

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

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Canadian Technical Report of Fisheries and Aquatic Sciences

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by

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ABSTRACT

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This report 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 mainland 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 154 tagged fish recaptured, fitted with a new tag and re-released. One previously tagged fish was retained for biological sampling. Eighteen north Pacific spiny dogfish (> 70 cm) were fitted with pop-off satellite tags for Alaska Fisheries Science Center (AFSC)'s Auke Bay Laboratories (ABL).

Catch per unit effort (CPUE) is an important result from this survey as it is incorporated into the sablefish harvest strategy 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 the lowest levels since 2003.

RÉSUMÉ

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1 Introduction

Sablefish (*Anoplopoma fimbria*) are managed in British Columbia (BC) using trap, longline and trawl gear as part of the Integrated Fisheries Management Plan (IFMP). Over the ten year span of 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 hook gear (52%) and longline trap gear (40%). 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 (Cox et al. 2011).

The design of the sablefish survey has remained 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 order to evaluate the impact of fishing gear on the benthic habitat, a pilot study began in 2012 to capture images from traps. In addition, exploratory sets were conducted in a Vancouver Island inlet near Quatsino Sound to assess for sablefish density and/or size composition. In this technical report we describe survey operations and summarize data collected on the 2012 chartered survey aboard the F/V Ocean Pearl.

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 (Table 1).

2.1.1 STRATIFIED RANDOM SAMPLING SURVEY 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 (Figure 2).

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. In 2011, the allocation of the blocks to strata were optimized and used in the 2012 survey (Table 2).

2.1.2 TRADITIONAL SURVEY COMPONENT

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. A string of 25 traps were set at five specific localities in each of the following four areas: Portland Inlet, Gil Island, Finlayson Channel, and Dean/Burke Channel (Table 1). Trap gear was deployed near the center of each of the five inlet boundaries in order to avoid the steep slopes characteristic of these channels/fjords (Figure 3).

2.1.3 EXPLORATORY COMPONENT

Two fishing sites for the exploratory component were visited in 2011 and 2012 to evaluate Vancouver Island inlets for sablefish density and/or size composition (Table 1).

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 traps to gather trap orientation and movement data.

2.2 VESSEL

The 2012 survey of 135 sets was chartered aboard the F/V Ocean Pearl (Figure 4), skippered by Darcy Nichols between Oct 9 - Nov 17 , 2012 (Appendix A). 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 5, a). 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 5, b). 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.

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, standardized fishing sets under the traditional component have occurred at the four mainland inlet localities. A string of 25 traps were set at five specific localities in each of the following four 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 (Figure 2).

2.5 CATCH PROCESSING

Haulback speed allowed the science crew to accurately record catch. The charter catch log data form (Appendix B, Figure B.3) was completed during hauling by the science staff recorder positioned at the Marel M1100 scale. Each trap number, trap use code (D=dump, A=age sample, B=length sex maturity biosample, T=tag sample, MT=empty trap), and trap species counts and weights were recorded. The Federal Court of Appeal ruling (*Larocque v. Canada (Minister of Fisheries and Oceans Canada)*) (Federal Court of Appeal Canada 2006) was used to support scientific research of key commercial fish in place of quota allocation. As a result, sablefish in traps assigned code D were released at sea.

Crew members alerted the recorder about any damage to a trap (i.e. holes) which was then recorded. 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

StRS sets used a sampling protocol that assigned a fate to the sablefish catch in each trap, dividing the 25 traps so that 1/3 of the traps were used for tagging, 1/3 were used for biological samples (~50 specimens) and 1/3 were released alive. At mainland inlet sites, sablefish catch from 1/2 of the traps were allocated for biosamples (~50 specimens) and 1/2 of the traps were used for tagging.

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 (Appendix B, Figure B.5).

Length and sex were collected from all other species on the LengthSexSpecies form (Appendix B, Figure B.6).

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 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) 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 B, Figure B.7).

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. Foreign tags were later returned to their country of origin (Appendix B, Figure B.8).

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 TAGGING NORTH PACIFIC SPINY DOGFISH

In each spatial stratum, several spiny dogfish with intact first dorsal spines and pre-caudal lengths greater than seventy centimetres were tagged with pop-off satellite tags for Auke Bay Laboratories (ABL). First, the recorder noted the set number, tag number, pre-caudal length and sex on the data sheet. The sampler then drilled a horizontal hole through the first dorsal spine and inserted a piece of monofilament that was attached to a pop-off satellite tag. The monofilament was secured with a crimping sleeve. Once the spiny dogfish had been observed in the recovery tank for a few minutes, it was released over the side of the boat.

2.10 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 third trap during gear deployment. Typically, data from the sensor was immediately downloaded after hauling using the Sea-Bird Electronics SeaTerm © software. Standard file format provided readings of temperature, pressure, date and time.

2.11 BENTHIC IMPACTS STUDY

This study was launched in testing phase to investigate gear interaction with bottom substrate. Designated traps with outfitted with a Nuytco autonomous camera system and a HOBO Pendant G logger (accelerometer) bolted to a trap (Appendix C, Figure C.1 a). The camera system consisted of a GoPro Hero HD camera designed to image at depths up to 1500 m for up to 48 hours. The motherboard allowed for configuration of image mode (still or video), camera activation depth, interval of imaging events, clip length (video mode only) and LED lighting brightness (Appendix C, Figure C.1 b). The loggers contained an internal three-axis accelerometer that measured acceleration of motion of the traps in units of g-force (m/s^2). Data from the camera units and accelerometers were processed after the pilot camera sets were hauled.

2.12 ELECTRONIC MONITORING VIDEO DATA COLLECTION

During haulback, the vessel's electronic monitoring (EM) cameras were activated by the skipper. Three internet protocol (IP) cameras and three standard analog cameras were positioned at optimal viewing angles to record the survey activities. IP camera 6 and analog cameras 1 and 3 were positioned along the mast to record the catch as it was processed at the hopper. IP camera 5 and analog camera 2 were positioned on the starboard to record the traps as they were brought over the rail. Last, IP camera 4 was positioned over the tagging tank. The video data from each set was reviewed by the catch recorder and an assistant shortly after the set to allow for quality control prior to the electronic catch data entry process.

3 Results and Discussion

3.1 FISHING

The 2012 survey was 40 days long, beginning in Victoria, BC on October 9, with crew changes on October 20 at Coal Harbour, October 29 at Rose Harbour and November 11 at Prince Rupert. In total, 135 sets were completed: 110 StRS sets, 3 camera sets, 2 exploratory sets and 20 standardized sets at mainland inlets.

3.2 CATCH PER UNIT EFFORT (CPUE)

3.2.1 StRS CPUE

In general, catch per unit effort as indexed by kilograms (Figure 6) and numbers (Figure 7) of sablefish per trap, attained the highest catch rates in the middle depth stratum (RD_2) in most years.

The average weight of sablefish over time in the deep depths (RD_3) tended to be higher in the northern survey areas. In the middle (RD_2) and shallow waters (RD_1) the mean weights were consistently higher in area S_4 (Figure 8).

CPUE over the survey years (2003 to 2012) reached over 26 kg/trap and over 9 fish/trap during 2003, 2005, 2006 and 2008. In 2012, the catch rate dropped to the lowest levels since 2003 (Figure 9,a,b). The average weight of sablefish remained close to 3 kg over time (Figure 9,c).

3.2.2 Mainland Inlet CPUE

CPUE in the mainland inlets has varied in a relatively predictable manner over time with peak CPUE occurring every 5-7 years. In the early part of the time series (mid-1990s) average CPUE remained relatively constant before a peak in CPUE was observed in 1999, followed by declines to consistent levels until another peak in 2003 and 2004, and again in 2011. In 2012, CPUE

(kg/trap) dropped to levels similar to 2010 (Figure 10 a,b). Annual mean weights of sablefish in 2012 were 0.5 kg less than those at StRS sites (Figure 10 c).

3.3 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/melanostictus*) and pectoral rattail (*Albatrossia pectoralis*) (Table 3).

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 4).

Two taxonomic groups were represented in the catches at the exploratory sites in 2012. Only one sablefish (*Anoplopoma fimbria*) and one Pacific ocean perch (*Sebastes alutus*) were captured (Table 5).

3.4 SABLEFISH SAMPLING

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

In the StRS portion of the survey, a total of 16,845 sablefish were caught. Of that total, 5,801 were tagged and released and 4,699 were retained for biological sampling. Of the tagged fish, 50 were previously tagged fish that were re-released with a new tag. In addition, one previously tagged fish was retained for sampling (Appendix F).

During the inlet standardized portion of the survey, a total of 6,213 sablefish were caught. Of that total, 2,925 were tagged and released and 983 were retained for biological sampling. Of the tagged fish, 104 were previously tagged fish that were re-released with a new tag (Appendix F).

One sablefish was caught on camera set 26 but not sampled (Table 5). One sablefish was caught on experimental set 43 and retained for biological sampling (Appendix F).

Overall, the StRS sets had a higher proportion of females than males over the spatial strata S₂, S₃, S₄ and S₅ (Table 6). More females than males were seen in the shallow depth stratum within the spatial strata S₂, S₃, S₄ and S₅. In the mid depth stratum, there were more males than females in S₁, S₂, S₃ and S₅. The deepest depth stratum saw more females in spatial strata S₁, S₂, S₃ and S₅.

Significant differences in length distributions between female and male sablefish are exhibited in

the data collected from the StRS portion of the 2003 - 2013 surveys. The mean fork length (\bar{x}) for the 23,234 females was 66.3 cm and the mean fork length (\bar{x}) for the 22,958 males was 59.2 cm (Figure 11,a).

In 2012, the mean fork length for the 2,404 females was 66 cm and the mean fork length for the 2,282 males was 58 cm (Figure 11,b).

On average, female sablefish grow faster and reach a far greater size (Figure 12,a) compared to males (Figure 12,b).

3.5 OTHER FISH SAMPLING

In 2012, length, sex, maturity, otoliths and DNA samples were collected for rough-eye/blackspotted rockfish. Of the 395 DNA samples, 238 were visually determined as blackspotted rockfish and 157 as rougheye rockfish (Appendix G). DNA analysis reveal that 269 had a genetic id of blackspotted rockfish, 97 were determined to be rougheye rockfish, 6 were designated as hybrid species and 23 were unsuccessful.

Fork length and sex were collected for arrowtooth flounder (*Atheresthes stomias*), aurora rockfish (*Sebastes aurora*), greenstriped rockfish (*Sebastes elongatus*), lingcod (*Ophiodon elongatus*), Pacific cod (*Squalus acanthias*), Pacific halibut (*Hippoglossus stenolepis*), redbanded rockfish (*Sebastes babcocki*), rosethorn rockfish (*Sebastes helvomaculatus*), shortraker rockfish (*Sebastes borealis*), walleye pollock (*Theragra chalcogramma*), yelloweye rockfish (*Sebastes ruberrimus*) and yellowmouth rockfish (*Sebastes reedi*) (Appendix H).

Pre-caudal length and sex were collected for the tagged North Pacific spiny dogfish (*Squalus acanthias*). Snout to anal fin lengths and sex were collected for giant grenadier (*Albatrossia pectoralis*) and Pacific grenadier (*Coryphaenoides acrolepis*). Total length and sex were collected for Dover sole (*Microstomus pacificus*), giant blobsculpin (*Psychrolutes phrictus*), longspine thornyhead (*Sebastolobus altivelis*), north Pacific spiny dogfish (second measurement), Pacific flatnose (*Antimora microlepis*), pink snailfish (*Paraliparis rosaceus*), and shortspine thornyhead (*Sebastolobus alascanus*) (Appendix H).

3.6 RECOVERED TAGGED SABLEFISH

Of the 155 Canadian tagged fish that were recovered on the survey, the majority (88%) had travelled within 50 kilometers of the release site. Most of these tagged fish (85%) were recaptured within 5 years at liberty (Table 7).

3.7 TAGGED NORTH PACIFIC SPINY DOGFISH

North Pacific spiny dogfish with a pre-caudal length greater than seventy centimetres were tagged and released with pop-off satellite tags (Table 8) throughout the survey area (Figure 2).

3.8 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 13, a).

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 13, b).

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.

3.9 OCEANOGRAPHIC TEMPERATURES AND DEPTHS

SBE 39 recorder data was successfully collected from 134 sets in 2012 (Appendix D). Co-plots of average temperatures and average depths by 1-degree latitude intervals from south-west Vancouver Island to northwest Haida Gwaii can be found in Figure 14. 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 to highest average temperatures reported by set were 4.4 °C (2007) to 7.1 °C (2009). In the mid-depth waters, the lowest to highest average temperatures reported by set were 3.5 °C (2007) to 5.5 °C (2008). In the deepest waters, the lowest to highest average temperatures reported by set were 2.3 °C (2007) to 4.1°C (2007) (Figure 15).

3.10 BENTHIC IMPACTS STUDY DATA COLLECTION

The Nuytco autonomous camera system gathered the pilot MP4 footage from various camera angles on sets 5, 6 and 26. Accelerometer readings of g-force (m/s^2) were successfully collected from 21 sets to reveal trap movement in all directions (Appendix D).

3.11 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, bottom sensors were on the seafloor and recorded the seismic activity of the 7.7 magnitude earthquake (Figure 16).

3.12 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.

Component	Bait/Method	Locations	Protocol	Total Sets
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	110
Traditional Inlet Standardized	1 kg squid (bagged)	Dean/Burke Channel	1/2 of traps used for tagging,	5
		Finlayson Channel	1/2 of traps used for biosamples (50 piece LSWMO)	5
		Gil Island		5
		Portland Inlet		5
Exploratory	1 kg squid (bagged) 5 kg hake (loose)	Cliffe Point Koskimo Bay	1/3 of traps used for biosamples (50 piece LSWMO), 1/3 of traps used for tagging and 1/3 of traps discarded	2
Benthic impact	Nuytco autonomous camera system and HOBO Pendant G Loggers attached to select traps	SW Vancouver Island	Camera system deployed on select sets. Accelerometers deployed on camera and survey sets.	3

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

Spatial Strata	Depth Strata						Total 2012
	RD1 2012	RD1 2012	RD2 2012	RD2 2012	RD3 2012	RD3 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
Total	41	41	34	34	35	35	110 110

Table 3. Summary of species captured during the 2012 survey StRS sets conducted by the Ocean Pearl.

Category	Common Name	Scientific Name	Count	Weight(kg)
Roundfish Species	Sablefish	ANOPLOPOMA FIMBRIA	41,994	
	Spiny dogfish	SQUALUS ACANTHIAS	2,286	
	Pectoral rattail	ALBATROSSIA PECTORALIS	976	
	Lingcod	OPHIODON ELONGATUS	722	
	Pacific grenadier	CORYphaenoides ACRONEPIS	695	
	Pacific flatnose	ANTIMORA MICROLEPIS	20	
	Pink snailfish	PARALIPARIS ROSACEUS	9	
	Blob sculpin	PSYCHROLUTES PHRICHTUS	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	1,563	
	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	
	Longspine thornyhead	SEBASTES HELVOMACULATUS	3	
	Aurora rockfish	SEBASTOLOBUS ALTIVELIS	3	
	Greenstriped rockfish	SEBASTES AURORA	2	
		SEBASTES ELONGATUS	1	
		SEBASTES	1	
	Sharpchin rockfish	SEBASTES ZACENTRUS	1	
Flatfish Species	Pacific halibut	HIPPOGLOSSUS STENOLEPIS	2,669	
	Arrowtooth flounder	ATHERESTHES STOMIAS	1,654	
	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	
		LOPHOLITHODES	2	
		STYLASTERIAS FORRERI	1	
		PARALITHODES BREVIPES	1	
		RATHBUNASTER CALIFORNICUS	1	
	Anemone	ACTINARIIDAE	1	
	Golden king crab	LITHODES AEQUISPINA	1	
	Octopus	OCTOPUS	1	
	Heart urchins	ATELOSTOMATA	1	
		HETEROZONIAS ALTERNATUS	1	
	Mud star	CTENODISCUS CRISPATUS	12	
	Sea lilies and feather stars	CRINOIDEA	12	
		ASTERONYX	11	
	Brittle stars	OPHIACANTHA	10	
		OPHIURAE	5	
		ZOROASTER EVERMANNI	2	
	Hermit crabs	STYLASTERIAS	2	
		PAGURIDAE	2	
	Soft sea cucumber	NEARCASTER ACICULOSUS	2	
	Prawn	PSEUDOSTICHOPUS MOLLIS	2	
		PANDALUS PLATYCEROS	2	

Table 3. continued.

