

# **Summary of the annual 2012 sablefish (*Anoplopoma fimbria*) trap survey, October 9 - November 17, 2012**

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2012

**Canadian Technical Report of  
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OCTOBER 9 - NOVEMBER 17, 2012

by

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## **ABSTRACT**

Lacko, L.C. 2012. Summary of the annual 2012 sablefish (*Anoplopoma fimbria*) trap survey, October 9 - November 17, 2012. Can. Tech. Rep. Fish. Aquat. Sci. nnn: vi + 57 p.

This document describes sampling activities and summarizes results from the 2012 British Columbia sablefish research and assessment survey. These annual surveys utilized sampling strategies used since 2003 at stratified random (StRS) and traditional inlet sites. In addition, a benthic impact study was initiated to collect images of trap gear on the ocean floor. Two exploratory sets were fished at a northern Vancouver Island inlet to evaluate sablefish size and density.

In total, 23,060 sablefish were caught of which 8,574 were tagged and released and 5,683 were used for biological samples. There were 151 tagged fish recaptured, fitted with a new tag and re-released. One previously tagged fish was retained for biological sampling. Eighteen spiny dogfish (> 70 cm) were fitted with pop-off satellite tags for a National Marine Fisheries Services (NMFS) Auke Bay Laboratories study.

Catch per unit effort (CPUE) is an important result from this survey as it is used to infer population trends. In 2012, survey data from StRS sets show a decreasing trend from previous years in both weight and numbers of fish per trap. Catch rates have steadily increased at mainland inlet locations between 2008 and 2011. In 2012, the catch rate dropped to levels seen in 2010.

## RÉSUMÉ

Lacko, L.C. 2012. Summary of the annual 2012 sablefish (*Anoplopoma fimbria*) trap survey, October 9 - November 17, 2012. Can. Tech. Rep. Fish. Aquat. Sci. nnn: vi + 57 p.

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## 1 Introduction

Sablefish (*Anoplopoma fimbria*) are currently managed in British Columbia (BC) using trap, longline and trawl gear as part of the Integrated Fisheries Management Plan (IFMP). Over ten years (2003 to 2012), BC fishermen have landed an average of 3,006 metric tons of sablefish annually. The majority of sablefish in 2012 were captured by longline trap gear (40%) and longline hook gear (52%). Commercial harvest of sablefish typically occurs at depths up to 985 fathoms, along the steep-walled slopes off the west coast of Haida Gwaii (formerly Queen Charlotte Islands), in the complex troughs of Queen Charlotte Sound, and in the steep canyons and ridges off the west coast of Vancouver Island.

Fishery-independent research and assessment surveys for sablefish have been conducted in BC coastal waters since 1988. Survey procedures have evolved over time, but each year they have consisted of fishing sets using trap gear at randomly selected and/or index sites. These surveys are used to obtain catch rate data, gather biological samples, capture oceanographic measurements and collect tag release and recapture data. In turn, this information is used as the key contemporary index of abundance for assessing the biological status of the sablefish stock, and to condition an operating model that serves as the biological basis of the coastal Management Strategy Evaluation.

The design of the sablefish survey has remained relatively consistent since 2011, and has been comprised of stratified random sampling (StRS) for sites along BC's continental shelf and the continuation of sampling at standardized index sites at four mainland inlets. For details about past survey designs, see the historic overview provided by (Wyeth and Kronlund 2003) and (Wyeth et al. 2004a). For details on specific surveys conducted from 1988 through 1993 see (Smith et al. 1996); for surveys in 1994 and 1995 see (Downes et al. 1997); for surveys from 1996 to 2000 see (Wyeth and Kronlund 2003). For the 2001 through 2006 surveys see (Wyeth and Kronlund 2003), (Wyeth et al. 2004b), (Wyeth et al. 2004a) and (Wyeth et al. 2006), respectively.

In this technical report we describe survey operations and summarize data collected on the 2012 chartered survey aboard the F/V Ocean Pearl. Tables and figures referred to in the main text are numbered sequentially. Tables and figures in the appendices are labelled with a letter code.

## 2 Methods

### 2.1 SURVEY DESIGN

Methodology for the 2012 sablefish research and assessment survey employed a stratified random sampling component, a traditional component, an exploratory study and a benthic impacts study.

### **2.1.1 STRATIFIED RANDOM SAMPLING SURVEY DESIGN COMPONENT**

Since 2011, the StRS design has been conducted in all offshore survey areas. The StRS design began in 2003 with the purpose of distributing tag releases at random, collecting biological samples and developing a catch-rate based index of abundance (Wyeth and Kronlund 2003). It also provided an alternative design to the historic traditional offshore component of the survey (1990 to 2010) which occurred at fixed locations.

Under the StRS design the offshore survey area is partitioned into five spatial strata ( $S_1$  to  $S_5$ ) and three depth strata ( $RD_1$  to  $RD_3$ ) for a total of 15 (Figure 1). The five spatial strata are  $S_1$  (South West Coast Vancouver Island or SWCVI),  $S_2$  (North West Coast Vancouver Island or NWCVI),  $S_3$  (Queen Charlotte Sound or QCS),  $S_4$  (South West Coast of Haida Gwaii or SWCHG), and  $S_5$  (North West Coast of Haida Gwaii or NWCHG). The three targeted depth ranges are 100-250 fathoms ( $RD_1$ ), 250-450 fathoms ( $RD_2$ ), and 450-750 fathoms( $RD_3$ ). The area within each of the 15 strata are sectioned into 2 km x 2 km grid cells or ‘fishing blocks’ from which set locations are randomly chosen.

From 2003 through 2005, five grid cells were randomly selected in each spatial-depth stratum. From 2006 through 2010, the number was increased to six. An analysis was completed for the 2011 survey to optimize the allocation of the blocks to strata for the 2011 and 2012 survey. However, in order to lower survey costs, the number of blocks were further reduced for the 2013 survey, from a total of 110 to 91 offshore blocks while maintaining the same relative allocation of blocks to strata. This total number of blocks has been in place on all subsequent surveys (Table 1), including 2012 (Figure 2).

### **2.1.2 TRADITIONAL STANDARD SURVEY COMPONENTS**

Standardized fishing sets under the traditional component of the survey have specific gear, bait, and sampling protocols. The original intent of the standardized sets was to collect catch rate data in order to index trends in abundance, tag fish and obtain biological samples. In 2010 the offshore portion of the traditional standardized survey was terminated as it was shown that the continued use of the standardized survey, in combination with the StRS, resulted in greater frequency for stock assessment errors (Cox et al. 2011). Since then only standardized fishing sets within four mainland inlet localities have continued (Appendix A). A string of twenty-five (25) traps were set at five specific localities in each of the following four (4) areas: Portland Inlet, Gil Island, Finlayson Channel, and Dean/Burke Channel. Trap gear was deployed near the center of each of the five locality boundaries in order to avoid the steep slopes characteristic of these channels/fjords (Figure 3).

### **2.1.3 EXPLORATORY COMPONENT**

Fishing sets for the exploratory component of the survey were used to evaluate Vancouver Island inlets that have not been surveyed for Sablefish density and/or size composition.

## **2.1.4 BENTHIC IMPACTS STUDY**

In order to evaluate the impact of fishing gear on the benthic habitat, camera sets were initiated during the 2012 Sablefish research and assessment survey. Nuytco autonomous camera systems were attached to traps to capture video and still images. In addition, accelerometers were deployed on many sets to gather trap orientation and movement data.

## **2.2 VESSELS**

The 2012 survey of 135 sets was chartered aboard the 25.34 meter F/V Ocean Pearl (Figure 3), skippered by Darcy Nichols between Oct 9 - Nov 17 , 2012 . Information about the vessel can be found at <http://marinetraffic.com>.

## **2.3 FISHING GEAR**

The longline trap gear consisted of a groundline resting on the ocean floor with 25 baited traps attached to beackets at 150 foot intervals along its length and 90 pound anchors at each end (Figure 4, b). A flagpole was required for at least one end of the set to improve visibility for retrieval. The traps were steel frame with a bottom hoop diameter of 54 inches and covered with an North American #84 black braided nylon web of 2.75 inch mesh (Figure 4, a). The tunnels were made of green braided, knotless, 1.25 inch mesh. The traps did not include escape rings; but instead a 'rot panel' of # 21 cotton located above the middle ring.

Standard bait bags (6 by 12 inches) made of 1/8 inch web with a nylon drawstring and #7 stainless trolling snaps were included with the traps.

## **2.4 FISHING OPERATIONS**

During normal survey fishing operations gear was deployed on alternate days. Prior to deployment, the Fishing Master inspected the block to determine fishability and if it was within the targeted depth range. The goal was to have as much gear as possible within the block boundaries. If unfishable, the survey protocol requires that an alternate block is to be chosen to the east, west, north, and south, respectively. If none of those blocks meet the criteria, an alternate block of the same area and depth strata was randomly chosen. In 2020, the choice of alternate blocks were limited to a pre-selected list prepared by DFO in advance of the survey.

Two science staff recorded information associated with the deployment of the gear. One science member was positioned in the wheelhouse and recorded set details on the bridge log data form. The start and end geo-referenced positions of each set were entered at the time when the first and last traps were set over the stern. Depths were recorded at one-minute intervals between the first and last anchors being set. Later, the duration of the set was calculated as the time elapsed between the first anchor being set over the stern and the first anchor hauled aboard (Appendix B, Figure B.1).

A set log was filled out on the deck by the science recorder who had maximum visibility of the crew setting the traps over the stern rail. The set log included the time and identity of the first and last buoys, anchor time, a tally of beackets and traps, as well as the unique identifying numbers of sensors deployed (Appendix B, Figure B. 2)

#### **2.4.1 STRATIFIED RANDOM SAMPLING SURVEY DESIGN COMPONENT**

Sets in StRS blocks had a targeted soak time of 24 hours. Fishing sets were designated useable if hauled between 22 and 26 hours. Traps were baited with 10 pounds of loose offshore Pacific Hake (*Merluccius productus*) and 2 pounds of bagged squid.

#### **2.4.2 TRADITIONAL STANDARD SURVEY COMPONENTS**

Standardized fishing sets under the traditional component of the survey have specific gear, bait, and sampling protocols. The original intent of the standardized sets was to collect catch rate data in order to index trends in abundance, tag fish and obtain biological samples. In 2010 the offshore portion of the traditional standardized survey was terminated as it was shown that the continued use of the standardized survey, in combination with the StRS, resulted in greater frequency for stock assessment errors (Cox et al. 2011). Since then only standardized fishing sets within four mainland inlet localities have continued (Appendix A). A string of twenty-five (25) traps were set at five specific localities in each of the following four (4) areas: Portland Inlet, Gil Island, Finlayson Channel, and Dean/Burke Channel. Trap gear was deployed near the center of each of the five locality boundaries in order to avoid the steep slopes characteristic of these channels/fjords (Figure 3).

#### **2.4.3 VANCOUVER ISLAND INLETS EXPLORATORY COMPONENT**

To assess those areas that have not been surveyed for Sablefish density and/or size composition, two exploratory sets were conducted in a Vancouver Island inlet near Quatsino Sound. These two sets were conducted in the immediate vicinity of the two exploratory sets that were done in the 2011 survey.

### **2.5 CATCH PROCESSING**

Haulback speed allowed the science crew to accurately record catch. Two science staff were positioned on deck at the haul card station; one recorded the catch and the other managed the movement of baskets. As the groundline was hauled, each becket and trap were entered in the charter catch log form (Appendix B, Figure B.3). Crew members alerted the recorder about any damage to a trap (i.e. holes) which was then recorded.

Catch by species from each trap was sorted into baskets by the crew. Baskets were then weighed to the nearest 0.2 kg on a motion compensating scale and given a basket use code

of D, A, T, L, SD or F. Code D designated fish species as discards or commercial catch; code A allocated sablefish for age samples; code T allocated sablefish to be tagged and released; code L allocated fish for length samples; code SD identified sublegal sablefish discards; code F represented fish frames with amphipod or hagfish damage (Appendix B, Figure B.3). The next day, the entries on charter catch log form were transposed to tabular format on the charter catch log entry form (Appendix B, Figure B.4).

### **2.5.1 Sablefish Allocation Details**

Sablefish were tagged from 1/3 of the traps on StRS sets and 1/2 of the traps on the inlet sets. Due to high catch numbers, the survey protocol was revised in 2018 to designate ~125 sablefish to be tagged (T) from 1/3 of the traps on all sets. When catches were high, traps targeted for tagging were spread throughout the string to avoid tagging the first 125 fish. A biological sample was collected from the coded “A” traps with the goal of selecting 50 to 60 fish. If CPUE was high, the new survey protocol of 2018 designated a minimal of two traps to be used for samples. If both traps contained more than 60 sablefish, a random process was used to select ~60 specimens.

The remaining traps were allocated to the discard category and sorted by size into either legal (D) or sublegal (SD) discards. The SD (sublegal discards) code was added during the 2017 survey to account for the large numbers of juvenile sablefish and facilitate their quick return to the ocean. Legal discards (D) of sablefish were kept by the vessel and processed as commercial catch.

## **2.6 BIOLOGICAL SAMPLING (LWSMO)**

Biological samples were collected from sablefish and rougheye/blackspotted rockfish (*Sebastodes aleutianus/Sebastodes melanostictus*) specimens. Measurements were recorded for fork length (L), body weight (W), sex (S) and maturity level (M) (Appendix B, Figure B.5). Sagittal otoliths (O) were collected and stored for potential ageing by the sclerochronology laboratory. In addition, tissue for DNA was collected from the rougheye/blackspotted rockfish complex for later species determination. Since this complex of two distinct species (Orr and Hawkins 2008) have similar appearances with slight variations in colour markings and dorsal fin lengths, the sampler visually identified each specimen as either a rougheye, a blackspotted or a hybrid species. All rockfish and legal-sized sablefish (fork length > 55 cm) that were sacrificed for biological samples were dressed, frozen, and landed as commercial catch.

Length (L) and weight (W) measurements were collected from all Pacific halibut (*Hippoglossus stenolepis*) before they were released at sea. Only the length (L) was recorded for Pacific sleeper sharks (*Somniosus pacificus*) before release. No biological samples were collected from other species.

## **2.7 SABLEFISH TAGGING**

Tagging became part of the annual sablefish research and assessment survey in 1991 (Wyeth and Kronlund (2003)). Fish destined to be tagged were transferred from the sorting area to a tagging tank. A vessel crew member was positioned to retrieve sablefish from the tank and provide assistance with fish handling. A scientist stood at the sample station and tagged fish with a Mark II Long Tagging gun loaded with Floy FD-94 T-bar anchor tags. The tag was inserted on the left side of the fish, 1 cm below and 2-3 cm behind the anterior insertion of the first dorsal fin. Fork length (mm to the nearest ½ cm) measurements were taken. Before release, any sampling errors, injuries or damage to the fish were recorded on the tagging form by a second scientist. Tag checks were performed systematically to ensure tag numbers on the data form matched those on the fish specimen (Appendix C, Figure B.6).

## **2.8 SABLEFISH TAG RECOVERY**

Any previously tagged fish brought aboard may have been treated in one of two ways. First, sablefish with Canadian tags were re-released with a new tag and the previous tag was removed. In addition, any wounds from the old tag were recorded. Second, sablefish with a foreign agency tag or sablefish that had sustained numerous injuries were retained for biological sampling. For these specimens, the tag and otoliths were stored in a bar-coded vial that was later scanned into the GFBioField Tag Recovery Entry form (Olsen 2010). Foreign tags were returned to their country of origin.

During survey years 1992 through 1997 and 2004, previously tagged sablefish were re-released with the same tag. New tagging protocols of replacing the tag began in 2005.

