Summary of the annual 2020 sablefish (*Anoplopoma fimbria*) trap survey, October 7 – November 21, 2020

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2021

Canadian Technical Report of Fisheries and Aquatic Sciences 3431

Fisheries and Oceans Canada
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Canadian Technical Report of Fisheries and Aquatic Sciences

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SUMMARY OF THE ANNUAL 2020 SABLEFISH (*ANOPLOPOMA FIMBRIA*) TRAP SURVEY, OCTOBER 7 - NOVEMBER 21, 2020

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Cat. No. Fs97-6/3431E-PDF ISBN 978-0-660-38572-3 ISSN 1488-5379

Correct citation for this publication:

Lacko, L.C., Acheson, S.M. and Connors, B.M. 2021. Summary of the annual 2020 sablefish (*Anoplopoma fimbria*) trap survey, October 7 - November 21, 2020. Can. Tech. Rep. Fish. Aquat. Sci. 3431: vi + 50 p.

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ABSTRACT

Lacko, L.C., Acheson, S.M. and Connors, B.M. 2021. Summary of the annual 2020 sablefish (*Anoplopoma fimbria*) trap survey, October 7 - November 21, 2020. Can. Tech. Rep. Fish. Aquat. Sci. 3431: vi + 50 p.

This document describes sampling activities and summarizes results from the 2020 British Columbia Sablefish research and assessment survey. The survey was comprised of stratified random sets (StRS) at five depth-stratified areas. A portion of the survey (traditional inlet sets) was removed to shorten the survey in response to the COVID-19 pandemic. Biological sampling for sablefish included collection of length, weight, sex, maturity and age structures. Sablefish were randomly sampled from every third trap on all sets, up to a maximum sample size of 60 sablefish. The tag and release study conducted annually since 1991 was continued in 2020. Sablefish were selected randomly for tag and release from every third trap up to a maximum of 125 fish.

A total of 48,092 sablefish were caught in 2020, of which 3,691 were used for biological samples and 8,200 were tagged and released. Catch per unit effort (CPUE) is an important product from this survey as it is used to infer population trends. In most recent years, survey data from stratified random sets showed increasing trends in CPUE in both mean weight and numbers of fish per trap. At the 2020 StRS sites, the stratified mean survey abundance was 35 kg/trap, down -17% from 2019 and -13% from the 2018-2019 average.

RÉSUMÉ

Lacko, L.C., Acheson, S.M. and Connors, B.M. 2021. Summary of the annual 2020 sablefish (*Anoplopoma fimbria*) trap survey, October 7 - November 21, 2020. Can. Tech. Rep. Fish. Aquat. Sci. 3431: vi + 50 p.

Le présent document décrit les activités d'échantillonnage réalisées dans le cadre du relevé d'évaluation et de recherche 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. On a éliminé une partie du relevé (traits habituels réalisés dans des bras de mer) pour raccourcir ce dernier en raison de la pandémie de COVID-19. L'échantillonnage biologique de la morue charbonnière comprend la collecte de données sur la longueur, le poids, le sexe, la maturité et les structures selon l'âge. 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 60 individus. L'étude de marquage et de remise à l'eau menée annuellement depuis 1991 s'est poursuivie en 2020. Dans le cadre de celle-ci, les morues charbonnières ont été choisies de façon aléatoire à partir du troisième casier de chaque trait, jusqu'à l'atteinte d'une quantité maximale de 125 individus.

Au total, 48 092 morues charbonnières ont été capturées en 2020. Parmi celles-ci, 3 691 ont été utilisées pour le prélèvement d'échantillons biologiques et 8 200 ont été marquées, puis remises à l'eau. Les captures par unité d'effort (CPUE) représentent des résultats importants du relevé parce qu'on les utilise pour inférer les tendances des populations. Au cours des dernières années, les données de relevé provenant des traits ayant fait l'objet d'un échantillonnage aléatoire stratifié ont montré des tendances à la hausse des CPUE, à la fois pour le poids moyen des prises et le nombre d'individus par casier. Aux sites où ces traits ont été effectués en 2020, l'abondance moyenne stratifiée du relevé était de 35 kg/casier, soit une diminution de 17% par rapport à 2019 et de 13% par rapport à la moyenne de 2018-2019.

1 Introduction

Sablefish (*Anoplopoma fimbria*) are a commercially valuable species that are harvested in British Columbia (BC) using trap, longline and trawl gear as part of the integrated management plan for the groundfish fishery. For the past ten years (2011 to 2020), BC fishermen have landed an average of 2,120 metric tons of sablefish annually. The majority of sablefish in 2020 were captured by longline trap gear (56%) and longline hook gear (38%). 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. 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).

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. Due to the COVID-19 pandemic, the 2020 survey was shortened and the inlet sites were not surveyed. In addition, a single science crew were contracted from Archipelago Marine Research (AMR) for the duration of the trip. 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. Surveys in 2018 and 2019 are found in Lacko et al. (2020).

This technical report describes survey operations and summarizes data collected on the 2020 chartered survey aboard the F/V Pacific Viking. Tables and figures referred to in the main text are numbered sequentially. Tables and figures in the appendices are labelled with a letter code.

2 Methods

2.1 SURVEY DESIGN

Methodology for the 2020 sablefish research and assessment surveys employed a stratified random sampling (StRS) design. The survey protocol required the StRS component to be completed from the southern end of Vancouver Island to the north coast of Haida Gwaii. The survey design was modified in 2020 in response to the COVID-19 pandemic. The length of the trip was reduced by removing the traditional inlet component of the survey.

2.1.1 STRATIFIED RANDOM SAMPLING SURVEY DESIGN COMPONENT

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

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

From 2003 through 2005, five grid cells were randomly selected in each spatial-depth stratum. From 2006 through 2010, the number was increased to six. An analysis was completed for the 2011 survey to optimize the allocation of the blocks to strata for the 2011 and 2012 survey. However, in order to lower survey costs, the number of blocks were further reduced for the 2013 survey, from a total of 110 to 91 offshore blocks while maintaining the same relative allocation of blocks to strata. This total number of blocks has been in place on all subsequent surveys (Table 1), including 2020 (Figure 2).

2.2 VESSELS

The 2020 survey of 87 sets was chartered aboard the 25.34 meter F/V Pacific Viking (Figure 3), skippered by Albert (Deacon) Melnychuk between Oct 7 - Nov 21 , 2020 (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 beckets at 150 foot intervals along its length and 90 pound anchors at each end (Figure 4, b). A flagpole was required for at least one end of the set to improve visibility for retrieval. The traps were steel frame with a bottom hoop diameter of 54 inches and covered with an North American #84 black braided nylon web of 2.75 inch mesh (Figure 4, a). The tunnels were made of green braided, knotless, 1.25 inch mesh. The traps did not include escape rings, however included a 'rot panel' of # 21 cotton located above the middle ring.

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

2.4 FISHING OPERATIONS

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

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 beckets and traps, as well as the unique identifying numbers of sensors deployed (Appendix B, Figure B.2)

2.4.1 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 CATCH PROCESSING

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

Catch by species from each trap was sorted into baskets by the crew. Baskets were then weighed to the nearest 0.2 kg on a motion compensating scale and given a basket use code of D, A, T, L, SD or F. Code D designated fish species as discards or commercial catch; code A allocated sablefish for age samples; code T allocated sablefish to be tagged and released; code L allocated fish for length samples; code SD identified sublegal sablefish discards; code F represented fish frames with amphipod or hagfish damage (Appendix B, Figure B.3). The next day, the entries on charter catch log form were transposed to tabular format on the charter catch log entry form (Appendix B, Figure B.4).

2.5.1 Sablefish Allocation Details

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

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

2.6 BIOLOGICAL SAMPLING (LWSMO)

Biological samples were collected from sablefish and rougheye/blackspotted rockfish (*Sebastes aleutianus/Sebastes 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 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.

2.7 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) 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.6).

2.8 SABLEFISH TAG RECOVERY

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

2.9 OCEANOGRAPHIC SENSOR DATA COLLECTION

A Sea-bird Bird SBE 39 temperature and pressure logger was placed in a protective plastic pipe and attached to the middle trap on the string of gear. Data was successfully collected from 87 sets in 2020 (Appendix C). A SBE 39 was also placed in the tagging tank on hauling days to record water temperature. Data from the SBE temperature and pressure loggers were processed at sea after the set was complete.

2.10 ELECTRONIC MONITORING VIDEO DATA COLLECTION

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

3 Results and Discussion

3.1 FISHING

The 2020 survey was 46 days long and divided into two legs of 16 and 29 days, with a single day between in Port Hardy. Several weeks of inclement weather contributed to a longer second leg. In total, 27 fishing days were recorded.

Of the 91 original blocks for the StRS portion of the survey, ten were replaced at-sea and four blocks were rejected, for a total of 87 blocks successfully fished (Table 1). Of the ten replacements, one was revoked after on-ground inspection, three were located within unfishable habitat, four had failed to meet depth strata requirements, one was located in a conservation area and one had a track-line in the neighboring block (Table 1).

3.2 CATCH PER UNIT EFFORT (CPUE)

The sablefish survey of 2020 have documented recent changes in the sablefish population structure.

3.2.1 Stratified Random Set CPUE

Catch per unit effort (CPUE), as indexed by kilograms of sablefish per trap, decreased in 2020 across the mid depth strata (RD_2); and remained steady in the shallow (RD_1) and deep (RD_3) depth strata (Figure 5). Comparison across spatial and depth strata indicate declining CPUE (kg/trap) in areas S_2 to S_5, but increasing in the most southern area S_1 (Figure 6). The CPUE (#fish/trap) across all strata declined remarkably with the exception of the northern strata S_5 (Figure 7). The mean weight was similar or slightly lower compared to 2019 (Figure 8). The stratified mean survey abundance in 2020 was 35 kg/trap, down -17% from 2019 and -13% from the 2018-2019 average (Figure 9).

3.3 CATCH COMPOSITION

A total of forty-two taxonomic groups were represented in the catches in StRS sets in 2020 (Table 2). These included ten roundfish species, seven rockfish species, four flatfish species and twenty-one invertebrate species. Other than sablefish, the most common species, by weight, were Pacific halibut (*Hippoglossus stenolepis*), lingcod (*Ophiodon elongatus*), spiny dogfish (*Squalus acanthias*), yelloweye rockfish (*Sebastes ruberrimus*) and redbanded rockfish (*Sebastes babcocki*).

3.4 SABLEFISH SAMPLING

A detailed breakdown of the fate of the catch in each trap for the 2020 survey is listed in Appendix D.

During the 2020 StRS, a total of 48,092 sablefish were caught. Of that total, 8,277 were tagged and released and 3,691 were retained for biological sampling. Of the tagged fish, 77 were previously tagged fish that were re-released with a new tag. One previously tagged fish was retained for sampling (Appendix E).

Overall, the StRS sets had a higher proportion of females than males over all spatial strata (Table 3). More females than males were caught in the shallow depth stratum within all spatial strata. In the mid depth stratum, there were more males than females in S_1, S_2 and S_5. The deepest depth stratum saw more females in spatial strata S_1, S_2, S_3 and S_4.

Differences in length distributions between female and male sablefish are exhibited in the data collected from the StRS portion of the 2003 - 2020 surveys. The mean fork length ($\bar{x}$) for females was 65.0 cm and the mean fork length ($\bar{x}$) for males was 58.4 cm (Figure 10).

In 2020, the average mean fork length for the 1,925 females was 60.4 cm and the average mean fork length for the 1,676 males was 54.8 cm. The mean length of both females and males reached their lowest mean size since 2003 (Figure 11).

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

3.5 SABLEFISH SUB-LEGAL ENCOUNTERS

Distinct distribution patterns became apparent across strata of increasing sub-legal sablefish (<55 cm fork length), following highly anomalous warm ocean conditions known as the “Blob” and the “Blob 2.0”. The first marine heat wave (Blob) began in the NE Pacific in late 2013 (Bond et al. 2015) and persisted until 2016 (Dorantes-Gilardi and Rivas 2019). A similar marine heat wave (Blob 2.0) with warm sea surface temperatures appeared again in the summer of 2019 (Amaya 2020).

More than half of the sub-legal specimens were captured in the southern strata (S_1) mid-depth waters (RD_2) in 2014 and shallow waters (RD_1) in 2015. The sub-legal specimen count was above 50% in both 2017 and 2018 in the northern strata of S_4 and S_5 mid-depth waters (RD_2). In 2019, the sub-legal specimens dominated in all StRS survey strata (S_1 to S_5) mid-depth waters (RD_2). In 2020, the sub-legal specimen count was over 50% in S_1, S_4 and S_5 in the mid-depth waters (RD_2) (Figure 13).

3.6 RECOVERED TAGGED SABLEFISH

Of the 77 Canadian tagged fish that were recovered on the survey, the majority (79%) had travelled no more than 50 kilometers from the release site. Most recoveries (70%) were recaptured within 5 years at liberty (Table 4). Three fish were recovered a second time and released a third time (Table 5).

3.7 OTHER FISH SAMPLING

Length, sex, maturity, otoliths and DNA samples were collected for 126 rougheye/blackspotted rockfish samples. The science samplers visually identified 68 as rougheye, 58 as blackspotted and none as hybrid species (Appendix F).

3.8 SABLEFISH AGES

At the time of this report, sablefish ages were only available prior to 2019. 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 (Figure 14a).

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 appeared in 2012 through to 2016 as 4, 5, 7, 7 and 8 year olds. A cohort also appeared to arrive in 2017 which was dominated by 3 year olds and in 2018 by 5 year olds (Figure 14b).

Historic data from all samples lists the oldest female sablefish at 92 years of age, collected in 2003 where as the oldest male sablefish with the age of 96 years old was documented for the year 2018.

3.9 OCEANOGRAPHIC TEMPERATURES AND DEPTHS

Co-plots of average temperatures and average depths by 1-degree latitude intervals from southwest Vancouver Island to northwest Haida Gwaii indicate that 2020 survey data exhibited a general trend of decreasing temperature with depth over latitude. The coldest average temperature per set recorded was 2.6 °C with an average depth of 1295 m in the latitude zone of 52° - 53° (Figure 15).

SBE 39 recorders have been placed 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 16).

3.10 ACKNOWLEDGEMENTS

The stock assessment survey and data report is the result of the collaborative efforts of many individuals. Wild Canadian Sablefish has provided coordination and support of the annual Sablefish survey since 1994. The scientific staff that conducted the 2020 sablefish research charter included Guy Boxall, Dean Gaidica, Talyn Ridgway of Archipelago Marine Research Ltd (AMR). 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 2020, the crew consisted of Deacon Melnychuk (skipper), Cody Melnychuk,Rick Schneider, David Holomego, Rory Johnson and Bruno Olsen.

4 Tables

Table 1. Spatial strata allocation and completed strata counts (blue) for the 2020 sablefish research and assessment survey.

Spatia Strata	Depth Strata							
	RD1	RD1 2020	RD2	RD2 2020	RD3	RD3 2020	Total	Total 2020
S1 (South West Coast Vancouver Island or SWCVI)	6	6	8	8	5	5	19	19
S2 (North West Coast Vancouver Island or NWCVI)	6	6	7	7	5	5	18	18
S3 (Queen Charlotte Sound or QCS)	8	7	6	6	5	4	19	17
S4 (South West Coast Haida Gwaii or SWCHG)	6	4	6	6	5	5	17	15
S5 (North West Coast Haida Gwaii or NWCHG)	6	6	7	7	5	5	18	18
Total	**32**	**29**	**34**	**34**	**25**	**24**	**91**	**87**

Table 2. Summary of species captured during the 2020 survey StRS sets conducted by the Pacific Viking. No value in the weight column indicates that the catch was not weighed. No value in weight and count of 1 indicates trace weights of less than 1 kg recorded.

Category	Common Name	Scientific Name	Count	Weight(kg)
Roundfish Species	Sablefish	ANOPLOPOMA FIMBRIA		92,169
	Lingcod	OPHIODON ELONGATUS		1,522
	Spiny dogfish	SQUALUS ACANTHIAS		1,122
	Pectoral rattail	ALBATROSSIA PECTORALIS		219
	Pacific grenadier	CORYPHAENOIDES ACROLEPIS		201
	Pacific cod	GADUS MACROCEPHALUS		6
	Pacific flatnose	ANTIMORA MICROLEPIS		2
	Walleye pollock	THERAGRA CHALCOGRAMMA		1
	Pink snailfish	PARALIPARIS ROSACEUS		1
	Pacific viperfish	CHAULIODUS MACOUNI	1	
Rockfish Species	Yelloweye rockfish	SEBASTES RUBERRIMUS		303
	Redbanded rockfish	SEBASTES BABCOCKI		288
	Rougheye/blackspotted rockfish complex	SEBASTES ALEUTIANUS		222
	Shortraker rockfish	SEBASTES BOREALIS		65
	Shortspine thornyhead	SEBASTOLOBUS ALASCANUS		55
	Rosethorn rockfish	SEBASTES HELVOMACULATUS		4
	Longspine thornyhead	SEBASTOLOBUS ALTIVELIS	2	
Flatfish Species	Pacific halibut	HIPPOGLOSSUS STENOLEPIS		1,554
	Arrowtooth flounder	ATHERESTHES STOMIAS		287
	Dover sole	MICROSTOMUS PACIFICUS		11
	Petrale sole	EOPSETTA JORDANI		2
Invertebrate Species	Grooved Tanner Crab	CHIONOECETES TANNERI		117
	Brown box crab	LOPHOLITHODES FORAMINATUS		6
	Oregontriton	FUSITRITON OREGONENSIS		6
	Red Queen Crab	LITHODES COUESI		3
		ALLOCENTROTUS FRAGILIS		3
		PARALOMIS MULTISPINA		3
	Jellyfish	SCYPHOZOA		2
	Octopus	OCTOPUS		2
	Fish-eating star	STYLASTERIAS FORRERI		1
	Prawn	PANDALUS PLATYCEROS		1
	Sea whip	OSTEOCELLA SEPTENTRIONALIS	1	
	Papillose sea cucumber	SYNALLACTES CHALLENGERI	1	
	Golden king crab	LITHODES AEQUISPINA	1	
		ACTINAUGE VERRILLI	1	
	Ophiuroidea	OPHIUROIDEA	1	
		PYROSOMA	1	
		SOLASTER	1	
		TARSASTER ALASCANUS	1	
		HETEROZONIAS ALTERNATUS	1	
		MEDIASTER TENELLUS	1	
		MYXODERMA SACCULATUM	1	

Table 3. Summary of sablefish sex ratios and fork length measurements collected during the 2020 stratified random sets by spatial and depth stratum.

