IPHC Fisheries Dependent Data Collection Design and Implementation in 2024 – Port operations

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PURPOSE

To provide the Commission with the design and implementation of the IPHC fishery-dependent data collection activities in 2024 – Port Operations.

BACKGROUND

The International Pacific Halibut Commission (IPHC) undertakes fishery-dependent data collection activities coastwide to collect Pacific halibut biological data and catch per unit effort data in the form of vessel logbooks. The IPHC fishery-dependent data collection is the IPHC's primary data source providing extensive information on both spatial and temporal variation of commercial landings for Pacific halibut on an annual basis. With sampled ports receiving landings from across the spatial range of the fishery throughout the commercial fishing period, the IPHC is able to obtain representative data that allow us to characterize spatio-temporal patterns in Pacific halibut size, age, sex and genetic information. The commercial fishery data are also an essential input into the estimation of contemporary length-weight relationships which are widely used to estimate the weight of removals outside of the IPHC (e.g. recreational and non-target removals).

Historical logbooks have been provided to the IPHC dating back to 1888. Biological data collection from the commercial sector began in 1933 and continues to the present day. The sampling design and implementation of these data collections has changed in line with the changing fishery regulations, fleet behaviour and best scientific practices.

The Canadian and U.S.A. governments implemented an Individual Vessel Quota (IVQ) in Canada, and an Individual Fishing Quota (IFQ) program in Alaska, in 1991 and 1995, respectively. As a result of this change, the Pacific halibut fishery along the Canadian and USA Alaskan coasts went from a 'derby style race for fish' open from 1-22 days to a nearly year-round fishery lasting 245 days with a winter closure. The length of the fishing period has extended further to present day and in 2024 is 267 days. Prior to the implementation of IVQ/IFQ, the fishery-dependent data collection was accomplished by one or more Secretariat stationed in landing ports for up to a week. After implementation, it became necessary to station Secretariat in major ports throughout the fishery's extended duration (8-9 months) to meet the spatio-temporal data objectives.

In addition to collecting data directly, the IPHC coordinates with other entities for standardised collection of fishery-dependent data. This includes provided training and materials for IPHC Regulatory Area 2A Tribal Commercial fishery stakeholders, California Department of Fish and Wildlife (CDFW), Oregon Department of Fish and Wildlife (ODFW), Washington Department of Fish and Wildlife (WDFW), and Alaska Department of Fish and Game (ADF&G).

FISHERIES DEPENDENT DATA COLLECTION DESIGN

The primary goal and objective of the IPHC port operations is to collect representative samples from Pacific halibut offloads from across the geographical range of the commercial fishery and throughout the commercial fishing period:

- To provide biological input data for the annual IPHC stock assessment;
- To ensure accurate estimation of quantities such as mean commercial weights, size at age, and length-weight relationships used for understanding stock dynamics and estimating non-commercial removals of Pacific halibut;

- To provide data in support of the IPHC research goals, including the collection of biological samples for genetics;
- To maintain field-based points of contact between the fishing industry and the IPHC Headquarters Secretariat.

These goals are achieved through staffing major ports for Pacific halibut landings throughout the commercial fishing period and collaborating with other entities as mentioned above.

Methods for Pacific halibut data collection

The IPHC Secretariat collects data from commercial Pacific halibut landings in major ports. Individual fish are randomly sampled from each landing using prescribed sampling rates for each port and IPHC Regulatory Area, with the goal of sampling a constant proportion of the landed catch over the entire fishing period within each IPHC Regulatory Area. Sampling Pacific halibut consists of the collection of fish lengths, weights, otoliths, and fin clips as well as Pacific halibut logbook data. Biological sampling targets are established by IPHC Regulatory Area to ensure sample sizes are sufficient for the needs of the stock assessment modelers. Prior to the start of each fishing period, landing patterns from each port (for the previous fishing period) are reviewed to ensure proportional sampling (by weight landed) by IPHC Regulatory Area and to ensure minimum data goals are met.

Canada 2024: The IPHC staffed two (2) ports in Canada (Port Hardy and Prince Rupert, BC) with Fisheries Data Specialists (Field, FDS(F)) (Fig. 1).

USA 2024: The IPHC staffed eight (8) ports in Alaska, (Dutch Harbor, St. Paul, Kodiak, Homer, Seward, Juneau, Sitka, Petersburg) with Fisheries Data Specialists (Field, FDS(F)) (Fig. 1). In addition, Pacific halibut landings in Bellingham, WA and Newport, OR were sampled by headquarters-based Secretariat. In 2024 assistance was also provided by IPHC Secretariat for sampling IPHC Regulatory Area 2A Tribal commercial landings in Neah Bay, Washington. Training was conducted for 2A Tribal commercial fishery stakeholders, and nine (9) Washington Treaty Tribes were represented at training.

