FISS design 2026-28

PREPARED BY: IPHC SECRETARIAT (R. WEBSTER, I. STEWART, K. UALESI, T. JACK & D. WILSON; 12 DECEMBER 2025)

PURPOSE

To present an optimal long-term FISS design and the adopted 2026 FISS design, together with a series of potential modular changes to the adopted design.

SUMMARY

The optimal long-term FISS design, the Base Block design (Option 1) is not financially viable for 2026, with a projected loss of over US$1 million. At IM101 (IPHC-2025-IM101-R, para. 33), the Commission adopted a more cost-effective alternative, the Supplemented Reduced Loss design (Option 2) with a projected loss of close to US$0.5 million. The Commission also noted that other FISS charter regions may be added to the design before the end of January 2026. Lists of potential modular changes to Option 2 are presented in Appendix A.

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 estimated for all stations 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).

In recent years, financial constraints due to reduced catch rates, lower sales prices and higher costs have led to the implementation of FISS designs with reduced spatial footprints compared to those that would provide optimal scientific information (low risk of bias and good precision while still maintaining cost effectiveness). Effort has been concentrated in IPHC Regulatory Areas 2B, 2C, 3A and 3B, with limited sampling in other areas (Figures 2 and 3).

The **Base Block design** was presented to the Commission at the 14th Special Session of the IPHC (SS014, IPHC-2024-SS014-03) as a more efficient approach to annual sampling in the core of the stock compared to previous designs based on random selection of FISS stations. This design implements sampling of complete FISS charter regions (subsets of stations generally sampled by a single vessel via multiple trips), with sampled charter regions in the core of the stock (IPHC Regulatory Areas 2B, 2C, 3A and 3B) rotated over two or three years depending on IPHC Regulatory Area. In other IPHC Regulatory Areas, coverage is prioritized based on minimizing the potential for bias and maintaining the coefficients of variation (CV, a relative measure of precision) below 25% for each IPHC Regulatory Area. The **Base Block design** includes some sampling in all IPHC Biological Regions in each year, ensuring that trend and biological data from across the spatial range of Pacific halibut are available to the stock assessment and for stock distribution estimation.

The **Base Block design** is considered the optimal long-term FISS design for the IPHC and is used as the benchmark for all other design proposals. The **Base Block design** will therefore be referred to as Option 1 moving forward.

High projected financial costs to undertake the **Base Block design** (Option 1) in 2026 means that it is not a financially viable option without substantial supplementary funding being received (in excess of US$1 million). The IPHC Secretariat therefore developed the **Supplemented Reduced Loss design** (Option 2), which reduces the deficit to close to US$0.5 million. As with Option 1, its cost is partially covered by the voluntary contribution of US$513,000 from the USA for supporting the 2026 FISS (see Discussion below). The Commission adopted Option 2 as the FISS design for 2026 at IM101 (IPHC-2025-IM101-R, para. 33).

FISS DESIGN OBJECTIVES (Table 1)

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 management. The priority of the current rationalized 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: *Cost effectiveness.*

The FISS is intended to be cost-effective without compromising the scientific integrity of the design. Any implemented design must consider logistics and cost together with scientific integrity.

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 emerging IPHC informational needs.

Table 1 Prioritized 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	Cost effectiveness without compromising the scientific integrity of the FISS design.	Balance operational feasibility/logistics, cost/revenue, and scientific needs. Includes an aspirational target reserve of US$2,000,000
Tertiary	Minimize removals, assist others where feasible on a cost-recovery basis, address specific Commission informational needs.	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

Annual design review, endorsement, and finalisation process

Since the completion of the FISS expansions in 2019, a review process has been developed for annual FISS designs created according to the above objectives:

- Step 1: The Secretariat presents preliminary design options based on the primary objective (Table 1) to the SRB for three subsequent years at the June meeting, based on analysis of prior years' data. Commencing in 2024, this has included preliminary cost projections based on prior year fiscal details (revenue) and current year vessel contract cost updates;
- Step 2: Updated design options for the following year that account for both primary and secondary objectives (Table 1) are reviewed by the Commission at the September work meeting, recognising that revenue and cost data from the current year's FISS are still preliminary at this time;
- Step 3: At their September meeting, the SRB reviews design options accounting for both primary and secondary objectives (Table 1) for comment and advice to the Commission (recommendation). FISS revenue and cost information from the current year is near-final at this time;
- Step 4: Designs are further modified to account for updates based on secondary and tertiary objectives before being finalized during the Interim and Annual meetings and the period prior to implementation:
    - Presentation of FISS designs for 'endorsement' by the Commission occurs at the annual Interim Meeting;
    - Ad-hoc modifications to the design for the current year (due to unforeseen issues arising) are possible at the IPHC Annual Meeting;

- The endorsed design for the current year is then modified (if necessary) to account for any additional tertiary objectives or revisions to inputs into the evaluation of secondary objectives prior (i.e., updated cost estimates) and logistical considerations raised by the operators of contracted vessels prior to summer implementation (February-April).

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

Although the review process examines designs for the next three years, revisions to designs for the second and third years are expected during subsequent review periods as additional data are collected. Having design proposals available for three years assists the Secretariat with medium-term planning of the FISS, and allows reviewers (SRB, Commission) and stakeholders to see more clearly the planning process for sampling the entire FISS footprint over multiple years.

POTENTIAL DESIGNS FOR 2026-28

OPTION 1: BASE BLOCK DESIGN

The **Base Block designs** (Option 1) shown in Figures 4 to 6 for 2026-28 were revised from the designs presented to Commissioners at AM101 (Webster et al. 2025) to account for the Commission-approved 2025 design. In particular, charter regions not selected in IPHC Regulatory Areas 3A and 3B in 2025 were prioritized for sampling in 2026.

Using samples generated from the fitted 2024 space-time models as simulated data for 2025-28, we projected the CV for mean O32 WPUE for each year of the design by IPHC Regulatory Area. As CVs are generally greater in the terminal year of the time series, and that year is usually the most relevant for informing management decisions, the CV values in Table 2 are for the final year of the modelled time series. For example, the values for 2027 were found by fitting the model to the data for 1993-2027, with simulated data used for 2025-27.

Table 2. Projected coefficients of variation (CVs, %) of mean O32 WPUE for the Base Block design by terminal year of time series and IPHC Regulatory Area and Biological Region.

Regulatory Area	2026	**Year** 2027	2028
2A	21	22	14
2B	11	7	10
2C	6	6	6
3A	8	7	8
3B	11	15	11
4A	18	22	13
4B	15	16	17
4CDE	9	9	8
Biological Region			
Region 2	6	5	5
Region 3	7	7	7
Region 4	9	10	7
Region 4B	15	16	17
Coastwide	4	4	4

Projected terminal year CVs for the Base Block design are 25% or less for all IPHC Regulatory Areas. In the core areas (2B, 2C, 3A and 3B), CVs are projected to be 15% or less (Table 2). All Biological Region CVs, except that of Region 4B, are at most 10%, while the coastwide CV is projected to be 4% in all years. The Base Block design is therefore expected to maintain precise estimates of indices of Pacific halibut density and abundance across the range of the stock. At the same time, the rotating nature of the sampled blocks means that almost all FISS stations are sampled within a 5-year period (2-3 years within the core areas) resulting in low risk of missing important stock changes and therefore a low risk of large bias in estimates of trend and stock distribution.

