Summary of the West Coast Haida Gwaii Synoptic Bottom Trawl Survey, August 25 - September 26, 2016

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SUMMARY OF THE WEST COAST HAIDA GWAII SYNOPTIC BOTTOM TRAWL SURVEY, AUGUST 25 - SEPTEMBER 26, 2016

by

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ABSTRACT

Nottingham, M. K., Williams, D. C., Wyeth, M. R., and Olsen, N. 2018. Summary of the West Coast Haida Gwaii synoptic bottom trawl survey, August 25 - September 26, 2016. Can. Manuscr. Rep. Fish. Aquat. Sci. 3151: viii + 51 p.

A bottom trawl survey off the west coast of Haida Gwaii was conducted on the F/V Frosti between August 25 and September 26, 2016. The survey was jointly conducted and funded by the Canadian Groundfish Research and Conservation Society (CGRCS) and Fisheries and Oceans Canada (DFO). The West Coast Haida Gwaii synoptic bottom trawl survey was first conducted annually from 2006 to 2008 and has since been repeated every second year on even numbered years. This survey is one of a set of long-term and coordinated surveys that together cover the continental shelf and upper slope of most of the British Columbia coast. The objectives of these surveys are to provide fishery independent abundance indices of all demersal fish species available to bottom trawling and to collect biological samples of selected species.

The survey follows a random depth-stratified design and the sampling units are 2 km by 2 km blocks. One hundred and twelve (86.2%) of the 130 blocks assessed in 2016 were successfully fished. The mean catch per tow was 1338 kg with 9-42 species per tow. The average number of species per tow was 22. The most abundant fish species (by weight) encountered was Pacific Ocean Perch (*Sebastes alutus)* followed by Rougheye Rockfish (*Sebastes aleutianus*), Sharpchin Rockfish (*Sebastes zacentrus*), Silvergray Rockfish (*Sebastes brevispinus)*, and Redstripe Rockfish (*Sebastes proriger*). Biological data including individual length, weight, sex, maturity, and ageing structures were collected from selected species. Samples were collected from a total of 41 different species of fish. Oceanographic and fishing gear data including water temperature, depth, salinity, and dissolved oxygen, were also recorded for most tows.

RÉSUMÉ

Nottingham, M. K., Williams, D. C., Wyeth, M. R., et Olsen, N. 2018. Sommaire du relevé synoptique au chalut de fond de la côte ouest d' Haida Gwaii, du 25 août au 26 septembre 2016. Can. Manuscr. Rep. Fish. Aquat. Sci. 3151: viii + 51 p.

Un relevé au chalut de fond au large de la côte ouest d'Haida Gwaii a été effectué par le navire de pêche *Frosti* entre le 25 août et le 26 septembre 2016. Le relevé a été réalisé et financé conjointement par la Canadian Groundfish Research and Conservation Society et Pêches et Océans Canada (MPO). Le premier relevé synoptique au chalut de fond de la côte ouest d'Haida Gwaii a été réalisé de 2006 à 2008, puis on a répété l'opération tous les deux ans depuis. Ce relevé fait partie d'un ensemble de relevés à long terme coordonnés qui couvre le plateau continental et le haut du talus de la majorité de la côte de la Colombie-Britannique. Ces relevés servent à obtenir des indices d'abondance indépendants de la pêche pour toutes les espèces de poissons démersaux pouvant être pêchées au chalut de fond, ainsi qu'à prélever des échantillons biologiques d'espèces précises.

Ce relevé est réalisé selon un plan d'échantillonnage aléatoire stratifié, et les unités d'échantillonnage sont des blocs de deux kilomètres carrés. Parmi les 130 blocs évalués en 2016, 112 (86,2%) ont fait l'objet d'une pêche. La moyenne de prises par trait était de 1338 kg, avec entre 9 et 42 espèces par trait. Le nombre moyen d'espèces par trait était de 22. Les espèces de poissons les plus abondantes observées étaient le sébaste à longue mâchoire (*Sebastes alutus*), le sébaste à œil épineux (*Sebastes aleutianus*), le sébaste à menton pointu (*Sebastes zacentrus*), le sébaste argenté (*Sebastes brevispinus*) et le sébaste à raie rouge (*Sebastes proriger*). On a recueilli des données biologiques sur certaines espèces, notamment la longueur, le poids, le sexe, la maturité et la structure par âge. Les échantillons ont été prélevés sur un total de 41 espèces de poissons différentes. Des données océanographiques et sur les engins de pêche, y compris la température de l'eau, la profondeur, la salinité et l'oxygène dissous, ont également été consignées pour la plupart des traits.

INTRODUCTION

In 2003, a report by the Pacific Scientific Advice Review Committee recommended development of fishery-independent relative abundance indices using bottom trawl surveys in British Columbia waters (Sinclair et al. 2003). The report recommended that a pilot survey be conducted in Queen Charlotte Sound (Figure 1). The survey design was synoptic in that is was intended to provide indices for as many species as possible rather than focusing on a limited number of target species.

In February 2003, funding was committed by the Canadian Groundfish Research and Conservation Society for the principal portion of the required vessel and net costs in addition to a significant portion of the scientific staff needed to conduct the survey and analyze the results. Funding by the Science Branch of Fisheries and Oceans Canada (DFO) was committed for additional scientific and sampling staff, and to provide the scientific sampling equipment.

The first Queen Charlotte Sound (QCS) synoptic bottom trawl survey was successfully completed in the summer of 2003 (Olsen et al. 2007). Following that, additional surveys were planned for the west coast of Vancouver Island (WCVI) beginning in 2004, Hecate Strait (HS) beginning in 2005, and the west coast of Haida Gwaii (WCHG, previously Queen Charlotte Islands) beginning in 2006. These surveys are conducted on a rotating biennial schedule with the QCS and HS surveys conducted in odd-numbered years and the WCVI and WCHG surveys conducted in even-numbered years. These four synoptic bottom trawl surveys provide comprehensive coverage of the continental shelf and upper slope of the British Columbia coast (Figure 1). Surveys are conducted on both chartered commercial fishing vessels as well as Canadian Coast Guard research trawlers.

The WCHG synoptic bottom trawl survey was successfully conducted annually from 2006 to 2008 (Workman et al. 2007, Workman et al. 2008 and Olsen et al. 2008) and has been repeated every second year since (Olsen et al. 2017, Nottingham et al. 2018 and Williams et al. 2018). This document provides a brief summary of the results and methods from the seventh WCHG synoptic bottom trawl survey which occurred between August 25 and September 26, 2016. It is not intended as a comprehensive review of the survey, nor does it provide interpretive analysis of the survey results.

METHODS

SURVEY DESIGN

The survey area is the west coast of Haida Gwaii from approximately latitude 52° 45' N to latitude 54° 35' N (Figure 1). The northern region, extending into Dixon Entrance, is nearly contiguous with the northwestern-most extent of the Hecate Strait survey except for a gap around Learmonth Bank, which was omitted from the survey to avoid catches of Red Tree Coral (*Primnoa* sp.) that are common to that area.

Depth Strata

All of the synoptic bottom trawl surveys along the British Columbia coast have followed the same random depth-stratified design. Each survey area is divided into 2 km by 2 km blocks and each block is assigned one of four depth strata based on the average bottom depth in the block. The four depth strata vary between areas. The depth strata for the WCHG synoptic bottom trawl survey are 180-330 m, 330-500 m, 500-800 m, and 800-1,300 m (Table 1). For each survey in the WCHG series, blocks are randomly selected within each depth stratum.

Block Allocation

Following the methods in Sinclair et al. (2003), commercial fishery catch data were used to model the expected groundfish catches prior to the first survey in each area. The target number of tows in each stratum was based on providing the most precise catch rate indices for as many species as possible. However, in any given year, not all of the randomly selected blocks will be fishable. Further, after the inaugural survey, a block that has been fished in a previous year may be re-selected. The results of previous surveys in each area are used to estimate both the expected proportion of blocks in each stratum that would not result in a useable tow (predicted failure rate) as well as the expected probability of returning to a block that was successfully fished in a previous survey (predicted revisit rate). The predicted failure and revisit rates are combined into a single probability for each survey area and depth stratum (predicted adjustment). These probabilities are then used to calculate the anticipated number of blocks per stratum required to complete the target number of tows.

When a synoptic bottom trawl survey is conducted on a chartered commercial fishing vessel the contract has been structured such that the survey will continue until the entire set of blocks that have been selected are assessed. Assuming that the predicted failure and revisit rates prove to be accurate, at the end of the survey the final distribution of tows in each strata should match the initial target allocation that was modeled based on the commercial fishing data.

For the 2016 WCHG survey, 132 blocks were randomly selected with the target of 125 successful tows (Table 1).

VESSEL

The survey was conducted aboard the F/V Frosti, a 41 m commercial stern trawler (Figure 2).

FISHING GEAR

The research trawl was an Atlantic Western IIA box trawl net connected to approximately 1200 kg Thyboron Type II heavy duty 110 doors (Figure 3). The net was thoroughly cleaned between tows to prevent cross-contamination of catches. The net was also inspected for damage after every tow. If the net was damaged, it was repaired and restored to its original dimensions prior to resuming fishing. Two nets were rigged at the start of the survey so that if one net was damaged beyond what could be immediately repaired, the second one could be used.

The net included a main body (wing and belly sections), two lengthening pieces, and a codend with liner (Figure 4 and Figure 5). The main body of the net had an 11 mm long-link steel chain frame and is constructed from a mix of double 4.5 mm strand 5 inch web, single 3.5 mm strand 5 inch web, and single 3.5 mm strand 4 ½ inch web (Figure 6). The intermediate sections were constructed from single 4.5 mm strand 4½ inch web (Figure 7). All web in the main body and lengthening pieces was constructed from a compacted strand braided polyethylene (Euroline Premium). The codend was constructed from double 5 mm strand 4 inch regular braided polyethylene web with a ½ inch 210/20 knotless nylon liner (Figure 7).

The Rockhopper footgear included flying wing, mid wing, bunt wing, and bosom sections (Figure 8). The bosom section was built from 16 inch diameter (worn 18 inch) aircraft tires, while the bunt and mid wing sections had 16 inch Rockhopper disks. The flying wings had 5 inch rubber disks with swivel center 16 inch solid bunt bobbins at each end.

The specifications of net and footgear components are shown in Table 2 and dimensions for the assembled trawl pieces are shown in Figure 6 through Figure 8.

SCHEDULE

The survey was split into three sections or "legs" of eight to 16 days in duration with five to six science staff in each. Crew changes were on September 9 and September 19 (Table 4).

FISHING PROTOCOL

Fishing was carried out during daylight hours, commencing approximately 30 minutes after sunrise and ending 30 minutes before sunset each day. An average working day length of 13 hours, starting at approximately 0800 hrs and ending at approximately 2100 hrs was typical.

Prior to fishing, the selected blocks were reviewed by the captain and chief scientist to determine a candidate set to visit throughout each day. During this review process, one or more blocks might be determined not fishable by the captain based on his experience and knowledge of the area. In such cases the blocks were marked as "rejected based on prior knowledge". After compiling a list of blocks to be visited, the most efficient route of travel between blocks would be planned.

The captain was asked to inspect each selected block and find a suitable tow location using the following criteria:

1. All tows should follow a depth contour.
2. If a block had been fished in a previous year, follow the same track so as to minimize the survey footprint.
3. If a block had not been fished in a previous year, make a tow entirely within the block and pass through the center of the block.
4. If it is not possible to make a tow through the center of the block, make a tow entirely within the block that passes as close to the center as possible.
5. If it is not possible to make a tow entirely within the block, make a tow such that at least 50 % of the tow is within the block.

The target tow length was 20 minutes long for the two shallow depth strata (180-330 m and 330-500 m) and 30 minutes for the two deeper depth strata (500-800 m and 800-1,300 m). The tow start was defined as the time at which the net mensuration data indicated stable bottom contact and the headline collapsed to 3-4 m above the bottom. After 20 minutes had elapsed, net haul back was initiated. Although the target on-bottom time was 20 or 30 minutes, tows that were at least 15 minutes in length were accepted. This was a pragmatic decision that allowed for retention of many tows that would otherwise have been unusable due to hang-ups or early haul-backs.

Tows were conducted at a target speed of 2.8 to 3.0 nautical miles per hour (5.2 - 5.6 km/hr). When retrieving the net, the captain was asked to maintain a water velocity through the net that was consistent with the rest of the tow.

Tows were made in the target depth stratum of the block. If the only possible tow was in a different depth stratum than that assigned to the block, then the tow was conducted, and the block was reassigned to the appropriate depth stratum.

If it was not possible to find a suitable tow location then the block was marked as "rejected based on on-ground inspection". The vessel would move on to the next selected block.

The result of trawling was either a useable or unusable tow. The most common reasons for deeming a tow unusable were a hang-up of the fishing gear, tear-up of the trawl net or not achieving the minimum bottom contact time. In the event of an unusable tow, additional attempts to fish the block could be made at either the same location or a different location within the block. Alternatively, the block could be deemed unfishable, in which case it was rejected.

If fishing was attempted in a block, the final status of the block would be either "successfully fished on first attempt", "successfully fished after multiple attempts", or "rejected after last attempt failed". Rejected blocks were removed from the sampling frame for all future surveys. This will increase the efficiency of subsequent surveys, as less time will be spent inspecting blocks that cannot be fished. Some selected blocks may not have been fished but may also not have been rejected. This could occur when a temporary obstacle (e.g. trap fishing gear, another vessel, or strong tidal currents) prevents fishing, or when there was insufficient time available to fish a block without spending another day in the area, or if fishing was attempted and although the tow was not successful, the block was not rejected. These blocks would be considered unassessed

at the end of the survey and have a final status of "block not fished but remains in sampling frame" or "not rejected but last attempt failed".

Fishing Data

The start and end positions, times, and bottom depths, as well as the direction, vessel speed, weather and environmental conditions, and warp length were recorded for every tow. In addition, global positioning system (GPS) data and bottom sounder data were logged continuously for the duration of the survey.

CATCH PROCESSING

At the end of each tow, the net was retrieved and the catch dumped into a sorting table. From there science staff and crew sorted the catch by species into separate baskets to be weighed. The catch from all tows, including both useable and unusable tows was recorded. Unusable tows, although not sampled for biological data, were recorded to track catch amounts. Whenever possible, the catch was completely sorted and weighed. However, for large catches in excess of 2,000 kg or large numbers of small individuals, some method of total catch estimation and sub-sampling for species composition was conducted. The specific method of catch estimation and sub-sampling varied based on the total weight and volume of the catch being subsampled as well as the composition of the catch. Large catches were typically visually estimated, although volumetric estimates were sometimes used. In all cases a representative sample of the catch was sorted to determine species composition and to provide individuals for biological sampling.

Baskets of species were weighed to the nearest 0.02 kg using a motion-compensating electronic balance. For small catches the number of individuals was often recorded in addition to the weight. Weights less than 0.02 kg were recorded as trace amounts. Catch was sorted to the lowest taxonomic group possible. For most fishes this was to the level of species although small and fragile species such as Snailfish, Lantern Fish, or young-of-the-year Rockfish may have only been identified to genus or family. In some cases a few representative individuals may have been frozen for later identification. Invertebrates may have only been identified to phylum or order.

BIOLOGICAL SAMPLING

While the primary purpose of the survey was to generate fishery-independent indices of relative abundance, the secondary goal was to collect biological information to characterize the size, sex, and age-composition of each species caught. Two types of biological samples were conducted: "Length" samples, consisting of individual fish length and sex, and "Age" samples, consisting of length, sex, weight, maturity, and age structure. In an effort to maintain a manageable workload, each species had a minimum catch level that had to be exceeded in the tow before biological samples would be collected. For rare species or species of special conservation concern the minimum number could be one fish, whereas for common and abundant species the number might be 25 or 50. The choice of the species to collect age samples from depended on the size of the catch of the species and the "desirability" of the species. The size of the catch was considered because the intent was to collect age structures from the largest catches of each species in each stratum over the survey. The "desirability" of the species was based

on any conservation concerns and whether or not the species was commercially exploited. Biological samples were typically not collected from unusable tows.

There are some species that are unlikely to ever be assessed using age-structured models. The list includes species such as North Pacific Spiny Dogfish (*Squalus suckleyi*) where the cost of ageing the spines is prohibitive. Other species such as Flathead Sole (*Hippoglossoides elassodon*), Pacific Sanddab (*Citharichthys sordidus*), Greenstriped Rockfish (*Sebastes elongatus*), or Pygmy Rockfish (*Sebastes wilsoni*) are also unlikely candidates for an age-structured assessment as they are not exploited by the commercial fishery. Starting in 2016, a new length-stratified age sample protocol was implemented for these species. The intent of the new protocol was that the data could be used to construct age-at-maturity or growth curves. There were roughly twenty species identified for the length-stratified ageing protocol and each survey year three or four species will be targeted (Table 3). Given the rotating schedule of the surveys, each species will be targeted for one or two years at a time and then will not be targeted for another nine years. The species targeted in the 2016 synoptic bottom trawl surveys were North Pacific Spiny Dogfish (*Squalus suckleyi*), Splitnose Rockfish (*Sebastes diploproa*), and Puget Sound Rockfish (*Sebastes emphaeus*).

Individual fish were measured to fork length, total length, standard length or other length depending on the species. All length measurements were collected to the nearest 0.5 cm using an electronic fish measuring board. Fish were weighed using a motion-compensating electronic balance. Measurements were to the nearest 1, 2, or 5 grams depending on the size of the fish as well as the model and weight range of the scale in use.

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There are a variety of hard parts of a fish that can be used to determine its age (Chilton and Beamish 1982). The specific structure that provides the most accurate and efficient estimate of age varies by species but all the structures have the common trait of a series of annular rings that can be counted. Sagittal otoliths (calcareous accretions of the inner ear) were collected from rockfish and flatfish species while fin rays were taken from Walleye Pollock (*Theragra chalcogramma*). Dorsal spines were collected from North Pacific Spiny Dogfish (*Squalus suckleyi*). All age samples collected on this survey were submitted to the Sclerochronology Lab located at the Pacific Biological Station in Nanaimo, BC for storage and future analysis. In addition to the biological sampling described above, specific data, specimens or tissue samples are routinely collected following requests from other institutions or researchers. In 2016, tissue for DNA analysis was collected from Yelloweye Rockfish (*Sebastes ruberrimus*), Eulachon (*Thaleichthys pacificus*), Pacific Flatnose (*Antimora microlepis*), Pacific Grenadier (*Coryphaenoides acrolepis*) and Giant Grenadier (*Albatrossia pectoralis*). Sablefish (*Anoplopoma fimbria*) heads were also collected.

Until the mid-2000s, Rougheye Rockfish (*Sebastes aleutianus*) was considered to be a single, highly variable species with light and dark colour morphs. Genetic and morphological analysis has since confirmed that there are two distinct species (Orr and Hawkins 2008): Rougheye Rockfish (*S. aleutianus*) and Blackspotted Rockfish (*S. melanostictus*). Historical biological and catch information for *S. aleutianus* must now be considered to be the aggregate of both species. During the 2008 WCHG survey an attempt was made to differentiate between the two species. That preliminary work showed that the two species cannot be reliably distinguished in the field because the morphological characteristics overlap. Further, there is evidence that the two species hybridize (Gharrett et al. 2005). Given that the historical data is recorded as *S. aleutianus* and that attempting to separate the species at the catch level is both time consuming and unreliable, beginning with the 2010 WCHG survey biological samples were collected from every catch that included both a visual assessment of the species (*S. aleutianus* or *S. melanostictus*) as well as a tissue sample for genetic confirmation of the species. The survey catch data, which continues to be recorded as *S. aleutianus*, can then be partitioned into the two species using either the visual assessment or the results of genetic analyses. We did not attempt to partition the catch data for this report.

