2025 and 2026-27 FISS designs

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PURPOSE

To provide the Research Advisory Board with design options considered by the Commission for the 2025 Fishery-Independent Setline Survey (FISS) together with potential designs for 2026-27.

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 81.3 cm in length) Pacific halibut estimated 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. Annual FISS designs are developed by selecting a subset of stations for sampling from the full 1890-station FISS footprint (Figure 1).

At the Commission Work Meeting (2024), the Commission was presented with three sets of FISS designs for 2025-29 based on rotating blocks of stations (the Base Block and Core Block designs) and on a reduced design based on the implemented 2024 FISS design (the Reduced Core design). These sets of designs were intended to represent FISS coverage achievable under different levels of available supplementary funding. This paper focuses on two designs considered by the Commission: the Base Block design (2025-27) which provides extensive sampling coverage over 3+ year period, and a fiscally viable design for 2025 that includes sampling in all IPHC Biological for lowest projected cost.

The Commission will further consider the 2025 FISS design options at the 14th Special Session of the IPHC (SS014), scheduled for 31 October 2024 (IPHC-2024-SS014-03).

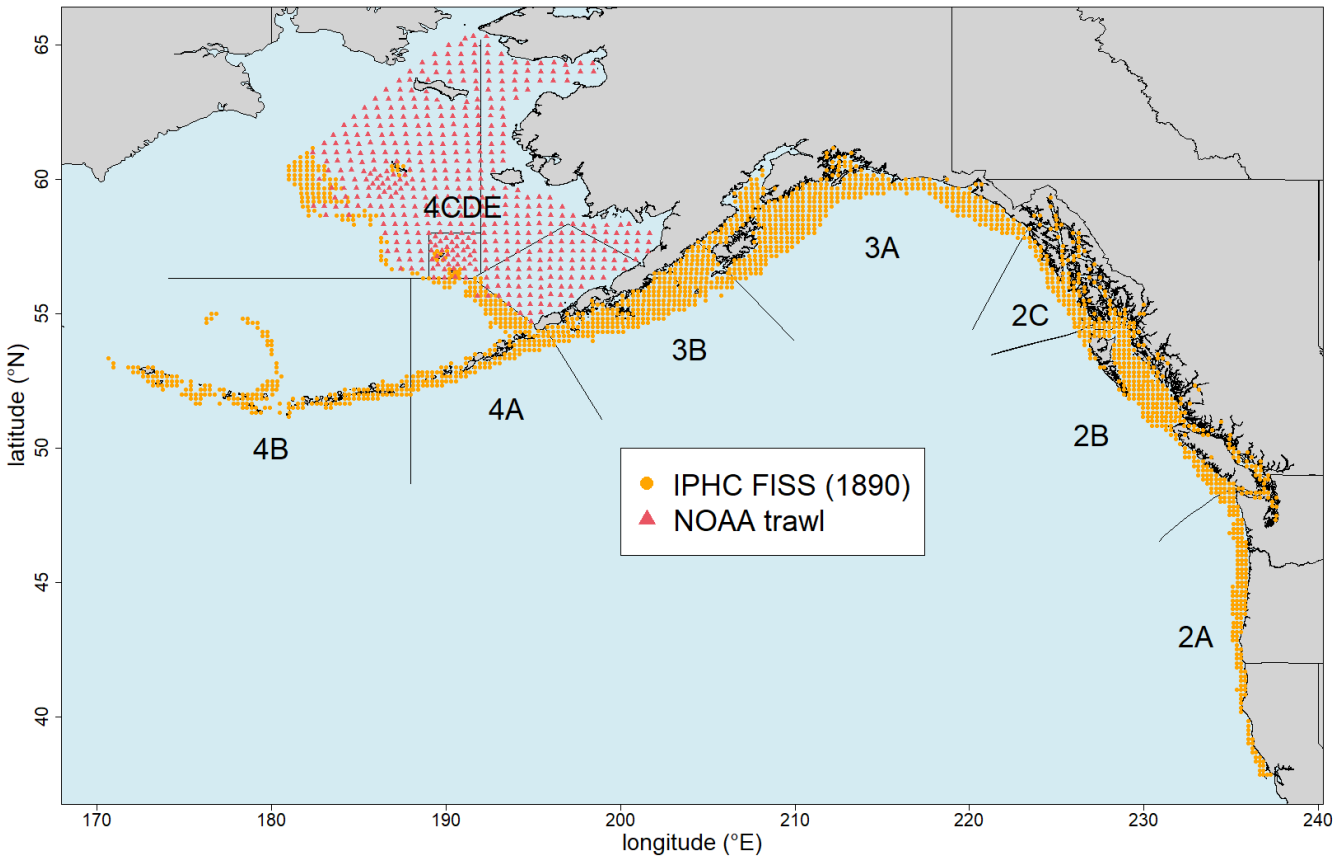

Figure 1. Map of the full 1890 station FISS design, with orange circles representing stations available for inclusion in annual sampling designs. Red triangles represent the locations NOAA trawl stations used to provide complementary data for Bering Sea modelling (not all are sampled each year).

FISS DESIGN OBJECTIVES (Table 1) – current Commission decision

Primary objective: *To sample Pacific halibut for stock assessment and stock distribution estimation.*

The primary purpose of the annual FISS is to sample Pacific halibut to provide data for the stock assessment (abundance indices, biological data) and estimates of stock distribution for use in the IPHC's management procedure. The priority of the current 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.

Secondary objective: *Long-term revenue neutrality.*

The FISS is intended to have long-term revenue neutrality, and therefore any implemented design must consider both logistical and cost considerations.

Tertiary objective: *Minimize removals and assist others where feasible on a cost-recovery basis.*

