

**2019–2020 Northern Southeast Inside (NSEI)
Subdistrict Sablefish Marking Survey and Escape
Ring Size Comparison Study**

by

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and

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September 2026

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



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Weights and measures (metric)		General		Mathematics, statistics	
centimeter	cm	Alaska Administrative Code		all standard mathematical signs, symbols and abbreviations	
deciliter	dL		AAC		
gram	g	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	H _A
hectare	ha			base of natural logarithm	e
kilogram	kg			catch per unit effort	CPUE
kilometer	km	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	coefficient of variation	CV
liter	L			common test statistics	(F, t, χ^2 , etc.)
meter	m	at	@	confidence interval	CI
milliliter	mL	compass directions:		correlation coefficient (multiple)	R
millimeter	mm	east	E	correlation coefficient (simple)	r
Weights and measures (English)		north	N	covariance	cov
cubic feet per second	ft ³ /s	south	S	degree (angular)	°
foot	ft	west	W	degrees of freedom	df
gallon	gal	copyright	©	expected value	E
inch	in	corporate suffixes:		greater than	>
mile	mi	Company	Co.	greater than or equal to	≥
nautical mile	nmi	Corporation	Corp.	harvest per unit effort	HPUE
ounce	oz	Incorporated	Inc.	less than	<
pound	lb	Limited	Ltd.	less than or equal to	≤
quart	qt	District of Columbia	D.C.	logarithm (natural)	ln
yard	yd	et alii (and others)	et al.	logarithm (base 10)	log
Time and temperature		et cetera (and so forth)	etc.	logarithm (specify base)	log ₂ , etc.
day	d	exempli gratia		minute (angular)	'
degrees Celsius	°C	(for example)	e.g.	not significant	NS
degrees Fahrenheit	°F	Federal Information Code	FIC	null hypothesis	H ₀
degrees kelvin	K	id est (that is)	i.e.	percent	%
hour	h	latitude or longitude	lat. or long.	probability	P
minute	min	monetary symbols		probability of a type I error	
second	s	(U.S.)	\$, ¢	(rejection of the null hypothesis when true)	α
Physics and chemistry		months (tables and figures): first three letters	Jan,...,Dec	probability of a type II error	
all atomic symbols		registered trademark	®	(acceptance of the null hypothesis when false)	β
alternating current	AC	trademark	™	second (angular)	"
ampere	A	United States		standard deviation	SD
calorie	cal	(adjective)	U.S.	standard error	SE
direct current	DC	United States of America (noun)	USA	variance	
hertz	Hz	U.S.C.	United States Code	population sample	Var var
horsepower	hp				
hydrogen ion activity (negative log of)	pH				
parts per million	ppm	U.S. state	use two-letter abbreviations		
parts per thousand	ppt, ‰		(e.g., AK, WA)		
volts	V				
watts	W				

REGIONAL OPERATIONAL PLAN NO. ROP.CF.1J.2026.10

**2019–2020 NORTHERN SOUTHEAST INSIDE (NSEI) SUBDISTRICT
SABLEFISH MARKING SURVEY AND ESCAPE RING SIZE
COMPARISON STUDY**

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September 2026

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Signature Page

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Comparison Study

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PURPOSE

The Alaska Department of Fish and Game (ADF&G) conducts sablefish marking surveys with pot gear in May and June to mark and release sablefish in the Northern Southeast Inside (NSEI) Subdistrict (Chatham Strait). The recapture event occurs during the commercial fishery season (August 15–November 15). The abundance estimate generated by the mark–recapture experiment represents one piece of information in the statistical catch-at-age (SCAA) model (along with the annual sablefish survey and fishery catch and biological data) to calculate the acceptable biological catch (ABC) for sablefish in NSEI. This regional operational plan details the methodology for that survey as well as the methods to compare the catchability and retention rates of differently sized escape rings on sablefish pot gear. Escape rings are rigid, fixed-diameter openings on pots designed to allow target species below a certain size to exit the pot while retaining others. As commercial fishing effort using pot gear has increased in state and federal sablefish fisheries, the department tested multiple escape-ring sizes to optimize the release of smaller, immature fish while retaining larger individuals. These escape ring studies were conducted during the 2019 and 2020 sablefish marking surveys.

Keywords: sablefish, groundfish, Clarence Strait, Chatham Strait, SSEI, NSEI, tagging, codcoil pots, slinky pots, escape rings, size selectivity, longline, CPUE

BACKGROUND

Sablefish (*Anoplopoma fimbria*; also known as black cod) are found in the northeastern Pacific Ocean, ranging from Baja, California to the Aleutian Islands and into the Bering Sea (Mecklenburg et al. 2002). Adult sablefish inhabit the deep waters of the continental shelf, slope, and coastal fjords. Most adults live at depths ranging from 366 m to 914 m (200 to 500 fathoms), but sablefish have been captured at depths over 1,829 m (1,000 fathoms; Allen and Smith 1988). Sablefish are long-lived, with individuals in Alaska waters aged to at least 94 years (Munk 2001). However, the age composition of commercial catches in Southeast Alaska is dominated by younger fish, with few individuals older than 20 years (Mueter 2010). Their high market value, delicate flesh, and longevity make them one of the most valuable groundfish species in the region, supporting both state and federally managed fisheries. Within Southeast Alaska, the Northern Southeast Inside (NSEI) Subdistrict in Chatham Strait and the Southern Southeast Inside (SSEI) Subdistrict in Clarence Strait comprise the 2 state-managed sablefish fishing areas.

Historically, the NSEI and SSEI sablefish fisheries have been prosecuted primarily with hook-and-line longline gear, with only a few pot permits (3 to 5) issued in SSEI. In 2017, regulation changes to the C61C (Clarence Strait longline) permit allowed the use of both longline and pot gear, followed by a similar amendment in 2022 for the NSEI (Chatham Strait) C61A permits. The introduction of collapsible codcoil, or “slinky,” pots in 2019 made it easier for longline vessels to transition between gear types with minimal deck modifications. Since 2018, fishers targeting sablefish using pots in the inside waters of southeastern Alaska have been required to have 2 or more circular escape rings per pot. These recent regulatory changes and research efforts have focused on gear innovation, whale depredation mitigation, and fishery selectivity.

Fishery-independent surveys have been integral to sablefish management in Southeast Alaska. The annual NSEI and SSEI longline surveys began in 1988 to monitor relative abundance, collect biological samples, and generate catch-per-unit-effort (CPUE) indices for stock assessment. In 1997, ADF&G initiated a mark–recapture program in NSEI using tagged sablefish to estimate absolute abundance and improve model accuracy. Early tagging efforts using longline gear

revealed hook-shyness in previously captured fish, prompting a switch to longlined pot gear in 2000. Additional improvements to the survey design and overall stock assessment were made after external review (Mueter 2010). Over time, the survey transitioned from chartered commercial vessels to the ADF&G research vessel, R/V *Medeia*, in 2012 (Green et al. 2016; Baldwin et al. 2022). However, the survey's core methodology has remained consistent: sablefish are captured, tagged, and double-marked with a caudal fin clip.

Typically, between 24 and 40 sets are completed throughout the length of Chatham Strait (Figure 1) over a 3 to 4 week period in May/June, ending approximately 2 months before the NSEI commercial fishery begins on August 15. This timeframe allows adequate mixing of marked and unmarked fish while minimizing movement in and out of NSEI before the recapture phase of the study. For mark recovery, port samplers observe the majority of NSEI commercial sablefish landings occurring in Sitka, Ketchikan, Juneau, and Petersburg. Fish are carefully examined for fin clips, and the numbers of fish with and without fin clips recovered are used to estimate abundance using a Petersen estimator. Tags are typically removed at sea by vessel crew and attached to a logbook. Tags missed by vessel crew are recovered by processor staff and given to ADF&G personnel. As an incentive for fishers and processor staff to return tags, ADF&G offers a baseball cap, t-shirt, or a similar promotional reward for each tag recovered. Since 2012, when the survey switched to the R/V *Medeia*, the average return rate on tags has been 5.2% (Table 1). See Dressel (2009) for a detailed description of the current statistical design and explanation of how the assumptions of the mark–recapture experiment are met.

