Summary of the West Coast Haida Gwaii Synoptic Bottom Trawl Survey, August 24 - September 19, 2012

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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 24 - September 19, 2012. Can. Manuscr. Rep. Fish. Aquat. Sci. 3133: viii + 55 p.

A bottom trawl survey off the west coast of Haida Gwaii was conducted on the fishing vessel Nordic Pearl between August 24 and September 19, 2012. 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 thirty (92.2%) of the 141 blocks assessed in 2012 were successfully fished. The mean catch per tow was 1,107 kg with 9-32 species per tow. The average number of species per tow was 20. The most abundant fish species encountered was Pacific Ocean Perch (*Sebastes alutus)* followed by Rougheye Rockfish (*Sebastes aleutianus*), Sharpchin Rockfish (*Sebastes zacentrus*), Silvergray Rockfish (*Sebastes brevispinus),* and Yellowmouth Rockfish (*Sebastes reedi*). Biological data including individual length, weight, sex, maturity, and ageing structures were collected from selected species. Samples were collected from a total of 53 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 effectué entre le 24 août et 19 septembre 2012 dans la côte ouest d'Haida Gwaii. Rapp. manus. can. sci. halieut. aquat. 3133: viii + 55 p.

Un relevé au chalut de fond au large de la côte ouest d'Haida Gwaii a été effectué par le navire de pêche *Nordic Pearl* entre le 24 août et le 19 septembre 2012. 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 141 blocs évalués en 2012, 130 (92,2 %) ont fait l'objet d'une pêche. La moyenne de prises par trait était de 1107 kg, avec entre 9 et 32 espèces par trait. Le nombre moyen d'espèces par trait était de 20. 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 bouche jaune (*Sebastes reedi*). 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 53 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 in 2006 to 2008 (Workman et al. 2007, Workman et al. 2008 and Olsen et al. 2008) and has been repeated every second year with the fourth survey occurring in 2010 (Olsen et al. 2017). This document provides a brief summary of the results and methods from the fifth WCHG synoptic bottom trawl survey which occurred between August 24 and September 19, 2012. 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.

Up until 2010, WCHG charters have been based on completing a set number of blocks. There was a final drop dead date (mid-October) that was several weeks later than the anticipated end date (end of September). This contract structure ensured that all blocks would be assessed even in years with abnormally high numbers of days that were unfishable due to poor weather. When using this method, the risk of poor weather was entirely on the vessel and there would be no impact to the scientific results (assessing all

the selected blocks). Unfortunately, one unintended consequence of these contracts was that vessels may have been forced to submit "worst case" scenario bids. Vessels would need to assume that the survey might run to the final drop dead date and would submit bids based on that number of days instead of the anticipated number of days. For the 2010 survey, an attempt was made to reduce the cost of the survey by sharing the risk of the survey running long between both the vessel and the scientific results. Given that in most years the surveys have been completed well in advance of the drop dead date, it was expected that on average, if the drop dead date was changed to be closer to the anticipated end date, the surveys would still be completed and that bids would be lower.

The anticipated end date includes a certain number of days lost to bad weather but if there are substantially more weather days, there is a risk of an uneven survey design. For example, if the survey is cut short some northern or deep areas could be missed if the vessel works in one direction through the entire set of blocks. To avoid such a situation, in 2010 the selected blocks were divided into a primary set and a secondary set. The primary set consisted of three-quarters of the total blocks and was visited first. The secondary set was visited once the primary set of blocks was completed. Although this method ensured the survey maintained the relative allocation of effort, it actually complicated the at-sea planning. Further, it reduced the efficiency of fishing operations as the average distance between blocks in the secondary set was substantial.

For 2012 the idea of creating a primary set and a secondary set of blocks was abandoned. To keep bids low, a realistic end date was set for the end of September that included some weather days. In most years, the survey has been completed well in advance of the drop dead date so the minimal risk of an uneven design was considered acceptable. Further, given modern communication systems and weather forecasting, it was likely that, while at sea, any extended lengths of unfishable weather would be predictable. If it appeared that all the selected blocks could not be assessed by the end date, it would be possible to randomly or selectively remove blocks as needed to maintain the target relative allocation of blocks amongst depth strata.

For the 2012 WCHG survey, 141 blocks were randomly selected with the target of 125 successful tows (Table 1).

VESSEL

The survey was conducted aboard the F/V Nordic Pearl, a 35 m commercial stern trawler (Figure 2).

FISHING GEAR

The research trawl was an Atlantic Western IIA box trawl net connected to approximately 850 kg Thyboron Type II 104 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 includes 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 has 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 are constructed from single 4.5 mm strand 4½ inch web (Figure 7). All web in the main body and lengthening pieces is constructed from a compacted strand braided polyethylene (Euroline Premium). The codend is 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 includes flying wing, mid wing, bunt wing, and bosom sections (Figure 8). The bosom section is built from 16 inch diameter (worn 18 inch) aircraft tires, while the bunt and mid wing sections have 16 inch Rockhopper disks. The flying wings have 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 eleven days in duration with five science staff in each. Crew changes were on September 3 and September 10 (Table 3).

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 14 hours, starting at approximately 0700 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. Approximately one minute before the target tow length was completed, net haul back was initiated. The extra minute was intended to account for uptake of slack in the main warps. Although the target on-bottom time was 20 or 30 minutes, tows that were at least 14 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 the vessel's hopper. The Nordic Pearl fish processing room includes a conveyor system that allows catch to be sorted by species into separate baskets as it moves towards the fish hold. 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 is commercially exploited. Biological samples were typically not collected from unusable tows.

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 1 cm for length samples, and 0.5 cm for age samples 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.

There are a variety of hard parts of a fish that can be used to determine the age of the fish (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*), and Pacific Cod (*Gadus macrocephalus*). 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 2012, samples of *Paragorgia sp* corals were collected as well as tissue for DNA analysis from Yelloweye Rockfish (*Sebastes ruberrimus*), a Blue Shark (*Prionace glausa*) and Blackspotted (*Sebastes melanostictus*) /Rougheye Rockfish (*Sebastes aleutianus*).

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 do not attempt to partition the catch data for this report.

NET-MOUNTED SENSORS AND DATA RECORDERS

The F/V Nordic Pearl is equipped with a Notus trawl mensuration system. Sensors attached to the net use acoustic signals to communicate with each other and the vessel and provide real-time net geometry. The Notus system only included doorspread sensors so a Furuno CN24 net sounder was used for headline height above bottom and depth. The sensor 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 consists of a pressure housing with an Onset Hobo data recorder in a stainless steel sled that trails behind the footrope.

The Hobo recorder measures acceleration in three axes which can then be converted into angles. The recorder is mounted in the sled such that the x-axis tilt indicates the angle of the steel sled. When the footgear contacts the bottom, the sled angle is approximately 80 degrees. When the footrope is off the bottom, the sled hangs down and the angle is approximately 40 degrees. These data are 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, BC.

RESULTS

FISHING

The 2012 WCHG synoptic bottom trawl survey was divided into three legs of eight to eleven days. From a total of 27 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 one and a half days at end of the survey, three days were required for offloading catch and changing crews, one day was spent unloading the vessel at the end of the survey and two fishing days were lost due to weather as well as one travel day to change crews. Thus, there was a total of approximately 15.5 full fishing days (Table 3).

From a total of 141 blocks assessed during the 2012 survey, 130 blocks were successfully fished, nine blocks were rejected based on on-ground inspection and two blocks were rejected after one or more failed fishing attempts (Table 4 and Figure 9).

A total of 141 tows, of which 130 were useable, were completed during the 16 days that fishing occurred. Table 5 shows tow results by stratum for this survey. The

scope (ratio of warp length to bottom depth) used for tows in 2012 is shown in Table 6 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 148,941 kg of fish and invertebrates was caught during the 2012 WCHG survey. The total catch weight for useable tows was typically less than 1,500 kg per tow, and averaged 1,107 kg per tow (Figure 11). The majority of the catch (147,492 kg, 99.0%) consisted of 98 different species of fish, including 23 rockfish and 8 flatfish species. The remainder (1,447 kg) consisted of 100 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 32 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 7. 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 Yellowmouth Rockfish (*Sebastes reedi*). 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 Conservation and Research Society (Table 8).

BIOLOGICAL SAMPLING

Biological samples were collected from a total of 17,137 individuals of 53 species of fish. The number of samples and recorded biological attributes per species is shown in Table 9. A summary of the biological data collected for each species is shown in Table 10.

NET-MOUNTED SENSORS AND DATA RECORDERS

Headline height and depth information was recorded from the Furuno CN24 system for 112 tows. (Table 11). Although the Notus system appeared to function properly, the doorspread values that were collected were not believable so the data have been excluded from the table.

Seabird SBE39 data (water temperature and depth) were collected from 141 tows while Seabird SBE19plus and SBE43 data (conductivity, water temperature, depth, and dissolved oxygen) were collected from 140 tows (Table 11 and Figure 13).

BCS data were collected from 107 tows (Table 11). An example of the type of data collected by the BCS is shown in Figure 14.

Global positioning system (GPS) data and Simrad bottom sounder data are available for all 141 tows.

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Table 1. 2012 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	74	0.09	81
330-500	31	0.06	33
500-800	10	0.09	11
800-1300	10	0.38	16
Total	**125**		**141**

Table 2. Atlantic Western IIa box trawl net specifications on the 2012 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. Summary of operations during the 2012 WCHG synoptic bottom trawl survey.

	Fishing				Tows			
Date	Start	End	Hours	Blocks Assessed	Useable	Not Useable	Total	Notes
08/24/2012	-	-	-	-	-	-	-	loading and set-up
08/25/2012	-	-	-	-	-	-	-	travel
08/26/2012	-	-	-	-	-	-	-	travel
08/27/2012	7:56	18:58	11	8	6	1	7	
08/28/2012	7:25	19:06	12	9	7	1	8	
08/29/2012	7:30	16:04	9	10	6	1	7	
08/30/2012	7:32	19:42	12	9	9	1	10	
08/31/2012	7:31	19:18	12	9	9	1	10	
09/01/2012	7:50	19:18	12	9	9	0	9	
09/02/2012	7:36	16:01	9	7	7	2	9	
09/03/2012	-	-	-	-	-	-	-	offload and science crew change
09/04/2012	9:25	19:27	10	8	7	0	7	
09/05/2012	7:38	18:43	11	10	10	1	11	
09/06/2012	7:48	19:38	12	12	11	0	11	
09/07/2012	7:56	18:48	11	7	7	1	8	
09/08/2012	7:43	18:42	11	11	11	0	11	
09/09/2012	-	-	-	-	-	-	-	travel
09/10/2012	-	-	-	-	-	-	-	offload and science crew change
09/11/2012	7:57	19:25	12	9	8	0	8	
09/12/2012	-	-	-	-	-	-	-	anchored due to weather
09/13/2012	-	-	-	-	-	-	-	anchored due to weather
09/14/2012	7:49	19:17	12	9	9	2	11	
09/15/2012	8:00	19:22	11	11	11	0	11	
09/16/2012	7:58	11:07	4	3	3	0	3	half day travel
09/17/2012	-	-	-	-	-	-	-	offload in Prince Rupert
09/18/2012	-	-	-	-	-	-	-	travel
09/19/2012	-	-	-	-	-	-	-	unload in Nanaimo
Total				**141**	**130**	**11**	**141**	
Average Per Day				**8.9**	**8.1**	**0.7**	**8.8**	

Table 4. Block results by stratum for the 2012 WCHG synoptic bottom trawl survey.

Depth Stratum (m)	Successful	Rejected Prior	Rejected Inspected	Rejected Failed	Total
180-330	75	0	5	1	81
330-500	29	0	3	1	33
500-800	10	0	1	0	11
800-1300	16	0	0	0	16
Total	**130**	**0**	**9**	**2**	**141**

Table 5. Tow results by stratum for the 2012 WCHG synoptic bottom trawl survey.

Depth Stratum (m)	Usable	Not Usable
180-330	75	8
330-500	29	3
500-800	10	0
800-1300	16	0
Total	130	11

Table 6. Mean warp length and scope by 50 meter depth interval for the 2012 WCHG synoptic bottom trawl survey.

Depth (m)	Mean Warp (m)	Mean Scope
150-200	503	2.71
200-250	582	2.61
250-300	693	2.55
300-350	841	2.61
350-400	919	2.47
400-450	1029	2.39
450-500	1097	2.40
500-550	1097	2.17
650-700	1463	2.17
750-800	1646	2.17
800-850	1463	1.80
850-900	1768	2.01
950-1000	1829	1.87
1000-1050	2012	1.97
1050-1100	2012	1.84
1100-1150	2073	1.85
1150-1200	2126	1.79
1250-1300	2316	1.83

Table 7. Frequency of occurrence, maximum catch weight, mean catch weight per tow, and total survey catch weight of each species captured during the 2012 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*	123	181.58	36.92	4541.53
Pacific Ocean Perch	*Sebastes alutus*	92	6521.28	664.33	61118.35
Redbanded Rockfish	*Sebastes babcocki*	88	68.00	7.16	629.66
Rosethorn Rockfish	*Sebastes helvomaculatus*	85	34.38	6.42	538.88
Silvergray Rockfish	*Sebastes brevispinis*	82	2318.31	155.30	12734.62
Sharpchin Rockfish	*Sebastes zacentrus*	72	5715.03	218.36	15721.63
Rougheye Rockfish	*Sebastes aleutianus*	70	6188.70	261.81	18326.76
Redstripe Rockfish	*Sebastes proriger*	44	2796.69	146.93	6464.85
Harlequin Rockfish	*Sebastes variegatus*	40	117.38	9.13	365.35
Greenstriped Rockfish	*Sebastes elongatus*	28	30.76	5.25	146.89
Yellowmouth Rockfish	*Sebastes reedi*	27	2238.83	341.03	9207.90
Longspine Thornyhead	*Sebastolobus altivelis*	26	50.76	17.78	462.24
Shortraker Rockfish	*Sebastes borealis*	24	367.40	41.63	999.05
Widow Rockfish	*Sebastes entomelas*	23	488.20	48.11	1106.60
Splitnose Rockfish	*Sebastes diploproa*	16	322.75	39.85	637.65
Yellowtail Rockfish	*Sebastes flavidus*	13	53.32	9.71	126.28
Canary Rockfish	*Sebastes pinniger*	13	111.70	27.18	353.40
Bocaccio	*Sebastes paucispinis*	9	14.20	7.77	69.90
Dusky Rockfish	*Sebastes variabilis*	9	105.78	13.71	123.41
Aurora Rockfish	*Sebastes aurora*	7	6.83	2.73	19.11
Darkblotched Rockfish	*Sebastes crameri*	6	27.46	8.46	50.74
Yelloweye Rockfish	*Sebastes ruberrimus*	6	57.22	19.83	118.98
Pygmy Rockfish	*Sebastes wilsoni*	3	1.04	0.47	1.42
Flatfishes	**Order Pleuronectiformes**				
Arrowtooth Flounder	*Atheresthes stomias*	114	576.92	28.03	3195.09
Rex Sole	*Glyptocephalus zachirus*	108	58.60	6.83	737.64
Dover Sole	*Microstomus pacificus*	103	67.90	7.55	769.71
Pacific Halibut	*Hippoglossus stenolepis*	48	106.00	15.18	728.82
Slender Sole	*Lyopsetta exilis*	29	0.64	0.19	5.35
Petrale Sole	*Eopsetta jordani*	17	71.35	5.87	99.76
English Sole	*Parophrys vetulus*	6	19.68	4.11	24.68
Deepsea Sole	*Embassichthys bathybius*	4	1.56	0.87	3.49
Cod-Like Fishes	**Order Gadiformes**				
Walleye Pollock	*Gadus chalcogrammus*	70	68.58	6.19	433.05
Pacific Hake	*Merluccius productus*	51	328.31	33.55	1711.10
Pacific Cod	*Gadus macrocephalus*	35	93.62	10.93	382.56
Pacific Grenadier	*Coryphaenoides acrolepis*	23	80.45	27.35	629.01
Giant Grenadier	*Albatrossia pectoralis*	22	84.10	20.46	450.07
Popeye	*Coryphaenoides cinereus*	22	176.68	16.73	367.97
Pacific Flatnose	*Antimora microlepis*	16	14.24	2.85	45.67
Cartilaginous Fish	**Class Chondrichthyes**				
Spotted Ratfish	*Hydrolagus colliei*	59	89.34	4.26	251.41
Longnose Skate	*Raja rhina*	33	29.32	10.97	362.16
North Pacific Spiny Dogfish	*Squalus suckleyi*	20	16.74	2.95	59.01
Sandpaper Skate	*Bathyraja interrupta*	15	3.00	1.41	21.22
Roughtail Skate	*Bathyraja trachura*	14	13.38	3.51	49.19
Aleutian Skate	*Bathyraja aleutica*	6	18.96	7.95	47.68
Abyssal Skate	*Bathyraja abyssicola*	2	7.50	7.18	14.36
Brown Cat Shark	*Apristurus brunneus*	1	0.60	0.60	0.60