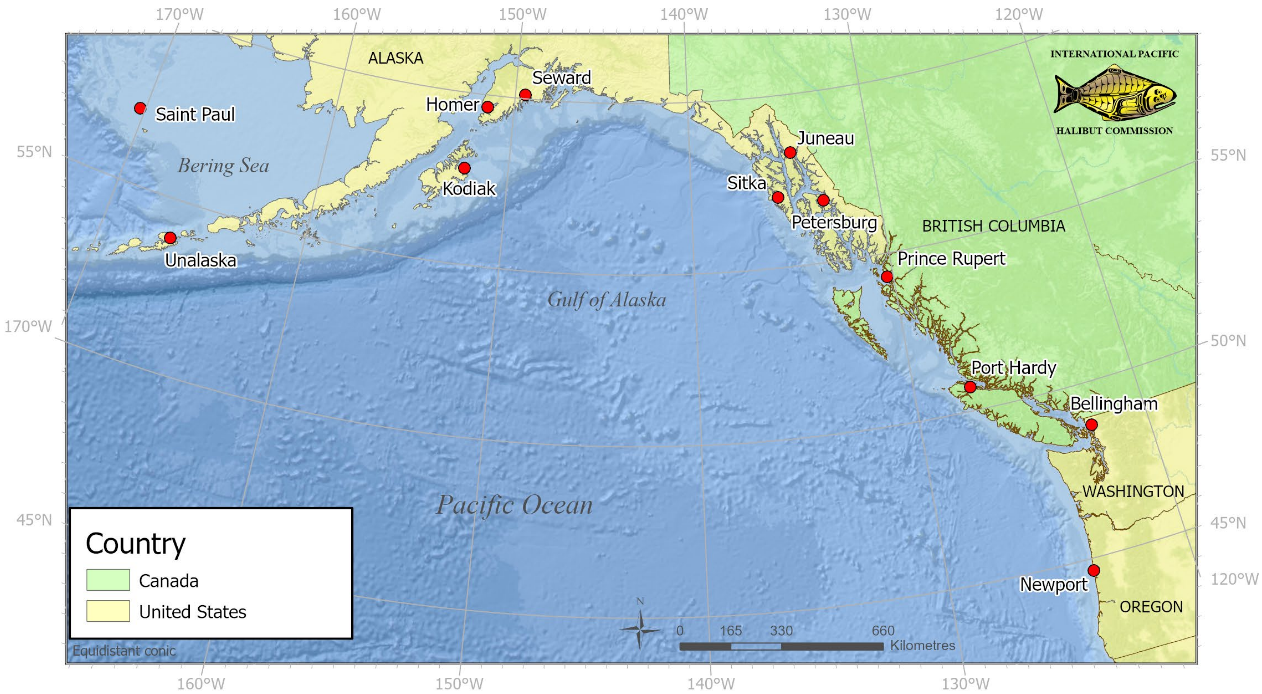

Figure 1. IPHC Fishery-Dependent Data Collection Ports 2024.

Sampling protocols

The IPHC Secretariat collect data according to protocols established in the 2024 International Pacific Halibut Commission Manual for Sampling Directed Commercial Landings (IPHC-2024-PSM01).

DATA COLLECTED IN 2024

Biological data were collected from randomly selected Pacific halibut during the 2024 fishing period. The following metrics were recorded for each sampled fish: left (blind side) sagittal otolith for age determination, fork length measured to the nearest centimeter, weight documented to the nearest tenth of a pound, and fin clip collected for genetic sex determination.

Minimum sampling targets were established to ensure adequate representation of the halibut population across all IPHC Regulatory Areas. The targets were set at 1,500 samples from each of the IPHC Regulatory Areas 2B, 2C, 3A, 3B, 4A, and the combined Areas 4CDE, and 1,000 samples from IPHC Regulatory Area 2A. Port- and IPHC Regulatory Area-specific sampling rates were determined based on access to catch, spatial and temporal goals, and the need to meet minimum sampling target numbers. Rationalisation for these targeted minimums are detailed in Appendix I. The summary of biological sampling can be found in Table 1.

Table 1: Biological samples collected during the 2024 Pacific halibut commercial fishing period.

IPHC Regulatory Area	Fish Sampled	Percent of Target Minimum	Percent Landed
2A	776	78%	88.3%
2B	1,774	118%	92.5%
2C	1,759	117%	89.9%
3A	1,481	99%	92.2%
3B	1,713	114%	88.3%
4A	1,185	79%	55.2%
4B	826	55%	26.3%
4CDE	930	62%	39.4%
Total	**10,444**	-	-

As seen in Table 1, IPHC Regulatory Areas 2B, 2C, and 3B surpassed the target minimum, achieving 118%, 117%, and 114%, respectively. These areas benefitted from high landing percentages and sufficient staffing to allow access to catch. Area 3A reached 99% of its target, nearly achieving the sampling goal. Conversely, IPHC Regulatory Areas 4A, 4B, and 4CDE fell below the target minimum, achieving 79%, 55%, and 62%, respectively. Lower landing percentages in these areas, particularly 4B (26.3%) and 4CDE (39.4%), reflect limited access to catch as percent landed was lower than expected as well as logistical challenges such as insufficient staffing. IPHC Regulatory Area 2A data collections did not meeting the minimum due to access to catch cause by staffing shortages.