NET-MOUNTED SENSORS AND DATA RECORDERS

The F/V Frosti was equipped with a Marport trawl mensuration system. Sensors attached to the net used acoustic signals to communicate with each other and the vessel and provided real-time net geometry. The Marport output was logged continuously during the survey and monitored in real-time during fishing operations.

A Mac Marine Industries Bottom Contact Sensor (BCS) was attached to the footrope to record contact with the sea floor. The BCS consisted of a pressure housing with an Onset Hobo data recorder in a stainless steel sled that trailed behind the footrope. The Hobo recorder measured acceleration in three axes which was then converted into angles. The recorder was mounted in the sled such that the x-axis tilt indicated the angle of the steel sled. When the footgear contacted the bottom, the sled angle was approximately 80 degrees. When the footrope was off the bottom, the sled hung down and the angle was approximately 40 degrees. These data were used to determine the exact times in each tow that the trawl net first and last contacted the sea floor, thus providing an accurate measure of total bottom contact time. The Hobo recorder was activated prior to the first tow of the day and downloaded at the end of each day.

A Seabird SBE39 temperature and pressure recorder (TDR) was attached to the starboard wing of the trawl. A Seabird SBE19plus recorder (CTD) equipped with an SBE43 dissolved oxygen sensor was attached to the center of the headline. The SBE19plus recorded conductivity, temperature and pressure data with derived values for salinity (Seabird 1989) and depth (Seabird 2002). The SBE43 recorded oxygen voltage output data with calculated values for dissolved oxygen (ml/l) using temperature, pressure, and salinity data (Seabird 2012). The SBE39 was activated prior to the first tow of the day and turned off after the last tow of the day, while the SBE19plus was turned on and off manually before and after each tow. Both the SBE39 and SBE19plus were downloaded at the end of each day.

DATA RECORDING

All the fishing, catch, and biological data were recorded directly into a Microsoft SQL server database through a Microsoft Access interface. Details of the electronic data acquisition system used for this survey can be found in Olsen (2010).

All the data from the survey are archived in an Oracle relational database called "GFBio", the Groundfish Biological Samples database maintained by the Groundfish Data Unit (Fisheries and Oceans Canada, Science Branch, Pacific Region) located at the Pacific Biological Station in Nanaimo, B.C.

RESULTS

FISHING

The 2016 WCHG synoptic bottom trawl survey was divided into three legs of eight to sixteen days. From a total of 33 survey days, one day was spent loading and setting up the vessel at the start of the survey, two days were required for travel at the start and two days at end of the survey, four days were required for offloading catch, changing crews and returning to fishing grounds, one and a half fishing days were lost due to weather and two days were spent returning to port to pick up parts for repairs. Thus, there were a total of approximately 20.5 fishing days (Table 4).

From a total of 130 blocks assessed during the 2016 survey, 112 blocks were successfully fished, 16 blocks were rejected based on on-ground inspection and two blocks were rejected after one or more failed fishing attempts (Table 5 and Figure 9). Two blocks remained unassessed at the end of the survey but remained in the sampling frame for future surveys.

A total of 120 tows, of which 112 were useable, were completed during days that fishing occurred. Table 6 shows tow results by stratum for this survey. The scope (ratio of warp length to bottom depth) used for tows in 2016 is shown in Table 7 and Figure 10. Complete information for each tow including date, duration, location, average depth, average speed, warp, total catch weight and usability is presented in Appendix A.

CATCH

A total of 160,511 kg of fish and invertebrates was caught during the 2016 WCHG survey. The total catch weight for tows was typically less than 1,800 kg per tow, and averaged 1,338 kg per tow (Figure 11). The majority of the catch (159,960 kg, 99.7%) consisted of 105 different species of fish, including 26 rockfish and 8 flatfish species. The remainder (551 kg) consisted of 136 invertebrate groups. The average number of species identified in useable tows was 20 with the minimum species count being nine and the maximum count being 42 per tow (Figure 12). The frequency of occurrence, maximum catch weight, mean catch weight per tow and total survey catch weight of each species are shown in Table 8. Of the fish species caught, Pacific Ocean Perch (*Sebastes alutus)* was the most dominant by weight, followed by Rougheye Rockfish (*Sebastes aleutianus*), Sharpchin Rockfish (*Sebastes zacentrus*), Silvergray Rockfish (*Sebastes brevispinus)* and Redstripe Rockfish (*Sebastes proriger*). Catch

weights by tow for the 50 most commonly encountered species in this survey are included in Appendix B.

Commercially marketable fish were retained and sold with the proceeds going to the Canadian Groundfish Research and Conservation Society (Table 9).

BIOLOGICAL SAMPLES AND SPECIMENS

Biological samples were collected from a total of 16,292 individuals of 41 species of fish. The number of samples and recorded biological attributes per species is shown in Table 10. A summary of the biological data collected for each species is shown in Table 11.

NET-MOUNTED SENSORS AND DATA RECORDERS

Headline height, door spread and depth information was recorded from the Marport Net sensors for 115 tows. (Table 12).

Seabird SBE39 data (water temperature and depth) were collected from 115 tows while Seabird SBE19plus and SBE43 data (conductivity, water temperature, depth, and dissolved oxygen) were collected from 114 tows (Table 12 and Figure 13).

BCS data were collected from 110 tows (Table 12). An example of the type of data collected by the BCS is shown in Figure 14.

Global positioning system (GPS) data and bottom sounder data are available for all 120 tows.

ACKNOWLEDGEMENTS

Thank-you to the captain crew of the Frosti and the science staff that participated in the survey. In addition, thank-you to the Canadian Groundfish Research and Conservation Society for their support in this survey.

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Table 1. 2016 WCHG synoptic bottom trawl survey design showing block allocation per stratum based on the target tow allocation and the combined predicted failure and revisit rates (predicted adjustment).

Depth Stratum (m)	Target Tows	Predicted Adjustment	Total Block Allocation
180-330	77	0.04	77
330-500	33	0.06	33
500-800	11	0.09	11
800-1300	11	0.09	11
Total	**125**		**132**

Table 2. Atlantic Western IIa box trawl net specifications on the 2016 WCHG synoptic bottom trawl survey.

Component	Dimension
Wings, square, and bottom belly netting	combination of 5 inch double strand 4.5mm Euroline Premium and 5 inch single strand 3.5 mm Euroline Premium
Belly netting	4 ½ inch single strand 3.5mm Euroline Premium
Lengthening piece netting	4 ½ inch single strand 4.5 mm Euroline Premium
Codend	4 inch double 5 mm orange braided polyethylene
Codend liner	½ inch 210/20 knotless nylon
Floats	8 inch diameter center hole rated to 2000 m
Net frame chain	11 mm long link (64 mm inner length) grade 80 steel chain
Net frame rope	1 inch 3-strand twisted Polysteel
Net frame rope to chain lashing	3/8 inch 3-strand twisted Esterpro
Riblines	1 ¼ inch 3-strand twisted Polysteel
Footgear bosom	16 inch diameter tires (worn 18 inch aircraft tires)
Rubber spacers	4 inch, 5 inch, and 6 inch diameter disks cut from tires
Footgear wing center chain	16 mm mid link (65 mm inner length) grade 80 steel chain
Footgear wing top chain	11 mm long link (64 mm inner length) grade 80 steel chain
Rockhopper disk	16 inch diameter
Solid rubber bunt bobbin with steel tube center	16 inch diameter by 10 inch
Steel toggles	5 inch diameter by 3 inch long with 13 inches of chain (from center of toggle)

Table 3. Length-stratified species age sample schedule by year for all Pacific synoptic bottom trawl surveys.

Species	Scientific Name	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Butter Sole	*Isopsetta isolepis*						x				
Curlfin Sole	*Pleuronichthys decurrens*			x	x						
Darkblotched Rockfish	*Sebastes crameri*							x	x		
Flathead Sole	*Hippoglossoides elassodon*					x	x				
Giant Grenadier	*Albatrossia pectoralis*	x									
Greenstriped Rockfish	*Sebastes elongatus*			x	x						
Harlequin Rockfish	*Sebastes variegatus*					x	x				
North Pacific Spiny Dogfish	*Squalus suckleyi*	x	x								
Pacific Flatnose	*Antimora microlepis*			x							
Pacific Grenadier	*Coryphaenoides acrolepis*					x					
Pacific Sanddab	*Citharichthys sordidus*									x	x
Pacific Tomcod	*Microgadus proximus*			x	x						
Popeye Grenadier	*Coryphaenoides cinereus*							x			
Puget Sound Rockfish	*Sebastes emphaeus*	x	x								
Pygmy Rockfish	*Sebastes wilsoni*					x	x				
Rosethorn Rockfish	*Sebastes helvomaculatus*							x	x		
Sand Sole	*Psettichthys melanostictus*		x								
Sharpchin Rockfish	*Sebastes zacentrus*									x	x
Shortbelly Rockfish	*Sebastes jordani*			x	x						
Slender Sole	*Lyopsetta exilis*							x	x		
Splitnose Rockfish	*Sebastes diploproa*	x	x								
Stripetail Rockfish	*Sebastes saxicola*									x	x

Table 4. Summary of operations during the 2016 WCHG synoptic bottom trawl survey.

	Fishing				Tows			
Date	Start	End	Hours	Blocks Assessed	Useable	Not Useable	Total	Notes
08/25/2016	-	-	-	-	-	-	-	load and set-up
08/26/2016	-	-	-	-	-	-	-	travel to fishing grounds
08/27/2016	-	-	-	-	-	-	-	travel to fishing grounds
08/28/2016	8:27	20:48	12	7	5	1	6	
08/29/2016	7:34	18:02	11	6	3	1	4	
08/30/2016	7:10	16:08	9	4	4	1	5	
08/31/2016	7:14	19:20	12	7	6	0	6	
09/01/2016	7:27	19:09	12	7	5	0	5	
09/02/2016	7:28	19:38	12	4	4	4	8	
09/03/2016	7:25	18:21	11	6	6	0	6	
09/04/2016	-	-	-	-	-	-	-	offload in Prince Rupert
09/05/2016	7:44	18:57	11	7	7	0	7	
09/06/2016	7:39	18:23	11	6	6	0	6	
09/07/2016	7:42	17:37	10	8	6	0	6	
09/08/2016	7:40	17:42	10	5	5	0	5	
09/09/2016	-	-	-	-	-	-	-	offload and science crew change
09/10/2016	-	-	-	-	-	-	-	travel to fishing grounds
09/11/2016	8:35	9:06	1	1	1	0	1	return to port for parts
09/12/2016	-	-	-	-	-	-	-	unscheduled maintenance
09/13/2016	10:35	20:12	10	4	4	0	4	
09/14/2016	8:35	18:38	10	8	5	1	6	
09/15/2016	7:49	19:17	12	4	3	0	3	half day fishing due to weather
09/16/2016	7:59	18:54	11	7	7	0	7	
09/17/2016	9:50	18:41	9	7	5	0	5	
09/18/2016	7:59	18:01	11	6	6	0	6	
09/19/2016	-	-	-	-	-	-	-	offload and science crew change
09/20/2016	8:05	18:30	10	8	7	0	7	
09/21/2016	8:05	18:47	10	7	7	0	7	
09/22/2016	-	-	-	-	-	-	-	no fishing due to weather
09/23/2016	8:11	19:08	11	8	8	0	8	
09/24/2016	8:06	10:30	2	3	2	0	2	
09/25/2016	-	-	-	-	-	-	-	travel to Port Hardy
09/26/2016	-	-	-	-	-	-	-	travel and offload
Total				**130**	**112**	**8**	**120**	
Average Per Day				**6.3**	**5.1**	**0.4**	**5.5**	

Table 5. Block results by stratum for the 2016 WCHG synoptic bottom trawl survey.

Depth Stratum (m)	Successful	Rejected Prior	Rejected Inspected	Rejected Failed	Not Assessed	Total
180-330	71	0	3	1	2	77
330-500	26	0	7	0	0	32
500-800	5	0	5	1	0	11
800-1300	10	0	1	0	0	11
Total	**112**	**0**	**16**	**2**	**2**	**132**

Table 6. Tow results by stratum for the 2016 WCHG synoptic bottom trawl survey.

Depth Stratum (m)	Useable	Not Useable
180-330	69	6
330-500	28	1
500-800	5	0
800-1300	10	1
Total	112	8

Table 7. Mean warp length and scope by 50 meter depth interval for the 2016 WCHG synoptic bottom trawl survey.

Depth (m)	Mean Warp (m)	Mean Scope
150-200	472	2.40
200-250	530	2.32
250-300	604	2.24
300-350	680	2.06
350-400	739	1.99
400-450	790	1.87
450-500	899	1.86
550-600	1097	1.88
600-650	1066	1.75
650-700	1189	1.83
800-850	1532	1.83
850-900	1555	1.79
900-950	1829	1.93
1050-1100	2012	1.83
1100-1150	2100	1.86
1150-1200	2195	1.87
1250-1300	2377	1.87

Table 8. Frequency of occurrence, maximum catch weight, mean catch weight per tow, and total survey catch weight of each species captured during the 2016 WCHG synoptic bottom trawl survey. Trace amounts (<0.02 kg) are entered as -.

Common Name	Scientific Name	Number of Tows	Catch Weight (kg)		
			Max	Mean	Total
Rockfishes	**Family Scorpaenidae**				
Shortspine Thornyhead	*Sebastolobus alascanus*	105	563.25	63.87	6706.69
Pacific Ocean Perch	*Sebastes alutus*	95	8005.53	852.88	81023.39
Silvergray Rockfish	*Sebastes brevispinis*	81	1322.24	129.35	10347.95
Redbanded Rockfish	*Sebastes babcocki*	78	109.36	12.15	947.51
Rosethorn Rockfish	*Sebastes helvomaculatus*	77	63.31	10.30	783.18
Sharpchin Rockfish	*Sebastes zacentrus*	67	1432.31	214.92	13754.86
Redstripe Rockfish	*Sebastes proriger*	62	1087.84	121.85	7433.08
Rougheye Rockfish	*Sebastes aleutianus*	51	2393.97	314.79	16054.28
Yellowmouth Rockfish	*Sebastes reedi*	45	3568.94	140.29	6313.23
Widow Rockfish	*Sebastes entomelas*	37	140.85	17.60	616.00
Harlequin Rockfish	*Sebastes variegatus*	34	64.38	3.30	108.76
Greenstriped Rockfish	*Sebastes elongatus*	23	16.67	5.10	117.36
Splitnose Rockfish	*Sebastes diploproa*	17	379.04	42.87	642.99
Canary Rockfish	*Sebastes pinniger*	16	2222.80	205.94	3294.98
Longspine Thornyhead	*Sebastolobus altivelis*	15	67.01	34.73	520.99
Yellowtail Rockfish	*Sebastes flavidus*	13	25.56	8.73	104.72
Shortraker Rockfish	*Sebastes borealis*	11	165.36	47.05	517.56
Darkblotched Rockfish	*Sebastes crameri*	8	13.62	4.20	33.56
Rockfishes	*Sebastes* (Genus)	7	-	-	-
Yelloweye Rockfish	*Sebastes ruberrimus*	6	44.64	13.59	81.56
Bocaccio	*Sebastes paucispinis*	6	35.68	10.89	65.33
Dusky Rockfish	*Sebastes variabilis*	5	10.95	3.52	17.59
Aurora Rockfish	*Sebastes aurora*	5	9.48	2.86	11.44
Pygmy Rockfish	*Sebastes wilsoni*	5	1.03	0.35	1.41
Stripetail Rockfish	*Sebastes saxicola*	1	0.17	0.17	0.17
Scorpionfishes	Scorpaenidae (Family)	1	-	-	-
Flatfishes	**Order Pleuronectiformes**				
Rex Sole	*Glyptocephalus zachirus*	98	128.08	9.29	873.07
Dover Sole	*Microstomus pacificus*	88	64.76	10.05	864.42
Arrowtooth Flounder	*Atheresthes stomias*	83	448.15	22.07	1787.65
Slender Sole	*Lyopsetta exilis*	37	1.47	0.36	13.07
Pacific Halibut	*Hippoglossus stenolepis*	28	229.85	16.53	462.74
English Sole	*Parophrys vetulus*	12	34.02	4.01	48.12
Deepsea Sole	*Embassichthys bathybius*	11	1.28	0.73	7.98
Petrale Sole	*Eopsetta jordani*	5	26.58	6.67	33.36
Cod-Like Fishes	**Order Gadiformes**				
Walleye Pollock	*Gadus chalcogrammus*	45	308.12	11.08	498.74
Pacific Cod	*Gadus macrocephalus*	45	22.62	6.26	275.58
Pacific Hake	*Merluccius productus*	34	240.51	25.29	834.53
Giant Grenadier	*Albatrossia pectoralis*	15	97.75	37.96	569.47
Pacific Grenadier	*Coryphaenoides acrolepis*	14	197.63	50.09	701.26
Popeye	*Coryphaenoides cinereus*	12	48.29	12.52	150.18
Pacific Flatnose	*Antimora microlepis*	11	12.82	2.40	24.03
Slender Codling	*Halargyreus johnsonii*	1	0.05	0.05	0.05
Cartilaginous Fish	**Class Chondrichthyes**				
Spotted Ratfish	*Hydrolagus colliei*	64	70.66	5.12	322.67
North Pacific Spiny Dogfish	*Squalus suckleyi*	46	24.02	4.82	221.58
Longnose Skate	*Raja rhina*	32	28.00	11.04	353.18
Roughtail Skate	*Bathyraja trachura*	11	26.80	7.12	78.32