Depth Strata/Locality		Proportion		Mean Fork Length (mm)		
Spatial	**Depth**	**Males**	**Females**	**Males**	**Females**	**Tagged**
S1	RD1	0.34	0.66	544	589	563
	RD2	0.64	0.36	516	552	528
	RD3	0.32	0.68	549	612	601
		0.43	**0.57**	**536**	**584**	**564**
S2	RD1	0.28	0.72	576	611	595
	RD2	0.63	0.37	547	606	562
	RD3	0.44	0.56	559	639	604
		0.45	**0.55**	**561**	**619**	**587**
S3	RD1	0.33	0.67	577	627	607
	RD2	0.50	0.50	548	588	569
	RD3	0.45	0.55	584	662	603
		0.43	**0.57**	**570**	**626**	**593**
S4	RD1	0.21	0.79	607	634	623
	RD2	0.50	0.50	529	562	552
	RD3	0.46	0.54	570	646	615
		0.39	**0.61**	**569**	**614**	**597**
S5	RD1	0.21	0.79	562	617	587
	RD2	0.58	0.42	541	583	553
	RD3	0.63	0.37	573	627	581
		0.47	**0.53**	**559**	**609**	**574**

Table 4. Sablefish tag recovery counts in 2020, 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	13	3	1	0	1	1	0	19
2-5	25	3	1	5	0	1	0	35
6-10	3	4	0	1	2	0	0	10
11+	7	3	1	2	0	0	0	13
Total Counts	48	13	3	8	3	2	0	77

Table 5. Tag history of the events of three previously tagged sablefish recovered on the 2020 survey.

Release Tag number	Previous Tag number	Event	Event no.	Event Trip	Event Set	Event year	Date	Distance travelled (km)	Days at Liberty
A00550705		RELEASE	1	48110	29	2002	10/15/2002		
A00545713	A00550705	RELEASE	2	80471	29	2016	10/20/2016	6.9	5117
A00125680	A00545713	RELEASE	3	85690	32	2020	10/20/2020	0.9	1463
A00315966		RELEASE	1	77830	51	2015	10/26/2015		
A00984002	A00315966	RELEASE	2	84250	62	2018	11/1/2018	1.6	1102
A00866014	A00984002	RELEASE	3	85690	49	2020	10/25/2020	4.7	724
A00733036		RELEASE	1	58145	33	2004	10/21/2004		
A00254854	A00733036	RELEASE	2	69067	64	2009	10/28/2009	124.1	1832
A00493546	A00254854	RELEASE	3	85690	45	2020	10/25/2020	12.7	4016

5 Figures

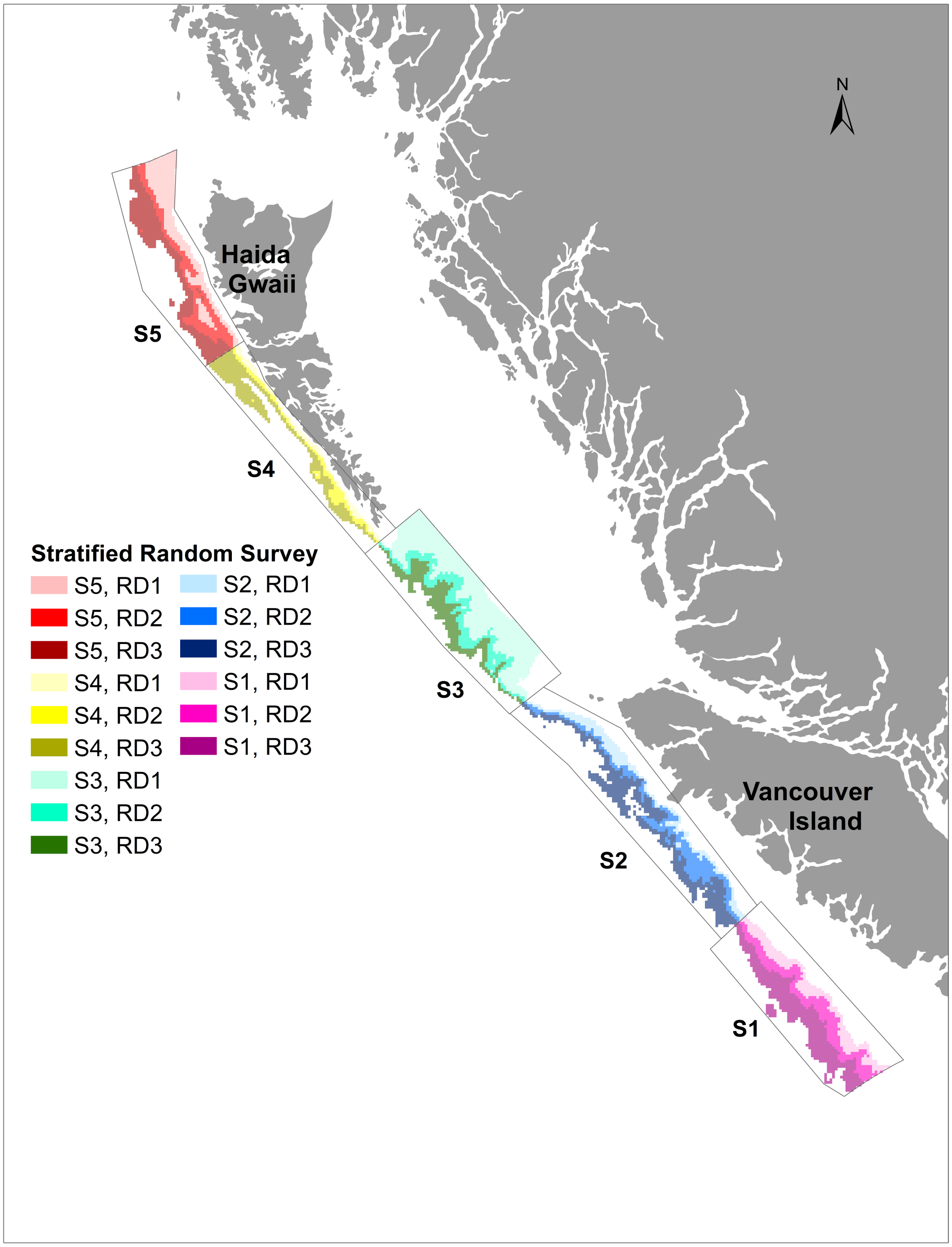


Figure 1. Location of the boundaries of the five spatial areas (S_1-S_5) of the 2020 stratified random survey design. The three depths strata (RD_1-RD_3) are colour-coded and nested within each of the five spatial strata.

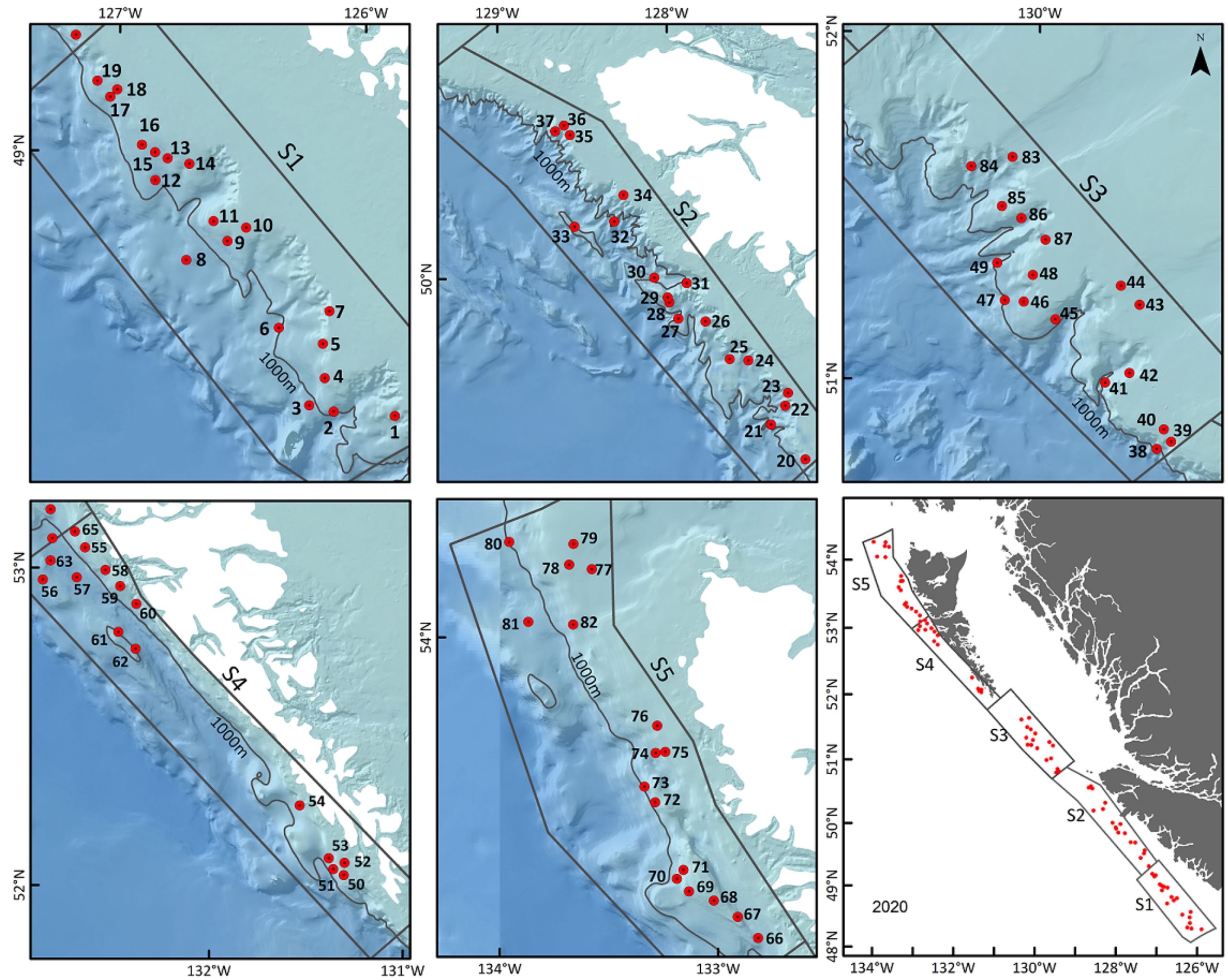
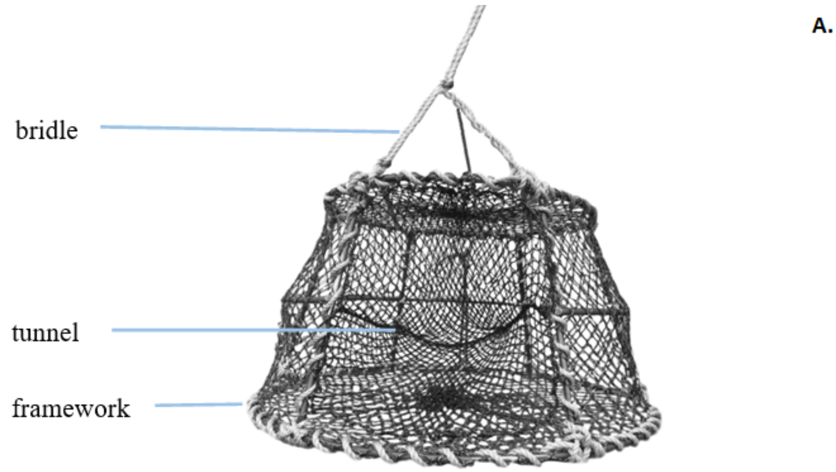


Figure 2. Start locations of survey sets (red markers) conducted in 2020 for the stratified random survey areas S_1 through S_5.

Figure 3. Image of the F/V Pacific Viking used for the 2020 sablefish research and assessment survey. Photo credit: Cody Melnychuk.



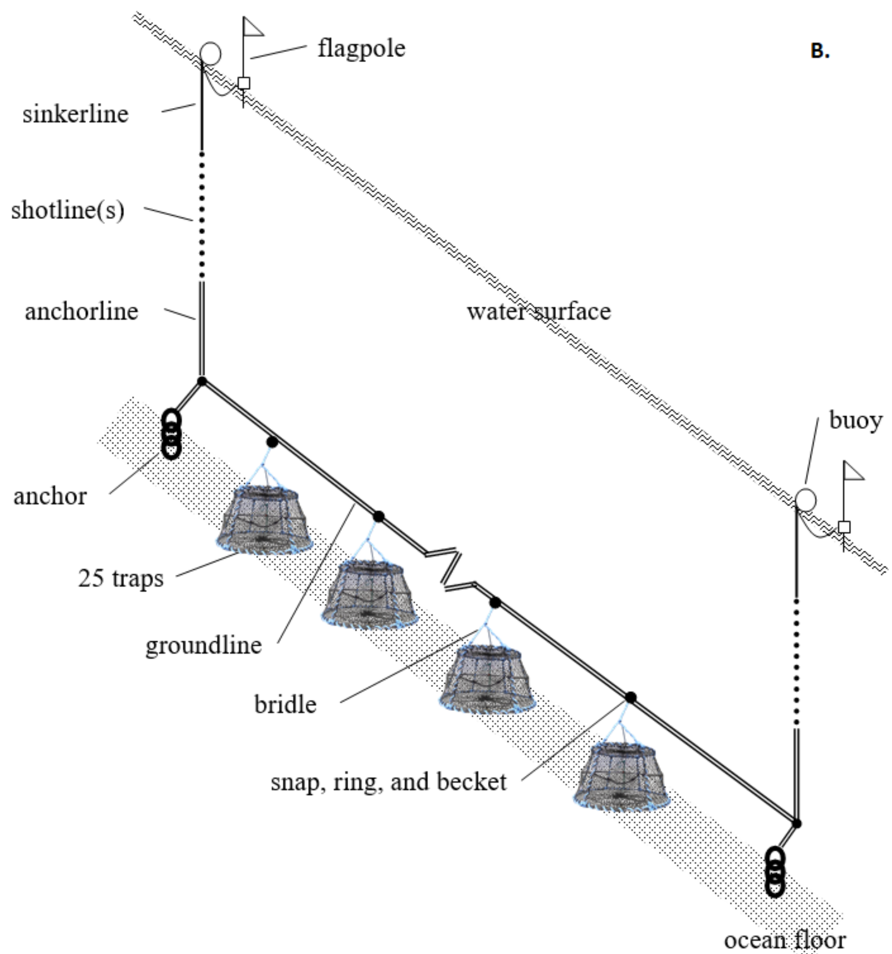


Figure 4. Trap elements (A). Trap gear elements consisting of 25 baited traps snapped to beckets along a groundline (B).

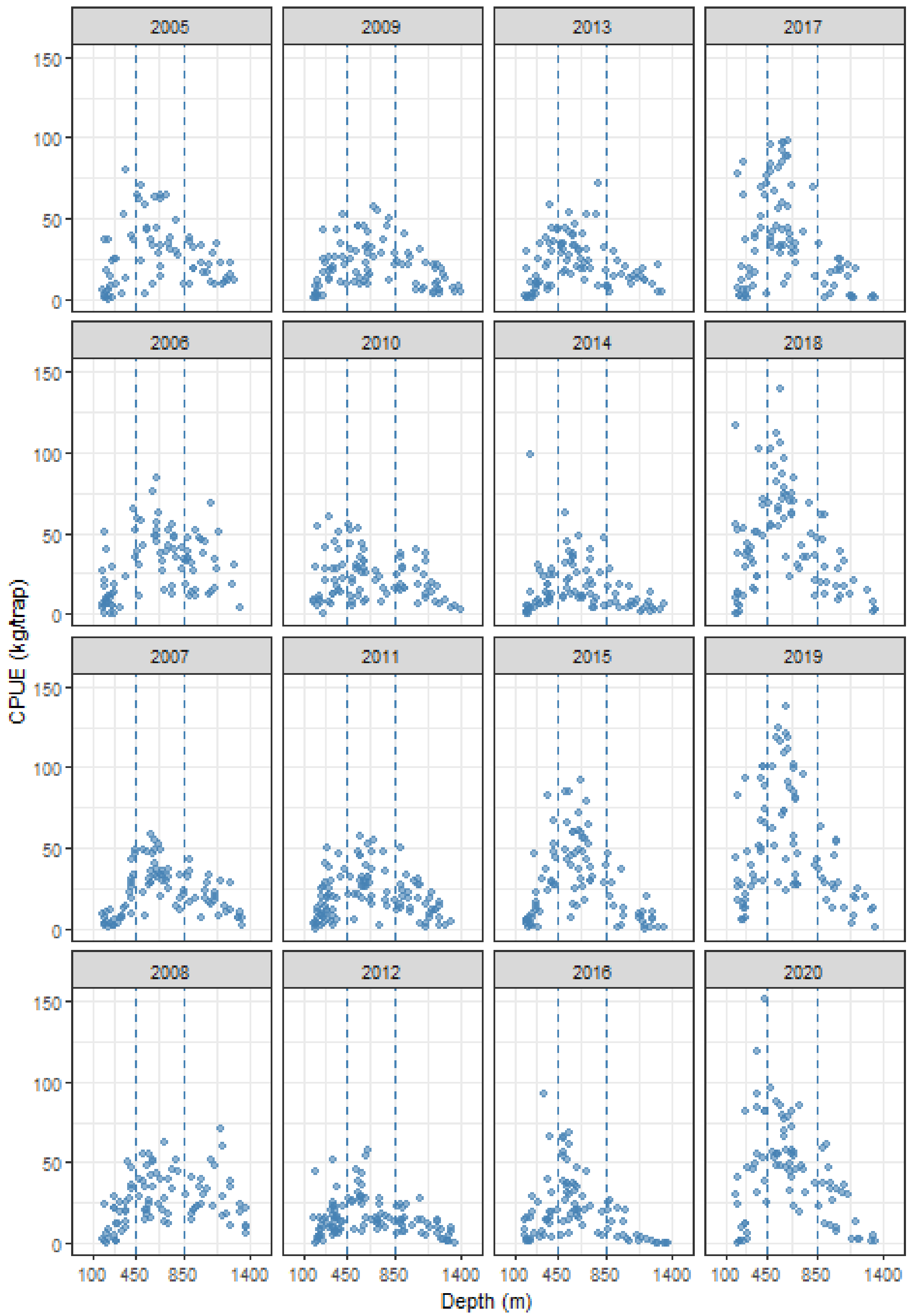


Figure 5. Sablefish catch per unit effort (CPUE) by depth and year for StRS sets. Dashed lines delineate depth strata (shallow(RD_1) = 100-450m, mid(RD_2) = 450-850m, deep(RD_3) = 850-1400m).