Category	Common Name	Scientific Name	Count	Weight(kg)
	Starfish	ASTERIODEA	2	
	Sponges	PORIFERA	1	
	Inshore Tanner Crab	AMPHIOPHIURA PONDEROSA	1	
	Sea urchins	CHIONOECETES BAIRDII	1	
	Pandalid shrimp	ECHINACEA	1	
	Rose starfish	PANDALUS	1	
	Scaly sea cucumber	CROSSASTER PAPPOSUS	1	
	Sea cucumber	PSOLUS SQUAMATUS	1	
		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.

Category	Common Name	Scientific Name	Count	Weight(kg)
Roundfish Species	Sablefish	ANOPOLOPOMA FIMBRIA	15,175	
	Spiny dogfish	SQUALUS ACANTHIAS	22	
	Walleye pollock	THERAGRA CHALCGRAMMA	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 STENOCEPIS	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 from exploratory and camera sets.

Set Type	Category	Common Name	Scientific Name	Count
Exploratory	Roundfish species	Sablefish	ANOPLOPOMA FIMBRIA	1
	Rockfish species	Pacific ocean perch	SEBASTES ALUTUS	1
Camera	Roundfish species	Sablefish	ANOPLOPOMA FIMBRIA	1

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

Strata		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
		0.52	0.48	565	629	589
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
		0.49	0.51	588	641	611
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
		0.44	0.56	586	649	610
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
		0.46	0.54	617	693	635
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
		0.48	0.52	598	657	615

Table 7. Sablefish tag recovery counts by distance from release site and years at liberty from tags recovered on the 2012 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+	
Grp0. 0	0	0	0	0	1	0	0	1
1	69	6	1	0	2	0	0	78
2-5	32	12	2	4	2	0	0	52
6-10	8	2	0	1	4	0	0	15
11+	4	3	0	2	0	0	0	9
Total Counts	113	23	3	7	9	0	0	155

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 GMU Area	Release Spatial Strata	GFBio Specimen ID
October 15,2012	23	118360-20937	895	3D	S1	12359130
October 17,2012	30	118355-20932	825	3D	S2	12359136
October 21,2012	42	118356-20933	893	3D		12359140
October 21,2012	43	118346-20923	880	3D		12359131
October 22,2012	49	118359-20936	880	5A	S2	12359139
October 22,2012	49	118348-20925	845	5A	S2	12359138
October 24,2012	53	118358-20935	842	5A	S3	12359132
October 24,2012	59	118351-20928	920	5A	S3	12359133
October 28,2012	70	118349-20926	865	5B	S3	12359134
October 31,2012	77	118350-20927	900	5B	S4	12359135
October 31,2012	80	118365-20942	920	5E	S4	12359147
November 2,2012	85	118352-20929	852	5E	S4	12359137
November 5,2012	93	118354-20931	918	5E	S4	12359144
November 5,2012	93	118366-20943	824	5E	S4	12359146
November 5,2012	93	118362-20939	988	5E	S4	12359145
November 5,2012	93	118347-20924	888	5E	S4	12359143
November 9,2012	112	118357-20934	906	5E	S5	12359142
November 9,2012	114	118364-20941	860	5E	S5	12359141

5 Figures

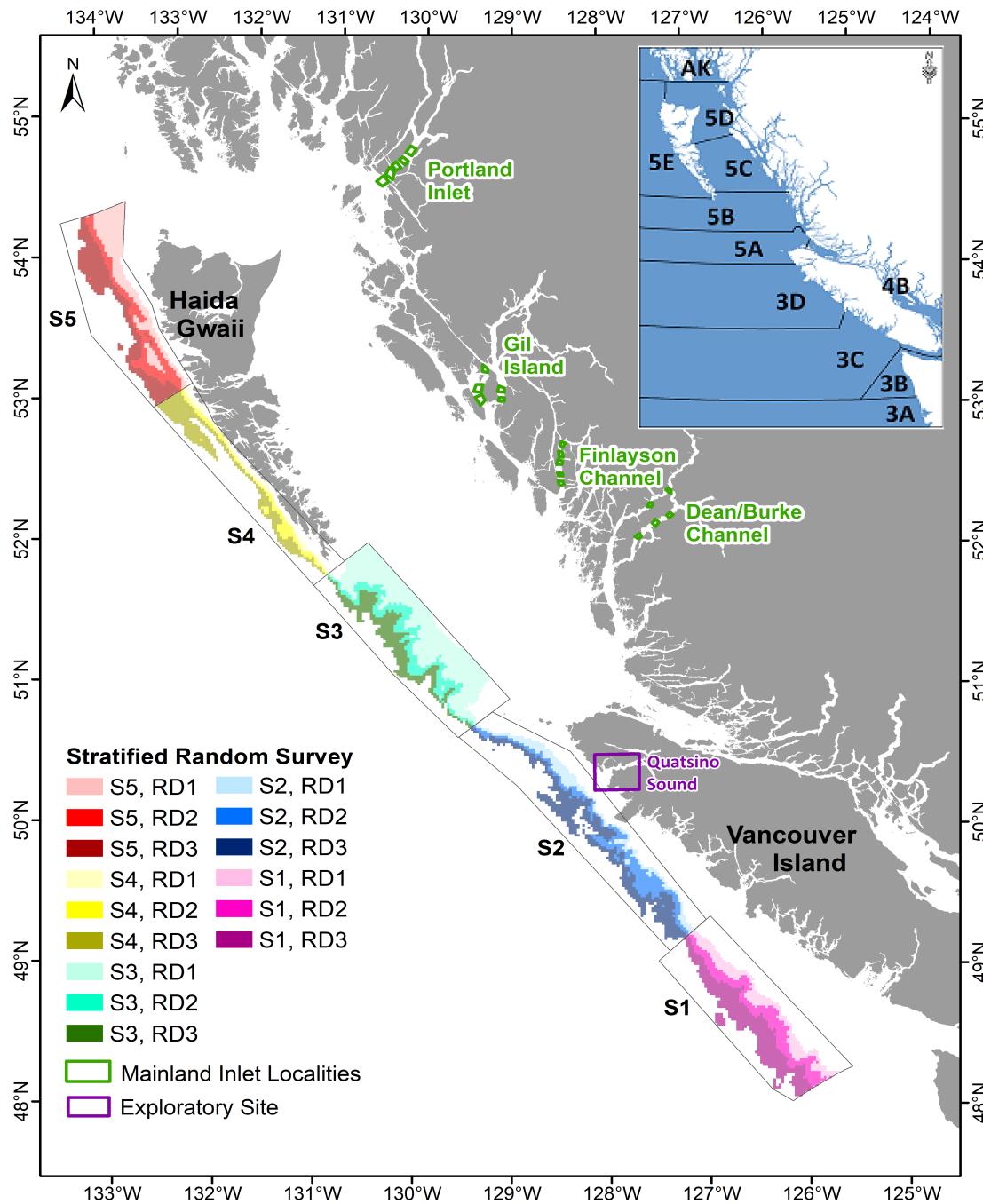


Figure 1. Location of the boundaries of the mainland inlet localities, one exploratory site and the five spatial areas (S_1-S_5) of the stratified random survey design. The three depths strata (RD_1-RD_3) are colour-coded and nested within each of the five spatial strata. Outline of groundfish management areas (inset).

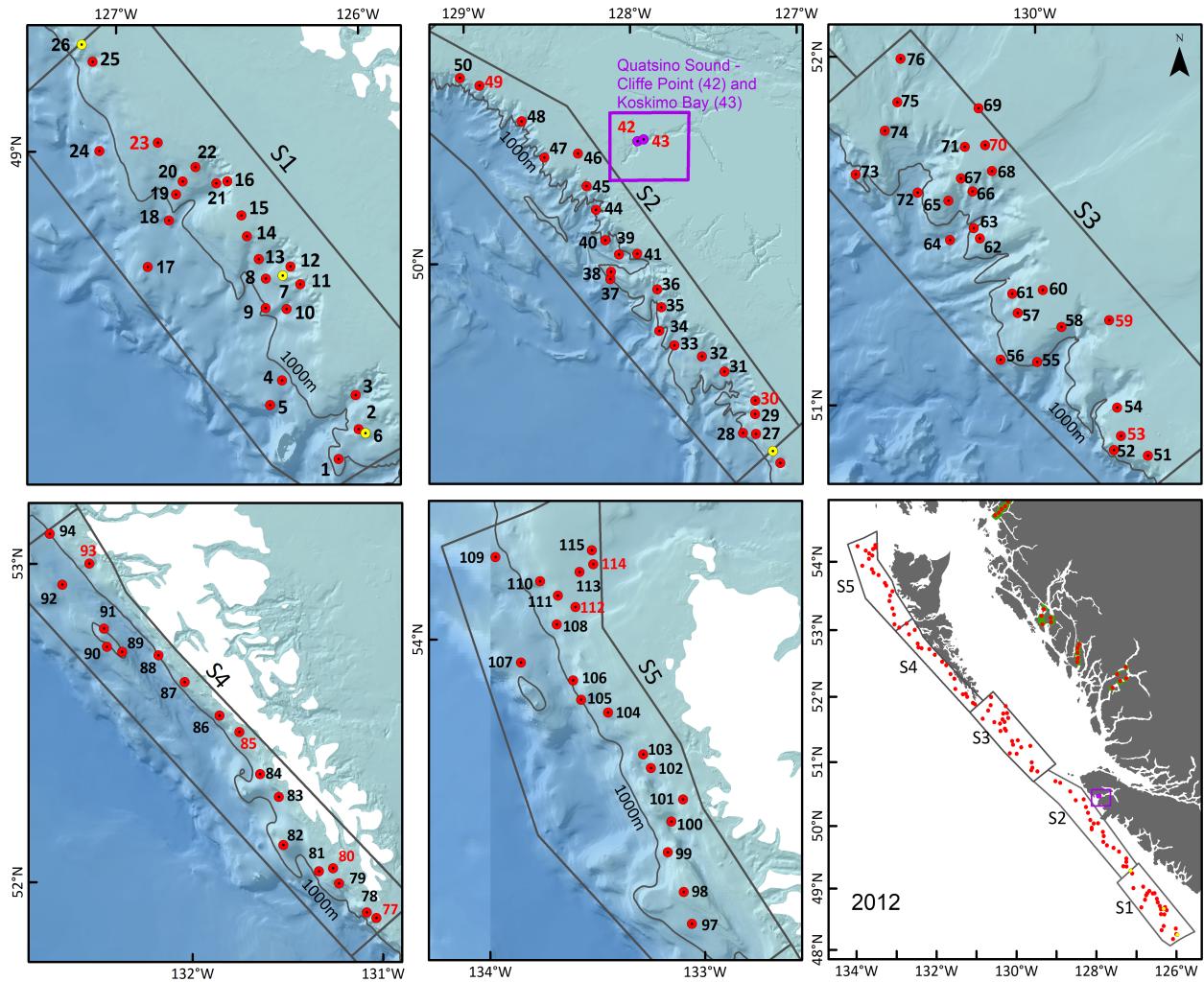


Figure 2. Start locations of survey sets in 2012 conducted in the stratified random survey areas S₁ through S₅ (red markers) and in the exploratory area (purple markers). The camera sets are represented by yellow markers. Set numbers in red font represent sets that released Pacific spiny dogfish with pop-off satellite tags for Alaska Auke Bay Laboratories (ABL).

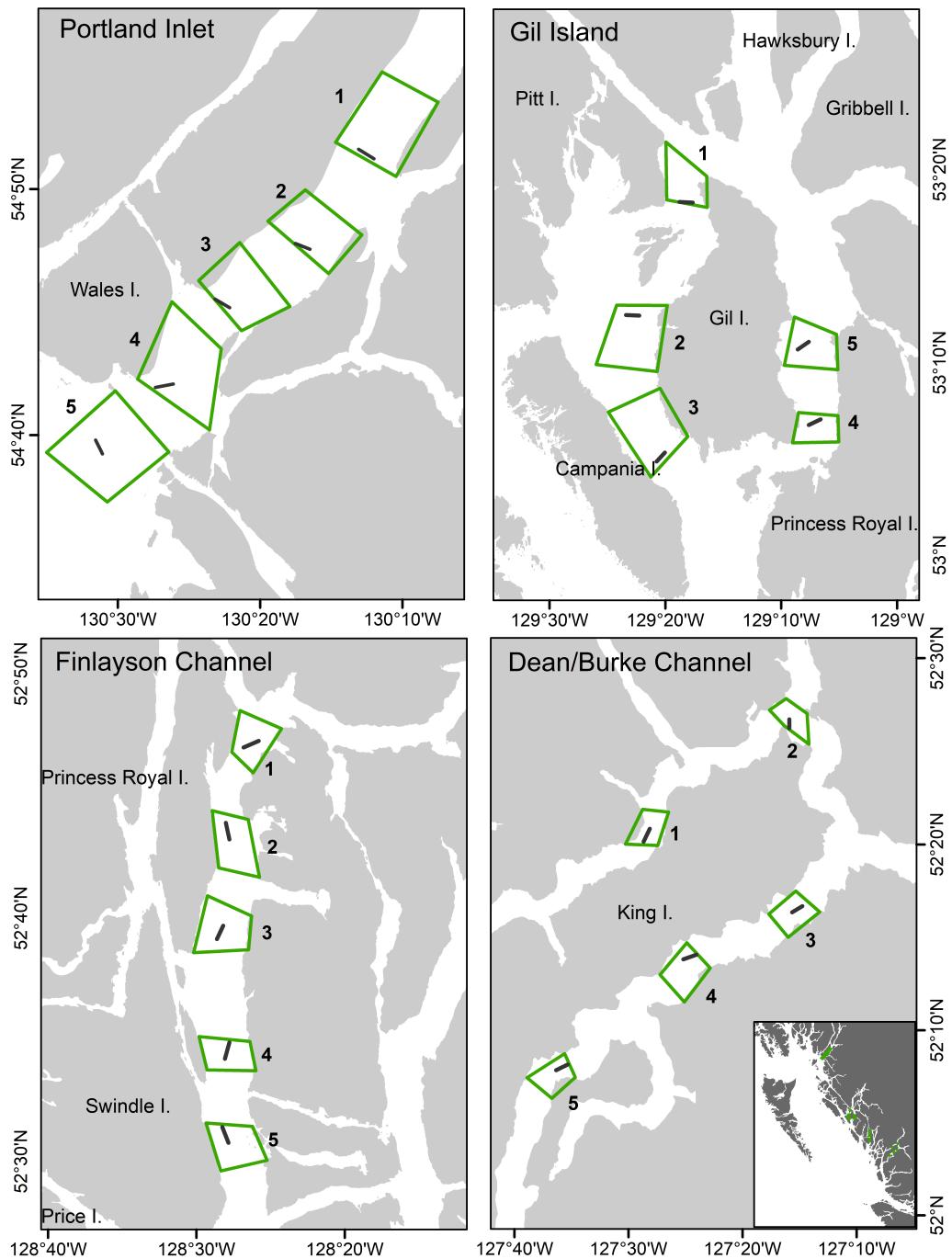


Figure 3. Location of the traditional survey sets within the mainland inlet localities for the 2012 survey.



Figure 4. Image of the 35.66 meter F/V Ocean Pearl used for the 2012 sablefish research and assessment survey. Photo credit: Ocean Pearl Facebook page.