Consideration is also given to the total expected FISS removals (impact on the stock), data collection assistance for other agencies, and IPHC policies.

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

THE OPTIMAL FIVE-YEAR ROTATIONAL FISS DESIGN

Base Block design

The **Base Block design** (Figures 2 to 4) when implemented on an annual basis ensures that all charter regions in the core areas are sampled over a three-year period, while prioritizing coverage in other areas based on minimising the potential for bias and maintaining CVs below 25% for each IPHC Regulatory Area, and below 15% for the core of the stock (IPHC Regulatory Areas 2B, 2C, 3A and 3B). The **Base Block design** also includes some sampling in all IPHC Biological Regions in each year, ensuring that both trend and biological data from across the spatial range of Pacific halibut in Convention waters are available to the stock assessment and for stock distribution estimation. From the perspective of meeting the Primary Objective of the FISS (Table 1), the **Base Block design** can be considered the optimal rotational design.

We note that paragraph 72 of the AM100 report (IPHC-2024-AM100-R) states:

> *The Commission NOTED that the use of the base block design (Figures 7 to 11 of paper IPHC-2024-AM100-13) will be the focus of future planning and annual FISS proposals from the Secretariat.*

***Base Block design - Costs and Revenue:* – 2025 Base Block Design: Figure 2**

Key numbers

2025	$	Notes
Total Projected Cost	US$3,829,000	**Base HQ costs:** US$606,000 (incurred even if no FISS is conducted) **Vessel bids**: $1,525,000 **Field staff:** $459,000 **Bait estimate**: $356,000
Total Projected Revenue*	US$$1,771,000	US$1,692,000 from Pacific halibut sales US$79,000 from byproduct sales
Net	**-US$2,058,000**	**Not fiscally possible without a large influx of supplementary funds.**

*Assumptions:

1) no bid inflation for 2025 (compared to 2024);
2) 5% decline in landings from observed 2024 rates;
3) no change in average price.

Due to the rotational nature of the Base Block design overall costs and revenue are likely to be generally comparable year-to-year. However, especially for large designs, the sensitivity to small fluctuations in price and catch rates is high. For example, a +/-10% change in price and landings beyond what is projected for 2025 could result in net profit/loss of US$1,546,000 to US$2,302,000. This type of uncertainty cannot be reduced and will compound over a longer time horizon, making projections of cost beyond the upcoming year of limited value.