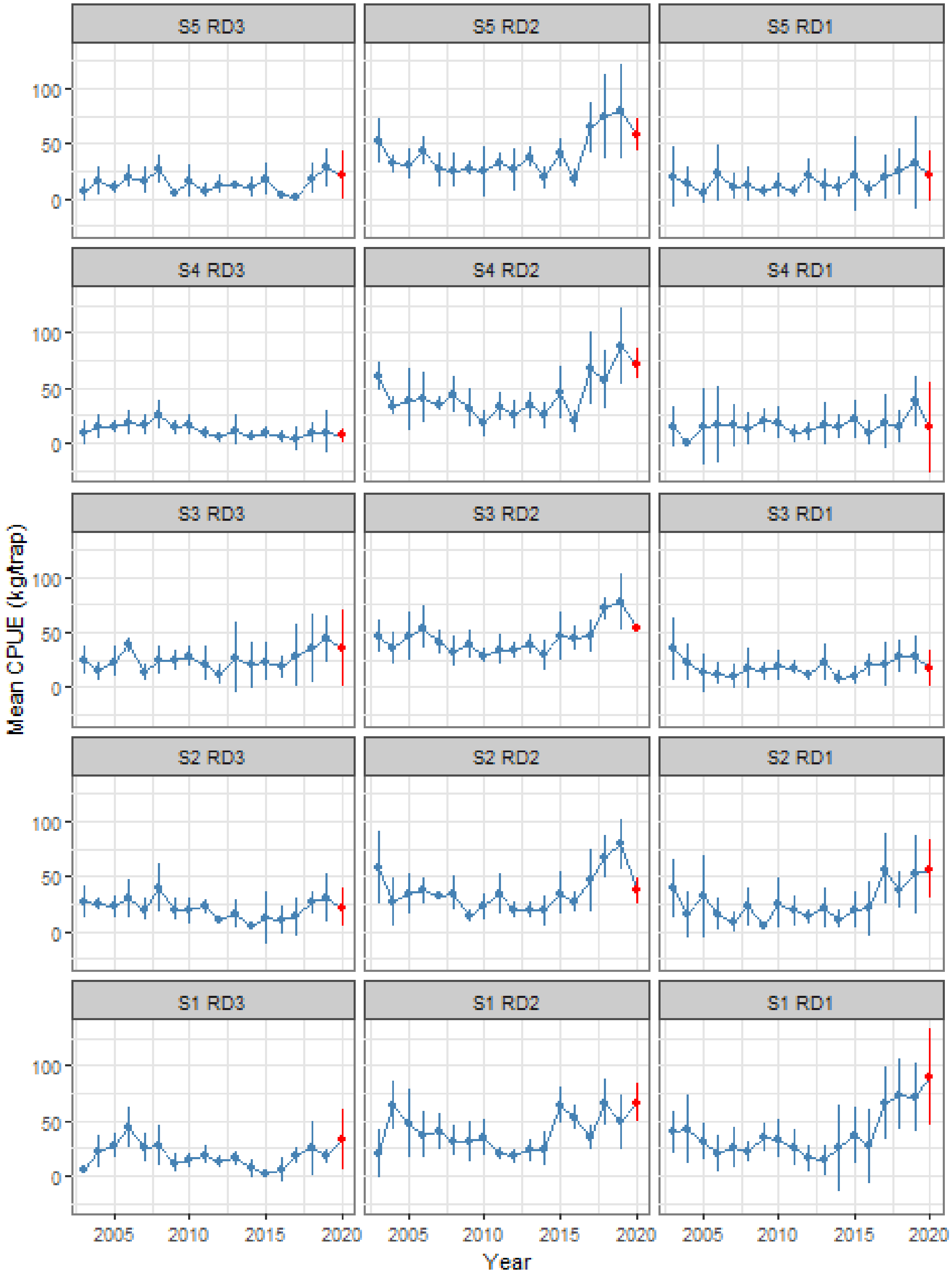


Figure 6. Average Sablefish catch per unit effort (CPUE; mean +/- 95% CIs) by survey strata since 2003. Panels run deep to shallow (left to right) and north to south (top to bottom).

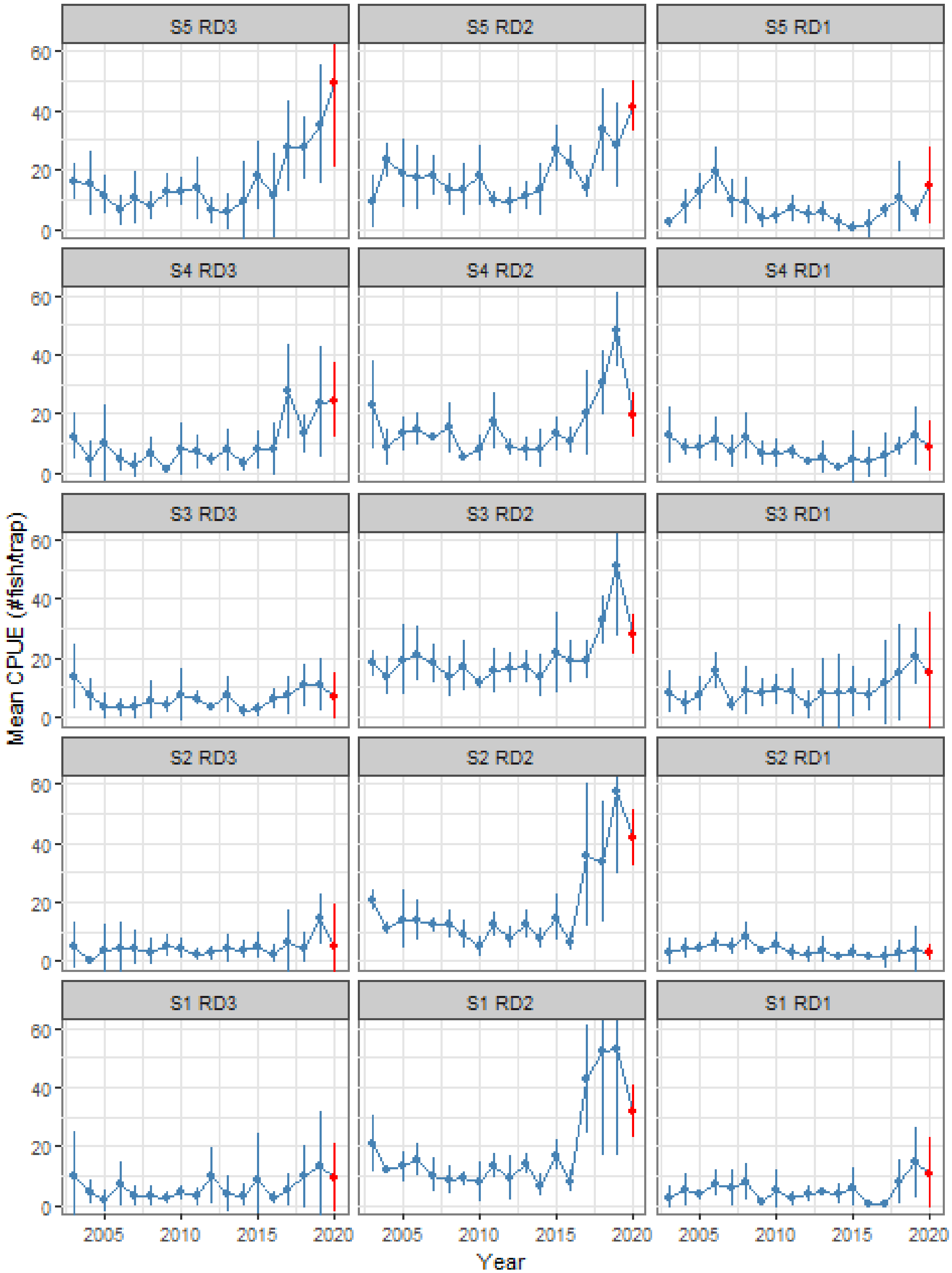


Figure 7. Average number of sablefish per trap (mean +/- 95% CIs) by StRS survey strata over time. Panels run shallow to deep (left to right) and south to north (top to bottom).

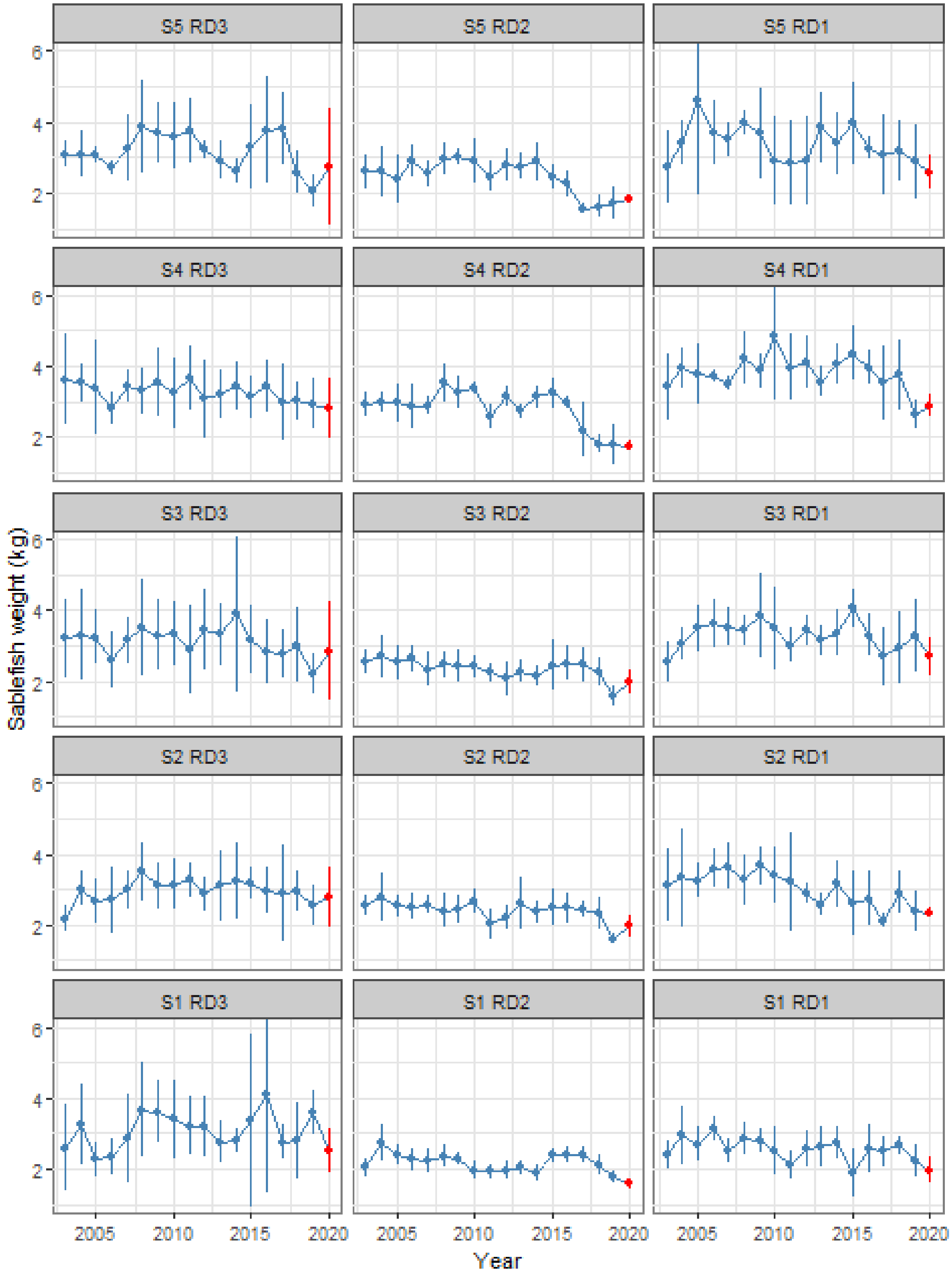


Figure 8. Average weight of sablefish (mean +/- 95% CIs) by survey strata over time. Panels run shallow to deep (left to right) and south to north (top to bottom).

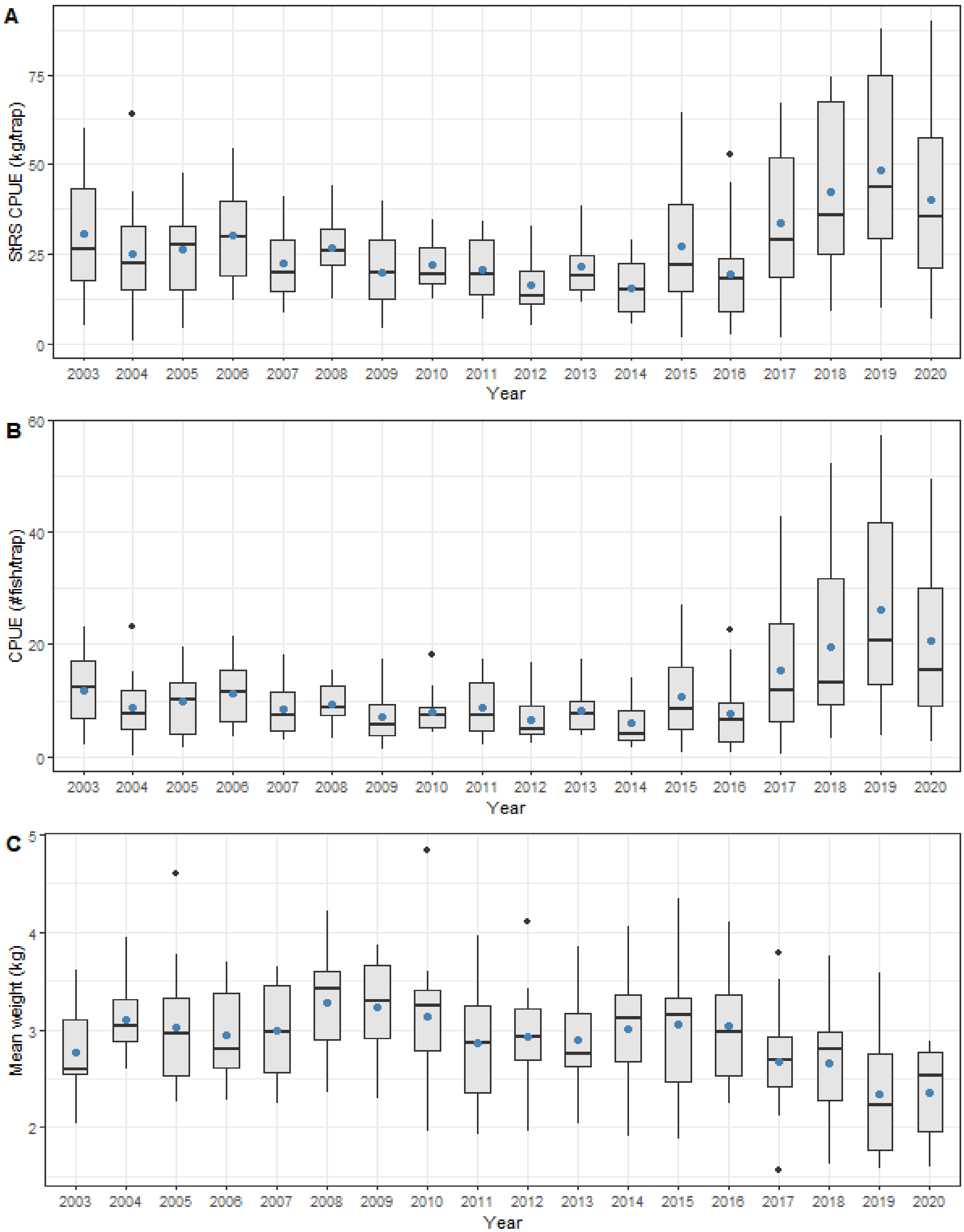


Figure 9. Annual mean weight of sablefish per trap (kg/trap) (A); annual mean number of sablefish per trap (#fish/trap) (B); annual mean weight of sablefish (kg) (C) by StRS survey strata over time. Horizontal line is median and blue dots are arithmetic mean.

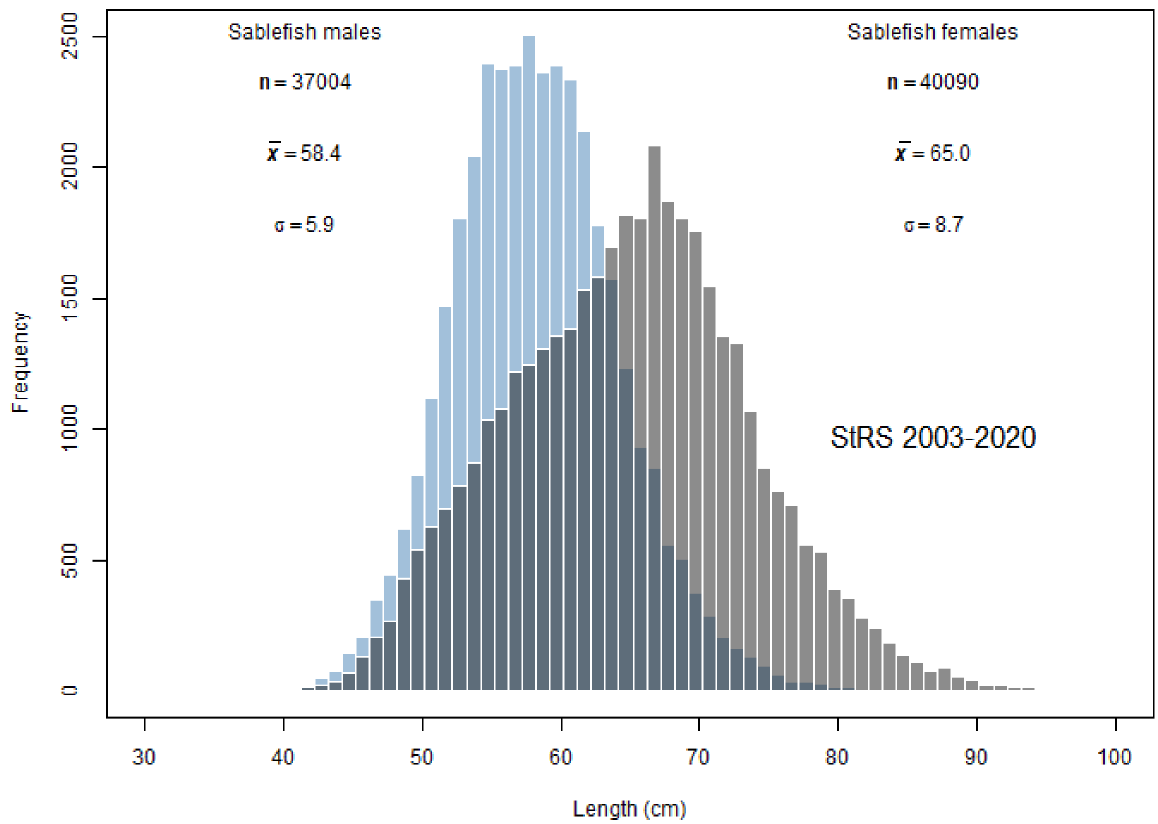


Figure 10. Length frequencies for female (grey) and male sablefish (steel blue) up to 2020 for all StRS sets. The number of specimens is denoted by the letter n, the mean indicated by the xbar $\overline{x}$ and the standard deviation is represented by the symbol sigma Σ.