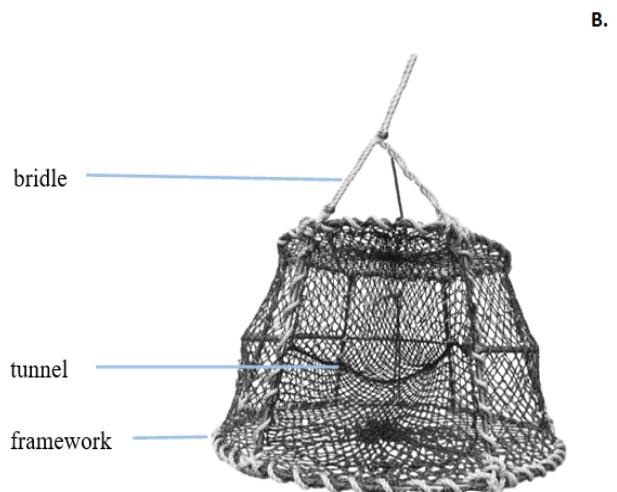
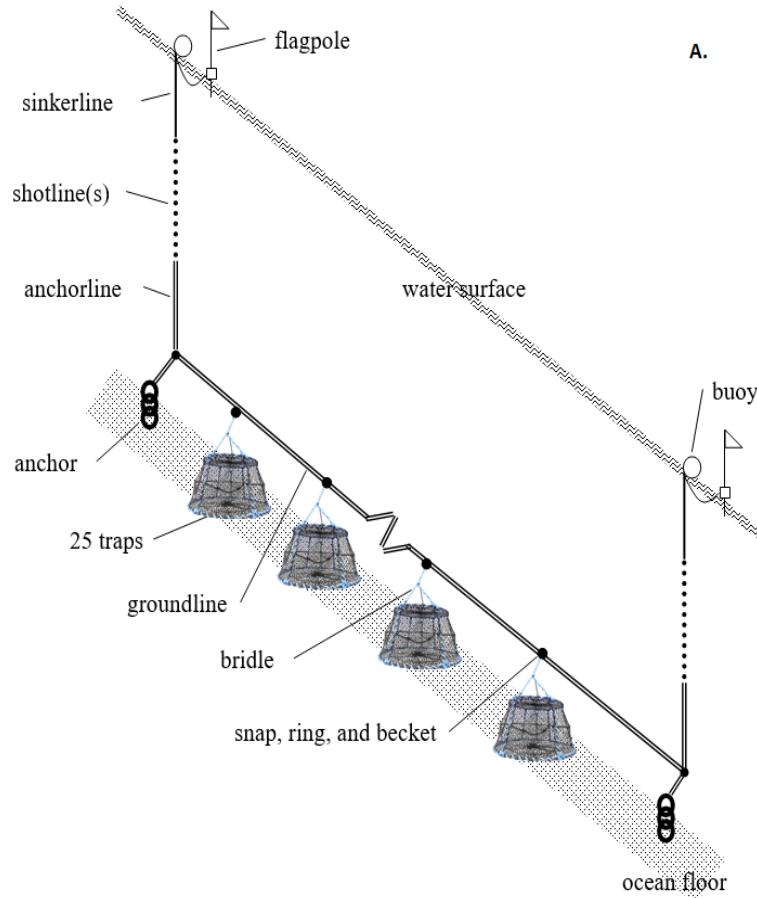


Figure 5. Trap gear elements consisting of 25 baited traps snapped to beackets along a groundline (A). Trap elements (B).

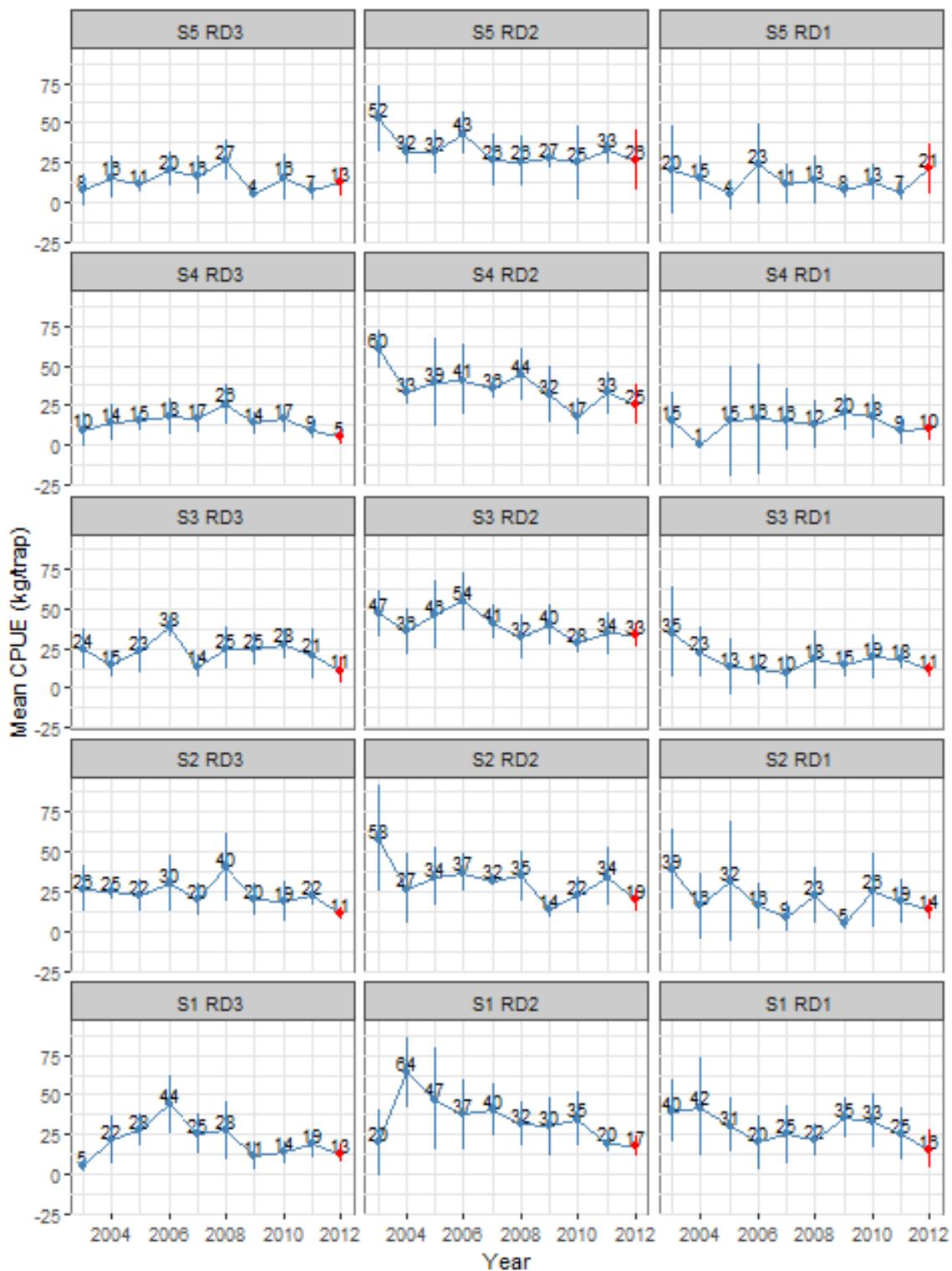


Figure 6. Average sablefish catch per unit effort (CPUE; mean +/- 95% CIs) by survey strata since 2003. Panels run deep to shallow (left to right) and north to south (top to bottom).

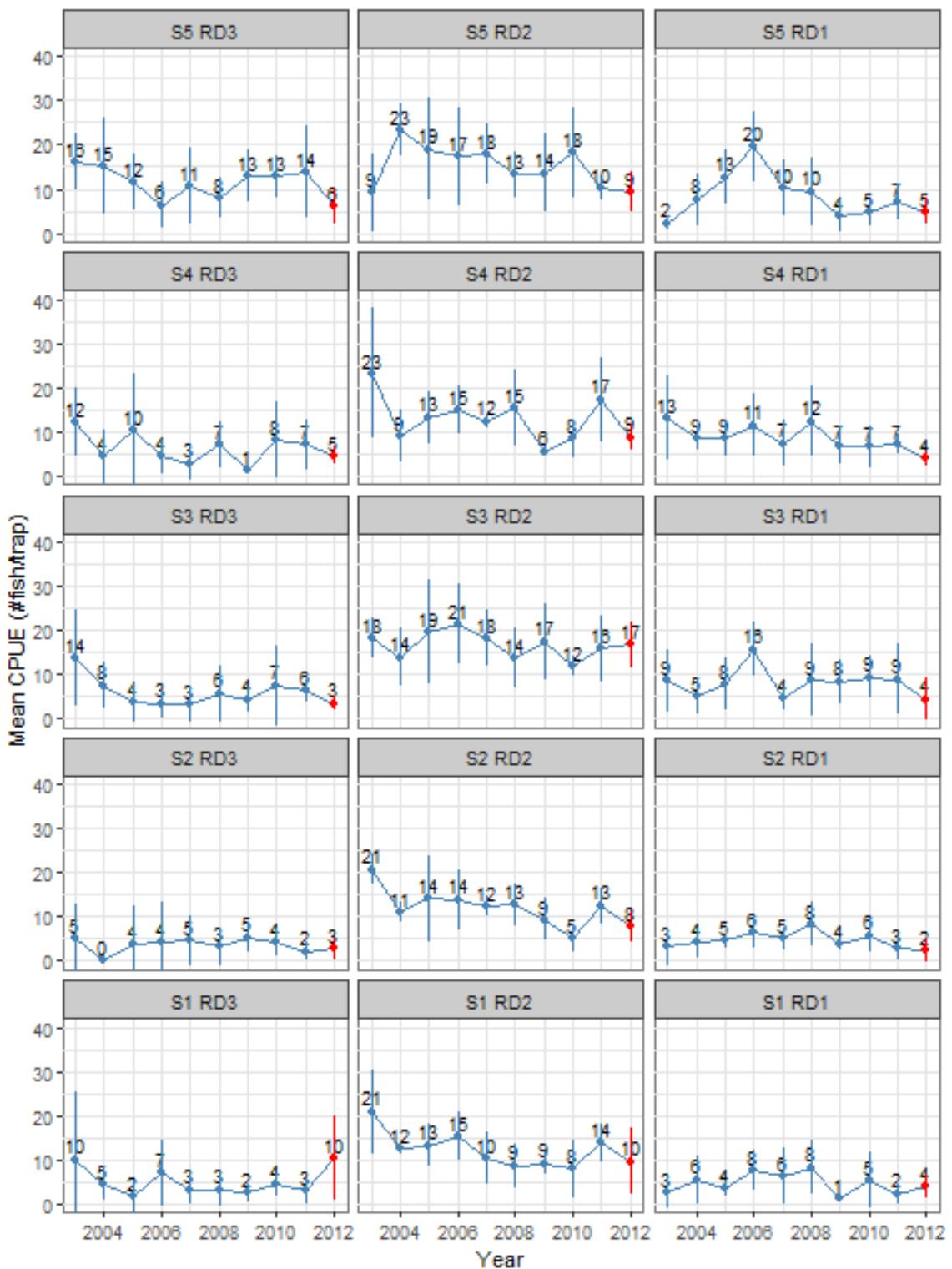


Figure 7. Average number of sablefish per trap (mean +/- 95% CIs) by StRS survey strata over time. Panels run deep to shallow (left to right) and north to south (top to bottom).

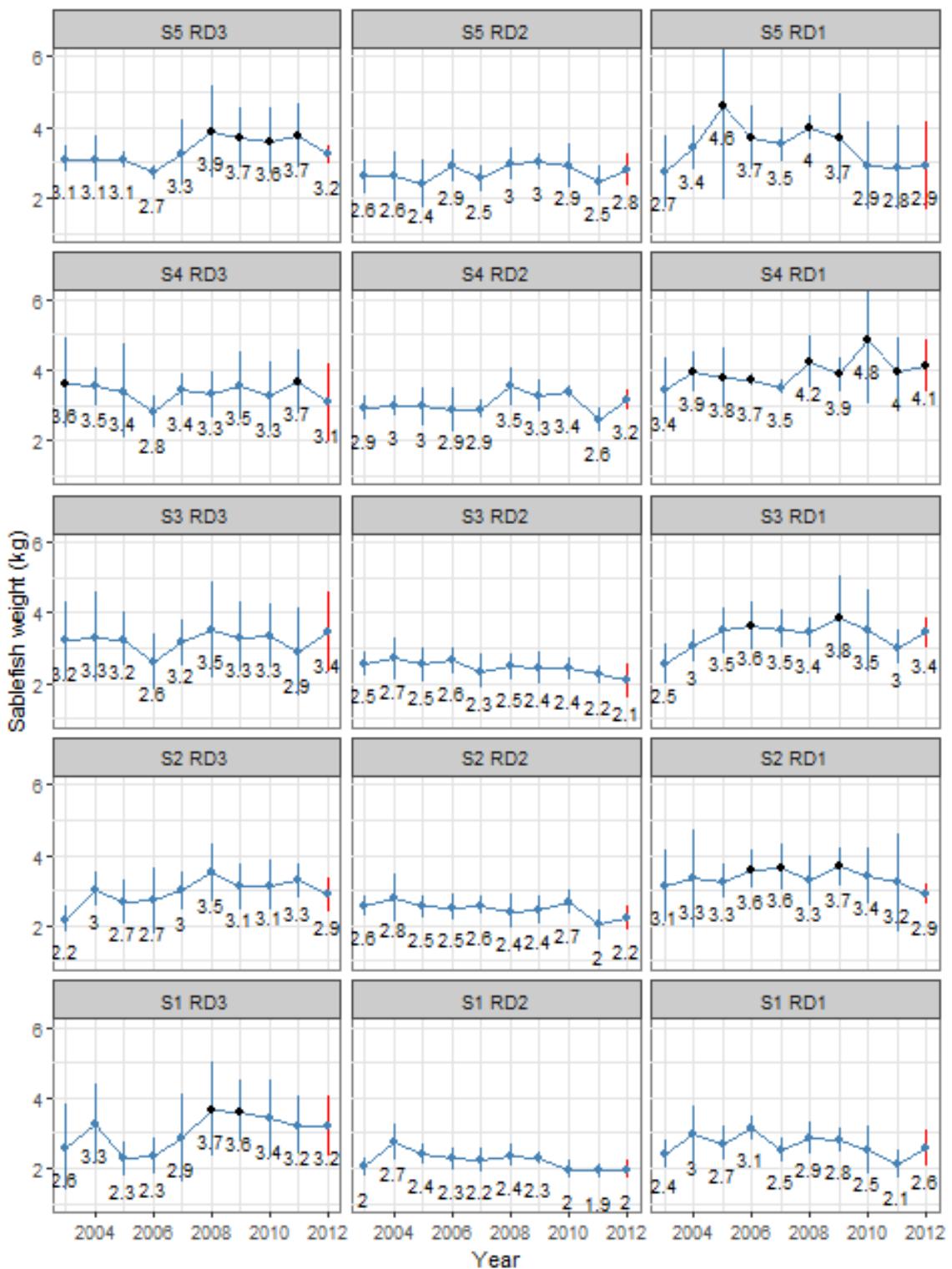


Figure 8. Average weight of sablefish (mean +/- 95% CIs) by survey strata over time. Panels run deep to shallow (left to right) and north to south (top to bottom). Points in black specify weights > 3.5 kg.

