Summary of the West Coast Haida Gwaii Synoptic Bottom Trawl Survey, August 25 – October 2, 2014

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V9T 6N7

2018

Canadian Manuscript Report of Fisheries and Aquatic Sciences 3134

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Canadian Manuscript Report of Fisheries and Aquatic Sciences

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Canadian Manuscript Report of
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SUMMARY OF THE WEST COAST HAIDA GWAII SYNOPTIC BOTTOM TRAWL SURVEY, AUGUST 25 - OCTOBER 2, 2014

by

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Cat. No. 97-4/3134E-PDF ISBN 978-0-660-23950-7 ISSN 1488-5387

Correct citation for this publication:

Williams, D. C., Nottingham, M. K., Olsen, N., and Wyeth, M. R. 2018. Summary of the West Coast Haida Gwaii synoptic bottom trawl survey, August 25 - October 2, 2014. Can. Manuscr. Rep. Fish. Aquat. Sci. 3134: viii + 42 p.

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ABSTRACT

Williams, D. C., Nottingham, M. K., Olsen, N., and Wyeth, M. R. 2018. Summary of the West Coast Haida Gwaii synoptic bottom trawl survey, August 25 - October 2, 2014. Can. Manuscr. Rep. Fish. Aquat. Sci. 3134: viii + 42 p.

A bottom trawl survey off the west coast of Haida Gwaii was conducted on the fishing vessel E. J. Safarik between August 25 and October 2, 2014. 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. Fifty-four (96.4%) of the 56 blocks assessed in 2014 were successfully fished. The mean catch per tow was 1,535 kg. The average number of species per tow was 21. The most abundant fish species (by weight) encountered was Pacific Ocean Perch (*Sebastes alutus)* followed by Sharpchin Rockfish (*Sebastes zacentrus*), Arrowtooth Flounder (*Atheresthes stomias*), Silvergray Rockfish (*Sebastes brevispinus)*, and Redstripe Rockfish (*Sebastes proriger*). Biological data including individual length, weight, sex, maturity, and ageing structures were collected from selected species. Samples were collected from a total of 39 different species of fish. Oceanographic and fishing gear data including water temperature, depth, salinity, and dissolved oxygen were also recorded for most tows.

RÉSUMÉ

Williams, D. C., Nottingham, M. K., Olsen, N., et Wyeth, M. R. 2018. Sommaire du relevé synoptique au chalut de fond de la côte ouest d' Haida Gwaii, du 25 août au 2 octobre 2014. Rapp. manus. can. sci. halieut. aquat. 3134: viii + 42 p.

Un relevé au chalut de fond au large de la côte ouest d'Haida Gwaii a été effectué par le navire de pêche *E. J. Safarik* entre le 25 août et le 2 soctobre 2014. 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 56 blocs évalués en 2014, 54 (96,4 %) ont fait l'objet d'une pêche. La moyenne de prises par trait était de 1535 kg. Le nombre moyen d'espèces par trait était de 21. Les espèces de poissons les plus abondantes observées étaient le sébaste à longue mâchoire (*Sebastes alutus*), le sébaste à menton pointu (*Sebastes zacentrus*), la plie à grande bouche (*Atheresthes stomias)*, le sébaste argenté (*Sebastes brevispinus*) et le sébaste à raie rouge (*Sebastes proriger*). On a recueilli des données biologiques sur certaines espèces, notamment la longueur, le poids, le sexe, la maturité et la structure par âge. Les échantillons ont été prélevés sur un total de 39 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 and fifth surveys occurring in 2010 and 2012 (Olsen et al. 2017 and Nottingham et al. 2017). This document provides a brief summary of the results and methods from the sixth WCHG synoptic bottom trawl survey which occurred between August 25 and October 2, 2014. It is not intended as a comprehensive review of the survey, nor does it provide interpretive analysis of the survey results.

METHODS

SURVEY DESIGN

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

Depth Strata

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

Block Allocation

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

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

For the 2014 WCHG survey, 133 blocks were randomly selected with the target of 125 successful tows. Part way through the survey it was determined that all blocks could not be assessed within the timeframe, therefore 7 blocks were randomly removed from the first two strata (Table 1).

VESSEL

The survey was conducted aboard the F/V E. J. Safarik, a 21 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 two sections or “legs” of 16-24 days in duration with five science staff in each. Crew change was on September 17 (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 12 hours, starting at approximately 0700 hrs and ending at approximately 1900 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 onto the deck. Catch was then sorted by species into separate baskets. 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: "Weight" samples, consisting of individual fish length, wieght 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.

The sampling protocols for the 2014 synoptic bottom trawl surveys adopted the first significant changes since 2009. Prior to 2014, the protocol focused on collecting as many biological samples for as many species as possible and was spread out to provide a synoptic view of the species biology throughout the survey areas. The protocol used for 2014 focused the sampling effort on species of commercial importance and species where the survey was likely to provide useful abundance indices. This was achieved through the introduction of relative catch weight ranking for each species in a tow to be used with the previously established species ranking system. In addition, the sample size was decreased from a target of 50 fish per sample to 25 fish in an effort to sample more species in a tow.

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 2014, tissue for DNA analysis was collected from Pacific Cod (*Gadus macrocephalus*), Rex Sole (*Glyptocephalus zachirus*) Flathead Sole (*Hippoglossoides elassodon*) and Pacific Halibut (*Hippoglossus stenolepis*) as well as tissue for DNA analysis from 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 E. J. Safarik was equipped with a Scanmar Scanbas trawl mensuration system. Sensors attached to the net use acoustic signals to communicate with each other and the vessel. This provides real-time net geometry headline height above bottom and depth, as well as doorspread and wingspread which are used to calculate swept area. The Scanmar output was not logging during the survey, therefore headline height was recorded manually during tows.

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, B.C.

RESULTS

FISHING

The 2014 WCHG synoptic bottom trawl survey was divided into two legs of 16-24 days. From a total of 39 survey days, one day was spent loading and setting up the vessel at the start of the survey, three days were required for travel at the start and three days at end of the survey, Two and a half days were required for offloading catch and changing crews, one day was spent unloading the vessel at the end of the survey and nine fishing days were lost due to weather. Seven and a half days were required for repairs and associated travel. The 12 days in which some fishing occurred were not all complete days due to weather and mechanical issues. It is estimated that about five full days of fishing took place (Table 3).

From a total of 56 blocks assessed during the 2014 survey, 54 blocks were successfully fished, one block was rejected after one or more failed fishing attempts and one block remained as not rejected after one or more failed fishing attempts (Table 4 and Figure 9).

A total of 64 tows, of which 54 were useable, were completed during the 12 days that fishing occurred. Due to a recording error, tow number 18 was missed, so although the number sequence terminates at tow number 65, the total number of tows completed is 64. Table 5 shows tow results by stratum for this survey. The scope (ratio of warp length to bottom depth) used for tows in 2014 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.

As a result of significant delays due to bad weather and mechanical issues, 70 survey blocks were not assessed out of the 126 blocks initially targeted. The 2014 WCHG survey was considered unusable for the purpose of stock assessments and/ or relative biomass indices.

CATCH

A total of 98,232 kg of fish and invertebrates was caught during the 2014 WCHG survey. The total catch weight for tows was typically less than 2,000 kg per tow, and averaged 1,535 kg per tow (Figure 11). The majority of the catch (97,795 kg, 99.5%) consisted of 81 different species of fish, including 24 rockfish and 8 flatfish species. The

remainder (437 kg) consisted of 68 invertebrate groups. The average number of species identified in useable tows was 21 with the minimum species count being 10 and the maximum count being 38 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 Sharpchin Rockfish (*Sebastes zacentrus*), Arrowtooth Flounder (*Atheresthes stomias*), Silvergray Rockfish (*Sebastes brevispinus)* and Redstripe Rockfish (*Sebastes proriger*). Catch weights by tow for the 50 most commonly encountered species in this survey are included in Appendix B.

Commercially marketable fish were retained and sold with the proceeds going to the Canadian Groundfish Research and Conservation Society (Table 8).

BIOLOGICAL SAMPLING

Biological samples were collected from a total of 7307 individuals of 39 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 manually for most of the 64 tows, but was not logged continuously by the Scanmar sytem so the data has been excluded.

Seabird SBE39 data (water temperature and depth) were collected from 60 tows while Seabird SBE19plus and SBE43 data (conductivity, water temperature, depth, and dissolved oxygen) were collected from 47 tows (Table 11 and Figure 13).

BCS data were collected from 64 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 bottom sounder data are available for 59 tows.

ACKNOWLEDGEMENTS

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

REFERENCES

Chilton D.E., and R.J. Beamish. 1982. Age determination methods for fishes studied by the Groundfish Program at the Pacific Biological Station. Can. Spec. Publ. Fish. Aquat. Sci. 60: 102p.

Gharrett, A. J., A. P. Matala, E. L. Peterson, A. K. Gray, Z. Li, and J. Heifetz. 2005. Two genetically distinct forms of rougheye rockfish (*Sebastes aleutianus*) are different species. Trans. Amer. Fish. Soc. 134: 242−260.

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.

Olsen, N. 2010. A user's guide to GFBioField: The Pacific Region's at-sea data acquisition system for groundfish trawl surveys. Can. Tech. Rep. Fish. Aquat. Sci. 2887: x + 77 p.

Olsen, N., Rutherford, K.L., and Stanley, R.D. 2008. West Coast Haida Gwaii groundfish bottom trawl survey August 25th to September 21st, 2008. Can. Manuscr. Rep. Fish. Aquat. Sci. 2858: vii + 50 p.

Olsen, N., Workman, G. D., and Stanley, R. D. 2007a. Queen Charlotte Sound groundfish bottom trawl survey, July 3rd to August 10th, 2003. Can. Manuscr. Rep. Fish. Aquat. Sci. 2782: 58 p.

Olsen, N., Wyeth, M. R., Williams, D. C. and Nottingham, M. K. 2017. Summary of the West Coast Haida Gwaii synoptic bottom trawl survey, August 25 - September 20, 2010. Can. Manuscr. Rep. Fish. Aquat. Sci. 3094: viii + 55 p.

Orr, J.W., and S. Hawkins. 2008. Species of the Rougheye Rockfish complex: resurrection of *Sebastes melanostictus* (Matsubara. 1934) and a redescription of *Sebastes aleutianus* (Jordan and Evermenn, 1898) (Teleostei: Scorpaeniformes). Fisheries Bulletin. 106: 111-134 p.

Sea-Bird Electronics, Inc. 1989. Application Note 14: 1978 Practical Salinity Scale. Available from http://www.seabird.com (accessed 16 November, 2016).

Sea-Bird Electronics, Inc. 2002. Application Note 69: Conversion of pressure to depth. Available from http://www.seabird.com (accessed 16 November, 2016).

Sea-Bird Electronics, Inc. 2012. Application Note 64-2: SBE 43 Dissolved oxygen sensor calibration and data corrections. Available from http://www.seabird.com (accessed 16 November, 2016).

Sinclair, A., Schnute, J., Haigh, R., Starr, P., Stanley, R. D., Fargo, J., and Workman, G. 2003. Feasibility of multispecies groundfish bottom trawl surveys on the BC coast. Can. Stock Assess. Sec. Res. Doc. 2003/049.

Workman, G.D., Olsen, N., and Rutherford, K.L. 2007. West Coast Queen Charlotte Islands groundfish bottom trawl survey, August 28th to September 25th, 2006. Can. Manuscr. Rep. Fish. Aquat. Sci. 2804: vii + 44 p.

Workman, G.D., Stanley, R.D., Olsen, N., and Rutherford, K.L. 2008. West Coast Queen Charlotte Islands groundfish bottom trawl survey September 11th to October 17th, 2007. Can. Manuscr. Rep. Fish. Aquat. Sci. 2823: vi + 45 p.

Table 1. 2014 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	Original Block Allocation	Revised Block Allocation
180-330	74	0.05	78	73
330-500	31	0.05	33	31
500-800	10	0.07	11	11
800-1300	10	0.06	11	11
Total	**125**		**133**	**126**

Table 2. Atlantic Western IIa box trawl net specifications on the 2014 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 2014 WCHG synoptic bottom trawl survey.

	Fishing				Tows			
Date	Start	End	Hours	Blocks Assessed	Useable	Not Useable	Total	Notes
08/25/2014	-	-	-	-	-	-	-	Load vessel
08/26/2014	-	-	-	-	-	-	-	Travel
08/27/2014	-	-	-	-	-	-	-	Travel
08/28/2014	-	-	-	-	-	-	-	Travel
08/29/2014	-	-	-	-	-	-	-	Weather day
08/30/2014	08:20	19:48	11	4	4	1	5	
08/31/2014	07:43	08:29	1	1	1	0	1	
09/01/2014	-	-	-	-	-	-	-	Weather day
09/02/2014	08:18	16:27	8	3	3	1	4	
09/03/2014	07:24	20:01	13	5	5	1	6	
09/04/2014	-	-	-	-	-	-	-	Travel to Prince Rupert for vessel repairs
09/05/2014	-	-	-	-	-	-	-	Vessel repairs and offload
09/06/2014	-	-	-	-	-	-	-	Vessel repairs
09/07/2014	12:01	17:54	5	3	2	2	4	
09/08/2014	-	-	-	-	-	-	-	Travel to Prince Rupert for vessel repairs
09/09/2014	-	-	-	-	-	-	-	Vessel repairs
09/10/2014	-	-	-	-	-	-	-	Vessel repairs and offload
09/11/2014	11:59	18:47	7	4	3	1	4	
09/12/2014	07:23	17:43	10	8	8	0	8	
09/13/2014	07:29	18:42	11	7	7	1	8	
09/14/2014	07:25	19:16	12	7	7	2	9	
09/15/2014	07:46	16:46	9	6	6	0	6	
09/16/2014	-	-	-	-	-	-	-	Travel
09/17/2014	-	-	-	-	-	-	-	Vessel repair and science crew change
09/18/2014	-	-	-	-	-	-	-	Vessel repairs
09/19/2014	-	-	-	-	-	-	-	Weather day
09/20/2014	-	-	-	-	-	-	-	Weather day
09/21/2014	-	-	-	-	-	-	-	Weather day
09/22/2014	-	-	-	-	-	-	-	Weather day
09/23/2014	08:22	17:16	9	5	5	0	5	
09/24/2014	-	-	-	-	-	-	-	Weather day
09/25/2014	-	-	-	-	-	-	-	Weather day
09/26/2014	09:05	17:11	8	3	3	1	4	
09/27/2014	-	-	-	-	-	-	-	Weather day
09/28/2014	-	-	-	-	-	-	-	Offload
09/29/2014	-	-	-	-	-	-	-	Travel
09/30/2014	-	-	-	-	-	-	-	Travel
10/01/2014	-	-	-	-	-	-	-	Travel
10/02/2014	-	-	-	-	-	-	-	Unload
Total				**56**	**54**	**10**	**64**	
Average Per Day				**4.7**	**4.5**	**0.8**	**5.3**	

Table 4. Block results by stratum for the 2014 WCHG synoptic bottom trawl survey.

