Regional Information Report No. 1J12-12

2011 Southern Southeast Inside Subdistrict Sablefish Longline Survey Field Report

by

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and

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November 2012

Alaska Department of Fish and Game **Division of Commercial Fisheries**

Symbols and Abbreviations

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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)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

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

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2011 SOUTHERN SOUTHEAST INSIDE SUBDISTRICT SABLEFISH LONGLINE SURVEY FIELD REPORT

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November 2012

Development and publication of this manuscript were partially financed by the Alaska Department of Fish and Game Test Fish Program

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This document should be cited as:
Carroll, K. and J. Stahl, 2012. 2011 Southern Southeast Inside Subdistrict sablefish longline survey report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Report Series No. 1J12-12, Douglas.

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ABSTRACT

This report summarizes methods and data from the 2011 sablefish longline survey conducted in the Southern Southeast Inside Subdistrict of the Eastern Gulf of Alaska Area. Catch rates, non-target species data and biological data including sablefish lengths, sex ratios, and ages are reported. Data from previous annual surveys are also presented. A new methodology using a weighted stratified estimator was developed and is presented here to estimate the overall annual survey catch per unit of effort. Overall catch per unit of effort for the 2011 survey was 0.24 fish per hook and 1.16 round pounds per hook for all size classes of fish and 0.21 fish per hook and 1.07 round pounds per hook for fish ≥520 mm fork length.

Key words: Sablefish, *Anoplopoma fimbria*, longline survey, SSEI, Clarence Strait, CPUE, Southeast Alaska

INTRODUCTION

The Alaska Department of Fish and Game (ADF&G) conducts annual longline surveys in the Southern Southeast Inside (SSEI) Subdistrict of Eastern Gulf of Alaska Area to assess sablefish *(Anoplopoma fimbria)* stock status (Figure 1). Annual surveys have been conducted since 1988. Survey methods were standardized in 1997 and in 2000 the gear and bait were standardized to match federal sablefish surveys so that state survey data is comparable to the federal offshore surveys in the Gulf of Alaska. In 2011, a different methodology for calculating survey catch per unit of effort (CPUE) was designed and is presented in this report. No survey was conducted in 2005 due to budgetary constraints. In 2011, the annual SSEI sablefish survey was conducted from May 7 through May 15 and was the 23rd ADF&G sablefish survey in Clarence Strait.

The specific objectives of the 2011 survey were:

1. Calculate survey CPUE for sablefish at the 37 surveyed stations.
2. Identify to the lowest possible taxonomic group, and enumerate, all fish captured.
3. Collect a representative sample of biological data (n=550) including otoliths, length, weight, sex, and stage of gonad maturity from a subsample of sablefish and an additional representative sample (n=550) of sablefish length measurements.
4. Collect biological data including length, weight, and sex, from all *Sebastes* rockfishes caught.
5. Collect length data from all shortspine thornyheads (*Sebastolobus alascanus*) caught.

METHODS

SURVEY AREA

The survey area included the waters of Clarence Strait and Dixon Entrance from 55^{o} 39.21' N. latitude and 132^{o} 19.13' W. longitude to 54^{o} 28.00' N. latitude and 132^{o} 32.77' W. longitude. There are currently 37 stations within the survey area (Figure 2). Station locations and amount of gear set at the stations has been consistent since 2002. Prior to that time some changes were made involving stations 10 and 11. For an explanation of the changes see Regional Informational Report No. IJ04-09, 2003.

VESSELS

ADF&G enters into annual 14-day charter agreements with two commercial longline vessels to fish 18 or 19 stations each. The survey area is split into two distinct sections, allowing all

stations to be fished within a single seven-day period. Contract length is longer than the anticipated survey length to allow for delays associated with weather, gear, or other problems.

The 2011 request for bids specified a maximum bid of $30,000 for each portion of the survey and that a vessel could not fish more than one section. Annual contracts were awarded to the two vessels with the lowest bids. Vessels were assigned a survey section at the discretion of ADF&G.

The *F/V Masonic* was awarded the contract ($22,949) for the northern survey portion, fishing 19 stations. The *F/V Viking Maid* was awarded the contract ($24,950) for the southern survey portion, fishing 18 stations.

Each vessel was required to provide three experienced crew members in addition to the skipper (Appendix B). The crew operated the vessel, baited, set, retrieved, and repaired all longline gear. Two ADF&G scientific personnel were assigned to each vessel to collect set, hook accounting, and biological data from sablefish and rockfish catch.

GEAR

In 2000, ADF&G contracted Lummi Fishery Supplies in Seattle to build skates of conventional longline gear to the same specifications as the NOAA longline survey gear to facilitate the comparisons of longline survey trends among agencies. Anecdotal information indicates that new, virgin gear may not fish as effectively as gear that has previously been baited and deployed at sea. To avoid bias associated with using new, virgin gear, all new gear was baited and set once prior to the survey.