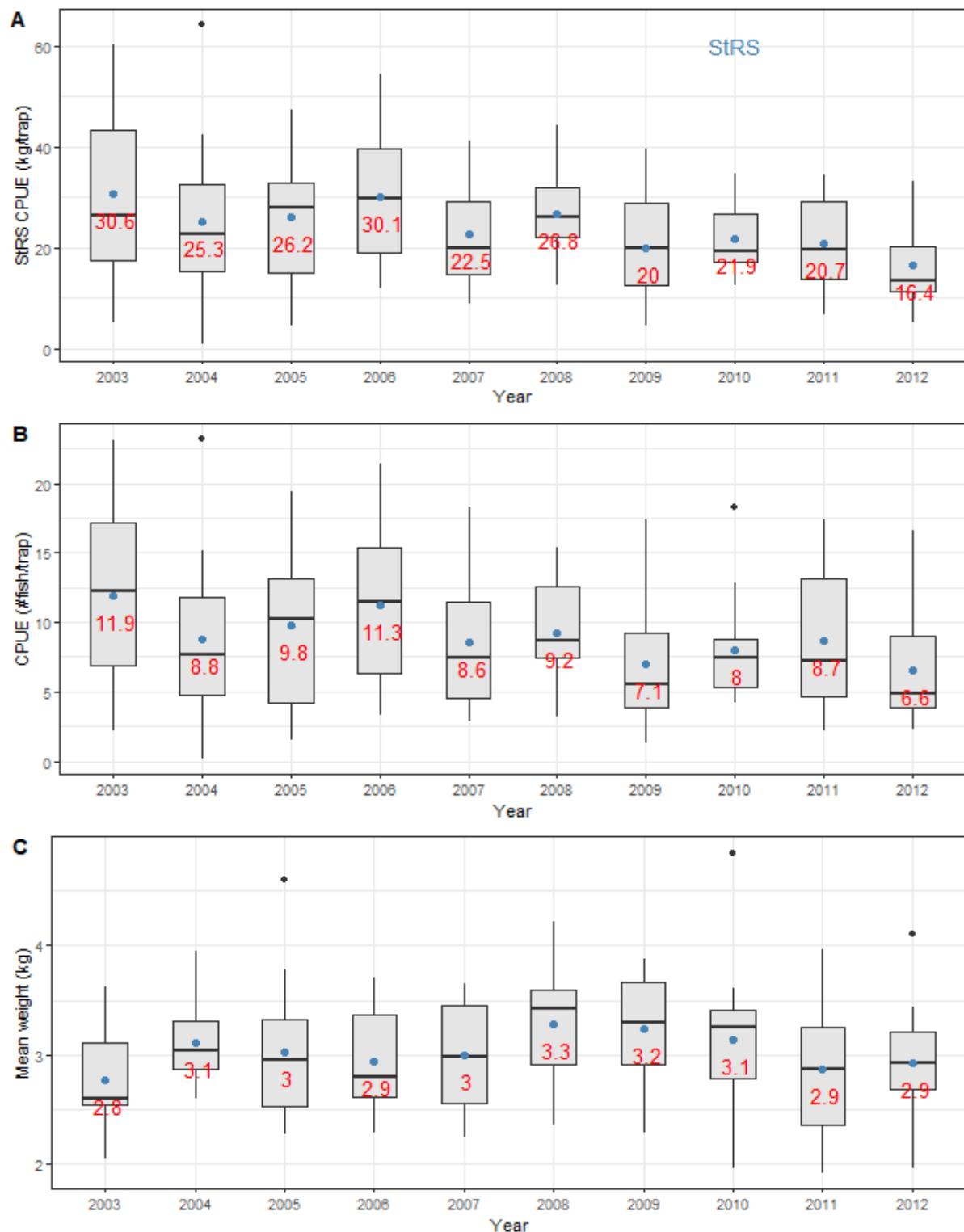


Figure 9. Annual mean weight of sablefish per trap (kg/trap) (A); annual mean number of sablefish per trap (#fish/trap) (B); annual mean weight of sablefish (kg) (C) by StRS survey strata over time. Horizontal line is median and blue dots are arithmetic mean.

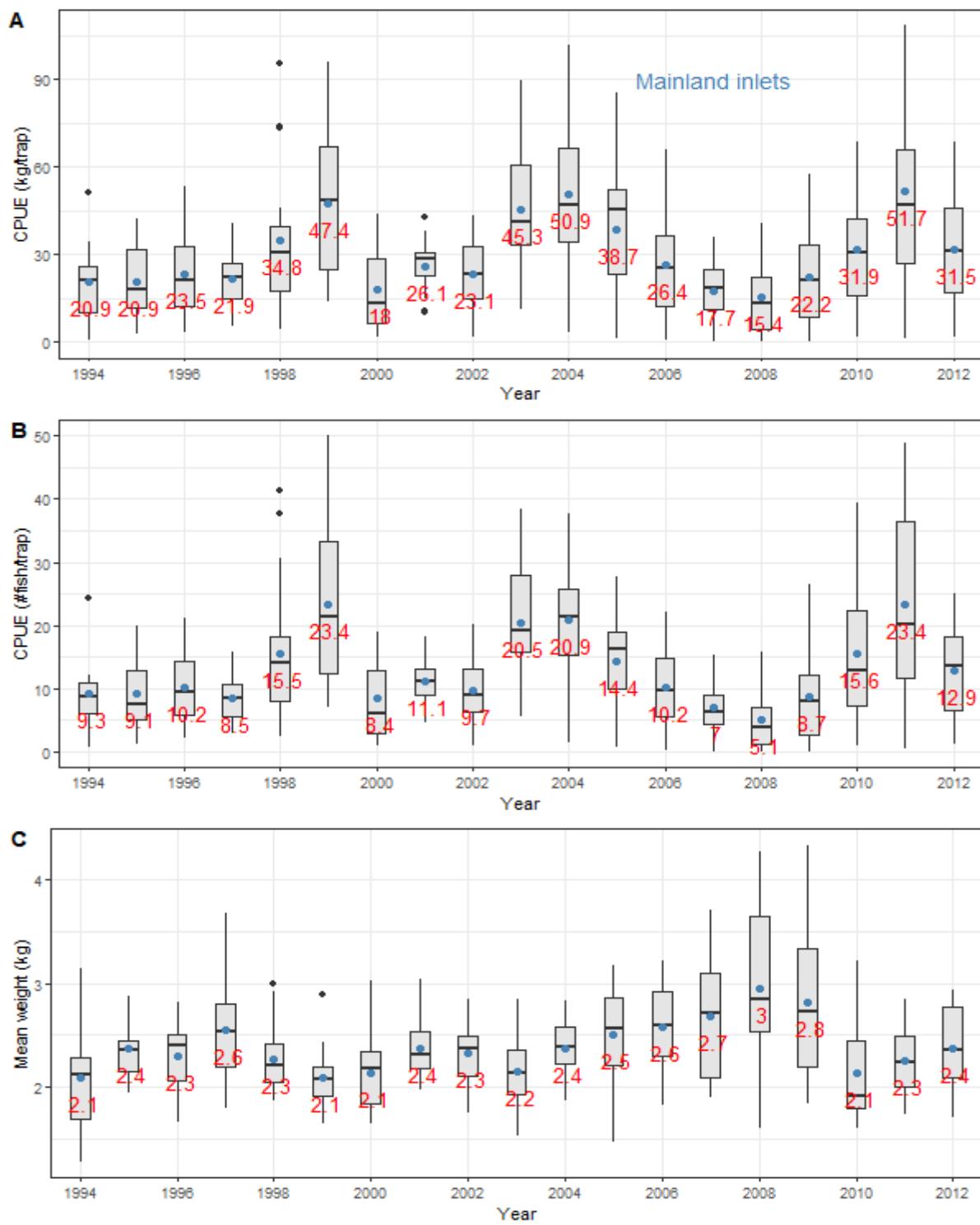


Figure 10. Average weight of sablefish per trap (kg/trap) (A); average number of sablefish per trap (#fish/trap) (B); annual average weight of sablefish (kg) (C) at mainland inlets over time. Horizontal line is median and blue dots are arithmetic mean.

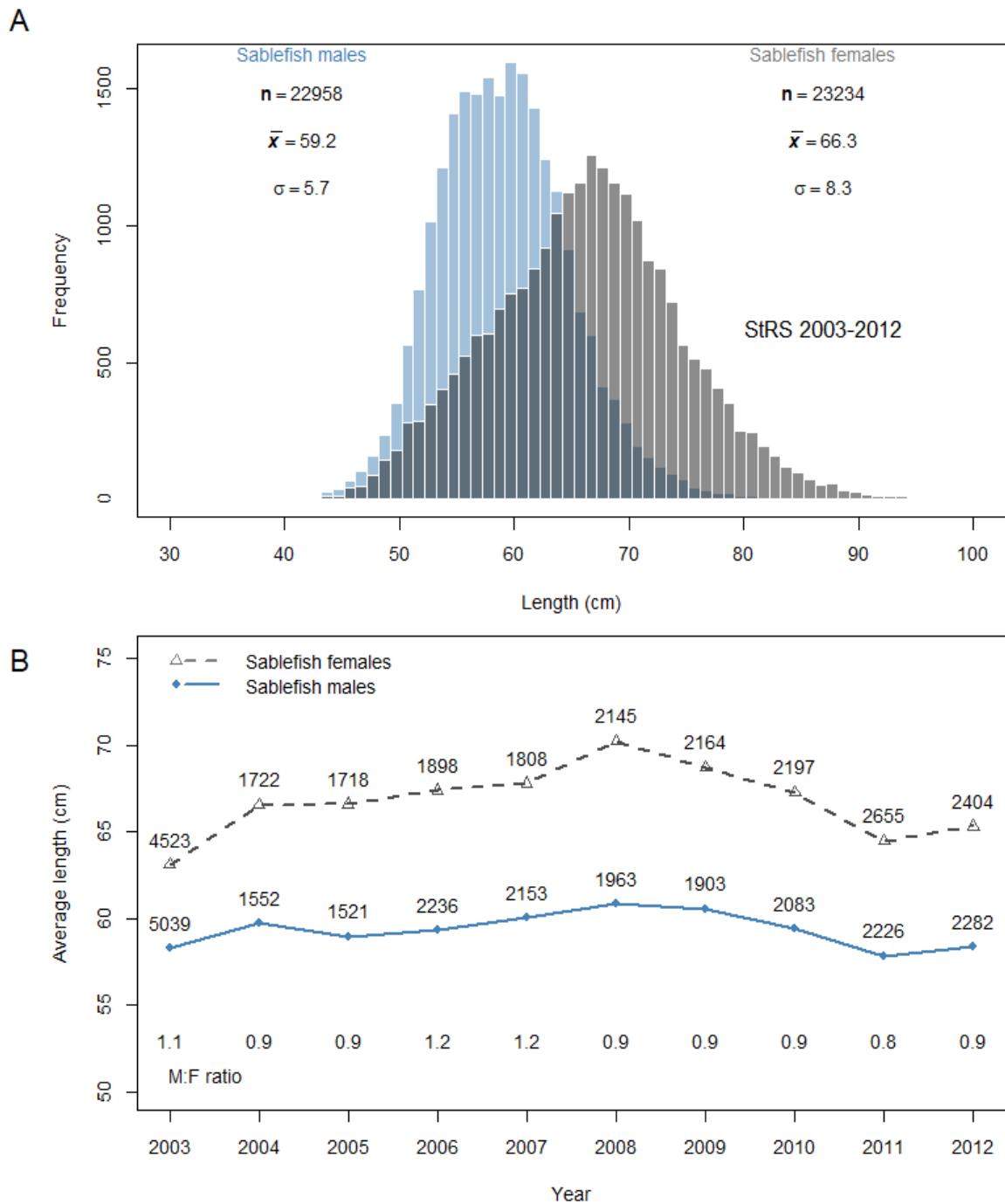


Figure 11. Length frequencies for female (cyan) and male sablefish (green) and up to 2013 for all StRS sets. The number of specimens is denoted by the letter n , the mean indicated by the $x\bar{r}$ and the standard deviation is represented by the symbol sigma σ (A). Average length and ratios of male and female sablefish by year. Counts by sex are shown across the top of the lines (B).

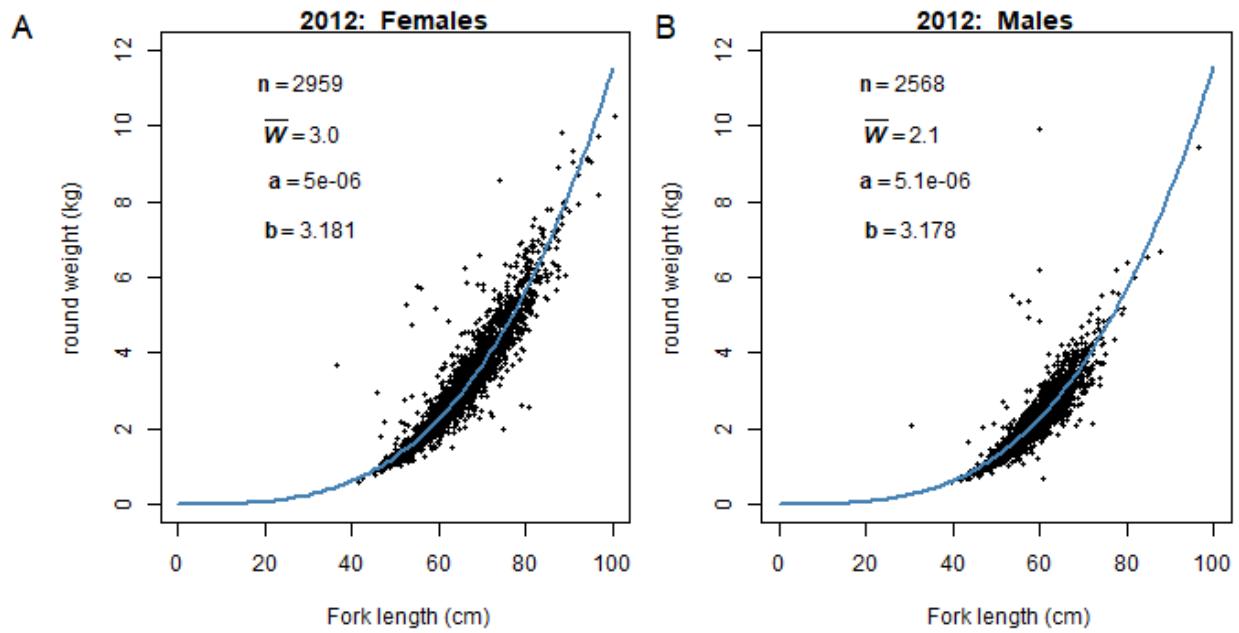
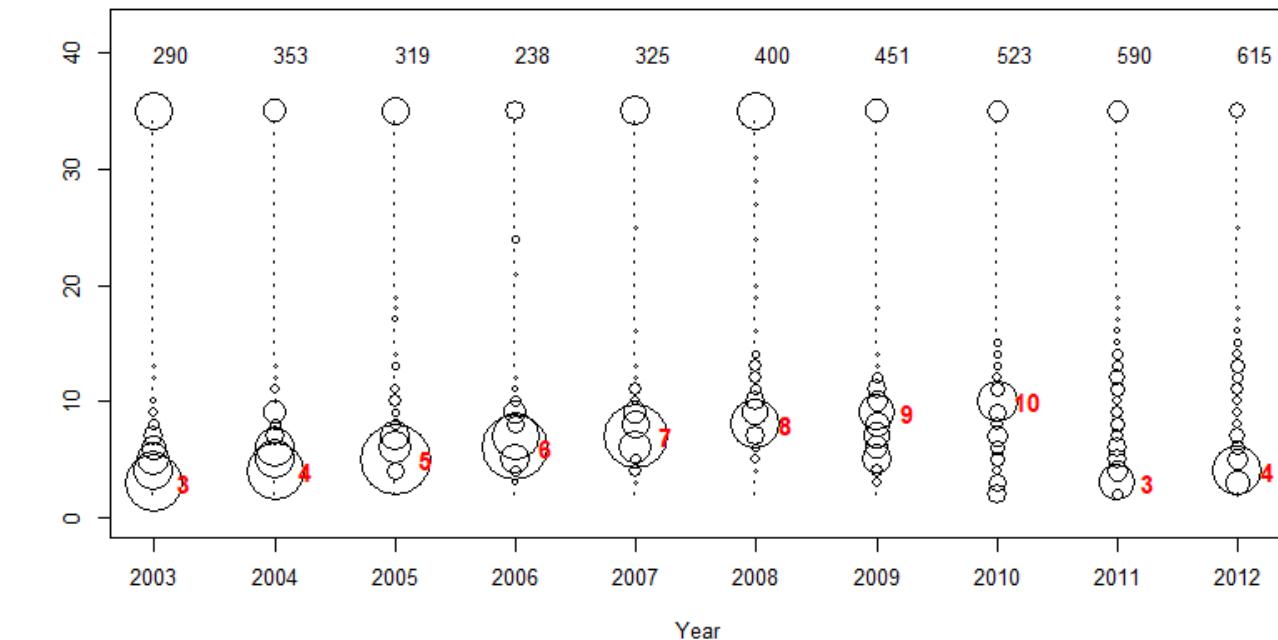


Figure 12. Sablefish fork length (L in cm) vs weight (W in kg) for females (A) and males (B) for the 2012 survey.