Common Name	Scientific Name	Number of Tows	Catch Weight (kg)		
			Max	Mean	Total
Blue Shark	*Prionace glauca*	1	9.24	9.24	9.24
Greenlings	**Family Hexagrammidae**				
Lingcod	*Ophiodon elongatus*	25	34.48	11.19	279.80
Sculpins	**Family Cottidae**				
Darkfin Sculpin	*Malacocottus zonurus*	70	1.46	0.43	26.45
Tadpole Sculpin	*Psychrolutes paradoxus*	2	-	-	-
Spotfin Sculpin	*Icelinus tenuis*	2	-	-	-
Flabby Sculpin	*Zesticelus profundorum*	1	-	-	-
Whitetail Sculpin	*Malacocottus aleuticus*	1	-	-	-
Bigmouth Sculpin	*Hemitripterus bolini*	1	3.76	3.76	3.76
Dusky Sculpin	*Icelinus burchami*	1	-	-	-
Eelpouts	**Family Zoarcidae**				
Black Eelpout	*Lycodes diapterus*	12	0.30	0.16	1.09
Deepwater Eelpout	*Lycodapus endemoscotus*	8	0.05	0.05	0.05
Twoline Eelpout	*Bothrocara brunneum*	6	3.78	1.36	8.15
Bigfin Eelpout	*Lycodes cortezianus*	5	0.48	0.32	1.59
Pallid Eelpout	*Lycodapus mandibularis*	3	-	-	-
Snakehead Eelpout	*Lycenchelys crotalina*	3	0.14	0.10	0.19
Poachers	**Family Agonidae**				
Blackfin Poacher	*Bathyagonus nigripinnis*	8	-	-	-
Smootheye Poacher	*Xeneretmus leiops*	4	0.08	0.08	0.08
Bigeye Poacher	*Bathyagonus pentacanthus*	7	0.10	0.07	0.28
Lanternfishes	**Family Myctophidae**				
Northern Lampfish	*Stenobrachius leucopsarus*	23	0.62	0.27	1.36
Garnet Lanternfish	*Stenobrachius nannochir*	20	0.17	0.11	0.65
California Headlightfish	*Diaphus theta*	9	-	-	-
Lanternfish	*Tarletonbeania* (Genus)	9	0.25	0.16	0.31
Pinpoint Lampfish	*Nannobrachium regale*	8	0.34	0.17	0.69
Lanternfishes	Myctophidae (Family)	6	0.14	0.14	0.14
Blue Lanternfish	*Tarletonbeania crenularis*	4	-	-	-
Other Fish					
Sablefish	*Anoplopoma fimbria*	72	468.36	38.62	2780.50
Pacific Viperfish	*Chauliodus macouni*	26	0.20	0.12	0.87
Deepsea Smelts	Bathylagidae (Family)	19	0.45	0.20	3.18
Crested Bigscale	*Poromitra crassiceps*	12	0.18	0.11	0.43
Chum Salmon	*Oncorhynchus keta*	11	9.96	5.74	63.16
Longfin Dragonfish	*Tactostoma macropus*	7	0.06	0.06	0.17
Snailfishes	*Liparis* (Genus)	6	-	-	-
Northern Ronquil	*Ronquilus jordani*	5	0.09	0.07	0.21
Prowfish	*Zaprora silenus*	3	10.20	4.79	14.38
Barracudinas	Paralepididae (Family)	3	-	-	-
Stout Blacksmelt	*Pseudobathylagus milleri*	3	0.10	0.10	0.10
Pacific Blacksmelt	*Bathylagus pacificus*	2	0.06	0.06	0.06
Pacific Lamprey	*Entosphenus tridentatus*	2	-	-	-
Snipe Eels	Nemichthyidae (Family)	2	-	-	-
Shining Tubeshoulder	*Sagamichthys abei*	2	0.11	0.11	0.21
Pearly Prickleback	*Bryozoichthys marjorius*	2	0.10	0.09	0.17
Alaska Snailfish	*Careproctus colletti*	2	0.44	0.44	0.44
Humpback Snailfish	*Elassodiscus caudatus*	2	-	-	-
Lightfish/Hatchetfish/Dragonfish	Stomiiformes (Order)	1	-	-	-
Emarginate Snailfish	*Careproctus furcellus*	1	0.40	0.40	0.40
Ragfish	*Icosteus aenigmaticus*	1	38.28	38.28	38.28
Smalldisk Snailfish	*Careproctus gilberti*	1	0.30	0.30	0.30
Blacktail Snailfish	*Careproctus melanurus*	1	0.32	0.32	0.32

Common Name	Scientific Name	Number of Tows	Catch Weight (kg)		
			Max	Mean	Total
Decorated Warbonnet	*Chirolophis decoratus*	1	0.16	0.16	0.16
White Barracudina	*Arctozenus risso*	1	-	-	-
Dreamers	Oneirodidae (Family)	1	-	-	-
Lampreys	Petromyzontidae (Family)	1	-	-	-
Crabs and Shrimp	**Class Malacostraca**				
Prawn	*Pandalus platyceros*	40	0.92	0.37	14.51
Yellowleg Shrimp	*Pandalus tridens*	29	-	-	-
Sidestripe Shrimp	*Pandalopsis dispar*	19	0.18	0.11	1.46
Grooved Tanner Crab	*Chionoecetes tanneri*	13	2.88	1.20	12.00
Deepsea Eualid	*Eualus biunguis*	12	-	-	-
Glass Shrimp	*Pasiphaea pacifica*	12	-	-	-
-	*Lithodes couesi*	11	1.35	0.71	4.97
Spiny Ridge Shrimp	*Notostomus japonicus*	4	-	-	-
Pink Shrimp (smooth)	*Pandalus jordani*	4	-	-	-
Deepwater Decorator Crab	*Oregonia bifurca*	4	-	-	-
Redclaw Crab	*Chorilia longipes*	3	-	-	-
-	*Neognathophausia* (Genus)	3	-	-	-
Isopods	Isopoda (Order)	3	-	-	-
Crimson Pasiphaeid	*Pasiphaea tarda*	3	0.06	0.06	0.11
Graceful Decorator Crab	*Oregonia gracilis*	3	-	-	-
Brown Box Crab	*Lopholithodes foraminatus*	2	0.44	0.30	0.60
Squat Lobster	*Munida quadrispina*	2	-	-	-
Brown King Crab	*Paralithodes brevipes*	1	0.42	0.42	0.42
-	*Paralomis multispina*	1	-	-	-
Right-handed Hermits	Paguridae (Family)	1	-	-	-
Northern Argid	*Argis lar*	1	-	-	-
Sea Stars	**Class Asteroidea**				
Spiny Red Sea Star	*Hippasteria spinosa*	9	1.00	0.32	1.26
-	*Hippasteria* (Genus)	6	3.02	0.69	4.14
-	*Zoroaster evermani*	5	-	-	-
-	*Poraniopsis inflatus inflatus*	4	0.16	0.16	0.16
Rose Starfish	*Crossaster papposus*	4	-	-	-
-	*Cheiraster dawsoni*	4	0.09	0.09	0.09
-	*Nearchaster* (Genus)	3	-	-	-
-	*Henricia* (Genus)	3	-	-	-
-	*Tarsaster alaskanus*	3	-	-	-
Fish-eating Star	*Stylasterias forreri*	2	-	-	-
-	*Lophaster furcilliger vexator*	2	0.08	0.08	0.08
-	*Crossaster* (Genus)	2	-	-	-
-	*Solaster* (Genus)	2	-	-	-
-	*Nearchaster aciculosus*	2	-	-	-
-	*Cheiraster* (Genus)	2	0.16	0.16	0.16
Starfish	Asteroidea (Class)	1	-	-	-
-	*Mediaster* (Genus)	1	-	-	-
-	*Pseudarchaster* (Genus)	1	0.08	0.08	0.08
Vermillion Starfish	*Mediaster aequalis*	1	0.02	0.02	0.02
Cookie Star	*Ceramaster patagonicus*	1	-	-	-
-	*Hippasteria californica*	1	-	-	-
-	*Ceramaster clarki*	1	-	-	-
Cushion Star	*Pteraster tesselatus*	1	-	-	-
-	*Pteraster* (Genus)	1	-	-	-
-	*Solaster paxillatus*	1	0.14	0.14	0.14
-	*Henricia aspera*	1	-	-	-
-	*Tarsaster* (Genus)	1	-	-	-

Common Name	Scientific Name	Number of Tows	Catch Weight (kg)		
			Max	Mean	Total
-	*Myxoderma sacculatum*	1	-	-	-
Brittle Stars	**Class Ophiuroidea**				
Basket Star	*Gorgonocephalus eucnemis*	14	1.08	0.29	2.60
-	*Ophiacantha* (Genus)	7	0.57	0.57	0.57
-	*Asteroschema sublaeve*	6	-	-	-
-	*Amphiophiura superba*	5	0.10	0.10	0.10
-	*Amphiophiura ponderosa*	4	0.24	0.24	0.24
-	*Ophiopthalmus normani*	1	-	-	-
Sea Cucumbers	**Class Holothuroidea**				
Soft Sea Cucumber	*Pseudostichopus mollis*	11	1.70	1.70	1.70
Armoured Sea Cucumber	*Psolus chitinoides*	1	-	-	-
Scaly Sea Cucumber	*Psolus squamatus*	1	-	-	-
-	*Pseudostichopus* (Genus)	1	0.64	0.64	0.64
Octopuses and Squid	**Class Cephalopoda**				
Schoolmaster Gonate Squid	*Berryteuthis magister*	76	30.08	4.98	358.35
Squids	Teuthida (Order)	13	1.06	0.43	3.85
Flapjack Devilfish	*Opisthoteuthis californiana*	5	0.92	0.56	1.67
Giant Squid	*Architeuthis martensi*	3	11.76	5.91	17.72
Pacific Bobtail Squid	*Rossia pacifica*	2	0.05	0.05	0.05
Octopus	*Octopus* (Genus)	2	-	-	-
-	*Belonella borealis*	2	-	-	-
Giant Pacific Octopus	*Enteroctopus dofleini*	1	0.52	0.52	0.52
-	Histioteuthidae (Family)	1	0.17	0.17	0.17
-	*Chiroteuthis calyx*	1	0.30	0.30	0.30
Neon Flying Squid	*Ommastrephes bartramii*	1	2.45	2.45	2.45
Gonate Squids	Gonatidae (Family)	1	19.14	19.14	19.14
-	*Gonatus berryi*	1	0.10	0.10	0.10
Sea Urchins	**Super Order Echinacea**				
Fragile Urchin	*Allocentrotus fragilis*	6	0.06	0.06	0.06
Sea Urchins	Echinacea (Super Order)	1	-	-	-
Jellyfish	**Phylum Cnidaria**				
Jellyfish	Scyphozoa (Class)	14	0.42	0.18	1.98
-	*Periphylla periphylla*	7	-	-	-
-	*Cyanea* (Genus)	3	0.26	0.2	0.61
Moon Jelly	*Aurelia aurita*	2	-	-	-
-	*Atolla* (Genus)	2	0.10	0.08	0.15
Anemones and Corals	**Class Anthozoa**				
Anemone	Actiniaria (Order)	36	1.38	0.48	7.20
-	*Primnoa* (Genus)	14	750.00	71.50	857.95
-	Virgulariidae (Family)	10	0.32	0.29	0.58
-	*Virgularia* (Genus)	7	-	-	-
Bubble Gum Coral	*Paragorgia arborea*	4	1.46	0.62	1.86
-	*Isidella* (Genus)	3	0.10	0.10	0.10
-	*Lillipathes* (Genus)	2	-	-	-
-	*Bathypathes patula*	1	-	-	-
Snails and Slugs	**Class Gastropoda**				
Oregontriton	*Fusitriton oregonensis*	4	0.08	0.08	0.08
Rosy Tritonia	*Tritonia diomedea*	4	1.68	0.59	2.34
-	*Neptunea* (Genus)	2	0.12	0.12	0.12
Other Invertebrate Species					
Sponges	Porifera (Phylum)	52	25.76	2.02	89.02
Salps	Thaliacea (Class)	19	0.53	0.38	0.75
Glass Sponges	Hexactinellida (Class)	17	14.63	2.44	31.72
Sea Mouse	*Aphrodita* (Genus)	6	-	-	-

Common Name	Scientific Name	Number of Tows	Catch Weight (kg)		
			Max	Mean	Total
-	Tunicata (Sub Phylum)	5	0.96	0.38	1.15
-	*Boltenia* (Genus)	5	0.98	0.51	1.54
Sea Lilies And Feather Stars	Crinoidea (Class)	3	-	-	-
-	Antedonidae (Family)	2	-	-	-
Fish Eggs		1	-	-	-
Polychaete Worms	Polychaeta (Class)	1	-	-	-

Table 8. Offloaded catch weight by species for the 2012 WCHG synoptic bottom trawl survey.

Species	Weight (kg)
Canary Rockfish	41.3
Darkblotched Rockfish	29.7
Dover Sole	224.6
English Sole	8.4
Lingcod	56.4
Pacific Cod	29.3
Pacific Ocean Perch	57194.1
Petrale Sole	41.7
Redbanded Rockfish	127.9
Redstripe Rockfish	6004.7
Rex Sole	11.1
Rougheye Rockfish	16128.8
Sablefish	2117.8
Sharpchin Rockfish	3827.2
Shortraker Rockfish	118.5
Shortspine Thornyhead	3991.0
Silvergray Rockfish	10723.4
Splitnose Rockfish	40.4
Widow Rockfish	748.5
Yellowmouth Rockfish	8378.5
Yellowtail Rockfish	49.3
Total	**109892.6**

Table 9. Species sampled during the 2012 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
Abyssal Skate	*Bathyraja abyssicola*	2	2	2	2	0	0
Aleutian Skate	*Bathyraja aleutica*	6	6	5	6	0	0
Arrowtooth Flounder	*Atheresthes stomias*	50	837	837	837	66	65
Aurora Rockfish	*Sebastes aurora*	6	19	19	19	0	0
Blue Shark	*Prionace glauca*	1	1	1	1	0	0
Bocaccio	*Sebastes paucispinis*	8	12	12	12	12	12
Brown Cat Shark	*Apristurus brunneus*	1	1	1	1	0	0
Canary Rockfish	*Sebastes pinniger*	12	118	118	118	98	98
Chum Salmon	*Oncorhynchus keta*	11	12	12	12	0	0
Darkblotched Rockfish	*Sebastes crameri*	4	24	24	24	0	0
Darkfin Sculpin	*Malacocottus zonurus*	1	11	0	0	0	0
Deepsea Sole	*Embassichthys bathybius*	4	8	8	8	0	0
Dover Sole	*Microstomus pacificus*	42	629	629	629	229	229
Dusky Rockfish	*Sebastes variabilis*	9	29	29	29	17	17
English Sole	*Parophrys vetulus*	1	22	22	22	0	0
Giant Grenadier	*Albatrossia pectoralis*	22	256	256	256	0	42
Greenstriped Rockfish	*Sebastes elongatus*	15	339	339	339	24	24
Harlequin Rockfish	*Sebastes variegatus*	28	291	291	291	183	183
Lingcod	*Ophiodon elongatus*	23	39	36	39	0	0
Longnose Skate	*Raja rhina*	31	36	36	35	0	0
Longspine Thornyhead	*Sebastolobus altivelis*	25	630	630	630	0	261
North Pacific Spiny Dogfish	*Squalus suckleyi*	20	29	29	29	0	0
Pacific Cod	*Gadus macrocephalus*	33	150	150	150	57	57
Pacific Flatnose	*Antimora microlepis*	15	95	95	95	0	26
Pacific Grenadier	*Coryphaenoides acrolepis*	23	543	543	543	0	151
Pacific Hake	*Merluccius productus*	29	555	555	555	175	176
Pacific Halibut	*Hippoglossus stenolepis*	44	81	72	62	0	0
Pacific Ocean Perch	*Sebastes alutus*	72	1765	1765	1765	1320	1320
Petrale Sole	*Eopsetta jordani*	17	65	65	65	35	35
Popeye	*Coryphaenoides cinereus*	22	328	328	328	0	88
Prowfish	*Zaprora silenus*	3	5	5	5	0	0
Pygmy Rockfish	*Sebastes wilsoni*	3	21	21	21	0	0
Redbanded Rockfish	*Sebastes babcocki*	48	525	525	525	331	332
Redstripe Rockfish	*Sebastes proriger*	23	479	479	479	198	198
Rex Sole	*Glyptocephalus zachirus*	46	823	823	823	86	86
Rosethorn Rockfish	*Sebastes helvomaculatus*	51	1138	1138	1138	114	115
Rougheye Rockfish	*Sebastes aleutianus*	66	954	954	954	952	954
Roughtail Skate	*Bathyraja trachura*	14	31	31	31	0	0
Sablefish	*Anoplopoma fimbria*	68	640	640	640	314	309
Sandpaper Skate	*Bathyraja interrupta*	13	17	17	17	0	0
Sharpchin Rockfish	*Sebastes zacentrus*	36	824	824	824	330	330
Shortraker Rockfish	*Sebastes borealis*	22	112	112	112	112	112
Shortspine Thornyhead	*Sebastolobus alascanus*	103	2189	2187	2188	0	423
Silvergray Rockfish	*Sebastes brevispinis*	49	987	987	987	537	537
Slender Sole	*Lyopsetta exilis*	1	9	9	9	0	0
Splitnose Rockfish	*Sebastes diploproa*	8	108	108	108	83	83
Spotted Ratfish	*Hydrolagus colliei*	12	192	192	192	0	0
Twoline Eelpout	*Bothrocara brunneum*	3	12	12	6	0	0
Walleye Pollock	*Gadus chalcogrammus*	64	505	505	505	39	39
Widow Rockfish	*Sebastes entomelas*	20	181	181	181	34	34

Common Name	Scientific Name	Number of Samples	Number of Recorded Biological Attributes				
			Length	Weight	Sex	Maturity	Age
Yelloweye Rockfish	*Sebastes ruberrimus*	6	30	30	30	30	30
Yellowmouth Rockfish	*Sebastes reedi*	14	370	370	370	264	260
Yellowtail Rockfish	*Sebastes flavidus*	5	52	52	52	0	0
Total		**1255**	**17137**	**17111**	**17099**	**5640**	**6626**