Depth Stratum (m)	Successful	Rejected Prior	Rejected Inspected	Rejected Failed	Not Rejected-Failed Attempt	Not Assessed-Not visited	Total
180-330	39	0	0	0	1	33	73
330-500	7	0	0	1	0	23	31
500-800	5	0	0	0	0	6	11
800-1300	3	0	0	0	0	8	11
Total	**54**	**0**	**0**	**1**	**1**	**70**	**126**

Table 5. Tow results by stratum for the 2014 WCHG synoptic bottom trawl survey.

Depth Stratum (m)	Useable	Not Usable
180-330	39	7
330-500	7	2
500-800	5	1
800-1300	3	0
Total	54	10

Table 6. Mean warp length and scope by 50 meter depth interval for the 2014 WCHG synoptic bottom trawl survey.

Depth (m)	Mean Warp (m)	Mean Scope
200-250	558	2.44
250-300	643	2.31
300-350	790	2.42
350-400	853	2.27
400-450	914	2.10
450-500	892	1.94
500-550	1280	2.35
550-600	1280	2.23
600-650	1372	2.23
650-700	1189	1.78
750-800	1554	1.99
1150-1200	1737	1.50
1250-1300	1737	1.36

Table 7. Frequency of occurrence, maximum catch weight, mean catch weight per tow, and total survey catch weight of each species captured during the 2014 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*	57	231.23	52.33	2930.26
Pacific Ocean Perch	*Sebastes alutus*	45	8596.84	1123.37	50551.59
Redbanded Rockfish	*Sebastes babcocki*	41	390.44	19.59	763.94
Silvergray Rockfish	*Sebastes brevispinis*	40	1181.17	152.02	6080.69
Sharpchin Rockfish	*Sebastes zacentrus*	39	4052.57	270.12	9724.43
Rosethorn Rockfish	*Sebastes helvomaculatus*	37	35.95	8.61	318.62
Rougheye Rockfish	*Sebastes aleutianus*	26	2082.85	132.03	3432.84
Redstripe Rockfish	*Sebastes proriger*	25	1500.00	205.13	5128.28
Harlequin Rockfish	*Sebastes variegatus*	18	609.89	41.15	699.59
Yellowmouth Rockfish	*Sebastes reedi*	16	1521.17	203.05	3248.75
Widow Rockfish	*Sebastes entomelas*	13	495.18	69.56	904.32
Greenstriped Rockfish	*Sebastes elongatus*	12	6.79	1.49	17.88
Shortraker Rockfish	*Sebastes borealis*	12	133.08	22.75	272.95
Longspine Thornyhead	*Sebastolobus altivelis*	9	66.04	32.04	288.34
Splitnose Rockfish	*Sebastes diploproa*	8	4.73	0.95	6.65
Bocaccio	*Sebastes paucispinis*	6	10.72	5.78	34.65
Dusky Rockfish	*Sebastes variabilis*	5	36.38	13	65
Canary Rockfish	*Sebastes pinniger*	3	18.54	7.63	22.88
Yellowtail Rockfish	*Sebastes flavidus*	3	4.67	3.28	9.85
Yelloweye Rockfish	*Sebastes ruberrimus*	2	141.64	76.65	153.3
Blackgill Rockfish	*Sebastes melanostomus*	1	0.90	0.90	0.90
Darkblotched Rockfish	*Sebastes crameri*	1	2.09	2.09	2.09
Puget Sound Rockfish	*Sebastes emphaeus*	1	1.96	1.96	1.96
Pygmy Rockfish	*Sebastes wilsoni*	1	0.16	0.16	0.16
Flatfishes	**Order Pleuronectiformes**				
Arrowtooth Flounder	*Atheresthes stomias*	52	2250	129.51	6604.87
Rex Sole	*Glyptocephalus zachirus*	52	89.72	14.18	709.09
Dover Sole	*Microstomus pacificus*	52	646.2	35.53	1811.88
Pacific Halibut	*Hippoglossus stenolepis*	31	156.27	18.26	547.92
Slender Sole	*Lyopsetta exilis*	18	2.75	0.50	8.02
Petrale Sole	*Eopsetta jordani*	8	5.69	2.42	16.92
Deepsea Sole	*Embassichthys bathybius*	5	1.66	0.83	4.17
English Sole	*Parophrys vetulus*	2	4.17	2.66	5.32
Cod-Like Fishes	**Order Gadiformes**				
Walleye Pollock	*Gadus chalcogrammus*	33	89.34	6.93	214.94
Pacific Hake	*Merluccius productus*	8	91.25	27.15	217.23
Pacific Grenadier	*Coryphaenoides acrolepis*	6	37.10	11.73	70.37
Giant Grenadier	*Albatrossia pectoralis*	6	52.92	16.52	99.14
Popeye	*Coryphaenoides cinereus*	5	31.09	7.16	35.78
Pacific Flatnose	*Antimora microlepis*	4	9.80	3.11	12.44
Cartilaginous Fishes	**Class Chondrichthyes**				
Spotted Ratfish	*Hydrolagus colliei*	44	91.72	14.33	616.31
Longnose Skate	*Raja rhina*	19	34.85	15.65	297.44
North Pacific Spiny Dogfish	*Squalus suckleyi*	10	5.51	2.57	25.66
Sandpaper Skate	*Bathyraja interrupta*	8	8.78	3.38	27.08
Aleutian Skate	*Bathyraja aleutica*	6	10.80	7.28	43.70
Roughtail Skate	*Bathyraja trachura*	4	2.57	1.33	5.31
Brown Cat Shark	*Apristurus brunneus*	2	4.04	3.27	6.54
Greenlings	**Family Hexagrammidae**				
Lingcod	*Ophiodon elongatus*	14	81.66	21.43	300.02
Sculpins	**Family Cottidae**				
Darkfin Sculpin	*Malacocottus zonurus*	32	2.12	0.84	16.73

Common Name	Scientific Name	Number of Tows	Catch Weight (kg)		
			Max	Mean	Total
Bigmouth Sculpin	*Hemitripterus bolini*	4	9.64	7.14	28.57
Spotfin Sculpin	*Icelinus tenuis*	1	-	-	-
Giant Blobsculpin	*Psychrolutes phrictus*	1	4.72	4.72	4.72
Eelpouts	**Family Zoarcidae**				
Pallid Eelpout	*Lycodapus mandibularis*	4	-	-	-
Black Eelpout	*Lycodes diapterus*	4	-	-	-
Twoline Eelpout	*Bothrocara brunneum*	3	2.29	1.78	5.35
Snakehead Eelpout	*Lycenchelys crotalina*	2	0.07	0.07	0.07
Blackmouth Eelpout	*Lycodapus fierasfer*	1	-	-	-
Lanternfishes	**Family Myctophidae**				
Lanternfishes	Myctophidae (Family)	12	-	-	-
California Headlightfish	*Diaphus theta*	5	-	-	-
Blue Lanternfish	*Tarletonbeania crenularis*	5	-	-	-
Other Fish					
Sablefish	*Anoplopoma fimbria*	29	186.64	30.69	890.08
Snailfishes	Liparidae (Family)	8	0.02	0.02	0.02
Bigeye Poacher	*Bathyagonus pentacanthus*	7	0.15	0.08	0.16
Pacific Viperfish	*Chauliodus macouni*	7	-	-	-
Deepsea Smelts	Bathylagidae (Family)	6	-	-	-
Crested Bigscale	*Poromitra crassiceps*	5	0.07	0.07	0.07
Smootheye Poacher	*Xeneretmus leiops*	5	-	-	-
Blackfin Poacher	*Bathyagonus nigripinnis*	4	-	-	-
Chum Salmon	*Oncorhynchus keta*	4	4.44	3.85	15.40
Pearly Prickleback	*Bryozoichthys marjorius*	3	0.09	0.09	0.09
Prowfish	*Zaprora silenus*	2	2.95	1.94	3.87
Blacktail Snailfish	*Careproctus melanurus*	2	0.40	0.35	0.70
Pacific Lamprey	*Entosphenus tridentatus*	2	0.28	0.28	0.28
Threadfin Slickhead	*Talismania bifurcata*	1	0.23	0.23	0.23
Black Bobtail Eel	*Cyema atrum*	1	-	-	-
Northern Ronquil	*Ronquilus jordani*	1	-	-	-
Shining Tubeshoulder	*Sagamichthys abei*	1	-	-	-
Northern Pearleye	*Benthalbella dentata*	1	-	-	-
Waryfish	*Scopelosaurus adleri*	1	-	-	-
Bulbous Dreamer	*Oneirodes bulbosus*	1	-	-	-
Bluethroat Argentine	*Nansenia candida*	1	-	-	-
Northern Smoothtongue	*Leuroglossus schmidti*	1	-	-	-
Crabs and Shrimp	**Class Malacostraca**				
Prawn	*Pandalus platyceros*	19	4.16	1.04	16.69
Glass Shrimp	*Pasiphaea pacifica*	6	-	-	-
Grooved Tanner Crab	*Chionoecetes tanneri*	6	14.97	4.00	20.01
Sidestripe Shrimp	*Pandalopsis dispar*	5	0.38	0.20	0.81
Yellowleg Shrimp	*Pandalus tridens*	5	-	-	-
Deepsea Eualid	*Eualus biunguis*	4	-	-	-
-	*Lithodes couesi*	3	1.28	0.77	1.54
-	*Eualus* (Genus)	2	-	-	-
-	*Pandalopsis ampla*	1	-	-	-
-	*Paralomis multispina*	1	-	-	-
Crimson Pasiphaeid	*Pasiphaea tarda*	1	-	-	-
Starfish	**Class Asteroidea**				
Rose Starfish	*Crossaster papposus*	8	-	-	-
-	*Poraniopsis inflatus inflatus* (Sub Species)	7	-	-	-
-	*Hippasteria californica*	6	0.46	0.23	1.17
Starfish	Asteroidea (Class)	5	0.35	0.35	0.35
-	*Cheiraster dawsoni*	4	0.34	0.34	0.34
-	*Nearchaster* (Genus)	3	0.08	0.08	0.08
-	*Pseudarchaster* (Genus)	2	0.24	0.21	0.42
-	*Ceramaster* (Genus)	2	-	-	-
-	*Crossaster* (Genus)	2	-	-	-
Winged Sea Star	*Pteraster militaris*	2	0.20	0.20	0.20
Cushion Star	*Pteraster tesselatus*	2	-	-	-

Common Name	Scientific Name	Number of Tows	Catch Weight (kg)		
			Max	Mean	Total
-	Zoroasteridae (Family)	2	6.98	6.98	6.98
-	*Solaster* (Genus)	1	-	-	-
-	*Henricia* (Genus)	1	-	-	-
Morning Sun Starfish	*Solaster dawsoni*	1	0.07	0.07	0.07
-	Goniasteridae (Family)	1	-	-	-
-	*Dipsacaster* (Genus)	1	-	-	-
Brittle Stars	**Class Ophiuroidea**				
Basket Star	*Gorgonocephalus eucnemis*	5	0.26	0.26	0.26
-	*Amphiophiura ponderosa*	3	9.36	9.36	9.36
-	*Ophiuroidea (Class)*	1	-	-	-
Sea Cucumbers	**Class Holothuroidea**				
Soft Sea Cucumber	*Pseudostichopus mollis*	7	-	-	-
Sea Cucumbers	Holothuroidea (Class)	2	-	-	-
-	*Synallactes* (Genus)	1	-	-	-
Armoured Sea Cucumber	*Psolus chitinoides*	1	-	-	-
Octopuses and Squid	**Class Cephalopoda**				
Schoolmaster Gonate Squid	*Berryteuthis magister*	35	51.32	8.05	241.48
-	*Chiroteuthis calyx*	4	0.15	0.15	0.15
Squids	Teuthida (Order)	3	0.39	0.39	0.39
Boreal Clubhook Squid	*Onychoteuthis borealijaponicus*	2	-	-	-
Flapjack Devilfish	*Opisthoteuthis californiana*	2	1.74	1.62	3.24
-	*Belonella borealis*	1	-	-	-
Sea Urchins	**Super Order Echinacea**				
Fragile Urchin	*Allocentrotus fragilis*	13	10.62	1.51	12.12
Pallid Urchin	*Strongylocentrotus pallidus*	2	-	-	-
Jellyfish	**Class Scyphozoa**				
Lions Mane	*Cyanea capillata*	7	2.57	1.29	5.15
Jellyfish	Scyphozoa (Class)	6	0.77	0.60	1.79
-	*Periphylla periphylla*	1	-	-	-
Anemones and Corals	**Class Anthozoa**				
-	*Primnoa (*Genus)	12	14.91	3.57	39.26
Anemone	Actiniaria (Order)	7	2.88	1.16	3.48
-	*Isidella* (Genus)	4	2.18	0.87	2.62
-	*Paragorgia* (Genus)	3	0.77	0.50	1.00
Sea Whip	*Balticina septentrionalis*	3	0.05	0.05	0.05
-	*Lillipathes* (Genus)	2	-	-	-
-	Hormathiidae (Family)	2	-	-	-
-	*Paractinostola faeculenta*	1	1.76	1.76	1.76
Sea Pens	Pennatulacea (Order)	1	-	-	-
Snails and Slugs	**Class Gastropoda**				
-	*Neptunea* (Genus)	3	-	-	-
Oregontriton	*Fusitriton oregonensis*	3	-	-	-
Seaslugs	Nudibranchia (Order)	1	-	-	-
Rosy Tritonia	*Tritonia diomedea*	1	-	-	-
Topshells	Trochidae (Family)	1	-	-	-
Other Species					
Sponges	Porifera (Phylum)	19	36.08	5.01	60.11
Sea Lilies and Feather Stars	Crinoidea (Class)	3	-	-	-
-	Tunicata (Sub Phylum)	2	0.92	0.92	0.92
Glass Sponges	Hexactinellida (Class)	2	3.34	2.21	4.42
-	Neomeniidae (Family)	1	-	-	-
Sea Mouse	*Aphrodita* (Genus)	1	-	-	-
Ascidians And Tunicates	Ascidiacea (Class)	1	-	-	-

Table 8. Offloaded catch weight by species for the 2014 WCHG synoptic bottom trawl survey.