Table 2 summarizes fishery logbook and biological data collection, as well as associated costs, by port for the 2024 fishing period. A total of 2007 logbooks and 10,444 biological samples were collected across all ports, with a program-wide cost of $687,300, excluding costs of IPHC Secretariat staff based in Seattle as well as indirect costs associated such at technology, and administrative staff time.

Table 2: Fishery logbook and biological data collected by port during the 2024 fishing period and estimated program costs for FY 2024 by port. Costs do not include IPHC Secretariat based at the headquarters office in Seattle which directly assist with and manage IPHC fishery dependent data collection, or indirect costs such as technology or administrative staffing.

Port	Logbooks	Biological samples	Total Cost (USD)	Total Cost/Month (USD)	Operational Costs (USD)
Dutch Harbor	94	2110	$90,500	$11,700	$37,900
Homer	245	1811	$72,700	$7,800	$11,700
Juneau	84	334	$68,200	$7,400	$7,200
Kodiak	207	873	$78,900	$8,500	$17,900
Petersburg	289	1101	$72,800	$8,100	$13,600
Seward	296	687	$81,900	$9,100	$15,000
Sitka	204	568	$72,800	$7,900	$5,900
St. Paul	125	396	$31,100	$12,100	$13,700
Prince Rupert	169	786	$57,200	$6,400	$13,800
Port Hardy	203	988	$49,400	$5,300	$4,800
2ATribal	91	664	$1,100	N/A	$1,100
Bellingham*	N/A	42	$6,800	N/A	$6,800
Newport*	N/A	84	$3,900	N/A	$3,900
TOTAL	2007		**$687,300**		

Data from IPHC Regulatory Areas 4A, 4B, and 4CDE were collected nearly solely from Dutch Harbor and St. Paul. These data were prioritized due to their critical role in understanding Pacific halibut stocks in this region. These areas experience variable sampling coverage by the IPHC Fishery-Independent Setline Survey, further emphasizing the importance of data collected through fishery-dependent programs. The higher monthly costs of sampling in Dutch Harbor and St. Paul reflect the high cost of living, elevated travel expenses, and the shorter fishing periods compared to other ports. For example, St. Paul was staffed for only 2.5 months, meaning travel costs were divided over a much shorter period than ports staffed for nine or more months. Despite its smaller sample size, St. Paul remains a critical port for stock assessment due to its operational focus on Area 4CDE fisheries.

Costs in the two Canadian ports, Prince Rupert and Port Hardy, were lower than those in Alaska ports, largely due to the reduced cost of employee benefits in Canada compared to the United States. Costs in other ports varied based on factors such as employee turnover, travel expenses, and intermittent staffing requirements.

Sampling in IPHC Regulatory Area 2A was concentrated in Bellingham, Newport, and 2A Tribal locations. While logbook data were collected in Bellingham and Newport, these were handled by IPHC Secretariat staff based in Seattle and are not included in the table. The collection of IPHC Regulatory Area 2A data was largely facilitated through collaboration with Washington State Treaty Tribes, which contributed significantly to the sampling effort. Treaty Tribes were responsible for 664 out of the total 776 biological samples collected in the region—86% of the total—as well as 91 logbooks.

CHALLENGES

While sampling goals were met or exceeded in most areas, challenges remain in achieving adequate sampling coverage in IPHC Regulatory Areas 2A, 4A, 4B, and 4CDE due to lower landings and limited access to catch. To address these challenges, increased staffing or alternative data collection strategies such collaboration with more external entities should be considered. Additional resources may be needed to support sampling in regions with historically low access.

RESULTS

Fishery-dependent data collected and verified prior to 30 October of this year were used in 2024 the Pacific halibut stock assessment. Data collected and processed after 30 October will be used in the following year's stock assessment.

Commercial biological and catch data interactives including 2024 fishery limits reports which are updated bi-monthly can be found at this link https://www.iphc.int/data/.

RECOMMENDATION

That the Commission:

1) **NOTE** paper IPHC-2025-AM101-07 that provides the Commission with a summary of the IPHC fishery-dependent data collection design and implementation in 2024.

APPENDICES

Appendix I – Fishery Dependent Data Sampling Targets

PURPOSE

To provide clarification of IPHC's rationalised biological data collection minimum goals.

INTRODUCTION

Biological sampling by the IPHC provides the primary source of biological information used for the annual stock assessment and management supporting analyses for Pacific halibut. Biological samples are collected by two primary resources; the Secretariat on the IPHC's Fishery-Independent Setline Survey (FISS) and from commercial fishery landings in major fishing ports coastwide.

In addition, the Alaska Department of Fish & Game (ADFG) collects data from the recreational fishery in Alaska, and both Secretariat [subject to funding] and National Oceanographic and

Atmospheric Administration Fisheries (NOAA) staff collect data from a subset of fish captured on the fishery-independent NOAA trawl surveys conducted in Alaska.