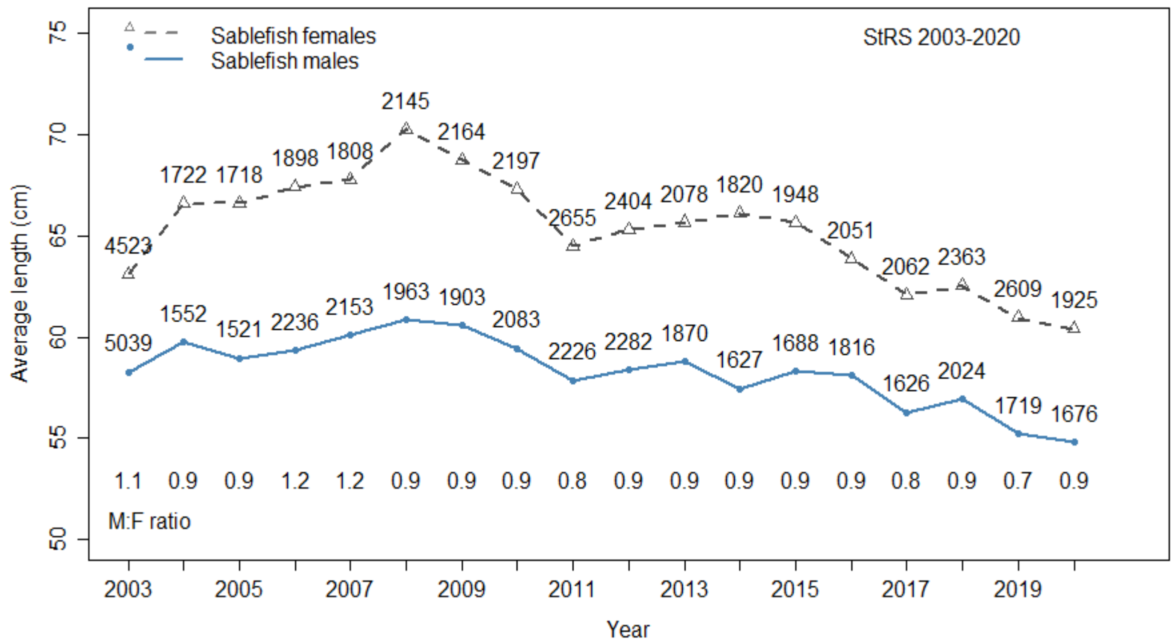


Figure 11. Average length and ratios of male and female sablefish by year. Counts by sex are labelled on top of the plotted lines.

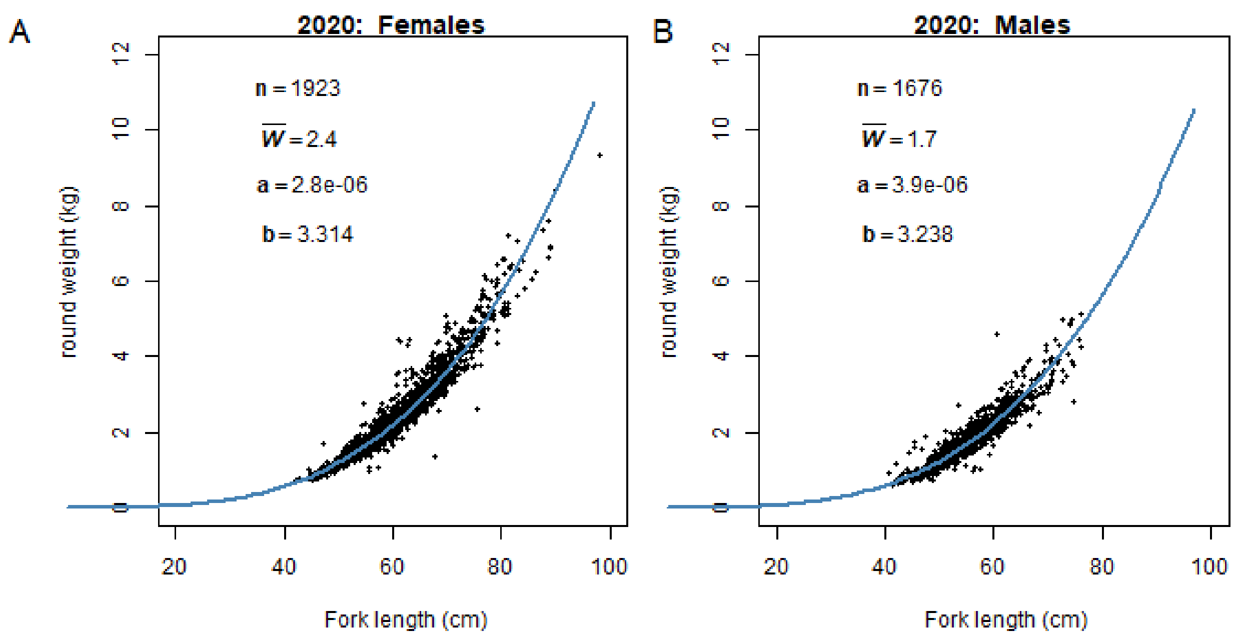


Figure 12. Sablefish fork length (L in cm) vs weight (W in kg) for females (A) and males (B) for the 2020 survey.

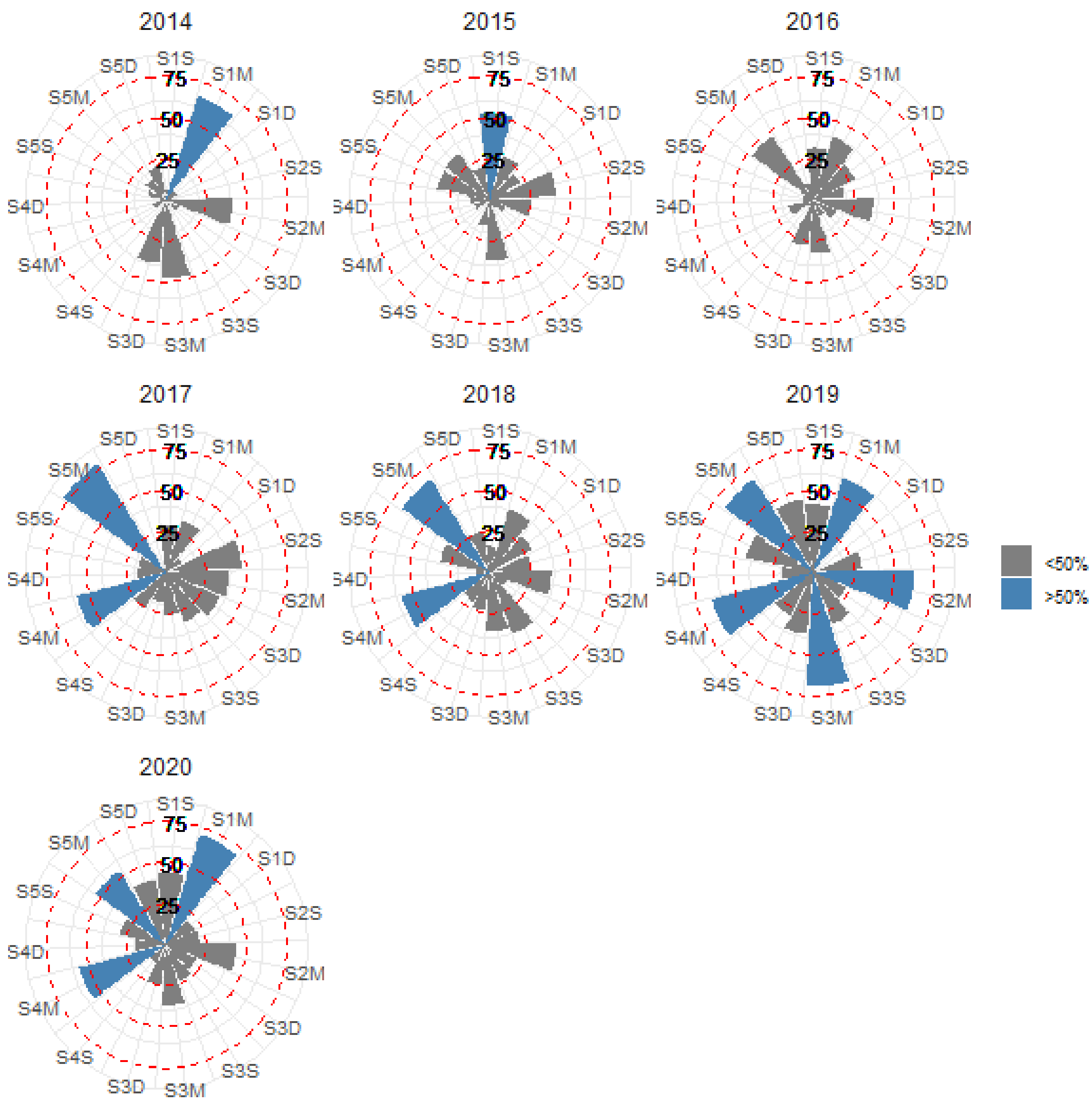


Figure 13. The percentage of sub-legal sablefish (<55 cm fork length) sampled by area (S_1-S_5) and depth strata (S=shallow, RD_1; M=mid, RD_2; D=deep, RD_3) over time. Sub-legal specimen count above 50% sampled shown in blue.

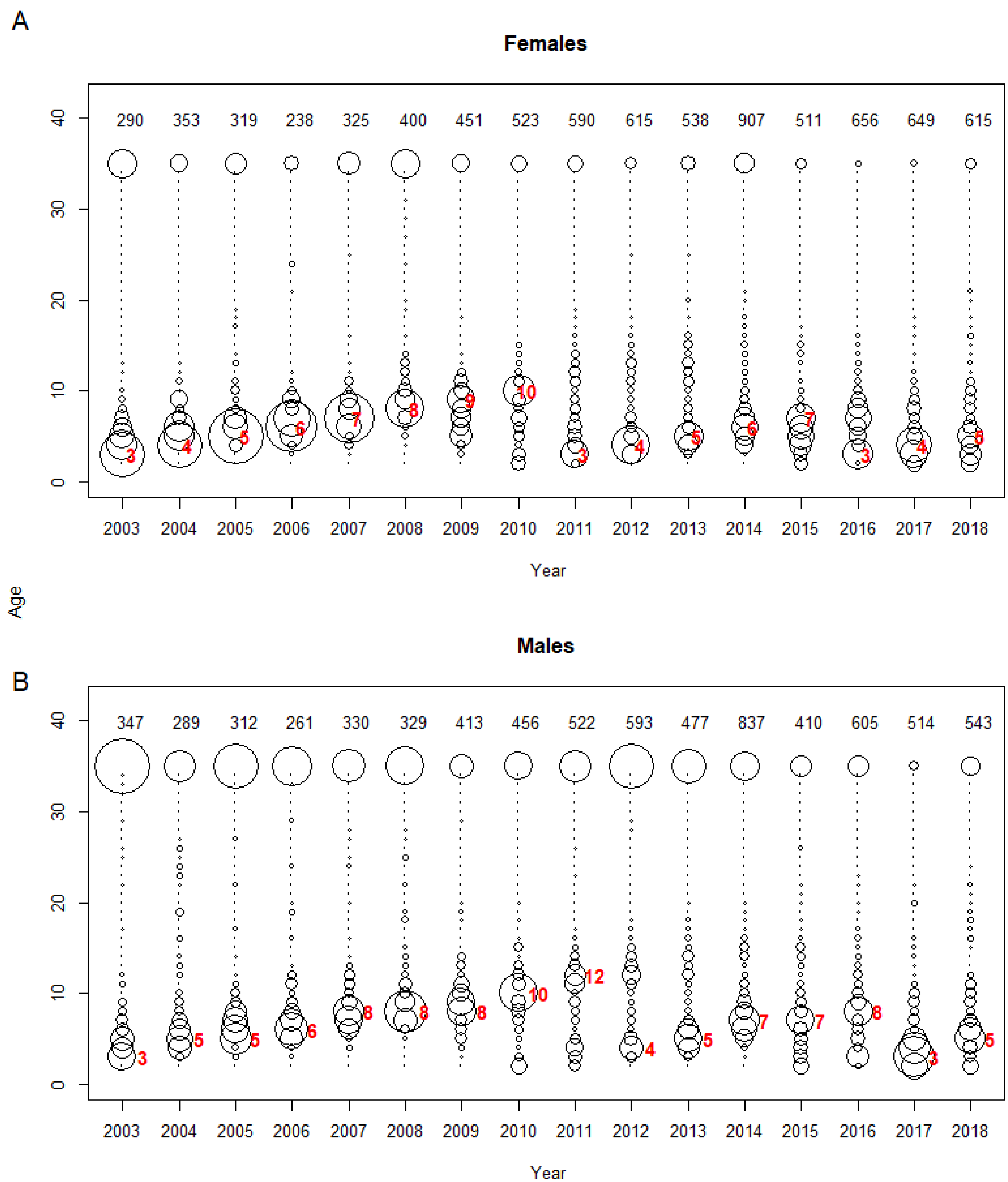


Figure 14. Bubble plot for female (A) and male (B) sablefish ages by survey year from StRS sets that have been aged. The sizes of the circles are proportional to the number of fish with given ages. Fish age 35 and older are included in one bubble. The total number(n) of fish aged are listed across the top of each panel. The ages with the highest ratios are posted to the right of each bubble.

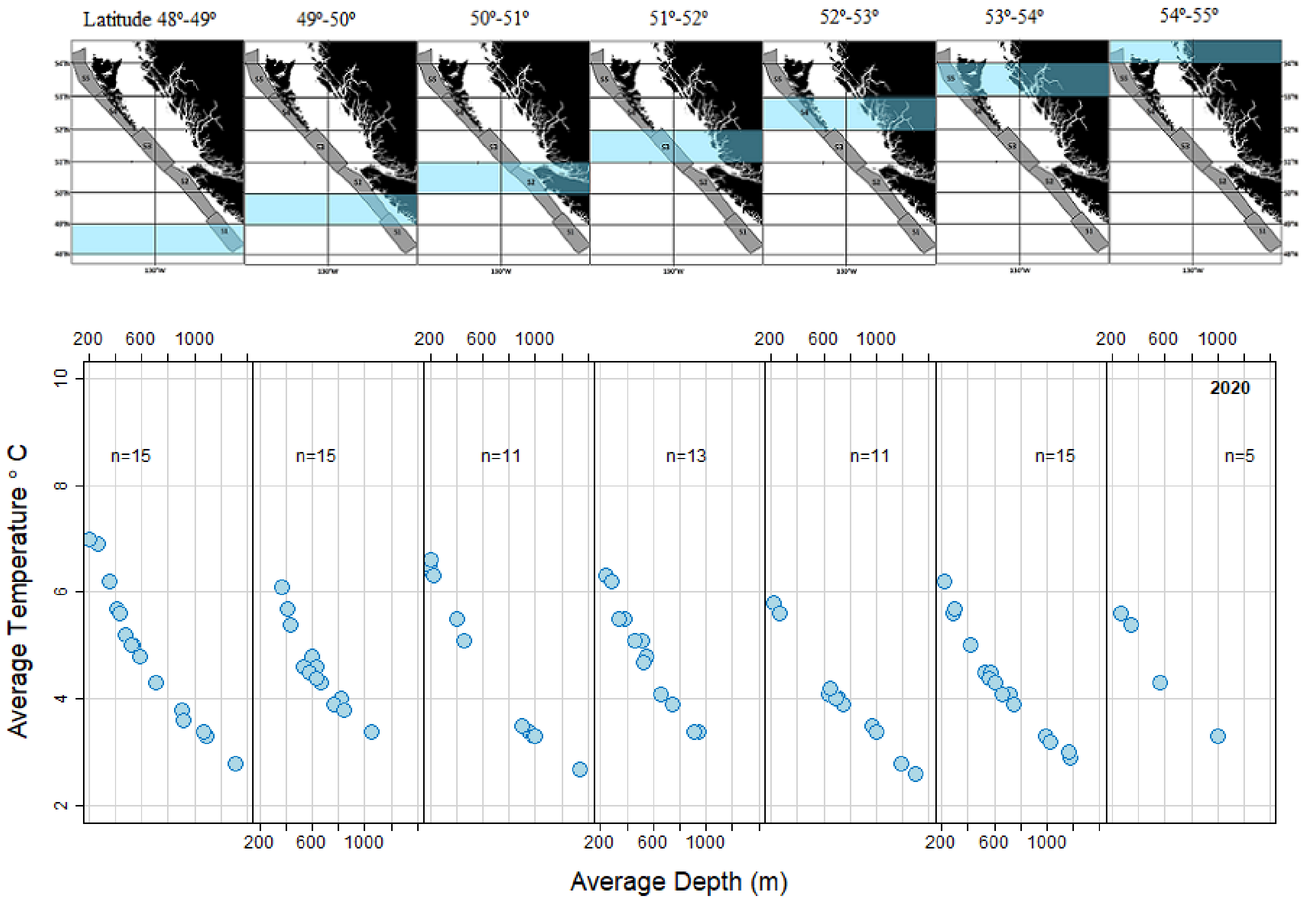


Figure 15. Coplot of average depth (m) vs average temperature (°C) for a given 1-degree latitude range (blue bands) for 2020. The number of fishing sets deployed with a SBE 39 recorder are represented by n.