## **2.9 OCEANOGRAPHIC SENSOR DATA COLLECTION**

A Sea-bird Bird SBE 39 temperature and pressure logger was placed in a protective plastic pipe and attached to the inside of the middle or end traps. Data was successfully collected from 134 sets in 2012 (Appendix C). A SBE 39 was also placed in the tagging tank on hauling days to record water temperature. Data from the SBE temperature and pressure loggers were processed at sea after the set was complete.

## **2.10 ELECTRONIC MONITORING VIDEO DATA COLLECTION**

During haulback, the electronic monitoring (EM) system cameras were activated by the hydraulic sensor. Three standard analog cameras were positioned at optimal viewing angles to record survey activities. Two cameras were stationed along the mast to record the catch as it was processed at the hopper. A third camera was stationed on the side of the wheelhouse to record the traps as they were brought over the rail. The video data from each set was reviewed by science staff the following day to provide quality control on catch data.

### **3 Results and Discussion**

#### **3.1 CATCH PER UNIT EFFORT (CPUE)**

The sablefish survey of 2012 have documented recent changes in the sablefish population structure.

##### **3.1.1 Stratified Random Set CPUE**

Catch per unit effort (CPUE), as indexed by kilograms of sablefish per trap, increased across most offshore survey strata in 2018, and again in 2019 (Figure 5). The most pronounced increases occurred in the middle depth strata which recorded the largest CPUEs in 2018 and 2019 since the StRS began (Figure 6). These increases in CPUE were the result of a relatively large increase in the number of small sablefish encountered on the survey (Figure 7 and Figure 8, likely due to a large recent recruitment event that has occurred coastwide (DFO 2020). The stratified mean survey abundance in 2012 was 35 kg/trap, which is down -17% from 2011 and -13% from the 2018-2019 average (DFO 2021) (Figure 9).

#### **3.2 CATCH COMPOSITION**

A total of seventy-three taxonomic groups were represented in the catches in StRS sets in 2012. These included thirteen roundfish species, twelve rockfish species, four flatfish species and forty-four invertebrate species. Other than sablefish, the most common species, by weight, were Pacific halibut (*Hippoglossus stenolepis*), Spiny dogfish (*Squalus acanthias*), arrowtooth flounder (*Atheresthes stomias*), rougheye/blackspotted rockfish complex (*Sebastodes aleutianus*) and pectoral rattail (*Albatrossia pectoralis*) (Table 2).

A total of twenty-six taxonomic groups were represented in the catches from traditional standardized sets conducted in mainland inlet localities in 2012. These included four roundfish species, four rockfish species, three flatfish species and fifteen invertebrate species. The most common species, by weight, other than sablefish were Pacific halibut (*Hippoglossus stenolepis*) and arrowtooth flounder (*Atheresthes stomias*) (Table 3).

Two taxonomic groups were represented in the catches at the exploratory sites in 2012. Only one sablefish (*Anoplopoma fimbria*) and one Pacific ocean perch (*Sebastodes alutus*) were captured (Table 4).

#### **3.3 SABLEFISH SAMPLING**

A detailed breakdown of the fate of the catch in each trap for the 2012 survey is listed in Appendix D.

During the 2012 StRS, a total of 6,213 sablefish were caught. Of that total, 2,924 were tagged and released and 983 were retained for biological sampling. Of the tagged fish, 102 were previously tagged fish that were re-released with a new tag. One previously tagged fish was retained for sampling (Appendix E).

Overall, the StRS sets had a higher proportion of females than males over the spatial strata S<sub>2</sub>, S<sub>3</sub>, S<sub>4</sub> and S<sub>5</sub> (Table 6). More females than males were seen in the shallow depth stratum within the spatial strata S<sub>2</sub>, S<sub>3</sub>, S<sub>4</sub> and S<sub>5</sub>. In the mid depth stratum, there were more males than females in S<sub>1</sub>, S<sub>2</sub>, S<sub>3</sub> and S<sub>5</sub>. The deepest depth stratum saw more females in spatial strata S<sub>1</sub>, S<sub>2</sub>, S<sub>3</sub> and S<sub>5</sub>.

In 2012, the average mean fork length for the 2,404 females was 66 cm and the average mean fork length for the 2,282 males was 58 cm. The mean length of both females and males reached their lowest mean size since 2003 (Figure 14).

On average, female sablefish grow faster and reach a far greater size (Figure 11a) compared to males (Figure 11b).

### **3.4 RECOVERED TAGGED SABLEFISH**

TBD Of the 102 Canadian tagged fish that were recovered on the survey, the majority (79%) had travelled within 50 kilometers of the release site. Most of these tagged fish (70%) were recaptured within 5 years at liberty .

### **3.5 OTHER FISH SAMPLING AND TAGGING**

Length, sex, maturity, otoliths and DNA samples were collected for 395 rougheye/blackspotted rockfish. (Appendix ??). Fork length, sex, collected for arrowtooth flounder, aurora rockfish, greenstriped rockfish, lingcod, Pacific cod, Pacific halibut, redbanded rockfish, rosethorn rockfish, shortraker rockfish, walleye pollock, yelloweye rockfish and yellowmouth rockfish (Appendix ??). Total length, sex, collected for dover sole, giant blobsculpin, longspine thornyhead, north Pacific spiny dogfish, Pacific flatnose, pink snailfish, and shortspine thornyhead (Appendix ??).

North Pacific spiny dogfish with a pre-caudal length greater than seventy centimetres were tagged with pop-off satellite tags. Four tagged fish were released in each of area 3D and 5A, two in area 5B and eight in area 5E (Figure 8).

### **3.6 SABLEFISH AGES**

The highest proportion of female ages in the StRS sets for 2003 through to 2010 were 3, 4, 5, 6, 7, 8, 9, 10 years of age, respectively. Then, another cohort appeared in 2011 and 2012, showing up as 3 and 4 year olds (Figure 12a).

The highest proportion of male ages in StRS sets for 2003 through to 2012 were 3, 5, 5, 6, 8, 8,

8, 10, 12 and 4 years of age, respectively (Figure 12b).

Up to 2012, the oldest female sablefish was 92 years of age, collected in 2003 and the oldest male sablefish was 84 years old, documented in 2010.

### **3.7 BENTHIC IMPACTS**

### **3.8 OCEANOGRAPHIC TEMPERATURES AND DEPTHS**

Co-plots of average temperatures and average depths by 1-degree latitude intervals from southwest Vancouver Island to northwest Haida Gwaii can be found in Figure 13. The 2012 survey data exhibit a general trend of decreasing temperature with depth over latitude.

SBE 39 recorders have been placed on survey fishing sets since 2006. In the shallow waters, the lowest average temperature was 4.4 °C in 2007; the highest average temperature was 7.1 °C in 2009. In the mid-depth waters, the lowest average temperature was 3.5 °C in 2007; the highest average temperature was 5.5 °C in 2008. In the deepest waters, the lowest average temperature of 2.3 °C in 2007 and the highest average temperature was 4.1°C in 2007 (Figure 14).

### **3.9 EARTHQUAKE EVENT**

Canada's strongest earthquake in more than 60 years hit Haida Gwaii on Saturday October 27, 2012 at 08:04 pm. At that time, several bottom sensors were on the seafloor and recorded the seismic activity of the 7.7 magnitude earthquake. The tremor was also felt aboard the vessel (Figure 15).

### **3.10 ACKNOWLEDGEMENTS**

The stock assessment survey and data report is the result of the collaborative efforts of many individuals. Wild Canadian Sablefish has provided coordination and support of the annual Sablefish survey since 1994. The scientific staff that conducted the 2012 sablefish research charter included Jonas Barranco, Guy Boxall, Jon Eis, Margo Elfert, Ian Hamilton, Matthew McKay, and Jonathan Monahan of Archipelago Marine Research Ltd (AMR) and Schon Acheson, Kristina Anderson, Lisa Lacko and Malcolm Wyeth of Fisheries and Oceans, Canada.

A special thanks to the skipper and crew of the F/V Ocean Pearl, whose efforts made the survey successful. In 2012, the crew consisted of D'Arcy Nichols (skipper), Gene Davidson, Kaleb Duggan, Todd Lower, Alex Pugh and James Simpson.

#### 4 Tables

Table 1. The four components of the 2012 Sablefish research and assessment survey.

<b>Component</b>	<b>Bait/Method</b>	<b>Locations</b>	<b>Protocol</b>
Stratified random sampling (StRS), Type 3 (Random tagging)	1 kg squid (bagged) 4 kg hake (loose)	Five spatial strata (S1-S5)	1/3 of traps used for tagging, 1/3 of traps used for biosamples, (50 piece LS(W)MO), 1/3 of traps discarded
Traditional Inlet Standardized	1 kg squid (bagged)	Dean/Burke Channel Finlayson Channel Gil Island Portland Inlet	1/2 of traps used for tagging, 1/2 of traps used for biosamples (50 piece LSWMO)
Exploratory	1 kg squid (bagged) 5 kg hake (loose)	Quatsino Sound	1/3 of traps used for biosamples (50 piece LSWMO), 1/3 of traps used for tagging and 1/3 of traps discarded
Benthic impact	Nuytco autonomous camera system and HOBO Pendant G Loggers attached to select traps	Coastwide	Camera system deployed on select sets. Accelerometers deployed on camera and survey sets.

Table 2. Spatial strata allocation for the stratified random survey design and completed strata counts (magenta) for the 2012 sablefish research and assessment survey.

Spatia Strata	Depth Strata						Total 2012	Total 2012
	RD1	RD1	RD2	RD2	RD3	RD3		
	2012	2012	2012	2012	2012	2012		
S1 (South West Coast Vancouver Island or SWCVI)	7	7	8	8	8	8	23	23
S2 (North West Coast Vancouver Island or NWCVI)	7	7	7	7	8	8	22	22
S3 (Queen Charlotte Sound or QCS)	14	14	6	6	6	6	26	26
S4 (South West Coast Haida Gwaii or SWCHG)	6	6	6	6	6	6	18	18
S5 (North West Coast Haida Gwaii or NWCHG)	7	7	7	7	7	7	21	21
<b>Total</b>	<b>41</b>	<b>41</b>	<b>34</b>	<b>34</b>	<b>35</b>	<b>35</b>	<b>110</b>	<b>110</b>

Table 3. Summary of species captured during the 2012 survey StRS sets conducted by the Ocean Pearl. No value in the weight column indicates that the catch was not weighed.

Category	Common Name	Scientific Name	Count	Weight(kg)
Roundfish Species	Sablefish	ANOPLOPOMA FIMBRIA	41994	
	Spiny dogfish	SQUALUS ACANTHIAS	2286	
	Pectoral ratail	ALBATROSSIA PECTORALIS	976	
	Lingcod	OPHIODON ELONGATUS	722	
	Pacific grenadier	CORYphaenoides ACROLEPIS	695	
	Pacific flatnose	ANTIMORA MICROLEPIS	20	
	Pink snailfish	PARALIPARIS ROSACEUS	9	
	Blob sculpin	PSYCHROLUTES PHRICTUS	7	
	Walleye pollock	THERAGRA CHALCOGRAMMA	3	
	Pacific cod	GADUS MACROCEPHALUS	1	
	Darkfin sculpin	MALACOCOTTUS ZONURUS	2	
	Black hagfish	EPTATRETUS DEANI	1	
	Sand lances	AMMODYTIDAE	1	
Rockfish Species	Rougheye/blackspotted rockfish complex	SEBASTES ALEUTIANUS	1563	
	Redbanded rockfish	SEBASTES BABCOCKI	320	
	Shortraker rockfish	SEBASTES BOREALIS	234	
	Yelloweye rockfish	SEBASTES RUBERRIMUS	121	
	Shortspine thornyhead	SEBASTOLOBUS ALASCANUS	76	
	Yellowmouth rockfish	SEBASTES REEDI	3	
	Rosethorn rockfish	SEBASTES HELVOMACULATUS	3	
	Longspine thornyhead	SEBASTOLOBUS ALTIVELIS	3	
	Aurora rockfish	SEBASTES AURORA	2	
	Greenstriped rockfish	SEBASTES ELONGATUS	1	
	Sharpchin rockfish	SEBASTES	1	
		ZACENTRUS	1	
Flatfish Species	Pacific halibut	HIPPOGLOSSUS STENOLEPIS	2669	
	Arrowtooth flounder	ATHERESTHES STOMIAS	1654	
	Dover sole	MICROSTOMUS PACIFICUS	30	
	Deepsea sole	EMBASSICHTHYS BATHYBIUS	1	
Invertebrate Species	Grooved Tanner Crab	CHIONOECETES TANNERI	329	
	Red Queen Crab	PARALOMIS MULTISPINA	93	
	Oregon triton	LITHODES COUESI	59	
	Brown box crab	ALLOCENTROTUS FRAGILIS	22	
	Giant pacific octopus	FUSITRITON OREGONENSIS	12	
	Box crabs	NEPTUNEIDAE	4	
	Fish-eating star	LOPHOLITHODES FORAMINATUS	3	
	Brown king crab	ENTEROCTOPUS DOFLEINI	3	
	Anemone	LOPHOLITHODES	2	
	Golden king crab	STYLASTERIAS FORRERI	1	
	Octopus	PARALITHODES BREVIPES	1	
	Heart urchins	RATHBUNASTER CALIFORNICUS	1	
	Mud star	ACTINIARIA	1	
	Sea lilies and feather stars	LITHODES AEQUISPINA	1	
		OCTOPUS	1	
		ATELOSTOMATA	1	
		HETEROZONIAS ALTERNATUS	1	
	Brittle stars	CTENODISCUS CRISPATUS	12	
		CRINODEA	12	
		ASTERONYX	11	
	Hermit crabs	OPHIACANTHA	10	
		OPHIURAE	5	
		ZOROASTER EVERMANNI	2	
		STYLASTERIAS	2	
		PAGURIDAE	2	
		NEARCHASTER ACICULOSUS	2	

Table 3. continued.

Category	Common Name	Scientific Name	Count	Weight(kg)
	Soft sea cucumber	PSEUDOSTICHOPUS MOLLIS	2	
	Prawn	PANDALUS PLATYCEROS	2	
	Starfish	ASTERIODEA	2	
	Sponges	PORIFERA	1	
		AMPHIOPHIURA PONDEROSA	1	
	Inshore Tanner Crab	CHIONOECETES BAIRDII	1	
	Sea urchins	ECHINACEA	1	
	Pandalid shrimp	PANDALUS	1	
	Rose starfish	CROSSASTER PAPPOSUS	1	
	Scaly sea cucumber	PSOLUS SQUAMATUS	1	
	Sea cucumber	HOLOTHUROIDEA	1	
		TARASTER ALASCANUS	1	
		TRIOPHA CATALINAE	1	
	Blood star	HENRICIA LEVIUSCULA	1	
		OPHIURA SARSI	1	
		SOLASTERIDAE	1	
	Cookie star	CERAMASTER PATAGONICUS	1	
	Decorator crab	OREGONIA GRACILIS	1	

Table 4. Summary of species captured by the Ocean Pearl during the 2012 survey standardized sets conducted at mainland inlet localities. Null values indicate the catch was not counted or weighed. No value in both weight and count indicates trace weights of less than 1 kg recorded.