Common Name	Scientific Name	Number of Tows	Catch Weight (kg)		
			Max	Mean	Total
Sandpaper Skate	*Bathyraja interrupta*	11	8.12	3.27	35.99
Aleutian Skate	*Bathyraja aleutica*	6	28.92	13.67	82.00
Brown Cat Shark	*Apristurus brunneus*	2	2.12	1.17	2.34
Big Skate	*Beringraja binoculata*	1	56.72	56.72	56.72
Greenlings	**Family Hexagrammidae**				
Lingcod	*Ophiodon elongatus*	27	37.26	11.07	299.00
Sculpins	**Family Cottidae**				
Darkfin Sculpin	*Malacocottus zonurus*	62	8.07	0.94	46.14
Bigmouth Sculpin	*Hemitripterus bolini*	4	12.92	7.24	28.94
Giant Blobsculpin	*Psychrolutes phrictus*	3	3.78	1.92	3.84
Spotfin Sculpin	*Icelinus tenuis*	2	0.12	0.12	0.12
Whitetail Sculpin	*Malacocottus aleuticus*	1	-	-	-
Tadpole Sculpin	*Psychrolutes paradoxus*	1	-	-	-
Eelpouts	**Family Zoarcidae**				
Twoline Eelpout	*Bothrocara brunneum*	11	6.82	2.88	31.70
Black Eelpout	*Lycodes diapterus*	7	0.52	0.28	1.67
Pallid Eelpout	*Lycodapus mandibularis*	6	0.07	0.05	0.09
Bigfin Eelpout	*Lycodes cortezianus*	3	0.66	0.45	1.36
Snakehead Eelpout	*Lycenchelys crotalina*	3	0.43	0.22	0.65
Eelpouts	Zoarcidae (Family)	3	-	-	-
Shortfin Eelpout	*Lycodes brevipes*	2	0.20	0.20	0.20
Eelpout	*Lycenchelys* (Genus)	1	-	-	-
Poachers	**Family Agonidae**				
Smootheye Poacher	*Xeneretmus leiops*	15	0.16	0.07	0.55
Bigeye Poacher	*Bathyagonus pentacanthus*	8	0.06	0.06	0.06
Blackfin Poacher	*Bathyagonus nigripinnis*	4	0.18	0.12	0.24
Poachers	Agonidae (Family)	3	-	-	-
Lanternfishes	**Family Myctophidae**				
Northern Lampfish	*Stenobrachius leucopsarus*	15	0.98	0.25	1.73
Lanternfishes	Myctophidae (Family)	15	-	-	-
Pinpoint Lampfish	*Nannobrachium regale*	14	0.34	0.14	1.36
Blue Lanternfish	*Tarletonbeania crenularis*	9	-	-	-
Garnet Lanternfish	*Stenobrachius nannochir*	6	0.14	0.08	0.25
California Headlightfish	*Diaphus theta*	3	0.03	0.03	0.03
Lanternfish	*Tarletonbeania* (Genus)	3	0.02	0.02	0.02
Other Fish					
Sablefish	*Anoplopoma fimbria*	56	113.19	29.74	1665.65
Pacific Viperfish	*Chauliodus macouni*	22	0.28	0.10	1.21
Bluethroat Argentine	*Nansenia candida*	16	0.03	0.02	0.05
Deepsea Smelts	Bathylagidae (Family)	14	0.80	0.34	3.75
Longfin Dragonfish	*Tactostoma macropus*	14	0.26	0.12	1.34
Snailfishes	Liparidae (Family)	9	0.40	0.26	0.51
Prowfish	*Zaprora silenus*	6	7.94	2.60	15.61
Crested Bigscale	*Poromitra crassiceps*	5	0.04	0.04	0.07
Blacktail Snailfish	*Careproctus melanurus*	4	1.94	0.87	3.46
Waryfish	*Scopelosaurus adleri*	3	0.23	0.23	0.23
Eulachon	*Thaleichthys pacificus*	3	-	-	-
Smooth Dreamer	*Chaenophryne melanorhabdus*	2	0.10	0.10	0.10
Shining Loosejaw	*Aristostomias scintillans*	1	27.59	27.59	27.59
Ragfish	*Icosteus aenigmaticus*	1	8.85	8.85	8.85
Chum Salmon	*Oncorhynchus keta*	1	5.46	5.46	5.46
California Slickhead	*Alepocephalus tenebrosus*	1	1.62	1.62	1.62
Black Hagfish	*Eptatretus deani*	1	0.36	0.36	0.36
Pacific Blacksmelt	*Bathylagus pacificus*	1	0.28	0.28	0.28

Common Name	Scientific Name	Number of Tows	Catch Weight (kg)		
			Max	Mean	Total
Emarginate Snailfish	*Careproctus furcellus*	1	0.21	0.21	0.21
Northern Ronquil	*Ronquilus jordani*	1	0.18	0.18	0.18
Bigscales	Melamphaidae (Family)	1	0.10	0.10	0.10
Dreamers	Oneirodidae (Family)	1	0.07	0.07	0.07
Whitebarred Prickleback	*Poroclinus rothrocki*	1	0.02	0.02	0.02
Toothless Snailfish	*Paraliparis paucidens*	1	0.01	0.01	0.01
Bony-eared Assfish	*Acanthonus armatus*	1	-	-	-
Closespine Snipe Eel	*Avocettina infans*	1	-	-	-
Slender Barracudina	*Lestidiops ringens*	1	-	-	-
Tadpole Snailfish	*Nectoliparis pelagicus*	1	-	-	-
White Barracudina	*Arctozenus risso*	1	-	-	-
Crabs and Shrimp	**Class Malacostraca**				
Prawn	*Pandalus platyceros*	41	2.44	0.41	15.62
Glass Shrimp	*Pasiphaea pacifica*	17	2.28	0.97	6.80
Grooved Tanner Crab	*Chionoecetes tanneri*	14	11.24	4.80	67.13
Sidestripe Shrimp	*Pandalopsis dispar*	11	0.24	0.10	0.59
Isopods	Isopoda (Order)	11	-	-	-
-	*Lithodes couesi*	9	3.76	1.35	9.45
Squat Lobster	*Munida quadrispina*	8	0.02	0.02	0.02
Large Eyed Eualid	*Eualus macropthalmus*	8	-	-	-
Yellowleg Shrimp	*Pandalus tridens*	5	-	-	-
-	Hippolytidae (Family)	5	-	-	-
Shrimp	Dendrobranchiata (Sub Order)	4	-	-	-
Brown Box Crab	*Lopholithodes foraminatus*	4	0.83	0.63	2.52
-	*Paralomis multispina*	3	0.62	0.33	0.66
Spiny Ridge Shrimp	*Notostomus japonicus*	3	-	-	-
Pandalid Shrimp	Pandalidae (Family)	3	-	-	-
-	*Eualus* (Genus)	3	-	-	-
Deepwater Decorator Crab	*Oregonia bifurca*	2	0.03	0.03	0.03
-	*Argis* (Genus)	2	-	-	-
-	*Neognathophausia* (Genus)	2	-	-	-
Golden King Crab	*Lithodes aequispinus*	1	1.32	1.32	1.32
Box Crabs	*Lopholithodes* (Genus)	1	0.05	0.05	0.05
-	*Pacifacanthomysis* (Genus)	1	-	-	-
Redclaw Crab	*Chorilia longipes*	1	-	-	-
Bristly Crab	*Acantholithodes hispidus*	1	-	-	-
-	Chirostylidae (Family)	1	-	-	-
Common Argid	*Argis alaskensis*	1	-	-	-
Barbed Eualid	*Eualus barbatus*	1	-	-	-
Crimson Pasiphaeid	*Pasiphaea tarda*	1	-	-	-
-	*Notostomus* (Genus)	1	-	-	-
Pink Shrimp (Smooth)	*Pandalus jordani*	1	-	-	-
-	Crangonidae (Family)	1	-	-	-
-	*Pandalopsis* (Genus)	1	-	-	-
Sea Stars	**Class Asteroidea**				
Starfish	Asteroidea (Class)	18	0.34	0.34	0.34
Rose Starfish	*Crossaster papposus*	14	0.08	0.05	0.19
-	*Henricia* (Genus)	10	0.10	0.10	0.20
Cushion Star	*Pteraster tesselatus*	9	-	-	-
-	*Hippasteria* (Genus)	8	0.29	0.27	0.81
-	*Nearchaster* (Genus)	8	-	-	-
-	*Lophaster* (Genus)	7	-	-	-
-	*Poraniopsis inflatus inflatus*	6	0.24	0.24	0.24
-	Solasteridae (Family)	5	-	-	-

Common Name	Scientific Name	Number of Tows	Catch Weight (kg)		
			Max	Mean	Total
-	Zoroasteridae (Family)	4	0.30	0.18	0.35
-	*Zoroaster* (Genus)	4	0.10	0.08	0.16
-	Goniasteridae (Family)	3	0.01	0.01	0.01
-	*Solaster* (Genus)	3	-	-	-
-	Pterasteridae (Family)	3	-	-	-
Cookie Star	*Ceramaster patagonicus*	3	-	-	-
Spiny Red Sea Star	*Hippasteria spinosa*	2	0.25	0.22	0.43
-	Echinasteridae (Family)	2	-	-	-
-	Poraniidae (Family)	1	0.06	0.06	0.06
-	*Ceramaster* (Genus)	1	-	-	-
-	*Poraniopsis* (Genus)	1	-	-	-
-	*Diplopteraster multipes*	1	-	-	-
-	*Lophaster furcilliger vexator* (Sub Species)	1	-	-	-
-	*Lophaster furcilliger*	1	-	-	-
-	*Crossaster* (Genus)	1	-	-	-
Fish-eating Star	*Stylasterias forreri*	1	-	-	-
-	*Hippasteria californica*	1	-	-	-
-	*Cheiraster* (Genus)	1	-	-	-
-	*Cheiraster dawsoni*	1	-	-	-
Brittle Stars	**Class Ophiuroidea**				
-	Ophiuroidea (Class)	12	-	-	-
-	Ophiuridae (Family)	8	-	-	-
Basket Star	*Gorgonocephalus eucnemis*	7	0.46	0.43	0.85
-	*Amphiophiura ponderosa*	4	-	-	-
-	*Amphiophiura superba*	3	-	-	-
-	*Amphiophiura* (Genus)	3	-	-	-
-	*Ophiura* (Genus)	2	-	-	-
-	*Gorgonocephalus* (Genus)	1	0.02	0.02	0.02
-	Asteronychidae (Family)	1	-	-	-
-	*Asteronyx* (Genus)	1	-	-	-
-	*Ophioscolex* (Genus)	1	-	-	-
-	Ophiurida (Order)	1	-	-	-
Sea Cucumbers	**Class Holothuroidea**				
Soft Sea Cucumber	*Pseudostichopus mollis*	23	1.30	0.24	2.92
Scaly Sea Cucumber	*Psolus squamatus*	2	0.29	0.29	0.29
Papillose Sea Cucumber	*Synallactes challengeri*	2	-	-	-
Whitespotted Sea Cucumber	*Apostichopus leukothele*	1	0.17	0.17	0.17
Octopuses and Squid	**Class Cephalopoda**				
Schoolmaster Gonate Squid	*Berryteuthis magister*	40	29.10	4.01	152.53
Clubhook Squids	Onychoteuthidae (Family)	11	1.54	0.42	3.33
-	*Chiroteuthis calyx*	9	0.52	0.36	2.16
Flapjack Devilfish	*Opisthoteuthis californiana*	8	5.80	2.84	22.72
Squids	Teuthida (Order)	7	0.47	0.26	0.51
Pacific Bobtail Squid	*Rossia pacifica*	6	-	-	-
-	*Octopoteuthis deletron*	5	0.51	0.36	1.09
-	*Japetella diaphana*	3	0.22	0.22	0.22
Robust Clubhook Squid	*Moroteuthis robusta*	2	4.96	3.66	7.32
Gonate Squids	Gonatidae (Family)	2	0.14	0.14	0.14
-	*Stigmatoteuthis dofleini*	1	0.90	0.90	0.90
-	*Benthoctopus* (Genus)	1	0.82	0.82	0.82
-	*Belonella borealis*	1	0.08	0.08	0.08
-	*Gonatus pyros*	1	-	-	-
Sea Urchins	**Super Order Echinacea**				
Fragile Urchin	*Allocentrotus fragilis*	18	9.76	1.81	25.35

Common Name	Scientific Name	Number of Tows	Catch Weight (kg)		
			Max	Mean	Total
Jellyfish	**Phylum Cnidaria**				
-	*Periphylla periphylla*	9	0.14	0.14	0.14
-	*Atolla* (Genus)	7	0.24	0.17	0.34
Jellyfish	Scyphozoa (Class)	3	3.14	1.68	3.36
Lions Mane	*Cyanea capillata*	1	0.70	0.70	0.70
Sea Nettle	*Chrysaora quinquecirrha*	1	0.22	0.22	0.22
Anemones and Corals	**Class Anthozoa**				
Anemone	Actiniaria (Order)	44	6.47	1.45	24.71
-	*Primnoa* (Genus)	12	7.52	1.96	19.56
Sea Whip	*Balticina septentrionalis*	8	0.14	0.14	0.14
-	Hormathiidae (Family)	3	0.76	0.60	1.20
-	*Paragorgia* (Genus)	3	0.45	0.45	0.45
-	*Isidella* (Genus)	3	0.25	0.21	0.62
-	*Anthomastus* (Genus)	3	-	-	-
-	*Lillipathes* (Genus)	2	0.17	0.12	0.23
Black Corals, Thorny Corals	Antipatharia (Order)	2	-	-	-
Bubble Gum Coral	*Paragorgia arborea*	1	1.60	1.60	1.60
Sea Pen	*Ptilosarcus gurneyi*	1	-	-	-
-	*Swiftia* (Genus)	1	-	-	-
Stony Corals	Scleractinia (Order)	1	-	-	-
Snails and Slugs	**Class Gastropoda**				
Oregontriton	*Fusitriton oregonensis*	10	-	-	-
Whelks	Buccinidae (Family)	2	-	-	-
Gastropods	Gastropoda (Class)	2	-	-	-
Topshells	Trochidae (Family)	1	-	-	-
-	*Neptunea amianta*	1	-	-	-
-	Neptuneidae (Family)	1	-	-	-
-	Opisthobranchia (Sub Class)	1	-	-	-
-	*Tritonia* (Genus)	1	-	-	-
Blue Glaucus	*Glaucus atlanticus*	1	-	-	-
Rosy Tritonia	*Tritonia diomedea*	1	-	-	-
Rock Snails	Muricidae (Family)	1	-	-	-
Other Invertebrate Species					
Sponges	Porifera (Phylum)	44	42.56	5.24	167.83
-	Antedonidae (Family)	14	0.12	0.07	0.14
Bath Sponges	Demospongiae (Class)	5	1.66	0.73	2.18
Sea Lilies and Feather Stars	Crinoidea (Class)	5	-	-	-
Polychaete Worms	Polychaeta (Class)	5	-	-	-
Sea Mouse	*Aphrodita* (Genus)	5	-	-	-
-	*Styela* (Genus)	4	1.00	0.90	1.79
-	*Hyalonema* (Genus)	4	3.39	1.85	5.54
Heart Urchin	*Brisaster latifrons*	3	0.01	0.01	0.01
-	Tunicata (Sub Phylum)	3	-	-	-
Ascidians and Tunicates	Ascidiacea (Class)	2	1.30	0.79	1.58
Peanutworms	Sipuncula (Phylum)	1	0.04	0.04	0.04
-	Goniadidae (Family)	1	-	-	-
Glass Sponges	Hexactinellida (Class)	1	-	-	-
Scallop	Pectinidae (Family)	1	-	-	-
-	*Placiphorella* (Genus)	1	-	-	-

Table 9. Offloaded catch weight by species for the 2016 WCHG synoptic bottom trawl survey.

Species	Weight (kg)
Big Skate	26.64
Bocaccio	3.11
Canary Rockfish	2062.99
Darkblotched Rockfish	1498.74
Dover Sole	247.27
Dusky Rockfish	1.33
English Sole	13.32
Greenstriped Rockfish	11.99
Lingcod	234.62
Longnose Skate	70.14
Pacific Cod	145.17
Pacific Ocean Perch	73303.37
Redbanded Rockfish	316.97
Redstripe Rockfish	6537.46
Rex Sole	36.85
Rosethorn Rockfish	210.87
Rougheye Rockfish	14112.85
Sablefish	689.23
Sharpchin Rockfish	4794.11
Shortraker Rockfish	192.23
Shortspine Thornyhead	3738.86
Silvergray Rockfish	8095.25
Splitnose Rockfish	250.83
Walleye Pollock	278.79
Widow Rockfish	384.90
Yellowmouth Rockfish	4742.17
Total	**122000.05**

Table 10. Species sampled during the 2016 WCHG synoptic bottom trawl survey. The number of samples and number of recorded biological attributes are shown for each species.

Common Name	Scientific Name	Number of Samples	Number of Recorded Biological Attributes				
			Length	Weight	Sex	Maturity	Age
Aleutian Skate	*Bathyraja aleutica*	6	9	1	9	0	0
Arrowtooth Flounder	*Atheresthes stomias*	11	239	239	239	86	87
Big Skate	*Beringraja binoculata*	1	2	0	2	0	0
Bocaccio	*Sebastes paucispinis*	6	8	8	8	8	8
Brown Cat Shark	*Apristurus brunneus*	1	5	5	5	0	0
Canary Rockfish	*Sebastes pinniger*	8	185	185	185	185	185
Dover Sole	*Microstomus pacificus*	24	570	570	570	405	405
English Sole	*Parophrys vetulus*	1	30	30	30	30	30
Giant Grenadier	*Albatrossia pectoralis*	15	446	223	223	81	50
Greenstriped Rockfish	*Sebastes elongatus*	8	174	174	174	0	0
Harlequin Rockfish	*Sebastes variegatus*	3	79	79	79	0	0
Lingcod	*Ophiodon elongatus*	17	28	5	5	0	0
Longnose Skate	*Raja rhina*	32	44	18	44	0	0
Longspine Thornyhead	*Sebastolobus altivelis*	14	480	480	480	0	458
North Pacific Spiny Dogfish	*Squalus suckleyi*	1	11	11	11	11	8
Pacific Cod	*Gadus macrocephalus*	7	51	51	51	0	0
Pacific Flatnose	*Antimora microlepis*	10	43	43	21	21	21
Pacific Grenadier	*Coryphaenoides acrolepis*	13	612	324	324	0	0
Pacific Hake	*Merluccius productus*	13	273	273	273	48	48
Pacific Halibut	*Hippoglossus stenolepis*	25	29	1	0	0	0
Pacific Ocean Perch	*Sebastes alutus*	83	2356	2356	2356	1594	1564
Petrale Sole	*Eopsetta jordani*	2	32	32	32	25	25
Popeye	*Coryphaenoides cinereus*	10	245	245	245	0	0
Redbanded Rockfish	*Sebastes babcocki*	40	496	496	496	495	495
Redstripe Rockfish	*Sebastes proriger*	32	834	834	832	474	475
Rex Sole	*Glyptocephalus zachirus*	34	1002	1002	1002	191	191
Rosethorn Rockfish	*Sebastes helvomaculatus*	49	1069	1069	1069	0	0
Rougheye Rockfish	*Sebastes aleutianus*	50	685	685	685	682	682
Roughtail Skate	*Bathyraja trachura*	11	39	38	39	0	0
Sablefish	*Anoplopoma fimbria*	37	539	539	539	508	0
Sandpaper Skate	*Bathyraja interrupta*	11	21	17	21	0	0
Sharpchin Rockfish	*Sebastes zacentrus*	40	1275	1275	1275	0	0
Shortraker Rockfish	*Sebastes borealis*	11	77	77	77	49	77
Shortspine Thornyhead	*Sebastolobus alascanus*	87	2383	2383	2383	0	685
Silvergray Rockfish	*Sebastes brevispinis*	39	908	908	908	548	548
Splitnose Rockfish	*Sebastes diploproa*	5	131	131	131	131	85
Spotted Ratfish	*Hydrolagus colliei*	6	133	133	133	0	0
Walleye Pollock	*Gadus chalcogrammus*	10	242	242	242	25	25
Widow Rockfish	*Sebastes entomelas*	5	72	72	72	0	0
Yelloweye Rockfish	*Sebastes ruberrimus*	4	16	16	16	16	16
Yellowmouth Rockfish	*Sebastes reedi*	17	419	419	419	350	350
Total		**799**	**16292**	**15689**	**15705**	**5963**	**6518**

Table 11. Summary of biological data collected during the 2016 WCHG synoptic bottom trawl survey. For each species the number of samples and specimens, the minimum, maximum, and mean length, the minimum, maximum, and mean weight, and female proportion is shown. Weights less than 0.1 kg are entered as <0.1 and no data collected is -.

