomes that may be used to improve existing management and will influence recommendations for future work.

4.1 MSE tasks

Seven (7) categories have been defined in the MSE program of work plus the recent external review which was completed in September 2020.

Task 1: Review, update, and further define goals and objectives

Task 2: Develop performance metrics to evaluate objectives

Task 3: Identify realistic management procedures of interest to evaluate

Task 4: Design and code a closed-loop simulation framework

Task 5: Further the development of operating models

Task 6: Run closed-loop simulations and evaluate results

Task 7: Develop tools that will engage stakeholders and facilitate communication

Details of these tasks have not been specified beyond 2021, and the description below focuses on 2020 leading up to the 97th Session of the IPHC Annual Meeting (AM097) in January 2021 followed by potential activities beyond 2021.

The full MSE results incorporating coastwide scale and distribution components of the management procedure (Figure 11) will be presented at the 97th Session of the IPHC Annual Meeting (AM097) in January 2021. There were three main tasks to accomplish in 2020: 1) identify management procedures incorporating coastwide and distribution components to simulate, 2) condition a multi-area operating model and prepare a framework for closed-loop simulations, and 3) present results in various ways in order to evaluate the management procedures. These three main tasks are described below and Table 17 identifies the tasks that were undertaken at each MSAB and SRB meeting in 2020.

Table 18: Tasks completed and in progress in 2020 and 2021 for MSAB, SRB, and IPHC meetings.

15th Session of the IPHC MSAB - May 2020	**Progress**
Review Goals and Objectives (Distribution & Scale)	Completed
Review simulation framework	Completed
Review multi-area model	Completed
Review preliminary results	
Identify MPs (Distribution & Scale)	Completed
16th Session of the IPHC SRB - June 2020	
Review simulation framework	Completed
Review multi-region operating model	Completed
Review preliminary results	
3rd Ad-hoc meeting of the MSAB – August 2020	
Examine preliminary results	Completed
17th Session of the IPHC SRB - September 2020	
Review multi-region operating model	Completed
Review penultimate results	Completed
17th Session of the IPHC MSAB - October 2020	
Review final results	In Progress
Provide recommendations on MPs for scale and distribution	In Progress
97th Session of the IPHC Annual Meeting (AM097)	
Presentation of first complete MSE product to the Commission Recommendations on Scale and Distribution MP	

4.2 Potential elements for a program of work moving forward

The MSE program has been focused on the delivery of simulation results examining management procedures incorporating scale and distribution components in January 2021. Future MSE-related research may fall under any of the seven tasks listed in Section 4.1. In reports from previous MSAB, SRB, and Commission meetings, some potential MSE-related research has been identified.

> **IPHC-2018-SRB013-R, para. 29**: *The SRB REQUESTED that in future iterations of the MSE, the IPHC Secretariat and MSAB consider: […] c) the current conditioned operating model used to simulate coast-wide survey index and that such data be used to consider an alternative survey-based management procedure (this may provide a more transparent TMq-setting algorithm than the current SPR based control-rule and help with MSAB deliberations).*

IPHC-2020-AM096-R, para. 83. *The Commission NOTED that MSE is the appropriate tool to evaluate management procedures related to discard mortality for non-directed fisheries (bycatch) because it can capture downstream effects, biological implications, and the management performance relative to objectives.*

IPHC-2020-AM096-R, para. 89. *The Commission REQUESTED the MSAB to confirm the proposed topics of work beyond the 2021 deliverables in time for the Interim Meeting (IM096), including work to investigate and provide advice on approaches for accounting for the impacts of bycatch in one Regulatory Area on harvesting opportunities in other Regulatory Areas.*

IPHC-2020-MSAB015-R, para. 20. *The MSAB REQUESTED that a procedure to distribute the coastwide TCEY be flexible to allow for distribution directly to IPHC Regulatory Areas, or to Biological Regions or Management Zones before distributing to IPHC Regulatory Areas. Methods of distribution may be based on stock distribution, relative fishing intensities, and other allocation adjustments.*

IPHC-2020-MSAB015-R, para. 22. *The MSAB NOTED that alternative management procedures may use area-specific data (e.g. modelled survey results) without using a coastwide TCEY, rather than the procedure described in paragraph 21. This example is a sub-category of a broader category of management procedures that are data-based rather than assessment-based.*

Additionally, management procedures that have been developed for many fisheries are reviewed at regular intervals given new observations and data that are collected after adoption (Punt et al 2014; Sharma et al. 2020). For example, tuna Regional Fisheries Management Organizations (RFMOs) have defined exceptional circumstances to determine when an OM should be reconditioned given updated information, and the SRB recommended defining exceptional circumstances for the Pacific halibut MSE.

IPHC-2020-SRB017-R, para. 60: *The SRB RECOMMENDED that Exceptional Circumstances be defined to determine whether monitoring information has potentially departed from their expected distributions generated by the MSE. Declaration of Exceptional Circumstances may warrant re-opening and revising the operating models and testing procedures used to justify a particular management procedure.*

5 RECOMMENDATIONS

That the Commission:

a) **NOTE** paper IPHC-2020-IM096-11 Rev_1 which provides a description of the IPHC MSE framework and simulations of management procedures for distributing the TCEY.

b) **RECOMMEND** the use of the MSE framework to evaluate management procedures incorporating scale and distribution elements.

c) **RECOMMEND** a management procedure that best meets Commission objectives and accounts for trade-offs between yield in IPHC Regulatory Areas and yield stability in IPHC Regulatory Areas.

6 References

IPHC-2018-MSAB011-08. Hicks A. 2018. IPHC Management Strategy Evaluation to Investigate Fishing Intensity. 18 p. https://iphc.int/uploads/pdf/msab/msab11/iphc-2018-msab011-08.pdf

IPHC-2018-SRB012-08. Hicks A, Stewart I. 2018. IPHC Management Strategy Evaluation: Update for 2018. 38 p. https://www.iphc.int/uploads/pdf/srb/srb012/iphc-2018-srb012-08.pdf

IPHC-2018-SRB012-R. Report of the 12th Session of the IPHC Scientific Review Board (SRB012). 17 p. https://www.iphc.int/uploads/pdf/srb/srb012/iphc-2018-srb012-r.pdf

IPHC-2018-SRB013-R. Report of the 13th Session of the IPHC Scientific Review Board (SRB013). 17 p. https://iphc.int/uploads/pdf/srb/srb013/iphc-2018-srb013-r.pdf

IPHC-2020-SRB017-R. Report of the 17th Session of the IPHC Scientific Review Board (SRB017). 21 p. https://www.iphc.int/uploads/pdf/srb/srb017/iphc-2020-srb017-r.pdf

IPHC-2019-AM095-08. Stewart I, Webster R. 2019. Overview of data sources for the Pacific halibut stock assessment, harvest policy, and related analyses. 76 p. https://www.iphc.int/uploads/pdf/am/2019am/iphc-2019-am095-08.pdf

IPHC-2019-MSAB014-08. Hicks A., Berukoff S., Carpi P. 2019. Development of a framework to investigate fishing intensity and distributing the total constant exploitation yield (TCEY) for Pacific halibut fisheries. 9 p. https://iphc.int/uploads/pdf/msab/msab014/iphc-2019-msab014-08.pdf

IPHC-2020-AM096-09 Rev_2. Stewart I., Hicks A., Webster R., Wilson D. 2020. Summary of the data, stock assessment, and harvest decision table for Pacific halibut (Hippoglossus stenolepis) at the end of 2019. 26 p. https://iphc.int/uploads/pdf/am/2020am/iphc-2020-am096-09.pdf

IPHC-2020-MSAB015-R. Report of the 15th Session of the IPHC Management Strategy Advisory Board (MSAB015). 23 p. https://www.iphc.int/uploads/pdf/msab/msab015/iphc-2020-msab015-r.pdf

IPHC-2020-MSAB016-08. Hicks A., Carpi P., Berukoff S., Stewart I. 2020. Development of a framework to investigate fishing intensity and distributing the total constant exploitation yield (TCEY) for Pacific halibut fisheries. 28 p. https://iphc.int/uploads/pdf/msab/msab016/iphc-2020-msab016-08.pdf

IPHC-2020-SRB016-08 Rev1. Hicks A., Carpi P., Berukoff S., Stewart I. 2020. An update of the IPHC Management Strategy Evaluation process for SRB016. 39 p. https://iphc.int/uploads/pdf/srb/srb016/iphc-2020-srb016-08.pdf

IPHC-2020-SA-01. 2020. Stewart I., Hicks A. 2020. Assessment of the Pacific halibut (Hippoglossus stenolepis) stock at the end of 2019. 32 p. https://www.iphc.int/uploads/pdf/sa/2020/iphc-2020-sa-01.pdf

IPHC-2020-SA-02. 2020. Stewart I., Webster R. 2020. Overview of data sources for the Pacific halibut stock assessment, harvest policy, and related analyses. 53 p. https://www.iphc.int/uploads/pdf/sa/2020/iphc-2020-sa-02.pdf

IPHC-2020-SRB016-07. Stewart I., Hicks A., Carpi P. 2020. 2020 Pacific halibut (Hippoglossus stenolepis) stock assessment: Development. 26 p. https://www.iphc.int/uploads/pdf/srb/srb016/iphc-2020-srb016-07.pdf

Punt A. E., Butterworth D. S., de Moor C. L., De Oliveira J. A. A., Haddon M. 2016. Management Strategy Evaluation: best practices. Fish and Fisheries 17(2): 303-334

Seitz, A. C., Farrugia, T. J., Norcross, B. L., Loher, T., & Nielsen, J. L. 2017. Basin-scale reproductive segregation of Pacific halibut (Hippoglossus stenolepis). Fisheries Management and Ecology, 24(4), 339–346.

Seitz, A. C., Loher, T., & Nielsen, J. L. 2007. Seasonal movements and environmental conditions experienced by Pacific halibut in the Bering Sea, examined by pop-up satellite tags. IPHC, Scientific Report No. 84. 24pp.

Sharma, R., Levontin P., Kitakado T., Kell L., Mosqueira I., Kimoto A. Scott R., Minte-Vera C., De Bruyn P., Ye Y., Kleineberg J., Lindsay Walton J., Miller S., Magnusson A. 2020. Operating model design in tuna Regional Fishery Management Organizations: current practice, issues and implications. Fish and Fisheries 21(5): 940-961. https://doi.org/10.1111/faf.12480

Stewart, I. J. and Hicks, A. C. 2017. Assessment of the Pacific halibut stock at the end of 2016. Int. Pac. Halibut Comm. Report of Assessment and Research Activities 2016: 365-394.

Stewart, I.J. and Martell, S. J. D. 2016. Development of the 2015 stock assessment. IPHC Report of Assessment and Research Activities 2015. https://iphc.int/uploads/pdf/rara/iphc-2015-rara25.pdf

Webster, R.A., Clark, W.G., Leaman, B.M., and Forsberg, J.E. 2013. Pacific halibut on the move: a renewed understanding of adult migration from a coastwide tagging study. Can. J. Fish. Aquat. Sci. 70(4): 642-653. doi:10.1139/cjfas-2012-0371.

7 APPENDICES

Appendix I: Primary objectives defined by the Commission for the MSE

Appendix II: Proposed and Recommended Management Procedures from MSAB015

Appendix III: Description of Management Procedures proposed from MSAB015

APPENDIX I
PRIMARY OBJECTIVES DEFINED BY THE COMMISSION FOR THE MSE

Table I.1: Primary objectives, evaluated over a simulated ten-year period, accepted by the Commission at the 7th Special Session of the Commission (SS07). Objective 1.1 is a biological sustainability (conservation) objective and objectives 2.1, 2.2, and 2.3 are fishery objectives.

GENERAL OBJECTIVE	MEASURABLE OBJECTIVE	MEASURABLE OUTCOME	TIME-FRAME	TOLERANCE	PERFORMANCE METRIC
1.1. KEEP FEMALE SPAWNING BIOMASS ABOVE A LIMIT TO AVOID CRITICAL STOCK SIZES AND CONSERVE SPATIAL POPULATION STRUCTURE	Maintain a female spawning stock biomass above a biomass limit reference point at least 95% of the time	*SB* < Spawning Biomass Limit (SB_{Lim}) SB_{Lim}=20% unfished spawning biomass	Long-term	0.05	$P(SB < SB_{Lim})$
	Maintain a defined minimum proportion of female spawning biomass in each Biological Region	$p_{SB,2} > 5\%$ $p_{SB,3} > 33\%$ $p_{SB,2} > 10\%$ $p_{SB,2} > 2\%$	Long-term	0.05	$P(p_{SB,R} < p_{SB,R,min})$
2.1 MAINTAIN SPAWNING BIOMASS AROUND A LEVEL THAT OPTIMIZES FISHING ACTIVITIES	Maintain the coastwide female spawning biomass above a biomass target reference point at least 50% of the time	*SB*<Spawning Biomass Target (SB_{Targ}) SB_{Targ}=$SB_{36\%}$ unfished spawning biomass	Long-term	0.50	$P(SB < SB_{Targ})$
2.2. LIMIT CATCH VARIABILITY	Limit annual changes in the coastwide TCEY	Annual Change (*AC*) > 15% in any 3 years	Short-term		$P(AC_3 > 15\%)$
		Median coastwide Average Annual Variability (AAV)	Short-term		*Median AAV*
	Limit annual changes in the Regulatory Area TCEY	Annual Change (*AC*) > 15% in any 3 years	Short-term		$P(AC_3 > 15\%)$
		Average AAV by Regulatory Area (AAV_A)	Short-term		*Median* AAV_A
2.3. PROVIDE DIRECTED FISHING YIELD	Optimize average coastwide TCEY	Median coastwide TCEY	Short-term		*Median* $\overline{TCEY}$
	Optimize TCEY among Regulatory Areas	Median $TCEY_A$	Short-term		*Median* $\overline{TCEY_A}$
	Optimize the percentage of the coastwide TCEY among Regulatory Areas	Median $\%TCEY_A$	Short-term		*Median* $\overline{\left(\frac{TCEY_A}{TCEY}\right)}$
	Maintain a minimum TCEY for each Regulatory Area	Minimum $TCEY_A$	Short-term		*Median Min(TCEY)*
	Maintain a percentage of the coastwide TCEY for each Regulatory Area	Minimum $\%TCEY_A$	Short-term		*Median Min(%TCEY)*

APPENDIX II
PROPOSED AND RECOMMENDED MANAGEMENT PROCEDURES FROM MSAB015

Recommended management procedures to be evaluated by the MSAB in 2020 and the priority of investigation. A priority of 1 denotes a focus on producing precise performance metrics. Reproduced from IPHC-2020-MSAB015-R.

Table II.1: Recommended management procedures to be evaluated by the MSAB in 2020 and the priority of investigation. A priority of 1 denotes a focus on producing precise performance metrics. A priority of 2 denotes potentially fewer simulations are desired, if time is constrained.

MP	Coastwide	Regional	IPHC Regulatory Area	Priority
MP 15-A	SPR 30:20		• O32 stock distribution • Proportional relative harvest rates (1.0 for 2-3A, 0.75 for 3B-4) • 1.65 Mlbs floor in 2A[1] • Formula percentage for 2B[2]	1
MP 15-B	SPR 30:20 MaxChange15%		• O32 stock distribution • Proportional relative harvest rates (1.0 for 2-3A, 0.75 for 3B-4) • 1.65 Mlbs floor in 2A[1] • Formula percentage for 2B[2]	1
MP 15-C	SPR 30:20 MaxChange15%	Biological Regions, O32 stock distribution Rel HRs[3]: R2=1, R3=1, R4=0.75, R4B=0.75	• O32 stock distribution • Relative harvest rates not applied • 1.65 Mlbs floor in 2A[1] • Formula percentage for 2B[2]	2
MP 15-D	SPR 30:20 MaxChange15% Max FI (36%)		First • O32 stock distribution • Relative harvest rates (1.0 for 2-3A, 0.75 for 3B-4) Second within buffer (pro-rated if exceeds buffer) • 1.65 Mlbs floor in 2A[1] • Formula percentage for 2B[2]	2
MP 15-E	SPR 30:20 MaxChange15%		• O32 stock distribution • Proportional relative harvest rates (1.0 for 2-3A, 0.75 for 3B-4) • 1.65 Mlbs floor in 2A[1]	2
MP 15-F	SPR 30:20 MaxChange15%	National Shares: 20% to 2B, 80% to other	• O32 stock distribution to areas other than 2B • Relative harvest rates (1.0 for 2-3A, 0.75 for 3B-4)	1
MP 15-G	SPR 30:20 MaxChange15%		• O32 stock distribution	1

MP	Coastwide	Regional	IPHC Regulatory Area	Priority
			• Relative harvest rates (1.0 for 2-3A, 0.75 for 3B-4)	
MP 15-H	SPR 30:20 MaxChange15%		• O32 stock distribution • Relative harvest rates (1 for 2-3, 4A, 4CDE, 0.75 for 4B)	1
MP 15-I	SPR 30:20 MaxChange15%		• All sizes stock distribution • Relative harvest rates (1.0 for 2-3A, 0.75 for 3B-4)	2
MP 15-J	SPR 30:20 MaxChange15%		• O32 stock distribution (5-year moving average) • Relative harvest rates (1.0 for 2-3A, 0.75 for 3B-4)	1
MP 15-K	SPR 30:20 MaxChange15%		• 5-year shares determined from 5-year O32 stock distribution (vary over time but change only every 5th year)	2

[1] paragraph 97b IPHC-2020-AM096-R
[2] paragraph 97c of IPHC-2020-AM096-R
[3] R2 refers to Biological Region 2 (2A, 2B, 2C); R3 refers to Biological Region 3 (3A, 3B); R4 refers to Biological Region 4 (4A, 4CDE), and R4B refers to Biological Region 4B

APPENDIX III
DESCRIPTION OF MANAGEMENT PROCEDURES PROPOSED FROM MSAB015

The proposed management procedures from the 15th Session of the Management Strategy Advisory Board (MSAB015) are described here. Each management procedure has a coastwide component and a distribution component (Appendix II). The distribution component can distribute directly to IPHC Regulatory Areas or distribute to Biological Regions first.

For all the MPs considered, the coastwide component sees the application of a coastwide SPR and of a 30:20 control rule. The 30:20 harvest control rule adjusts the reference SPR if the estimated stock status falls below the 30% trigger value. Specifically, the fishing intensity is reduced linearly if the stock status falls below 30% of unfished spawning stock biomass to a value of zero at and below an estimated status of 20% of unfished spawning stock biomass.

MP15-A: this MP applies a coastwide SPR and the 30:20 harvest control rule to obtain a coastwide TCEY. The coastwide TCEY is then distributed to IPHC Regulatory Areas using the O32 stock distribution (i.e. biomass of fish over 32 inches) from FISS. A proportional relative harvest rate is applied to IPHC Regulatory Areas such that the relative harvest rate in the western areas (i.e. 3B, 4A, 4CDE, and 4B) is 0.75 and the relative harvest rate in eastern areas (i.e. 2A, 2B, 2C, 3A) is 1.0. Further adjustments are applied to the distributed TCEY, to assign a fixed 1.65 million pounds for IPHC Regulatory Area 2A (when possible) and a percentage allocation for IPHC Regulatory Area 2B calculated from a 30% weight on the current interim management procedure's target TCEY distribution (i.e., O32 stock distribution and relative harvest rates) and 70% weight to 20%.

MP15-B: this MP applies a coastwide SPR and the 30:20 harvest control rule to obtain a coastwide TCEY. A 15% constraint is then applied to not allow the coastwide TCEY to increase or decrease by more than 15% from the previous year's limit. The coastwide TCEY is then distributed to IPHC Regulatory Areas using the O32 stock distribution (i.e. biomass of fish over 32 inches) from the FISS. A proportional relative harvest rate is applied to IPHC Regulatory Areas such that the relative harvest rate in the western areas (i.e. 3B, 4A, 4CDE, and 4B) is 0.75 and the relative harvest rate in eastern areas (i.e. 2A, 2B, 2C, 3A) is 1.0. Further adjustments are applied to the distributed TCEY, to assign a fixed 1.65 million pounds for IPHC Regulatory Area 2A (when possible) and a percentage allocation for IPHC Regulatory Area 2B calculated from a 30% weight on the current interim management procedure's target TCEY distribution (i.e., O32 stock distribution and relative harvest rates) and 70% weight to 20%.

MP15-C: this MP applies a coastwide SPR and the 30:20 harvest control rule to obtain a coastwide TCEY. A 15% constraint is then applied to not allow the coastwide TCEY to increase or decrease by more than 15% from the previous year's limit. The coastwide TCEY is then distributed to Biological Regions using the O32 stock distribution (i.e. biomass of fish over 32 inches) from the FISS. A proportional relative harvest rate is applied to Biological Regions such that the relative harvest rate in Biological Regions 4 and 4B is 0.75 and the relative harvest rate in Biological Regions 2 and 3 is 1.0. The regional TCEY is then distributed to IPHC Regulatory Areas using the O32 stock distribution (i.e. biomass of fish over 32 inches) from the FISS. Further adjustments are applied to the distributed TCEY, to assign a fixed 1.65 million pounds for IPHC Regulatory Area 2A (when possible) and a percentage allocation for IPHC Regulatory Area 2B calculated from a 30% weight on the current interim management procedure's target TCEY distribution (i.e., O32 stock distribution and relative harvest rates) and 70% weight to 20%.

MP15-D this MP applies a coastwide SPR and the 30:20 harvest control rule to obtain a coastwide TCEY. A 15% constraint is then applied to not allow the coastwide TCEY to increase or decrease by more than 15% from the previous year's limit. The coastwide TCEY is then distributed to IPHC Regulatory Areas using the O32 stock distribution (i.e. biomass of fish over 32 inches) from the FISS. A proportional relative harvest rate is applied to IPHC Regulatory Areas such that the relative harvest rate in the western areas (i.e. 3B, 4A, 4CDE, and 4B) is 0.75 and the relative harvest rate in eastern areas (i.e. 2A, 2B, 2C, 3A) is 1.0. Further adjustments are applied to the distributed TCEY, to assign a fixed 1.65 million pounds for IPHC Regulatory Area 2A (when possible) and a percentage allocation for IPHC Regulatory Area 2B calculated from a 30% weight on the current interim management procedure's target TCEY distribution (i.e., O32 stock distribution and relative harvest rates) and 70% weight to 20%. These 2A and 2B adjustments are made by adding to the total coastwide TCEY, rather than reallocating among IPHC Regulatory Areas (as in other MPs). Once this last step is complete, the sum of the distributed TCEY is compared with the TCEY corresponding to a SPR value of 36% (maximum fishing intensity). If the sum of the distributed TCEY is higher than the TCEY corresponding to the maximum fishing intensity, IPHC Regulatory Areas 2A and 2B are adjusted so that the sum of the distributed TCEY is equal to the TCEY corresponding to the maximum fishing intensity. If the sum of the distributed TCEY is lower than the TCEY corresponding to the maximum fishing intensity, no further adjustments are made.

MP15-E: this MP applies a coastwide SPR and the 30:20 harvest control rule to obtain a coastwide TCEY. A 15% constraint is then applied to not allow the coastwide TCEY to increase or decrease by more than 15% from the previous year's limit. The coastwide TCEY is then distributed to IPHC Regulatory Areas using the O32 stock distribution (i.e. biomass of fish over 32 inches) from the FISS. A proportional relative harvest rate is applied to IPHC Regulatory Areas such that the relative harvest rate in the western areas (i.e. 3B, 4A, 4CDE, and 4B) is 0.75 and the relative harvest rate in eastern areas (i.e. 2A, 2B, 2C, 3A) is 1.0. Further adjustments are applied to the distributed TCEY, to assign a fixed 1.65 million pounds for IPHC Regulatory Area 2A (when possible).

MP15-F: this MP applies a coastwide SPR and the 30:20 harvest control rule to obtain a coastwide TCEY. A 15% constraint is then applied to not allow the coastwide TCEY to increase or decrease by more than 15% from the previous year's limit. A National Share of 20% is then applied to IPHC Regulatory Area 2B and the remaining 80% is then distributed to IPHC Regulatory Areas using the O32 stock distribution (i.e. biomass of fish over 32 inches) from the FISS. A proportional relative harvest rate is applied to IPHC Regulatory Areas such that the relative harvest rate in the western areas (i.e. 3B, 4A, 4CDE, and 4B) is 0.75 and the relative harvest rate in eastern areas (i.e. 2A, 2B, 2C, 3A) is 1.0.

MP15-G: this MP applies a coastwide SPR and the 30:20 harvest control rule to obtain a coastwide TCEY. A 15% constraint is then applied to not allow the coastwide TCEY to increase or decrease by more than 15% from the previous year's limit. The coastwide TCEY is then distributed to IPHC Regulatory Areas using the O32 stock distribution (i.e. biomass of fish over 32 inches) from the FISS. A proportional relative harvest rate is applied to IPHC Regulatory Areas such that the relative harvest rate in the western areas (i.e. 3B, 4A, 4CDE, and 4B) is 0.75 and the relative harvest rate in eastern areas (i.e. 2A, 2B, 2C, 3A) is 1.0.

MP15-H: this MP applies a coastwide SPR and the 30:20 harvest control rule to obtain a coastwide TCEY. A 15% constraint is then applied to not allow the coastwide TCEY to increase or decrease by more than 15% from the previous year's limit. The coastwide TCEY is then distributed to IPHC Regulatory Areas using the O32 stock distribution (i.e. biomass of fish over 32 inches) from the FISS. A proportional relative harvest rate is applied to IPHC Regulatory Areas such that the relative harvest rate in IPHC Regulatory Area 4B is 0.75 and the relative harvest rate in all other IPHC Regulatory Areas is 1.0.

MP15-I: this MP applies a coastwide SPR and the 30:20 harvest control rule to obtain a coastwide TCEY. A 15% constraint is then applied to not allow the coastwide TCEY to increase or decrease by more than 15% from the previous year's limit. The coastwide TCEY is then distributed to IPHC Regulatory Areas using the 'all-sizes' stock distribution, which is determined from the biomass of all sizes of Pacific halibut caught in the FISS. A proportional relative harvest rate is applied to IPHC Regulatory Areas such that the relative harvest rate in the western areas (i.e. 3B, 4A, 4CDE, and 4B) is 0.75 and the relative harvest rate in eastern areas (i.e. 2A, 2B, 2C, 3A) is 1.0.

MP15-J: this MP applies a coastwide SPR and the 30:20 harvest control rule to obtain a coastwide TCEY. A 15% constraint is then applied to not allow the coastwide TCEY to increase or decrease by more than 15% from the previous year's limit. The coastwide TCEY is then distributed to IPHC Regulatory Areas using a 5 year moving average of the O32 stock distribution (i.e. biomass of fish over 32 inches) from the FISS. A proportional relative harvest rate is applied to IPHC Regulatory Areas such that the relative harvest rate in the western areas (i.e. 3B, 4A, 4CDE, and 4B) is 0.75 and the relative harvest rate in eastern areas (i.e. 2A, 2B, 2C, 3A) is 1.0.

MP15-K: this MP applies a coastwide SPR and the 30:20 harvest control rule to obtain a coastwide TCEY. A 15% constraint is then applied to not allow the coastwide TCEY to increase or decrease by more than 15% from the previous year's limit. The coastwide TCEY is then distributed to IPHC Regulatory Areas using the previous 5-year average of the O32 stock distribution (i.e. biomass of fish over 32 inches) from the FISS, calculated only every 5th year.

INTERNATIONAL PACIFIC HALIBUT COMMISSION

IPHC Fishery Regulations: Proposals for the 2020/21 process

Agenda item 10

IPHC-2020-IM096-12

IPHC-2020-IM096-PropA1-PropA3

IPHC-2020-IM096-INF01

IPHC Fishery Regulations

- IPHC Fishery Regulation Portal available on the IPHC website
  - Third year of fully-electronic submission
- Deadline for IM096 was 19 October 2020 - Closed
- Deadline for AM097 = **26 December 2020**
- Stakeholders may also submit statements up until the day before the Annual Meeting

IPHC Secretariat fishery regulation proposals

Document number	Title	Brief description if provided (Sector/Area)
IPHC-2020-IM096-PropA1	Mortality and Fishery Limits (Sect. 5)	To provide the fishery limits table for the IPHC Fishery Regulations that will be filled in when the Commission adopts TCEYs for the individual IPHC Regulatory Areas.
IPHC-2020-IM096-PropA2	Commercial Fishing Periods (Sect. 9)	To provide recommendations for commercial fishing periods: All IPHC Regulatory Areas for 2021
IPHC-2020-IM096-PropA3	Minor amendments and clarifications.	To improve clarity and consistency in the IPHC Fishery Regulations.

Contracting Party fishery regulation proposals

Document number	Title	Brief description if provided (Sector/Area)
IPHC-2020-IM096-PropB1 Not submitted	Recreational (Sport) Fishing for Pacific Halibut—IPHC Regulatory Area 2B (Sect. 28) (DFO)	**Proponent**: DFO To provide an overage/underage mechanism for recreational fisheries: 1. IPHC Regulatory Area 2B
IPHC-2020-IM096-PropB2 Not submitted	Charter Management Measures in IPHC Regulatory Areas 2C and 3A (Sect. 29)	**Proponent**: NOAA-Fisheries To provide charter management measures reflective of fishery limits for the recreational fisheries: 1. IPHC Regulatory Area 2C 2. IPHC Regulatory Area 3A

Stakeholder fishery regulation proposals

Document number	Title	Brief description if provided (Sector/Area)
IPHC-2020-IM096-PropC1	None submitted	None submitted

Stakeholder statements on Fishery Regulation proposal

Stakeholder	Subject
IPHC-2020-IM096-INF01	None provided as of 6 November 2020

IPHC Fishery Regulations for 2021

- IPHC Fishery Regulation Portal available on the IPHC website
  - Third year of fully-electronic submission
- Deadline for AM097 = **26 December 2020**
- Stakeholders may also submit statements up until the day before the Annual Meeting

INTERNATIONAL PACIFIC

HALIBUT COMMISSION

IPHC Fishery Regulations: Proposals for the 2020-21 process

PREPARED BY: IPHC SECRETARIAT (D. WILSON, L. ERIKSON; 16 OCTOBER 2020)

PURPOSE

To provide the Commission with an initial indication of the IPHC Fishery Regulation proposals, which the IPHC Secretariat, Contracting Parties, and other stakeholders have indicated they anticipate submitting, for consideration by the Commission in the 2020-21 regulatory process.

BACKGROUND

Recalling the IPHC fishery regulation proposal submission and review process instituted in 2017, this paper is intended to provide a preliminary indication of the fishery regulation proposals being submitted to the Commission in the 2020-21 process. Fishery regulation proposals from the Contracting Parties and other stakeholders are typically received later in the process.

> ***Note****: The date for submission of draft proposals for consideration at the 96th Session of the IPHC Interim Meeting (IM096) is* ***19 October 2020****, and for the 97th Session of the Annual Meeting (AM097) is* ***26 December 2020****.*

DISCUSSION

A listing of the preliminary titles, subjects, and sponsors for IPHC fishery regulation proposals expected to be considered as part of the 2020-21 process is provided at Appendix I.

RECOMMENDATION

That the Commission:

1) **NOTE** paper IPHC-2020-IM096-12, which provides the Commission with an initial indication of the IPHC fishery regulation proposals that the IPHC Secretariat, Contracting Parties, and other stakeholders have indicated that they expect to submit for consideration by the Commission in the 2020-21 process.

APPENDICES

Appendix I: Preliminary: Titles, subjects, and sponsors for IPHC Fishery Regulation proposals for 2020-21.

APPENDIX I

Preliminary: Titles, subjects, and sponsors for IPHC Fishery Regulation proposals for the 2020-21 process

Ref. No.	Title	Brief description if provided (Sector/Area)
IPHC Secretariat		
IPHC-2020-IM096-PropA1	Mortality and Fishery Limits (Sect. 5)	To provide the fishery limits table for the IPHC Fishery Regulations that will be filled in when the Commission adopts TCEYs for the individual IPHC Regulatory Areas.
IPHC-2020-IM096-PropA2	Commercial Fishing Periods (Sect. 9)	To provide recommendations for commercial fishing periods: All IPHC Regulatory Areas for 2021
IPHC-2020-IM096-PropA3	Minor amendments and clarifications.	To improve clarity and consistency in the IPHC Fishery Regulations.
Contracting Parties		
IPHC-2020-IM096-PropB1	Recreational (Sport) Fishing for Pacific Halibut—IPHC Regulatory Area 2B (Sect. 28) (DFO)	**Proponent**: DFO To provide an overage/underage mechanism for recreational fisheries: 1. IPHC Regulatory Area 2B
IPHC-2020-IM096-PropB2	Charter Management Measures in IPHC Regulatory Areas 2C and 3A (Sect. 29)	**Proponent**: NOAA-Fisheries To provide charter management measures reflective of fishery limits for the recreational fisheries: 1. IPHC Regulatory Area 2C 2. IPHC Regulatory Area 3A
Stakeholders		
IPHC-2020-IM096-PropC1	Nil	Nil

INTERNATIONAL PACIFIC
HALIBUT COMMISSION

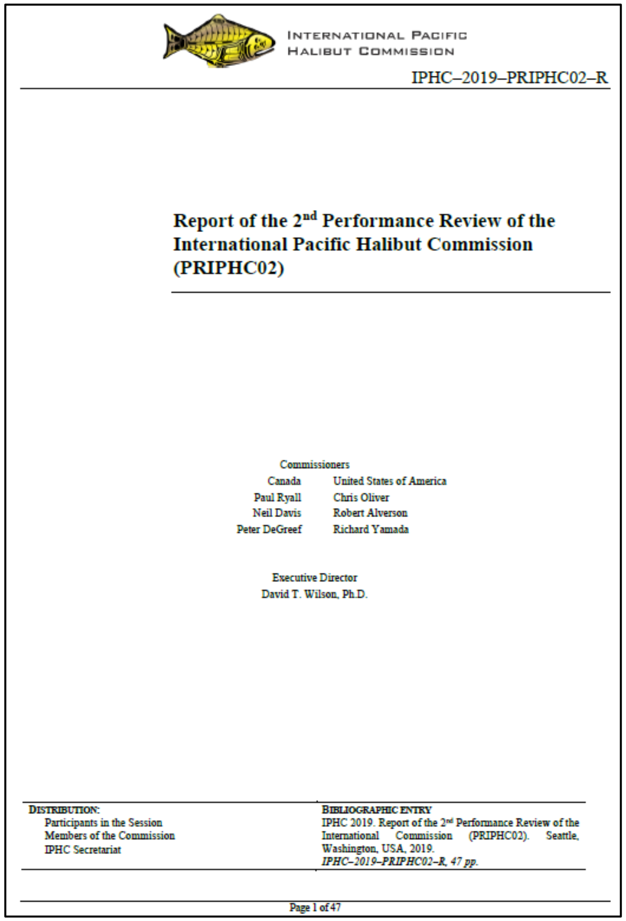
Implementation of the Recommendations from the 2nd IPHC Performance Review (PRIPHC02)

Agenda Item 11

IPHC-2020-IM096-13

PURPOSE

To provide the Commission with an update on the implementation of the recommendations arising from the 2nd Performance Review of the IPHC (PRIPHC02).


INTERNATIONAL PACIFIC HALIBUT COMMISSION

IPHC–2019–PRIPHC02–R

Report of the 2nd Performance Review of the International Pacific Halibut Commission (PRIPHC02)

Commissioners

Canada	United States of America
Paul Ryall	Chris Oliver
Neil Davis	Robert Alverson
Peter DeGreef	Richard Yamada

Executive Director
David T. Wilson, Ph.D.

DISTRIBUTION:
Participants in the Session
Members of the Commission
IPHC Secretariat

BIBLIOGRAPHIC ENTRY
IPHC 2019. Report of the 2nd Performance Review of the International Commission (PRIPHC02). Seattle, Washington, USA, 2019.
IPHC–2019–PRIPHC02–R, 47 pp.

