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## UPDATE ON THE ACTIONS ARISING FROM THE 23<sup>ND</sup> SESSION OF THE IPHC SCIENTIFIC REVIEW BOARD (SRB023)

PREPARED BY: IPHC SECRETARIAT (17 MAY 2024)

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### PURPOSE

To provide the Scientific Review Board (SRB) with an opportunity to consider the progress made during the intersessional period, on the recommendations/requests arising from the SRB023.

### BACKGROUND

At the SRB023, the members recommended/requested a series of actions to be taken by the IPHC Secretariat, as detailed in the SRB023 meeting report ([IPHC-2023-SRB023-R](#)) available from the IPHC website, and as provided in [Appendix A](#).

### DISCUSSION

During the 24<sup>th</sup> Session of the SRB (SRB024), efforts will be made to ensure that any recommendations/requests 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 (such as the IPHC Staff or SRB officers);
- 3) a desired time frame for delivery of the action (such as by the next session of the SRB or by some other specified date).

### RECOMMENDATIONS

That the SRB:

- 1) **NOTE** paper IPHC-2024-SRB024-03, which provided the SRB with an opportunity to consider the progress made during the inter-sessional period, in relation to the consolidated list of recommendations/requests arising from the previous SRB meeting (SRB023).
- 2) **AGREE** to consider and revise the actions as necessary, and to combine them with any new actions arising from SRB024.

### APPENDICES

[Appendix A](#): Update on actions arising from the 23<sup>rd</sup> Session of the IPHC Scientific Review Board (SRB023).

## APPENDIX A

Update on actions arising from the 23<sup>rd</sup> Session of the IPHC Scientific Review Board (SRB023)

## RECOMMENDATIONS

Action No.	Description	Update
	<i>International Pacific Halibut Commission 5-year program of integrated research and monitoring (2022-26)</i>	
SRB023– Rec.01 ( <a href="#">para. 17</a> )	The SRB <b>AGREED</b> that AI techniques may improve efficiency of age estimation and <b>RECOMMENDED</b> continued research and cross-validation of AI-based aging.	<b>Ongoing</b> <b>Update:</b> See paper <b>IPHC-2024-SRB024-INF01</b>
	<i>Research: Pacific halibut stock assessment</i>	
SRB023– Rec.02 ( <a href="#">para. 19</a> )	<b>NOTING</b> that the inclusion of whale depredation in the assessment requires many assumptions and results in only small changes to the TCEY, the SRB <b>RECOMMENDED</b> that whale depredation not be included in the 2023 stock assessment model.	<b>Completed</b> <b>Update:</b> Whale depredation was not included in the 2023 stock assessment and will be revisited in the future.
SRB023– Rec.03 ( <a href="#">para. 20</a> )	The SRB <b>RECOMMENDED</b> that the Secretariat investigate approaches (e.g. simulation testing) to estimating uncertainty (or bounding the minimum level of uncertainty) in different assessment outputs: e.g. coastwide and Biological Region spawning stock biomass (see related actions under <a href="#">Section 4.2</a> ).	<b>Completed</b> <b>Update:</b> Simulation results provided in IPHC-2024-SRB024-08.
SRB023– Rec.04 ( <a href="#">para. 21</a> )	The SRB <b>RECOMMENDED</b> continuing annual sex ratio sampling while the stock is declining given that estimated SSB remains sensitive to these data.	<b>Completed</b> <b>Update:</b> Sex ratio sampling is ongoing with 2023 samples to be processed for the 2024 stock assessment.
	<b>Research: Management strategy evaluation</b>	
SRB023– Rec.05 ( <a href="#">para. 24</a> )	The SRB <b>RECOMMENDED</b> that an objective to maintain spatial population structure be added or redefined to maintain the spawning biomass in a Biological Region above a defined threshold	<b>In Progress</b> <b>Update:</b> This secondary objective is presented in document <b>IPHC-2024-</b>