Table 10. Summary of biological data collected during the 2012 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	Length (cm)			Weight (kg)			Female
Common Name	**Scientific Name**	**Samples**	**Specimens**	**Type**	**Min.**	**Max.**	**Mean**	**Min.**	**Max.**	**Mean**	**Proportion**
Abyssal Skate	*Bathyraja abyssicola*	2	2	Total	11	115	63	6.8	7.5	7.1	1.00
Aleutian Skate	*Bathyraja aleutica*	6	6	Total	69	139	105	2.0	12.3	5.8	0.33
Arrowtooth Flounder	*Atheresthes stomias*	50	837	Fork	14	84	48	<0.1	6.3	1.2	0.64
Aurora Rockfish	*Sebastes aurora*	6	19	Fork	25	37	33	0.2	0.9	0.6	0.53
Blue Shark	*Prionace glauca*	1	1	Total	141	141	141	9.2	9.2	9.2	1.00
Bocaccio	*Sebastes paucispinis*	8	12	Fork	65	87	74	3.4	8.8	5.4	0.42
Brown Cat Shark	*Apristurus brunneus*	1	1	Total	55	55	55	0.6	0.6	0.6	-
Canary Rockfish	*Sebastes pinniger*	12	118	Fork	36	62	50	0.8	3.6	2.2	0.42
Chum Salmon	*Oncorhynchus keta*	11	12	Fork	58	86	73	2.4	8.7	5.2	0.33
Darkblotched Rockfish	*Sebastes crameri*	4	24	Fork	36	51	46	1.0	2.9	2.0	0.92
Darkfin Sculpin	*Malacocottus zonurus*	1	11	Total	7	22	15	-	-	-	-
Deepsea Sole	*Embassichthys bathybius*	4	8	Total	20	39	32	0.1	0.7	0.4	0.25
Dover Sole	*Microstomus pacificus*	42	629	Total	24	59	40	0.1	2.4	0.7	0.23
Dusky Rockfish	*Sebastes variabilis*	9	29	Fork	40	47	44	1.1	1.9	1.4	0.48
English Sole	*Parophrys vetulus*	1	22	Total	30	46	36	0.2	1.1	0.5	0.68
Giant Grenadier	*Albatrossia pectoralis*	22	256	-	-	-	-	0.3	10.3	1.4	0.49
Greenstriped Rockfish	*Sebastes elongatus*	15	339	Fork	14	35	26	<0.1	0.6	0.2	0.44
Harlequin Rockfish	*Sebastes variegatus*	28	291	Fork	13	34	26	<0.1	0.5	0.2	0.59
Lingcod	*Ophiodon elongatus*	23	39	Fork	70	108	87	3.2	12.6	6.3	0.97
Longnose Skate	*Raja rhina*	31	36	Total	79	146	110	2.6	18.5	8.8	0.54
Longspine Thornyhead	*Sebastolobus altivelis*	25	630	Total	7	32	21	<0.1	0.4	0.1	0.45
North Pacific Spiny Dogfish	*Squalus suckleyi*	20	29	Total	62	95	79	0.8	4.4	2.0	0.28
Pacific Cod	*Gadus macrocephalus*	33	150	Fork	33	82	59	0.4	5.9	2.3	0.47
Pacific Flatnose	*Antimora microlepis*	15	95	Total	14	53	41	<0.1	1.1	0.5	0.29
Pacific Grenadier	*Coryphaenoides acrolepis*	23	543	-	-	-	-	<0.1	1.4	0.3	0.42
Pacific Hake	*Merluccius productus*	29	555	Fork	41	74	52	0.5	3.1	0.9	0.68
Pacific Halibut	*Hippoglossus stenolepis*	44	81	Fork	54	140	81	1.7	34.8	7.0	0.61
Pacific Ocean Perch	*Sebastes alutus*	72	1765	Fork	17	52	40	0.1	2.0	0.9	0.47
Petrale Sole	*Eopsetta jordani*	17	65	Total	29	50	39	0.2	1.4	0.6	0.25
Popeye	*Coryphaenoides cinereus*	22	328	-	-	-	-	<0.1	0.6	0.2	0.52
Prowfish	*Zaprora silenus*	3	5	Fork	56	73	62	1.7	4.9	2.8	0.60

Common Name	Scientific Name	Number of Samples	Number of Specimens	Length Type	Length (cm) Min.	Length (cm) Max.	Length (cm) Mean	Weight (kg) Min.	Weight (kg) Max.	Weight (kg) Mean	Female Proportion
Pygmy Rockfish	*Sebastes wilsoni*	3	21	Fork	14	22	18	<0.1	0.1	0.1	0.90
Redbanded Rockfish	*Sebastes babcocki*	48	525	Fork	11	59	35	<0.1	3.6	0.9	0.48
Redstripe Rockfish	*Sebastes proriger*	23	479	Fork	26	45	35	0.2	1.1	0.6	0.58
Rex Sole	*Glyptocephalus zachirus*	46	823	Total	22	45	33	0.1	0.6	0.2	0.32
Rosethorn Rockfish	*Sebastes helvomaculatus*	51	1138	Fork	13	38	26	<0.1	0.8	0.2	0.49
Rougheye Rockfish	*Sebastes aleutianus*	66	954	Fork	15	66	45	<0.1	5.9	1.5	0.46
Roughtail Skate	*Bathyraja trachura*	14	31	Total	25	81	59	0.1	3.0	1.6	0.32
Sablefish	*Anoplopoma fimbria*	68	640	Fork	38	104	63	0.5	12.6	2.8	0.32
Sandpaper Skate	*Bathyraja interrupta*	13	17	Total	41	64	54	0.4	1.5	1.0	0.47
Sharpchin Rockfish	*Sebastes zacentrus*	36	824	Fork	10	41	27	<0.1	1.0	0.3	0.57
Shortraker Rockfish	*Sebastes borealis*	22	112	Fork	18	103	72	0.1	18.2	7.5	0.53
Shortspine Thornyhead	*Sebastolobus alascanus*	103	2189	Total	7	73	26	<0.1	6.3	0.3	0.42
Silvergray Rockfish	*Sebastes brevispinis*	49	987	Fork	40	72	52	0.7	5.2	1.9	0.49
Slender Sole	*Lyopsetta exilis*	1	9	Total	19	26	22	<0.1	0.1	0.1	0.44
Splitnose Rockfish	*Sebastes diploproa*	8	108	Fork	16	38	26	0.1	1.0	0.3	0.54
Spotted Ratfish	*Hydrolagus colliei*	12	192	2nd Dorsal	8	54	28	<0.1	1.8	0.4	0.60
Twoline Eelpout	*Bothrocara brunneum*	3	12	Total	20	60	39	<0.1	1.2	0.5	0.67
Walleye Pollock	*Gadus chalcogrammus*	64	505	Fork	16	69	35	<0.1	2.3	0.4	0.72
Widow Rockfish	*Sebastes entomelas*	20	181	Fork	39	58	49	0.9	2.8	1.8	0.59
Yelloweye Rockfish	*Sebastes ruberrimus*	6	30	Fork	48	72	57	2.0	8.2	4.0	0.53
Yellowmouth Rockfish	*Sebastes reedi*	14	370	Fork	25	54	43	0.2	2.7	1.4	0.54
Yellowtail Rockfish	*Sebastes flavidus*	5	52	Fork	45	56	51	1.5	2.6	2.0	0.79

Table 11. Summary of data from net-mounted recorders during the 2012 WCHG synoptic bottom trawl survey, showing the number of tows and total number of records. A total of 141 survey tows were conducted, of which 130 were useable. Although the Notus system appeared to function properly during the survey, the data that was collected was not useable.

		Number of	
Data Recorder	**Attribute**	**Tows**	**Records**
Simrad ES60 Depth Sounder	Bottom Depth (m)	141	150610
Hobo Pendant Acceleration Data Logger	Bottom Contact Sensor Tilt Angle	107	47347
Furuno CN24 net sounder	Headline Depth (m)	111	574
	Headline height above bottom (m)	112	574
Seabird SBE19plus Seacat Profiler	Conductivity of sea water (S/m)/ Salinity (PSU)	140	46423
	Water temperature (^{o}C)	140	46423
	Pressure (db)/ Depth (m)	140	46423
Seabird SBE43	Oxygen voltage (V)/ Dissolved oxygen (ml/L)	140	46423
Seabird SBE39 Temperature And Pressure Recorder	Water temperature (^{o}C)	141	92527
	Pressure (db)/ depth (m)	141	92527

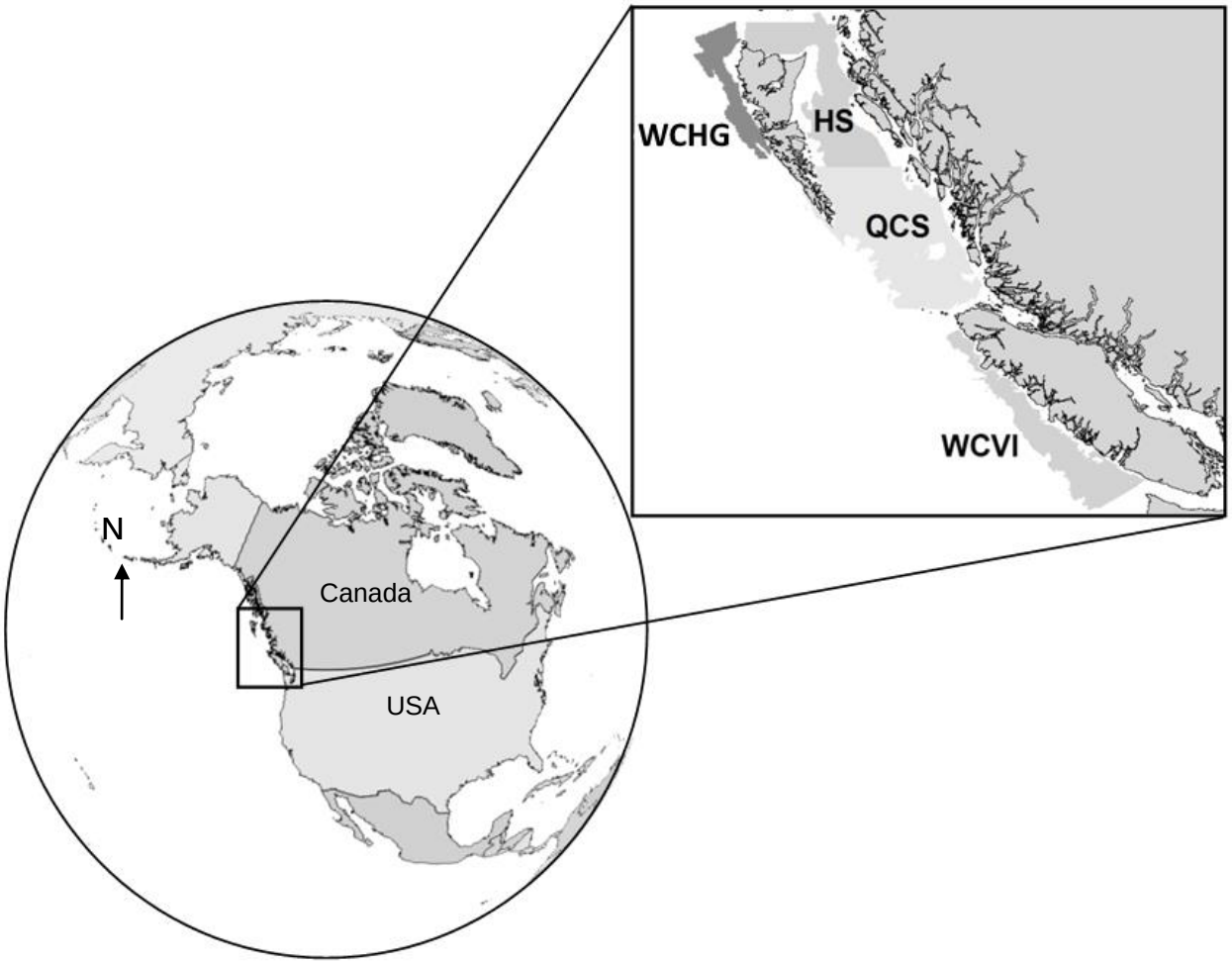

Figure 1. Locations of the current synoptic bottom trawl surveys on the coast of British Columbia, Canada. WCHG = West Coast Haida Gwaii; HS = Hecate Strait; QCS = Queen Charlotte Sound; WCVI = West Coast Vancouver Island.

Figure 2. The commercial stern trawler F/V Nordic Pearl used for the 2012 WCHG synoptic bottom trawl survey. (Photo: Schon Acheson).

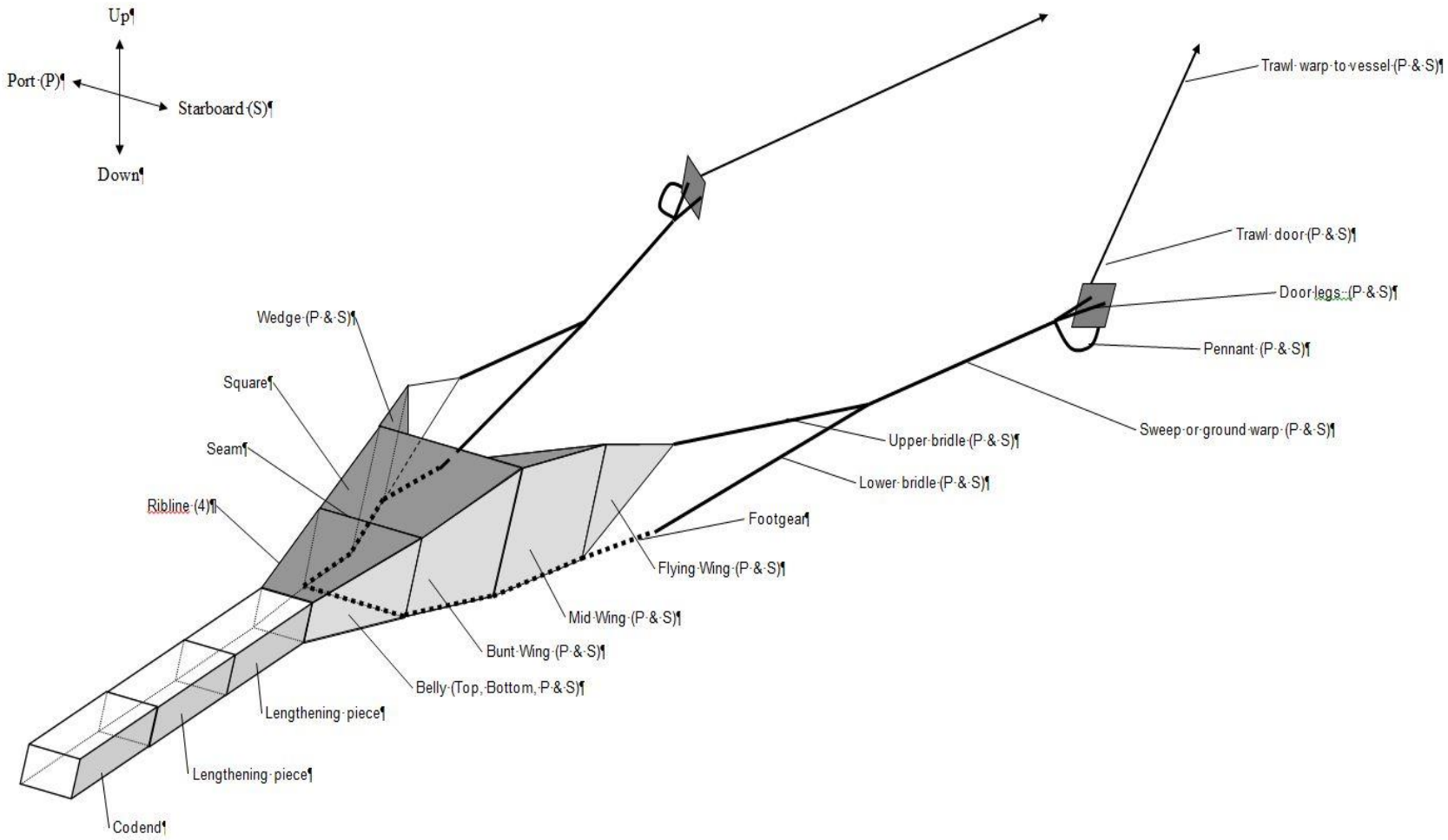

Figure 3. Overview diagram of the Atlantic Western IIa box trawl used on the 2012 WCHG synoptic bottom trawl survey.