This total comprises approximately:

1) 10,000-12,000 otoliths from the FISS (target collections include 2,000 per IPHC Regulatory Area, but are often lower due to actual vs projected catch rates and generally insufficient overall catch in Biological Region 4 even at a 100% sampling rate);
2) 11,500 otoliths from the directed commercial fishery landings (1,500 targeted per IPHC Regulatory Area 2B, 2C, 3A, 3B, 4A, 4B and 4CDE combined, and 1000 from IPHC Regulatory Area 2A);
3) 1,500-2,000 from the recreational sector (collected in the previous year); and
4) 1,500-3,000 from the NOAA trawl surveys (collected in the previous year).

Ideally, all Pacific halibut landings would have the same probability of being sampled and therefore our sampling frame would be random with regard to the entire fishery. This is not feasible, so only the ports with the largest amount of landings have been prioritized for sampling, except for St. Paul which is the primary source of information from IPHC Regulatory Area 4CDE.

The Secretariat has undertaken a review and analysis of the IPHC capacity for sampling, aging and annual needs for stock assessment and provides the following information for general awareness.

ASSESSMENT OF THE EFFECTIVE SAMPLE SIZE FOR 2024

To evaluate current and future data collection priorities, we use the concept of effective sample size (Hulson et al. 2023; Stewart and Hamel 2014) to investigate how reducing the number of otolith ages determined from the biological samples collected would reduce the 'information content' of the fish age data set. Briefly, calculation of effective sample size entails bootstrapping (resampling) the observed ages thousands of times and comparing the simulated data sets to the full data set across the entire range of ages. Generally, effective sample size is much lower than the number of actual fish sampled, because it reflects the fact that fish from a single trip are generally more similar to each other than to fish from different trips and thus not independent samples (Pennington and Volstad 1994). This generally means that the number of trips (or logs) sampled is much more important for statistical power than the number of individual otoliths. The number of otoliths becomes important as the data are portioned for further analyses by IPHC Regulatory Area, by sex and into other important categories (e.g., recent minimum size limit analyses of legal and sublegal fish), Effective sample size is also an appropriate measure for this type of analysis because it is used as the starting point for weighting the age data in the IPHC's stock assessment models.

We first summarized commercial fishery age reading over the most recent five years (2017-2021; the 2022 data was still pending genetic sex assignment). Table A1 reports the average annual number of commercial fishery trips sampled, the annual average number of otoliths read from those trips and the effective sample size that resulted. As expected, the effective sample size is considerably lower than the number of fish because multiple fish are sampled from each unique trip. We then repeated the effective sample size calculation, but randomly subsampled the number of fish to 50% of the actual number. Comparing these results allows us to answer the question: If in recent years we had read only 50% of the ages, how large would the reduction in effective sample size have been? We can speculate that a similar pattern is likely for future sampling yet to be undertaken.

Table A1. Summary of recent (2017-2021) commercial fishery fish ages by Biological Region and possible reductions for 2024. Values reported for effective sample size are the simulated sample size and percentage reduction from the actual effective sample sizes at each level of subsampling.

Biological Region	Recent average number of trips sampled	Recent average number of ages	Recent effective sample size	Effective sample size from 50% subsampling	Percentage reduction from actual
Region 2	366	4,436	1,525	1,069	30%
Region 3	169	2,552	905	646	29%
Region 4	81	1,866	629	478	24%
Region 4B	13	1,148	57	54	5%

Results showed that the largest effective sample sizes have been coming from the commercial fishery in Biological Region 2; we use Biological Regions here as this is the finest spatial scale at which the data are used directly in the stock assessment. Region 2 is followed by Regions 3, 4 and 4B in descending order of actual effective sample size. When subsampling at a rate of 75% or 50% for age reading was simulated, there was only a 1-11% or 5-30% loss respectively in effective sample size. Specifically, Biological Regions 2 and 3 could be subsampled at a rate of 50% and would only lose approximately 30% of the effective sample size, still resulting in larger effective sample sizes than Regions 4 and 4B. Due to similar analyses conducted during 2022, the target number of fish sampled per trip in Biological Region 4B was reduced for 2023 (not included in this summary), so effectively these fish are already being subsampled with the expectation that this may lead to more trips sampled and therefore a higher effective sample size despite fewer individual fish. Due to the capacity at which IPHC can read otoliths given current staffing, otoliths that are selected for age-reading represent a subsample of those collected.

Table A2. Biological sampling rates in commercial fisheries for 2024, otolith ageing subsampling rates, and the target size of the sample for ageing by IPHC Regulatory Area.

Regulatory Area	Rate	Ageing subsample
2A	0.5	500
2B	0.5	750
2C	0.5	750
3A	0.5	750
3B	0.5	750
4A	1	1,500
4B	1	1,500
4C	1	750
4D	1	750
4E	1	NA
TOTAL		**8,000**

The remaining 50% of the 2024 Region 2 and 3 market sample and the 2023 trawl and recreational samples are planned to be aged with alternative methods when these are available.