	relative to the dynamic unfished equilibrium spawning biomass in that Biological Region with a pre-defined tolerance. The percentage and tolerance may be defined based on historical patterns and appropriate risk levels recognizing the limited fishery control of biomass distribution.	<b>SRB024-07</b> and will be discussed at SRB024.
SRB023– Rec.06 ( <a href="#">para. 25</a> )	The SRB <b>RECOMMENDED</b> that the Commission re-evaluate the target objective for long-term coastwide female spawning stock biomass given that estimated 2023 female spawning biomass (and associated WPUE), which was well-above the current target B36%, in part triggered harvest rate reductions from the interim harvest policy. Such ad-hoc adjustments limited the value of projections and performance measures from MSE.	<b>In Progress</b> <b>Update:</b> This priority objective was discussed with the MSAB at MSAB019, is presented in document <b>IPHC-2024-SRB024-07</b> , and will be discussed with the SRB at SRB024.
SRB023– Rec.07 ( <a href="#">para. 26</a> )	The SRB <b>RECOMMENDED</b> continued examination, within the MSE, of FISS scenarios that are better representative of the levels of uncertainty and bias that may result from future reductions in FISS sampling.	<b>In Progress</b> <b>Update:</b> The design of simulations to conduct in 2024 is presented in documents <b>IPHC-2024-SRB024-07</b> and <b>IPHC-2024-SRB024-08</b> .
SRB023– Rec.08 ( <a href="#">para. 27</a> )	<b>RECOGNIZING</b> the spatial variability of environmental factors that influence population dynamics, the SRB <b>RECOMMENDED</b> that an exceptional circumstance be defined based on regional as well as stock-wide deviations from expectations. For example, an exceptional circumstance could be declared if any of the following are met:  a) The coastwide all-sizes FISS WPUE or NPUE from the space-time model falls above the 97.5 <sup>th</sup> percentile or below the 2.5 <sup>th</sup> percentile of the simulated FISS index for two or more consecutive years.  b) The observed FISS all-sizes stock distribution for any Biological Region is above the 97.5 <sup>th</sup> percentile or below the 2.5 <sup>th</sup> percentile of the simulated FISS index over a period of 2 or more years.  c) Recruitment, weight-at-age, sex ratios, other biological observations, or new research	<b>Completed</b> <b>Update:</b> Exceptional circumstances are presented in document <b>IPHC-2024-SRB024-07</b> .

	indicating parameters that are outside the 2.5 <sup>th</sup> and 97.5 <sup>th</sup> percentiles of the range used or calculated in the MSE simulations.	
SRB023– Rec.09 ( <a href="#">para. 28</a> )	<p>The SRB <b>RECOMMENDED</b> that if an exceptional circumstance occurred the following actions would take place:</p> <p>a) A review of the MSE simulations to determine if the OM can be improved and MPs should be re-evaluated.</p> <p>b) If a multi-year MP was implemented and an exceptional circumstance occurred in a year without a stock assessment, a stock assessment would be completed as soon as possible along with the re-examination of the MSE.</p> <p>c) Consult with the SRB and MSAB to identify why the exceptional circumstance occurred, what can be done to resolve it, and determine a set of MPs to evaluate with an updated OM.</p> <p>d) Further consult with the SRB and MSAB after simulations are complete to identify whether a new MP is appropriate.</p>	<p><b>Completed</b></p> <p><b>Update:</b> Actions to take if an exceptional circumstance is declared are provided in document <b>IPHC-2024-SRB024-07</b>.</p>
SRB023– Rec.10 ( <a href="#">para. 29</a> )	<p>The SRB <b>RECOMMENDED</b> evaluating fishing intensity and frequency of the stock assessment elements of management procedures and FISS uncertainty scenarios using the MSE framework. MP elements related to constraints on the interannual change in the TCEY and calculation of stock distribution may be evaluated for a subset of the priority management procedures as time allows.</p>	<p><b>In Progress</b></p> <p><b>Update:</b> Elements of management procedures to evaluate in 2024 are discussed in document <b>IPHC-2024-SRB024-07</b>.</p>
SRB023– Rec.11 ( <a href="#">para. 30</a> )	<p>The SRB <b>RECOMMENDED</b> that the Commission consider revising the harvest policy to (i) determine coastwide TCEY via a formal management procedure and (ii) negotiate distribution independently (e.g. during annual meetings). Such separated processes are used in other jurisdictions (e.g. most tuna RFMOs, Mid Atlantic Fishery Management Council, AK Sablefish, etc.).</p>	<p><b>Completed</b></p> <p><b>Update:</b> The harvest strategy has been updated such that the determination of the coastwide TCEY is the management procedures under investigation using the MSE. See document <b>IPHC-2024-SRB024-07</b>.</p>