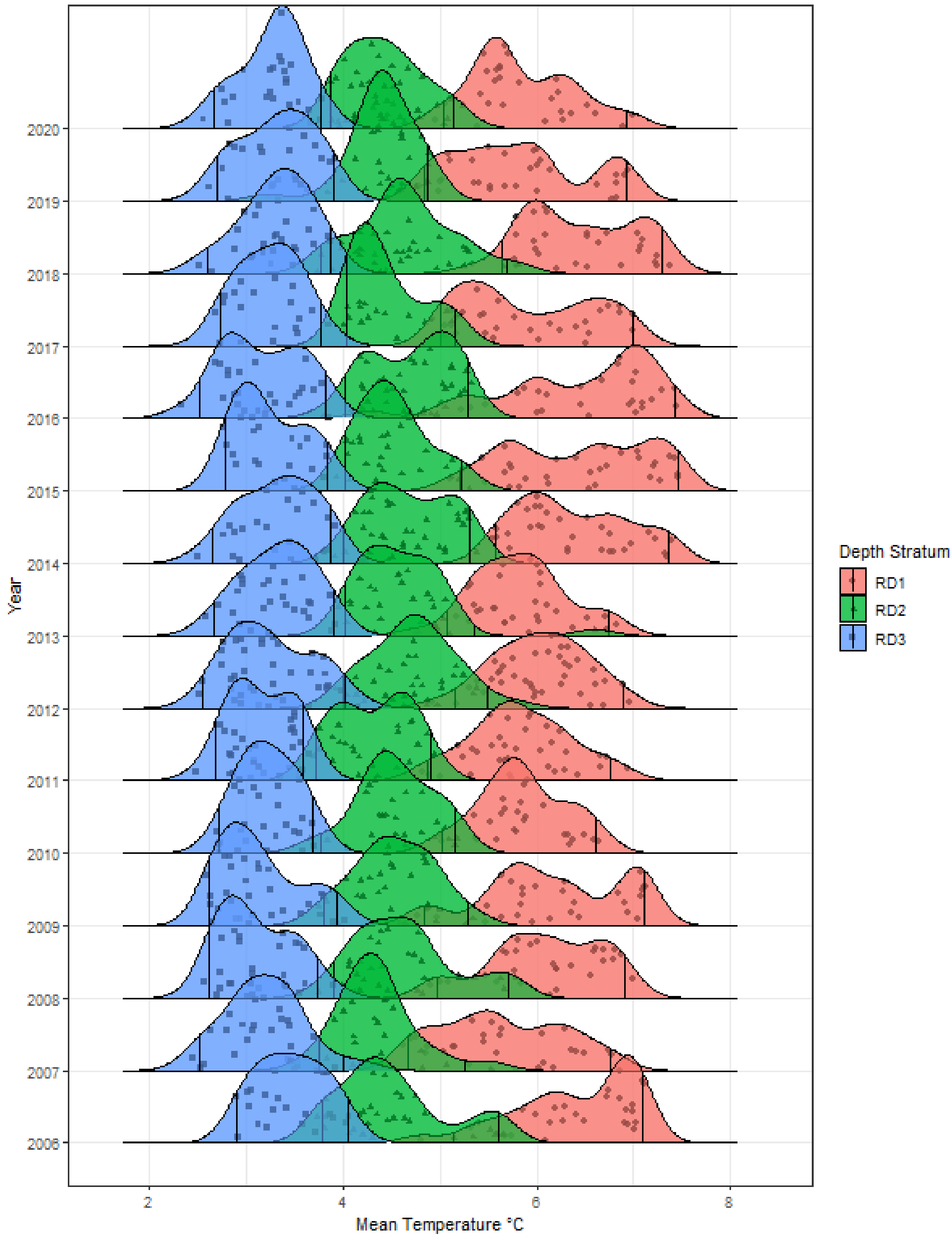
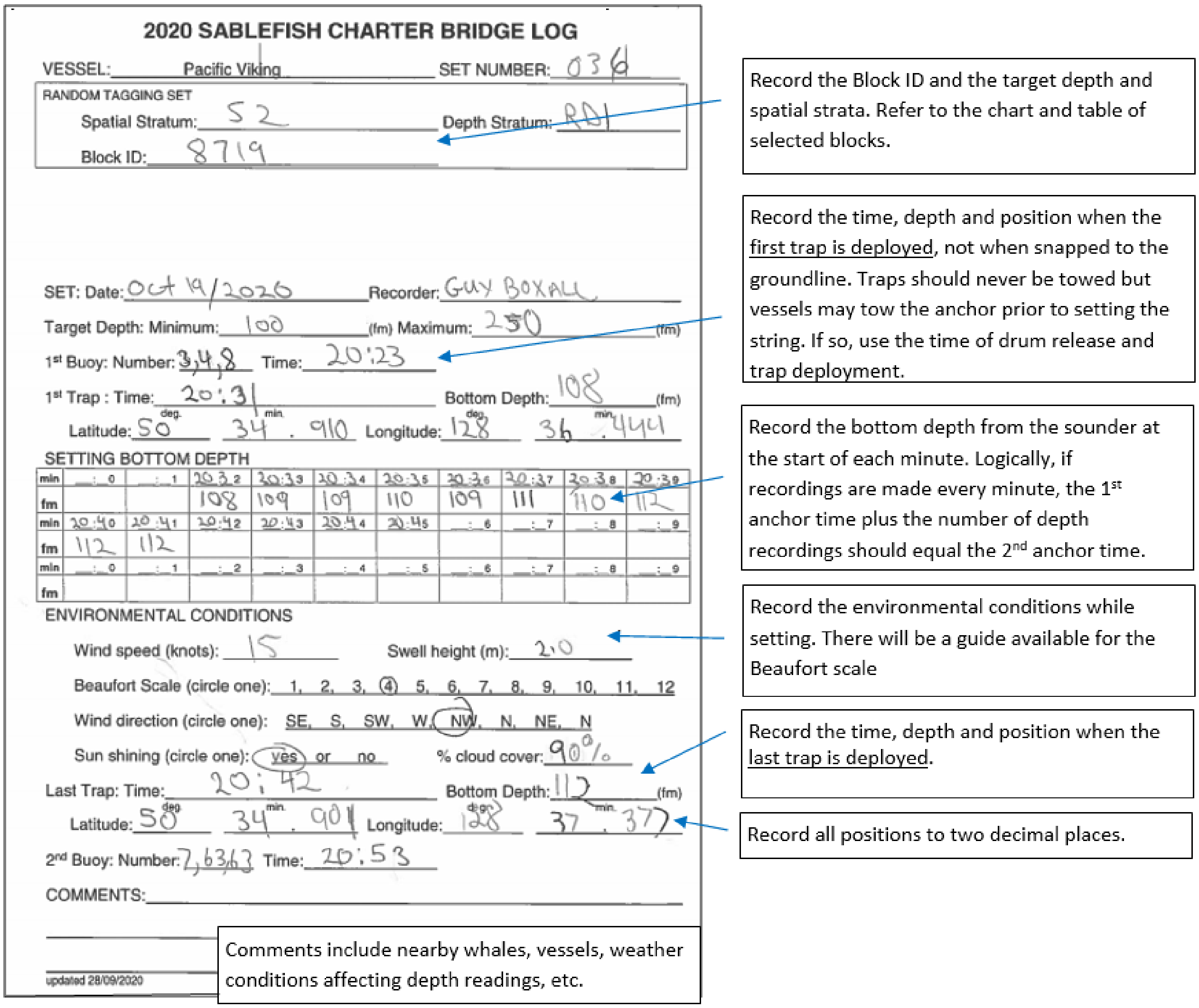


Figure 16. Vertical density ridgeplots of mean temperatures per year as reported by set from the Sea-bird SBE 39 loggers on traps at three depth intervals, RD_1 = shallow (100-450 m), RD_2 = mid (450-850 m), RD_3 = deep (850-1400 m). Lines indicate the 2.5% and 97.5% tails.

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 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

APPENDIX B DATA FORMS OF THE 2020 SABLEFISH SURVEY.



2020 SABLEFISH CHARTER BRIDGE LOG

VESSEL: Pacific Viking SET NUMBER: 036

RANDOM TAGGING SET

Spatial Stratum: S2 Depth Stratum: RD1

Block ID: 8719

SET: Date: Oct 19/2020 Recorder: GUY BOXALL

Target Depth: Minimum: 100 (fm) Maximum: 250 (fm)

1st Buoy: Number: 3,4,8 Time: 20:23

1st Trap : Time: 20:31 Bottom Depth: 108 (fm)

Latitude: 50 deg. 34 min. 910 Longitude: 128 deg. 36 min. 444

SETTING BOTTOM DEPTH

min	:0	:1	20:32	20:33	20:34	20:35	20:36	20:37	20:38	20:39
fm			108	109	109	110	109	111	110	112
min	20:40	20:41	20:42	20:43	20:44	20:45	:6	:7	:8	:9
fm	112	112								
min	:0	:1	:2	:3	:4	:5	:6	:7	:8	:9
fm										

ENVIRONMENTAL CONDITIONS

Wind speed (knots): 15 Swell height (m): 2.0

Beaufort Scale (circle one): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

Wind direction (circle one): SE, S, SW, W, NW, N, NE, N

Sun shining (circle one): yes or no % cloud cover: 90%

Last Trap: Time: 20:42 Bottom Depth: 112 (fm)

Latitude: 50 deg. 34 min. 901 Longitude: 128 deg. 37 min. 377

2nd Buoy: Number: 7,63,63 Time: 20:53

COMMENTS:

updated 28/09/2020

Record the Block ID and the target depth and spatial strata. Refer to the chart and table of selected blocks.

Record the time, depth and position when the first trap is deployed, not when snapped to the groundline. Traps should never be towed but vessels may tow the anchor prior to setting the string. If so, use the time of drum release and trap deployment.

Record the bottom depth from the sounder at the start of each minute. Logically, if recordings are made every minute, the 1st anchor time plus the number of depth recordings should equal the 2nd anchor time.

Record the environmental conditions while setting. There will be a guide available for the Beaufort scale

Record the time, depth and position when the last trap is deployed.

Record all positions to two decimal places.

Comments include nearby whales, vessels, weather conditions affecting depth readings, etc.

Figure B.1. Example of a completed bridge log data form with directions from the 2020 survey instruction manual.

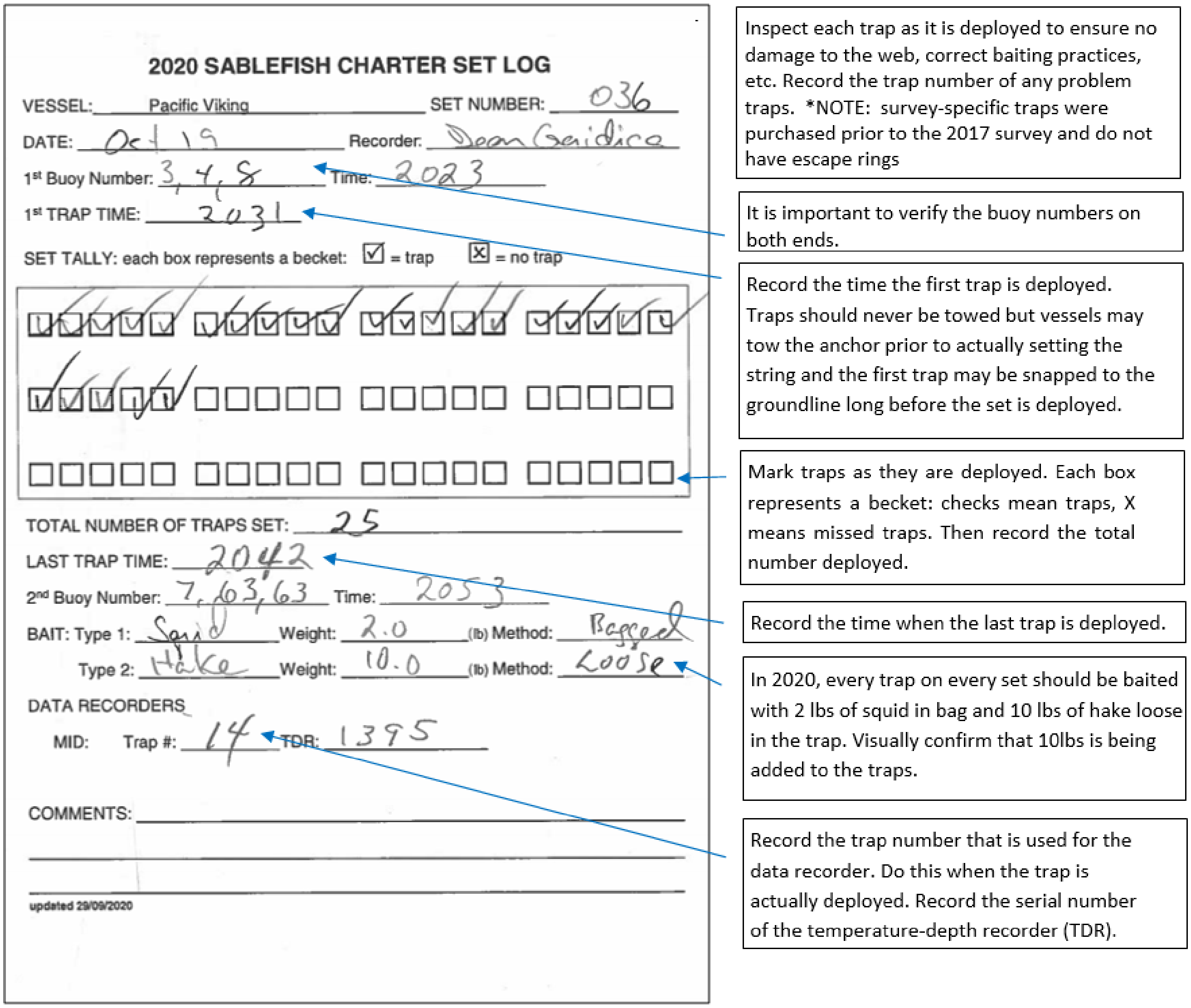
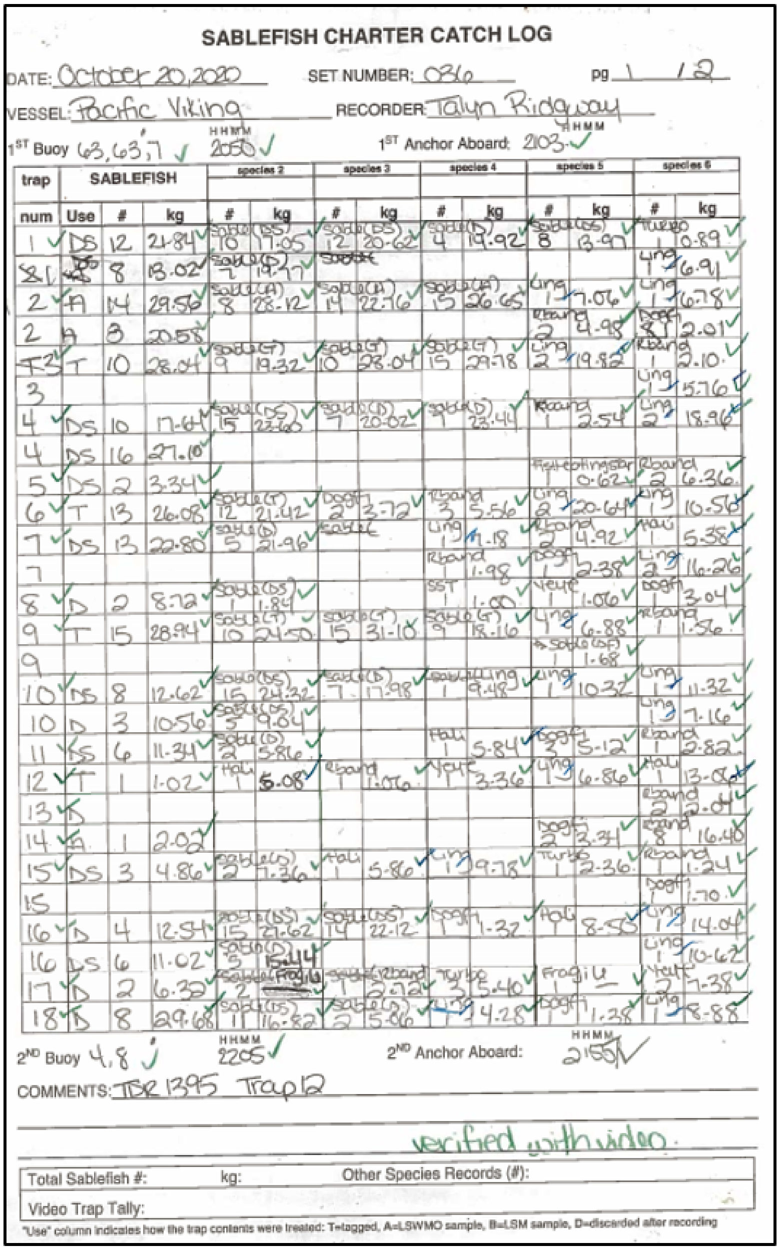


Figure B.2. Example of a completed set log data form with directions from the 2020 survey instruction manual.



SABLEFISH CHARTER CATCH LOG

DATE: October 20, 2020 SET NUMBER: 036 pg 1 / 2

VESSEL: Pacific Viking RECORDER: Talyn Ridgway

1ST Buoy 63, 63, 7 HHMM 2050 1ST Anchor Aboard: HHMM 2103

trap num	SABLEFISH Use	#	kg
1	DS	12	21.84
8		8	13.02
2	A	14	29.56
2	A	3	20.58
3	T	10	28.04
3			
4	DS	10	17.64
4	DS	16	27.10
5	DS	2	3.34
6	T	13	26.08
7	DS	13	22.80
7			
8	D	2	8.72
9	T	15	28.94
9			
10	DS	8	12.62
10	D	3	10.56
11	DS	6	11.34
12	T	1	1.02
13			
14	A	1	2.02
15	DS	3	4.86
15			
16	D	4	12.54
16	DS	6	11.02
17	D	2	6.32
18	D	8	29.68

2ND Buoy 4, 8 HHMM 2205 2ND Anchor Aboard: HHMM 2155

COMMENTS: TDR 1395 Trap 12

verified with video.