Commercial fishery ages are read as they arrive at the IPHC HQ during the fishing season, therefore it is important to set the subsampling rate in advance and apply it consistently across the entire season to ensure representative aging samples. Changing the biological sampling or the ageing subsample rate during the season could lead to bias if the fishery encounters a differing demographic of fish early or late in the year. The results presented here suggest that commercial fishery data from Biological Regions 2 and 3 subsampled at a rate of 50% still result in effective sample sizes only modestly reduced from recent levels.

In the long-term, it is preferable to continue the field sampling of otoliths at current rates even if age reading is subsampled. There is little to no additional cost savings of collecting fewer otoliths in each port once the IPHC has placed Secretariat in that location for the season. By maintaining current sampling rates, we maintain the potential for the IPHC read the unaged otoliths to increase sample sizes if evidence suggests that the existing age data from certain years might not be adequately reflecting population demographics. Thus, any changes in age reading subsample rates do not translate into permanently compromised data sets in the same manner that reductions in field sampling could.

DISTRIBUTION OF THE FISHERY SAMPLES BY PORT

In recent years, the IPHC has sampled biological information from the directed commercial fishery in eight primary Alaskan ports, with a small number of samples also collected from deliveries made into ports in the state of Washington (Table A3). Two ports are nearly the sole source of samples for entire IPHC Regulatory Areas: 96% of the 4B samples are from Dutch Harbor, 85% of the 4A samples are from Dutch Harbor, and 52% of the 4CDE samples are from St. Paul (this increases to 76% in years when the local fleet in St. Paul does not participate in the fishery). Each of 2C, 3A and 3B have landings spread over three primary ports: Juneau, Petersburg, and Sitka for 2C, and Homer, Kodiak, and Seward for 3A and 3B.

Table A3. Distribution among ports of complete directed commercial fishery biological samples collected from each IPHC Regulatory Area in Alaska over 2017-2022.

Port	2C	3A	3B	4A	4B	4CDE
Dutch	0	0	95	5,236	6,005	1,709
Homer	0	2,293	3,074	415	177	394
Juneau	1,694	820	0	0	0	0
Kodiak	0	1,840	2,301	376	101	383
Petersburg	4,064	121	0	0	0	0
Seward	0	2,276	1,312	128	0	114
Sitka	2,709	643	0	0	0	0
St. Paul	0	0	0	0	0	2,783
Washington	153	661	0	0	0	0

DISTRIBUTION OF FISHERY-DEPENDENT SAMPLES BY MONTH

To evaluate the potential loss of samples if FDS(F) coverage was reduced over certain time-periods during the fishing season the distribution of all samples collected into each port was summarized by month (Table A4). Some ports have fewer landings at the beginning of the season (e.g. Homer, Kodiak, Seward), the end of the season (most ports) or months during the summer when fishing/processing focuses on other species (e.g. Juneau in July, Petersburg in July, Sitka in August). These months may be the best candidates for some of the options that reduce or eliminate sampling for a portion of the fishing season, though they may not lead to much cost savings due to increased travel costs for mid-year reductions (July, August).

Table A4. Samples collected from 2017-2022 by port and month

Port	March	April	May	June	July	August	September	October	November
Dutch	-	214	749	2,352	2,113	2,687	3,227	1,173	530
Homer	98	584	1,102	976	784	1,075	768	842	124
Juneau	359	495	563	254	77	241	258	177	90
Kodiak	38	484	951	377	595	630	667	840	419
Petersburg	389	704	789	530	173	553	591	353	103
Seward	86	655	640	447	447	716	418	274	147
Sitka	381	703	673	406	308	156	283	335	107
St. Paul	-	-	-	241	986	1,556	-	-	-
Washington	-	13	27	42	16	130	229	174	183

DIFFERENCES IN AGE COMPOSITIONS BY PORT, SEASON AND MONTH

In addition to maintaining adequate sample sizes overall, by IPHC Regulatory Area, and by Biological Region, it is critical that landings with different demographic characteristics (age, length, weight, sex) are characterized such that the commercial fishery data accurately represents the aggregate characteristics of the entire fishery in Alaska. Several examples of patterns in the age composition data for a given IPHC Regulatory Area are provided below to illustrate how bias would be introduced if sampling were eliminated in a port or entire season. For IPHC Regulatory Area 3A, landings into ports in Southeast Alaska (Juneau and Sitka) have fewer males than landings into 3A ports (Figure A1). Fish sampled in Kodiak tend to be younger than those in other ports, and the relative strength of certain ages also differs among ports. Female halibut from IPHC Regulatory Area 3B landed into Seward tend to be slightly older than those fish landed into Homer and Kodiak (Figure A2). Differences in the relative strength of specific age-classes by port become even more pronounced when individual years are considered. For example, in 2017 landings in Sitka showed a much stronger 2002 year-class (age-15) than those in Petersburg or Juneau (Figure A4). These systematic differences are likely to arise based on spatial patterns in the biology interacting with the specific locations within the larger IPHC Regulatory Area that fishing took place.