The survey's established tagging framework also provides an ideal platform for experimental research, such as evaluating the effects of escape rings on pot selectivity. Escape rings are rigid openings installed in pot gear to allow smaller or undersized target species (e.g., fish or shellfish) to exit while retaining larger, more marketable fish (Sullivan et al. 2024). In fisheries management, escape rings are typically sized to allow immature or pre-spawning individuals to escape. Prior to this study, the influence of different escape ring sizes on sablefish catch composition in Alaska (i.e., number of fish retained, sizes of fish retained) had not been evaluated. Anecdotal evidence from the commercial fleet also suggests that soak time may affect escapement rates; smaller fish may be physically capable of exiting the pot but require sufficient time to locate the opening. To address these questions, the study incorporated escape-ring experiments into the NSEI marking surveys conducted in 2019 and 2020, with the 2020 experiments specifically evaluating the effects of escape-ring size and soak time on sablefish catch and retention.

OBJECTIVES

1. Capture, collect fork length (cm), tag, clip, and release 11,000 (2019) and 8,000 (2020) sablefish greater than 32 cm throughout Chatham Strait to estimate population abundance based on a Petersen mark–recapture estimate, as part of the mark–recapture portion of annual stock assessment.
2. Compare catch per unit effort (CPUE) and length composition of sablefish captured in conical pots using 3 sizes of escape rings as well as control pots without escape rings. Collect weight and girth data from a subset of tagged fish (2019 only).
3. Evaluate the effect of soak times of approximately one-day versus approximately two-day sets on catch and size composition of sablefish captured in pots (2020 only).
4. Identify and enumerate, to the lowest practical taxonomic group, all species captured in pots during the survey.

METHODS

SAMPLE DESIGN

The project was conducted during the 2019 and 2020 NSEI sablefish marking surveys. The primary goal of the marking surveys was to capture, measure (fork length, cm), tag, clip (mark), and release 8,000–11,000 sablefish above 32 cm fork length throughout Chatham Strait, with sampling effort allocated in proportion to the commercial harvest over the previous 3 years and prior to the start of the commercial fishery (Table 2). Depths ranged from 509–809 meters (278–442 fathoms). The proportion of commercial harvest by statistical area was determined for each year using fish ticket data and then averaged across all 3 years. The tagging goal by year was determined prior to the survey, and this total, along with an estimate of the total number of sets, was used to determine the maximum number of fish that were tagged per set. A detailed description of tagging goals and efforts to distribute marks throughout the management area can be found in Baldwin et al. (2022).

The secondary goals of the project in 2019 and 2020 were to compare CPUE, weight, girth, and length composition among conical pots equipped with 3 sizes of escape rings and a control pot without escape rings, and to evaluate the effects of soak time on CPUE and sablefish size. In 2020, 1-day and 2-day soak times were compared. The tertiary goal was to identify and enumerate all bycatch captured in the pots.

POT GEAR DESIGN AND SABLEFISH CAPTURE

Longlined pot gear was used to catch live sablefish during the survey. At each station a string of gear, or “set”, was deployed consisting of a floating line with a large buoy bag followed by a highflier pole, a buoy line equal to approximately 640 m depending on set depth, followed by the groundline. The groundline was configured with 91 m of leading line at each end followed by 42 beckets with c-links spaced at approximately 91 m intervals. The first and last beckets were attached to 160 kg anchors. Pots were attached to each of the remaining 40 beckets if a 40 pot set was made and every other becket if a 20 pot set was made. The end of the set was configured with buoy line, highflier, and buoys matching the beginning (Figure 2).

Conical pots were used for sablefish capture. The pots had a bottom diameter of 150 cm, top diameter of 107 cm, and a height of 60 cm (Figure 3). Pots were constructed with 1.5 cm diameter rebar and 5.08 x 5.08 cm nylon mesh, with 2 tunnel openings on opposite sides, each approximately 23 cm in diameter. Pots were baited with approximately 1.8 kg of chopped *Illex* squid and 1.8 kg of chopped pollock, mixed and packed into a hanging bait bag. Pots were divided equally into 4 treatments: a control without escape rings and 3 treatments with escape rings measuring 8.9, 9.5, and 10.2 cm internal diameters. For ease of identification, we color-coded and marked pots from each treatment with high-visibility paint: purple for 8.9 cm escape rings, green for 9.5 cm escape rings, yellow for 10.2 cm escape rings, and blue for the control with no escape rings.

In 2019, each set consisted of 40 pots, with 1 to 2 sets deployed per day. In 2020, due to high sablefish catch rates, fewer pots were used per set: each set contained 20 pots, with 1 to 2 sets still deployed daily. Despite changes in the number of pots, a fixed alternating design was maintained – each set included equal numbers of pots from each of the 4 treatments (Figure 2). Pot spacing differed by set size: pots were spaced 91 m apart in 40-pot sets and 182 m apart in 20-pot sets. The wider spacing in 20-pot sets was achieved by skipping every other becket on the groundline. Except for the addition of escape rings, all gear configurations remained consistent with those used

in previous marking surveys (Green et al. 2016). In both 2019 and 2020, pots were typically soaked for approximately 18 hours, or a “one-day” soak. However, in 2020, 10 sets were soaked for approximately 42 hours (an additional 24 hours; a “2-day” soak). These longer soak sets were pre-selected based on proximity to a comparable short-soak set and their compatibility with the overall daily schedule (Table 3).

During hauling and tagging operations, pots waiting to be brought onboard were kept underwater to prevent battering or injuring fish in that pot. For each set hauled, staff rotated among the recorder, clipper, and tagger positions. As each pot was brought on board, the escape ring size (treatment) was recorded while contents of each pot were released onto a sorting table. Non-sablefish catches were identified, recorded, and released overboard, and all sablefish were funneled into a holding tank supplied with a continuous flow of saltwater. If pots were hauled too quickly one after the other and fish from more than one pot needed to be held in the tank simultaneously, dividing panels were used to keep the groups of fish separate. Colored floats corresponding to each treatment type were also added to the tank to clearly identify the fish from each pot.

The clipper collected the fish from the holding tank, held the fish on a measuring board as necessary, and clipped the upper (2019) or lower (2020) 1/3 lobe of the caudal fin using a straight cut angled at a 45-degree orientation from the dorsal-ventral axis (Figure 4). The tagger read out the fork length (cm) of the fish, tagged each fish, noted the condition of the fish, and read out the tag number to the recorder. Sablefish were most effectively handled by gently holding the fish in a “U-shaped position” with one hand on the fish’s head and one on the fish’s body. Sablefish were tagged with an external T-bar tag applied at a shallow angle posterior to the base of the first dorsal spine between the interneural spines on the left side of the fish’s body (Figure 4). Previously tagged fish, fish less than 32 cm in fork length, dead fish, and fish determined to be in poor condition were measured and either retained as mortalities or released untagged. Once the maximum number of fish to be tagged per set was reached—either because the tagging goal for the statistical area had been met or because a disproportionate number of fish had been tagged in a single set—the remaining fish were measured, enumerated by pot and treatment, and released without marking.

During the 2019 survey, 30 sablefish per set were selected for biological measurements. These fish were grouped into 6 predefined fork length categories (<50 cm, 50–55 cm, 56–60 cm, 61–65 cm, 66–70 cm, and >70 cm), with 5 fish measured from each category per set. For each selected fish, weight (kg) and girth (cm), which was measured around the body at the pectoral girdle (Figure 5), were recorded. As fish were processed, the data recorder tracked the number measured in each length category until the target of 5 fish per bin was reached. Sablefish found trapped in escape rings were also measured, weighed, and had their girth recorded, but were not tagged. In 2020, fish were not weighed or girthed.

DATA COLLECTION

All data collected during the marking survey were recorded on paper forms that were entered into Zander applications following the completion of each haul. These data were divided into set data and biological data. Set data included information about the physical gear, such as set coordinates, number of pots, pot depths, and total number of fish caught. Biological data included information recorded for individual sablefish, such as length, tag number, and release condition. Set data were entered into the Zander Pot Survey application, while biological data were entered into the Zander Pot Survey Age-Sex-Length (ASL) application. The 2 programs were independent of each other but shared some information; for example, sablefish totals by pot from the ASL application were

automatically tallied into the set data. Because of programming limitations, 2019 weight and girth data were added to the database by programming staff following the vessel's return to port.