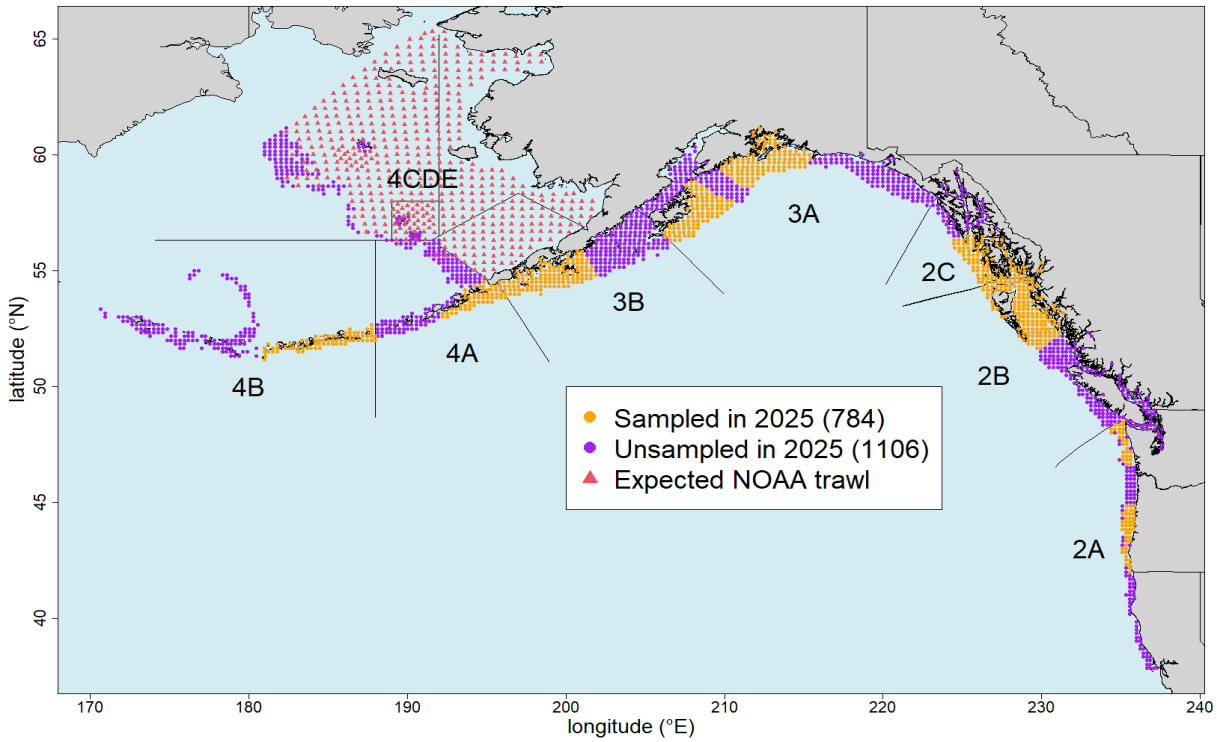

Figure 2. Base Block design for 2025 (orange circles). Design is based on fishing 2-4 complete blocks of stations (charter regions) in the core areas (2B, 2C, 3A and 3B) and previously implemented subareas elsewhere.

