Regional Operational Plan No. ROP.CF.1J.2022.10

Northern Southeast Inside (NSEI) Subdistrict (Chatham Strait) Sablefish Marking Survey

by

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October 2022

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat or long
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations

alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	E
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	″
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

REGIONAL OPERATIONAL PLAN NO.ROP.CF.1J.2022.10

NORTHERN SOUTHEAST INSIDE (NSEI) SUBDISTRICT (CHATHAM STRAIT) SABLEFISH MARKING SURVEY

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October 2022

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This document should be cited as follows:
Baldwin, A., M. Bargas, and R. Ehresmann. 2022. Northern Southeast Inside (NSEI) Subdistrict (Chatham Strait) sablefish marking survey. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Operational Plan No. ROP.CF.1J.2022.10, Douglas.

SIGNATURE PAGE

Project Title:	Northern Southeast Inside (NSEI) Subdistrict (Chatham Strait) Marking Survey
Project leader(s):	*Aaron Baldwin*
Division, Region, and Area	*Commercial Fisheries, Region 1, Douglas*
Project Nomenclature:	*TF-187 SE Groundfish*
Period Covered	*2022–2027*
Field Dates:	*2 May–29 May*
Plan Type:	Category II

Approval

Title	Name	Signature	Date
Project leader	Rhea Ehresmann		9-23-2022
Biometrician	Philip Joy		9-23-2022
Research Coordinator	Andrew Olson		9-23-2022

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ABSTRACT

The Northern Southeast Inside (NSEI) Subdistrict sablefish (*Anoplopoma fimbria*) fishery stock assessment uses a statistical catch-at-age (SCAA) model that integrates data from the mark-recapture project as well as age and CPUE data from the longline survey and commercial fishery. The assessment utilizes mark-recapture methodology to estimate sablefish abundance using a time-stratified Petersen mark-recapture model. The Alaska Department of Fish and Game (ADF&G) conducts sablefish marking surveys with pot gear in May and June to mark and release fish in the NSEI Subdistrict. 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 SCAA (along with the longline survey and fishery CPUE data and age and length data from all sources) to calculate the acceptable biological catch (ABC) for sablefish in NSEI. This Regional Operational Plan documents the current marking survey methodology and protocol in detail and is designed to be a detailed guide to use in preparation for, and onboard the survey.

Keywords: Sablefish, Mark-Recapture, Groundfish, Chatham Strait, Tagging, Codcoil Pots, Slinky Pots, Longline, Petersen Estimate

OBJECTIVES

1. Capture, measure, tag, mark, and release 6,000–10,000 sablefish > 32 cm among statistical areas in proportion to the most recent three-year average effort of the commercial harvest.
2. Compare the catch per unit effort (CPUE) and length distribution of fish captured by collapsible (slinky) to those captured by conical pots (traditional).
3. Collect length, capture location, and tag information from recaptured marked fish.

BACKGROUND

Since 1997, mark-recapture surveys have been performed in the NSEI Subdistrict to assess the sablefish stock (Figure 1). Prior to this time, sablefish stock assessment activities were based on catch per unit effort (CPUE) from the NSEI department longline survey, and age, size, and maturity composition from the survey and port sampling of the commercial landings. The initial mark-recapture survey was designed as a biomass-based harvest rate approach to stock assessment (Carlile et al. 2002). The results of the mark-recapture experiment were not used for stock assessment immediately, as the methodology needed some refinement. For example, during the first three years of the survey (1997–1999), sablefish were tagged during the annual longline survey. In 1999, it was determined that low numbers of recaptures were due to the fish becoming hook-shy (i.e., avoiding recapture by longline). In 2000, the survey transitioned to using pot gear to capture fish to avoid the hook-shyness response to longline gear. Additional improvements to the survey design and overall stock assessment were made after external review (Mueter 2010). Sablefish have been marked with external T-bar tags with the exception of 2004 when Passive Integrated Transponder (PIT) tags were used as part of an experiment to use an 'invisible' mark. However, PIT tag recovery was not successful in the noisy acoustic environment of the processing plants. In addition to tagging, sablefish are 'double marked' with an upper or lower caudal fin clip. This allows for recovery of marked fish even if the tag is removed by fishermen or falls out. Upper and lower caudal fin clips are alternated every other year so that clipped fish from two years ago are more easily differentiable from the current year's clip. 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.

Since 2012, the survey has been conducted on the 30 meter (m) ADF&G vessel, *R/V Medeia*. The survey was shifted to this vessel after the 2011 marking survey was cancelled due to mechanical problems with the contract vessel. A gear shift by industry to replace longline hook-and-line gear with longlined collapsible slinky pots began in 2019. Smaller vessels are able to fish the collapsible pots easily from their existing hook-and-line platforms, providing the fleet with a new way to effectively catch sablefish without the tedious nature of hand-baited hook and line gear. Slinky pots are more affordable, lighter weight (safer and easier to maneuver), and purportedly more efficient at catching sablefish compared to the large, hard conical pots. Therefore, a secondary objective of this study is to compare the CPUE and length distribution of captured fish from slinky pots to traditional conical pots to determine the feasibility of converting this survey from conical pots to slinky pots.

The recapture portion of the study occurs during the NSEI commercial longline fishery season when the number of marked and unmarked sablefish are enumerated during commercial landings. The mark-recapture abundance estimates provide an index of exploitable abundance for years when a marking survey occurred. The NSEI harvest policy defines maximum permissible ABC at a fully selected fishing mortality rate of F_{50}, the spawning potential ratio (SPR) based biological reference point that determines the fishing mortality needed to reduce equilibrium female spawning biomass to 50% of unfished levels. However, recommended ABCs are constrained to a maximum 15% change between years to increase fishing stability and maximize catch.