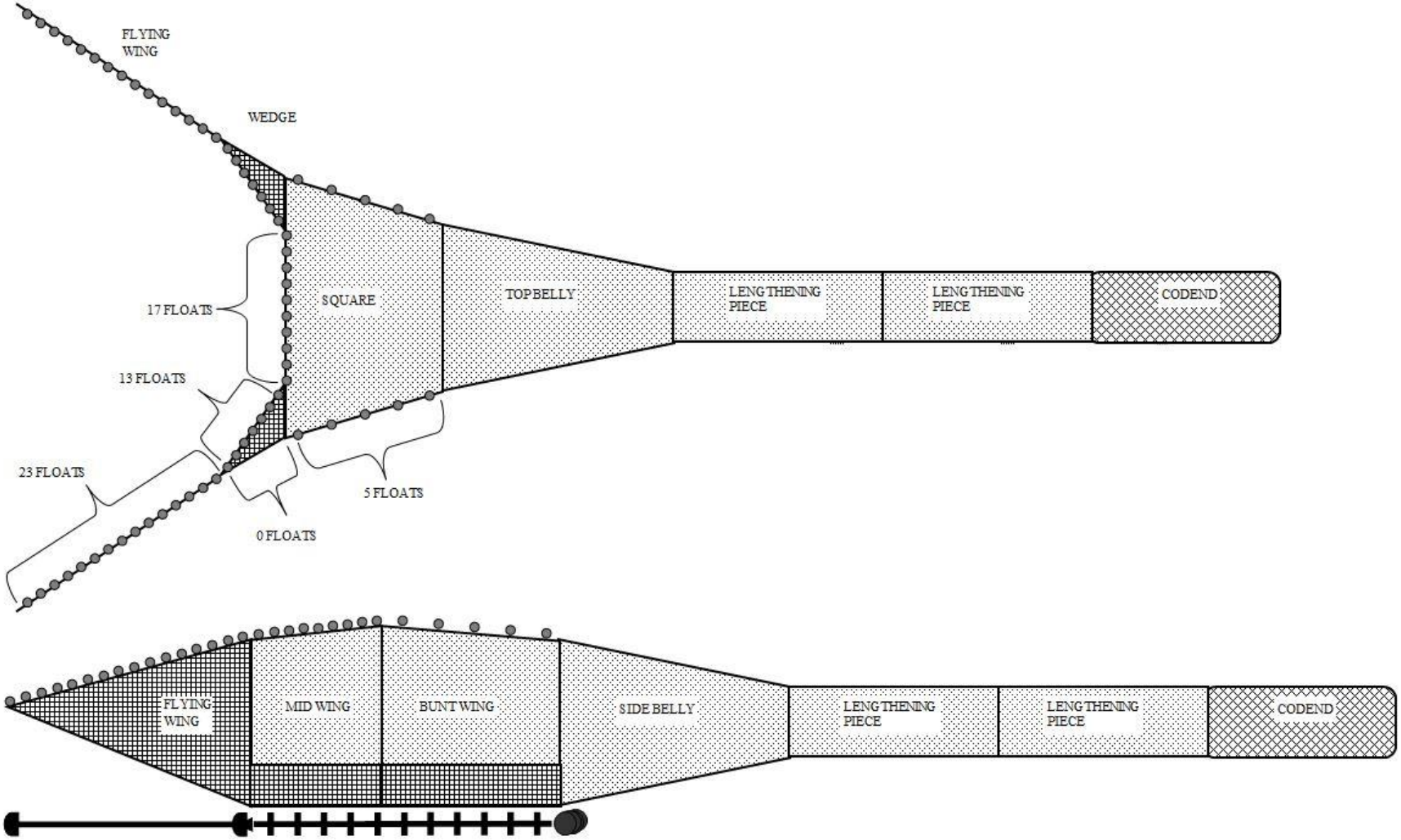

Figure 4. Top and side view of the Atlantic Western IIa box trawl used on the 2012 WCHG synoptic bottom trawl survey.

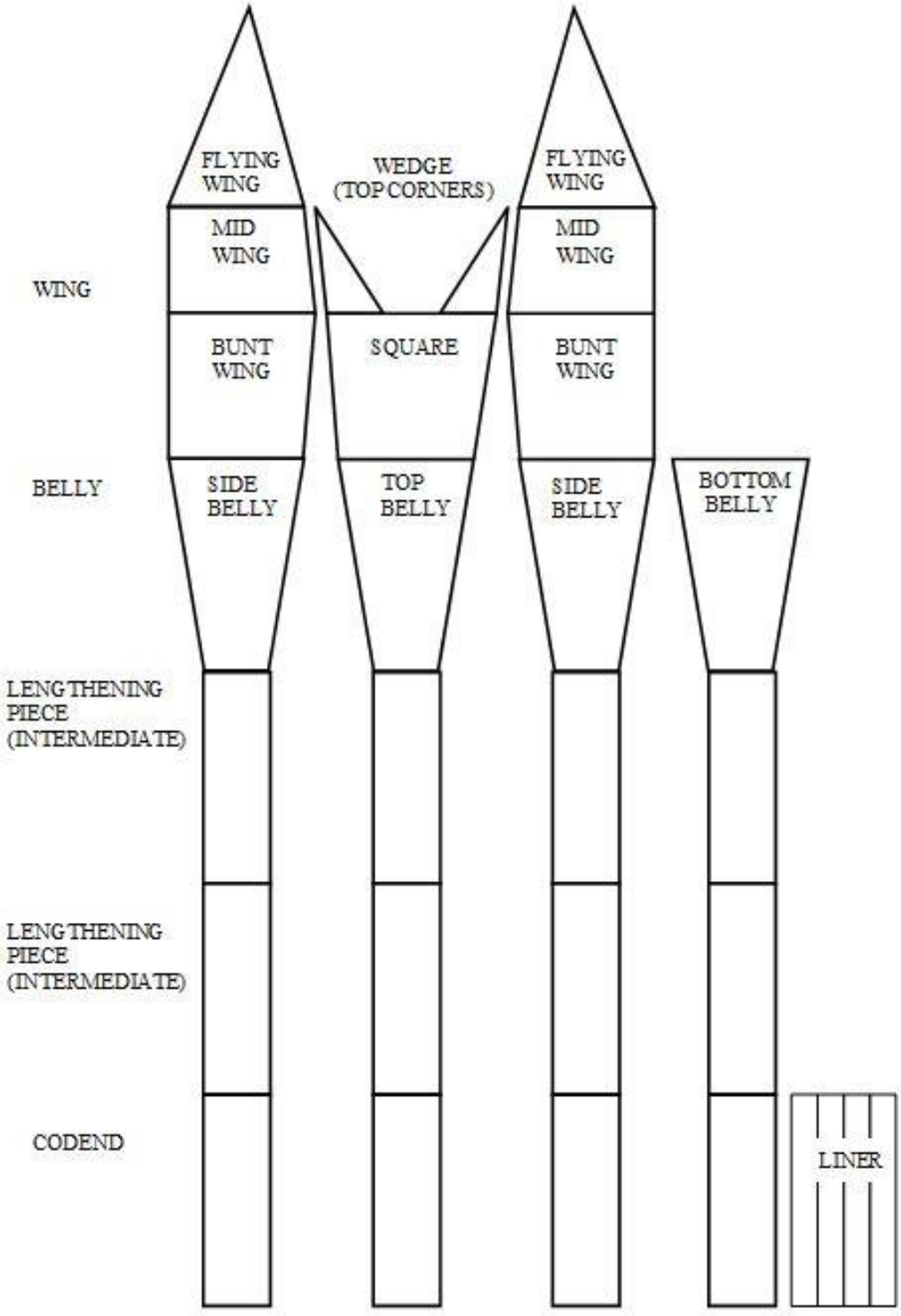

Figure 5. Diagram of the net panels with section names for the Atlantic Western IIa box trawl used on the 2012 WCHG synoptic bottom trawl survey.

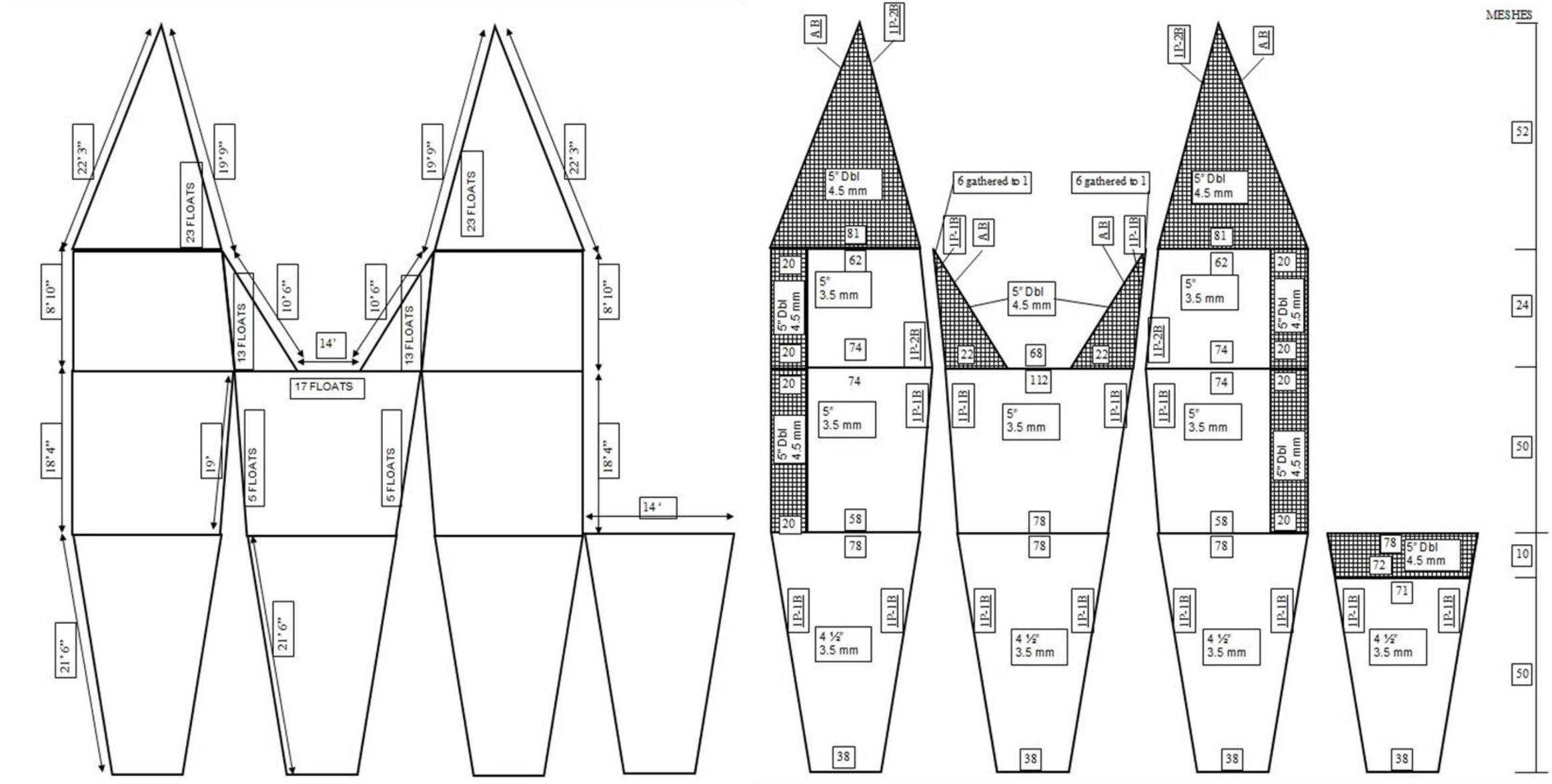

Figure 6. Schematics of the wing and belly sections of the Atlantic Western IIa box trawl used on the 2012 WCHG synoptic bottom trawl survey. Dimensions and the float arrangement are shown on the left while netting details, mesh counts, and mesh cuts are shown on the right side of the diagram.

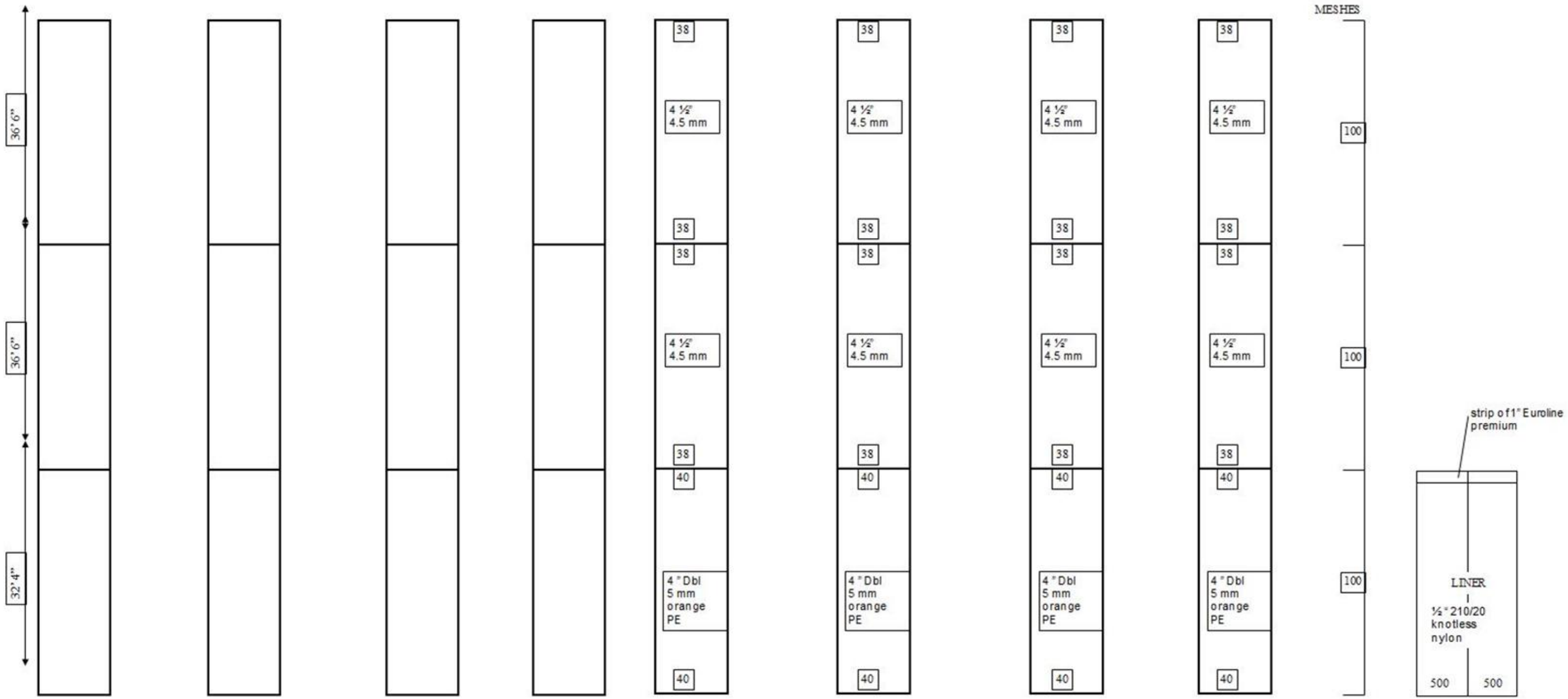

Figure 7. Details of the lengthening (intermediate) pieces and codend sections of the Atlantic Western IIa box trawl used on the 2012 WCHG synoptic bottom trawl survey. Dimensions are shown on the left while netting details, mesh counts, and mesh cuts including the codend liner are shown on the right side of the diagram.

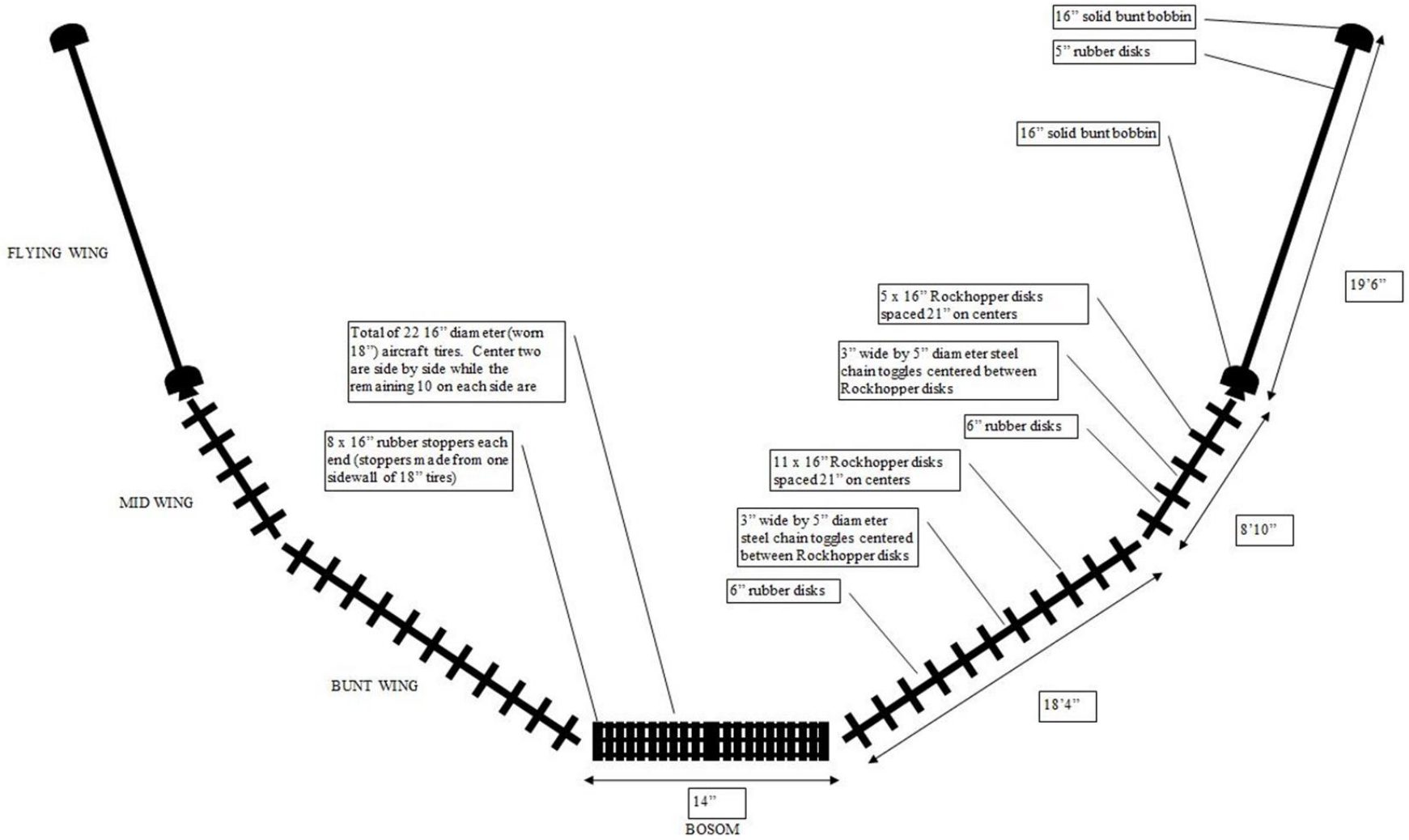

Figure 8. Details of the Rockhopper foot gear for the Atlantic Western IIa box trawl used on the 2012 WCHG synoptic bottom trawl survey.