		Number of			Length (cm)			Weight (kg)			
Common Name	Scientific Name	Samples	Specimens	Length Type	Min.	Max.	Mean	Min.	Max.	Mean	Female Proportion
Aleutian Skate	*Bathyraja aleutica*	6	9	Total	91	130	113	5.3	5.3	5.3	0.33
Arrowtooth Flounder	*Atheresthes stomias*	11	239	Fork	27	64	48	0.2	2.9	1.1	0.69
Big Skate	*Beringraja binoculata*	1	2	Total	120	175	148	-	-	-	1.00
Bocaccio	*Sebastes paucispinis*	6	8	Fork	58	79	68	2.3	6.5	4.2	0.38
Brown Cat Shark	*Apristurus brunneus*	1	5	Total	38	61	49	0.2	0.8	0.4	0.40
Canary Rockfish	*Sebastes pinniger*	8	185	Fork	43	64	53	1.3	4.1	2.5	0.44
Dover Sole	*Microstomus pacificus*	24	570	Total	27	56	40	0.2	1.6	0.7	0.16
English Sole	*Parophrys vetulus*	1	30	Total	26	43	37	0.2	0.8	0.5	0.80
Giant Grenadier	*Albatrossia pectoralis*	15	223	Total	48	143	75	0.3	14.3	1.9	0.58
Greenstriped Rockfish	*Sebastes elongatus*	8	174	Fork	16	34	27	<0.1	0.5	0.3	0.41
Harlequin Rockfish	*Sebastes variegatus*	3	79	Fork	20	34	25	0.1	0.5	0.2	0.38
Lingcod	*Ophiodon elongatus*	17	28	Fork	66	110	92	8.1	15.2	11.4	1.00
Longnose Skate	*Raja rhina*	32	44	Total	51	139	105	2.9	15.1	8.0	0.55
Longspine Thornyhead	*Sebastolobus altivelis*	14	480	Total	10	31	21	<0.1	0.4	0.1	0.52
North Pacific Spiny Dogfish	*Squalus suckleyi*	1	11	Total	77	86	81	1.8	2.5	2.2	0.00
Pacific Cod	*Gadus macrocephalus*	7	51	Fork	45	76	59	0.9	4.4	2.3	0.57
Pacific Flatnose	*Antimora microlepis*	10	43	Total	14	56	40	<0.1	1.3	0.6	0.29
Pacific Grenadier	*Coryphaenoides acrolepis*	13	324	Total	7	68	40	<0.1	1.2	0.4	0.54
Pacific Hake	*Merluccius productus*	13	273	Fork	47	72	58	0.6	2.7	1.4	0.82
Pacific Halibut	*Hippoglossus stenolepis*	25	29	Fork	57	120	84	5.8	5.8	5.8	-
Pacific Ocean Perch	*Sebastes alutus*	83	2356	Fork	13	51	38	<0.1	2.1	0.8	0.46
Petrale Sole	*Eopsetta jordani*	2	32	Total	33	45	40	0.4	1.1	0.8	0.34
Popeye	*Coryphaenoides cinereus*	10	245	-	-	-	-	<0.1	0.5	0.2	0.60
Redbanded Rockfish	*Sebastes babcocki*	40	496	Fork	12	64	37	<0.1	5.6	1.0	0.51
Redstripe Rockfish	*Sebastes proriger*	32	834	Fork	23	45	35	0.1	1.1	0.6	0.56
Rex Sole	*Glyptocephalus zachirus*	34	1002	Total	14	44	33	<0.1	0.5	0.2	0.31
Rosethorn Rockfish	*Sebastes helvomaculatus*	49	1069	Fork	9	35	26	<0.1	0.6	0.3	0.48
Rougheye Rockfish	*Sebastes aleutianus*	50	685	Fork	16	77	48	0.1	5.5	1.9	0.46
Roughtail Skate	*Bathyraja trachura*	11	39	Total	18	127	61	<0.1	13.9	2.0	0.26
Sablefish	*Anoplopoma fimbria*	37	539	Fork	42	108	59	0.7	16.2	2.3	0.36
Sandpaper Skate	*Bathyraja interrupta*	11	21	Total	42	99	62	0.7	5.8	1.8	0.52

Common Name	Scientific Name	Number of		Length Type	Length (cm)			Weight (kg)			Female Proportion
		Samples	Specimens		Min.	Max.	Mean	Min.	Max.	Mean	
Sharpchin Rockfish	*Sebastes zacentrus*	40	1275	Fork	12	39	28	<0.1	0.8	0.3	0.59
Shortraker Rockfish	*Sebastes borealis*	11	77	Fork	48	98	70	1.6	16.7	6.7	0.60
Shortspine Thornyhead	*Sebastolobus alascanus*	87	2383	Total	4	77	26	<0.1	5.7	0.3	0.49
Silvergray Rockfish	*Sebastes brevispinis*	39	908	Fork	38	69	51	0.7	4.3	1.9	0.46
Splitnose Rockfish	*Sebastes diploproa*	5	131	Fork	8	34	22	<0.1	0.7	0.2	0.51
Spotted Ratfish	*Hydrolagus colliei*	6	133	2nd Dorsal	12	50	30	<0.1	1.3	0.4	0.53
Walleye Pollock	*Gadus chalcogrammus*	10	242	Fork	13	68	37	<0.1	2.1	0.5	0.70
Widow Rockfish	*Sebastes entomelas*	5	72	Fork	40	55	48	0.9	2.4	1.7	0.67
Yelloweye Rockfish	*Sebastes ruberrimus*	4	16	Fork	52	67	60	2.4	6.8	4.3	0.38
Yellowmouth Rockfish	*Sebastes reedi*	17	419	Fork	32	54	42	0.5	2.5	1.3	0.47

Table 12. Summary of data from net-mounted recorders during the 2016 WCHG synoptic bottom trawl survey, showing the number of tows and total number of records. A total of 132 survey tows were conducted, of which 112 were useable.

		Number of	
Data Recorder	**Attribute**	**Tows**	**Records**
Simrad Es60 Depth Sounder	Bottom Depth (m)	120	148525
Hobo Pendant Acceleration Data Logger	Bottom Contact Sensor Tilt Angle	110	50254
Marport Net Sensors	Net Depth (m)	115	51434
	Trawl Net Doorspread (m)	115	11169
	Headline height above bottom (m)	114	50719
Seabird Sbe19plus Seacat Profiler	Conductivity of sea water (S/m)	114	38300
	Pressure (db)/ depth (m)	114	38300
	Salinity (PSU)	114	38300
	Water temperature (^{o}C)	114	38300
Seabird SBE43	Oxygen Voltage (V)/ Dissolved Oxygen (ml/L)	114	38300
Seabird SBE39 Temperature And Pressure Recorder	Water temperature (^{o}C)	115	82633
	Pressure (db)/ depth (m)	115	82633

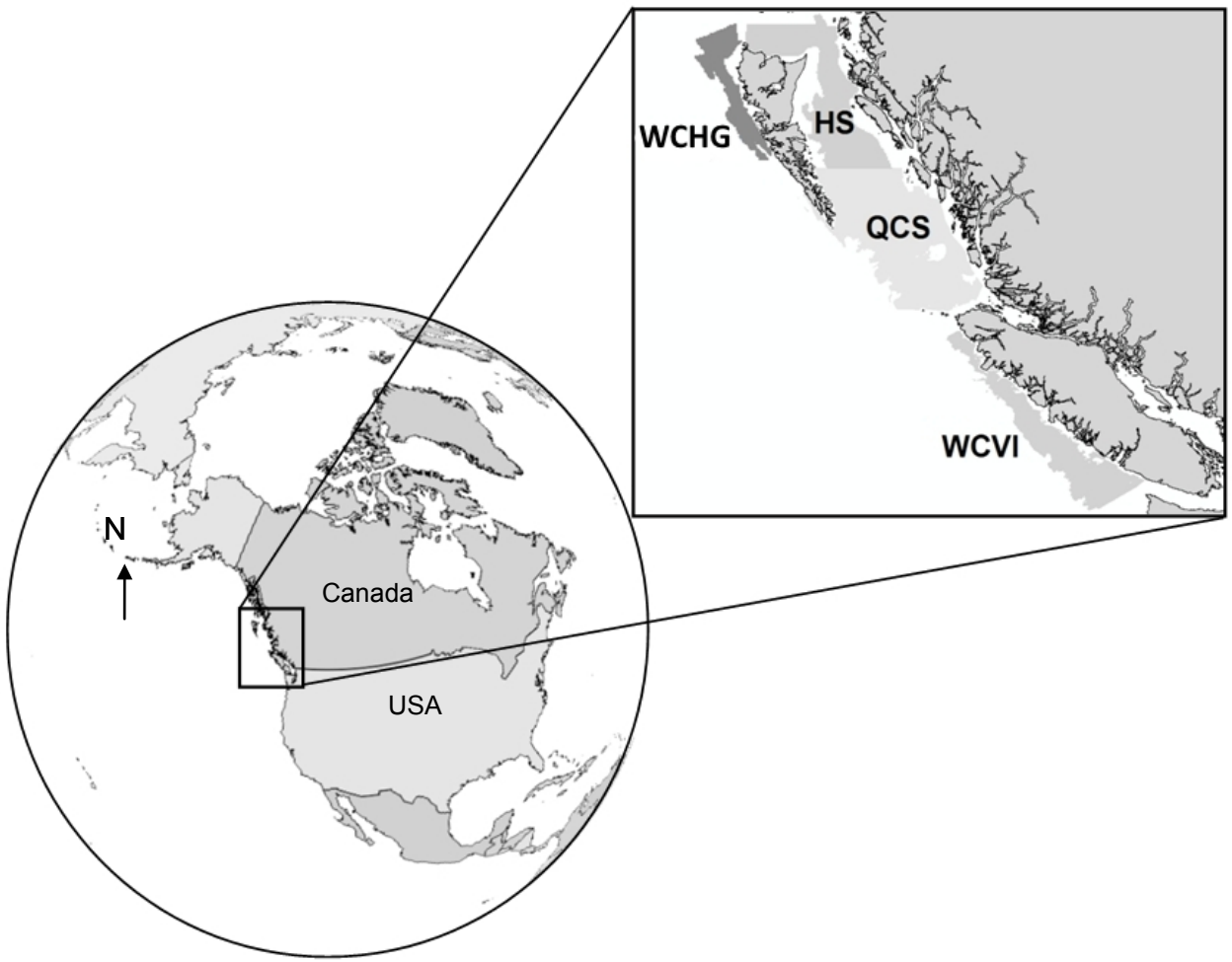

Figure 1. Locations of the current synoptic bottom trawl surveys on the coast of British Columbia, Canada. WCHG = West Coast Haida Gwaii; HS = Hecate Strait; QCS = Queen Charlotte Sound; WCVI = West Coast Vancouver Island.

Figure 2. The commercial stern trawler F/V Frosti used for the 2016 WCHG synoptic bottom trawl survey.

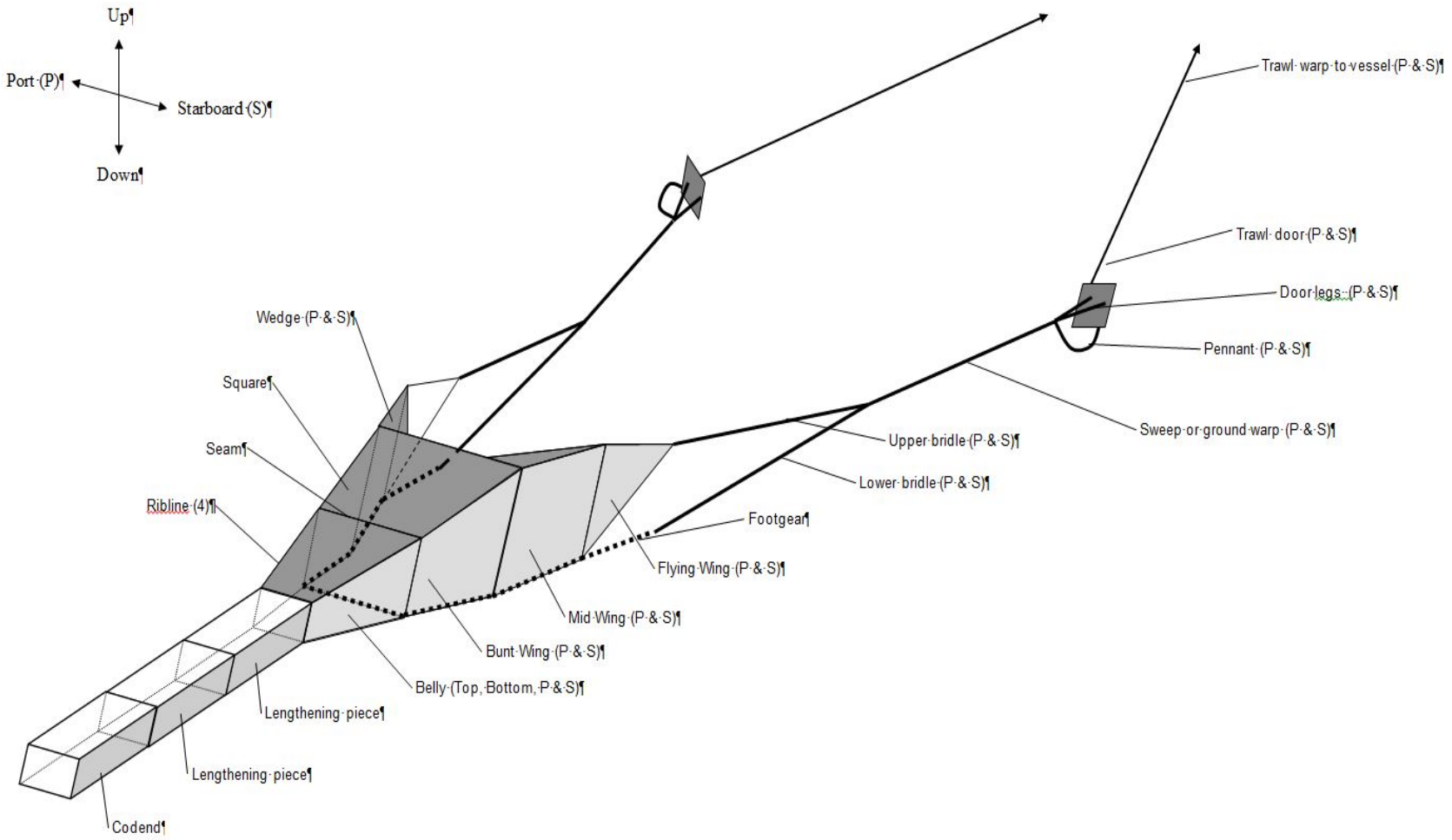

Figure 3. Overview diagram of the Atlantic Western IIa box trawl used on the 2016 WCHG synoptic bottom trawl survey.

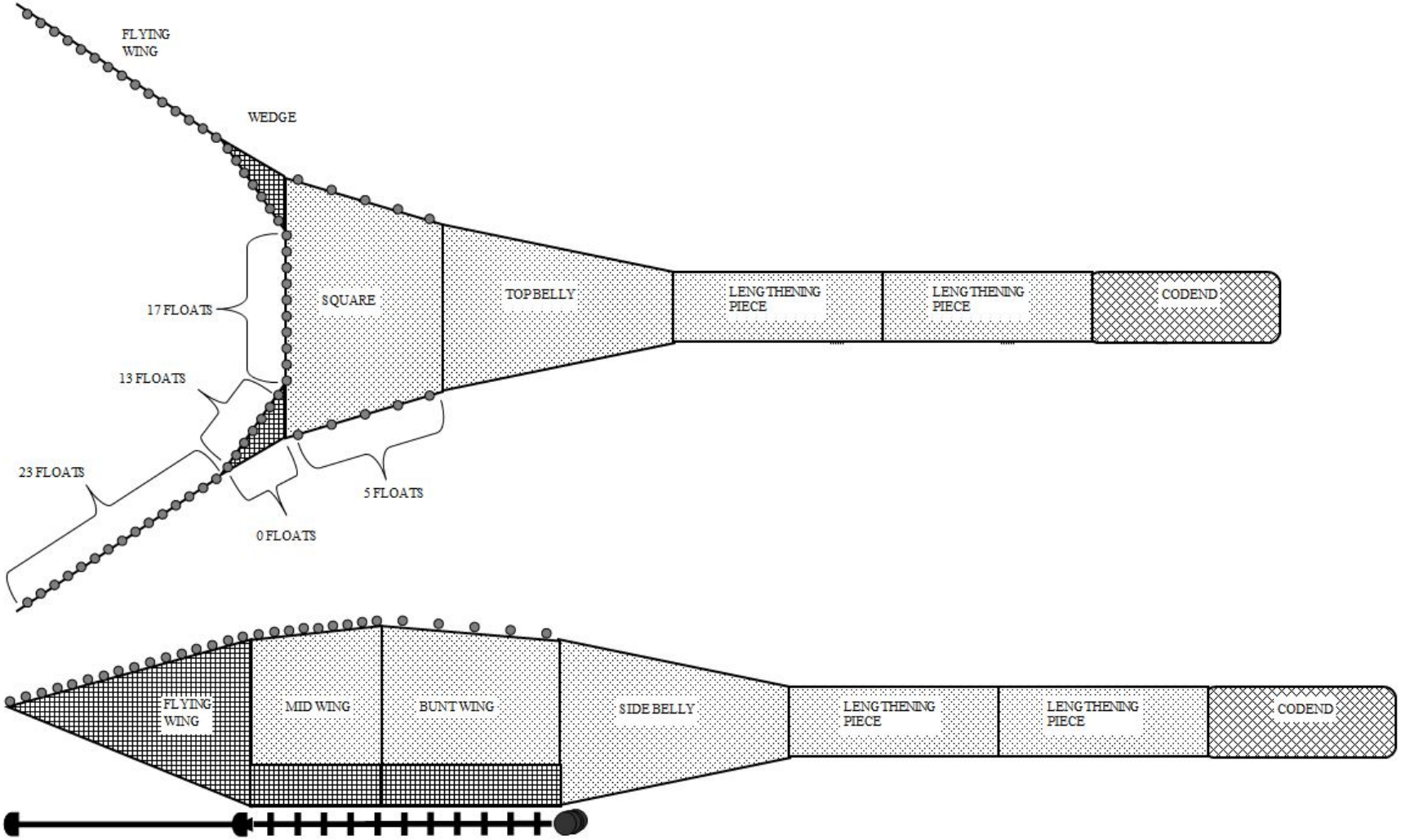

Figure 4. Top and side view of the Atlantic Western IIa box trawl used on the 2016 WCHG synoptic bottom trawl survey.