Set Information

For each set, deployment and haul information were recorded on the “Set Form” (Appendix A). During deployment of the set, the science crew recorded the latitude and longitude (decimal minutes) at the start and end of the pot string using the coordinates at which the first and second anchors went overboard. The depth (fathoms) at which each pot was released overboard was also recorded. The depths of the first and last pots were recorded as the start and end depths for the set, respectively, and the average depth of the set was calculated as the mean depth of all pots set, excluding the anchor depths. The crew also recorded whether the gear was hauled in the same or opposite direction from which it was set, the number of pots set, the number of pots hauled, and the substrate of the ocean floor.

In addition, the date and time (military) were recorded when the second anchor went overboard during setting and when the first and second anchors came onboard while hauling. Any additional information unique to a set was recorded in the comments section, including the number of pots lost, returned with open purse strings, and/or returned with holes in the webbing; the time and location within a pot string where any breaks in the groundline occurred; and any tangled gear. If pots were lost during hauling, the actual number of pots retrieved was entered into the database.

While on deck at the beginning of the haul, the recorder noted on the “Pot Tally Form” (Appendix B) the time of first buoy, first anchor, and second anchor on board for each set as well as any substrate (e.g. mud, clay, or rocks) observed on each anchor during hauling. If the groundline of a pot string broke during hauling, the vessel ran to the other end of the string and hauled from the second anchor. The recorder noted the time each end of the broken line was encountered, the time the second buoy was brought onboard, and the time the second anchor was brought aboard in the comments section of the “Pot Tally Form” (Appendix B). The time at which the second break in the line was encountered was recorded in place of the second-anchor-onboard time on this form.

Immediately following gear deployment, data from the Set Form, including the start and end position and individual pot depths, were entered into the Zander Marking Survey Application (Appendix C). Set data recorded on deck (i.e., haul start and end times, haul order, and bycatch) were also entered into the Zander application after hauling was complete. Any additional notes from paper forms were entered into the Zander application.

Biological and Tagging Information

During the haul, biological data were collected on paper forms by the recorder. For every marked sablefish, the recorder recorded the fork length (cm), tag number, and fish condition on the “Marking Release Form” (Appendix D) and noted the pot number and treatment from which each marked sablefish was caught in the margins of the form. During the 2019 survey, the data recorder tracked the number of fish that were weighed and girthed. These measurements were recorded on the “Length-Weight-Girth Form” (Appendix E). After each set, the number of fish marked in each pot was calculated and entered on the “Pot Tally Form” (Appendix B).

In addition to recording data, the recorder was responsible for managing tags. This included providing the tagger with a tagging gun pre-loaded with the next sequential group of tags and confirming that recorded tag numbers were in the correct order. It was important that the tags were consecutive, both within and among batches. Regular verification of the entire six-digit number

(e.g. at the beginning of a new batch of tags) ensured the correct sequential order. If tags were out of order or a tag number was voided, the recorder made a note in the margins of the release form and returned to the correct order at the end of the batch.

After the haul was complete, the biological data for all sablefish were entered from the paper forms into the Zander Groundfish Pot Survey ASL application (Appendix F). All sablefish that were measured were recorded in the biological data table. All sablefish recorded on this form had a sample type of “random sample” (01) and length type of “fork length” (01), or “no length taken” (00) if the length was missed or not recorded. The pot number from which each fish was captured was recorded for each specimen as is the treatment (“color”). Each fish was assigned the appropriate discard (Appendix G) and release (Appendix H) condition codes. For each marked sablefish, the tag batch and tag number were also recorded.

Previously Tagged Fish

All sablefish that were previously tagged by ADF&G and were in good health were released after their tag number was recorded and the fish was measured. If a fish was in poor health or dead, or if the tag was no longer readable or securely attached, the fish was measured, the tag number was recorded, and the tag was collected. Occasionally tags from other agencies were recovered during the survey. In all cases, the tag number was recorded, and the fish length was measured. Depending upon the agency and/or specific project, fish were rereleased or retained for collection of additional biological data; in some cases, tagged fish required special processing (i.e., growth-study fish or fish with archival tags). Detailed instructions for processing fish tagged by other agencies are provided in Appendix I.

All tags from other agencies, associated data, and otoliths were mailed to the National Marine Fisheries Service (NMFS) Auke Bay Laboratory in Juneau. For fish recaptured that had been previously tagged by ADF&G or another agency, tag numbers were recorded in the comment section of the “Tag Recovery Form” (Appendix J), beginning with “T-” followed by the tag number. For fish previously tagged by ADF&G that were harvested, and other agency tagged fish that were harvested or rereleased, data were recorded on the “Tag Recovery Form” (Appendix J).

Discards

Any sablefish determined to have a reduced probability of survival were measured and released without marking. These included fish with a high number of flea bites or exposed tissue due to flea bites; fish damaged from pot gear, such as gilling or abrasions that caused exposed tissue; fish with old injuries; or fish that lacked vigor. Fish with substantial pot abrasions or sand flea damage may have had a higher risk of infection, potentially leading to delayed mortality. In addition, sablefish <32 cm were measured and released without marking. All information for discarded sablefish was recorded on the “Marking Discard Form” (Appendix K) using the appropriate discard (Appendix G) and release condition (Appendix H) codes.

When tagging goals for a set were reached, all remaining pots were brought onboard as normal; however, all fish were measured and released without tagging or clipping. Unlike prior sablefish marking surveys, no sablefish were dumped at rail unless there was a sleeper shark trapped in the pot. If a sleeper shark was in a pot and the pot could not be brought aboard because of the shark’s size, the number of sablefish in the pot was estimated and recorded on the “Pot Tally Form” (Appendix B), regardless of whether an accurate count of sablefish in the pot could be made.

Incidental catch

All incidental catch, including rockfish and thornyheads, were discarded. Bycatch species were tallied on the “Marking Discard Form” (Appendix K). No biological data were collected for bycatch. However, in special cases (i.e., other-agency projects or when an unusually large individual of a species was captured), biological data may have been collected, and the sample was recorded as “select” (05) in the Zander Groundfish Pot Survey ASL application.

SCHEDULE AND DELIVERABLES

The 2019 survey began on May 13 and ended on June 4. The 2020 survey began on May 4 and ended on May 26. The timing of the survey was scheduled to end approximately 8 weeks before the Chatham commercial sablefish fishery opened on August 15 to allow marked fish to mix into the population. Data entry, review, and quality control were done in the office following the survey and finalized by June 30, 2023. The final report on the 2019 portion of this study was published in July 2024 (Sullivan et al. 2024). Further analyses of the 2020 survey data CPUE and soak time will be conducted later as time and staffing allow.

RESPONSIBILITIES

2019:

- Andrew Olson, Fishery Biologist III (Groundfish project leader, Survey deckhand)
- Aaron Baldwin, Fishery Biologist II (Survey crew leader)
- Jane Sullivan, Biometrician I (Biometric review)
- Kellii Wood, Fishery Biologist II (Survey science crew)
- Sara Miller, Biometrician III (Survey science crew)
- Jim deLaBruere, Boat Officer IV (Captain R/V Medeia)
- Cedar Stark, Boat Officer III (Engineer R/V Medeia)
- Craig Conger, Boat Officer II (1st Mate R/V Medeia)
- Asia Beder, Fishery Biologist II (Cook and deckhand R/V Medeia)
- Ben Williams, Biometrician IV (Survey deckhand)
- Rich Brenner, Fishery Biologist IV (Survey deckhand)

2020:

- Rhea Ehresmann, Fishery Biologist III (Groundfish project leader)
- Aaron Baldwin, Fishery Biologist II (Survey crew leader)
- Jane Sullivan, Biometrician I (Biometric review, Survey science crew)
- Madison Bargas, Fish and Wildlife Technician III (Survey science crew)
- Jim deLaBruere, Boat Officer IV (Captain R/V Medeia)
- Cedar Stark, Boat Officer III (Engineer R/V Medeia)
- Craig Conger, Boat Officer II (1st Mate R/V Medeia)
- Luke Erikson, Boat Officer I (Cook and deckhand R/V Medeia)
- Rich Brenner, Fishery Biologist IV (Survey deckhand)

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TABLES

Table 1.—The number of sablefish tagged, total number of tags returned, number of tags returned during the same year in which they were released, and proportion of same-year survey tags returned, 2000–2020.

