Summary of the annual 2021 Sablefish (Anoplopoma fimbria) trap survey, October 6 – November 21, 2021

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SUMMARY OF THE ANNUAL 2021 SABLEFISH (*ANOPLOPOMA FIMBRIA*) TRAP SURVEY, OCTOBER 6 - NOVEMBER 21, 2021

by

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This document describes sampling activities and summarizes results from the 2021 British Columbia Sablefish research and assessment survey. The survey was comprised of stratified random sets (StRS) at five depth-stratified areas and standardized sets at one traditional inlet locality. Four sets were dedicated to bottom contact research with three deep-water autonomous cameras mounted on a 60 trap string. Biological sampling was conducted for Sablefish and incidentally captured species such as rockfishes and Lingcod. Sablefish were randomly sampled from every third trap on all sets, up to a maximum sample count of 50. The tag and release study conducted annually since 1991 was continued in 2021.

A total of 41,020 Sablefish were caught on StRS sets in 2021, of which 3,865 were used for biological samples and 8,013 were tagged and released. Due to weather conditions, 77 out of 111 planned StRS blocks and one out of four mainland inlets were surveyed. Survey CPUE are presented in relation to previous years to describe trends over time. In the most recent two years, survey data from stratified random sets show a slight increasing trend in CPUE. At the 2021 StRS sites, the stratified mean survey abundance was 36 kg/trap, up 3% from 2020 and down -6% from the 2019-2020 average.

RÉSUMÉ

Lacko, L.C., Acheson, S.M. and Holt, K.R. 2023. Summary of the annual 2021 Sablefish (*Anoplopoma fimbria*) trap survey, October 6 - November 21, 2021. Can. Tech. Rep. Fish. Aquat. Sci. 3530: vii + 48 p.

Le présent document décrit les activités d'échantillonnage réalisées dans le cadre du relevé d'évaluation et de recherche de 2021 sur la morue charbonnière mené en Colombie-Britannique, et résume les résultats connexes. Ce relevé comprenait des traits ayant fait l'objet d'un échantillonnage aléatoire stratifié qui ont été effectués dans cinq zones stratifiées en fonction de la profondeur et des traits normalisés réalisés dans un site traditionnel des bras de mer. Quatre traits ont été consacrés à la recherche de fond avec trois caméras autonomes en eau profonde montées sur une ligne de 60 pièges. On a effectué un échantillonnage biologique pour la morue charbonnière et les espèces capturées accidentellement, comme les sébastes et les morues-lingues. On a échantillonné les morues charbonnières capturées de façon aléatoire à partir du troisième casier de chaque trait, jusqu'à l'atteinte d'une taille d'échantillon maximale de 50 individus. L'étude de marquage et de remise à l'eau menée annuellement depuis 1991 s'est poursuivie en 2021.

Au total, 41 020 morues charbonnières ont été capturées en 2021 au moyen de traits ayant fait l'objet d'un échantillonnage aléatoire stratifié. Parmi celles-ci, 3 865 ont été utilisées pour le prélèvement d'échantillons biologiques et 8 013 ont été marquées, puis remises à l'eau. En raison des conditions météorologiques, 77 des 111 des blocs d'échantillonnage aléatoire stratifié et un des quatre bras de mer continentaux ont fait l'objet d'un échantillonnage. Les CPUE des relevés sont présentées en rapport avec les années précédentes afin de décrire les tendances au fil du temps. Au cours des deux dernières années, les données de relevé provenant des ensembles aléatoires stratifiés montrent une légère tendance à l'augmentation des CPUE. Aux sites où ces traits ont été effectués en 2021, l'abondance moyenne stratifiée du relevé était de 36 kg/casier, soit une augmentation de 3 % par rapport à 2020 et une diminution de 6 % par rapport à la moyenne de 2019-2020.

1 Introduction

British Columbia (BC) Sablefish (*Anoplopoma fimbria*), also known as black cod, is a highly valuable commercial fish species that is harvested directly by the commercial groundfish K (Sablefish) and T (Trawl) licence sectors. They are also intercepted by the non-directed groundfish longline hook fisheries of the L (Pacific Halibut), ZN (rockfishes), LC (Lingcod) and DF (North Pacific Spiny Dogfish) licence sectors. BC vessels have landed an average of 2,227 metric tons of Sablefish annually over the past ten years (2012 to 2021), with the majority captured in 2021 by longline trap gear (58%) and longline hook gear (34%).

Fishery-independent research surveys using longline trap gear have been conducted by the Department of Fisheries and Oceans (DFO) in collaboration with the Canadian Sablefish Association under a collaborative agreement. Survey procedures have evolved over time with: 1. standardized fishing sets (1988 - 2010) and traditional tagging sets (1991 - 2007) conducted at offshore indexing localities; 2. traditional tagging sets conducted at offshore tagging localities (1995 - 2008); 3. standardized fishing sets conducted at mainland inlet localities (1994 - 2019, 2021); and 4. stratified random sets conducted within five spatial strata (2003-2021).

These surveys are used to obtain catch rate data, gather biological samples, capture oceanographic measurements, record gear bottom contact and collect tag release and recapture data. 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 (DFO 2020). In 2021, the Canadian Sablefish Association implemented a multi-year research study to understand and quantify movement of longline trap gear.

2 Methods

2.1 SURVEY DESIGN

The 2021 Sablefish research and assessment surveys employed a stratified random sampling (StRS) design and a traditional standardized inlet component. The methods for these elements are described in Sections 2.1.1 and 2.1.2, respectively. In addition, a new design component was added to the survey in 2021 to support a multi-year investigation of the impacts of longline trap gear on the ocean floor. The methodology for this gear movement work is described in Section 2.1.3.

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 which occurred from 1990 to 2010 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 strata (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 for a total of 75 targeted survey blocks. From 2006 through 2010, the number was increased to six blocks per stratum. An analysis was completed for the 2011 survey to optimize the allocation of the blocks to strata for the 2011 and 2012 surveys. The sampling rate was increased to a target of 110 blocks. In order to lower survey costs, the number of blocks was reduced for the 2013 survey, from 110 to 91 offshore blocks while maintaining the same relative allocation of blocks to strata. This target number of blocks has been in place on all subsequent surveys, including 2021 (Table 1).

2.1.2 TRADITIONAL MAINLAND INLET SURVEY COMPONENT

Under the traditional mainland inlet design, sets were allocated to five specific polygons in each of the following four areas: Portland Inlet, Gil Island, Finlayson Channel, and Dean/Burke Channel (Figure 1). In 2021, only Dean/Burke Channel was fished.

2.1.3 GEAR MOVEMENT RESEARCH

The objectives for the gear movement research in 2021 were to: 1. validate estimates of gear movement derived from a movement classification algorithm developed from 25-trap strings of Sablefish gear; and 2. estimate bottom-contact and gear movement from 60-trap strings in BC coastal fishing grounds, by collecting movement data near the ends and middle of the string.

Data to support the first research objective were collected via the deployment of trap cameras on selected sets from the StRS design component. The target number of 25-trap StRS sets with cameras was 25 in 2021. There were no specific requirements for which StRS sets the camera package should be deployed; however, on days in which 60-trap experimental gear movement sets were done (described below), attempts were made to deploy in the same depth range as the experimental set. On days with no experimental sets, attempts were made to spread the sets over depth strata.

Data to support the second research objective were collected by deploying additional "experimental" sets with 60 traps on a string. The 60-trap gear movement sets were new in 2021; gear movement research in previous years had only involved the 25-trap strings used for the StRS survey, as described above. Sixty-trap experimental sets were added in 2021 to better represent commercial fishing practices, and to compare gear movement behavior with the 25-trap strings. The target for 2021 was to complete five sets in each of the three depth strata, for a total of 15 experimental 60-trap sets. Set locations were selected by the Fishing Master and were only planned for days that could accommodate the deployment and retrieval of traps without affecting StRS survey operations. Experimental sets were required to be set at least 1 nautical mile away from any survey blocks that had not yet been fished and were not used for abundance indexing purposes.

No tagging or biological sampling were conducted on any species caught on the experimental gear movement sets, with the exception of Sablefish tag recoveries. If a tagged fish was encountered, then the fish was sampled, as opposed to being re-released.

2.2 GHNMCA AND HAIDA HERITAGE SITE

Approval was granted for three years (2021 to 2023) to conduct research sets in the designated multi-use zones of the GHNMCA (Gwaii Haanas National Marine Conservation Area), as identified in the Gwaii Haanas Gina 'Waadluxan KilGuhlGa Land-Sea-People Management Plan https://www.pc.gc.ca/en/pn-np/bc/gwaiihaanas/info.

2.3 VESSEL

The 2021 survey of 77 fishing sets and four gear movement sets was chartered aboard the F/V Pacific Viking (Figure 2), skippered by Albert (Deacon) Melnychuk between Oct 6 - Nov 21 , 2021 (Appendix A). Information about the vessel can be found at http://marinetraffic.com.

2.4 FISHING GEAR

The longline trap gear for StRS and inlet sets consisted of a groundline resting on the ocean floor with 25 baited traps attached to beckets at 150 foot intervals along its length and 90 pound anchors at each end (Figure 3a). 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 3b).

The tunnels were made of green braided, knotless, 1.25 inch mesh. Although the traps did not include escape rings, a 'rot panel' of #21 cotton was 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.

2.5 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, an adjacent block was chosen as a replacement, either to the east or west of the original block, or failing that, to the north or south. If none of those blocks met the criteria, an alternate block in the same area and depth stratum was randomly chosen.

Two science staff recorded information associated with the deployment of the gear. One science member was positioned in the wheelhouse and entered data in the GFBioField Bridge Log form within the Electronic Data Acquisition System (EDAS) (Olsen 2010). The global positioning system (GPS) and bottom sounder data were logged continuously for the duration of the survey and designated fields on the bridge log were auto-populated. Details on electronic entry of all EDAS GFBioField forms mentioned in this document are available in the GFBio Field User Guide (Olsen 2010).

A set paper 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 deployment time and identity of the first and last buoys, the times that the first and last traps were deployed, a tally of beckets and traps, as well as the information about the data recorders that were deployed (which trap they were in, and the unique identifying number of each data recorder) (Appendix B). The science recorder on the back deck also ensured that each trap deployed was correctly baited and not damaged.

2.5.1 Stratified Random Component (StRS)

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.

2.5.2 Traditional Standardized Inlet Component

Fishing sets in inlet localities had a targeted soak time of 18 hours. These sets were designated useable if hauled between 16 and 20 hours, compatible with the historic inlet survey protocols. Traps were baited with 2 pounds of bagged squid.

2.5.3 Gear Movement Research

2.5.4 25 Trap Strings

For the subset of StRS sets selected for gear movement research, cameras and associated equipment (Section 2.10.1) were placed in an open, unbaited trap positioned in the middle of a 25 trap string of gear. Specifically, camera traps were positioned as trap 13 on the string, increasing the total number of traps to 26 so that there remained 25 traps fished as part of the StRS design.

2.5.5 60 Trap Strings

These sets were intended to replicate commercial fishing practices, and as such, closed traps were baited at the discretion of the Fishing Master as per commercial fishing practices. Soak time was also at the discretion of the Fishing Master, with gear deployed and retrieved at times convenient to other operations. Trap cameras were deployed in open, unbaited traps located at positions 5, 35, and 55 on the 60-trap string.

2.6 CATCH PROCESSING

The skipper modified haulback speed as needed, to allow the science crew to accurately record catch as each trap came on board. Two science staff were positioned on deck at the haul card station; one recorded the catch and the other managed the movement of baskets. In addition, the catch recorder entered set details into the EDAS GFBioField Bridge Log. These included the haul start and end times, the buoy numbers, the buoy retrieval times, the first and last trap retrieval times, and the trap number which contained the data recorder.

As the groundline was hauled, each becket and trap was entered in the EDAS GFBioField Trap Catch form. Crew members alerted the recorder about any damage to a trap (i.e., holes) which was then recorded in the EDAS GFBioField Trap Usability form.

The crew sorted catch by species from every trap, and counted the catch into baskets. Catch counts for each basket of fish were recorded, and weighed to the nearest 0.2 kg on a motion compensating scale. Each basket was given a basket use code of D, A, T, SD or F. Code D designated fish species as discards or commercial catch; code A allocated fish to age samples; code T allocated Sablefish to be tagged and released; code SD identified sublegal Sablefish discards; code F represented fish frames with amphipod or hagfish damage.

If catch from a trap was not designated for tagging (T) or for sampling (A), then the crew sorted Sablefish into legal-sized and sublegal fish so that the sublegal fish could be released promptly after weighing.

2.6.1 Sablefish Allocation Details

Prior to 2018, Sablefish were tagged from 1/3 of the traps on StRS sets and 1/2 of the traps on the inlet sets (basket code T). Due to high catch numbers, the survey protocol was revised in 2018 to designate up to 125 Sablefish to be tagged from 1/3 of the traps on all sets. This convention was continued in 2021. 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 minimum of two traps to be used for samples. If the 2 traps contained more than 60 Sablefish total, then 50-60 specimens were randomly selected from the sample. If catch rates were low, a sufficient number of traps not designated for tagging (T), were coded as ‘A’ traps, to ensure that the biosample contained 50-60 pieces.

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 that were encountered, and to facilitate their quick return to the ocean. Legal discards (basket code D) of Sablefish were kept by the vessel and processed as commercial catch.

2.7 BIOLOGICAL SAMPLING (LWSMO)

Biological samples were collected from Sablefish and incidentally captured species such as rockfishes and Lingcod on the EDAS GFBioField Fish Recording form. Measurements were electronically recorded for fork length (L), body weight (W), sex (S) and maturity level (M). Sagittal otoliths (O) were collected and stored for potential ageing by the Sclerochronology Laboratory located at the Pacific Biological Station in Nanaimo, BC. In 2021, Shortraker Rockfish (*Sebastes borealis*), Yelloweye Rockfish (*Sebastes ruberrimus*), and Rougheye/Blackspotted Rockfish (*Sebastes aleutianus/melanostictus*) were sampled for LWSMO (~ 25 pieces/set). Tissue samples (fin clips in vials containing 95% ethanol) for DNA extraction were collected from Yelloweye Rockfish and Rougheye/Blackspotted Rockfish.

On Groundfish surveys, fin clips are routinely collected from the Rougheye/Blackspotted Rockfish complex for later species confirmation using genetic methods. Since this complex of two distinct species (Orr and Wildes 2008) have similar appearances with slight variations in colour markings and dorsal fin lengths, the sampler visually identifed 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.

Biological sampling of Lingcod (*Ophiodon elongatus*) was a special sample request for 2021.

Samples were collected for the specific purpose of supporting a paired ageing study comparing fin ages and otolith ages, so both ageing structures were collected from sampled fish. The goal of Lingcod sampling on the Sablefish survey in 2021 was to increase the number of very large Lingcod included in the length-stratified samples for the study, so a subset of large Lingcod were opportunistically collected for sampling.

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.

2.8 SABLEFISH TAGGING

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 taken on the Scantrol measuring board were electronically transferred to the EDAS GFBioField Fish Recording form (Olsen 2010). Before release, any sampling errors, injuries or damage to the fish were documented on the Fish Recording form by a second scientist who was stationed at the sample computer. Tag checks were performed systematically to ensure tag numbers on the data form matched those on the fish specimen.

Water temperature in the tagging tank was measured at 1 minute intervals by a Sea-Bird 39 temperature and pressure logger (SBE 39), which was installed in the tank during the haul.

2.9 SABLEFISH TAG RECOVERY

Any previously tagged fish brought aboard were 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 EDAS GFBioField Tag Recovery Entry form by DFO staff (Olsen 2010). DFO returned foreign tags to their country of origin through the Canadian Sablefish Association tag rewards program.

2.10 CAMERA AND OCEANOGRAPHIC SENSOR DATA COLLECTION

2.10.1 25 TRAP STRINGS

For StRS sets used for gear movement research, an open unbaited “camera” trap was added to the middle of a string of gear, for a total of 26 traps. A Nuytco autonomous deep-water camera

system, a Sea-Bird temperature and pressure logger (SBE 39) and an Actigraph xGT3X-BT accelerometer (AXL) were attached inside the trap.

The Nuytco Camera system consisted of a pressure housing with high intensity LEDs for lighting and a GoPro camera for collecting image data. Both were controlled by a microcontroller that also had an onboard accelerometer and depth recorder. The camera unit was programmed to record when triggered by movement or by depth value. The unit was placed in a bracket and mounted inside the top of the trap, with the camera facing out of the tunnel. After the data was uploaded, video footage was synced with accelerometer measurements using software developed for this purpose.

The SBE39s were housed in a PVC housing which was clipped to the inside of the trap with carabiners. They were programmed to record temperature and pressure at either 3 second intervals when deployed with a camera or accelerometer, and at 60 second intervals if deployed alone.

Accelerometers were programmed to record movement at 100 Hz and were secured in a pressure housing, which was installed in a bracket. The bracket was then bolted to the top of the trap frame. An accelerometer was also attached to the rail next to the trap hauler to provide information about the movement of the vessel during hauling.

A target number of sets were allocated for the camera trap deployments in each of the fifteen StRS area-depth strata (Table 2). Data from the CTD sensors, SBE temperature and pressure loggers were processed after the set was complete using tools on the GFBioField Upload Sensor Data form to prepare it for upload to the Groundfish database (GFBio).