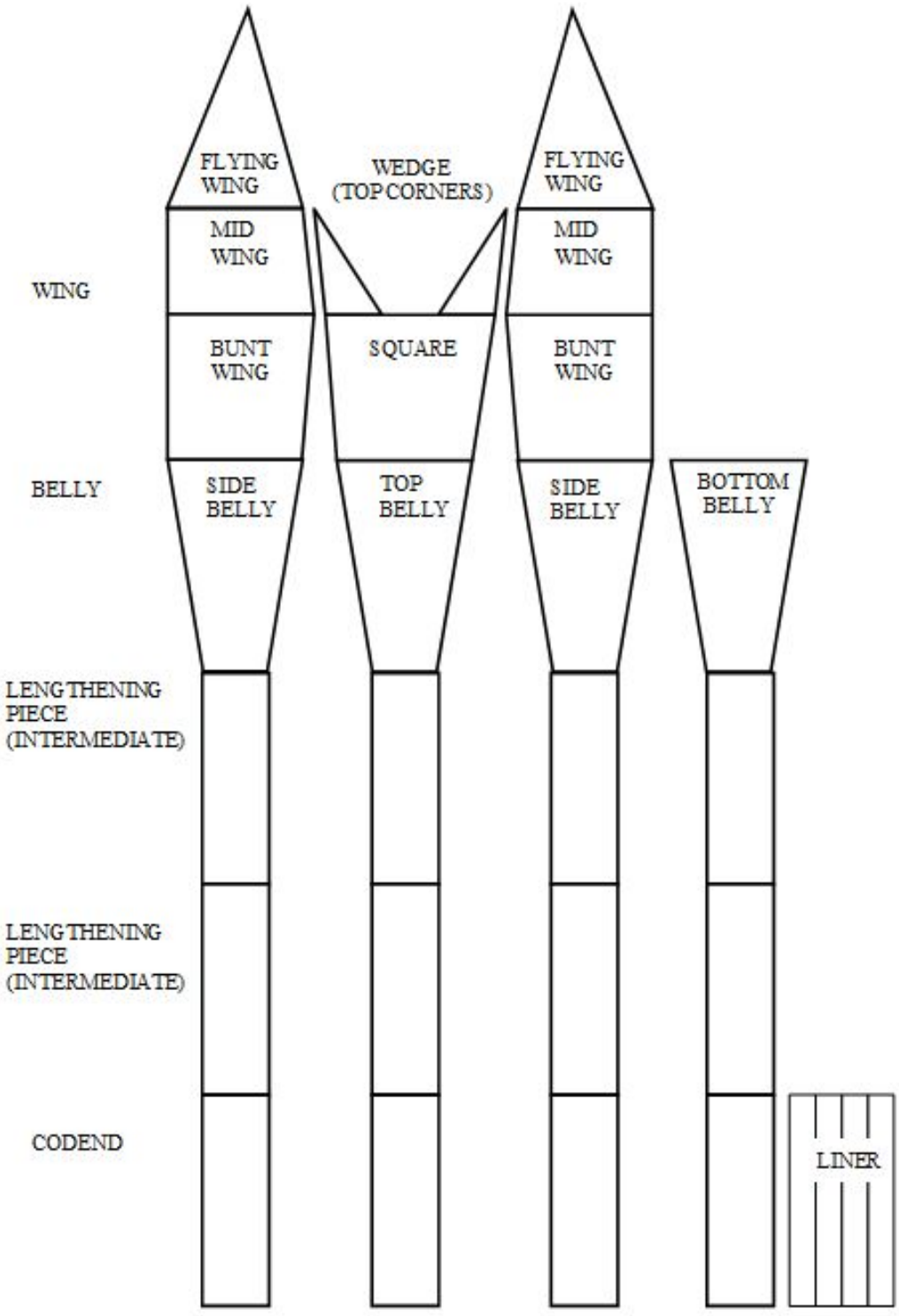

Figure 5. Diagram of the net panels with section names for the Atlantic Western IIa box trawl used on the 2016 WCHG synoptic bottom trawl survey.

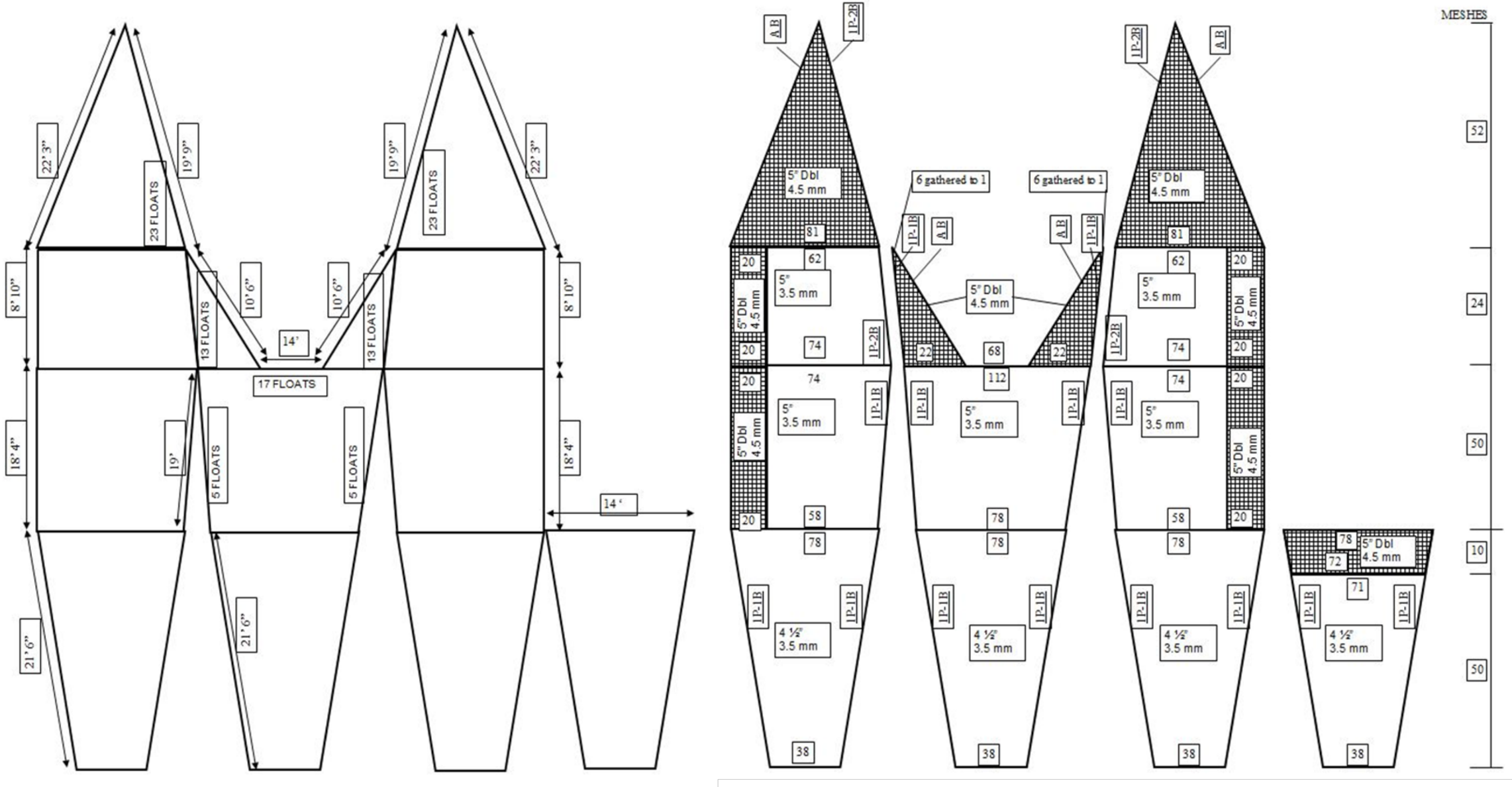

Figure 6. Schematics of the wing and belly sections of the Atlantic Western IIa box trawl used on the 2016 WCHG synoptic bottom trawl survey. Dimensions and the float arrangement are shown on the left while netting details, mesh counts, and mesh cuts are shown on the right side of the diagram.

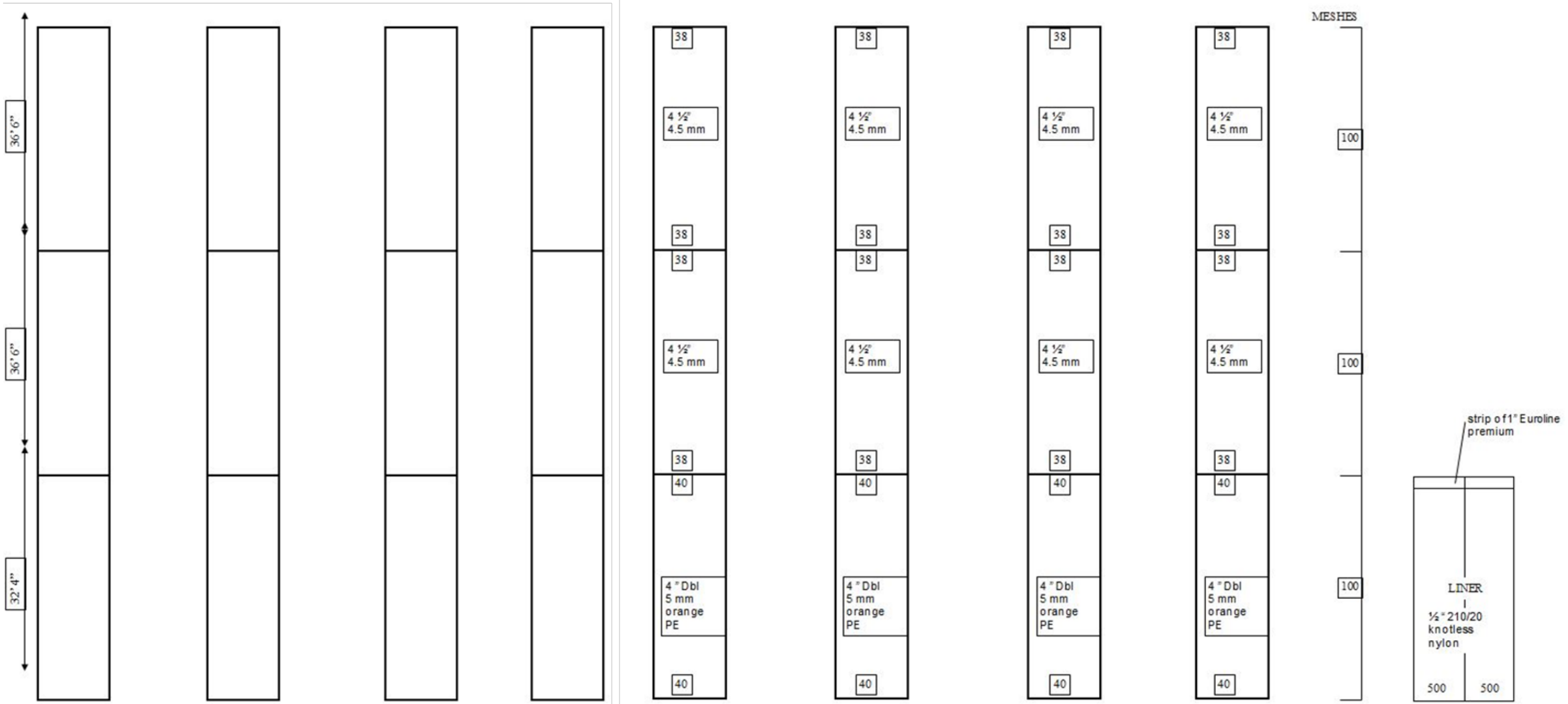

Figure 7. Details of the lengthening (intermediate) pieces and codend sections of the Atlantic Western IIa box trawl used on the 2016 WCHG synoptic bottom trawl survey. Dimensions are shown on the left while netting details, mesh counts, and mesh cuts including the codend liner are shown on the right side of the diagram.

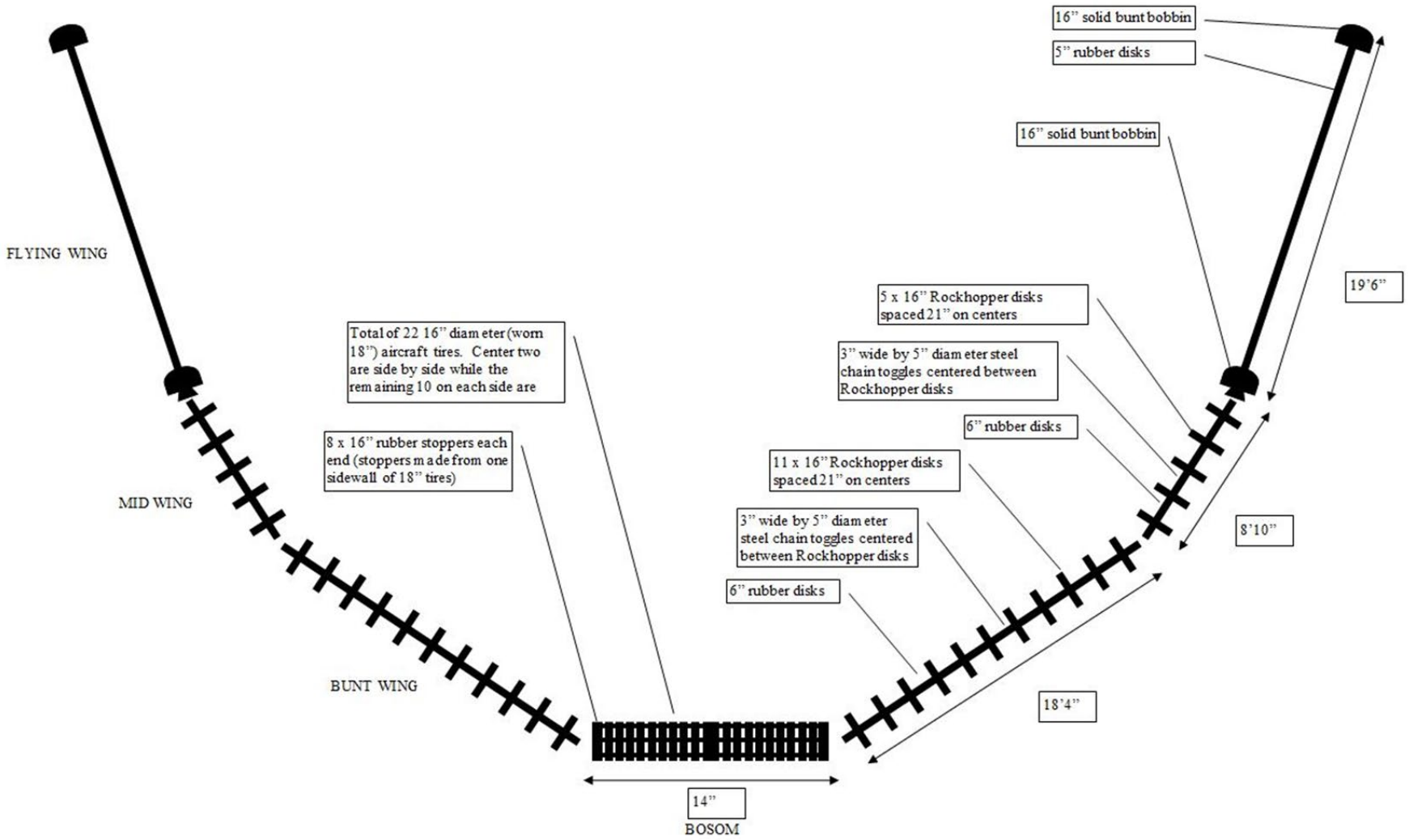

Figure 8. Details of the Rockhopper foot gear for the Atlantic Western IIa box trawl used on the 2016 WCHG synoptic bottom trawl survey.

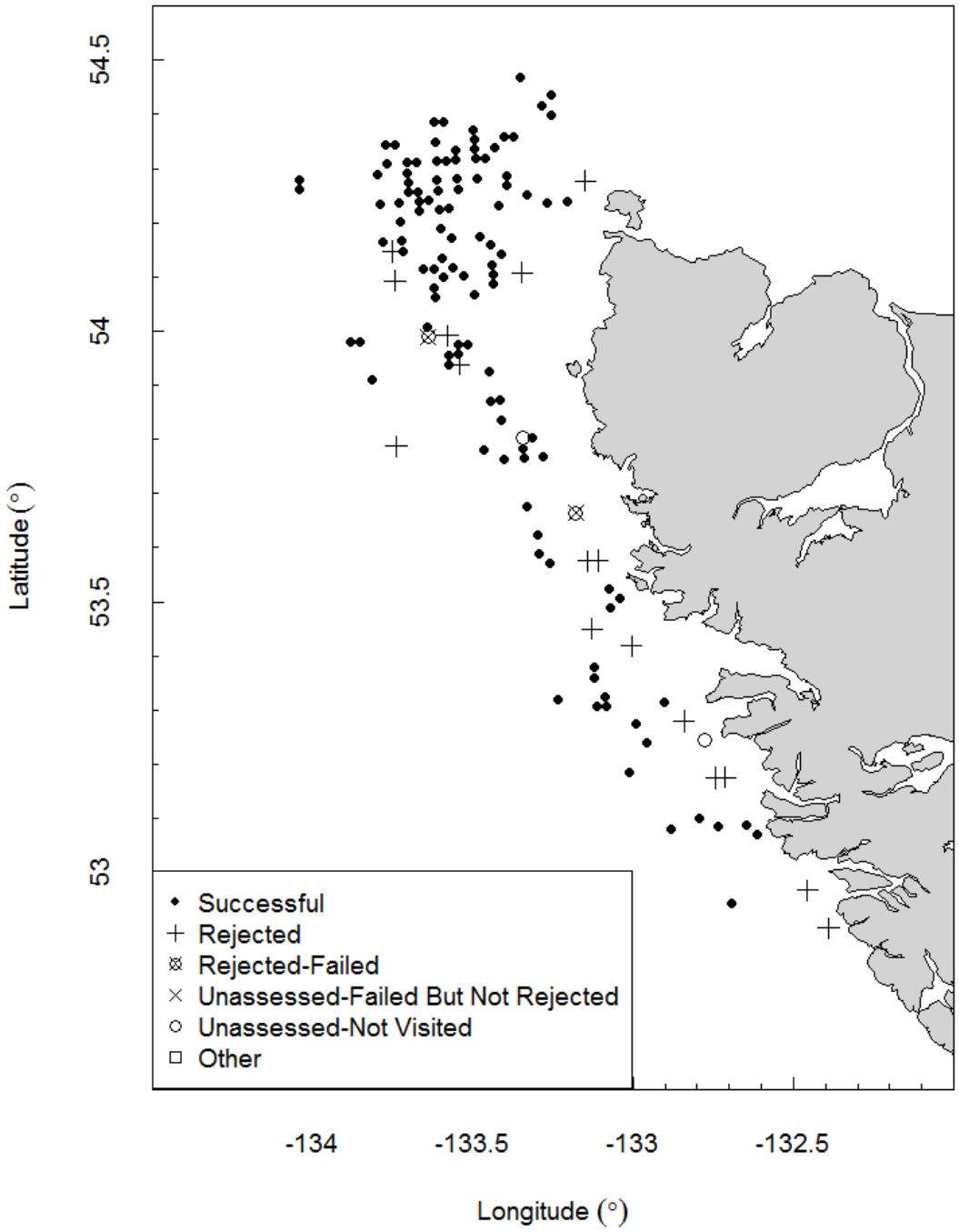

Figure 9. Final status of the 2016 WCHG synoptic bottom trawl survey showing 112 successfully fished blocks (Successful), 16 blocks rejected after inspection (Rejected), two blocks rejected after one or more failed fishing attempts (Rejected-Failed) and two blocks that remained unassessed at the end of the survey.

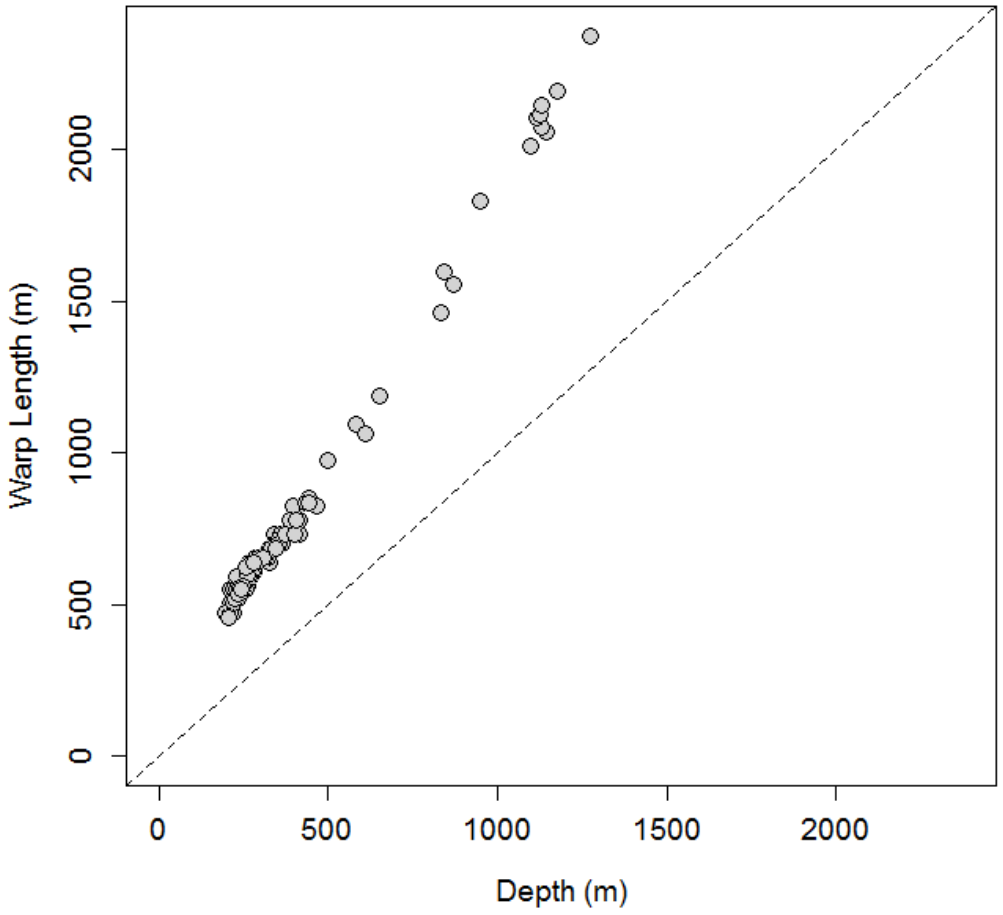

Figure 10. Warp length versus starting depth for each tow during the 2016 WCHG synoptic bottom trawl survey.