	<b>Research: Biology and ecology</b>	
SRB023– Rec.12 ( <a href="#">para. 36</a> )	<b>NOTING</b> that the genomics research is and will continue to be a key element of the Biological and Ecosystem Science Research program, and that the Secretariat wishes to (i) document stock structure, (ii) use genetic markers to quantify movements, (iii) assign individuals of any age, location, season to a genetic population, (iv) annotate markers and use genomic data to between understand genetic and environmental sources of variation in growth, maturity and fecundity, (v) engage in close-kin capture-recapture to estimate stock abundance, the SRB <b>RECOMMENDED</b> adding qualified staff to help address these diverse and important activities in a timely fashion.	<b>In Progress</b>  <b>Update:</b> The IPHC Secretariat is currently studying this recommendation in the context of the goals and objectives of the 5Y-PRIM 2022-2026.
SRB023– Rec.13 ( <a href="#">para. 42</a> )	The SRB <b>RECOMMENDED</b> that the Secretariat continue to work with collaborators to collect and process genetic samples from juveniles. Collections of younger (pre-reproductive) age classes would be particularly important for anticipated future close-kin capture-recapture work.	<b>In Progress</b>  <b>Update:</b> The IPHC Secretariat has over the recent years collected genetic samples (fin clips) from juvenile Pacific halibut captured in the NMFS Bottom Trawl Survey in the Gulf of Alaska, Bering Sea and Aleutian Islands. This is the only source of juvenile Pacific halibut biological samples since the FISS captures typically fish that are 5-6 years of age and above. Unfortunately, the Commission did not fund the deployment of IPHC Staff in the NMFS Bottom Trawl Survey in 2024 and no Pacific halibut juvenile samples will be collected.
SRB023– Rec.14 ( <a href="#">para. 44</a> )	The SRB <b>RECOMMENDED</b> to apply the genetic sampling more broadly, to estimate genetic diversity of the (sub)populations, for example through the effective number of breeding adults by cohort.	<b>Completed</b>  <b>Update:</b> The Secretariat is not aware of software that is currently available for estimating these

		parameters directly from genotype likelihood data. That being the case, effort would need to be redirected to adapting existing methods that make use of called genotype data.
SRB023– Rec.15 ( <a href="#">para. 45</a> )	The SRB <b>RECOMMENDED</b> that the compensatory assumption of the stock recruitment models be critically evaluated via a MSE stress test scenario in which recruitment is dependant at some low spawning biomass.	<b>In Progress</b> <b>Update:</b> The IPHC Secretariat is currently addressing this recommendation and results will be presented as part of the MSE presentation during SRB024.
SRB023– Rec.16 ( <a href="#">para. 49</a> )	The SRB <b>RECOMMENDED</b> that Secretariat proceed to the next step of individual assignment based on K of 4 or K of 5. Based on the large number of loci with low levels of divergence among reporting regions (Manhattan plot in Figure 4 of paper <a href="#">IPHC-2023-SRB023-08</a> ) that posterior probabilities of cluster assignment (in a Bayesian context) may be low when all loci are used. The Secretariat should conduct a comparable analysis using only ‘outlier loci’.	<b>Completed</b> <b>Update:</b> Probabilistic cluster assignment results are provided in document IPHC-2024-SRB024-09.
SRB023– Rec.17 ( <a href="#">para. 50</a> )	<b>RECOGNIZING</b> that future applications of ‘outlier loci’ to address SA and MSE objectives will necessitate development of more ‘rapid screening approaches’ and screening based on fewer loci, the SRB <b>RECOMMENDED</b> that the Secretariat work to identify the numbers of loci and locus characteristics (e.g. high levels of diversity and high level of allele frequency variation) so loci may be applied.	<b>In Progress</b> <b>Update:</b> The IPHC Secretariat is investigating whether some additional optimization of the assignment testing could be done to determine if assignment accuracy increases with alternative SNP selection strategies.
SRB023– Rec.18 ( <a href="#">para. 53</a> )	The SRB <b>RECOMMENDED</b> that the Secretariat: a) conduct simulations as a means of assessing the accuracy of group or admixture assignments; b) establish criteria for acceptable group assignment accuracy and that is relevant for	<b>Completed</b> <b>Update:</b> Assignment testing results are provided in document <b>IPHC-2024-SRB024-09</b> .