Category	Common Name	Scientific Name	Count	Weight(kg)
Roundfish Species	Sablefish	ANOPLOPOMA FIMBRIA	15175	
	Spiny dogfish	SQUALUS ACANTHIAS	22	
	Walleye pollock	THERAGRA CHALCOGRAMMA	5	
	Pacific cod	GADUS MACROCEPHALUS	2	
Rockfish Species	Shortraker rockfish	SEBASTES BOREALIS	11	
	Rougheye/blackspotted rockfish complex	SEBASTES ALEUTIANUS	4	
	Shortspine thornyhead	SEBASTOLOBUS ALASCANUS	2	
	Redbanded rockfish	SEBASTES BABCOCKI	1	
Flatfish Species	Pacific halibut	HIPPOGLOSSUS STENOCEPIST	923	
	Arrowtooth flounder	ATHERESTHES STOMIAS	33	
	Dover sole	MICROSTOMUS PACIFICUS	1	
Invertebrate Species	Golden king crab	LITHODES AEQUISPINA	5	
	Starfish	ASTERIODEA	1	
		NEPTUNEIDAE	1	
	Mud star	CTENODISCUS CRISPATUS	68	
		MEDIASTER TENELLUS	12	
	Heart urchins	ATELOSTOMATA	7	
	Oregon triton	FUSITRITON OREGONENSIS	6	
	Gastropods	GASTROPODA	5	
	Sweet potato sea cucumber	MOLPADIA INTERMEDIA	2	
	Cookie star	CERAMASTER PATAGONICUS	2	
	Decorator crab	OREGONIA GRACILIS	2	
		STYLAESTER CAMPYLECUS	1	
	Bivalve molluscs	BIVALVIA	1	
	Sea cucumber	HOLOTHUROIDEA	1	
	Inshore Tanner Crab	CHIONOECETES BAIRDII	1	

Table 5. Summary of species captured by the Ocean Pearl during the 2012 survey Total count and weight of species captured during the 2012 survey at the exploratory sites.

Category	Common Name	Scientific Name	Count	Weight(kg)
Roundfish species	Sablefish	ANOPLOPOMA FIMBRIA	1	3
Rockfish species	Pacific ocean perch	SEBASTES ALUTUS	1	1

Table 6. Summary of sablefish fork length measurements collected during the 2012 stratified random sets by spatial and depth stratum.

Depth Strata/Locality		Proportion		Mean Fork Length (mm)		
Spatial	Depth	Males	Females	Males	Females	Tagged
S1	RD1	0.52	0.48	580	618	599
	RD2	0.74	0.26	555	606	548
	RD3	0.30	0.70	561	664	620
		<b>0.52</b>	<b>0.48</b>	<b>565</b>	<b>629</b>	<b>589</b>
S2	RD1	0.35	0.65	600	648	633
	RD2	0.70	0.30	572	614	582
	RD3	0.43	0.57	591	662	618
		<b>0.49</b>	<b>0.51</b>	<b>588</b>	<b>641</b>	<b>611</b>
S3	RD1	0.27	0.73	616	675	665
	RD2	0.60	0.40	556	597	564
	RD3	0.46	0.54	587	676	601
		<b>0.44</b>	<b>0.56</b>	<b>586</b>	<b>649</b>	<b>610</b>
S4	RD1	0.18	0.82	654	694	662
	RD2	0.48	0.52	620	667	644
	RD3	0.72	0.28	577	717	599
		<b>0.46</b>	<b>0.54</b>	<b>617</b>	<b>693</b>	<b>635</b>
S5	RD1	0.39	0.61	568	610	562
	RD2	0.62	0.38	590	660	617
	RD3	0.43	0.57	636	700	665
		<b>0.48</b>	<b>0.52</b>	<b>598</b>	<b>657</b>	<b>615</b>

Table 7. Sablefish tag recovery counts by distance from release site and years at liberty before re-release for the 2020 survey. Distances were determined using the great circle distance between the survey release location and survey recovery location.

Years at Liberty	Distance (km) from Release Location							Recovery count
	<10	11-50	51-100	101-250	251-500	501-1000	1000+	
1	13	3	1	0	1	1	0	19
2-5	25	3	1	5	0	1	0	35
6-10	3	4	0	1	2	0	0	10
11+	7	3	1	2	0	0	0	13
Total Counts	48	13	3	8	3	2	0	77

Table 8. List of the North Pacific spiny dogfish tagged with pop-off satellite tags. The tube label and tag number identify the dogfish. The GFBIO specimen identifier is included for database reference.

Date	Set	Tube-tag ID	Precaudal length (mm)	Release Area	GFBio Specimen ID
October 15,2012	23	118360-20937	895	3D	12359130
October 17,2012	30	118355-20932	825	3D	12359136
October 21,2012	42	118356-20933	893	3D	12359140
October 21,2012	43	118346-20923	880	3D	12359131
October 22,2012	49	118348-20925	845	5A	12359138
October 22,2012	49	118359-20936	880	5A	12359139
October 24,2012	53	118358-20935	842	5A	12359132
October 24,2012	59	118351-20928	920	5A	12359133
October 28,2012	70	118349-20926	865	5B	12359134
October 31,2012	77	118350-20927	900	5B	12359135
October 31,2012	80	118365-20942	920	5E	12359147
November 2,2012	85	118352-20929	852	5E	12359137
November 5,2012	93	118366-20943	824	5E	12359146
November 5,2012	93	118362-20939	988	5E	12359145
November 5,2012	93	118354-20931	918	5E	12359144
November 5,2012	93	118347-20924	888	5E	12359143
November 9,2012	112	118357-20934	906	5E	12359142
November 9,2012	114	118364-20941	860	5E	12359141

## **5 Figures**

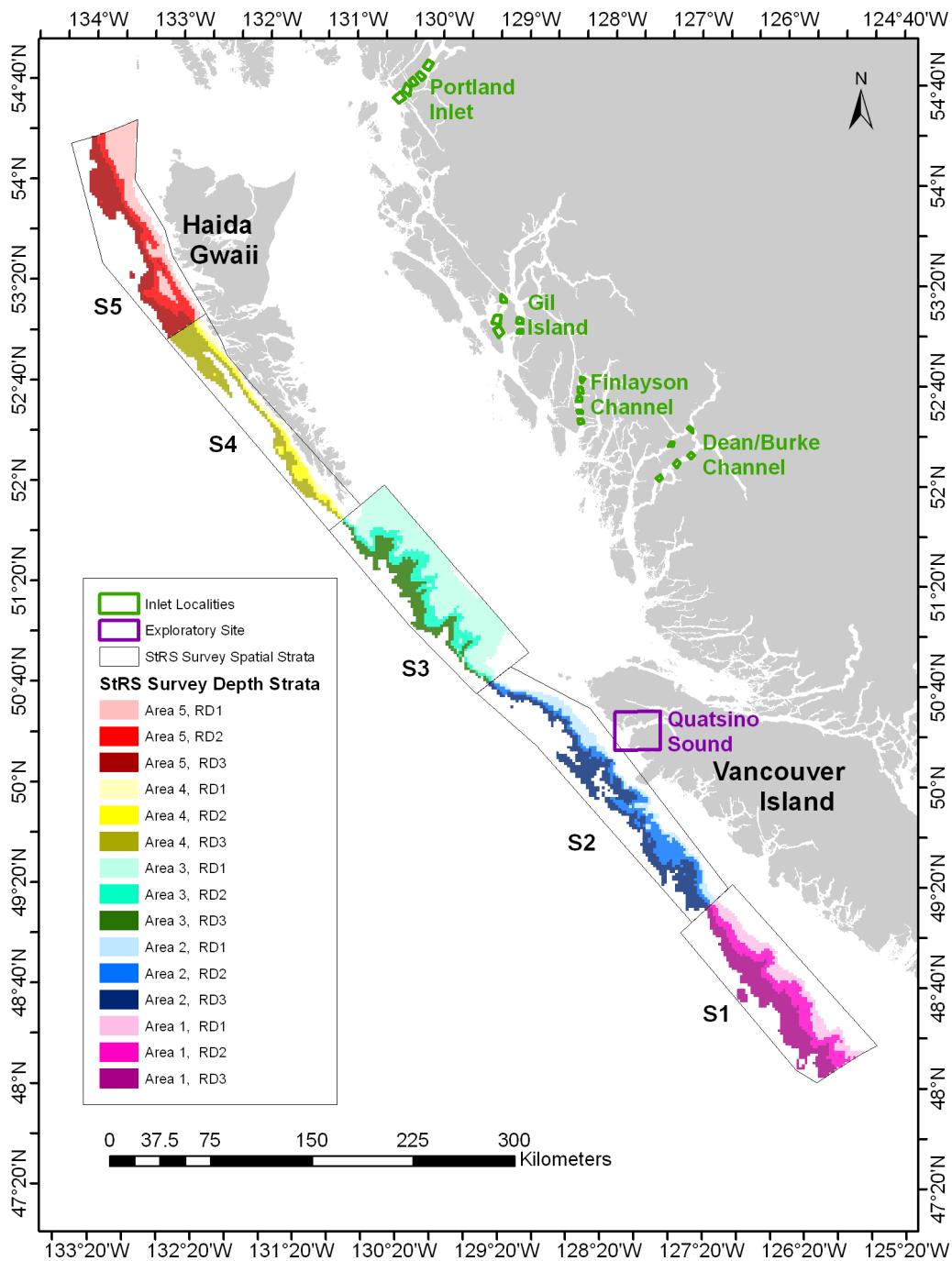


Figure 1. Location of the boundaries of the mainland inlet localities, one exploratory site and the five spatial areas (S<sub>1</sub>-S<sub>5</sub>) of the stratified random survey design. The three depths strata (RD<sub>1</sub>-RD<sub>3</sub>) are colour-coded and nested within each of the five spatial strata.

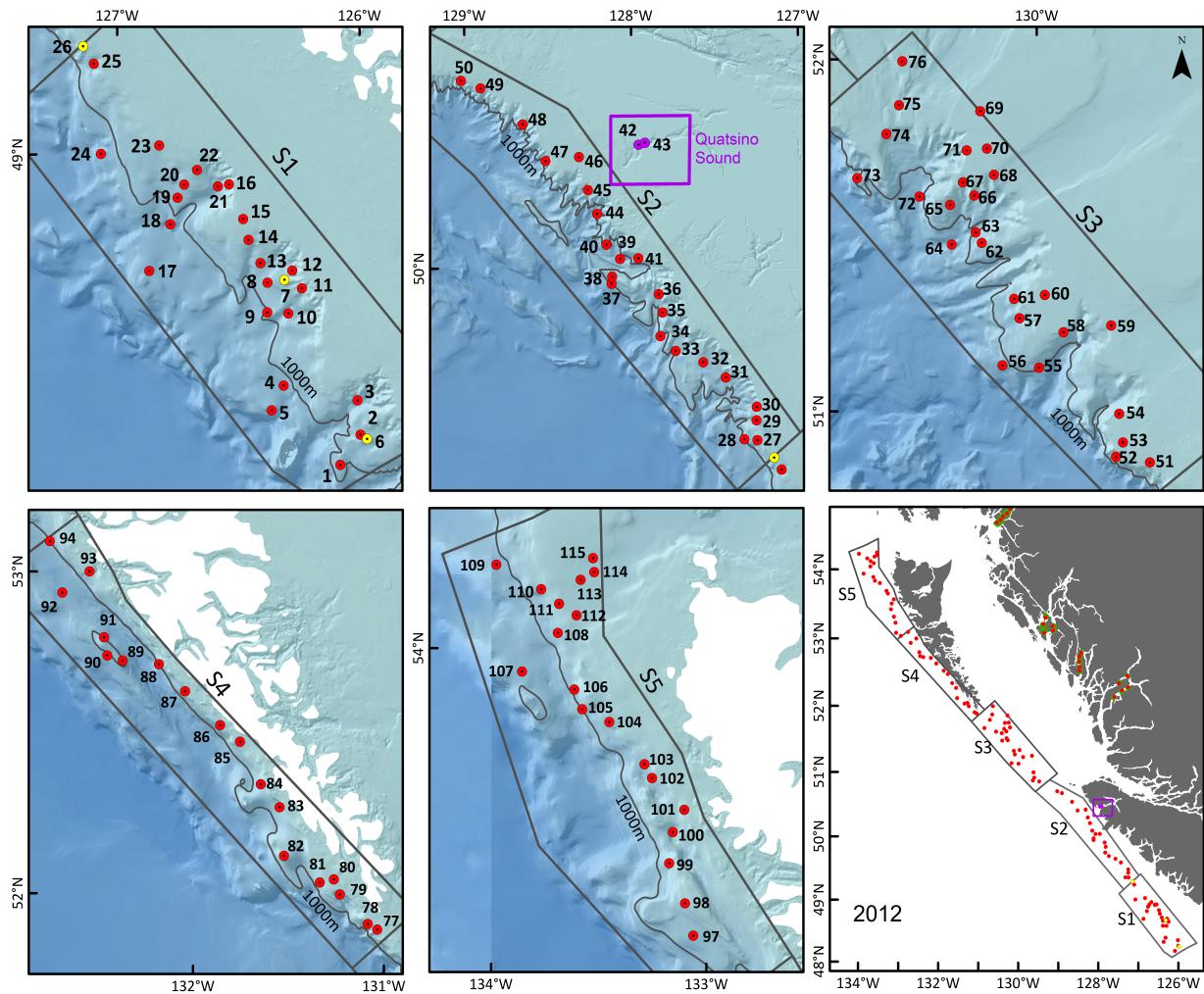


Figure 2. Start locations of survey sets in 2012 conducted in the stratified random survey areas S<sub>1</sub> through S<sub>5</sub> (red markers) and in the exploratory area (purple markers). The camera sets are represented by yellow markers.



Figure 3. Image of the F/V Ocean Pearl used for the 2012 sablefish research and assessment survey. Photo credit: .

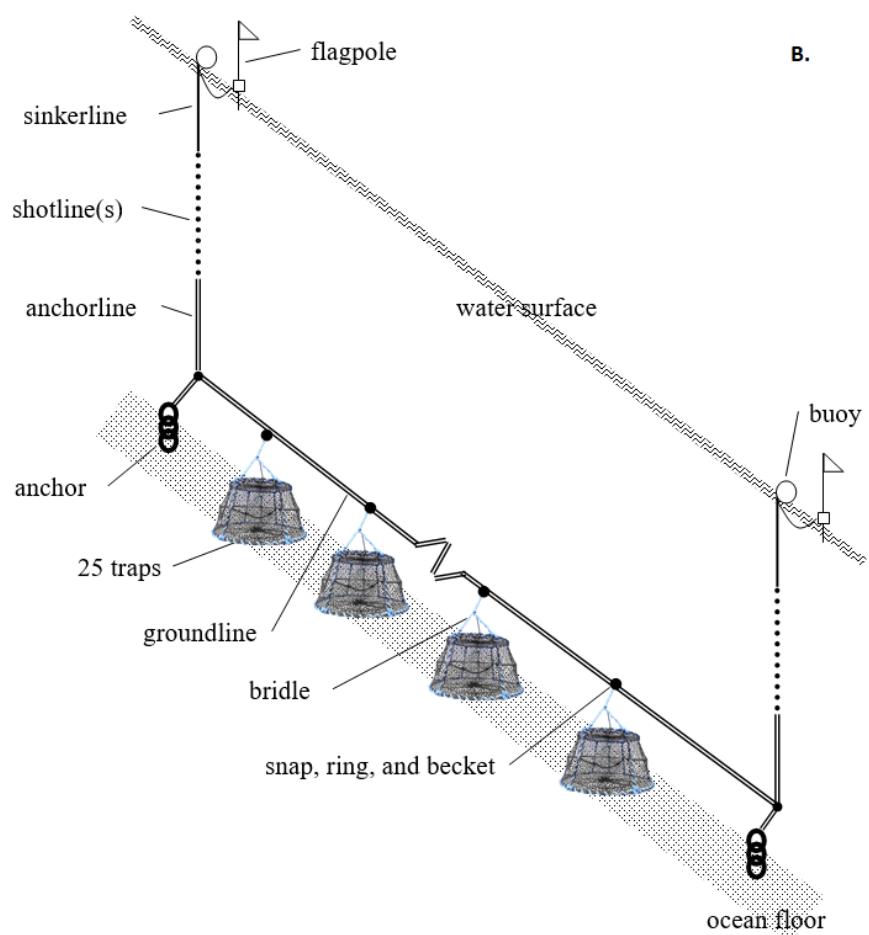
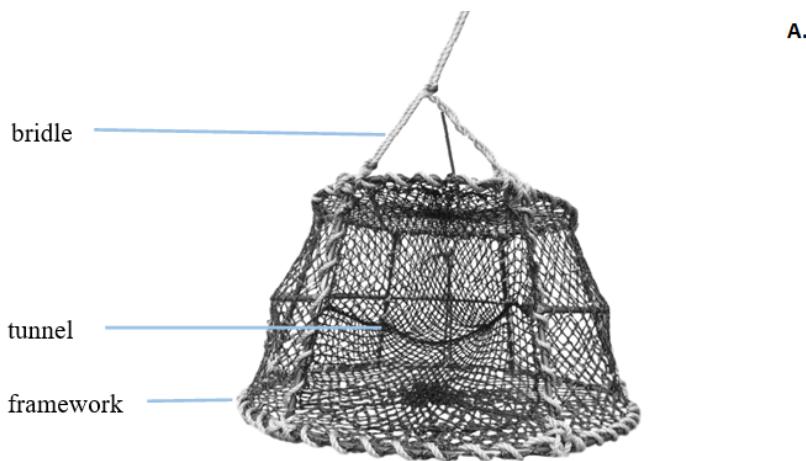


Figure 4. Trap elements (A). Trap gear elements consisting of 25 baited traps snapped to beackets along a groundline (B).