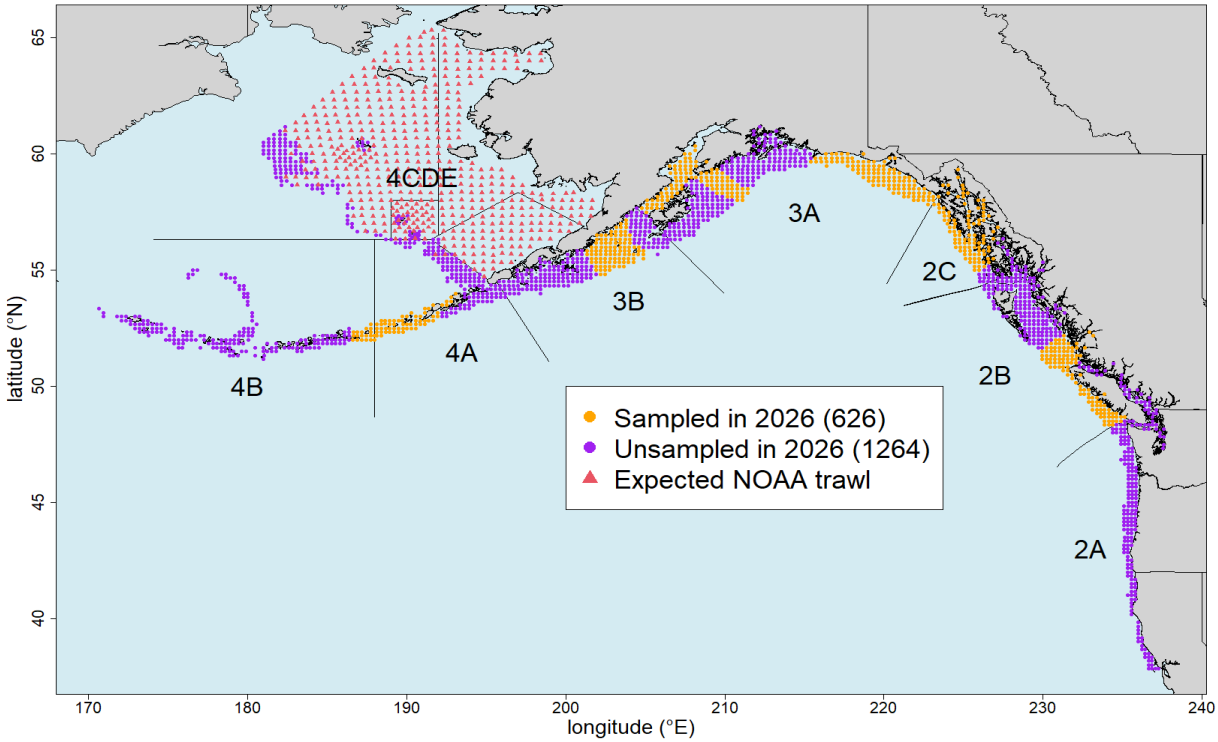

Figure 3. Base Block design for 2026 (orange circles) – indicative only. Design is based on fishing 2-4 complete blocks of stations (charter regions) in the core areas (2B, 2C, 3A and 3B) and previously implemented subareas elsewhere.