Sablefish mortality in other fisheries are deducted from the ABC to determine the directed commercial annual harvest objective (AHO), which is typically released in June. In addition, marked fish recaptured in the fishery provide information on sablefish migrations.

METHODS

SAMPLE DESIGN

The primary goal of the survey is to distribute marked fish throughout Chatham Strait in proportion to the commercial harvest (round pounds) over the prior three years. The proportion of commercial harvest by statistical area is determined for each year separately using fish ticket data and then averaged across all three years. Survey sets will only be made in statistical areas where greater than 2% of the total commercial harvest for the three-year average occurred. Survey effort (number of sets) by each statistical area will thus be set proportional to the relative commercial harvest in that area over the last three years (Table 1). Setting survey effort proportional to the commercial harvest has in the past resulted in survey catches that are also proportional to the commercial harvests in statistical areas (Table 2). To capture 6,000 or more sablefish, an optimum number of sets (24–36) is decided prior to the start of a survey. The total number of sets is based on the catch rates of the most recent survey. If the most recent survey had high catches, we will make fewer sets than if the most recent survey catches were low.

While survey effort in proportion to the commercial harvest among statistical areas is of primary importance, the distribution of marks throughout a statistical area is an important consideration as well. Survey set locations within statistical areas are selected in an effort to distribute marks throughout the statistical area within the logistical constraints of bottom topography and past fishing experience. To distribute marked fish throughout a statistical area, no overlapping sets are performed within a statistical area, and sets are performed both over the latitudinal (north-south) and longitudinal (east-west) range when possible. No sets are made in locations where significant

gear problems have occurred in the past, such as parted or abraded groundline or torn pot webbing. In addition, sets where large numbers of rockfish have been caught or where sand fleas are abundant may be avoided. The number of sablefish captured and marked during previous marking surveys are considered as well for placement of current year's sets (Table 3). For new set locations, charts with information on bathymetry and substrate are examined to determine that sets are in the appropriate depth zone and do not have any steep drop-offs that could cause problems with gear retrieval; the skipper will likely verify bathymetry by running the set course prior to gear deployment. The crew leader will recommend set locations to the skipper, along with any changes in number of pots to set or length of time of the set; no sets will be performed if the skipper has any reservations.

All fish captured during a set that are determined to be healthy and above 32 cm are marked and tagged, up to 750 fish. After 750 fish are marked, all remaining fish are measured and released without marking or tagging. Once the predetermined number of sets for a statistical area are completed, the next statistical area is sampled.

SABLEFISH CAPTURE

Longlined pot gear is used to catch live sablefish during the survey. At each station a string of gear is set consisting of a floating line with a large buoy bag followed by a high-flier pole, buoy line equal to approximately 640 m depending on set depth, followed by the groundline. The groundline is configured with 91 m of leading line at each end followed by 22 beckets spaced at approximately 73 m intervals. The first and last beckets are attached to 160 kg anchors. Pots are attached to the remaining 20 beckets. The other end of the set is configured the same as the first: a 640 m buoy line attached to a high-flier pole and a large buoy bag (Figure 2). Conical pots have a 1.5 m diameter, a total internal capacity of 803 L, and two opposing tunnels. Slinky pots vary in dimension, material, and set-up, but the slinky pots chosen for this study are 152 cm in length and have a diameter of 81 cm with a total internal capacity of 787 L.

In general, one or two pot strings are set and hauled per day with a maximum of 20 pots per string. In order to compare the CPUE and the length distribution of captured fish from traditional pots with slinky pots the two gear types will be fished in the same sets, thus eliminating the need to consider other covariates (depth, contour, etc.) when comparing catch rates. For each string, ten conical pots and ten slinky pots will be deployed in an alternating pattern, starting with a conical pot and ending with a slinky pot (i.e., conical pot, slinky pot, conical pot, slinky pot, conical pot, slinky pot, and so on). Pots are configured to attach to the same groundline in a similar manner, and each pot is baited with approximately 1.8 kg of chopped pollock and 1.8 kg of chopped squid, which are placed in a bait bag inside the pot. Pots are typically soaked for 10–24 hours. The minimum soak time is used in areas with a large quantity of "sand fleas" (amphipods) to help prevent sablefish mortalities. In other areas the soak time is increased to ensure the bait "smell" has dispersed and sablefish have enough time to find the bait and enter the pots. Soak times over 24 hours are usually avoided due to the increase in fish with flea damage or pot abrasions; however, they are sometimes unavoidable. Unexpected weather or mechanical issue have resulted in delaying hauls for 48 hours or more.

Should slinky pots fail to capture sablefish and jeopardize the ability to accomplish objective 1 of this survey, staff will revert all pot strings back to conical pots and objective 2 will be examined on a future survey.

During hauling operations, pots attached to the groundline that contain sablefish will be kept underwater to prevent battering or injuring of fish in that pot. The gear is checked throughout hauling so that the next pot on the string is completely submerged even as the vessel navigates to stay on the gear. Torn lips and injuries on the fish are an indication that the pot is too near the ocean surface and needs to be kept lower in the water until brought on board. As a pot is brought on board, the pot type is announced, and sablefish (and bycatch) are released on to a sorting table connected to a live well. The aluminum well (66 cm x 218 cm x 38 cm) is continuously plumbed with saltwater. Sablefish are removed individually from the holding tank for marking, releasing, or discarding. Incidental catches are released with minimum holding time.

DATA COLLECTION

All data collected during the marking survey is done on paper forms that are later entered into Zander applications. These data are divided into "Set" and "Biological" data. Set data include all of the recorded information about the physical gear such as set coordinates, number of pots, pot depths, and total numbers of fish caught. Biological data are the information recorded from individual sablefish captured such as length, tag number if tagged, and release condition. Set data are entered into the Zander Pot Survey application while biological data are entered in the Zander Pot Survey Age-Sex-Length (ASL) application. The two programs are independent of each other but are capable of sharing some information (e.g., the sablefish totals by pot from the ASL application are tallied automatically into the set data).