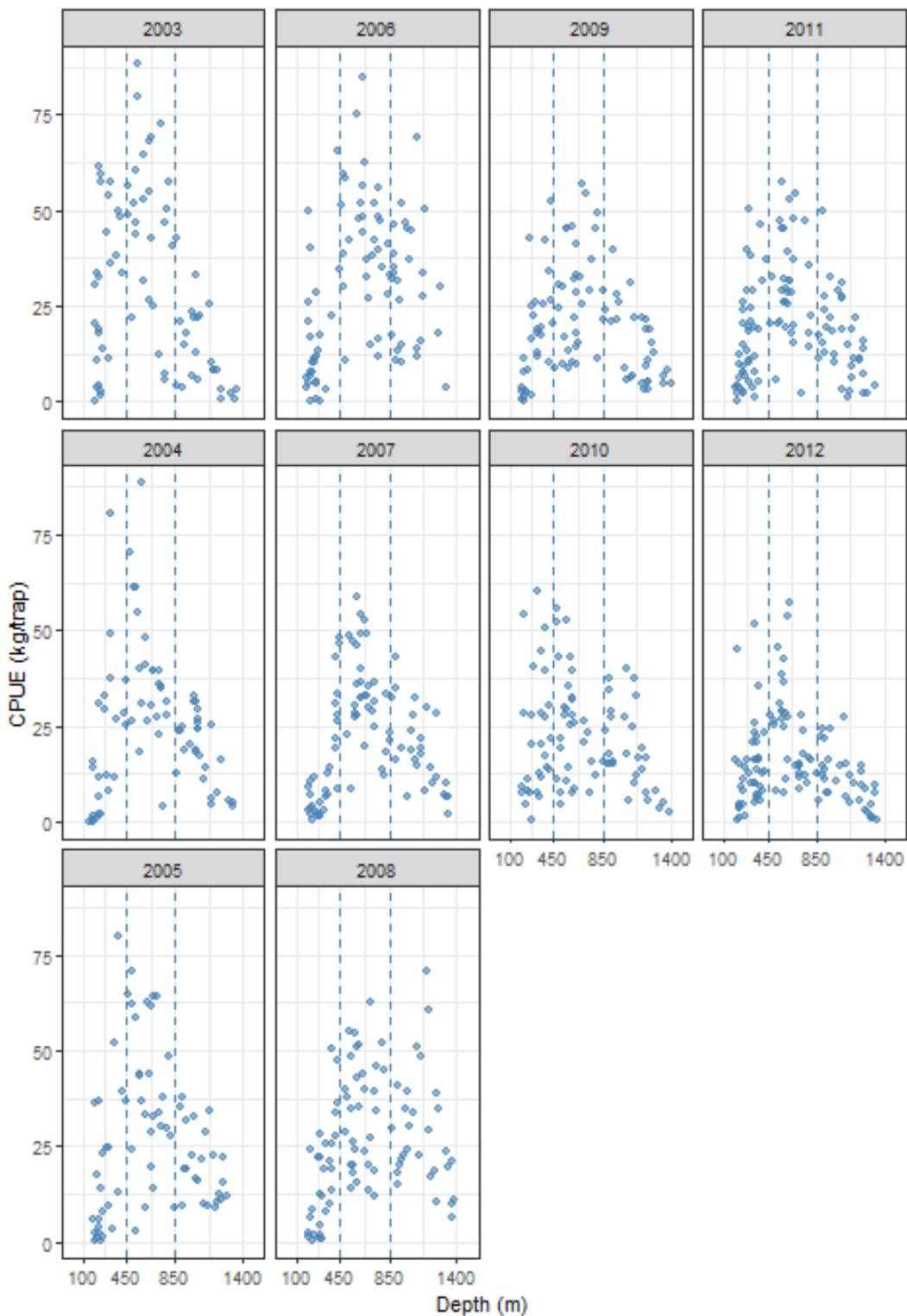


Figure 5. Sablefish catch per unit effort (CPUE) by depth and year for StRS sets. Dashed lines delineate depth strata (shallow(RD<sub>1</sub>) = 100-450m, mid(RD<sub>2</sub>) = 450-850m, deep(RD<sub>3</sub>) = 850-1400m).

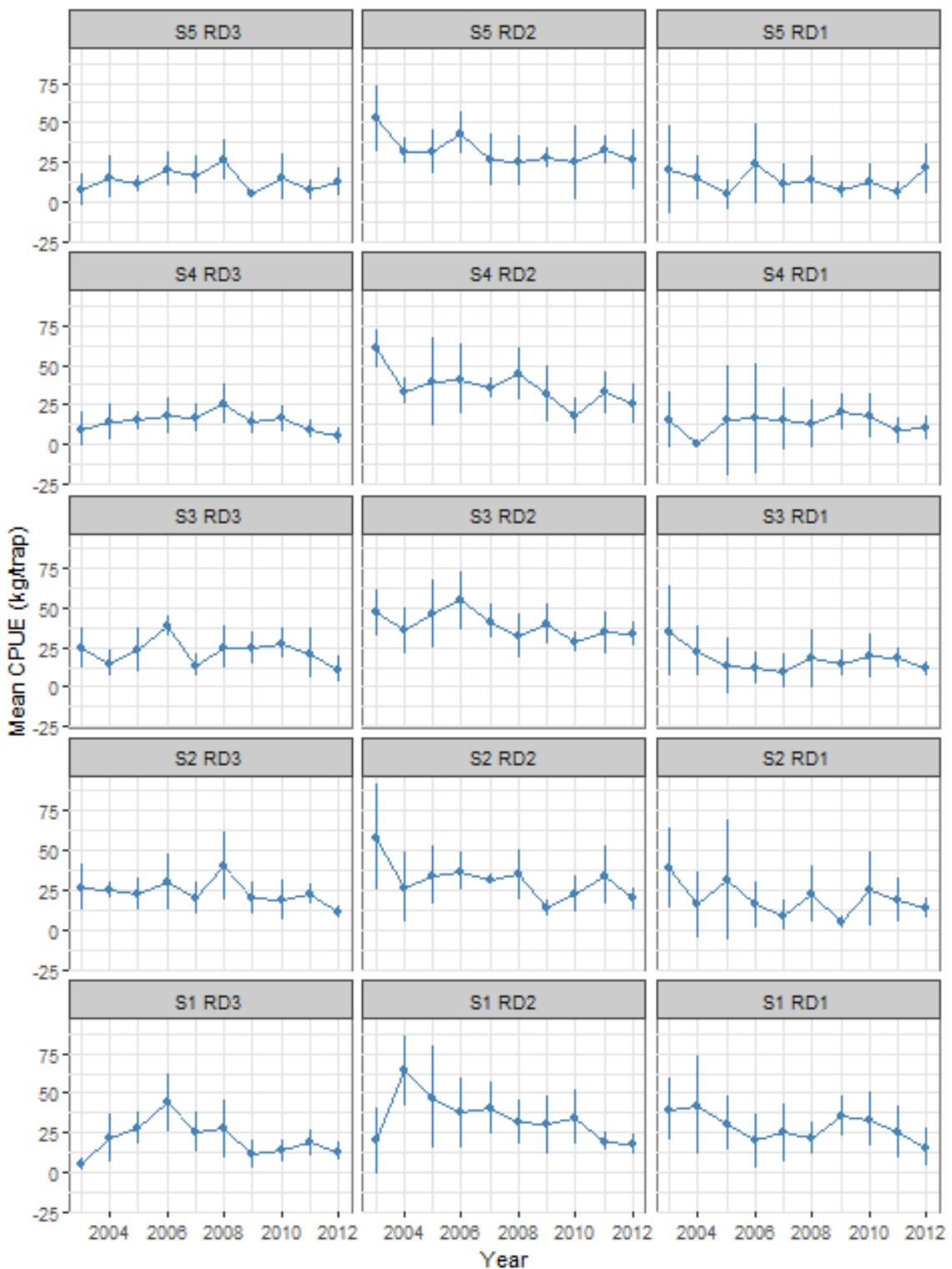


Figure 6. Average Sablefish catch per unit effort (CPUE; mean +/- 95% CIs) by survey strata since 2003. Panels run deep to shallow (left to right) and north to south (top to bottom).

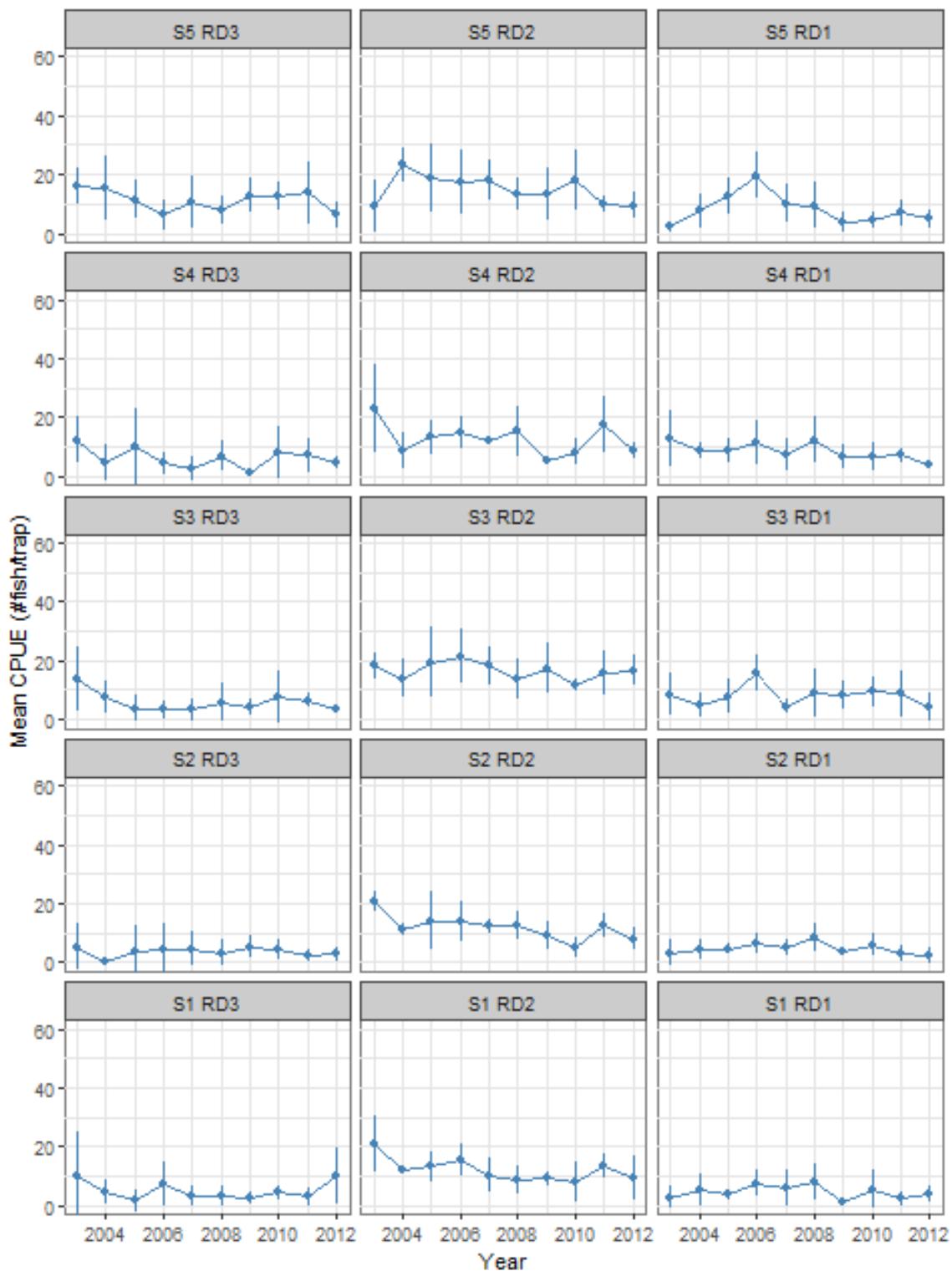


Figure 7. Average number of sablefish per trap (mean +/- 95% CIs) by StRS survey strata over time. Panels run shallow to deep (left to right) and south to north (top to bottom).