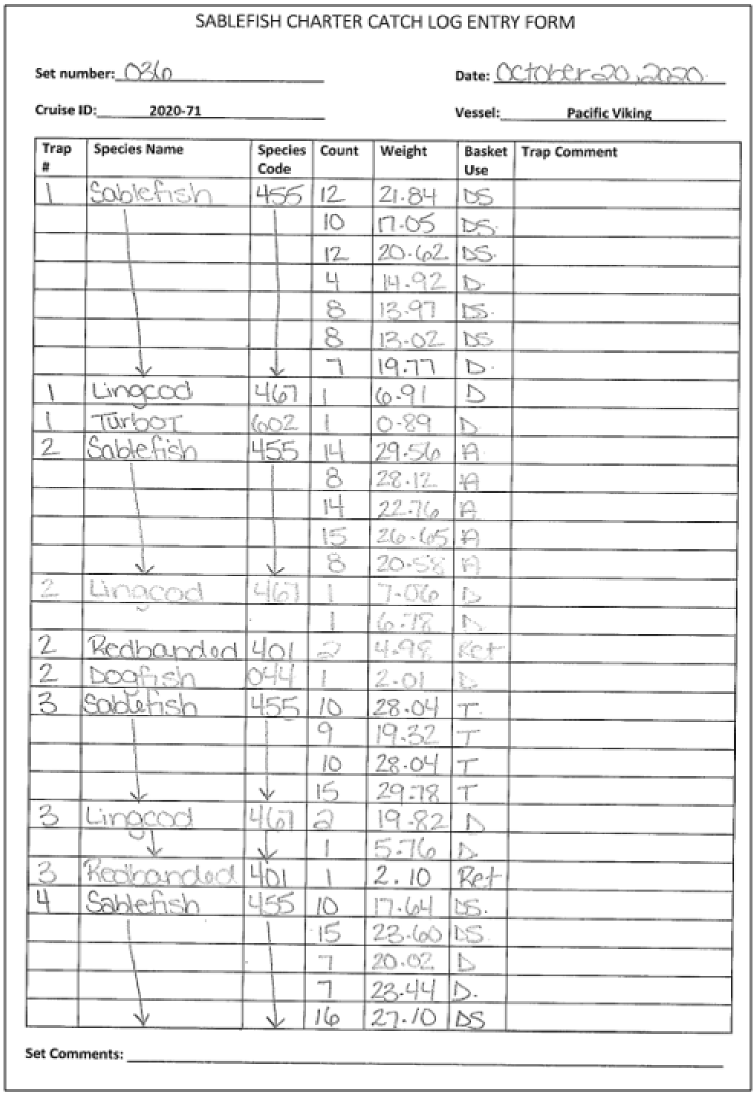
Total Sablefish #: kg: Other Species Records (#):

Video Trap Tally:

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

- Accurate count of traps is very important.
- Verify buoy numbers as they are retrieved.
- Record times the first trap and last trap are hauled aboard.
- Identify specific columns for common species.
- Ensure all species abbreviations are recorded on the worksheet.
- Label specific cells for uncommon species in the set. Species names in cells override the species name in a column for that row only. Subsequent rows revert back to the original species.
- Record species count and weight for each trap. Each row is a single trap but one trap can be in multiple rows.
- Indicate trace weights with a dash in the weight field
- Put a line through the sablefish column if there are no sablefish or record ***MT (***empty). Never leave a row completely blank.
- Record how the catch was used:
  - Sablefish: ***T*** = tagged, ***A*** = age biosample, ***D*** = discarded, ***DS*** = discarded sublegal, ***DF*** = discarded frames, ***TRA*** = tag recovery age (USA tags), ***TRT***= tag recovery tagged (CAN tags)
  - All other species: assumed as discarded so indicate if frames or age biosample
- Track the number of Sablefish in the biosample and tagging in the margins
- Record the count and weight of each basket as they occur to ensure the form matches the video.
- If a fish is lost overboard, indicate if it was before or after weighing.
- Either in the trap row or in the comments section, record any open traps, snarls, missed beckets, trap damage (include estimate in inches of hole size), gilled in mesh, gilled in tunnel, open escape panels, etc. Ensure the crew inspects the trap and reports any damage.

Figure B.3. Example of a completed catch log data form with directions from the 2020 survey instruction manual.



SABLEFISH CHARTER CATCH LOG ENTRY FORM

Set number: 036 Date: October 20, 2020

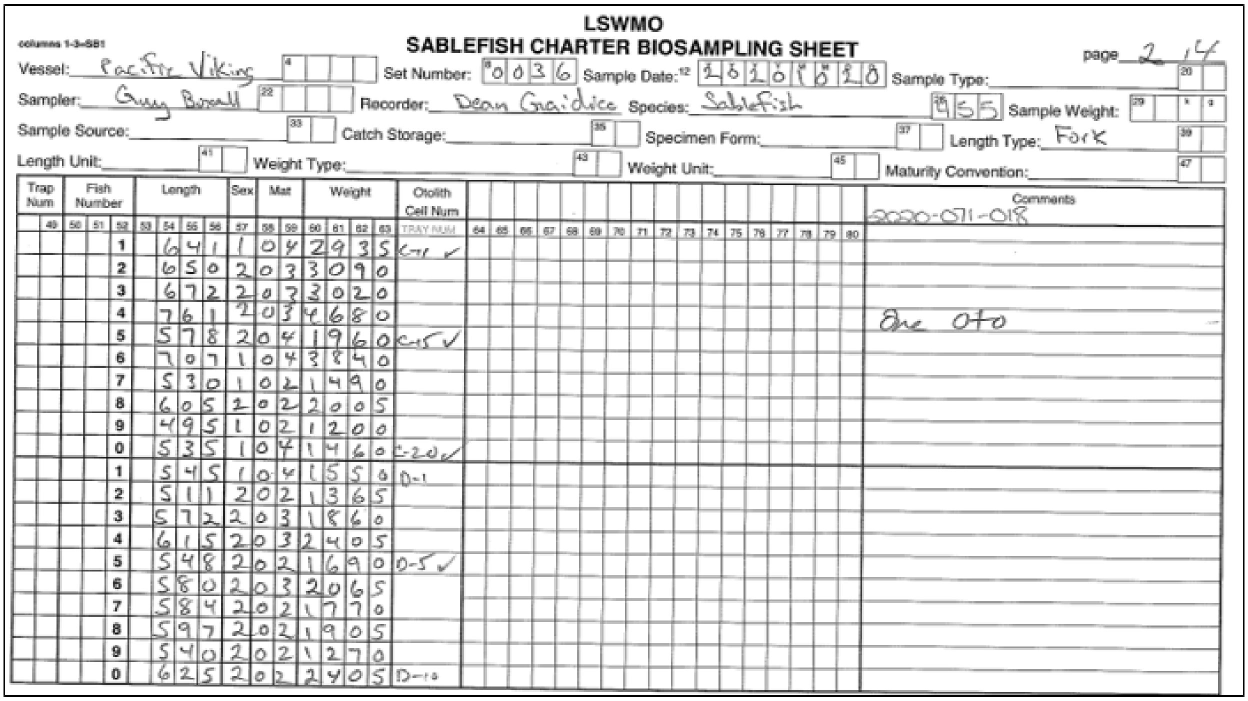
Cruise ID: 2020-71 Vessel: Pacific Viking

Trap #	Species Name	Species Code	Count	Weight	Basket Use	Trap Comment
1	Sablefish	455	12	21.84	DS	
			10	17.05	DS	
			12	20.62	DS	
			4	14.92	D	
			8	13.97	DS	
			8	13.02	DS	
			7	19.77	D	
1	Lingcod	467	1	6.91	D	
1	Turbot	602	1	0.89	D	
2	Sablefish	455	14	29.56	A	
			8	28.12	A	
			14	22.76	A	
			15	26.65	A	
			8	20.58	A	
2	Lingcod	467	1	7.06	D	
			1	6.78	D	
2	Redbanded	401	2	4.98	Ret	
2	Dogfish	044	1	2.01	D	
3	Sablefish	455	10	28.04	T	
			9	19.32	T	
			10	28.04	T	
			15	29.78	T	
3	Lingcod	467	2	19.82	D	
			1	5.76	D	
3	Redbanded	401	1	2.10	Ret	
4	Sablefish	455	10	17.64	DS	
			15	23.60	DS	
			7	20.02	D	
			7	23.44	D	
			16	27.10	DS	

Set Comments:

- Record the date the set was hauled
- Enter records by trap
- Enter every basket. For each basket, enter:
  - the species code
  - the count (the only records without counts should be trace amounts)
  - the weight or a dash ("-") for trace weights
  - the basket use
    - ***T*** = tagged
    - ***A*** = age biosample
    - ***D*** = discarded
    - ***DS*** = discarded sublegal
    - ***DF*** = discarded frames
    - ***TRA*** = tag recovery age (US tag recoveries)
    - ***TRT***= tag recovery tagged (Canadian tag recoveries)
- For the first basket in each trap, enter comments about the trap: record any open traps, snarls, missed beckets, trap damage (include the location (top, bottom, side, tunnel), as well as an estimated measure of the hole size in inches), gilled in mesh, gilled in tunnel, open escape panels, etc. If there are multiples holes of different sizes in the same area of the trap: the largest is the one that gets coded.
- If the trap is empty, enter "***MT***" in the species code field
- Count the number of baskets and compare it to the number on the original catch log.

Figure B.4. Example of a tabular catch log data entry form transposed from the catch log in Figure B.3. Directions from the 2020 survey instruction manual.



columns 1-3=SB1

LSWMO

SABLEFISH CHARTER BIOSAMPLING SHEET

Vessel: Pacific Viking | Set Number: 0036 | Sample Date: 26102020 | Sample Type: | page 2 / 4

Sampler: Guy [illegible] | Recorder: Dean [illegible] | Species: Sablefish 455 | Sample Weight:

Sample Source: | Catch Storage: | Specimen Form: | Length Type: Fork

Length Unit: | Weight Type: | Weight Unit: | Maturity Convention:

Trap Num	Fish Number	Length	Sex	Mat	Weight	Otolith Cell Num	Comments
						TRAY NUM	2020-071-018
	1	641	1	04	2935	C-11 ✓	
	2	650	2	03	3090		
	3	672	2	03	3020		
	4	761	2	03	4680		One oto
	5	578	2	04	1960	C-15 ✓	
	6	707	1	04	3840		
	7	530	1	02	1490		
	8	605	2	02	2005		
	9	495	1	02	1200		
	0	535	1	04	1460	C-20 ✓	
	1	545	1	04	1550	D-1	
	2	511	2	02	1365		
	3	572	2	03	1860		
	4	615	2	03	2405		
	5	548	2	02	1690	D-5 ✓	
	6	580	2	03	2065		
	7	584	2	02	1770		
	8	597	2	02	1905		
	9	540	2	02	1270		
	0	625	2	02	2405	D-10	

Calibrate the scale with a basket on the platform

Always complete **Vessel**, **Set Number, Sample Date, Page, Sampler, Recorder,** and **Species** fields.

- If the sample is recovered tagged Sablefish (US tags), record '*Selected Tag Recoveries*' in the **Sample Source** field. Otherwise leave the field blank.
- Record the **Length Type** you are measuring (***Fork Length***)
- Leave the all other fields blank.

On the first page:

- Record the time the first fish is sampled in the **Comments**

For each fish:

- Leave the **Trap Num** and **Fish Number** columns blank.
- Record **Weight** (grams), **Length** (mm)**, Sex** (0=not looked at, 1=male, 2=female, 3=looked at but unknown), and **Maturity**.

For **otolith** age samples:

- Record the otolith Tray Number in the **Comments** header
- For each fish record the **Otolith Cell Num**. Use a checkmark next to the cell number to indicate when an otolith is verified and ensure to verify the first fish, every fifth fish, and the last fish. The check mark signifies that the otolith in the cell matches the fish.
- If large otoliths occupy two cells, make a comment and record the last cell in the **Cell No.**
- The assumption is that 2 otoliths are collected from every fish. If this is not the case, make a note as to 0 or 1 otolith.
- If you break an otolith make a note ('BO' is acceptable). Otolith pieces are useful if larger than half an otolith.

For **DNA** samples (Rougheye/Blackspotted Rockfish only in 2020)

- DNA will be collected using vials. Each vial has a unique number as follows: ***394-########_V***. Ignore the "*-V*" and record the "***394_***"part in the header and then verify and record the 8 digit number (***########***) for each fish. It is acceptable to use some means to indicate repeated numbers after the first fish.

For **Tag Recoveries** (US tagged Sablefish), ensure to record the vial number, last three digits of the tag number, and the wound condition in the Comments section.

On the last page: Record the time the biosample is complete in the **Comments**

Figure B.5. Example of a completed Sablefish biological sampling form and directions from the 2020 survey instruction manual.

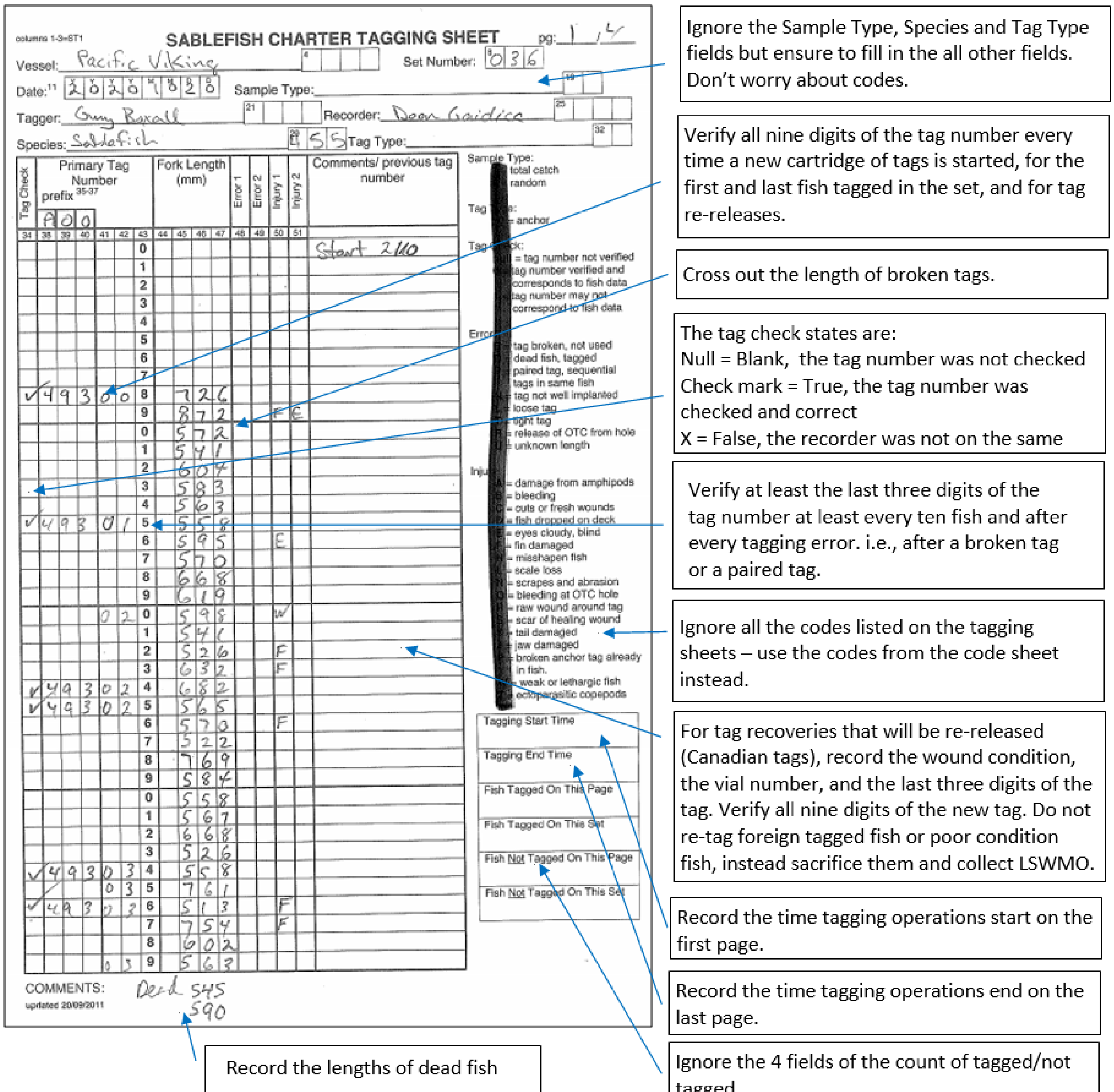


Figure B.6. Example of a completed tagging form with directions from the 2020 survey instruction manual.

APPENDIX C SURVEY SET DETAILS 2020.

Details of sets completed during the 2020 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 are indicated with an ‘x’.