	<p>assignment of individuals as a ‘pure’ or ‘admixed’. Thus, observations, though made with some error would be used as ‘observed’ estimates to tally over space and across age classes.</p> <p>c) should evaluate what the uncertainty in classification (errors) will mean to their estimates. The SRB draws the Secretariat’s attention to a widely cited paper by Manel et al. (2005) in Trends in Ecology and Evolution, where authors compare individual assignment tests to a widely used alternative method (mixed stock analysis). These authors point out that use of individual assignment tests for relative population (or reporting group) compositional estimation can be fraught with problems because assignment error compounds across all individuals.</p>	
	<b><i>Monitoring: 2024 FISS design evaluation</i></b>	
SRB023– Rec.19 ( <a href="#">para. 59</a> )	The SRB <b>RECOMMENDED</b> that the Secretariat continue exploring ways of estimating the impacts of different FISS designs and efficiency decisions on stock assessment outputs and fishery performance objectives. The end goal should be to provide a decision support tool that can frame decisions about FISS design in terms of costs and benefits in comparable currencies.	<b><i>In Progress</i></b> <b>Update:</b> FISS design comparisons are presented in <b>IPHC-2024-SRB024-06</b> . Proposals for stock assessment evaluation and MSE investigations of these designs are provided for SRB review in <b>IPHC-2024-SRB024-08</b> and <b>IPHC-2024-SRB024-07</b> .
SRB023– Rec.20 ( <a href="#">para. 62</a> )	The SRB <b>RECOMMENDED</b> that the life-histories, particularly population age structure, lengths-at-age, and weight-at-age continue to be monitored in the FISS and fishery to obtain a proxy of total mortality, cohort resonance, and reproductive potential as well as to detect longer term trends in life histories.	<b><i>Ongoing</i></b>

	<b><i>Updates to space-time modelling</i></b>	
SRB023– Rec.21 ( <a href="#">para. 63</a> )	The SRB <b>NOTED</b> that the switch from a hurdle model to a Tweedie distribution reduces model parameters and overall Deviance Information Criterion (DIC) and reduces run times and <b>RECOMMENDED</b> that the Secretariat continue investigating whether the space-time model can be successfully transitioned to a Tweedie distribution for all regulatory areas.	<b>Ongoing</b> <b>Update:</b> Further results to be presented at SRB024.
	<b><i>Management Supporting Information</i></b>	
SRB023– Rec.22 ( <a href="#">para. 64</a> )	<b>NOTING</b> the presentation demonstrating how secondary FISS objectives influence choices for future FISS designs that may have already been endorsed by the SRB based only on primary objectives, the SRB <b>RECOMMENDED</b> that the MSE include some scenarios in which the FISS is skipped (as similarly requested above in <a href="#">paras. 62 and 63</a> ) because of occasional (or functional) economic constraints on executing full FISS designs. Such simulation scenarios would provide some indication of the potential scale of impacts on MP performance of maintaining long-term revenue neutrality of the FISS.	<b>In Progress</b> <b>Update:</b> A proposal for MSE investigations of FISS design scenarios is provided for SRB review in <b>IPHC-2024-SRB024-07</b> .