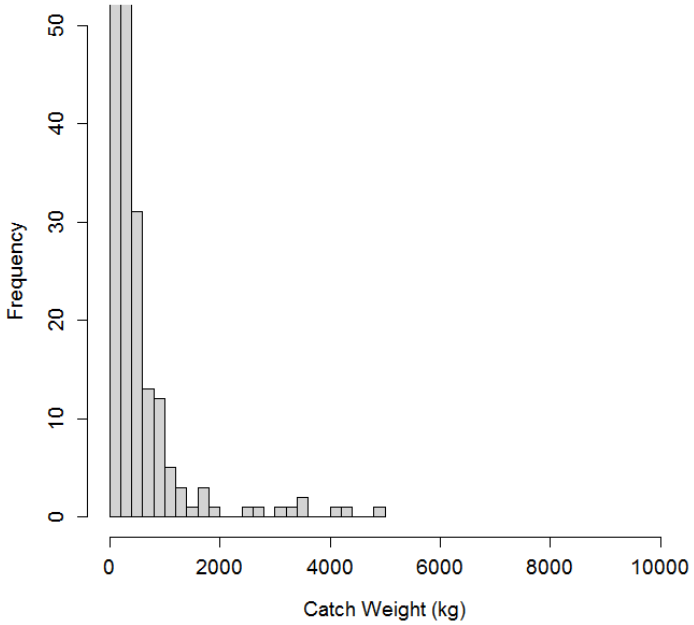

Figure 11. Histogram of catch weight per useable tow during the 2016 WCHG synoptic bottom trawl survey.

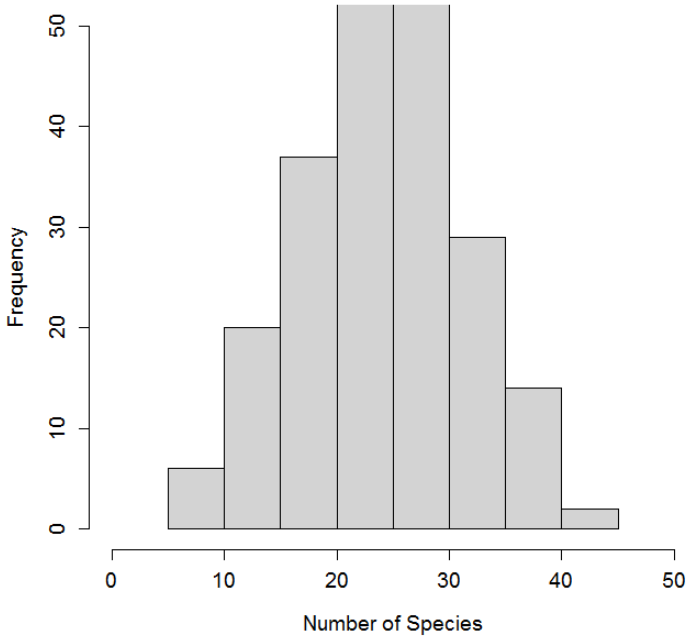

Figure 12. Histogram of the number of species caught in useable tows during the 2016 WCHG synoptic bottom trawl survey.

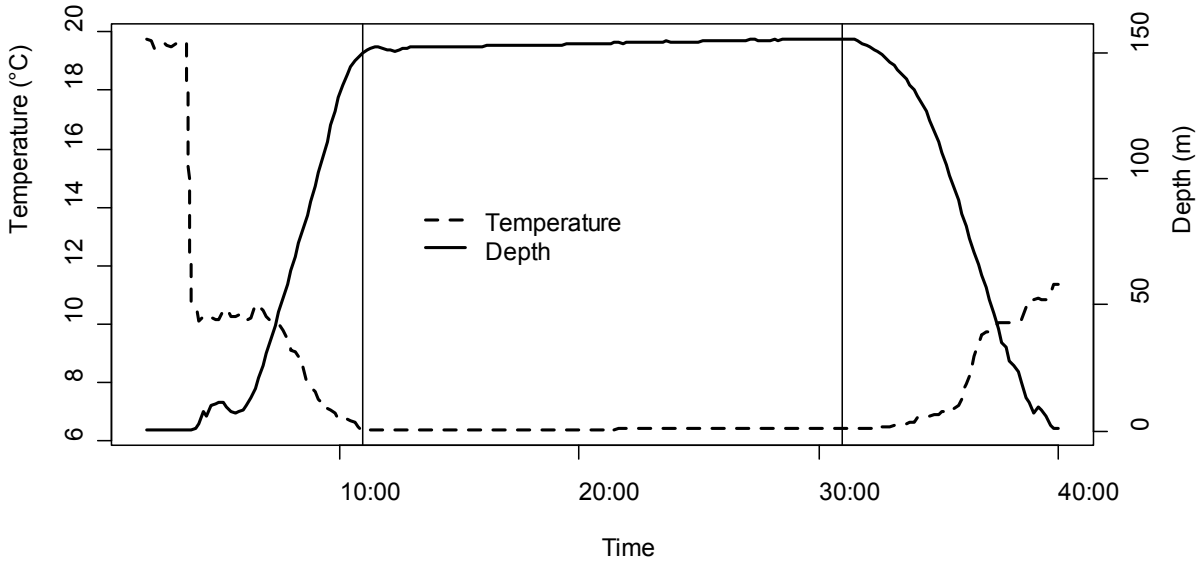

Figure 13. Example of a Seabird 39 temperature and depth profile collected during a synoptic bottom trawl survey. The vertical lines indicate the start and end of net contact with the sea floor.

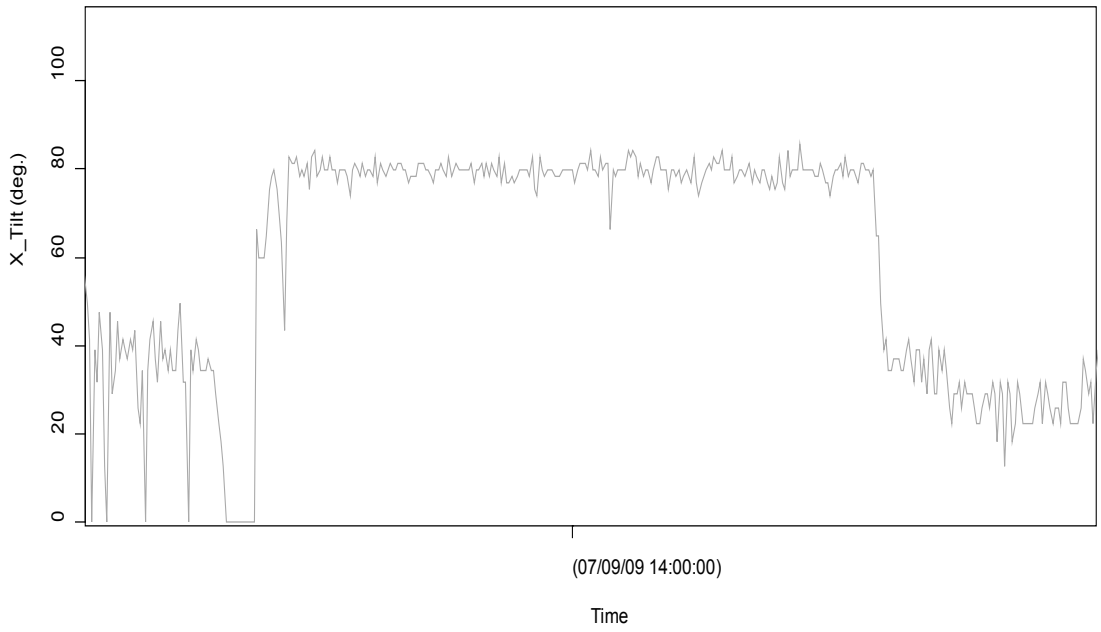

Figure 14. Example of a Mac Marine Industries bottom contact sensor profile collected during a bottom trawl survey. The raised segment in the middle of the profile at approximately 80° indicates where the net made contact with the sea floor.

APPENDIX A: WCHG 2016 SURVEY BRIDGE LOG

Tow	Date	Time	Latitude	Longitude	Depth (m)	Duration (min)	Speed (km/h)	Warp (m)	Catch (kg)	Usable
1	Aug-28	7:57	52.9470	132.7057	1212.5	32	4.5	1829	28.8	No
2	Aug-28	10:50	52.9393	132.7027	1273.8	50	4.7	2377	333.5	Yes
3	Aug-28	14:05	53.0651	132.6207	209.6	23	5.9	549	257.7	Yes
4	Aug-28	15:25	53.0825	132.6538	228.3	21	6.0	594	1081.1	Yes
5	Aug-28	17:25	53.0824	132.7293	949.8	37	4.8	1829	67.9	Yes
6	Aug-28	19:44	53.0987	132.7844	1096.6	35	4.6	2012	320.8	Yes
7	Aug-29	6:59	53.0789	132.8761	1176.4	47	4.6	2195	344.5	Yes
8	Aug-29	9:58	53.1914	132.9991	841.5	37	5.2	1600	109.8	Yes
9	Aug-29	14:05	53.2525	132.7886	258.9	5	5.8	640	1129.3	No
10	Aug-29	17:13	53.3031	132.9011	583.6	31	5.2	1097	203.5	Yes
11	Aug-30	6:55	53.2497	132.9624	340.8	21	5.4	732	1075.3	Yes
12	Aug-30	8:45	53.2792	133.0061	266.1	18	5.5	640	2272.9	Yes
13	Aug-30	10:40	53.3283	133.0950	221.4	4	4.7	594	384.8	No
14	Aug-30	11:36	53.3246	133.0910	223.9	16	5.6	549	3192.0	Yes
15	Aug-30	15:37	53.3150	133.0881	274.7	21	5.6	640	2282.3	Yes
16	Aug-31	7:06	53.3818	133.1317	220.0	21	5.7	549	1616.7	Yes
17	Aug-31	9:09	53.3667	133.1270	226.9	21	5.7	549	3183.3	Yes
18	Aug-31	11:11	53.3026	133.0968	416.8	21	5.5	777	895.6	Yes
19	Aug-31	13:28	53.3238	133.2457	830.3	33	5.0	1463	71.3	Yes
20	Aug-31	16:56	53.4888	133.0761	274.5	23	5.6	640	1104.5	Yes
21	Aug-31	18:52	53.5076	133.0535	211.6	20	5.7	503	286.7	Yes
22	Sep-01	7:19	53.5218	133.0812	212.6	23	5.6	503	330.4	Yes
23	Sep-01	10:40	53.5666	133.2460	285.7	22	5.7	655	1700.0	Yes
24	Sep-01	12:13	53.5870	133.2779	260.5	21	5.6	594	8173.5	Yes
25	Sep-01	15:38	53.6196	133.3062	326.5	21	5.6	640	921.6	Yes
26	Sep-01	18:09	53.6868	133.3282	868.6	31	4.9	1555	270.9	Yes
27	Sep-02	7:21	53.6637	133.1932	212.6	5	5.5	503	153.0	No
28	Sep-02	8:19	53.6668	133.1928	210.6	12	5.7	503	281.2	No
29	Sep-02	10:04	53.7570	133.2834	212.3	21	5.7	503	638.7	Yes
30	Sep-02	11:47	53.7715	133.3422	294.1	23	5.6	655	1301.8	Yes
31	Sep-02	14:03	53.7775	133.3399	263.5	21	5.7	594	803.1	Yes
32	Sep-02	15:46	53.8072	133.3432	220.2	15	5.6	503	779.2	No
33	Sep-02	18:02	53.7975	133.3331	219.2	12	5.3	503	257.9	No
34	Sep-02	19:14	53.7917	133.3219	217.9	19	5.6	472	474.9	Yes
35	Sep-03	7:17	54.2338	133.6536	276.5	21	5.5	609	2622.6	Yes
36	Sep-03	9:25	54.2304	133.6565	273.8	21	5.6	609	969.1	Yes
37	Sep-03	11:16	54.2460	133.6603	270.0	23	5.7	609	1168.6	Yes
38	Sep-03	13:09	54.2266	133.7287	245.1	21	5.7	563	713.2	Yes
39	Sep-03	14:49	54.2442	133.7871	247.8	21	5.5	549	4534.3	Yes
40	Sep-03	17:45	54.2388	133.4154	414.3	21	5.5	732	276.2	Yes
41	Sep-05	7:35	54.3791	133.5060	242.6	21	5.4	549	834.3	Yes
42	Sep-05	9:12	54.3677	133.4907	243.9	21	5.6	549	738.7	Yes
43	Sep-05	10:49	54.3468	133.4867	244.0	22	5.3	563	2076.0	Yes
44	Sep-05	12:41	54.3159	133.4674	256.7	22	5.5	624	915.6	Yes
45	Sep-05	14:24	54.3344	133.4755	242.9	21	5.6	563	3693.3	Yes
46	Sep-05	16:32	54.3449	133.4538	224.4	20	5.7	518	2819.1	Yes
47	Sep-05	18:25	54.3700	133.3986	234.8	21	5.6	534	708.9	Yes
48	Sep-06	7:30	53.9324	133.4640	196.6	22	5.9	472	881.7	Yes
49	Sep-06	9:11	53.8769	133.4518	231.2	22	5.5	-	2070.0	Yes
50	Sep-06	10:59	53.8749	133.4302	209.3	21	5.6	472	993.7	Yes
51	Sep-06	12:36	53.8454	133.4282	276.3	22	5.5	609	1369.0	Yes
52	Sep-06	14:46	53.7710	133.4121	497.3	32	5.3	975	518.8	Yes

Tow	Date	Time	Latitude	Longitude	Depth (m)	Duration (min)	Speed (km/h)	Warp (m)	Catch (kg)	Usable
53	Sep-06	17:26	53.7757	133.4588	650.4	31	5.2	1189	160.3	Yes
54	Sep-07	7:33	53.9271	133.5708	332.5	20	5.5	686	850.6	Yes
55	Sep-07	9:09	53.9552	133.5853	466.5	20	5.2	823	962.0	Yes
56	Sep-07	11:00	53.9572	133.5510	395.9	21	5.5	777	625.6	Yes
57	Sep-07	12:42	53.9864	133.5349	237.0	21	5.6	532	1649.8	Yes
58	Sep-07	14:33	53.9837	133.5286	218.0	17	5.6	503	890.5	Yes
59	Sep-07	17:05	54.0538	133.6018	341.0	20	5.5	700	2871.1	Yes
60	Sep-08	7:29	54.0742	133.6323	345.5	22	5.5	700	5488.5	Yes
61	Sep-08	10:04	54.1089	133.5954	357.8	22	5.5	722	4106.6	Yes
62	Sep-08	12:18	54.1209	133.6596	323.9	21	5.4	655	2835.7	Yes
63	Sep-08	14:34	54.1105	133.6318	343.7	21	5.6	700	4552.1	Yes
64	Sep-08	17:07	54.1474	133.5825	355.3	23	5.5	715	518.5	Yes
65	Sep-11	7:55	54.2707	134.0304	1123.5	52	4.9	2118	356.4	Yes
66	Sep-13	10:04	54.2666	134.0355	1128.5	42	4.8	2149	232.6	Yes
67	Sep-13	14:21	53.9673	133.8262	1118.0	43	4.8	2103	261.2	Yes
68	Sep-13	16:40	53.9605	133.8666	1130.9	40	5.0	2072	395.7	Yes
69	Sep-13	19:19	53.9008	133.8175	1142.8	28	5.1	2057	153.3	Yes
70	Sep-14	8:21	54.1636	133.7699	399.6	11	5.4	777	485.0	No
71	Sep-14	9:33	54.1657	133.7720	414.6	18	5.5	777	1137.6	Yes
72	Sep-14	11:35	54.1598	133.7198	271.7	21	5.8	594	9060.2	Yes
73	Sep-14	14:14	54.1575	133.7165	272.6	21	5.8	594	2572.3	Yes
74	Sep-14	16:05	54.2090	133.7394	230.6	21	5.5	549	3069.9	Yes
75	Sep-14	18:06	54.2527	133.6194	280.5	21	5.7	609	1285.1	Yes
76	Sep-15	7:39	54.2475	133.2050	206.5	21	5.0	457	880.3	Yes
77	Sep-15	9:50	54.2370	133.2720	402.6	16	6.1	732	330.8	Yes
78	Sep-15	18:34	54.2501	133.3431	441.6	21	5.6	852	115.5	Yes
79	Sep-16	7:50	54.3005	133.7833	224.9	21	5.4	518	1364.6	Yes
80	Sep-16	9:41	54.2954	133.7723	235.1	21	5.6	518	2799.6	Yes
81	Sep-16	11:39	54.3183	133.6923	248.3	21	5.2	563	1257.1	Yes
82	Sep-16	13:26	54.3276	133.6890	252.3	23	5.8	563	2588.1	Yes
83	Sep-16	15:15	54.2981	133.6921	255.3	23	6.0	563	1315.8	Yes
84	Sep-16	16:55	54.2871	133.6844	257.7	21	5.5	554	2226.9	Yes
85	Sep-16	18:27	54.2657	133.6858	259.1	22	5.5	563	1097.6	Yes
86	Sep-17	9:29	53.9891	133.6322	610.7	31	5.1	1066	299.4	Yes
87	Sep-17	11:49	54.1143	133.5727	361.9	21	5.6	700	1320.8	Yes
88	Sep-17	13:42	54.0891	133.5399	365.0	20	5.5	715	3863.2	Yes
89	Sep-17	16:05	54.0739	133.4774	222.5	18	5.9	518	3685.8	Yes
90	Sep-17	18:08	54.1157	133.4327	360.3	21	5.5	732	346.7	Yes
91	Sep-18	7:52	54.4767	133.3512	279.7	22	5.5	640	321.6	Yes
92	Sep-18	9:42	54.4414	133.2748	310.0	21	5.7	655	302.4	Yes
93	Sep-18	11:20	54.4108	133.2956	343.3	21	5.4	686	250.6	Yes
94	Sep-18	12:56	54.3969	133.2588	406.6	22	5.6	777	266.4	Yes
95	Sep-18	15:21	54.3670	133.3884	246.2	21	5.7	563	1494.2	Yes
96	Sep-18	17:25	54.2917	133.3806	443.3	21	5.8	838	196.2	Yes
97	Sep-20	7:57	54.3332	133.7568	239.8	21	5.5	554	2159.8	Yes
98	Sep-20	9:53	54.3344	133.7550	240.0	22	5.4	554	1214.2	Yes
99	Sep-20	11:48	54.3728	133.6076	205.2	21	5.8	463	903.5	Yes
100	Sep-20	13:27	54.3743	133.5833	203.7	20	5.7	457	1773.7	Yes
101	Sep-20	15:07	54.3479	133.6416	246.4	21	6.0	549	1066.0	Yes
102	Sep-20	16:29	54.3495	133.5444	249.5	21	6.0	563	592.5	Yes
103	Sep-20	18:02	54.3234	133.5500	262.5	21	5.9	600	1452.2	Yes
104	Sep-21	7:57	54.3259	133.5807	257.5	21	5.6	549	1505.0	Yes
105	Sep-21	9:48	54.3174	133.6315	256.4	21	5.4	549	1629.0	Yes
106	Sep-21	11:29	54.2836	133.6323	267.0	21	5.6	594	1126.8	Yes