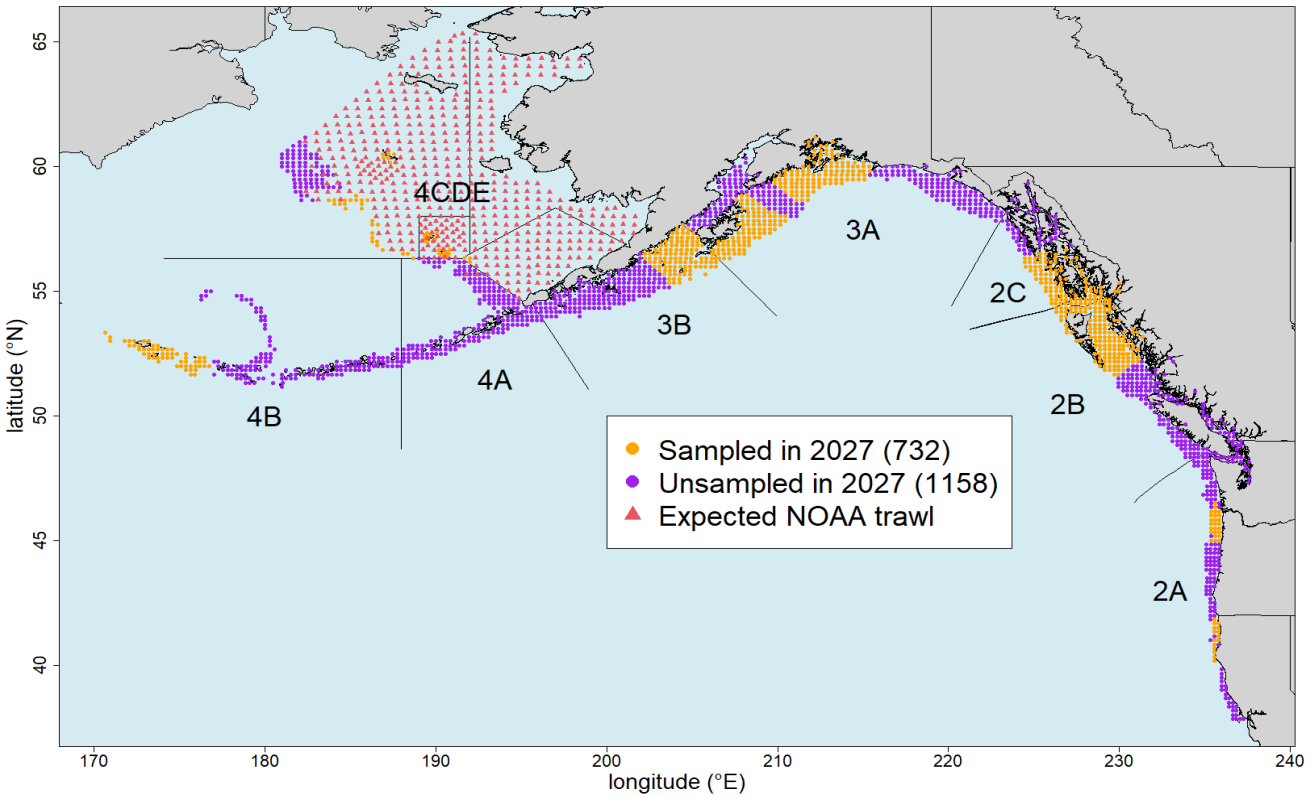

Figure 4. Base Block design for 2027 (orange circles) – indicative only. Design is based on fishing 2-4 complete blocks of stations (charter regions) in the core areas (2B, 2C, 3A and 3B) and previously implemented subareas elsewhere.

A FISCALLY VIABLE FISS DESIGN OPTION FOR 2025

The 2024 FISS showed continued declines in average catch rates in most IPHC Regulatory Areas, resulting in projected losses for even the lowest cost 2025 designs. Our starting point was therefore not a revenue-neutral design, but one that maintains sampling in all IPHC Biological Regions in order to provide basic data for the IPHC stock assessment, while aiming to limit the financial loss.

Only two charter regions, one each in IPHC Regulatory Areas 2B and 2C, are projected to be revenue-positive in 2025. In addition, supplementary funding has been made available for sampling 60 stations in each of IPHC Regulatory Areas 4A/4B and IPHC Regulatory Area 2A (these two sets of 60 stations are each considered to be a single charter region when projecting costs). To ensure sampling in all Biological Regions, the most cost-effective charter regions in each of IPHC Regulatory Areas 3A and 3B are also included to creating a fiscally viable design that also meets basic data needs (Figure 5).