Species	Weight (kg)
Arrowtooth Flounder	53.72
Bank Rockfish	21.31
Darkblotched Rockfish	1.78
Dover Sole	900.75
Dusky Rockfish	25.30
English Sole	4.44
Greenstriped Rockfish	4.88
Grenadiers	1.33
Harlequin Rockfish	48.83
Lingcod	66.59
Longnose Skate	8.43
Longspine Thornyhead	274.35
Pacific Cod	139.40
Pacific Ocean Perch	25680.60
Prowfishes	3.11
Redbanded Rockfish	151.38
Redstripe Rockfish	2104.72
Rex Sole	131.41
Rosethorn Rockfish	112.32
Rougheye/Blackspotted Rockfish Complex	3043.21
Total	**32777.87**

Table 9. Species sampled during the 2014 WCHG synoptic bottom trawl survey. The number of samples and number of recorded biological attributes are shown for each species.

Common Name	Scientific Name	Number of Samples	Number of Recorded Biological Attributes				
			Length	Weight	Sex	Maturity	Age
Aleutian Skate	*Bathyraja aleutica*	5	7	3	7	0	0
Arrowtooth Flounder	*Atheresthes stomias*	25	661	661	661	67	67
Bocaccio	*Sebastes paucispinis*	5	6	6	6	6	6
Brown Cat Shark	*Apristurus brunneus*	2	8	8	8	0	0
Canary Rockfish	*Sebastes pinniger*	1	8	8	8	0	0
Dover Sole	*Microstomus pacificus*	26	590	590	590	191	191
Dusky Rockfish	*Sebastes variabilis*	1	27	27	27	0	0
Giant Grenadier	*Albatrossia pectoralis*	3	36	36	36	0	0
Greenstriped Rockfish	*Sebastes elongatus*	1	12	12	12	0	0
Harlequin Rockfish	*Sebastes variegatus*	3	80	80	80	0	0
Lingcod	*Ophiodon elongatus*	6	26	26	26	19	19
Longnose Skate	*Raja rhina*	17	33	6	33	0	0
Longspine Thornyhead	*Sebastolobus altivelis*	7	224	224	224	0	152
Pacific Cod	*Gadus macrocephalus*	12	63	63	63	0	0
Pacific Flatnose	*Antimora microlepis*	1	15	15	15	0	0
Pacific Grenadier	*Coryphaenoides acrolepis*	3	54	54	54	0	0
Pacific Hake	*Merluccius productus*	3	56	56	56	0	0
Pacific Halibut	*Hippoglossus stenolepis*	28	70	44	45	0	0
Pacific Ocean Perch	*Sebastes alutus*	37	1063	1063	1063	868	869
Petrale Sole	*Eopsetta jordani*	1	5	5	5	0	0
Popeye	*Coryphaenoides cinereus*	1	31	31	31	0	0
Redbanded Rockfish	*Sebastes babcocki*	14	168	168	168	161	161
Redstripe Rockfish	*Sebastes proriger*	13	265	265	265	130	131
Rex Sole	*Glyptocephalus zachirus*	19	505	505	505	29	31
Rosethorn Rockfish	*Sebastes helvomaculatus*	18	367	367	367	0	0
Rougheye Rockfish	*Sebastes aleutianus*	22	269	269	269	268	268
Roughtail Skate	*Bathyraja trachura*	3	3	3	2	0	0
Sablefish	*Anoplopoma fimbria*	14	202	202	202	56	57
Sandpaper Skate	*Bathyraja interrupta*	7	17	17	17	0	0
Sharpchin Rockfish	*Sebastes zacentrus*	20	570	570	570	47	47
Shortraker Rockfish	*Sebastes borealis*	10	46	46	46	46	46
Shortspine Thornyhead	*Sebastolobus alascanus*	37	1077	1079	1079	0	182
Silvergray Rockfish	*Sebastes brevispinis*	21	461	461	461	199	199
Slender Sole	*Lyopsetta exilis*	1	15	15	15	0	0
Splitnose Rockfish	*Sebastes diploproa*	1	12	12	12	0	0
Walleye Pollock	*Gadus chalcogrammus*	6	98	98	98	0	0
Widow Rockfish	*Sebastes entomelas*	2	34	33	34	0	0
Yelloweye Rockfish	*Sebastes ruberrimus*	2	29	29	29	29	29
Yellowmouth Rockfish	*Sebastes reedi*	4	94	94	94	79	81
Total		**402**	**7307**	**7251**	**7283**	**2195**	**2536**

Table 10. Summary of biological data collected during the 2014 WCHG synoptic bottom trawl survey. For each species the number of samples and specimens, the minimum, maximum, and mean length, the minimum, maximum, and mean weight, and female proportion is shown. Weights less than 0.1 kg are entered as <0.1 and no data collected is -.

		Number of			Length (cm)			Weight (kg)			
Common Name	**Scientific Name**	**Samples**	**Specimens**	**Length Type**	**Min.**	**Max.**	**Mean**	**Min.**	**Max.**	**Mean**	**Female Proportion**
Aleutian Skate	*Bathyraja aleutica*	5	7	Total	10	125	83	2.5	5.4	3.7	0.86
Arrowtooth Flounder	*Atheresthes stomias*	25	661	Fork	21	82	47	0.1	6.3	1.1	0.48
Bocaccio	*Sebastes paucispinis*	5	6	Fork	61	76	72	3.1	5.4	4.8	0.50
Brown Cat Shark	*Apristurus brunneus*	2	8	Total	53	67	62	0.5	1.2	0.8	0.13
Canary Rockfish	*Sebastes pinniger*	1	8	Fork	44	55	50	1.5	2.9	2.3	0.50
Dover Sole	*Microstomus pacificus*	26	590	Total	25	58	40	0.2	2.1	0.7	0.26
Dusky Rockfish	*Sebastes variabilis*	1	27	Fork	39	48	43	0.9	1.8	1.3	0.44
Giant Grenadier	*Albatrossia pectoralis*	3	36	-	-	-	-	0.6	4.9	1.4	0.56
Greenstriped Rockfish	*Sebastes elongatus*	1	12	Fork	25	30	27	0.2	0.3	0.3	0.08
Harlequin Rockfish	*Sebastes variegatus*	3	80	Fork	14	33	24	0.0	0.5	0.2	0.66
Lingcod	*Ophiodon elongatus*	6	26	Fork	62	110	91	2.0	14.3	8.4	1.00
Longnose Skate	*Raja rhina*	17	33	Total	67	150	109	1.7	12.8	8.0	0.58
Longspine Thornyhead	*Sebastolobus altivelis*	7	224	Total	9	31	21	0.0	0.4	0.1	0.45
Pacific Cod	*Gadus macrocephalus*	12	63	Fork	42	66	54	0.7	2.9	1.7	0.49
Pacific Flatnose	*Antimora microlepis*	1	15	Total	37	50	44	0.3	1.0	0.7	0.27
Pacific Grenadier	*Coryphaenoides acrolepis*	3	54	-	-	-	-	0.0	1.3	0.2	0.55
Pacific Hake	*Merluccius productus*	3	56	Fork	51	67	57	0.9	2.6	1.3	0.77
Pacific Halibut	*Hippoglossus stenolepis*	28	70	Fork	8	135	78	2.5	34.9	6.9	0.60
Pacific Ocean Perch	*Sebastes alutus*	37	1063	Fork	27	52	40	0.3	2.2	0.9	0.55
Petrale Sole	*Eopsetta jordani*	1	5	Total	34	41	39	0.5	0.8	0.6	0.60
Popeye	*Coryphaenoides cinereus*	1	31	-	-	-	-	0.2	0.3	0.2	0.84
Redbanded Rockfish	*Sebastes babcocki*	14	168	Fork	16	55	35	0.1	3.0	0.8	0.49
Redstripe Rockfish	*Sebastes proriger*	13	265	Fork	26	43	35	0.2	1.2	0.6	0.52
Rex Sole	*Glyptocephalus zachirus*	19	505	Total	23	44	33	0.1	0.6	0.2	0.37

Common Name	Scientific Name	Number of		Length Type	Length (cm)			Weight (kg)			Female Proportion
		Samples	Specimens		Min.	Max.	Mean	Min.	Max.	Mean	
Rosethorn Rockfish	*Sebastes helvomaculatus*	18	367	Fork	13	36	26	0.0	0.7	0.3	0.50
Rougheye Rockfish	*Sebastes aleutianus*	22	269	Fork	15	67	42	0.0	4.4	1.4	0.46
Roughtail Skate	*Bathyraja trachura*	3	3	Total	8	74	33	0.0	2.6	1.7	0.50
Sablefish	*Anoplopoma fimbria*	14	202	Fork	45	92	63	0.9	9.1	2.7	0.33
Sandpaper Skate	*Bathyraja interrupta*	7	17	Total	48	69	61	0.6	1.9	1.3	0.35
Sharpchin Rockfish	*Sebastes zacentrus*	20	570	Fork	12	39	29	0.0	0.8	0.4	0.58
Shortraker Rockfish	*Sebastes borealis*	10	46	Fork	31	100	62	0.5	16.0	4.5	0.59
Shortspine Thornyhead	*Sebastolobus alascanus*	37	1079	Total	10	67	27	0.0	4.3	0.3	0.49
Silvergray Rockfish	*Sebastes brevispinis*	21	461	Fork	40	64	51	0.8	3.6	1.8	0.48
Slender Sole	*Lyopsetta exilis*	1	15	Total	19	26	23	0.0	0.1	0.1	0.67
Splitnose Rockfish	*Sebastes diploproa*	1	12	Fork	26	30	28	0.3	0.5	0.4	0.58
Walleye Pollock	*Gadus chalcogrammus*	6	98	Fork	17	68	38	0.0	2.0	0.5	0.71
Widow Rockfish	*Sebastes entomelas*	2	34	Fork	43	56	50	1.3	2.7	1.8	0.74
Yelloweye Rockfish	*Sebastes ruberrimus*	2	29	Fork	42	67	56	1.2	5.8	3.5	0.45
Yellowmouth Rockfish	*Sebastes reedi*	4	94	Fork	32	53	43	0.4	2.6	1.4	0.60

Table 11. Summary of data from net-mounted recorders during the 2014 WCHG synoptic bottom trawl survey, showing the number of tows and total number of records. A total of 65 survey tows were conducted, of which 54 were useable. The net mensuration information collected during the survey was not useable.

		Number of	
Data Recorder	**Attribute**	**Tows**	**Records**
Hobo Pendant Acceleration Data Logger	Bottom Contact Sensor Tilt Angle	64	26969
Seabird Sbe19plus Seacat Profiler	Conductivity of sea water (S/m)	47	17448
	Pressure (db)/ depth (m)	47	17448
	Salinity (PSU)	47	17448
	Water temperature (^{o}C)	47	17448
Seabird SBE43	Oxygen Voltage (V)/ Dissolved Oxygen (ml/L)	47	17448
Seabird SBE39 Temperature And Pressure Recorder	Water temperature (^{o}C)	60	44020
	Pressure (db)/ depth (m)	60	44020