Year	Sablefish tagged	Total tags returned	Same-year survey tags returned	Proportion of same-year survey tags returned
2000	5,772	1,060	725	12.6%
2001	4,552	1,019	805	17.7%
2002	5,229	1,284	1,112	21.3%
2003	7,788	1,638	683	8.8%
2004	6,357	1,211	598	9.4%
2005	7,118	1,621	615	8.6%
2006	5,325	1,686	548	10.3%
2007	6,158	1,243	394	6.4%
2008	5,450	1,504	747	13.7%
2009	7,071	1,303	416	5.9%
2010	7,443	1,445	406	5.5%
2011	—	—	—	—
2012	7,582	1,478	520	6.9%
2013	7,967	1,996	603	7.6%
2014	—	—	—	—
2015	6,862	1,330	365	5.3%
2016	—	—	—	—
2017	7,096	927	262	3.7%
2018	9,679	1,443	407	4.2%
2019	10,790	1,654	376	3.5%
2020	7,916	1,745	426	5.4%

Note: En dashes signify no data collected. No survey was conducted in 2011, 2014, or 2016.

Table 2.—Mean proportion of sablefish harvested by statistical area for previous 3 years of the commercial fishery, 2016–2018 (2019) and 2017–2019 (2020). Only statistical areas where 2% or greater of the average annual commercial harvest occurred were included in this calculation.

Statistical area	Proportion of harvest for 2019 survey	Proportion of harvest for 2020 survey
345803	7%	8%
345731	10%	8%
345701	40%	40%
345631	32%	34%
345603	11%	10%

Table 3.—Set locations made during the 2019 and 2020 marking surveys.

Year	Effort number	Statistical area	Start latitude	Start longitude	End latitude	End longitude	Number of pots	Soak time (hr:min)	Soak treatment	Haul back order	Average depth (fathoms)
2019	1	345803	58° 22.11	135° 00.33	58° 20.06	135° 00.17	40	18:44	N/A	Opposite	298
2019	2	345803	58° 14.72	134° 59.45	58° 12.76	134° 58.63	40	17:45	N/A	Same	358
2019	3	345731	57° 54.19	134° 50.19	57° 52.10	134° 49.99	40	18:40	N/A	Same	278
2019	4	345731	57° 45.87	134° 52.33	57° 47.73	134° 52.55	40	18:00	N/A	Same	294
2019	5	345701	57° 28.54	134° 42.41	57° 26.64	134° 43.44	40	17:32	N/A	Same	315
2019	6	345701	57° 25.92	134° 41.14	57° 24.05	134° 42.02	40	17:30	N/A	Same	303
2019	7	345701	57° 13.04	134° 44.43	57° 11.37	134° 43.50	40	18:39	N/A	Same	368
2019	8	345701	57° 09.68	134° 45.38	57° 11.65	134° 45.99	40	17:12	N/A	Opposite	333
2019	9	345701	57° 06.24	134° 42.34	57° 08.37	134° 43.56	40	20:37	N/A	Same	351
2019	10	345701	57° 01.65	134° 42.33	57° 03.47	134° 42.68	40	19:34	N/A	Opposite	357
2019	11	345631	56° 57.61	134° 41.82	56° 55.55	134° 41.56	40	19:32	N/A	Same	338
2019	12	345631	56° 53.25	134° 36.25	56° 51.71	134° 34.93	40	16:42	N/A	Opposite	371
2019	13	345631	56° 44.48	134° 31.53	56° 42.41	134° 31.92	40	18:40	N/A	Opposite	388
2019	14	345631	56° 33.02	134° 32.72	56° 30.90	134° 33.36	40	18:04	N/A	Same	319
2019	15	345603	56° 27.64	134° 36.06	56° 25.59	134° 36.16	40	17:53	N/A	Same	315
2019	16	345603	56° 24.52	134° 30.16	56° 22.78	134° 28.69	40	17:25	N/A	Same	395
2019	17	345631	56° 38.94	134° 31.73	56° 37.12	134° 33.32	40	17:45	N/A	Same	365
2020	1	345803	58° 22.08	135° 00.32	58° 20.05	135° 00.21	20	17:44	1-day	Same	295
2020	2	345803	58° 14.81	134° 59.50	58° 12.86	134° 58.65	20	43:51	2-day	Opposite	357
2020	3	345731	57° 47.68	134° 52.50	57° 45.79	134° 52.29	20	17:10	1-day	Same	295
2020	4	345731	57° 54.12	134° 50.19	57° 52.33	134° 50.01	20	42:18	2-day	Same	278
2020	5	345701	57° 23.72	134° 42.15	57° 25.56	134° 41.28	20	17:19	1-day	Opposite	307
2020	6	345701	57° 26.54	134° 43.48	57° 28.42	134° 42.45	20	42:17	2-day	Opposite	317
2020	7	345701	57° 14.78	134° 42.23	57° 16.78	134° 41.63	20	21:08	1-day	Opposite	442
2020	8	345701	57° 17.11	134° 43.52	57° 19.07	134° 43.65	20	42:40	2-day	Same	464

-continued-

Table 3.–Page 2 of 2.

Year	Effort number	Statistical area	Start latitude	Start longitude	End latitude	End longitude	Number of pots	Soak time (hr:min)	Soak treatment	Haul back order	Average depth (fathoms)
2020	9	345701	57° 11.36	134° 43.44	57° 13.24	134° 44.54	20	17:36	1-day	Same	364
2020	10	345701	57° 09.38	134° 45.34	57° 11.36	134° 45.99	20	39:39	2-day	Same	334
2020	11	345701	57° 09.69	134° 43.19	57° 11.52	134° 42.82	20	20:12	1-day	Opposite	381
2020	12	345701	57° 10.22	134° 42.24	57° 12.17	134° 42.11	20	40:36	2-day	Same	429
2020	13	345701	57° 07.34	134° 42.59	57° 09.28	134° 42.40	20	17:40	1-day	Same	350
2020	14	345701	57° 07.98	134° 43.35	57° 06.02	134° 42.25	20	44:36	2-day	Opposite	349
2020	15	345701	57° 04.12	134° 42.80	57° 02.10	134° 42.42	20	23:35	1-day	Same	358
2020	16	345631	56° 57.47	134° 41.80	56° 55.58	134° 41.50	20	17:49	1-day	Same	338
2020	17	345631	56° 53.67	134° 36.43	56° 51.92	134° 35.14	20	40:38	2-day	Opposite	368
2020	18	345631	56° 51.76	134° 38.78	56° 50.45	134° 36.33	20	23:16	1-day	Opposite	377
2020	19	345631	56° 49.12	134° 37.55	56° 47.32	134° 36.27	20	41:48	2-day	Opposite	391
2020	20	345631	56° 49.27	134° 35.77	56° 47.37	134° 34.20	20	16:53	1-day	Opposite	399
2020	21	345631	56° 42.54	134° 31.89	56° 44.52	134° 31.57	20	23:00	1-day	Same	389
2020	22	345631	56° 41.72	134° 27.98	56° 39.90	134° 28.67	20	17:56	1-day	Opposite	344
2020	23	345631	56° 39.15	134° 31.54	56° 37.25	134° 33.20	20	19:32	1-day	Opposite	367
2020	24	345631	56° 35.88	134° 33.07	56° 33.94	134° 32.94	20	18:20	1-day	Opposite	341
2020	25	345631	56° 35.47	134° 29.84	56° 33.45	134° 30.48	20	19:09	1-day	Same	354
2020	26	345603	56° 24.96	134° 36.11	56° 26.93	134° 36.13	20	49:22	2-day	Same	310
2020	27	345603	56° 24.63	134° 30.26	56° 22.92	134° 28.82	20	17:40	1-day	Opposite	392
2020	28	345603	56° 18.95	134° 27.95	56° 21.08	134° 28.07	20	21:16	1-day	Same	398
2020	29	345631	56° 53.13	134° 37.59	56° 54.92	134° 39.05	20	12:32	1-day	Same	360

Note: N/A values signify no data collected as soak time was not tested during the 2019 survey.