Set Information

For each pot string, the set and haul data are recorded on the "Set Form" (Table 4; Appendix A). During setting, science crew will record the latitude and longitude (decimal minutes) for each end of the pot string using the coordinates of the first and last anchors. Crew will also record depth (fathoms) at the location each pot is released overboard with the first and last pots recorded as the start and stop depths for the set. The average depth of the set is the mean depth for all pots set. The date and time (military) are recorded when the second anchor goes overboard during setting and when the first and second anchors come onboard while hauling a pot string. Crew will note whether the gear is hauled in the same direction as it was set, the number and type of pots set, the number and type of pots hauled, and the substrate of the ocean floor (e.g., mud, clay, rocks) as observed on each anchor. Any additional information unique to a set is recorded in the comments section, (e.g., number of lost pots, pots returned with open purse strings or holes in the webbing, time and location of breaks in the groundline, and tangled gear). In the event pots are lost during hauling, the actual number of pots retrieved is entered into the database.

If the groundline of a pot string breaks during hauling, the vessel will run to the other end of the string and haul from the second anchor. The recorder will note the time each end of the broken line is encountered, the second buoy is brought on board, and the second anchor is brought on board in the comments section of the "Set Form" (Appendix A). The time that the second break in the line is encountered is recorded in place of the second anchor onboard on this form.

Immediately following gear setting, the data from the Set Form, including start and end position as well as individual pot depths, are entered into the Zander Marking Survey Application (Appendix B). Set data recorded on deck (i.e., haul start and end times, haul order, and bycatch) is also entered into the Zander application after hauling is complete. Any additional notes from paper set form or pot tally form should also be entered into the Zander application.

Marking

All healthy sablefish brought on board and greater than 32 cm are marked (fin-clipped and tagged) and released. Sablefish selected for marking will have one of the lobes of their caudal fin clipped and a tag inserted below the dorsal fin (Figure 3). For each set hauled, staff will rotate between the positions of clipper, tagger, or recorder. The clipper will collect the fish, hold the fish on the measuring board as necessary, and clip the upper 1/3 of the caudal fin using a straight cut angled at a 45 degree orientation from the dorsal-ventral axis (Figure 3). The tagger will read out loud the fork length (cm) of the fish, tag the fish, note the condition of the fish, and read out loud the tag number to the recorder. Fish are most effectively handled by gently holding the fish in a "U-shaped position" with one hand on the fish head and one on the fish body. Sablefish are 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 body (Figure 3). For every marked sablefish, the recorder will write the length in cm, tag number, and fish condition on the "Marking Release Form" (Appendix C) and note the pot number from which each marked sablefish is caught in the margins of the form. After each set, the number of fish marked in each pot is calculated and entered on the "Pot Tally Form" (Appendix D). Pot type (conical or slinky) is recorded as well on the Pot Tally Form.

In addition to recording data, the recorder is responsible for managing tags. This includes providing the tagger with a tagging gun pre-loaded with the next bank of 25 tags and confirming recorded tag numbers are in the correct order. It is important that the tags be consecutive throughout haul. Regular verification of the entire six-digit number (e.g., at the beginning of a new bank of tags) ensures correct sequential order. If tags are out of order or a tag number is voided, make a note in the margins of the release form and return to the correct order at the end of the batch.

After the haul is complete the biological data for all sablefish are entered from the paper forms into the Zander "Groundfish Pot Survey ASL" application. All sablefish are measured and recorded in the biological data table, except for sablefish in pots that are not brought on board (e.g., sablefish numbers estimated in a pot due to a sleeper shark). All sablefish recorded on this form have a sample type of "random sample" (01) and length type of "fork length" (01) or "no length taken" (00). The pot number from which the fish was captured is recorded for each specimen. Each fish is assigned the appropriate discard (Appendix H) and release (Appendix I) condition codes. For each marked sablefish, the tag batch and tag number are also recorded. For fish recaptured and previously tagged by ADF&G or by other agencies, tag numbers are recorded in the comment section beginning with "T-" followed by the tag number.

Recapturing Previously Tagged Fish

All sablefish captured that were previously tagged by ADF&G and are in good health are re-released after recording tag number and measuring the fish. If a fish is in poor health, dead, or the tag is no longer readable or well attached, the fish is measured, the tag number is recorded, and the tag is collected. Occasionally tags from other agencies are recovered during this survey. In all cases the tag number is recorded and the fish is measured. Depending on the agency and/or specific project, fish may be re-released or retained in order to collect additional biological data; in some cases, tagged fish require special processing, (e.g., growth study fish or those with archival tags). Detailed instructions for processing other agency tagged fish may be found in Appendix E. All other agency tags, associated data, and otoliths will be mailed to the National Marine Fisheries

Service (NMFS) Auke Bay laboratory in Juneau. For previously tagged ADF&G fish that are harvested, and other agency tagged fish that are harvested or re-released, data should be recorded on the "Tag Recovery Form" (Appendix F).

Discards

Any fish determined to have a reduced survival probability (e.g., high number of sand flea bites, severe abrasions from pot gear, gilled in pot mesh, old injuries that haven not healed, or lacking vigor) are measured and released without marking. Fish with substantial pot abrasions or sand flea damage may have a higher risk of infection leading to delayed mortality. In addition, sablefish < 32 cm are measured and released without marking as these fish will not reach a marketable size during that year's commercial fishery. All information for discarded sablefish is recorded on the "Marking Discard Form" (Appendix G) using the appropriate discard (Appendix H) and release condition (Appendix I) codes. If the number captured during a set exceeds 500 sablefish, all remaining sablefish from that pot are marked but fish from the rest of the set are measured and released without marking.