A set of gear consists of a flag pole, an array of buoys, buoy line of length dependent upon the set depth, a 60 pound (27 kg) longline anchor, 150 fm (274 m) of running line, 25 skates of 45 #13/0 Mustad circle hooks, a second 150 fm of running line, a second 60 pound longline anchor, a second buoy line, a second array of buoys and a second flagpole. Beginning in 2000, a 7 pound (3 kg) lead ball was snapped to the end of each skate. Hooks were front threaded to gangions secured to beckets tied into the groundline at 6.5 foot (2 m) intervals. All hooks were secured at 15 inches (38 cm) from the groundline, which was the length of the gangion and the becket when tied together and attached to groundline. Sixteen feet (5 m) of groundline were left bare at each skate end. Gangions were medium lay #60 nylon round braided twine, beckets were medium lay #72 nylon becket twine, and the groundline was medium lay 3/8 inch (1 cm) nylon American Line SSR 100. Each vessel crew attached new hooks on all skates prior to the start of the survey. Bent, straightened, and missing hooks were replaced after each set, as the gear was baited.

BAIT

Argentine illex (*Illex argentinus*), 100–200 gm squid was used as bait and the rate of use averaged 12.5 pounds (5.7 kg) per 100 hooks. Only the squid body was used as bait; the head and tentacles were discarded. Bait pieces were 1.5 to 2 inches (3.8–5.0 cm) long. Bait was thawed within 24 hours of use. This bait protocol replicates bait protocol on federal sablefish surveys and is consistent with previous ADF&G surveys from 2000 through the present.

International Marine Industries, Inc., of Newport, Rhode Island won the bait bid to provide 5,600 pounds of Argentine illex for the SSEI survey. The winning bid was $1.67 per pound ($3.67/kg), including freight costs.

SCHEDULE

The survey began on May 7 and concluded on May 15 and was scheduled to correspond with the timing of previous surveys, occurring during the favorable tide series (Appendix C) just prior to the start of the commercial fishing season. Each vessel made two deliveries to the Ketchikan processor during the survey.

SET INFORMATION

Sets were made in the same direction as the tidal current. Haul back direction was dependent on tide, wind direction, and currents. Sets were allowed to soak for a minimum of three and a maximum of 11 hours, which is consistent with federal survey protocol. If it was necessary to deviate from standard set coordinates due to circumstances such as tidal currents or weather, the set was to pass through the start latitude and longitude and be made as close to the original coordinates as possible.

Set information collected at each station included date and time of set and haul, start and end latitude and longitude coordinates, the deployment depth of each anchor and skate, haul back direction as same or opposite, wind direction and estimated speed, and bottom substrate. Substrate was evaluated based on the skipper's interpretation of sounder information and any substrate that came up on fishing gear. Problems with gear or other factors potentially impacting CPUE, observations regarding the presence of sharks and whales were recorded.

HOOK ACCOUNTING, CATCH, AND CPUE

ADF&G staff recorded hook status at water surface. A hook without a fish was recorded as "bare," "bait," or "invalid" (bent, broken, missing, or snarled). Sablefish breaking the surface on a hook but not landed were recorded as "lost." Sablefish less than approximately 45 cm (18 inches) long were recorded as "small" and immediately returned to the water unless the fish was a random biological sample. Non-marketable sablefish were discarded with the discard reason reported as flea, shark, or general. Sablefish with evidence of hagfish damage were reported under the general discard category. All other fish breaking the surface attached to a hook were identified to the lowest possible taxonomic group and tallied. All species other than sablefish, rockfish, and Pacific cod were immediately released. Halibut were retained if survey vessel skipper had available halibut individual fishing quota.

For all CPUE calculations only valid skates were included. An entire skate was considered invalid if 12 or more hooks were identified as invalid on that skate. No catch information was included in the calculations for invalid skates. In addition, a skate was considered invalid if any killer whale predation occurred on that skate even if it appeared that less than 12 hooks were affected. Sablefish lost or discarded on valid skates were included in calculations. Survey staff also noted killer or other whale presence in the fishing area in the set comments.

CPUE in terms of fish per hook by station was calculated by dividing the number of sablefish caught by the number of hooks retrieved. CPUE in round pounds per hook by station was calculated by multiplying the CPUE in fish per hook for each station by the average weight of the fish sampled at that station.

We have updated our methodology for estimating annual overall SSEI survey CPUE to reflect the random stratified design used to obtain original survey station locations. Both the Northern Southeast Inside (NSEI) and SSEI surveys were originally designed as random stratified surveys so the calculation of CPUE should use a stratified random estimator. In 2009, the NSEI survey

CPUE was calculated (and back-calculated to 1988) with a stratified random estimator. Although we are still in the process of investigating the boundaries used for stratification in the original SSEI survey design, we have applied a stratified estimator for SSEI survey CPUE for the recent, standardized survey data (1997 to 2011) to at least account for the disproportionate distribution of stations by region. This is particularly important due to changes in the location of fishing effort by region over time and differences in size composition of fish by region within SSEI. Due to the higher number of stations per square km in the northern portion of SSEI, the overall CPUE of SSEI could be misrepresented if the stations by region are not weighted by the area (square km) of each region. We will continue to research the original survey design in SSEI and will make refinements to the boundaries used for the stratified estimator in the future if necessary. Survey CPUE has been back-calculated using this new methodology for 1997 through 2011.