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THE PANEL

The Panel for the 2nd Performance Review of the IPHC was as follows:

a) Chairperson: **Mr Terje Løbach** (Norway).

b) Contracting Parties: **Mr Robert Day** (Canada); **Ms Staci MacCorkle** (U.S.A.).

c) Science Advisor: **Dr Kevin Stokes** (New Zealand).

d) Regional Fishery Management Organisations: **Mr Peter Flewwelling** (North Pacific Fisheries Commission); & **Mr Jeongseok Park** (North Pacific Anadromous Fish Commission).

e) Non-Governmental Organisations: **Ms Amanda Nickson** (The PEW Charitable Trusts).

BACKGROUND

The Report of the 2nd Performance Review of the IPHC (PRIPHC02), IPHC-2019-PRIPHC02-R (adopted on 11 October 2019) is available for download from the IPHC website: https://www.iphc.int/library/documents/post/iphc-2019-priphc02-r-report-of-the-2nd-performance-review-of-the-international-pacific-halibut-commission-priphc02

BACKGROUND

At the 96th Session of the IPHC Annual Meeting (AM096), the Commission:

> *(para. 137) "The Commission **NOTED** that the PRIPHC02 was carried out over the course of 2019 via three face-to-face meetings: one in Seattle, USA (4-6 June 2019), one in New York City, USA (25 August 2019) and one in Ottawa, Canada (7-11 October 2019). The Panel held several additional tele-conferences, both among themselves, and with stakeholders. The meeting was also supported by Independent Legal and Science Experts who each dedicated additional working days to providing technical reviews and reports on specific components of the review criteria relevant to their areas of expertise."*
>
> *(para 138) "The Commission **NOTED** para. 22 of the report which stated:*
>
>> *(para. 22) "The PRIPHC02 **CONGRATULATED** the Commission and Secretariat for the positive strides in response to the first performance review. Through the course of the consultations, document review and interviews, the panel saw consistent and significant improvements in transparency, availability and modernisation of documentation and background information, and heard resounding praise for this increased transparency and the movement away from previously "closed-door" and perceived "secretive" processes and decision-making."*

BACKGROUND

At the 96th Session of the IPHC Annual Meeting (AM096), the Commission:

> *(para. 139) "The Commission* ***REQUESTED*** *that paper IPHC-2020-AM096-14 be reviewed intersessionally by each Contracting Party, with the intention of providing edits/additions, for endorsement. The IPHC Secretariat will facilitate this request by proposing intersessional meeting dates."*

During the 6th Special Session of the IPHC (SS06) held on 3 March 2020, the Commission:

> (para. 6) "*The Commission* ***ENDORSED*** *the recommendations, priorities, responsibilities, timelines and updates provided at Appendix B, and* ***AGREED*** *that these would be reported on at each IPHC meeting.*" (IPHC-2020-SS06-R)

PRIPHC02 RECOMMENDATIONS

RECOMMENDATIONS OF THE 2ND PERFORMANCE REVIEW OF THE INTERNATIONAL PACIFIC HALIBUT COMMISSION

(PRIPHC02)

See paper IPHC-2020-IM096-13

26 Recommendations in total

ACTION

That the Commission **NOTE** paper IPHC-2020-IM096-13 that provides the Commission with an update on the implementation of the recommendations arising from the 2nd Performance Review of the IPHC (PRIPHC02).

INTERNATIONAL PACIFIC

HALIBUT COMMISSION

Implementation of the Recommendations from the 2nd IPHC Performance Review (PRIPHC02)

PREPARED BY: IPHC SECRETARIAT (D. WILSON; 6 OCTOBER 2020)

PURPOSE

To provide the Commission with an update on the implementation of the recommendations arising from the 2nd Performance Review of the IPHC (PRIPHC02).

BACKGROUND

The Report of the 2nd Performance Review of the IPHC (PRIPHC02), IPHC-2019-PRIPHC02-R (adopted on 11 October 2019) is available for download from the IPHC website: https://www.iphc.int/library/documents/post/iphc-2019-priphc02-r-report-of-the-2nd-performance-review-of-the-international-pacific-halibut-commission-priphc02

At the 96th Session of the IPHC Annual Meeting (AM096), the Commission:

> *(para. 137) "The Commission **NOTED** that the PRIPHC02 was carried out over the course of 2019 via three face-to-face meetings: one in Seattle, USA (4-6 June 2019), one in New York City, USA (25 August 2019) and one in Ottawa, Canada (7-11 October 2019). The Panel held several additional tele-conferences, both among themselves, and with stakeholders. The meeting was also supported by Independent Legal and Science Experts who each dedicated additional working days to providing technical reviews and reports on specific components of the review criteria relevant to their areas of expertise."*
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> > *(para. 22) "The PRIPHC02 **CONGRATULATED** the Commission and Secretariat for the positive strides in response to the first performance review. Through the course of the consultations, document review and interviews, the panel saw consistent and significant improvements in transparency, availability and modernisation of documentation and background information, and heard resounding praise for this increased transparency and the movement away from previously "closed-door" and perceived "secretive" processes and decision-making."*
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> *(para. 139) "The Commission **REQUESTED** that paper IPHC-2020-AM096-14 be reviewed intersessionally by each Contracting Party, with the intention of providing edits/additions, for endorsement. The IPHC Secretariat will facilitate this request by proposing intersessional meeting dates."*

During the 6th Special Session of the IPHC (SS06) held on 3 March 2020, the Commission:

> (para. 6) "*The Commission **ENDORSED** the recommendations, priorities, responsibilities, timelines and updates provided at Appendix B, and **AGREED** that these would be reported on at each IPHC meeting.*" (IPHC-2020-SS06-R)

RECOMMENDATION

That the Commission **NOTE** paper IPHC-2020-IM096-13 that provides the Commission with an update on the implementation of the recommendations arising from the 2nd Performance Review of the IPHC (PRIPHC02).

APPENDICES

Appendix A: Table of recommendations arising from the PRIPHC02, including 1) responsibilities, 2) timeline, 3) priorities; and 4) any initial comments of relevance.

Appendix A
RECOMMENDATIONS OF THE 2ND PERFORMANCE REVIEW OF THE INTERNATIONAL PACIFIC HALIBUT COMMISSION (PRIPHC02)

REF#	RECOMMENDATION	PRIORITY	RESPONSIBILITY	TIMELINE	UPDATE/STATUS
PRIPHC02 –Rec.01 (para. 32)	***Legal analysis of the IPHC Convention*** The PRIPHC02 **RECOMMENDED** that consideration be given to updating the Convention at the next opportunity, to become consistent with newer international legal instruments, and specifically consider including the following elements: a) – z)	N/A	N/A	N/A	**N/A:** At this time, the Contracting Parties do not wish to commence the process of updating the IPHC Convention.
PRIPHC02 –Rec.02 (para. 33)	The PRIPHC02 **RECOMMENDED** to update the Convention, while in the interim period seek alternate mechanisms to implement international best practices and* legal principles.	N/A	N/A	N/A	**N/A**
	Commission directive: The Commission **RECOMMENDED** the exploration and implementation of alternate mechanisms to implement international best practices, such as revisions to the IPHC Rules of Procedure, IPHC Financial Regulations and IPHC Fishery Regulations.	High	Commission	2020-24	**In progress**: The IPHC Rules of Procedure and the IPHC Financial Regulations will be periodically updated (at least once every 2 years) and where possible, should accommodate applicable improvements as recommended in the legal review. See paper **IPHC-2020-IM096-16** for the next iteration.
PRIPHC02 –Rec.03 (para. 44)	***Science: Status of living marine resources*** The PRIPHC02 **RECOMMENDED** that opportunities to engage with western Pacific halibut science and management agencies be sought, to strengthen science links and data exchange. Specifically, consider options to investigate pan-Pacific stock structure and migration of Pacific halibut.	High	IPHC Secretariat	2020-24	**In progress**: There are three non-Contracting Parties who exploit Pacific halibut: Russia, Rep. of Korea and Japan. Most recently we have engaged Russian scientists working on Pacific halibut through PICES (https://meetings.pices.int/).

REF#	RECOMMENDATION	PRIORITY	RESPONSIBILITY	TIMELINE	UPDATE/STATUS
PRIPHC02 –Rec.04 (para. 45)	The PRIPHC02 **RECOMMENDED** that: a) further efforts be made to lead and collaborate on research to assess the ecosystem impacts of Pacific halibut fisheries on incidentally caught species (retained and/or discarded); b) where feasible, this research be incorporated within the IPHC's 5-Year Research Plan (https://www.iphc.int/uploads/pdf/besrp/2019/iphc-2019-besrp-5yp.pdf); c) findings from the IPHC Secretariat research and that of the Contracting Parties be readily accessible via the IPHC website.	Medium	IPHC Secretariat	2020-24	**In progress**: The IPHC's work in this area has been limited to date. However, some efforts to incorporate ecosystem considerations into the MSE work has commenced.
PRIPHC02 –Rec.05 (para. 63)	***Science: Quality and provision of scientific advice*** The PRIPHC02 **RECOMMENDED** that simplified materials be developed for RAB and especially MSAB use, including training/induction materials.	High	IPHC Secretariat	2020-24	**In progress**: The IPHC Secretariat continues to seek ways to ensure broad stakeholder understanding of our work. For the MSAB and associated MSE work, a webpage is in development to provide a user friendly means to explore and understand the utility of MSE and the simulation results arising. See paper **IPHC-2020-IM096-11** for the latest iteration.
PRIPHC02 –Rec.06 (para. 64)	The PRIPHC02 **RECOMMENDED** that consideration be given to amending the Rules of Procedure to include appropriate fixed terms of service to ensure SRB peer review remains independent and fresh; a fixed term of three years seems appropriate, with no more than one renewal.	Medium	Commission; IPHC Secretariat	2020	**Completed**: The IPHC Secretariat provided the Commission with revised Rules of Procedure for consideration at AM096, which included a two-term limit. This was adopted by the Commission and is now in force. See **IPHC Rules of Procedure (2020)**
PRIPHC02 –Rec.07 (para. 65)	The PRIPHC02 **RECOMMENDED** that the peer review process be strengthened through expanded subject specific independent reviews including data quality and standards, the FISS, MSE, and biological/ecological research; as well as conversion of "grey literature" to primary literature publications. The latter considered important to ongoing information outreach efforts given the cutting-edge nature of the Commission's scientific work.	High	Commission; IPHC Secretariat	2020-24	**In progress**: The Commission has approved peer review of the IPHC stock assessment which was **concluded** in 2019, the IPHC MSE which was concluded on 25 September 2020. See **IPHC-2020-CR-022**. The Commission has indicated its strong support topic based peer review moving forward.

REF#	RECOMMENDATION	PRIORITY	RESPONSIBILITY	TIMELINE	UPDATE/STATUS
PRIPHC02 –Rec.08 (para. 66)	The PRIPHC02 **RECOMMENDED** that the IPHC Secretariat develop options for simple graphical summaries (i.e. phase plot equivalents) of fishing intensity and spawning stock biomass for provision to the Commission.	High	IPHC Secretariat	2020	**In progress**: The IPHC Secretariat has provided a number of examples of phase plots over the past years, with the most recent examples being presented at IM096. See paper **IPHC-2020-IM096-08**.
PRIPHC02 –Rec.09 (para. 73)	***Conservation and Management: Data collection and sharing*** The PRIPHC02 **RECOMMENDED** that observer coverage be adjusted to be commensurate with the level of fishing intensity in each IPHC Regulatory Area. Commission directive: The Commission **RECOMMENDED** that the IPHC Secretariat, in consultation with the Commission, develop minimum data collection standards for Pacific halibut by scientific observer programs. The intention would be for the Commission to review and approve the minimum standards, and recommend them for implementation by domestic agencies.	N/A High	N/A Contracting Parties	N/A 2020-24	**N/A** **Pending**: Nil work in 2020 to-date.
PRIPHC02 –Rec.10 (para. 82)	***Conservation and Management: Consistency between scientific advice and fishery Regulations adopted*** The PRIPHC02 **RECOMMENDED** that the development of MSE to underpin multi-year (strategic) decision-making be continued, and as multi-year decision making is implemented, current Secretariat capacity usage for annual stock assessments should be refocused on research to investigate MSE operating model development (including consideration of biological and fishery uncertainties) for future MSE iterations and regularised multi-year stock assessments.	High	IPHC Secretariat	2021-24	**In progress**: To be considered once the initial MSE products are delivered at AM097 in January 2021.
PRIPHC02 –Rec.11 (para. 83)	The PRIPHC02 **RECOMMENDED** that ongoing work on the MSE process be prioritised to ensure there is a management framework/procedure with minimal room for ambiguous interpretation, and robust pre-agreed mortality limit setting frameworks.	High	IPHC Secretariat	2020-21	**In progress**: See paper **IPHC-2020-IM096-11**.
PRIPHC02 –Rec.12 (para. 88)	***Fishing allocations and opportunities*** The PRIPHC02 **STRONGLY URGED** the Commission to conclude its MSE process and **RECOMMENDED** it meet its 2021 deadline to adopt a harvest strategy.	High	IPHC Secretariat	2020-21	**In progress**: See paper **IPHC-2020-IM096-11**.

REF#	RECOMMENDATION	PRIORITY	RESPONSIBILITY	TIMELINE	UPDATE/STATUS
PRIPHC02 –Rec.13 (para. 96)	***Compliance and enforcement: Port State measures*** The PRIPHC02 **RECOMMENDED** that Contracting Party enforcement agencies adopt common standards for assessment of implementation of the principles of port State measures.	Medium	Contracting Parties	2020-24	**Pending**: Potentially to be incorporated into the Contracting Party National Reports at each Annual Meeting. The Secretariat will work with each Contracting Party.
PRIPHC02 –Rec.14 (para. 105)	***Compliance and enforcement: Monitoring, control and surveillance (MCS)*** The PRIPHC02 **RECOMMENDED** enhancement of coordination of MCS activities to result in a common, integrated enforcement report for each Contracting Party to facilitate assessment of compliance efforts, trends and input into management decisions.	Medium	Contracting Parties	2021-24	**Pending**: Potentially to be incorporated into the Contracting Party National Reports at each Annual Meeting.
PRIPHC02 –Rec.15 (para. 106)	The PRIPHC02 **RECOMMENDED** that the Commission re-assess the 'derby-style' fisheries management concept in operation in IPHC Regulatory Area 2A in terms of available resources, impact on validity of monitoring results, and safety of fishers, and amend the management processes, if and as necessary.	High	IPHC Secretariat; Commission	2020	**In progress**: The IPHC Secretariat is coordinating with relevant Contracting Party domestic agencies regarding shifting management of all Pacific halibut fisheries in IPHC Regulatory Area 2A from the IPHC to the relevant domestic agencies. At IM095, the Commission requested: IM095 (para. 89) *The Commission **WELCOMED** the PFMC's commitment to transition management of Pacific halibut fisheries in IPHC Regulatory Area 2A from the IPHC to domestic agencies and **REQUESTED** that the IPHC Secretariat continue to support this process in the short-term, with the aim of transitioning management of the fishery to the domestic agencies at the earliest opportunity.* NOAA-Fisheries continues to deliberate this topic.
PRIPHC02 –Rec.16 (para. 108)	***Compliance and enforcement: Follow-up on infringements*** The PRIPHC02 **RECOMMENDED** that the IPHC request information regarding Contracting Party follow-up of infringements, to assist in determining the overall efficacy of MCS and enforcement activities. This would support best practices with respect to transparency.	High	IPHC Secretariat; Commission	2020	**In progress**: The IPHC Secretariat has requested this information be provided by domestic agencies via the Contracting Party National Reports to the Commission.

REF#	RECOMMENDATION	PRIORITY	RESPONSIBILITY	TIMELINE	UPDATE/STATUS
PRIPHC02 –Rec.17 (para. 109)	The PRIPHC02 **RECOMMENDED** that the Commission improve the process of Contracting Party reporting to the Commission by aggregating individual agency reports into a consolidated, standardised, Contracting Party report to the Commission.	Medium	IPHC Secretariat; Contracting Parties	2020	**In progress**: The IPHC Secretariat has requested this information be provided by domestic agencies via a consolidated Contracting Party National Report to the Commission. This will likely take several years to become an efficient process of reporting.
PRIPHC02 –Rec.18 (para. 124)	***Governance: Decision-making*** The PRIPHC02 **RECOMMENDED** that the IPHC Rules of Procedure be modified to include a clear category and recognition for observer organisations, which would be in addition to the general public.	Low	IPHC Secretariat	2020-21	**Completed**: IPHC Rules of Procedure (2020) published on 7 February 2020.
PRIPHC02 –Rec.19 (para. 128)	***Governance: Dispute settlement*** The PRIPHC02 **RECOMMENDED** updating the rules of procedure to reflect intersessional decision making approaches.	Medium	IPHC Secretariat	2020-21	**Completed**: IPHC Rules of Procedure (2020) published on 7 February 2020. Further amendments will be presented at IM096 and AM097 for adoption. See paper **IPHC-2020-IM096-16**.
PRIPHC02 –Rec.20 (para. 137)	***Governance: Transparency*** The PRIPHC02 **RECOMMENDED** that the significant level of transparency achieved across Commission business continue to be improved.	High	Commission; IPHC Secretariat;	2020-24	**In progress**: Monitor progress through the IPHC meeting cycle.
PRIPHC02 –Rec.21 (para. 146)	***International cooperation: Relationship to non-Contracting Parties*** The PRIPHC02 **RECOMMENDED** that the Commission prioritise scientific work to confirm the full range of the Pacific halibut stock.	High	IPHC Secretariat;	2020-24	**In progress**: There are three non-Contracting Parties who exploit Pacific halibut: Russia, Rep. of Korea and Japan. Most recently we have engaged Russian scientists working on Pacific halibut through PICES (https://meetings.pices.int/).
PRIPHC02 –Rec.22 (para. 147)	The PRIPHC02 **RECOMMENDED** that if the full range of the Pacific halibut stock extends outside the Convention Area, the Contracting Parties invite collaboration with all parties involved in the harvest of this stock, to ensure science and management includes accurate data regarding all removals from the stock.	Low/ Medium	IPHC Secretariat	2020-24	**In progress**: The IPHC Secretariat is engaging with other countries harvesting Pacific halibut via PICES as a first step.

REF#	RECOMMENDATION	PRIORITY	RESPONSIBILITY	TIMELINE	UPDATE/STATUS
PRIPHC02 –Rec.23 (para. 156)	***Efficiency and transparency of financial and administrative management: Availability of resources for IPHC activities*** The PRIPHC02 **RECOMMENDED** the continued establishment of a Business Continuity Plan (BCP), which will serve to strengthen the long-term viability of IPHC Secretariat functioning and accountability, in line with best practices of an organisation of its size and breadth. Prioritising a financial and administrative BCP, with the ultimate goal of establishing a comprehensive BCP for the IPHC Secretariat as a whole.	High	IPHC Secretariat; FAC	2020	**In progress**: The IPHC Secretariat has developed a BCP for the Finance and Administrative Services Branch (financial and administrative BCP) over the past months, and will move to consolidate with other Branches of the organization throughout 2020.
PRIPHC02 –Rec.24 (para. 162)	***Efficiency and transparency of financial and administrative management: Efficiency and cost-effectiveness*** The PRIPHC02 **RECOMMENDED** the FAC produce a report detailing the actual FAC meeting and that the presentation of the report be incorporated into the Annual Meeting agenda and report, along with the final decisions of the Commission.	High	FAC; IPHC Secretariat	2020-24	**Completed**: The first report of the IPHC Finance and Administration Committee (FAC) was adopted on 4 February 2020, and presented to the Commission at its 96th Session for consideration.
PRIPHC02 –Rec.25 (para. 165)	***Efficiency and transparency of financial and administrative management: Advisory structure*** The PRIPHC02 **RECOMMENDED** that when revisiting PRIPHC01 Recommendation 3.1 on unifying subsidiary bodies, treat the CB and PAB as non-science process and maintain separated RAB and MSAB at least until the 2021 adoption and implementation of a new management strategy.	N/A	Commission	N/A	**Completed**: The Commission agreed to keep the two subsidiary bodies separate moving forward.
PRIPHC02 –Rec.26 (para. 166)	The PRIPHC02 **RECOMMENDED** that continued support for high quality stakeholder engagement through the science-focused subsidiary bodies (RAB and MSAB) or any future subsidiary bodies be maintained.	High	Commission; IPHC Secretariat	2020-24	**Completed**: The Commission agreed to keep the two subsidiary bodies separate moving forward, and for them to be enhanced wherever feasible.

Pacific Halibut Multiregional Economic Impact Assessment (PHMEIA): summary of progress

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PURPOSE

To provide an update on the International Pacific Halibut Commission (IPHC) economic study, including progress on developing the economic impact assessment model, state of the collection of primary economic data from Pacific halibut dependent sectors, and plan for the year ahead.

BACKGROUND

Under the Convention, the IPHC's mandate is *optimum* management of the Pacific halibut resource, which necessarily includes an economic dimension. Fisheries economics is an active field of research around the world in support of fisheries policy and management. Adding the economic expertise to the IPHC Secretariat, the IPHC has become the first regional fishery management organization (RFMO) in the world to do so.

The goal of the IPHC economic study is to provide stakeholders with an accurate and all-sectors-encompassing assessment of the economic impact of the Pacific halibut resource in Canada and the United States of America. The intention of this update is to inform on the project progress and reiterate the need for active participation of the IPHC stakeholders in developing the necessary data for analysis.

The economic effects of changes to harvest levels can be far-reaching. Fisheries management policies that alter catch limits have a direct impact on commercial harvesters, but at the same time, there is a ripple effect through the economy. Industries that supply commercial fishing vessels with inputs, generally referred to as *backward-linked industries*, rely on this demand when making decisions related to their production levels and expenditure patterns. For example, vessels making more fishing trips purchase more fuel and leave more money in a local grocery store that supplies crew members' provisions. More vessel activity means more business to vessel repair and maintenance sector or gear suppliers. An increase in landings also brings more employment opportunities, and, as a result, more income from wages is in circulation. When spending their incomes, local households support local economic activity that is indispensable to coastal communities' prosperity.

Changes in the domestic fisheries output, unless fully substituted by imports, are also associated with production adjustments by industries relying on the supply of fish, such as seafood processors. Similarly to the directly affected sector, any change in production by the *forward-linked industry* has a similar ripple effect on its suppliers. The complete path of landed fish, from the hook to the plate, also includes seafood wholesalers and retailers, and, in the case of highly-prized fish such as Pacific halibut, services. Traditionally, the vast majority of Pacific halibut is consumed at white-tablecloth restaurants. Any adjustment in gross revenue generated by these industries resulting from a change in the supply of directly affected fish is further magnifying the economic impact of management decision altering harvest levels.

Similar effects are attributed to the recreational fishing sector. By running their businesses, charter operators generate demand for fuel, bait fish, boat equipment, and fishing trip provisions. They also create employment opportunities and provide incomes that can be spent locally, supporting various local businesses. What is more, anglers themselves contribute to the economy by creating demand for goods and services related to their fishing trips. A number of sectors support tourism relaying on the Pacific halibut fishing, both guided or unguided. These include lodging, local retailers, or restaurants.

Besides shaping a complex combination of local effects, the industries' interlinked nature is generating cross-regional impacts. Economic benefits from the primary area of the resource extraction are leaked when inputs are imported or when wages earned by non-residents are spent outside the place of employment. At the same time, the inflow of economic benefits to the local economies from outside is occurring when products are exported or local businesses are bringing tourism cash to the region.

Understanding the multiregional impacts of changes to fisheries sectors is now more important than ever considering how globalized it is becoming. Fish harvested on the other side of the globe can be easily found on the shelf or on the menu in the United States or Canada, competing with domestically produced seafood. The United States and Canada imported seafood worth over USD 28.8 billion (CAD 37.4 billion) in 2018 (Statistics Canada, 2020a; US Census, 2020b). On the production side, the origin of inputs to any sector is increasingly distant, implying a gradual shift of economic activity supported by fisheries and seafood industries abroad. While cost-effective, such high exposure to international markets makes seafood accessibility fragile to perturbations, as shown by the covid-19 outbreak (OECD, 2020). Fisheries are also at the forefront of exposure to the accelerating impacts of climate change. A rapid increase of the water temperature of the coast of Alaska, termed *the blob*, is affecting fisheries (Cheung and Frölicher, 2020) and may have a profound impact on Pacific halibut distribution. Thus analyzing the sector in a broader context is crucial.

Update on the model development

Economic impacts are typically estimated with the use of an input-output (IO) model. The traditional IO model is used to investigate how changes in final demand affect economic variables such as output, income and employment or contribution to the region's gross domestic product (GDP). This is known as impact analysis. With an adjustment for the shock type, the model can also demonstrate the magnitude of changes in supply-constrained industries such as total allowable catch (TAC) constrained fisheries. Adopting a multiregional approach, the model accommodates the cross-regional trade. The IO model can also be extended to the so-called social accounting matrix (SAM). Adopting SAM, the calculated effects account for labor commuting patterns and, as a result, the flow of earnings between regions.

The Pacific halibut multiregional economic impact assessment (PHMEIA) model is a multiregional SAM model describing economic interdependencies between sectors and regions developed with a specific purpose of assessing the economic contribution of Pacific halibut resource to the economy of the United States and Canada. The adopted methodology is an extension from the multiregional SAM model for Southwest Alaska developed by Seung, Waters, and Taylor (2019) and draws on a few decades' worth of experience in developing IO models with applications to fisheries.

The model reflects the interdependencies between eleven major sectors and two Pacific halibut-specific sectors. These include the Pacific halibut fishing sector, as well as the forward-linked Pacific halibut processing sector.[1] The inclusion of the Pacific halibut charter sector is underway. The list of industries considered in the PHMEIA model, as well as the primary commodities they produce, is available in Table 1.

The model accounts for interregional spillovers. These represent economic stimulus in the regions other than the one in which the exogenous change is considered. This allows accommodation of increasing economic interdependence of regions and nations. The model considers three primary Pacific halibut producing regions, as well as residual regions to account for cross-boundary effects of fishing in the Pacific Northwest:

- Alaska (AK)
- West Coast (WC – including WA, OR and CA)
- British Columbia (BC)
- Rest of the US (RUS)
- Rest of Canada (ROC)
- Rest of the world (ROW)[2]

By accounting for the economic linkages among these six regions, the study shows the importance of multiregional approaches to measuring economic impacts more accurately. This is particularly important in the context of shared resources and joint management, such as the case of collective management of Pacific halibut by the IPHC. The economic metrics derived from the PHMEIA model range from total economic impact on output along the value chain to impacts on employment and incomes, as well as contribution to the GDP and households' prosperity.

The model adopts a recently published multiregional generalized RAS (MRGRAS) updating technique (Temursho, Oosterhaven and Alejandro, 2019) to develop an up-to-date model that can incorporate partial information on its components while continuing to conform to the predefined balanced structure. This technique can make the multiregional model consistent with aggregated national data[3] and include up-to-date estimates from a limited number of focus sectors. For more details on the methodological approach, please refer to the economic study section on the IPHC website (subsection *Development of the model*).

[1] As noted by Steinback and Thunberg (2006), there are number of seafood substitutes available to buyers. Thus including impacts beyond processors and wholesalers could be misleading considering that it is unlikely that supply shortage would result in a noticeable change in retail level gross revenues. Data limitations dictate the exclusion of wholesale buyers from the assessment of forward-linked effects.

[2] The ROW region in the model is considered exogenous. This implies that the trade relations with the ROW are not affected by the changes to the Pacific halibut sector considered in this project. However, the full inclusion of ROW component allows for assessment of impact outside Canada and the United States if trade with ROW was to be considered responsive to changes in Pacific halibut sector activity.

[3] For example, data from the National Economic Accounts (NEA). NEA data provide a comprehensive view of national production, consumption, investment, exports and imports, and income and saving. These statistics are best known by summary measures such as gross domestic product (GDP), corporate profits, personal income and spending, and personal saving.

The current version of the model is based solely on secondary data sources. [4] As such, the results are conditional on the adopted assumptions for the components for which data were not available. In order to improve the accuracy of the assessment, the IPHC intends to incorporate into the model primary economic data collected directly from members of Pacific halibut dependent sectors (see *Update on the identification of available data sources and primary data collection*), applying the so-called partial-survey method (Miller and Blair 2009, pp. 303). **The subsequent revisions of the model incorporating IPHC-collected data will bring improved estimates on the Pacific halibut sectors' economic impact**.

The model is operational and available for 2014, 2016, and 2018. For more details on the SAM application to the assessment of the impact of the Pacific halibut resource on the economies of Canada and the United States, please refer to the economic study section on the IPHC website (subsection *PHMEIA model*).

Table 1. Industries and commodities considered in the PHMEIA model.

	Industry	Primary commodity produced
1	Pacific halibut fishing	Pacific halibut
2	Other fish and shellfish fishing	Other fish and shellfish[(1)]
3	Agriculture and natural resources (ANR)	Agriculture and natural resources
4	Construction	Construction
5	Utilities	Utilities
6	Pacific halibut processing	Seafood
7	Other fish and shellfish processing	Seafood
8	Food manufacturing (excluding seafood)	Food[(2)]
9	Manufacturing (excluding food manufacturing)	Manufactured goods (excluding food)
10	Transport	Transport
11	Wholesale	Wholesale
12	Retail	Retail
13	Services (including public administration)	Services (including public administration)
14	Pacific halibut charter sector[(2)]	Pacific halibut fishing trips

[(1)]In the case of Canada case, other fish and shellfish commodity include, besides wild capture production, also aquaculture output produced by aquaculture industry that is a part of the ANR industry. Other fish and shellfish processing industry in the US component, on the other hand, draws more on the ANR commodity that includes aquaculture output. As a result, the misalignment between model components is not concerning as linking these is based on the trade of aggregated seafood commodity. [(2)]There is a slight misalignment between model components related to the allocation of beverage and tobacco product manufacturing products that, in some cases, are considered non-durable goods and lumped with the food commodity. In the case of the US component, this misalignment is corrected with the use of additional data available from the AMS. No correction is performed for the ROW component, but the global production of beverage and tobacco products is considered of minor importance compared to other food commodities. [(2)]Inclusion of the Pacific halibut charter sector is underway, the current version of the model accounts only for the economic impact associated with sectors related to commercial Pacific halibut fishing.

[4] I.e. data collected by other parties, not the IPHC.

Update on the identification of available data sources and primary data collection

The current version of the model is built using a broad set of secondary data sources. These include region-specific commercial fishing outputs in terms of value (DFO, 2020; NOAA, 2020a), wholesale value[5] (AgriService BC, 2018; COAR, 2020), employment and wages[6] (AK DLWD, 2020; Statistics Canada, 2020c), seafood trade (NOAA, 2020b; Statistics Canada, 2020a). Additional data are available on recreational harvest and participation in recreational angling (ADFG, 2020; RecFIN, 2020), subsistence and research harvest (IPHC, 2020a). More details on fisheries-related secondary data sources can be found in the economic study section on the IPHC website (subsection *Fisheries-related economic statistics*).

The social accounting matrix, even if built with the purpose of assessing a limited number of sectors (i.e. Pacific halibut dependent industries in this case), also requires input on supply and use by all industries in the economy, as well as supplementary data on household accounts to provide insight into the demographics of the workforce that builds the market for supply and demand of labor and trade data to link model components. The following sources serve as a base for the up-to-date estimates (list not exhaustive):

- US Bureau of Economic Analysis (BEA) industry accounts supplemented by BEA Regional Data resources (BEA, 2020) - the USA model component
- United States Census Bureau's Annual Survey of Manufactures (ASM) (US Census 2020a) – complementary statistics on manufacturing establishments
- Provincial-level supply and use tables published by Statistics Canada (Statistics Canada, 2020b) – the Canadian model component
- World Input-Output Tables (Timmer *et al.*, 2015) - base for the rest of the world component
- US Trade provided by the U.S. Census Bureau (US Census, 2020b)
- Canadian International Merchandise Trade Database (Statistics Canada, 2020a)

More accuracy of the results can be achieved by incorporating into the model primary economic data collected directly from members of Pacific halibut dependent sectors. An essential input to the SAM model is data on production structure (i.e. data on the distribution of revenue between profit and expenditure items). The only currently available source specifically identifying Pacific halibut is the NOAA model for Alaska for 2014 (Seung, Waters and Taylor, 2019). NOAA input-output model for the Pacific Coast fisheries (Leonard and Watson, 2011) provides some data for the West Coast, but it is outdated. No equivalent detail model is available for British Columbia.

A series of surveys to gather information from commercial fishers and processing plant operators has been announced at the AM96. To expand the current model's scope, a survey aimed at charter business owners is being announced at the IM96. The draft survey form has been discussed with a small focus group consisting of charter business owners from all IPHC regions who advised on the questionnaire's clarity and suitability.

[5] Not available for the US West Coast (confirmed with NOAA NWFSC, personal communication).
[6] Not available for the US West Coast (confirmed with NOAA NWFSC, personal communication).

New, web-based survey forms will be available:

- For Pacific halibut commercial harvesters;
- For Pacific halibut processors;
- For Pacific halibut charter business owners.

IPHC stakeholders are encouraged to fill relevant survey form and contribute to the assessment of the importance of the Pacific halibut resource to the economy of Canada and the United States of America.

Note on data discrepancies

Several discrepancies in crucial economic statistics have been identified. For example, the 2018 Alaska Pacific halibut output value ranges from USD 79.2 mil., as reported by the Alaska Fisheries Information Network (AKFIN, 2020), to USD 88.1 mil., as reported in the Commercial Operator's Annual Reports (COAR, 2020). Data from fish tickets available through the eLandings (confidential) suggest Pacific halibut output of about USD 78 mil., but there are tickets with missing price data suggesting the need for extrapolation of prices for estimating the total fisheries output value. British Columbia output value ranges from CAD 44.1 mil. reported by the Province of British Columbia (AgriService BC, 2018) to CAD 55.4 mil reported by the Fisheries and Oceans Canada (DFO, 2020). The best effort is made to identify the best data sources for model inputs. Additionally, a table with data comparison between sources will be prepared for verification and/or model input adjustments.

Note on increasing spatial resolution of assessed economic impacts

Moving forward, increased resolution of the assessed economic impacts would be an interesting component of the study output. More granularity in results would, however, require access to trip-level data on revenue from landed harvest. The IPHC has access to fish ticket data for Alaska (via eLandings), but the access to individual trip revenue data for British Columbia and the US West Coast is pending. More details on this data-dependent extension of the study are available in the section Extension depending on availability of inputs, subsection Assessment of community impacts.

Note on data on Pacific halibut value along the supply chain

The complete path of landed fish, from the hook to the plate, includes, besides harvesters and processors, also seafood wholesalers and retailers, and in the case of highly-prized fish such as Pacific halibut, services when it is served in restaurants. Any change in gross revenue generated by these industries as a result of a change in the supply of directly affected fish is further magnifying the economic impact of management decision altering harvest levels.

Isolating data on Pacific halibut wholesale and retail is challenging as no relevant data has been identified. However, it is important to note that there are many seafood substitutes available to buyers. Thus, including economic impacts beyond processors and wholesalers could be misleading when considering that it is unlikely that supply shortage would result in a noticeable change in retail level gross revenues (Steinback and Thunberg, 2006).

Note on primary data collection in the time of the crisis

Recent perturbations in the markets caused by covid-19 serve as an additional argument for considering the broader economic dimension of Pacific halibut's contribution to regional economies. Widespread closure of restaurants, the Pacific halibut's biggest customers, diminished the demand for fish, particularly high-quality fresh fish that fetch higher prices. Lower prices, down in 2020 by up to 30% compared with the previous year (Stremple, 2020), caused a slow first half of the season (Ess 2020). Less harvest activity has repercussions in the economy beyond the harvest sector as it affects also harvest sector suppliers and downstream industries that rely on its output. Outbreaks of covid-19 in fish processing plants (Estus, 2020; Krakow, 2020) also affect economic activity generated regionally by this directly related to the Pacific halibut supply sector. Moreover, seafood processors incur additional costs associated with protective gear, testing, and quarantine accommodations (Ross, 2020; Sapin and Fiorillo, 2020; Welch, 2020).