2.10.2 60 TRAP STRINGS

In order to evaluate gear bottom-contact and movement from a typical commercial fishing set, 60 traps were set with electronic gear at the middle and ends of the string on fishing sets (Table 3). A Nuytco autonomous deep-water camera, SBE 39 and AXL were attached to trap number 5, 35, and 55. As with the 25 trap strings, an accelerometer was attached to the rail next to the trap hauler to provide information about vessel movement during hauling.

2.11 ELECTRONIC MONITORING (EM) 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 FISHING

The 2021 survey was 47 days long, starting in Nanaimo, BC on October 6, with crew changes on October 27, and November 2nd at Port Hardy. There were six weather days on leg one due to the October 2021 Northeast Pacific bomb cyclone. Inclement weather prevented fishing one day on leg two, and four days on leg three. In total, 81 sets were completed (Appendix C): 72 StRS sets at random sites, four 60-trap experimental sets for gear movement research (Figure 4) and five standardized sets at Dean/Burke Channel mainland inlet locality (Figure 5).

Of the 91 original blocks for the StRS portion of the survey, 4 blocks were deemed unfishable during the survey and alternate blocks were selected to replace them, two blocks were rejected after on-ground inspection and two blocks were rejected based on prior knowledge (Figure 6).

3.2 CATCH PER UNIT EFFORT (CPUE)

Catch per unit effort (CPUE) statistics for 2021 are presented in relation to the available time series for each of the survey components used to index abundance: (i) StRS (2003-2021) and (ii) traditional mainland inlet indexing sites (1991-2019).

3.2.1 Stratified Random Set CPUE

Catch rates (catch per unit effort; CPUE) as indexed by kilograms of Sablefish per trap (Figure 7) and numbers of fish per trap (Figure 8) were generally higher in the middle depth strata over the survey time series (2003-2021). In 2020 and 2021, the kg/trap and #fish/trap in the middle depth strata (RD_2) were lower than the peak reached in 2019 in all areas with the exception of South West Vancouver Island (S_1).

The mean weight of captured Sablefish in 2021 was similar or slightly lower compared to 2020 in areas S_2, S_3 and S_4, and slightly higher in the areas S_1 and S_5 (Figure 9). The stratified mean survey abundance in 2021 was 36 kg/trap, which is up 3% from 2020 and down -6% from the 2019-2020 average (Figure 10).

3.2.2 Mainland Inlet CPUE

CPUE in the mainlaind inlets has varied over time with peak CPUE occurring every 5-8 years (Figure 11 a,b). 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 2018, CPUE returned (~23 fish, and ~40 kg per trap) to the levels observed during previous peaks. In 2019, the highest catch rates of the 26 year time series were observed (~36 fish, and ~61 kg per trap).

Notably, the 2018-2019 mean weight (~1.7 kg) declined to an all time low due to large number of small fish becoming available to the survey (Figure 11 c).

No inlets were surveyed in 2020. Dean/Burke Channel was the only mainland inlet locality surveyed in 2021. It is not included in the CPUE figures because the other inlets were not sampled.

3.3 CATCH COMPOSITION

A total of thirty-eight taxonomic groups were represented in the 2021 catch from StRS sets (Table 4). These included eight roundfish species, twelve rockfish species, three flatfish species and fifteen invertebrate species. Other than Sablefish, the most common species, by weight, were North Pacific Spiny Dogfish (*Squalus acanthias*), Lingcod (*Ophiodon elongatus*), Pacific Halibut (*Hippoglossus stenolepis*) and Rougheye/Blackspotted Rockfish complex (*Sebastes aleutianus*).

A total of six taxonomic groups were represented in the catches from traditional standardized sets conducted in mainland inlet localities in 2021 (Table 5). These included one roundfish species, no rockfish species, one flatfish species and four invertebrate species. The most common species captured, in terms of total weight, other than Sablefish was Pacific Halibut.

3.4 SABLEFISH SAMPLING

A detailed breakdown of the fate of the Sablefish catch in each trap for the 2021 survey is listed in Appendix D. Over all sets, 325 traps with Sablefish were sampled and 455 traps with Sablefish were tagged.

During the 2021 StRS survey component, a total of 39,747 Sablefish were caught. Of that total, 7,720 were tagged and released and 3,605 were retained for biological sampling. Of the tagged fish, 71 were previously tagged fish that were re-released with a new tag. There were 2 previously tagged fish retained for sampling (Appendix E).

Out of the 1,273 Sablefish captured during the 2021 traditional survey component (inlet standardized sets), 359 were tagged and released, 260 were used for biological sampling and 11 were previously tagged fish re-released with a new tag (Appendix E).

The four dedicated 60-trap gear movement sets that deployed cameras captured 7,589 Sablefish. Sublegal Sablefish and other species were returned to the water, except for those fish permitted for retention under the Section 52 licence. There were 14 previously tagged fish retained for sampling (Appendix E).

Overall, the StRS sets had a higher proportion of females than males over all spatial strata (S_1 - S_5). More females than males were caught in the shallow depth stratum (RD_1) within all spatial strata (S_1 - S_5). In the mid depth stratum (RD_2), there were more males than females in S_1, S_2, S_3 and S_5. The deepest depth stratum (RD_3) saw more females in spatial strata S_1, S_2 and S_5 (Table 6).

Differences in length distributions between female and male Sablefish are exhibited in the data collected from the StRS portion of the 2003 - 2021 surveys, consistent with a sexually dimorphic growth pattern in this species. Over these 19 years, the mean fork length ($\bar{x}$) was 64.9 cm for females and 58.2 cm for males (Figure 12).

In 2021, the average mean fork length for the 1,998 females was 61.6 cm and the average mean fork length for the 1,557 males was 54.8 cm. The average length of males reached its lowest mean size since 2003 (Figure 13).

On average, female Sablefish grow faster and reach a far greater size (Figure 14 a) compared to males (Figure 14 b).

3.5 SABLEFISH SUB-LEGAL ENCOUNTERS

More than half of the sub-legal specimens were captured in the mid-depth waters of i) the northern strata of S_4 and S_5 in 2017 and 2018, ii) all spatial strata in 2019, iii) S_1, S_4 and S_5 in 2020, and iv) S_1, S_2, S_3 and S_5 in 2021 (Figure 15).

3.6 RECOVERED TAGGED SABLEFISH

Of the 426 Canadian tagged fish that were recovered on the survey, the majority (62%) had travelled no more than 50 kilometers from the release site. More than half of the recoveries (67%) were recaptured within 5 years at liberty (Table 7).

3.7 OTHER FISH SAMPLING

Length, sex, maturity, otoliths and DNA samples were collected for 151 Rougheye/Blackspotted Rockfish specimens. The science samplers visually identified 19 specimens as Rougheye, 81 specimens as Blackspotted and 1 specimen as a hybrid species (Appendix F).

Length, sex, maturity and otoliths were collected for Shortraker Rockfish, Yelloweye Rockfish, and Lingcod (Appendix G).

3.8 SABLEFISH AGES

The highest proportion of female ages in StRS sets for 2003 through to 2010 were 3, 4, 5, 6, 7, 8, 9 and 10 years of age, respectively. Then, another cohort appeared in 2011 through to 2015, showing up as 3, 4, 5, 6 and 7 year olds. In 2016, 2017 and 2018 the highest proportion of female Sablefish were ages 3, 4, and 5 year olds. Last, the years 2019, 2020 and 2021 were dominated by 3, 4 and 5 year old female Sablefish, respectively (Figure 16 a). This pattern suggests a large 2016 recruitment event with fish from this cohort dominating StRS catch in recent years.

The highest proportion of male ages in StRS sets for 2003 through to 2011 were 3, 5, 5, 6, 8, 8, 8, 10 and 12 years of age, respectively. Another cohort dominated StRS catch starting in 2012, appearing first as 4 year olds in 2012, followed by 5 year olds in 2013, 7 year olds in 2014, 7 year olds in 2015 and 8 year olds in 2016. The years 2019, 2020 and 2021 were represented by 3, 4 and 5 year old males, respectively (Figure 16 b), as was seen for females.

The maximum reported age in B.C. for females is 92 years, collected in 2003. The maximum reported age in B.C. for males is 96 years, collected in 2018.

3.9 OCEANOGRAPHIC TEMPERATURES AND DEPTHS

As with previous years, the 2021 survey data exhibited a trend of decreasing temperature with depth over 1-degree latitude intervals from southwest Vancouver Island to northwest Haida Gwaii (Figure 17).

SBE 39 recorders have been deployed on survey fishing sets since 2006. In the shallow waters, the lowest average temperature of 4.1 °C was recorded in 2016 (latitude zone 52° - 53°); the highest average temperature was 7.4 °C in 2016 (50° - 51°). In the mid-depth waters, the lowest average temperature was 2.9 °C in 2019 (52° - 53°); the highest average temperature was 6.4 °C in 2013 (50° - 51°). In the deepest waters, the lowest average temperature was 2.2 °C in 2016 (54° - 55°) and the highest average temperature was 4.1°C in 2016 (48° - 49°) (Figure 18).

3.10 ACKNOWLEDGEMENTS

The stock assessment survey and data report is the result of the collaborative efforts of many individuals. The Canadian Sablefish Association has provided coordination and support of the annual Sablefish survey since 1994. The scientific staff that conducted the 2021 Sablefish research charter included Dean Gaidica and Peter Jankiewicz of Archipelago Marine Research Ltd (AMR); Schon Acheson, Kristina Castle, Ryan Luft, Erika Nielsen, Kathryn Temple, Daniel Williams and Malcolm Wyeth of Fisheries and Oceans, Canada.

A special thanks to the Vessel Master and crew of the F/V *Pacific Viking*, whose efforts made the survey successful and safe during the COVID-19 pandemic. In 2021, the crew consisted of Deacon Melnychuk (skipper), David Holomego, Rory Johnson, Shae Lawson, Rick Schneider and Kevin Wright.

4 Figures

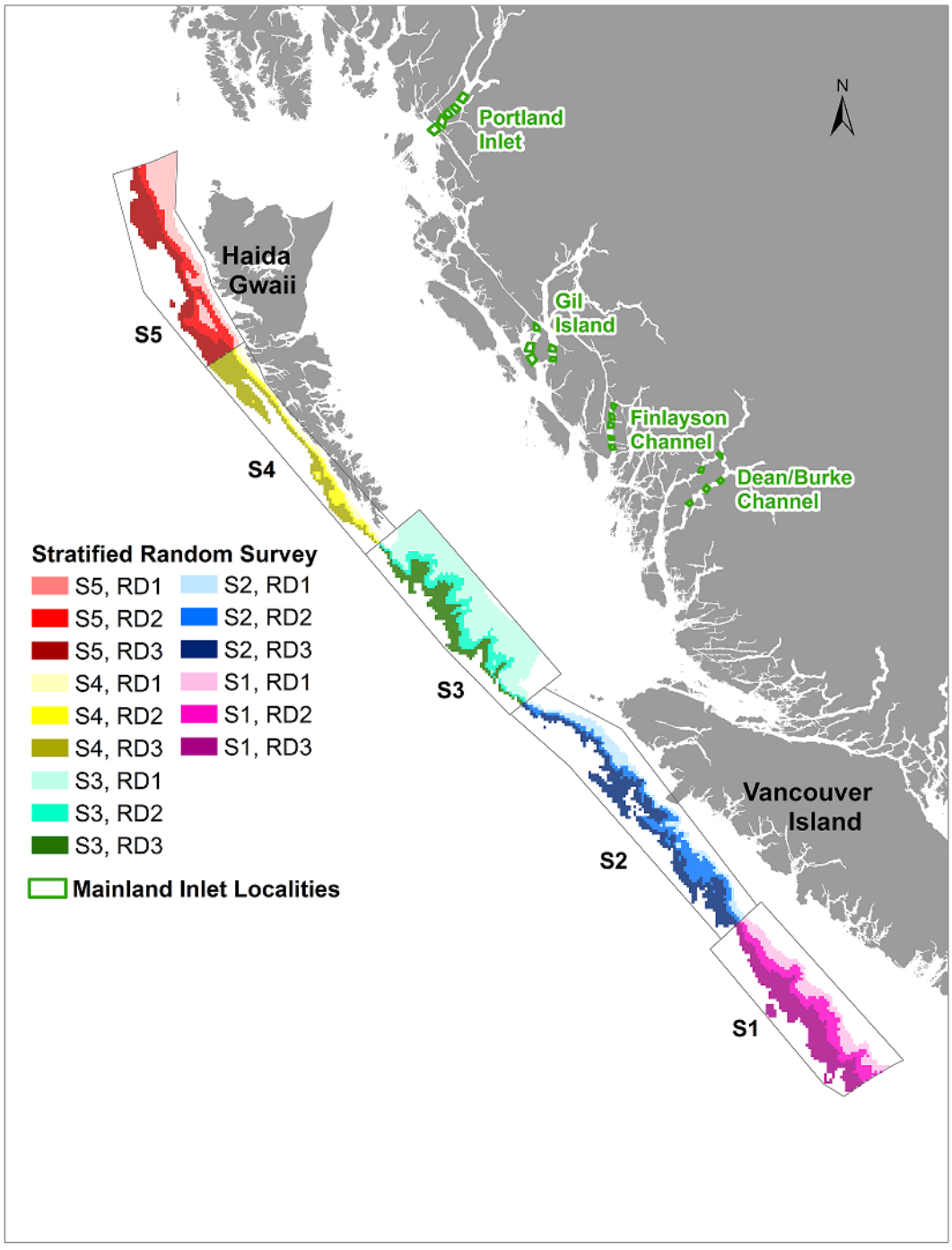


Figure 1. Location of the survey design boundaries of the mainland inlet localities, and the five spatial areas (S_1-S_5) of the stratified random survey design. The three depths strata (RD_1-RD_3) are colour-coded and nested within each of the five spatial strata.

Figure 2. Image of the F/V Pacific Viking used for the 2021 Sablefish research and assessment survey. Photo credit: Cody Melnychuk.

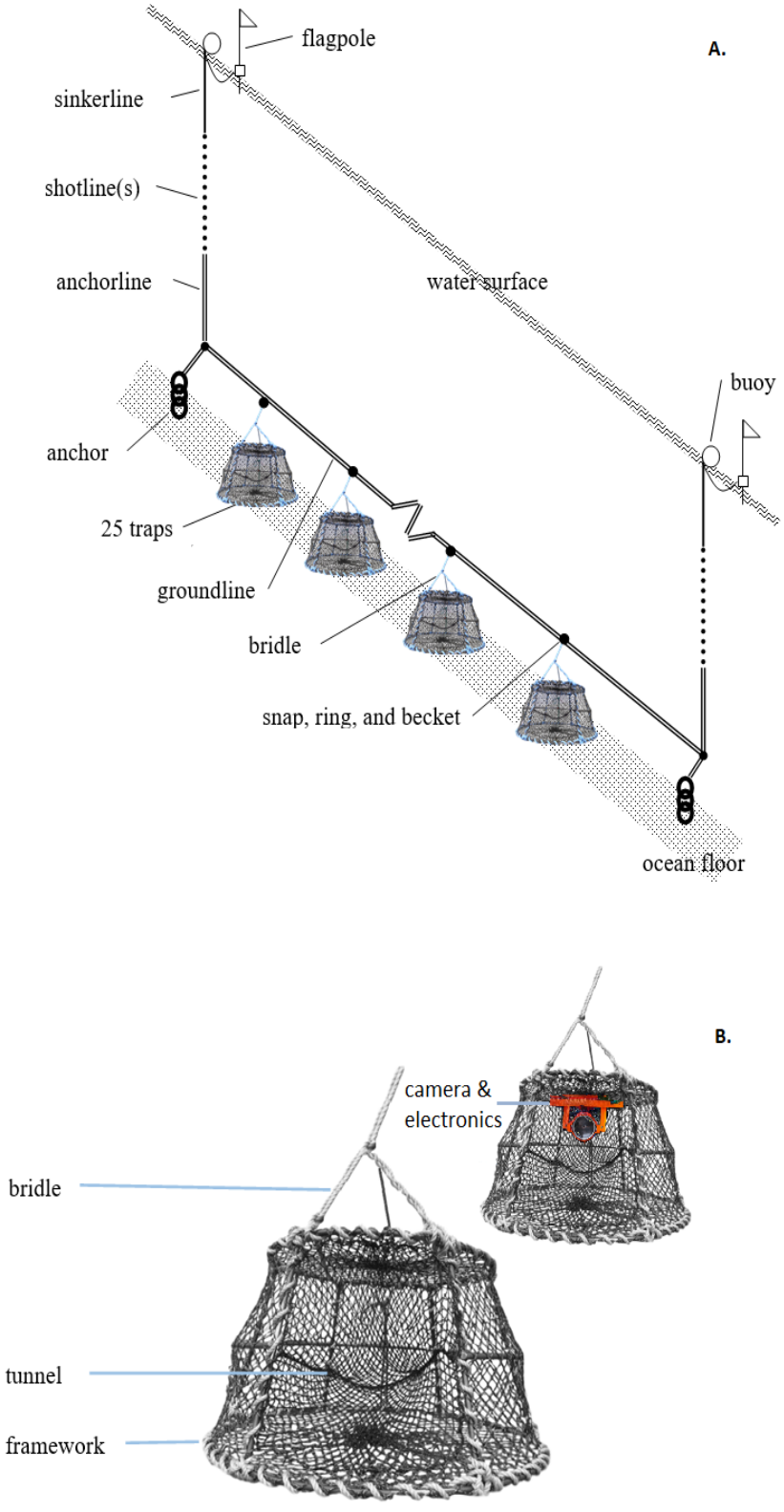


Figure 3. Trap gear elements consisting of 25 baited traps snapped to beckets along a groundline (A). Trap and camera trap elements (B).