FIGURES

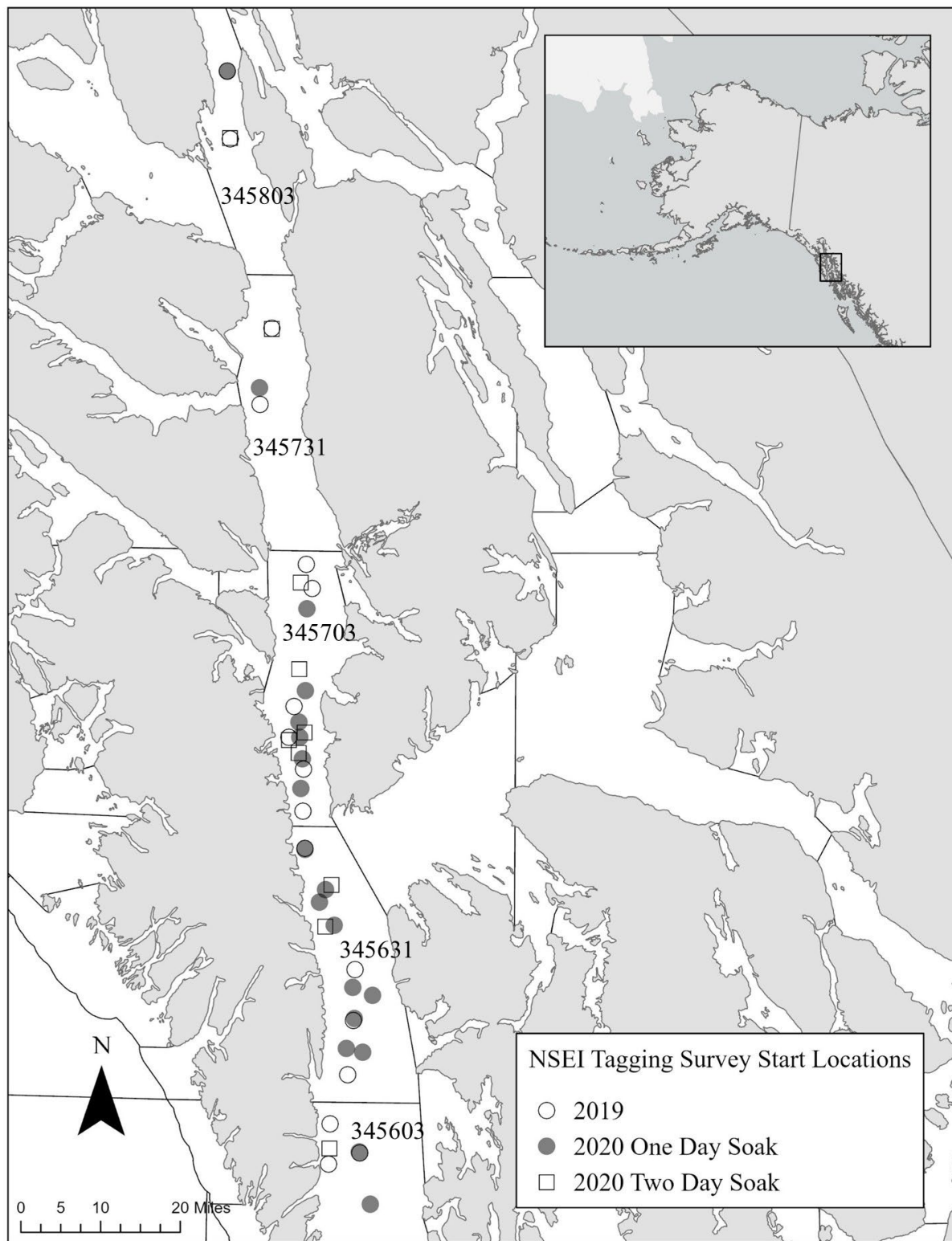


Figure 1.—Map of set locations used during the 2019 and 2020 marking surveys.

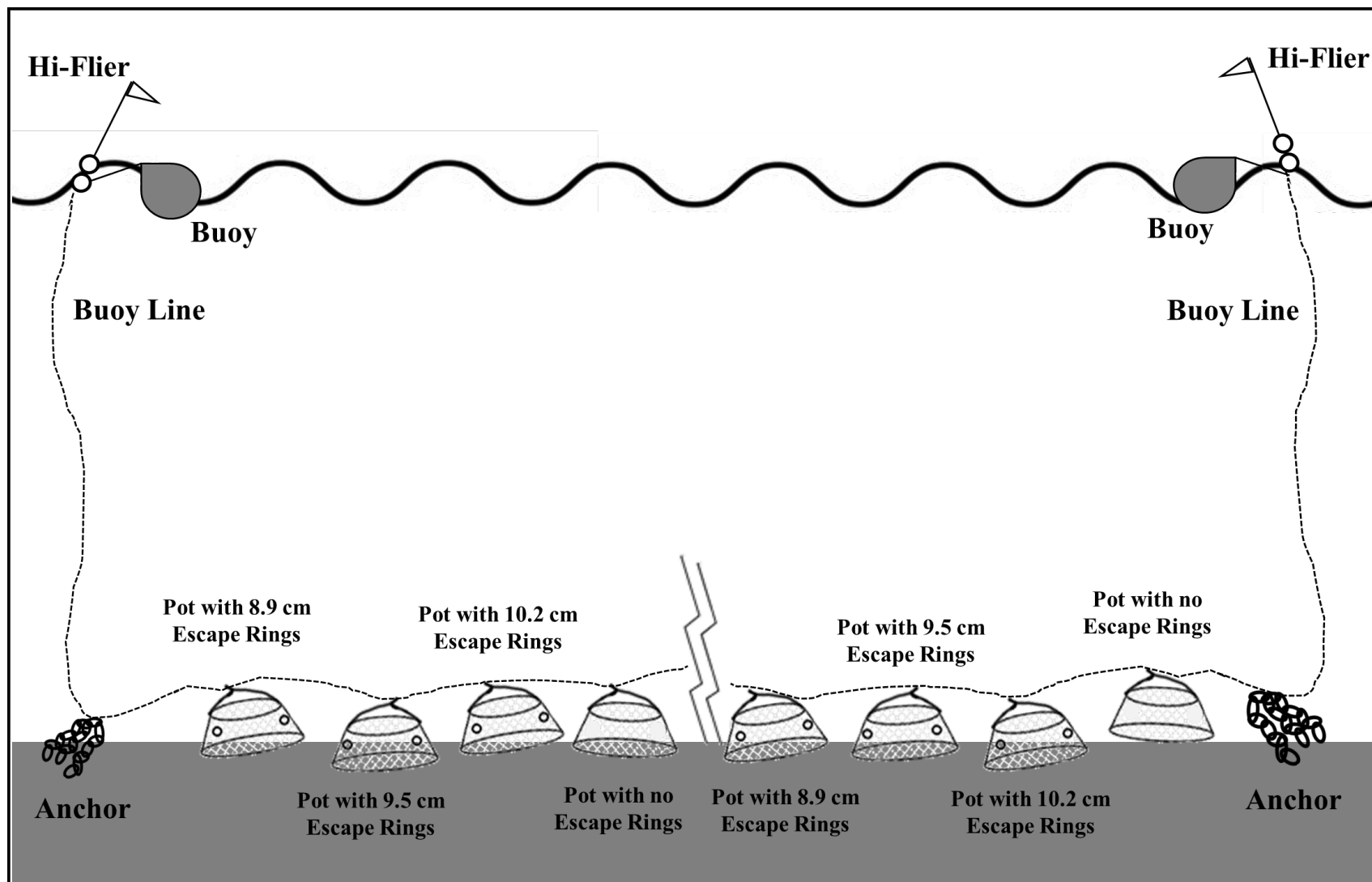


Figure 2.—Sablefish pot set configuration.