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
S1	1	StRS	RD1	Oct 9	08:04	1334	3C	48° 7’N	125° 53’W	48° 6.4’N	125° 53.2’W	405	468	433	25	x
S1	2	StRS	RD3	Oct 9	10:31	1398	3C	48° 7.7’N	126° 7.9’W	48° 7.5’N	126° 8.9’W	904	973	898	25	x
S1	3	StRS	RD3	Oct 9	12:07	1421	3C	48° 8.8’N	126° 13.9’W	48° 8.8’N	126° 14.9’W	1086	1092	1110	25	x
S1	4	StRS	RD2	Oct 9	13:54	1429	3C	48° 3.2’N	126° 10.1’W	48° 3.8’N	126° 10.6’W	477	495	477	25	x
S1	5	StRS	RD1	Oct 9	15:30	1479	3C	48° 8.8’N	126° 10.5’W	48° 8.8’N	126° 11.5’W	336	390	356	25	x
S1	6	StRS	RD3	Oct 9	17:28	1534	3C	48° 1.4’N	126° 21.3’W	48° 1.5’N	126° 22.3’W	982	1169	1075	25	x
S1	7	StRS	RD1	Oct 9	19:37	1537	3C	48° 4’N	126° 9’W	48° 3.7’N	126° 9.8’W	188	232	207	25	x
S1	8	StRS	RD3	Oct 11	08:19	1317	3C	48° 2.3’N	126° 43.9’W	48° 2.4’N	126° 45’W	1324	1330	1331	25	x
S1	9	StRS	RD2	Oct 11	10:28	1330	3C	48° 5.4’N	126° 33.8’W	48° 5.4’N	126° 34.9’W	629	690	675	25	x
S1	10	StRS	RD1	Oct 11	12:02	1330	3C	48° 7.6’N	126° 29.3’W	48° 7.6’N	126° 30.3’W	261	269	265	25	x
S1	11	StRS	RD2	Oct 11	13:17	1378	3C	48° 8.6’N	126° 37.3’W	48° 8.7’N	126° 38.3’W	499	559	526	25	x
S1	12	StRS	RD3	Oct 11	15:52	1403	3C	48° 5.2’N	126° 51.4’W	48° 5.1’N	126° 52.3’W	941	930	935	25	x
S1	13	StRS	RD2	Oct 11	17:16	1422	3C	48° 8.7’N	126° 48.4’W	48° 8.8’N	126° 49.4’W	524	574	547	25	x
S1	14	StRS	RD1	Oct 11	19:06	1442	3C	48° 7.8’N	126° 43.1’W	48° 7.9’N	126° 44’W	410	430	420	25	x
S1	15	StRS	RD2	Oct 14	07:04	1329	3C	48° 9.7’N	126° 51.5’W	48° 9.7’N	126° 52.6’W	572	614	591	25	x
S1	16	StRS	RD2	Oct 14	08:24	1372	3D	49° 0.9’N	126° 54.7’W	49° 0.8’N	126° 55.8’W	603	675	640	25	x
S1	17	StRS	RD2	Oct 14	10:28	1387	3D	49° 0.6’N	127° 2.4’W	49° 0.5’N	127° 3.4’W	625	673	647	25	x
S1	18	StRS	RD1	Oct 14	12:09	1365	3D	49° 0.8’N	127° 0.7’W	49° 0.3’N	127° 1.6’W	435	436	433	25	x
S1	19	StRS	RD2	Oct 14	13:49	1394	3D	49° 1.2’N	127° 5.6’W	49° 1.1’N	127° 6.4’W	572	643	607	25	x
S2	20	StRS	RD1	Oct 14	15:41	1402	3D	49° 8.5’N	127° 10.8’W	49° 8.6’N	127° 11.8’W	329	437	367	25	x
S2	21	StRS	RD3	Oct 14	18:16	1402	3D	49° 6.6’N	127° 23’W	49° 6.5’N	127° 24’W	1022	1070	1058	25	x
S2	22	StRS	RD2	Oct 14	19:48	1420	3D	49° 1’N	127° 17.9’W	49° 0.8’N	127° 19’W	649	832	720	25	x
S2	23	StRS	RD1	Oct 16	07:05	1328	3D	49° 3.9’N	127° 17’W	49° 4.1’N	127° 17.9’W	447	438	423	25	x
S2	24	StRS	RD2	Oct 17	07:49	1331	3D	49° 1.4’N	127° 31’W	49° 1’N	127° 31.7’W	629	609	629	25	x
S2	25	StRS	RD2	Oct 17	09:22	1345	3D	49° 1.7’N	127° 37.7’W	49° 1.7’N	127° 38.7’W	617	666	641	25	x
S2	26	StRS	RD2	Oct 17	11:41	1346	3D	49° 0.3’N	127° 46.2’W	49° 0.5’N	127° 47.1’W	580	712	666	25	x
S2	27	StRS	RD3	Oct 17	13:11	1373	3D	49° 1’N	127° 55.9’W	49° 1’N	127° 57’W	822	881	848	25	x
S2	28	StRS	RD2	Oct 17	14:53	1384	3D	49° 4.7’N	127° 59’W	49° 4.6’N	128° 0.2’W	690	766	742	25	x
S2	29	StRS	RD2	Oct 17	17:04	1344	3D	49° 5.9’N	127° 59.6’W	49° 5.9’N	128° 0.8’W	529	520	528	25	x
S2	30	StRS	RD3	Oct 17	18:42	1387	3D	50° 0.3’N	128° 4.4’W	50° 0.2’N	128° 5.5’W	1355	1229	1317	25	x
S2	31	StRS	RD2	Oct 19	07:01	1328	3D	49° 9.1’N	127° 52.9’W	49° 9’N	127° 53.8’W	587	703	601	25	x
S2	32	StRS	RD3	Oct 19	11:42	1333	3D	50° 3.2’N	128° 18.6’W	50° 2.5’N	128° 19.2’W	997	964	988	25	x
S2	33	StRS	RD3	Oct 19	13:43	1349	3D	50° 2’N	128° 32.6’W	50° 1.8’N	128° 33.6’W	1037	1048	1021	25	x
S2	34	StRS	RD1	Oct 19	16:16	1341	3D	50° 9.2’N	128° 15.3’W	50° 8.4’N	128° 15.4’W	248	425	370	25	x
S2	35	StRS	RD1	Oct 19	19:29	1408	5A	50° 2.7’N	128° 34.3’W	50° 2.7’N	128° 35.3’W	192	197	195	25	x
S2	36	StRS	RD1	Oct 19	20:31	1472	5A	50° 4.9’N	128° 36.4’W	50° 4.9’N	128° 37.4’W	195	203	200	25	x
S2	37	StRS	RD1	Oct 19	21:30	1518	5A	50° 3.6’N	128° 39.5’W	50° 2.9’N	128° 39.8’W	222	598	358	25	x
S3	38	StRS	RD3	Oct 21	05:53	1332	5A	50° 7.7’N	129° 27.7’W	50° 7.1’N	129° 27.2’W	779	1140	928	25	x
S3	39	StRS	RD1	Oct 21	07:22	1334	5A	50° 8.9’N	129° 23.7’W	50° 8.9’N	129° 24.7’W	208	230	221	25	x
S3	40	StRS	RD1	Oct 21	09:04	1325	5A	50° 1.1’N	129° 25.7’W	50° 1.1’N	129° 26.8’W	195	209	199	25	x
S3	41	StRS	RD3	Oct 21	11:49	1344	5A	50° 9.3’N	129° 42’W	50° 8.9’N	129° 42.8’W	785	890	880	25	x
S3	42	StRS	RD2	Oct 21	13:18	1347	5A	51° 0.9’N	129° 35.2’W	51° 0’N	129° 36.2’W	543	586	538	25	x

continued.

Spatial Stra-tum	Set	Type	Depth Stra-tum	Date	Time	Duration (min-utes)	Area	Start Latitude	Start Longitude	End Latitude	End Longitude	Start Depth (m)	End Depth (m)	Mean Depth (m)	Traps Fished	SBE 39
S3	43	StRS	RD1	Oct 24	08:19	1330	5A	51° 2.8'N	129° 32.4'W	51° 2.7'N	129° 33.3'W	290	290	290	25	x
S3	44	StRS	RD1	Oct 24	09:46	1333	5B	51° 6.2'N	129° 37.6'W	51° 5.9'N	129° 38.6'W	243	243	242	25	x
S3	45	StRS	RD2	Oct 24	12:04	1339	5A	51° 0.3'N	129° 55.7'W	51° 0.1'N	129° 56.8'W	689	750	724	25	x
S3	46	StRS	RD2	Oct 24	13:35	1359	5A	51° 3.4'N	130° 4.5'W	51° 3.1'N	130° 5.5'W	619	686	650	25	x
S3	47	StRS	RD3	Oct 24	15:00	1384	5A	51° 3.6'N	130° 9.7'W	51° 3.5'N	130° 10.7'W	938	973	955	25	x
S3	48	StRS	RD1	Oct 24	16:50	1388	5B	51° 8'N	130° 1.9'W	51° 7.8'N	130° 3'W	303	354	329	24	x
S3	49	StRS	RD3	Oct 24	18:30	1411	5B	51° 0.1'N	130° 11.8'W	51° 9.9'N	130° 12.8'W	880	944	910	25	x
S4	50	StRS	RD1	Oct 26	07:07	1321	5E	52° 0.9'N	131° 18.3'W	52° 0.4'N	131° 18.8'W	234	318	255	25	x
S4	51	StRS	RD2	Oct 26	08:30	1328	5E	52° 0'N	131° 21.5'W	52° 0.4'N	131° 22.6'W	538	824	673	25	x
S4	52	StRS	RD1	Oct 26	09:50	1342	5E	52° 0.3'N	131° 18'W	52° 0.2'N	131° 19.1'W	214	222	217	25	x
S4	53	StRS	RD2	Oct 26	11:18	1348	5E	52° 0.1'N	131° 22.9'W	52° 0.4'N	131° 24'W	530	652	618	25	x
S4	54	StRS	RD2	Oct 26	13:47	1371	5E	52° 5.2'N	131° 31.9'W	52° 5.4'N	131° 33'W	573	685	644	25	x
S4	55	StRS	RD1	Nov 2	14:44	1321	5E	53° 0.8'N	132° 38.3'W	53° 0.8'N	132° 39.5'W	331	468	412	25	x
S4	56	StRS	RD3	Nov 2	17:00	1347	5E	52° 7.8'N	132° 51.4'W	52° 7.8'N	132° 52.5'W	1210	1190	1200	25	x
S4	57	StRS	RD3	Nov 2	19:01	1350	5E	52° 8.2'N	132° 40.9'W	52° 8.2'N	132° 42'W	1315	1307	1310	25	x
S4	58	StRS	RD2	Nov 2	20:49	1344	5E	52° 9.5'N	132° 32'W	52° 9.5'N	132° 33.3'W	604	805	717	25	x
S4	59	StRS	RD1	Nov 2	22:27	1365	5E	52° 6.6'N	132° 27.4'W	52° 6.6'N	132° 28.6'W	211	231	215	25	x
S4	60	StRS	RD2	Nov 3	00:07	1358	5E	52° 3.2'N	132° 22.5'W	52° 3.1'N	132° 23.7'W	625	720	672	25	x
S4	61	StRS	RD3	Nov 3	01:57	1384	5E	52° 8'N	132° 28'W	52° 8'N	132° 29.2'W	1022	940	967	25	x
S4	62	StRS	RD3	Nov 3	03:49	1389	5E	52° 4.8'N	132° 22.7'W	52° 4.8'N	132° 23.9'W	1080	975	1019	25	x
S4	63	StRS	RD3	Nov 5	23:39	1328	5E	53° 0.3'N	132° 49'W	53° 0.3'N	132° 50.2'W	1250	1092	1180	25	x
S5	64	StRS	RD3	Nov 6	01:21	1355	5E	53° 0.5'N	132° 48.5'W	53° 0.5'N	132° 49.7'W	1178	1214	1199	25	x
S4	65	StRS	RD2	Nov 6	03:00	1367	5E	53° 0.7'N	132° 41.5'W	53° 0.6'N	132° 42.5'W	536	604	565	25	x
S5	66	StRS	RD2	Nov 6	04:33	1410	5E	53° 0.9'N	132° 49'W	53° 0.7'N	132° 50.1'W	735	868	766	25	x
S5	67	StRS	RD2	Nov 6	06:05	1429	5E	53° 4.3'N	132° 54.6'W	53° 4.1'N	132° 53.5'W	497	770	656	25	x
S5	68	StRS	RD1	Nov 6	07:40	1487	5E	53° 7.1'N	133° 1.2'W	53° 7'N	133° 2.3'W	243	308	280	25	x
S5	69	StRS	RD2	Nov 6	09:01	1519	5E	53° 8.5'N	133° 8'W	53° 8.5'N	133° 9.1'W	519	631	555	25	x
S5	70	StRS	RD3	Nov 10	06:20	1332	5E	53° 0.6'N	133° 11.3'W	53° 0.6'N	133° 12.4'W	818	1023	971	25	x
S5	71	StRS	RD2	Nov 10	07:40	1346	5E	53° 2.1'N	133° 9.5'W	53° 2.3'N	133° 10.4'W	469	601	517	25	x
S5	72	StRS	RD2	Nov 10	10:17	1342	5E	53° 3.2'N	133° 17.3'W	53° 3.7'N	133° 18.5'W	444	685	580	25	x
S5	73	StRS	RD3	Nov 10	11:34	1389	5E	53° 5.7'N	133° 20.2'W	53° 5.7'N	133° 21.3'W	699	1126	967	25	x
S5	74	StRS	RD2	Nov 10	13:29	1382	5E	53° 1.2'N	133° 17.2'W	53° 1.2'N	133° 18.3'W	558	752	653	25	x
S5	75	StRS	RD1	Nov 10	14:37	1429	5E	53° 1.4'N	133° 14.5'W	53° 1.4'N	133° 15.7'W	228	345	283	25	x
S5	76	StRS	RD1	Nov 10	16:14	1437	5E	53° 5.7'N	133° 16.7'W	53° 5.6'N	133° 17.9'W	201	224	214	25	x
S5	77	StRS	RD1	Nov 12	07:34	1318	5E	54° 1'N	133° 34.7'W	54° 0.9'N	133° 35.6'W	352	344	346	25	x
S5	78	StRS	RD1	Nov 12	08:48	1362	5E	54° 1.8'N	133° 40.9'W	54° 1.7'N	133° 41.8'W	271	256	264	25	x
S5	79	StRS	RD1	Nov 12	10:02	1374	5E	54° 5.1'N	133° 39.7'W	54° 5'N	133° 40.8'W	276	270	272	25	x
S5	80	StRS	RD3	Nov 12	12:08	1409	5E	54° 5.4'N	133° 57.4'W	54° 5.4'N	133° 58.5'W	974	1039	1013	25	x
S5	81	StRS	RD3	Nov 12	15:01	1409	5E	54° 0.5'N	133° 52.1'W	54° 0.5'N	133° 53.4'W	1107	1202	1144	25	x
S5	82	StRS	RD2	Nov 12	16:48	1423	5E	54° 0.1'N	133° 39.8'W	54° 0'N	133° 40.9'W	538	639	580	25	x
S3	83	StRS	RD1	Nov 18	03:10	1327	5B	51° 8.4'N	130° 7.6'W	51° 8.3'N	130° 8.5'W	335	418	368	25	x
S3	84	StRS	RD2	Nov 18	04:53	1341	5B	51° 6.8'N	130° 19'W	51° 7'N	130° 20'W	481	567	505	25	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
S3	85	StRS	RD2	Nov 18	06:52	1370	5B	51° 9.9'N	130° 10.5'W	51° 0.1'N	130° 11.6'W	466	491	485	25	x
S3	86	StRS	RD2	Nov 18	08:25	1388	5B	51° 7.9'N	130° 5.1'W	51° 7.4'N	130° 6'W	512	632	530	25	x
S3	87	StRS	RD1	Nov 18	09:55	1430	5B	51° 4.1'N	129° 58.5'W	51° 4.2'N	129° 59.5'W	443	439	435	24	x

APPENDIX D SUMMARY OF BASKET USE BY TRAP 2020.

Summary of the basket use by trap number for StRS sets during the 2020 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.

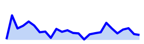
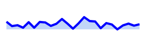
Set	Trap.1	Trap.2	Trap.3	Trap.4	Trap.5	Trap.6	Trap.7	Trap.8	Trap.9	Trap.10	Trap.11	Trap.12	Trap.13	Trap.14	Trap.15	Trap.16	Trap.17	Trap.18	Trap.19	Trap.20	Trap.21	Trap.22	Trap.23	Trap.24	Trap.25
1	D,SD	A	T,F	D,SD	D,SD	T	D,SD	D,F	T,F	D,SD	D,F	D,SD	D,F	D,SD	D,SD	A	D,SD	D,SD	D,F	D,F	D,F	D,SD	D,SD	D,SD	D,SD
2	T	D,SD	A	T	D,SD	A	T	D,SD	D,SD	T	D,SD	D,SD	T	D,F	D,SD	T	D,SD	A		D,SD	T	D,SD	D,SD	D,SD	D,SD
3	A	T	D,SD	A	T	D	A	T	D	A	T	D,SD	A	T	D,SD	D	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	D,SD
4	T	D,SD	A	T	D,SD	D,SD	D,SD	D,SD	D,F	D,SD	D,SD	D,SD	D,SD	T	A	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD
5	T,F	D,SD	A	D,SD	D,SD	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,SD	D,SD	D,SD	D,SD	D,SD		D,SD
6	A,F	T	D,SD	A	T	D,SD	A	T	D,SD	A	T	D,SD	T,SD	T	D,SD	D,SD	T	D,SD	D,SD	T,F	D,SD	D,SD	T	D,SD	D,SD
7	T	D,SD		T	T,SD	A	T	D,SD	A	T		A	T	D	A	T		D,SD	T	D,SD	D			D	T
8						D					T											A			
9	D,SD	A	T	D,F	D,SD	T	D,SD	D,SD	T	D,SD	D,F	T	D,SD	A	D,SD	D,SD	D,F	D,SD	T,F	D,F	D,SD	D,SD	D,SD	D,F	D,F
10	T	D,SD	A	T	D,SD	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,SD	D,SD	D,SD	D,SD	D,SD	D,SD
11	D,SD	A	T	D,SD	D,SD	T	D,SD	D,SD	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,SD	D,SD
12	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,F	T	D,SD	D,SD	D,SD	T,SD	T,SD	D,SD	D,SD	D,SD
13	T	D,SD	A	D,SD	D,SD	D,SD	D,SD	D,SD	T,SD	D,SD	D,SD	D,SD	T	D,SD	A	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD
14	D,SD	A	T	D,SD	D,SD	D,SD	D,SD	D,SD	T,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,SD	D,SD
15	A	T	D,F	T,SD	D,SD	D,SD	D,SD	T	D,SD	T,SD	D,SD	D,SD	A	T	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD
16	D,SD	A	T,F	D,SD	D,F	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	D,SD	D,SD	D	D,SD	D,SD
17	T	D,SD	A	T	D,SD	A	T	D,SD	A	T	D	A	T	D,SD		T	D,SD	D,SD	D,SD	D,SD	D,F	D,F	D,SD	D,SD	T,SD
18	T	D,F	A	T	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	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD
19	T	D,SD	A	T	D,SD	D,SD	D,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	D,SD	D,SD
20	A	T	D,SD	D	T		D,SD	T	D	D,SD	D,SD	D,SD	A	T	D,SD	T,SD	T		D,SD	D,SD		A	D,SD	D,SD	D,SD
21	T	D		T	D,SD	T	T	D,SD	A		D,SD	A	T	D,SD	D,SD	T	D,SD	T,SD	T	D,SD	D,SD		D,SD	D	
22		A	T	D,SD	A	T	D,SD	A	T	D,SD	A	T	T,SD	A	T	D,SD	D,SD	T	D,SD	D,SD		D,SD	D,SD	T	D,SD
23	D,SD	A	T	D,SD	A	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	A	T	D,SD	T,SD	T	D	A	T	D,SD	D,SD	T	D,SD
24	A	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	A	T	D,SD	A	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	D,F
25	T	T,SD	A	D,SD	D,SD	D,SD		D,SD	D,SD	D,SD	D,SD	D,SD	T	D,SD	A	D,SD	D,SD		T	D,SD			D,SD	D,SD	D,SD
26	T	D,SD	A	T	D,SD	A	T	D,F	D,SD	T	D,SD	D,SD	T	D,SD	A	T	D,SD	A	T	D,SD	A			D,SD	T
27	T	D,SD	A	T	T,SD	A	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
28	A	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	A	D,SD		D,F	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD
29	A	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	D,SD	D,SD	D,SD	T,SD	T	D,SD	A	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD
30	A	T				D	A	T		A		D	A	T	D				A		D		T		A
31	A	T	D,SD	A	T	D,SD	D,SD	T,F	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	A	T	T,SD	D,SD	D,SD	T	D,SD	D,SD	D,SD	D,SD
32	D,SD	A	T	D,SD	T	T	D,SD	A		D,SD	A	T	D,SD		T		A	T	D,SD	A	T	D,SD	A	T	D
33	D	A	T	D	A	T			T	T,SD	A	T	D,SD	A					D,SD	A	T	D,SD	A	T	
34	T,F	D,SD	A	D,SD	D,SD	D,SD	D,SD	D,SD		D,SD	D,SD	D,F	T	D,SD	A	T	D,SD	D,SD	D,SD	D,F	D,SD	D,SD	D,SD	D,SD	D,SD
35			T		A	T	D,SD				A				T	D,SD	A	T	D,SD	A,F	T	D,SD	D,SD	T,F	D,F
36	D,SD	A	T	D,SD	A	T	D,SD	D,SD	T,F	D,SD	D,SD	T		A	D,SD	D,SD	D	D,SD		D,SD	D,F	D,SD	D,F		
37	T	D,SD	A	T	D,SD	D,SD	T	D,SD	D,SD	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
38	A	T		A	T			T	D		T	D,SD	A	T	D	A	T	D,SD	A	T		A	T	D,SD	A
39						A	T		A									A							
40												T												T	D
41		T	D	A	T	D	A	T	D	A	T	D	A		D,SD	A	T	D,SD	A	T	D,SD	A	T	D	A
42	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	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	T,SD	D,SD
43	A	T			T		A	T	D			D		T	D,SD			D,SD	A	T	D		T		A
44	T	D,SD		T	D		T		A	T	D,SD	A		D,SD	A	T			T	D,SD	A	T		A	
45	D,SD	A	T	D,SD	A	T	D,SD	D,SD	T	D,SD	T,SD	T	D,SD	D,SD	T	D,SD	A	D,SD	D,F	T,SD	D,SD	D,SD	D,SD	D,SD	D,SD
46	A	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	D	D,SD	D,SD	D,SD	T	D,SD	T	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,F	D,SD	D,SD
47	T	T,SD	T	T	D,SD	T,SD	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	A	T	D,SD	D,SD	T,SD	D,SD	T,SD	D,SD	D,SD	D,SD	T,SD
48	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	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD
49	T,SD	A	T	T,SD	A	T	T,SD	D,SD	T		D,SD	T,SD	T,SD	T,SD	T	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	T,SD	D,SD	D,SD
50	A	T	D					T																	
51	A	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	D,SD	T	D,F	A	T	D,SD	A	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD
52											D,SD							A	T					A	
53	D,SD	A,F	T	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD		D,SD	D,SD	D,SD	A	T	D,SD	D,SD	D,SD	D,SD	D,SD	T	D,SD	D,SD	D,F	D,F
54	D,SD	A	T	D,SD	D,SD	T,F	D,SD	D,SD	T	D,F	D,F	D,F	D,F	A	T,F	D,SD	D,SD	D,SD	D,F	D,F	D,F	D,SD	D,SD	D	D,SD
55	T,SD	A	T	D,SD	D,SD	T	D	D,SD	D,SD	D,SD	D,SD	D,SD	D	A	T	D,SD	D,SD	T	D,SD	D,SD	D,SD	D	D,SD	D,SD	D,SD
56			A			A	T						T			T	D	A			A	T			

continued.