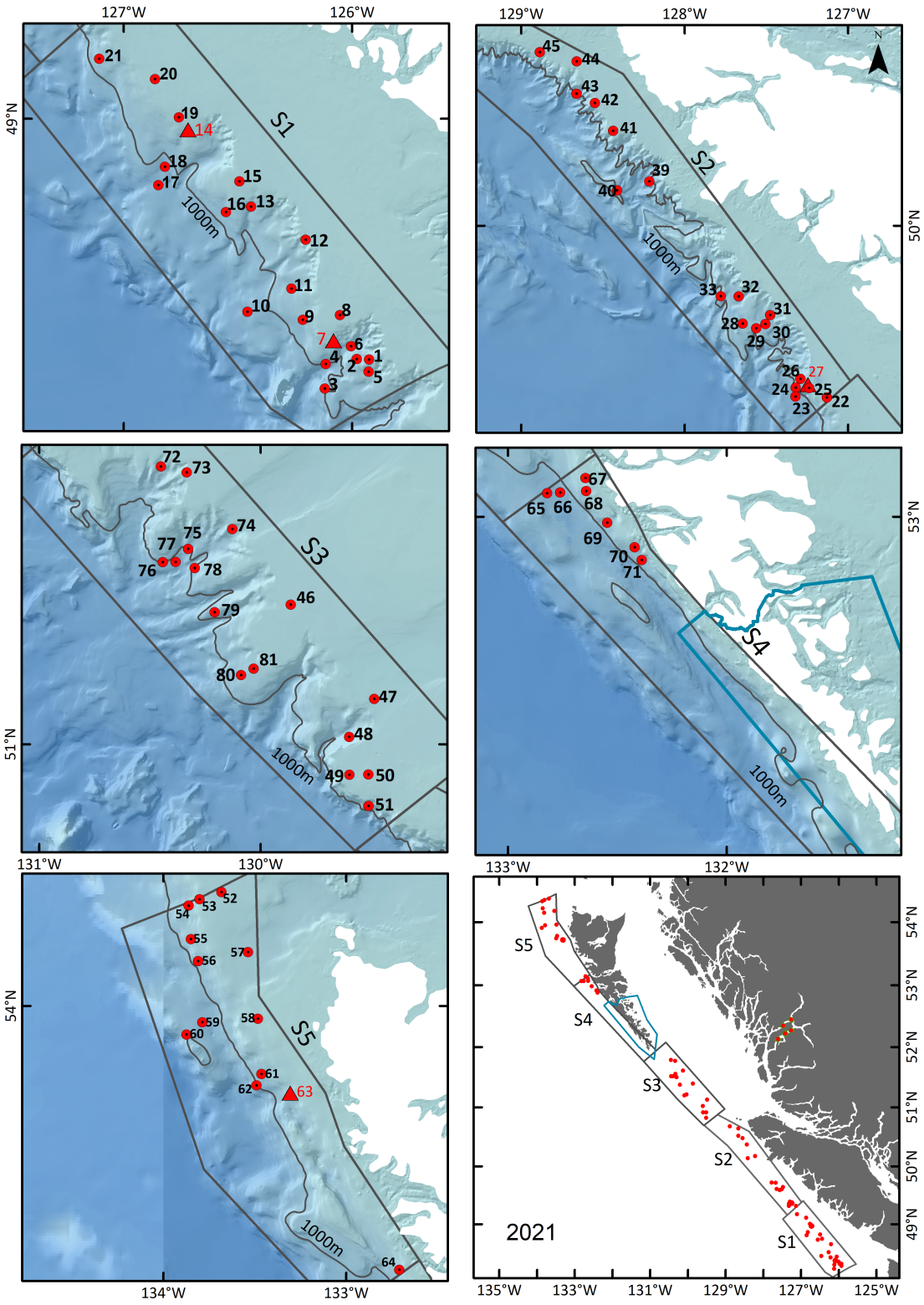


Figure 4. Start locations of survey sets (red markers) conducted in 2021 for the stratified random survey areas S_1 through S_5. Movement/deep-water autonomous camera locations (triangle symbols) are labelled in red font.

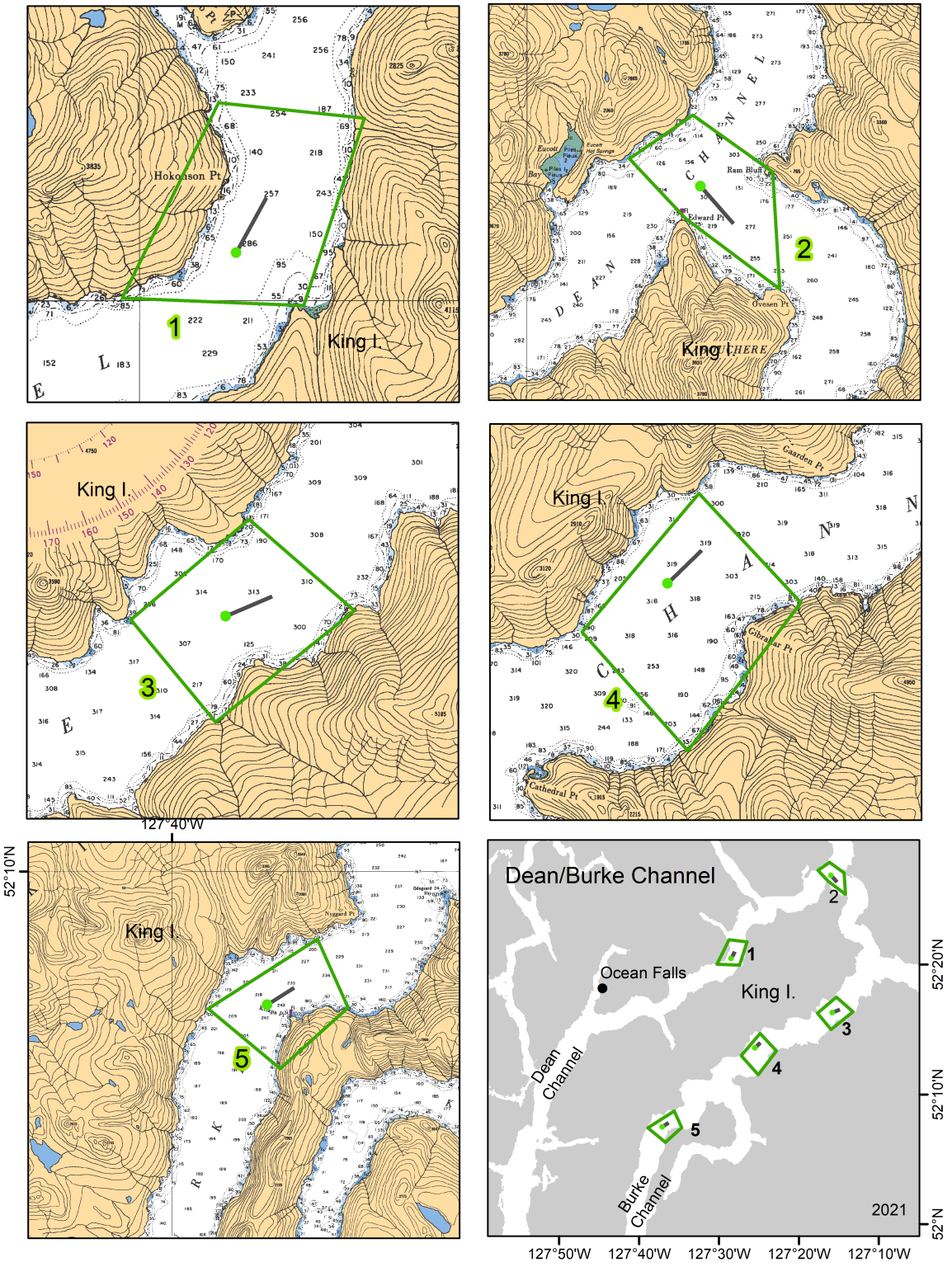


Figure 5. Location of the 2021 standardized sets within the Dean/Burke Channel mainland inlet locality.

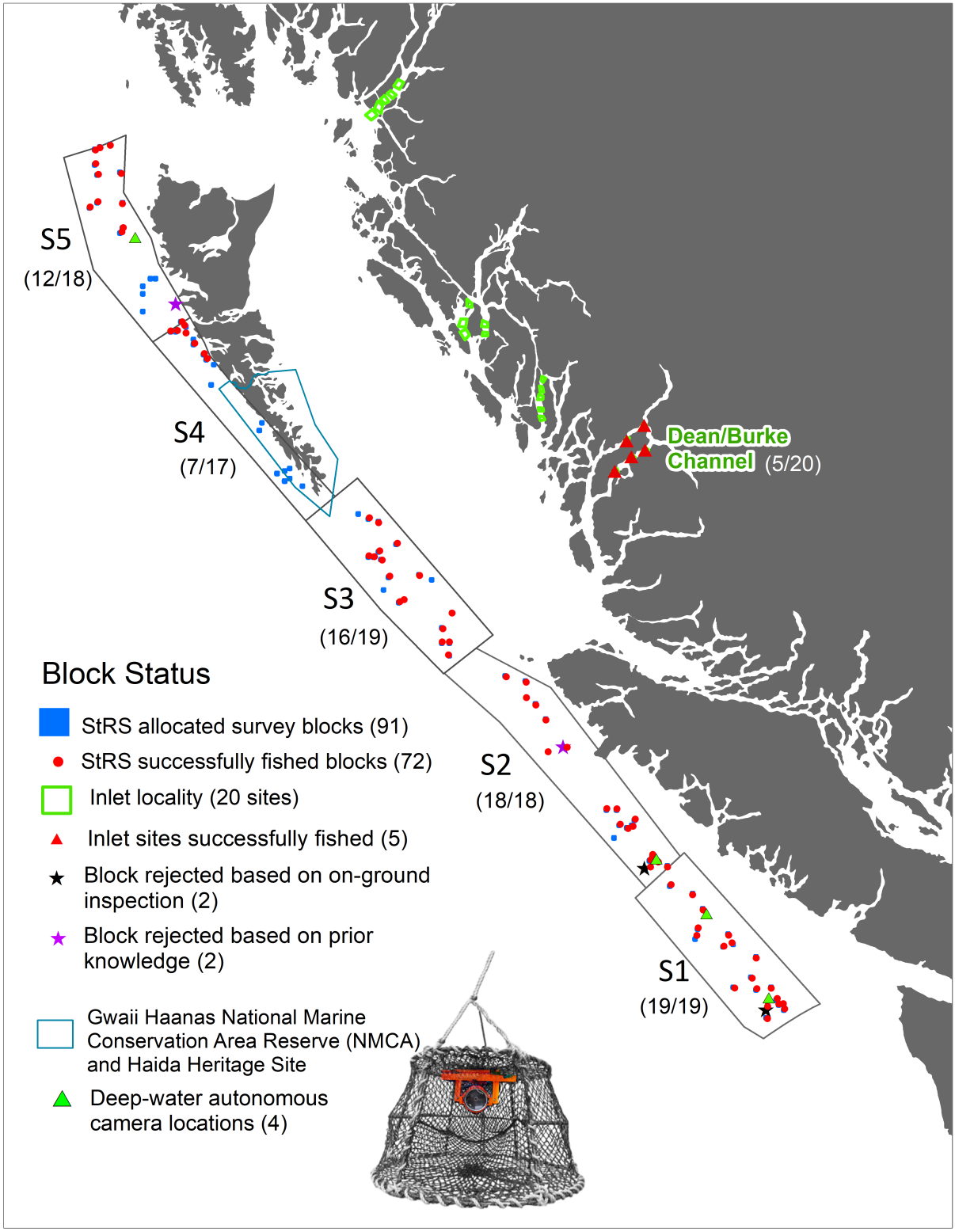


Figure 6. Map of allocated vs completed survey blocks for the 2021 survey sets. Star symbols depict rationale for dropped survey blocks.

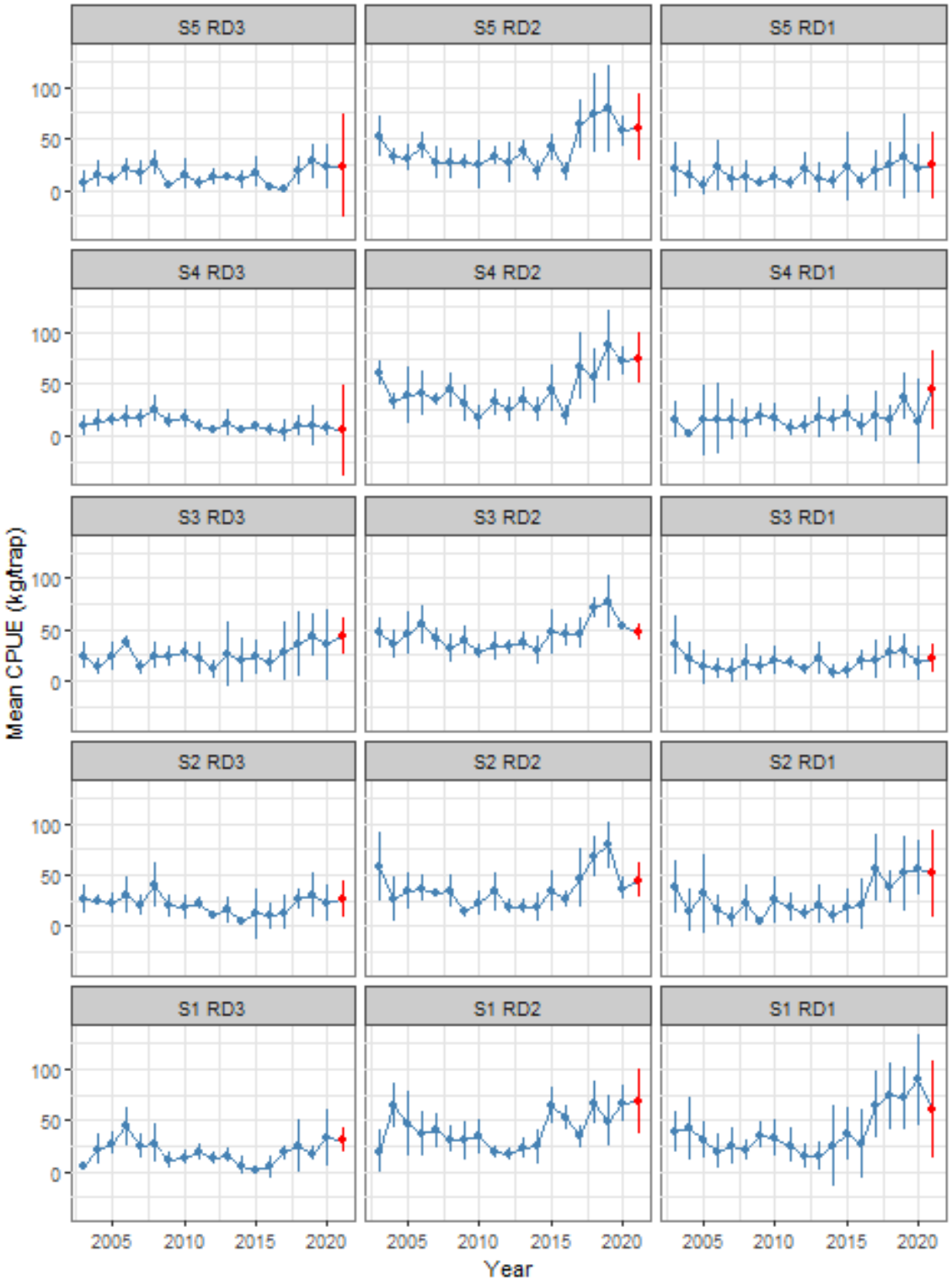


Figure 7. Average Sablefish catch per unit effort (CPUE; mean +/- 95% CIs) by survey strata since 2003. Panels run deep to shallow (left to right) and north to south (top to bottom).

Figure 8. 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).