A

Females

Age

Males

B

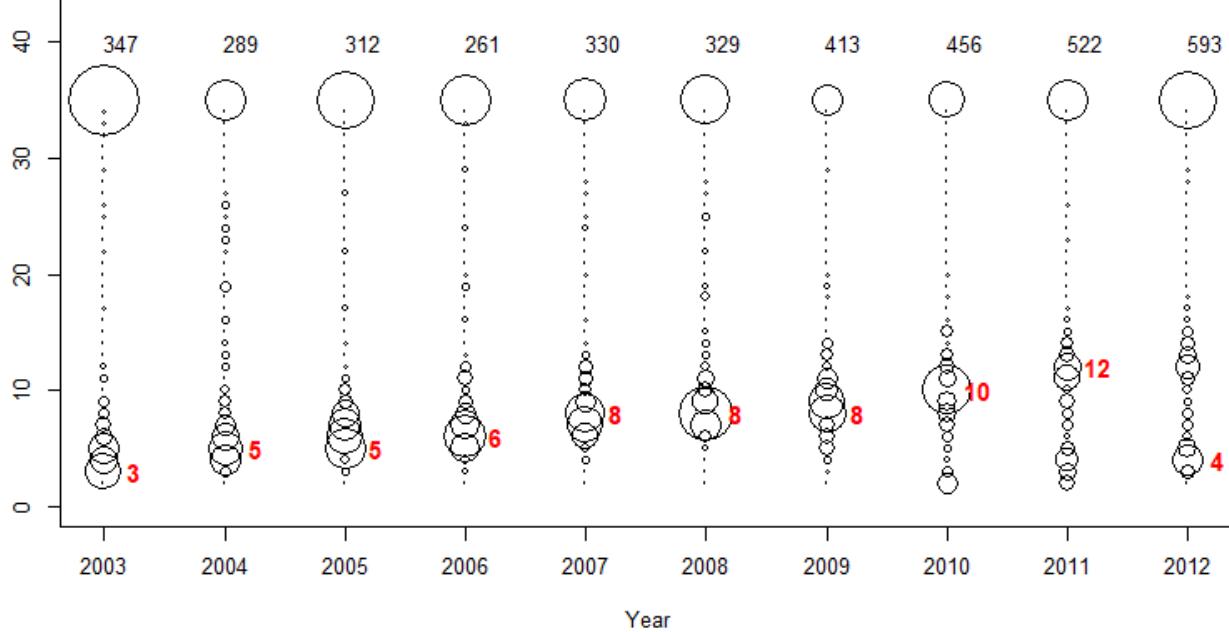


Figure 13. Bubble plot for female (A) and male (B) sablefish ages by survey year from StRS sets that have been aged. The sizes of the circles are proportional to the number of fish with given ages. Fish age 35 and older are included in one bubble. The total number(n) of fish aged are listed across the top of each panel. The ages with the highest ratios are posted to the right of each bubble.

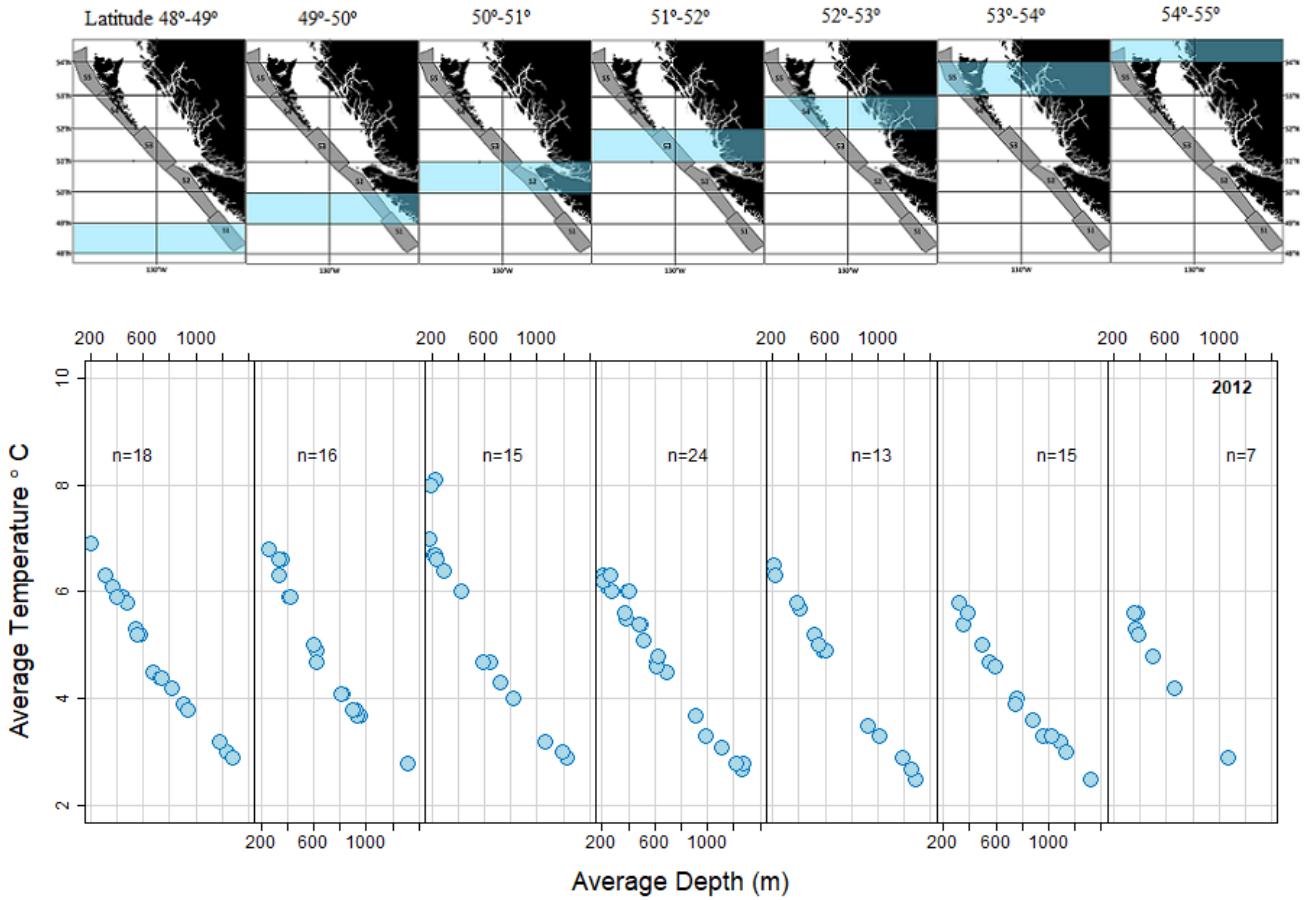


Figure 14. Coplot of average depth (m) vs average temperature ($^{\circ}\text{C}$) for a given 1-degree latitude range (blue bands) for 2012. The number of fishing sets deployed with a SBE 39 recorder are represented by n.

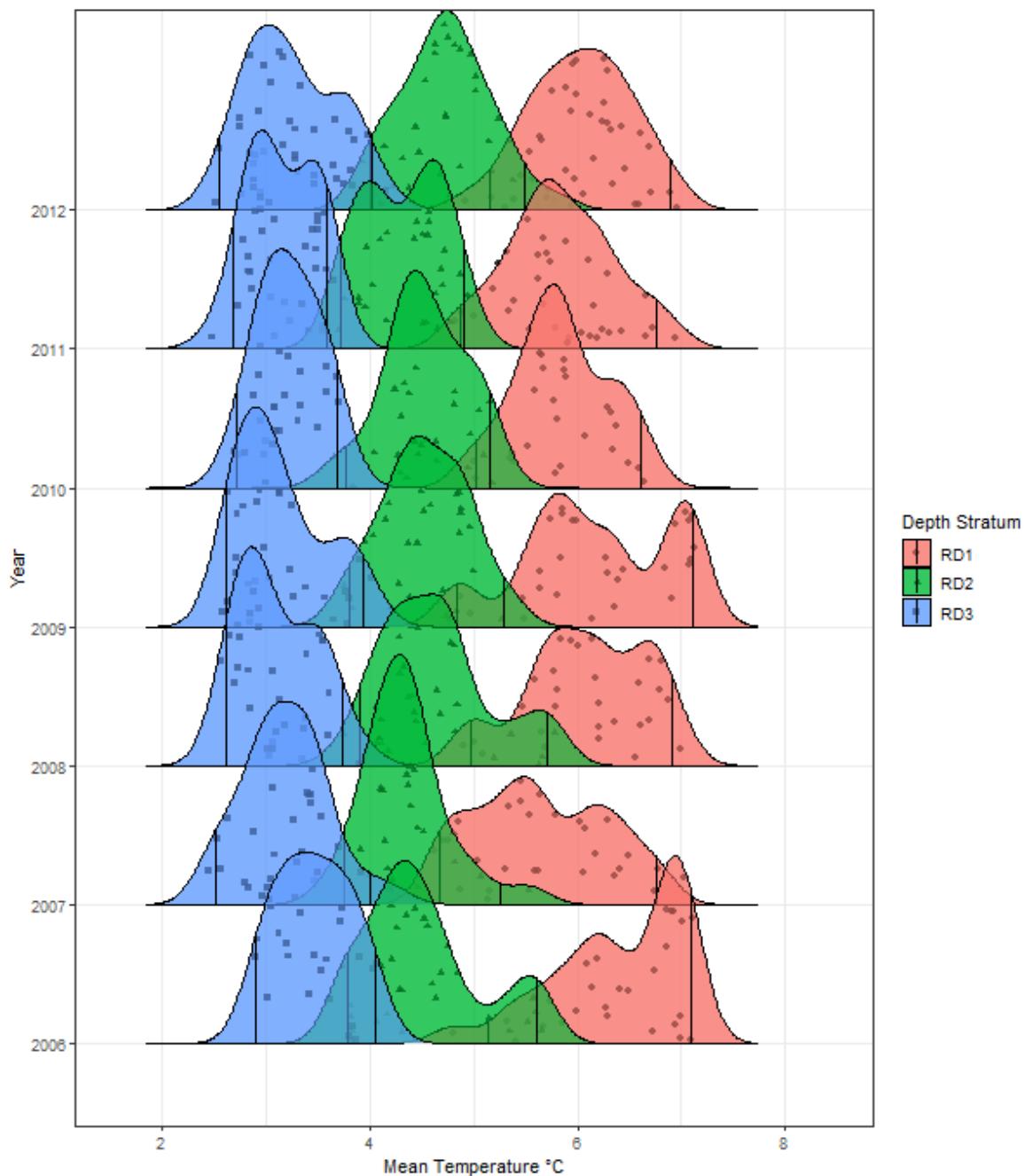


Figure 15. Vertical density ridgeplots of mean temperatures per year as reported by set from the Sea-bird SBE 39 loggers on traps at three depth intervals, RD₁ = shallow (100-450 m), RD₂ = mid (450-850 m), RD₃ = deep (850-1400 m). Lines indicate the 2.5% and 97.5% tails.

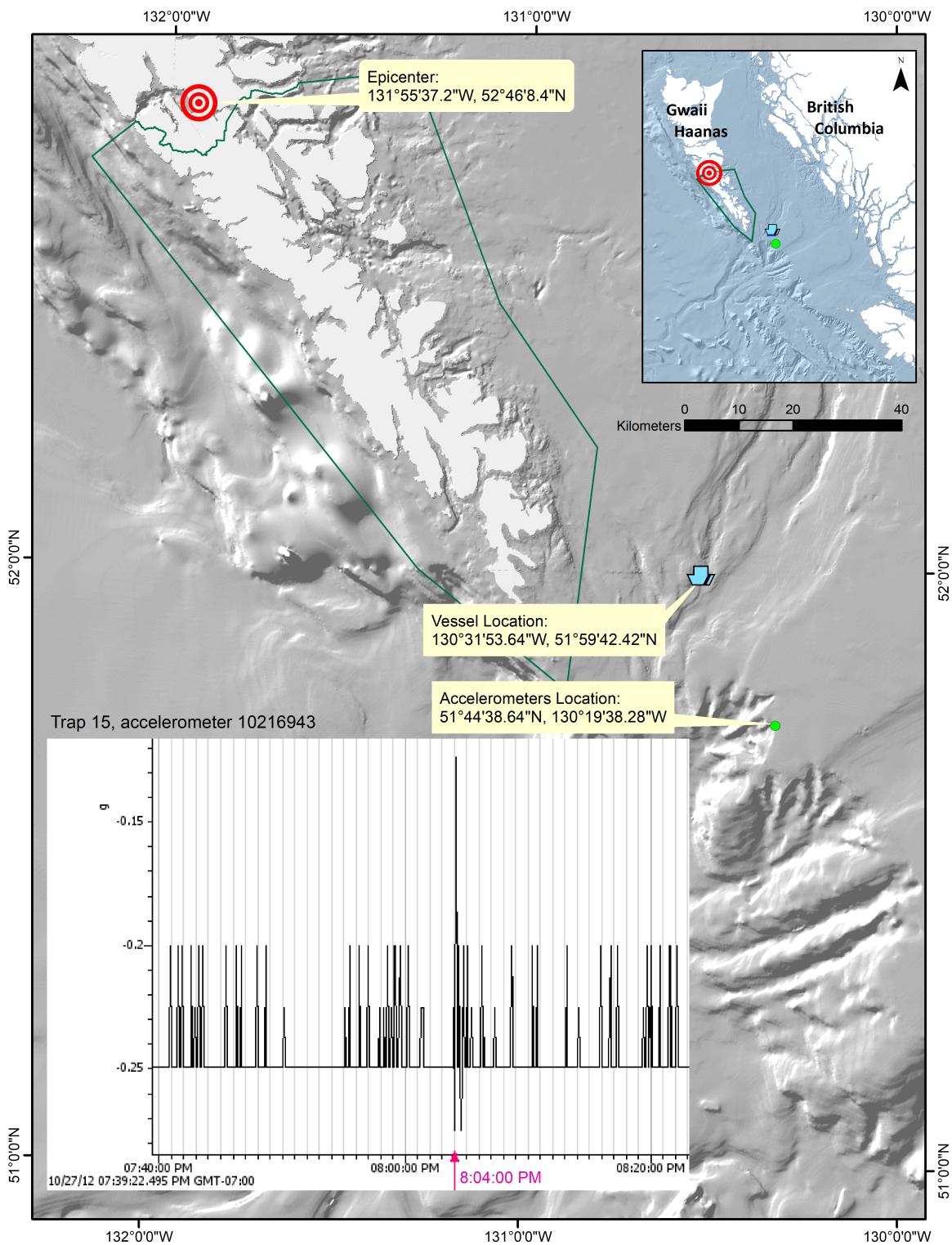


Figure 16. Location of the vessel, accelerometer and the epicentre of a 7.7 magnitude earthquake on Saturday October 27, 2012 at 8:04 p.m. Trap 15 accelerometer captured the earthquake event (inset).

APPENDIX A LIST OF SABLEFISH RESEARCH AND ASSESSMENT SURVEYS.

Year	Dates	Vessel	Captain	Set Count	GFBIO Id
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.

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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.

1st Buoy Number: 5 Time: 16:12

1st ANCHOR TIME 16:20

NUMBER TRAPS SET: JK JK JK JK Total: 25

TEMP-DEPTH RECORDER:

Serial Number: 3903 On Trap #: 3

MISSED BECKETS:

2nd ANCHOR TIME 16:31

2nd 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.

updated 19/09/2011

SABLEFISH CHARTER CATCH LOG

DATE: October 26, 2012

SET NUMBER: 065

pg 1 / 1

VESSEL: Ocean Pearl

RECORDER: Jonas B.