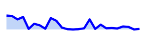
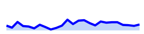
Set	Trap.1	Trap.2	Trap.3	Trap.4	Trap.5	Trap.6	Trap.7	Trap.8	Trap.9	Trap.10	Trap.11	Trap.12	Trap.13	Trap.14	Trap.15	Trap.16	Trap.17	Trap.18	Trap.19	Trap.20	Trap.21	Trap.22	Trap.23	Trap.24	Trap.25
57					D		T				D			D							A	T	D		
58	T	D,SD	A	T	D,SD	D,SD	D,SD	D,SD	A,SD	D,SD	T,SD	D,SD	T	D,SD	D,SD	D,SD	D,SD	A	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD
59									A						A				T				D		
60	A	T	D,SD	A	T	D,SD	D,SD	T	D,SD		D,SD	D,SD	A	T	D,SD	T,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD
61	T	T,SD	A	T		A	T	D,SD	A	T	T,SD	A	T	D,SD	A	T	D		T	D,SD	A	T		A	T
62	T	D,SD	A	T	D,SD	A	T	D,SD	A			A	T	D,SD	A			A	T					A	T
63		T		A	T		A	T	D	A				T	D,SD	A	T	D		T		A	T	D	A
64		T			T				D				A		D				A	T					A
65	T	T	D,SD	D,SD	D,SD	D,SD	D,SD	T,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	D,SD	D,SD
66	A	T	D,SD	D,SD	T	D,SD	A	T	D,SD	D,SD	T	D,SD	A	T			T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	D,SD
67	D,SD	A	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	D,SD	D,SD	T,SD	A	T	D	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD
68	D,SD	A	T	D,SD	D,SD	T		D,SD	D,SD		D,SD	D,SD			T	D,SD	A	D,SD	D,SD		D,SD	D,SD	T	D,SD	
69	T	D,SD	A	T	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	T,SD	D,SD	T	D,SD	A	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	D,SD	D,SD
70		A	T	D,SD		D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	A	T	D,SD	D,SD	T	T,SD	D,SD	T	D,SD	D,SD	T	T,SD
71	A	T	D,SD	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	T	D	D,SD
72	D,SD	D,SD	T	D,SD	T	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	A	T	D,SD	D,SD	D,SD	D,SD	D,SD	T	D,SD	D,SD	D,SD	D,SD
73	A	T	D	A	T	D,SD	A	T	T,SD	A	T	D,SD	D,SD	T	D,SD	A	T	D,SD		T	T,SD	D,SD		D,SD	T,SD
74	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	D,SD	D,SD		D,SD	D,SD	D,SD		D,SD
75					A		D,SD						D	A	T										
76		T								A,F	T			T		A									
77	T	D,SD	A	T	D,SD	D	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
78	A	T	D	A			A	T				D	A		D		T	D,SD	A	T	D,SD	A		D,SD	A
79		A		D	A	T	D,SD		T	D,SD	D,SD	T	D,SD		T		A	T			T	D,SD	A	T	
80	D,SD			D,SD	A	T	D,SD	A	T	D,SD	A	T	D,SD	A	T	D,SD	D,SD	T	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD
81			T			T							D	A			A		D				A		
82	T	D,SD	A	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	A	T	D,SD	D,SD	T	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD
83	D,SD	A	T	D	A	T	D	A	T	D,SD	A	T	D,SD	A	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD	D,SD	T	D,SD
84		A	T	D,SD	T	T	T,SD	A	T	D,SD	A	T	D,SD	D,SD	T	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,F
85	T	D,SD	A	T	D,SD	A	T	D,SD	D,SD	D,SD	D,SD	D,SD	T	D,SD	A	T	D,SD	D,SD	D,SD	D,SD	D,SD	T	D,SD	D,SD	D,SD
86	A	T	D,SD	D,SD	T	D,SD	D,SD	D,SD	D,SD	D	D,SD	D,SD	D,SD	T	D,SD	A	T	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD	D,SD
87	T	D,SD	A	T	D,SD		T	D,SD	A	T		A	T		A	T	D,SD	A	T	D	A	T	D,SD	D,SD	T

APPENDIX E SUMMARY OF SABLEFISH BIOLOGICAL DATA 2020.

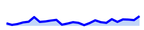
Biological data collected for sablefish by set, catch weight in kilograms and numbers of fish. Sablefish counts by trap are represented by sparklines. Tagged fish counts by number for recovered, re-released, deceased and those released for the first time. Tagged fish fork lengths are presented by count and mean (millimeters). Specimen counts are listed by sample type; mean fork lengths are tabulated.

Set	Total Catch			Tagged Fish Counts			Tagged Fork Lengths(mm)		Specimen Count						Mean Fork Length(mm)		
	kg	Count	Count by Trap	Recover-Rerelease	Deceased	Released	Count	Mean	Fork Length	Sex	Maturity	Otoliths	Weight	Count	Proportion Males	Males	Females
1	3772	2305		0	0	163	162	554	72	49	49	49	49	72	0.43	536	569
2	932	454		1	0	126	127	575	48	48	48	48	48	48	0.46	541	589
3	748	287		0	0	91	91	619	43	43	43	43	43	43	0.19	568	636
4	2389	1355		0	0	156	155	554	50	50	50	50	50	50	0.40	557	583
5	2960	1625		0	0	116	116	556	48	41	41	41	41	48	0.51	541	583
6	917	372		2	0	115	117	617	44	46	46	46	46	47	0.17	599	615
7	573	214		1	0	97	98	606	45	45	45	45	45	46	0.07	580	627
8	20	6		0	0	1	1	601	1	1	1	1	1	1	0.00	0	745
9	1159	788		1	0	140	140	518	57	57	57	56	57	61	0.74	516	539
10	1970	1032		0	0	112	112	572	54	53	54	54	54	54	0.23	561	590
11	2192	1230		0	0	159	159	539	54	54	54	54	54	54	0.74	518	582
12	1545	717		2	0	121	123	602	50	49	49	49	49	50	0.45	535	596
13	2128	1283		2	0	127	129	535	50	50	50	50	49	50	0.50	526	566
14	2053	1160		1	0	113	114	545	61	61	61	61	61	61	0.39	543	573
15	1738	1155		2	0	144	146	528	57	57	57	57	57	57	0.63	509	514
16	1236	915		0	0	152	152	503	46	46	46	46	46	46	0.74	499	508
17	1011	642		0	0	115	115	524	58	57	57	56	57	58	0.70	511	550
18	2030	1033		0	0	124	124	563	54	54	54	54	54	54	0.39	545	579
19	1448	916		0	0	127	127	522	48	48	48	47	48	48	0.67	514	545
20	1390	566		1	0	135	136	600	52	52	52	52	52	52	0.37	573	623
21	772	294		2	0	66	68	624	48	48	48	48	48	48	0.42	569	629
22	480	244		1	0	72	73	568	55	55	55	55	55	55	0.69	558	631
23	977	403		1	0	120	121	596	47	47	47	47	47	47	0.45	586	607

continued.

Set	Total Catch			Tagged Fish Counts			Tagged Fork Lengths(mm)		Specimen Count						Mean Fork Length(mm)		
	kg	Count	Count by Trap	Recover-Rerelease	Deceased	Released	Count	Mean	Fork Length	Sex	Maturity	Otoliths	Weight	Count	Proportion Males	Males	Females
24	807	400		0	0	131	131	566	48	48	48	47	48	48	0.73	571	616
25	1106	746		1	0	112	113	522	58	58	58	57	58	58	0.67	503	548
26	561	252		1	0	84	85	578	53	52	52	52	52	53	0.58	552	641
27	938	463		2	0	135	137	583	40	40	40	40	40	40	0.73	536	588
28	1131	633		0	0	135	135	548	45	45	45	45	45	45	0.60	531	580
29	1202	667		1	0	108	109	549	46	46	46	46	46	46	0.54	531	562
30	110	28		0	0	9	9	666	14	14	14	14	14	14	0.00	0	703
31	1183	476		2	0	125	127	605	52	52	52	52	52	52	0.58	588	665
32	664	244		1	0	64	65	619	55	55	55	55	55	55	0.33	594	637
33	243	92		1	0	22	23	612	19	19	19	19	19	19	0.53	544	642
34	2314	1033		0	0	147	147	588	51	46	46	46	46	51	0.17	584	613
35	738	297		0	0	100	100	615	52	50	50	49	50	52	0.08	569	610
36	1028	478		0	0	117	117	586	66	62	62	62	62	66	0.31	566	602
37	2092	928		0	0	115	115	594	47	47	47	47	47	47	0.30	576	617
38	308	84		0	0	33	33	677	26	26	26	26	26	26	0.19	571	733
39	20	9		0	0	1	1	537	6	6	6	6	6	6	0.17	602	635
40	9	3		0	0	1	1	641	1	0	0	0	0	1	0.00	0	0
41	539	152		0	0	56	56	667	53	53	53	53	53	53	0.45	638	701
42	1380	599		2	0	111	113	595	51	51	51	51	51	51	0.37	560	595
43	150	59		0	0	21	21	593	11	11	11	11	11	11	0.09	584	607
44	247	66		0	0	32	32	711	13	13	13	13	13	13	0.00	0	677
45	1208	646		3	0	139	142	567	51	51	51	51	51	51	0.86	545	564

continued.

Set	Total Catch			Tagged Fish Counts			Tagged Fork Lengths(mm)		Specimen Count						Mean Fork Length(mm)		
	kg	Count	Count by Trap	Recover-Rerelease	Deceased	Released	Count	Mean	Fork Length	Sex	Maturity	Otoliths	Weight	Count	Proportion Males	Males	Females
46	1429	1031		2	0	119	121	512	49	49	49	49	49	49	0.63	513	579
47	1188	558		8	0	102	110	578	51	51	51	51	51	51	0.45	571	614
48	1102	557		0	0	114	114	570	52	52	52	52	52	57	0.46	552	591
49	1482	735		8	0	127	134	580	46	46	46	46	46	47	0.59	551	597
50	32	12		0	0	3	3	559	4	4	4	4	4	4	0.00	0	592
51	1350	674		1	0	122	123	563	58	58	58	58	58	63	0.59	549	565
52	39	13		0	0	1	1	573	10	10	10	10	10	10	0.40	674	643
53	1959	1128		0	0	139	139	548	56	56	56	56	56	56	0.45	525	558
54	2038	1233		0	0	119	119	559	67	47	47	44	47	67	0.49	519	567
55	1382	490		1	0	128	129	625	55	55	55	48	55	55	0.20	583	635
56	51	17		0	0	7	7	661	7	7	7	6	7	7	0.00	0	641
57	27	7		0	0	2	2	719	1	1	1	1	1	1	0.00	0	657
58	2123	1237		1	0	122	123	565	53	53	53	53	53	53	0.45	506	552
59	18	6		0	0	2	2	649	3	3	3	3	3	3	0.00	0	677
60	1370	840		1	0	151	152	543	49	49	49	49	49	49	0.55	546	571
61	264	120		2	0	28	30	575	44	44	44	44	44	44	0.45	558	648
62	184	87		0	0	27	27	590	29	29	29	29	29	29	0.79	563	595
63	323	113		0	0	56	56	641	35	35	35	35	35	35	0.29	612	658
64	64	24		0	0	10	10	647	6	6	6	6	6	6	0.17	652	641
65	1972	1100		2	1	140	143	552	60	60	60	60	60	61	0.47	523	566
66	773	459		0	0	139	139	543	44	44	44	44	44	44	0.64	547	577
67	1369	721		1	0	138	139	561	44	44	44	44	44	45	0.66	530	594

continued.

Set	Total Catch			Tagged Fish Counts			Tagged Fork Lengths(mm)		Specimen Count						Mean Fork Length(mm)		
	kg	Count	Count by Trap	Recover-Rerelease	Deceased	Released	Count	Mean	Fork Length	Sex	Maturity	Otoliths	Weight	Count	Proportion Males	Males	Females
68	1173	654		1	0	134	135	559	52	52	52	52	52	52	0.33	532	568
69	1214	635		2	0	142	144	553	52	52	52	52	52	53	0.63	536	603
70	933	556		3	0	132	135	539	46	46	46	46	46	46	0.70	524	556
71	1388	695		0	0	110	110	557	49	49	49	49	49	49	0.57	526	570
72	1917	1111		1	0	130	131	551	61	61	61	61	61	61	0.48	552	558
73	773	398		9	0	109	118	576	53	53	53	53	53	53	0.62	558	592
74	1797	1035		0	0	118	118	570	46	46	46	46	46	46	0.54	542	610
75	67	25		0	0	7	7	626	11	11	11	11	11	11	0.36	548	631
76	24	9		0	0	4	4	645	4	2	2	2	2	4	0.50	530	625
77	1246	506		0	0	152	152	600	54	54	54	54	54	54	0.19	564	631
78	278	86		0	0	17	17	641	37	37	37	37	37	37	0.08	624	655
79	283	106		0	0	32	32	606	29	29	29	29	29	29	0.14	665	611
80	848	347		0	0	127	127	623	52	52	52	52	52	52	0.73	619	643
81	75	15		0	0	2	2	754	10	10	10	10	10	10	0.20	697	806
82	1667	924		0	0	126	126	543	50	50	50	50	50	50	0.58	561	592
83	776	281		0	0	71	71	621	46	46	46	46	46	46	0.26	593	650
84	1320	623		3	0	140	143	589	47	47	47	47	47	47	0.49	565	612
85	1415	648		0	0	137	137	579	49	49	49	49	49	49	0.39	570	591
86	1381	681		0	0	127	127	573	51	51	51	51	50	51	0.24	572	577
87	635	244		0	0	97	97	612	47	47	47	47	47	47	0.43	597	619
Total	**92167**	**48092**		**77**	**1**	**8200**	**8274**		**3669**	**3603**	**3604**	**3587**	**3602**	**3691**			

APPENDIX F SUMMARY OF BIOLOGICAL DATA FOR 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 number of species visually identified as either a RE = rougheye rockfish, BS = blackspotted rockfish or a hybrid.

		Specimen Count							Mean Fork Length(mm)				Sampler Visual id Count		
Species Name	**Set**	**Fork Length**	**Weight**	**Sex**	**Maturity**	**Otolith**	**DNA**	**Total Count**	**Proportion Males**	**Males**	**Females**	**No sex**	**RE**	**BS**	**Hybrid**
ROUGHEYE/ BLACKSPOTTED ROCKFISH COMPLEX	5	2	2	2	2	2	2	2	0.5	481	526	0	2	0	0
	14	7	7	7	7	7	7	7	0.57	457	494	0	5	2	0
	20	11	11	11	11	11	11	11	0.55	484	487	0	8	3	0
	23	4	4	4	4	4	4	4	0.5	468	483	0	2	2	0
	31	1	1	1	1	1	1	1	0	0	516	0	1	0	0
	34	1	1	1	1	1	1	1	1	389	0	0	1	0	0
	37	3	3	3	3	3	3	3	0.67	485	525	0	3	0	0
	42	1	1	1	1	1	1	1	0	0	450	0	0	1	0
	50	1	1	1	1	1	1	1	0	0	667	0	1	0	0
	55	18	18	18	18	18	18	18	0.61	450	438	0	4	14	0
	65	1	1	1	1	1	1	1	1	533	0	0	0	1	0
	69	3	3	3	3	3	3	3	0.67	518	546	0	1	2	0
	71	25	25	25	25	25	25	25	0.44	498	498	0	9	16	0
	72	3	3	3	3	3	3	3	0.33	490	483	0	1	2	0
	77	2	2	2	2	2	2	2	0.5	581	574	0	1	1	0
	83	22	22	22	22	22	22	22	0.5	464	471	0	14	8	0
	84	2	2	2	2	2	2	2	1	470	0	0	2	0	0
	85	11	11	10	10	11	11	11	0.5	458	477	408	8	3	0
	86	2	2	2	2	2	2	2	0.5	495	459	0	2	0	0
	87	6	6	6	6	6	6	6	0.67	486	492	0	3	3	0
Total		**126**	**126**	**125**	**125**	**126**	**126**	**126**					**68**	**58**	**0**

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