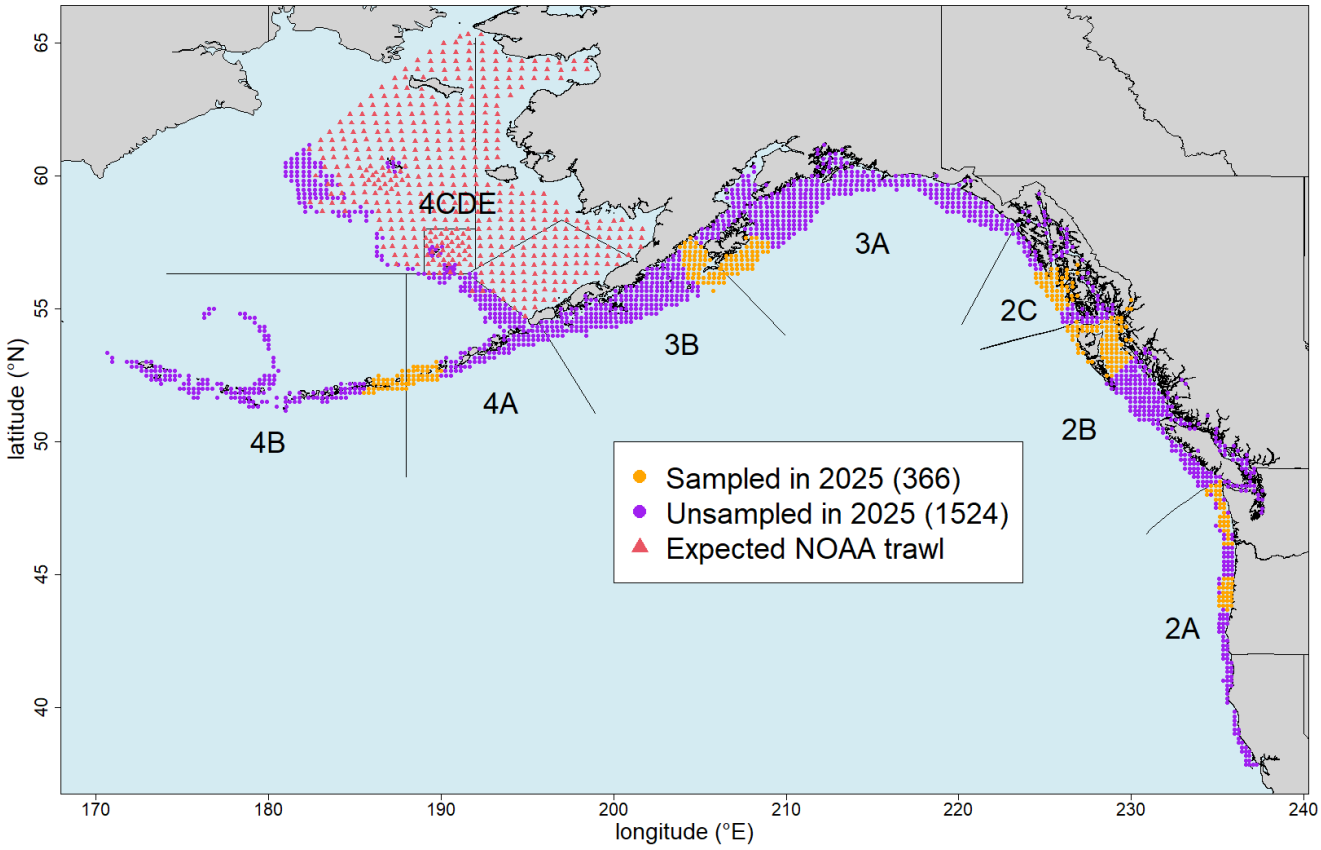

Figure 5. A fiscally viable FISS design for 2025 that includes the two most cost-effective charter regions in Biological Region 3, as well as projected revenue-positive charter regions in Biological Region 2, and stations in IPHC Regulatory Areas 2A and 4A/4B covered by supplementary funding.

A fiscally viable FISS design option for 2025: Figure 5 - Costs and Revenue:

Key numbers

2025	$	Notes
Total Projected Cost	US$2,102,000	**Base HQ costs:** US$606,000 (incurred even if no FISS is conducted) **Vessel bids:** $691,000 **Field staff:** $197,000 **Bait estimate:** $179,000
Total Projected Revenue*	US$1,141,000	US$1,098,000 from Pacific halibut sales US$43,000 from byproduct sales
Supplementary Funding (known)	US$387,000	USA Supplementary Funding (Received) - for sampling in 2A and 4A/4B.
Net	**-US$574,000**	**To be covered by any additional supplementary funding received in-year, and the IPHC Fund 50 (Reserve).**

*Assumptions:

1) no bid inflation for 2025 (compared to 2024);
2) 5% decline in landings from observed 2024 rates;
3) no change in average price.