In addition, fish may be discarded before pots are brought on board if a sleeper shark is captured in the pot. In such cases, the number of sablefish is estimated and recorded on the "Pot Tally Form" (Appendix D), and the incidental catch are estimated and tallied on the "Marking Discard Form" (Appendix G).

Incidental Catch

All incidental catch, including rockfish and thornyheads, are marked as discards. Thornyheads are released while other rockfishes are retained. All rockfish retained will have length, weight, and otoliths taken. Bycatch species are tallied on the "Marking Discard Form" (Appendix G). No biological data are collected for non-rockfish bycatch; however, in special cases (e.g., other agency projects, an extremely large fish is caught, or a rare species is captured), biological data may be collected and the sample would be recorded as "select" (05) in the biological table. Total numbers by species of bycatch are entered into the Zander Set application at a set level (not by pot number).

SCHEDULE AND DELIVERABLES

The survey typically begins in mid-May and ends in mid-June; however, this may be adjusted as needed depending on factors such as staff availability, vessel schedule, etc. The NSEI Science crew leader will begin survey preparation in March to ensure vessel crew and scientific staff availability, survey gear is organized, in working condition, and loaded prior to departing port. The 2022 survey will depart from and return to Juneau, beginning on May 2 and concluding May 29 with a five-day mid-survey stop in Juneau for crew change and supplies. The timing of the survey is scheduled to allow marked sablefish to disperse prior to the NSEI commercial sablefish opening on August 15. Data review and quality control will be done in the office following the survey and will be finalized on or before June 17, 2022. During the longline commercial fishery season, August 15–November 15, all landed sablefish in Petersburg, Juneau, and Sitka are individually examined for finclips from the current year's marking survey. These data are used for stock assessment and the determination of the annual harvest objective (AHO) in June of the following year.

RESPONSIBILITIES

- Rhea Ehresmann, Fishery Biologist III (Groundfish Project leader, survey science crew)
- Aaron Baldwin, Fishery Biologist II (Science crew leader)
- Philip Joy, Biometrician II (Biometric review, survey science crew)
- Chris Hinds, Fishery Biologist II (Survey science crew)
- Maureen Blair, Fish and Wildlife Technician IV (Survey science crew)
- Madison Bargas, Fishery Biologist I (Survey gear fabrication)
- Cedar Stark, Boat Officer IV (Captain *R/V Medeia*)
- Luke Erickson, Boat Officer III (Engineer *R/V Medeia*)
- Craig Conger, Boat Officer II (1st Mate *R/V Medeia*)
- Madeline Kombrink, Boat Officer I (Cook and deckhand *R/V Medeia*)
- Andrew Olson, Fish and Game Coordinator (Survey deckhand)
- Adam Messmer, Fishery Biologist II (Survey deckhand)
- Rich Brenner, Fishery Biologist IV (Survey deckhand)
- Whitney Crittenden, Fishery Biologist II (Survey deckhand)

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TABLES

Table 1.–Mean percentage of sablefish harvested by statistical area for previous three years of the commercial fishery, 2019–2021. Only statistical areas where 2% or greater of the average annual commercial harvest occurred are included in this calculation. The distribution of the sampling effort amongst statistical areas in the 2022 mark-tag survey will mirror the distribution of the harvest.

Statistical area	Percentage of harvest
345803	6%
345731	7%
345701	40%
345631	40%
345603	6%

Table 2.–Mean percentage of sablefish tagged and distribution of survey effort (percentage of total pots set) by statistical area in 2020 compared to the percentage of sablefish harvested in those statistical areas in 2018–2020.

Statistical area	Percentage of commercial harvest	Percentage of fish tagged	Percentage of survey effort
345803	8%	9%	11%
345731	8%	13%	15%
345701	40%	38%	34%
345631	34%	29%	28%
345603	10%	11%	11%

Table 3.–The number of sablefish tagged, total number of tags returned, number of tags returned during the same year in which they were initially released, and percentage of same-year survey tags returned, 2000–2021. No survey was conducted in 2011, 2014, 2016, or 2021.

Survey year	Sablefish tagged	Total tags returned	Same-year survey tags returned	Percentage 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%
2021	–	–	–	–

Table 4.–Planned sets by statistical area, latitude and longitude coordinates, average depth, and number of pots for the 2022 survey.

Effort no	Statistical area	Start latitude	Start longitude	End latitude	End longitude	Avg depth (fathoms)	Number of pots
1	345803	58° 22.39	135° 00.20	58° 20.57	135° 00.25	316	20
2	345803	58° 14.81	134° 59.50	58° 12.86	134° 58.66	357	20
3	345731	57° 47.68	134° 52.50	57° 45.79	134° 52.30	295	20
4	345731	57° 45.99	134° 52.36	57° 48.04	134° 52.63	292	20
5	345701	57° 28.54	134° 42.41	57° 26.64	134° 43.44	315	20
6	345701	57° 23.72	134° 42.16	57° 25.56	134° 41.29	307	20
7	345701	57° 17.11	134° 43.52	57° 19.07	134° 43.65	464	20
8	345701	57° 16.44	134° 41.77	57° 14.49	134° 42.30	449	20
9	345701	57° 14.78	134° 42.23	57° 16.78	134° 41.63	442	20
10	345701	57° 13.04	134° 44.44	57° 11.37	134° 43.49	368	20
11	345701	57° 11.39	134° 45.90	57° 09.32	134° 45.24	336	20
12	345701	57° 6.24	134° 42.35	57° 08.37	134° 43.55	351	20
13	345701	57° 1.65	134° 42.33	57° 03.47	134° 42.68	357	20
14	345603	56° 24.63	134° 30.26	56° 22.92	134° 28.82	392	20
15	345603	56° 27.64	134° 36.05	56° 25.59	134° 36.16	315	20
16	345631	56° 30.95	134° 33.38	56° 32.94	134° 32.95	317	20
17	345631	56° 33.89	134° 32.92	56° 35.90	134° 33.13	340	20
18	345631	56° 39.15	134° 31.54	56° 37.25	134° 33.20	367	20
19	345631	56° 39.81	134° 33.79	56° 41.96	134° 33.89	371	20
20	345631	56° 44.33	134° 31.73	56° 42.27	134° 33.00	392	20
21	345631	56° 49.12	134° 37.55	56° 47.32	134° 36.27	391	20
22	345631	56° 53.55	134° 36.31	56° 51.71	134° 34.97	372	20
23	345631	56° 55.34	134° 41.45	56° 57.36	134° 41.80	340	20
24	345631	56° 57.61	134° 41.82	56° 55.55	134° 41.56	338	20