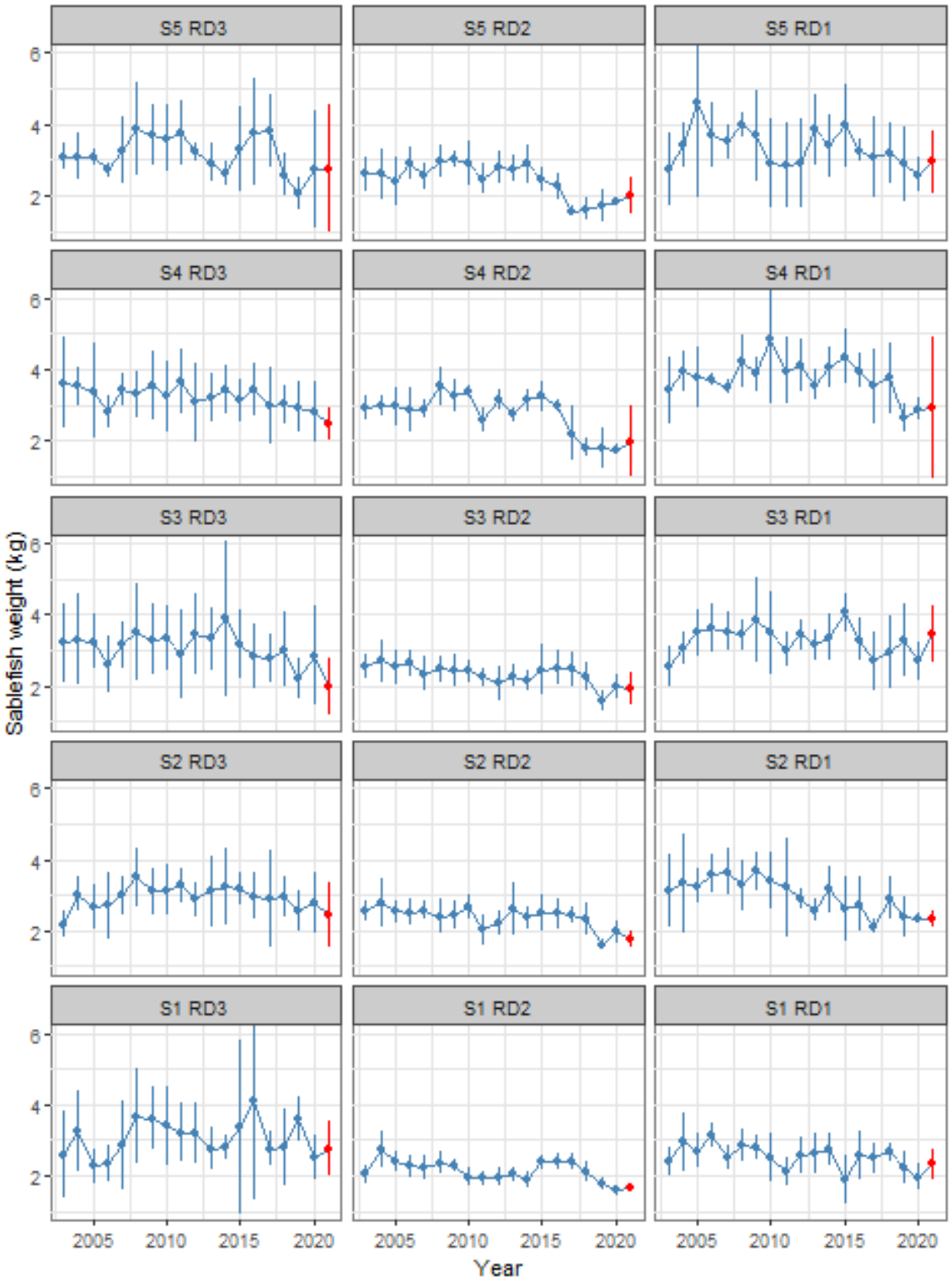


Figure 9. Average weight of Sablefish (mean +/- 95% CIs) by survey strata over time. Panels run deep to shallow (left to right) and north to south (top to bottom).

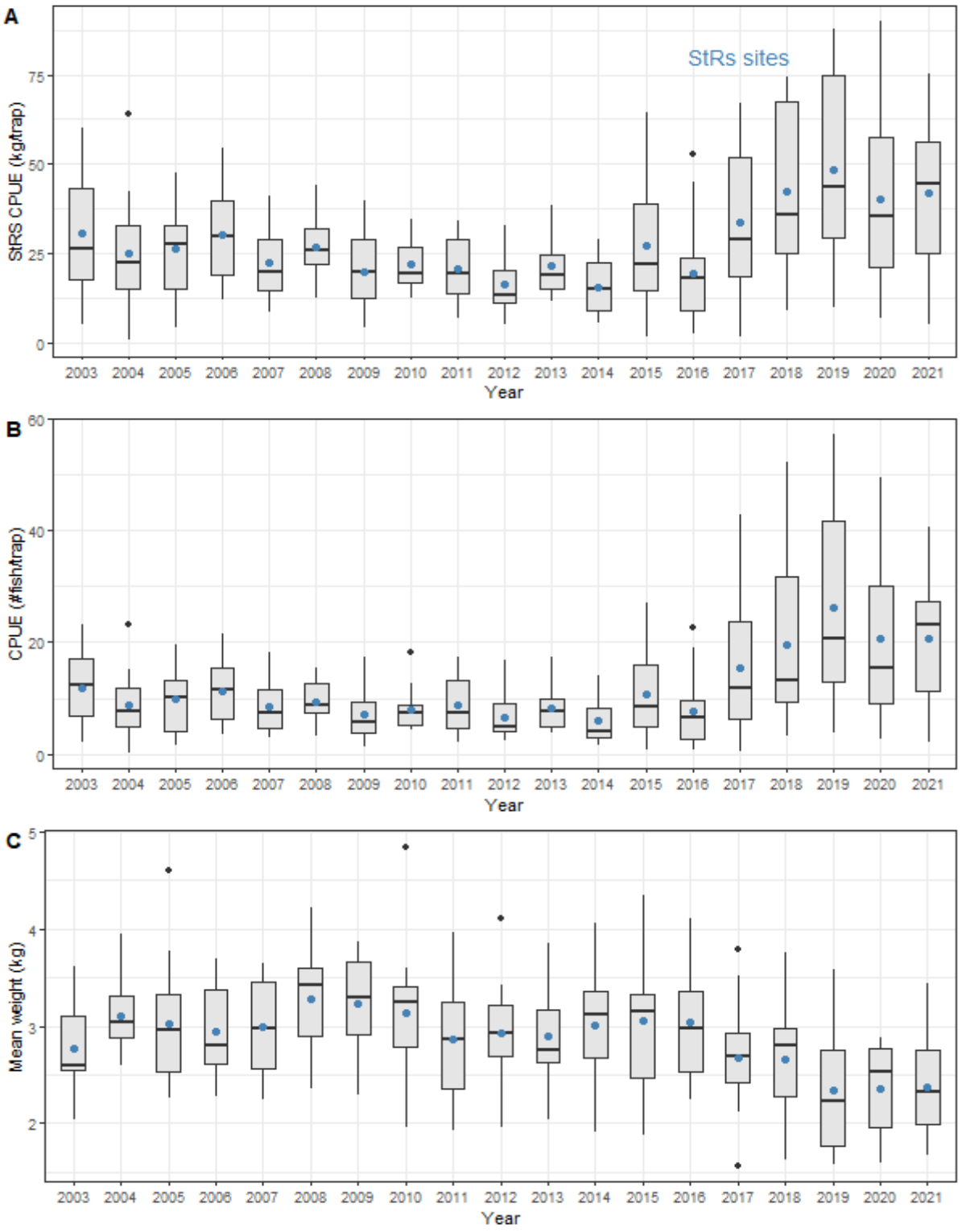


Figure 10. (A) Annual mean weight of Sablefish per trap (kg/trap); (B) annual mean number of Sablefish per trap (#fish/trap); (C) annual mean weight of Sablefish (kg) by StRS survey strata over time. Horizontal line is median and blue dots are arithmetic mean.

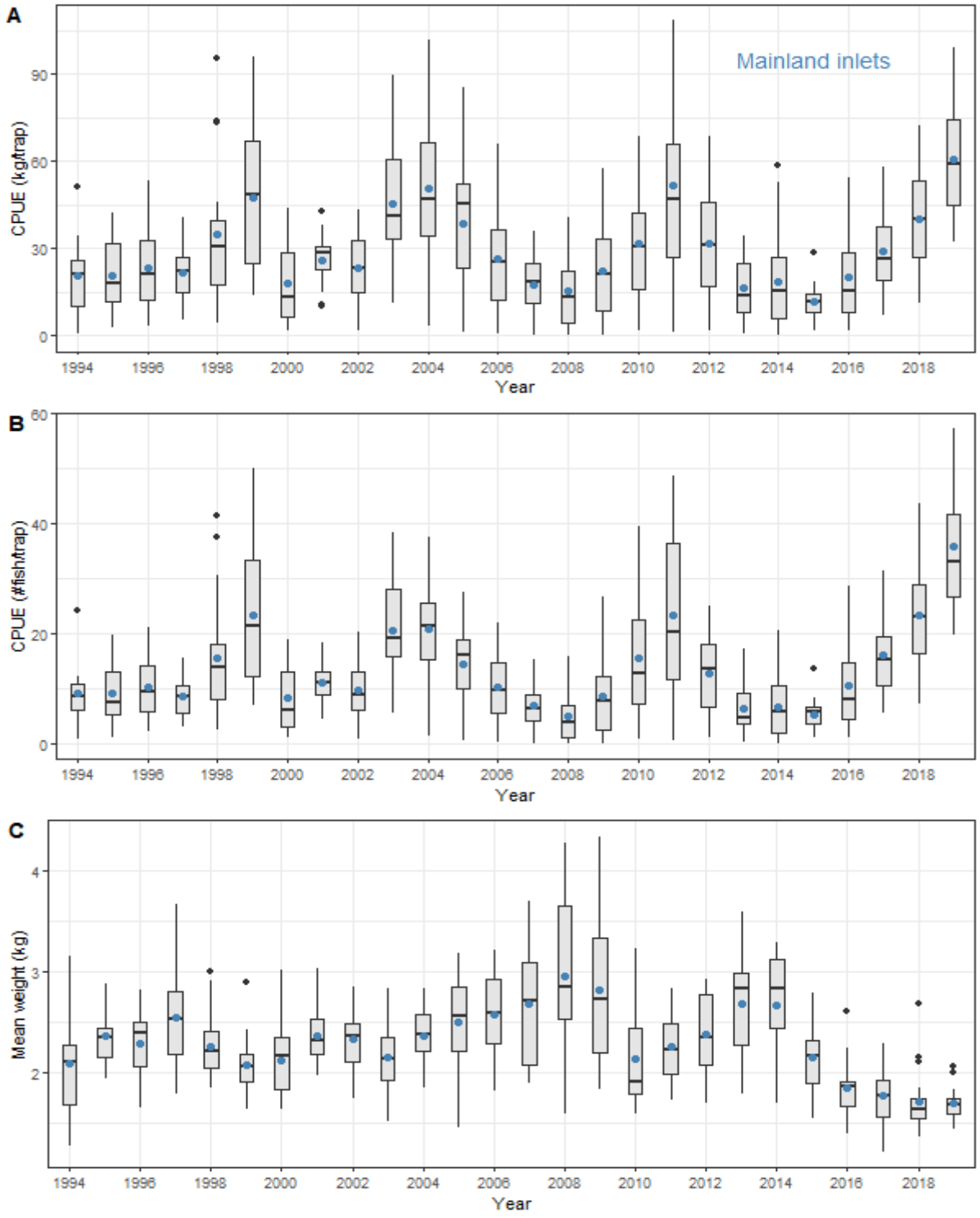


Figure 11. Annual distributions of catch statistics over all mainland inlet indexing sets between 1994 and 2019, including: (A) CPUE in units of weight of Sablefish per trap (kg/trap); (B) CPUE in units of Sablefish per trap (#fish/trap); and (C) mean Sablefish body weight (kg). Horizontal line is median, grey shading shows the 25th and 75% percentiles, and blue dots show arithmetic means. No inlets were surveyed in 2020. Dean/Burke Channel inlet was the only inlet surveyed in 2021 and not included in these figures.

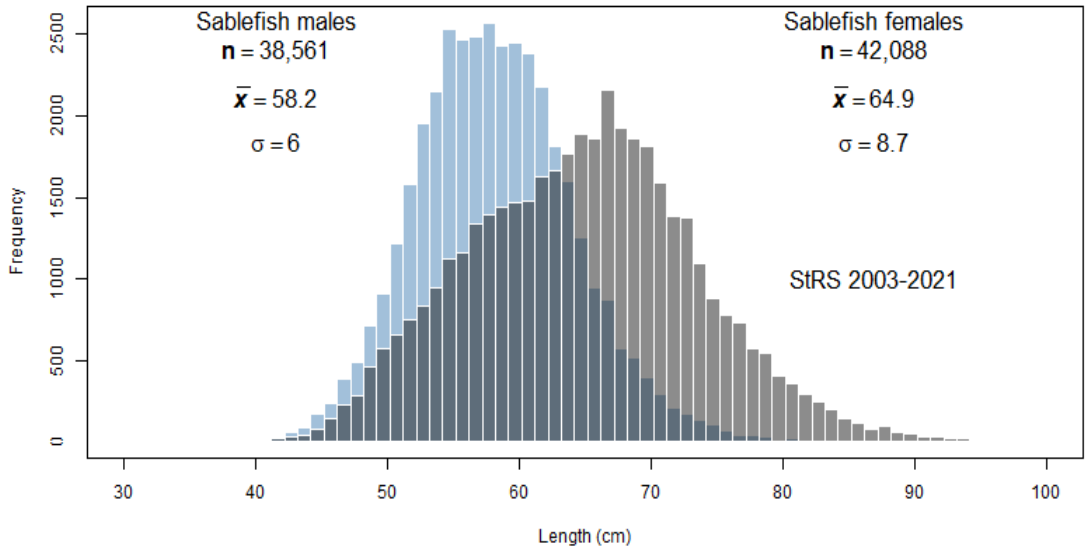


Figure 12. Length frequencies for female (grey) and male Sablefish (steel blue) up to 2021 for all StRS sets. Specimen number (n), mean ($\overline{x}$) and standard deviation (σ) are displayed.

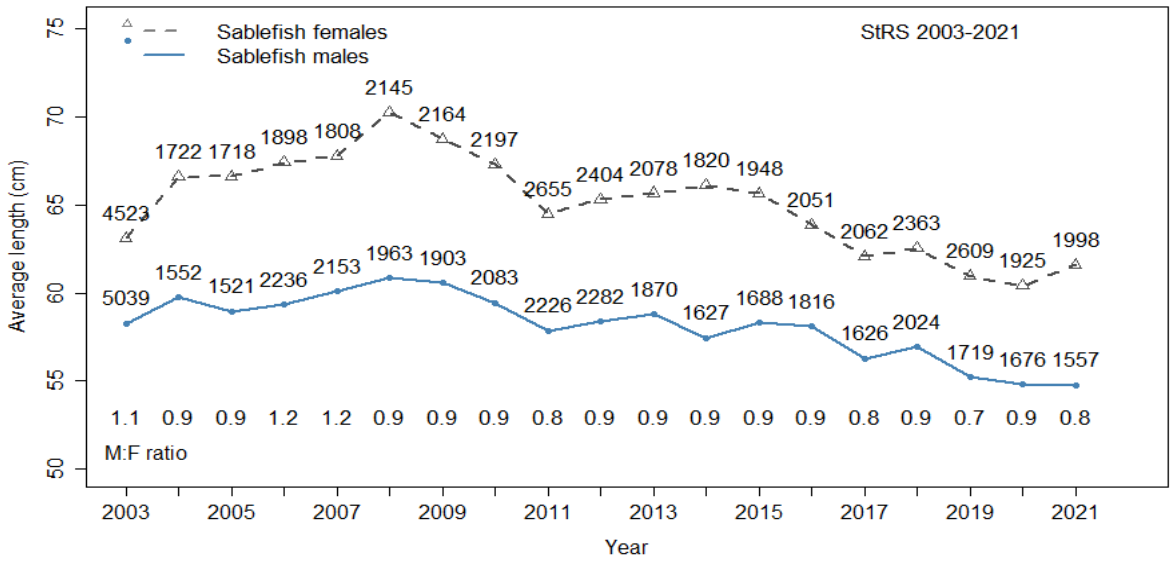


Figure 13. Average length and ratios of male and female Sablefish by year. Counts by sex are labelled on top of the plotted lines.

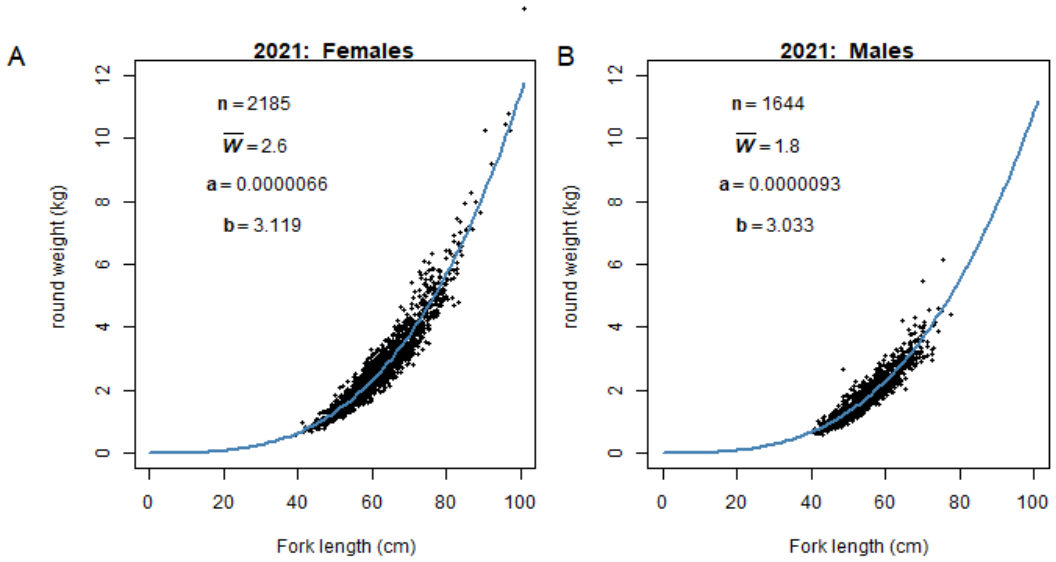


Figure 14. Sablefish fork length (L in cm) vs weight (W in kg) for females (A) and males (B) for the 2021 survey.