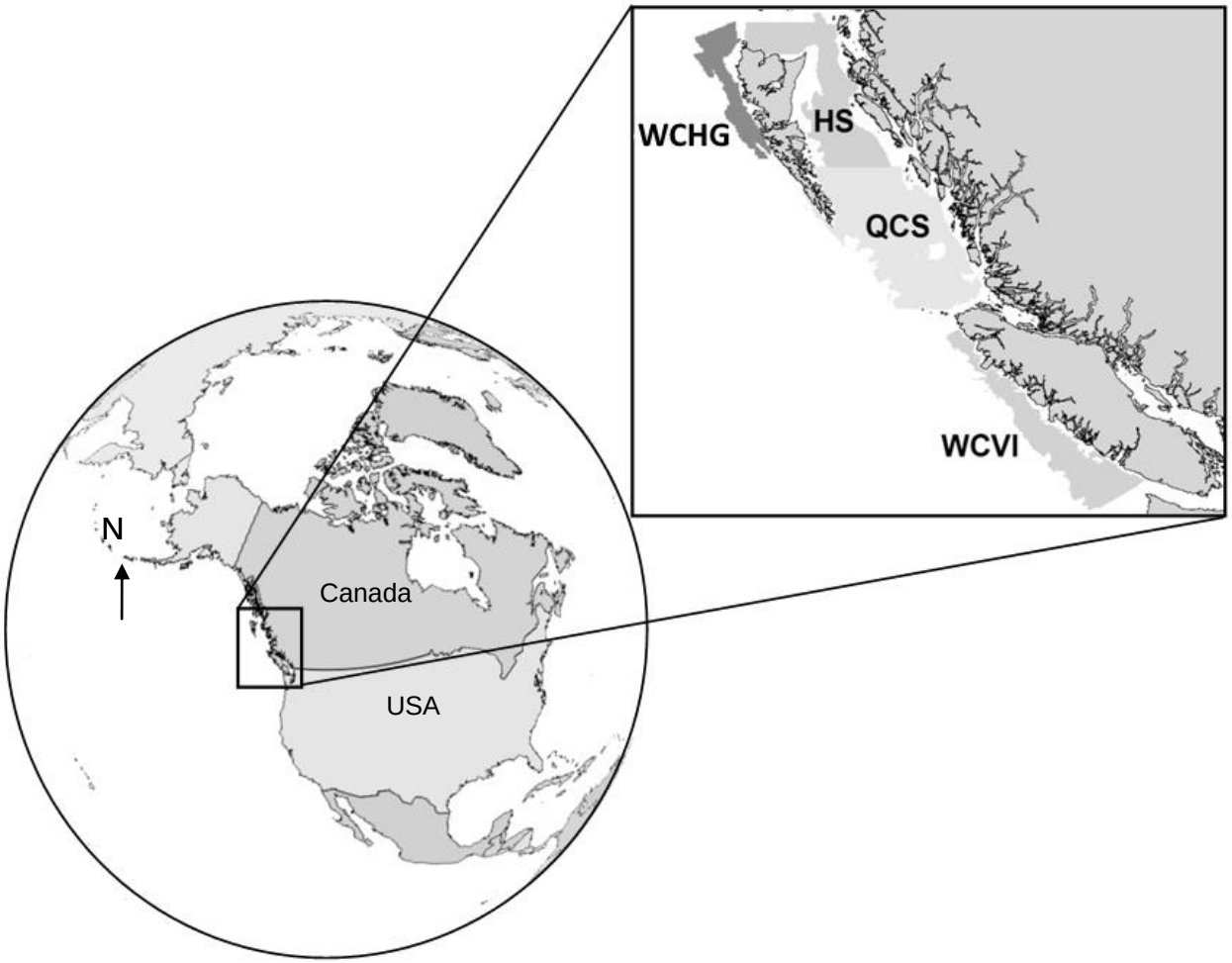

Figure 1. Locations of the current synoptic bottom trawl surveys on the coast of British Columbia, Canada. WCHG = West Coast Haida Gwaii; HS = Hecate Strait; QCS = Queen Charlotte Sound; WCVI = West Coast Vancouver Island.

Figure 2. The commercial stern trawler E. J. Safarik used for the 2014 WCHG synoptic bottom trawl survey.

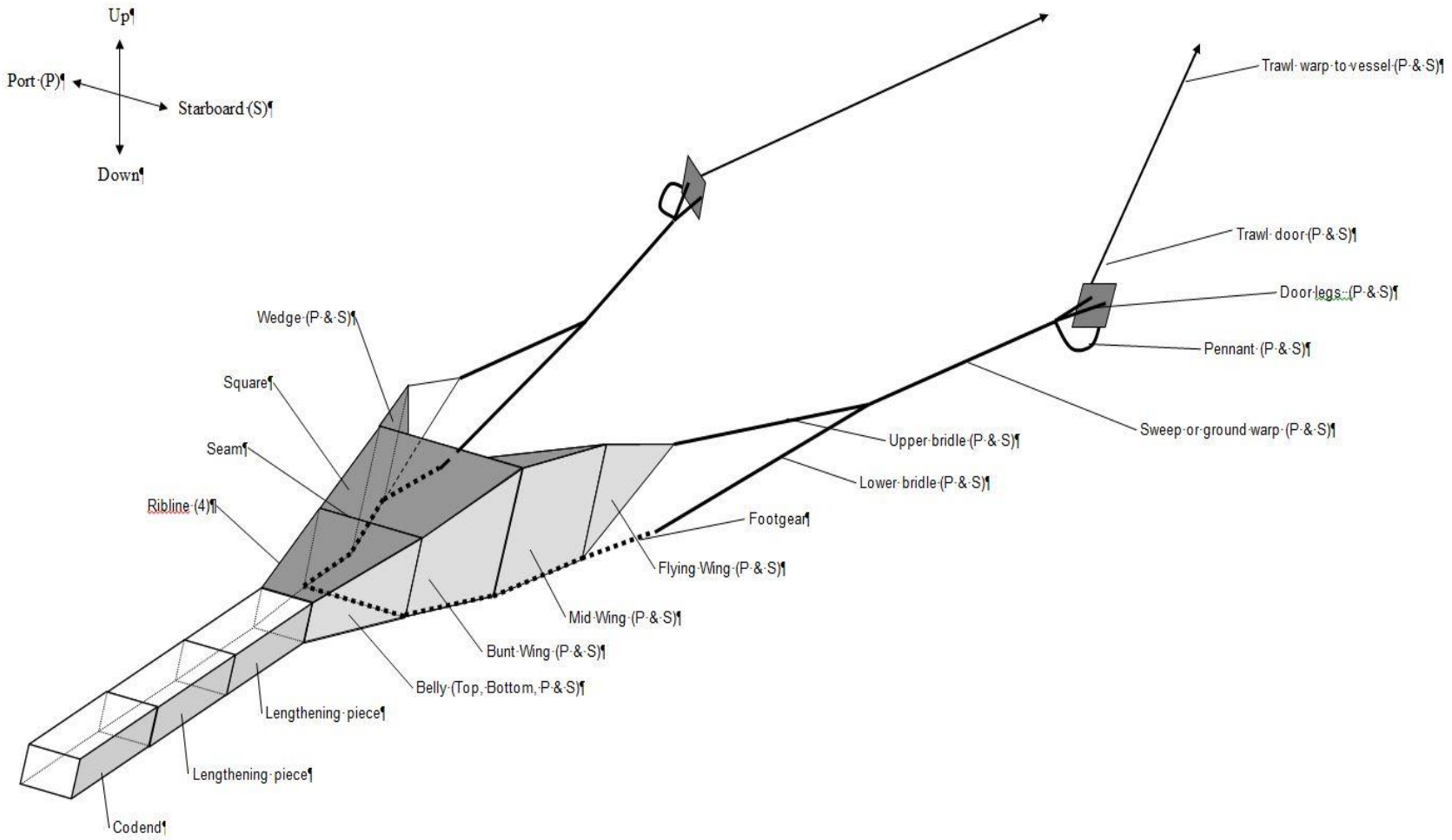

Figure 3. Overview diagram of the Atlantic Western IIa box trawl used on the 2014 WCHG synoptic bottom trawl survey.

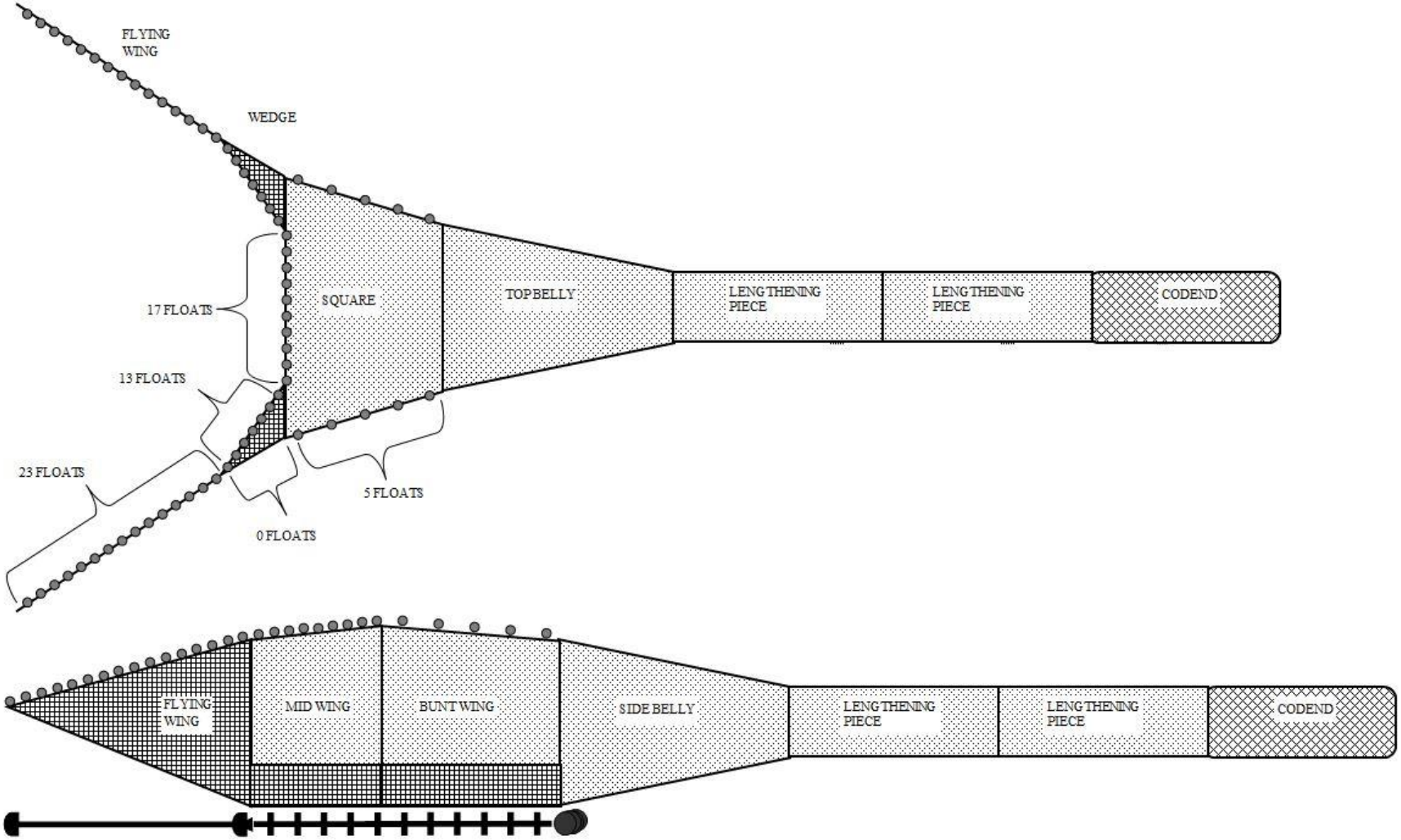

Figure 4. Top and side view of the Atlantic Western IIa box trawl used on the 2014 WCHG synoptic bottom trawl survey.

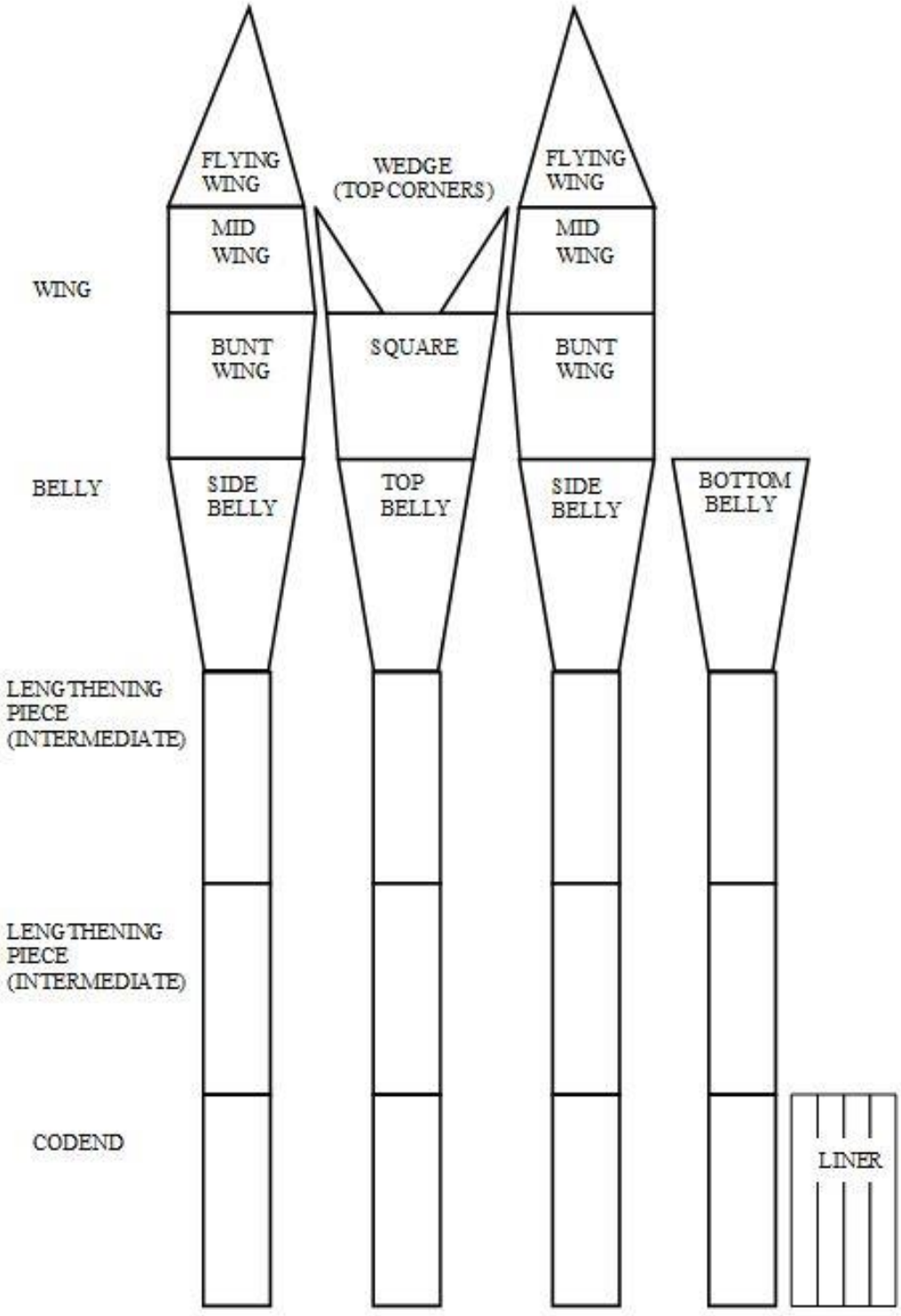

Figure 5. Diagram of the net panels with section names for the Atlantic Western IIa box trawl used on the 2014 WCHG synoptic bottom trawl survey.