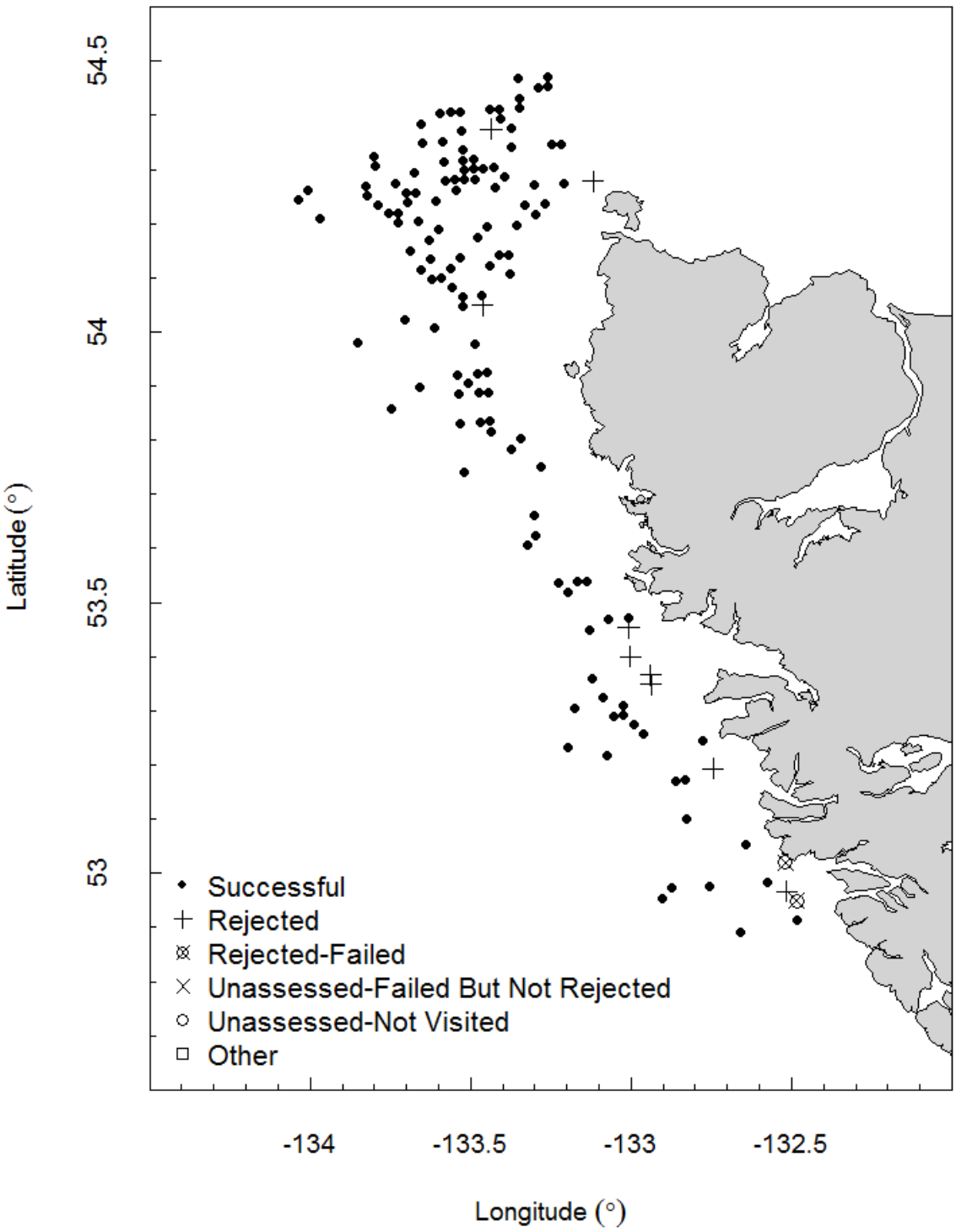

Figure 9. Final status of the 2012 WCHG synoptic bottom trawl survey showing 130 successfully fished blocks (Successful), nine blocks rejected after inspection (Rejected), and two blocks rejected after one or more failed fishing attempts (Rejected-Failed). No blocks remained unassessed at the end of the survey.

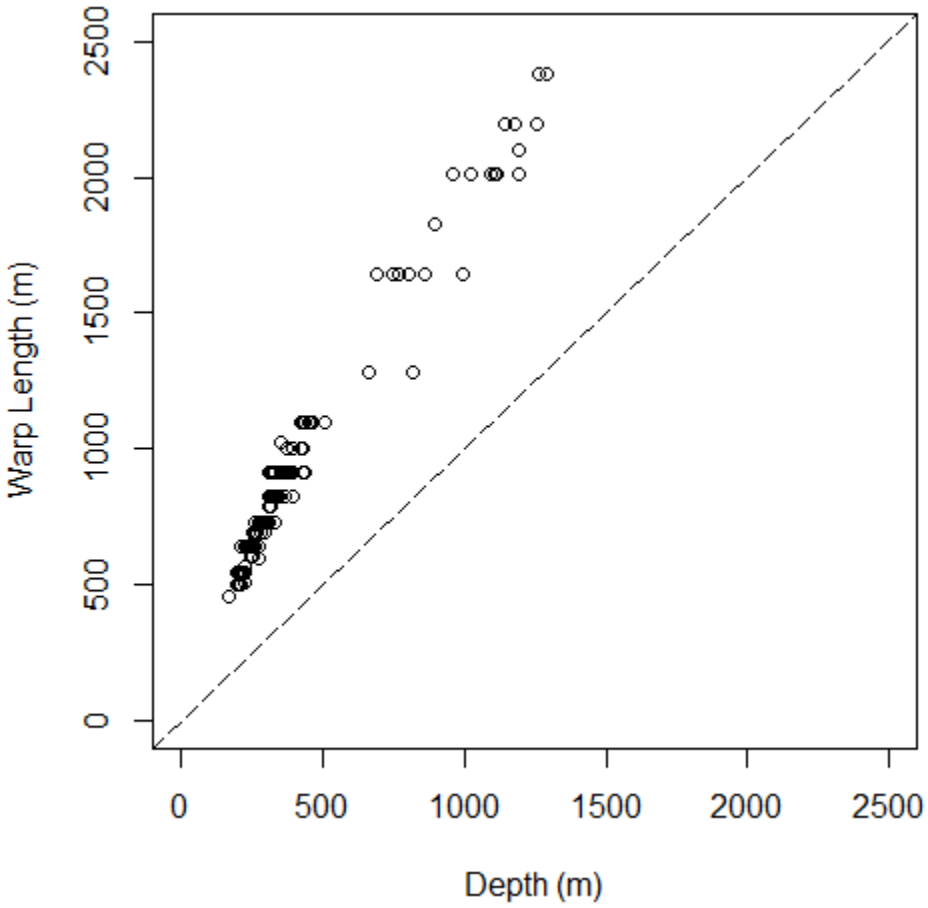

Figure 10. Warp length versus starting depth for each tow during the 2012 WCHG synoptic bottom trawl survey.

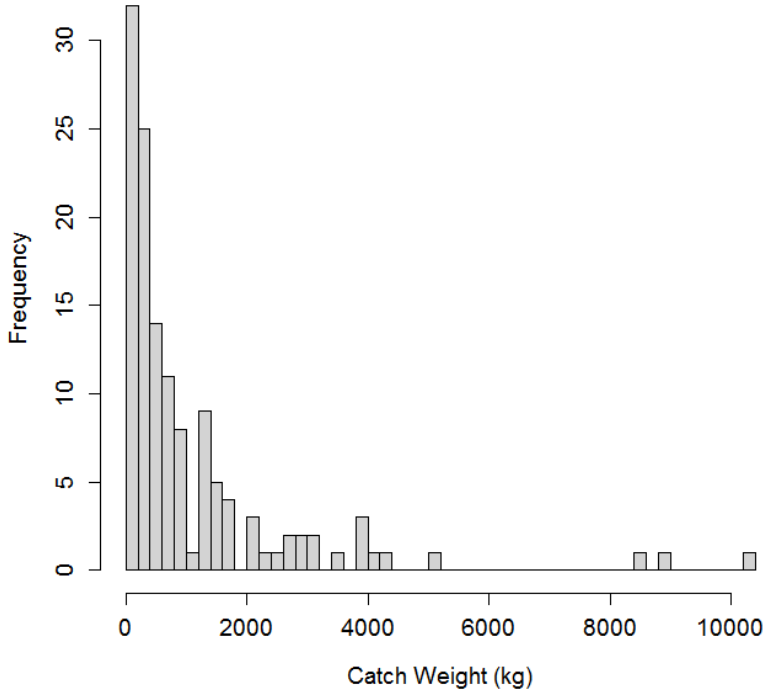

Figure 11. Histogram of catch weight per useable tow during the 2012 WCHG synoptic bottom trawl survey.

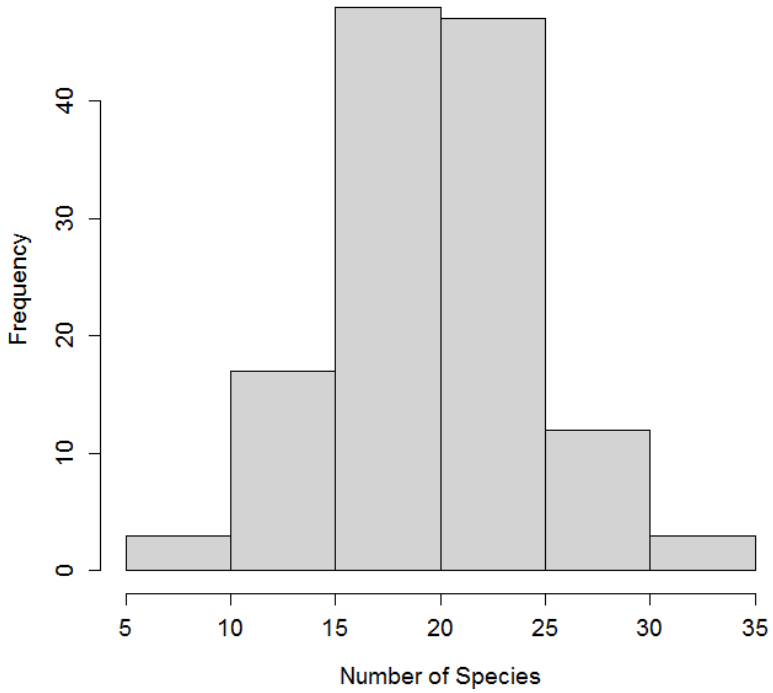

Figure 12. Histogram of the number of species caught in useable tows during the 2012 WCHG synoptic bottom trawl survey.

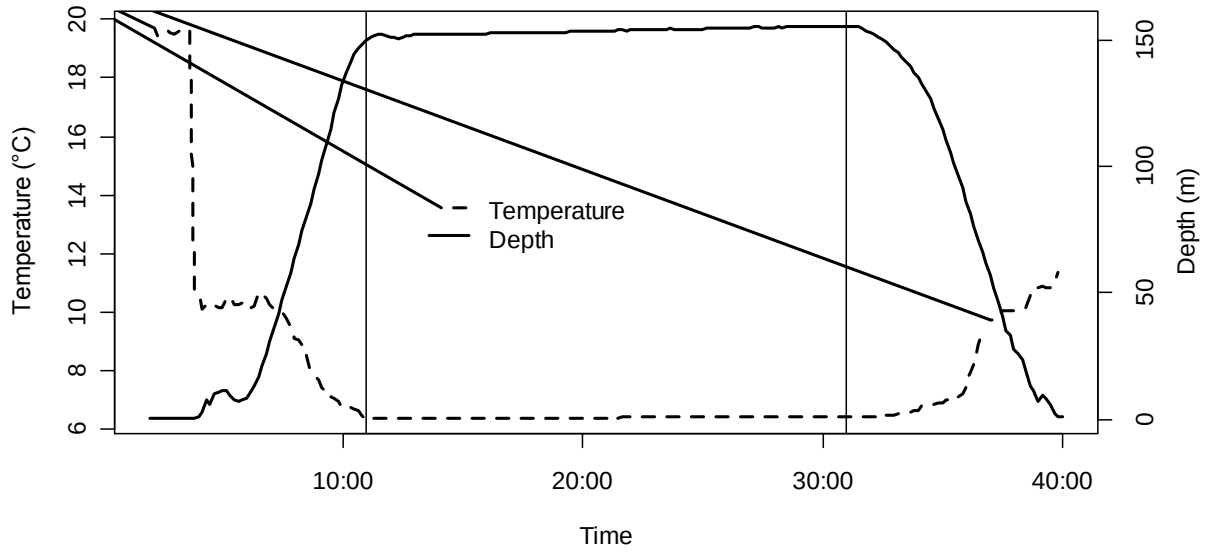

Figure 13. Example of a Seabird 39 temperature and depth profile collected during a synoptic bottom trawl survey. The vertical lines indicate the start and end of net contact with the sea floor.

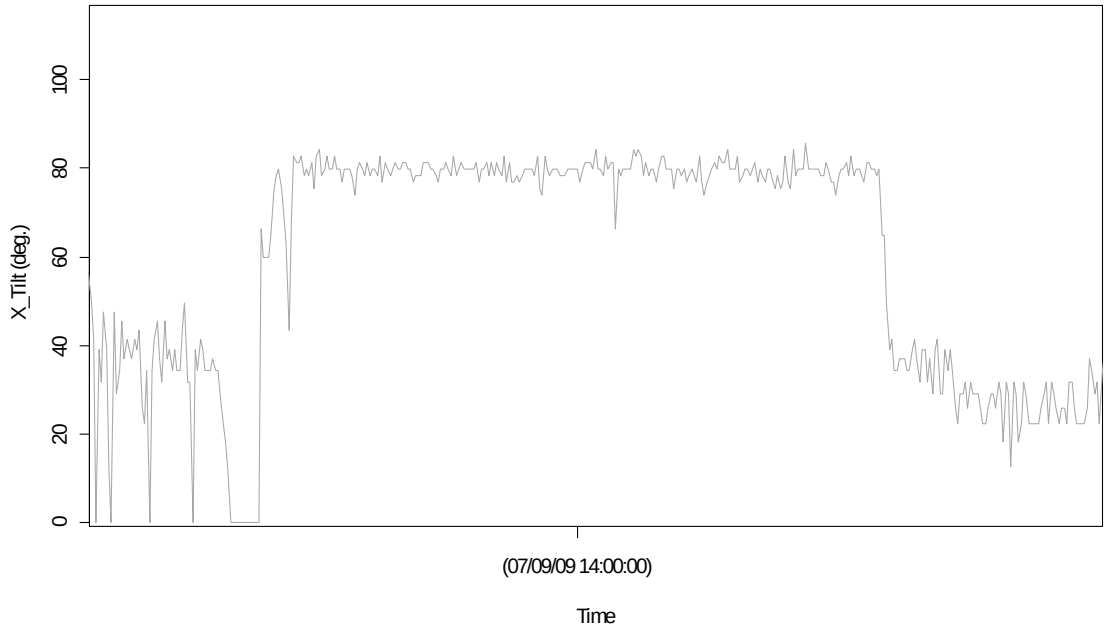

Figure 14. Example of a Mac Marine Industries bottom contact sensor profile collected during a bottom trawl survey. The raised segment in the middle of the profile at approximately 80° indicates where the net made contact with the sea floor.