For 2010 and 2011, the post-stratification process included four strata. Survey CPUE was then calculated for each strata, weighted (multiplied) by the proportion of area of each strata relative to the total area surveyed, and then summed across all strata to obtain an overall survey CPUE. Sablefish habitat was estimated for each strata based on area with depths greater than 200 fm (Figure 3). Bathymetric data were obtained from NOAA soundings. In areas with no available bathymetric data (Dixon Entrance and portions of statistical area 315431), the area of sablefish habitat for a stratum was estimated using the boundary of 2011 fishery catch distribution. Fishery data was deemed to be an appropriate proxy for depth, as in areas where both fishery and bathymetric data were available, fishing typically occurred at depths greater than 200 fm. For comparison of SSEI survey CPUE with SSEI fishery CPUE, CPUE was calculated not only for all size classes of fish but also with an additional method using only fish ≥520 mm fork length (typical minimum size caught in the commercial fishery). CPUE in fish per hook was multiplied by the proportion of fish ≥520 mm fork length to obtain CPUE in fish per hook by stratum. To obtain CPUE in round pounds per hook by stratum, CPUE of fish per hook was multiplied by the average weight by stratum for either all size classes or for fish ≥520 mm fork length only.

BIOLOGICAL SAMPLING

The first sablefish of each set, and every 10th sablefish thereafter from the first 23 skates of each set, were set aside for biological sampling. Length and weight were measured, sex and maturity were assessed, and otoliths were removed from each biological sample. Additional length measurements were collected from every 11th sablefish from the first 23 skates of each set.

Lengths were measured to the nearest cm from the tip of the snout to the fork of the tail using a measuring board. Weights were measured to the nearest 0.1 kg using a Salter Heavy-Duty Hanging (#235-10S) metric (44 lb/20 kg) scale. If seas were too rough to obtain repeatable weights during a haul, fish were not weighed. Sablefish sex and maturity were assessed from visual observation of the gonads. Fish were classified into six maturity categories: immature, maturing juvenile, mature/developing, spawning, spent/post spawning, and resting (Appendix D). After sampling, fish were cleaned and dressed to industry standards by ADF&G staff.

Otoliths were cleaned on board the survey vessels using warm water with highly diluted detergent, hand-dried, and stored dry in plastic multi-cell trays. Otoliths are aged at the ADF&G Age Determination Unit in Juneau using the break-and-burn technique.

Sebastes rockfish lengths and weights were taken using the same methods and equipment used for sablefish. Sex was determined by examination of the urogenital papillae. All *Sebastes* rockfish were retained. The length of every shortspine thornyhead (*Sebastolobus alascanus*)

caught was measured to the nearest cm. The same measurement methods were used as those for sablefish. Shortspine thornyheads were released immediately after measurement if the fish appeared healthy.

TAGGED SABLEFISH

All tagged sablefish encountered during the survey were retained. Tags were collected and associated recovery information was recorded for each fish. Fish tagged by agencies other than ADF&G were handled according to the protocols specified by the tagging agency.

BID TO PURCHASE ADF&G FISH

ADF&G solicited bids from area processors to purchase survey caught fish. Bids were based upon the actual dressed poundage breakdown by size category of catch delivered during the 2010 survey. Trident Seafoods Corporation in Ketchikan was the successful bidder for the Clarence Strait (SSEI) longline survey testfish harvest at $128,325.10. The bid was for 22,526 dressed pounds of sablefish, and 762 round pounds of bycatch (Pacifc cod, thornyheads, and rockfishes (Appendix E).

RESULTS

SET INFORMATION

All 37 stations were surveyed in 2011 (Appendix A, Appendix F). A total of 25 skates with approximately 1,125 hooks each were set at fixed stations and a total of 925 skates were deployed during the survey. Six skates were classified as invalid and not included because of gear snarls. Crab pot gear was identified in close proximity to stations 41 (Niblack Point) station 37 (Caamano Island) and 36 (Vallenar Point). Gear at these stations was set at slightly deeper depths than the established latitude and longitude assigned to each station in order to avoid potential gear interference.

CATCH AND CPUE

A total of 7,982 sablefish were caught during the survey and 7,469 were retained. Valid skates accounted for 7,933 sablefish caught and 7,425 retained (Table 4). Of the remaining sablefish on valid skates, 335 were lost at the roller, 120 were discarded due to hagfish damage, 48 were released due to small size, three were discarded due to shark damage, and two were discarded due to sand flea damage.

CPUE (fish/hook) by station (Table 2) ranged from 0.02 fish/hook at station 16, Kendrick Island, to 0.55 fish/hook at station 54, near Cape Muzon. CPUE (round lb/hook ranged from 0.07 round lb/hook (0.03 kg/hook) at station 16, Kendrick Island, to 2.94 round lb/hook (1.33 kg/hook) at station 54, Cape Muzon (Table 2).

Overall survey CPUE in 2011 increased from the 2010 level to 1.16 round lb/hook for all size classes and 1.07 round lb/hook for fish ≥520 mm (Table 3). CPUE in 2011 was slightly above the five and 10-year average for all size classes of fish (1.07 and 1.11 round lb/hook, respectively), and for fish ≥520 mm fork length (0.98 and 1.03 round lb/hook, respectively). However, prior to 2011 longline survey CPUE (round lb/hook) generally declined from 2006 to 2010 for all size classes of fish and for fish ≥520 mm fork length (Figure 4). These trends were similar for CPUE measured in fish per hook with the exception of 2010 in which survey CPUE in terms of fish per hook increased when including fish of all size classes; this difference was not

observed for fish of ≥520 mm fork length. The increase in CPUE (fish/hook) was caused by a large influx of small fish in 2010; however, these fish had a low average weight which resulted in a decrease in CPUE measured in round pounds per hook (Figure 4).