OPTION 2: SUPPLEMENTED REDUCED LOSS DESIGN (APPROVED DESIGN FOR 2026)

Option 2, the **Supplemented Reduced Loss Design** (Figure 7) is a design that meets the broad spatial coverage goals of Option 1, while modifying which stations are sampled in order to account for the Secondary Priority of the FISS (Table 1). This design includes FISS sampling in all IPHC Biological Regions, and some sampling in all IPHC Regulatory Areas except 4CDE (expected to be sampled by NOAA trawl) and 2A. Option 2 differs from the Base Block design (Option 1) as follows:

- Replaces one revenue-negative charter region in IPHC Regulatory Area 2B with two regions projected to be revenue-positive
- Adds one revenue-positive region to IPHC Regulatory Area 2C
- Replaces three high-cost regions in IPHC Regulatory Area 3A with two regions that ensure projected overall losses are maintained close to US$0.5 million
- Has one fewer charter region in IPHC Regulatory Area 3B

COST PROJECTIONS

Table 3 provides cost and revenue projections for the Base Block design (Option 1) and the Supplemented Reduced Loss design (Option 2). Projections include the following assumptions:

1. Designs are optimized for numbers of skates, with 4, 6 or 8 skate-sets used, depending on projected catch rates and bait costs
2. Pacific halibut price will decline by 10% from 2025 values
3. Pacific halibut landings will decline by 5% from 2025 values
4. The price of chum salmon bait increases to US$2.50 per pound from $1.65 per pound in 2025.

Regarding #2, there was a large average increase in price from 2024 to 2025, but without fully understanding the reasons for this increase, it seems prudent and precautionary to assume that prices will return to values closer to those experienced in previous years. Further, 2025 FISS catch rates show that in much of the stock, the landings have continued to decline and therefore it is reasonable to assume a further decline from 2025 to 2026.

Potential modular changes to Option 2, the **Supplemented Reduced Loss design** that lead to designs (Options 3 to 10) intermediate to it and the **Base Block design** (Option 1) are provided in Appendix A, along with other modular options that add sampling outside of footprint of both designs (Options 11 to 16). If selected, options from the latter set would bring sampling forwards by 1-3 years from what is currently proposed under future Base Block designs.

Table 3. Comparison of projected income and expenses for the 2026 Base Block design (Option 1) and the Supplemented Reduced Loss design (Option 2) ($US). (Totals may not equal the sum of individual rows due to rounding.)

Design		**Option 1 (Base Block)**	**Option 2 (Supplemented Reduced Loss)**
Income	**Pacific halibut sales**	1,747,000	2,519,000
	Byproduct sales	85,000	102,000
	Voluntary contribution - USA	513,000	513,000
	Total	**2,345,000**	**3,134,000**
Expenses	**Base HQ (staff salary and wages, and benefits x 4)**	(534,000)	(534,000)
	Vessel contracts	(1,366,000)	(1,382,000)
	Field staff (salary and wages, and benefits)	(492,000)	(492,000)
	Bait	(414,000)	(457,000)
	Non-IPHC fish sales	(224,000)	(301,000)
	Other expenses*	(471,000)	(471,000)
	Total	**(3,500,000)**	**(3,636,000)**
Net revenue		**($1,155,000)**	**($502,000)**

*Other costs include training, personnel expenses, mailing and shipping, travel, technology, gear replacement, customs fees, bait storage fees, field supplies and equipment, equipment maintenance fees, facility rental fees, and communication fees.

DISCUSSION

The **Base Block design** (Option 1) has a projected net loss of ~$1,155,000 and therefore would rely on additional supplementary funding for implementation. While the Commission-adopted **Supplemented Reduced Loss design** (Option 2) has a similar number of stations to the Base Block design, it prioritizes some regions that have been fished recently over others that were included in the Base Block design because they lacked recent sampling. This helps ensure that the Secondary Objective is met (Table 1) by reducing net operating losses. Coverage in Biological Region 3 is reduced for the Option 2 design relative to the Base Block design (Option 1), increasing the chance of bias in estimates for that region. Nevertheless, the Option 2 design represents a substantial improvement in coverage over the implemented 2025 design, and complements the 2025 design by including seven charter regions not sampled this year: two each in 2B and 2C, one each in 3A and 3B, and one in 4A. Compared with 2024 and 2025, this will result in more representative biological data, more precise indices of abundance and stock distribution, and an assessment model that is less reliant on commercial data.

Option 2 is financially viable due to the USA's voluntary contribution of **US$513,000** to support the 2026 FISS. We note that the USA requested that the voluntary contribution be allocated as follows:

- US$265,000 to fund the FISS in IPHC Regulatory Area 4B;
- US$163,000 to fund one FISS charter region in IPHC Regulatory Area 3B;
- US$85,000 to partially fund the FISS in IPHC Regulatory Area 4A.

The voluntary USA contribution has allowed for a greater number of stations to be included in Option 2 than would otherwise have been viable.

RECOMMENDATIONS

That the Commission **NOTE** paper IPHC-2026-AM102-13 that provides FISS design options for 2026, including the approved Supplemented Reduced Loss Design (Option 2).

References

IPHC 2012. IPHC setline charters 1963 through 2003 IPHC-2012-TR058. 264p.

IPHC 2018. Report of the 13th Session of the IPHC Scientific Review Board (SRB) IPHC-2018-SRB013-R. 17 p.

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

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Webster, R. A., Soderlund, E, Dykstra, C. L., and Stewart, I. J. 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.

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

Webster, R., Stewart, I., Ualesi, K., Jack, T. and Wilson, D. 2025. 2025 and 2026-29 FISS Designs. IPHC-2025-AM101-14. 15 p.

Appendix A: Modular design options

Table A.1 lists potential modular changes to the 2026 **Supplemented Reduced Loss design** (Option 2) that lead to designs intermediate to Option 1 (**Base Block Design**) and Option 2 in terms of cost. See Figure 8 for a map showing the FISS charter regions named in the table. For Options 3 to 10, the values in the fourth column are the projected changes in net revenue for the overall FISS design that would result from implementing a given option. The change in overall net revenue from selecting multiple modular options from Options 3 to 10 is found by summing the values for each of the selected options.

Table A.2 presents options for expanding coverage into parts of the stock not covered by either the Option 1 or Option 2, in IPHC Regulatory Areas 2A, 4B and 4CDE. Figure 9 shows the stations in each of the options in Table A.2 except for Option 15b, which repeats the 2025 FISS design in IPHC Regulatory Area 2A (Figure 2). As with Options 3 to 10 in Table A.1, the change in overall net revenue from selecting multiple modular options from Options 11 to 16 is found by summing the values for each of the selected options.

In both tables, there are some row and column values that do not sum to the stated totals due to rounding.