The pandemic is thought to be a major impediment to successful primary data collection in 2020. The survey's announcement happened shortly before the covid-19 outbreak that shifted the focus of participants to the Pacific halibut fishery. An intensified effort to reach out to commercial vessel operators was made starting July when the IPHC fisheries data specialists (ports) distributed a paper version of the survey. To this date, however, too few responses have been received to make reliable estimates for the sector.

The new edition of the IPHC economic survey that is being announced at the IM96 will allow the participants to the Pacific halibut fisheries (commercial and charter sector) to fill the form for 2020, but also retrospectively submit information for 2019. We will leave the choice to the survey participants, noting the benefits of filling for each year:

- Data for 2019, covering pre-covid-19 operations, can be considered a baseline suitable for drawing conclusions under normal circumstances and using for predictions.
- Data for 2020, covering an abnormal year of operations, can be used to assess losses incurred by the Pacific halibut sectors, but also sectors' resilience to unfavorable exogenous circumstances. If the project continues and data for 2021 are collected, the project could inform on the response to the crisis and undertake an analysis of the path to recovery.

Note on the inclusion of the recreational sector in the PHMEIA model

There are two components to consider when attempting to assess the full scope of the Pacific halibut resource's economic impact occurring as a result of recreational fishing activities. The first is the contribution to the economy by the charter sector that provides service to anglers. These include services directly related to angling, for example, providing a boat, trip supplies and guides, but also not directly related, for example, hospitality services in case of fly-in lodges that specialize in serving customers interested in Pacific halibut fishing. The economic impact is generated by the sector's demand for inputs from other industries, including manufacturing, professional services (accounting, marketing, etc.) and demand for labor. Assessment of the charter sector economic impact typically requires surveying charter business owners on their revenues and expenditures.

The second component is the contribution of anglers themselves by creating demand for goods and services related to their fishing trips. This includes expenses related to the travel that would otherwise not be incurred (e.g. auto rental, fuel cost, lodging, food, site access fees), as well as money spent on durable goods that are associated with recreational fishing activity, e.g. rods, tackle, outdoor gear, boat purchase, etc. This component applies to both guided and unguided recreational fishing. Assessment of anglers' contribution to the economy typically requires surveying private anglers on their fishing-related expenditures and fishing preferences.

First glance at the preliminary results

This section summarizes the preliminary outcomes of the PHMEIA model. It is important to note that these are based on **the current version of the model incorporating only secondary data sources**. As such, **the results are conditional on the adopted assumptions for the components for which data were not available and are subject to change**.

The preliminary results suggest that Pacific halibut commercial fishing's total estimated impact in 2018 amounts to USD 243 mil. (CAD 316) in GDP, USD 124 mil. (CAD 160 mil.) in labor income, 4,169 in jobs, and USD 130 mil (CAD 168 mil.) in households income and over USD 610 mil. (CAD 790 mil.) in output. This is about 4.7 times the fishery output value of USD 129 mil. (CAD 167 mil.) recorded for 2018 (DFO, 2020; NOAA, 2020a). The estimate is the total economic impact, the sum of the direct, indirect, and induced effects from changes to the Pacific halibut fishing sector, as well as indirect and induced effects associated with forward-linked industries (Pacific halibut processing sector).

The results suggest that the revenue generated by Pacific halibut at the harvest stage accounts for only a fraction of economic activity that would be forgone if the resource was not available to fishers in the pacific northwest. Besides supporting production by other industries, the sector also contributes to the GDP of Canada and the United States and has a considerable impact on employment in both countries. Understanding such a broad scope of impacts is essential for designing policies with desired effects depending on regulators' priorities.

The study's main contribution is the first consistent estimation of both backward and forward-linked effects of fisheries supply changes in a multiregional setup tracing the transmission of impacts internationally.[7] By linking multiple spatial components, the model offers a better understanding of the impacts of changes in shared stock supply.

The complexity of Pacific halibut supply-side restriction in the form of region-based allocations suggests the need for a tool enabling regulators to assess various combinations of TAC allocations. To address this, the results are complemented by an interactive web-based application allowing users to estimate and visualize joint effects based on custom changes simultaneously applied to all IPHC-managed Pacific halibut producing areas.

[7] While a study analyzing the impact of Pacific salmon fisheries on the economy of both the USA and Canada using the IO approach was identified (Gislason et al. 2017), the models therein are disconnected and do not offer the consistency of an integrated multiregional model.

The preliminary version of the tool is available here. The current version of the tool accounts only for the commercial sector, inclusion of the recreational component is underway.

Besides providing economic impact estimates for broadly-defined regions, the PHMEIA model results can inform the community impacts of the Pacific halibut resource throughout its range.[8] However, while the quantitative analysis is conducted with respect to components that involve monetary transactions, Pacific halibut's value is also in its contribution to the diet through subsistence fisheries and importance to the traditional users of the resource. To native people, traditional fisheries constitute a vital aspect of local identity and a major factor in cohesion. One can also consider the Pacific halibut's existence value as an iconic fish of the Pacific Northwest. While these elements are not quantified at this time, recognizing such an all-encompassing definition of the Pacific halibut resource contribution, the project echoes a broader call to include the human dimension into the research on the impact of management decisions, as well as changes in environmental or stock conditions.

OBJECTIVES

Table 2 summarizes the progress to-date against the IPHC economic study objectives.

Table 2. The study objectives – summary of progress

Objective	**Status***
Item 1: Survey of previous studies and existing information	**---**
Item 1.a: Literature review	**COMPLETED**
Item 1.b: Description of ongoing regular data collection programs	**COMPLETED**
Item 1.c: Collection of primary data – commercial sector survey	**IN PROGRESS**
Item 1.d: Collection of primary data – charter sector survey	**UNDER REVIEW**
Item 2: Comprehensive qualitative structural description of the current economics of the Pacific halibut resource	**---**
Item 2.a: Description of the economics of the Pacific halibut commercial sector	**COMPLETED**
Item 2.b: Description of the economics of the Pacific halibut recreational sector	**IN PROGRESS**
Item 2.c: Description of the economics of other Pacific halibut sectors (bycatch, subsistence, ceremonial, research, non-directed)	

[8] Subject to data availability. At this time, trip-level revenue data are available for Alaska. The IPHC requested access to equivalent data from British Columbia and the US West Coast.

Item 3: Quantitative analysis of the economic impact of the directed Pacific halibut fishery	**---**
Item 3.a: Methodology – a model of the economy	**COMPLETED**
Item 3.b: Methodology – inclusion of the commercial sector in the SAM	**IN PROGRESS**
Item 3.c: Methodology – inclusion of the recreational sector in the SAM	**UNDER REVIEW**
Item 3.d: Methodology – economic value of the subsistence use	
Item 4: Account of the geography of the economic impact of the Pacific halibut sectors	**---**
Item 4.a: Visualization of region-specific economic impacts	**IN PROGRESS**
Item 5: Analysis of the community impacts of the Pacific halibut fishery throughout its range, including all user groups	**---**
Item 5.a: Community impacts assessment of the Pacific halibut fishery	**Data-dependent**
Item 6: Summary of the methodology and results of the IPHC study in comparison to other economic data and reports for the Pacific halibut resource, other regional fisheries, and comparable seafood industry sectors	**---**
Item 6.a: Putting methodology into perspective	**IN PROGRESS**
Item 6.b: Putting results into perspective	

* All items marked as COMPLETED are subject to updates based on the direction of the project and evolution of the situation in the Pacific halibut fisheries.

Extensions depending on availability of inputs

Assessment of community impacts

While some of the local communities particularly rely on fishing-related economic activities, extending the proposed SAM model to the community level (or any other spatial scale) requires significant investment in identifying the economic relationships between different sectors or industries (including both seafood and non-seafood industries) within each broader-defined region. It is an appealing extension of the current model, but not a feasible avenue for the project with its current time frame.

At this time, a simplified approach is suggested. The community impacts can be evaluated based on local exposure to the region's Pacific halibut economic impact, using calculated multiplier effects. Key metrics to consider here are created employment opportunities, wages brought to local circulation, and inflow of capital from outside through offering recreational fishing opportunities. It is also essential to consider the changes in quota distribution. In a system based on transferable quotas, small remote fishing communities are more likely to sell their quota, and what follows is a disproportional economic impact on the spatial scale. Loss of fisheries opportunities in small indigenous communities can be an unintended consequence of quota systems (Carothers, Lew, and Sepez 2010; Szymkowiak, Kasperski, and Lew 2019).

While the specifics of the methodology for this component of the study are yet to be determined, the results could be delivered at, for example, port-level, considerably increasing the resolution of the assessed economic impacts. More granularity in results would, however, require access to trip-level data on revenue from landed harvest. Such data are currently available only for Alaska.[9] Access to equivalent data for British Columbia and the US West Coast is a prerequisite for conducting such analysis for all IPHC-managed Pacific halibut producing areas.

Study of recreational demand

It is important to note that while it is reasonable to assume that changes in harvest limits have a relatively proportional impact on production by commercial fishers (unless these are dramatic and imply fleet restructure), the effects on the recreational sector are not so straightforward.

A separate study estimating changes in saltwater recreational fishing participation as a response to the changing recreational harvest limits is necessary if the stakeholders are interested in policy impact rather than snapshot economic assessment. Such studies typically require surveying recreational fishers.

There is scope for collaboration here with the NOAA Alaska Fisheries Science Center, where there is ongoing work on estimating the marginal value of a Pacific halibut from the charter fishing sector in Alaska.

If the project was to continue beyond two years, the IPHC could consider surveying recreational fishers. The charter owners who participated in the charter survey pilot implied willingness to help with, e.g., distributing a link to the IPHC survey inquiring about their customers' fishing preferences. How to reach private anglers partaking in unguided fishing was not researched at this time.

Suggested extensions beyond the 2-year time frame

Expanding the static SAM model to a computable general equilibrium model

Relaxing the assumption of fixed technical coefficients by specifying these coefficients econometrically as a function of relative prices of inputs is one of the most compelling extensions to the static IO or SAM models. Such models, generally referred to as computable general equilibrium (CGE) models, require however extensive research to develop credible functional relationships between prices and consumption that would guide economic agents' behavior in the model.

The CGE approach is a preferred way forward when expanding the model usability and considering applying it in conjunction with the Pacific halibut management strategy evaluation (IPHC, 2020b). The dynamic model is well suited to analyze the impact of a broad suite of policies or external factors that would affect the stock over time.

[9] IPHC has access to fish ticket data for Alaska through eLandings portal (https://elandings.alaska.gov/).

Improving the granularity of the SAM model

As mentioned earlier, extending the proposed SAM model by disaggregating currently proposed regions into smaller components would require significant investment in identifying the economic relationships between sectors within each broader-defined region.

However, a good understanding of localized effects could be beneficial to policymakers that are often concerned about community impacts. Fisheries policies have a long history of disproportionally hurting smaller communities, often because potential adverse effects were not sufficiently assessed.

RECOMMENDATIONS

That the Commission:

1) **NOTE** paper IPHC-2020-IM096-14 which provides the Commission with an update on the IPHC economic study, including progress on the development of the economic impact assessment model, state of the collection of primary economic data from Pacific halibut dependent sectors and plan for the year ahead;
2) **NOTE** that the accuracy of economic impact assessment of the Pacific halibut resource depends on broader stakeholders' active participation in developing the necessary data for analysis;
3) **NOTE** that increasing the resolution of the assessed economic impacts is conditional on cooperation between Contracting Parties and the IPHC on economic data exchange.

ACKNOWLEDGMENTS

The IPHC Fisheries Policy and Economics Branch would like to thank all those who participated to date in the commercial sector survey, as well as the member of the focus group advising on the content of the charter sector survey.

LITERATURE

ADFG (2020) *Alaska Sport Fishing Survey database*, *Alaska Department of Fish and Game, Division of Sport Fish*. Available at: http://www.adfg.alaska.gov/sf/sportfishingsurvey.

AgriService BC (2018) *British Columbia Seafood Processing Employment 2014*.

AK DLWD (2020) *Statewide Data: Fishing and Seafood Industry Data*, *Department of Labor and Workforce Development*. Available at: https://live.laborstats.alaska.gov/seafood/seafoodstatewide.cfm.

AKFIN (2020) *Alaska Fisheries Information Network (AKFIN) APEX reporting system*, *Alaska Fisheries Information Network*. Available at: https://reports.psmfc.org/akfin/f?p=501.

BEA (2020) *Input-Output Accounts Data*, *Bureau of Economic Analysis*. Available at: https://www.bea.gov/industry/input-output-accounts-data.

Carothers, C., Lew, D. K. and Sepez, J. (2010) ‘Fishing rights and small communities: Alaska halibut IFQ transfer patterns’, *Ocean and Coastal Management*, 53(9), pp. 518–523. doi: 10.1016/j.ocecoaman.2010.04.014.

Cheung, W. W. L. and Frölicher, T. L. (2020) 'Marine heatwaves exacerbate climate change impacts for fisheries in the northeast Pacific', *Scientific Reports*, 10(1), pp. 1–10. doi: 10.1038/s41598-020-63650-z.

COAR (2020) *Commercial Fishing Reporting*, *Commercial Operator's Annual Reports*. Available at: https://www.adfg.alaska.gov/index.cfm?adfg=fishlicense.coar.

DFO (2020) *Seafisheries Landings*, *Fisheries and Oceans Canada*. Available at: https://www.dfo-mpo.gc.ca/stats/commercial/sea-maritimes-eng.htm.

Ess, C. (2020) 'Restaurant closings , depressed Japan market push halibut , blackcod prices down', *National Fisherman*.

Estus, J. (2020) 'COVID spikes at Alaska sh processing plants raise alarm', *Indian Country Today*.

IPHC (2020a) *2020 Pacific Halibut Landings*, *International Pacific Halibut Commission*. Available at: https://www.iphc.int/data/landings-2020.

IPHC (2020b) *Management Strategy Evaluation*, *International Pacific Halibut Commission*. Available at: https://www.iphc.int/management/science-and-research/management-strategy-evaluation.

Krakow, M. (2020) '56 workers at Anchorage seafood plant test positive for COVID-19', *Anchorage Daily News*.

Leonard, J. and Watson, P. (2011) 'Description of the Input-Output model for Pacific Coast fisheries', *NOAA Technical Memorandum NMFS-NWFSC*, 111(April).

Miller, R. E. and Blair, P. D. (2009) *Input-Output Analysis: Foundations and Extensions*. Cambridge: Cambridge University Press. doi: DOI: 10.1017/CBO9780511626982.

NOAA (2020a) *Annual commercial landing statistics*. Available at: https://foss.nmfs.noaa.gov/apexfoss/f?p=215.

NOAA (2020b) *Foreign Trade*, *NOAA Fisheries*. Available at: https://www.st.nmfs.noaa.gov/apex/f?p=213:3.

OECD (2020) 'Fisheries, aquaculture and COVID-19: Issues and Policy Responses', *Tackling Coronavirus (Covid-19)*.

RecFIN (2020) *Pacific Recreational Fisheries Information Network (RecFIN) APEX reporting system*, *Recreational Fisheries Information Network*. Available at: https://reports.psmfc.org/recfin/f?p=601.

Ross, I. (2020) *For Alaska's seafood processors, the COVID-19 pandemic has cost tens of millions of dollars*, *KDLG*.

Sapin, R. and Fiorillo, J. (2020) 'Seafood processors pay a steep price to keep workers safe from coronavirus', *IntraFish*. Available at: https://www.intrafish.com/processing/seafood-processors-pay-a-steep-price-to-keep-workers-safe-from-coronavirus/2-1-852502.

Seung, C. K., Waters, E. and Taylor, M. L. (2019) 'Developing a Multi-Regional Social Accounting Matrix (MRSAM) for Southwest Alaska Fisheries', *NOAA Technical Memorandum NMFS-AFSC*, 399.

Statistics Canada (2020a) *Canadian International Merchandise Trade Database*. Available at:

https://www5.statcan.gc.ca/cimt-cicm/home-accueil?lang=eng.

Statistics Canada (2020b) *Supply and Use Tables*. Available at: https://www150.statcan.gc.ca/n1/en/catalogue/15-602-X.

Statistics Canada (2020c) *Table 14-10-0023-01 Labour force characteristics by industry, annual*. Available at: https://doi.org/10.25318/1410002301-eng.

Steinback, S. R. and Thunberg, E. M. (2006) 'Northeast Region Commercial Fishing Input-Output Model', *NOAA Technical Memorandum NMFS-NE*, 188.

Stremple, C. (2020) 'Local fish put Haines residents to work despite COVID-19 economic slump', *KHNS*.

Szymkowiak, M., Kasperski, S. and Lew, D. K. (2019) 'Identifying community risk factors for quota share loss', *Ocean and Coastal Management*, 178, p. 104851. doi: 10.1016/j.ocecoaman.2019.104851.

Temursho, U., Oosterhaven, J. and Alejandro, M. (2019) 'A multiregional generalized RAS updating technique', *IOpedia Research Paper Series*.

Timmer, M. P. *et al.* (2015) 'An Illustrated User Guide to the World Input–Output Database: the Case of Global Automotive Production', *Review of International Economics*, 23, pp. 575–605. Available at: http://www.wiod.org/database/wiots16.

US Census (2020a) *Annual Survey of Manufactures*, *United States Census Bureau*. Available at: https://www.census.gov/programs-surveys/asm.html.

US Census (2020b) *USA Trade® Online*. Available at: https://usatrade.census.gov/.

Welch, L. (2020) 'Alaska Seafood Processors Get Clobbered by COVID Costs', *Alaska Fish Radio*.

INTERNATIONAL PACIFIC

HALIBUT COMMISSION

Pacific halibut multiregional economic impact assessment

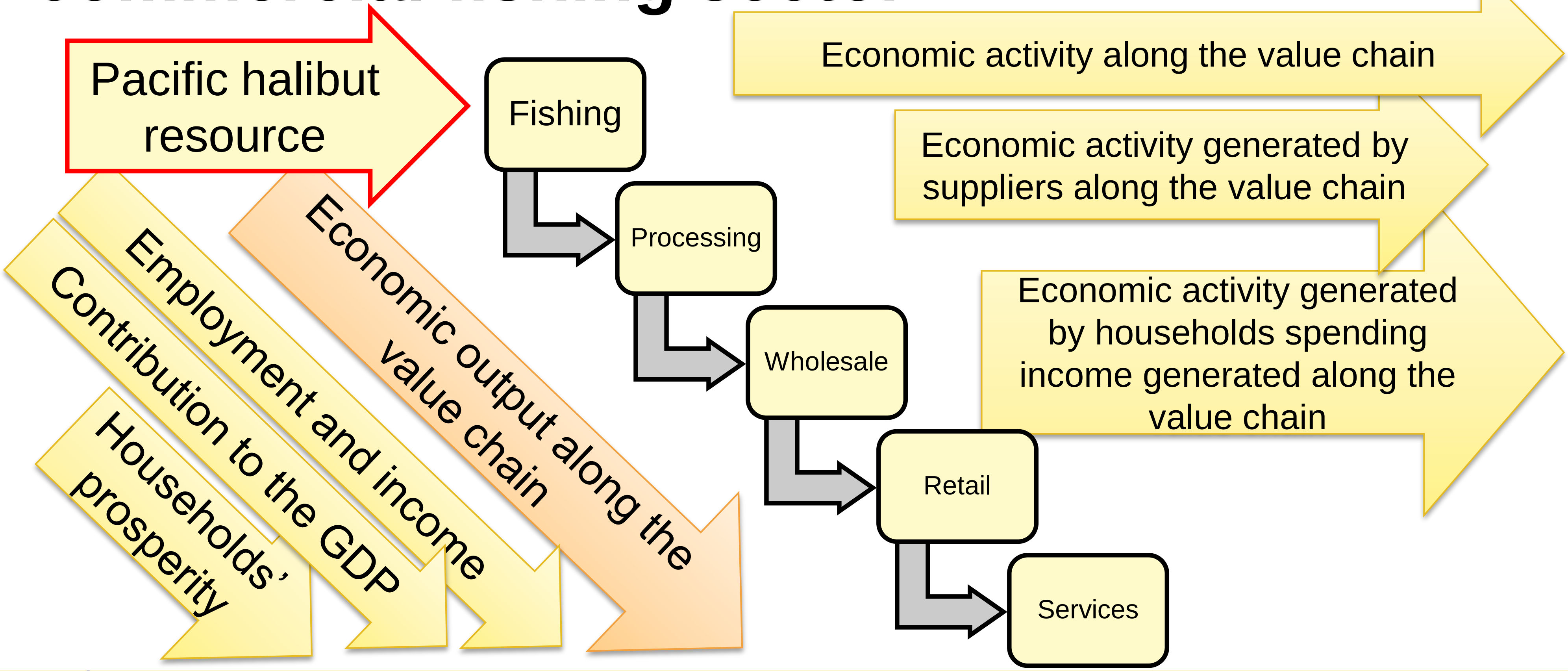
Agenda Item 12

IPHC-2020-IM096-14

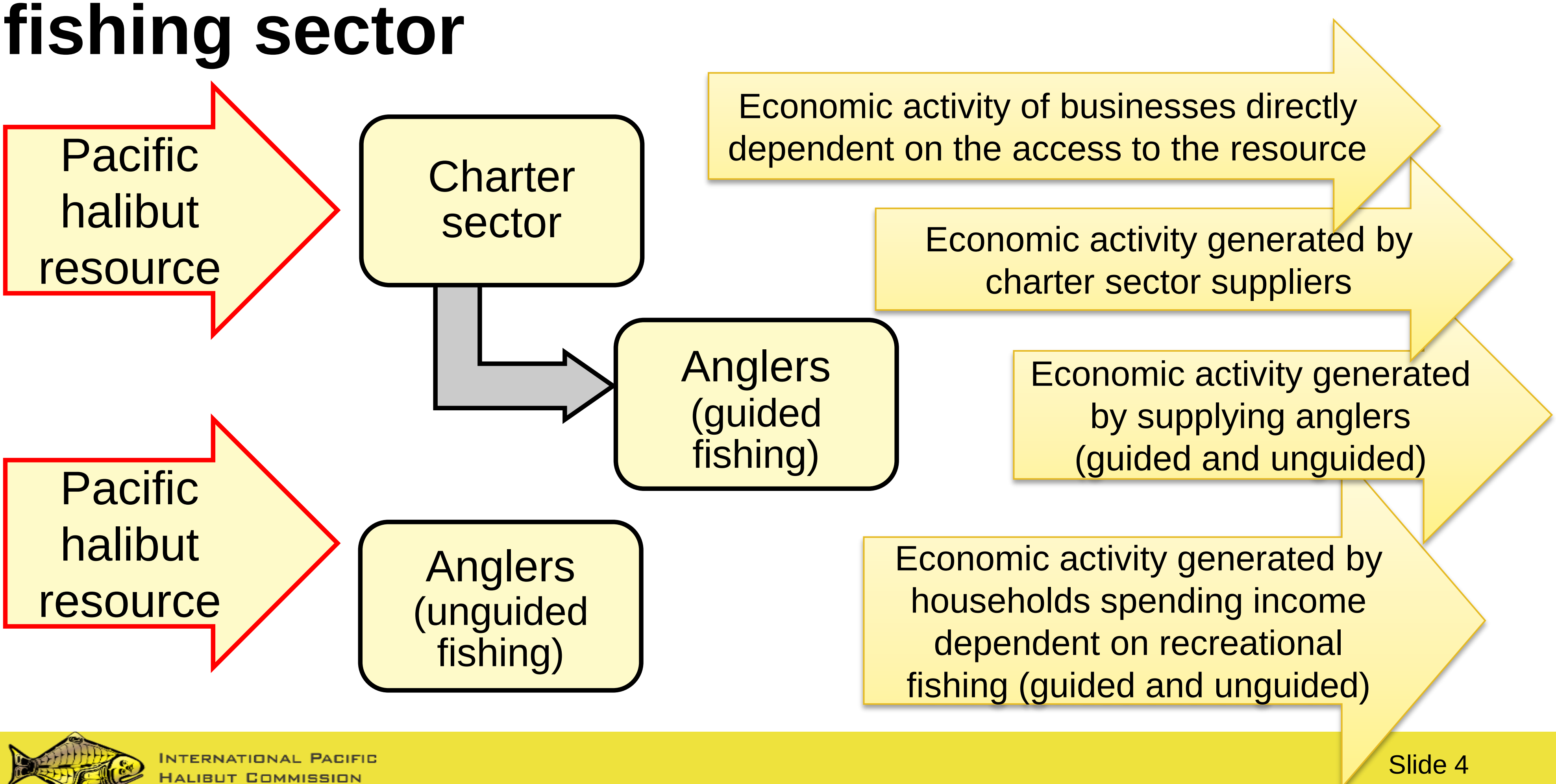
Outline

- Economic impacts
  - Commercial fishing
  - Recreational fishing
- Model setup
- IPHC data collection
- Preliminary results
- Conclusions

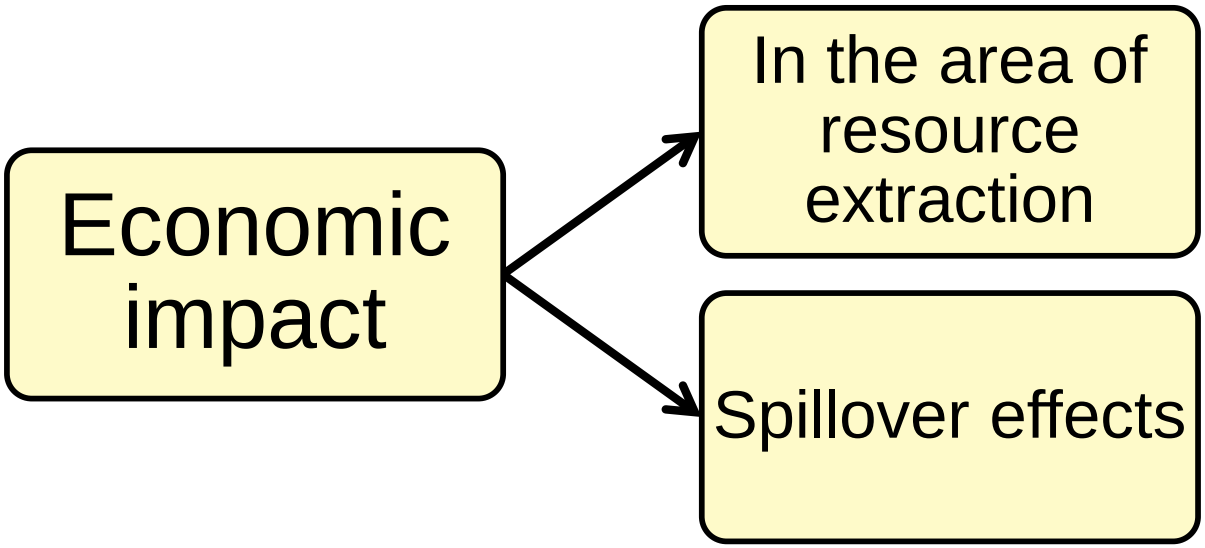
Economic impact of Pacific halibut commercial fishing sector



Economic impact of Pacific halibut sport fishing sector



Multiregional effects



- Monetary flows related to inputs to production
- Monetary flows related to final consumption
- Wages earned by residents vs. non-residents
- Profit from quota owned by residents vs. non-residents

Economic impact (EI) metrics

- **Direct EIs**
- **Indirect EIs**
- **Induced EIs**

Regions

- Alaska (AK)
- West Coast (WC –WA, OR and CA)
- British Columbia (BC)
- Rest of the US (RUS)
- Rest of Canada (ROC)
- Rest of the world (ROW)

Primary data collection

Secondary data use vs. collecting primary data

The surveys :

- Commercial Vessel Expenditures Survey (revised)
- Processing Plant Expenditures Survey (revised, simplified)
  (for land-based processing plants)
- Charter Sector Expenditures Survey (new!)

Covid-19 impact on primary data collection

Benefits of filling for:

2019 – pre-COVID-19, baseline year, suitable to draw conclusions under normal circumstances

2020 – abnormal year, assessment of incurred losses and sectors’ resilience

2021 – post-crisis, path to recovery

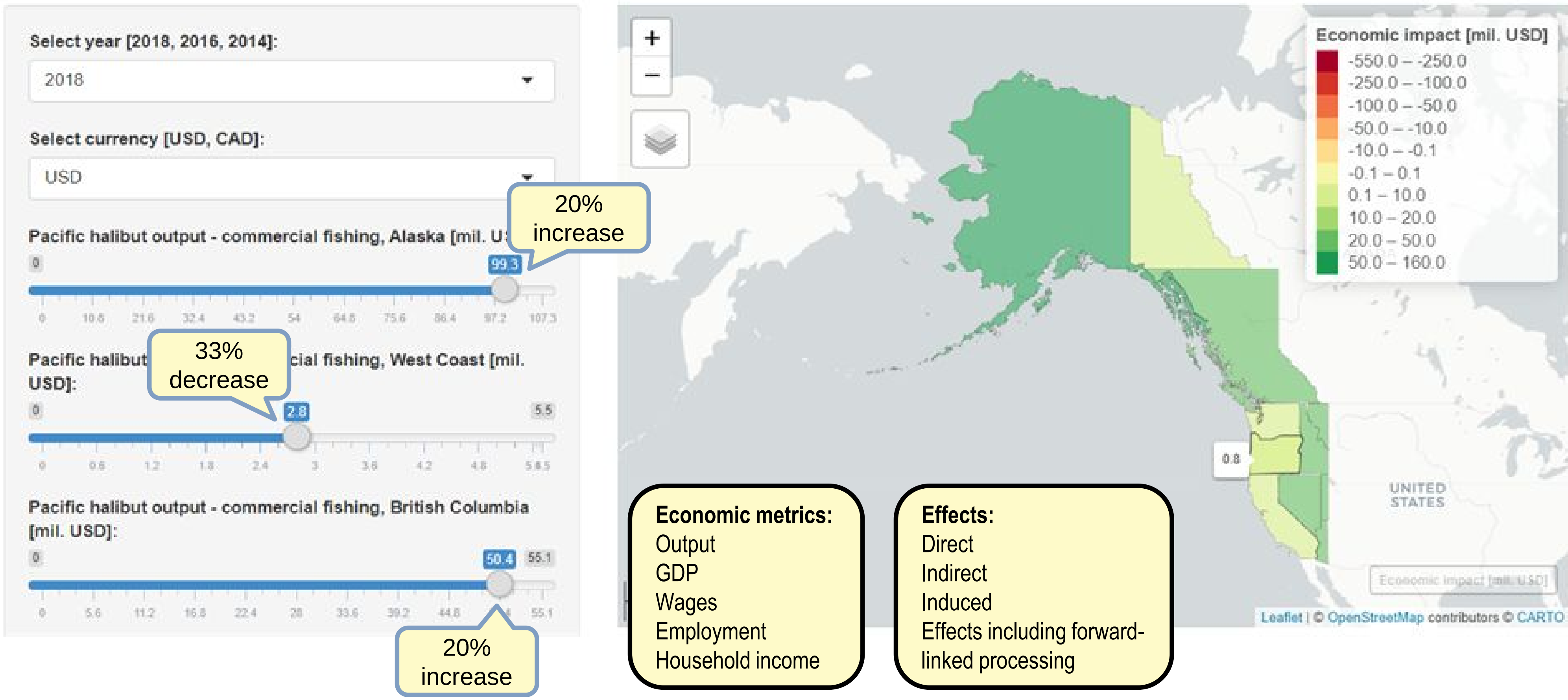
Preliminary results for commercial sector

Value of landings	**USD 129 mil. / CAD 167 mil.**
Economic impact - output	USD 610 mil. / CAD 790 mil
Economic impact – contribution to the GDP	USD 243 mil. / CAD 316 mil.
Economic impact – wages	USD 124 mil. / CAD 160 mil.
Economic impact - employment	4,169 jobs
Household income	USD 130 mil / CAD 168 mil.

[web-based tool]

Map of the economic impact of Pacific halibut resources

Preliminary results, more detials in IPHC-2020-IM096-14



Conclusions

- Comprehensive understanding of the impact of the Pacific halibut resource
- Accounts for transboundary flows of benefits

- The results suggest that the revenue generated by Pacific halibut at the harvest stage accounts for only a fraction of economic activity that would be forgone if the resource was not available to fishers

Way forward:

- Inclusion of the recreational sector
- Incorporation of IPHC-collected data (waiting for sufficient number of responses to the surveys)
- Increasing spatial resolution of the assessment (data-dependent)
- Impact of COVID-19 on the assessed values

Other activities

- Benefits of in-house economic expertise available
  - o economist perspective on regulatory proposals
  - o input to requested analysis (e.g. size limits analysis - IPHC-2020-IM096-09)
  - o input to MSE work

Contact information

Questions or comments?

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INTERNATIONAL PACIFIC

HALIBUT COMMISSION

FY2021 Budget modifications

PREPARED BY: IPHC SECRETARIAT (D. WILSON, K. JERNIGAN, 19 & 21 OCTOBER 2020 & 6 NOVEMBER 2020)

PURPOSE

To provide the Commission with the new Chart of Accounts and reallocated FY2021 budget.

BACKGROUND

Chart of Accounts: The new accounting software, Aplos, went live on 15 June 2020 after several months of evaluating options to best meet organizational needs. We immediately began the development and population with FY2020 budgets, expenses and income received for FY2020. The subscription based software allows for organizations perform fund accounting. Fund accounting provides transparency while separating the accounting of financial transactions by fund. It also allows for the management of grant or fund restrictions and for each fund to have a self-balanced set of accounts. This is especially important when managing and keeping IPHC Fishery-Independent Setline Survey (FISS) accounting separate from our general operations funded through Contracting Party contributions. Aplos also provides functionality for managing multi-year budgets and reviewing and updating our Chart of Accounts. This functionality was not previously available with the IPHC implementation of Microsoft GP 2015. Professional services were initially acquired from Aplos to assist with system setup and bookkeeping services.

Reallocation for FY2021 budget lines: Recalling that the current IPHC Financial Regulations (2020), Regulation 5 – Budget, Para. 10, states that:

> "*The Executive Director may, in any fiscal year, reallocate funds in an amount not exceeding 5% of total income between budget expense categories within the current fiscal year's approved budget. The Chairperson of the Commission may, in any fiscal year, authorize the Executive Director to reallocate funds in an amount exceeding 5% to meet mission needs.*"

Recalling that at the 96th Session of the IPHC Finance and Administration Committee (FAC096) (IPHC-2020-FAC096-R):

> Para. 25. *The FAC **NOTED** that the General Fund budget for FY2021 included US$372,063 in expenses above the projected income for the fiscal year. The aim was to reduce the aggregate carryover for the General Fund and Supplemental Fund to at or around $1,000,000. As that level was reached one year ahead of schedule (end FY2019) due to low FISS fish sales in FY2019, the IPHC Secretariat is undertaking a process of budget rationalisation for FY2021 and will aim to ensure expenses are no more than projected income.*
>
> Para 28. *The FAC **RECOMMENDED** the Commission adopt the FY2021 budget (financial period: 1 October 2020 to 30 September 2021) (Appendix V), noting that the IPHC*

Secretariat has balanced the General Fund expenses against income, rather than the previously planned loss in the General Fund to draw down carry-over.

DISCUSSION

Throughout FY2020, the IPHC Secretariat has undertaken an extensive review and reformation of the IPHC accounting system. In doing so, we have also revised the IPHC Chart of Accounts. This has subsequently required a reallocation of the approved budget line items, to newly named or allocated budget lines.