FIGURES

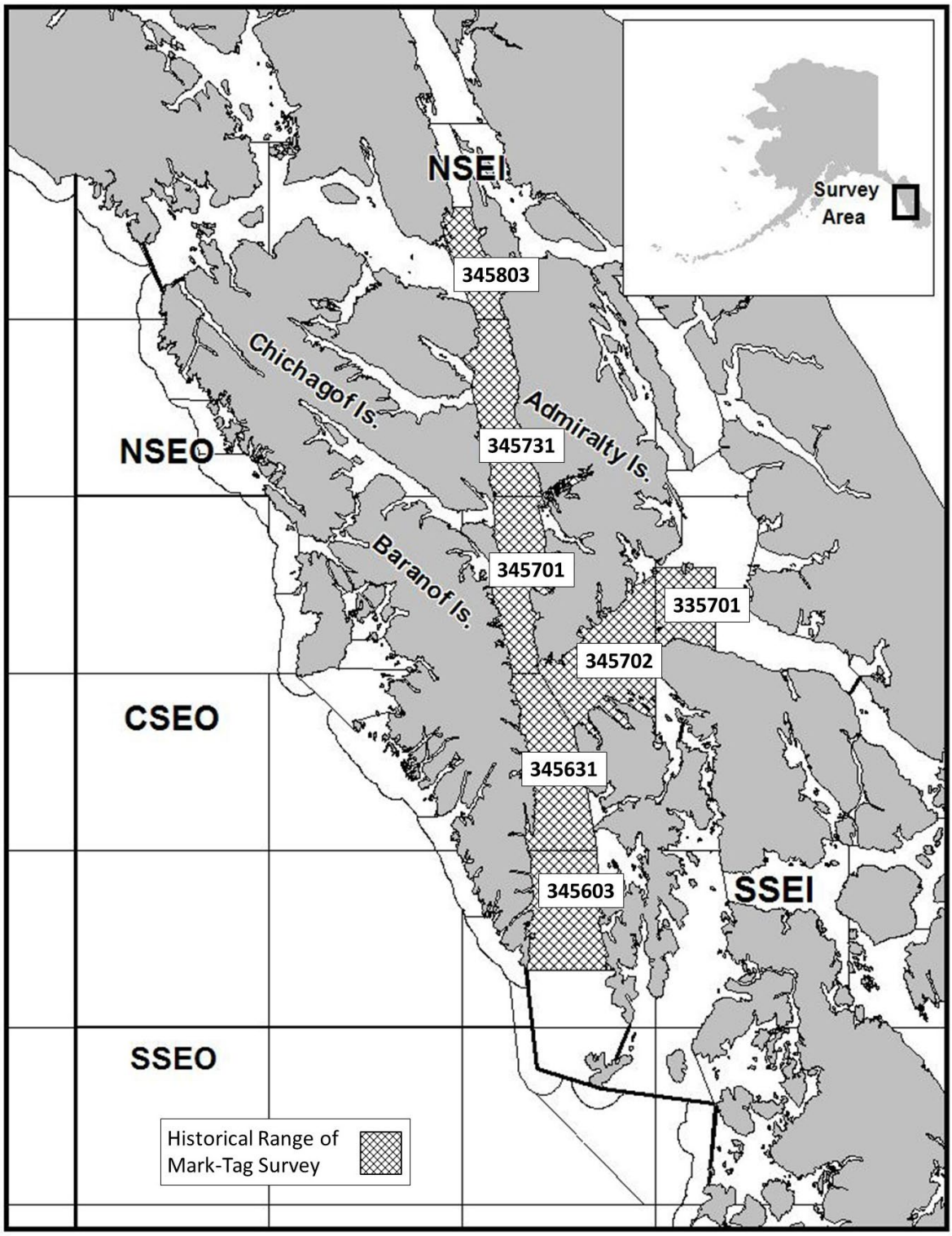


Figure 1.–Statistical areas in the Northern Southeast Inside (NSEI) Subdistrict showing historical range of the mark-tag survey.