Table A.1 Cost projections of modular changes to Option 2 (Supplemented Reduced Loss). Each of modular Options 3 to 10 can be added in any combination to Option 2, with the net revenue of the resulting FISS design found by summing the revenue changes for each selected option. For reference, FISS charter regions are shown in Figure 8.

Option	Design	Sampled IPHC Regulatory Areas (with number of FISS charter regions)	Projected expenses ($US)	Projected income ($US)	Projected net revenue	Benefit/rationale
1	Base Block	2B(2), 2C(2), 3A(4), 3B(2), 4A(1), 4B(1)	($3,500,000)	$2,345,000	($1,155,000)	Optimal long-term design
2	Supplemented Reduced Loss	2B(3), 2C(3), 3A(3), 3B(1), 4A(1), 4B(1)	($3,636,000)	$3,134,000	($502,000)	Financially viable design using IPHC FISS reserve funds.
	Design change	**Change in sampling**	**Projected change in expenses ($US)**	**Projected change in income ($US)**	**Projected change in net revenue**	
3	Add Semidi	3B(+1)	($219,000)	$70,000	($150,000)	Improves 3B coverage. Last sampled 2023.
4	Replace Prince William Sound with Gore Pt	3A(+0)	$45,000	($109,000)	($64,000)	Gore Point last sampled 2023, PWS in 2025.
5	Replace Yakutat with Fairweather	3A(+0)	$25,000	($127,000)	($102,000)	Fairweather last sampled 2023, Yakutat in 2025.
6	Add Goose Island	2B(+1)	($244,000)	$138,000	($106,000)	Improves 2B coverage. Last sampled 2023.
7	Add Shelikof	3A(+1)	($250,000)	$150,000	($101,000)	Improves 3A coverage. Last sampled 2024.
8	Remove St James	2B(-1)	$246,000	($311,000)	($66,000)	Removes lower-priority revenue-positive region. Last sampled 2024.
9	Remove Ketchikan	2C(-1)	$218,000	($220,000)	($2,000)	Removes lower-priority revenue-positive region. Last sampled 2024.
10	Remove Charlotte	2B(-1)	$314,000	($379,000)	($65,000)	Removes lower-priority revenue positive region. Last sampled 2025.

Table A.2 Projected change in net revenue for modular design add-ons to Option 2 that would expand FISS coverage to stations not included in either Option 1 or Option 2 (Figure 9).

Option	Design change	Change in sampling	Projected change in expenses ($US)	Projected change in income ($US)	Projected change in net revenue ($US)	Benefit/rationale	Next proposed sampling in Base Block design
11	Add 4CDE South (includes St George, St Paul and St Matthew)	4CDE(+1)	($240,000)	$34,000	($205,000)	Add FISS coverage to highest density part of 4CDE. Last sampled in 2024.	2027
12	Add 4CDE Central	4CDE(+1)	($184,000)	$28,000	($155,000)	Add FISS coverage to 4CDE. Last sampled in 2022.	2029
13	Add 4CDE North	4CDE(+1)	($178,000)	$8,000	($171,000)	Add FISS coverage to 4CDE. Last sampled in 2021.	2029
14	Add Attu	4B(+1)	($242,000)	$28,000	($214,000)	Improves 4B coverage. Last sampled in 2019.	2027
15a	Add highest-density stations in 2A	2A(+1)	($308,000)	$40,000	($268,000)	For comparison with 2025 (localized hypoxia). Partially sampled in 2025.	2028
15b	Repeat 2025 2A design	2A(+1)	($281,000)	$34,000	($247,000)	Smaller, more cost-effective comparison with 2025 than Option 15a.	N/A
16	Add medium-density stations in 2A	2A(+1)	($313,000)	$18,000	($295,000)	Last sampled in 2017-18.	2027

Appendix B: FISS history and modelling

FISS history 1993-2019

The IPHC has undertaken FISS activity since the 1960s, although methods were not standardized to a degree (e.g., the bait and gear used) that allowed for simple combined data 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 parts of 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) bottom trawl survey (Webster et al. 2020).

Through examination of commercial logbook data and information from other sources, it became clear by 2010 that the historical 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 historical FISS depth range (0-20 fathoms and 275-400 fathoms), and unsurveyed stations on the 10 nmi grid within the 20-275 fathom depth range within each IPHC Regulatory Area. This led the IPHC Secretariat to propose expanding the FISS to provide coverage of the unsurveyed habitat in 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 standardized fishing of longline gear in shallower waters. The 400-fathom maximum depth is understood to cover the vast majority of Pacific halibut summer habitat. A second expansion in IPHC Regulatory Area 2A was completed in 2013, with a pilot survey in California waters between the latitudes of 40 and 42°N.

The full expansion program began in 2014 and continued through 2019, resulting in the sampling of the entire FISS design of 1890 stations in the shortest time logistically possible. The FISS expansion program 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, and, in conjunction with space-time modelling of survey data (see below), has improved precision and fully quantified the uncertainty associated with estimates based on partial annual 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 developing annual FISS designs. This station selection process began in 2019 for the 2020 FISS and continues with the current review of design proposals for 2026-28. 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 the National Oceanic and Atmospheric Administration (NOAA) Bering Sea trawl survey (stations can vary by year – standard grid stations are shown in Figure 1) and the Alaska Department of Fish and Game (ADFG) trawl survey conducted in Norton Sound (40-60 stations). Both supplementary surveys have been conducted approximately annually in recent years.

Rationalized FISS, 2020-25

Following the 2011-2019 program of FISS expansions, a rationalized FISS design was approved for 2020 based on random selection of over 50% of stations in the core of the stock (IPHC Regulatory Areas 2B, 2C, 3A and 3B) and sampling of all stations in selected subareas of the remaining IPHC Regulatory Areas. For the latter areas, sampling priorities were determined based on maintaining precise estimates of area-specific indices of density and ensuring low bias in index estimators. That year, the COVID19 pandemic led to a reduced FISS with realized sampling only in the core areas. The 2021-22 FISS sampling proceeded largely as designed, although planned stations in western IPHC Regulatory 4B in 2022 were unsampled due to a lack of viable charter bids. In some charter regions in the core areas, 100% of stations were sampled in order to achieve revenue goals (see below). The 2023 FISS design had more limited spatial coverage, with almost no FISS sampling outside of the core areas due to large projected revenue losses from designs that included extensive sampling in IPHC Regulatory Areas 2A, 4A, 4B and 4CDE. Limited sampling was carried out in northern IPHC Regulatory 2A, while planned stations around the IPHC Regulatory Area 4A/4B boundary were again not sampled due to a lack of charter bids. The adopted 2024 FISS design (IPHC-2024-AM100-R) included high sampling rates in IPHC Regulatory Areas 2B and 2C, a small number of charter regions in IPHC Regulatory Areas 3A and 3B, and sampling of the southern shelf edge and Bering Sea islands in IPHC Regulatory Area 4CDE. The 2025 design (Figure 2) included stations in IPHC Regulatory Areas 3A and 3B that complemented coverage in recent years along with stations in IPHC Regulatory Areas 2A, 4A and 4B that had not been sampled for three or more years. This design was expected to reduce the potential for bias in most IPHC Regulatory Areas relative to 2023 and 2024 designs (see Figure 3).