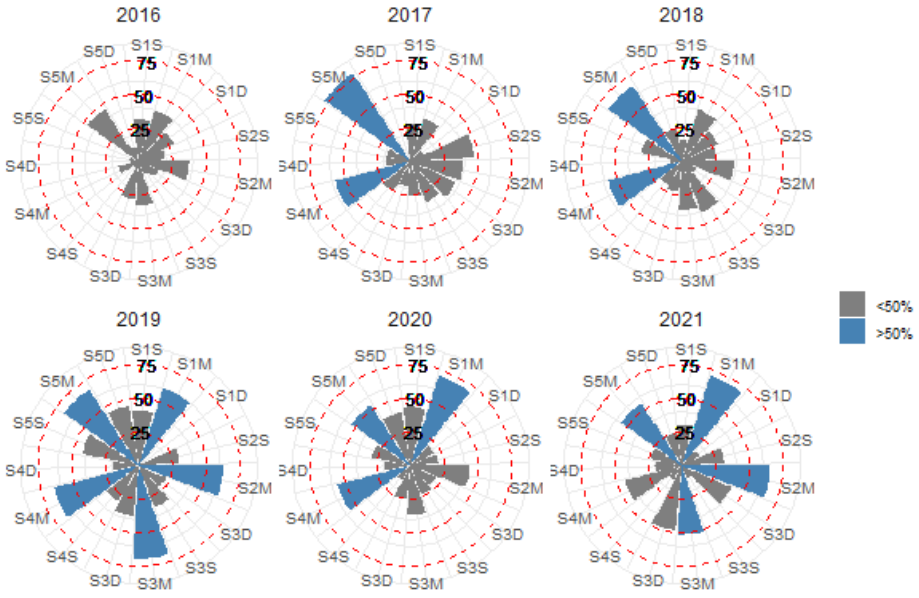


Figure 15. The percentage of sub-legal Sablefish (<55 cm fork length) sampled by spatial (S_1-S_5) and depth strata (S=shallow, RD_1; M=mid, RD_2; D=deep, RD_3) over time. Sub-legal specimen count above 50% sampled shown in blue.

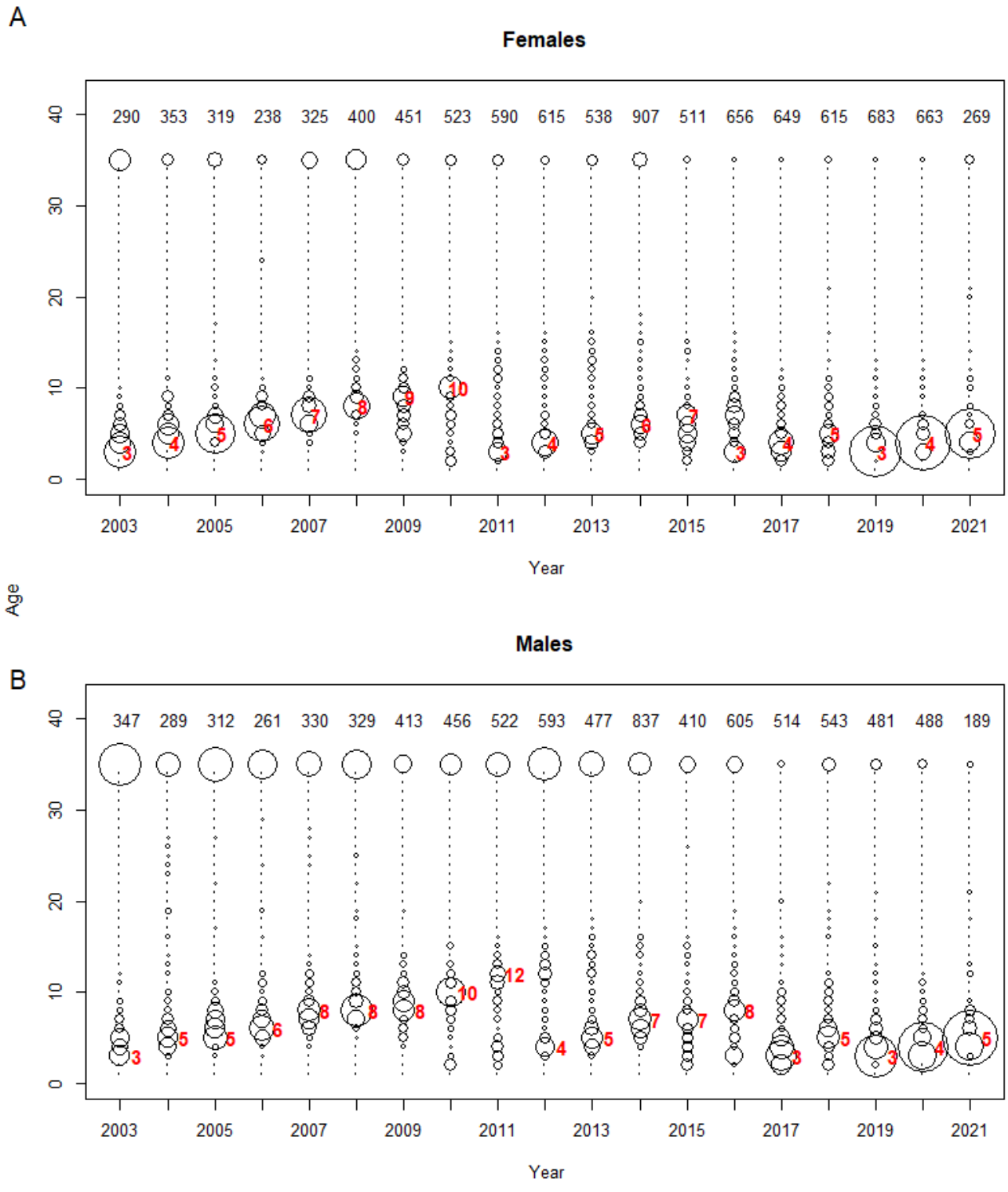


Figure 16. Bubble plot for female (A) and male (B) Sablefish ages by survey year from StRS sets that have been aged. The sizes of the circles are proportional to the number of fish with given ages. Fish age 35 and older are included in one bubble. The total number of fish aged are listed across the top of each panel. The ages with the highest ratios are posted to the right of each bubble.

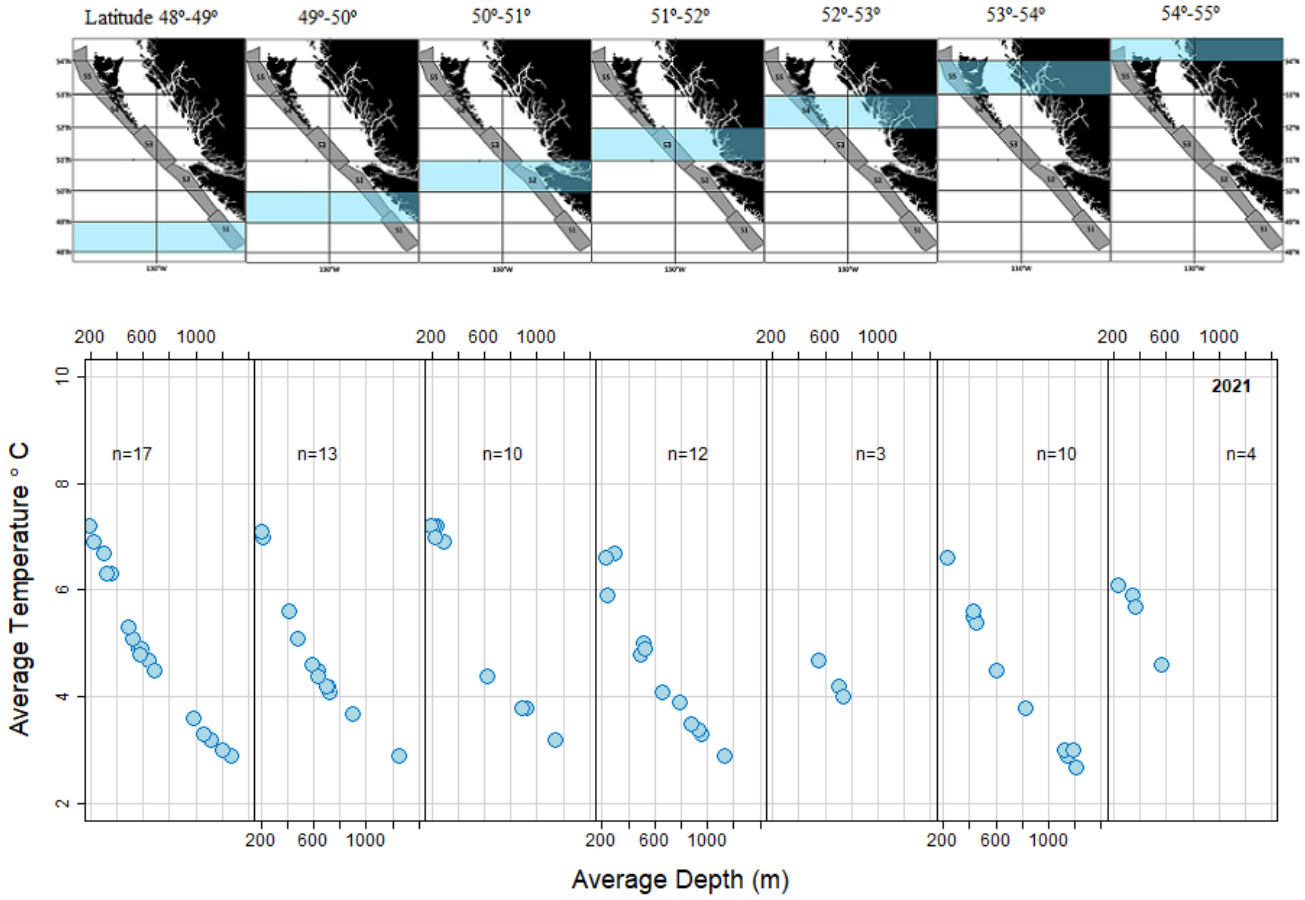


Figure 17. Coplot of average depth (m) vs average temperature (°C) for a given 1-degree latitude range (blue bands) for 2021. The number of fishing sets deployed with a SBE 39 recorder are represented by n.

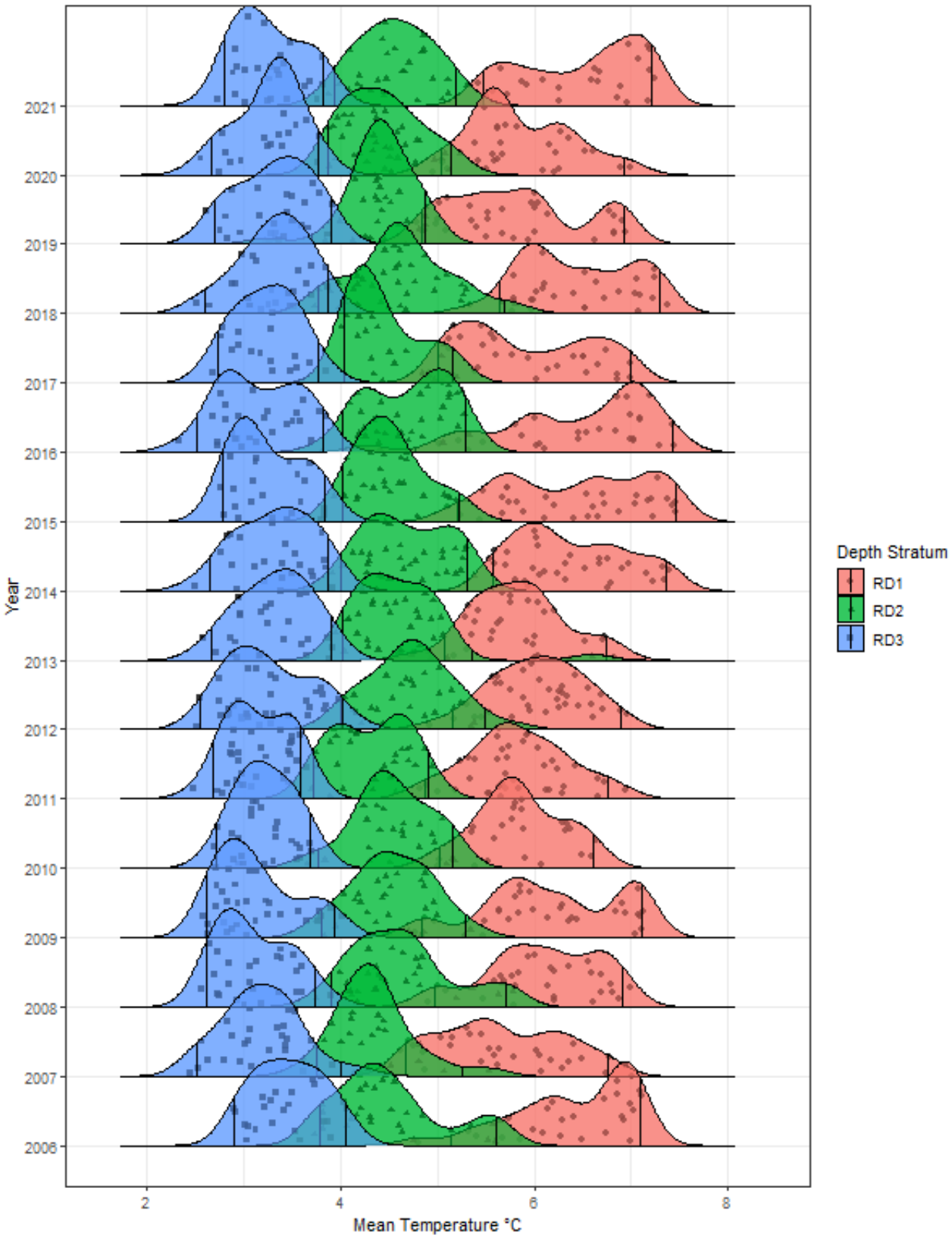


Figure 18. Vertical density ridgeplots of mean temperatures per year as reported by set from the Sea-bird SBE 39 loggers on traps at three depth intervals, RD_1 = shallow (100-450 m), RD_2 = mid (450-850 m), RD_3 = deep (850-1400 m). Lines indicate the 2.5% and 97.5% tails.

5 Tables

Table 1. Spatial and depth stratum allocation and completed set counts (blue) for the 2021 Sablefish research and assessment survey.

Spatial Strata	Depth Strata						Total	Total 2021
	RD_1	RD_1 2021	RD_2	RD_2 2021	RD_3	RD_3 2021		
S_1 (South West Coast Vancouver Island or SWCVI)	6	6	8	8	5	5	19	19
S_2 (North West Coast Vancouver Island or NWCVI)	6	6	7	7	5	5	18	18
S_3 (Queen Charlotte Sound or QCS)	8	6	6	6	5	4	19	16
S_4 (South West Coast Haida Gwaii or SWCHG)	6	2	6	3	5	2	17	7
S_5 (North West Coast Haida Gwaii or NWCHG)	6	5	7	4	5	3	18	12
Total	**32**	**25**	**34**	**28**	**25**	**19**	**91**	**72**

Table 2. Target number of 25-trap camera survey sets and completed counts (blue) for the 2021 Sablefish research and assessment survey.

Strata	Sets in Depth Strata						Inlet	Total	Total 2021
	RD_1	RD_1 2021	RD_2	RD_2 2021	RD_3	RD_3 2021			
S_1 (SWCVI)	2	3	2	4	1	0		5	7
S_2 (NWCVI)	2	3	2	4	1	1		5	8
S_3 (QCS)	2	1	2	1	1	0		5	2
S_4 (SWCHG)	2	2	2	2	1	0		5	4
S_5 (NWCHG)	2	0	2	0	1	1		5	1
Inlet (Dean/Burke)							1		1
Total	**10**	**9**	**10**	**11**	**5**	**2**	**1**	**25**	**23**

Table 3. Details of completed 60 trap camera movement sets. Seabird temperature and pressure recorder (SBE39), Actigraph accelerometer (AXL) and camera (CAM) are indicated with an 'x'.

Spatial Strata	Set	Becket id	Trap id	SBE39	AXL	CAM
S_1 (SWCVI)	7	5	5	x	x	x
		30	30	x	x	x
		55	55	x	x	x
S_1 (SWCVI)	14	2	2	x	x	x
		30	30	x	x	x
		59	59	x	x	x
S_2 (NWCVI)	27	5	5	x	x	x
		30	30	x	x	x
		51	51	x	x	x
S_5 (NWCHG)	63	5	5	x	x	x
		30	30	x	x	x
		55	55	x	x	x

Table 4. Summary of species captured during the 2021 survey StRS sets conducted by the Pacific Viking. No value in both weight and count fields indicate trace weights.