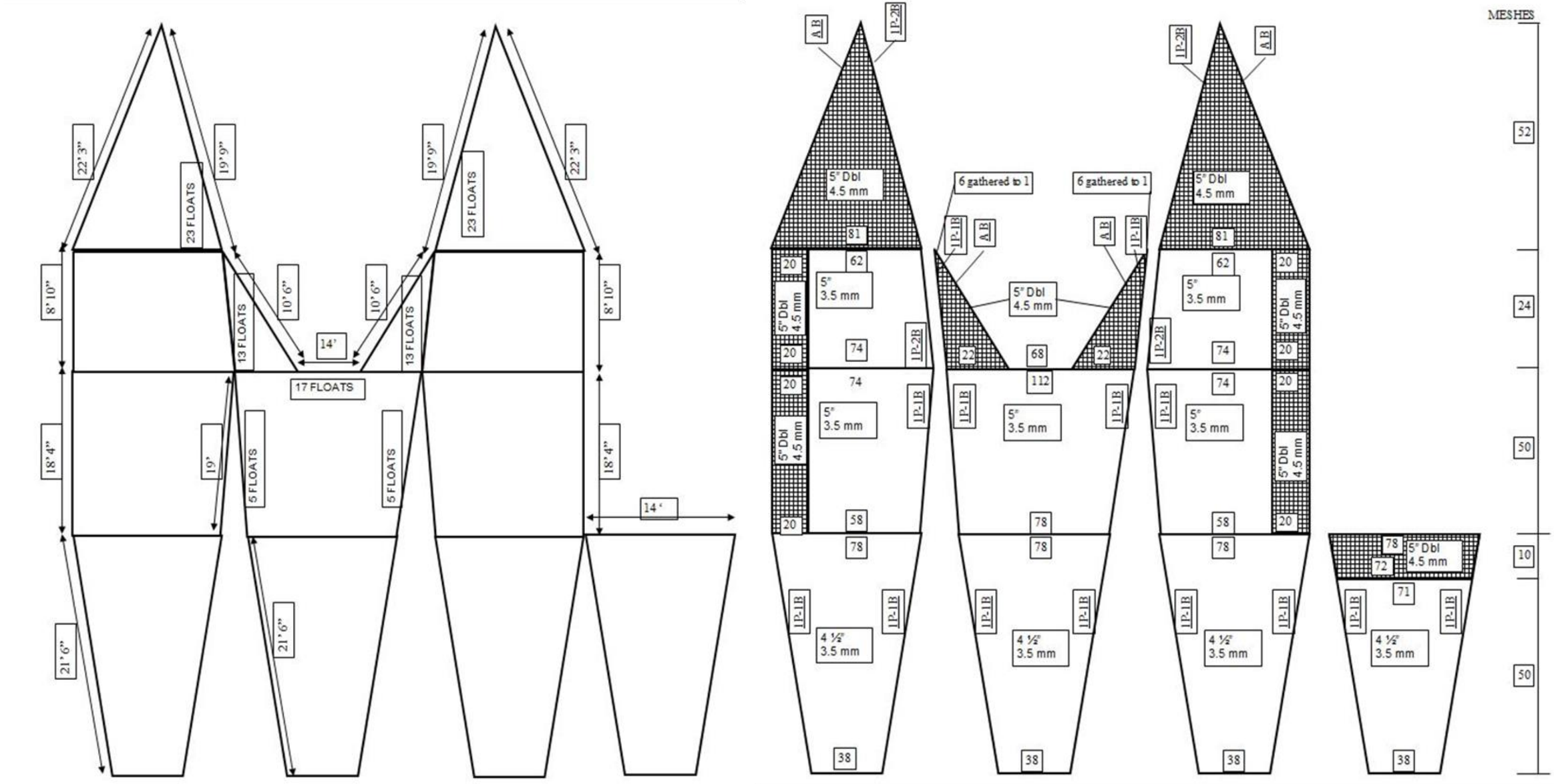

Figure 6. Schematics of the wing and belly sections of the Atlantic Western IIa box trawl used on the 2014 WCHG synoptic bottom trawl survey. Dimensions and the float arrangement are shown on the left while netting details, mesh counts, and mesh cuts are shown on the right side of the diagram.

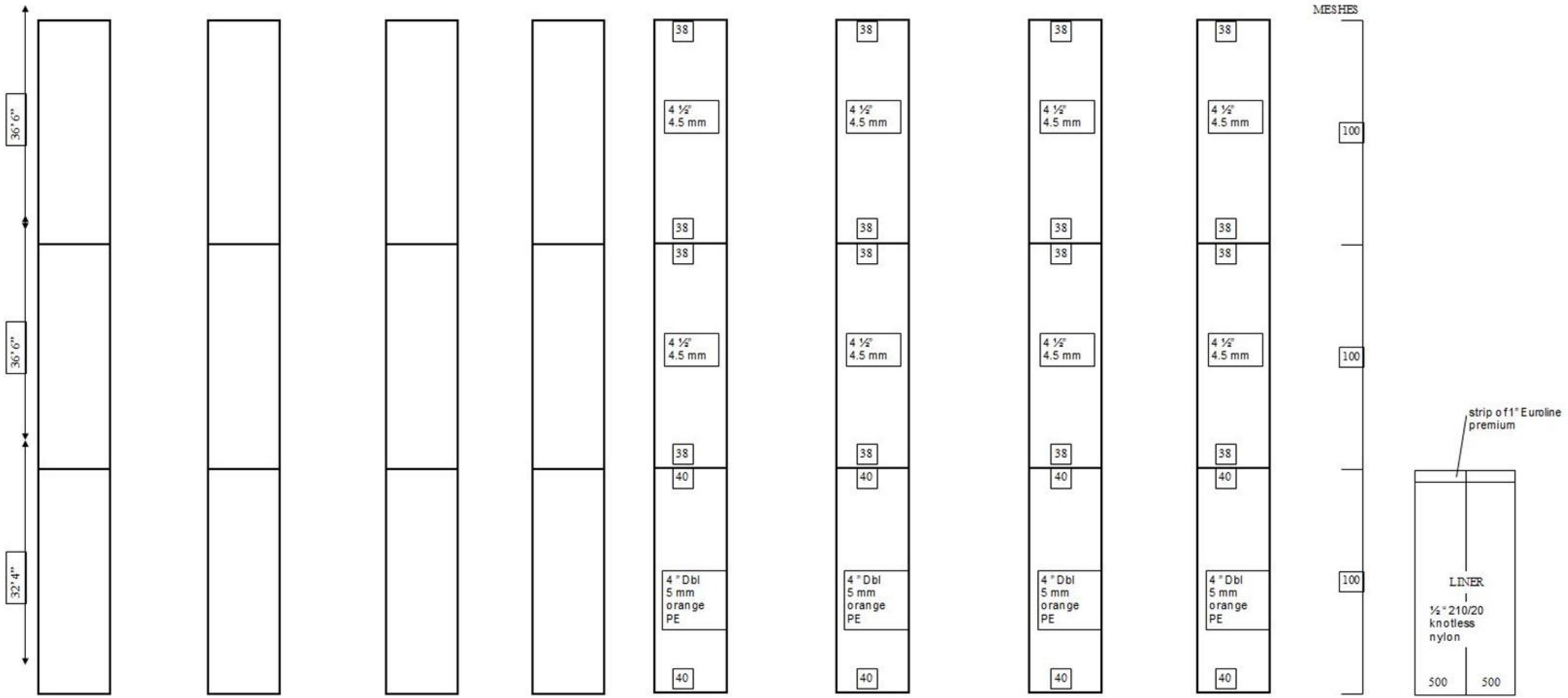

Figure 7. Details of the lengthening (intermediate) pieces and codend sections of the Atlantic Western IIa box trawl used on the 2014 WCHG synoptic bottom trawl survey. Dimensions are shown on the left while netting details, mesh counts, and mesh cuts including the codend liner are shown on the right side of the diagram.

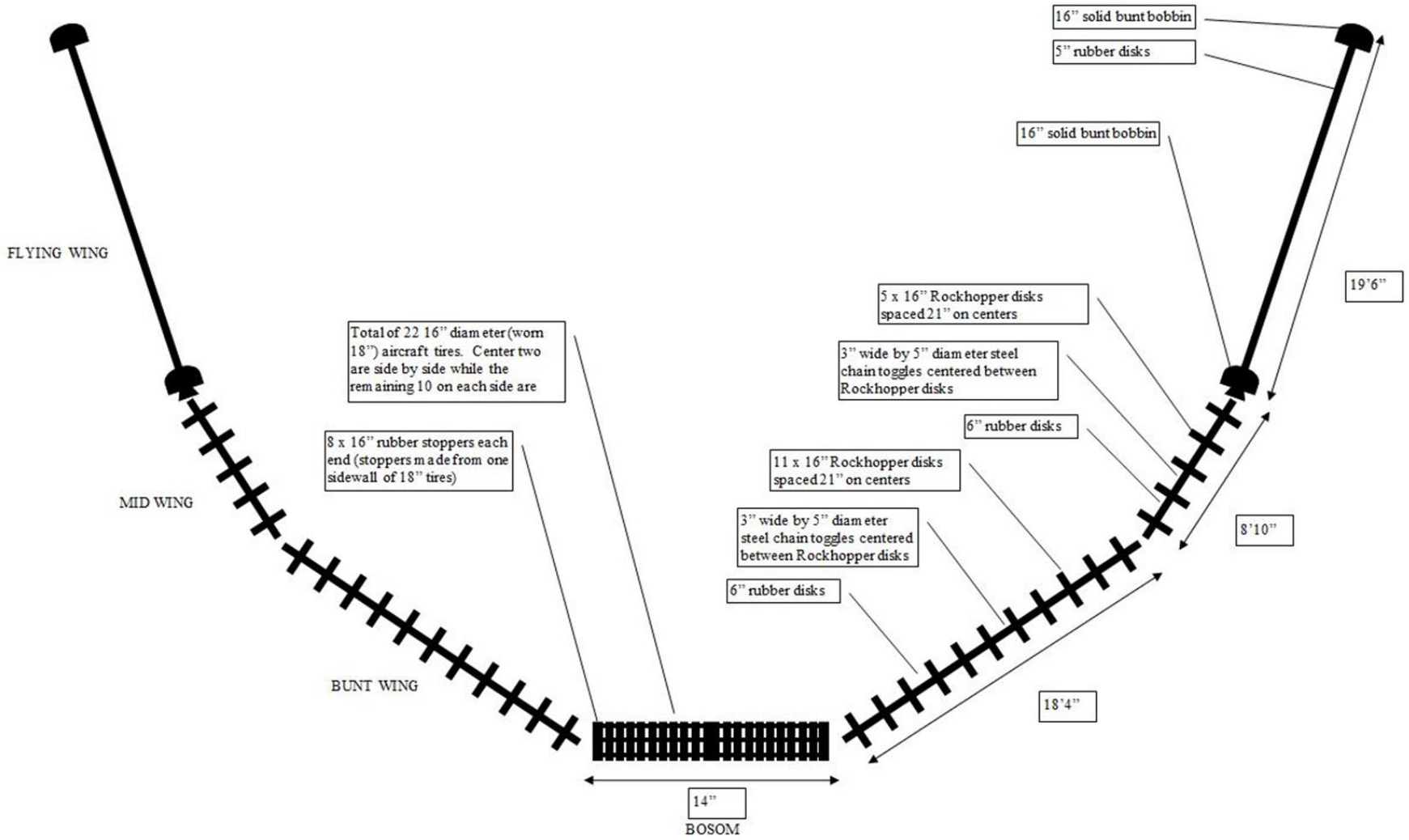

Figure 8. Details of the Rockhopper foot gear for the Atlantic Western IIa box trawl used on the 2014 WCHG synoptic bottom trawl survey.