Provided at Appendix I is a table of the new IPHC Chart of Accounts (at the group and account level), and the allocation of the previously approved FY2021 budget into the new Chart of Accounts, in accordance with Regulation 2, para 10 of the IPHC Financial Regulations (2020). As none of the reallocations exceed the 5% maximum permitted under Regulation 5, para. 10, this new budget allocation is provided for transparency, accountability, and future reporting purposes.

Provided at Appendix II is the budget and account lines approved at the 96th Session of the IPHC Annual Meeting (AM096).

RECOMMENDATION/S

That the Commission:

1) **NOTE** paper IPHC-2020-IM096-15 which provides the Commission with the new IPHC Chart of Accounts and reallocated FY2021 budget.
2) **ADOPTED** the revised FY2021 budget (financial period: 1 October 2020 to 30 September 2021) as provided at Appendix I, noting that there is no change in the Contracting Party contributions for FY2021.

APPENDICES

Appendix I: IPHC Chart of Accounts and reallocated FY2021 budget.

Appendix II: IPHC FY2021 budget approved at AM096.

APPENDIX I
FY2021 IPHC CHART OF ACCOUNTS AND REALLOCATED FY2021 BUDGET

Account Number	Account Name	FY2021 modified budget (Fund Accounting)	FY2021 modified budget (FISS)
Income			
Income			
40000	**Contracting Party Contributions**		
40000.01	Canada	900,407	
40000.02	United States of America	4,157,760	
40050	**IFC Pension**		
40050.01	IFC Pension - Canada	111,250	
40050.02	IFC Pension - United States of America	139,424	
40055	**Headquarters** (Lease & Maintenance)	470,717	
40060	Other Income		0
40100	Grants, Contracts & Agreements	562,227	46,400
40200	Interest Income	0	11,000
40350	Fish Sales		
40350.01	Fish Sales - Pacific Halibut		5,210,500
40350.02	Fish Sales - Byproduct		56,000
	Total Income	**6,341,785**	**5,323,900**
Expense			
Personnel Expenses			
50000	Salaries & Wages	3,587,417	455,795
50100	Benefits	1,538,178	14,131
50100.09	Medical Reimbursement - Retiree	97,350	
50200	Training & Education	25,000	52,000
50300	Personnel Related Expenses	10,000	34,644
50300.01	Scholarship Awards	8,000	
	Total Personnel Expenses	5,265,945	556,570
Operational Expenses			
51000	Publications	15,000	
51100	Mailing and Shipping	15,000	76,000
51200	Travel	100,000	111,920
51300	Meeting and Conference Expenses	104,000	
51400	Technology	150,000	
	Total Operational Expenses	384,000	187,920

<u>Fees and Contract Expenses</u>			
52000	Professional Fees	134,750	
52100	Vessel Expenses		
52200	Other Fees and Charges		562,824
52300	Leases and Contracts	374,773	2,312,754
54000	Communications	17,000	82,650
	Total Fees and Contract Expenses	526,523	2,958,228
<u>Facilities and Equipment Expenses</u>			
53000	Equipment Expense	51,010	32,400
53100	Supplies Expense	146,583	889,505
53200	Maintenance and Utilities	161,421	40,000
53300	Facility Rentals	395,580	20,000
	Total Facilities and Equipment Expenses	754,594	981,905
<u>Other Expenses</u>			
55000	Budget Contingency	50,000	
55100	Other Expenses		
55200	Fund Cost Recovery	-639,277	639,277
	Total Other Expenses	-589,277	639,277
	Total Expense	**6,341,785**	**5,323,900**
	Net Income (Loss)	**0**	**0**

APPENDIX II
IPHC FY2021 BUDGET APPROVED AT AM096

Extracts from the Report of the 96th Session of the IPHC Annual Meeting (AM096)

13.4 Budget estimates: FY2021 (for approval); FY2022 (for information)

FY2021

127. The Commission **RECALLED** that subsequent to the Commission approving an annual budget, with associated Contracting Party contributions, the Contracting Parties go through an internal process of review and appropriation. Should an appropriation be lower than the Commission approved budget, an intersessional meeting would need to be held to agree on in-year budget reductions to match the contributions received.

128. The Commission **ADOPTED** Contracting Party contributions for FY2021 as follows:
    a) Canadian Contribution – US$1,011,657 (US$900,407 for contributions to the General Fund, and US$111,250 to cover pension deficit payments, noting that the pension fund will be valued in April of 2020 and may result in a variation of the deficit payment required by Canada);
    b) U.S.A. Contribution – US$4,767,901 (US$4,157,760 for contributions to the General Fund; US$139,424 to cover pension deficit payments (noting that the pension fund will be valued in April of 2020 and may result in a variation of the deficit payment required by USA), and US$470,717 to cover the headquarters building lease (US$370,798) and maintenance (US$99,919) costs.

129. The Commission **ADOPTED** the FY2021 budget (financial period: 1 October 2020 to 30 September 2021) (Appendix VI).

130. The Commission **NOTED** that the IPHC Headquarters Lease is currently being renewed for the period 1 Oct 2020 to 30 September 2025. The draft was received in-session and provided to the Commission for information. The new lease represents a significant increase from the previous lease (~50%) for the first year, and continues to increase incrementally for each of the 4 subsequent years. The IPHC Secretariat will commence investigations into potential options to move the Headquarters and keep the Commission informed consistent with the provisions of the Northern Pacific Halibut Act of 1982.

APPENDIX VI
FY2021 PROPOSED BUDGET
(1 Oct. 2020 to 30 Sept. 2021)

General Fund

Income			Expenses	
Contributions			**Core IPHC Activities**	
United States of America	$4,767,960	[1,2]	Administration	$2,402,610
Canada	$1,011,657	[1]	Scientific	$3,427,938
			Catch Sampling	$646,945
Other Income			**Research Activities**	
Grants & Contracts	$478,599		Field Research	$0
Interest Income	$5,000		Other Research	$425,000
Misc. Income	$0			
			FISS Program Cost Recovery	($639,277)

General Fund Total	$6,263,216	*General Fund Total*	$6,263,216
General Fund - Gain/Loss	***($0)***	***Year-end Carryover***	***$434,954***

Supplemental Fund

Income		***Expenses***	
Fish Sales Income		**FISS Expenses**	
FISS Program	$5,010,798	FISS Program	$4,608,624
Other Research	$46,400	FISS Program Cost Recovery	$639,277
Other Income			
Interest	$1,125		
Rollover from Reserve Account	$25,000		
Supplemental Fund Total	$5,083,323	*Supplemental Fund Total*	$5,247,901
Supplemental Fund - Gain/Loss	***$164,579***	***Year-end Carryover***	***$451,858***

Combined General/Supplemental Funds

Combined Gain/Loss	***($164,579)***	***Year-end Combined Balance***	***$886,812***

Notes: [1] - Includes Pension Funding Payment.
[2] - Includes Headquarters Lease and Building Maintenance Payments.

INTERNATIONAL PACIFIC

HALIBUT COMMISSION

FY2021 Budget modifications

Agenda item 13.1

IPHC-2020-IM096-15

Quick Summary

- FY2021 Approved Budget Review
- Updating our Chart of Accounts (CoA)
  - A transition to new accounting software
- Reallocation of FY2021 budget lines
  - Updating the budget to align with a new GL
- Cash Flow for FY2020
  - Working capital and contributions from Contracting parties
- FY2020 Financials preview
  - FY2020 Balance Sheet Preview
  - FY2020 Consolidated Income Statement
- FY2021 Reallocated Budget Summary

FY2021 Approved Budget

General Fund

Income		Expenses	
Contributions		**Core IPHC Activities**	
United States of America	$4,767,960 [1,2]	Administration	$2,402,610
Canada	$1,011,657 [1]	Scientific	$3,427,938
		Catch Sampling	$646,945
Other Income		**Research Activities**	
Grants & Contracts	$478,599	Field Research	$0
Interest Income	$5,000	Other Research	$425,000
Misc. Income	$0		
		FISS Program Cost Recovery	($639,277)
General Fund Total	$6,263,216	*General Fund Total*	$6,263,216
General Fund - Gain/Loss	***($0)***	***Year-end Carryover***	***$434,954***

Supplemental Fund

Income		Expenses	
Fish Sales Income		**FISS Expenses**	
FISS Program	$5,010,798	FISS Program	$4,608,624
Other Research	$46,400	FISS Program Cost Recovery	$639,277
Other Income			
Interest	$1,125		
Rollover from Reserve Account	$25,000		
Supplemental Fund Total	$5,083,323	*Supplemental Fund Total*	$5,247,901
Supplemental Fund - Gain/Loss	***$164,579***	***Year-end Carryover***	***$451,858***

Updated Chart of Accounts (CoA)

Legacy	Updated
Personnel	**Personnel Expenses**
Related Expenses	Salaries & Wages
Salaries	Taxes
Benefits	Other & Contracted
Taxes	Benefits
Other	Medical Reimbursement - R
Contracted	Training & Education
	Personnel Related Expenses
	Scholarship Awards
Programs	**Operational Expenses**
Meetings	Publications
Travel	Mailing and Shipping
Communications	Travel
Publications	Meeting and Conference Expenses
	Technology

Legacy	Updated
Administration	**Fees and Contract Expenses**
Contracts	Professional Fees
Maintenance	Vessel Expenses
Facility Rentals	Other Fees and Charges
Training & Education	Leases and Contracts
Fees	Communications
Contingencies	
Supplies & Equipment	**Facilities and Equipment Expenses**
Equipment	Equipment Expense
Supplies	Supplies Expense
	Maintenance and Utilities
	Facility Rentals
	Other Expenses
	Budget Contingency
	Other Expenses
	Fund Cost Recovery

Reallocation of budget lines (Income)

Income

Fund Accounting (10-General, 30-Statistics, 20-Research, 50-Reserve)
Fishery Independent Setline Survey (40- FISS)

Account Number	Account Name	FY2021 Budget (Fund Accounting)	AM096 Legacy CoA	Difference	FY2021 modified budget (FISS)	AM096 Legacy CoA	Difference
<u>Income</u>							
40000	Contracting Party Contributions						
40000.01	Canada	900,407.00	1,011,657.00				
40000.02	United States of America	4,157,760.00	4,767,960.00				
40050	IFC Pension						
40050.01	IFC Pension - Canada	111,250.00					
40050.02	IFC Pension - United States of America	139,424.00					
40055	Headquarters (Lease & Maintenance)	470,717.00					
40060	Other Income					25,000.00	
40100	Grants, Contracts & Agreements	562,227.00	478,599.00		46,400.00	46,400.00	
40200	Interest Income	0.00	5,000.00		11,000.00	1,125.00	
40350	Fish Sales						
40350.01	Fish Sales - Pacific Halibut				5,210,500.00	5,010,798.00	
40350.02	Fish Sales - Byproduct				56,000.00		
Total Income		**6,341,785.00**	**6,263,216.00**	**78,569.00**	**5,323,900.00**	**5,083,323.00**	**240,577.00**

Reallocation of budget lines (Income)

General Fund

Income

Contributions	
United States of America	$4,767,960
Canada	$1,011,657
Other Income	
Grants & Contracts	$478,599
Interest Income	$5,000
Misc. Income	$0
General Fund Total	$6,263,216
General Fund - Gain/Loss	***($0)***

FY2021 Budget (Fund Accounting)	AM096 Legacy CoA	Difference
6,341,785.00	6,263,216.00	78,569.00

Supplemental Fund

Income

Fish Sales Income	
FISS Program	$5,010,798
Other Research	$46,400
Other Income	
Interest	$1,125
Rollover from Reserve Account	$25,000
Supplemental Fund Total	$5,083,323
Supplemental Fund - Gain/Loss	***$164,579***

FY2021 modified budget (FISS)	AM096 Legacy CoA	Difference
5,323,900.00	5,083,323.00	240,577.00

Reallocation of budget lines (Expenses)

Expenses

Fund Accounting (10-General, 30-Statistics, 20-Research, 50-Reserve)
Fishery Independent Setline Survey (40- FISS)

Account Number	Account Name	FY2021 Budget (Fund Accounting)	AM096 Legacy CoA	Difference	FY2021 modified budget (FISS)	AM096 Legacy CoA	Difference
Expense							
50000	Personnel	5,265,945.00	5,291,650.00	-25,705.00	556,570.00	556,570.00	
51000	Operations	384,000.00	388,700.00	-4,700.00	187,920.00	111,920.00	76,000.00
52000	Fees & Contracts	526,523.00	403,559.00	122,964.00	2,958,228.00	2,958,228.00	
53000	Facilities and Equipment	754,594.00	731,399.00	23,195.00	981,905.00	981,905.00	
55000	Other	-589,277.00	-552,092.00	-37,185.00	639,277.00	639,277.00	0.00
Total Expense		**6,341,785.00**	**6,263,216.00**	**78,569.00**	**5,323,900.00**	**5,247,900.00**	**76,000.00**
Net Income (Loss)		**0.00**	**0.00**	**0.00**	**0.00**	**164,577.00**	**-164,577.00**

Reallocation of budget lines (Expenses)

Expenses

Core IPHC Activities	
Administration	$2,402,610
Scientific	$3,427,938
Catch Sampling	$646,945
Research Activities	
Field Research	$0
Other Research	$425,000
FISS Program Cost Recovery	($639,277)
General Fund Total	$6,263,216
Year-end Carryover	***$434,954***

FY2021 Budget (Fund Accounting)	AM096 Legacy CoA	Difference
5,265,945.00	5,291,650.00	-25,705.00
384,000.00	388,700.00	-4,700.00
526,523.00	403,559.00	122,964.00
754,594.00	731,399.00	23,195.00
-589,277.00	-552,092.00	-37,185.00
6,341,785.00	**6,263,216.00**	**78,569.00**

Expenses

FISS Expenses	
FISS Program	$4,608,624
FISS Program Cost Recovery	$639,277
Supplemental Fund Total	$5,247,901

FY2021 modified budget (FISS)	AM096 Legacy CoA	Difference
556,570.00	556,570.00	
187,920.00	111,920.00	76,000.00
2,958,228.00	2,958,228.00	
981,905.00	981,905.00	
639,277.00	639,277.00	0.00
5,323,900.00	**5,247,900.00**	**76,000.00**

Reallocation of budget lines (Expenses)

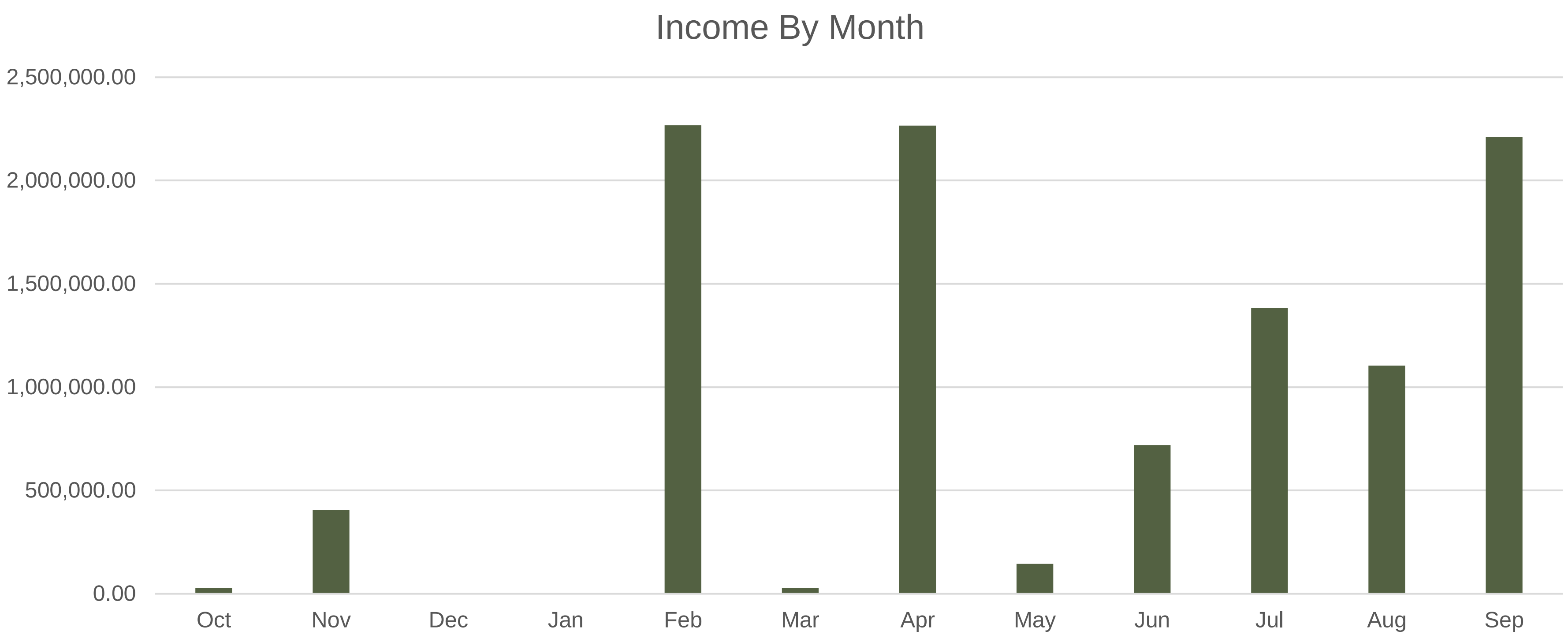
Account Number	Account Name	FY2021 modified budget (Fund Accounting)	AM096 Legacy CoA	Difference	FY2021 modified budget (FISS)	AM096 Legacy CoA	Difference
Personnel Expenses							
50000	Salaries & Wages	3,587,417.00	3,404,663.00		455,795.00	421,547.00	
	Taxes		240,794.00			32,248.00	
	Other & Contracted		25,300.00			36,644.00	
50100	Benefits	1,538,178.00	1,520,313.00		14,131.00	14,131.00	
50100.09	Medical Reimbursement - R	97,350.00					
50200	Training & Education	25,000.00	67,050.00		52,000.00	52,000.00	
50300	Personnel Related Expenses	10,000.00	33,530.00		34,644.00	7,700.00	
50300.01	Scholarship Awards	8,000.00				*-7,700.00*	
Total Personnel Expenses		**5,265,945.00**	**5,291,650.00**	**-25,705.00**	**556,570.00**	**556,570.00**	**0.00**
Operational Expenses							
51000	Publications	15,000.00	37,000.00				
51100	Mailing and Shipping	15,000.00			76,000.00		
51200	Travel	100,000.00	197,200.00		111,920.00	111,920.00	
51300	Meeting and Conference Ex	104,000.00	154,500.00				
51400	Technology	150,000.00					
Total Operational Expenses		**384,000.00**	**388,700.00**	**-4,700.00**	**187,920.00**	**111,920.00**	**76,000.00**

Reallocation of budget lines (Expenses)

Account Number	Account Name	FY2021 modified budget (Fund Accounting)	AM096 Legacy CoA	Difference	FY2021 modified budget (FISS)	AM096 Legacy CoA	Difference
Fees and Contract Expenses							
52000	Professional Fees	134,750.00	40,350.00			562,824.00	
52100	Vessel Expenses						
52200	Other Fees and Charges				562,824.00		
52300	Leases and Contracts	374,773.00	331,162.00		2,312,754.00	2,312,754.00	
54000	Communications	17,000.00	32,047.00		82,650.00	82,650.00	
Total Fees and Contract Expenses		**526,523.00**	**403,559.00**	**122,964.00**	**2,958,228.00**	**2,958,228.00**	**0.00**
Facilities and Equipment Expenses							
53000	Equipment Expense	51,010.00	51,010.00		32,400.00	32,400.00	
53100	Supplies Expense	146,583.00	123,388.00		889,505.00	889,505.00	
53200	Maintenance and Utilities	161,421.00	161,421.00		40,000.00	40,000.00	
53300	Facility Rentals	395,580.00	395,580.00		20,000.00	20,000.00	
Total Facilities and Equipment Expenses		**754,594.00**	**731,399.00**	**23,195.00**	**981,905.00**	**981,905.00**	**0.00**
Other Expenses							
55000	Budget Contingency	50,000.00	87,185.00				
55100	Other Expenses						
55200	Fund Cost Recovery	-639,277.00	-639,277.00		639,277.00	639,277.00	
Total Other Expenses		**-589,277.00**	**-552,092.00**	**-37,185.00**	**639,277.00**	**639,277.00**	**0.00**
Total Expense		**6,341,785.00**	**6,263,216.00**	**78,569.00**	**5,323,900.00**	**5,247,900.00**	**76,000.00**

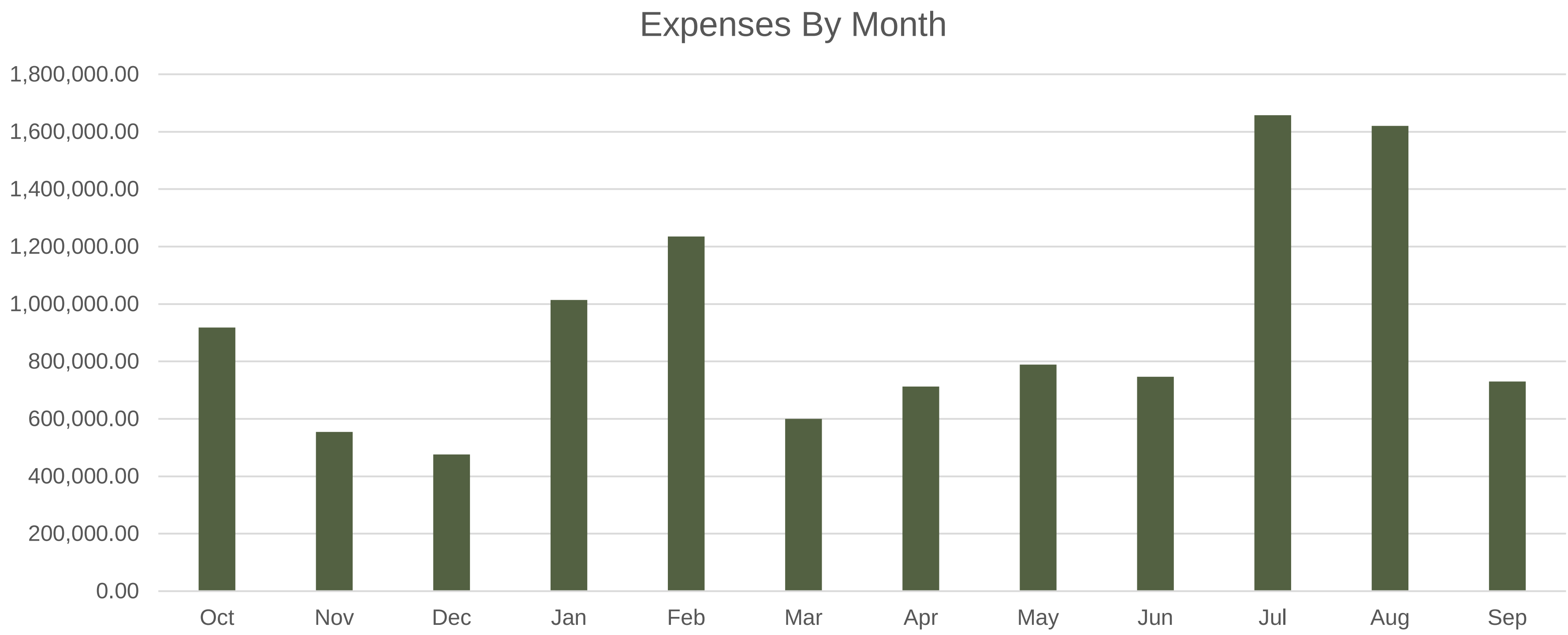
FY2020 Monthly Cash Flow - Income

FY2020



FY2020 Monthly Cash Flow – Expenses

FY2020



FY2020 – Balance Sheet Preview

Account Number	Account Name	10 - General	20 - Research	30 - Statistics	40 - FISS	50 - Reserve	Amount
Assets							
10000	Cash in Bank (Wells Fargo)	$ 2,272,109.16	$ 26,382.71	$ 24,181.73	$ 85,073.04	$ 0.00	$ 2,407,746.64
10200	Investments - Certificate of Deposit	$ 0.00	$ 0.00	$ 0.00	$ 2,837.71	$ 198,508.91	$ 201,346.62
11000	Accounts Receivable	$ 111,250.18	$ 0.00	$ 240.61	$ 304,827.44	$ 0.00	$ 416,318.23
13000	Prepaid Expenses	$ 34,671.99	$ 0.00	$ 0.00	$ 0.00	$ 0.00	$ 34,671.99
14000	Deposits	$ 11,705.86	$ 0.00	$ 1,083.34	$ 0.00	$ 0.00	$ 12,789.20
Total Assets		**$ 2,429,737.19**	**$ 26,382.71**	**$ 25,505.68**	**$ 392,738.19**	**$ 198,508.91**	**$ 3,072,872.68**
Liabilities							
20000	Purchase Card - US Bank	$ 35,341.87	$ 5,241.88	$ 2,761.01	$ 11,327.91	$ 0.00	$ 54,672.67
20100	Travel Card - US Bank	$ (11,925.25)	$ 0.00	$ (256.68)	$ 3,157.28	$ 0.00	$ (9,024.65)
21000	Accounts Payable	$ 33,461.99	$ 26,538.12	$ 17,916.16	$ 41,612.54	$ 0.00	$ 119,528.81
22000	Payroll Tax Liabilities	$ 53,116.68	$ 0.00	$ 3,761.24	$ 2,988.07	$ 0.00	$ 59,865.99
22100	Payroll Benefit Liabilities	$ 917,176.54	$ 0.00	$ 0.00	$ 0.00	$ 0.00	$ 917,176.54
Total Liabilities		**$ 1,027,171.83**	**$ 31,780.00**	**$ 24,181.73**	**$ 59,085.80**	**$ 0.00**	**$ 1,142,219.36**
Equity							
30100	10 - General	$ 1,402,565.36	$ 0.00	$ 0.00	$ 0.00	$ 0.00	$ 1,402,565.36
30200	20 - Research	$ 0.00	$ (5,397.29)	$ 0.00	$ 0.00	$ 0.00	$ (5,397.29)
30300	30 - Statistics	$ 0.00	$ 0.00	$ 1,323.95	$ 0.00	$ 0.00	$ 1,323.95
30400	40 - FISS	$ 0.00	$ 0.00	$ 0.00	$ 333,652.39	$ 0.00	$ 333,652.39
30500	50 - Reserve	$ 0.00	$ 0.00	$ 0.00	$ 0.00	$ 198,508.91	$ 198,508.91
Total Equity		**$ 1,402,565.36**	**$ (5,397.29)**	**$ 1,323.95**	**$ 333,652.39**	**$ 198,508.91**	**$ 1,930,653.32**
Total Liabilities + Total Equity		**$ 2,429,737.19**	**$ 26,382.71**	**$ 25,505.68**	**$ 392,738.19**	**$ 198,508.91**	**$ 3,072,872.68**

FY2020 Income Statement – Preview

Account Number	Account Name	Amount	Annual Budget
Income			
40000	Contracting Party Contributions	$ 4,895,079.53	$ 4,895,085.00
40050	IFC Pension	$ 250,674.00	$ 250,674.00
40055	Headquarters (Lease & Maintenance)	$ 371,673.00	$ 371,673.00
40060	Other Income	$ 26,624.77	$ 10,000.00
40100	Grants, Contracts & Agreements	$ 659,323.36	$ 495,962.00
40200	Interest Income	$ 11,692.09	$ 6,125.00
40350	Fish Sales	$ 4,343,613.23	$ 4,904,582.00
42000	Gain/Loss	$ (704.87)	$ 0.00
Total Income		$ 10,557,975.11	$ 10,934,101.00

FY2020 Income Statement – Preview

Account Number	Account Name	Amount	Annual Budget
Expense			
50000	Salaries & Wages	$ 4,332,877.19	$ 4,179,343.00
50100	Benefits	$ 1,632,611.39	$ 1,573,438.00
50200	Training & Education	$ 37,533.49	$ 119,050.00
50300	Personnel Related Expenses	$ 17,195.20	$ 68,174.00
51000	Publications	$ 31,081.94	$ 37,000.00
51100	Mailing and Shipping	$ 91,247.04	$ 0.00
51200	Travel	$ 114,338.00	$ 309,120.00
51300	Meeting and Conference Expenses	$ 177,527.90	$ 154,500.00
51400	Technology	$ 137,808.48	$ 0.00
52000	Professional Fees	$ 240,164.53	$ 34,750.00
52100	Vessel Expenses	$ 842,208.80	$ 0.00
52200	Other Fees and Charges	$ 193,542.45	$ 552,202.00
52300	Leases and Contracts	$ 2,009,927.58	$ 2,569,956.00
54000	Communications	$ 17,544.74	$ 114,697.00
53000	Equipment Expense	$ 122,173.76	$ 173,410.00
53100	Supplies Expense	$ 641,274.69	$ 1,162,992.00
53200	Maintenance and Utilities	$ 23,893.31	$ 198,510.00
53300	Facility Rentals	$ 384,343.08	$ 319,008.00
55100	Other Expenses	$ 8,114.79	$ 0.00
56444	AR Adjustments	$ 5.17	$ 0.00
Total Expense		$ 11,055,413.53	$ 11,653,375.00
Net Income (Loss)		$ (497,438.42)	$ (719,274.00)

FY2021 Budget (Expenses)

Personnel Expenses		
50000	Salaries & Wages	3,587,417.00
50100	Benefits	1,538,178.00
50100.09	Medical Reimbursement - Retiree	97,350.00
50200	Training & Education	25,000.00
50300	Personnel Related Expenses	10,000.00
50300.01	Scholarship Awards	8,000.00
Operational Expenses		
51000	Publications	15,000.00
51100	Mailing and Shipping	15,000.00
51200	Travel	100,000.00
51300	Meeting and Conference Expenses	104,000.00
51400	Technology	150,000.00
Fees and Contract Expenses		
52000	Professional Fees	134,750.00
52100	Vessel Expenses	
52200	Other Fees and Charges	
52300	Leases and Contracts	374,773.00
54000	Communications	17,000.00
Facilities and Equipment Expenses		
53000	Equipment Expense	51,010.00
53100	Supplies Expense	146,583.00
53200	Maintenance and Utilities	161,421.00
53300	Facility Rentals	395,580.00
Other Expenses		
55000	Budget Contingency	50,000.00
55100	Other Expenses	
55200	Fund Cost Recovery	-639,277.00
	Total Other Expenses	**-589,277.00**
	Total Expense	**6,341,785.00**

FY2021 Budget (Income)

Account Number	Account Name	FY2021 modified budget (Fund Accounting)
Income		
40000	Contracting Party Contributions	
40000.01	Canada	900,407.00
40000.02	United States of America	4,157,760.00
40050	IFC Pension	
40050.01	IFC Pension - Canada	111,250.00
40050.02	IFC Pension - United States of America	139,424.00
40055	Headquarters (Lease & Maintenance)	470,717.00
40060	Other Income	
40100	Grants, Contracts & Agreements	562,227.00
40200	Interest Income	0.00
40350	Fish Sales	
40350.01	Fish Sales - Pacific Halibut	
40350.02	Fish Sales - Byproduct	
	Total Income	**6,341,785.00**
	Total Expense	**6,341,785.00**
	Net Income (Loss)	**0.00**

RECOMMENDATION/S

- That the Commission:
- **NOTE** paper IPHC-2020-IM096-15 which provides the Commission with the new IPHC Chart of Accounts and reallocated FY2021 budget.
- **ADOPTED** the revised FY2021 budget (financial period: 1 October 2020 to 30 September 2021) as provided at Appendix I, noting that there is no change in the Contracting Party contributions for FY2021.

INTERNATIONAL PACIFIC

HALIBUT COMMISSION

DRAFT: IPHC Rules of Procedure (2021)

PREPARED BY: IPHC SECRETARIAT (D. WILSON, 13 OCTOBER 2020)

PURPOSE

To provide the Commission with proposed amendments to the IPHC Rules of Procedure (2020).

BACKGROUND

In accordance with Rule 19, paragraph 1 of the IPHC Rules of Procedure (2020), which states:

"1. *These Rules of Procedure should be reviewed for their consistency and appropriateness at least biennially*.",

At the 7th Special Session of the IPHC (SS07; 20 May 2020), the Commission made the following request of the IPHC Secretariat regarding on the IPHC Rules of Procedure:

IPHC-2020-ID009 Intersessional meeting formats

*"The Commission **REQUESTED** that the IPHC Secretariat prepare draft guidelines for intersessional meetings to compliment those already contained with the IPHC Rules of Procedure (2020), given the potential ongoing COVID-19 impacts."*

DISCUSSION

Provided at Appendix I are proposed revisions to the IPHC Rules of Procedure (2020), which incorporate process and functional amendments intended to further modernise the IPHC's governance procedures for public intersessional meetings of the Commission.

Specifically to Rule 6 (Sessions of the Commission) and Rule 11 (Decision making).

RECOMMENDATION/S

That the Commission:

1) **NOTE** paper IPHC-2020-IM096-16 which proposed amendments to the IPHC Rules of Procedure (2020).

APPENDICES

Appendix I: DRAFT: International Pacific Halibut Commission Rules of Procedure (2021), Rules 6 and 11.

APPENDIX I

Rule 6 – Sessions of the Commission

Regular Sessions

1. The Commission may alternate its regular Sessions of the Annual Meeting and its Interim Meeting between Canada and the United States of America, or via electronic means in exceptional circumstances, and may hold other meetings as it may determine necessary.

~~1.~~2. Meetings of the Commission may be open to Observers and the general public.

~~2.~~3. Meetings of the Commission shall be available via electronic communication means approved by the Commission, unless the Commission otherwise decides.

~~3.~~4. Meetings with representatives of the Pacific halibut fishing industry may be held annually at the seat of the Commission or at any other place that the Commission shall determine, and arrangements for such meetings shall be determined by the Chairperson in consultation with the Executive Director.

~~4.~~5. Invitations to meetings of the Commission shall be prepared by the Executive Director and issued no later than **90 days** in advance of the date fixed for the opening of the Session.

Special Sessions

6. The Commission may hold Special Sessions of the Commission as it may determine necessary, if so requested by at least one third of its Members.
7. Invitations to Special Sessions shall be issued not less than **20 days** in advance of the date fixed for the opening of the Session.
8. Any documents to be discussed at a Special Session of the Commission shall be submitted to the Executive Director no less than **15 days** before the date fixed for the opening of the Special Session, unless otherwise decided by the Commission. Documents received later than 15 days in advance of the Special Session shall be deemed as Information Papers only.
9. Amendments to existing IPHC Fishery Regulations shall be submitted to the Executive Director no less than **15 days** before the date fixed for the opening of the Special Session at which they are to be considered. The Executive Director shall make the proposals available on the public access area of the IPHC website no later than one (1) business day after receipt.
10. The procedures of the Special Session established in accordance with paragraph Rule 6, para 6 shall be governed *mutatis mutandis* by the Rules of Procedure of the Commission.

Rule 11 – Decision making

Decision-making at Sessions of the Commission

1. As a general rule, decision-making in the Commission should be by consensus. For the purposes of these rules, "consensus" means the absence of any formal objection made at the time the decision was taken.

2. If it appears to the Chairperson that all efforts to reach a decision by consensus have been exhausted, decisions will be made in accordance with Article III, paragraph 1 of the Convention.

3. Each Commissioner shall be entitled to one vote, and in accordance with Article III, Paragraph 1 of the Convention, all decisions of the Commission shall be made by a concurring vote of at least two of the Commissioners of each Contracting Party. At meetings, a public vote shall be taken by show of hands or roll call of the Commissioners, whether in person or via electronic communication, on each issue.

Intersessional decision-making

4. In case of the need for adoption of an emergency measure between Sessions, or where a decision needs to be taken intersessionally, the Chairperson may propose that a decision be taken by mail, telephone, or electronic communication.

5. When a decision is to be taken by electronic means, the Executive Director shall transmit the proposed decision to all Commissioners.

6. Commissioners shall promptly acknowledge receipt of any proposed decision by electronic means. If no acknowledgement is received from any particular Commissioner within one week of the date of transmittal, the Executive Director will retransmit the proposed decision, and will use all reasonable means to ensure that it has been received.