APPENDIX A: WCHG 2012 SURVEY BRIDGE LOG

Tow	Date	Start Time	Start Latitude	Start Longitude	Average Depth (m)	Bottom Duration (min)	Speed (km/h)	Warp (ftm)	Catch (kg)	Useable
1	Aug-27	7:26	52.8908	132.6578	1192	28	5.1	1150	57.7	Yes
2	Aug-27	9:39	52.9536	132.9014	1261	30	5.2	1300	187.3	Yes
3	Aug-27	11:33	52.9813	132.8795	1180	29	5.3	1200	99.6	Yes
4	Aug-27	13:26	52.9792	132.7566	1290	31	5.4	1300	171.1	Yes
5	Aug-27	15:25	52.9896	132.5857	893	28	5.0	1000	260.6	Yes
6	Aug-27	17:00	52.9290	132.4996	892	29	5.1	1000	305.0	Yes
7	Aug-27	18:34	52.9387	132.4748	348	9	7.2	560	345.5	No
8	Aug-28	7:15	53.0270	132.5357	196	10	5.1	275	17.5	No
9	Aug-28	8:23	53.0655	132.6434	370	20	6.1	550	471.5	Yes
10	Aug-28	9:48	53.0962	132.8149	1177	30	5.2	1200	190.2	Yes
11	Aug-28	11:32	53.1667	132.8478	768	29	5.6	900	221.4	Yes
12	Aug-28	13:07	53.1819	132.8494	661	25	5.3	700	114.1	Yes
13	Aug-28	15:35	53.2517	132.7906	392	17	5.2	450	298.4	Yes
14	Aug-28	17:14	53.2643	132.9734	323	20	5.9	500	401.5	Yes
15	Aug-28	18:38	53.2785	133.0041	282	20	6.1	400	2628.3	Yes
16	Aug-29	7:16	53.3180	133.0425	206	3	2.2	275	0.0	No
17	Aug-29	7:50	53.3138	133.0328	204	18	6.1	275	2554.4	Yes
18	Aug-29	9:00	53.2995	133.0376	221	22	5.8	310	3003.7	Yes
19	Aug-29	10:07	53.2985	133.0546	256	20	5.7	400	3919.7	Yes
20	Aug-29	11:25	53.2281	133.0875	805	30	5.5	900	118.2	Yes
21	Aug-29	13:05	53.2292	133.1849	1023	32	5.3	1100	130.6	Yes
22	Aug-29	15:17	53.2984	133.1753	819	34	5.2	700	92.4	Yes
23	Aug-30	7:19	53.3325	133.1020	227	3	5.4	350	344.1	No
24	Aug-30	7:55	53.3268	133.0935	224	22	5.8	350	2803.2	Yes
25	Aug-30	9:10	53.3564	133.1205	224	19	6.2	350	1489.5	Yes
26	Aug-30	10:35	53.4499	133.1163	961	25	4.8	1100	303.9	Yes
27	Aug-30	12:34	53.4839	133.0737	318	19	6.2	450	1389.9	Yes
28	Aug-30	13:36	53.4842	133.0190	226	19	6.1	300	885.9	Yes
29	Aug-30	15:22	53.5451	133.1399	353	19	5.8	500	551.0	Yes
30	Aug-30	16:34	53.5444	133.1627	427	19	5.7	600	859.8	Yes
31	Aug-30	18:04	53.5358	133.2065	463	30	5.6	600	751.6	Yes
32	Aug-30	19:11	53.5268	133.2242	314	19	5.8	500	3822.7	Yes
33	Aug-31	7:18	53.5976	133.3127	427	20	5.6	500	453.3	Yes
34	Aug-31	8:15	53.6167	133.3053	310	14	6.1	400	1646.0	Yes
35	Aug-31	9:04	53.6596	133.2905	859	31	4.8	900	66.5	Yes
36	Aug-31	11:02	53.7681	133.2904	214	20	6.2	300	1289.0	Yes
37	Aug-31	11:52	53.7945	133.3249	221	12	6.2	300	637.7	No
38	Aug-31	12:43	53.8078	133.3437	222	19	6.1	280	747.7	Yes
39	Aug-31	13:50	53.7927	133.3700	310	20	6.3	450	837.3	Yes
40	Aug-31	15:07	53.7369	133.5239	1253	30	4.9	1200	216.6	Yes
41	Aug-31	16:55	53.8226	133.5150	688	34	5.3	900	173.0	Yes
42	Aug-31	18:21	53.8926	133.6348	997	30	5.0	900	139.0	Yes
43	Sep-01	7:19	53.8535	133.7460	1191	28	4.9	1100	55.1	Yes
44	Sep-01	9:06	53.9782	133.8371	1142	26	5.5	1200	202.3	Yes
45	Sep-01	11:37	54.0358	133.7037	750	29	5.1	900	22.1	Yes
46	Sep-01	13:01	54.0258	133.6277	505	30	5.1	600	227.2	Yes
47	Sep-01	14:37	54.1136	133.5734	366	22	6.3	500	860.9	Yes
48	Sep-01	15:46	54.1349	133.5453	369	20	5.4	500	418.7	Yes
49	Sep-01	16:46	54.1669	133.4974	376	20	5.1	500	284.4	Yes
50	Sep-01	17:47	54.1856	133.4654	388	20	5.6	500	178.5	Yes
51	Sep-01	18:48	54.2540	133.4426	426	20	6.1	550	185.8	Yes

Tow	Date	Start Time	Start Latitude	Start Longitude	Average Depth (m)	Bottom Duration (min)	Speed (km/h)	Warp (ftm)	Catch (kg)	Useable
52	Sep-02	7:23	54.2911	133.5095	307	20	6.0	400	781.0	Yes
53	Sep-02	8:24	54.2843	133.5386	294	20	5.7	400	1506.7	Yes
54	Sep-02	9:30	54.2636	133.5526	307	11	5.9	430	382.0	No
55	Sep-02	10:13	54.2683	133.5374	319	19	5.8	430	514.1	Yes
56	Sep-02	11:29	54.2793	133.4843	342	19	5.9	450	455.8	Yes
57	Sep-02	12:19	54.3030	133.4768	294	19	5.9	400	280.0	Yes
58	Sep-02	13:32	54.3030	133.4283	420	22	4.8	550	210.4	Yes
59	Sep-02	14:31	54.2807	133.4012	448	19	5.9	600	132.9	Yes
60	Sep-02	15:35	54.2790	133.2938	466	12	5.1	600	112.8	No
61	Sep-04	8:57	54.3458	133.1972	454	20	5.8	600	290.3	Yes
62	Sep-04	10:41	54.3496	133.3682	362	20	5.4	450	152.9	Yes
63	Sep-04	11:36	54.3156	133.4367	276	19	5.4	350	1738.1	Yes
64	Sep-04	13:49	54.3153	133.4709	262	20	5.7	350	8596.1	Yes
65	Sep-04	16:55	54.4242	133.4063	288	20	5.7	400	148.6	Yes
66	Sep-04	18:01	54.4147	133.4432	273	19	5.9	400	328.8	Yes
67	Sep-04	18:56	54.3983	133.4155	291	21	5.9	400	224.3	Yes
68	Sep-05	7:29	54.4172	133.5260	207	20	5.9	300	3521.0	Yes
69	Sep-05	8:27	54.4150	133.5513	202	20	6.1	300	447.8	Yes
70	Sep-05	9:17	54.4071	133.5802	202	19	5.7	300	1206.9	Yes
71	Sep-05	10:12	54.3771	133.6370	210	20	6.1	300	137.1	Yes
72	Sep-05	11:08	54.3533	133.6515	244	20	6.1	330	890.3	Yes
73	Sep-05	12:13	54.3458	133.5251	250	12	5.2	330	943.2	No
74	Sep-05	12:59	54.3436	133.5268	252	19	6.2		1560.2	Yes
75	Sep-05	14:01	54.3265	133.4996	261	20	5.8	400	3136.9	Yes
76	Sep-05	15:23	54.3100	133.5055	278	21	5.8	400	3952.0	Yes
77	Sep-05	17:06	54.2606	133.3205	464	20	5.7	600	165.6	Yes
78	Sep-05	18:03	54.2766	133.2272	453	19	5.6	600	249.8	Yes
79	Sep-06	7:32	54.2423	133.2491	375	19	6.0	500	642.7	Yes
80	Sep-06	8:59	54.2273	133.2952	435	19	5.4	500	219.5	Yes
81	Sep-06	10:15	54.2409	133.3324	450	19	5.6	600	313.9	Yes
82	Sep-06	11:21	54.2110	133.3538	435	15	5.2	600	180.9	Yes
83	Sep-06	12:24	54.1544	133.3574	358	19	5.5	500	167.3	Yes
84	Sep-06	13:31	54.1512	133.3968	396	19	5.3	550	304.9	Yes
85	Sep-06	14:43	54.0778	133.4578	211	20	6.2	350	70.0	Yes
86	Sep-06	15:37	54.0797	133.5479	362	19	5.6	500	1285.1	Yes
87	Sep-06	16:41	54.1018	133.6545	332	19	6.2	500	2384.7	Yes
88	Sep-06	17:56	54.1356	133.6848	275	20	6.2	325	5011.9	Yes
89	Sep-06	19:06	54.1772	133.6146	330	20	5.4	450	423.4	Yes
90	Sep-07	7:23	54.2023	133.9542	1114	30	5.1	1100	146.4	Yes
91	Sep-07	9:12	54.2362	134.0225	1110	29	5.0	1100	163.3	Yes
92	Sep-07	10:47	54.2537	134.0190	1095	30	4.9	1100	150.1	Yes
93	Sep-07	13:01	54.2908	133.7915	229	19	6.1	350	315.2	Yes
94	Sep-07	13:54	54.3312	133.8088	330	20	5.6	400	516.8	Yes
95	Sep-07	14:44	54.2810	133.8126	395	24	5.4	500	1613.1	Yes
96	Sep-07	15:43	54.2594	133.8127	392	25	5.7	550	845.1	No
97	Sep-07	18:15	54.2619	133.8196	425	21	5.1	600	1233.4	Yes
98	Sep-08	7:32	54.2379	133.6943	262	19	5.7	350	2149.5	Yes
99	Sep-08	8:32	54.2180	133.6666	279	19	6.4	380	1335.5	Yes
100	Sep-08	9:34	54.2279	133.6257	295	19	5.9	400	700.7	Yes
101	Sep-08	10:31	54.3047	133.5986	261	20	5.8	380	2115.3	Yes
102	Sep-08	11:58	54.3613	133.5356	243	20	5.8	350	739.3	Yes
103	Sep-08	13:28	54.4048	133.3578	325	19	5.9	500	175.7	Yes
104	Sep-08	14:26	54.4276	133.3501	305	19	5.4	500	271.0	Yes

Tow	Date	Start Time	Start Latitude	Start Longitude	Average Depth (m)	Bottom Duration (min)	Speed (km/h)	Warp (ftm)	Catch (kg)	Useable
105	Sep-08	15:21	54.4450	133.3007	304	17	5.6	400	74.4	Yes
106	Sep-08	16:17	54.4506	133.2756	293	19	5.6	400	268.1	Yes
107	Sep-08	17:13	54.4733	133.2384	278	20	6.1	400	138.8	Yes
108	Sep-08	18:06	54.4762	133.3283	284	19	5.4	400	135.6	Yes
109	Sep-11	7:29	54.3505	133.2274	227	20	5.8	600	219.1	Yes
110	Sep-11	8:58	54.3771	133.3640	349	20	5.8	500	259.9	Yes
111	Sep-11	10:50	54.3472	133.5681	247	21	6.1	350	2036.7	Yes
112	Sep-11	11:56	54.3009	133.6613	260	21	5.8	380	1240.7	Yes
113	Sep-11	12:48	54.2884	133.7110	252	20	5.7	380	1567.6	Yes
114	Sep-11	13:57	54.2488	133.7866	240	20	5.6		10233.2	Yes
115	Sep-11	18:08	54.0643	133.5087	251	20	5.5	350	765.5	Yes
116	Sep-11	18:58	54.0599	133.5110	210	20	5.5	300	515.2	Yes
117	Sep-14	7:43	54.1181	133.3647	206	19	5.2	300	622.5	Yes
118	Sep-14	8:36	54.1189	133.4312	377	21	5.6		799.0	Yes
119	Sep-14	10:02	54.1079	133.5726	364	21	5.8	500	1269.1	Yes
120	Sep-14	11:14	54.1261	133.6161	350	23	5.4	500	447.0	Yes
121	Sep-14	12:08	54.1622	133.6359	308	5	5.0	500	65.2	No
122	Sep-14	13:00	54.1787	133.6202	320	21	5.8	450	496.7	Yes
123	Sep-14	14:03	54.1948	133.7137	239	19	6.0	350	4079.8	Yes
124	Sep-14	15:22	54.2479	133.7154	260	21	4.6	350	1527.1	Yes
125	Sep-14	16:41	54.2279	133.7512	230	19	6.3	350	2883.0	Yes
126	Sep-14	18:05	54.2482	133.6624	269	9	5.4	380	1359.6	No
127	Sep-14	18:51	54.2703	133.6615	260	13	5.7	370	862.3	Yes
128	Sep-15	7:47	54.2913	133.5623	282	20	5.6	380	472.6	Yes
129	Sep-15	9:11	54.2372	133.732	247	20	5.5	350	4202.3	Yes
130	Sep-15	10:40	54.1059	133.6179	359	20	5.3	500	805.9	Yes
131	Sep-15	12:09	53.991	133.4833	167	20	5.4	250	116.5	Yes
132	Sep-15	13:01	53.9314	133.4792	227	20	5.8	300	2787.2	Yes
133	Sep-15	14:03	53.8946	133.459	226	20	5.6	300	359.3	Yes
134	Sep-15	14:56	53.8929	133.5044	363	21	5.3	500	1238.2	Yes
135	Sep-15	16:08	53.9257	133.5541	373	20	5.5	500	800.9	Yes
136	Sep-15	17:10	53.8931	133.4724	297	20	6.1	380	640.9	Yes
137	Sep-15	18:02	53.8448	133.4477	312	20	5.8	450	762.2	Yes
138	Sep-15	18:54	53.8257	133.4419	347	20	5.3	450	399.3	Yes
139	Sep-16	7:51	53.9164	133.4562	193	19	6.1	300	1068.6	Yes
140	Sep-16	9:01	53.8899	133.5503	338	19	5.7	450	8842.2	Yes
141	Sep-16	10:33	53.8393	133.4776	380	20	5.4	500	1606.5	Yes

APPENDIX B: CATCH BY TOW (KG). <0.1 KG ENTERED AS –

Common Name	Scientific Name	Total Weight (Kg)	1	2	3	4	5
Abyssal Skate	*Bathyraja abyssicola*	14.4				6.9	
Aleutian Skate	*Bathyraja aleutica*	47.7					
Arrowtooth Flounder	*Atheresthes stomias*	3195.1					
Aurora Rockfish	*Sebastes aurora*	19.1					
Blue Shark	*Prionace glauca*	9.2					
Bocaccio	*Sebastes paucispinis*	69.9					
Canary Rockfish	*Sebastes pinniger*	353.4					
Darkblotched Rockfish	*Sebastes crameri*	50.7					
Darkfin Sculpin	*Malacocottus zonurus*	26.5					
Dover Sole	*Microstomus pacificus*	769.7					
Dusky Rockfish	*Sebastes variabilis*	123.4					
English Sole	*Parophrys vetulus*	24.7					
Giant Grenadier	*Albatrossia pectoralis*	450.1	0.8	84.1	9.4	17.2	32.9
Greenstriped Rockfish	*Sebastes elongatus*	146.9					
Harlequin Rockfish	*Sebastes variegatus*	365.4					
Lingcod	*Ophiodon elongatus*	279.8					
Longnose Skate	*Raja rhina*	362.2					
Longspine Thornyhead	*Sebastolobus altivelis*	462.2	2.6	2.1	9.2	16.7	22.5
North Pacific Spiny Dogfish	*Squalus suckleyi*	59.0					
Pacific Cod	*Gadus macrocephalus*	382.6					
Pacific Flatnose	*Antimora microlepis*	45.7	2.2	14.2	2.4	9.2	1.4
Pacific Grenadier	*Coryphaenoides acrolepis*	629.0	37.0	77.3	42.7	57.2	26.0
Pacific Hake	*Merluccius productus*	1711.1					
Pacific Halibut	*Hippoglossus stenolepis*	728.8					
Pacific Ocean Perch	*Sebastes alutus*	61118.4					
Petrale Sole	*Eopsetta jordani*	99.8					
Popeye	*Coryphaenoides cinereus*	368.0	1.5	3.5	1.7	7.4	6.5
Prowfish	*Zaprora silenus*	14.4					
Ragfish	*Icosteus aenigmaticus*	38.3					
Redbanded Rockfish	*Sebastes babcocki*	629.7					
Redstripe Rockfish	*Sebastes proriger*	6464.9					
Rex Sole	*Glyptocephalus zachirus*	737.6					
Rosethorn Rockfish	*Sebastes helvomaculatus*	538.9					
Rougheye Rockfish	*Sebastes aleutianus*	18326.8					
Roughtail Skate	*Bathyraja trachura*	49.2	3.0	0.2	0.3	0.1	
Sablefish	*Anoplopoma fimbria*	2780.5	6.6		22.5	40.9	160.8
Sandpaper Skate	*Bathyraja interrupta*	21.2					
Sharpchin Rockfish	*Sebastes zacentrus*	15721.6					
Shortraker Rockfish	*Sebastes borealis*	999.1					
Shortspine Thornyhead	*Sebastolobus alascanus*	4541.5	2.3	4.9	8.9	6.6	8.8
Silvergray Rockfish	*Sebastes brevispinis*	12734.6					
Slender Sole	*Lyopsetta exilis*	5.4					
Splitnose Rockfish	*Sebastes diploproa*	637.7					
Spotted Ratfish	*Hydrolagus colliei*	251.4					
Twoline Eelpout	*Bothrocara brunneum*	8.2			1.0	3.8	
Walleye Pollock	*Gadus chalcogrammus*	433.1					
Widow Rockfish	*Sebastes entomelas*	1106.6					
Yelloweye Rockfish	*Sebastes ruberrimus*	119.0					
Yellowmouth Rockfish	*Sebastes reedi*	9207.9					
Yellowtail Rockfish	Sebastes flavidus	126.3					
Other		1534.5	1.7	0.9	1.6	5.1	1.8
Total		**148940.6**	**57.7**	**187.3**	**99.6**	**171.1**	**260.6**

Common Name	6	7	8	9	10	11	12	13	14	15	16	17
Abyssal Skate												
Aleutian Skate												
Arrowtooth Flounder		5.2	5.6	53.7			3.3	10.4		1.4		
Aurora Rockfish				0.3								
Blue Shark								9.2				
Bocaccio												8.7
Canary Rockfish				3.2								
Darkblotched Rockfish												
Darkfin Sculpin		0.4		0.2			0.1		0.1	0.5		0.2
Dover Sole		1.7	0.3	4.0		9.2	7.1	2.1	1.5	0.3		
Dusky Rockfish												
English Sole												
Giant Grenadier	19.5				42.6	21.9	2.3					
Greenstriped Rockfish			1.1									2.6
Harlequin Rockfish												6.0
Lingcod												
Longnose Skate												
Longspine Thornyhead	24.9				24.9	33.5	50.8	1.2				
North Pacific Spiny Dogfish								2.4				
Pacific Cod												
Pacific Flatnose	-				5.8	0.3						
Pacific Grenadier	38.5				51.0	8.1	1.1					
Pacific Hake		30.0		53.3	2.4			36.7				
Pacific Halibut										106.0		11.3
Pacific Ocean Perch		3.2		50.2				139.6	67.1	1175.2		1.0
Petrale Sole												
Popeye	4.5				15.1	13.0	0.9					
Prowfish										1.9		
Ragfish												
Redbanded Rockfish		4.5		3.3				5.2		0.3		0.2
Redstripe Rockfish			1.1									973.9
Rex Sole		0.3	0.4	0.4				0.5				
Rosethorn Rockfish			0.2					1.3	0.4	31.6		9.3
Rougheye Rockfish	6.7	114.4		33.3				8.6	292.3	147.2		
Roughtail Skate					2.9	2.7						
Sablefish	194.9	108.2		154.7	28.8	121.2	8.7		3.7	3.5		
Sandpaper Skate				1.1						1.2		
Sharpchin Rockfish								1.1		0.9		28.4
Shortraker Rockfish		8.7						28.2	17.2			
Shortspine Thornyhead	12.9	58.2		71.7	5.3	5.6	38.0	45.4	19.1	28.4		
Silvergray Rockfish			4.8	4.7				3.6		46.1		407.3
Slender Sole				0.3				0.2				
Splitnose Rockfish												
Spotted Ratfish		5.2	0.8	7.8								
Twoline Eelpout												
Walleye Pollock		3.1	3.3	27.8				1.6				
Widow Rockfish										102.5		170.7
Yelloweye Rockfish												
Yellowmouth Rockfish										980.3		933.5
Yellowtail Rockfish												
Other	3.3	2.5	-	1.3	11.3	6.0	1.9	1.1	0.1	0.9		1.2
Total	**305.0**	**345.5**	**17.5**	**471.5**	**190.2**	**221.4**	**114.1**	**298.4**	**401.5**	**2628.3**	**0.0**	**2554.4**