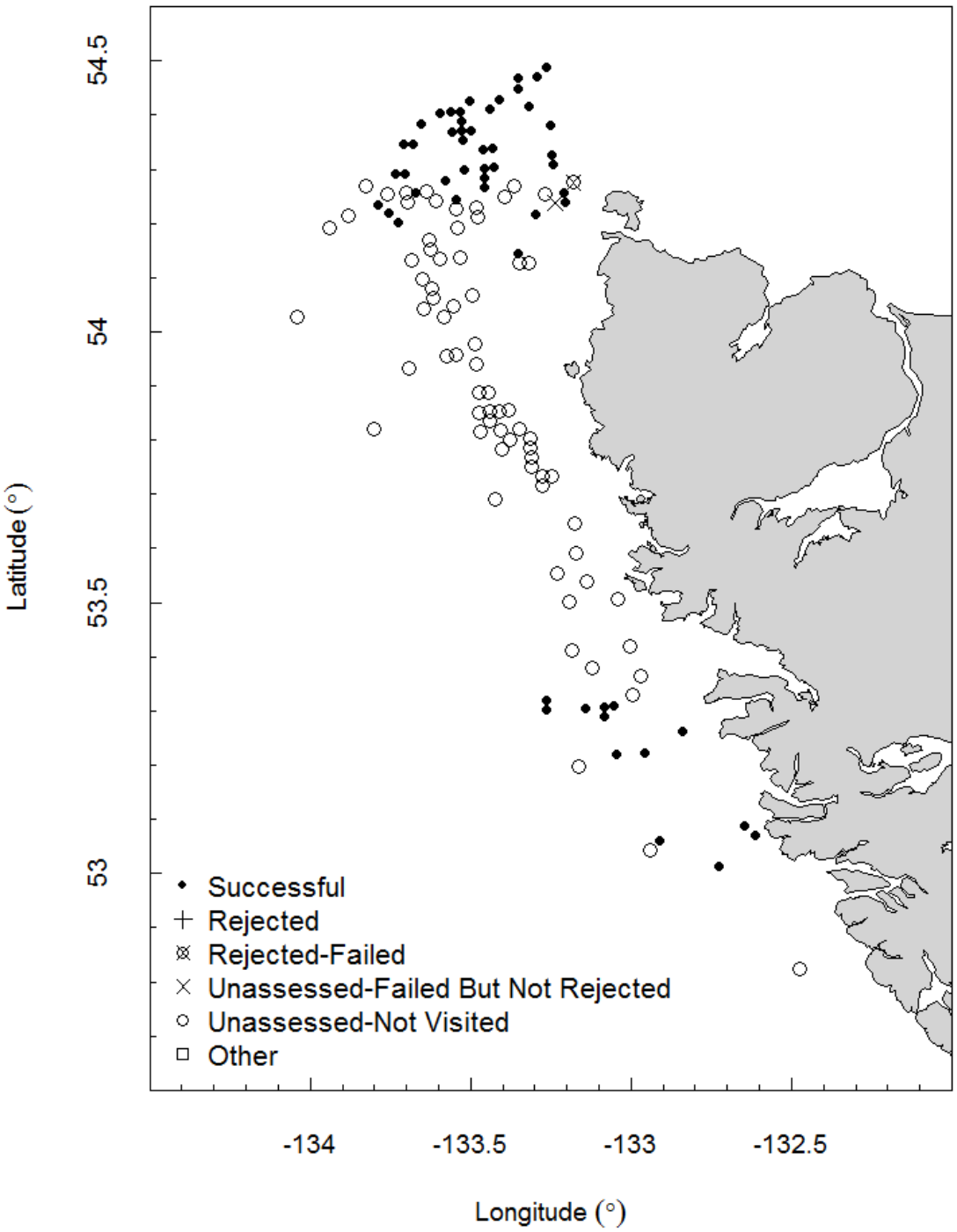

Figure 9. Final status of the 2014 WCHG synoptic bottom trawl survey showing 54 successfully fished blocks (Successful), one block rejected after one or more failed attempts (Rejected-Failed), one block left unassessed, but not removed from future surveys (Unassessed- Failed but not Rejected), and 70 blocks remained unassessed at the end of the survey.

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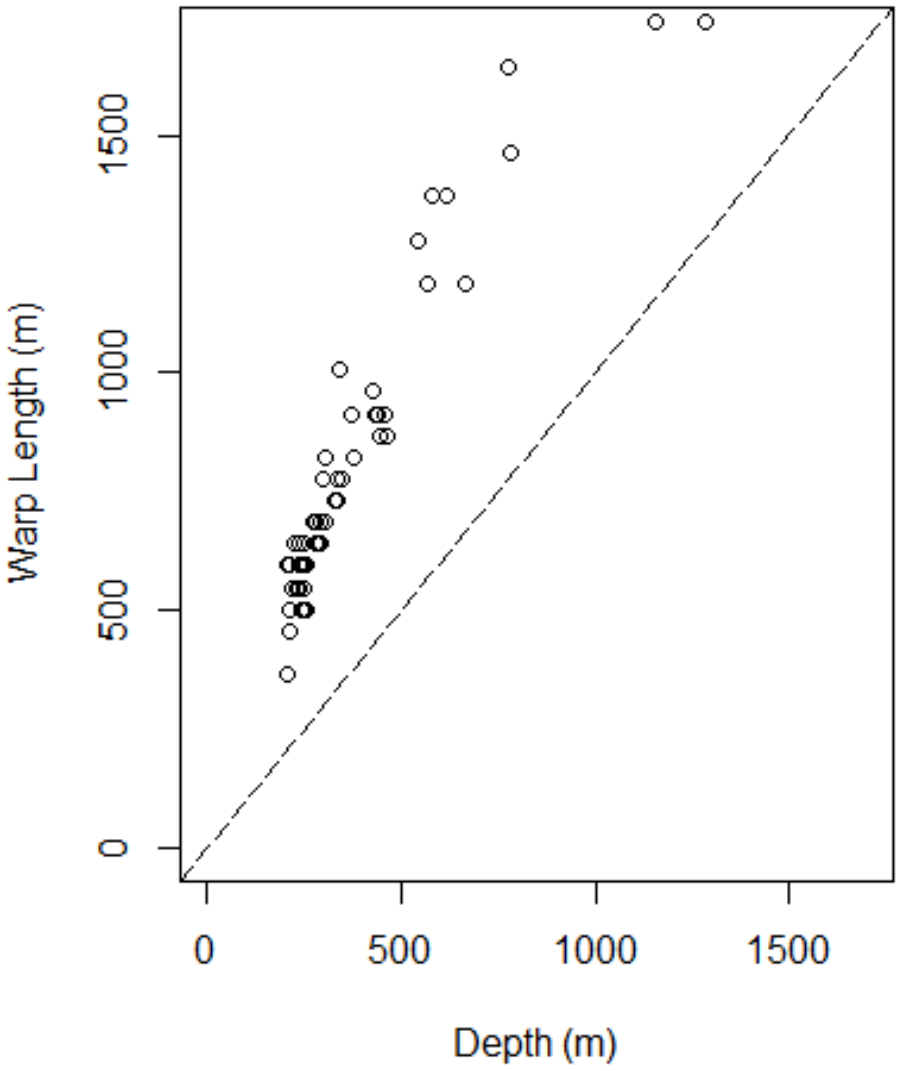

Figure 10. Warp length versus starting depth for each tow during the 2014 WCHG synoptic bottom trawl survey

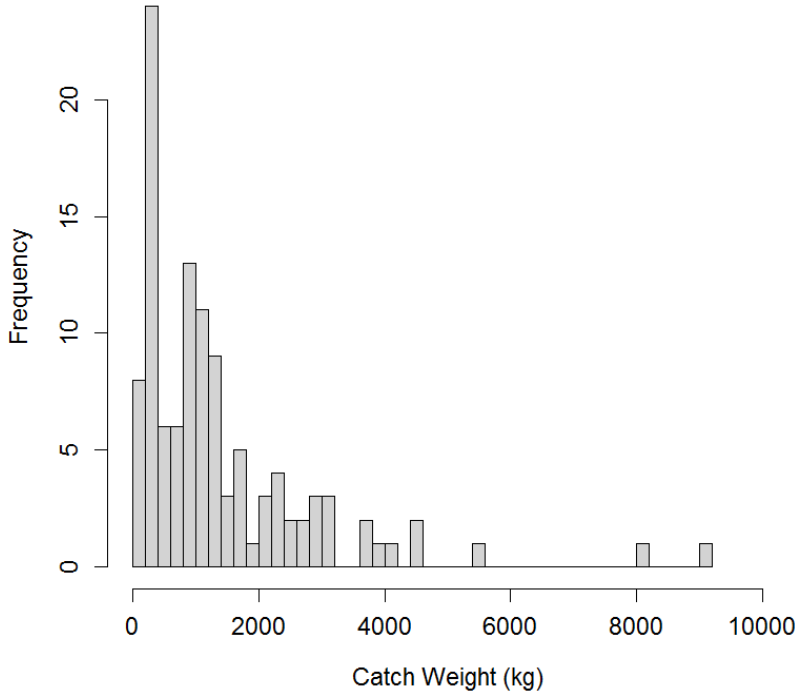

Figure 11. Histogram of catch weight per useable tow during the 2014 WCHG synoptic bottom trawl survey.

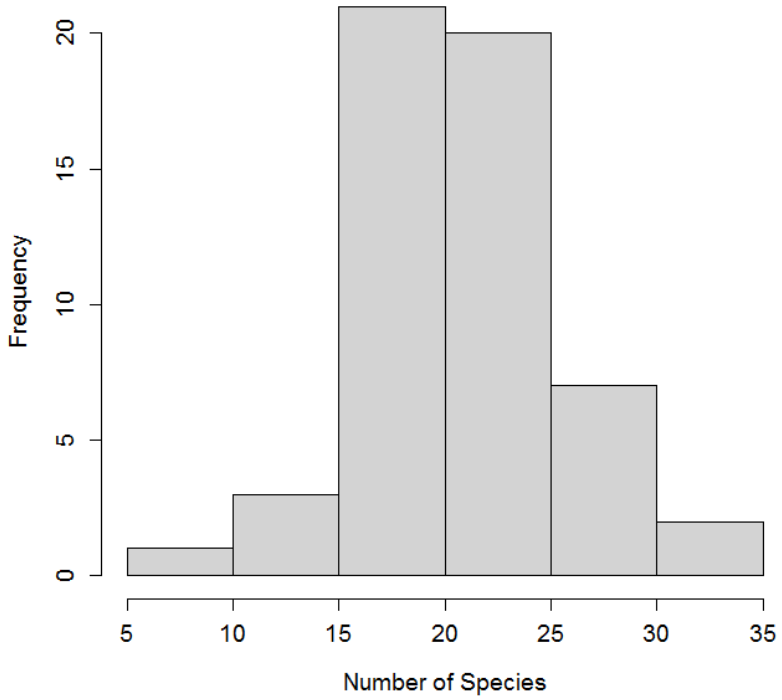

Figure 12. Histogram of the number of species caught in useable tows during the 2014 WCHG synoptic bottom trawl survey.

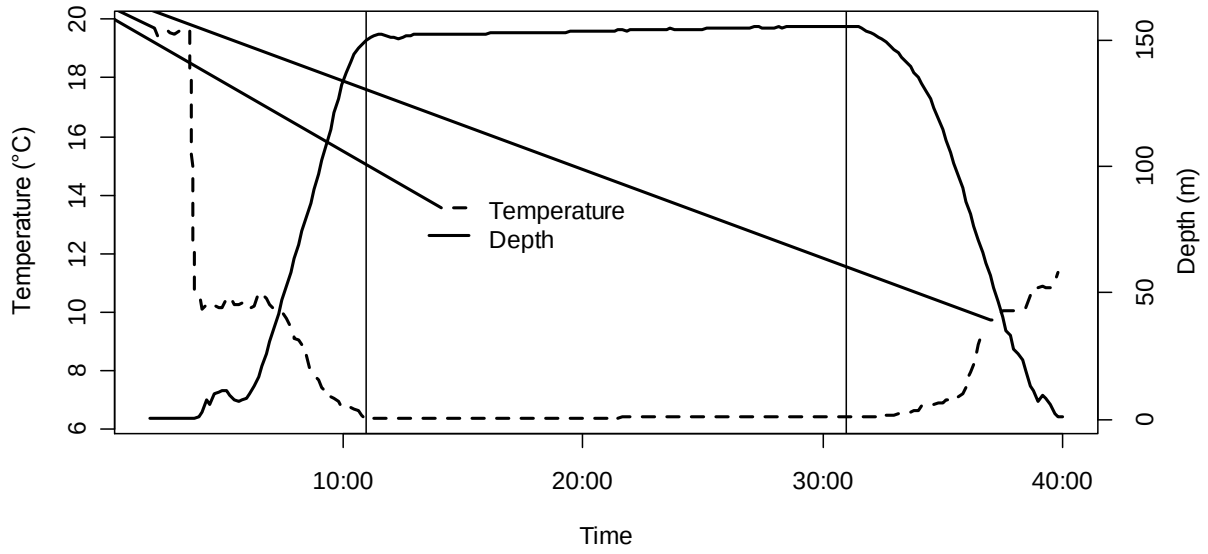

Figure 13. Example of a Seabird 39 temperature and depth profile collected during a synoptic bottom trawl survey. The vertical lines indicate the start and end of net contact with the sea floor.

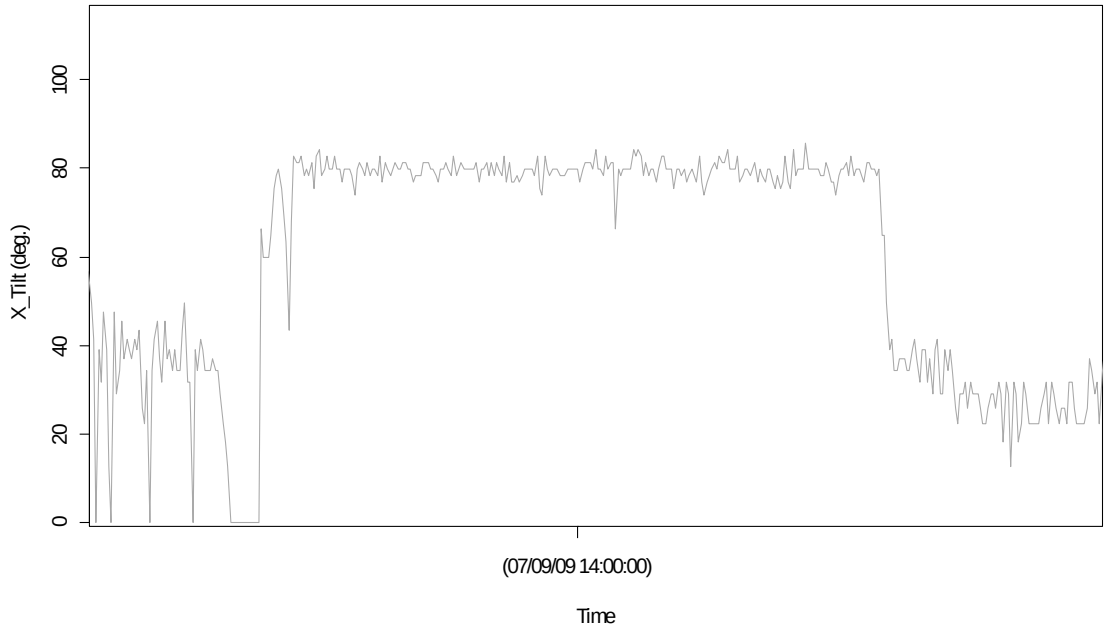

Figure 14. Example of a Mac Marine Industries bottom contact sensor profile collected during a bottom trawl survey. The raised segment in the middle of the profile at approximately 80° indicates where the net made contact with the sea floor.