Note that the results presented for preliminary 2025 FISS design projections include continued increased costs and decreased catch rates.

The IPHC Secretariat has recommended that the Commission move forward with the fiscally viable 2025 FISS design option described above (Figure 5), with the assumption that additional supplementary funding will become available in early 2025, and that any remaining deficit will be covered by the IPHC Reserve Fund (50 – Reserve). Should additional supplementary funding not become available, we are comfortable covering the full amount of the deficit from the Reserve Fund for one (1) year.

POTENTIAL BIAS IN FISCALLY VIABLE DESIGN.

Indices of Pacific halibut density can change by large amounts over short periods, with annual changes of 15% or more regularly observed at the level of Biological Region and IPHC Regulatory Area (IPHC-2024-SS014-03). Over a three-year period, large changes in indices of density are the norm, including at the coastwide level. Lack of sampling or low spatial coverage in an area or region means such changes are fully or largely unobserved, leading to biased estimates of indices, stock trends, and stock distribution. The greater the unobserved change, the greater the bias. Designs such as that implemented in 2024 and the 2025 fiscally viable design (Figure 5) therefore have high potential for bias in area, regional and coastwide estimates, particularly as 2025 would be the second or third year with reduced coverage for much of the stock.

Including the habitat covered by the annual NOAA trawl survey in the Bering Sea, implementation of the fiscally viable design (Figure 5) means either FISS or trawl sampling will cover about 60% of habitat in each of 2024 and 2025. Based on this level of sampling coverage and historical levels of change (IPHC-2024-SS014-03), we would expect coastwide indices of abundance to have bias of up to +/-15% following the 2025 FISS. However, bias could be much higher in Biological Regions 3 and 4B, which would have had lower levels of sampling than the coast as a whole for two or more years following completion of the 2025 FISS.

Recently completed simulation analyses explored the effect on stock assessment results of a cumulative bias in the FISS index of 15% over the upcoming period from 2025-2027 (IPHC-2024-SRB025-06). If the true FISS trend were going down by 15%, but due to a reduced design the FISS index was estimated to be flat over this same period, the estimates of spawning biomass, fishing intensity (SPR) and probability of stock decline in 2028 at the same harvest level would be biased. The simulation results indicated that this bias correspond to a 2-3% overestimate of spawning biomass, a 1% overestimate of SPR (underestimate of fishing intensity) and a 9% underestimate of the probability of stock decline in 2028. Based on recent harvest decision tables, to account for a 9% underestimate of the probability of stock decline the coastwide TCEY would need to be reduced by approximately 4 million pounds, equating to approximately US$24 million in landed catch. Thus, under significantly reduced FISS designs accounting for potential bias in management decisions could have a significant impact on short-term fishery yields and revenue. While the true degree of bias would be unknown (at least until the next comprehensive FISS design was completed), this level of bias (15%) is possible in the reduced designs evaluated here.

RECOMMENDATION

That the Research Advisory Board **NOTE** paper IPHC-2024-RAB025-08 that presents potential FISS designs for 2025, 2026, and 2027.

REFERENCES

IPHC 2024. Report of the 100th session of the IPHC Annual Meeting (AM100). IPHC-2024-AM100-R. 55 p.

Stewart, I. and Hicks, A. 2024. Development of the 2024 Pacific halibut (*Hippoglossus stenolepis*) stock assessment. IPHC-2024-SRB025-06. 12 p.

Webster, R. A., Stewart, I., Ualesi, K., Jack,T. and Wilson, D. 2024. 2025 and 2026=29 FISS designs. IPHC-2024-SS014-03. p 21.