The changes in methodology for calculating survey CPUE resulted in similar trends with only small differences in CPUE from historical, unweighted calculations. Consequently, it is unlikely that these revisions in CPUE calculations would have resulted in management actions notably differing from those previously implemented.

NON-TARGET SPECIES CATCH

In addition to sablefish, a total of 2,923 fish and 11 other marine invertebrates were caught during the 2011 survey (Table 5). Shortspine thornyhead (*Sebastolobus alascanus*) were the most abundant non-sablefish species, comprising 26% of the non-target species count. Skates (*Raja* spp. and *Bathyraja* spp.) were the next most abundant, comprising 16%. Both Spiny dogfish sharks (*Squalus acanthias*) and Pacific halibut (*Hippoglossus stenolepis*) comprised 14% each, Pacific hagfish (*Eptatretus stoutii*) comprised 11%. The remaining non-sablefish catch was made up of, in descending order of abundance: arrowtooth flounder (*Atheresthes stomias*), spotted ratfish (*Hydrolagus colliei*), Pacific cod (*Gadus macrocephalus*), shortraker rockfish (*Sebastes borealis*), redbanded rockfish (*Sebastes babcocki*), rougheye rockfish (*Sebastes aleutianus*), coral (various species), Dover sole (*Microstomus pacificus*), Pacific sleeper shark (*Somniosus Pacificus*), and walleye pollock (*Theragramma chalogramma*).

BIOLOGICAL DATA

Sablefish

Fork lengths were measured, sex and maturity were assessed, and otoliths were taken from 699 sablefish. Valid weights were obtained for 700 sablefish and valid age estimates were determined for 693 sablefish. An additional 694 sablefish were measured for length only, for a total of 1,394 length measurements. Lengths ranged from 39 cm (15 in) to 86 cm (34 in) (Figure 5). Mean length of fish sampled in 2011 was 58 cm (23 in) with a SE (standard error) ± 0.18. 2010 mean length was 56 cm (22 in) ±0.31, 2009 mean was 61 cm (24 in) ± 0.28, and the 2008 mean was 62 cm (24 in) ± 0.21 (Figure 6).

Females comprised 48% of sampled fish while both females and males showed a mean fork length of 58 cm (23 in) (Figure 7). The average weight of all the sablefish sampled was 2.1 kg (4.6 lb) (Table 1). Females averaged 2.1 kg (4.6 lb) and males averaged 2.0 kg (4.4 lb).

Age estimates ranged from 1 to 47 years with an average age of 8 years ±0.22 (Figure 8). The modal age was 5 years, and the median was 6 years. Female ages ranged from 3 to 25 years with an average age of 7 years. Male ages ranged from 1 to 47 years with an average age of 10 years.

Visual inspection of gonads indicated that the majority of females and males sampled had not previously spawned (Table 6).

Sebastes Rockfishes

A total of 23 redbanded rockfish (*Sebastes babcocki*), 20 rougheye rockfish (*S. aleutianus*), and 28 shortraker rockfish (*S. borealis*) were sampled for length, weight and sex. Average fork length was 43 cm (17in) with SE of 0.9 for the redbanded rockfish, rougheye were 53 cm (21in),

SE of 2.4, and shortraker 65 cm (26in) SE of 2.4. Redbanded rockfish averaged 1.5 kg (3.3 lb), rougheye averaged 2.9 kg (6.4 lb), and shortraker rockfish averaged 4.8 kg (10.6 lb).

Shortspine Thornyheads

Lengths were taken from 670 shortspine thornyheads. Fork lengths ranged from 20 cm to 63 cm (8 in to 25 in) and mean length was 40 cm(16 in) with SE of 0.2.

FISH TICKET AND LANDING DATA

A total of 34,472 round pounds of sablefish, 472 round pounds of rockfish, and 342 round pounds of Pacific cod were landed for a total exvessel value of $114,167. An estimated 27% of the sablefish catch by weight came from ADF&G statistical area 325531, 21% from 315502, 18% from 315432, 15% from 325401, 8% from 325431, 8% from 315431, and 3% from 315401 (Figure 1). Twenty-nine percent of the fish were graded in the size range category of 3/4 pounds dressed weight, 28% were 2/3 grade 19% were 4/5 grade, 13% were 5/7 grade, 8% were 1/2, and 3% were 7/10. Five percent of the sablefish catch was graded as #2 quality indicating the fish were identified as less than a premium product.

ACKNOWLEDGEMENTS

The authors would like to thank the crews of the *F/V Masonic* and *F/V Viking Maid*, and ADF&G staff Jodi Neil, Rhea Ehresmann, and Lyndsey Jensen for their work aboard the survey vessels.

TABLES AND FIGURES

Table 1.–Hook condition, sablefish average weight, by station for the 2011 SSEI sablefish longline survey.