APPENDIX A: WCHG 2014 SURVEY BRIDGE LOG

Tow	Date	Start Time	Start Latitude	Start Longitude	Average Depth (m)	Bottom Duration (min)	Speed (km/h)	Warp (m)	Catch (kg)	Useable
1	Aug-30	08:15	53.0818	132.6504	219	13	4.6	164	396.8	No
2	Aug-30	09:52	53.0800	132.6516	226	27	5.1	191	892.0	Yes
3	Aug-30	11:53	53.0639	132.6211	210	27	4.9	178	1142.3	Yes
4	Aug-30	14:46	53.0182	132.7383	1281	38	3.4	520	183.2	Yes
5	Aug-30	18:36	53.0728	132.9063	1155	36	3.8	520	161.2	Yes
6	Aug-31	07:26	53.2727	132.8517	544	45	4.2	383	543.8	Yes
7	Sep-02	07:45	53.2644	132.8087	339	6	2.2	301	1.5	No
8	Sep-02	09:43	53.2226	132.9482	615	45	4.5	410	120.1	Yes
9	Sep-02	12:41	53.2255	133.0446	777	50	4.0	492	379.5	Yes
10	Sep-02	15:44	53.2838	133.0612	424	32	4.2	287	2279.7	Yes
11	Sep-03	07:14	53.3037	133.0581	236	23	4.6	178	3022.4	Yes
12	Sep-03	09:53	53.3084	133.0768	282	25	4.7	205	3013.5	Yes
13	Sep-03	12:15	53.3051	133.1391	568	44	4.4	355	304.0	Yes
14	Sep-03	15:27	53.3005	133.2561	580	4	3.7	410	29.8	No
15	Sep-03	16:42	53.3156	133.2621	784	40	4.2	437	87.4	Yes
16	Sep-03	19:02	53.3047	133.2432	668	41	4.5	355	98.3	Yes
17	Sep-07	11:54	54.2400	133.2177	212	24	4.7	137	580.6	Yes
19	Sep-07	13:21	54.2386	133.2429	291	27	5.3	205	1638.9	No
20	Sep-07	15:40	54.2502	133.2201	307	30	4.7	246	2565.7	Yes
21	Sep-07	17:27	54.2711	133.1884	379	19	5.0	246	1539.9	No
22	Sep-11	11:48	54.2719	133.1865	380	14	5.6	246	802.0	No
23	Sep-11	14:57	54.3019	133.2508	462	28	5.4	260	500.4	Yes
24	Sep-11	16:37	54.3262	133.2567	459	32	5.0	273	358.4	Yes
25	Sep-11	18:16	54.3694	133.2543	446	30	5.3	260	881.7	Yes
26	Sep-12	07:15	54.4830	133.2699	277	21	6.0	191	260.4	Yes
27	Sep-12	08:44	54.4683	133.3071	286	24	5.8	191	349.3	Yes
28	Sep-12	09:56	54.4812	133.3318	283	21	5.4	191	225.3	Yes
29	Sep-12	11:09	54.4605	133.3373	292	27	5.1	191	360.3	Yes
30	Sep-12	12:41	54.4209	133.3083	333	27	5.3	219	545.1	Yes
31	Sep-12	14:10	54.4256	133.4022	289	25	5.6	191	437.9	Yes
32	Sep-12	15:34	54.4070	133.4316	279	26	5.7	191	926.4	Yes
33	Sep-12	17:21	54.4177	133.5111	239	21	5.4	191	158.0	Yes
34	Sep-13	07:24	54.3986	133.5393	206	22	4.7	109	134.1	Yes
35	Sep-13	08:38	54.4005	133.5714	204	23	5.1	178	3696.3	Yes
36	Sep-13	11:18	54.3999	133.5943	204	8	4.5	178	1593.2	No
37	Sep-13	12:53	54.4090	133.5817	205	23	5.1	178	161.5	Yes
38	Sep-13	14:04	54.3839	133.5378	239	24	6.3	164	1519.3	Yes
39	Sep-13	15:48	54.3761	133.5473	242	26	5.4	178	2762.6	Yes
40	Sep-13	17:05	54.3673	133.5355	247	27	5.4	178	2007.9	Yes
41	Sep-13	18:15	54.3791	133.5071	250	22	5.6	178	1138.3	Yes
42	Sep-14	07:17	54.3507	133.5291	249	19	5.6	191	1095.6	Yes
43	Sep-14	08:34	54.3434	133.4664	229	22	5.5	164	4018.5	Yes
44	Sep-14	10:36	54.3352	133.4312	231	6	4.5	164	489.4	No
45	Sep-14	11:39	54.3422	133.4414	231	25	5.7	164	4551.6	Yes
46	Sep-14	13:33	54.2649	133.4602	370	28	5.8	273	641.6	Yes
47	Sep-14	15:03	54.2830	133.4649	332	2	4.2	232	9.2	No
48	Sep-14	15:56	54.2864	133.4638	347	26	5.5	232	944.8	Yes
49	Sep-14	17:21	54.3051	133.4598	296	28	5.6	232	478.4	Yes
50	Sep-14	18:48	54.2984	133.4289	434	24	5.5	273	452.1	Yes
51	Sep-15	07:41	54.3786	133.6682	214	23	5.9	150	766.1	Yes
52	Sep-15	08:50	54.3412	133.6647	248	22	5.7	150	934.5	Yes

Tow	Date	Start Time	Start Latitude	Start Longitude	Average Depth (m)	Bottom Duration (min)	Speed (km/h)	Warp (m)	Catch (kg)	Useable
53	Sep-15	09:57	54.3392	133.6966	243	22	5.6	150	1231.4	Yes
54	Sep-15	11:38	54.2832	133.7456	247	21	5.8	150	7522.9	Yes
55	Sep-15	13:57	54.2832	133.7167	256	23	5.5	150	6787.1	Yes
56	Sep-15	16:19	54.2509	133.6632	273	26	5.5	205	807.7	Yes
57	Sep-23	08:13	54.2435	133.5498	322.1	23	5.8	219	477.7	Yes
58	Sep-23	09:40	54.2765	133.5855	275.4	23	5.8	191	1845.2	Yes
59	Sep-23	11:29	54.2973	133.5227	275.1	25	5.9	191	1070.4	Yes
60	Sep-23	14:52	54.2180	133.3082	428.9	27	5.0	273	417.3	Yes
61	Sep-23	16:43	54.1458	133.3587	306.1	30	5.5	205	942.6	Yes
62	Sep-26	08:58	54.1957	133.7147	235.1	22	5.9	164	9250.4	Yes
63	Sep-26	12:57	54.2109	133.7474	228.1	23	5.9	164	5531.7	Yes
64	Sep-26	15:10	54.2319	133.7884	244.5	11	5.4	178	3625.1	No
65	Sep-26	16:43	54.2446	133.7834	244.5	27	5.4	191	6541.8	Yes

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

Common Name	Scientific Name	Total Weight (Kg)	1	2	3	4	5
Aleutian Skate	*Bathyraja aleutica*	43.7					
Arrowtooth Flounder	*Atheresthes stomias*	6604.9	9.0	71.6	71.8		
Bigmouth Sculpin	*Hemitripterus bolini*	28.6					
Bocaccio	*Sebastes paucispinis*	34.7	5.5		5.2		
Brown Cat Shark	*Apristurus brunneus*	6.5					
Canary Rockfish	*Sebastes pinniger*	22.9	2.2		2.1		
Darkblotched Rockfish	*Sebastes crameri*	2.1					
Darkfin Sculpin	*Malacocottus zonurus*	16.7		0.1	-		
Deepsea Sole	*Embassichthys bathybius*	4.2				0.3	0.5
Dover Sole	*Microstomus pacificus*	1811.9	0.4	0.7	0.9		
Dusky Rockfish	*Sebastes variabilis*	65.0					
English Sole	*Parophrys vetulus*	5.3					
Giant Blobsculpin	*Psychrolutes phrictus*	4.7				4.7	
Giant Grenadier	*Albatrossia pectoralis*	99.1				52.9	19.8
Greenstriped Rockfish	*Sebastes elongatus*	17.9	0.8	0.5	6.8		
Harlequin Rockfish	*Sebastes variegatus*	699.6					
Lingcod	*Ophiodon elongatus*	300.0	12.1	12.2	7.2		
Longnose Skate	*Raja rhina*	297.4			3.4		
Longspine Thornyhead	*Sebastolobus altivelis*	288.3				8.0	25.7
North Pacific Spiny Dogfish	*Squalus suckleyi*	25.7					
Pacific Cod	*Gadus macrocephalus*	488.7		3.1			
Pacific Flatnose	*Antimora microlepis*	12.4				9.8	1.9
Pacific Grenadier	*Coryphaenoides acrolepis*	70.4				37.1	29.8
Pacific Hake	*Merluccius productus*	217.2					
Pacific Halibut	*Hippoglossus stenolepis*	547.9	3.7	2.5	6.1		
Pacific Ocean Perch	*Sebastes alutus*	50551.6	82.8	154.4	532.6		
Petrale Sole	*Eopsetta jordani*	16.9					
Popeye	*Coryphaenoides cinereus*	35.8				31.1	4.0
Prowfish	*Zaprora silenus*	3.9					
Redbanded Rockfish	*Sebastes babcocki*	763.9		0.9			
Redstripe Rockfish	*Sebastes proriger*	5128.3		1.9	37.8		
Rex Sole	*Glyptocephalus zachirus*	709.1	0.6	1.0	3.7		
Rosethorn Rockfish	*Sebastes helvomaculatus*	318.6			1.3		
Rougheye Rockfish	*Sebastes aleutianus*	3432.8					
Roughtail Skate	*Bathyraja trachura*	5.3					0.4
Sablefish	*Anoplopoma fimbria*	890.1		5.7	0.4	3.5	24.2
Sandpaper Skate	*Bathyraja interrupta*	27.1					
Sharpchin Rockfish	*Sebastes zacentrus*	9724.4	0.4	1.0	0.2		
Shortraker Rockfish	*Sebastes borealis*	273.0					
Shortspine Thornyhead	*Sebastolobus alascanus*	2930.3	1.2	9.5	0.6	17.7	5.7
Silvergray Rockfish	*Sebastes brevispinis*	6080.7	246.9	582.4	338.3		
Slender Sole	*Lyopsetta exilis*	8.0	0.4	0.1	0.2		
Splitnose Rockfish	*Sebastes diploproa*	6.7	0.1		-		
Spotted Ratfish	*Hydrolagus colliei*	616.3	5.0	4.2	16.6		
Twoline Eelpout	*Bothrocara brunneum*	5.4				2.3	2.2
Walleye Pollock	*Gadus chalcogrammus*	214.9	12.3	34.2	89.3		
Widow Rockfish	*Sebastes entomelas*	904.3	12.2	5.2	14.2		
Yelloweye Rockfish	*Sebastes ruberrimus*	153.3					
Yellowmouth Rockfish	*Sebastes reedi*	3248.8			0.6		
Yellowtail Rockfish	*Sebastes flavidus*	9.9			2.3		
Other		456.6	0.9	0.8	0.4	15.8	47.0
Total		**98231.7**	**396.8**	**892.0**	**1142.3**	**183.2**	**161.2**

Common Name	6	7	8	9	10	11	12	13	14	15	16	17
Aleutian Skate					8.2							
Arrowtooth Flounder	103.5					-	303.3					247.5
Bigmouth Sculpin												
Bocaccio						10.7	4.6					
Brown Cat Shark	4.0											
Canary Rockfish												18.5
Darkblotched Rockfish												
Darkfin Sculpin					-	-	2.1	-				
Deepsea Sole	1.7		0.9	0.8								
Dover Sole	57.7		34.3	7.7	47.7			38.0	5.2	2.4	8.2	1.0
Dusky Rockfish												
English Sole												
Giant Blobsculpin												
Giant Grenadier			2.7	11.6						1.4	10.6	
Greenstriped Rockfish						1.3						0.5
Harlequin Rockfish												
Lingcod												34.6
Longnose Skate												14.0
Longspine Thornyhead	5.0		13.5	66.0				62.2	4.0	51.8	52.1	
North Pacific Spiny Dogfish												2.4
Pacific Cod												4.9
Pacific Flatnose			0.6	0.1								
Pacific Grenadier			0.5	2.1						0.1	0.7	
Pacific Hake												
Pacific Halibut						11.7	6.0					3.3
Pacific Ocean Perch						1324.2	2415.0					
Petrale Sole												1.9
Popeye				0.3						0.3	0.1	
Prowfish							3.0					
Redbanded Rockfish					8.5	-	6.8					
Redstripe Rockfish												
Rex Sole	3.0		2.4		17.3	2.2	-	2.0	1.7			1.6
Rosethorn Rockfish						4.3	15.9					
Rougheye Rockfish	21.2	1.5			2082.9		25.8	14.1	10.4			
Roughtail Skate	2.2		2.6	0.1								
Sablefish	60.3		24.2	186.6				22.7		23.2	9.1	
Sandpaper Skate	1.2							1.3				
Sharpchin Rockfish												0.3
Shortraker Rockfish	133.1				19.9			10.1				
Shortspine Thornyhead	139.7		37.2	68.8	93.7	1.0	51.8	151.7	8.5	7.0	13.9	
Silvergray Rockfish						384.7	72.5					219.3
Slender Sole						-						
Splitnose Rockfish												
Spotted Ratfish												25.5
Twoline Eelpout				0.9								
Walleye Pollock						-	-					0.6
Widow Rockfish						495.2	107.0					
Yelloweye Rockfish												
Yellowmouth Rockfish						787.0						
Yellowtail Rockfish												4.7
Other	11.4	-	1.2	34.4	1.5	-	0.1	2.1	-	1.1	3.5	
Total	**543.8**	**1.5**	**120.1**	**379.5**	**2279.7**	**3022.4**	**3013.5**	**304.0**	**29.8**	**87.4**	**98.3**	**580.6**