Category	Common Name	Scientific Name	Count	Weight(kg)
Roundfish Species	Sablefish	ANOPLOPOMA FIMBRIA		79,274
	North Pacific Spiny Dogfish	SQUALUS ACANTHIAS		1,750
	Lingcod	OPHIODON ELONGATUS		1,061
	Pacific Grenadier	CORYPHAENOIDES ACROLEPIS		206
	Pectoral Rattail	ALBATROSSIA PECTORALIS		194
	Pink Snailfish	PARALIPARIS ROSACEUS		2
	Pacific Flatnose	ANTIMORA MICROLEPIS		2
	Threadfin Sculpin	ICELINUS FILAMENTOSUS	2	
Rockfish Species	Rougheye/Blackspotted Rockfish Complex	SEBASTES ALEUTIANUS/MELANOSTICTUS		240
	Redbanded Rockfish	SEBASTES BABCOCKI		178
	Yelloweye Rockfish	SEBASTES RUBERRIMUS		144
	Shortspine Thornyhead	SEBASTOLOBUS ALASCANUS		43
	Shortraker Rockfish	SEBASTES BOREALIS		25
	Canary Rockfish	SEBASTES PINNIGER		3
	Yellowmouth Rockfish	SEBASTES REEDI		2
	Rosethorn Rockfish	SEBASTES HELVOMACULATUS		1
	Greenstriped Rockfish	SEBASTES ELONGATUS		1
	Longspine Thornyhead	SEBASTOLOBUS ALTIVELIS		1
	Sharpchin Rockfish	SEBASTES ZACENTRUS	1	
	Darkblotched Rockfish	SEBASTES CRAMERI	1	
Flatfish Species	Pacific Halibut	HIPPOGLOSSUS STENOLEPIS		928
	Arrowtooth Flounder	ATHERESTHES STOMIAS		159
	Dover Sole	MICROSTOMUS PACIFICUS		6
Invertebrate Species	Grooved Tanner Crab	CHIONOECETES TANNERI		206
	Fragile Sea Urchin	ALLOCENTROTUS FRAGILIS		60
	Oregontriton	FUSITRITON OREGONENSIS		23
	Brown Box Crab	LOPHOLITHODES FORAMINATUS		8
	Red Queen Crab	LITHODES COUESI		4
	Giant Pacific Octopus	ENTEROCTOPUS DOFLEINI		3
		NEPTUNEA		2
		HETEROZONIAS ALTERNATUS		1
	Rose Starfish	CROSSASTER PAPPOSUS	1	
		PARALOMIS MULTISPINA	1	
		SOLASTERIDAE	1	
		CROSSASTER	1	
	Sea Lilies And Feather Stars	CRINODEA		
	Fish-Eating Star	STYLASTERIAS FORRERI		
	Ophiuroidea	OPHIUROIDEA		

Table 5. Summary of species captured by the Pacific Viking during the 2021 survey standardized sets conducted at Dean/Burke Channel mainland inlet locality. No value in both weight and count fields indicate trace weights.

Category	Common Name	Scientific Name	Count	Weight(kg)
Roundfish Species	Sablefish	ANOPLOPOMA FIMBRIA		2840
Flatfish Species	Pacific Halibut	HIPPOGLOSSUS STENOLEPIS		22
Invertebrate Species	Mud Star	CTENODISCUS CRISPATUS	2	
	Vermillion Starfish	MEDIASTER AEQUALIS	1	
	Sponges	PORIFERA		
		NEPTUNEA		

Table 6. Summary of Sablefish sex ratios and mean fork length measurements collected during the 2021 stratified random sets by spatial and depth stratum.

Strata		Proportion		Mean Fork Length (mm)		
Spatial	Depth	Males	Females	Males.1	Females.1	Tagged
S_1	RD_1	0.24	0.76	550	601	581
	RD_2	0.74	0.26	531	568	531
	RD_3	0.23	0.77	577	648	615
		0.40	**0.60**	**553**	**606**	**576**
S_2	RD_1	0.21	0.79	546	592	579
	RD_2	0.67	0.33	528	569	540
	RD_3	0.45	0.55	559	645	574
		0.44	**0.56**	**544**	**602**	**564**
S_3	RD_1	0.22	0.78	600	670	649
	RD_2	0.53	0.47	539	578	549
	RD_3	0.62	0.38	544	617	566
		0.46	**0.54**	**561**	**622**	**588**
S_4	RD_1	0.32	0.68	601	643	621
	RD_2	0.43	0.57	543	587	561
	RD_3	0.63	0.37	611	627	605
		0.46	**0.54**	**585**	**619**	**596**
S_5	RD_1	0.28	0.72	562	648	608
	RD_2	0.52	0.48	528	561	547
	RD_3	0.37	0.63	600	661	596
		0.39	**0.61**	**563**	**623**	**584**

Table 7. Canadian tag recovery counts from all sets during the 2021 survey, by distance from release site and years at liberty. Distances were determined using the great circle distance between the release location and recovery location.

	Distance (km) from Release Location							
Years at Liberty	**<10**	**11-50**	**51-100**	**101-250**	**251-500**	**501-1000**	**1000+**	**Recovery count**
1	38	22	8	8	1	0	0	77
2-5	82	42	13	38	28	2	4	209
6-10	22	13	3	16	8	3	1	66
11+	24	21	8	12	6	1	2	74
Total Counts	166	98	32	74	43	6	7	426

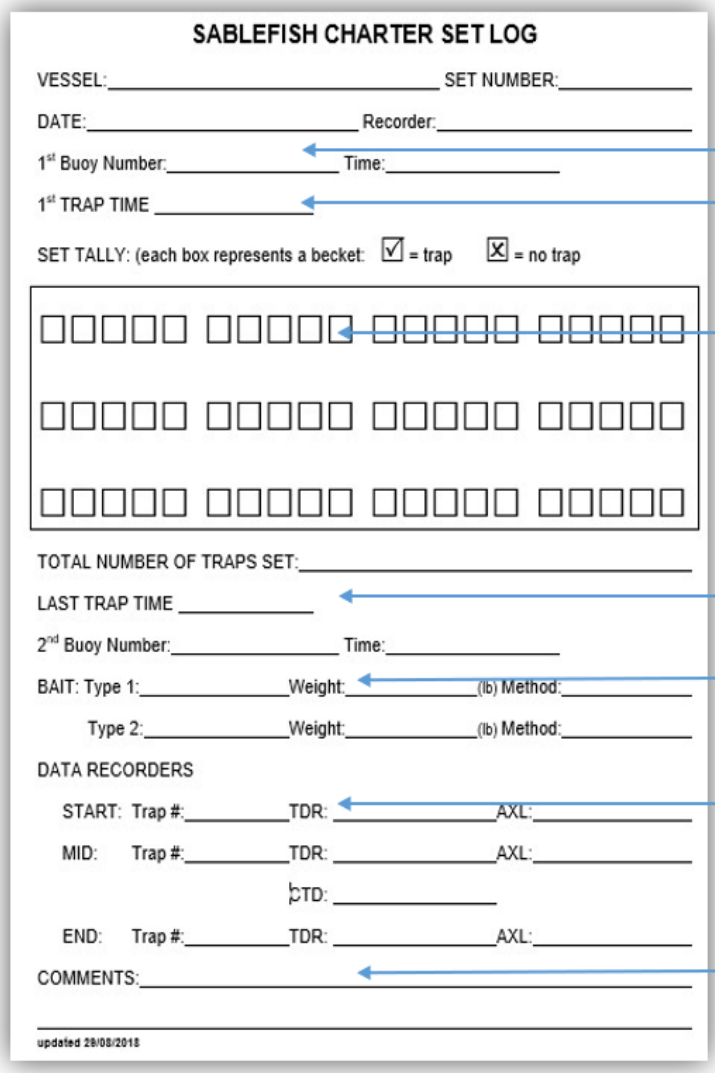
APPENDIX A LIST OF SABLEFISH RESEARCH AND ASSESSMENT SURVEYS.

Year	Dates	Vessel	Captain	Set Count	GFBIO Trip 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 BEAUVAIS	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
2013	Oct 11 - Nov 17	PACIFIC VIKING	ALBERT (DEACON) MELNYCHUK	111	74872
2014	Oct 9 - Nov 17	OCEAN PEARL	DARCY NICHOLS	111	76150
2015	Oct 9 - Nov 20	PACIFIC VIKING	ALBERT (DEACON) MELNYCHUK	111	77830
2016	Oct 7 - Nov 22	OCEAN PEARL	DARCY NICHOLS	111	80471
2017	Oct 6 - Nov 21	PACIFIC VIKING	ALBERT (DEACON) MELNYCHUK	109	82790
2018	Oct 9 - Nov 19	OCEAN PEARL	DARCY NICHOLS	111	84250
2019	Oct 8 - Nov 25	PACIFIC VIKING	ALBERT (DEACON) MELNYCHUK	109	85230
2020	Oct 7 - Nov 21	PACIFIC VIKING	ALBERT (DEACON) MELNYCHUK	87	85690
2021	Oct 6 - Nov 21	PACIFIC VIKING	ALBERT (DEACON) MELNYCHUK	81	86130

APPENDIX B SABLEFISH CHARTER SET LOG 2021.

Example of the set log data form with directions from the survey instruction manual.

Inspect each trap as it is deployed to ensure no damage to the web, correct baiting practices, etc. Record the trap number of any problem traps. *NOTE: survey-specific traps were purchased prior to the 2017 survey and do not have escape rings.



SABLEFISH CHARTER SET LOG

VESSEL:_____ SET NUMBER:_____

DATE:_____ Recorder:_____

1st Buoy Number:_____ Time:_____

1st TRAP TIME _____

SET TALLY: (each box represents a becket: ☑ = trap ☒ = no trap

☐☐☐☐☐ ☐☐☐☐☐ ☐☐☐☐☐ ☐☐☐☐☐

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TOTAL NUMBER OF TRAPS SET:_____

LAST TRAP TIME _____

2nd Buoy Number:_____ Time:_____

BAIT: Type 1:_____ Weight:_____ (lb) Method:_____

Type 2:_____ Weight:_____ (lb) Method:_____

DATA RECORDERS

START: Trap #:_____ TDR: _____ AXL:_____

MID: Trap #:_____ TDR: _____ AXL:_____

CTD: _____

END: Trap #:_____ TDR: _____ AXL:_____

COMMENTS:_____

updated 28/08/2018

Verify the buoy numbers at each end.

Record time when **first trap** is deployed.

Mark traps as they are deployed. Each box represents a becket. ☑ represents traps, ☒ represents missed traps. At the end, record total.

Record time when **last trap** is deployed.

If applicable, visually estimate bait weight.

Record the trap numbers used for data recorders. Record the serial numbers for the temperature-depth recorder (TDR), accelerometer (AXL) and camera.

Record comments about any extra anchors to secure excess buoyline, marine mammal sightings, etc.

APPENDIX C SURVEY SET DETAILS 2021.

Details of sets completed during the 2021 survey program (F/V Pacific Viking). 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_1 (100-250 fathoms), RD_2 (250-450 fathoms) and RD_3 (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 (SBE 39), an accelerometer (AXL) or a camera (CAM) are indicated with an 'x'.

Set	Spatial Stratum	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	AXL	CAM
1	S1	StRS	RD1	Oct 7	07:57	1330	3C	48°8.6'N	125°55.8'W	48°8.1'N	125°56.3'W	328	313	307	25	x		
2	S1	StRS	RD2	Oct 7	09:03	1443	3C	48°8.6'N	125°58.6'W	48°8.1'N	125°59.1'W	571	598	594	25	x		
3	S1	StRS	RD3	Oct 7	10:52	1504	3C	48°2.5'N	126°6.3'W	48°2.5'N	126°7.3'W	1051	1048	1052	25	x		
4	S1	StRS	RD3	Oct 7	12:25	1525	3C	48°7.7'N	126°5.8'W	48°7.8'N	126°6.8'W	977	1053	998	25	x		
5	S1	StRS	RD2	Oct 7	14:13	1545	3C	48°6.4'N	125°55.1'W	48°6.1'N	125°56'W	484	514	503	25	x	x	x
6	S1	StRS	RD2	Oct 7	15:43	1604	3C	48°0.9'N	125°59.5'W	48°0.8'N	126°0.7'W	736	737	707	25	x	x	x
7		Movement		Oct 7	17:35	1594	3C	48°1.3'N	126°4.8'W	48°0.3'N	126°6.6'W	415	546	482	56	x	x	x
8	S1	StRS	RD1	Oct 9	07:59	1325	3C	48°5.4'N	126°3.2'W	48°5.5'N	126°4.2'W	187	196	191	25	x		
9	S1	StRS	RD2	Oct 9	09:39	1378	3C	48°5.4'N	126°12.2'W	48°5.4'N	126°13.2'W	532	601	567	25	x		
10	S1	StRS	RD3	Oct 9	11:50	1473	3C	48°6'N	126°26.4'W	48°6'N	126°27.4'W	1199	1264	1220	25	x		
11	S1	StRS	RD2	Oct 9	14:58	1421	3C	48°0'N	126°15'W	48°0.2'N	126°16.1'W	655	711	685	25	x	x	x
12	S1	StRS	RD1	Oct 9	16:45	1451	3C	48°8.5'N	126°11.9'W	48°8.5'N	126°13'W	205	421	316	25	x	x	x
13	S1	StRS	RD2	Oct 9	18:58	1503	3C	48°5.3'N	126°27.2'W	48°4.6'N	126°27.2'W	467	576	520	25	x	x	x
14		Movement		Oct 11	09:28	488	3C	48°8.1'N	126°43.1'W	48°8'N	126°45.5'W	396	474	432	57	x	x	x
15	S1	StRS	RD1	Oct 13	05:58	1326	3C	48°8.6'N	126°29.2'W	48°8.6'N	126°30.2'W	224	236	229	25	x		
16	S1	StRS	RD2	Oct 13	07:42	1332	3C	48°4.1'N	126°32.5'W	48°3.6'N	126°33'W	553	612	583	25	x		
17	S1	StRS	RD3	Oct 13	10:20	1366	3C	48°8.9'N	126°49.7'W	48°9'N	126°50.6'W	1254	1326	1298	25	x		
18	S1	StRS	RD3	Oct 13	11:55	1380	3C	48°2.2'N	126°48.7'W	48°2.2'N	126°49.8'W	1124	1139	1135	25	x		
19	S1	StRS	RD1	Oct 13	14:12	1371	3C	48°9.8'N	126°45.2'W	48°9.8'N	126°46.2'W	315	337	324	25	x	x	x
20	S1	StRS	RD1	Oct 13	16:16	1368	3D	49°0.4'N	126°51.7'W	49°0.4'N	126°52.9'W	209	233	220	25	x	x	x
21	S1	StRS	RD2	Oct 15	05:59	1324	3D	49°0.9'N	127°5.5'W	49°0.5'N	127°6.4'W	595	691	643	25	x		
22	S2	StRS	RD1	Oct 15	08:10	1323	3D	49°8.5'N	127°7.5'W	49°8.5'N	127°8.5'W	194	205	199	25	x		
23	S2	StRS	RD3	Oct 15	10:16	1353	3D	49°8.6'N	127°18.6'W	49°8.7'N	127°19.7'W	1261	1316	1285	25	x		
24	S2	StRS	RD3	Oct 15	11:44	1362	3D	49°1.7'N	127°18.4'W	49°1.8'N	127°19.5'W	828	953	920	25	x		
25	S2	StRS	RD1	Oct 15	13:12	1378	3D	49°0.7'N	127°13.3'W	49°0.9'N	127°14.5'W	357	475	421	25	x	x	x
26	S2	StRS	RD2	Oct 15	14:18	1448	3D	49°4'N	127°17'W	49°3.4'N	127°17.3'W	457	527	489	25	x	x	x
27		Movement		Oct 15	16:33	1431	3D	49°2.1'N	127°14.7'W	49°2.5'N	127°16.9'W	363	617	479	57	x	x	x
28	S2	StRS	RD2	Oct 17	04:52	1325	3D	49°7.1'N	127°37.8'W	49°7.1'N	127°39'W	630	593	602	25	x		
29	S2	StRS	RD2	Oct 17	06:26	1329	3D	49°5.2'N	127°32.7'W	49°5.1'N	127°33.8'W	517	767	657	25	x		
30	S2	StRS	RD2	Oct 17	07:46	1328	3D	49°6.1'N	127°29.5'W	49°6.1'N	127°30.5'W	707	722	715	25	x		
31	S2	StRS	RD2	Oct 17	09:04	1340	3D	49°9.2'N	127°27.9'W	49°9.2'N	127°29'W	622	660	648	25	x	x	x
32	S2	StRS	RD2	Oct 17	11:02	1359	3D	49°3.7'N	127°39.8'W	49°3.2'N	127°40.5'W	611	668	636	25	x	x	x
33	S2	StRS	RD2	Oct 17	12:26	1378	3D	49°3.9'N	127°46.5'W	49°3.2'N	127°46.9'W	713	682	722	25	x	x	x
34	Dean/Burke	Inlet		Oct 24	12:07	1071	5B	52°0.5'N	127°37.1'W	52°0.8'N	127°36.3'W	445	446	448	25	x		
35	Dean/Burke	Inlet		Oct 24	13:59	1092	5B	52°3.6'N	127°25.5'W	52°4'N	127°24.8'W	594	596	595	25	x		
36	Dean/Burke	Inlet		Oct 24	15:23	1115	5B	52°6.3'N	127°15.8'W	52°6.6'N	127°14.9'W	583	583	583	25	x		
37	Dean/Burke	Inlet		Oct 24	17:32	1129	5B	52°6.8'N	127°16'W	52°6.3'N	127°15.2'W	524	515	522	25	x		
38	Dean/Burke	Inlet		Oct 24	19:29	1138	5B	52°0.5'N	127°28.5'W	52°1'N	127°28'W	521	515	519	25	x	x	x
39	S2	StRS	RD3	Oct 28	06:38	1343	3D	50°0.2'N	128°12'W	50°0.1'N	128°13.2'W	1171	1194	1148	25	x		
40	S2	StRS	RD3	Oct 28	08:31	1375	3D	50°0.4'N	128°24.7'W	50°0.4'N	128°26'W	962	907	912	25	x		
41	S2	StRS	RD1	Oct 28	11:08	1398	3D	50°1.9'N	128°26'W	50°2'N	128°27.1'W	275	350	311	25	x		
42	S2	StRS	RD1	Oct 28	12:40	1449	3D	50°8.4'N	128°32.7'W	50°8.4'N	128°34'W	223	262	237	25	x		

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continued.