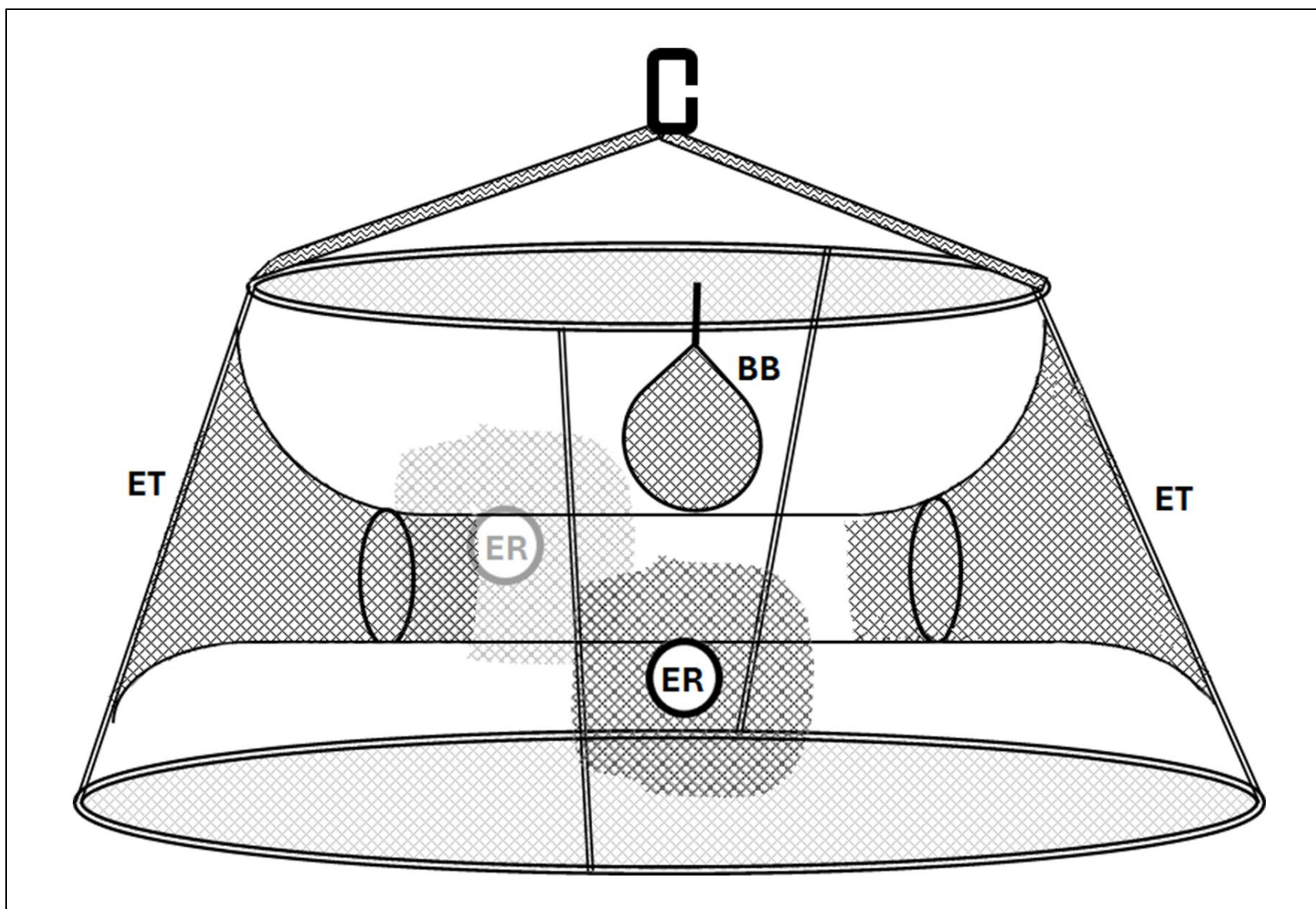


Figure 3.—Configuration for conical pots used in the escape ring study. ER = escape rings; ET = entrance tunnels; BB = bait bag.

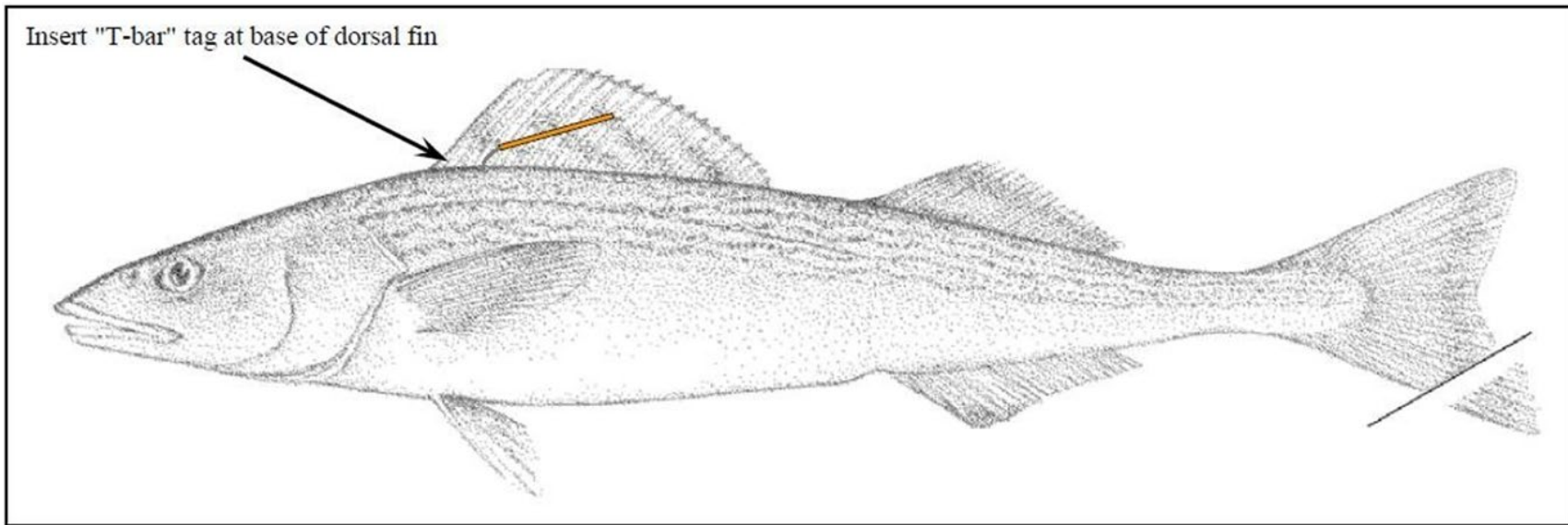


Figure 4.—Sablefish tagging guidelines showing proper T-bar tag placement. The upper or lower lobe (alternating between survey years) is clipped on all tagged fish.