Common Name	19	20	21	22	23	24	25	26	27	28	29	30
Aleutian Skate		3.45		6.6	10.2					4.3		
Arrowtooth Flounder	660.8	2250.0	514.8	139.8	70.5	50.6	27.6	31.9	64.9	32.8	33.2	66.7
Bigmouth Sculpin	7.2	9.6										
Bocaccio		5.6										
Brown Cat Shark							2.5					
Canary Rockfish												
Darkblotched Rockfish												
Darkfin Sculpin	0.6			0.4				0.7	0.7	1.7	1.7	0.9
Deepsea Sole												
Dover Sole	1.5	6.5	53.2	85.9	57.5	35.5	646.2	15.2	18.0	6.3	16.9	82.5
Dusky Rockfish												
English Sole												
Giant Blobsculpin												
Giant Grenadier												
Greenstriped Rockfish												
Harlequin Rockfish						0.2		0.2				
Lingcod	81.7	52.5										
Longnose Skate	7.7			7.9	24.3	24.4	25.8	26.0	1.8			
Longspine Thornyhead												
North Pacific Spiny Dogfish										3.6		
Pacific Cod	16.4	6.6	28.9	3.4				3.7	8.2	6.9	5.2	1.7
Pacific Flatnose												
Pacific Grenadier												
Pacific Hake			2.8		91.3	72.7	16.3					
Pacific Halibut						5.7	5.1				8.0	
Pacific Ocean Perch	520.3	190.1	288.4	109.0				93.9	106.9	92.5	142.3	178.4
Petrale Sole	1.0											
Popeye												
Prowfish												
Redbanded Rockfish	20.3	3.3	17.6	11.4				3.4	12.2	0.8	1.9	10.0
Redstripe Rockfish												
Rex Sole	2.0	7.3	40.6	13.3	12.4	5.2	8.7	4.8	5.8	3.7	8.5	34.2
Rosethorn Rockfish	5.3			0.7					0.3	1.2	4.4	
Rougheye Rockfish			447.0	279.2	84.6	36.5	14.7	2.6	14.3	6.5	14.8	12.1
Roughtail Skate												
Sablefish			29.2	29.5	94.7	69.5	57.2					
Sandpaper Skate				4.7			8.8		1.2			
Sharpchin Rockfish	1.7	0.7	-	0.3		0.1	-		-	0.1		0.2
Shortraker Rockfish			7.9	11.7		3.6						
Shortspine Thornyhead	76.3	9.5	109.4	73.8	27.0	16.1	35.5	37.2	86.7	60.5	85.8	145.1
Silvergray Rockfish	200.4	11.5		2.2				3.5	5.3		18.3	3.1
Slender Sole												
Splitnose Rockfish												
Spotted Ratfish	23.6	6.3		19.5	6.0	6.6	11.5	0.6	3.2	0.5	0.7	0.9
Twoline Eelpout												
Walleye Pollock	7.7	1.6		1.6				14.9	12.7	0.8	0.5	5.4
Widow Rockfish												
Yelloweye Rockfish												
Yellowmouth Rockfish												
Yellowtail Rockfish	2.9											
Other	1.6	1.1	-	1.0	22.0	31.7	22.0	21.8	7.0	3.0	18.3	3.9
Total	**1638.9**	**2565.7**	**1539.9**	**802.0**	**500.4**	**358.4**	**881.7**	**260.4**	**349.3**	**225.3**	**360.3**	**545.1**

Common Name	31	32	33	34	35	36	37	38	39	40	41	42
Aleutian Skate												
Arrowtooth Flounder	65.0	54.1	13.6	3.0	2.2	0.2	0.4	47.1	162.0	56.5	20.5	7.5
Bigmouth Sculpin												
Bocaccio					3.1							
Brown Cat Shark												
Canary Rockfish												
Darkblotched Rockfish												
Darkfin Sculpin		0.1						-	1.1		0.1	1.7
Deepsea Sole												
Dover Sole	10.6	9.2	3.1		0.4				13.9	3.8	1.2	0.8
Dusky Rockfish						14.4						
English Sole	4.2											
Giant Blobsculpin												
Giant Grenadier												
Greenstriped Rockfish			0.5		2.1		0.4	1.4				
Harlequin Rockfish		0.2	0.3		609.9		2.5				0.2	0.7
Lingcod												14.2
Longnose Skate											12.7	
Longspine Thornyhead												
North Pacific Spiny Dogfish					2.4		3.4	2.2	1.8			
Pacific Cod	2.1	4.2	6.0	4.6	4.0		2.0	24.9	69.6	20.3	8.4	1.8
Pacific Flatnose												
Pacific Grenadier												
Pacific Hake												
Pacific Halibut	14.4		11.2		38.1	-		10.1	10.8	3.4	3.3	
Pacific Ocean Perch	204.4	702.8	46.6	5.2				1226.7	1702.4	1281.8	924.6	830.9
Petrale Sole			1.2	3.2					5.7			
Popeye												
Prowfish												
Redbanded Rockfish	2.7	4.4	1.2		106.2	4.1	7.1	7.5	13.6		2.5	1.7
Redstripe Rockfish	0.5	5.3	0.6	2.7	922.5	1500.0	24.6		255.8	237.9	4.4	3.2
Rex Sole	64.8	24.6	10.9			0.2	0.2	0.5	82.1	89.7	20.1	10.3
Rosethorn Rockfish		8.0			11.4	2.2	2.0	10.9	6.1	2.5	11.1	27.0
Rougheye Rockfish	0.9	3.2										
Roughtail Skate												
Sablefish								7.0				10.3
Sandpaper Skate												
Sharpchin Rockfish	0.2		9.9	0.5	1349.7		10.7	152.5	185.7	149.2	57.6	65.4
Shortraker Rockfish												
Shortspine Thornyhead	12.8	77.3	0.2					-	33.2	16.7	6.7	32.4
Silvergray Rockfish	46.4	26.8	29.7	113.2	430.1	54.1	85.2	21.1	175.0	129.1	61.5	80.0
Slender Sole	0.2		1.2				0.2			1.1	0.1	0.1
Splitnose Rockfish	0.5											
Spotted Ratfish		0.9	0.5		66.1	15.9	10.7	7.4			1.9	3.9
Twoline Eelpout												
Walleye Pollock	3.4		0.9						3.7	1.7	0.2	1.6
Widow Rockfish												
Yelloweye Rockfish					141.6		11.7					
Yellowmouth Rockfish		1.7	20.5	1.7	4.2				36.4	9.8	0.7	0.9
Yellowtail Rockfish												
Other	4.8	3.8	-	-	2.3	2.0	0.5	-	3.8	4.4	0.5	1.3
Total	**437.9**	**926.4**	**158**	**134.1**	**3696.3**	**1593.2**	**161.5**	**1519.3**	**2762.6**	**2007.9**	**1138.3**	**1095.6**

Common Name	43	44	45	46	47	48	49	50	51	52	53	54
Aleutian Skate												
Arrowtooth Flounder	38.1	0.2	30.3	63.4	1.6	45.0	51.0	63.9	12.0	55.1	56.0	18.5
Bigmouth Sculpin												
Bocaccio												
Brown Cat Shark												
Canary Rockfish												
Darkblotched Rockfish							2.1					
Darkfin Sculpin				-		-	1.6	-	-	-		
Deepsea Sole												
Dover Sole	7.2	1.9	68.6	78.7	1.7	18.0	40.8	50.2	1.2	8.2	4.0	-
Dusky Rockfish		1.7	11.5								36.4	
English Sole												
Giant Blobsculpin												
Giant Grenadier												
Greenstriped Rockfish									3.3	0.2	0.1	
Harlequin Rockfish								0.5	0.6		0.2	4.1
Lingcod	8.1		32.2							2.5		10.3
Longnose Skate			19.4	34.9		4.7	9.4	31.1			11.6	
Longspine Thornyhead												
North Pacific Spiny Dogfish								1.1		5.5	1.5	
Pacific Cod	11.2	1.3	91.7			8.3	20.4		2.9	1.4	3.5	-
Pacific Flatnose												
Pacific Grenadier												
Pacific Hake								4.6				
Pacific Halibut			62.8	7.7					24.0	24.7		
Pacific Ocean Perch	1658.0	172.8	1120.5	7.2	1.1	460.1	177.1		353.6	710.1	1000.0	5848.0
Petrale Sole									1.8			
Popeye												
Prowfish												
Redbanded Rockfish	-	5.0	3.6	11.0		24.2	9.5	2.3		1.3	6.7	21.7
Redstripe Rockfish	5.1	4.6	51.8				1.7		70.1	1.7		817.9
Rex Sole		0.6	35.1	25.3	1.2	6.3	5.4	16.6	1.6	8.0	5.5	7.6
Rosethorn Rockfish	8.0	1.9	7.9	0.5		5.4	10.0	0.3	1.3	9.0	5.3	23.1
Rougheye Rockfish				134.5		115.3	1.5	89.5				
Roughtail Skate												
Sablefish	5.3			16.0		8.8		44.4	7.4	8.2		
Sandpaper Skate				6.1				1.0				
Sharpchin Rockfish	821.3	12.3	158.8			0.3	11.3		30.1	57.9	82.3	656.6
Shortraker Rockfish						41.5		4.6				11.8
Shortspine Thornyhead	27.3	5.1	35.3	231.2	3.6	197.1	98.9	88.7		18.8	3.9	17.4
Silvergray Rockfish	734.4	48.7	1181.2				18.5		211.0	5.5	5.9	46.7
Slender Sole		0.1	2.8						0.2			
Splitnose Rockfish				0.3			0.4			0.4		
Spotted Ratfish	4.0	1.9	32.8	8.5		1.8	1.2	1.2	36.4	12.3	3.7	-
Twoline Eelpout												
Walleye Pollock		0.3				1.4	1.2		1.3	3.5	4.5	
Widow Rockfish	104.7		84.2						2.2			18.2
Yelloweye Rockfish												
Yellowmouth Rockfish	585.8	230.8	1521.2				10.5					17.9
Yellowtail Rockfish												
Other	-	-	-	16.4	-	6.6	5.9	52.2	5.2	0.4	0.4	3.2
Total	**4018.5**	**489.4**	**4551.6**	**641.62**	**9.2**	**944.8**	**478.4**	**452.1**	**766.1**	**934.5**	**1231.4**	**7522.9**

Common Name	55	56	57	58	59	60	61	62	63	64	65
Aleutian Skate	10.8										
Arrowtooth Flounder		40.3	15.7	54.5	23.8	75.8	666.6	11.8		3.1	95.9
Bigmouth Sculpin					7.3	4.5					
Bocaccio											
Brown Cat Shark											
Canary Rockfish											
Darkblotched Rockfish											
Darkfin Sculpin	-	0.4	0.2	0.6	1.1	0.8	0.1	-			
Deepsea Sole											
Dover Sole	80.1	9.8	29.8	43.2	11.8	15.6	47.4	21.2			
Dusky Rockfish				1.1							
English Sole							1.2				
Giant Blobsculpin											
Giant Grenadier											
Greenstriped Rockfish											
Harlequin Rockfish	-	0.5		0.2					43.7	17.8	18.0
Lingcod					12.4		6.0	14.0			
Longnose Skate	14.1			12.5							12.0
Longspine Thornyhead											
North Pacific Spiny Dogfish	1.8										
Pacific Cod	-	3.9		3.3	8.9		1.9	3.3	89.9		
Pacific Flatnose											
Pacific Grenadier											
Pacific Hake				2.2		19.4	7.9				
Pacific Halibut	10.4	10.9		3.0	5.9	25.2	15.9	23.4	27.6	6.8	156.3
Pacific Ocean Perch	5608.7	578.9	265.4	1533.0	863.8	18.4	34.2	8596.8	381.5	2528.6	5477.4
Petrale Sole	-						2.1				
Popeye											
Prowfish										0.9	
Redbanded Rockfish		5.6	1.3	1.9	7.2		8.8	3.7	390.4	11.8	
Redstripe Rockfish	717.7	1.4							185.6	22.8	250.8
Rex Sole	13.5	5.4	7.9	17.9	10.0	1.5	54.2	-			
Rosethorn Rockfish	12.5	21.8	2.8	20.4	17.6		1.2	15.7	36.0	3.4	
Rougheye Rockfish			2.5		0.4	9.8	7.1				
Roughtail Skate											
Sablefish			23.5		0.6	39.2	1.0	66.0			12.6
Sandpaper Skate						2.9					
Sharpchin Rockfish	173.8	86.8			16.4			400.2	4052.6	807.0	370.3
Shortraker Rockfish						14.8	7.9			6.1	
Shortspine Thornyhead	59.9	26.6	75.6	149.6	69.9	176.7	50.5	18.3	8.4	3.0	14.6
Silvergray Rockfish	22.9	7.8			1.4		4.4	26.1	220.3	205.6	
Slender Sole	-	0.1	0.4		0.6		0.2				
Splitnose Rockfish			0.2				4.7				
Spotted Ratfish	56.7	1.5	2.0	1.0	1.8	2.9	3.8	47.7	91.7		65.4
Twoline Eelpout											
Walleye Pollock		0.3			0.6	0.5	6.0	1.1		0.5	0.7
Widow Rockfish					1.1				4.1	7.7	48.5
Yelloweye Rockfish											
Yellowmouth Rockfish											19.2
Yellowtail Rockfish											
Other	4.2	5.6	50.5	0.9	7.9	9.3	9.6	1.1			0.3
Total	**6787.1**	**807.7**	**477.7**	**1845.3**	**1070.4**	**417.3**	**942.6**	**9250.4**	**5531.7**	**3625.1**	**6541.8**