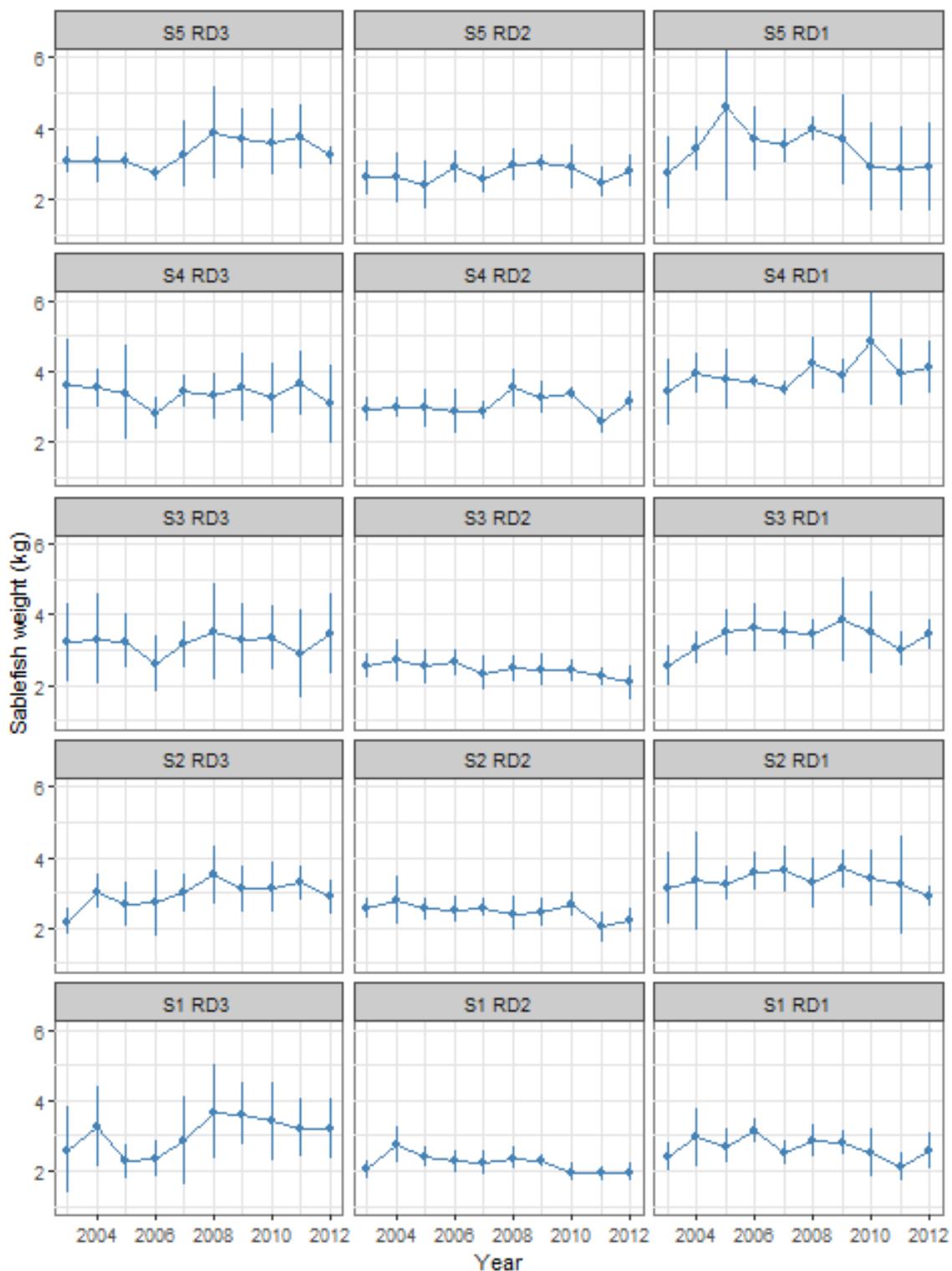


Figure 8. Average weight of sablefish (mean +/- 95% CIs) by survey strata over time. Panels run shallow to deep (left to right) and south to north (top to bottom).

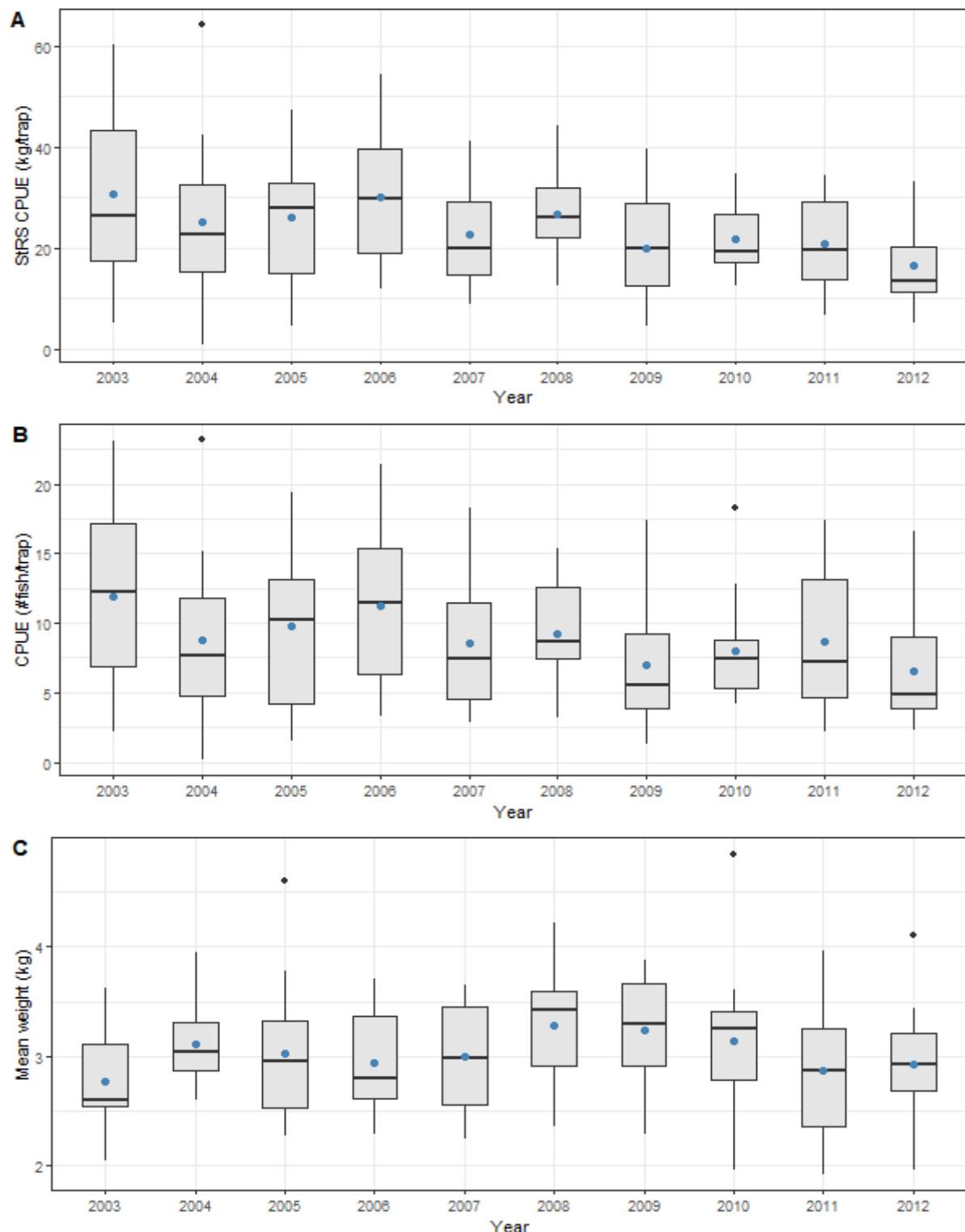


Figure 9. Annual mean weight of sablefish per trap (kg/trap) (A); annual mean number of sablefish per trap (#fish/trap) (B); annual mean weight of sablefish (kg) (C) by StRS survey strata over time. Horizontal line is median and blue dots are arithmetic mean.

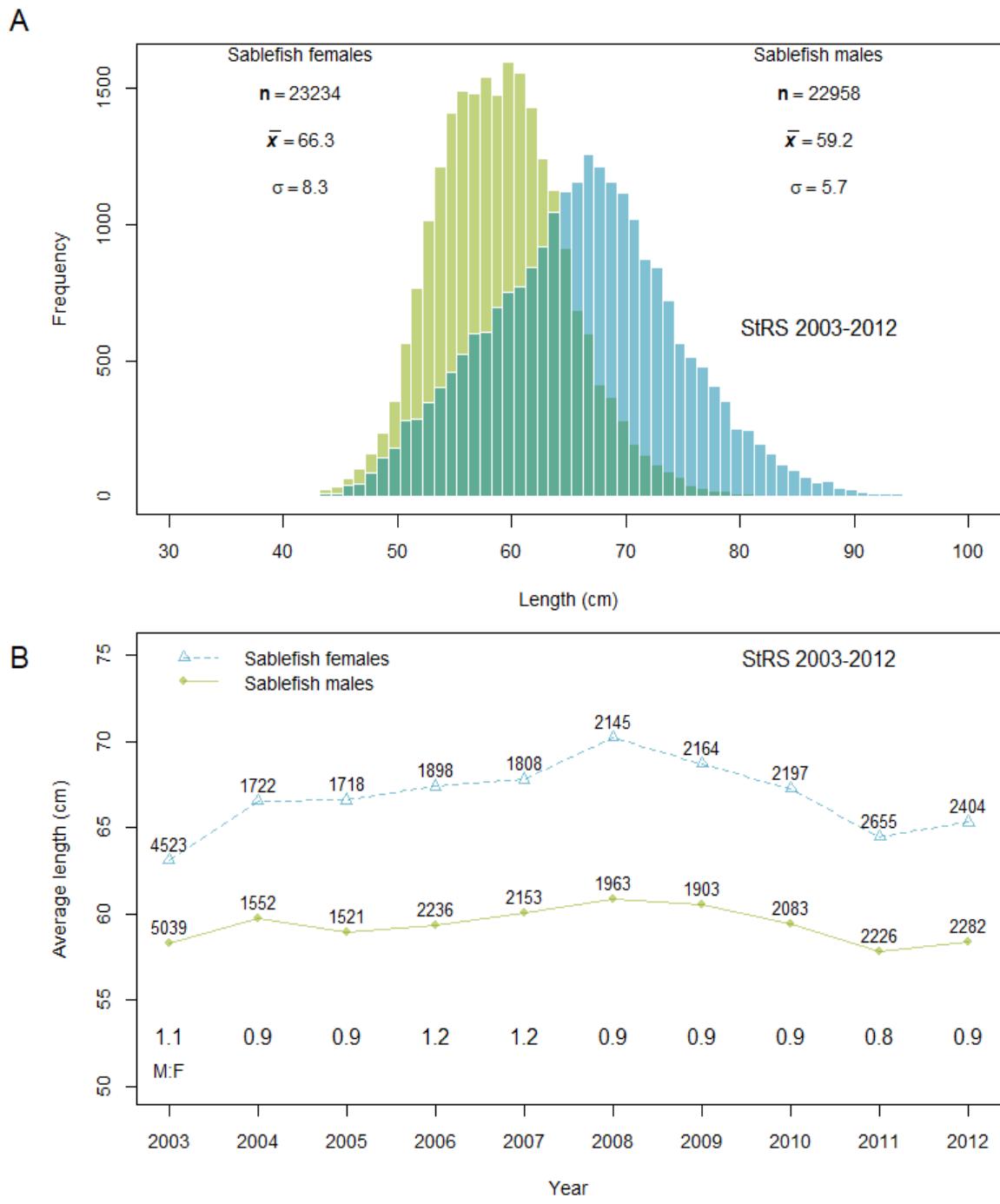


Figure 10. Length frequencies for female (cyan) and male sablefish (green) and up to 2013 for all StRS sets. The number of specimens is denoted by the letter n, the mean indicated by the  $\bar{x}$  and the standard deviation is represented by the symbol sigma  $\Sigma$  (A). Average length and ratios of male and female sablefish by year. Counts by sex are shown across the top of the lines (B).

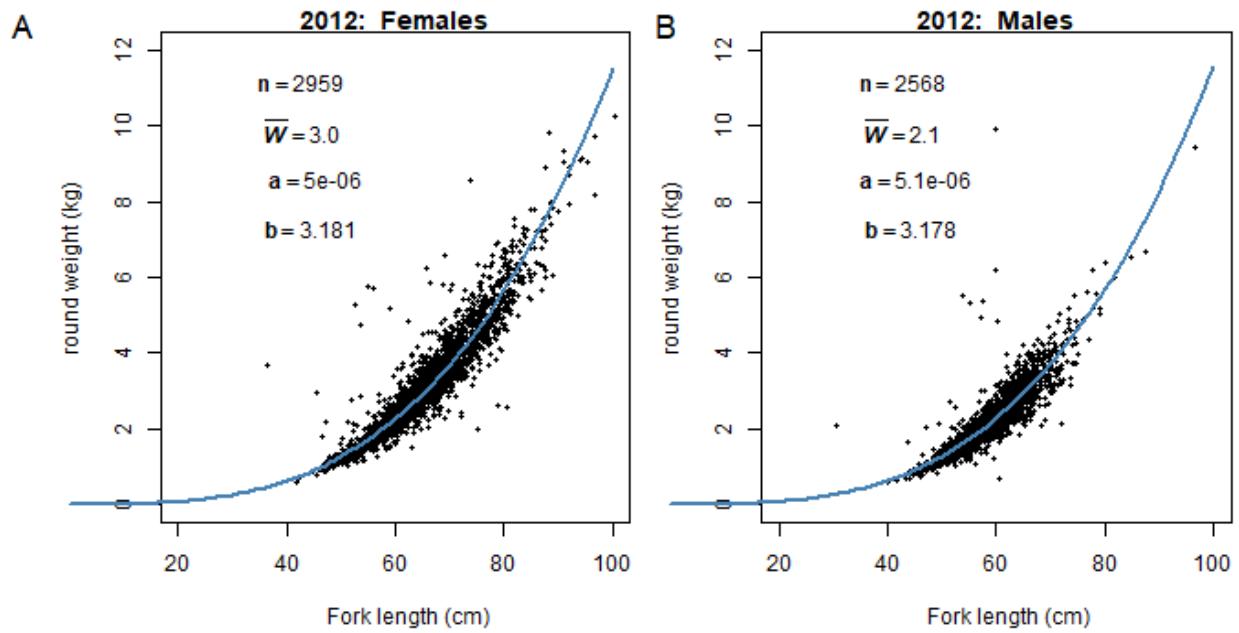
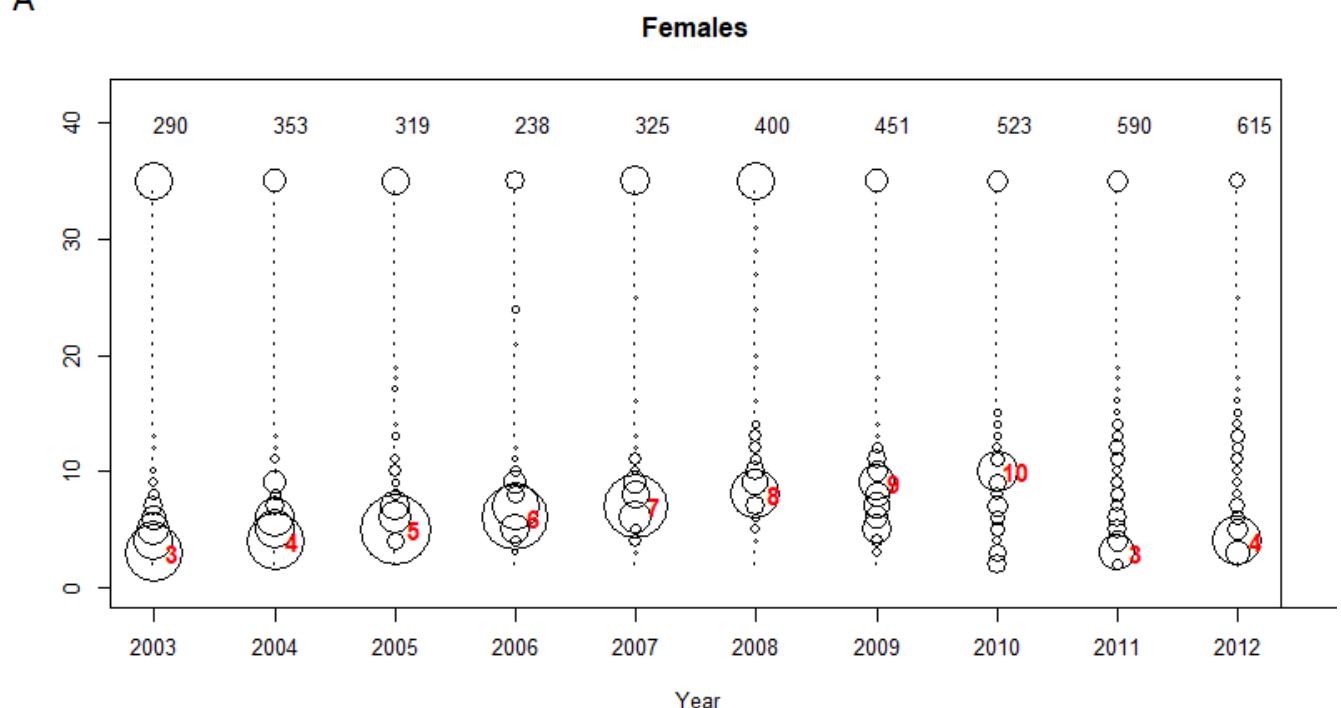


Figure 11. Sablefish fork length (L in cm) vs weight (W in kg) for females (A) and males (B) for the 2012 survey.