### REQUESTS

Action No.	Description	Update
	<b><i>Research: Biology and ecology</i></b>	
SRB023– Req.01 ( <a href="#">para. 37</a> )	<b>NOTING</b> that future applications of genomic data will necessitate more expansive sampling geographically and demographically to achieve IPHC goals, the SRB <b>REQUESTED</b> that the Secretariat establish explicit long-term objectives for use of genomic data and work with staff, fishermen, and agency collaborators to establish a short and long-term sampling program and data and sample archival plan to ensure samples are available to address Secretariat objectives.	<b>In Progress</b> <b>Update:</b> The IPHC Secretariat is currently implementing long-term objectives for the collection of genetic samples coastwide that include the collection of fin clips from sampled commercial landings (since 2017; used to generate sex ratio information by genotyping), from all fish sampled in the FISS (since 2016) and



		from all research projects that have involved the capture of Pacific halibut (since 2016). An important source of genetic samples from juvenile Pacific halibut derives from the NMFS Ground Trawl Survey in the Gulf of Alaska, Bering Sea and Aleutian Islands (since 2019). Unfortunately, the Commission did not fund the deployment of IPHC Staff in the NMFS Bottom Trawl Survey in 2024 and no juvenile Pacific halibut samples will be collected this year.
SRB023– Req.02 ( <a href="#">para. 41</a> )	<p><b>NOTING</b> paper <a href="#">IPHC-2023-SRB023-08</a> (subsection 1.1 - Identification of Pacific halibut juvenile habitat), and that the narrative describes work to be conducted but does not explicitly identify research objectives or hypotheses that the data would be used to address, the SRB <b>REQUESTED</b> that objectives/hypotheses be developed for SRB024 where hypotheses could include:</p> <p>a) regions with larger amounts of juvenile rearing habitat and larger number of juveniles would realize numerically larger levels of recruitment to the adult population;</p> <p>b) b) genotypes of juveniles from rearing habitats could be assigned to specific spawning areas.</p>	<p><b>In Progress</b></p> <p><b>Update:</b> The IPHC Secretariat conducted initial work on Pacific halibut juvenile habitat identification with the involvement of the 2023 IPHC Intern and is in the process of investigating avenues to continue this work.</p>
SRB023– Req.03 ( <a href="#">para. 43</a> )	<p><b>NOTING</b> paper <a href="#">IPHC-2023-SRB023-08</a> (subsection 1.2 - wire tagging of U32 Pacific halibut), where the narrative describes numbers of fish tagged and recovered, no information is provided summarizing distances moved by size/age and location, the SRB <b>REQUESTED</b> that information be provided during SRB024, including background on statistical methods for analysis of data.</p>	<p><b>Completed</b></p> <p><b>Update:</b> The IPHC Secretariat will provide information on movement of tagged fish and plans to use these data to inform on survival during SRB024.</p>