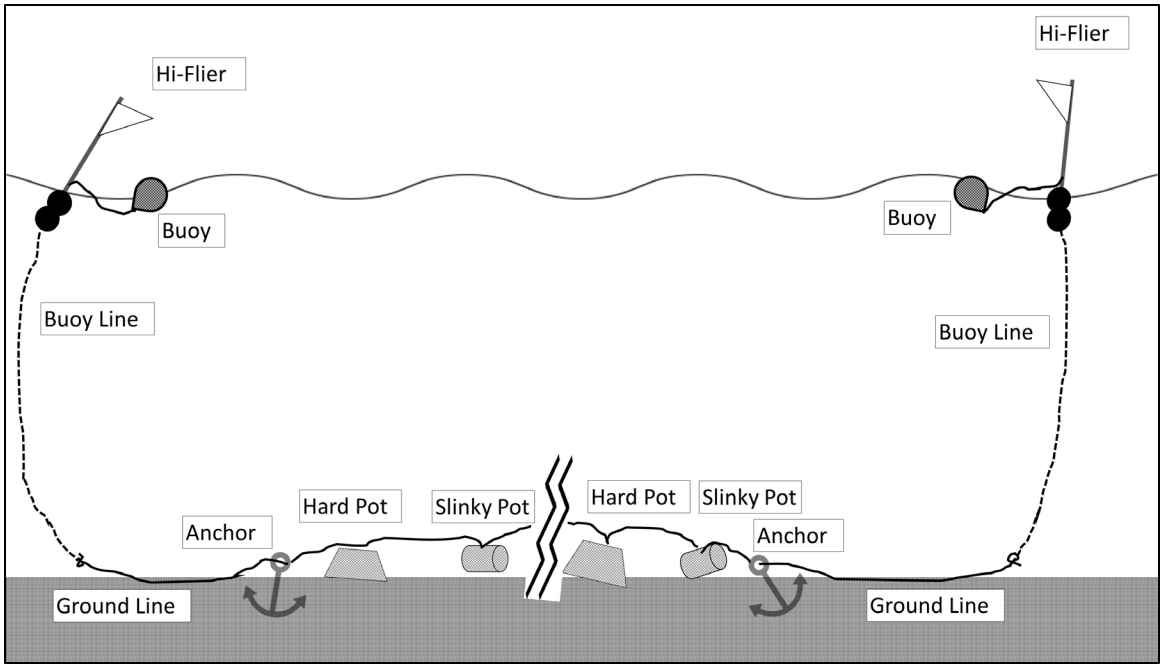


Figure 2.–Set configuration to be used on the 2022 Marking survey. The buoy line is variable in length dependent upon water depth but is most often 600 to 800 meters. There is 91 m of groundline between the buoy line and the anchor at each end. The anchors and pots are attached to permanent beckets on the groundline that are spaced 73 meters apart.

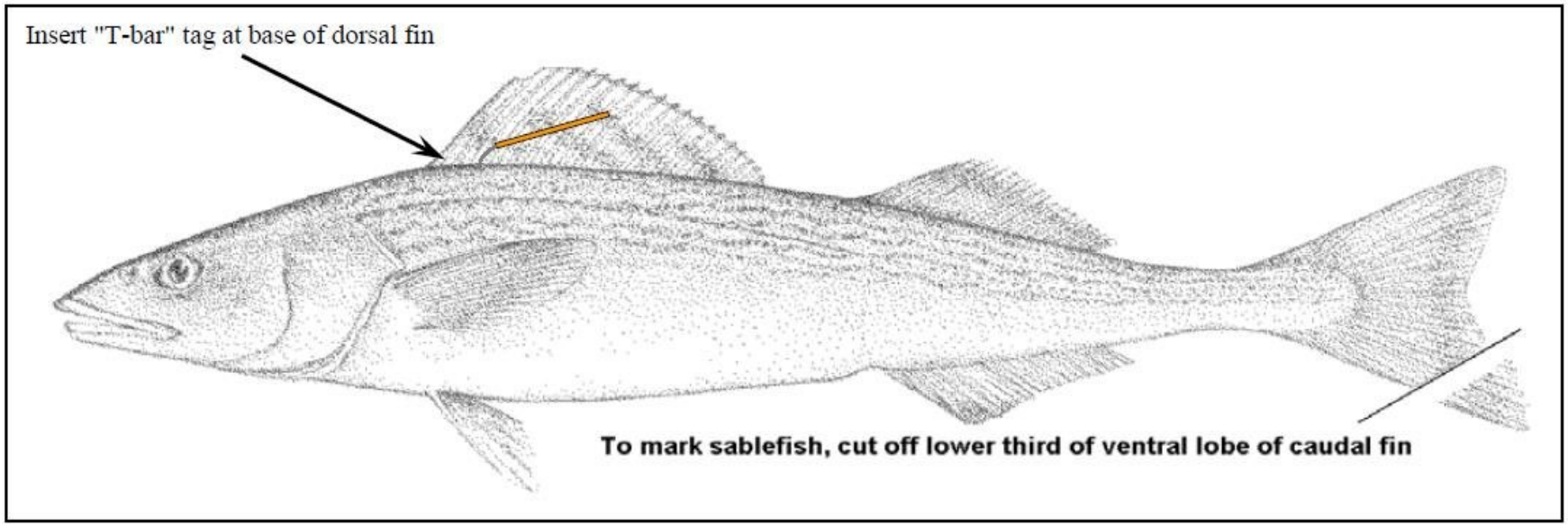
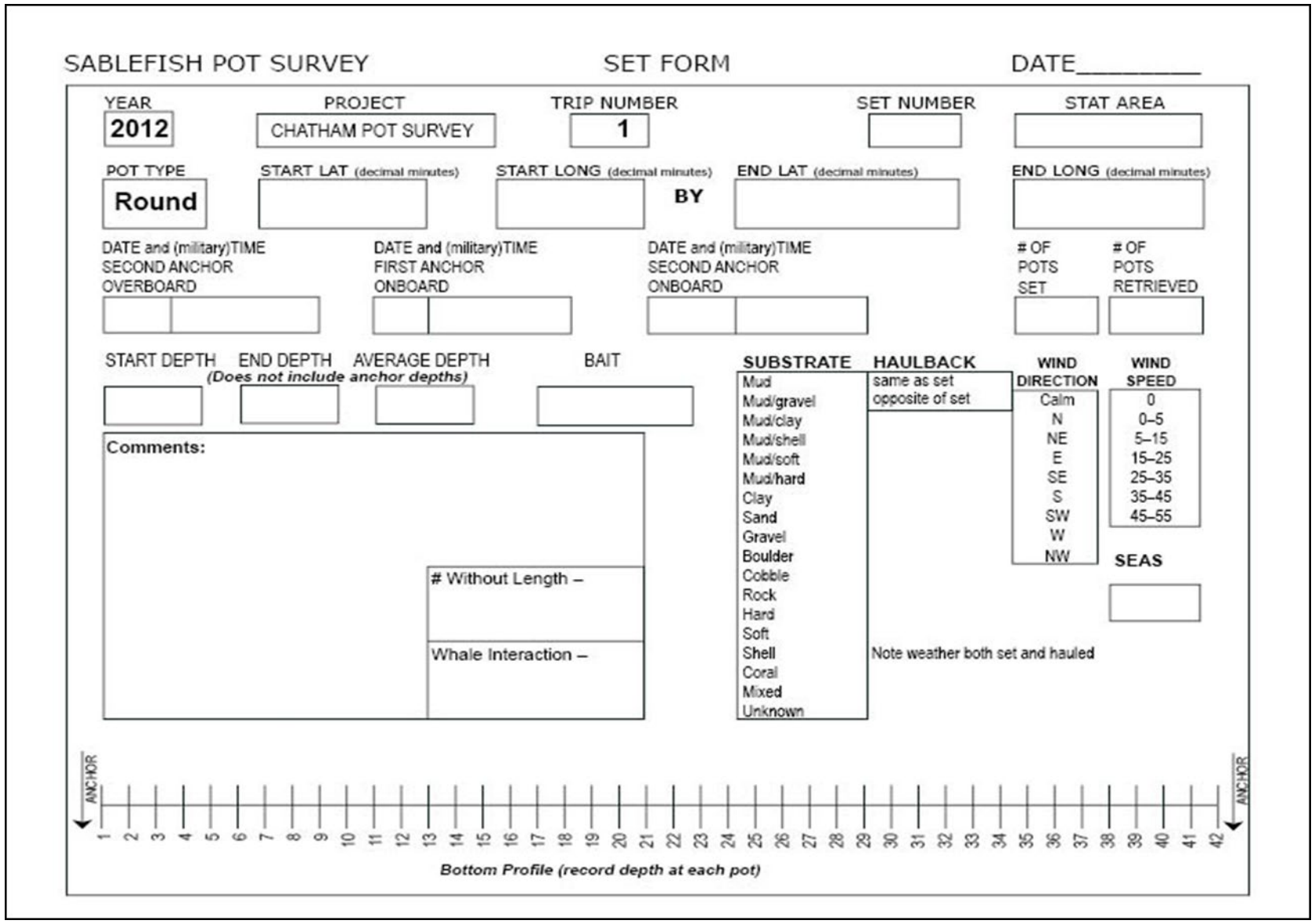