Tow	Date	Time	Latitude	Longitude	Depth (m)	Duration (min)	Speed (km/h)	Warp (m)	Catch (kg)	Usable
107	Sep-21	13:06	54.2584	133.6317	277.3	21	6.0	609	1165.7	Yes
108	Sep-21	14:47	54.2750	133.5363	307.3	21	5.4	655	2231.1	Yes
109	Sep-21	16:33	54.2922	133.5281	290.3	20	5.5	640	1967.9	Yes
110	Sep-21	18:14	54.2789	133.4842	332.4	21	5.3	686	393.9	Yes
111	Sep-23	7:59	54.2204	133.5842	326.5	21	5.4	686	412.0	Yes
112	Sep-23	9:33	54.2371	133.5865	310.6	21	5.7	655	1137.2	Yes
113	Sep-23	11:10	54.1975	133.5866	332.7	21	5.7	686	213.4	Yes
114	Sep-23	12:33	54.1832	133.5511	355.6	21	5.3	700	553.8	Yes
115	Sep-23	14:07	54.1700	133.4934	370.6	21	5.5	732	387.6	Yes
116	Sep-23	15:38	54.1444	133.4296	388.2	21	5.5	777	1137.0	Yes
117	Sep-23	17:04	54.1562	133.3908	396.5	20	5.4	823	1220.0	Yes
118	Sep-23	18:35	54.1110	133.4212	323.8	21	5.4	673	305.0	Yes
119	Sep-24	7:59	54.0833	133.4465	223.4	22	6.1	518	712.2	Yes
120	Sep-24	9:52	54.2609	133.4058	432.1	22	5.3	838	176.0	Yes

APPENDIX B: CATCH BY TOW (KG). <0.01 KG ENTERED AS –

Common Name	Scientific Name	Weight (Kg)	1	2	3	4	5
Aleutian Skate	*Bathyraja aleutica*	82.00					
Arrowtooth Flounder	*Atheresthes stomias*	1787.65			30.68	20.44	
Aurora Rockfish	*Sebastes aurora*	11.44					
Big Skate	*Beringraja binoculata*	56.72					
Bigmouth Sculpin	*Hemitripterus bolini*	28.94					
Bocaccio	*Sebastes paucispinis*	65.33					
Canary Rockfish	*Sebastes pinniger*	3294.98			131.80	124.46	
Darkblotched Rockfish	*Sebastes crameri*	33.56					
Darkfin Sculpin	*Malacocottus zonurus*	46.14					
Dover Sole	*Microstomus pacificus*	864.42				0.58	0.80
Dusky Rockfish	*Sebastes variabilis*	17.59					
English Sole	*Parophrys vetulus*	48.12			0.36		
Giant Grenadier	*Albatrossia pectoralis*	569.47		62.22			5.68
Greenstriped Rockfish	*Sebastes elongatus*	117.36			3.52	1.36	
Harlequin Rockfish	*Sebastes variegatus*	108.76				0.32	
Lingcod	*Ophiodon elongatus*	299.00					
Longnose Skate	*Raja rhina*	353.18					
Longspine Thornyhead	*Sebastolobus altivelis*	520.99		23.50			15.93
North Pacific Spiny Dogfish	*Squalus suckleyi*	221.58			8.90	1.66	
Pacific Cod	*Gadus macrocephalus*	275.58					
Pacific Flatnose	*Antimora microlepis*	24.03		12.82			-
Pacific Grenadier	*Coryphaenoides acrolepis*	701.26		158.02			1.14
Pacific Hake	*Merluccius productus*	834.53					
Pacific Halibut	*Hippoglossus stenolepis*	462.74					
Pacific Ocean Perch	*Sebastes alutus*	81023.39			10.28	309.86	
Petrale Sole	*Eopsetta jordani*	33.36					
Popeye	*Coryphaenoides cinereus*	150.18		13.72			0.61
Prowfish	*Zaprora silenus*	15.61					
Redbanded Rockfish	*Sebastes babcocki*	947.51					
Redstripe Rockfish	*Sebastes proriger*	7433.08			7.34	183.66	
Rex Sole	*Glyptocephalus zachirus*	873.07			5.06	5.18	
Rosethorn Rockfish	*Sebastes helvomaculatus*	783.18					
Rougheye Rockfish	*Sebastes aleutianus*	16054.28					
Roughtail Skate	*Bathyraja trachura*	78.32		21.90			
Sablefish	*Anoplopoma fimbria*	1665.65		15.70	0.70		29.00
Sandpaper Skate	*Bathyraja interrupta*	35.99					
Sharpchin Rockfish	*Sebastes zacentrus*	13754.86			0.14	0.98	
Shining Loosejaw	*Aristostomias scintillans*	27.59	27.59				
Shortraker Rockfish	*Sebastes borealis*	517.56					
Shortspine Thornyhead	*Sebastolobus alascanus*	6706.69					7.00
Silvergray Rockfish	*Sebastes brevispinis*	10347.95			31.96	397.58	
Slender Sole	*Lyopsetta exilis*	13.07			0.14		
Splitnose Rockfish	*Sebastes diploproa*	642.99				0.86	
Spotted Ratfish	*Hydrolagus colliei*	322.67			7.40	4.16	
Twoline Eelpout	*Bothrocara brunneum*	31.70		2.28			0.81
Walleye Pollock	*Gadus chalcogrammus*	498.74			18.74	25.58	
Widow Rockfish	*Sebastes entomelas*	616.00					
Yelloweye Rockfish	*Sebastes ruberrimus*	81.56					
Yellowmouth Rockfish	*Sebastes reedi*	6313.23					
Yellowtail Rockfish	*Sebastes flavidus*	104.72				4.42	
Other		612.78	1.18	23.30	0.70	-	6.93
Total		**160511.10**	**28.77**	**333.46**	**257.72**	**1081.10**	**67.90**

Common Name	6	7	8	9	10	11	12	13	14	15	16	17
Aleutian Skate						5.38				10.14		
Arrowtooth Flounder				11.74	4.46							
Aurora Rockfish						0.62						
Big Skate												
Bigmouth Sculpin												
Bocaccio												
Canary Rockfish												
Darkblotched Rockfish												
Darkfin Sculpin				0.38		1.14	-	-		8.07		
Dover Sole			1.53		4.02	35.62	-			5.48	0.76	
Dusky Rockfish												
English Sole												
Giant Grenadier	61.46	97.75	8.92		19.80							
Greenstriped Rockfish								0.58	4.32	1.81	8.82	0.67
Harlequin Rockfish												
Lingcod												
Longnose Skate											13.12	
Longspine Thornyhead	65.34	60.12	29.86									
North Pacific Spiny Dogfish								2.52			2.16	5.34
Pacific Cod									-			
Pacific Flatnose	0.86	0.78										
Pacific Grenadier	77.54	61.08	1.36		0.06							
Pacific Hake					4.40							
Pacific Halibut								6.64	6.10			229.85
Pacific Ocean Perch				861.87		79.24	1587.61	101.20	610.97	1055.48	799.98	890.97
Petrale Sole												
Popeye	11.53	7.10	1.57									
Prowfish									7.94	1.34		
Redbanded Rockfish				2.08		0.42			2.43	4.46	0.54	
Redstripe Rockfish				0.52			51.71	132.40	1011.39	64.81	13.74	518.17
Rex Sole				0.88	-	6.50				16.48	2.32	
Rosethorn Rockfish				3.26		5.10	63.31	7.60	24.12	26.08	0.24	
Rougheye Rockfish		1.84		1.70	3.84	850.30	75.64			13.32		
Roughtail Skate	26.80	6.08										
Sablefish	39.51	37.91	46.72		69.88	1.32	2.90					
Sandpaper Skate												
Sharpchin Rockfish				3.14					3.54			
Shining Loosejaw												
Shortraker Rockfish				165.36								
Shortspine Thornyhead	11.40	20.91	10.08	50.50	87.24	83.46	70.52			296.50		
Silvergray Rockfish				10.02			110.53	90.04	1029.75	725.90	757.54	1322.24
Slender Sole				-		0.26				1.47	0.58	
Splitnose Rockfish				0.28								
Spotted Ratfish				0.66								
Twoline Eelpout	1.29	1.97			3.50							
Walleye Pollock				3.72								
Widow Rockfish				1.78			14.42	3.34	140.85	38.95	3.32	45.94
Yelloweye Rockfish												
Yellowmouth Rockfish				8.68		1.96	296.27	40.52	350.63	11.18	11.02	170.16
Yellowtail Rockfish				2.46					-		2.40	
Other	25.09	49.00	9.77	0.26	6.28	3.98	-			0.83	0.18	
Total	**320.82**	**344.54**	**109.81**	**1129.29**	**203.48**	**1075.30**	**2272.91**	**384.84**	**3192.04**	**2282.30**	**1616.72**	**3183.34**

Common Name	18	19	20	21	22	23	24	25	26	27	28	29
Aleutian Skate												
Arrowtooth Flounder	5.78		11.58	17.16	41.18			0.51		34.58	27.13	87.29
Aurora Rockfish	0.74											
Big Skate												
Bigmouth Sculpin												
Bocaccio												2.33
Canary Rockfish				3.86	35.60						4.90	7.74
Darkblotched Rockfish						10.76						
Darkfin Sculpin	-		1.32	0.16		1.44	-	1.56				
Dover Sole	23.68	4.48	1.14		0.50	1.40		5.48	1.68			3.66
Dusky Rockfish												
English Sole					0.78					0.89		34.02
Giant Grenadier		4.00							39.78			
Greenstriped Rockfish				2.74	13.27					0.06		16.67
Harlequin Rockfish			0.28	0.24	0.66						0.55	0.20
Lingcod				2.82	8.62						6.56	
Longnose Skate				28.00								
Longspine Thornyhead		32.46							42.58			
North Pacific Spiny Dogfish					1.25			1.85				
Pacific Cod			2.66	8.70	3.91							6.26
Pacific Flatnose		0.01										
Pacific Grenadier		0.36							10.02			
Pacific Hake	6.20	1.08	17.02		3.50							
Pacific Halibut			8.10		4.98						4.12	6.36
Pacific Ocean Perch			582.35	47.00	5.71	1024.66	3596.18	389.66				4.60
Petrale Sole					0.56							
Popeye		0.06							17.68			
Prowfish							1.46					
Redbanded Rockfish			28.24	3.84	5.29			1.08		1.77	59.23	
Redstripe Rockfish			11.08	36.18	50.75	156.50	606.87			56.43	6.88	99.99
Rex Sole	4.93		1.00	4.12	5.17	1.97		1.78		2.70	3.94	128.08
Rosethorn Rockfish			13.46	3.36	8.35	8.63	54.13	18.22		1.03	7.04	1.36
Rougheye Rockfish	745.21		4.12			33.35		308.77				
Roughtail Skate		0.03							0.48			
Sablefish		15.28	0.38						94.86			
Sandpaper Skate												
Sharpchin Rockfish			16.68	0.40	1.79					6.91	66.38	0.72
Shining Loosejaw												
Shortraker Rockfish	17.28		139.76					13.33				
Shortspine Thornyhead	90.54	10.24	127.92	1.60	7.74	102.20	27.43	173.93	41.96	0.78	1.28	0.24
Silvergray Rockfish			71.76	98.84	113.92	31.14	226.88	1.62		45.37	89.75	207.77
Slender Sole			0.18	0.40	0.18					0.12	0.32	0.98
Splitnose Rockfish			43.61	-	0.12							
Spotted Ratfish				3.12	6.95							3.79
Twoline Eelpout									3.02			
Walleye Pollock			4.16	8.20	4.04					0.58	0.74	13.18
Widow Rockfish			3.22	3.60	4.88	42.06	91.57	1.86				
Yelloweye Rockfish												
Yellowmouth Rockfish			7.82	1.54	0.40	285.89	3568.94				0.68	
Yellowtail Rockfish				10.68								4.77
Other	1.26	3.34	6.62	0.18	0.32	-	-	1.98	18.81	1.80	1.67	8.66
Total	**895.62**	**71.34**	**1104.46**	**286.74**	**330.42**	**1700.00**	**8173.46**	**921.63**	**270.87**	**153.02**	**281.17**	**638.67**

Common Name	30	31	32	33	34	35	36	37	38	39	40	41
Aleutian Skate										28.92		
Arrowtooth Flounder	13.12	3.59	73.91	23.37	59.51	0.76	5.04	0.54		-	1.56	4.78
Aurora Rockfish												
Big Skate												
Bigmouth Sculpin												
Bocaccio				3.44								
Canary Rockfish			45.38		2.42							
Darkblotched Rockfish	0.50									13.62		
Darkfin Sculpin	-					0.16	0.80	0.28	0.66	1.11		0.34
Dover Sole	5.62			5.72	28.47	1.70	1.78	2.98	0.66	-		1.72
Dusky Rockfish	1.36											
English Sole	3.80		1.44	0.46	2.29							
Giant Grenadier												
Greenstriped Rockfish		3.33	9.32	1.57	15.27							
Harlequin Rockfish	0.28	0.40	10.70	0.31	0.55	0.20		0.16		64.38		
Lingcod		8.26		2.61	13.72		3.14					7.28
Longnose Skate					26.95						5.34	
Longspine Thornyhead												
North Pacific Spiny Dogfish		4.30		3.03	2.71				4.19			
Pacific Cod	2.46	6.78	2.04	3.22			3.54	2.18				3.96
Pacific Flatnose												
Pacific Grenadier												
Pacific Hake	240.51										23.17	
Pacific Halibut		7.38	6.06					10.52	14.49			
Pacific Ocean Perch	453.40	589.76	21.08	12.79	7.78	2500.00	773.82	942.92	265.47	2685.09		677.59
Petrale Sole												
Popeye												
Prowfish												
Redbanded Rockfish	40.76	5.83	3.18	13.32	22.17	6.60	15.82	5.32	3.35	14.24		9.52
Redstripe Rockfish	2.54	2.73	47.09	20.26	78.43	0.58			20.73			1.74
Rex Sole	3.24	1.57	22.80	19.48	97.21	2.64	6.56	8.24	3.19	2.23	-	8.14
Rosethorn Rockfish	5.66	1.27	12.52	6.59	7.12	10.64	17.06	34.86	9.48	13.50		3.28
Rougheye Rockfish										5.38	117.03	
Roughtail Skate												
Sablefish							2.92				107.47	
Sandpaper Skate												
Sharpchin Rockfish	3.68	0.80	398.47	74.87	6.86	39.08	76.34	110.76	348.10	1432.31		41.64
Shining Loosejaw												
Shortraker Rockfish												
Shortspine Thornyhead	61.05	15.19		0.54	1.06	30.88	43.86	32.20	9.90	127.53	8.32	20.32
Silvergray Rockfish	63.55	138.17	112.22	51.24	91.38	25.54	17.60	16.92	23.18	145.98		32.08
Slender Sole	1.02	0.31	0.18	0.26	1.05		0.26	0.46				0.30
Splitnose Rockfish	379.04	6.48										
Spotted Ratfish			1.14	0.58	1.89				6.27	-	5.32	2.94
Twoline Eelpout												
Walleye Pollock	9.22	4.95	0.60		1.24							0.90
Widow Rockfish									3.49	-		
Yelloweye Rockfish			3.42	8.48								
Yellowmouth Rockfish	0.58	1.84	7.42	5.27	1.40	2.38						17.36
Yellowtail Rockfish					3.59							
Other	10.42	0.14	0.20	0.53	1.87	1.46	0.58	0.26	-	-	8.03	0.44
Total	**1301.81**	**803.08**	**779.17**	**257.94**	**474.94**	**2622.62**	**969.12**	**1168.60**	**713.16**	**4534.29**	**276.24**	**834.33**

Common Name	42	43	44	45	46	47	48	49	50	51	52	53
Aleutian Skate			12.96								4.44	
Arrowtooth Flounder	-			7.88	3.42	1.84	448.15	71.06	85.82	16.86	3.84	
Aurora Rockfish												
Big Skate												
Bigmouth Sculpin												
Bocaccio								5.28		7.54		
Canary Rockfish							122.44		415.22	4.94		
Darkblotched Rockfish												
Darkfin Sculpin	0.84	-	0.56	-		0.50				-		
Dover Sole	0.46		8.14		0.48	1.80					29.84	35.99
Dusky Rockfish		1.16										
English Sole							1.46		0.34			
Giant Grenadier												8.87
Greenstriped Rockfish							13.80	7.50	4.78			
Harlequin Rockfish		-	0.24			0.36			1.18	0.84		
Lingcod	8.54	26.40			15.10		15.38		5.18	8.40		
Longnose Skate		15.56		11.22				8.86		12.28	0.78	
Longspine Thornyhead												29.00
North Pacific Spiny Dogfish							3.58	4.06	6.58	1.64		
Pacific Cod	4.11		2.12	10.98	1.64	3.96	19.84	5.00	20.30	3.92		
Pacific Flatnose												0.26
Pacific Grenadier												0.48
Pacific Hake											15.50	
Pacific Halibut		11.08					6.19			5.36		
Pacific Ocean Perch	534.48	1607.92	514.28	2093.70	1450.79	586.42		1080.17	4.62	754.68		
Petrale Sole							26.58					
Popeye												
Prowfish												
Redbanded Rockfish	3.31	11.36	8.74	12.13		8.88				74.82		
Redstripe Rockfish	15.03	33.93	4.86	14.63	25.35	2.94	8.70	427.49	181.44	4.12		
Rex Sole	5.50	0.90	11.30	3.58	1.54	2.38	57.00	7.78	9.10		3.34	4.83
Rosethorn Rockfish	9.21	5.83	13.08	34.96	7.26	5.76			3.98	1.42		
Rougheye Rockfish										4.70	247.26	
Roughtail Skate												
Sablefish	4.22										40.28	22.33
Sandpaper Skate												
Sharpchin Rockfish	89.87	94.77	219.85	1141.64	906.81	41.42			5.48	53.92		
Shining Loosejaw												
Shortraker Rockfish											65.70	
Shortspine Thornyhead	13.29	5.83	35.94	51.72	9.97	11.66				99.18	102.54	51.66
Silvergray Rockfish	21.79	17.54	13.32	22.44	67.50	16.40	148.44	392.65	235.24	58.16		
Slender Sole			0.22			0.62	0.38			0.18		
Splitnose Rockfish								-		208.30		
Spotted Ratfish	0.52	1.48	2.04	3.54	1.92	0.84	1.76	2.26	0.68	2.96		
Twoline Eelpout												1.12
Walleye Pollock		0.86			1.18			1.56	0.64	26.62		
Widow Rockfish					2.24		3.52	18.07		8.72		
Yelloweye Rockfish												
Yellowmouth Rockfish	26.91	240.36	67.52	283.23	323.82	21.30		17.23	0.24	6.12		
Yellowtail Rockfish						1.40		21.03	12.64			
Other	0.60	1.04	0.38	1.64	0.10	0.40	4.52		0.20	3.28	5.26	5.78
Total	**738.68**	**2076.02**	**915.55**	**3693.29**	**2819.12**	**708.88**	**881.74**	**2070.00**	**993.66**	**1368.96**	**518.78**	**160.32**