Common Name	18	19	20	21	22	23	24	25	26	27	28	29
Abyssal Skate												
Aleutian Skate												
Arrowtooth Flounder	3.0	32.5				2.0	4.0	5.3		51.7	576.9	24.7
Aurora Rockfish												
Blue Shark												
Bocaccio		14.2					9.2			7.3		
Canary Rockfish											6.9	
Darkblotched Rockfish												
Darkfin Sculpin	0.2	0.5				0.3	0.8			0.4		0.1
Dover Sole		0.3	5.5	2.3	0.6	0.2				0.6	2.0	1.3
Dusky Rockfish												
English Sole											1.6	
Giant Grenadier			4.0	15.8	8.3				15.4			
Greenstriped Rockfish	15.2	5.1				4.8	8.3	5.6				
Harlequin Rockfish	1.1										0.3	
Lingcod												
Longnose Skate		15.0									6.8	
Longspine Thornyhead			29.5	15.4	43.4				19.6			
North Pacific Spiny Dogfish	1.6						2.2			1.2	2.5	
Pacific Cod											32.3	
Pacific Flatnose												
Pacific Grenadier			2.0	4.0	3.5				11.1			
Pacific Hake												328.3
Pacific Halibut										2.1		4.7
Pacific Ocean Perch	507.4	786.6				77.7	554.1	205.3		705.2	55.3	46.2
Petrale Sole												
Popeye			0.2	2.2	0.2				176.7			
Prowfish		10.2					2.3					
Ragfish												
Redbanded Rockfish	2.0	1.4					1.5	0.7		11.6	1.4	22.3
Redstripe Rockfish	513.2	43.4				9.0	603.8	120.8				
Rex Sole		0.2					0.6			0.6	8.2	
Rosethorn Rockfish	11.0	19.0				2.0	34.4	16.2		8.6	0.9	1.2
Rougheye Rockfish										6.0		29.5
Roughtail Skate					2.4							
Sablefish		4.3	49.1	79.4	23.3				58.8			
Sandpaper Skate												
Sharpchin Rockfish	0.4						3.8	2.0		9.0	8.3	
Shortraker Rockfish										44.6		18.2
Shortspine Thornyhead		2.2	26.4	6.6	10.2			0.6	20.3	53.1	2.1	23.3
Silvergray Rockfish	528.4	257.6				155.7	652.0	410.4		119.9	144.0	12.2
Slender Sole	0.4	0.1						0.4		0.2	0.3	
Splitnose Rockfish										322.8	3.0	
Spotted Ratfish										1.9		
Twoline Eelpout				0.2								
Walleye Pollock										15.7	0.8	27.2
Widow Rockfish	176.1	488.2				2.0	22.0	4.6		2.2		
Yelloweye Rockfish											2.6	
Yellowmouth Rockfish	1243.7	2238.8				90.4	898.6	717.4		16.0	0.5	1.7
Yellowtail Rockfish										4.4	2.1	
Other	-	-	1.4	4.7	0.5	0.1	5.6	0.2	2.0	4.9	27.2	10.0
Total	**3003.7**	**3919.7**	**118.2**	**130.6**	**92.4**	**344.1**	**2803.2**	**1489.5**	**303.9**	**1389.9**	**885.9**	**551.0**

Common Name	30	31	32	33	34	35	36	37	38	39	40	41
Abyssal Skate												7.5
Aleutian Skate		4.6										
Arrowtooth Flounder	4.6	2.0	2.1		2.2		214.6	16.0	11.9	16.4		
Aurora Rockfish	3.6	4.7										
Blue Shark												
Bocaccio							4.3	5.1		10.5		
Canary Rockfish							45.2	11.1	13.0			
Darkblotched Rockfish			12.8									
Darkfin Sculpin	-	0.2	1.0	-	0.9					0.1		
Dover Sole	24.8	19.3	1.2	26.4	0.4		0.4	0.4		1.7		26.3
Dusky Rockfish												
English Sole							19.7	1.4				
Giant Grenadier						6.1					64.2	4.4
Greenstriped Rockfish							30.8	1.9	2.4	0.2		
Harlequin Rockfish							0.2	1.7	18.7	0.7		
Lingcod							19.1	5.4	14.1			
Longnose Skate	4.9			6.2	3.8					3.1	11.8	
Longspine Thornyhead						15.1					20.6	43.2
North Pacific Spiny Dogfish							6.0					
Pacific Cod							13.7		3.2			
Pacific Flatnose											1.4	0.5
Pacific Grenadier						3.3					44.0	5.1
Pacific Hake	29.2	2.5	0.7							0.7		
Pacific Halibut	10.4			21.5			7.5	6.7		8.0		
Pacific Ocean Perch	6.1		593.2		1007.3					451.4		
Petrale Sole							1.6					
Popeye						0.3					19.8	0.7
Prowfish												
Ragfish												
Redbanded Rockfish	1.5				0.5			4.3	2.1	67.6		
Redstripe Rockfish			0.5				160.2	108.8	218.4			
Rex Sole	1.2	4.0	3.4	7.0	0.6		58.6	9.4	9.2	2.4		
Rosethorn Rockfish			9.7		18.6		0.7	1.7	4.1	8.2		
Rougheye Rockfish	662.5	365.6	3000.0	282.2	22.1							
Roughtail Skate											13.4	3.0
Sablefish	14.7	3.6		16.2		10.8	4.2				16.5	42.4
Sandpaper Skate												
Sharpchin Rockfish							0.9	376.6	322.4	46.8		
Shortraker Rockfish	40.9	209.2	21.3	35.7								
Shortspine Thornyhead	50.5	132.3	168.5	58.1	46.4	24.5				28.7	21.2	32.7
Silvergray Rockfish			3.1		2.1		662.3	48.6	76.1	100.6		
Slender Sole					0.1				0.1	0.2		
Splitnose Rockfish										60.7		
Spotted Ratfish							1.2	0.2	0.2			
Twoline Eelpout						1.2					1.2	
Walleye Pollock	1.1						33.5	1.8	1.3	17.6		
Widow Rockfish			1.4							1.7		
Yelloweye Rockfish									5.6			
Yellowmouth Rockfish					541.0			36.6	42.8	0.9		
Yellowtail Rockfish							4.2		1.8	1.6		
Other	3.7	3.7	3.8	0.2		5.2	0.2	-	0.2	7.5	2.6	7.1
Total	**859.8**	**751.6**	**3822.7**	**453.3**	**1646.0**	**66.5**	**1289.0**	**637.7**	**747.7**	**837.3**	**216.6**	**173.0**

Common Name	42	43	44	45	46	47	48	49	50	51	52	53
Abyssal Skate												
Aleutian Skate												
Arrowtooth Flounder					10.1	20.3	10.9	9.3	7.9	5.2	12.4	12.8
Aurora Rockfish					1.5							
Blue Shark												
Bocaccio												
Canary Rockfish												
Darkblotched Rockfish												
Darkfin Sculpin					-	0.3					0.7	0.3
Dover Sole	0.6				11.3	22.7	12.3	13.0	6.9	1.7	1.2	0.3
Dusky Rockfish												1.4
English Sole												
Giant Grenadier	8.0	6.9	27.1									
Greenstriped Rockfish												
Harlequin Rockfish						0.2						
Lingcod												
Longnose Skate						3.2			11.0			
Longspine Thornyhead	32.2	5.3	12.7	1.3	10.3							
North Pacific Spiny Dogfish												
Pacific Cod											2.2	2.2
Pacific Flatnose	0.2	0.6	1.0									
Pacific Grenadier	5.8	25.3	80.5	5.1								
Pacific Hake					15.9	47.6	30.3	28.9	5.9	26.9	3.2	0.9
Pacific Halibut							7.0					
Pacific Ocean Perch						214.7	109.5	99.2	30.7	1.8	653.6	1430.3
Petrale Sole												
Popeye	25.0	2.9	8.7									
Prowfish												
Ragfish												
Redbanded Rockfish						2.0	1.7	2.1			4.8	1.3
Redstripe Rockfish												
Rex Sole					1.5	40.2	35.0	8.6	1.0	0.3	1.5	2.0
Rosethorn Rockfish						0.3	0.4				3.6	1.5
Rougheye Rockfish					82.3	403.3	159.5	53.0	45.0	35.2	1.8	1.7
Roughtail Skate	3.0	3.1	3.2	6.0								
Sablefish	47.1	3.9	42.1		53.1	5.2	2.0	20.7	23.3	69.2		
Sandpaper Skate						1.4	2.6		0.6			
Sharpchin Rockfish						0.7			0.1		0.2	0.5
Shortraker Rockfish					5.3							
Shortspine Thornyhead	10.9	6.8	7.5	1.9	33.2	84.2	26.7	25.9	37.1	25.2	69.1	38.5
Silvergray Rockfish						1.5	2.0	5.0			4.5	5.2
Slender Sole						0.2						
Splitnose Rockfish											0.4	
Spotted Ratfish						2.4		0.8	1.1	2.5		0.8
Twoline Eelpout				0.8								
Walleye Pollock						2.6	2.1	1.3			1.6	1.8
Widow Rockfish												
Yelloweye Rockfish												
Yellowmouth Rockfish												
Yellowtail Rockfish												
Other	6.1	0.4	19.5	7.0	2.7	7.9	16.9	16.6	7.9	17.8	20.3	5.3
Total	**139.0**	**55.1**	**202.3**	**22.1**	**227.2**	**860.9**	**418.7**	**284.4**	**178.5**	**185.8**	**781.0**	**1506.7**

Common Name	54	55	56	57	58	59	60	61	62	63	64	65
Abyssal Skate												
Aleutian Skate					19.0	5.0						
Arrowtooth Flounder	8.6	2.0	15.7	18.1	5.0	3.4	2.9	21.0	0.8	0.7	2.8	21.5
Aurora Rockfish												
Blue Shark												
Bocaccio				5.5								
Canary Rockfish												
Darkblotched Rockfish			1.9									
Darkfin Sculpin		0.3	0.4	1.0					0.4	0.2	-	
Dover Sole	4.2	0.9	1.1	4.6	23.1	0.8	17.2	48.8	6.6	0.4	1.1	5.8
Dusky Rockfish										105.8	5.4	
English Sole												
Giant Grenadier												
Greenstriped Rockfish												
Harlequin Rockfish				0.3						117.4		
Lingcod				7.0						34.5	7.7	
Longnose Skate	13.1					5.0	29.3	12.5	22.4			18.5
Longspine Thornyhead North Pacific Spiny Dogfish												
Pacific Cod			2.4	8.1					2.5		1.7	
Pacific Flatnose												
Pacific Grenadier												
Pacific Hake		0.7	1.9			1.0	9.3	54.3				
Pacific Halibut				15.7				5.0				
Pacific Ocean Perch	293.4	447.8	255.1	102.5	4.7				9.4	14.2	6521.3	40.2
Petrale Sole												
Popeye												
Prowfish												
Ragfish												
Redbanded Rockfish		1.7	7.9	8.6	3.1				3.8	62.4	7.1	0.4
Redstripe Rockfish				0.8						7.4	9.7	
Rex Sole	3.7	3.1	2.8	2.5	13.6	1.2	1.2	21.7	1.9	1.0	1.6	41.3
Rosethorn Rockfish	3.7	3.4	7.4	7.5					0.9	3.2	3.8	
Rougheye Rockfish	1.9		29.4	5.1	18.5	7.1	3.9	2.0	3.7			1.0
Roughtail Skate												
Sablefish		5.7			17.2	73.6	29.3	59.8			7.9	
Sandpaper Skate					1.4		1.2	1.5				
Sharpchin Rockfish	0.3	0.2	0.2	1.2						409.8	235.3	0.2
Shortraker Rockfish			4.8						41.7			
Shortspine Thornyhead	47.2	39.9	120.7	68.1	103.0	21.1	13.1	29.4	56.3	20.5	5.6	11.0
Silvergray Rockfish	1.5			17.2						20.7	563.8	4.2
Slender Sole				0.1								
Splitnose Rockfish												
Spotted Ratfish		3.3	1.7	1.8	0.9	9.8	4.2	4.9	1.4	1.3	1.6	
Twoline Eelpout												
Walleye Pollock		4.1	0.8					0.9			2.5	1.3
Widow Rockfish	2.1										56.1	
Yelloweye Rockfish										47.4		
Yellowmouth Rockfish				2.5						131.9	1150.9	
Yellowtail Rockfish												
Other	2.3	1.1	1.6	1.7	0.8	5.0	1.2	28.5	1.1	759.5	10.2	3.1
Total	**382.0**	**514.1**	**455.8**	**280.0**	**210.4**	**132.9**	**112.8**	**290.3**	**152.9**	**1738.1**	**8596.1**	**148.6**

Common Name	66	67	68	69	70	71	72	73	74	75	76	77
Abyssal Skate												
Aleutian Skate					5.0							
Arrowtooth Flounder	12.8	4.9	2.5	1.3	0.9	3.0	5.7	0.7	1.7	6.7	22.4	3.2
Aurora Rockfish												
Blue Shark												
Bocaccio												
Canary Rockfish												
Darkblotched Rockfish												
Darkfin Sculpin	-	0.9						0.2	-	0.3	0.1	
Dover Sole	4.0	1.5	1.4				2.6	0.3	1.3	1.0	2.3	7.5
Dusky Rockfish							3.2				1.4	
English Sole												
Giant Grenadier												
Greenstriped Rockfish			0.3	0.9	1.8	2.9	0.6					
Harlequin Rockfish	0.2		1.2	3.1	109.9	0.3		0.3	0.4	0.2	0.4	
Lingcod				5.3				8.2	7.6	12.4	22.7	
Longnose Skate		10.1		6.0	10.2	15.5						6.6
Longspine Thornyhead												
North Pacific Spiny Dogfish			2.2				2.3					
Pacific Cod	1.2		5.1			4.6	15.1	1.8	1.0	2.8	2.3	
Pacific Flatnose												
Pacific Grenadier												
Pacific Hake												20.2
Pacific Halibut	2.3			13.4	28.6	2.6		9.9			43.6	
Pacific Ocean Perch	231.4	151.8				0.8	601.0	700.0	1129.3	2522.7	3400.0	
Petrale Sole			2.7	0.6	0.7	2.0	0.7					
Popeye												
Prowfish												
Ragfish												
Redbanded Rockfish	3.6	3.8	9.5	5.1	2.1		17.6	1.2	4.1	7.3	11.2	
Redstripe Rockfish	0.5		2796.7	114.8	437.4	12.6		3.9	7.2	7.7		
Rex Sole	10.4	4.3	0.3	0.2	0.3	1.7	9.0	1.1	2.3	3.5	3.2	3.4
Rosethorn Rockfish	2.7	1.0	2.2	5.2	12.2	0.3	3.0	10.9	14.5	5.6	9.4	
Rougheye Rockfish	0.3	3.9							0.3		0.6	19.3
Roughtail Skate												
Sablefish	3.9									2.6		60.7
Sandpaper Skate												1.5
Sharpchin Rockfish	4.4	0.3	75.9	90.6	264.9	12.7	171.4	98.7	261.4	198.0	182.9	
Shortraker Rockfish												
Shortspine Thornyhead	21.0	28.4			0.5		3.2	5.1	9.9	12.8	33.5	32.8
Silvergray Rockfish	27.8	5.3	484.9	196.7	267.7	63.4	24.4	94.7	114.9	315.1	206.4	
Slender Sole			0.1			0.4	0.2	-	0.2			
Splitnose Rockfish												
Spotted Ratfish			2.4	4.0	7.3	14.5	1.7	2.8		0.6	3.1	2.5
Twoline Eelpout												
Walleye Pollock	0.5	1.6	0.2			0.1	1.0			0.5	1.1	
Widow Rockfish												
Yelloweye Rockfish			3.9		57.2							
Yellowmouth Rockfish			125.3					0.3	3.4	34.9	3.8	
Yellowtail Rockfish												
Other	1.8	6.6	4.1	0.6	0.3	-	27.8	3.1	0.7	2.0	1.8	7.9
Total	**328.8**	**224.3**	**3521.0**	**447.8**	**1206.9**	**137.1**	**890.3**	**943.2**	**1560.2**	**3136.9**	**3952.0**	**165.6**