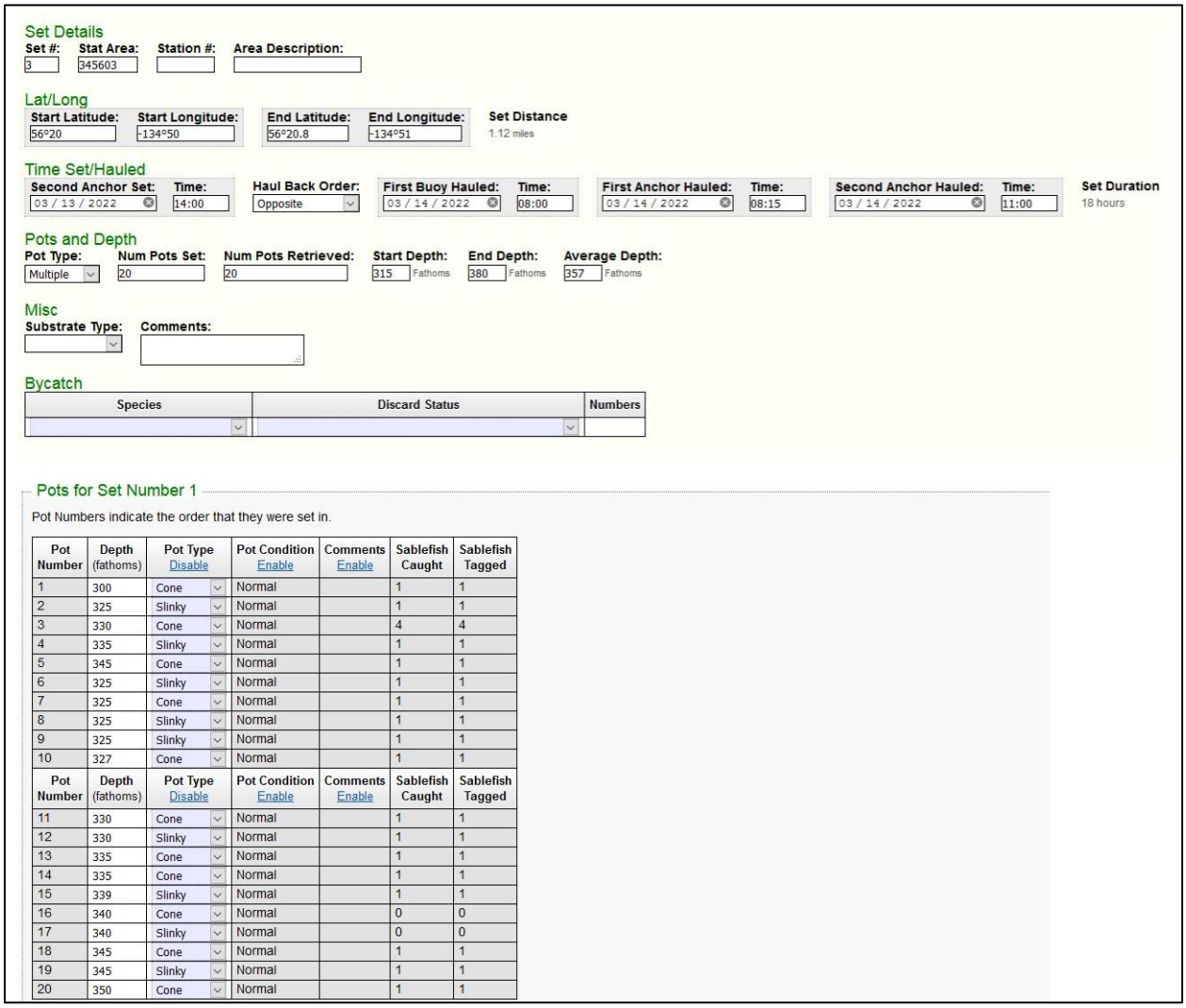
Figure 3.–Sablefish marking guidelines showing tag placement and lower caudal fin clip. During alternate years the upper lobe would be clipped instead.