7. Members shall have ~~**30**~~ **10 days** to respond, unless a longer period is specified by the Executive Director in the transmittal.

8. If no reply from a Commissioner reaches the Executive Director within the period established under Rule 11.8, that decision shall be deferred to the next session of the Commission.

9. All inter-sessional decisions must be made by consensus.

10. The Executive Director shall promptly ascertain and transmit the decision to all Commissioners via an IPHC Circular. The date of that transmittal shall be the 'date of notification'. Such decisions shall be duly recorded in the Commission's records by the Executive Director. Copies of such decisions shall be published with unique Intersessional Decision (ID) numbering on the IPHC website, via an IPHC Circular.

INTERNATIONAL PACIFIC
HALIBUT COMMISSION

Independent peer review of the IPHC Management Strategy Evaluation process

Agenda Item 8.2

IPHC-2020-IM096-17

Purpose

To provide the Commission with an opportunity to further consider the report of the independent peer review of the IPHC Management Strategy Evaluation process.

Background

At the 96th Session of the IPHC Annual Meeting (AM096) on 7 February 2020, the Commission noted the following:

96th Session of the IPHC Annual Meeting (AM096)

(para. 81) *"The Commission **NOTED** that an independent peer review of the MSE will take place in April 2020 and August 2020 with a report supplied to the SRB, MSAB, and Commission."* Reference paper **IPHC-2020-AM096-INF03**

The IPHC Secretariat undertook an Expression of Interest process and recruited Dr Trevor Branch, Associate Professor, School of Aquatic and Fishery Sciences, University of Washington.

Background

- The IPHC Scientific Review Board (SRB) considered a draft version of the report at its 17th Session from 22-24 September 2020, and provided feedback within the SRB report (IPHC-2020-SRB017-R), and also directly to the peer reviewer immediately following the meeting.
- The final report was published on 25 September 2020, via IPHC Circular 2020-022.
- The report is also available on the Management Strategy Evaluation page of the IPHC website:

https://www.iphc.int/management/science-and-research/management-strategy-evaluation

- The IPHC Management Strategy Advisory Board (MSAB) considered the final report at its 16th Session from 19-22 October 2020 (IPHC-2020-MASB016-R).

MSE Peer reviewer

Dr. Trevor Branch

Associate Professor

School of Aquatic and Fishery Sciences

University of Washington

TERMS OF REFERENCE

My review is intended to provide advice on and contribute to a subset of the following topics, both in terms of peer review and technical contribution:

1) Review the goals and objectives used to evaluate management procedure.
2) Review the IPHC MSE closed-loop simulation framework.
3) Review and advise on the operating model and how it is conditioned to mimic the Pacific halibut population.
4) Review tools and methods used to communicate simulation results for the evaluation of management procedures.
5) Evaluate the process of soliciting objectives from stakeholders and managers and creating performance metrics from those objectives.
6) Assist with developing and defining reference points and management procedures.
7) Advise on methods to communicate results of the simulations, the trade-offs between various management procedures, and the ranking of management procedures.

REVIEW PROCESS

Desktop review components:

Reviewed documents and decisions from recent IPHC meetings (2019-20) including MSAB, SRB, and Commission meetings, including the independent peer review of the IPHC stock assessment, the second performance review of the IPHC, and the main stock assessment and MSE documents.

Direct engagement review components:

I attended the August informational meeting presenting preliminary MSE results to members of the MSAB; conducted a series of informal conversations with a diverse array of MSAB members including the MSE team, scientists, managers, and industry representatives; and presented interim recommendations to the SRB meeting in September for feedback.

SUMMARY FINDINGS

The Management Strategy Evaluation (MSE) of IPHC is intended to simulate test rules for setting allowable catch for Pacific halibut and the allocation of catch and bycatch among IPHC Regulatory Areas.

In my judgment the MSE is technically sound. Furthermore, the MSE team led by Dr. Allan Hicks was praised by all interviewed participants involved in the process for their technical work, collaboration with stakeholders in developing harvest control rules, and communication of results to stakeholders.

The MSE model framework was implemented according to international guidelines and standards for the evaluation of harvest control rules, and comprises a simulated model of truth (the operating model), a simulation of the stock assessment process (estimation model) and a simulation of the catch setting and catch allocation process (the harvest control rule).

SUMMARY FINDINGS

The following issues need to be resolved to ensure the continued success and accuracy of MSE simulations for IPHC:

(1) decide soon on the future of the MSE process beyond January 2021 and allocate necessary funding;

(2) treat the MSE framework as an ongoing process that will be used over many years alongside the stock assessment, to test the effectiveness of data gathering, stock assessment assumptions, and catch-setting in IPHC;

(3) require the Commission to codify the rules they used to adjust catch levels within each Regulatory Area after the harvest control rule is applied, so that the MSE framework accurately evaluates risk to the stock and catches within each such Area.

PRIORITY RECOMMENDATIONS

Recommendation #1. That the Commission plans ahead for the future of the MSE process beyond January 2021, and allocates required funding and personnel accordingly.

Recommendation #2. That the MSE process be treated as an ongoing process that is used each year alongside the stock assessment itself, to test different features of the data gathering, stock assessment, and catch-setting components of Pacific halibut.

Recommendation #3. To analyze the impact of the Commission modifying catch levels in each Regulatory Area after the TCEY recommendation from the harvest control rule. Such analysis should preferably be conducted using the MSE process and be based empirically on past Commission modifications. Since catch-setting is an integral part of the MSE, the MSE framework will be most accurate when it accurately models the decision-making process of the Commission.

ADDITIONAL RECOMMENDATIONS

Recommendation #4. MSAB membership could be expanded to include representatives for crew members, fishing communities, and environmental organizations.

Recommendation #5. Complete the documentation of technical details of the IPHC MSE framework (Hicks et al. 2019), which is currently an incomplete working document. To ensure the methods can be repeated, a full description of the methods used to obtain the results presented in January 2021 should be presented at the same time as the results.

INTERNATIONAL PACIFIC

HALIBUT COMMISSION

Independent peer review of the IPHC Management Strategy Evaluation process

PREPARED BY: IPHC SECRETARIAT (D. WILSON, 13 OCTOBER 2020)

PURPOSE

To provide the Commission with an opportunity to further consider the report of the independent peer review of the IPHC Management Strategy Evaluation process.

BACKGROUND

The Commission directed the IPHC Secretariat via Commission decisions **AM095-Rec.11** to:

> **95th Session of the IPHC Annual Meeting (AM095) – 1 February 2019**
> **AM095–Rec.11 (para. 130)** "*The Commission* ***RECOMMENDED*** *that the IPHC Secretariat finalise terms of reference for an expert/consultant to undertake a peer review of the IPHC Pacific halibut MSE, for implementation in early November 2019 and July 2020. The terms of reference and budget shall be endorsed by the Commission inter-sessionally.*"

At the 95th Session of the IPHC Interim Meeting (IM095) on 25-26 November 2019, the Commission noted the following:

> **95th Session of the IPHC Interim Meeting (IM095)**
> (para. 74) *"The Commission* ***NOTED*** *that an independent peer review of the MSE will take place in April 2020 and August 2020 with a report supplied to the SRB017, MSAB016, and to the Commission before AM0*97."
> (para. 75) "*The Commission* ***NOTED*** *that the SRB will review the MSE process and MSE results in September 2020, and these results including scale and distribution management procedures will be presented to the Commission at AM097 in 2021.*"

At the 96th Session of the IPHC Annual Meeting (AM096) on 7 February 2020, the Commission noted the following:

> **96th Session of the IPHC Annual Meeting (AM096)**
> (para. 81) *"The Commission* ***NOTED*** *that an independent peer review of the MSE will take place in April 2020 and August 2020 with a report supplied to the SRB, MSAB, and Commission."* Reference paper **IPHC-2020-AM096-INF03**

The report by the independent consultant was provided to the Commission on 25 September 2020, via IPHC Circular 2020-22.

DISCUSSION

The report by the independent peer reviewer, Dr Trevor Branch, is attached (**Attachment I**). The report is also be made available on the Management Strategy Evaluation page of the IPHC website for transparency and accountability purposes:

https://www.iphc.int/management/science-and-research/management-strategy-evaluation

The IPHC Scientific Review Board (SRB) considered a draft version of the report at its 17th Session from 22-24 September 2020, and provided feedback within the SRB report (IPHC-2020-SRB017-R), and also directly to the peer reviewer immediately following the meeting.

The IPHC Management Strategy Advisory Board (MSAB) is scheduled to note the peer reviewer's recommendations at its 16th Session scheduled for 19-22 October 2020.

RECOMMENDATION/S

That the Commission **NOTE** paper IPHC-2020-IM096-17 which provided the Commission with an opportunity to further consider the independent peer review of the IPHC Management Strategy Evaluation process.

APPENDICES

Appendix A: Independent peer review of the IPHC Management Strategy Evaluation process (T. Branch)

APPENDIX I

Independent peer review of the 2020 IPHC Management Strategy Evaluation process

Trevor A. Branch
Associate Professor, School of Aquatic and Fishery Sciences, University of Washington
Final report, 24 September 2020

Summary

The management strategy evaluation (MSE) of IPHC is intended to simulation test rules for setting allowable catch for Pacific halibut and the allocation of catch and bycatch among IPHC Regulatory Areas. In my judgment the MSE is technically sound. Furthermore, the MSE team led by Allan Hicks was praised by all interviewed participants involved in the process for their technical work, collaboration with stakeholders in developing harvest control rules, and communication of results to stakeholders. However, the following issues need to be resolved to ensure the continued success and accuracy of MSE simulations for IPHC: (1) decide soon on the future of the MSE process beyond January 2021 and allocate necessary funding; (2) treat the MSE framework as an ongoing process that will be used over many years alongside the stock assessment, to test the effectiveness of data gathering, stock assessment assumptions, and catch-setting in IPHC; (3) require the Commission to codify the rules they used to adjust catch levels within each Regulatory Area after the harvest control rule is applied, so that the MSE framework accurately evaluates risk to the stock and catches within each such Area. Additional discussion, points, and thoughts are presented in full below.

Acronyms and terms used

HCR: harvest control rule
MSAB: management strategy advisory board
MSE: management strategy evaluation
SRB: scientific review board
TCEY: total constant exploitation yield

Background

Development of a management strategy evaluation (MSE) was started in 2013 at the IPHC, but progress has generally been slow until the most recent 2-3 years with the formation of the current MSE team comprising Allan Hicks, Piera Carpi, and Steve Berukoff. A key MSE milestone was the testing of different harvest control rules (HCRs) for setting coastwide allowable catch (Total Constant Exploitation Yield, or TCEY), presented in multiple documents during 2019 and 2020 (e.g. Hicks et al. 2020). This year, the MSE has focused on modeling the allocation of the TCEY among the IPHC Regulatory Areas. Preliminary results were presented at an informational meeting in August, with further results expected at the 22-24 September 2020 session of the Scientific Review Board (SRB) and 19–22 October 2020 meeting of the Management Strategy Advisory Board (MSAB). A final report has been requested by the Commission on MSE development testing rules for allocating the TCEY among IPHC Regulatory Areas for the 97th Annual Meeting of the IPHC in 25–29 January 2021.

Terms of reference

This review is intended to provide advice on and contribute to a subset of the following topics, both in terms of peer review and technical contribution:

1. Review the goals and objectives used to evaluate management procedures
2. Review the IPHC MSE closed-loop simulation framework

3. Review and advise on the operating model and how it is conditioned to mimic the Pacific halibut population
4. Review tools and methods used to communicate simulation results for the evaluation of management procedures.
5. Evaluate the process of soliciting objectives from stakeholders and managers and creating performance metrics from those objectives.
6. Assist with developing and defining reference points and management procedures
7. Advise on methods to communicate results of the simulations, the trade-offs between various management procedures, and the ranking of management procedures.

This report is a succinct written review of the IPHC MSE process, evaluating results, and any other aspects identified, including recommendations for the simulation framework and other aspects of the MSE framework.

Information gathering

In the process of writing this report, I reviewed documents and decisions from recent IPHC meetings (2019-20) including MSAB, SRB, and Commission meetings, including the independent peer review of the IPHC stock assessment, the second performance review of the IPHC, and the main stock assessment and MSE documents. I attended the August informational meeting presenting preliminary MSE results to members of the MSAB; conducted a series of informal conversations with a diverse array of MSAB members including the MSE team, scientists, managers, and industry representatives; and presented interim recommendations to the SRB meeting in September for feedback.

Findings

The MSE model framework was implemented according to international guidelines and standards for the evaluation of harvest control rules (e.g. Butterworth 2007, Plagányi et al. 2007, Punt et al. 2016), and comprises a simulated model of truth (the operating model), a simulation of the stock assessment process (estimation model) and a simulation of the catch setting and catch allocation process (the harvest control rule).

In my review and examination of the model structure and implementation, I did not identify any major technical issues or flaws, although some of the technical documentation of the MSE (Hicks et al. 2019) was incomplete. MSEs are notorious for the long time they take to run, but the IPHC addressed this known bottleneck by coding the operating model in C++ and the estimation model in AD Model Builder, both well known for their speed, by using parallelization, and accessing fast processors. In this way, the MSE simulations could be conducted relatively rapidly and be responsive in addressing topical questions. Statistical software R was used for reporting and visualization, as is standard practice.

The suite of performance metrics covers all aspects usually considered important in other MSEs: ensuring that biomass does not fall below some minimum level; examining spawning biomass relative to a target level; maximizing catches; and limiting catch variability from one year to the next. Additional metrics report the proportion of the total catch taken in each of the Biological Areas or Regulatory Area. Many metrics are computed and reported in addition to the core list, and the suite of performance metrics is comprehensive, was developed with extensive stakeholder input, and meets the needs of the MSE process.

The presentation of the results through reports follows standard practice, although it could additionally use some refinement to ensure that each scenario can be compared in as little space as possible (perhaps on a single page in a dashboard format). The use of the online visualization of results using the R Shiny app is encouraged, as it allows stakeholders to interact more directly with the results and understand the implications of changes to key model parameters, although the Shiny application would achieve broader uptake among stakeholders with more extensive instructional and example materials.

Overall, the science capability of the IPHC MSE team is strong, and trusted by all participants that I spoke to, often resulting in unsolicited comments praising the leadership from Allan Hicks and others on the team. In my experience, grudging acceptance is a more common reaction than open praise, which speaks highly to the work conducted by the MSE team over the last two years, both technically and in ensuring widespread participation and acceptance of the process among stakeholders.

The effectiveness of the Management Strategy Advisory Board is a particularly strong feature of the MSE process at IPHC. Despite diverse representation from multiple sectors, the overwhelming impression I received from interviews and participating in the informational meeting, was that the MSAB members are clearly committed to ensuring the best science possible, are motivated to participate fully, and have in-depth knowledge of the MSE models and the process around the models. It helps that many of the members have been attending meetings for several years, and that the meetings have been regular (twice a year or more often). A key step to ensuring well-functioning MSAB meetings was appointing two co-chairs who are not part of the MSE science team to facilitate discussions, which should be continued. Efforts should however be made to ensure that all sectors are represented in the MSAB, including crew, communities, and NGOs or environmental organizations, to ensure that any management changes arising from the MSE process are accepted by all parties benefiting from the halibut fishery. MSAB members also need time to report back to, and consult with, the stakeholder groups that they represent to ensure that all stakeholders accept decisions coming out of the MSE process.

The current MSE timeline is strict, with a final deadline for the MSE process being set for the January 2021 Annual Meeting of the IPHC. This strict deadline may arise from the long period from 2013 to the present over which the MSE process has developed, although it is only in the past 2-3 years with the expansion of the MSE team that rapid progress has been made. Given the amount of time needed to run the MSEs, and their complexity, I expect that results examining allocation of catches among Regulatory Areas, to be presented in January, will need one more round of modification before being finalized and ready for management implementation. For these reasons, it is likely that recommendations from the MSE process will need to be run in parallel with the current process for setting and allocating catches for 1-2 years, before any new rules replace current rules.

There is considerable uncertainty over the future role of the MSE process in the management of Pacific halibut. Two members of the science team (Carpi, Berukoff) are on short-term contracts, which would need to be extended to retain their expertise, but it was not clear what plans have been made by the Commission for ongoing MSE work beyond January 2021. The Commission needs to clearly delineate the amount of resources to be devoted to MSE work after January 2021 and, if deemed essential, act to retain personnel required to conduct future MSE simulations.

MSE simulations can be used in a wide variety of ways to provide advice useful to management. In some fisheries, the sole aim of MSEs is to identify a harvest control rule (HCR) that will be used to set annual catches in a more-or-less automatic manner: each year, data are collected, an assessment is conducted, and the results are fed into the HCR to set the catch limit for the next year. This automated process is often touted as the most valuable feature of the MSE process: avoiding the annual haggling over catch-setting (e.g. Butterworth 2007). It is key to outline so-called "exceptional circumstances" that would allow managers to change the HCR from the rules tested by the MSE. In other words, the role of the MSE process is to ensure that the HCR is robust, and allows a good balance between sustainability and catches to meet the objectives of the management body. Thus far, this is how the MSE process at IPHC has been conducted, with the exception that the Commission retains the ability to make final adjustments to catch levels and allocations instead of these being set in an automated manner.

Increasingly, however, MSE simulations are being used in much more varied ways than just deciding on a harvest control rule for catch setting. MSEs can be used to assess the impact of changing survey frequency, altered effort on each survey, different frequency of stock assessments, and different structural models of the truth. For example, MSEs can assess whether different migration models will affect long-term sustainability, the impact of bycatch in other fisheries, and whether some Russian catches should be included in the stock assessment. MSEs can evaluate the consequences of making incorrect assumptions in the model about natural mortality, steepness, or trends in weight-at-age. For IPHC-specific problems, MSEs could be used to assess whether four stock assessment models are needed, and if so, how to weight them; whether Bayesian methods would improve management; how to tune the models to fit to age composition data vs. surveys; and the impact of changes in size limits and bycatch management. Finally, MSEs can be used to identify areas of research that should be prioritized by IPHC in the future though a cost-benefit analysis that weighs research cost against the benefits of more precise stock assessments (e.g. Muradian et al. 2019).

Given the potential array of applications of the MSE process, the IPHC should think of MSE as a tool for evaluating the long-term sustainability of Pacific halibut and the fishery under a variety of scenarios, rather than just a tool for deciding on a harvest control rule. In other words, MSE should be treated as an integral part of the assessment and management cycle to better predict long-term consequences of decisions about the stock assessment, data gathering, and management processes. This path is the one followed by the Pacific Hake/Whiting Treaty organization, where every year a different suite of questions are answered by MSE simulations. This requires a stable team and sufficient in-house expertise to ensure that the MSE models can be applied to new questions each year.

One of the trickier aspects of the MSE process in IPHC is the inherent tension between testing harvest control rules, and Commission flexibility in deviating from any specific control rule. One of the core assumptions of MSE is that it captures the key rules used to (1) gather data, (2) conduct an assessment, and (3) set catches (e.g. Punt et al. 2016). Only then can it accurately evaluate the long-term consequences of an entire management system. In other jurisdictions, considerable time is spent ensuring that every aspect of these rules is included in the MSE process. However, in IPHC, there is an additional step not included in the MSE simulations, which involves the Commission adjusting catches in each Regulatory Area to account for other objectives (social, economic, etc.). In the EU, this kind of final tinkering step has led to decades of overfishing—politicians there set catches 20% higher than scientific advice during 2001–15 (Carpenter et al. 2016). Elsewhere, notably for the Commission for the Conservation of Southern Bluefin Tuna (e.g. Hillary et al. 2016), and in South African fisheries (e.g. Plagányi et al. 2007), the MSE process was carefully designed to replace annual haggling over catch limits with an automated and transparent process. For the IPHC, the impacts of such policy adjustments have not recently been evaluated, but in 2013-16, adopted mortality limits were higher than the recommended "blue line" catches. A careful analysis (ideally using the MSE process itself) is needed to determine the long-term impacts of Commission discretion in setting final mortality limits that differ from those recommended by a prescribed harvest control rule. While this is flagged here by me, I should also note that MSAB participants are in favor of retaining Commission discretion in modifying final mortality limits in each Regulatory Area, and this aspect of management was not currently regarded as problematic.

In the MSE evaluation of harvest control rules, "exceptional circumstances" rules are currently missing from the discussion. Such rules are invoked when circumstances in the fishery, surveys, data gathering, or stock assessment fall outside those modelled in the MSE process (e.g. Hillary et al. 2016). For example, if large levels of unreported catch are discovered, then exceptional circumstances could be invoked. When exceptional circumstances are invoked, a new MSE should be conducted to replace the current harvest control rule with a new (and hopefully better) harvest control rule for the changed circumstances. Rules governing exceptional circumstances need to be pre-specified so that the harvest control rule is not arbitrarily overruled in setting catches.

Priority recommendations

1. I recommend that the Commission plans ahead for the future of the MSE process beyond January 2021, and allocates required funding and personnel accordingly.
2. The MSE process will be most useful to IPHC in the future if it is considered to be an ongoing process that is used each year alongside the stock assessment itself, to test different features of the data gathering, stock assessment, and catch-setting components of Pacific halibut.
3. Analysis is needed of the impact of the Commission modifying catch levels in each Regulatory Area after the TCEY recommendation from the harvest control rule. Preferably such analysis should be conducted using the MSE process and be based empirically on past Commission modifications. Since catch-setting is an integral part of the MSE, the MSE framework will be most accurate when it accurately models the decision-making process of the Commission.

Additional recommendations

1. MSAB membership could be expanded to include representatives for crew members, fishing communities, and environmental organizations.
2. The current documentation of technical details of the IPHC MSE framework (Hicks et al. 2019) is described as a working document that will be revised often. As it stands, it is incomplete. To ensure the methods can be repeated, a full description of the methods used to obtain the results presented in January 2021 should be presented at the same time as the results.

References

Butterworth DS (2007) Why a management procedure? Some positives and negatives. ICES Journal of Marine Science 64:613-617

Carpenter G, Kleinjas R, Villasante S, O'Leary BC (2016). Landing the blame: the influence of EU Member States on quota setting. Marine Policy 64:9-15.

Hicks A, Carpi P, Berukoff S (2019) Technical details of the IPHC MSE framework. IPHC-2019-MSAB014-INF02

Hicks A, Carpi P, Berukoff S, Stewart I (2020) IPHC Management Strategy Evaluation (MSE): update. IPHC-2020-AM096-12

Hillary RM, Preece AL, Davies CR, Kurota H, Sakai O, Itoh T, Parma AM, Butterworth DS, Ianelli J, Branch TA (2016) A scientific alternative to moratoria for rebuilding depleted international tuna stocks. Fish and Fisheries 17:469-482

Muradian ML, Branch TA, Punt AE (2019) A framework for assessing which sampling programs provide the best trade-off between accuracy and cost of data in stock assessments. ICES Journal of Marine Science 76:2102-2113

Plagányi ÉE, Rademeyer RA, Butterworth DS, Cunningham CL, Johnston SJ (2007) Making management procedures operational - innovations implemented in South Africa. ICES Journal of Marine Science 64:626-632

Punt AE, Butterworth DS, de Moor CL, De Oliveira JAA, Haddon M (2016) Management strategy evaluation: best practices. Fish and Fisheries 17:303-334

Contracting Party contributions – Historical review

PREPARED BY: IPHC SECRETARIAT (D. WILSON, 14 OCTOBER 2020)

PURPOSE

To provide the Commission with information requested by the United States of America, as follows:

> "*Could the Secretariat prepare, to the best of their abilities based on the information that they do have, a paper recapping how we came to the current contribution amounts by Party. In other words, what is the history of the U.S./Canadian Contracting Party Contributions evolving from the initial 50/50 percentage to the current ~82/18 percentage split, respectively. These percentages do not include any of our respective pension liability payments nor the lease and maintenance costs paid by the United States.*
> *FY21 Budget General Fund Assessments/Contributions:*
> - *United States: $4,157,760 (does not include pension liability or lease/maintenance payments)*
> - *Canada: $900,407 (does not include pension liability payments)*"

DISCUSSION

Provided at Appendix I, is an amalgamation of currently available information. Information prior to 2016 is poorly recorded in the previous IPHC accounting systems.

RECOMMENDATION/S

That the Commission:

1) **NOTE** paper IPHC-2020-IM096-18 which provides information requested by the United States of America on the historical contributions of each Contracting Party.

APPENDICES

Appendix I: Amalgamation of currently available information on Contracting Party contribution history and reasons for modifications. **See presentation (MS-Excel file associated with this paper)**

Financial Year	General budget CONTRIBUTIONS					IFC Pension Fund Contributions		HQ Building Lease and Maintenance (USA)	TOTAL APPROPRIATIONS						
1 Oct (prior year) - 30 Sept (current year)	Canada (CAN)	United States of America (USA)	TOTAL	CAN%	USA%	Canada (CAN)	United States of America (USA)		CAN Total	USA Total	TOTAL	CAN%	USA%	Source	Supporting report text
FY2021 *(Pending)*	$900,407	*$4,157,760*	*$5,058,167*	*17.80*	*82.20*	$111,250	*$139,424*	*$470,717*	$1,011,657	*$4,767,960*	*$5,779,617*	*17.50*	*82.50*	IPHC-2020-AM096-R	**As well as internally documented Invoices and Payment receipts**
FY2020	$874,182	$3,978,086	$4,852,268	18.02	81.98	$111,250	$167,598	$386,316	$985,432	$4,532,000	$5,517,432	17.86	82.14	IPHC-2019-AM095-R	**As well as internally documented Invoices and Payment receipts**
FY2019	$848,720	$3,870,512	$4,719,232	17.98	82.02	$111,250	$145,640	$378,848	$959,970	$4,395,000	$5,354,970	17.93	82.07	IPHC-2018-AM094-R	**As well as internally documented Invoices and Payment receipts**
FY2018	$848,720	$3,773,024	$4,621,744	18.36	81.64	$107,315	$149,575	$352,401	$956,035	$4,275,000	$5,231,035	18.28	81.72	IPHC-2017-AM093-R	**As well as internally documented Invoices and Payment receipts**
FY2017	$848,720	$3,721,347	$4,570,067	18.57	81.43	$95,508	$95,508	$343,145	$944,228	$4,160,000	$5,104,228	18.50	81.50	IPHC-2016-AM092-R	**As well as internally documented Invoices and Payment receipts**
FY2016	$848,720	$4,054,492	$4,903,212	17.31	82.69	$95,508	$95,508	???	$944,228	$4,150,000	$5,094,228	18.54	81.46		
FY2015	$848,720	$4,054,492	$4,903,212	17.31	82.69	$95,508	$95,508	???	$944,228	$4,150,000	$5,094,228	18.54	81.46		
FY2014	$848,720	$4,015,613	$4,864,333	17.45	82.55	$98,400	$98,400	$235,987	$947,120	$4,350,000	$5,297,120	17.88	82.12	IPHC-2014-AM090-R	***Minutes:*** *"U.S. appropriations totaled $4.172M after sequestration reduced the original appropriation of $4.5M. Canadian appropriations totaled $848,720 and an additional sum of $98,400 to cover pension deficit payments. "*
FY2013	$848,720	$3,837,613	$4,686,333	18.11	81.89	$98,400	$98,400	$235,987	$947,120	$4,172,000	$5,119,120	18.50	81.50		
FY2012	$848,720	$3,400,000	$4,248,720	19.98	80.02	$0	$0	???	$848,720	$4,500,000	$5,348,720	15.87	84.13	IPHC-2012-AM088-R	***Minutes:*** *"There was some discussion of the $4.5M appropriation from the U.S. and the reason it is higher than expected. It was noted that the base request was for $3.4M with additional requests for three specific items, including office space lease and maintenance costs, new tag development, and the bait comparison study. Regarding the IPHC office space, it was noted that funds have been designated to look at various aspects including considering alternative spaces and costs of lease versus ownership. Following clarification and some discussion of these three items, Mr. Field requested a separate meeting with Staff to discuss offsets and expectations in the future.Commissioners asked staff to identify the lease costs for the IPHC headquarters as a distinct budget item . "*
FY2011	$848,720	???	$848,720			$0	$0	???	$848,720	$3,240,000	$4,088,720	20.76	79.24	IPHC-2011-AM087-R	***Minutes:*** *"Mr. John Field from U.S. Department of State concurred, that the IPHC is anticipating $3.24M from the U.S. for 2011, although this has not yet been confirmed. Mr. Field added that there is no omnibus bill currently so the government is working quarter to quarter."*
FY2010	$848,720	???	$848,720			$0	$0	???	$848,720	$3,250,000	$4,098,720	20.71	79.29	IPHC-2010-AM086-R	***Minutes:*** *"The FY2010 budget was presented for review. Mr. John Field, U.S. State Department, confirmed that the appropriation amount for 2010 is $3.25M. There was some discussion of setline survey expenses. It was noted that an estimated cost for a full IPHC Bering Sea survey is estimated at $600K."*
FY2009	$848,720	???	$848,720			$0	$0	???	$848,720	$3,500,000	$4,348,720	19.52	80.48		
FY2008	$848,720	???	$848,720			$0	$0	???	$848,720	$2,300,000	$3,148,720	26.95	73.05		
FY2007	$848,720	???	$848,720			$0	$0	???	$848,720	$2,833,765	$3,682,485	23.05	76.95	IPHC-2007-AM083-R	**Minutes:** "*The 2008 projected budget was presented. It was explained that the $2.9M listed as the U.S. appropriations contribution is the number proposed by the U.S. Senate and is not yet official. The U.S. House of Representatives gave no direction on the budget item for fisheries commissions except how much should be spent for the Great Lakes Commission. The Senate was more specific and is $1M higher overall. Ms. Amanda Johnson-Miller noted that the current continuing resolution expires December 14 and the U.S. State Department is hoping for further direction at that time. For 2008, the administration request for the IPHC is $2.3M.* "
FY2006	$848,720	???	$848,720			$0	$0	???	$848,720						
FY2005	$848,720	???	$848,720			$0	$0	???	$848,720	$1,800,000	$2,648,720	32.04	67.96	IPHC-2005-AM081-R	
FY2004	$848,720	???	$848,720			$0	$0	???	$848,720	$2,180,000	$3,028,720	28.02	71.98	IPHC-2004-AM080-R	***Minutes:*** *The U.S. financial advisor, Ms. Nikki Brajevich presented a report of current funding status from the U.S. Last year, $ 400K was reprogrammed from the IPHC to keep the Pacific Salmon Commission running. For 2004, a total of $20.043 million was requested to fund all the commissions. However, the government currently has no budget and is operating under a continuing resolution based on last year's appropriations. Several possible outcomes were presented. Mr. Balsiger noted that NMFS headquarters may be in favor of reprogramming the commissions in order to get them all funded, though not at requested levels. The possibility of fishing more gear during the surveys or adding additional research projects was discussed as a method of generating additional funds. It was noted that the Commission received some criticism from industry in the past for doing just that. The Commission discussed the high cost and possible cancellation of the Area 2A setline survey in 2004. It was agreed to send out the charter requests including Area 2A, recognizing that budget issues could force a cancellation later in the year. The Commission also agreed to meet via conference call once the U.S. budget is finalized."*
FY2003	$848,720	???	$848,720			$0	$0	???	$848,720	$2,086,000	$2,934,720	28.92	71.08	IPHC-2003-AM079-R	***Minutes:*** *"The F&A Committee discussed the contingency plan produced by IPHC staff to be used in the event that the $2.1 million expected from the U.S. government is not approved. Following some discussion, the Commission decided at this time to plan on the $2.1 million and to spend no more time on a contingency for this year.* *Mr. Blair Hodgson noted that Canada has approved a 3% increase in appropriations for the next fiscal year."*
FY2002	$824,000	???	$824,000			$0	$0	???	$824,000	$2,100,000	$2,924,000	28.18	71.82	IPHC-2002-AM078-R	***Minutes:*** *"A U.S. State Department representative commented that the historically favorable performance of the Commission will be useful in maintaining funding at the current U.S. level of $2.1 million. The U.S. is pleased to see a 3% increase in funding from Canada The 1979 protocol states that joint expenses will be paid by the two parties in equal shares, but the two parties can also agree to differ in contribution. The U.S. has given the increase, but would like to see Canada approach the original agreement of equal funding in future years. The Commission staff is welcome to continue doing research, but perhaps funding at a higher rate can help free up more fish for the harvesters. The U.S. understands that there are some pressures on the wild fishery such as farmed fish concerns and it is important to make the resources available for fishers to maintain their fishery. In the longer term, the U.S. hopes that fishers will be able to weather these other marketing concerns."*
FY2001	$800,000	???	$800,000			$0	$0	???	$800,000	$1,881,000	$2,681,000	29.84	70.16		**Minutes:** "Projections were based on the assumption of an increase in Canadian appropriations when the U.S. did the same. A lengthy discussion took place regarding the increase in appropriations by both countries. Canadian representatives argued that it is unclear whether the U.S. increase is a one time amount or an actual increase in appropriations. U.S. representatives noted that part of the argument to the State department for an increase was that Canada had committed to an increase contingent on the U.S. approving one. U.S. delegates fought for two years at the national level and received the increase. Budgets must be approved every year so there are no long term guarantees even with the $800,000 appropriations, but it is the feeling that the increase is permanent. The U.S. has taken the first step and would now like to go back to the language where Canada committed to an increase. The minutes from the 1999 Annual Meeting were cited as the record where Canada committed to an increase. Canadian delegates commented that Ottawa representatives need to show that the Commission has a need for increased funds. Following a long discussion, it was agreed that for planning purposes, the budgets would show appropriations of $1.881 million from the U.S. and an 8% increase for Canada for 2002 and a 16% increase for 2003 (the percentage being based on the base amount of $800,000). The Commission agreed to meet in June regarding any further unresolved budget issues."
FY2000	$800,000	???	$800,000			$0	$0	???	$800,000	$800,000	$1,600,000	50.00	50.00		Letter to US State Dept request ad-hoc increase of $64K
FY1999	$800,000	???	$800,000			$0	$0	???	$800,000	$800,000	$1,600,000	50.00	50.00		The U.S. may fund the Commission with as much as $1.88 million and Canada will honor its commitment to fund at a percentage of the U.S. based on harvest.
FY1998	$800,000	???	$800,000			$0	$0	???	$800,000	$800,000	$1,600,000	50.00	50.00		Currently, revenues expenditures are proportional to distribution of the survey catch.
FY1997	$800,000	???	$800,000			$0	$0	???	$800,000	$800,000	$1,600,000	50.00	50.00		
FY1996	$800,000	???	$800,000			$0	$0	???	$800,000	$800,000	$1,600,000	50.00	50.00	No meeting	
FY1995	$800,000	???	$800,000			$0	$0	???	$800,000	$800,000	$1,600,000	50.00	50.00	IPHC-1995-AM071-R	**Minutes:** "Dr. Beamish reminded the commissioners and staff that budgets will be cut rather than expanded in the future due to 25-40% cuts that Canadian departments are experiencing."
FY1994	$833,500	???	$833,500			$0	$0	???	$833,500	$891,000	$1,724,500	48.33	51.67	IPHC-1994-AM070-R	**Para** *"9) The Canadian government will reduce Commission funding from October 1994 to September 1995, by 5% ($33,500), and will continue at this level at least through 1997."* ***Other supporting text in the minutes:*** *" Dr. Beamish stated that as a result of widespread budget cuts, the Canadian government will reduce Commission funding from October 1994 to September 1995, by $67,000, and that the Commission should not expect an allocation greater than $800,000 through 1997. A discussion then took place on whether the countries were required to make matching cuts. It was noted by Dr. McCaughran that the Commission voted last year regarding monies not provided by the governments, and that a separate vote by the commission would be required for either country to make unmatched allocations. After discussion regarding the effect of the cuts, Mr. Pennoyer expressed his concern and noted that he would confer with the U.S. financial advisors, and also commented that the U.S. would likely not increase it's share from $833,000 to $867,000 as requested. Mr. Lariviere was instructed to re-work the 1995 budget using $800,000 from each country and re-present it on Wednesday. Dr. McCaughran stated that a number of items would be affected and especially noted the current lack of workman's compensation, Washington state's solicitation of the Commission for B&O tax, and cuts in port sampling budget as matters of extreme concern. Ms. Eileen Cooney was asked to check on options regarding workman's compensation."*
FY1993	$833,500	???	$833,500			$0	$0	???	$833,500	$833,500	$1,667,000	50.00	50.00	IPHC-1993-AM069-R	***Minutes:*** *"The 1993/1994 budget, as submitted, includes a $16,500 increase over the 1992/1993 budget. Canada has indicated that no increase is likely at this time. The proposed increase was removed and the budget at $833,500, as in 1992/1993, was passed."*
FY1992	$833,500	???	$833,500			$0	$0	???	$833,500	$833,500	$1,667,000	50.00	50.00	IPHC-1992-AM068-R	First meeting minutes in electronic files
FY1991	$797,500	???	$797,500			$0	$0	???	$797,500	$797,500	$1,595,000	50.00	50.00		
FY1990	$796,500	???	$796,500			$0	$0	???	$796,500	$796,500	$1,593,000	50.00	50.00		
FY1989	$776,500	???	$776,500			$0	$0	???	$776,500	$776,500	$1,553,000	50.00	50.00		
FY1988	$787,000	???	$787,000			$0	$0	???	$787,000	$787,000	$1,574,000	50.00	50.00		
FY1987	$777,500	???	$777,500			$0	$0	???	$777,500	$777,500	$1,555,000	50.00	50.00		
FY1986	$739,500	???	$739,500			$0	$0	???	$739,500	$739,500	$1,479,000	50.00	50.00		

IPHC Fishery Regulations:

Mortality and Fishery Limits (Sect. 5)

PREPARED BY: IPHC SECRETARIAT (13 OCT 2020)

PURPOSE

To improve clarity and transparency of fishery limits within the IPHC Fishery Regulations: Mortality and Fishery Limits (Sect. 5).