Some IPHC Regulatory Areas also show strong seasonal patterns in the age compositions (e.g. very few males in the summer fishery in IPHC Regulatory Area 4CDE; Figure A4), but these generally persist across several months (fewer older fish in IPHC Regulatory Area 2C landings until August; Figure A5), so adjusting effort for a single month by port combination may not be problematic. Because Pacific halibut are highly migratory, fisheries in specific areas may be encountering fish during spawning migrations and/or during summer feeding areas and thus the age- and sex- composition of the landings may differ in important ways over the course of the fishery.

In aggregate, these spatial and seasonal patterns indicate that further cuts to biological port sampling would likely introduce bias in the estimation of the sex and ages captured by the directed commercial fishery. Potential effects of such bias on the stock assessment and other management supporting analyses will depend on the quality of other input data (e.g. the FISS) and the degree to which reductions are temporary or continued for multiple years.

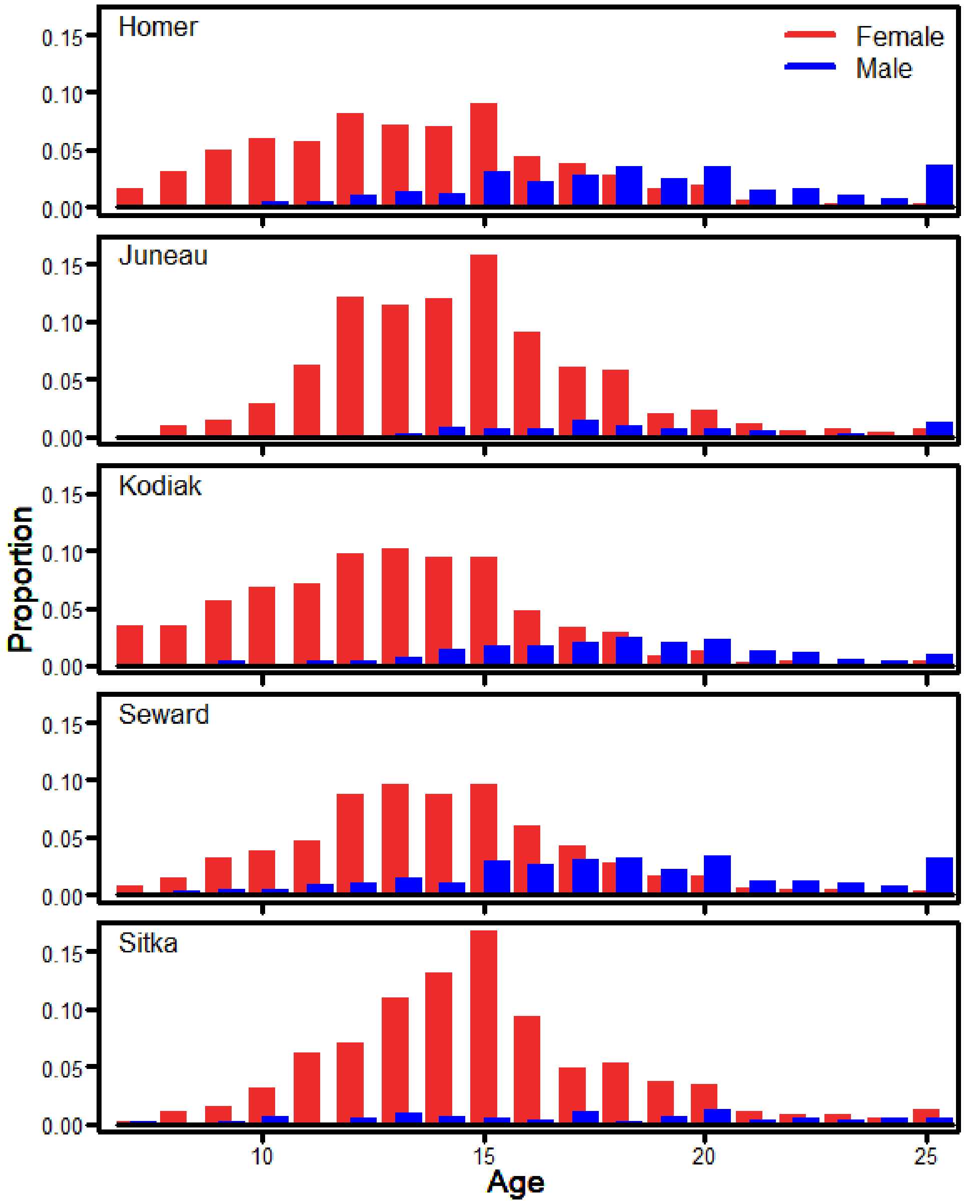

Figure A1. Age frequency distributions for 2017-2022 from IPHC Regulatory Area 3A landings by the port in which they were sampled. Red bars represent the proportion of the landings (by number of fish) that were female at each age (age-7 includes all fish up to age-7 and age-25 includes all fish 25 or older), and blue bars represent the proportion of males at each age.