APPENDICES

Appendix A.–Set Form used to record information related to gear and environment for a set string.



Appendix B.–Zander Marking Survey Application set and pot form. Data from paper set and pot tally forms are entered into this application.



Set Details

Set #:	Stat Area:	Station #:	Area Description:
3	345603		

Lat/Long

Start Latitude:	Start Longitude:	End Latitude:	End Longitude:	Set Distance
56°20	-134°50	56°20.8	-134°51	1.12 miles

Time Set/Hauled

Second Anchor Set:	Time:	Haul Back Order:	First Buoy Hauled:	Time:	First Anchor Hauled:	Time:	Second Anchor Hauled:	Time:	Set Duration
03 / 13 / 2022	14:00	Opposite	03 / 14 / 2022	08:00	03 / 14 / 2022	08:15	03 / 14 / 2022	11:00	18 hours

Pots and Depth

Pot Type:	Num Pots Set:	Num Pots Retrieved:	Start Depth:	End Depth:	Average Depth:
Multiple	20	20	315 Fathoms	380 Fathoms	357 Fathoms

Misc

Substrate Type: Comments:

Bycatch

Species	Discard Status	Numbers

Pots for Set Number 1

Pot Numbers indicate the order that they were set in.

Pot Number	Depth (fathoms)	Pot Type Disable	Pot Condition Enable	Comments Enable	Sablefish Caught	Sablefish Tagged
1	300	Cone	Normal		1	1
2	325	Slinky	Normal		1	1
3	330	Cone	Normal		4	4
4	335	Slinky	Normal		1	1
5	345	Cone	Normal		1	1
6	325	Slinky	Normal		1	1
7	325	Cone	Normal		1	1
8	325	Slinky	Normal		1	1
9	325	Slinky	Normal		1	1
10	327	Cone	Normal		1	1
Pot Number	Depth (fathoms)	Pot Type Disable	Pot Condition Enable	Comments Enable	Sablefish Caught	Sablefish Tagged
11	330	Cone	Normal		1	1
12	330	Slinky	Normal		1	1
13	335	Cone	Normal		1	1
14	335	Cone	Normal		1	1
15	339	Slinky	Normal		1	1
16	340	Cone	Normal		0	0
17	340	Slinky	Normal		0	0
18	345	Cone	Normal		1	1
19	345	Slinky	Normal		1	1
20	350	Cone	Normal		1	1

Appendix C.–Marking Release Form used to record status and tag number of tagged fish.

Project: NSEI Sablefish Mark Tag Release Form **Set_____**

Year: **Trip:** **Date: __/____/** **Pg no.____**

(number sets consecutively throughout trip)

	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 D.–Pot Tally Form used to record the total number of sablefish captured in each pot, including those tagged and those released without tagging.

Pot Tally Form

Date:
Set #

Haul Direction: (Circle One)
Same **Opposite**

	Time	Weather, Sea Conditions, Substrate Cues from Anchors
Start Haul (1st Anchor)		
End Haul (2nd Anchor)		

Pot #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
# Fish Tagged:																				
# Estimated:																				
Pot #	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
# Fish Tagged:																				
# Estimated:																				

Above each pot number add a "c" (conical) or an "s" (slinky) to indicate pot type

Enter the number of fish tagged in each pot, tallied from bio form. If pot is empty indicate with null ("Ø"). If fish are rail dumped write # and circle to indicate ("Ⓝ") below gray dashed line (---). If additional data (# of discards, fish measured but not tagged) are needed please make a note explaining how these are distinguished from tagged fish counts (e.g. "Ⓝ = total number of fish measured, tagged plus discards")

Appendix E.–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 vial masked 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 F.–Tag Recovery Form used to record recovery information for sablefish that are previously tagged.

Tag Recovery Form

Species_____

Release Agency_____

Tag Number_____

Attach tag here
(so tag number is visible)

below data to be filled in by ADFG

Hat issued_Y_N_date____by___

Eligible lottery_____

Letter issued_____

Data entered (date)_____

Recovery info vessel/processor/ log/fishticket logbook(trip) #_____

Date received_____

Sampler_____

F/V or Tender:_____
(specify)

Date of Landing: _____yr__
mm/dd

Date captured:_____yr__
mm/dd

Lat_____
decimal minutes

Subdistrict/Mgtarea_____

Depth_____fm

Recovery gear: LL other_____

Tag turned in by vessel/processor/other_____

Reward To: (Capt/crew/processor/other)_____

Permanent Address:_____

_____

ADFG #_____

Port of landing_____

Statarea_____

Long_____
decimal minutes

Location_____
(specify if no lat and long)

Size_____cm____in rnd/east/unkn
accuracy:_____ specify: 1(most accurate)-5(least)

measured by staff__ **other_____**
(specify)

Appendix G.–Marking Discard Form used to record bycatch and status (i.e., health) of sablefish that are released without tagging.

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	09-01 Tag No.	HALIBUT (200) Alive (20) Dead (21)
															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					

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

Release Condition	Details
00 = Unknown	Fish condition unknown, i.e., for lost fish.
01 = Presumed healthy	Fish appear 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 have infection or injuries that existed prior to capture with pot gear, i.e., mouth damaged from capture with longline.
05 = Presumed dead	Fish 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.