Common Name	78	79	80	81	82	83	84	85	86	87	88	89
Abyssal Skate												
Aleutian Skate			12.3		1.9							
Arrowtooth Flounder	16.3	111.2	58.2	21.5	16.0	69.5	52.7	1.2	18.1	45.3	97.9	6.3
Aurora Rockfish												
Blue Shark												
Bocaccio				5.1								
Canary Rockfish		5.3										
Darkblotched Rockfish		1.0										
Darkfin Sculpin	0.1	0.8	0.3			-			0.7	1.0	0.7	
Dover Sole	28.8	24.2	7.1	12.6	5.3	14.4	15.2		4.3	8.6	0.8	5.8
Dusky Rockfish												
English Sole												
Giant Grenadier												
Greenstriped Rockfish								1.9	0.6			
Harlequin Rockfish		0.1								0.5	16.9	
Lingcod			5.3					20.5	9.3		19.2	
Longnose Skate							10.6					
Longspine Thornyhead					0.8							
North Pacific Spiny Dogfish												
Pacific Cod												
Pacific Flatnose												
Pacific Grenadier												
Pacific Hake	8.1	6.8	28.1	18.6	9.3		21.4		24.5			12.1
Pacific Halibut	31.7	6.1					4.8	41.4			25.8	
Pacific Ocean Perch		315.9	8.6	3.2	0.5	3.0	40.8		811.1	2193.6	2218.4	331.0
Petrale Sole												
Popeye												
Prowfish												
Ragfish												
Redbanded Rockfish		7.4	1.1			1.6	1.8		1.5	0.8	22.9	0.9
Redstripe Rockfish											0.6	
Rex Sole	11.3	8.3		14.0	3.9	26.9	41.0	0.4	0.8	0.4		4.7
Rosethorn Rockfish		1.9				0.2			9.5	12.6	7.1	4.4
Rougheye Rockfish	14.4	5.5	8.5	55.9	95.8	13.0	36.0		237.3	17.3	5.7	1.4
Roughtail Skate												
Sablefish	26.7	12.8		46.4			2.8				12.3	1.4
Sandpaper Skate				1.5	1.5							
Sharpchin Rockfish		-						0.4	0.3	0.3	1356.6	
Shortraker Rockfish										6.3	367.4	
Shortspine Thornyhead	93.7	110.1	79.6	106.8	39.9	30.9	55.1		125.5	75.7	10.9	43.5
Silvergray Rockfish		7.9				1.4	4.6		36.9	21.1	846.1	9.6
Slender Sole												0.1
Splitnose Rockfish		0.5										0.5
Spotted Ratfish			2.2				1.2	3.0		1.2	2.7	
Twoline Eelpout												
Walleye Pollock		1.7		1.1	1.0	0.6	0.9	0.4	0.6			0.7
Widow Rockfish									2.2			
Yelloweye Rockfish												
Yellowmouth Rockfish												
Yellowtail Rockfish		4.2					3.6					
Other	18.6	10.7	8.2	27.1	5.1	5.7	12.5	0.7	1.9	-	-	0.9
Total	**249.8**	**642.7**	**219.5**	**313.9**	**180.9**	**167.3**	**304.9**	**70.0**	**1285.1**	**2384.7**	**5011.9**	**423.4**

Common Name	90	91	92	93	94	95	96	97	98	99	100	101
Abyssal Skate												
Aleutian Skate												
Arrowtooth Flounder				3.7	2.7	4.1	1.1	8.5	6.1	22.3	8.9	7.5
Aurora Rockfish						0.8	6.8	1.3				
Blue Shark												
Bocaccio												
Canary Rockfish												
Darkblotched Rockfish												
Darkfin Sculpin					0.7	1.5	0.5		0.6	0.4	0.3	
Dover Sole					4.9	11.9	0.7	22.6	1.5	4.7	3.2	0.5
Dusky Rockfish												
English Sole												
Giant Grenadier	12.8	22.2	24.0									
Greenstriped Rockfish				0.2								
Harlequin Rockfish				26.3						0.5		
Lingcod												
Longnose Skate									14.0			
Longspine Thornyhead	4.2	10.4	10.0									
North Pacific Spiny Dogfish											1.8	
Pacific Cod												1.1
Pacific Flatnose	5.6	0.3	0.4									
Pacific Grenadier	56.2	30.8	13.6									
Pacific Hake					5.4	58.0	21.8	3.7				
Pacific Halibut				27.2	24.8				22.5	3.3		
Pacific Ocean Perch				124.7	342.9	137.2			1960.1	1199.3	580.0	1711.5
Petrale Sole				1.4						1.0		
Popeye	48.6	16.3	12.5									
Prowfish												
Ragfish												
Redbanded Rockfish				14.2	2.1	0.6	0.6		3.8	7.2	0.3	68.0
Redstripe Rockfish				13.7	0.9				2.1	1.3		
Rex Sole				0.5	0.3	0.2	0.5	5.4	0.6	2.9	4.6	3.8
Rosethorn Rockfish				7.1	5.0	2.3	1.3		5.6	8.7	4.9	9.5
Rougheye Rockfish					4.9	1233.7	648.4	612.5				0.6
Roughtail Skate		5.8										
Sablefish	11.4	69.4	80.6		13.5	61.6	75.5	468.4				
Sandpaper Skate							3.0					
Sharpchin Rockfish				48.3					99.9	30.6	0.2	168.7
Shortraker Rockfish					32.7	8.0	19.0					
Shortspine Thornyhead	4.8	7.0	7.0	4.8	59.5	85.9	62.3	109.9	9.2	20.2	72.8	6.9
Silvergray Rockfish				40.1	14.7	2.5			18.9	27.1	18.2	97.6
Slender Sole										0.1	0.1	
Splitnose Rockfish											0.8	
Spotted Ratfish				2.1		1.4			0.5	3.0		
Twoline Eelpout												
Walleye Pollock									1.9	2.0		
Widow Rockfish												
Yelloweye Rockfish												
Yellowmouth Rockfish												
Yellowtail Rockfish												
Other	2.6	1.2	2.2	0.9	1.8	3.3	3.5	1.1	2.1	1.0	4.7	39.6
Total	**146.4**	**163.3**	**150.1**	**315.2**	**516.8**	**1613.1**	**845.1**	**1233.4**	**2149.5**	**1335.5**	**700.7**	**2115.3**

Common Name	102	103	104	105	106	107	108	109	110	111	112	113
Abyssal Skate												
Aleutian Skate												
Arrowtooth Flounder	5.4	50.1	50.6	14.6	21.7	9.7	14.7	19.9	35.1	1.3	11.8	5.4
Aurora Rockfish												
Blue Shark												
Bocaccio												
Canary Rockfish												
Darkblotched Rockfish		5.5										
Darkfin Sculpin	0.4		0.1	0.2	0.5	0.6	0.4		-	0.1	-	0.2
Dover Sole	0.4	21.0	8.3	2.8	2.7	2.2	1.7	67.9	21.9		2.5	1.6
Dusky Rockfish										1.3		1.6
English Sole												
Giant Grenadier												
Greenstriped Rockfish											0.3	
Harlequin Rockfish			0.2							0.5		0.2
Lingcod						14.1				4.8		
Longnose Skate		3.9					9.1	9.0	8.8	8.1		
Longspine Thornyhead												
North Pacific Spiny Dogfish	1.6											1.1
Pacific Cod			3.6	2.8	4.1	7.8			2.9		2.6	
Pacific Flatnose												
Pacific Grenadier												
Pacific Hake		17.9	3.8					19.0	20.3	1.9		
Pacific Halibut								7.0			6.6	14.9
Pacific Ocean Perch	562.8		92.1	37.4	140.2	31.8	43.4		4.6	1771.3	1010.3	1296.2
Petrale Sole												
Popeye												
Prowfish												
Ragfish												
Redbanded Rockfish	2.6	4.8	3.1	0.8	1.6	1.6	0.3		3.2	10.2	7.3	9.0
Redstripe Rockfish	2.3									2.6		0.6
Rex Sole	7.0	31.9	22.2	1.6	2.9	3.1	2.0	14.2	11.8	2.3	3.3	3.6
Rosethorn Rockfish	12.2				0.5	1.1	0.3			11.1	12.3	12.5
Rougheye Rockfish		3.5	8.5	0.6	10.5	4.0	3.1	2.4	10.3	6.2		
Roughtail Skate												
Sablefish	7.5	5.9	3.5					40.3	17.4			
Sandpaper Skate									0.7			
Sharpchin Rockfish	85.0				0.3	0.2				159.3	150.7	193.6
Shortraker Rockfish					8.7				3.8			
Shortspine Thornyhead	6.8	16.4	41.2	10.3	48.6	38.2	54.3	24.7	79.7	12.6	6.6	11.3
Silvergray Rockfish	44.6		6.6		1.2		2.7			35.3	22.9	3.7
Slender Sole			0.2							0.1		
Splitnose Rockfish									0.6			
Spotted Ratfish						0.9		1.1		4.6		3.1
Twoline Eelpout												
Walleye Pollock		7.3	16.3	2.3	5.8	8.1	0.5		4.7	1.2	3.0	1.3
Widow Rockfish												
Yelloweye Rockfish												
Yellowmouth Rockfish								0.5				
Yellowtail Rockfish						1.5						
Other	0.7	7.5	10.8	0.9	18.8	14.0	3.3	13.2	34.2	1.8	0.5	7.5
Total	**739.3**	**175.7**	**271.0**	**74.4**	**268.1**	**138.8**	**135.6**	**219.1**	**259.9**	**2036.7**	**1240.7**	**1567.6**

Common Name	114	115	116	117	118	119	120	121	122	123	124	125
Abyssal Skate												
Aleutian Skate												
Arrowtooth Flounder	0.6	29.5	6.2	22.4	101.2	23.8	17.2	4.3	6.6		10.6	5.6
Aurora Rockfish												
Blue Shark												
Bocaccio												
Canary Rockfish		9.5	28.2	34.1								
Darkblotched Rockfish												
Darkfin Sculpin	0.3		-			1.2	1.1	0.3				0.2
Dover Sole	0.6				31.0	6.1	10.4	0.6	4.9			-
Dusky Rockfish			1.8									
English Sole		0.9										
Giant Grenadier												
Greenstriped Rockfish		0.6	15.8	5.5								0.3
Harlequin Rockfish	25.2	0.7	0.3	0.4					0.4	11.1	1.0	15.4
Lingcod	8.1		3.6	11.1			12.4			5.3		
Longnose Skate		11.3		22.3	6.1							
Longspine Thornyhead												
North Pacific Spiny Dogfish		1.4	1.7	4.9		2.3						1.8
Pacific Cod	7.5	22.1	93.6	17.6						1.1	6.7	11.8
Pacific Flatnose												
Pacific Grenadier												
Pacific Hake	9.9				36.0	134.7		0.8		0.8		
Pacific Halibut	4.5	11.2	33.8	2.9	21.3			4.3		18.9		
Pacific Ocean Perch	4119.5	4.3				322.2	262.1	43.2	355.9	1415.3	1244.7	757.3
Petrale Sole	0.8		2.0	3.1						0.7		0.8
Popeye												
Prowfish												
Ragfish					38.3							
Redbanded Rockfish	12.5		0.1		3.0	0.8	0.6		1.2	4.4	1.1	8.5
Redstripe Rockfish	2.4	0.6	1.3	38.6						167.5	3.2	24.7
Rex Sole	0.9	1.8	0.4	2.3	31.6	13.6	6.3	0.9	4.9	0.8	0.3	1.2
Rosethorn Rockfish	7.1		11.8	4.6		2.0	3.2	1.4	12.2	4.1	6.3	10.8
Rougheye Rockfish					412.6	652.3			1.0			
Roughtail Skate												
Sablefish	5.6				38.7	3.2	5.9		8.6	6.4		
Sandpaper Skate									0.5			
Sharpchin Rockfish	5715.0	5.7	4.2	5.4	0.5	0.7	0.4	0.2	0.3	2267.2	232.6	1692.7
Shortraker Rockfish						5.7						
Shortspine Thornyhead	4.2				58.3	83.0	124.9	6.4	66.8	0.9	1.6	3.1
Silvergray Rockfish	206.6	606.6	249.0	427.8		1.6		2.6	26.3	175.0	14.9	344.8
Slender Sole		0.1										0.1
Splitnose Rockfish									0.7			
Spotted Ratfish	89.3	3.3	2.6	0.2	1.2	1.4						0.8
Twoline Eelpout												
Walleye Pollock	9.8	12.3	4.9	1.0		1.7	1.1		0.9		1.3	
Widow Rockfish	2.4	2.2									2.5	2.4
Yelloweye Rockfish				2.3								
Yellowmouth Rockfish				7.3		0.7						
Yellowtail Rockfish		41.3	53.3									
Other	0.2	-	0.6	8.9	19.1	12.1	1.5	-	5.6	0.2	0.3	0.7
Total	**10233.2**	**765.5**	**515.2**	**622.5**	**799.0**	**1269.1**	**447.0**	**65.2**	**496.7**	**4079.8**	**1527.1**	**2883.0**

Common Name	126	126	127	128	129	130	131	132	133	134	135	136
Abyssal Skate												
Aleutian Skate												
Arrowtooth Flounder	4.1	4.1	9.7	1.5	9.5	24.5	4.3	262.6	65.5	94.2	14.1	16.5
Aurora Rockfish												
Blue Shark												
Bocaccio												
Canary Rockfish								111.7	5.6			
Darkblotched Rockfish												
Darkfin Sculpin	0.1	0.1		0.3		1.0				0.7		0.1
Dover Sole	1.6	1.6	1.7	1.3	1.2	5.9				4.1	12.8	2.9
Dusky Rockfish						1.4						
English Sole												0.6
Giant Grenadier												
Greenstriped Rockfish								5.0	15.2			
Harlequin Rockfish	0.4	0.4				2.0			0.2			
Lingcod							6.0			9.1	7.1	
Longnose Skate								24.8			14.8	4.4
Longspine Thornyhead												
North Pacific Spiny Dogfish								2.2	2.5			0.9
Pacific Cod					4.8			9.7	58.6			
Pacific Flatnose												
Pacific Grenadier												
Pacific Hake										138.3	32.1	
Pacific Halibut					6.5	11.1	17.0	3.3	3.3	2.7		17.5
Pacific Ocean Perch	1177.2	1177.2	703.0	413.8	3694.3	496.6		0.3	0.6	489.0	86.5	286.5
Petrale Sole					1.9		71.4	5.1				
Popeye												
Prowfish												
Ragfish												
Redbanded Rockfish	0.6	0.6	2.3	1.5	3.2	2.3				13.9	2.3	42.7
Redstripe Rockfish	0.4	0.4	1.2		6.9	1.6						
Rex Sole	2.0	2.0	2.6	2.5	3.5	7.5	0.3	20.6	14.4	5.0	0.2	12.8
Rosethorn Rockfish	9.0	9.0	12.1	3.5	11.8	6.5		0.1	0.8	6.3		0.7
Rougheye Rockfish						49.9				367.3	535.0	7.5
Roughtail Skate												
Sablefish										7.1	1.0	5.4
Sandpaper Skate						1.7						
Sharpchin Rockfish	137.9	137.9	118.5	1.4	409.7	3.8		0.8	1.1			15.2
Shortraker Rockfish										22.8		
Shortspine Thornyhead	3.5	3.5	3.7	16.1	2.0	181.6		0.1		37.1	61.0	17.9
Silvergray Rockfish	22.0	22.0	4.4	21.4	33.3	2.2		2318.3	176.0			126.3
Slender Sole								0.1	0.1			
Splitnose Rockfish						0.5				0.6	0.6	3.3
Spotted Ratfish					3.4	3.8	17.1	1.6	2.1			
Twoline Eelpout												
Walleye Pollock			0.4		1.1	1.4		8.7	10.9	20.7	20.5	68.6
Widow Rockfish				2.6	6.6			8.6	2.2			9.1
Yelloweye Rockfish												
Yellowmouth Rockfish				1.8	2.3							
Yellowtail Rockfish								2.7				1.7
Other	1.0	1.0	2.8	4.9	0.2	0.6	0.4	0.9	0.1	19.1	13.0	0.1
Total	**1359.6**	**1359.6**	**862.3**	**472.6**	**4202.3**	**805.9**	**116.5**	**2787.2**	**359.3**	**1238.2**	**800.9**	**640.9**

Common Name	137	138	139	140	141
Abyssal Skate					
Aleutian Skate					
Arrowtooth Flounder	45.3	54.7	183.1	20.0	30.9
Aurora Rockfish					
Blue Shark					
Bocaccio					
Canary Rockfish			74.7	4.9	
Darkblotched Rockfish				27.5	2.0
Darkfin Sculpin		0.1		0.1	
Dover Sole	1.2	16.2			10.6
Dusky Rockfish					
English Sole			0.5		
Giant Grenadier					
Greenstriped Rockfish			16.8	0.3	
Harlequin Rockfish	0.2	0.2			
Lingcod					
Longnose Skate					
Longspine Thornyhead					
North Pacific Spiny Dogfish			16.7		
Pacific Cod			22.0		
Pacific Flatnose					
Pacific Grenadier					
Pacific Hake	8.6	102.4		48.4	187.4
Pacific Halibut	5.0	31.8	3.5	7.9	
Pacific Ocean Perch	255.9	75.4		2496.3	49.0
Petrale Sole			3.5		
Popeye					
Prowfish					
Ragfish					
Redbanded Rockfish	18.2	5.5	4.7		17.9
Redstripe Rockfish			39.3	0.7	0.5
Rex Sole	5.3	4.4	20.7	0.9	0.7
Rosethorn Rockfish	6.9	1.7	-	4.4	
Rougheye Rockfish		6.6		6188.7	1217.0
Roughtail Skate					
Sablefish	7.3	14.2			14.8
Sandpaper Skate					
Sharpchin Rockfish	3.6	0.3			
Shortraker Rockfish		6.7		6.1	35.9
Shortspine Thornyhead	117.1	58.3	0.3	22.4	24.7
Silvergray Rockfish	9.6		627.9	7.9	
Slender Sole	0.1	0.6		-	
Splitnose Rockfish	239.7	2.0		1.1	
Spotted Ratfish			0.4	1.1	1.4
Twoline Eelpout					
Walleye Pollock	15.9	11.0	10.2	2.0	8.8
Widow Rockfish			36.1		
Yelloweye Rockfish					
Yellowmouth Rockfish					
Yellowtail Rockfish			3.9		
Other	22.5	7.2	4.3	1.6	4.9
Total	**762.2**	**399.3**	**1068.6**	**8842.2**	**1606.5**