Space-time modelling

Since 2016, a space-time modelling approach has been used 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 represents an improvement over the largely empirical approach used previously, as it uses information contained within the survey data to estimate the degree of spatial and temporal correlation in Pacific halibut density, along with information from covariates such as depth. It also allows a more complete 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. Prior to the application of space-time modelling, these unsampled regions were either imputed using independently estimated scalar calibrations (if fished at least once) or catch-rates at unsampled stations were assumed to simply be equal to the mean for the entire Regulatory Area. The IPHC's Scientific Review Board (SRB) has supported the space-time modelling approach (e.g., IPHC-2018-SRB013-R), and the methods have been published in a peer-review journal (Webster et al. 2020). The IPHC space-time models are fitted through the R-INLA package in the R software (R Core Team, 2025). Importantly, the space-time modelling approach enables the development of annual designs that are optimized to achieve the maximum quality of scientific information possible with the least amount of sampling required.

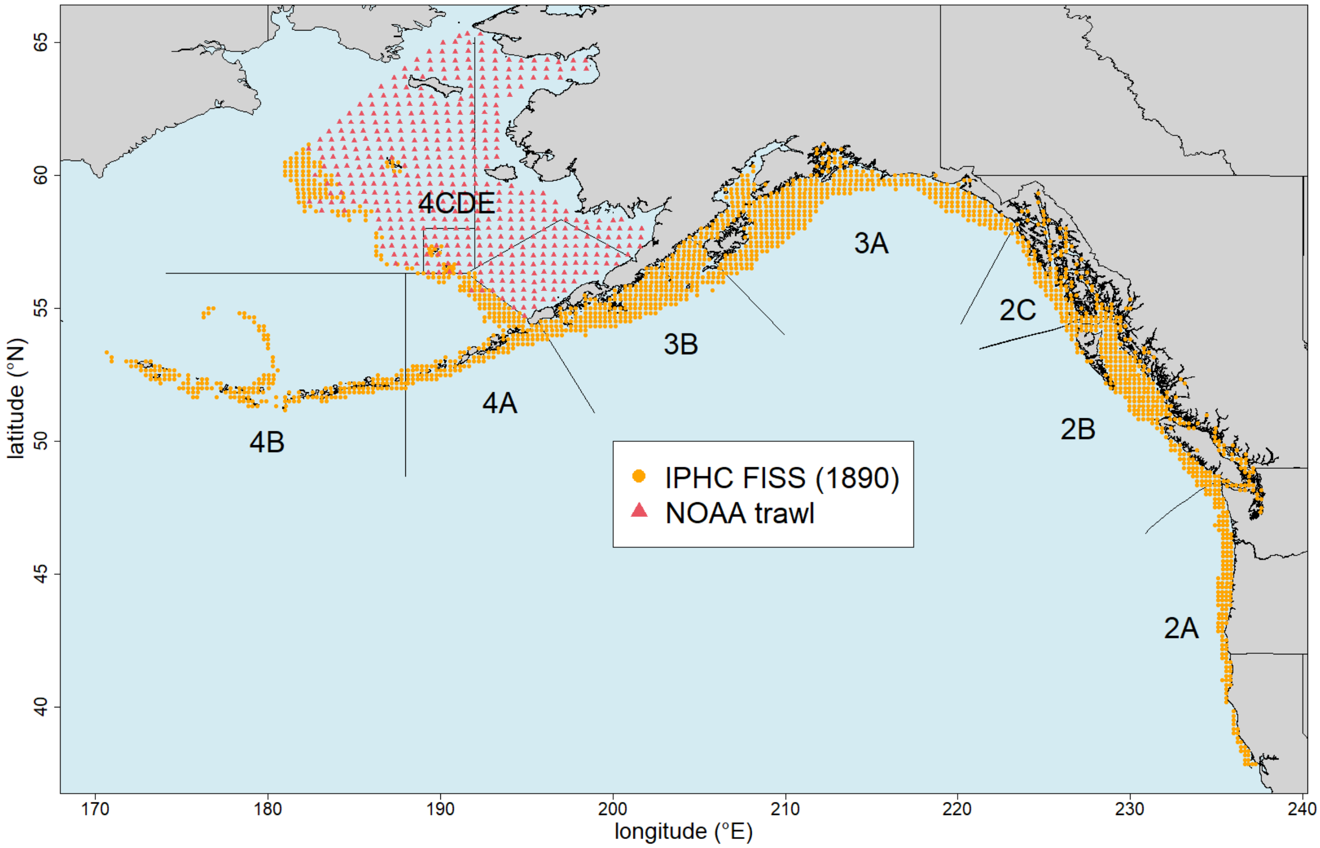

Figure 1. Map of the full 1890 station FISS design, with orange circles representing stations available for inclusion in annual sampling designs. Red triangles represent standard locations of NOAA trawl stations used to provide complementary data for Bering Sea modelling (actual NOAA trawl design can vary year-to-year).