BACKGROUND

The Commission considers new and revised IPHC Fishery Regulations, including proposed changes to mortality and fishery limits, and makes changes as deemed necessary at each Annual Meeting. In the absence of changes being deemed necessary, the existing IPHC Fishery Regulations remain in effect.

In accordance with the IPHC Convention[1], the Contracting Parties may also implement fishery regulations that are more restrictive than those adopted by the IPHC.

This proposal suggests improvements to IPHC Fishery Regulations Section 5, '*Mortality and Fishery Limits,'* to reflect TCEY values adopted by the IPHC and the applicable fishery sector limits resulting from those TCEY values according to existing Contracting Party catch sharing arrangements.

DISCUSSION

IPHC Fishery Regulations Section 5, '*Mortality and Fishery Limits,'* was adopted in 2020 in order to provide clear documentation of the limits for fishery sectors within defined Contracting Party catch sharing arrangements, which are themselves tied to the mortality distribution (TCEY) decisions of the Commission. This section includes a table of the TCEY values adopted by the Commission for clarity, and to emphasize the role of the TCEY values as the basis for the subsequent setting of sector allocations through the operation of the Contracting Parties' existing catch sharing arrangements. Both the TCEY and the fishery sector allocation table will be populated as TCEY decisions are made for each IPHC Regulatory Area by the Commission during the 97th Session of the IPHC Annual Meeting (AM097) in January 2021.

Benefits/Drawbacks: The benefit is a clear identification of fishery limits resulting from Commission decisions on distributed mortality (TCEY) values for each IPHC Regulatory Area. The potential drawback is a misconception that the resulting catch sharing arrangements and associated fishery limits are within the Commission's mandate, when in fact they are the responsibility of the Contracting Parties. The intention is to reinforce that distinction by clarifying

[1] The Convention between Canada and the United States of America for the Preservation of the [Pacific] Halibut Fishery of the Northern Pacific Ocean and Bering Sea.

which decisions are made by the Commission.

Sectors Affected: This proposal affects all sectors of the Pacific halibut fishery.

ADDITIONAL DOCUMENTATION / REFERENCES

None

RECOMMENDATIONS

That the Commission:

1) **NOTE** regulatory proposal IPHC-2020-IM096-PropA1, which provides the Commission with an opportunity to consider the format of the IPHC Fishery Regulations: *Mortality and Fishery Limits* (Sect. 5).

APPENDICES

Appendix A: Suggested IPHC Fishery Regulation Language

APPENDIX A

SUGGESTED REGULATORY LANGUAGE

5. Mortality and Fishery Limits

(1) The Commission has adopted the following distributed mortality (TCEY) values:

IPHC Regulatory Area	*Distributed mortality limits (TCEY) (net weight)*	
	Tonnes (t)	**Million Pounds (Mlb)**
Area 2A (California, Oregon, and Washington)		
Area 2B (British Columbia)		
Area 2C (southeastern Alaska)		
Area 3A (central Gulf of Alaska)		
Area 3B (western Gulf of Alaska)		
Area 4A (eastern Aleutians)		
Area 4B (central/western Aleutians)		
Areas 4CDE (Bering Sea)		
Total		

(2) The fishery limits resulting from the IPHC-adopted distributed mortality (TCEY) limits and the existing Contracting Party catch sharing arrangements are as follows, recognising that each Contracting Party may implement more restrictive limits:

IPHC Regulatory Area	*Fishery limits (net weight)*	
	Tonnes (t)	**Million Pounds (Mlb)**
Area 2A (California, Oregon, and Washington)		
Non-tribal directed commercial (south of Pt. Chehalis)		
Non-tribal incidental catch in salmon troll fishery		
Non-tribal incidental catch in sablefish fishery (north of Pt. Chehalis)		
Treaty Indian commercial		
Treaty Indian ceremonial and subsistence (year-round)		
Recreational – Washington		
Recreational – Oregon		
Recreational – California		
Area 2B (British Columbia) (combined commercial/recreational)		
Commercial fishery		
Recreational fishery		

Area 2C (southeastern Alaska) (combined commercial/guided recreational)		
Commercial fishery (catch)		
Commercial fishery (X.XX Mlb catch and 0.XX Mlb incidental mortality)		
Guided recreational fishery (includes catch and incidental mortality)		
Area 3A (central Gulf of Alaska) (combined commercial/guided recreational)		
Commercial fishery (X.XX Mlb catch and 0.XX Mlb incidental mortality)		
Commercial fishery (incidental mortality)		
Guided recreational fishery (includes catch and incidental mortality)		
Area 3B (western Gulf of Alaska)		
Area 4A (eastern Aleutians)		
Area 4B (central/western Aleutians)		
Areas 4CDE (Bering Sea)		
Area 4C (Pribilof Islands)		
Area 4D (northwestern Bering Sea)		
Area 4E (Bering Sea flats)		
Total		

* Allocations resulting from the IPHC Regulatory Area 2A Catch Share Plan are listed in *pounds*.

IPHC Fishery Regulations:

Commercial Fishing Periods (Sect. 9)

PREPARED BY: IPHC SECRETARIAT (16 OCTOBER 2020)

PURPOSE

To specify fishing periods for the directed commercial Pacific halibut fisheries within the IPHC Fishery Regulations: Commercial Fishing Periods (Sect. 9).

BACKGROUND

Each year the International Pacific Halibut Commission (IPHC) selects fishing period dates for the directed commercial Pacific halibut fisheries in each of the IPHC Regulatory Areas. Historically, the first management measures implemented by the IPHC were to limit periods when fishing was allowed. Biological factors considered in the past when setting fishing period dates included migration and spawning considerations, neither of which is now used as a basis for determining fishing periods. Weather patterns, predicted tides in some fishing areas, whale activity, and business considerations for both fishers and processors have also been factors in the discussions surrounding the setting of fishing period dates.

The IPHC's practice is to use the same overall commercial fishing period dates for all IPHC Regulatory Areas with the exception of IPHC Regulatory Area 2A. These dates have varied from year to year, and in recent years have allowed directed commercial fishing to begin sometime in March and end sometime in November for all IPHC Regulatory Areas with the exception of IPHC Regulatory Area 2A.

DISCUSSION

The IPHC Secretariat proposes that the commercial fishing periods for all IPHC Regulatory Areas be set at AM097.

No change is recommended for IPHC Regulatory Area 2A for 2021.

Expected outcomes

Should the Commission approve this shift in fisheries management to the applicable Contracting Party, the need for setting dates for this derby fishery would no longer be an IPHC consideration and the dates would be set by the Contracting Party within the overall commercial fishing period dates.

Sectors Affected: Commercial Pacific halibut fisheries in each IPHC Regulatory Area.

RECOMMENDATIONS:

That the Commission:

1) **NOTE** fishery regulation proposal IPHC-2020-IM096-PropA2, which proposed the adoption of fishing periods for the commercial Pacific halibut fisheries within the IPHC Pacific Halibut Fishery Regulations: Commercial Fishing Periods (Sect. 9);

APPENDICES

Appendix A: Suggested regulatory language

APPENDIX A
SUGGESTED REGULATORY LANGUAGE

9. Commercial Fishing Periods

(1) The fishing periods for each IPHC Regulatory Area apply where the fishery limits specified in section 5 have not been taken.

(2) Unless the Commission specifies otherwise, commercial fishing for Pacific halibut in all IPHC Regulatory Areas may begin no earlier in the year than 1200 local time on ~~14 March~~DD MMMM.

(3) All commercial fishing for Pacific halibut in all IPHC Regulatory Areas shall cease for the year at 1200 local time on ~~15 November~~DD MMMM~~, with the exception of IPHC Regulatory Area 2B which shall cease at 1200 local time on 7 December 2020~~.

(4) The first fishing period in the IPHC Regulatory Area 2A non-tribal directed commercial fishery[2] shall begin at 0800 on the fourth Monday in June and terminate at 1800 local time on the subsequent Wednesday, unless the Commission specifies otherwise. If the Commission determines that the fishery limit specified for IPHC Regulatory Area 2A in Section 5 has not been exceeded, it may announce a second fishing period of up to three fishing days to begin on Monday two weeks after the first period, and, if necessary, a third fishing period of up to three fishing days to begin on Monday four weeks after the first period.

(5) Notwithstanding paragraph (4), and paragraph (6) of section 12, an incidental catch fishery[3] is authorized during the sablefish seasons in IPHC Regulatory Area 2A in accordance with regulations promulgated by NOAA Fisheries. This fishery will occur between the dates and times listed in paragraphs (2) and (3) of this section.

(6) Notwithstanding paragraph (4), and paragraph (6) of section 12, an incidental catch fishery is authorized during salmon troll seasons in IPHC Regulatory Area 2A in accordance with regulations promulgated by NOAA Fisheries. This fishery will occur between the dates and times listed in paragraphs (2) and (3) of this section.

[2] The non-tribal directed fishery is restricted to waters that are south of Point Chehalis, Washington, (46°53.30´ N. latitude) under regulations promulgated by NOAA Fisheries and published in the Federal Register.

[3] The incidental fishery during the directed, fixed gear sablefish season is restricted to waters that are north of Point Chehalis, Washington, (46°53.30´ N. latitude) under regulations promulgated by NOAA Fisheries at 50 CFR 300.63. Landing restrictions for Pacific halibut retention in the fixed gear sablefish fishery can be found at 50 CFR 660.231.

12. Application of Commercial Catch Limits

(1) …

(5) If the Commission determines that the fishery limit specified for IPHC Regulatory Area 2A in section 5 would be exceeded in an additional directed commercial fishing period as specified in paragraph (4) of section 9, the fishery limit for that area shall be considered to have been taken and the directed commercial fishery closed as announced by the Commission.

INTERNATIONAL PACIFIC HALIBUT COMMISSION

IPHC Fishery Regulations: minor amendments

PREPARED BY: IPHC SECRETARIAT (13 OCTOBER 2020)

PURPOSE

To improve clarity and consistency in the IPHC Fishery Regulations.

BACKGROUND

This proposal would make minor amendments to the IPHC Regulations. These revisions to the regulations may include:

- Updating and clarifying existing fishery regulations;
- Reordering regulations for clarity and emphasis.

DISCUSSION

Periodically, regulations should be reviewed to ensure they are clear, concise, consistent, and current. These proposed revisions to the IPHC Fishery Regulations are a result of a holistic review. The primary revisions resulting from this review are described below, and will be provided for the 97th Session of the IPHC Annual Meeting (AM097) in detail:

- Updating and clarifying fishery regulations
    1. Section 3, Definitions, (1)(a) would include IPHC Secretariat.
    2. Section 22, Supervision of Unloading and Weighing, would be expanded to include access for sampling or inspecting.
    3. Minor edits would be made throughout for stylistic consistency among Sections.
- Reordering fishery regulations for clarity and emphasis
    1. No reordering is necessary at this time.

Benefits/Drawbacks: The benefit is clearer and more consistent regulations that are easier to use. No known drawback.

Sectors Affected: This proposal affects all sectors of the Pacific halibut fishery.

RECOMMENDATIONS:

That the Commission:

1) **NOTE** regulatory proposal IPHC-2020-AM096-PropA3, which recommends changes to improve the clarity and transparency of the IPHC Fishery Regulations.
2) **ADOPT** the recommended changes to the IPHC Fishery Regulations as provided in

Appendix A.

ADDITIONAL DOCUMENTATION / REFERENCES

None

APPENDICES:

APPENDIX A: Suggest regulatory language

APPENDIX A
SUGGESTED REGULATORY LANGUAGE

1. Section 3, Definitions, (1)(a) would include IPHC Secretariat.

3. Definitions

(1) In these Regulations,

(a) "authorized officer" means any State, Federal, or Provincial officer authorized to enforce these Regulations including, but not limited to, the International Pacific Halibut Commission (IPHC) Secretariat, National Marine Fisheries Service (NOAA Fisheries), Department of Fisheries and Oceans (DFO), Alaska Wildlife Troopers (AWT), United States Coast Guard (USCG), Washington Department of Fish and Wildlife (WDFW), Oregon State Police (OSP), and California Department of Fish and Wildlife (CDFW);

2. Section 22, Supervision of Unloading and Weighing, would be expanded to include access for sampling or inspecting.

22. Supervision of Unloading and Weighing

The unloading and weighing of Pacific halibut may be subject to the supervision of authorized officers to assure the fulfillment of the provisions of these Regulations and to the IPHC Secretariat for inspection and sampling.

2. Minor edits throughout for stylistic consistency among Sections.

Stakeholder statements on IPHC Fishery Regulation proposals

PREPARED BY: IPHC SECRETARIAT (18 NOVEMBER 2020)

PURPOSE

To provide the Commission with a consolidated document containing 'Statements' from stakeholders submitted to the Commission for its consideration at the 96th Session of the IPHC Interim Meeting (IM096).

BACKGROUND

The IPHC Secretariat has continued to make improvements to the Fishery Regulations portal on the IPHC website, which includes instructions for stakeholders to submit statements to the Commission for its consideration. Specifically:

> *"Informal Statements by stakeholders should be submitted as an email to the following address, secretariat@iphc.int, which will then be provided to the Commissioners as Stakeholder Statements at each Session.*

DISCUSSION

No Stakeholder Statements were received by the IPHC Secretariat as of 19 October 2020. This paper will be updated for the 97th Session of the IPHC Annual Meeting (AM097) to include any Stakeholder Statements received before AM097 begins.

APPENDICES

None

IPHC-2020-IM096-INF02

Agenda Item I.2
Supplemental PPT 1
September 2020

Updated Range of Alternatives for the Proposed Transfer of Management Responsibilities for Area 2A Pacific Halibut Fisheries with Focus on the Non-Indian Directed Commercial Fishery

Prepared for:

Pacific Fishery Management Council

Prepared by:

Pacific Fishery Management Council Staff, and
West Coast Region National Marine Fisheries Service Staff

Goals for today

- Consider Range of Alternatives
- Adopt Preliminary Preferred Alternatives
- Discuss the Future Workload and Schedule

Document Highlights

Sections 1 & 2: Purpose and Need, & Scope of Action

Section 3: Council process for transfer, and associated tasks

Section 4: Range of Alternatives
4.1 – Fishery Management
4.2 – Permitting Process

Sections 5 & 6 cover workload planning, timeline, and tables

Purpose and Need

Note: Purpose statement revised to better reflect the intended action

(previously stated: *…is to provide Area 2A managers and stakeholders a direct role in the management of all Area 2A Pacific halibut fisheries, including the non-Indian directed commercial fishery)*

The purpose of the action is to provide the Council and stakeholders with opportunities to consult on the transitions of regulations and permitting responsibilities from IPHC to NMFS, and for the Council to develop a process for its future consideration of regulations affecting the Area 2A non-Indian directed commercial fishery.

This action is needed because IPHC requested that management of the non-Indian directed commercial fishery be transferred to Area 2A managers as soon as possible.

Scope of Action

(1) Develop a permitting process for halibut fisheries. This scope would include all licenses currently issued by IPHC

(2) Transfer management of the non-Indian directed commercial fishery from IPHC to the Council and NMFS. This scope includes development of a schedule, process and regulatory language for season structure. This scope includes both preseason and inseason protocols.

(3) Identify lead entities and management responsibilities for preseason, inseason, and post season activities.

3.0 Council Process to transfer management and associated tasks

Assuming responsibility for managing the directed fishery will require:

p.5

- Establishing a schedule for a preseason process & inseason guidance
- Amending the CSP and COP 9; Identifying agency tasks
- Developing protocols for a new permitting process
- Consider establishing an advisory body to help inform the Council on fishery management

4.0 Range of Alternatives

4.1 Fishery management process

4.2 Permitting process

Focus is the transfer of management responsibilities

4.1 – Fishery management process: When to consider the framework of the directed fishery falls mainly to the Council

4.2 – Permitting process: How to implement the permitting process is mostly an administrative task and falls mainly to NMFS

4.1 Fishery Management Process

To accommodate the management transfer, the Council will need to:

p. 5-6

1. Establish a framework for a preseason process
2. Provide guidance for inseason management
3. Decide when decisions will be made

Provide for public comment and review

4.1.1 Fishery Management Process

Three Alternatives for the schedule and process for setting seasons and potentially initial vessel limits

- 4.1.1: No Action Alternative
- 4.1.2: Directed fishery considered during the CSP process
- 4.1.3: Same as 4.1.2, except delay some guidance until spring

4.1 Fishery Management

4.1.1 Alternative 1

p. 6-7

Alternative 1: No Action

No management transfer;

Maintain existing IPHC process

4.1 Fishery Management

4.1.2 Alternative 2

p. 6-7

Alternative 2: Consider the directed fishery during the CSP process (Sep/Nov)

- September: adopt fishery framework, including any guidance for vessel limits and inseason changes, for public review
- November: adopt fishery framework for recommendation to NMFS
- NMFS implements fishery
- No changes needed for NMFS rulemaking schedule

4.1 Fishery Management

4.1.3 Alternative 3

p. 6-7

Alternative 3: Same as Alternative 2 but delay some guidance until spring

- September/November CSP process for fishery framework
- Delay Council final guidance on vessel limits and/or inseason changes until spring (March or April)
- NMFS implements fishery
- Requires change to NMFS rulemaking schedule

4.2 Permitting Process

p. 7

- 4.2.1 Which Area 2A halibut fisheries would be issued permits
- 4.2.2 Application deadlines
- 4.2.3 Development of application process
- 4.2.4 Notification for issuance of permit
- 4.2.5 Proof of permit

4.2.1
Which Permits to Issue

Although the focus is on the directed fishery, including all Area 2A fisheries in the new NMFS permitting system appears to be the most efficient approach, and would relieve IPHC of Area 2A duties related to licensing

p. 8

Alternative 1: Issue permits only for the Area 2A non-Indian directed commercial halibut fishery

Alternative 2: Issue permits for all Area 2A halibut fisheries

Permits would include:

commercial directed,

incidental salmon troll,

incidental sablefish, and

recreational charter halibut fisheries

4.2.2 Application Deadlines

Current IPHC deadlines:
April 30 - directed
March 15 - incidental

Consider adjusting the deadlines to an earlier date to better align with Council meetings as necessary

Information from applications:
- Number of permits issued
- Vessel class assigned to each permit

p.8

Alternative 1:

Status quo: Maintain the IPHC application deadline for the directed fishery of April 30

Alternative 2:

NMFS determines appropriate application deadlines

4.2.3 Development of an Application Process

This is mainly an administrative matter that can be addressed by NMFS

The new process should require similar information and take about the same amount of time to complete the application form

p.8

NMFS is the best suited to determine and implement the most efficient and appropriate application platform

The transfer of management responsibilities will require a new system to be developed to accept applications and issue permits

In November 2019, NMFS provided 3 scenarios for a new system that would allow participants to submit applications and obtain permits

4.2.4 Notification for Issuance of Permit

This is mainly an administrative matter that can be addressed by NMFS

Master log of permits issued will be maintained

p. 8-9

NMFS best suited to determine the appropriate means of notification

In March 2020, the Project Team provided multiple options for notification upon application approval, either in electronic or paper form

a. Confirmation code, or unique number, sent electronically;
b. Confirmation with electronic permit to access and/or print;
c. Provide a paper permit via postal mail (current IPHC method);
d. Combination of methods.

4.2.5 Proof of Permit

Currently, participants are required to carry a paper copy of the permit onboard the vessel and made available to show as proof of permit upon request.

Strong support from industry and enforcement to continue with status quo

p. 9

Alternative 1: Status quo. Require paper copy of proof of permit to be onboard fishing vessel and made available upon request. NMFS to provide access to permit in a printable format or send paper copy directly to participant.

Alternative 2: No requirement for paper proof of permit to be onboard fishing vessel. NMFS work with enforcement to develop acceptable format of required proof of permit.

4.3 Roles and Responsibilities

Which management entity(s) will be responsible for any tasks related to management of the fishery during and after the transfer.

As the transition progresses and is eventually complete, roles and responsibilities may need to change.

P. 9

Some tasks fall into NMFS purview while others fall naturally to the Council

NMFS responsible for permits and management (comparable to IPHC process).

Council responsible for public process to recommend seasons and regulations to NMFS

Section 6 provides additional information

5.0 Workload and Timeline

p. 9-10

- November 2019 - Project Team assigned to develop report for March 2020
- March 2020 – Council approves purpose and need, scope of action, and adopts range of alternatives (ROAs) for public review
- September 2020 – Council considers ROAs and adopts preliminary preferred alternatives (PPAs) for public review
- November 2020 – Council considers PPAs and adopts final preferred alternatives for recommendation to NMFS
- February –March 2021 NMFS develops permitting system
- January 2022: NMFS initiates new permit system

6.0 Tables

p. 10-13

Table 1. PFMC Area 2A halibut fishery management topics (chain of events)

Table 2. Organizational list of contributors in halibut management

Table 3. List of roles and responsibilities necessary for halibut fishery management

(potential changes highlighted)

Kind reminder:

Goals for today

- Consider Range of Alternatives
- Adopt Preliminary Preferred Alternatives
- Discuss the Future Workload and Schedule

Agenda Item I.2
Attachment 1
September 2020

Updated Range of Alternatives for the Proposed Transfer of Management Responsibilities for Area 2A Pacific Halibut Fisheries with Focus on the Non-Tribal Directed Commercial Fishery

August 2020

Prepared for:

Pacific Fishery Management Council

Prepared by:

Pacific Fishery Management Council Staff, and
West Coast Region National Marine Fisheries Service Staff

Contents

List of Acronyms and Abbreviations

CDFW	California Department of Fish and Wildlife
COP	Council Operating Procedure
CSP	Catch Sharing Plan
Council	Pacific Fishery Management Council
FCEY	Fishery Constant Exploitation Yield
FPA	Final Preferred Alternatives
IPHC	International Pacific Halibut Commission
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
ODFW	Oregon Department of Fish and Wildlife
PFMC	See ’Council’
PPA	Preliminary Preferred Alternatives
TCEY	Total Constant Exploitable Yield
WCR	NMFS West Coast Region
WDFW	Washington Department of Fish and Wildlife

Introduction

At its March 2020 meeting, the Pacific Fishery Management Council (Council, or PFMC) considered a report developed by staff from the Council and NMFS WCR (Project Team) describing how the Council might proceed with the transfer of management responsibilities of the non-Indian directed halibut fishery (directed fishery) from the International Pacific Halibut Commission (IPHC) to the Council and the National Marine Fisheries Service (NMFS). The report included a purpose and need statement, scope of action, and a potential range of alternatives. The Council adopted the major tenets of the report, with the expectation to address the topic again in September 2020 to consider adopting preliminary preferred alternatives for public review, and in November 2020 to adopt final preferred alternatives for recommendation to NMFS. An outline of past Council discussions on the transition topic is provided in Table 1.

1.0 Purpose and Need

The proposed action is to transition the permitting and management of the non-Indian Pacific halibut (halibut) fisheries within IPHC regulatory Area 2A from the IPHC to the Council and NMFS, with a focus on the directed fishery. Area 2A (waters off the coast of Washington, Oregon and California) is the only area where halibut fisheries are still managed directly by the IPHC. IPHC currently issues licenses[1] for all Area 2A fisheries, and solely manages the non-Indian directed commercial fishery. The purpose of the action is to provide the Council and stakeholders with opportunities to consult o~~f~~n the transitions of regulations and permitting responsibilities from IPHC to NMFS, and for the Council to develop a process for its future consideration of regulations affecting the Area 2A non-Indian directed commercial fishery.

This action is needed because IPHC requested that management of the non-Indian directed commercial fishery be transferred to Area 2A managers as soon as possible. In a letter addressed to the Council on October 17, 2019, the IPHC stated their "…desire for the IPHC to move full management of the [IPHC Regulatory Area 2A Non-Indian Directed Commercial] fishery from the IPHC (an international fisheries management body) to the relevant domestic agencies."

2.0 Proposed Scope of Action

Currently, the directed fishery opening date(s), duration, and vessel trip limits are determined by the IPHC with fishing periods implemented in IPHC regulations and published by NMFS each March. The IPHC requested transfer of management for only the non-Indian directed commercial fishery; however, when scoping this request, it seemed prudent to consider management aspects for all Area 2A Pacific halibut fisheries, especially when considering the licensing strategy (See Workgroup Report, June 2019). Therefore, the proposed action as noted under the Purpose and Need section is broad in scope so that the Council could consider transferring the licensing responsibilities for all Area 2A Pacific halibut fisheries. Note that this action does not include the treaty Indian fisheries.

The proposed scope of action is intended to:

(1) Develop a permitting process and mechanism administered by NMFS to issue permits for Area 2A Pacific halibut fisheries. This scope would include all licenses currently issued by IPHC: non-Indian directed commercial, commercial incidental salmon troll, commercial incidental sablefish, and recreational charter.

[1] The term 'permitted' is synonymous with 'licensed' and 'registered'. IPHC documents generally use 'license' and NMFS/Council use 'permit.'

(2) Transfer management of the non-Indian directed commercial fishery from IPHC to the Council and NMFS. This scope includes development of a schedule, process and regulatory language to determine the season structure (start date, open periods, duration, vessel limits, etc.) within the overall season established by IPHC. This scope includes both preseason and inseason protocols to ensure access to available harvest and timely notification of such changes.

(3) Identify lead entities and management responsibilities for preseason, inseason, and post season activities.

3.0 Council Process to Transfer Management and Associated Tasks

Assuming responsibility for managing the directed fishery will require developing protocols for a new permitting process, a preseason process, protocols for inseason management, amending the CSP and Council Operating Procedure (COP) #9, and identifying management entities and staff responsible for such tasks. The Council's public process provides an opportunity to solicit stakeholder input on the issues associated with these proposed actions.

The focus of this action is specific to the transfer of management and involves mainly administrative and logistical topics, therefore the Project Team believes the Council should continue utilizing the current Project Team to complete the management transfer work. To help inform the Council on halibut-related topics associated with halibut fishery management of the directed fishery, or other halibut fisheries, the Council could establish either an ad-hoc or permanent advisory body to assist in management of the fishery once it is under Council authority. At the March 2020 meeting it was also suggested that the Council could establish a joint halibut subcommittee made up of three Groundfish Advisory Subpanel (GAP) members, three Salmon Advisory Subpanel (SAS) members, and one processor from either body to deal with transition issues or, if the Council preferred, it could meet as necessary to also deal with halibut fishery topics as they arise.

4.0 Range of Alternatives

The range of alternatives presented to the Council in March 2020 were separated into two major categories: fishery management and the permitting process. From a logistical standpoint, the decisions on when to consider the fishery management aspects of the directed fishery would fall mainly to the Council, and NMFS would lead the permitting process. Although there is cross-over between the two categories, the Project Team focused the Alternatives on Council-related tasks (fishery management) and less on the permitting process.

4.1 Fishery Management Process

If the Council decides to transfer management of the directed fishery, then the Council will need to 1) establish a framework for a preseason process (mainly season structure and vessel limits), 2) establish protocols necessary for inseason management, and 3) decide when these decisions will be made. Identifying a fishery start date, interval, duration of each opener, and fishery objective, plus protocol for establishing vessel limits (using the existing vessel classes) could all be part of the preseason process. In addition, the preseason process could include criteria for inseason management, which would guide any needed adjustments so NMFS could implement the fishery seamlessly and efficiently.

In the future, after the transfer of management is complete, the Council could consider changes to the overall structure of the fishery if its desired (i.e., limited entry, development of individual fishing quotas, changes to allocations, etc.). These items would need to be developed under a separate process and are not being considered as part of this action.

The Council has an established CSP process that occurs at the September and November Council meetings, which includes consideration of the seasonal framework mainly for recreational fisheries for the upcoming year. The CSP process is complete before the subquota for the recreational fisheries is available in late January, but because the preseason framework describes how to distribute the subquota and make inseason adjustments, this approach is successful. This same method could be used for the directed fishery, with clear guidance in place for any necessary inseason adjustments. Other options would be to wait until the spring Council meetings (March or April) to finalize the framework for the directed fishery, or choose to finalize the fishery framework through the CSP process (September/November), but wait until March or April to determine the vessel limits and inseason adjustments.

For the directed fishery, vessel limits will need to be set before the season begins, and potentially adjusted inseason. In order to set vessel limits, the subquota and the number of licenses issued for the fishery need to be known. This data is not available until late January (subquota) and late March (number of licenses issued). Vessel limits will be set using the range of vessel classes currently employed, and could be set by NMFS at least initially. The subquota will be distributed to each vessel class to provide as much meaningful opportunity as possible. Vessel limits will be implemented by NMFS throughout the season.

The directed fishery historically has required inseason management, and any needed changes are currently decided and implemented solely by IPHC. IPHC can collect and analyze the inseason data, decide on needed changes, implement the regulations, and announce the change all within the two-week interval of the scheduled fishing periods. Once the Council and NMFS gain management of the fishery, if inseason action is anticipated, then the structure of the fishery – mainly the interval between open dates – may need to be up to 30 days apart in order to compile and analyze the data and implement change. The reaction from the industry regarding possible longer intervals between open fishing periods (greater than two weeks) is anticipated to be negative. To remedy this potential increased interval, the Council could consider including guidance for conditional responses in the preseason planning process to address any inseason action needed. For example, a table describing how vessel limits are distributed initially, and adjusted after the initial period based the balance of subquota may help for timelier implementation of inseason fishery changes by NMFS. Inseason changes to the directed fishery are typically a reduction in vessel limits to remain within the subquota but could also include a reduction in duration if the openers are longer than the 10-hour fishing periods used prior to 2020.

For Council consideration, alternatives for the schedule and process for setting seasons and initial vessel limits:

- 4.1.1 Alternative 1: No action. No management transfer; maintain existing IPHC process.
- 4.1.2 Alternative 2: Consider the directed fishery framework during the CSP process in September and November; including any guidance for vessel limits and inseason changes for NMFS implementation.
- 4.1.3 Alternative 3: Consider the directed fishery framework during the CSP process in September and November; finalize guidance for vessel limits and inseason changes at the following March or April Council meeting.

Under Alternative 4.1.2, the September/November Council meetings would continue to be used for the current suite of changes to the CSP. Consistent with the CSP process, public input for changes to the seasonal management aspects of the directed fishery would help shape the Council's preliminary recommendations for the upcoming season. Proposed changes would go out for public review after September, and final consideration would occur at the November Council meeting. This process could include establishing a range of initial vessel limits, and criteria for any inseason adjustments to be implemented by NMFS. This process would not require changes the current NMFS rulemaking schedule. The Workgroup believes this may be the best approach in for considering the annual fishery structure.

Under Alternative 4.1.3, the same process described in Alternative 4.1.2 would be used, except the final Council decision on guidance for vessel limits and inseason changes would be made at the March or April Council meeting. This gives the benefit of knowing the 2A allocation which is announced at the IPHC annual meeting in January; however, like the season setting process for the recreational fisheries, this information is not essential when developing the framework for the directed fishery.

The Council could also choose to modify Alternative 4.1.3 to adopt preliminary alternatives at the September meeting and wait until March or April (not November) to make final decisions on both the fishery framework, initial vessel limits, and any inseason protocols for implementing change.

Alternative 4.1.3 would require changes the current NMFS rulemaking schedule, and final rulemaking on these recommendations would be scheduled to conclude in May. This will require NMFS to have two halibut rulemakings each year: one for the usual catch sharing plan changes, and another for the commercial directed fishery. This scenario increases the workload and reduces the amount of time to process the rulemaking, which could potentially delay the start of the fishery if the federal rulemaking process is not finalized in time.

To help the Council make informed management decisions, under both action alternatives, NMFS would provide an annual report on the performance of the directed fishery (e.g. start date, number of openers and participants, quota attainment, etc.), which would be submitted in time for Council's September advanced Briefing Book.

4.2 Permitting Process

With regards to permitting, the Project Team believes that all the details of the permit system could be left to NMFS Permit Program to decide. However, the Project Team believes that NMFS should require vessels to carry paper permits on-board and take into consideration Council discussion on deadlines for permits.

IPHC currently issues four types of annual halibut vessel licenses (permits) for IPHC regulatory area 2A (West Coast) for the following fisheries: 1) directed commercial, 2) incidental commercial during longline sablefish north of Point Chehalis, 3) incidental commercial during salmon troll, and 4) recreational charter. IPHC does not issue licenses for any other regulatory areas. License applications must be submitted using an online form to IPHC by specified deadlines: March 15 for the incidental fisheries and April 30 for the directed commercial fishery.

The Project Team suggests the Council and NMFS maintain IPHC's current rules for which halibut permits can be held in tandem, at least initially to streamline the transition process of assuming management responsibilities. However, consideration would need to be given to the timing of Council meeting dates and current deadlines for applications.

Considerations for developing a permitting process:

1. Which Area 2A halibut fisheries would be issued permits;
2. Development of application process;
3. Application deadlines;
4. Notification for issuance of permit;
5. Proof of permit.

4.2.1 Which Area 2A Halibut Fishery Permits to Issue

Since it is the desire of IPHC to discontinue its fishery management tasks for halibut fishing in Area 2A, the Project Team believes NMFS should include all Area 2A halibut fisheries in the new permitting system Having two independent permitting systems (IPHC and NMFS) would require substantial coordination between the two entities and cause additional burden to stakeholders wishing to participate in multiple Area 2A halibut fisheries.

- 4.2.1 Alternative 1 – Issue permits only for the Area 2A non-Indian directed commercial halibut fishery.
- 4.2.1 Alternative 2 – Issue permits for all Area 2A halibut fisheries
  - commercial directed, incidental salmon troll, incidental sablefish, and recreational charter halibut fisheries.

4.2.2 Application Deadlines

The current IPHC application deadline for the directed fishery is April 30, and March 15 for the incidental fisheries. Given the timing of the Council's annual meetings and typical start date (late June) of the directed fishery, the Project Team believes the deadline for the directed fishery should be moved to an earlier date so management decisions can better align with the Council's annual meeting schedule, and coincide with the schedule and process for preseason planning. The number of permits, and the vessel class assigned to each permit, is information needed to determine the vessel limits. NMFS will process the permits and report the details after the application deadline has passed. Having the same deadline for all commercial halibut applications seems to be the most efficient and consistent approach for the stakeholders and NMFS.