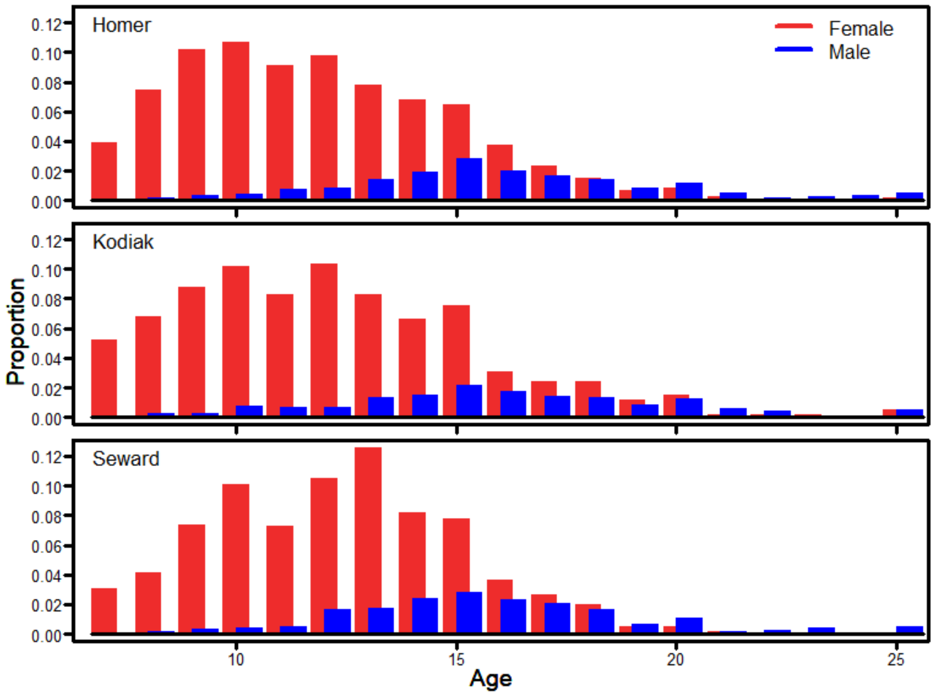

Figure A2. Age frequency distributions for 2017-2022 from IPHC Regulatory Area 3B landings by the port in which they were sampled. Red bars represent the proportion of the landings (by number of fish) that were female at each age (age-7 includes all fish up to age-7 and age-25 includes all fish 25 or older), and blue bars represent the proportion of males at each age.

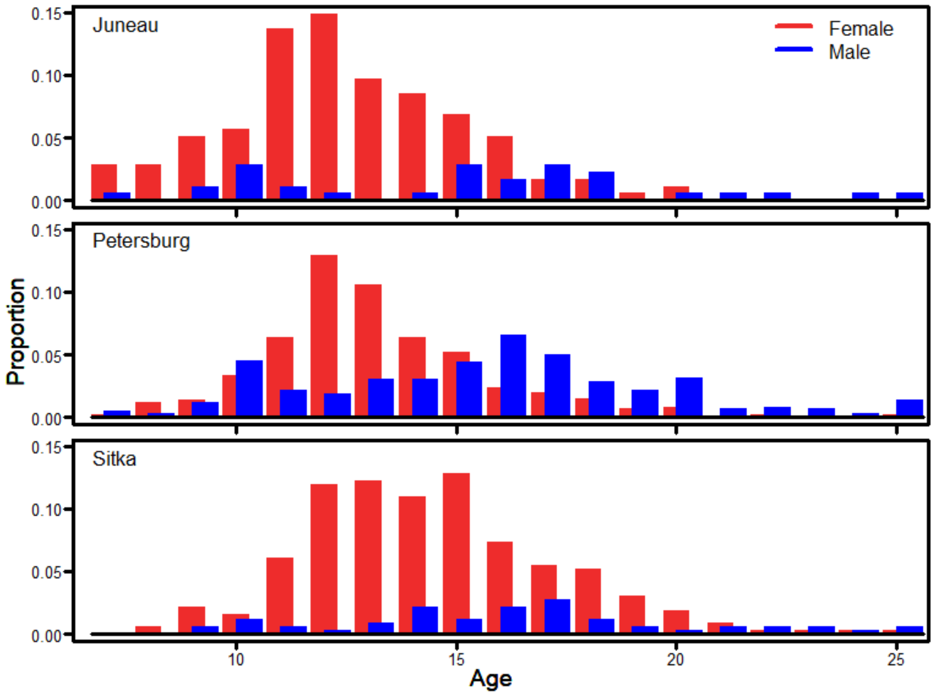

Figure A3. Age frequency distributions from IPHC Regulatory Area 2C landings in 2017 by the port in which they were sampled. Red bars represent the proportion of the landings (by number of fish) that were female at each age (age-7 includes all fish up to age-7 and age-25 includes all fish 25 or older), and blue bars represent the proportion of males at each age.