1ST Buoy

5 HHMM

16:47

1ST Anchor Aboard:

HHMM

17:02

trap	SABLEFISH		species 2		species 3		species 4		species 5		species 6	
	num	use	#	kg	#	kg	#	kg	#	kg	#	kg
1	T	6	10.2	6	12.6	9	13.7					
2	D	10	15.4	10	15.3	10	13.7	10	14.9	4	7.5	
3	A	10	21.2	10	18.9			1	1.3	1	Nept.	see back
4	T	10	19.1	3	5.4							1x5in
5	D	10	20.8	11	17.3	1	1.8					
6	D	10	22.8	10	16.4	10	18.4			1	2.6	
7	T	6	17.6	8	14.7	4	7.4	12	23.3		3.7	
8	D	11	25.3	9	16.6	10	18.0			1	Nept.	
9	D	10	20.1	4	7.9	10	18.5					
10	T	10	19.2	10	20.1	10	20.6	2	5.5			
11	D	10	18.7	10	16.9	10	18.8	15	29.3	10	19.1	4 6.9
12	D	10	18.9	3	8.5							
13	T	4	14.8	8	16.7					1	5.0	
14	D	10	22.1	10	20	2	3.9					2x4in
15	A	5	9.2									
16	T	9	19.6	7	17.8							
17	D	9	18.3	6	12.4							
18	A	2	6.0	5	9.6							
19	T	11	23.1									1x3in
20	D	1	2.3	Tagged	10	11.9						
21	A	16	21.9	21								
22	F	2	5.8									
23	D	10	19.3	2	7.9							
24	X	10	18.1	9	17.2							
25	T	15	22.9									seen with F
Total			423.8		296		134.8	73		26.0		6.9

2ND Buoy

9 HHMM

17:42

2ND Anchor Aboard:

HHMM

17:31

COMMENTS: 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. This form was completed during hauling by the science staff recorder positioned at the weighing scale.

Length Sex Species			page <u>111</u>
SABLEFISH CHARTER BIOSAMPLING SHEET			
Vessel: <u>OCEAN PEARL</u>	<u>0732</u>	Set Number: <u>046</u>	Recorder: <u>IAN</u>
Sample Date: <u>2012 10 22</u>	<u>Y Y Y M M M</u>	Sampler: <u>LISA</u>	<u>107A</u>
Catch Storage: <u>fresh</u> Specimen Form: <u>round</u> Length Unit: <u>mm</u> Sample Source: <u>unsorted</u>			
Species: <u>TURBOT</u> <u>602</u> Total number sampled: <u>1</u>			
Length Type: <u>FORK</u> Sample Type (circle one): <u>Random</u> / <u>Total</u>			
Fish Number	Length	Sex	
1	<u>5733</u>		
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: <u>DOGFISH</u> <u>044</u> Total number sampled: <u>28</u>			
Length Type: <u>TOTAL</u> Sample Type (circle one): <u>Random</u> / <u>Total</u>			
Fish Number	Length	Sex	
1	<u>7201</u>		
2	<u>8721</u>		
3	<u>7801</u>		
4	<u>7351</u>		
5	<u>7102</u>		
6	<u>9412</u>		
7	<u>8331</u>		
8	<u>7402</u>		
9	<u>7341</u>		
0	<u>7651</u>		
Fish Number	Length	Sex	
1	<u>7951</u>		
2	<u>7101</u>		
3	<u>7601</u>		
4	<u>7631</u>		
5	<u>7421</u>		
6	<u>7512</u>		
7	<u>7661</u>		
8	<u>7751</u>		
9	<u>7232</u>		
0	<u>7641</u>		
Fish Number	Length	Sex	
1	<u>7141</u>		
2	<u>7022</u>		
3	<u>8691</u>		
4	<u>7591</u>		
5	<u>8231</u>		
6	<u>8541</u>		
7	<u>7541</u>		
8	<u>7751</u>		
9			
0			
Species: _____ Total number sampled: _____			
Length Type: _____ Sample Type (circle one): <u>Random</u> / <u>Total</u>			
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			

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

Vessel: OCEAN PEARL 4 732 Set Number: 065 pg: 4, 4

Date:¹¹ 2012 08 26 Sample Type: RANDOM 19 82

Tagger: GUY BOXALL 21 358 Recorder: LACKO 25 2071

Species: SABLE FISH 29 455 Tag Type: ANCHOR 32 10

Tag Check	Primary Tag Number prefix <small>35-37</small>	Fork Length (mm)	Comments/ previous tag number				
			Error 1	Error 2	Injury 1	Injury 2	
	A 0 0						
34	38 39 40 41 42 43	44 45 46 47 48 49 50 51					
	4 7 1 4 2 0	4 9 5					
		1 5 2 5	F				
		2 5 9 1					
0	4 2 3	5 8 7					
	4	6 2 3					
	4 2 5	U N K					
	4 2 6	5 8 5					
	7	5 6 8	P				
	8	5 5 5					
	4 2 9	6 8 2		1b			
0	4 3 0	5 8 3					
	1	5 7 5	F				
	2	5 9 5					
	3	6 0 4					
	4	6 1 5					
	5	5 7 1					
	3 6	6 5 1					
	7	5 4 2					
	8	6 1 5					
	4 3 9	5 6 5		1b			
	4 4 0	5 1 1					
0	4 4 1	5 0 6					
	2	6 1 0					
	3	5 1 5					
	4	5 5 6					
	4 7 1 4 4 5	5 8 0					
	6	5 6 1	F				
	7	5 5 5					
	8	6 3 1					
0	4 4 9	6 7 2		1b			
	4 5 0	5 4 8					
	1	5 7 5					
	2	5 9 0					
	3	5 4 2					
	4 5 4	5 2 2					
	4 5 5	5 2 8					
	6	5 8 3					
	4 5 7	5 3 3	F				
0	4 5 8	5 6 5		9			
	9						

COMMENTS:

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 = missshapen 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 NUYTCO AUTONOMOUS CAMERA SYSTEM.

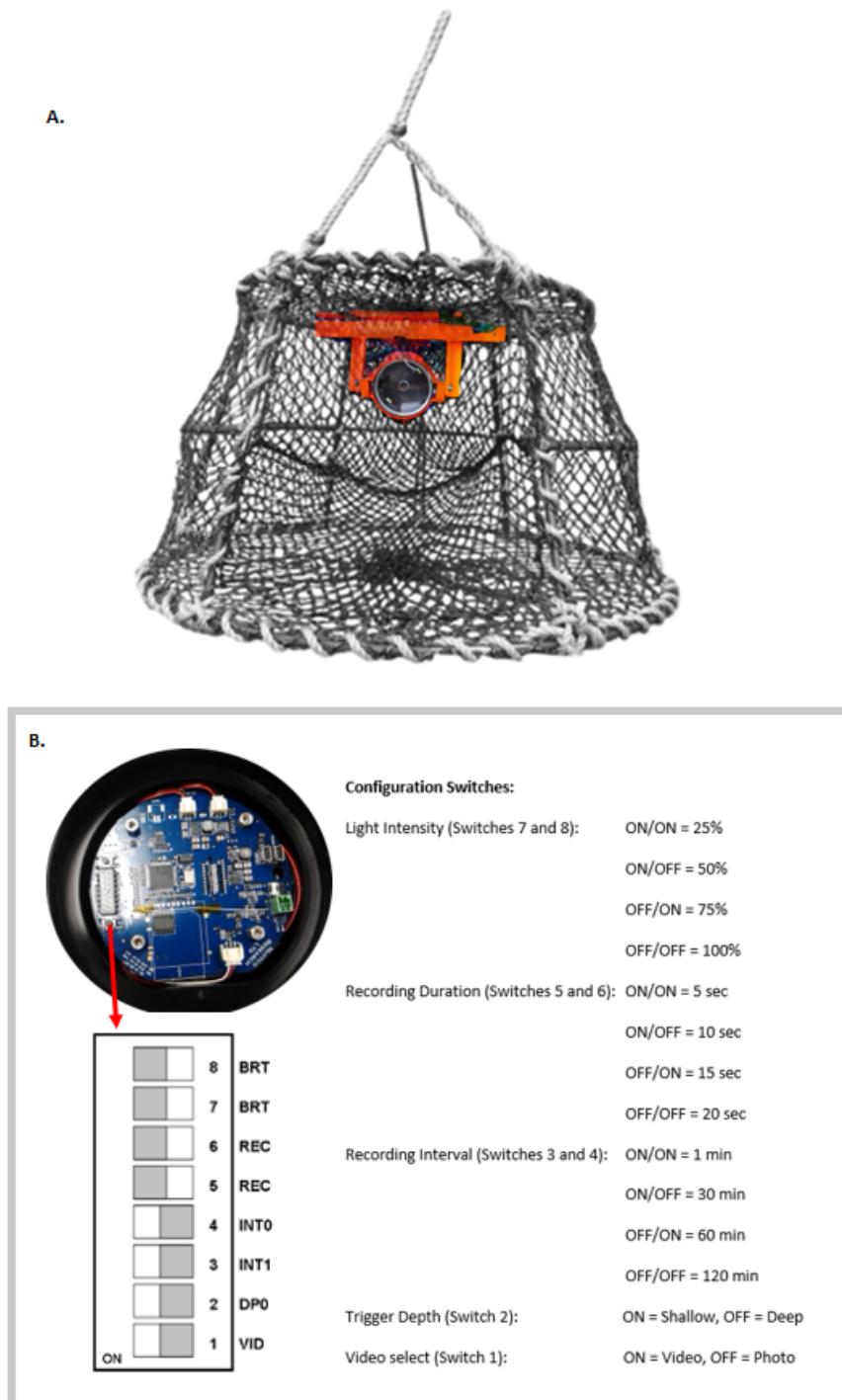


Figure C.1. Nuytco autonomous camera in bracket mounted to the frame of a trap (A). Internal motherboard configuration settings (B).

APPENDIX D SET DETAILS 2012.

Details of sets completed during the 2012 survey program (F/V Ocean Pearl). Sets are listed by spatial name, set type, depth stratum, start date, end of gear deployment time and duration in minutes. The depth strata for StRS sets include RD₁ (100-250 fathoms), RD₂ (250-450 fathoms) and RD₃ (450-750 fathoms). The position data includes the major area, start and end latitude and longitude in degrees decimal minutes. The bottom depths (meters) of the fishing set are listed 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, Hobo accelerometer or Nuytco autonomous camera 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 E SUMMARY OF BASKET USE BY TRAP 2012.

Summary of the basket use by trap number for 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. Set numbers highlighted in blue indicate exploratory sets and those highlighted in green indicate sets at mainland inlet localities. No fish were retained in traps on camera sets 6, 7 and exploratory set 42.

Set	Trap																									Total			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	A	D	T	-
1	D	A	T	D	A	T	D	D	T	D	D	T	D	A	T	A	T	D	A	T	D	D	A	T	D	6	10	8	1
2	A	T	D	A	T	D	A	T	D	A	T	D	A	T	D	A,F	T	D	A	T	D	D	T	D	A	8	9	8	0
3	A	T	D	A	T	D	A	T	D,F	D	T	D	A	T	D	T	D,F	A	T	D	A	T	D	A	7	9	8	1	
4	D	A		A	D	A	T	A	A				A	A		A	A	A	A	A	A	A	A	A	T	11	2	2	10
5	T	D	A	T	A	A	T	A	A	T	A	A	A	T	A	A	A	A	A	T	A	A	T	14	1	7	3		
8	A	T	D	D	T	D	A	T	D	D	T	D	A	A	A	A	A	A	A	T	A	D	T	D	D	8	9	7	1
9	D	A	T	D	A	T	D	D	T	D	A	T	D	D	T	D,D	T	D	A	T	D	A	T	D	5	12	8	0	
10	T	D	A	T	D	A	T	D	A	T	D	A	T	D	A	T	A	T	A	A	T	D	A	T	9	6	9	1	
11	D	T	D	T	A	A	A	A				A	A	T	A	T	A,F	A	A	A	T	A	T	A	11	2	5	7	
12	T	D	A	T	D	A	T	D	A		A	T	A	T	A	T	A	T	A	A	T	T	A	T	9	3	8	5	
13	A	T	D	D	T	D	A	T	D	A	T	D	D	T	D	D	D	T	D	D	T	D	D	D	3	14	8	0	
14	T	A	T	A		A	A	T		A	T	A		A	D	A	T	A	A	T	A		T	T	8	1	7	9	
15	T	D	T	D	A		A	A	T	D	A	T	D	D	D	D	T	D	A	T	D	D	T	T	5	10	8	2	
16	A	D	T	A		A		T	D		T	D		T	D	T	T	A	T	A	T	D	D	A	7	5	7	6	
17	T	D	A	T			T	A	A	T							A	T	A	T	A	T	A	T	T	6	1	7	11
18	A	T	A	A	T		A	T	A	A	T	A	A	A	A	T	D	A	T	A		D	D	D	12	3	6	4	
19	D	A	T	D	A	T	A	A	T	D	A	T	D	D	T	D	A	T	D	A	T	D	D	T	7	9	8	1	
20	T	D	A	T	D	A	T	D	D	T	D	D	T	D	D	D	D	T	D	D	T	D	A	T	4	12	9	0	
21	D	A	T	D	A	T	D	A	T	D,A	T,F	D	A	T	D	A	T	D	A	T	D	D	T	D	D	7	10	8	0
22	T	D	A	T	D	A	T	D	A	T	D	A	T	D	A	T	D	A	T	D	D	T	D	D	D	7	9	9	0
23	T	A	A	T	A		A		A	A	D		D	A	T	D	A	T	D	D	T	D	D	D	7	7	5	6	
24	T	A	A	A	A	T	A	A				A	A	A	A	A	A	A	T	A	A	T	A	T	A	11	0	6	8
25	D	A			A	T		A	T	A	A	T	A	A	T	A	A,F	A	T	A	A				13	1	6	5	
26							D																			0	1	0	24
27	T	A	D	A	T	D	A	T	D	A	T	D	T	T	D	T	D	A	D	A	T	D	A	T	6	7	7	5	
28	A	T	A	T	D	A	T	D	A	T	D	A	T	D	A	T	D	A	T	D	D	T	D	D	7	9	8	1	
29	T	A	A	A	A	A	T	A		T	A	A	T	A	T	A	T	A	D	D	T	D	T	T	9	2	6	8	
30	A	A	A	A	A	A			A,F	A	A	A	A	A	A	A	A	T	A	A				T	12	0	2	11	
31	D,F	T	A,F	A	T	A	T	A	A	D	A	T	T	A	T	D	D	T	D	A					8	5	7	5	
32	T	D	A	D	A	A	T	D	T	D	A	T	A	T	D	D	T	D	D	T	D	A	T	6	9	8	2		
33	A	T			A	T	A	A	T	A	A	T	A		T	A	A	T	A	A	T	A	A	T	13	0	7	5	
34	A	A			A	T	A		A	A	A	T	A	A	T	A	A	T	A	A	T	D	A	T	13	1	6	5	
35	T	A,F	A,F	T	A	T	A	A	T	D	A	T	D	D	T	D	A		D	T	D	D	7	7	7	4			
36	A		A		A	T	D	A	A	A	T	D	A	T,F	D,F	A	T		T		T			8	3	5	9		
37	T	D	A	T	A	A	T	A	A	T	A	A	T	D	D	T	D	A	T	D	A	T	T	10	6	9	0		
38	A	T	D	A	T	D		T	D	A	T	D	A	T	D	A	T	D	D	D	T	D	T	T	5	10	9	1	

continued.