When determining the application deadline, the preseason schedule (section 4.1) should be part of the deliberations. The Project Team believes since NMFS will be responsible for processing and issuing the permits, NMFS should also determine the appropriate application deadline for the permits, as long as the deadlines are well enough in advance so that the data is available for Council meetings as necessary.

- 4.2.2 Alternative 1 – Status quo: Maintain the IPHC application deadline for the directed fishery of April 30.
- 4.2.2 Alternative 2 – Allow NMFS to determine the appropriate application deadlines for all commercial halibut applications, set to coincide with Council meetings and NMFS processing time.

4.2.3 Development of an Application Process

Currently, NMFS does not have a system in place to accept applications and issue permits specifically for halibut fisheries. The transfer of management responsibilities will require a new system to be identified and a process developed. In their report submitted in November 2019, NMFS provided three options for a new platform or system that would allow participants to submit applications to obtain permits for the directed fishery.

The Project Team believes NMFS is best suited to determine and implement the most efficient and appropriate application platform.

4.2.4 Notification for Issuance of Permit

Once the participant submits the permit application and the required information is verified, NMFS would issue a response to the applicant to signal issuance of a permit. A master log of permitted participants will continue to be maintained by NMFS and shared with enforcement personnel and state agencies as needed.

The Project Team believes NMFS should determine the most appropriate and efficient means of notification of issuance of permit.

4.2.5 Proof of Permit

Currently, participants are required to carry a paper copy of the permit onboard the vessel and made available to show as proof of permit upon request. Given the strong response in support of this topic from stakeholders, the Council's Enforcement Consultants, and Groundfish Advisory Subpanel, the Project Team agrees this protocol (status-quo) should be maintained.

For Council consideration, alternatives for proof of permit onboard:

- 4.2.5 Alternative 1 – Status quo. Require paper copy of proof of permit to be onboard fishing vessel and made available upon request. NMFS to provide access to permit in a printable format or send paper copy directly to participant.
- 4.2.5 Alternative 2 – No requirement for paper proof of permit to be onboard fishing vessel. NMFS work with enforcement to develop acceptable format of required proof of permit.

4.3 Roles and responsibilities

The Council will need to identify which management entity(s) will be responsible for any tasks related to management of the directed fishery during the transition and after assuming management responsibilities. This includes preseason, inseason and postseason tasks. These roles and responsibilities could change once the management of the fishery is complete but having clear expectations in place initially will help identify where changes may need to occur in the future. Some of the tasks naturally fall into NMFS purview-issuing permits and implementing regulations; while others fall naturally to the Council; setting seasons and developing regulations for NMFS consideration. Table 2 is an organizational chart that identifies (current) lead staff and roles. Table 3 describes potential changes to current roles and responsibilities by management entity.

The Project Team believes that Table 3 in this document provides the most appropriate and efficient means of identifying roles and responsibilities of pertinent tasks related to directed fishery management, and supports it use as NMFS and the Council undertake management of the fishery.

5.0 Workload and Timeline

Generally, it requires at least three Council meetings to adopt major changes to a fishery to accommodate an open transparent process that encourages public input; these meetings need not be consecutive. NMFS provided a detailed timeline with principal achievements outlined in the November report (Agenda Item F.3.a NMFS Report 1, November 2019) which the Council agreed was a reasonable path forward.

5.1 Council Workload Planning

- March 2020
    - Maintain the current Project Team to continue the transition work, or if necessary, establish an advisory body.
    - Approve scope of action and purpose and need statement for transition process.
    - Review range of alternatives for transition of management of directed fishery.
        - Consider other alternatives suggested through the Council process
        - Provide guidance for additional or modified alternatives as necessary
    - Consider adopting range of alternatives for public review
    - Approve schedule to complete project.
- September 2020
    - Project Team identifies preliminary preferred alternatives (PPAs)

- Council adopts for public review preliminary preferred alternatives
  - Project Team develops any necessary analytical documents

- November 2020
  - Project Team presents updated preliminary alternatives (PPAs)
  - Council adopts final preferred alternatives (FPAs).
  - Council transmits recommendation to NMFS.

- Spring/summer 2021
  - Project team works to develop potential vessel limit framework table

- September 2021 (potential scenario)
  - Council considers directed fishery season structure and vessel limit framework for public review

- November 2021 (potential scenario)
  - Council adopts directed fishery season structure and vessel limit framework for recommendation to IPHC

5.2 Timeline for Approval and Implementation

Timeline hinges on Council transmittal and that the Council takes final action in November 2020:

- March 2020 – range of alternatives provided; preliminary preferred alternatives (PPAs) identified
- May-August 2020 – PPAs refined (Council and NMFS staff)
- September 2020 – Council considers PPAs
- November 2020 – Council adopts FPAs
- November 2020- January: NMFS start PRA process and drafting proposed rule, and other analytical documents
- February 2021: NMFS publishes proposed rule
- February -March 2021: NMFS begins programming for new permitting system
- April 2021: NMFS public comment period ends
- May -August 2021: NMFS reviews comments, drafts final rule
- September 2021: NMFS submits final rule, concludes PRA
- November 2021: NMFS completes programming for new permitting system
- December 2021: NMFS tests new permit system
- January 2022: NMFS initiates new permit process

6.0 Tables

The IPHC Regulatory Area 2A non-tribal commercial directed Pacific halibut fishery structure has been a topic of discussion between the International Pacific Halibut Commission (IPHC) and the Pacific Fishery Management Council (Council) since May 2017, when the Council received a letter from the IPHC recommending the Council consider a change in the management of the fishery. The IPHC did not recommend a particular management structure for the fishery but supported changes that would reduce the concentration of fishing effort. The Council has engaged in discussions regarding this request over several Council meetings since then. Outlined in Table 1 are some of the major discussion points during Council meetings.

Table 1. PFMC Area 2A Halibut fishery management topics:
November 2018 Council meeting: The IPHC provided a copy of a proposal for longer fishing periods (Agenda Item F.1.a, Supplemental IPHC Report 1). In response, the Council developed a list of issues and concerns, noting that the Council and its management partners could consider the structure of the directed fishery in a holistic way through a workshop.
March 2019 Council meeting: The Council directed Council members and staff to develop the scope of a workshop that could address management of the fishery.
April 2019 Council meeting: The Council reviewed the report (Agenda Item H.2 Supplemental Attachment 1, April 2019) which highlights management considerations that include licensing (i.e., permitting) and inseason management. Further direction by the Council was provided and includes the Council's intent to manage the directed fishery and continue development of a stakeholder workshop (Council Decision Document, April 2019).
June 2019 Council meeting: The Council reviewed the report (Agenda Item H.1 Attachment 1, June 2019) that outlines key questions for consideration and highlights that IPHC would like to discontinue their 2A vessel licensing system at some point in the future, so the timing of IPHC's withdrawal of issuing permits will likely be a key point of the transition plan. Plans for a workshop suspended.
September 2019 Council meeting: The Council submitted a letter to the IPHC stating their intent to manage the fishery as soon as practicable (Agenda Item G.2 Supplemental Attachment 3 September 2019) and noted that a news release was sent to notify stakeholders that the Council will consider the 2020 season structure for the directed fishery for recommendation to IPHC, but does not intend to consider any major changes to the fishery management structure.
November 2019 Council Meeting: The Council received a response from the IPHC that states their willingness to support the Council's efforts and a desire for the transition to conclude in time for the 2021 fishery (Agenda Item F.3.a IPHC Report 1 November 2019). Council adopts the 2020 season structure for recommendation to IPHC. Council assigns NMFS/Council staff to draft document to describe purpose and need, scope of action and range of alternative for Council consideration in March 2020.
March 2020 Council meeting: Council considers Project Teams report (Agenda Item F.3, Attachment 2, March 2020) Council adopts purpose and need, scope of action and range of alternatives for public review. Project Team to provide draft Preliminary Preferred Alternatives in September 2020. Council review and potential adoption of Final Preferred Alternatives scheduled for November 2020.

Table 2. Organizational list of contributors in halibut management (*list incomplete)*

Organization	Name	Responsibility
NMFS WCR Sustainable Fisheries Division	Kathryn Blair [Contractor]	Inseason manager and lead regulation writer and analytical reports.
NMFS WCR Sustainable Fisheries Division	Frank Lockhart	Identify potential policy, regulatory, and administrative issues during development and review. Consultation on Indian interests and interactions between Commissioners, WCR and AKR.
NMFS WCR General Counsel	Caitlin Imaki Maggie Smith	Review and consultation on Indian and Halibut Act and other legal matters.
NMFS WCR Sustainable Fisheries Division	Peggy Mundy	Salmon and incidental halibut inseason manager.
NMFS WCR NEPA	Galeeb Kachra [Contractor]	Review document for completeness in terms of NEPA requirements during development and review.
NMFS WCR Protected Resources Division		Consultation on Protected Species Impact Analyses. Consultation on development of measures and impacts on protected resources (if needed)
NMFS WCR Observer Program	Jon McVeigh	Consultation on bycatch and marine mammal interactions observed in the directed commercial fishery.
PFMC	Robin Ehlke	Pacific Fishery Management Council halibut staff point-of-contact
WDFW	Heather Hall	Lead staff/contact for halibut in state agency
ODFW	Lynn Mattes, Christian Heath	Lead staff/contact for halibut in state agency
CDFW	Caroline McKnight, Melanie Parker	Lead staff/contact for halibut in state agency
IPHC	Lara Erikson, Caroline Robinson	IPHC contact for 2A commercial fishery management

Table 3. List of roles and responsibilities necessary for Pacific halibut fishery management. Shaded areas denote potential change.

Task	Currently performed by:	Post transition potentially performed by
Setting TCEY/FCEY for Area 2A	IPHC	IPHC
Distributing FCEY for various Area 2A fisheries	Council	Council
Licensing		
● Commercial and charter vessel licenses	IPHC	NMFS
● Recreational angler license	States	States
● Tribal license	Tribes	Tribes
Setting vessel/bag limits (preseason and inseason)		
● Directed commercial	IPHC	Council/NMFS
● Incidental	Council	Council
● Recreational	Council	Council
● Tribal	Tribes	Tribes
Setting overall fishing season		
● Directed commercial	IPHC	Council/NMFS
● Incidental	Council	Council
● Recreational	Council	Council
● Tribal restricted and unrestricted seasons	Tribes	Tribes
Setting open and closed fishing areas	NMFS/Council	NMFS/Council
Conducting biological sampling	IPHC/States/Tribes	IPHC/States/Tribes
Development of fishery regulations/changes to fishery regulations		
● Directed	IPHC	Council/NMFS
● Incidental	Council	Council
● Recreational	Council	Council
Publication of fishery regulations (including inseason FRNs)		
● Directed	IPHC/NMFS	NMFS
● Incidental	NMFS	NMFS
● Recreational	NMFS/IPHC/States	NMFS/IPHC/States
Inseason management and monitoring of fisheries		
● Directed	IPHC	NMFS
● Incidental	Council/States/ IPHC	Council/States
● Recreational	States/NMFS	States/NMFS
● Tribal	Tribes	Tribes
Providing observer coverage for directed commercial	NMFS	NMFS
Providing enforcement coverage of fisheries	NMFS/States/Coast Guard	NMFS/States/Coast Guard

The IPHC mortality projection tool for 2021 (and 2022) mortality limits

PREPARED BY: IPHC SECRETARIAT (I. STEWART; 13 OCTOBER 2020)

PURPOSE

This document provides an updated description of the IPHC's web-based mortality projection tool (https://www.iphc.int/data/projection-tool) for setting mortality limits in 2021 (and 2022).

BACKGROUND

To support the IPHC's process for setting the 2019 mortality limits, IPHC Secretariat developed an interactive tool for the evaluation of alternative Pacific halibut mortality levels based on the coastwide TCEY and the distribution of that mortality among IPHC Regulatory Areas. The tool was updated for use in developing mortality limits for 2020; however, agreements made during AM095 and IM095 led to additional complexity that rendered simple use of the tool challenging.

For the evaluation of 2021 mortality limits, the existing web-based tool has been updated to again provide all participants in the process the ability to create alternative projection tables as is necessary for decision making, without having to rely directly on the IPHC Secretariat. Specifically, agreements in place for 2021 and 2022 have been included by default in the calculations.

THE MORTALITY PROJECTION TOOL

The tool relies on previously calculated stock assessment outputs representing a broad range of total mortality. These include projections of spawning stock size and fishing intensity, such that alternative harvest levels can be evaluated in the context of the harvest decision table as well as relative trends. The tool is divided into five components:

1) Inputs
2) Summary results
3) Biological distribution
4) Detailed sector mortality information
5) Graphics

A brief description of each of these is provided below, noting all key features and changes from previously available versions.

Inputs

The first section of the tool provides the user with inputs primary information (Figure 1):

1) The total distributed mortality limit (TCEY) in millions of net[1] pounds.
2) The percent of the distributed mortality limit (TCEY) assigned to each IPHC Regulatory Area.

The default values loaded into the tool reflect the IPHC's interim management procedure, adjusted for current agreements for 2021 (and 2022) mortality limits and TCEY distribution, as well as an intersessional decision during 2020. The total TCEY is based on the value that

[1] Net pounds refer to the weight with the head and entrails removed; this is approximately 75% of the round (wet) weight.

produces a projected level of fishing intensity equal to $F_{43\%}$, or the fishing intensity that reduces the spawning output of the stock per recruit to 43% of its unfished level (SPR=43%) given recent recruitment, and current biology (weight at age, maturity, fecundity), allocation among fisheries

Inputs

Enter 2021 coastwide distributed mortality limit (TCEY) **50.00**

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
Enter 2021 distributed mortality limit %	3.3%	18.6%	14.0%	35.1%	9.0%	5.0%	5.0%	10.0%	100.0%

Select non-directed discard option: **Three-year average discards**
Select weight units: **Millions of net pounds**

Figure 1: Example of the “Inputs” section of the mortality projection tool. Cells in yellow are intended to be modified by the user. Note that specific values are for illustration only and do **NOT** correspond to default values for 2021 (or 2022).

and selectivity within fisheries. This level of fishing intensity reflects an adjustment made intersessionally (after AM096; IPHC 2020a) to the previous $F_{46\%}$ handrail adopted in 2016, in response to the results from the IPHC’s ongoing Management Strategy Evaluation (MSE) process. The MSE results, presented at AM096 (IPHC-2020-AM096-12), found that a management procedure utilizing an $F_{43\%}$ target level of fishing intensity, and a control rule reducing that level of fishing intensity linearly if the relative spawning biomass drops below 30%, to a target value of $F_{100\%}$ (no fishing) if the spawning biomass reaches 20% successfully met the coastwide conservation and fishery objectives.

The IPHC’s interim management procedure also includes a method for distributing the coastwide TCEY among IPHC Regulatory Areas. The distribution method consists of the following steps:

1) Determine the current stock distribution of Pacific halibut greater than 32-inches (82.5 cm, O32) from the modeled survey WPUE and geographic extent of each IPHC Regulatory Area.
2) Assign relative harvest rates of 1.0 to IPHC Regulatory Areas 2A-3A and 0.75 to IPHC Regulatory Areas 3B-4CDE.
3) Generate a target TCEY distribution, as the normalized product (sums to 100%) of steps 1 and 2.

During AM095 (para. 69) two additional steps were adopted by the Commission, to apply to mortality limits for 2019-2022:

4) Set the IPHC Regulatory Area 2A TCEY to a value of 1.65.
5) Set the IPHC Regulatory Area 2B target TCEY percentage to a weighted average of 20% (weight = 0.7) and the result of step 3 (weight = 0.3).
6) In order to satisfy the coastwide TCEY as well as steps 4-5, reduce the target TCEY percentages for IPHC Regulatory Areas 2C-4CDE in proportion to the result of step 3.

At IM095 (Req.03, para. 49) an additional adjustment was added:

7) Remove all non-directed commercial discard (‘bycatch’) mortality of Pacific halibut less than 26 inches in length (66 cm; U26) occurring in Alaska from the projections.

8) Recalculate the TCEY (using the stock assessment ensemble) that corresponds to the reference fishing intensity (coastwide) and the distribution percentages from step 6.
9) Compare the recalculated TCEYs to those from step 6 to determine the 'yield gained' in IPHC Regulatory Area 2B.

This adjustment was further modified during AM096 (para. 97):

10) Add 50% the yield gained for IPHC Regulatory Area 2B (step 9) to that from step 6.
11) In order to satisfy the coastwide TCEY as well as steps 6 and 10, reduce the target TCEY percentages for IPHC Regulatory Areas 2C-4CDE in proportion to the result of step 6 (also equivalent to step 3).

The mortality projection tool satisfies these constraints by using the input coastwide TCEY to determine the distributed components. This relies on the inputs described above, as well as a range of pre-calculated yield gained values for 2B due to accounting for U26 non-directed discard mortality (the yield gained depends on the overall level of fishing intensity). Therefore, the distribution percentages for 2A and 2B are shaded grey[2] in the mortality projection tool, and will update to the appropriate percentages if the coastwide TCEY is adjusted. The distribution percentages for IPHC Regulatory Areas 2C-4CDE can be adjusted manually. Although the percentages describing the distribution of the mortality limit are intended to sum to 100%, if they do not the total will be highlighted in red, and 2C-4CDE are automatically rescaled so that the sum of the distributed mortality limits across all IPHC Regulatory Area will exactly match the coastwide total input.

There are two optional inputs, with drop-down menus, specifying:

1) The basis for projecting non-directed discard mortality. The default projection, consistent with the IPHC's Interim Management Procedure (specified during AM096 para. 97), is to use the three-year average non-directed discard mortality from the most recent year. Alternatives include the previous year's estimates and the values consistent with full regulatory attainment of domestic non-directed discard mortality limits.
2) The units of mortality measurement. This can either be millions of net pounds (default) or net metric pounds.

Summary results

The second section of the tool provides the projected coastwide SPR for comparison with the harvest decision table. In addition, this section reports the distributed mortality limit (TCEY) for each IPHC Regulatory Area; the total can be compared to the total input above to verify that the calculations are working properly. The total mortality limit (all sizes and sources of mortality, including U26 non-directed discard mortality of Pacific halibut) is also summarized by IPHC Regulatory Area.

Biological and fishery distribution

The third section of the mortality projection tool provides the most current modelled estimates of stock distribution by Biological Region, compared to the distributed mortality limits (TCEY). These two values are then used to project a harvest rate by Region, standardized such that

[2] Note that the percentages for 2A and 2B can be adjusted manually for comparison of alternative distribution procedures, but the tool must be refreshed to return to automatic calculations that satisfy the Interim Management Procedure.

Region 3 (IPHC Regulatory Areas 3A and 3B) is always equal to a value of 1.0 and the other Regions (2, 4 and 4B) are relative to that value.

Detailed sector mortality information

This section provides a full distribution of mortality among IPHC Regulatory Areas and fishery sectors. Calculations are based on catch sharing agreements used by the domestic agencies for IPHC Regulatory Areas 2A, 2B, 2C, 3A, and 4CDE (4CDE allocating among sub-Areas). Static projections are used for non-directed discard mortality (see above), and subsistence mortality (based on the most recent estimates available). Discard mortality in directed fisheries scales with the landings based on the most recently observed rates for each fishery. The total of this section (matching the total in the summary results) provides the best projection of all sizes and sources of Pacific halibut mortality based on the specified mortality limits.

Graphics

The last section of the projection tool provides a series of five graphical results updated to reflect the inputs made by the user. These graphics are similar to those provided in the annual stock assessment and/or presentation material.

The first figure uses previously calculated three-year projections for a range of coastwide TCEY (and corresponding SPR) values to illustrate the coastwide spawning biomass trend associated with the specified inputs to the tool. Uncertainty is shown as a shaded region, with the projected period highlighted by the brighter color relative to the darker estimated time-series. Importantly, not all possible SPR values are available, so the closest value available is reported. The projected SPR is reported above the figure, and a warning will be returned if the user has specified a coastwide TCEY outside of the range of values available, or if the value lies between the pre-calculated grid.

The second figure provides a bar chart of the time-series of estimated relative fishing intensity with 95% confidence intervals. The inputs to the projection tool provide the basis for the projected fishing intensity, shown as the hatched bar at the end of the series. Values are relative to the IPHC's Interim Management procedure, currently based on an SPR of 43% (see description above), such that values above the target ('handrail from 2016-2020) represent higher fishing intensity.

The third figure provides a graphical display of the relative harvest rates by Biological Region as reported in the ***Biological and fishery distribution*** section.

The fourth and fifth figures provided the detailed sector mortality information (allocations) in both absolute values (millions of net pounds) and relative values (percent of the projected mortality) by IPHC Regulatory Area.

DISCUSSION

There may be some alternatives (e.g. evaluations of alternative relative harvest rates by IPHC Regulatory Area) that will not be possible using this tool. Such alternatives will continue to be produced by the IPHC Secretariat as needed to support all meetings and decision-making.

UPDATE SCHEDULE

The existing mortality projection tool will be updated in early January 2021, in order to include the final end-of-year 2020 mortality estimates from various fisheries, for use during the 97th Session of the IPHC Annual Meeting (AM097).

REFERENCES

Hicks, A., Carpi, P., Berukoff, S., and Stewart, I. 2020. IPHC Management Strategy Evaluation (MSE): update.

IPHC. 2019a. Report of the 95th Session of the IPHC Annual Meeting (AM095). Victoria, Canada, 28 January to 1 February 2019.

IPHC. 2019b. Report of the 95th Session of the IPHC Interim Meeting (IM095).

IPHC. 2020a. IPHC Circular 2020-007: Intersessional Decisions (1 January - 17 March 2020).

IPHC. 2020b. Report of the 96th Session of the IPHC Annual Meeting (AM096).

The IPHC MSE Explorer tool

PREPARED BY: IPHC SECRETARIAT (A. HICKS & P. CARPI; 10 NOVEMBER 2020)

PURPOSE

This document provides a description and tutorial of the IPHC's web-based MSE Explorer tool (http://shiny.westus.cloudapp.azure.com/shiny/sample-apps/MSE-Explorer) used to examine current Management Strategy Evaluation (MSE) results.

BACKGROUND

To support the IPHC's MSE process, IPHC Secretariat developed an interactive tool that can be used to examine the MSE results (i.e. performance metrics) by comparing and ranking management procedures (MPs), plotting performance metrics, and investigating trade-offs. There are many different views in MSE Explorer with control over what is viewed. There is a table of performance metrics, a page with plots of performance metrics against the MPs, plots of trade-offs between performance metrics, plots of trade-offs between IPHC Regulatory Areas, and tables ranking the MPs against the primary objectives. Additionally, there are help pages defining commonly used terms and acronyms, describing the performance metrics, and explaining the MPs.

THE MSE EXPLORER

The MSE Explorer is a necessary tool to understand the outcomes of the IPHC MSE because it filters pre-calculated performance metrics and pre-defined MPs that resulted from simulations using the IPHC MSE framework. An MSE can simulate many MPs and have many performance metrics calculated for each MP. The table of results can become so large that it becomes onerous to interpret the results and compare MPs. The MSE Explorer assists with the evaluation by allowing the users to select exactly what they would like to focus on and make comparisons that are easier to interpret.

There are eleven general MPs defined by the MSAB and for each MP, different levels of fishing intensities (i.e. Spawning Potential Ration, SPR) were included. Additional MPs were included to investigate additional components or specifications. Each management procedure has nearly 700 performance metrics calculated for it. The MSE explorer gives the user the freedom to view specified performance metrics for selected management procedures in tabular form or with various plots. The selected tables can be easily downloaded for further analysis and plots can be copied and pasted into a document.

There are eight pages in MSE Explorer:

1) **Description**: First page displayed by default showing a description, updates, and grids indicating available and chosen MPs.
2) **Table**: A table of the performance metrics for selected MPs. Useful to see the exact values of the performance metrics to make detailed comparisons.
3) **Plots**: Plots of each performance metric for all selected MPs. Useful to compare a lot of MPs for individual MPs.

4) **Trade-offs**: Two performance metrics plotted against each other for all selected MPs. Useful to examine trade-offs between two performance metrics.
5) **Regulatory Areas Trade-offs**: Plots of selected Regulatory Area performance metrics with all Regulatory Areas on each plot. Useful to examine trade-offs between IPHC Regulatory Areas.
6) **MPs Ranking**: Table ranking the MPs for performance metrics related to the primary objectives. Additional tables are provided that summarize over IPHC Regulatory Areas and measurable objectives. Useful to compare the performance of MPs and quickly identify MPs that perform well compared to others.
7) **MPs**: A description of the all of the MPs that may be selected.
8) **Help**: Definitions of some terms and descriptions of the performance metrics.

The left portion of the MSE Explorer is where options are selected for the management procedures, time-period over which statistics are calculated, Biological Regions and IPHC Regulatory Areas to include, and performance metrics to display. Pages 2 to 6 show results based on these specific selections. The logo on the top right corner of each page will direct directly to the IPHC website. A tutorial on how to select options is provided first, followed by a brief description of each page. How to interpret outcomes is provided throughout.

SELECTING OPTIONS

The left portion of the MSE Explorer, with a black background, is where the page, the elements of the MP, the time-period, the Biological Regions, the IPHC Regulatory Areas, and the performance metrics to be displayed can be selected. This selection panel can be hidden or made visible by clicking on the three horizontal lines at the top, immediately to the right of the words “IPHC MSE Results”. The performance metrics can be chosen by clicking on “Expert Mode”.

Figure 1 shows the different sections of the selection panel. The current pages that can be displayed are discussed in detail below. The other components are described here.

MP Elements

This section of the selection panel allows the user to select the elements of the MPs that in combination will be displayed in the results pages.

Estimation Error indicates the method used to simulate estimation error, and **“Sim” is the recommended option to use when evaluating MPs**. The three types of estimation error are:

None: No estimation error is simulated, thus the quantities needed to determine total mortality (e.g., population abundance and age-structure) and to distribute the TCEY to IPHC Regulatory Areas (e.g., O32 stock distribution) are known without error. This is useful to understand the underlying variability in outcomes due to the simulated population variability. However, it is an unrealistic simulation of the management process and is not to be used to evaluate MPs.

Sim: Estimation error for the stock assessment is simulated through a simple approximation using unbiased random number generation. Estimation error for the survey data is simulated realistically as determined from previous observations. This is the same method used for the IPHC coastwide MSE and is currently the most complete and trusted method to evaluate these MSE results.

SS: Estimation error for the stock assessment is simulated using a stock synthesis (SS) model similar to one of the models used in the current stock assessment ensemble. This approach is the most realistic method to use in MSE simulations, but is currently incomplete in these MSE results. Additional work is being done to improve this method for future use. However, it is currently not ready for evaluation of MPs, but is included as a comparison.

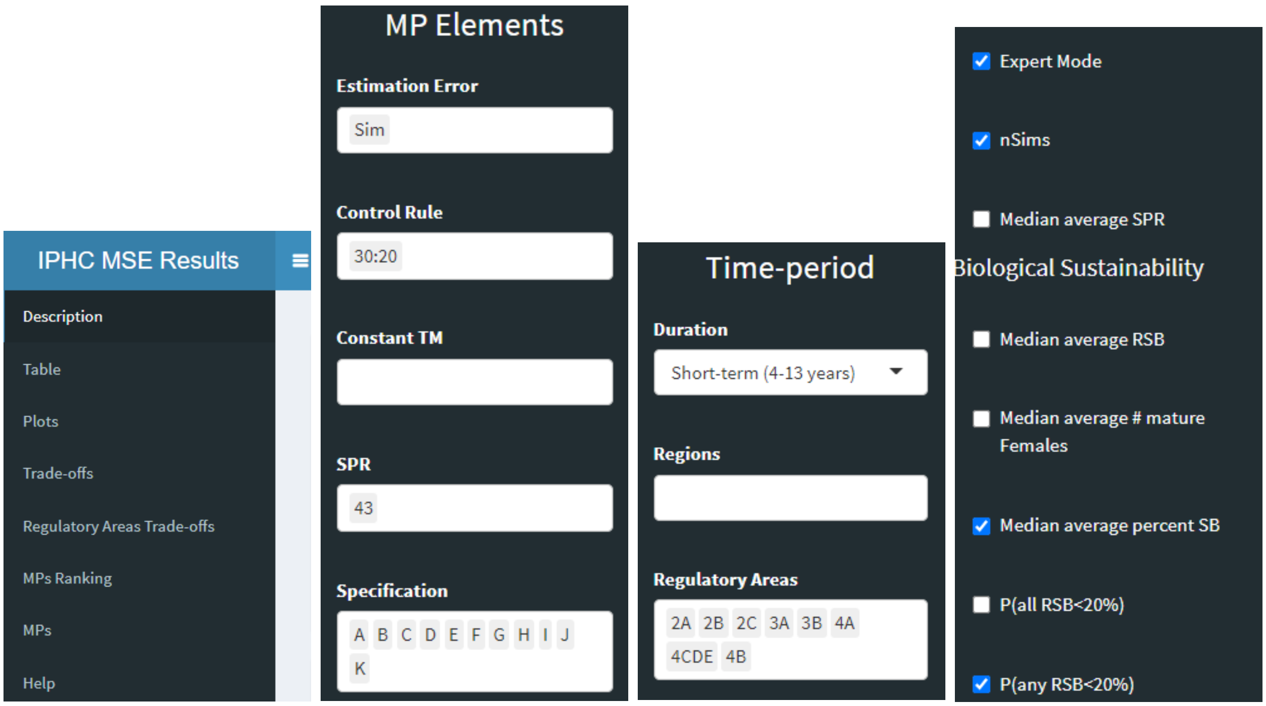


Figure 1: Four sections of the portion of MSE Explorer that allows you to select options. The four sections are located on the left of the screen and allow you to (from left to right) select the page, select the elements of the MPs, select the time-period, Biological Regions, and IPHC Regulatory Areas, and select the performance metrics once "Export Mode" is checked. The three horizontal bars next to the words "IPHC MSE Results" will hide or display the panel for these options.

Control Rule is the specification of the trigger and limit in a control rule, indicating the stock status at which the fishing intensity would begin to be reduced and where it would be theoretically set to zero, respectively. Currently, only a 30:20 control rule is available, thus is the only option.

Constant TM is a placeholder for results that project into the future under a constant total mortality. For example, a total mortality of zero (no fishing) or a specified value may be useful to understand the population and fishery dynamics. Currently, there are not simulations available for this element, but may be added in the future.

SPR is the spawning potential ratio which determines the fishing intensity. Lower SPR values correspond to higher fishing intensity and '43%' is the SPR currently used in the interim harvest strategy policy. The stock assessment (simulated in the MSE) uses the SPR to determine the coastwide total mortality. Most MPs have been tested for different SPR values.

Specification indicates the specifications of the MP as defined at MSAB015. Specifications were provided for eleven MPs and are described in Appendix V of IPHC-2020-MSAB015-R. Additional specifications, identified as 'Extra MPs' in the dropdown menu and prefixed with the number '16', were supplied to supplement the evaluation of the original eleven MPs. Descriptions of all specifications are available on the "MPs" page in MSE Explorer.

Results for an MP combining the selected elements for estimation error, SPR, and specification may not be available. In that case, that MP will not appear on any pages. For example, there are no results for an SPR of 36 and MP-I, but there is for an SPR of 36 and MP-A. The grids at the bottom of the Description page are useful to determine what combinations are available for evaluation.

Time-period

There are three time-periods to choose from in the drop-down box labeled "Duration". These are short-term (4-13 year projection), medium-term (14-23 year projection), and long-term (51-60 year projection). All three options cover ten-year periods so that statistics are comparable. Typically, sustainability objectives are evaluated in the long-term, representing equilibrium values, which is a common concept used in fisheries management. Any of the time-period may be considered for fishery objectives, and are useful to compare. Despite being provided, the MSE simulations are not purposefully designed for short-term predictions. MSE is, however, designed to represent long-term variability useful for strategic decision making.

Biological Regions and IPHC Regulatory Areas

Some performance metrics are calculated for Biological Regions and/or IPHC Regulatory Areas (Figure 2), but they are only displayed when a region or area is chosen in the drop-down boxes. Therefore, to view a performance metric for a region or area, a performance metric must be selected and the IPHC Regulatory Area or Biological Region must also be chosen.

Performance Metrics

When the box labeled "Expert Mode" is checked, the list of all available performance metrics is displayed with a check box next to each one. A set of default performance metrics associated with the current primary objectives are selected when the MSE Explorer is first visited or reloaded. Selecting the check box will display that performance metric along with other ones that are checked, although some performance metrics will also need to have an IPHC Regulatory Area or Biological Region chosen. The performance metrics are defined on the "Help" page and only those related to the primary objectives are defined in Appendix I.

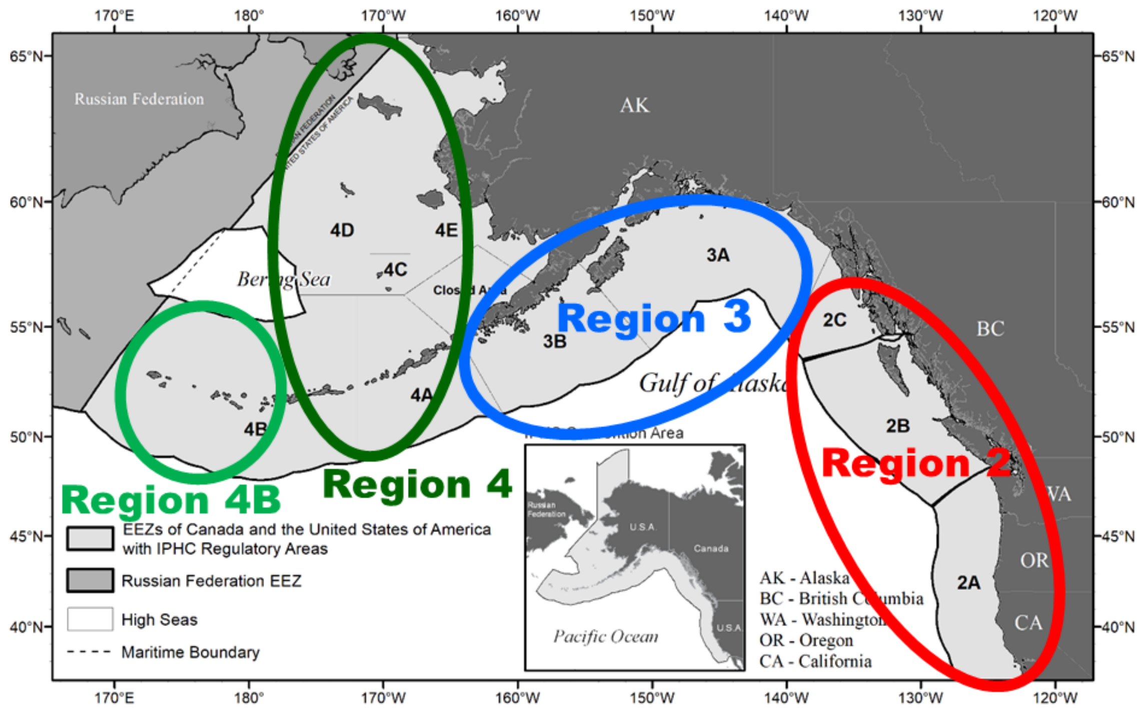


Figure 2: IPHC Regulatory Areas and Biological Regions. The Biological Region boundaries match IPHC Regulatory Area boundaries for practical purposes.

Pages of the MSE Explorer

Description

The Description page is the general landing page for the MSE Explorer and provides a description of the tool, a list of updates, and a display (grids) of the available and selected MPs. This page is displayed by default when first visiting the MSE Explorer or when refreshing the webpage. It is always a good idea to refresh the webpage (e.g., press the reload button on your browser or press F5) when you visit to make sure that you are viewing the most recent version.