Set	Spatial Stratum	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	AXL	CAM
43	S2	StRS	RD3	Oct 28	14:27	1464	5A	50°1.6'N	128°38.9'W	50°1.5'N	128°40.5'W	1008	1135	985	25	x	x	x
44	S2	StRS	RD1	Oct 28	16:24	1468	5A	50°8.1'N	128°39.1'W	50°8.1'N	128°40.3'W	190	195	193	25	x	x	x
45	S2	StRS	RD1	Oct 28	18:18	1487	5A	50°0.5'N	128°52.3'W	50°0.4'N	128°53.4'W	219	223	222	25	x	x	x
46	S3	StRS	RD1	Oct 30	04:03	1239	5B	51°3.5'N	129°51.2'W	51°3.4'N	129°52'W	228	231	229	25	x		
47	S3	StRS	RD1	Oct 30	07:26	1283	5A	51°0.6'N	129°28.9'W	51°0.5'N	129°30'W	289	292	292	25	x		
48	S3	StRS	RD2	Oct 30	08:52	1330	5A	51°0.9'N	129°35.1'W	51°0'N	129°36.2'W	503	571	542	25	x		
49	S3	StRS	RD1	Oct 30	10:14	1371	5A	50°5.3'N	129°35.4'W	50°5.2'N	129°36.5'W	237	242	239	25	x	x	x
50	S3	StRS	RD1	Oct 30	11:34	1375	5A	50°5.3'N	129°30.7'W	50°5.4'N	129°31.8'W	195	222	209	25	x		
51	S3	StRS	RD2	Oct 30	13:31	1363	5A	50°9.8'N	129°31.2'W	50°9.2'N	129°31'W	487	773	639	25	x	x	x
52	S5	StRS	RD1	Nov 6	04:16	1235	5E	54°1.6'N	133°40.4'W	54°1.5'N	133°41.6'W	228	231	230	25	x		
53	S5	StRS	RD1	Nov 6	05:45	1248	5E	54°0.3'N	133°47.7'W	54°0.2'N	133°48.8'W	241	377	313	25	x		
54	S5	StRS	RD2	Nov 6	06:45	1306	5E	54°9.2'N	133°50.9'W	54°9.1'N	133°52'W	507	591	543	25	x		
55	S5	StRS	RD2	Nov 6	08:30	1338	5E	54°3.4'N	133°50'W	54°3.4'N	133°51.2'W	475	513	488	25	x		
56	S5	StRS	RD2	Nov 6	10:09	1363	5E	54°0.9'N	133°47.5'W	54°0.9'N	133°48.6'W	533	609	559	25	x		
57	S5	StRS	RD1	Nov 6	12:12	1423	5E	54°0'N	133°31.1'W	54°0.1'N	133°32.1'W	372	371	371	25	x		
58	S5	StRS	RD1	Nov 9	08:46	1316	5E	53°7.1'N	133°29'W	53°7.1'N	133°30.4'W	211	262	231	24	x		
59	S5	StRS	RD3	Nov 9	10:53	1343	5E	53°7.3'N	133°46.6'W	53°7.4'N	133°47.8'W	1169	1140	1151	25	x		
60	S5	StRS	RD3	Nov 9	12:26	1359	5E	53°4.8'N	133°51.9'W	53°5'N	133°53.2'W	1137	1080	1121	25	x		
61	S5	StRS	RD2	Nov 9	15:48	1356	5E	53°7'N	133°27.2'W	53°6.9'N	133°28.3'W	600	721	636	25	x		
62	S5	StRS	RD3	Nov 9	16:51	1393	5E	53°5.2'N	133°28'W	53°5.1'N	133°29.1'W	836	935	877	25	x	x	x
63		Movement		Nov 9	18:55	1373	5E	53°3.1'N	133°18.3'W	53°3.3'N	133°20.9'W	417	641	517	56	x	x	x
64	S5	StRS	RD1	Nov 13	16:37	1323	5E	53°0.4'N	132°41.5'W	53°0.7'N	132°42.5'W	441	474	431	25	x		
65	S4	StRS	RD3	Nov 13	18:10	1381	5E	53°0.3'N	132°49.2'W	53°0.1'N	132°50.4'W	1231	1221	1229	25	x		
66	S4	StRS	RD3	Nov 13	19:50	1387	5E	53°0.5'N	132°44.4'W	53°0.4'N	132°45.6'W	1103	1224	1186	25	x		
67	S4	StRS	RD1	Nov 13	21:14	1398	5E	53°0.9'N	132°39.6'W	53°0.2'N	132°39.6'W	307	363	401	24	x	x	x
68	S4	StRS	RD1	Nov 13	22:12	1455	5E	53°0.7'N	132°38.3'W	53°0.7'N	132°39.6'W	347	517	437	24	x	x	x
69	S4	StRS	RD2	Nov 14	00:04	1475	5E	52°9.5'N	132°31.8'W	52°9.5'N	132°33.2'W	608	807	712	25	x	x	x
70	S4	StRS	RD2	Nov 14	01:46	1526	5E	52°5.4'N	132°24.6'W	52°5.1'N	132°25.8'W	512	602	564	25	x	x	x
71	S4	StRS	RD2	Nov 14	02:54	1567	5E	52°3.3'N	132°22.5'W	52°3.2'N	132°23.9'W	558	737	645	24	x		
72	S3	StRS	RD1	Nov 17	08:52	1331	5B	51°7.7'N	130°26.2'W	51°7.7'N	130°27.1'W	289	426	342	25	x		
73	S3	StRS	RD1	Nov 17	10:16	1368	5B	51°5.8'N	130°19.8'W	51°5.8'N	130°20.7'W	240	245	242	25	x		
74	S3	StRS	RD2	Nov 17	13:09	1335	5B	51°7.1'N	130°6.6'W	51°7'N	130°7.7'W	465	482	478	25	x		
75	S3	StRS	RD3	Nov 17	15:21	1332	5B	51°3.8'N	130°18.6'W	51°3.8'N	130°19.8'W	968	927	943	25	x		
76	S3	StRS	RD3	Nov 17	17:04	1342	5B	51°1.5'N	130°25.9'W	51°1.5'N	130°26.9'W	950	1175	970	25	x		
77	S3	StRS	RD3	Nov 17	18:38	1353	5B	51°1.2'N	130°22.3'W	51°1.2'N	130°23.2'W	1167	1133	1151	25	x		
78	S3	StRS	RD3	Nov 19	00:16	1320	5B	51°9.9'N	130°16.9'W	51°9.9'N	130°17.9'W	827	936	876	25	x		
79	S3	StRS	RD2	Nov 19	02:09	1346	5B	51°3'N	130°11.5'W	51°3'N	130°12.5'W	767	807	788	25	x		
80	S3	StRS	RD2	Nov 19	04:30	1377	5A	51°2.2'N	130°4.4'W	51°2.2'N	130°5.4'W	643	704	670	25	x		
81	S3	StRS	RD2	Nov 19	05:43	1411	5A	51°3.1'N	130°1.5'W	51°3.1'N	130°2.6'W	499	542	522	25	x		

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APPENDIX D SUMMARY OF BASKET USE BY TRAP 2021.

Summary of the basket use by trap number for StRS and inlet sets during the 2021 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, SD = Sublegal discarded, F= Frames, NULL = No Sablefish catch/trap missing. Standardized sets at mainland inlet localities are highlighted with green colour and StRS sets have no background colour. Those set numbers highlighted with purple colour had a camera deployed on the string of gear.

	Trap																									Total			
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	26	A	D	T	-
1	T	D,SD	A	D,SD	D,SD	T	D,SD	D,SD	D,SD	D,SD	D,SD	A	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	A	D,SD	D,F	D,F	D,SD	D,SD	D,SD		3	2	2	0
2	D,F	A	T,F	D,SD	D,F	D,SD	D,F	D,SD	T	D,SD	D,SD	D,SD	D,SD	A,F	D,F	D,F	D,F	T,F	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD		2	6	3	0
3	A		A	A	T	D	A	T	D,SD	D	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	A	T	T,SD	T,SD		5	2	7	1
4	T		A	T	D,SD	D,SD	T	D,SD	A	T	D,SD	D,SD	T	D,SD	A	T	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	A	D,SD		4	0	6	1
5	D,F	A,F	T,F	D,SD	D,SD	D,F	D,SD	D,SD	D,SD	D,F	D,F	T	D,SD		D,F	D,F	A	D,SD	D,F	D,F	D,F	D,SD	T,F	D,F	D,F	D,F	2	12	3	0
6	D,F	T	D,F	A	T,F	D,SD	A	T	D,SD	A	T	D,SD	D,SD		D,SD	A	T	D,F	D,SD	T	D,SD	A,F	T,F	D,F	D,SD	D,F	5	5	7	0
8	D,SD	A	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	D,SD	D	D,SD	D,SD	D,SD	D,SD	D,SD	T	D,SD	D,SD	D	D,SD	A	D	D		2	4	4	0
9	D,SD	T	D,SD	D,SD	D,SD	T,SD	A	D,SD	D,SD	D,SD	T	D,SD	D,SD	D,SD	D,SD	A	T	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	T		2	0	4	0
10	T	D,SD	A	T	D	A	T	A	D,SD	T	D	A	T	T	D	T	D	A	T	D,SD	D	T	D,SD	D,SD	T		5	5	10	0
11	D,SD	D,SD	T	D,SD	A	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD		D,SD	D,SD	D,SD	T	D,SD	A	D,SD	T,SD	D,SD	D,SD	D,SD	D,SD	2	0	5	0
12	D,SD	T	D,SD	D,SD	T	D,SD	A,F	T	D,SD	D,F	D,SD	D,F	D,F		D,SD	T,SD	T	D,SD	D,SD	D,F	D,SD	A	D,SD	D,SD	D,SD	D	2	5	4	0
13	T	D,SD	D,SD	D,SD	D,SD	A,F	T	D,SD	D,SD	T	T,SD	D,SD	D,SD		D,SD	T	D,SD	D,SD	T	D,SD	A	D,SD	D,SD	D,SD	D,SD	D,SD	2	0	5	0
15	A	T	A	D,SD	T				A	D,SD	T		A	T	D,SD		T		A	T	A	D,SD	T	D,SD	D,SD		6	0	7	6
16	T	T,SD	D,SD	D,SD	D,SD	A	T	D,SD	D,SD	T	D,SD	D,SD	T	T,SD	D,SD	D,SD	D,SD	D,SD	A	D,SD	A	D,SD	D,SD	D,SD	D,SD		3	0	4	0
17	A	T	T	D	A	T				A		T	D			A	A	T	D	A		D		T	D		6	5	6	8
18	A	T	T,SD	D,SD	T		A	T	D,SD	D	T	D,SD	T,SD	T		A	T	D,SD	D,SD	T	D,SD	A	T	T,SD	T,SD		4	1	8	2
19	D,SD	D,SD	A	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	D,SD	T		D,SD	T		A	T		A			A	T	A	5	0	7	4
20	D	A	T	A	A	T	D,SD	A	T	D,SD			D,SD			A		T	D	D,SD	T				D	D	5	4	5	7
21	A	T	D	A	T	D,SD	D,SD	T	D,SD	D,SD	D,SD	D,SD	D,SD	T	D,SD	T,SD	T	D,SD	A	T,SD	D,SD	D,SD	D,SD	D,SD	D,SD		3	1	5	0
22	T	D,SD		D,SD	D	A	T		A					D,SD		T	A	A	T	D,SD			A	D,SD	T		5	1	5	9
23	A	A	T	D	A	T	D	A	T	D	A	T	D	D	T	D,SD	A	T		A	T			T	A		8	5	8	3
24	A	T	D,SD	D,SD	T	D,SD	T	T	T,SD	T,SD	T	D,SD	D,SD	D,SD	D,SD	T,SD	T	D,SD	D,SD	D,SD	D,SD	A	D,SD	D,SD	D,SD		2	0	6	0
25	T	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	A	D,SD	D,SD	D,SD	T		D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	A	D,SD	D,SD	D,SD	D,SD	D,SD	2	0	2	0
26	D,SD	D,SD	T	D,SD	A	T	D,SD	D,SD	T	D,SD	D,SD	D,SD	D,SD		D,SD	D,SD	D,SD	T	D,SD	A	D,SD	D,SD	D,SD	D,F	D,SD	D,SD	2	1	4	0
28	T	D,SD	D,SD	T	D,SD	A	T	D,SD	D,SD	T	D,SD	A	T	D,SD	D,SD	T	D,SD	A	T	D,SD	A	T	D,SD	D,SD	T		4	0	9	0
29	D,SD	A		D,SD		T	D,SD	D,SD	T	D,SD		D,SD	D,SD	A	T	D,SD	D,SD	T	D,SD	A	T	D,SD	D,SD	D,SD	D,SD		3	0	5	3
30	D,SD	T	D,SD	A	T	D,SD	A	T	D,SD	A	T	D,SD	D,SD	T		A	T	D,SD	D,SD	T	D,SD	A	T		D,SD		5	0	8	2
31	T	D,SD	A	T	D,SD	D,F	T	D,SD	A	T	D,SD	D,SD	D,SD		A	T	D,SD	D,SD	D,SD	T,SD	D,SD	T	D,SD	D,SD	D,F	D,SD	3	2	6	0
32	D,SD	D,SD	T	T,SD	A	T	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD		D,SD	D,SD	D,SD	T	D,SD	A	T	D,SD	D,SD	T	D,SD	D,SD	2	0	5	0
33	D,SD	T	D,SD	A	T	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD		D,SD	D,SD	T	D,SD	D,SD	D,SD	D,SD	A	D,SD	D,SD	D,SD	D,SD	2	0	3	0
34	T	T,SD	A	T	D,SD	T,SD	T,SD	T,SD	T,SD	D,SD	D,SD	T,SD	T	D,SD	A	D,SD	D,SD	A	T	D,SD	A	T			T		4	0	6	2
35	D,SD			A	A	T			T	D,SD			A	A	T	A			A	A	T	A	A	T	D,SD		9	0	5	8
36	A	T	D,SD	A	T	D,SD	A	T	D,SD	A	T	D,SD	T	T		A	T	T,SD	A	T		A		A			8	0	8	4
37	T	D,SD	A		T,SD	A		A	A	T	D,SD		T	A	D,SD	T	D,SD			A	A	T		D,SD	T		7	0	6	6
38	D,SD		T		A	T		A	T		A				T		A		A		T	A		T	A	A	8	0	6	10
39				A	T	D,SD	A	T		A		T	A	T		T	T	T		T	T						4	0	9	11
40	T	D,SD	A	T	D,SD	T	T	D		T	D,SD		T	D,SD	A	T	A	D,SD	T		D,SD	D,SD	D,SD	D,SD			3	1	8	4
41	D	A	T	D,SD	D,SD	T	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	A	D,SD	D,SD	D,SD	D,SD		D,SD	D,SD	D,SD	D,SD	D,SD		2	1	2	1
42		T	D,SD	A	D,SD	D,SD	A	T	T,SD	A	D,SD	D	A	T	D	D,F	D,SD	D,SD	D,SD	D,SD		D,SD	D,SD	D,SD	D,SD		4	3	3	2
43	T		T	T		T		A		T	A	A	T			T		T	D,SD	T	T	D,SD	D,SD		D,SD		3	0	10	8
44			A	T	A	A	T	D,SD	T	T	A	A	T		A		T	A		A	D	T	T	T	T	T	8	1	11	4
45	A	T,F	D,SD		T	A	D,SD	T	D,SD	A,F	T	T,F	D,SD				T	T	T	T	D,SD	T	T			T	3	0	12	5
46	T	D,SD	A	T	D,SD	T	T	D,SD	A	T	D,SD	T,F	D,SD	D,SD	D,SD	T	D,SD	T	D,SD	D,SD	T	D,SD	T	D,SD			2	0	10	1
47				A	A	T		A	T		A	T			T	A							A				6	0	4	15
48	A	T	D,SD	A	T	D,SD	A	T	D,SD	D,SD	T	D,SD	D,SD	D,SD	D,SD	T	D,SD	D	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	T,SD		3	1	5	0
49	T	A	A	T	D	A	T	A	A	T	A	A	T		A	T	A	A	T	D	A				T		11	2	8	4

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continued.