Station	Total Hooks	Bare hooks	Baited hooks	Invalid hooks	Sablefish	Avg. fish weight (lb)
2	1,125	435	77	47	407	4.9
3	1,074	790	0	14	205	2.9
4	1,120	835	1	18	201	2.9
5	1,112	869	8	9	161	3.7
6	1,124	904	2	15	111	2.9
11	1,118	629	16	15	390	4.1
12	1,068	814	4	13	181	2.9
14	1,125	596	0	7	445	3.2
15	1,126	949	0	35	75	3.5
16	1,124	981	2	36	17	4.5
17	1,121	951	1	22	51	3.2
18	1,119	867	0	28	118	3.1
20	1,117	821	1	12	217	3.6
21	1,080	890	0	27	136	3.5
26	1,121	608	274	5	137	5.9
27	1,126	640	4	19	394	4.9
30	1,120	952	0	23	120	4.0
31	1,123	999	0	12	89	3.8
33	1,124	1009	0	15	81	3.5
35	1,121	900	0	19	179	4.8
36	1,117	751	11	23	279	3.9
37	1,067	813	43	6	136	5.1
39	1,113	837	3	25	173	4.5
41	1,099	822	21	5	181	5.9
43	1,115	563	169	15	181	5.9
44	1,079	578	0	7	424	5.5
46	1,118	925	42	17	91	3.8
47	1,114	754	96	35	153	5.6
48	1,025	696	26	9	277	6.1
49	1,114	875	0	30	193	6.1
50	1,114	891	0	30	153	5.6
52	1,092	382	39	26	425	6.6
53	1,112	395	30	34	458	4.5
54	1,085	343	11	12	593	5.4
55	1,125	697	10	28	255	3.7
56	1,129	834	7	10	155	3.1
57	1,119	917	0	12	140	3.0
Total	41,025	28,512			7,982	

Table 2.–Sablefish fish CPUE both number per hook and round lb per hook by station for the SSEI sablefish longline survey, 2008–2011

	2011		2010		2009		2008	
Station	**Fish/hook**	**lb/hook**	**Fish/hook**	**lb/hook**	**Fish/hook**	**lb/hook**	**Fish/hook**	**lb/hook**
2	0.36	1.78	0.12[a]	0.37	0.23	1.25	0.32	—
3	0.19	0.54	0.11	0.25	0.12	0.34	0.19	—
4	0.18	0.53	0.10	0.17	0.10	0.24	0.17	—
5	0.14	0.53	0.18	0.49	0.11	0.55	0.16	—
6	0.10	0.29	0.17	0.42	0.06	0.21	0.13	—
11	0.35	1.44	0.31	1.20	0.37	2.1	0.44	—
12	0.17	0.49	0.07	0.25	0.10	0.42	0.12	—
14	0.40	1.27	0.42	1.20	0.34	1.59	0.45	—
15	0.07	0.23	0.09	0.23	0.03	0.17	0.12	—
16	0.02	0.07	0.02	0.06	0.02	0.11	0.06	—
17	0.05	0.15	0.07	0.17	0.04	0.24	0.08	—
18	0.11	0.33	0.29	0.75	0.04	0.21	0.08	—
20	0.19	0.70	0.19	0.48	0.16	0.72	0.22	1.04
21	0.13	0.44	0.10	0.24	0.07	0.33	0.10	0.46
26	0.12	0.72	0.12	0.74	0.07	0.4	0.21	1.34
27	0.35	1.72	0.30	1.52	0.19	0.99	0.22	1.52
30	0.11	0.43	0.05	0.18	0.05	0.26	0.07	0.50
31	0.08	0.30	0.04	0.12	0.02	0.14	0.1	0.64
33	0.07	0.25	0.03	0.08	0.03	0.10	0.03	0.22
35	0.16	0.77	0.08	0.31	0.09	0.38	0.12	0.65
36	0.25	0.97	0.17	0.82	0.15	0.94	0.17	1.09
37	0.13	0.65	0.14	0.66	0.13	0.85	0.18	1.35
39	0.16	0.69	0.15	0.86	0.09	0.59	0.15	0.96
41	0.16	0.97	0.18	1.07	0.2	1.05	0.13	0.86
43	0.16	0.95	0.15	0.90	0.11	0.72	0.21	1.12
44	0.39	2.14	0.28	1.63	0.26	1.33	0.26	1.38
46	0.08	0.31	0.05	0.35	0.11	0.57	0.13	0.91
47	0.14	0.77	0.16	0.89	0.14	0.74	0.14	0.65
48	0.27	1.64	0.22	1.60	0.36	2.33	0.21	1.61
49	0.17	1.06	0.07	0.44	0.10	0.65	0.14	0.88
50	0.14	0.77	0.12	0.75	0.05	0.41	0.1	0.65
52	0.39	2.57	0.26[a]	1.15	0.35	2.46	0.25	—
53	0.41	1.87	0.31	0.89	0.39	2.03	0.38	—
54	0.55	2.94	0.03[a]	0.13	0.45	2.35	0.53	—
55	0.23	0.85	0.10[a]	0.22	0.29	0.97	0.21	—
56	0.14	0.43	0.05[a]	0.10	0.11	—	0.25	—
57	0.13	0.38	0.14[a]	0.35	0.10	0.58	0.14	—

Note: Stations with a — indicate weights were not taken due to rough seas or problems with the scale.