The grids are presented separately for each type of estimation error. Each grid shows the SPR values on the vertical axis and the selected specification (i.e. Distribution Procedure) on the horizontal axis. Blue colored cells indicate that results are available for the combination of estimation error, SPR, and specification. Light-blue indicates that the elements are not selected and dark-blue indicates that they are selected and that results are displayed on other pages.

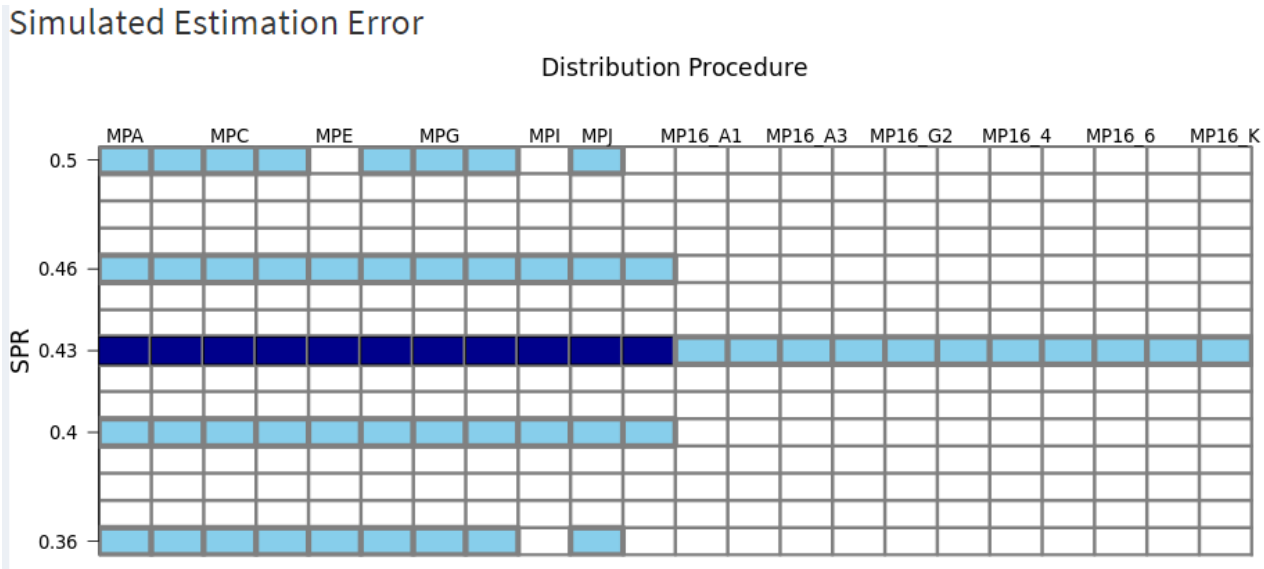


Figure 3: The grid for simulated estimation error showing the MPs available for combinations of SPR (vertical axis) and Specification (labeled Distribution Procedure) on the horizontal axis. The light-blue indicates that the combination is not selected for display and dark-blue indicates that the combination is displayed for evaluation on results pages. The grid is interactive and changes immediately upon a change in selection.

Table

The Table page presents the selected performance metrics as rows for the selected MPs across columns. The performance metrics are grouped by those related to the population and those related to the fisheries. The table expands based on the selections made and can be scrolled left and right as well as up and down. The values can be copied to a different program, such as a word processor or spreadsheet, by selecting rows and using copy commands. Alternatively, the table based on the selections can be downloaded as a csv file (comma delimited) with the "Download Table" button, making it easy to import into a spreadsheet for further analysis.

The Table page is useful because it reports the numeric values of each selected performance metrics. This allows the user to assess the actual difference between MPs, that could be difficult to determine in the pages with plots or ranks. In the plots, the difference between MPs might appear larger due to the scale used in the y axis, but looking at the Table page will allow one to evaluate if the difference is actually meaningful.

Plots

The Plots page is an extremely useful page to investigate the value of a single performance metric across all the selected MPs. This page shows an individual plot for each selected performance metric with the specification along the horizontal axis and the metric as the vertical axis. If multiple SPR values and/or estimation error types are chosen, they will be displayed as different colors in each plot (Figure 4).

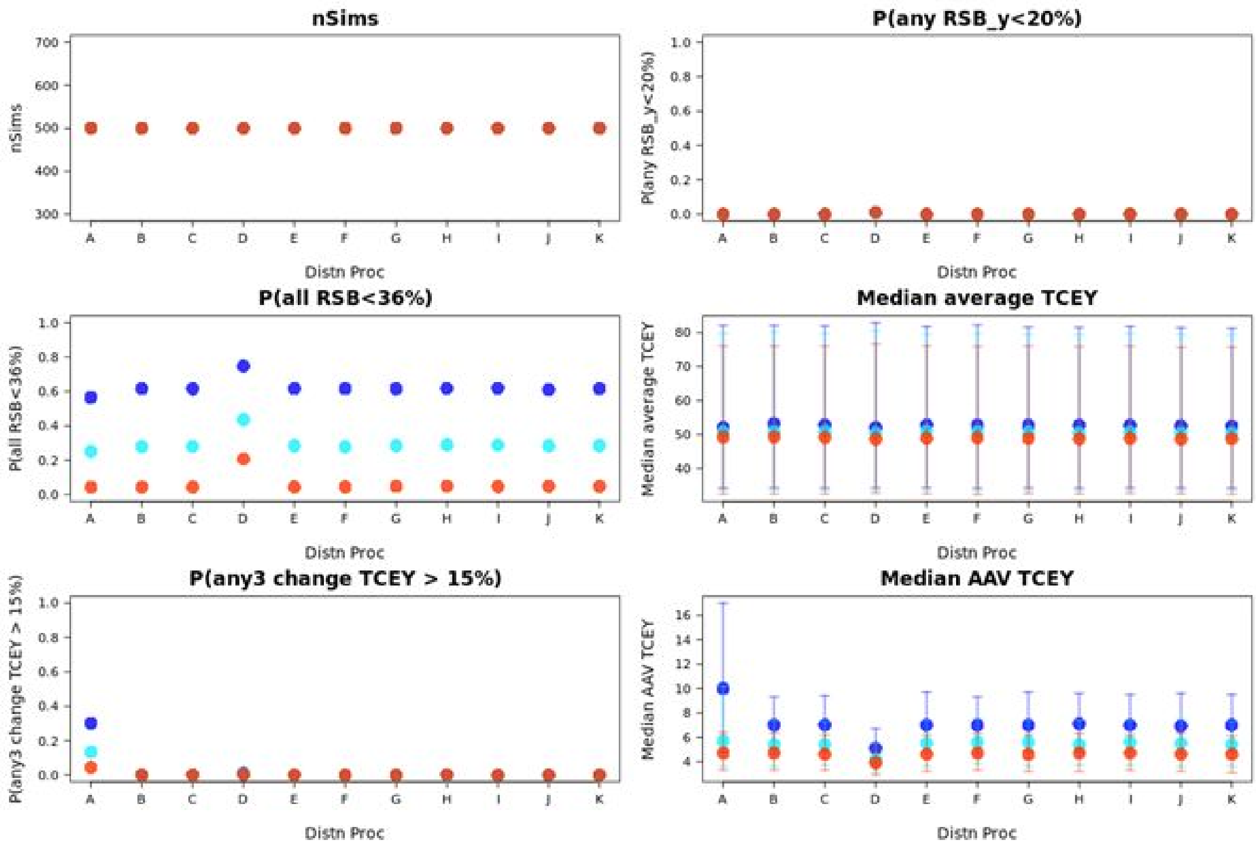


Figure 4: Plots of single performance metrics from the Plots page for the eleven MPs and three levels of SPR (40% in dark blue, 43% in light blue, and 46% in red). The 25th and 75th percentiles are shown for the median average TCEY and the median AAV of the TCEY. "nSims" is not a performance metric but is the number of simulations which is informative about the precision of performance metrics.

Some additional options are available on the Plots page. The height of the plot can be resized and the size of the plotting character (circle) can be changed. Performance metrics that are not probabilities are summarized by the median value average over a 10-year period. These also have the 5th, 25th, 75th, and 95th percentiles calculated and can be plotted by checking the appropriate box in the upper right. A percentile indicates that the defined percentage of simulations were less than that percentile value. For example, a 25th percentile means that 25% of the simulations were less than that value. Note that the median is the 50th percentile.

The plots are useful to examine a single performance metric for a range of MPs. In Figure 4, the median AAV (average annual variability) of the coastwide TCEY is shown in the lower right, and highlights some important results. First, the dark blue circles for an SPR of 40% (i.e., higher fishing intensity) show more variability in the TCEY that higher SPR values (i.e., lower fishing intensities). Furthermore, the variability tends to be highest for MP-A and lowest for MP-D.

Trade-offs

The Trade-offs page produces a plot showing the relationship between two performance metrics. The user chooses a metric (near the top of the page) to be plotted on the horizontal axis and a metric to be plotted on the vertical axis. Only performance metrics selected by the user are present in the drop-down boxes. The resulting plot is color coded by specification and shows different SPR values with different shapes (Figure 5). There is a drop-down box for Factor, which currently contains only one choice. The plot height and point size can be adjusted as with the Plots page.

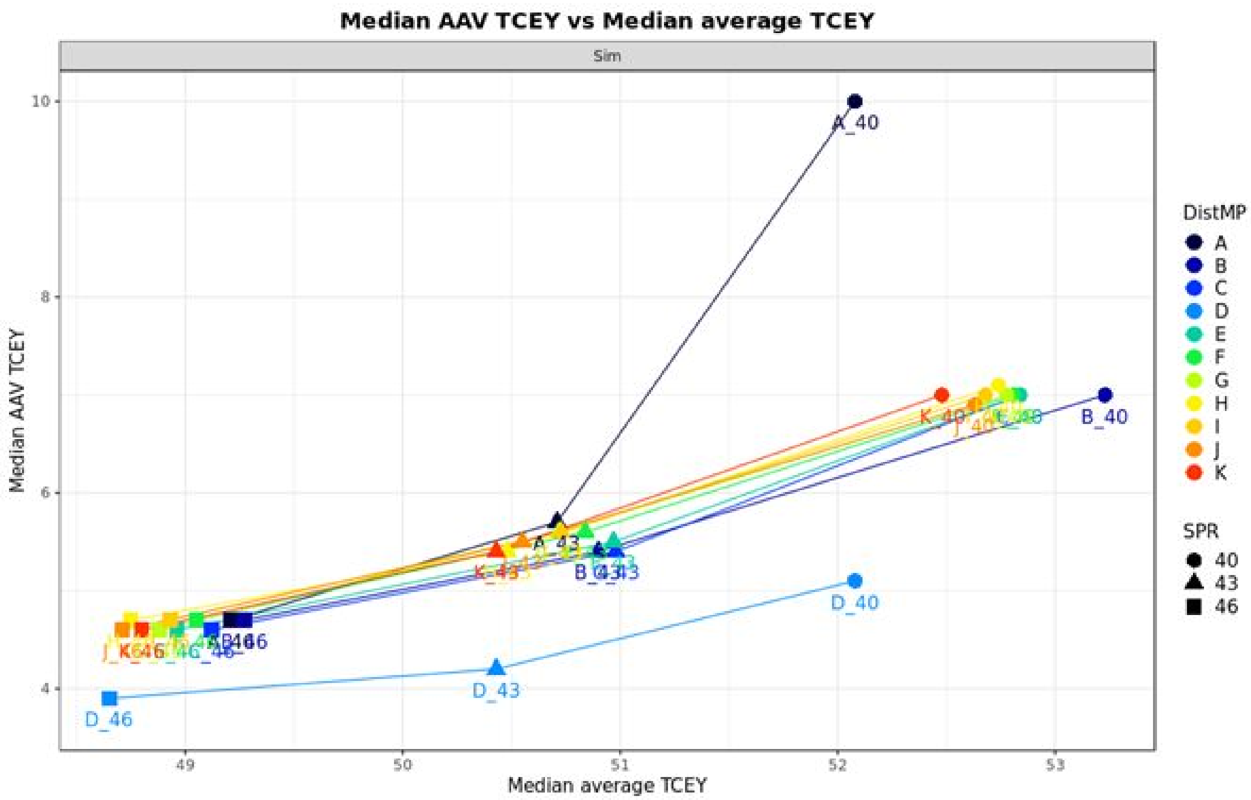


Figure 5: A trade-off plot from the Trade-offs page showing the relationship between the median AAV of the coastwide TCEY and the median average TCEY for the various specifications of the MPs (colors and letters) and three-levels of SPR (shapes connected by lines).

Trade-offs are an important concept to consider when evaluating MPs using MSE simulations. The performance metrics are typically related to objectives and it is important to determine the trade-offs between those objectives. For example, Figure 5 shows the trade-off between the median AAV of the coastwide TCEY and the median TCEY. As more fish are caught (horizontal axis) the variability also increases (vertical axis), indicating that two common objectives of reducing variability and increasing yield cannot be met simultaneously. Also in Figure 5, MP-A with an SPR of 40% stands out, and MP-D stands out as having lower variability, but also lower yield than the other specifications. Many insights can be gained from trade-off plots.

Regulatory Areas Trade-offs

The Regulatory Areas Trade-offs page contains plots for each performance metric showing the values organized by IPHC Regulatory Areas (Figure 6). The specification is shown along the horizontal axis and SPR levels are noted with different symbol shapes. Each IPHC Regulatory Area that is selected in the drop-down box on the selection panel is shown with a different color. The estimation error method selected is specified in the grey bar on top of each plot. Different plots are drawn for each of the estimation error methods, if desired. The user can use the dropdown menu for the 'Horizontal (x) Axis' to plot IPHC Regulatory Areas on the x-axis and display the different specification as different colors.

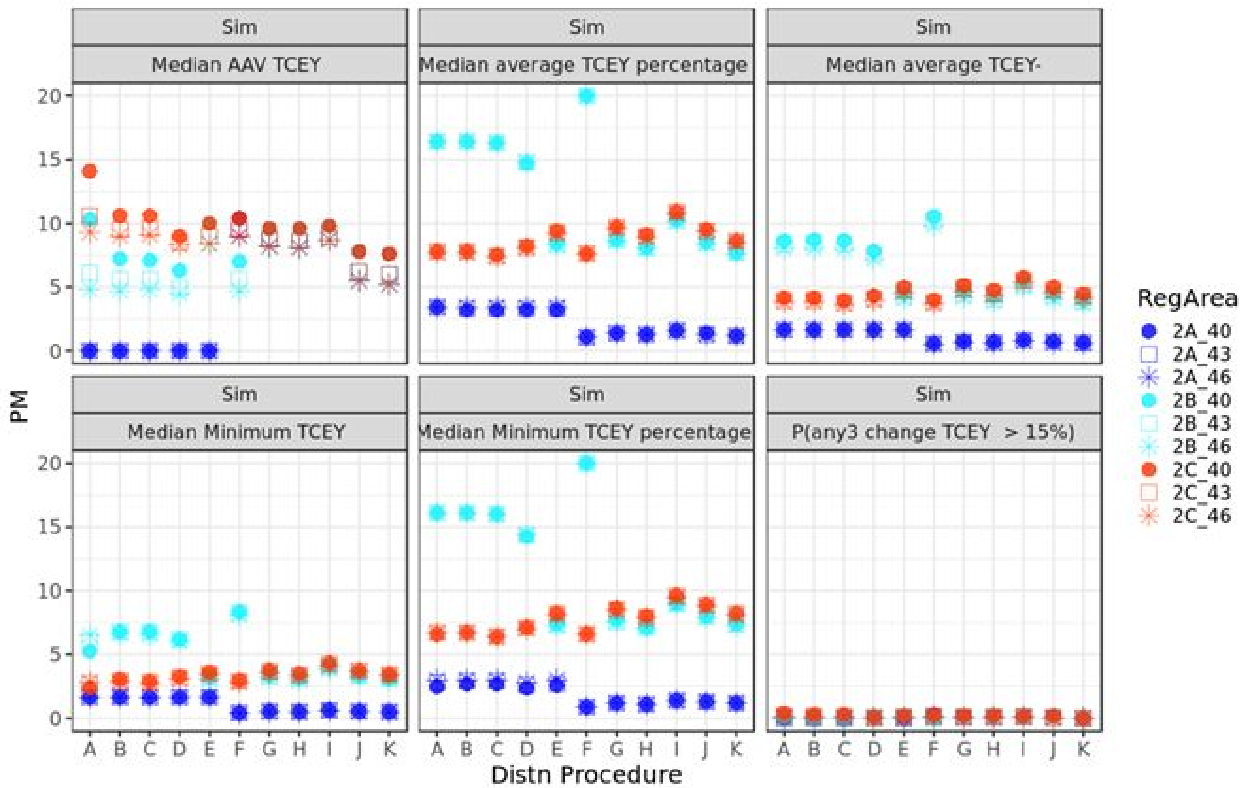


Figure 6: Plots from the Regulatory Areas Trade-offs page for simulated estimation error, various performance metrics, three SPR values, and IPHC Regulatory Areas 2A, 2B, and 2C.

This page allows for easier examination of the trade-offs between IPHC Regulatory Areas by plotting the areas on the same plot. In Figure 6, the SPR has a small effect on the performance metric for each IPHC Regulatory Area, while the specification of the MP has a much larger effect. The median AAV of the TCEY in IPHC Regulatory Areas 2A, 2B, and 2C (upper left of Figure 6) increases significantly for 2A while decreasing for 2C in the MP specifications to the right, which do not contain specific agreements for 2A and 2B.

MPs Ranking

A useful method to discern between multiple management procedures is to rank each MP based on the values of the performance metrics related to defined objectives, such as those currently defined by the Commission. Currently specified biological objectives and one of the fishery objectives are defined in a way such that it can be determined if they are met or not. In particular, the Biological sustainability objectives are stated as a probability of staying above a defined level with a specified tolerance. For example, a coastwide sustainability objective is to maintain the female spawning biomass above a biomass limit reference point 95% of the time. Using the outcomes of the MSE simulations, it can be determined if this objective is met, or not, by an MP. Most of the fishery objectives, on the other hand, do not have a tolerance defined. In this case, the scoring of the related performance metrics will identify a set of the best performing MPs relative to each objective.

The MPs Ranking page incorporates both of these concepts and summarizes the outcomes in a succinct way to assist with identifying robust MPs that perform well against the defined objectives. The page has different sections in accordance with the general objectives:

- 1.1: Biological Sustainability: Keep female spawning biomass above a limit to avoid critical stock sizes and conserve spatial population structure.
- 2.1: Fishery: Maintain female spawning biomass around a level that optimises fishing activities.
- 2.2: Fishery: Limit catch variability.
- 2.3: Fishery: Provide directed fishing yield.

At the top of each rank table is an option for the time-period (short-, medium-, or long-term): the default is set to the time period specified by the MSAB when objectives were defined. The tables that rank the MPs provide rounding options to be applied before ranking. Rounding to different levels implies different levels of significance. Additional tables summarize the results over IPHC Regulatory Areas and then again for the three fishery goals (general objectives 2.1, 2.2, and 2.3). The dash on the top right corner of each table minimize the table itself, so to reduce the length of the page. The search box on top of each table allows filtering of the rows in each table using simple keywords.

The table for general objective 1.1. provides the actual value for that performance metric (a probability) and a color code to indicate if the objective is met (green to indicate it is met, red it is not). This table can be determined using short-term, medium-term, or long-term results, although long-term is recommended since these are Biological Sustainability objectives. There is a check box labelled “Include in Summary” which will color code columns in summary tables in red if any Biological Sustainability objectives are not met. Excluding the biological sustainability objective from the summary tables, allows for trade-offs in fishery objectives to be evaluated for all MPs regardless if they pass the Biological Sustainability objectives.

The tables for the fishery objectives contain ranks for individual performance metrics determined across the selected MPs. Cells are color coded with higher (better) ranked MPs given a light color and lower (worse) ranked MPs getting a dark blue color. MPs with the same value for a performance metric (i.e., a tie) are given the same rank and subsequent ranks continue from the total number of MPs ranked better than it. For example, if three MPs all tie for first rank, they are given a 1, and the fourth MP is given a rank of 4. There are alternative ranking methods, but they are not applied here.

The table for general objective 2.1. provides the ranks for a single performance metric: how close to 0.5 is the probability that the spawning biomass is less than a target of 36% of unfished spawning biomass. This ranking is done on the proximity to 0.5 because the objective is related to a target The time-period defaults to long-term, but the user can select short- or medium-term. Additionally, the difference in the probability from 0.5 can be rounded to one or two decimals before ranking.

The ranks for many performance metrics are provided for the objective to limit catch variability (2.2). These include two coastwide metrics: the probability that the annual change is greater than 15% and the median AAV. Both performance metrics are also reported for each IPHC Regulatory Area, resulting in a total of 18 rows in the table. The probabilities can be rounded to one or two decimals and the AAV can be rounded to the nearest integer, 0.5, or one decimal. This table uses short-term by default but can also use medium- or long-term periods.

The final ranking table is for general objective 2.3: provide directed fishing yield. The median coastwide TCEY is the only coastwide performance metric used in this table. The median TCEY, minimum TCEY, median percentage of the coastwide TCEY, and the minimum % of the coastwide TCEY are ranked for each IPHC Regulatory Area. This results in 33 rows. The short-term time-period is the default with medium- and long-term options available. The TCEY metrics can be rounded to the nearest one million pound or the nearest 0.1 million pounds. The percentages can be rounded to the nearest integer, one decimal, or two decimals.

The three tables for the fishery objectives have a total of 52 rows due to performance metrics for each IPHC Regulatory Area, which can still be overwhelming to evaluate. Therefore, a summary table is provided that averages over the ranks for IPHC Regulatory Areas within each performance metric, with equal weighting by default, resulting in ten rows (Figure 7). Weights for each IPHC Regulatory Area can be entered for comparison purposes, but equal weighting is recommended because there is currently no reason to give more weight to objectives in any particular areas. The resulting averages are color coded with light colors indicating better performance and dark blues indicating worse performance.

The ranks are further summarized to the three primary general fishery objectives by averaging over the measurable objectives within each general objective (Figure 8). This results in three rows with an average rank for general objectives 2.1, 2.2, and 2.3, allowing the user to examine the overall ranking of a management procedure relative to the target spawning biomass, catch variability, and fishing yield. The table is color coded with shades of blue as with other tables. Different weights can be assigned to the measurable objectives within 2.2 and 2.3 if desired, but the current objectives definition doesn't prioritize any fishery objective over the others.

The ranking tables are presented as one method to quickly examine many MPs and how they perform relative to each other given the currently defined objectives. The evaluation may be different depending on the rounding choices and the MPs selected. The page defaults to the methods and MPs used at MSAB016 and presented in IPHC-2020-MSAB016-R.

MPs

The MPs page provides a description of each specification of a management procedure. Elements of the MP are described for coastwide components, regional components, and components specific to IPHC Regulatory Area. A priority is provided to indicate the priority assigned at MSAB015 in IPHC-2020-MSAB015-R for initial analysis, but is less pertinent now that results are complete. The MPs with a label beginning with MP16 were created by IPHC secretariat staff based on elements of interest identified at MSAB015. They are meant to supplement the evaluation and examine additional elements such as a slow-up fast-down constraint on the coastwide TCEY.

Help

The Help page provides a brief overview of how to use MSE Explorer, various definitions, and a description of the performance metrics. Performance metrics related to the primary objectives are described in Appendix I.

Summary table by Measurable Objectives

Weight for average

2A	2B	2C	3A	3B	4A	4CDE	4B
1	1	1	1	1	1	1	1

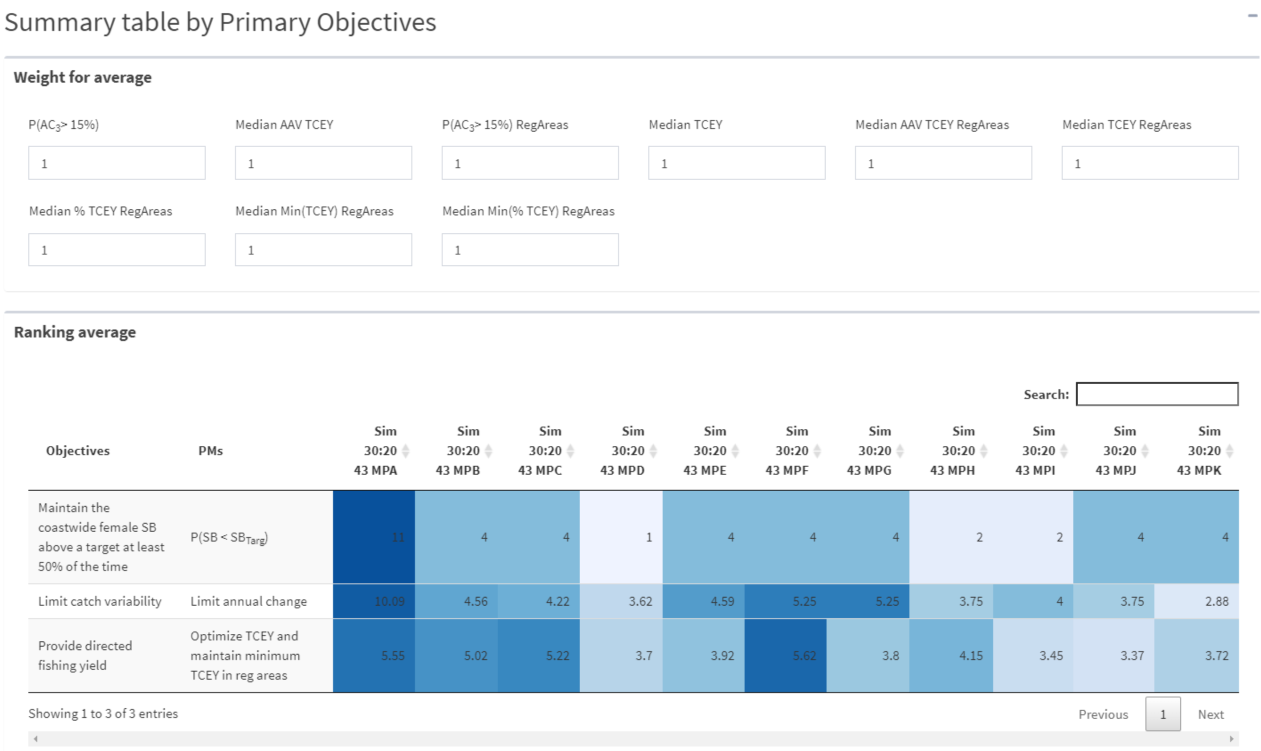
Ranking average

Search:

Objectives	PMs	Sim 30:20 43 MPA	Sim 30:20 43 MPB	Sim 30:20 43 MPC	Sim 30:20 43 MPD	Sim 30:20 43 MPE	Sim 30:20 43 MPF	Sim 30:20 43 MPG	Sim 30:20 43 MPH	Sim 30:20 43 MPI	Sim 30:20 43 MPJ	Sim 30:20 43 MPK
Maintain the coastwide female SB above a target at least 50% of the time	$P(SB < SB_{Targ})$	11	4	4	1	4	4	4	2	2	4	4
Limit AC in coastwide TCEY	$P(AC_3 > 15\%)$	11	1	1	10	1	1	1	1	1	1	1
Limit AC in coastwide TCEY	Median AAV TCEY	11	3	2	1	3	8	8	3	3	8	3
Limit AAV in Reg Areas TCEY	Median AAV TCEY RegAreas	9.75	7.25	6.75	1.75	7	5.62	6	5.88	5.75	2.5	3.5
Limit AC in Reg Areas TCEY	$P(AC_3 > 15\%)$ RegAreas	8.62	7	7.12	1.75	7.38	6.38	6	5.12	6.25	3.5	4
Optimize average coastwide TCEY	Median TCEY	1	3	3	1	3	3	3	3	3	3	3
Maintain minimum % TCEY by Reg Areas	Median Min(% TCEY) RegAreas	8.5	6.62	7.5	6.12	5.25	7.62	4.88	5.38	4.25	3.62	4.12
Maintain minimum TCEY by Reg Areas	Median Min(TCEY) RegAreas	6.38	4	3.75	1.75	2.62	4.5	3.25	3	2.88	2.5	3.12
Optimize Reg Areas TCEY	Median TCEY RegAreas	3.62	4.75	4.25	3.12	3.75	5.5	3.5	4.5	3.12	3.5	3.88
Optimize TCEY percentage among Reg Areas	Median % TCEY RegAreas	8.25	6.75	7.62	6.5	5	7.5	4.38	4.88	4	4.25	4.5

Showing 1 to 10 of 10 entries — Previous 1 Next

Figure 7: A screenshot of the summary table of ranks by measurable objectives. Columns are MPs and rows are coastwide measurable objectives or measurable objectives averaged over IPHC Regulatory Areas. The averaging is weighted by the assigned values at the top of this section, and equal weighting is the default and recommended. Lighter colors indicate higher ranks (i.e. better performance) and darker blues indicate lower ranks (i.e. worse performance).



Summary table by Primary Objectives

Weight for average

P(AC_3> 15%)	Median AAV TCEY	P(AC_3> 15%) RegAreas	Median TCEY	Median AAV TCEY RegAreas	Median TCEY RegAreas
1	1	1	1	1	1

Median % TCEY RegAreas	Median Min(TCEY) RegAreas	Median Min(% TCEY) RegAreas
1	1	1

Ranking average

Search:

Objectives	PMs	Sim 30:20 43 MPA	Sim 30:20 43 MPB	Sim 30:20 43 MPC	Sim 30:20 43 MPD	Sim 30:20 43 MPE	Sim 30:20 43 MPF	Sim 30:20 43 MPG	Sim 30:20 43 MPH	Sim 30:20 43 MPI	Sim 30:20 43 MPJ	Sim 30:20 43 MPK
Maintain the coastwide female SB above a target at least 50% of the time	P(SB < SB_{Targ})	11	4	4	1	4	4	4	2	2	4	4
Limit catch variability	Limit annual change	10.09	4.56	4.22	3.62	4.59	5.25	5.25	3.75	4	3.75	2.88
Provide directed fishing yield	Optimize TCEY and maintain minimum TCEY in reg areas	5.55	5.02	5.22	3.7	3.92	5.62	3.8	4.15	3.45	3.37	3.72

Showing 1 to 3 of 3 entries

Previous 1 Next

Figure 8: A screenshot of the summary table of ranks by general objectives. Columns are MPs and rows are general objectives averaged over measurable objectives within a general objective. The averaging is weighted by the assigned values at the top of this section, and equal weighting is the default and recommended. Lighter colors indicate higher ranks (i.e. better performance) and darker blues indicate lower ranks (i.e. worse performance).

Discussion

The MSE Explorer is a tool to assist in the evaluation of MPs, and other methods may be employed to further understand the simulation results. Performance metrics linked to the primary objectives are available along with many other performance metrics that may be useful. Additional metrics are being considered and may be added to the MSE Explorer in the future.

The MSE Explorer has evolved over time with different simulations, different performance metrics, and different pages. Archives of past MSE Explorers linked to MSAB meetings are available if desired. The following webpages refer to archives of the results used when writing reports for past MSAB meetings.

Coastwide MSE

http://shiny.westus.cloudapp.azure.com/shiny/sample-apps/IPHC-MSAB012/

http://shiny.westus.cloudapp.azure.com/shiny/sample-apps/IPHC-MSAB013/

Multi-Region MSE

http://shiny.westus.cloudapp.azure.com/shiny/sample-apps/IPHC-MSE-MSAB016/

The most recent version of MSE Explorer will also be at the following URL.

http://shiny.westus.cloudapp.azure.com/shiny/sample-apps/MSE-Explorer/

REFERENCES

IPHC-2020-IM096-11 Rev_1. Hicks A, Carpi P, Berukoff S, Stewart I. Management Strategy Evaluation results for distribution management procedures. 50 p. https://iphc.int/uploads/pdf/im/im096/iphc-2020-im096-11.pdf

IPHC-2020-MSAB015-R. Report of the 15th Session of the IPHC Management Strategy Advisory Board (MSAB015). 23 p. https://www.iphc.int/uploads/pdf/msab/msab015/iphc-2020-msab015-r.pdf

IPHC-2020-MSAB016-R. Report of the 16th Session of the IPHC Management Strategy Advisory Board (MSAB016). 25 p. https://iphc.int/uploads/pdf/msab/msab016/iphc-2020-msab016-r.pdf

APPENDICES

Appendix I: Performance Metrics

APPENDIX I
PERFORMANCE METRICS LINKED TO PRIMARY OBJECTIVES FOR THE MSE

Below are descriptions of the performance metrics linked to the primary objectives. Additional performance metrics are available in the MSE Explorer with definitions provided on the Help page.

Metric	Description
BIOLOGICAL SUSTAINABILITY	
Median average RSB	The median dynamic relative spawning biomass (stock status), averaged over a ten-year period, that occurs over all simulations.
Median average percent SB	The median percentage of spawning biomass (averaged over a ten-year period) in each Biological Region. Available only when one or more Biological Regions are selected.
P(any RSB < 20%)	Probability that the dynamic relative spawning biomass (stock status) is less than 20% of the biomass if no fishing had occurred. 'Any' refers to the probability of this event occurring in a ten year period (at least 1 of 10 years).
P(all RSB < 36%)	Probability that the dynamic relative spawning biomass (stock status) is less than 36% of the biomass if no fishing had occurred. 'All' refers to the chance that this event occurs in a given year.
P(all percSB<min)	Probability that the percent spawning biomass is less than a defined minimum for each Biological Region. Available only when one or more Biological Regions are selected. The defined minimums are 5%, 33%, 10%, and 2% for Biological Regions 2, 3, 4, and 4B, respectively.

Metric	Description
FISHERY SUSTAINABILITY	
Median Annual Change TCEY	Median annual change in TCEY (averaged over a ten-year period) that occurs over all simulations. The annual change in TCEY from year to year is greater than this value in half of the simulations. This metric is reported at a coastwide level and at an IPHC Regulatory Area level.
P(any3 change TCEY>15%)	Probability for any three years in a 10 year period that the change in TCEY limit is greater than 15%. This is one of the primary performance metrics for the stability objective. This metric is reported at a coastwide level and at a IPHC Regulatory Areas level. Also noted as $P(AC_3>15\%)$.
Median average TCEY	Median TCEY mortality limit (averaged over a ten-year period) that occurs over all simulations. The TCEY is greater than this value in half of the simulations. This metric is reported at a coastwide level and at the IPHC Regulatory Area level.
Median AAV TCEY	The Median Average Annual Variability (AAV) over a ten-year period for the TCEY, which can be thought of as the average change in the TCEY from year to year. The AAV is greater than this value in half of the simulations.
Median Minimum TCEY	Median minimum value of TCEY in each IPHC Regulatory Area over a ten-year period. Refers to the primary objective of maintain a minimum TCEY for each IPHC Regulatory Area. This metric is reported at the IPHC Regulatory Areas level.
Median Minimum TCEY percentage	Median minimum percentage of TCEY in each IPHC Regulatory Area over a ten-year period. Refers to the primary objective of maintain a percentage of the coastwide TCEY for each IPHC Regulatory Area. This metric is reported at the IPHC Regulatory Area level.
Median Average TCEY percentage	Median percentage of TCEY in each IPHC Regulatory Area (averaged over a ten-year period). Refers to the primary objective of optimize the percentage of the coastwide TCEY among Regulatory Areas. This metric is reported at the IPHC Regulatory Areas level.
PERCENTILES	
5^{th}	the 5th percentile over a ten-year period. Five percent of the simulated metrics are lower than this metric.
25^{th}	the 25th percentile over a ten-year period. Twenty-five percent of the simulated metrics are lower than this metric.
75^{th}	the 75th percentile over a ten-year period. Twenty-five percent of the simulated metrics are greater than this metric.
95^{th}	the 95th percentile over a ten-year period. Five percent of the simulated metrics are greater than this metric.