A



Age

B

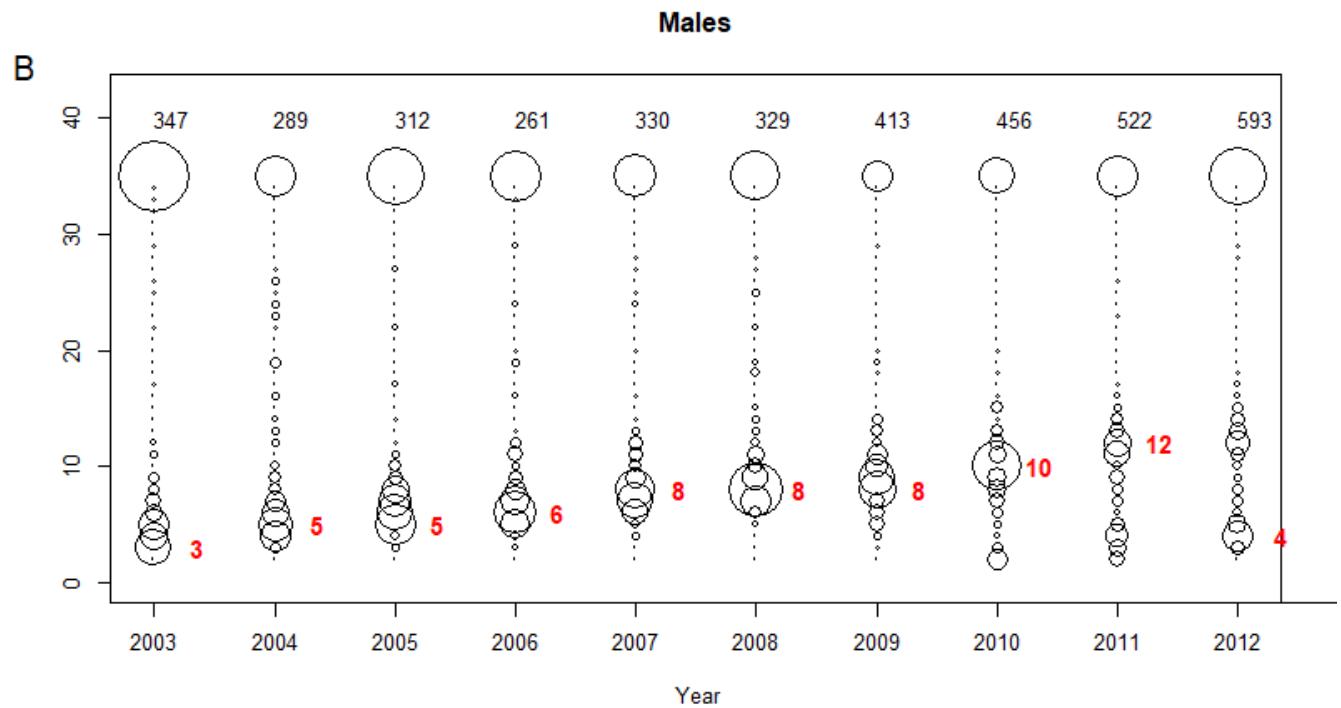


Figure 12. Bubble plot for female (A) and male (B) sablefish ages by survey year from StRS sets that have been aged. The sizes of the circles are proportional to the number of fish with given ages. Fish age 35 and older are included in one bubble. The total number(n) of fish aged are listed across the top of each panel. The ages with the highest ratios are posted to the right of each bubble.

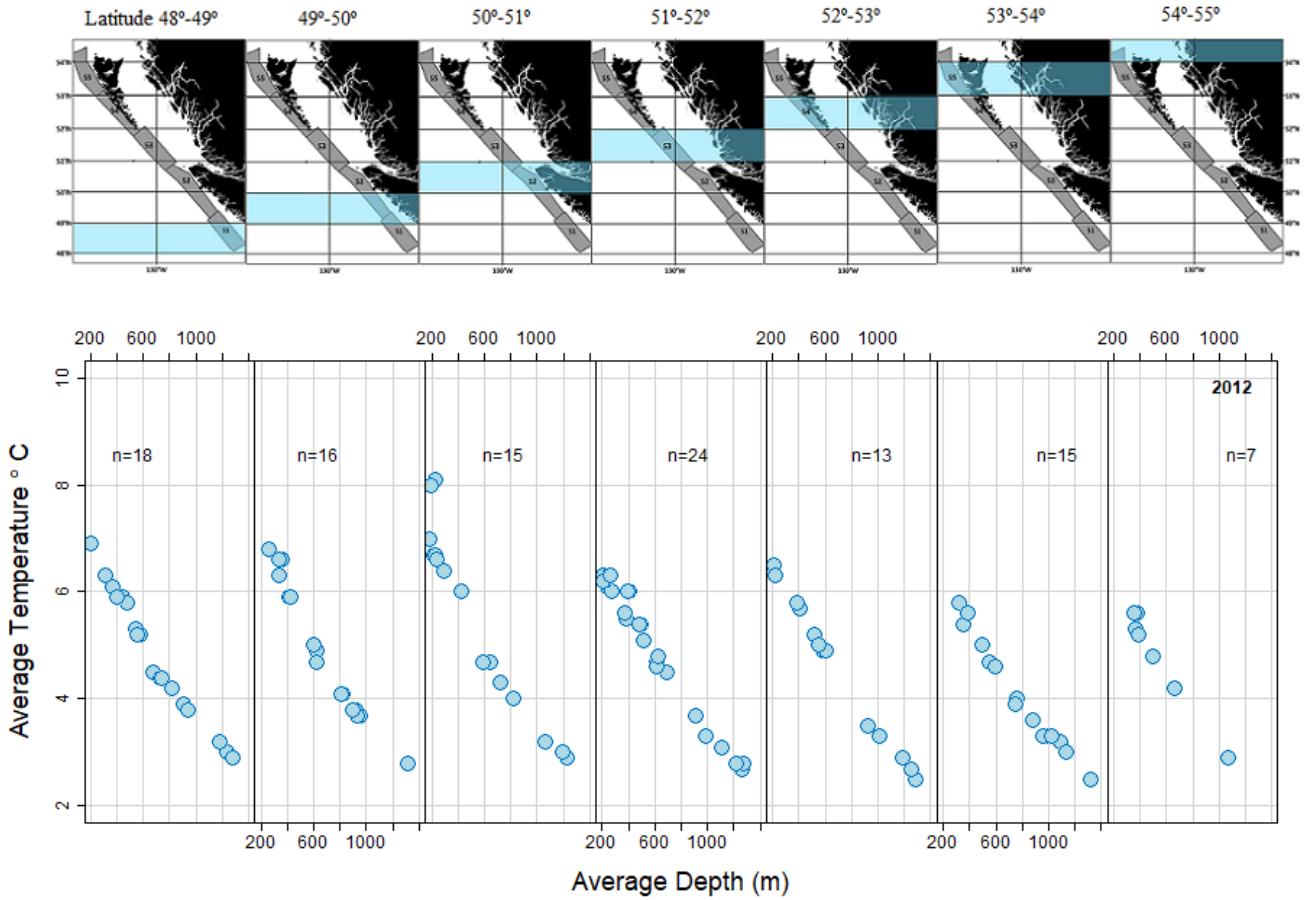


Figure 13. Coplot of average depth (m) vs average temperature ( $^{\circ}\text{C}$ ) for a given 1-degree latitude range (blue bands) for 2012. The number of fishing sets deployed with a SBE 39 recorder are represented by n.

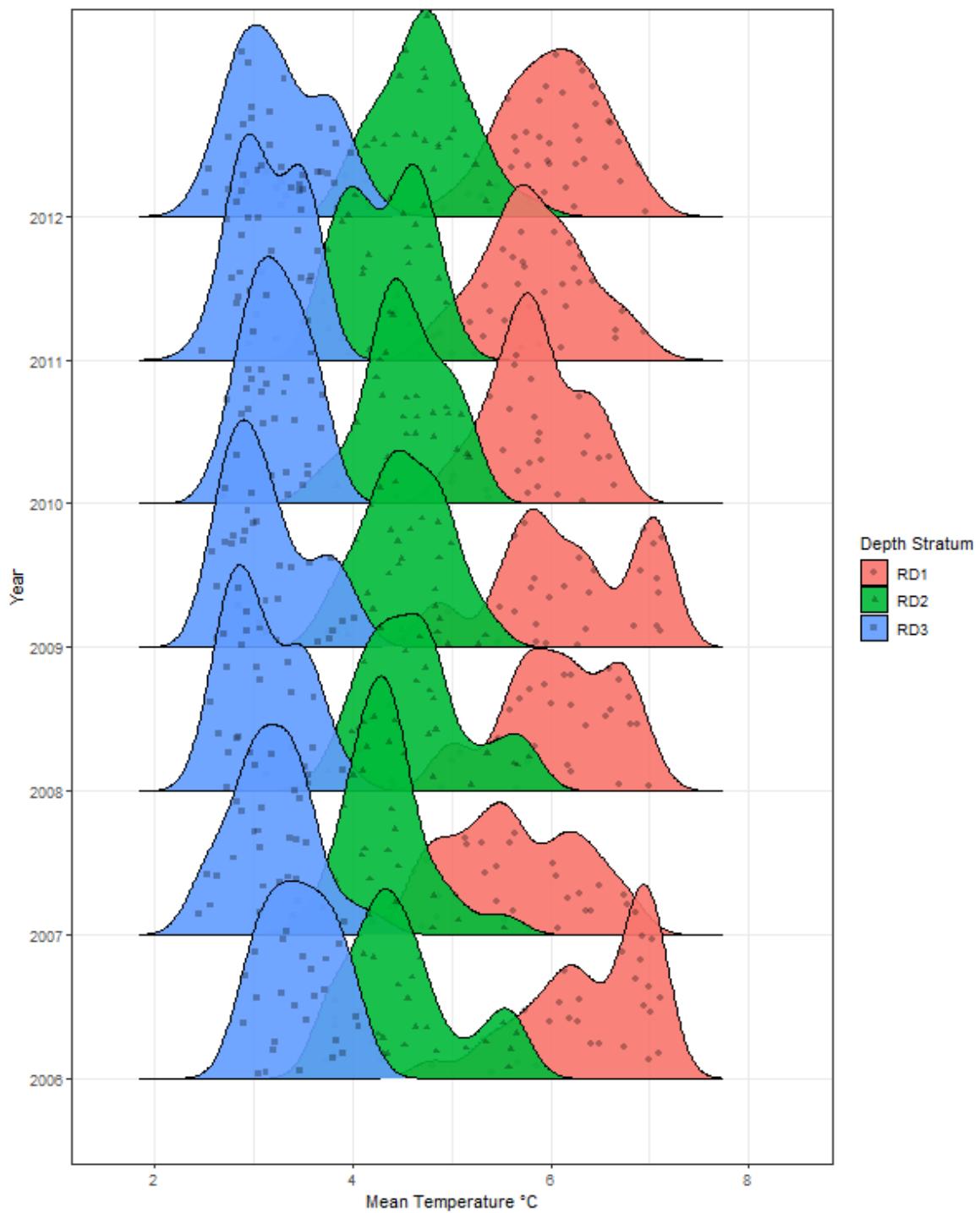


Figure 14. Vertical density ridgeplots of mean temperatures per year as reported by set from the Sea-bird SBE 39 loggers on traps at three depth intervals,  $RD_1$  = shallow (100-450 m),  $RD_2$  = mid (450-850 m),  $RD_3$  = deep (850-1400 m). Lines indicate the 2.5% and 97.5% tails.

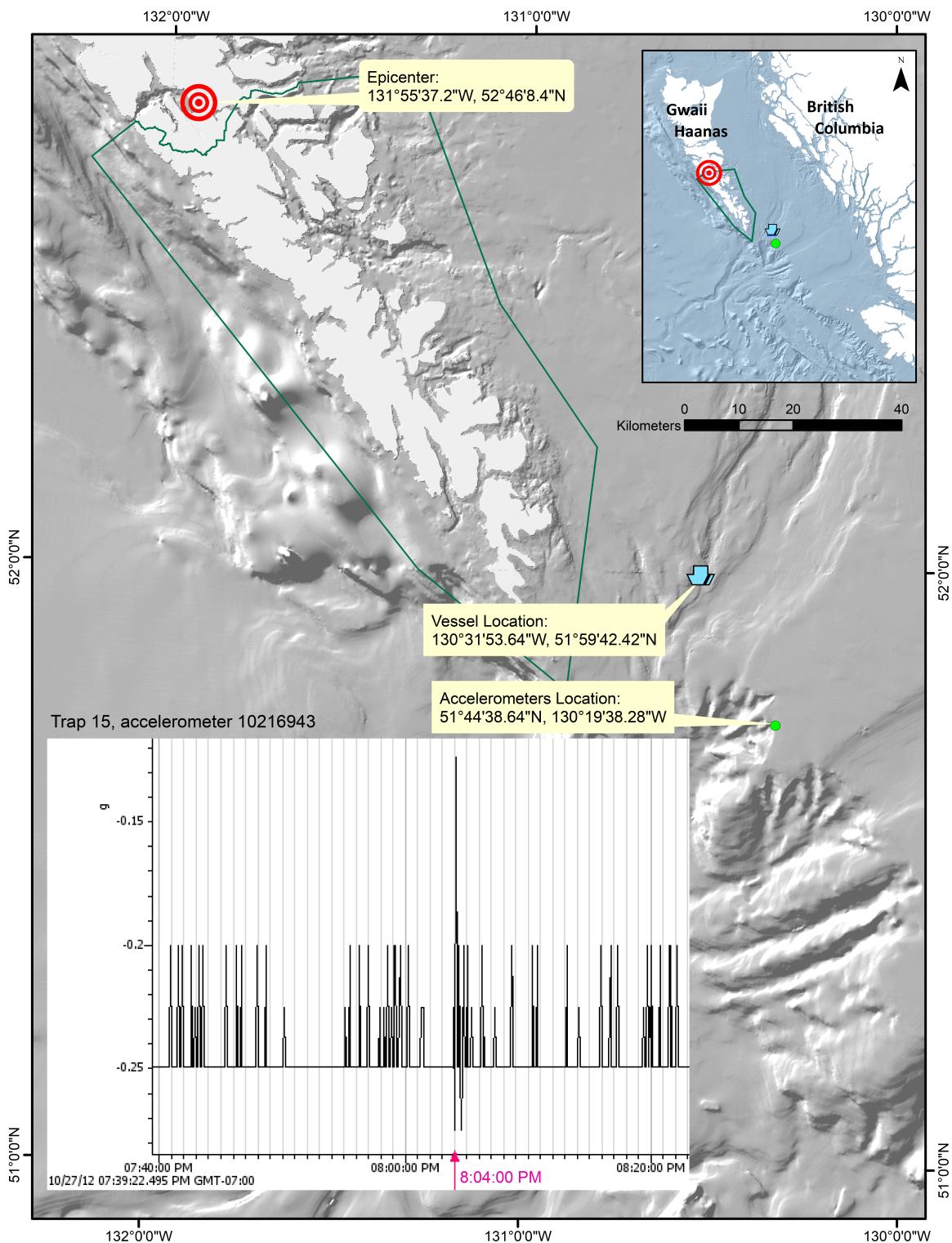


Figure 15. Location of the epicentre of a 7.7 magnitude earthquake on Saturday October 27, 2012 at 8:04 p.m. The accelerometer on the ocean floor captured the earthquake event (inset).