[a] Stations that were affected by orca whale predation on 12 or more skates.

Table 3.–Overall CPUE measured in fish per hook or round lb per hook (biomass) for the longline survey from 1997–2011.

Year	CPUE fish/hk all fish	CPUE fish/hk ≥520 mm	CPUE biomass all fish	CPUE biomass ≥520 mm
1997	0.16	0.11	0.69	0.59
1998	0.16	0.12	0.73	0.62
1999	0.24	0.17	1.03	0.88
2000	0.23	0.20	1.11	1.03
2001	0.18	0.15	0.89	0.80
2002	0.26	0.22	1.08	0.98
2003	0.27	0.23	1.20	1.10
2004	0.26	0.23	1.21	1.15
2005	No Survey	No Survey	No survey	No survey
2006	0.25	0.24	1.41*	1.36*
2007	0.23	0.20	1.17	1.08
2008	0.23	0.22	1.20	1.20
2009	0.21	0.19	1.08	1.04
2010	0.21	0.11	0.75	0.53
2011	0.24	0.21	1.16	1.07
5-yr avg.	0.22	0.18	1.07	0.98
10-yr avg.	0.23	0.20	1.11	1.03

Table 4.–Sablefish retention and discard status in numbers of fish (valid skates only), during the 2011 SSEI sablefish longline survey

	Discarded due to predation			Released Alive			
Station	**Sand fleas**	**Sharks**	**Hagfish**	**Small Size**	**Lost at Roller**	**Retained**	**Total**
2	0	0	0	0	14	393	407
3	0	0	6	12	5	172	195
4	0	0	3	12	7	179	201
5	0	0	0	0	4	157	161
6	0	0	2	2	6	101	111
11	0	0	2	0	9	379	390
12	0	0	7	5	3	160	175
14	1	0	2	0	15	427	445
15	0	0	4	0	2	69	75
16	0	0	0	0	1	16	17
17	0	0	1	0	0	50	51
18	0	0	3	0	5	110	118
20	0	0	3	3	11	200	217
21	0	0	7	0	3	118	128
26	0	0	0	3	9	125	137
27	0	0	0	0	12	382	394
30	0	0	5	0	5	110	120
31	0	0	3	0	2	84	89
33	0	0	1	0	7	73	81
35	0	0	2	0	10	167	179
36	0	0	0	0	31	248	279
37	0	0	4	0	8	116	128
39	0	0	1	0	18	154	173
41	0	0	0	0	6	175	181
43	0	0	0	0	11	170	181
44	1	0	1	0	23	395	420
46	0	0	6	0	5	80	91
47	0	0	0	0	5	148	153
48	0	1	1	0	26	249	277
49	0	0	25	0	15	153	193
50	0	0	4	0	4	145	153
52	0	0	0	1	9	415	425
53	0	0	0	0	12	446	458
54	0	0	24	0	17	539	580
55	0	1	3	2	5	244	255
56	0	1	0	3	5	146	155
57	0	0	0	5	5	130	140
Total	2	3	120	48	335	7,425	7,933

Table 5.–Overall catch in numbers by species (valid and invalid skates), in the 2011 SSEI sablefish longline survey.

Station	Sablefish	Thornyhead rockfish	Pacific Halibut	Spiny dogfish shark	Pacific hagfish	Skate, long–nose	Arrowtooth flounder	Skate, general	Ratfish	Pacific cod	Shortraker rockfish	Redbanded rockfish	Rougheye rockfish	Coral	Dover sole	Other[a]
2	407	32	10	55	0	27	2	8	15	1	1	1	0	7	0	0
3	215	26	4	7	12	8	6	2	1	0	0	0	0	0	0	0
4	201	20	3	4	18	11	7	1	1	0	0	0	0	0	0	0
5	161	23	2	12	13	5	5	2	1	1	0	0	0	0	0	1
6	111	39	1	10	18	6	5	5	8	0	0	0	0	0	0	0
11	390	9	11	16	8	7	3	12	2	0	0	0	0	0	0	0
12	187	13	1	7	17	8	5	3	4	0	0	0	0	0	0	0
14	445	11	2	15	11	13	11	7	6	1	0	0	0	0	0	0
15	75	20	3	5	27	8	1	0	3	0	0	0	0	0	0	0
16	17	40	0	6	29	6	5	1	0	0	1	0	0	0	0	0
17	51	37	1	1	39	7	3	5	2	0	1	0	0	0	0	0
18	118	42	1	8	20	13	9	9	4	0	0	0	0	0	0	0
20	217	16	9	4	2	2	26	5	0	0	0	0	2	0	0	0
21	144	8	1	2	7	6	4	1	0	0	0	0	0	0	0	0
26	137	4	24	8	0	1	1	3	5	45	0	3	3	0	0	0
27	394	9	13	28	0	8	6	0	4	1	0	0	0	0	0	0
30	120	13	2	4	4	1	0	1	0	0	0	0	0	0	0	0
31	89	8	0	1	5	4	2	2	0	0	0	0	1	0	0	0
33	81	4	2	1	7	1	1	1	1	0	1	0	0	0	0	0
35	179	8	2	2	3	2	1	0	0	0	4	1	0	0	0	0
36	279	3	15	4	1	4	21	2	0	1	0	2	0	0	0	0
37	144	22	19	4	6	5	10	1	0	1	1	2	1	0	0	0
39	173	33	8	18	0	6	5	4	0	0	1	0	0	0	0	0
41	181	20	8	23	1	2	8	1	4	0	0	1	2	0	0	0
43	181	29	59	43	0	1	5	4	12	13	6	9	6	0	0	0
44	428	13	22	15	1	8	5	5	2	0	0	0	1	0	0	0
46	91	13	3	3	15	5	2	2	0	0	0	0	0	0	0	0
47	153	22	12	19	1	11	4	4	0	0	1	0	1	0	0	1
48	277	3	0	3	0	6	0	4	1	0	0	0	0	0	0	0
49	193	2	0	2	8	1	0	2	0	0	0	0	1	0	0	0
50	153	3	0	2	20	5	2	6	0	0	0	0	2	0	0	0
52	425	77	42	8	0	26	16	14	6	15	4	7	1	3	1	0
53	458	34	88	2	1	18	27	21	0	1	2	0	0	0	1	0
54	606	39	26	4	0	16	17	13	10	1	3	0	1	1	1	0
55	255	30	18	29	11	12	21	10	0	1	2	0	0	0	1	0
56	155	19	10	39	18	2	17	10	5	0	0	0	0	0	2	1
57	140	9	2	3	14	4	7	8	2	0	1	0	0	0	0	0
Total	8,031	753	424	417	337	276	270	179	99	82	29	26	22	11	6	3