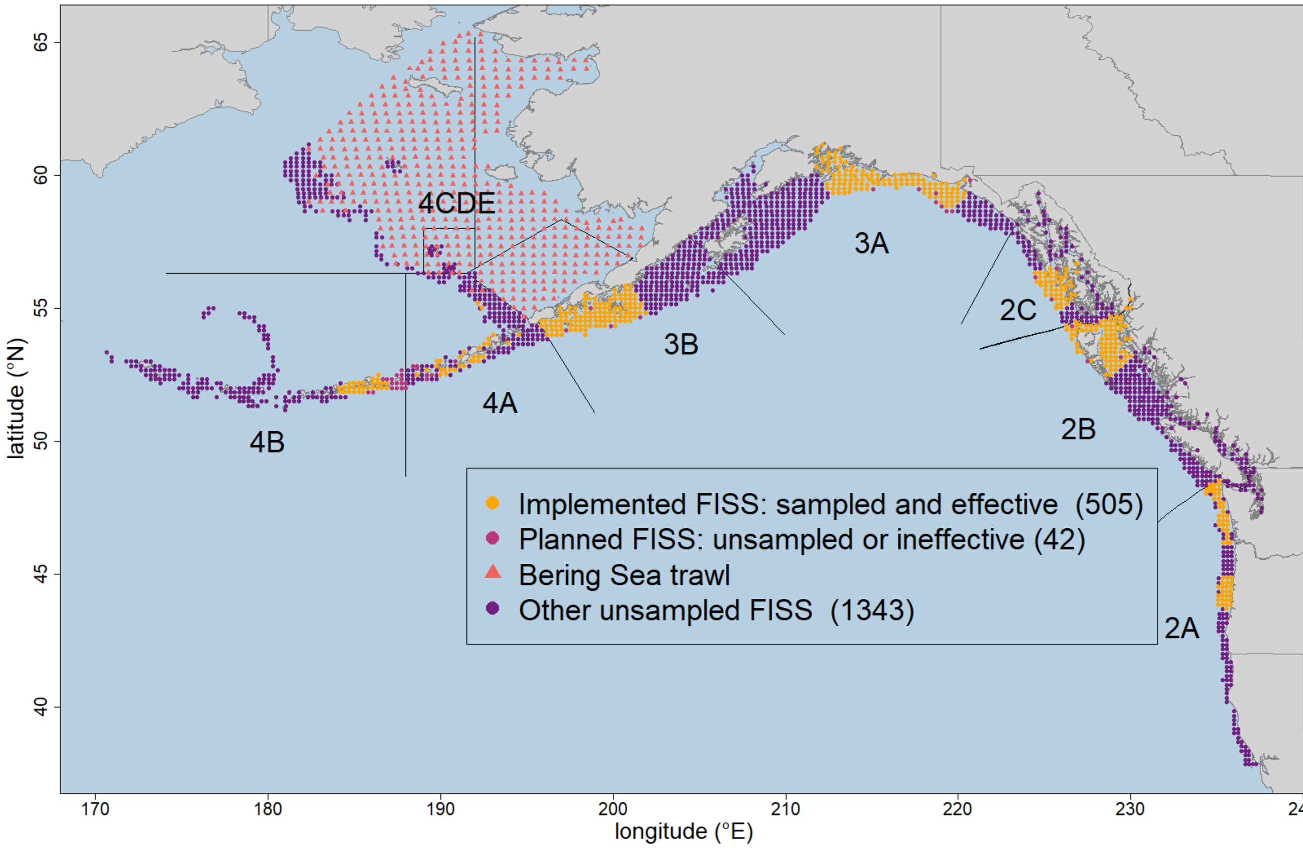

Figure 2. Map of implemented 2025 sampled FISS design showing sampled stations with data used in modelling (orange circles for FISS, red triangles for trawl), along with planned but ineffective FISS stations.

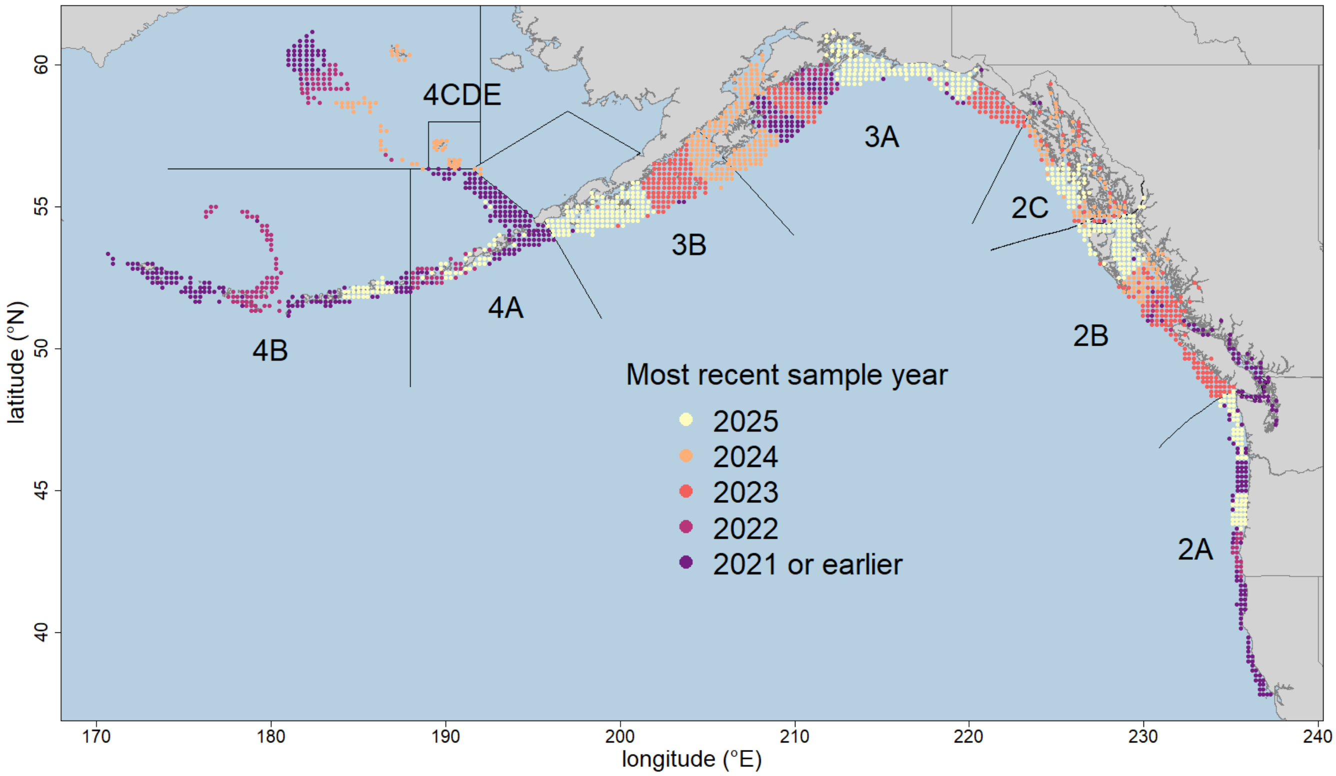

Figure 3. Map showing the most recent sample year of each station on the full FISS grid.