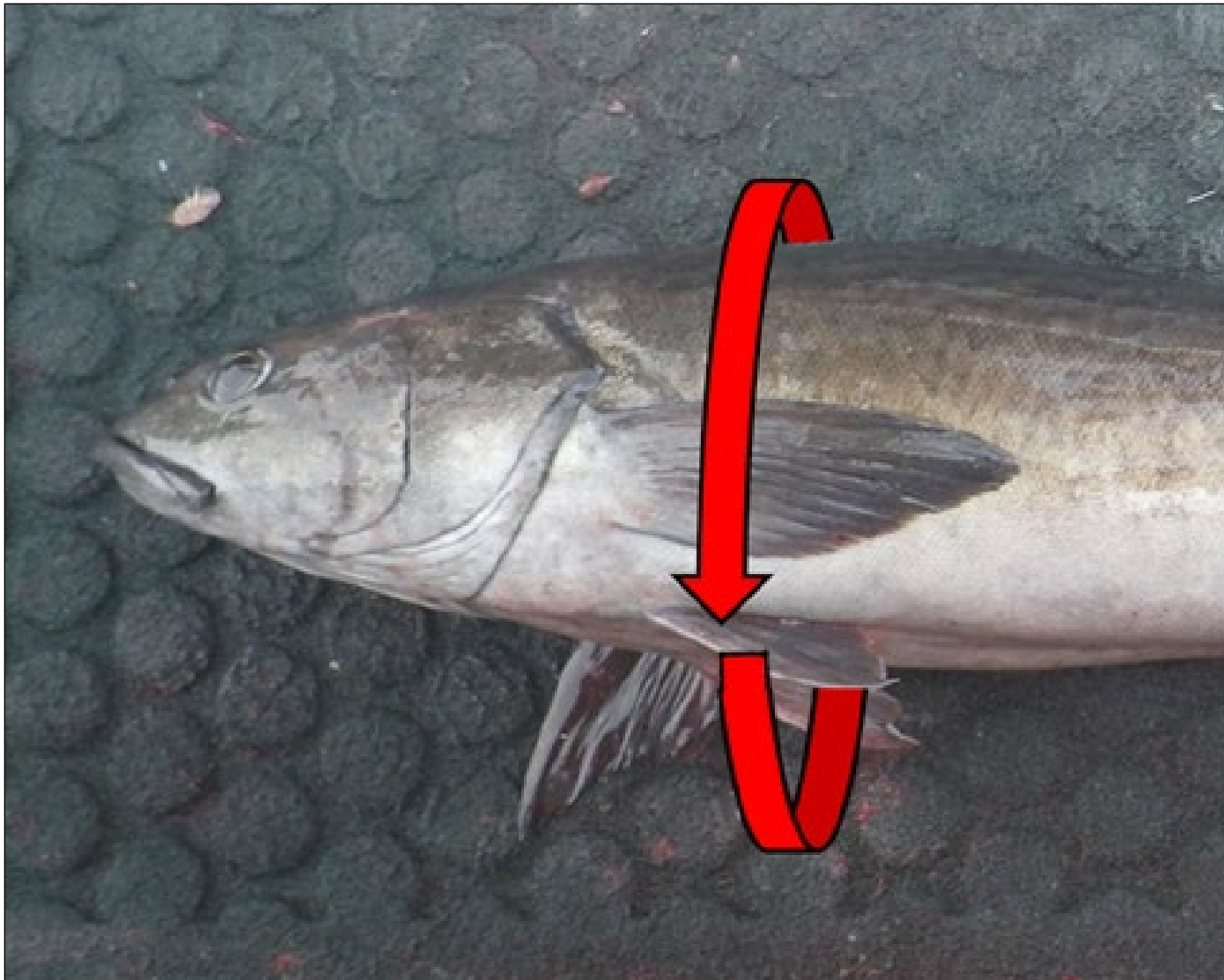


Figure 5.—Girth measurement location used in this study. This location corresponds to the thickest section of the sablefish that is also relatively inflexible due to the bony pectoral girdle.

APPENDICES

Appendix B.—Pot Tally Form used to record the total number of sablefish captured in each pot, including those tagged and those released without tagging on deck.

Pot Tally and Temperature Form																					
Date:																					
Set number:																					
Bottom temp				Surface temp				Holding tank													
Tidbit #				Tidbit #				Tidbit #													
Pot #				Time in				Time in													
				Time out				Time out													
		Time		Weather																	
Start haul																					
End haul																					
Pot #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
# Sablefish																					
Pot #	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
# Sablefish																					

Appendix C.—Example of Zander Marking Survey Application set and pot form. Data from paper set and pot tally forms are entered into this application after each set.

Set #1
+ Hide section

Set Information
Edit Set

Set Details
Set #: 1 Station #: 0 Stat Area: 345803 Area Description:

Lat/Long
Start Latitude: 58°22.076 Start Longitude: -135°00.323 End Latitude: 58°20.049 End Longitude: -135°00.213 Set Distance: 2.34 miles

Time Set/Hauled
Second Anchor Set: 05 / 04 / 2020 14:56 First Buoy Hauled: mm / dd / yyyy Time: First Anchor Hauled: 05 / 05 / 2020 08:40 Second Anchor Hauled: 05 / 05 / 2020 11:13 Second Buoy Hauled: mm / dd / yyyy Time: Set Duration: 17 hours, 44 minutes

Pots and Depth
Pot Type: Round Num Pots Set: 20 Num Pots Retrieved: 20 Start Depth: 334 End Depth: 268 Average Depth: 295 Haul Back Order: Same

Other
Substrate Type: Mud Haul Wind Direction: Haul Wind Speed (kt): Haul Seas (ft): Sample Rate: Number of Pots Sampled: 0 Comments: Is effort valid?:

Bycatch

Species	Discard Status	Numbers
692 - Pacific sleeper shark	02 - Discarded, not marketable	1
710 - Sablefish	02 - Discarded, not marketable	4
710 - Sablefish	04 - Lost	2
710 - Sablefish	05 - Tagged and released	454
710 - Sablefish	06 - Mortality retained	3
710 - Sablefish	09 - Released; already tagged by ADFG	8
710 - Sablefish	12 - Clipped only and released	1

Edit Set

Pots for Set Number 1 (The form has unsaved changes) — Revert
+ Hide section

Add/Edit Pots
The form has unsaved changes — Revert Changes

Pots for Set Number 1
Pot Numbers indicate the order that they were set in.

Pot Number	Depth (fathoms)	Pot Condition Disable	Comments Enable	Sablefish Caught	Sablefish Tagged
1	334			2	1
2	330			32	32
3	325			7	7
4	321			1	1
5	318			23	22
6	314			42	38
7	313			49	48
8	313			45	43
9	316			11	10
10	316			20	20
11	312			26	26
12	297			29	28
13	294			6	6
14	283			31	31
15	268			36	32
16	257			21	21
17	248			15	14
18	241			27	27
19	259			37	36
20	268			11	11

Pot Type column is not shown since the pot type for the effort is not set to Multiple.

Save Pots

Cancel - Do Not Modify Pots

+ Show Customizations

Appendix D.—Marking Release Form used to record status and tag number of tagged fish on deck.

Project: NSEI Sablefish Mark Tag Release Form				Set _____							
Year: _____		Trip: _____		Date: ____/____/____							
				Pg no. ____							
(number sets consecutively throughout trip)											
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 33%;">TAG NUMBER</th> <th style="width: 33%;">LENGTH</th> <th style="width: 33%;">COMMENTS</th> </tr> </table>			TAG NUMBER	LENGTH	COMMENTS	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 33%;">TAG NUMBER</th> <th style="width: 33%;">LENGTH</th> <th style="width: 33%;">COMMENTS</th> </tr> </table>			TAG NUMBER	LENGTH	COMMENTS
TAG NUMBER	LENGTH	COMMENTS									
TAG NUMBER	LENGTH	COMMENTS									
1				26							
2				27							
3				28							
4				29							
5				30							
6				31							
7				32							
8				33							
9				34							
10				35							
11				36							
12				37							
13				38							
14				39							
15				40							
16				41							
17				42							
18				43							
19				44							
20				45							
21				46							
22				47							
23				48							
24				49							
25				50							
Tagger _____ Recorder _____											

Appendix E.-Length-Weight-Girth Form, used during the 2019 survey.

Date _____		Set # _____		Initials _____	
Under 50 cm			61 to 65 cm		
1.	Pot _____	Tag _____	Len _____	1.	Pot _____
	Wt. _____	Gir _____	Sp# _____		Tag _____
2.	Pot _____	Tag _____	Len _____	2.	Pot _____
	Wt. _____	Gir _____	Sp# _____		Tag _____
3.	Pot _____	Tag _____	Len _____	3.	Pot _____
	Wt. _____	Gir _____	Sp# _____		Tag _____
4.	Pot _____	Tag _____	Len _____	4.	Pot _____
	Wt. _____	Gir _____	Sp# _____		Tag _____
5.	Pot _____	Tag _____	Len _____	5.	Pot _____
	Wt. _____	Gir _____	Sp# _____		Tag _____
50 to 55 cm			66 to 70 cm		
1.	Pot _____	Tag _____	Len _____	1.	Pot _____
	Wt. _____	Gir _____	Sp# _____		Tag _____
2.	Pot _____	Tag _____	Len _____	2.	Pot _____
	Wt. _____	Gir _____	Sp# _____		Tag _____
3.	Pot _____	Tag _____	Len _____	3.	Pot _____
	Wt. _____	Gir _____	Sp# _____		Tag _____
4.	Pot _____	Tag _____	Len _____	4.	Pot _____
	Wt. _____	Gir _____	Sp# _____		Tag _____
5.	Pot _____	Tag _____	Len _____	5.	Pot _____
	Wt. _____	Gir _____	Sp# _____		Tag _____
56 to 60 cm			Greater than 70 cm		
1.	Pot _____	Tag _____	Len _____	1.	Pot _____
	Wt. _____	Gir _____	Sp# _____		Tag _____
2.	Pot _____	Tag _____	Len _____	2.	Pot _____
	Wt. _____	Gir _____	Sp# _____		Tag _____
3.	Pot _____	Tag _____	Len _____	3.	Pot _____
	Wt. _____	Gir _____	Sp# _____		Tag _____
4.	Pot _____	Tag _____	Len _____	4.	Pot _____
	Wt. _____	Gir _____	Sp# _____		Tag _____
5.	Pot _____	Tag _____	Len _____	5.	Pot _____
	Wt. _____	Gir _____	Sp# _____		Tag _____

Appendix F.–Zander Age-Sex-Length (ASL) Form. All sablefish data are entered into the ASL Form after hauling each set.