	Trap																									Total			
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	26	A	D	T	-
50		A	T	D,F	A	T	A	A	T	A	A	T	A	A	T	A	A	T	T	T		T		A	T		11	1	10	3
51	A	T	D,SD	A	T	D,SD	D,SD	T	D,SD	A	T	D,SD		D,SD	D,SD		T	D,SD	D,SD	T		T	D,SD	D,SD	D,SD	D,SD	3	0	7	2
52	T	D,SD		T	A			D,SD	A			A	T					A	T	A	A	T	A	A	T		8	0	6	9
53		A	T	D,SD	A	T	D,SD	A	A	A	T			A	T	A	A	T	A	A			A		A		12	0	5	6
54	A	T	D,SD	D,SD	T	D,SD	D,SD	D,SD	D,SD	D,SD	T	D,SD	D,SD	D,SD	D,SD	D,SD	T	D,SD	A	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD		2	0	4	0
55	T	D,SD	A	T	D,SD	A	T	D,SD	D,SD	T	D,SD	D,SD	D,SD	D,SD	D	T	D,SD		D,SD	D,SD	A	T	D,SD	A	D,SD		4	1	6	1
56	D,SD	A	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	A	T	D,SD	D,SD	T	D,SD	D,SD		D,SD	D,SD	D,SD	D,SD		2	0	6	1
57	A	T		D,SD	T	D,SD	A	D,SD	T,SD	A	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	A	T	D,SD	A	T	D,SD	T		5	0	8	1
58													T				A				A				T		2	0	2	21
59	A		T	A	A	T		A	T	A	A		T	A	A	T	A	A	T	D	D,SD	T	D				10	2	7	5
60	A		A		T	A		T	D		T	D	A	T		A		A		T		A		A	A		9	2	5	9
61	T	D,SD	A	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	D,SD	D,SD	D,SD	A	T	D,SD	D,SD	D,SD		D,SD	D,SD		2	0	4	1
62	D,SD	A	T	D,SD	D,SD	T	D,SD	A	T	D,SD	D,SD	T	D,SD		T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	A	D,SD	D,SD	D,SD	3	0	7	0
64	T	D,SD	A	T	D,SD	D,SD	D,SD	D,SD	D,SD	T	D	D,SD	T	D,SD	D,SD	T	D,SD	A	D,SD	D	A	T	D,SD	D,SD	D,SD		3	2	6	0
65		A	T			T	A	A	T				A								T	A					5	0	4	16
66		T	A	A		A			A	T	T		A	T	D,SD	D,SD	T	D			A	A					7	1	5	10
67	T	D	A	T	D	A	T	D,SD	D,SD	T	D,SD	D,SD			T,SD	T	D,SD	A	T	D,SD	D,SD	T	T		T	D	3	3	9	2
68	D,SD	A	T	D,SD	D,SD	D,SD	D	D,SD	T	D,SD		T	D,SD		T	D,SD	D,SD	T	D,SD	A	T		A	T	A		4	1	7	3
69	A	T	D,SD	D,SD	D,SD	D,SD	A	T		D,SD	T	D,SD	D		D,SD	D,SD	T	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	2	1	4	1
70	T	D,SD	A	T	D,SD	D,SD	D,SD	D,SD	D,SD	T	D,SD	T,SD	D,SD		D,SD	T	D,SD	A	D,SD	D,SD	A	T	D,SD	A	D,SD	D,SD	4	0	5	0
71	D,SD	A	T	D,SD	D,SD	D,SD	D,SD	D,SD	T	D,SD	D,SD	D,SD	D,SD	D,SD	T	D,SD	D,SD		D,SD	D,SD	A	D,SD	D,SD	D,SD	T,SD		2	0	3	1
72	A	T	D,SD	D,SD	T	D,SD	A	T	D	A	T	D		T	D,SD	A	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	D,SD		4	2	8	1
73	T	A	A		D,SD	D,SD	T	D,SD	T,SD	T,F	D	D,SD	T		A	T	T,SD	A	T	D,SD		T	D,SD	A	T		5	1	8	3
74	D,SD	A	T	D,SD	D,SD	T	D,SD	D,SD	D,SD	D,SD	D,SD	T	D,SD	A	T		D,SD	T	D,SD	A	T	D,SD	D,SD	T	D,SD		3	0	7	1
75	A	T	D,SD	D,SD	D,SD	D,SD	D,SD	T	D,SD	D,SD	D,SD	D,SD	D,SD	T	D,SD	A	D,SD	D,SD		D,SD	T,SD	D,SD		D,SD	D,SD		2	0	3	2
76	T	T,SD	A	T	D,SD	D,SD	T	D,SD	A	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	A	D,SD	D,SD	D,SD	D,SD		3	0	7	0
77	D,SD	A	T	D	A	T	D,SD	A	T	T,SD	D,SD	T	D,SD	A	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD		4	1	8	0
78	A	T	D,SD	D,SD		D,SD	D,SD	T	D,SD	D,SD	D,SD	D,SD	D,SD	T	D,SD	A	T	D,SD	A	T	D,SD	D,SD	T,SD	D,SD	D,SD		3	0	5	1
79	T	D,SD	A	D,SD	D,SD	T,SD	T	D,SD	D,SD			D,SD	D,SD	D,SD	A	T	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,F		2	1	3	2
80	D,SD	A	T	D,SD	T,SD	T	D,SD	D,SD	T	D,SD	D,SD	D,SD	T,SD	D,SD	T	D,SD	A	T,SD	D,SD	D,SD	T,SD	D,SD	D,SD	D,SD	D,SD		2	0	4	0
81	A	T	D,SD	T,SD	D,SD	D,SD	D,SD	T	D,SD	A	T	D,SD	D,SD	T	T,SD	D,SD	T	D,SD	A	T	D,SD	D,SD	D,SD	D,SD	T,SD		3	0	6	0

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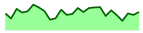
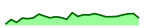
APPENDIX E SUMMARY OF SABLEFISH BIOLOGICAL DATA 2021.

Summary of biological data collected for Sablefish by set, catch weight in kilograms and numbers of fish. Sablefish counts by trap are represented by sparklines, with every string picked up from the end location in 2021. Tagged fish counts are recorded by number of fish recovered and re-released, fish sampled and fish tagged and released. Tagged fish fork lengths are listed by count and mean (millimeters). Specimen counts are listed by sample type; mean fork lengths are tabulated. Standardized sets at mainland inlet localities are highlighted with green colour and StRS sets have no background colour. Those set numbers highlighted with purple colour had a camera deployed on the string of gear. The 4 sets highlighted in blue colour represent the 60 trap sets that were deployed to evaluate gear bottom-contact.

Set	Total Catch			Tagged Fish Counts			Tagged Fork Lengths(mm)		Specimen Count						Mean Fork Length(mm)		
	kg	Count	Count by Trap	Recover-Rerelease	Tag Sample	Released	Count	Mean	Fork Length	Sex	Maturity	Otoliths	Weight	Count	Proportion Males	Males	Females
1	3403	1829		0	0	139	137	549	49	49	49	49	49	49	0.31	528	575
2	2645	1567		0	0	190	190	536	50	49	49	49	49	50	0.73	537	580
3	857	330		5	0	102	107	622	51	51	51	51	51	51	0.16	615	632
4	953	489		0	0	121	121	571	57	52	52	52	52	57	0.63	556	604
5	3565	2123		1	0	143	144	541	55	55	55	50	55	55	0.62	535	578
6	880	527		1	0	121	122	546	54	48	48	48	48	54	0.69	546	569
7	0	2476		0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	1907	727		0	0	139	139	610	58	57	57	58	58	58	0.11	558	607
9	1709	938		2	0	123	125	536	43	43	43	43	43	43	0.67	544	550
10	867	284		1	0	93	94	653	50	51	51	51	51	51	0.12	638	659
11	1323	761		1	0	137	138	531	46	46	46	44	46	46	0.83	541	594
12	1811	825		1	0	127	128	582	58	54	54	54	54	58	0.07	569	596
13	1353	768		1	0	135	136	538	57	57	57	57	57	57	0.75	538	563
14	0	1861		0	9	0	9	580	9	9	9	9	9	9	0.89	599	580
15	869	304		0	0	122	122	624	55	55	55	55	55	55	0.24	585	625
16	1116	716		3	0	130	133	508	51	51	51	51	51	51	0.86	510	524
17	367	102		1	0	19	20	685	48	48	48	48	48	48	0.02	530	692
18	824	312		4	0	97	101	619	50	49	50	50	50	50	0.2	590	626
19	743	397		0	0	98	98	528	56	57	57	57	57	57	0.44	529	554
20	347	137		0	0	33	33	606	54	54	54	54	54	54	0.28	572	638
21	1127	741		4	0	146	150	518	50	50	50	50	50	50	0.78	509	575
22	527	197		0	0	60	59	620	47	47	47	47	47	47	0.11	537	605
23	342	102		0	0	29	29	646	47	47	47	47	47	47	0.04	630	668

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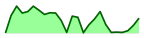
continued.

Set	Total Catch			Tagged Fish Counts			Tagged Fork Lengths(mm)		Specimen Count						Mean Fork Length(mm)		
	kg	Count	Count by Trap	Recover-Rerelease	Tag Sample	Released	Count	Mean	Fork Length	Sex	Maturity	Otoliths	Weight	Count	Proportion Males	Males	Females
24	1236	755		4	0	145	149	545	52	52	52	52	52	52	0.48	528	579
25	2729	1219		0	0	134	134	567	47	47	47	47	47	47	0.4	554	574
26	2070	960		1	0	129	129	582	55	55	55	55	55	55	0.62	565	599
27	0	1892		0	4	0	4	558	4	4	4	4	4	4	0.5	565	638
28	846	493		0	0	136	135	540	51	51	51	51	51	51	0.65	530	568
29	802	441		1	0	127	126	539	48	47	47	47	47	48	0.79	514	562
30	751	441		1	0	110	111	544	52	52	52	52	52	52	0.62	538	600
31	920	495		3	0	116	119	537	49	49	49	49	49	50	0.71	546	554
32	1100	632		1	1	102	104	536	49	49	49	49	49	49	0.67	512	562
33	1377	980		0	0	147	147	514	52	52	52	52	52	52	0.63	498	531
34	1059	468		7	0	105	111	591	48	48	48	48	48	48	0.21	537	594
35	406	176		0	0	54	53	594	53	53	53	53	53	53	0.36	512	576
36	503	217		3	0	59	62	578	54	54	54	54	54	54	0.24	562	606
37	618	281		1	0	61	62	582	54	54	54	54	54	54	0.31	522	581
38	255	131		0	0	69	68	536	51	51	51	51	51	51	0.35	536	560
39	484	154		0	0	88	87	631	58	58	58	56	58	58	0.33	616	680
40	690	355		1	0	130	131	547	52	52	52	52	52	52	0.75	528	587
41	2372	1143		0	0	190	189	559	59	59	59	59	59	59	0.22	527	589
42	1052	462		1	0	121	122	588	54	52	52	52	52	54	0.08	575	606
43	588	262		2	0	133	134	581	53	53	53	53	53	53	0.64	583	655
44	351	161		0	0	91	91	586	54	49	49	48	49	55	0.27	543	587
45	709	286		0	0	116	116	593	54	53	53	53	53	54	0.23	551	587
46	1070	361		2	0	127	128	628	57	56	56	56	56	57	0.13	578	634

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continued.

Set	Total Catch			Tagged Fish Counts			Tagged Fork Lengths(mm)		Specimen Count						Mean Fork Length(mm)		
	kg	Count	Count by Trap	Recover-Rerelease	Tag Sample	Released	Count	Mean	Fork Length	Sex	Maturity	Otoliths	Weight	Count	Proportion Males	Males	Females
47	110	41		0	0	11	11	594	30	30	30	30	30	30	0.33	579	641
48	1326	536		1	0	131	132	595	51	51	51	51	51	51	0.43	590	596
49	294	65		0	0	28	28	679	31	31	31	31	31	31	0.19	625	748
50	473	134		0	0	81	80	668	49	49	49	49	49	49	0.2	616	676
51	965	464		0	0	127	127	575	55	55	55	55	55	55	0.44	562	588
52	231	72		0	0	19	19	665	47	47	47	47	47	47	0.06	508	664
53	262	74		0	0	19	19	652	47	47	47	47	47	47	0.26	605	703
54	1616	924		0	0	122	122	532	47	47	47	47	47	47	0.49	536	553
55	1072	472		0	0	120	120	570	51	51	51	51	51	51	0.55	541	555
56	1149	506		0	0	130	129	583	51	51	51	51	51	51	0.47	540	596
57	762	443		2	0	113	115	548	59	59	59	59	59	59	0.44	519	543
58	29	9		0	0	5	5	646	4	4	4	4	4	4	0.25	665	662
59	266	90		0	0	30	30	629	52	52	52	52	52	52	0.25	633	675
60	269	81		0	0	24	24	678	46	46	46	46	46	46	0.24	666	678
61	2227	1332		1	0	185	186	517	58	58	58	58	58	58	0.55	503	539
62	1122	574		1	0	118	119	572	51	51	51	51	51	51	0.61	563	606
63	0	1360		0	1	0	1	796	1	1	1	1	1	1	0	0	775
64	1659	543		0	0	138	138	644	55	55	55	55	55	55	0.33	601	672
65	40	16		0	0	10	10	580	6	6	6	6	6	6	0.33	548	614
66	215	89		1	0	14	15	622	45	45	45	45	45	45	0.67	616	631
67	1107	360		2	1	110	113	637	51	50	50	50	50	51	0.32	618	657
68	1047	374		0	0	115	115	607	44	44	44	42	44	44	0.32	583	628
69	2324	1280		1	0	138	139	565	64	50	50	50	50	64	0.48	548	569

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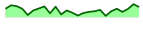
continued.

Set	Total Catch			Tagged Fish Counts			Tagged Fork Lengths(mm)		Specimen Count						Mean Fork Length(mm)		
	kg	Count	Count by Trap	Recover-Rerelease	Tag Sample	Released	Count	Mean	Fork Length	Sex	Maturity	Otoliths	Weight	Count	Proportion Males	Males	Females
70	1599	657		1	0	133	134	604	53	53	53	53	53	53	0.38	590	622
71	2006	1137		1	0	134	135	527	55	54	54	54	54	55	0.44	499	565
72	585	190		0	0	55	55	647	49	49	49	49	49	49	0.37	613	654
73	678	197		3	0	57	60	670	53	52	52	52	52	53	0.17	584	689
74	995	429		0	0	140	140	565	51	51	51	51	51	51	0.49	571	604
75	1426	909		1	0	127	128	538	51	52	52	52	52	52	0.75	534	597
76	1089	569		1	0	147	148	557	51	51	51	51	51	51	0.69	562	636
77	779	288		1	0	108	109	626	52	52	52	52	52	52	0.35	540	644
78	1091	616		1	0	129	130	555	54	54	54	54	54	54	0.69	540	561
79	1380	1025		1	0	126	127	500	52	52	52	52	52	52	0.58	502	551
80	1351	887		5	0	127	132	505	54	54	54	54	54	54	0.61	497	552
81	1050	588		5	0	132	137	555	49	49	49	49	49	49	0.61	539	559
Movement		7,589		0	14	0	14		14	14	14	14	14	14			
Other		41,020		82	2	7,997	8,065		3,860	3,818	3,819	3,808	3,820	3,865			
Total		**48,609**		**82**	**16**	**7,997**	**8,079**		**3,874**	**3,832**	**3,833**	**3,822**	**3,834**	**3,879**			

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

Biological data collected for Rougheye/Blackspotted Rockfish complex. Each set is listed with counts of specimens sampled, calculations of mean fork lengths and the number of species visually identified as either a RE = Rougheye Rockfish, BS = Blackspotted Rockfish or a hybrid. All were captured on StRS sets.

	Specimen Count							Mean Fork Length(mm)				Sampler Visual id		
Set	Fork Length	Weight	Sex	Maturity	Otolith	DNA	Total Count	Proportion Males	Males	Females	No sex	RE	BS	Hybrid
19	3	3	3	3	3	3	3	0	0	492	0	2	1	0
26	1	1	1	1	1	1	1	0	0	520	0	0	0	0
48	2	2	2	2	2	2	2	0	0	445	0	1	1	0
53	2	2	2	2	2	2	2	1	465	0	0	0	2	0
55	25	25	25	25	25	25	62	0.44	475	474	0	9	16	0
56	11	11	11	11	11	11	11	0.73	470	490	0	2	9	0
64	24	24	24	24	24	24	36	0.38	457	472	0	0	24	0
67	14	14	14	14	14	14	14	0.64	488	480	0	1	12	1
68	10	10	10	10	10	10	10	0.5	487	453	0	1	9	0
70	1	1	1	1	1	1	1	1	410	0	0	0	1	0
72	8	8	8	8	8	8	8	0.63	449	510	0	3	5	0
74	1	1	1	1	1	1	1	1	415	0	0	0	1	0
	102	102	102	102	102	102	151					19	81	1

APPENDIX G SUMMARY OF BIOLOGICAL DATA FOR OTHER ROCKFISH SPECIES AND LINGCOD.

Biological data collected for other rockfish species and Lingcod. Both fin clips and otolith structures were collected for Lingcod. Each set is listed with counts of specimens sampled and calculations of mean fork lengths. All were captured on StRS sets.

Species Name	Set	Specimen Count							Mean Fork Length(mm)			
		Fork Length	Weight	Sex	Maturity	Aging Structures Collected	DNA	Total	Prop Males	Males	Females	No sex
SHORTRAKER ROCKFISH	54	1	1	1	1	1	0	1	1.00	485	0	0
	68	1	1	1	1	1	0	1	1.00	635	0	0
	70	2	2	2	2	2	0	2	0.00	0	543	0
	72	1	1	1	1	1	0	1	1.00	775	0	0
	74	1	1	1	1	1	0	1	1.00	450	0	0
	81	2	2	2	2	2	0	2	0.50	635	520	0
YELLOWEYE ROCKFISH	20	2	2	2	2	2	2	2	1.00	533	0	0
	44	15	15	15	15	15	15	15	0.47	594	548	0
	45	6	6	6	6	6	6	6	0.33	625	604	0
	46	3	3	2	2	3	3	3	0.50	450	495	595
	49	2	2	2	2	2	2	2	0.50	495	605	0
	50	15	15	15	15	15	15	15	0.47	544	494	0
	52	1	1	1	1	1	1	1	1.00	565	0	0
LINGCOD	22	3	3	3	3	6	0	14	0.00	0	975	0
	42	2	2	2	2	4	0	6	0.00	0	1003	0
	44	1	1	1	1	2	0	18	0.00	0	1000	0
	45	2	2	2	2	4	0	39	0.00	0	1043	0
	50	2	2	2	2	4	0	11	0.00	0	1085	0
	52	2	2	2	2	4	0	8	0.00	0	1100	0
	58	9	9	9	9	18	0	12	0.00	0	1084	0
	68	2	2	2	2	4	0	2	0.00	0	1077	0

6 References

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