## APPENDIX A LIST OF SABLEFISH RESEARCH AND ASSESSMENT SURVEYS.

<b>Year</b>	<b>Dates</b>	<b>Vessel</b>	<b>Captain</b>	<b>Set Count</b>	<b>GFBIO Id</b>
1988	Oct 28 - Nov 24	VICIOUS FISHER	VANCE FLETCHER	16	43990
1989	Oct 19 - Nov 18	LA PORSCHE	SIGURD BRYNJOLFSON	29	43910
1990	Nov 8 - Nov 18	VIKING STAR	DOUG FARRINGTON	24	43750
1991	Oct 9 - Oct 29	W. E. RICKER	ALAN FARRINGTON	32	43673
1992	Oct 13 - Nov 4	W. E. RICKER	RON ROBERTS	38	43670
1993	Oct 19 - Nov 11	W. E. RICKER	ALAN FARRINGTON	42	43650
1994	Oct 13 - Oct 31	LA PORSCHE	RICHARD BEAUV AIS	39	43630
1994	Oct 18 - Nov 13	WESTERN VIKING	RICK JONES	27	43390
1995	Oct 8 - Oct 20	OCEAN PEARL	ROBERT FRAUMENI	29	43270
1995	Oct 11 - Oct 28	VICTOR F	MICHAEL DERRY	34	43330
1995	Oct 1 - Oct 31	VIKING SUNRISE	JASON OLSEN	40	43350
1996	Sep 26 - Oct 10	OCEAN PEARL	MICHAEL DERRY	32	43039
1996	Sep 30 - Oct 22	VIKING STAR	OTTO ELVAN	49	43210
1996	May 10 - May 30	VIKING SUNRISE	ALBERT (DEACON) MELNYCHUK	42	43024
1997	Sep 26 - Oct 21	OCEAN PEARL	MICHAEL DERRY	74	42699
1997	May 20 - Jun 10	VIKING SUNRISE	ALBERT (DEACON) MELNYCHUK	42	42760
1998	Sep 22 - Oct 17	OCEAN PEARL	MICHAEL DERRY	89	41122
1999	Sep 29 - Oct 30	OCEAN PEARL	MICHAEL DERRY	109	40589
2000	Oct 8 - Nov 14	PACIFIC VIKING	ALBERT (DEACON) MELNYCHUK	131	40517
2001	Oct 6 - Nov 6	OCEAN PEARL	MICHAEL DERRY	134	43233
2002	Oct 4 - Nov 7	PACIFIC VIKING	ALBERT (DEACON) MELNYCHUK	125	48120
2002	Oct 5 - Nov 13	VIKING SUNRISE	JASON OLSEN	90	48110
2003	Oct 15 - Nov 13	OCEAN PEARL	MICHAEL DERRY	94	52100
2003	Oct 7 - Nov 10	VIKING STAR	JIM FARRINGTON	84	52120
2004	Oct 5 - Nov 15	MILBANKE SOUND	DON QUAST	95	58145
2004	Oct 5 - Nov 3	OCEAN MARAUDER	ALBERT (DEACON) MELNYCHUK	84	57360
2005	Oct 4 - Nov 2	PACIFIC VIKING	ALBERT (DEACON) MELNYCHUK	84	60529
2005	Oct 7 - Nov 17	VIKING SUNRISE	RORY JOHNSON	88	60503
2006	Oct 1 - Nov 1	PACIFIC VIKING	ALBERT (DEACON) MELNYCHUK	98	62966
2006	Oct 2 - Nov 15	SENA II	TIM JOYS	98	62666
2007	Oct 7 - Nov 12	PACIFIC VIKING	ALBERT (DEACON) MELNYCHUK	99	65106
2007	Oct 8 - Nov 12	VIKING TIDE	JASON OLSEN	91	65107
2008	Sep 29 - Nov 16	OCEAN PEARL	ROBERT FRAUMENI	157	67007
2009	Oct 8 - Nov 25	OCEAN PEARL	ROBERT FRAUMENI	155	69067
2010	Oct 9 - Nov 30	OCEAN PEARL	ROBERT FRAUMENI	153	70787
2011	Oct 9 - Nov 21	OCEAN PEARL	DARCY NICHOLS	132	72067
2012	Oct 9 - Nov 17	OCEAN PEARL	DARCY NICHOLS	135	73190

## APPENDIX B DATA FORMS 2012 SABLEFISH SURVEY.

### SABLEFISH CHARTER BRIDGE LOG

VESSEL: <u>OCEAN PEARL</u>	SET NUMBER: <u>065-</u>
RANDOM TAGGING SET	
Spatial Stratum: <u>53</u>	Depth Stratum: <u>RDZ</u>
Box ID: <u>10256</u>	
EXPLORATORY VANCOUVER ISLAND INLET SET	
Location Name:	
INLET SET	
Locality Name:	Location Number:
year                    month                    day	
SET: Date: <u>2012      10      25</u>	Recorder: <u>I4N</u>
Target Depth: Minimum: <u>250</u> (fm) Maximum: <u>450</u> (fm)	
1 <sup>st</sup> Buoy: Number: <u>5'</u>	Time: <u>1612'</u>
1 <sup>st</sup> Anchor : Time: <u>1619'</u>	Bottom Depth: <u>364</u> (fm)
Latitude: <u>51</u> deg. <u>35</u> . <u>374</u> min. Longitude: <u>130</u> deg. <u>24</u> . <u>311</u> min.	
SETTING BOTTOM DEPTH	
min : 0    : 1    : 2    : 3    : 4    : 5    : 6    : 7    : 8    : 9	
fm	
min : 0    : 1    : 2    : 3    : 4    : 5    : 6    : 7    : 8    : 9	
fm <u>355</u> <u>338</u> <u>323</u> <u>313</u> <u>305</u> <u>304</u> <u>291</u> <u>282</u> <u>274</u> <u>272</u>	
min : 0    : 1    : 2    : 3    : 4    : 5    : 6    : 7    : 8    : 9	
fm	

#### ENVIRONMENTAL CONDITIONS

Wind speed (knots): <u>20</u>	Swell height (m): <u>2'</u>
Beaufort Scale (circle one): <u>1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12</u>	
Wind direction (circle one): <u>SE, S, SW, W, NW, N, NE, N</u>	
Sun shining (circle one): <u>yes</u> or <u>no</u>	% cloud cover: <u>100</u>
2 <sup>nd</sup> Anchor: Time: <u>1630'</u>	Bottom Depth: <u>269</u> (fm)
Latitude: <u>51</u> deg. <u>35</u> . <u>742</u> min. Longitude: <u>130</u> deg. <u>25</u> . <u>265</u> min.	
2 <sup>nd</sup> Buoy: Number: <u>9'</u>	Time: <u>1639'</u>
COMMENTS: <u>Facing</u>	

Figure B.1. Example of a completed bridge log data form used during the 2012 survey. This form was completed from the bridge of the Ocean Pearl for each set.

### SABLEFISH CHARTER SET LOG

VESSEL: Ocean Pearl SET NUMBER: 065

DATE: October 25, 2012 Recorder: Jonas B.

1<sup>st</sup> Buoy Number: 5 Time: 16:12

1<sup>st</sup> ANCHOR TIME 16:20

NUMBER TRAPS SET: 10 10 10 10 Total: 25

TEMP-DEPTH RECORDER:

Serial Number: 3903 On Trap #: 3

MISSED BECKETS:

2<sup>nd</sup> ANCHOR TIME 16:31

2<sup>nd</sup> Buoy Number: 9 Time: 16:39

BAIT: Type 1: Squid Weight: 2.0 (lb) Method: Bagged

Type 2: Hake Weight: 10.0 (lb) Method: Loose

COMMENTS:

updated 19/09/2011

Figure B.2. Example of a completed set log data form used during the 2012 survey. This form was completed by science staff from the deck as the gear was set.

## SABLEFISH CHARTER CATCH LOG

DATE: October 26, 2012 SET NUMBER: 065 pg 1 / 1  
 VESSEL: Ocean Pearl RECORDER: Jonas B.

1<sup>ST</sup> Buoy 5 HHMM 16:47 1<sup>ST</sup> Anchor Aboard: 17:02

trap	SABLEFISH				species 2 Sable	#	kg	species 3 Sablefish	#	kg	species 4 Sable	#	kg	species 5 Sable	#	kg	species 6	
	num	Use	#	kg														
1	T	6	10.2	12.6	✓	13.7												1x4in
2	D	10	15.4	15.3	✓	13.7		✓	17.9		✓	7.5						
3	A	10	21.2	18.9					✓	1.3								2x20.3
4	T	10	19.1	5.4														1x5in
5	D	10	20.4	17.3	✓	1.8												
6	D	10	22.8	10.6		18.4												1x2.6
7	T	6	17.6	8.7	✓	7.4		✓	23.3		✓	3.1						1x1.7
8	D	10	29.3	16.6	✓	18.0												1x Nept
9	D	10	20.1	7.9	✓	18.5												
10	F	10	19.2	20.1	✓	20.6	✓	✓	5.5									
11	D	10	18.7	18.9	✓	18.8	✓	✓	29.3	✓	10	19.1	✓	4	✓	6.9		
12	D	10	18.9	3	✓	8.5												
13	T	4	14.8	8.7														1x Short spine
14	D	10	22.1	20	✓	3.9												2x4in
15	A	5	9.2															
16	T	9	19.6	17	✓	17.8												
17	D	9	18.3	12.4														
18	A	2	6.0	5	✓	9.6												
19	T	11	23.1															1x3in
20	D	✓	2.3	Tagged	✓	11.9												3.3
21	A	9	18.1	11.9														2.7
22	F	2	5.8															1x Short
23	D	10	19.3	2	✓	7.9												2.9
24	A	10	18.1	9	✓	17.2												1x 12.9
25	T	10	22.9															1x Sea urch F
Total			423.8			286		130.3		73		26.6		6.4				

2<sup>ND</sup> Buoy 9 HHMM 17:42 2<sup>ND</sup> Anchor Aboard: 17:51

COMMENTS: 1 fish lost without weight set 14. (fall in the chute)

Total Sablefish #: 482 kg: 888.1 Other Species Records (#): 11

Video Trap Tally:

"Use" column indicates how the trap contents were treated: T=tagged, A=LSWMO sample, B=LSM sample, D=discarded after recording

Figure B.3. Example of a completed catch log data form.





Length Sex Species page 11  
**SABLEFISH CHARTER BIOSAMPLING SHEET**

Vessel: OCEAN PEARL 0732 Set Number: 046 Recorder: JAN  
 Sample Date: 20121022 Sampler: LISA 107A  
 Catch Storage: fresh Specimen Form: round Length Unit: mm Sample Source: unsorted

Species: TURBOT 602 Total number sampled: 1  
 Length Type: FORK Sample Type (circle one): Random / Total

Fish Number	Length	Sex
1	5733	
2		
3		
4		
5		
6		
7		
8		
9		
0		

Fish Number	Length	Sex
1		
2		
3		
4		
5		
6		
7		
8		
9		
0		

Fish Number	Length	Sex
1		
2		
3		
4		
5		
6		
7		
8		
9		
0		

Species: DOGFISH 044 Total number sampled: 28  
 Length Type: TOTAL Sample Type (circle one): Random / Total

Fish Number	Length	Sex
1	7201	
2	8721	
3	7801	
4	7351	
5	7102	
6	9412	
7	8331	
8	7402	
9	7341	
0	7651	

Fish Number	Length	Sex
1	7951	
2	7101	
3	7601	
4	7631	
5	7421	
6	7512	
7	7661	
8	7751	
9	7232	
0	7641	

Fish Number	Length	Sex
1	7141	
2	7022	
3	8691	
4	7591	
5	8231	
6	8541	
7	7541	
8	7751	
9		
0		

Species: \_\_\_\_\_ Total number sampled: \_\_\_\_\_  
 Length Type: \_\_\_\_\_ Sample Type (circle one): Random / Total

Fish Number	Length	Sex
1		
2		
3		
4		
5		
6		
7		
8		
9		
0		

Fish Number	Length	Sex
1		
2		
3		
4		
5		
6		
7		
8		
9		
0		

Fish Number	Length	Sex
1		
2		
3		
4		
5		
6		
7		
8		
9		
0		

updated 20/09/2011

Figure B.6. Example of a completed LSS biological sampling form used during the 2012 survey for samples of species other than sablefish or rougheye/blackspotted rockfish.

columns 1-3=ST1

## SABLEFISH CHARTER TAGGING SHEET

pg: 4, 4

Vessel: OCEAN PEARL Set Number: 065

Date:<sup>11</sup> 20127826 Sample Type: RANDOM

19 02

Tagger: GUY BOXALL 21 358 Recorder: LACKS 25 2071

Species: SABLE FISH 29 455 Tag Type: ANCHOR 30 90

Tag Check	Primary Tag Number prefix 35-37	Fork Length (mm)	Error 1	Error 2	Injury 1	Injury 2	Comments/ previous tag number	
	A 00							
34	38 39 40 41 42 43 44 45 46 47 48 49 50 51							
	471420	495						
	1	525	F					
	2	591						
O	42 3	587					400 674 307 ✓	
	4	623						
	42 5	UNK						
	42 6	595						
	7	568	P					
	8	555						
	42 9	682			1b			
O	43 0	583						
	1	575	F					
	2	595						
	3	604						
	4	615						
	5	571						
3	6	661						
	7	542						
	8	615						
	43 9	565			1b			
	44 0	511						
O	44 1	506						
	2	610						
	3	515						
	4	556						
	471445	580						
	6	561	F					
	7	555						
	8	631						
	44 9	672			1b			
O	45 0	548						
	1	575						
	2	590						
	3	542						
	45 4	522						
	45 5	528						
	6	583						
	45 7	533	F					
O	45 8	565			9			
	9							

## COMMENTS:

updated 20/09/2011

## Sample Type:

- 1 = total catch
- 2 = random

## Tag Type:

- 10 = anchor

## Tag Check:

- null = tag number not verified
- 0 = tag number verified and corresponds to fish data
- 1 = tag number may not correspond to fish data

## Error:

- B = tag broken, not used
- D = dead fish, tagged
- P = paired tag, sequential tags in same fish
- N = tag not well implanted
- L = loose tag
- T = tight tag
- R = release of OTC from hole
- U = unknown length

## Injury:

- A = damage from amphipods
- B = bleeding
- C = cuts or fresh wounds
- D = fish dropped on deck
- E = eyes cloudy, blind
- F = fin damaged
- H = misshapen fish
- L = scale loss
- N = scrapes and abrasion
- O = bleeding at OTC hole
- R = raw wound around tag
- S = scar of healing wound
- T = tail damaged
- J = jaw damaged
- P = broken anchor tag already in fish.
- W = weak or lethargic fish
- Z = ectoparasitic copepods

Tagging Start Time

17:08

Tagging End Time

17:35

Fish Tagged On This Page

39 ✓

Fish Tagged On This Set

152

Fish Not Tagged On This Page

Fish Not Tagged On This Set

Figure B.7. Example of a completed tagging form used during the 2012 survey.



## **APPENDIX C SET DETAILS 2012.**

Details of sets completed during the 2012 survey program (F/V Ocean Pearl). Sets are listed by stratum/inlet name, set type, depth stratum, start date, end of gear deployment time and duration in minutes. The depth strata for type 3 tagging sets include RD<sub>1</sub> (100-250 fathoms), RD<sub>2</sub> (250-450 fathoms) and RD<sub>3</sub> (450-750 fathoms). The position data includes the major area and start and end latitude and longitude in degrees decimal minutes. The bottom depths (in meters) of the fishing set are shown with the mean bottom depth calculated from recordings at one minute intervals between the start and end of the set. The number of traps fished for each set excludes open traps, while holed or fouled traps have been included. Sets that successfully deployed a Seabird SBE temperature and pressure recorder or Hobo accelerometer or Nuytco autonomous camera system are indicated with an 'x'.







continued.