Set	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	A	D	T	-	
39		T			T	A	A			A	A							A								5	0	2	18	
40	T	D	A	T	D	T		A	T	A	A	T	D	A	T	D	T	T	A	A	T	D	A	8	5	8	4			
41	D	A	T	D	A	T	D	D,F	T	D	D	T	D	A	T	D	D	T	D	T	D	A	T	D	4	12	8	1		
43														A												1	0	0	24	
44	A	A			A	T	A	A	T	D			A	A	T	D	A	T	A					A	A	T	11	2	5	7
45	A	A	T	D	A	T	D	D	T	D	D	T	D	D	T	D	A	T	A	A	T	A	T	7	8	8	2			
46	T	A		D	A		D	T	D	A,F	T		A	T				T	D	D	T,F	D	A	5	6	6	8			
47	A	A	T	A	T	A	A	T	A	A	A	T	A	A	T	A	D	T	A	A	T	A	D	D	13	3	7	2		
48	A	T	D	A	T	D	A	T	A	A	T	D	A	T	D	A	T	A	A	A	T	D	11	5	7	2				
49		A		A	A	A	T	D	A	A		A	A	D	T		A	T		D	D	7	4	3	11					
50	T	D	A	T	D	A	T	D	A		A		A	T	D	A	T	D	A				A	T	8	5	6	6		
51	D,F	A			T	A		T			A						A							A	5	1	2	17		
52	T	A	D	T	D	A	T	D	A		D	A	T	D	T		T	A	T	A	A	T	8	6	8	3				
53		T	A	A	A	A	A	T	A	T	A	T	A	T				A	A	T				8	0	5	12			
54	T	A	A	A	A	T	A	A	T	A	A	T	D	D	T	D	A	T	D	T	A	D	9	5	7	4				
55	T	D	A	T	D	A	T	D	A	T	D	A	A	T	D	D	D	T	D	D	T	T	5	10	8	1				
56	A	T	A	A	T	A	A	T	A	A	A	T	A	A	T	T	A	A	T	A	A	14	0	7	4					
57	T	D	A	T	D	D	T	D	D	T	D	D	T	D	D	T	A	D	T	D	D	T	2	14	9	0				
58	A	T	D	D	T	D	D	T	D	D	T	D	D	A	T	D	A	T	A	A	T	D	5	11	8	1				
59	A			T		T			A			A	T	A	A	T		A	T					7	0	5	13			
60	T		T	A	A	T	A	T	A		A	A		A	A	A	A	A	A	T	A		11	0	5	9				
61	D	A	T	D	A	T	A	D	T	D	D	T	D	D	T	D	D	T	D	D	T	D	3	14	8	0				
62	T	D	A	T	D	D	T	D	D	T	D	A	T	D	D	T	D	D	T	D	D	T	3	13	9	0				
63	A	T	D	A	T	D	A	T	A	A	T	D	A	T	A	A	T	D	A	A	A	A	12	5	7	1				
64	A	A	A	A		T			T		T	A	A	A	A	T								5	0	3	17			
65	T	D	A	T	D	D	T	D	D	T	D	D	A	T	D	A	T	D	A	T	D	A	5	11	9	0				
66	A	T	D	A	T	D	D	T	D	A	T	D	D	T	D	D	T	A	T	D	D	T	4	13	8	0				
67	T	D	A	T	A	A	T	D	D	T	D	A	T	D	D	T	D	A	T	D	D	T	6	9	9	1				
68	A	A	T	D	A	T	A	T	A		T	A	A	T	A	A	T	A	T	A	A	T	11	1	7	6				
69	T								A														1	0	1	23				
70	A		T	A			T	A	A	T	A						T	A	A	T	A			8	0	5	12			
71	A	A	A	T	D	T	A	D	A	T	D	T		A	T	A		A	A	A	A		9	3	5	8				
72	T	D	A	T					T	A	T	A	A	T	A	A								A	8	1	5	11		
73	A	T	D	A	T	A	D	T	D	D	T	D	A	A	A	T	D	A	T	D	A	9	8	7	1					
74	T	A	T	A	A	A	T	A	A	A	T	A	A	A	T	A	T	A	A	T	A	A	13	0	6	6				
75	A	A	T	A	T	A	T	A	A	T	D	A	T	A	A	A	T	A	A	T	A	A	13	1	7	4				
76	A	T	D	A	T	D	D	T	D	A	T	D	A	T	D	D	T	D	D	T	D	A	5	12	8	0				

continued.

Set	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	A	D	T	-
114	T	D	D	T	D	A	T	D	A	D	A	T	D	D	T	D	A	D	A	T	D	A	T	6	10	7	2		
115	D	A	T		D	T	D	A	T	D	D,F	T	D	D	D	T	D	D	D	T	D	D	T	2	13	8	2		
116	A	T	T			T			A	T	A	T	A				A	T	A	A	A	T	A	8	0	7	10		
117	T	A	T	A	T	A	T	D	T	D	T	D	T	D	T	A	T	T	D	T	D	T	A	T	5	6	13	1	
118	A	T	D	T	A	T	D	T	A	T	D	T	D	T	D	T	D	T	A	T	D	T	4	8	12	1			
119	A	T	D	T	A	T	A	T	D	T	D	T	D	T	D	T	A	T	D	T	D	T	A	T	5	8	12	0	
120	T	A	T	D	T	D	T	D	T	D	T	D	D	T,F	D	T	A	T	A	T	D	A	T	T	4	8	12	1	
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	3	9	12	1	
122	A	T	A	T	D	T	D	T	D	T	D	T	D	T	A	T	D	T	D	T	D	T	D	T	3	10	12	0	
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	3	9	12	1	
124	A	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	A	T	A	T	D	T	D	T	3	10	12	0	
125	T	D	T	D	T	D	T		T	A	T	A	T	A	T	A	T	T	A	D	T	D	T	5	5	12	3		
126	A	T	D	T	D	T	D	T	D	T	D	T	A	T	D	T	D	T	D	T	D	T	D	T	2	11	12	0	
127	T	T	A	T	D	T	A	T	A	T	D	T	A			T	A	T	T	A	T	D	T	6	3	12	4		
128	A	T	D	T	D	T	D	T	D	T	D	T	A	T	D	T	D	T	T	D	T	D	T	D	2	10	12	1	
129	T	A	T	D	T	A	T	D	T	D	T	A	T	D	T	D	T	D	T	A	T	D	T	A	T	5	7	13	0
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	2	11	12	0	
131	T	A	A			A	A	A	A	A	A	A	A	A	A	A	A	T	A	T	A	T	A	T	11	0	6	8	
132	A	A	A	T	A		T		T	D	T		A	A	A	T	A	A	T	A	T	A	T	A	9	1	7	8	
133	T	A	T	A	T	A	A	T	A	D		T	A	T	A	T	T	D	T	A	T	8	2	10	5				
134	A	T	A	T	D	T	D	T	A	T	D	T	A	T	A	T	A	T	A	T	A	T	A	7	4	10	4		
135	T	T	T	A	T								A	T,F	A,F	T	A	A	A	5	0	6	14						

APPENDIX F SUMMARY OF SABLEFISH BIOLOGICAL DATA 2012.

Specimen counts of biological data collected for sablefish by set, including catch weight in kilograms and numbers of fish. Details include a tally of specimens recovered, tagged and sampled. Mean fork lengths for tagged sablefish and sampled male and female sablefish are listed. No sablefish catch was reported on camera sets 6, 7 and exploratory set 42.

Set	Total Catch			Tagged Fish Counts			Tagged Fork Lengths(mm)			Specimen Count						Mean Fork Length(mm)		
	kg	Count	Count by Trap	Recover-Rerelease	Sampled	Released	Count	Mean	Fork Length	Sex	Maturity	Otoliths	Weight	Count	Proportion Males	Males	Females	
54	1	514	213		1	0	60	61	603	62	62	62	62	62	0.42	566	639	
	2	389	195		1	0	48	49	569	68	68	68	68	68	0.66	559	603	
	3	320	167		0	0	49	49	576	57	57	57	57	57	0.74	552	615	
	4	141	45		0	0	2	2	660	41	41	41	41	41	0.05	608	650	
	5	250	69		1	0	20	21	683	43	43	43	43	43	0.07	651	676	
	8	327	169		0	0	50	50	560	47	47	47	47	47	0.79	562	601	
	9	603	275		0	0	74	74	597	47	47	47	47	47	0.53	576	623	
	10	336	164		0	0	58	58	568	55	55	55	55	55	0.80	553	624	
	11	192	66		0	0	19	19	623	44	44	44	44	44	0.25	588	643	
	12	206	89		0	0	37	37	611	39	39	39	39	39	0.69	588	593	
	13	730	432		1	0	131	132	525	44	44	44	44	44	0.80	525	539	
	14	206	83		0	0	32	32	601	41	41	41	41	41	0.63	600	598	
	15	893	315		2	0	61	63	629	84	84	84	84	84	0.36	618	639	
	16	277	97		0	0	31	31	607	48	48	48	48	48	0.48	616	659	
	17	208	44		0	0	27	27	719	10	10	10	10	10	0.10	618	761	
	18	263	76		0	0	16	16	660	52	52	52	52	52	0.06	648	673	
	19	369	194		1	0	60	61	567	49	49	49	49	49	0.82	532	630	
	20	710	451		2	0	184	186	519	56	56	56	56	56	0.82	525	514	
	21	444	178		0	0	45	45	605	62	62	62	62	62	0.66	588	679	
	22	418	226		2	0	87	89	568	63	63	63	63	63	0.65	542	556	
	23	265	154		2	0	27	29	543	63	63	63	63	63	0.63	540	528	
	24	194	48		0	0	20	20	694	28	28	28	28	28	0.00	0	700	
	25	219	71		0	0	26	26	675	40	40	40	40	40	0.73	606	703	
	26	3	1		0	0	0	0		0	0	0	0	0	0.00	0	0	

continued.

Set	Total Catch			Tagged Fish Counts			Tagged Fork Lengths(mm)		Specimen Count							Mean Fork Length(mm)		
	kg	Count	Count by Trap	Recover-Rerelease	Sampled	Released	Count	Mean	Fork Length	Sex	Maturity	Otoliths	Weight	Count	Proportion Males	Males	Females	
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	
48	355	140		1	0	53	54	601	55	55	55	55	55	55	0.58	583	620	
49	315	103		0	0	17	17	637	61	61	61	61	0	61	0.18	572	635	
50	453	127		0	0	39	39	659	47	47	47	47	47	47	0.15	636	677	

continued.

Set	Total Catch			Tagged Fish Counts			Tagged Fork Lengths(mm)		Specimen Count						Mean Fork Length(mm)		
	kg	Count	Count by Trap	Recover-Rerelease	Sampled	Released	Count	Mean	Fork Length	Sex	Maturity	Otoliths	Weight	Count	Proportion Males	Males	Females
51	29	11		0	0	1	1	559	8	8	8	8	8	8	0.38	617	625
52	592	207		0	0	84	84	633	51	51	51	51	51	51	0.33	599	661
53	153	29		0	0	9	9	801	20	20	20	20	20	20	0.20	685	747
54	336	101		0	0	30	29	664	45	48	48	48	48	48	0.25	606	666
55	591	297		0	0	137	137	562	53	53	53	53	53	53	0.85	555	572
56	213	54		1	0	15	16	707	38	38	38	38	38	38	0.05	664	705
57	1,181	654		2	0	273	275	544	57	57	57	57	57	57	0.56	557	531
58	641	222		1	0	65	66	636	52	52	52	52	52	52	0.33	617	640
59	131	41		1	0	19	20	697	20	20	20	20	0	20	0.20	639	620
60	151	54		0	0	16	16	659	34	34	34	34	34	34	0.15	590	632
61	668	432		1	0	114	115	536	59	59	59	59	59	59	0.59	516	541
62	710	373		0	0	132	132	557	60	60	60	60	60	60	0.77	549	604
63	305	115		2	0	41	43	634	49	49	48	49	48	49	0.22	598	631
64	42	10		0	0	2	2	767	7	7	7	7	7	7	0.00	0	700
65	953	482		1	0	151	151	568	61	61	61	61	61	61	0.77	564	587
66	924	401		1	0	146	146	586	57	57	57	57	57	57	0.51	582	631
67	531	155		0	0	50	50	672	50	50	50	50	50	50	0.32	617	667
68	360	87		1	0	40	41	707	39	39	39	39	39	39	0.15	609	704
69	22	4		0	0	3	3	761	2	2	2	2	2	2	0.50	558	778
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

APPENDIX G SUMMARY OF BIOLOGICAL DATA FOR ROUGHEYE/BLACKSPOTTED ROCKFISH COMPLEX.

Biological data collected for rougheye/blackspotted rockfish complex in 2012. Each set is listed with counts of specimens sampled, calculations of mean fork lengths and number visually identified as either a RE = rougheye rockfish, BS = blackspotted rockfish or a hybrid.

Species Name	Set	Specimen Count						Mean Fork Length(mm)			Visual id Count			
		Fork Length	Weight	Sex	Maturity	Otolith	DNA	Total Count	Proportion Males	Males	Females	No sex	RE	
ROUGHEYE/ BLACKSPOTTED ROCKFISH COMPLEX	11	1	1	1	1	1	1	1	1	440	0	0	1	0
	14	22	22	22	22	22	22	22	0.5	475	493	0	21	1
	16	6	6	6	6	6	6	9	0.5	442	488	0	5	1
	22	25	25	25	25	25	25	54	0.28	457	456	0	18	7
	23	26	26	26	26	26	26	26	0.54	459	489	0	19	7
	25	4	4	4	4	4	4	4	0.75	471	505	0	4	0
	27	15	15	15	15	15	15	16	0.73	484	529	0	8	7
	30	9	9	9	9	9	9	9	0.44	488	524	0	9	0
	36	3	3	3	3	3	3	3	1	459	0	0	2	1
	50	4	4	4	4	4	4	4	0.5	406	507	0	4	0
	52	2	2	2	2	2	2	2	1	452	0	0	0	2
	54	8	8	7	7	8	8	8	0.43	468	466	511	1	7
	58	19	19	19	19	19	19	18	0.63	423	430	0	5	14
	65	3	3	3	3	3	3	3	0.33	615	578	0	3	0
	67	52	52	52	51	52	52	52	0.65	451	453	370	17	35
	74	20	20	20	20	20	20	20	0.45	472	450	0	0	20
	75	5	5	5	5	5	5	5	0.4	425	475	0	1	4
	76	6	6	6	6	6	6	6	0.67	486	438	0	2	4
	79	3	3	3	3	3	3	3	1	452	0	0	1	2
	81	9	9	9	9	9	9	9	0.78	462	454	0	0	9
	82	8	8	8	8	8	8	8	0.38	470	469	0	0	8
	85	3	3	3	3	3	3	3	0.33	423	421	0	0	3
	86	31	31	31	31	31	31	31	0.45	480	508	0	9	22
	87	14	14	14	14	14	14	14	0.5	461	463	0	1	13
	93	23	23	23	23	23	23	24	0.35	479	475	0	7	16
	98	10	10	10	10	10	10	283	0.6	466	509	0	3	7
	99	10	10	10	10	10	10	24	0.3	514	506	0	1	9
	101	10	10	10	10	10	10	17	0.2	498	592	0	5	5
	110	17	17	17	17	17	17	64	0.35	460	469	0	4	13
	111	15	15	15	15	15	15	74	0.27	470	474	0	5	10
	112	10	10	10	10	10	10	97	0.4	453	503	0	1	9
	120	1	1	0	0	1	1	1	0	0	0	480	0	1
	132	1	1	1	1	1	1	1	0	0	526	0	0	1
Total		395	395	393	392	395	395	915				157	238	

APPENDIX H SUMMARY OF BIOLOGICAL DATA FOR OTHER SPECIES.

Details of biological data collected from species other than sablefish or rougheye/blackspotted rockfish during the 2012 survey. The number of specimens taken for length and sex, proportion males and mean lengths are listed by species and set number.