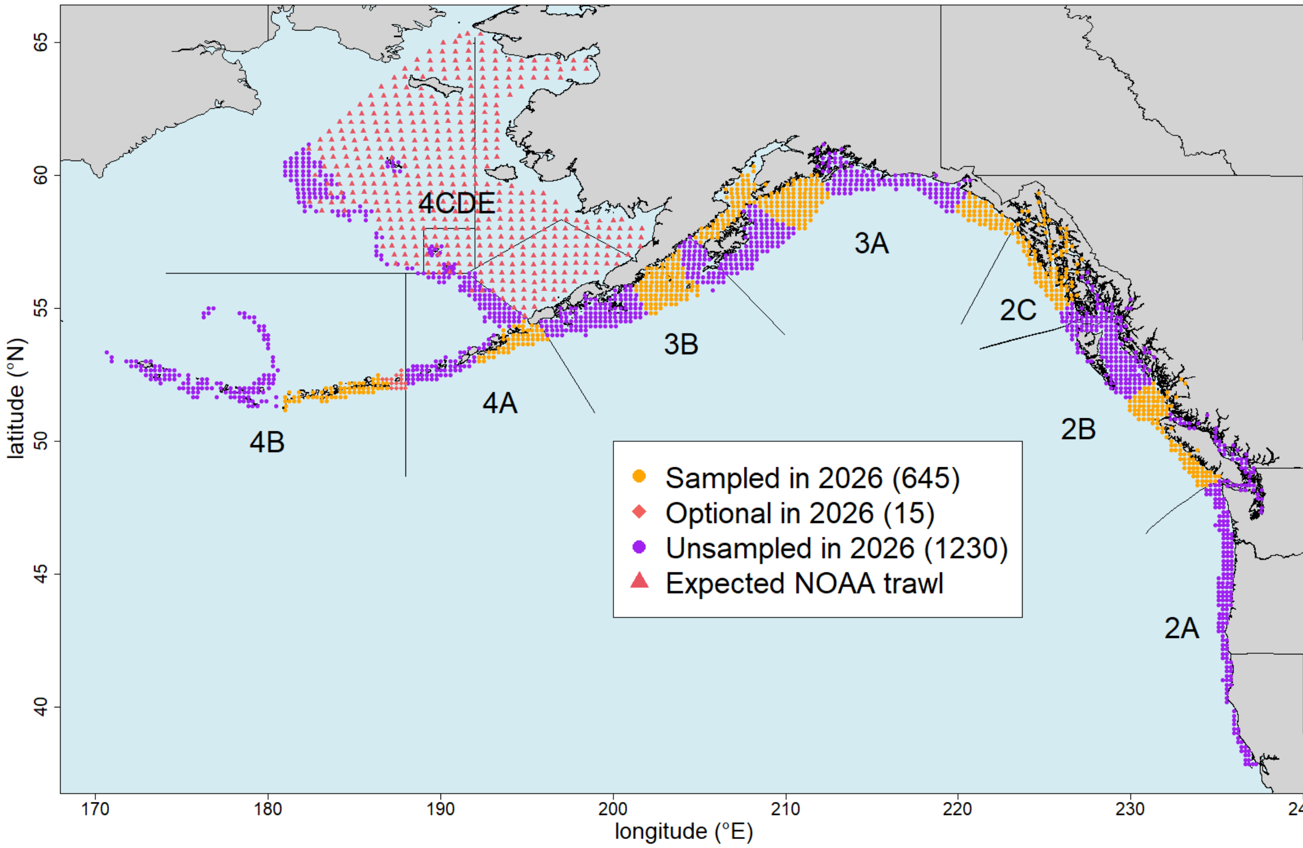

Figure 4. Base Block design for 2026 (orange circles). Design is based on fishing 2-4 complete blocks of stations (charter regions) in the core areas (2B, 2C, 3A and 3B) and previously implemented subareas elsewhere. Fifteen stations in IPHC Area 4B have proved challenging to fish successfully in recent years and are considered optional for 2026 to help attract charter bids.

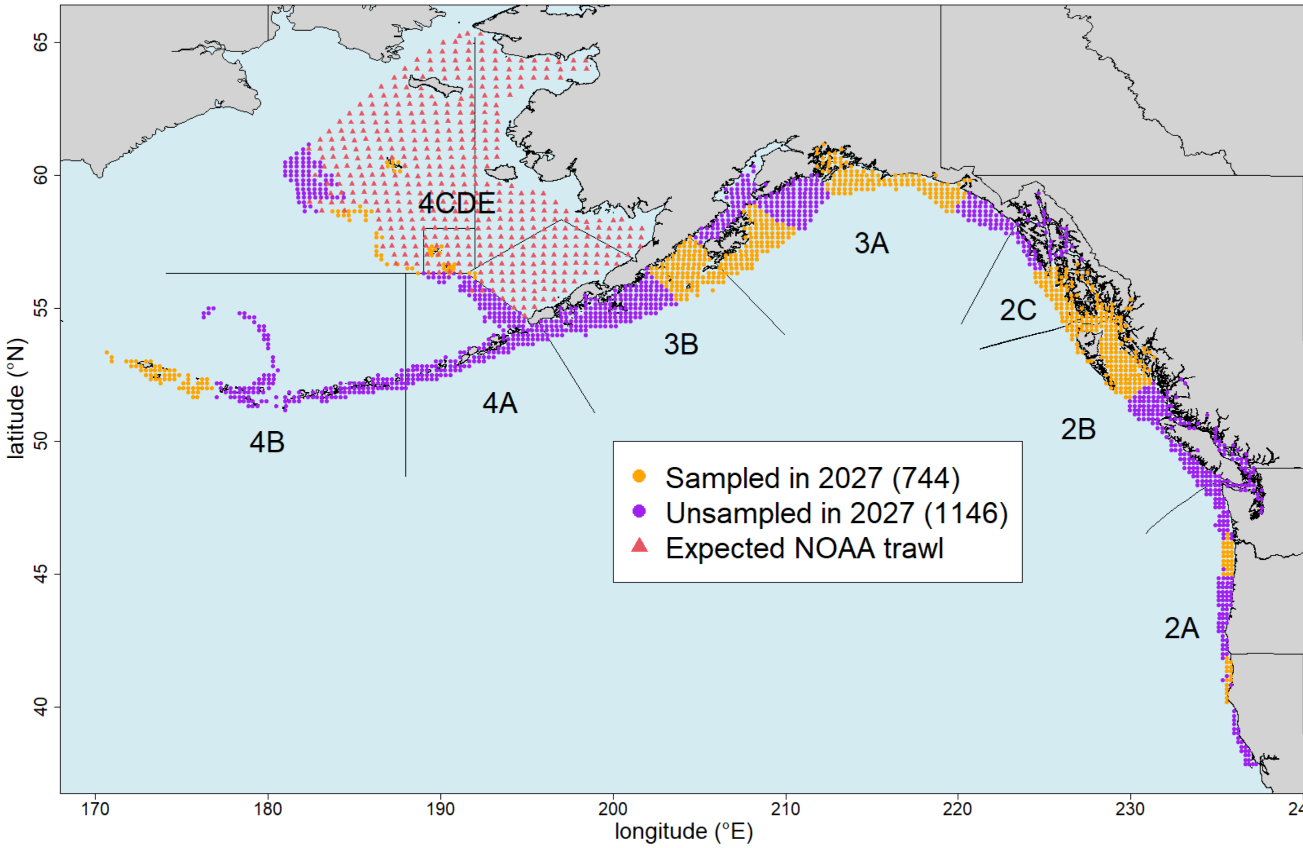

Figure 5. Base Block design for 2027 (orange circles). Design is based on fishing 2-4 complete blocks of stations (charter regions) in the core areas (2B, 2C, 3A and 3B) and previously implemented subareas elsewhere.