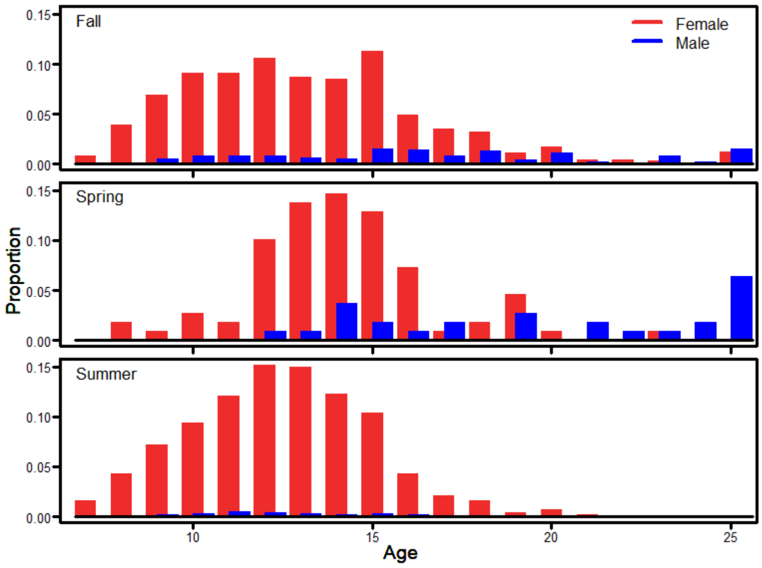

Figure A4. Age frequency distributions for 2017-2022 from IPHC Regulatory Area 4CDE by season in which they were sampled. Spring indicates March-May, Summer June-August, and Fall September-December. Red bars represent the proportion of the landings (by number of fish) that were female at each age (age-7 includes all fish up to age-7 and age-25 includes all fish 25 or older), and blue bars represent the proportion of males at each age.

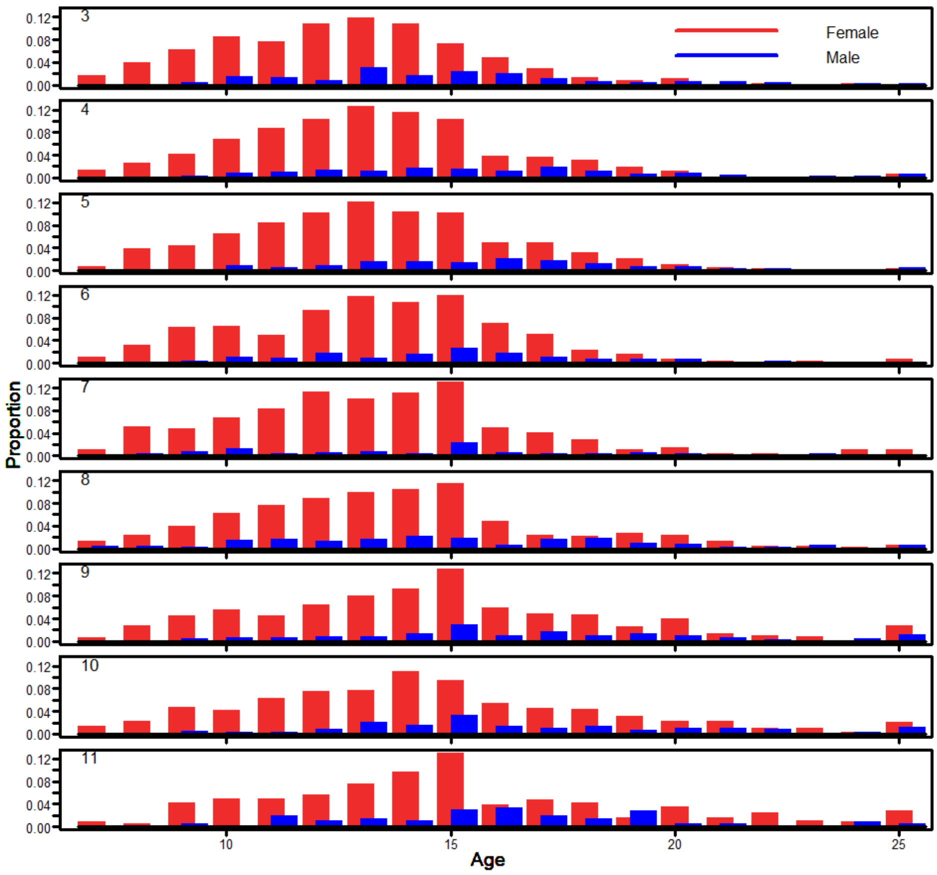

Figure A5. Age frequency distributions for 2017-2022 from IPHC Regulatory Area 2C by the month in which they were sampled. Red bars represent the proportion of the landings (by number of fish) that were female at each age (age-7 includes all fish up to age-7 and age-25 includes all fish 25 or older), and blue bars represent the proportion of males at each age.

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