Common Name	54	55	56	57	58	59	60	61	62	63	64	65
Aleutian Skate						20.16						
Arrowtooth Flounder	1.81	1.40	13.58	1.17	3.34	3.12		8.49	5.44	17.32	3.12	
Aurora Rockfish		0.60										
Big Skate												
Bigmouth Sculpin	3.01											
Bocaccio												
Canary Rockfish				30.14	16.88							
Darkblotched Rockfish												
Darkfin Sculpin	0.76					-	-		1.40	4.28		
Dover Sole	19.32	26.30	9.44			11.96	35.80	8.49	27.86	39.35	20.51	
Dusky Rockfish												
English Sole				0.60								
Giant Grenadier												96.97
Greenstriped Rockfish												
Harlequin Rockfish				4.58	3.00							
Lingcod				12.33	4.40	19.68				6.28		
Longnose Skate		14.54	3.24			9.81		2.87			3.09	
Longspine Thornyhead												45.11
North Pacific Spiny Dogfish				0.85	1.84	4.75	1.40			2.04	7.07	
Pacific Cod				9.01	3.02			2.26	2.50			
Pacific Flatnose												1.17
Pacific Grenadier												46.84
Pacific Hake		6.16	10.62			9.53	1.02	40.24			29.96	
Pacific Halibut									4.80		3.76	
Pacific Ocean Perch	455.70		10.08	56.79	3.80	2290.91	2538.11	1514.42	2528.18	3400.46	246.08	
Petrale Sole												
Popeye												48.29
Prowfish				1.61								
Redbanded Rockfish	3.73		9.50	5.84	8.12	1.00			8.36	9.84	0.63	
Redstripe Rockfish				378.39	105.59				11.00			
Rex Sole	2.92	3.00	6.54	2.30	2.04	4.88	4.46	10.92	5.24	5.45	13.47	
Rosethorn Rockfish	6.63		0.16	11.43	10.28	9.02			11.44		0.40	
Rougheye Rockfish	247.70	766.24	455.74			115.06	2393.97	2267.89	11.00	548.17	26.41	
Roughtail Skate												
Sablefish	19.61	15.38	8.48			14.96	31.12	6.58			32.10	88.10
Sandpaper Skate							6.95			1.52	0.50	
Sharpchin Rockfish				350.58	301.69		-		2.20	4.28		
Shining Loosejaw												
Shortraker Rockfish		21.56				10.02					24.07	
Shortspine Thornyhead	74.13	105.48	91.40	2.27		309.01	447.56	235.55	151.82	510.86	102.52	9.30
Silvergray Rockfish	4.01		2.84	739.01	346.81	23.64	28.10		64.42	-	3.36	
Slender Sole	0.15											
Splitnose Rockfish												
Spotted Ratfish	3.25			0.75	0.66	8.58				0.73	1.22	
Twoline Eelpout												4.41
Walleye Pollock	0.70		0.82	0.80								
Widow Rockfish				26.88	37.32			-				
Yelloweye Rockfish					8.16							
Yellowmouth Rockfish												
Yellowtail Rockfish				13.23	25.56							
Other	7.14	1.34	3.20	1.22	7.96	4.96	-	8.85	-	1.55	0.26	16.22
Total	**850.57**	**962.00**	**625.64**	**1649.78**	**890.47**	**2871.05**	**5488.49**	**4106.56**	**2835.66**	**4552.13**	**518.53**	**356.41**

Common Name	66	67	68	69	70	71	72	73	74	75	76	77
Aleutian Skate												
Arrowtooth Flounder					0.80	5.80	0.60		0.15		89.78	18.52
Aurora Rockfish						9.48						
Big Skate										56.72		
Bigmouth Sculpin					6.55							
Bocaccio												
Canary Rockfish											2.00	
Darkblotched Rockfish								5.10		0.76		
Darkfin Sculpin					3.00	0.15		3.62	2.61			
Dover Sole					5.78	31.66	1.28	3.74	1.48	6.00	0.22	26.01
Dusky Rockfish												
English Sole												
Giant Grenadier	27.55	39.84	51.82	33.46								
Greenstriped Rockfish												
Harlequin Rockfish							2.01		2.14	0.02		
Lingcod							12.94				37.26	
Longnose Skate						9.42	11.50				11.00	
Longspine Thornyhead	42.73	67.01	35.52	26.08		1.94						
North Pacific Spiny Dogfish								2.64	2.72			
Pacific Cod							3.20		2.25			
Pacific Flatnose	1.40		3.78	2.90								
Pacific Grenadier	64.76	21.50	197.63	60.47								
Pacific Hake						3.28						2.42
Pacific Halibut							4.12	6.50	12.92			
Pacific Ocean Perch					125.85	19.74	8005.53	2219.16	1511.08	1161.10	317.46	14.78
Petrale Sole									0.80			
Popeye	21.69	17.47	6.96	3.50								
Prowfish							2.06	1.20				
Redbanded Rockfish					3.84	1.10	48.15	1.10	109.36	2.78	1.09	8.54
Redstripe Rockfish								-	66.72	0.20		
Rex Sole					0.18	2.42	0.10	1.24	1.48	1.68	1.06	15.77
Rosethorn Rockfish							10.83	2.82	3.58	1.62	-	
Rougheye Rockfish					298.34	928.44		28.39				91.38
Roughtail Skate	3.14	2.27	2.91	0.32			13.93					
Sablefish	25.22	25.98	24.70	9.42	1.94	9.12			12.16		14.82	32.10
Sandpaper Skate												6.64
Sharpchin Rockfish							894.56	248.83	1196.07	0.96	-	
Shining Loosejaw												
Shortraker Rockfish						47.60						
Shortspine Thornyhead	22.46	21.15	17.20	11.81	36.54	63.28	38.92	11.48	4.54	25.94	0.40	97.79
Silvergray Rockfish							1.50	29.60	86.68	24.32	86.70	2.17
Slender Sole												
Splitnose Rockfish					0.74							
Spotted Ratfish							8.92	6.84	3.68	2.68	9.02	5.41
Twoline Eelpout	3.66	6.82	2.82									
Walleye Pollock											308.12	1.72
Widow Rockfish									43.06			
Yelloweye Rockfish												
Yellowmouth Rockfish									6.05			
Yellowtail Rockfish												
Other	19.99	59.18	52.36	5.37	1.46	4.16	-	-	0.38	0.36	1.33	7.53
Total	**232.60**	**261.22**	**395.70**	**153.33**	**485.02**	**1137.59**	**9060.15**	**2572.26**	**3069.91**	**1285.14**	**880.26**	**330.78**

Common Name	78	79	80	81	82	83	84	85	86	87	88	89
Aleutian Skate												
Arrowtooth Flounder	1.37	2.60	2.02		2.10	15.98	0.80	6.18		6.28	3.96	4.00
Aurora Rockfish												
Big Skate												
Bigmouth Sculpin			6.46									
Bocaccio												35.68
Canary Rockfish												2222.80
Darkblotched Rockfish												
Darkfin Sculpin		1.70		0.18		0.20	0.44	0.52			0.45	
Dover Sole	1.02	0.52	2.78	0.54	1.76	0.98	1.62	2.72	64.76	9.42	7.70	
Dusky Rockfish												10.95
English Sole												
Giant Grenadier									11.35			
Greenstriped Rockfish		0.42										4.22
Harlequin Rockfish		8.30	1.84									
Lingcod					1.36	2.66						20.02
Longnose Skate	11.96									15.66		
Longspine Thornyhead									3.81			
North Pacific Spiny Dogfish		3.56	16.24	4.26	24.02	7.67	4.28			6.30		8.28
Pacific Cod		6.50	10.19		16.56	6.06	2.16					1.72
Pacific Flatnose									0.05			
Pacific Grenadier												
Pacific Hake	14.23								5.64	51.84	11.74	
Pacific Halibut						18.59					6.24	7.73
Pacific Ocean Perch		308.15	1042.97	920.39	1100.98	696.83	1614.34	922.98		331.70	878.99	17.68
Petrale Sole		0.68										
Popeye												
Prowfish												
Redbanded Rockfish		7.02	17.57	2.30	9.44	3.93	15.06	6.96		3.48		
Redstripe Rockfish		211.38	167.50	150.78	1087.84	68.38	96.47	29.10				752.31
Rex Sole	0.42	3.10	1.43	1.96	3.08	4.82	4.02	4.54	14.28	33.20	0.48	
Rosethorn Rockfish		7.84	20.99	2.98	16.17	20.79	24.73	9.96		0.18	3.81	
Rougheye Rockfish	31.13	2.44							6.30	722.83	2353.96	
Roughtail Skate									0.46			
Sablefish	19.40				5.38	25.06			79.06	25.74	14.08	
Sandpaper Skate									1.16		8.12	
Sharpchin Rockfish		697.88	1040.26	146.42	258.35	384.32	403.70	80.36				
Shining Loosejaw												
Shortraker Rockfish												
Shortspine Thornyhead	18.16	7.66	26.84	4.78	36.66	29.68	45.69	22.90	102.44	111.56	563.25	
Silvergray Rockfish		80.30	254.04	10.26	9.76	16.78	10.30	3.62			8.52	567.66
Slender Sole				0.18	0.16		0.32	0.46				
Splitnose Rockfish				0.26				0.50				
Spotted Ratfish			70.66	3.10	11.34	9.51	2.08	3.68			1.10	3.62
Twoline Eelpout												
Walleye Pollock			0.35		0.28		0.68			0.74		0.46
Widow Rockfish		10.70	5.79	6.20	2.38			1.80				25.30
Yelloweye Rockfish												
Yellowmouth Rockfish		3.54	111.38	2.46								3.41
Yellowtail Rockfish												
Other	17.76	0.28	0.27	-	0.48	3.54	0.24	1.36	10.07	1.84	0.82	
Total	**115.45**	**1364.57**	**2799.58**	**1257.05**	**2588.10**	**1315.78**	**2226.93**	**1097.64**	**299.38**	**1320.77**	**3863.22**	**3685.84**

Common Name	90	91	92	93	94	95	96	97	98	99	100	101
Aleutian Skate												
Arrowtooth Flounder	65.46	7.10	5.12		1.88			3.64	2.52	2.36	0.02	4.02
Aurora Rockfish												
Big Skate												
Bigmouth Sculpin	12.92											
Bocaccio												
Canary Rockfish												
Darkblotched Rockfish												
Darkfin Sculpin		0.24	0.12	-		-		2.78	0.70	0.14		0.20
Dover Sole	27.58	15.40	39.82	42.93	23.60	1.24	0.42	6.00	1.20	0.50		1.82
Dusky Rockfish												3.06
English Sole												
Giant Grenadier												
Greenstriped Rockfish										0.92	0.25	
Harlequin Rockfish								2.58			0.36	
Lingcod			12.74						12.74			
Longnose Skate		5.44		7.16	15.36				11.62			4.20
Longspine Thornyhead												
North Pacific Spiny Dogfish			2.24						6.05	6.32	6.34	4.00
Pacific Cod		3.74				15.56		10.30	11.35	6.20		9.42
Pacific Flatnose												
Pacific Grenadier												
Pacific Hake	50.88	-		6.53	45.06		29.26					
Pacific Halibut	2.40			18.36		5.38					5.82	
Pacific Ocean Perch	28.54	203.48	49.92	37.78	7.26	1271.59	5.08	1652.77	570.63	349.72	410.64	576.70
Petrale Sole										4.74		
Popeye												
Prowfish												
Redbanded Rockfish	1.40	2.40	11.18	17.24		17.04		8.58	17.13	20.82	77.72	22.30
Redstripe Rockfish		0.32				4.85	0.52	8.56	58.80	80.68	237.14	0.98
Rex Sole	20.10	6.72	38.94	8.31	0.40	1.14	-	7.64	6.79	1.28		7.64
Rosethorn Rockfish		0.36	0.34			2.92		4.94	12.97	7.10	1.30	8.08
Rougheye Rockfish	13.00	3.44	21.12	13.57	9.86		47.63					
Roughtail Skate												
Sablefish	3.78		1.66	6.56	113.19	4.10	88.01					14.58
Sandpaper Skate			1.64	3.06	2.92							
Sharpchin Rockfish		-		0.10	0.26	101.32		392.23	445.31	131.84	764.95	155.70
Shining Loosejaw												
Shortraker Rockfish			8.10									
Shortspine Thornyhead	90.12	54.74	102.16	73.47	14.40	31.26	14.92	4.10	15.41	0.52	0.39	19.42
Silvergray Rockfish		12.84				6.10		33.56	26.58	163.15	184.96	9.84
Slender Sole												0.40
Splitnose Rockfish												0.30
Spotted Ratfish			1.44	5.28	10.60	4.64	1.30	3.72	4.18	2.24	0.74	2.32
Twoline Eelpout												
Walleye Pollock		4.90	3.18	6.24	3.98	4.44						0.56
Widow Rockfish	1.40					2.94		10.68		2.14		2.34
Yelloweye Rockfish									2.24	14.62	44.64	
Yellowmouth Rockfish						19.52		5.30	7.37	108.13	37.27	215.50
Yellowtail Rockfish												
Other	29.10	0.50	2.72	3.97	17.64	0.16	9.08	2.44	0.65	0.08	1.15	2.66
Total	**346.68**	**321.62**	**302.44**	**250.56**	**266.41**	**1494.20**	**196.22**	**2159.82**	**1214.24**	**903.50**	**1773.69**	**1066.04**

Common Name	102	103	104	105	106	107	108	109	110	111	112	113
Aleutian Skate												
Arrowtooth Flounder	0.09	8.52	1.42	0.52	3.20		2.28			2.12	4.92	16.00
Aurora Rockfish			-									
Big Skate												
Bigmouth Sculpin												
Bocaccio												
Canary Rockfish												
Darkblotched Rockfish						0.80				1.02	1.00	
Darkfin Sculpin	0.49	0.22	0.48	0.24	0.20	0.20	0.10	0.52	0.22	0.01	-	
Dover Sole	0.42	1.92	5.62	2.16	5.04	7.88	3.64	4.98	3.76	7.32	2.78	1.50
Dusky Rockfish												
English Sole												
Giant Grenadier												
Greenstriped Rockfish												
Harlequin Rockfish						0.06		0.42			0.30	
Lingcod			10.42									
Longnose Skate				26.90				11.90		7.16		7.22
Longspine Thornyhead												
North Pacific Spiny Dogfish			2.34	1.86	4.40	2.30				8.68		2.22
Pacific Cod	1.04	2.64	1.90				4.08	3.72				
Pacific Flatnose												
Pacific Grenadier												
Pacific Hake										1.50	0.94	10.68
Pacific Halibut												
Pacific Ocean Perch	447.95	1221.79	1274.08	1393.32	950.48	1040.56	2042.15	1746.42	272.47	281.92	858.02	64.84
Petrale Sole												
Popeye												
Prowfish												
Redbanded Rockfish	4.41	16.40	14.52	13.54	4.68	5.30	6.03	5.90	1.75	1.38	1.32	2.08
Redstripe Rockfish			3.98	2.04	0.98	0.42						
Rex Sole	6.62	8.08	12.66	8.32	8.38	4.36	3.54	1.82	2.30	1.98	5.16	1.10
Rosethorn Rockfish	21.73	15.66	6.16	5.20	13.56	19.64	16.45	11.78	2.86	1.38	5.30	0.42
Rougheye Rockfish						1.96	14.89	2.58	14.66	1.02	175.06	17.86
Roughtail Skate												
Sablefish									6.50	40.28	2.90	31.88
Sandpaper Skate												
Sharpchin Rockfish	75.85	136.72	112.58	139.33	84.26	14.26			0.02			
Shining Loosejaw												
Shortraker Rockfish												
Shortspine Thornyhead	23.59	20.48	31.84	17.34	38.24	38.50	120.48	120.42	86.96	45.95	69.88	52.70
Silvergray Rockfish	2.92	5.36	22.46	14.48	5.26	25.44	12.98	46.06		2.40	1.68	
Slender Sole	0.18	0.12			0.34		0.20	0.15			0.24	0.16
Splitnose Rockfish								0.74		0.84		0.48
Spotted Ratfish	2.06	2.40	1.44		4.70	0.60	1.20	1.46	1.28	1.94		
Twoline Eelpout												
Walleye Pollock						0.92	1.40	0.66		3.50	5.20	
Widow Rockfish				1.36			1.50					
Yelloweye Rockfish												
Yellowmouth Rockfish	3.86	1.88		1.90				6.99				
Yellowtail Rockfish												
Other	1.24	10.00	3.10	0.49	3.05	2.52	0.19	1.36	1.11	1.57	2.51	4.21
Total	**592.45**	**1452.19**	**1505.00**	**1629.00**	**1126.77**	**1165.72**	**2231.11**	**1967.88**	**393.89**	**411.97**	**1137.21**	**213.35**

Common Name	114	115	116	117	118	119	120
Aleutian Skate							
Arrowtooth Flounder	14.54	9.24	10.70	24.18	137.76	120.48	2.25
Aurora Rockfish							
Big Skate							
Bigmouth Sculpin							
Bocaccio						11.06	
Canary Rockfish						124.40	
Darkblotched Rockfish							
Darkfin Sculpin			0.32	0.12	0.20	0.01	
Dover Sole	4.86	2.36	5.02	37.92	20.96	0.58	
Dusky Rockfish					1.06		
English Sole						1.68	
Giant Grenadier							
Greenstriped Rockfish						2.16	
Harlequin Rockfish				0.18	0.32	0.80	
Lingcod					14.16		
Longnose Skate	12.92			3.06		11.96	13.08
Longspine Thornyhead							
North Pacific Spiny Dogfish	7.82	1.66			2.46	11.20	
Pacific Cod						22.62	
Pacific Flatnose							
Pacific Grenadier							
Pacific Hake	63.88	54.92	32.60	7.74	12.42		20.06
Pacific Halibut				21.66		17.23	
Pacific Ocean Perch	216.20	65.56	76.18	79.40	39.36	19.96	
Petrale Sole							
Popeye							
Prowfish							
Redbanded Rockfish	8.12	4.82	1.04		2.94		
Redstripe Rockfish						7.14	
Rex Sole	1.83		8.56	45.72	21.44	3.10	-
Rosethorn Rockfish					0.60		
Rougheye Rockfish	109.92	123.84	879.19	880.74	2.42		13.67
Roughtail Skate							
Sablefish	68.30	66.10	29.90	22.26			93.76
Sandpaper Skate				1.48			2.00
Sharpchin Rockfish		0.06	0.66	0.18		1.36	0.06
Shining Loosejaw							
Shortraker Rockfish				4.78			
Shortspine Thornyhead	37.66	54.66	84.36	84.44	31.56		9.58
Silvergray Rockfish						293.53	
Slender Sole	0.14						
Splitnose Rockfish			0.44				
Spotted Ratfish		0.74				49.34	
Twoline Eelpout							
Walleye Pollock	1.16	1.12	1.42		10.34	8.34	
Widow Rockfish						2.38	
Yelloweye Rockfish							
Yellowmouth Rockfish							
Yellowtail Rockfish						2.54	
Other	6.46	2.51	6.60	6.14	7.02	0.31	21.49
Total	**553.81**	**387.59**	**1136.99**	**1220.00**	**305.02**	**712.18**	**175.95**