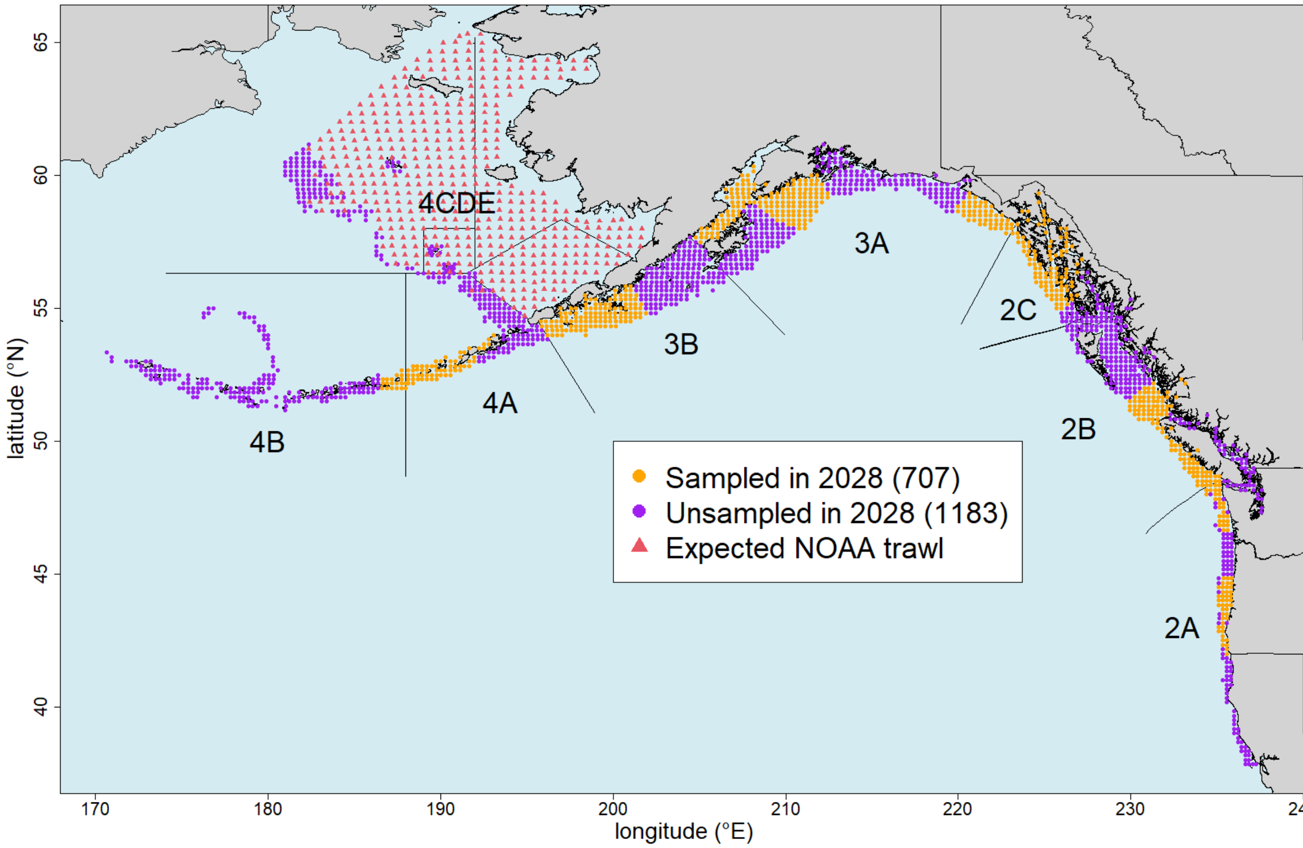

Figure 6. Base Block design for 2028 (orange circles). Design is based on fishing 2-4 complete blocks of stations (charter regions) in the core areas (2B, 2C, 3A and 3B) and previously implemented subareas elsewhere.

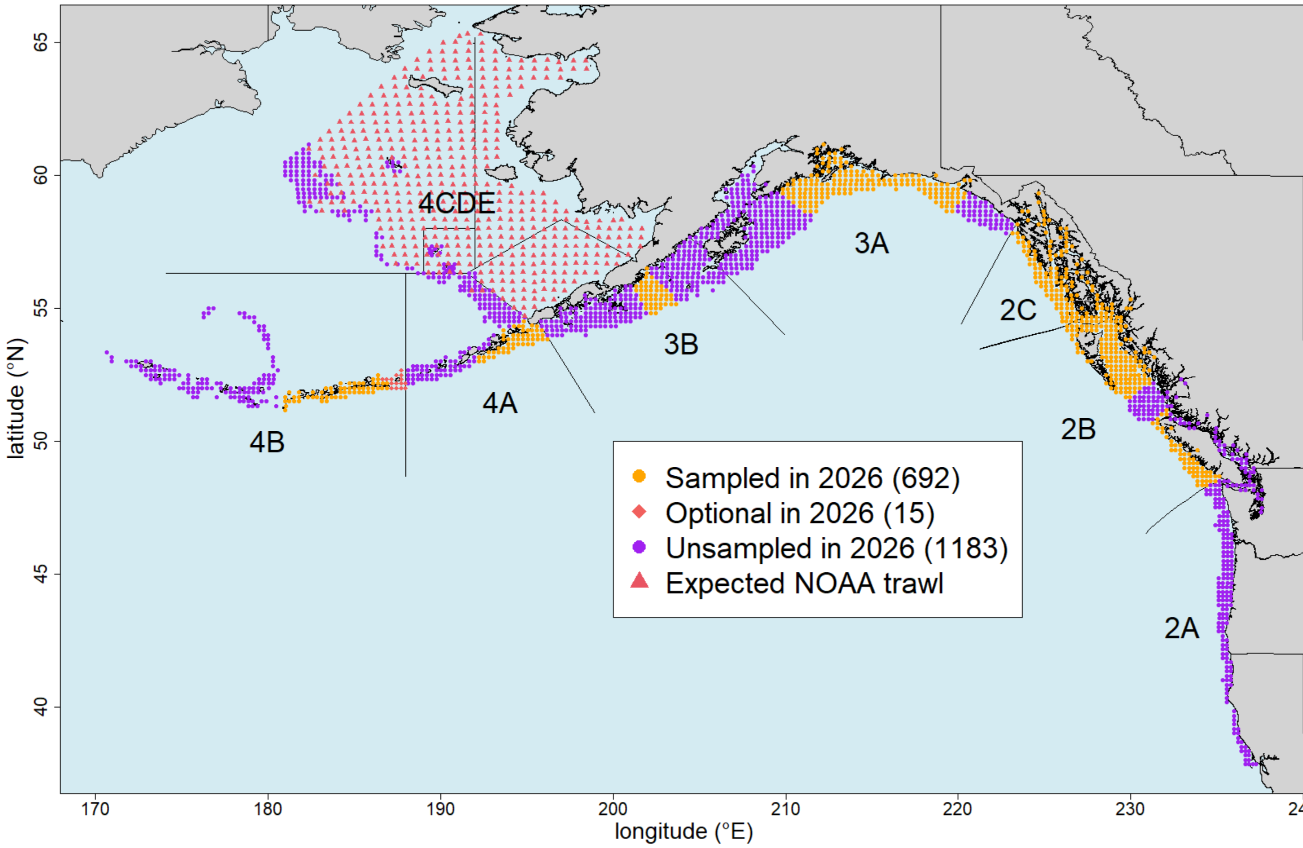

Figure 7. Supplemented Reduced Loss design for 2026 that includes the most cost-effective charter regions in Biological Region 3, projected revenue-positive charter regions in Biological Region 2, and stations in IPHC Regulatory Areas 2A, 4A and 4B covered by supplementary funding. Fifteen stations in IPHC Area 4B have proved challenging to fish successfully in recent years and are considered optional for 2026 to help attract charter bids.