SRB023– Req.04 ( <a href="#">para. 51</a> )	<p>The SRB <b>ACKNOWLEDGED</b> Table 1 in paper <a href="#">IPHC-2023-SRB023-08</a>, produced in response to SRB022 inquiry, and that discrepancies in the genetic diversity measure Fis (deviation of observed and expected heterozygosity) across collection years within reporting regions. The Secretariat estimates Fis on a collection year by year basis and overall years for each region. The SRB <b>REQUESTED</b>:</p> <p>a) further investigation of the disparity in Fis for reporting regions (yearly vs total). Higher positive Fis could indicate admixture of individuals from genetically differentiated groups;</p> <p>b) investigations into discrepancies between estimates of Fis, observed heterozygosity (Ho), and expected heterozygosity (He).</p>	<p><b>Completed</b></p> <p><b>Update:</b> Results on genetic diversity measures are provided in document IPHC-2024-SRB024-09.</p>
SRB023– Req.05 ( <a href="#">para. 52</a> )	<p>The SRB <b>NOTED</b> that the Secretariat proposes to conduct individual admixture (i.e. among IPHC reporting regions) estimation using software NGSadmix and individual assignment testing using WGSassign, both of which are amenable to low coverage sequence data, to estimate proportional contributions of reporting groups to unknown individuals. This analysis would be conducted after ‘best supported’ number of genetic groups (K) has been established. The SRB <b>REQUESTED</b> that admixture analyses and assignment testing be conducted and reported at SRB024, including estimates of assignment accuracy.</p>	<p><b>Completed</b></p> <p><b>Update:</b> Results on admixture analyses and assignment testing are provided in document <b>IPHC-2024-SRB024-09</b>.</p>
	<p><b>Monitoring: 2024 FISS design evaluation</b></p>	
SRB023– Req.06 ( <a href="#">para. 57</a> )	<p>The SRB <b>REQUESTED</b> that the Commission <b>NOTE</b> the addition of cost estimates to the presentation of alternative FISS designs. The short-term risk implications in 2024 to the stock and TCEY of a drastically reduced FISS design (e.g. approx. revenue neutral Design 9 with efficiencies) are probably not profound given that the estimated current abundance is still above the implied B36% target. Impacts may appear more in the estimates of stock distribution since</p>	<p><b>Completed</b></p> <p><b>Update:</b> Request (IPHC-2023-SRB023-R) provided to the Commission, see <a href="#">AM100 Collection of Documents</a></p>

	unsampled areas will be more dependent on the space-time model than actual data.	
SRB023– Req.07 ( <a href="#">para. 60</a> )	<p>The SRB <b>REQUESTED</b> that the Commission <b>NOTE</b> that some longer-term (2025 and beyond) implications of reduced FISS designs are predictable and potentially consequential. For instance, higher FISS CVs will generally result in higher inter-annual variation in TCEY under the current decision-making process. This would occur for two reasons: (1) biomass estimates and projections from the assessment model will have greater uncertainty and therefore greater variability in outputs and (2) ad hoc management adjustments to the interim harvest policy recommendations would be more frequent and/or more variable for greater input uncertainty. The SRB therefore <b>REQUESTED</b> the following analyses for SRB024:</p> <p>a) Assessment of reduced FISS designs (2025-2027) via simulation tests of assessment model outputs (e.g. probability of decline, estimated stock abundance and status, TCEY) under alternative revenue-neutral FISS designs using the existing stock assessment ensemble;</p> <p>b) Mitigation options of reduced FISS designs (short-term and long-term) via MSE simulations of management procedures that deliberately aim to reduce inter-annual variability in TCEY via multi-year TCEYs and (possibly) fixed stock distribution schemes;</p> <p>c) Components (a,b) above would be integrated since (a) will need to inform simulations in (b).</p>	<p><b>Completed</b></p> <p><b>Update:</b> Request (IPHC-2023-SRB023-R) provided to the Commission, see <a href="#">AM100 Collection of Documents</a></p>
SRB023– Req.08 ( <a href="#">para. 61</a> )	<p>The SRB <b>REQUESTED</b> that simulations above (<a href="#">para. 60</a>) include:</p> <p>a) a relationship in which the FISS CV is relatively higher at lower stock abundance (i.e. the current CV issue is a function of stock abundance rather than a short-term condition);</p> <p>b) target regulatory area CVs of 15%, 20%, 25%, and 30%;</p>	<p><b>In Progress</b></p> <p><b>Update:</b> FISS design comparisons are presented in <b>IPHC-2024-SRB024-06</b>. Proposals for stock assessment evaluation and MSE investigations of these designs are provided for SRB review in <b>IPHC-2024-SRB024-08</b> and <b>IPHC-2024-SRB024-07</b>.</p>

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	coastwide target CV of 15% without controlling specific regulatory area CVs.	
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