State of Alaska – Department of Fish and Game


Zander: Fishery Management Applications for Southeast Alaska
Groundfish Pot Survey ASL

Select a Trip/Effort

Year
2020

Project
Chatham Sablefish Pot Survey

Trip Number
1

Effort Number
1

Load Effort

Effort found. Set Date: May 4, 2020 2:56:00 PM. Haul Date: May 5, 2020 11:13:00 AM. Number of Pots: 20.
[Open New Trip Metadata Editor Tab](#)

Specimen Information

+ Show Change Multiple Rows at Once

	Specimen Number	Pot Number	Pot Color	Species Code	Length Type	Length (cm)	Tag Batch Number	Tag Number	Discard Code	Release Condition	Otolith Number	Otolith Condition	Comments
Edit Row	1	1	Y	710	01	48			12	01			
Edit Row	2	1	Y	710	01	54	29	101513	05	01			
Edit Row	3	2	G	710	01	60	29	101514	05	01			
Edit Row	4	2	G	710	01	65	29	101515	05	01			
Edit Row	5	2	G	710	01	56	29	101516	05	01			
Edit Row	6	2	G	710	01	59	29	101517	05	01			
Edit Row	7	2	G	710	01	62	29	101518	05	01			
Edit Row	8	2	G	710	01	55	29	101519	05	01			
Edit Row	9	2	G	710	01	64	29	101520	05	01			
Edit Row	10	2	G	710	01	59	29	101521	05	01			
Edit Row	11	2	G	710	01	61	29	101522	05	01			
Edit Row	12	2	G	710	01	58	29	101523	05	01			
Edit Row	13	2	G	710	01	57	29	101524	05	01			
Edit Row	14	2	G	710	01	58	29	101525	05	01			
Edit Row	15	2	G	710	01	57	29	101526	05	01			

Appendix G.—Discard codes for sablefish and bycatch captured on the marking survey.

Discard Status	Details
00 = Unknown	Discard status unknown or not recorded.
01 = Retained	Fish is not released.
02 = Discarded, not marketable	Fish has new or old injury and is released without marking to prevent bias in recapture event. This is the standard discard code for released bycatch with the exception of halibut.
03 = Discarded, too small	Fish < 320 mm fork length, released without marking.
04 = Lost	Fish lost before clipping or tagging.
05 = Tagged and released	Fish clipped, tagged, and released unharmed.
06 = Mortality retained	Fish dead or likely to die so retained.
07 = Discarded healthy	Fish measured but released without tagging or clipping.
08 = Retained bio sample	Fish sacrificed to collect biological data.
09 = Already tagged by ADF&G	Fish previously tagged by Region I ADF&G.
10 = Discarded due to fleas	Fish measured but not tagged or clipped due to flea bites (dead or alive).
11 = Discarded due to sharks	Fish measured but not tagged or clipped due to damage from sharks.
12 = Clipped only and released	Fish measured and clipped but lost before tagging.
13 = Retained, other agency tag	Fish tagged by another agency that has requested biological sampling.
15 = Released, other agency tag	Fish tagged by another agency that has requested fish be re-released.
16 = Retained, tagged by ADF&G	Fish previously tagged by ADF&G but retained due to injury or tag damage.
17 = Discarded, numbers estimated	Fish released directly from pot and number of fish estimated.
20 = Released alive	Halibut that is released alive.
21 = Mortality discarded	Halibut that is released dead.

Appendix H.–Release condition codes for sablefish captured during the marking survey.

Release Condition	Details
00 = Unknown	Fish condition unknown (i.e., lost fish).
01 = Presumed healthy	Fish appears to have no recent or old injuries and no flea bites.
03 = Flea bitten	Flea bites visible on skin and/or fins.
04 = Old injury	Fish has infection or injuries that existed prior to capture with pot gear (i.e., mouth damaged from capture with longline).
05 = Presumed dead	Fish is dead or death is imminent.
06 = No clip	Fish measured and tagged but lost before clipping.
08 = Pot damage	Fish have injuries from pot gear (i.e., abrasions, torn mouth, or gilled).

Appendix I.—List of tag-types recovered on the marking survey with instructions on processing.

Tag type	Instructions
ADF&G Sitka (orange, red, or green)	Healthy fish with tag well attached - measure, record tag number, and release. Unhealthy fish and/or tag not well attached - collect length, sex, and maturity data; record tag number; retain tag.
ADF&G Homer (red)	All fish - collect fork length, sex, otoliths, and maturity data; record tag number; retain tag.
ADF&G/NMFS COOP (orange)	Healthy fish with tag well attached - measure, record tag number, and release. Unhealthy fish and/or tag not well attached - collect length, sex, and maturity data; record tag number; retain tag.
NMFS (yellow)	Healthy fish with tag well attached - measure, record tag number, and release. Unhealthy fish and/or tag not well attached - collect length, sex, and maturity data; record tag number; retain tag.
Japanese (orange)	Healthy fish with tag well attached - measure, record tag number, and release. Unhealthy fish and/or tag not well attached - collect length, sex, and maturity data; record tag number; retain tag.
NMFS Auke Bay growth study (pink)	All fish - collect length, sex, otoliths, and maturity data; record tag number; retain tag. Special instructions to store otoliths in masked vial to keep out light.
NMFS archival marker (green/pink)	All fish - collect length, sex, otoliths, and maturity data; record tag number; retain tag. Special instructions to collect archival tag from body cavity and retain with tag.
Canadian Pacific Bio Station (yellow)	All fish - collect length, sex, otoliths, and maturity data; record tag number; retain tag.

Appendix J.—Tag Recovery Form used to record recovery information for sablefish that are previously tagged.

Tag Recovery Form		
Species_____	F/V or Tender:_____	ADFG #_____
Release Agency_____	(specify) Date of Landing: _____yr____	Port of landing_____
Tag Number_____	mm/dd Date captured:_____yr____	Statarea_____
Attach tag here (so tag number is visible)	Lat_____	Long_____
	decimal minutes	decimal minutes
	Subdistrict/Mgtarea_____	Location_____
	Depth_____fm	(specify if no lat and long) Size_____cm_____in rnd/east/unkn
	Recovery gear: LL other_____	accuracy:_____ specify: 1(most accurate)-5(least)
	measured by staff_____	other_____
	Tag turned in by vessel/processor/other_____	(specify)
	Reward To: (Capt/crew/processor/other)_____	
	Permanent Address:_____	

below data to be filled in by ADFG Hat issued_Y_N_date_____by_____ Eligible lottery_____ Letter issued_____ Data entered (date)_____ Recovery info <u>vessel/processor/</u> log/fishticket logbook(trip) #_____ Date received_____ Sampler_____		

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NSEI Sablefish Mark-Tag Discard Form

Year: _____ Trip: _____ Set: _____ Date: _____ Page: _____

Abrasion				Old Injury		Fleas-Alive				Fleas-Dead		Previously Tagged			Bycatch		
Spec. No.	02-08 Length	Spec. No.	02-08 Length	Spec. No.	02-04 Length	Spec. No.	10-08 Length	Spec. No.	10-08 Length	Spec. No.	10-05 Length	Spec. No.	09-01				
													Length	Tag No.			
															HALIBUT (200) Alive (20) Dead (21)		
															ATF (121)		
Mortality Retained																DOVER (124)	
Spec. No.	06-05 Length															GKC (923)	
																THORNYHEAD (143)	
																OTHER	
												04-01 – Lost 03-01 – Too Small 12-01 – Clipped only					

Year: _____ Trip: _____ Set: _____ Date: _____ Page: _____

Abrasion				Old Injury		Fleas-Alive				Fleas-Dead		Previously Tagged			Bycatch
Spec. No.	02-08 Length	Spec. No.	02-08 Length	Spec. No.	02-04 Length	Spec. No.	10-08 Length	Spec. No.	10-08 Length	Spec. No.	10-05 Length	Spec. No.	09-01		
													Length	Tag No.	HALIBUT (200) Alive (20) Dead (2)
															ATF (121)
Mortality Retained										Other					DOVER (124)
Spec. No.	06-05 Length									Too small, lost, etc.					
															GKC (923)
															THORNYHEAD (143)
															OTHER
										04-01 – Lost 03-01 – Too Small 12-01 – Clipped only					