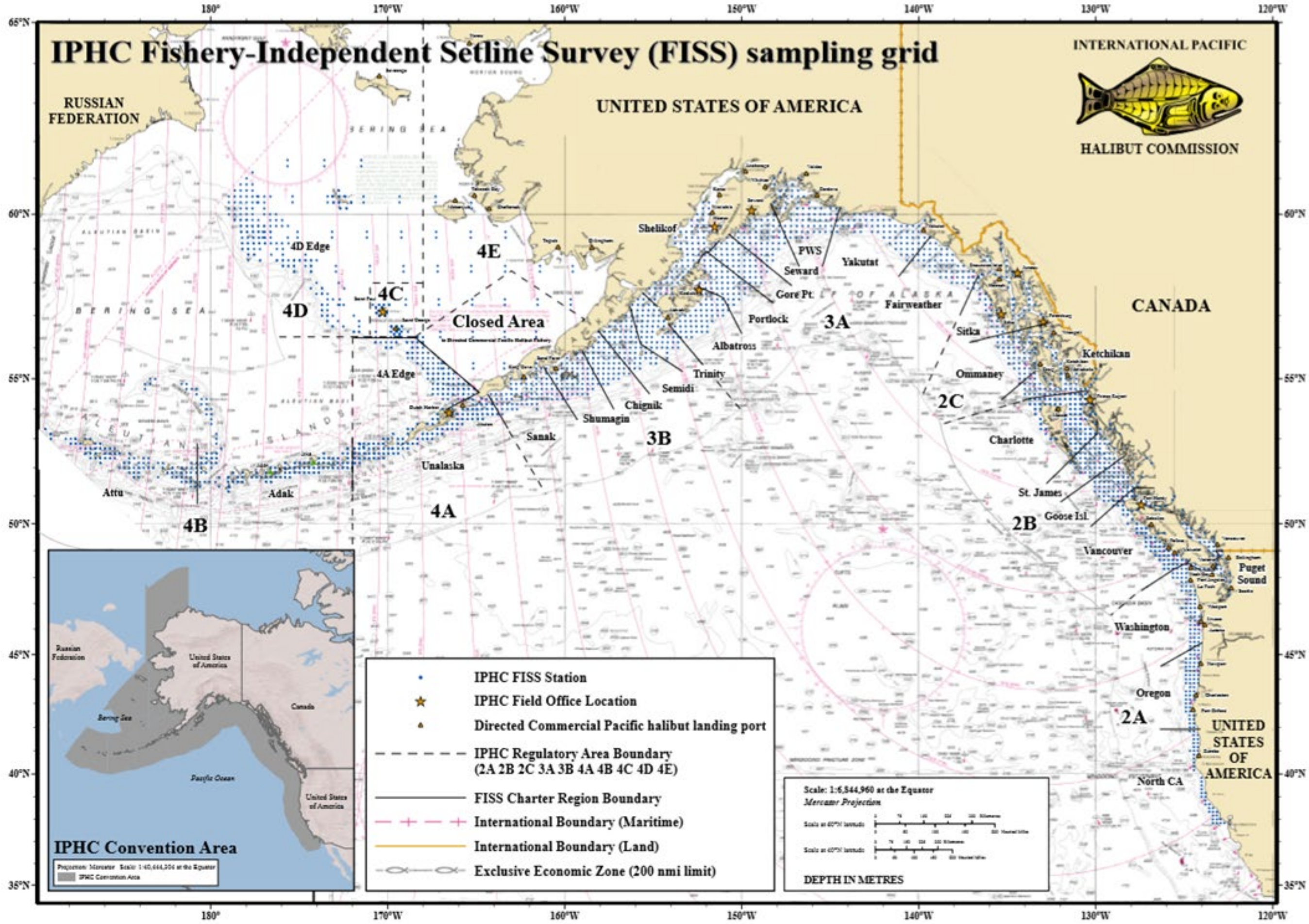

Figure 8. IPHC FISS showing full station grid and current FISS charter regions.

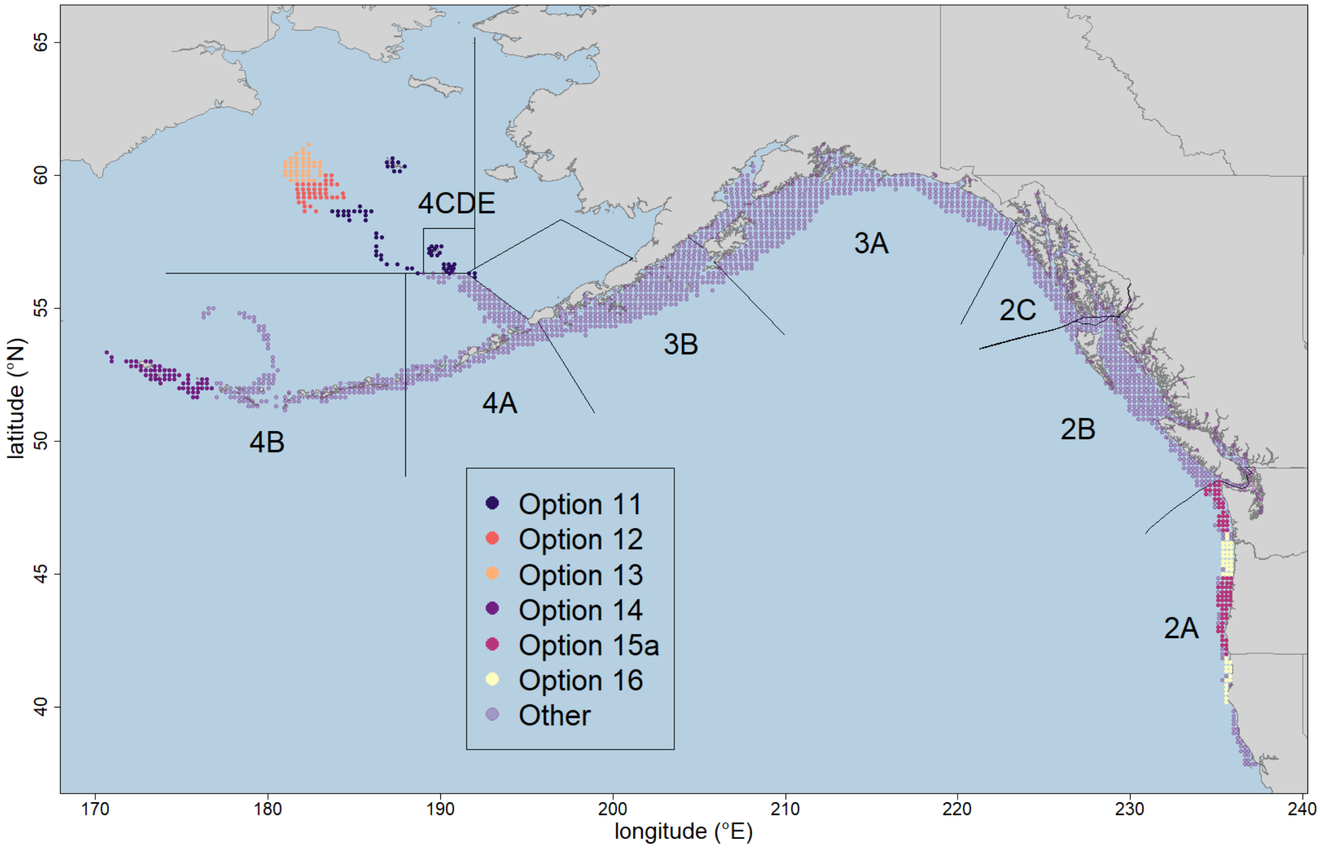

Figure 9. IPHC FISS modular Options 11 to 16 (Table A.2) for 2026.