Species Name	Set	Length Type	Specimen Count			Mean Length(mm)			
			Length	Sex	Total Count	Proportion Males	Males	Females	No sex
ARROWTOOTH FLOUNDER	11	FORK LENGTH	25	25	36	0.00	0	585	0
	12		13	13	23	0.00	0	568	707
	14		2	2	2	0.00	0	635	0
	15		18	18	18	0.00	0	593	565
	22		1	1	1	0.00	0	496	0
	23		5	5	6	0.00	0	551	0
	25		22	22	39	0.00	0	592	602
	27		19	19	21	0.00	0	608	0
	29		21	21	25	0.00	0	602	560
	30		15	15	15	0.00	0	601	589
	36		10	10	14	0.00	0	601	671
	41		2	2	4	0.00	0	564	0
	42		16	16	16	0.00	0	555	527
	43		22	22	22	0.00	0	565	552
	46		1	1	1	0.00	0	0	573
	49		11	11	16	0.00	0	583	612
	50		4	4	4	0.00	0	555	0
	51		1	1	1	0.00	0	689	0
	54		14	14	15	0.00	0	559	0
	58		8	8	8	0.00	0	618	0
	59		13	13	25	0.00	0	553	0
	60		30	30	39	0.00	0	548	0
	65		1	1	1	0.00	0	495	0
	67		22	21	41	0.00	0	568	507
	68		21	21	61	0.00	0	589	0
	69		7	7	7	0.00	0	571	0
	70		28	28	28	0.00	0	540	0
	71		19	19	20	0.00	0	552	493
	74		77	77	77	0.00	0	565	567
	75		30	30	70	0.00	0	550	0
	76		27	27	53	0.00	0	555	0
	77		4	4	4	0.00	0	546	0
	78		3	3	3	0.00	0	571	0
	79		4	4	4	0.00	0	573	0
	80		7	7	8	0.00	0	572	613
	81		7	7	7	0.00	0	584	0
	83		10	10	12	0.00	0	548	0
	85		3	3	3	0.00	0	600	0
	86		9	9	9	0.00	0	566	555
	87		7	7	7	0.00	0	571	535
	93		23	23	23	0.00	0	566	0
	99		2	2	2	0.00	0	536	0
	101		9	9	10	0.00	0	564	0
	103		3	3	3	0.00	0	546	0
	104		2	2	2	0.00	0	595	0
	110		7	7	7	0.00	0	546	0
	111		30	30	51	0.00	0	580	0
	112		23	23	46	0.00	0	568	0
	113		16	16	16	0.13	431	560	0
	114		9	9	10	0.00	0	512	0

continued.

Species Name	Set	Length Type	Specimen Count			Mean Length(mm)			
			Length	Sex	Total Count	Proportion Males	Males	Females	
	115		11	11	12	0.00	0	580	0
	121		2	2	2	0.00	0	554	0
	122		1	1	1	0.00	0	601	0
	124		2	2	2	0.00	0	569	0
	125		5	5	5	0.00	0	545	0
	126		3	3	3	0.00	0	548	0
	128		1	1	1	0.00	0	595	0
	132		1	1	1	0.00	0	844	0
	133		2	2	2	0.00	0	473	0
	134		1	1	1	0.00	0	576	0
AURORA ROCKFISH	82	FORK LENGTH	2	2	2	0.50	324	368	0
	93		1	1	1	1.00	357	0	0
GREENSTRIPED ROCKFISH	15	FORK LENGTH	1	1	1	0.00	0	327	0
	60		1	1	1	1.00	268	0	0
LINGCOD	51	FORK LENGTH	3	3	3	0.00	0	927	930
PACIFIC COD	29	FORK LENGTH	1	1	1	1.00	471	0	0
	42		1	1	1	0.00	0	0	735
	43		7	7	7	0.29	646	724	0
	124		1	0	1	0.00	0	0	580
PACIFIC HALIBUT	11	FORK LENGTH	2	2	15	0.00	0	814	0
	23		1	1	1	0.00	0	861	0
	25		1	1	11	1.00	799	0	0
	27		1	1	5	0.00	0	0	803
	30		1	1	4	0.00	0	870	0
	36		1	1	1	0.00	0	0	802
	51		6	6	9	0.67	814	1080	0
	53		1	1	2	0.00	0	961	0
	71		1	1	11	0.00	0	990	0
	119		4	4	9	1.00	813	0	953
REDBANDED ROCKFISH	14	FORK LENGTH	3	3	3	0.33	414	416	0
	22		1	1	1	0.00	0	436	0
	23		1	1	1	1.00	381	0	0
	25		7	7	7	0.29	411	418	0
	27		6	6	6	0.50	419	478	0
	29		3	3	3	1.00	447	0	0
	30		6	6	6	0.83	405	452	0
	42		2	2	2	0.50	370	360	0
	43		2	2	2	0.50	373	333	0
	49		7	7	7	0.86	438	473	0
	50		9	9	9	0.67	433	444	0
	51		2	2	2	0.50	435	539	0
	53		5	5	5	0.60	443	458	0
	54		22	22	25	0.55	435	449	0
	58		10	10	10	0.70	387	423	0
	59		3	3	3	1.00	408	0	0
	60		6	6	6	1.00	434	0	0
	67		9	9	9	0.67	435	430	0
	68		4	4	4	0.50	455	579	0
	69		15	15	15	0.60	452	487	0
	70		5	5	5	0.80	470	508	0
	71		2	2	2	0.00	0	412	0
	74		9	9	9	0.67	443	433	0
	75		14	14	14	0.64	414	450	0
	76		6	6	6	0.67	448	504	0
	77		9	9	9	0.33	486	510	0
	80		16	16	16	0.38	447	444	0

continued.

Species Name	Set	Length Type	Specimen Count			Mean Length(mm)		
			Length	Sex	Total Count	Proportion Males	Males	Females
	85		3	3	3	0.67	466	408
	86		3	3	3	0.67	435	432
	87		5	5	5	0.80	425	441
	93		2	1	2	1.00	445	0
	101		8	8	8	0.38	465	468
	113		1	1	2	1.00	341	0
	115		2	2	2	0.50	519	330
	125		1	1	1	0.00	0	373
ROSETHORN ROCKFISH	50	FORK LENGTH	1	1	1	0.00	0	300
	60		2	2	2	1.00	289	0
	68		2	2	2	1.00	307	0
	70		2	2	2	1.00	251	0
SHORTRAKER ROCKFISH	29	FORK LENGTH	1	1	1	0.00	0	701
	36		1	1	1	1.00	843	0
	41		1	1	1	0.00	0	604
	54		2	2	2	0.50	624	680
	58		1	1	1	1.00	331	0
	65		2	2	2	0.00	0	594
	78		4	4	4	0.75	448	588
	79		4	4	4	0.25	658	589
	81		9	9	9	0.67	627	627
	82		10	10	10	0.70	652	545
	83		2	2	2	1.00	536	0
	84		1	1	1	1.00	621	0
	86		3	3	3	0.67	723	561
	87		5	5	5	0.40	477	595
	93		7	7	7	0.57	677	686
	99		4	4	4	0.00	0	635
	104		2	2	2	0.00	0	577
	131		2	2	2	0.50	406	794
WALLEYE POLLOCK	113	FORK LENGTH	2	2	2	0.00	0	489
	132		1	0	1	0.00	0	0
							0	520
YELLOWEYE ROCKFISH	42	FORK LENGTH	1	1	1	0.00	0	520
	51		3	3	3	1.00	604	0
	53		3	3	3	0.33	572	492
	69		1	1	1	1.00	615	0
	77		21	21	22	0.33	577	576
	85		4	4	4	0.50	582	628
YELLOWMOUTH ROCKFISH	60	FORK LENGTH	2	2	2	1.00	438	0
NORTH PACIFIC SPINY DOGFISH	23	PRE-CAUDAL LENGTH	1	1	1	0.00	0	895
	30		1	1	1	0.00	0	825
	42		1	1	1	0.00	0	862
	43		1	1	1	0.00	0	873
	49		2	2	2	0.00	0	862
	53		1	1	1	0.00	0	842
	59		1	1	1	0.00	0	920
	70		1	1	1	0.00	0	865
	77		1	1	1	0.00	0	900
	80		1	1	1	0.00	0	920
	85		1	1	1	0.00	0	852
	93		4	4	4	0.00	0	904
	112		1	1	1	0.00	0	906
	114		1	1	1	0.00	0	860

continued.

Species Name	Set	Length Type	Specimen Count			Mean Length(mm)			
			Length	Sex	Total Count	Proportion Males	Males	Females	
GIANT GRENADEIER (PECTORAL RATTLAIL)	1	SNOUT TO ANAL FIN LENGTH	4	4	4	0.33	230	258	248
	4		4	4	4	0.50	311	259	0
	5		4	4	4	0.00	0	357	0
	17		18	18	18	0.17	280	366	0
	24		12	12	12	0.25	308	335	0
	39		10	10	10	0.00	0	325	0
	40		1	1	1	0.00	0	291	0
	47		2	2	2	0.50	24	375	0
	56		14	14	14	0.21	274	340	0
	62		1	0	1	0.00	0	0	762
	63		2	2	2	0.00	0	349	441
	64		2	2	2	0.00	0	455	0
	72		5	5	5	0.20	310	375	0
	84		1	1	1	0.00	0	378	0
	88		8	8	8	0.25	280	354	0
	89		1	1	1	0.00	0	326	0
	90		6	6	6	0.33	287	348	0
	91		2	2	2	0.50	258	307	0
	92		25	25	25	0.24	262	307	0
	94		5	5	5	0.20	264	304	0
	95		12	12	12	0.00	0	293	0
	96		23	23	23	0.35	245	338	0
	105		1	1	1	0.00	0	416	0
	106		3	3	3	0.00	0	404	0
	107		13	13	13	0.00	0	337	0
	108		2	2	3	0.00	0	334	0
	109		14	14	14	0.07	310	366	0
PACIFIC GRENADEIER	4	SNOUT TO ANAL FIN LENGTH	4	4	4	0.75	165	196	0
	5		11	11	11	0.91	204	136	0
	17		16	16	16	0.69	207	215	0
	18		10	10	10	0.70	202	205	0
	24		30	30	67	0.52	211	230	224
	28		2	2	2	0.00	0	259	0
	33		1	1	1	0.00	0	322	0
	34		1	1	1	1.00	176	0	0
	37		1	1	1	1.00	124	0	0
	39		29	29	58	0.72	206	244	0
	40		1	1	1	0.00	0	190	0
	44		18	18	53	0.83	205	227	0
	45		1	1	1	0.00	0	105	0
	56		38	38	74	0.71	211	226	0
	63		1	1	1	0.00	0	200	0
	64		18	18	48	0.89	209	218	0
	72		28	28	86	0.50	209	221	0
	73		8	8	8	0.88	187	185	0
	88		30	30	47	0.90	200	212	0
	90		30	30	69	0.90	214	220	0
	91		1	1	1	0.00	0	210	0
	92		26	26	41	0.31	218	221	0
	94		8	8	8	0.63	183	191	0
	95		6	6	6	0.33	193	190	0
	96		30	30	71	0.37	315	243	0
	105		1	1	1	1.00	210	0	0
	107		25	25	25	0.56	196	206	0
	109		5	5	5	0.40	209	222	0
DOVER SOLE	11	TOTAL LENGTH	2	2	2	0.00	0	542	0

continued.

Species Name	Set	Length Type	Specimen Count			Mean Length(mm)		
			Length	Sex	Total Count	Proportion Males	Males	Females
	12		2	0	2	0.00	0	0
	22		2	2	2	0.00	0	477
	23		2	2	2	0.00	0	337
	36		1	1	1	0.00	0	508
	45		2	2	2	0.50	415	502
	57		1	1	1	1.00	405	0
	59		1	1	1	1.00	465	0
	75		1	1	1	0.00	0	582
	78		1	1	1	0.00	0	0
	99		3	3	3	0.00	0	516
	132		1	0	1	0.00	0	0
GIANT BLOBSULPIN	56	TOTAL LENGTH	1	1	1	0.00	0	655
LONGSPINE THORNYHEAD	3	TOTAL LENGTH	1	1	1	1.00	240	0
	4		1	1	1	0.00	0	183
	10		1	1	1	1.00	265	0
	28		2	2	2	0.50	227	233
	31		1	1	1	0.00	0	236
	38		2	2	2	0.50	233	244
	91		1	1	1	0.00	0	222
	100		1	1	1	0.00	0	206
NORTH PACIFIC SPINY DOGFISH	11	TOTAL LENGTH	2	2	2	1.00	689	0
	12		3	3	3	0.67	726	692
	14		67	67	67	0.49	726	717
	15		62	62	62	0.31	684	682
	22		8	8	8	0.38	729	714
	23		27	27	27	0.46	713	684
	25		34	34	34	0.24	654	655
	27		24	24	24	0.38	693	680
	29		26	26	26	0.50	705	674
	30		7	7	7	0.38	744	689
	42		8	12	12	0.15	738	932
	43		9	12	12	0.15	897	904
	46		28	28	28	0.79	776	795
	49		27	27	27	0.38	809	907
	50		29	29	29	0.24	782	778
	51		8	8	8	0.00	0	961
	53		33	33	33	0.21	758	766
	54		21	21	21	0.19	799	806
	58		5	5	5	0.40	647	795
	59		9	9	9	0.20	794	820
	60		33	33	33	0.30	740	754
	67		20	20	20	0.15	790	767
	68		11	11	11	0.27	741	766
	69		4	4	4	0.00	0	897
	70		19	19	19	0.30	734	789
	71		16	16	16	0.00	0	796
	77		22	22	22	0.30	813	992
	80		28	28	28	0.14	820	1016
	85		18	18	18	0.05	835	981
	86		19	19	19	0.44	822	889
	87		17	17	17	0.35	847	936
	93		7	7	7	0.00	0	916
	101		26	26	26	0.31	806	858
	112		3	3	3	0.00	0	961
	113		10	10	10	0.60	754	798
	115		1	1	1	0.00	0	870

continued.

Species Name	Set	Length Type	Specimen Count			Mean Length(mm)			
			Length	Sex	Total Count	Proportion Males	Males	Females	No sex
	122		6	6	6	0.00	0	746	0
	123		4	4	4	0.00	0	801	0
	124		1	1	1	0.00	0	806	0
PACIFIC FLATNOSE	4	TOTAL LENGTH	1	1	1	0.00	0	382	0
	17		3	3	3	1.00	523	0	0
	24		5	5	5	0.80	471	485	0
	39		1	1	1	1.00	554	0	0
	56		5	5	5	0.40	444	481	0
	72		3	3	3	1.00	455	0	0
	88		1	1	1	1.00	490	0	0
	90		2	2	2	1.00	478	0	0
	96		3	3	3	1.00	493	0	0
PINK SNAILFISH	5	TOTAL LENGTH	1	1	1	0.00	0	385	0
	44		1	0	2	0.00	0	0	335
SHORTSPINE THORNYHEAD	3	TOTAL LENGTH	2	2	2	0.50	355	571	0
	19		1	1	1	1.00	381	0	0
	28		2	2	2	0.00	0	259	0
	31		2	2	2	0.00	0	428	0
	33		1	1	1	1.00	427	0	0
	34		1	1	1	0.00	0	554	0
	37		12	12	12	0.67	458	469	0
	38		1	1	1	1.00	535	0	0
	40		4	4	4	0.75	390	353	0
	44		1	1	1	0.00	0	530	0
	45		2	2	2	0.50	360	358	0
	47		2	2	2	1.00	455	0	0
	56		2	2	2	0.50	401	432	0
	60		1	1	1	0.00	0	535	0
	63		1	1	1	1.00	460	0	0
	65		1	1	1	1.00	357	0	0
	66		1	1	1	1.00	395	0	0
	74		1	1	1	0.00	0	457	0
	75		1	1	1	1.00	420	0	0
	76		1	1	1	0.00	0	635	0
	82		4	0	4	0.00	0	0	481
	91		1	0	1	0.00	0	0	374
	94		2	2	2	0.50	440	454	0
	97		1	0	1	0.00	0	0	711
	100		1	1	1	1.00	463	0	0
	103		1	1	1	0.00	0	389	0
	104		1	1	1	1.00	423	0	0
	109		1	1	1	1.00	350	0	0
	110		1	1	1	0.00	0	362	0
	124		1	0	1	0.00	0	0	450

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