Spatial Stratum	Set	Type	Depth Stratum	Date	Time	Duration (minutes)	Area	Start Latitude	Start Longitude	End Latitude	End Longitude	Start Depth (m)	End Depth (m)	Mean Depth (m)	Traps Fished	SBE 39	HoboCam
Finlayson	127	Inlet		Nov 13	13:03	1163	5C	52° 3.9'N	128° 28'W	52° 3.2'N	128° 27.8'W	716	581	618	25	x	
Finlayson	128	Inlet		Nov 13	14:02	1252	5C	52° 9.7'N	128° 28.2'W	52° 9.1'N	128° 28.6'W	656	587	630	25	x	x
Finlayson	129	Inlet		Nov 13	14:50	1299	5C	52° 4.9'N	128° 27.8'W	52° 4.2'N	128° 28.1'W	766	645	676	25	x	
Finlayson	130	Inlet		Nov 13	15:33	1357	5C	52° 1.4'N	128° 28.3'W	52° 0.8'N	128° 27.8'W	689	795	746	25	x	
Dean/Burke	131	Inlet		Nov 14	21:16	1077	5B	52° 0.2'N	127° 28.7'W	52° 0.9'N	127° 28.1'W	468	515	515	25	x	
Dean/Burke	132	Inlet		Nov 14	22:42	1121	5B	52° 6.7'N	127° 15.9'W	52° 6.3'N	127° 15.9'W	548	510	524	25	x	x
Dean/Burke	133	Inlet		Nov 15	00:16	1163	5B	52° 6.7'N	127° 14.8'W	52° 6.4'N	127° 15.7'W	579	581	581	25	x	
Dean/Burke	134	Inlet		Nov 15	01:16	1205	5B	52° 4.1'N	127° 24'W	52° 3.8'N	127° 25.2'W	596	594	596	25	x	
Dean/Burke	135	Inlet		Nov 15	02:28	1253	5B	52° 0.2'N	127° 35.4'W	52° 0.8'N	127° 36.4'W	437	433	442	25	x	

## **APPENDIX D SUMMARY OF BASKET USE BY TRAP 2012.**

Summary of the basket use by trap number for StRS sets during the 2012 sablefish survey. The fate of the sablefish catch for each set and trap is indicated using the following abbreviations: D = Discarded after weighing (processed as commercial catch), A = Sampled for LSMWO, T = Tagged and released, F= Frames, NULL = No sablefish catch/trap missing.





continued.

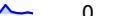
Set	Trap.1	Trap.2	Trap.3	Trap.4	Trap.5	Trap.6	Trap.7	Trap.8	Trap.9	Trap.10	Trap.11	Trap.12	Trap.13	Trap.14	Trap.15	Trap.16	Trap.17	Trap.18	Trap.19	Trap.20	Trap.21	Trap.22	Trap.23	Trap.24	Trap.25
115	D	A	T		D	T	D	A	T	D	D,F	T	D	D	T	D	D	T	D	D	T	D	D	T	
116	A	T		T			T		A	T	A	T	A	T	A	T	A	T	D	T	A	A	T	A	
117	T	A	T	A	T	A	T	D	T	D	T	D	T	A	T	T	D	T	D	T	A	T	A	T	
118	A	T	D	T	A	T	D	T	A	T	D	T	D	T	D	T	D	T	A	T	D	T	A	T	
119	A	T	D	T	A	T	D	T	D	T	D	T	D	T	A	T	D	D	T	A	T	D	T	D	
120	T	A	T	D	T	D	T	D	T	D	T	D	T	D	T	A	T	A	T	D	A	T	T	T	
121	A	T	D	T	D	T	A	T	D	T	A	T	D	T	D	T	D	T	D	T	D	T	D	T	
122	A	T	A	T	D	T	D	T	D	T	D	T	D	T	A	T	D	D	T	D	T	D	T	D	
123	T	A	T	D	T	D	T	A	T	D	T	D	T	D	T	D	T	D	T	D	T	D	A	T	
124	A	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	A	T	D	T	D	T	D	T	
125	T	D	T	D	T	D	T	T	A	T	A	T	A	T	A	T	T	A	T	D	T	D	T	D	
126	A	T	D	T	D	T	D	T	D	T	A	T	D	T	D	T	D	T	D	T	D	T	D	T	
127	T	T	A	T	D	T	A	T	A	T	D	T	A	T	D	T	A	T	T	A	T	D	T	D	
128	A	T	D	T	D	T	D	T	D	T	A	T	D	T	D	T	D	T	D	T	D	T	D	T	
129	T	A	T	D	T	A	T	D	T	D	T	A	T	D	T	D	T	A	T	D	T	A	T	D	
130	A	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	A	T	D	T	D	T	D	T	
131	T	A	A	A			A	A	A	A	A	A	A	A	A	T	A	T	A	T	A	T	A	T	
132	A	A	T	A			T			T	D	T	A	A	A	T	A	A	A	T	A	T	A	T	A
133	T	A	T	A	T	A	A	T	A	D	T	A	T	A	T	A	T	T	D	T	A	T	A	T	
134	A	T	A	T	D	T	D	T	A	T	D	T	A	T	A	T	A	T	F	A,F	T	A	A	A	
135	T		T		T	A	T								A	T,F	A,F	T	A		A		A		A

## **APPENDIX E SUMMARY OF SABLEFISH BIOLOGICAL DATA 2012.**

Biological data collected for sablefish by set, catch weight in kilograms and numbers of fish. Sablefish counts by trap are represented by sparklines. Details include a tally of specimens recovered, tagged and sampled. Mean fork lengths for tagged sablefish and sampled male and female sablefish are listed.

Set	Total Catch			Tagged Fish Counts			Tagged Fork Lengths(mm)			Specimen Count					Mean Fork Length(mm)			
	kg	Count	Count by Trap	Recover-Rerelease	Deceased	Released	Count	Mean	Fork Length	Sex	Maturity	Otoliths	Weight	Count	Proportion Males	Males	Females	
1	514	213		1	0	60	61	603	62	62	62	62	62	62	0.42	566	639	
2	389	195		1	0	48	49	569	68	68	68	68	68	68	0.66	559	603	
3	320	167		0	0	49	49	576	57	57	57	57	57	57	0.74	552	615	
4	141	45		0	0	2	2	660	41	41	41	41	41	41	0.05	608	650	
5	250	69		1	0	20	21	683	43	43	43	43	43	43	0.07	651	676	
8	327	169		0	0	50	50	560	47	47	47	47	47	47	0.79	562	601	
9	603	275		0	0	74	74	597	47	47	47	47	47	47	0.53	576	623	
10	336	164		0	0	58	58	568	55	55	55	55	55	55	0.80	553	624	
11	192	66		0	0	19	19	623	44	44	44	44	44	44	0.25	588	643	
50	12	206	89		0	0	37	37	611	39	39	39	39	39	39	0.69	588	593
13	730	432		1	0	131	132	525	44	44	44	44	44	44	0.80	525	539	
14	206	83		0	0	32	32	601	41	41	41	41	41	41	0.63	600	598	
15	893	315		2	0	61	63	629	84	84	84	84	84	84	0.36	618	639	
16	277	97		0	0	31	31	607	48	48	48	48	48	48	0.48	616	659	
17	208	44		0	0	27	27	719	10	10	10	10	10	10	0.10	618	761	
18	263	76		0	0	16	16	660	52	52	52	52	52	52	0.06	648	673	
19	369	194		1	0	60	61	567	49	49	49	49	49	49	0.82	532	630	
20	710	451		2	0	184	186	519	56	56	56	56	56	56	0.82	525	514	
21	444	178		0	0	45	45	605	62	62	62	62	62	62	0.66	588	679	
22	418	226		2	0	87	89	568	63	63	63	63	63	63	0.65	542	556	
23	265	154		2	0	27	29	543	63	63	63	63	63	63	0.63	540	528	
24	194	48		0	0	20	20	694	28	28	28	28	28	28	0.00	0	700	

continued.

Set	Total Catch			Tagged Fish Counts			Tagged Fork Lengths(mm)		Specimen Count					Mean Fork Length(mm)			
	kg	Count	Count by Trap	Recover-Rerelease	Deceased	Released	Count	Mean	Fork Length	Sex	Maturity	Otoliths	Weight	Count	Proportion Males	Males	Females
25	219	71		0	0	26	26	675	40	40	40	40	40	40	0.73	606	703
26	3	1		0	0	0	0		0	0	0	0	0	0	0.00	0	0
27	482	184		1	0	61	62	620	56	56	56	56	56	56	0.68	579	632
28	371	160		0	0	61	61	606	56	56	56	56	56	56	0.54	567	612
29	234	84		0	0	11	11	621	62	62	62	62	62	62	0.26	589	626
30	56	21		0	0	7	7	612	14	14	14	14	14	14	0.43	590	651
31	195	93		1	0	27	28	585	46	46	45	46	45	46	0.78	568	649
32	422	260		0	0	103	103	534	47	47	47	47	47	47	0.53	512	557
33	146	56		1	0	20	21	629	35	35	35	35	35	35	0.26	584	629
34	180	74		0	0	16	16	599	48	48	48	48	48	48	0.63	572	664
35	415	195		0	0	61	61	563	54	54	50	54	50	54	0.59	553	641
36	291	101		0	0	26	26	627	41	41	41	41	41	41	0.68	624	665
37	339	126		0	0	43	43	620	53	53	53	53	53	53	0.40	571	662
38	593	297		0	0	113	113	576	60	60	60	60	60	60	0.73	548	618
39	69	18		0	0	7	7	683	11	11	11	11	11	11	0.09	697	710
40	387	149		0	0	75	75	601	51	51	51	51	51	51	0.55	592	676
41	774	300		0	0	124	123	617	54	54	54	54	54	54	0.91	623	705
43	1	1		0	0	0	0		1	1	1	1	0	1	1.00	453	0
44	351	92		0	0	26	26	695	57	57	57	57	0	57	0.28	646	697
45	657	251		1	0	97	97	599	49	49	49	49	49	49	0.71	588	602
46	325	107		0	0	34	34	642	51	51	50	51	51	51	0.22	642	663
47	256	87		1	0	19	20	601	53	53	53	53	53	53	0.38	631	660



continued.

Set	Total Catch			Tagged Fish Counts			Tagged Fork Lengths(mm)		Specimen Count					Mean Fork Length(mm)			
	kg	Count	Count by Trap	Recover-Rerelease	Deceased	Released	Count	Mean	Fork Length	Sex	Maturity	Otoliths	Weight	Count	Proportion Males	Males	Females
70	91	24	_____	0	0	9	9	670	15	15	15	15	15	15	0.13	686	707
71	246	86	_____	0	0	24	24	644	48	48	48	48	48	48	0.33	619	661
72	101	21	_____	0	0	6	6	725	11	11	11	11	11	11	0.09	710	759
73	391	132	_____	1	0	30	31	646	56	56	56	56	56	56	0.68	617	707
74	279	62	_____	0	0	24	23	682	38	38	38	38	38	38	0.18	672	752
75	203	55	_____	0	0	18	18	688	34	34	34	34	34	34	0.35	621	690
76	403	160	_____	1	0	42	43	611	47	47	47	47	47	47	0.38	581	660
77	16	3	_____	0	0	0	0		3	3	3	3	3	3	0.00	0	799
78	1100	333	_____	2	0	123	125	651	55	55	55	55	55	55	0.47	629	693
79	382	120	_____	1	0	35	36	637	46	47	47	47	47	47	0.26	631	675
80	14	4	_____	0	0	0	0		4	4	4	4	4	4	0.25	642	685
81	628	192	_____	1	0	82	83	646	53	54	54	54	54	54	0.52	616	659
82	277	100	_____	2	1	36	38	619	53	53	53	53	53	53	0.79	613	621
83	679	194	_____	0	0	76	76	661	58	58	58	58	58	58	0.43	639	681
84	615	219	_____	3	0	54	57	625	58	58	58	58	58	58	0.40	604	648
85	72	18	_____	0	0	5	5	680	6	6	6	6	6	6	0.00	0	706
86	115	25	_____	0	0	7	7	699	18	18	18	18	18	18	0.28	716	693
87	404	122	_____	0	0	55	54	640	55	55	55	55	55	55	0.22	630	674
88	100	21	_____	0	0	3	3	692	18	18	18	18	18	18	0.22	697	796
89	338	171	_____	1	0	73	74	578	38	38	38	38	38	38	0.87	553	692
90	26	7	_____	0	0	7	7	721	0	0	0	0	0	0	0.00	0	0
91	194	92	_____	1	0	37	38	569	45	45	45	45	45	45	0.80	554	624

continued.

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Set	Total Catch			Tagged Fish Counts			Tagged Fork Lengths(mm)		Specimen Count					Mean Fork Length(mm)			
	kg	Count	Count by Trap	Recover-Rerelease	Deceased	Released	Count	Mean	Fork Length	Sex	Maturity	Otoliths	Weight	Count	Proportion Males	Males	Females
92	29	8		0	0	4	4	698	4	4	4	4	4	4	0.25	648	718
93	269	67		1	0	25	26	696	41	41	41	41	41	41	0.12	657	710
94	139	53		1	0	29	30	638	23	23	23	23	23	23	0.78	641	688
95	116	40		1	0	12	13	650	27	27	27	27	27	27	0.41	621	667
96	12	4		0	0	2	2	655	2	2	2	2	2	2	0.00	0	653
97	249	122		0	0	50	50	564	52	52	52	52	52	52	0.79	556	648
98	139	58		1	0	30	31	608	27	27	27	27	27	27	0.70	583	611
99	188	72		0	0	22	22	625	38	38	38	38	38	38	0.71	578	610
100	230	62		0	0	15	15	706	41	41	41	41	41	41	0.17	593	706
101	160	42		0	0	17	17	671	24	24	24	24	24	24	0.21	665	703
102	452	152		0	0	52	52	645	56	56	56	56	56	56	0.66	602	674
103	1306	435		0	0	168	168	627	58	58	58	58	58	58	0.41	611	674
104	1315	533		1	0	203	202	598	41	41	41	41	41	41	0.61	583	616
105	359	112		0	0	45	45	665	53	53	53	53	53	53	0.45	640	694
106	480	152		0	0	57	57	648	51	51	51	51	49	51	0.53	610	698
107	252	72		0	0	33	32	669	39	39	39	39	39	39	0.41	677	719
108	281	89		0	0	38	38	653	50	50	50	50	50	50	0.58	593	669
109	684	211		0	0	72	71	673	51	50	50	51	51	51	0.58	652	711
110	746	217		1	0	72	73	644	54	54	54	54	54	54	0.63	619	689
111	447	118		0	0	36	36	659	42	42	42	42	42	42	0.50	638	678
112	152	30		0	0	11	11	722	17	17	17	17	17	17	0.24	714	760
113	1228	586		0	0	186	186	572	62	62	62	62	62	62	0.31	541	596



continued.

Set	Total Catch			Tagged Fish Counts			Tagged Fork Lengths(mm)		Specimen Count					Mean Fork Length(mm)			
	kg	Count	Count by Trap	Recover-Rerelease	Deceased	Released	Count	Mean	Fork Length	Sex	Maturity	Otoliths	Weight	Count	Proportion Males	Males	Females
135	126	53	<u>      </u>	1	0	30	31	593	21	21	21	21	21	21	0.19	546	622
Total	57178	23060		151	1	8574	8708		5677	5682	5674	5683	5535	5683			

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