[a]Other includes pollock, and Pacific sleeper sharks.

Table 6.–Sablefish maturity stages from observation of gonad gross morphology, found in samples taken during the 2011 SSEI sablefish longline survey.

Maturity Stage	Number of males	Number of females	Sex unidentified	Total
Immature	132	78	0	210
Maturing Juvenile	87	186	0	273
Mature/developing	15	1	0	16
Spawning	13	0	0	13
Spent/post spawning	36	26	0	62
Resting	77	48	0	125
Not observed	0	0	0	0
Total	360	339	0	699
Percent of Total	51.5	48.5	0	

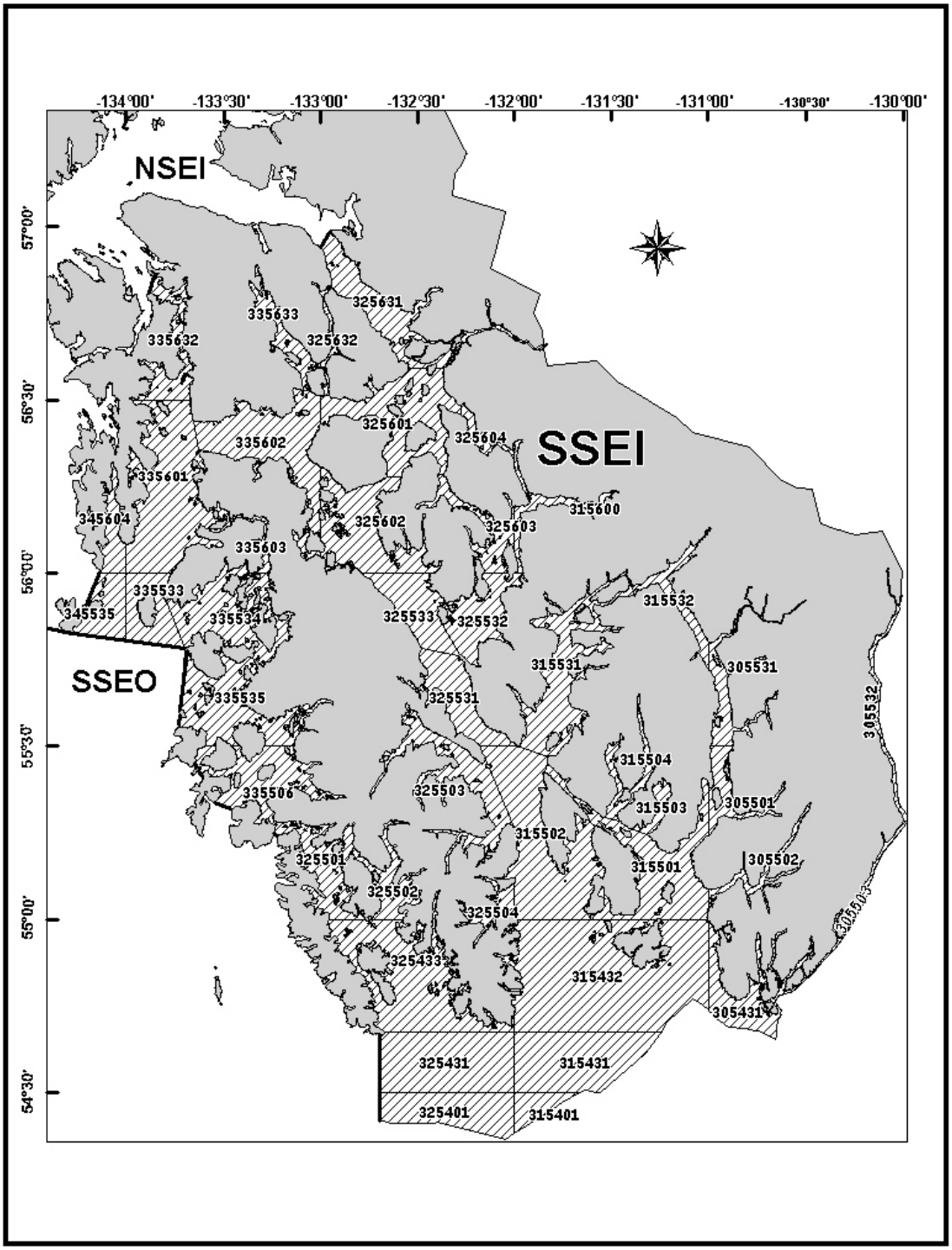

Figure 1.–Shaded regions indicate marine waters included in the Southern Southeast Inside (SSEI) Subdistrict. Adjacent Groundfish Management areas include Northern Southeast Inside (NSEI) and Southern Southeast Outside (SSEO).

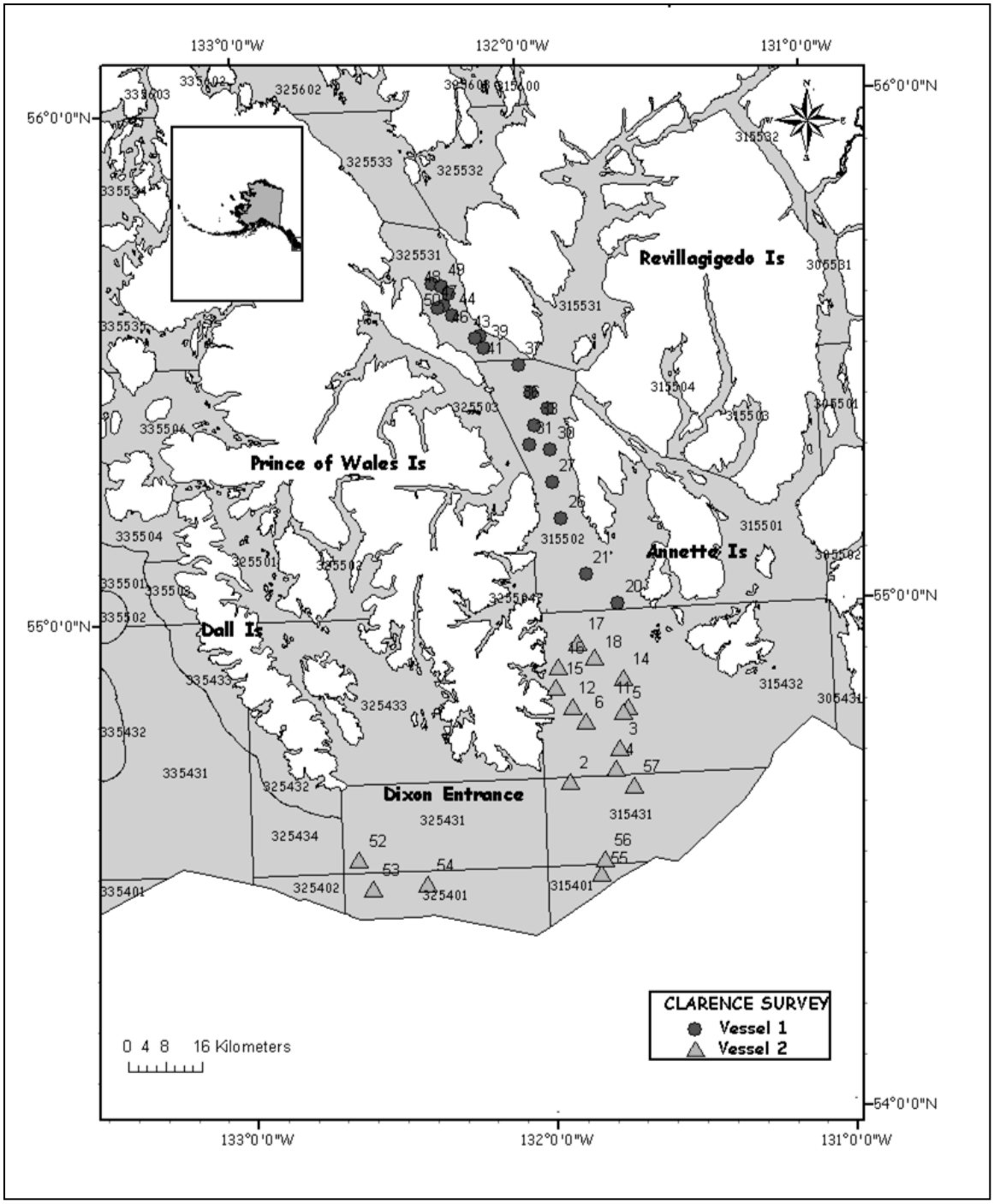

Figure 2.–Marine waters included in the Southern Southeast Inside (SSEI) Subdistrict including survey station locations, statistical areas, and trip station assignments.

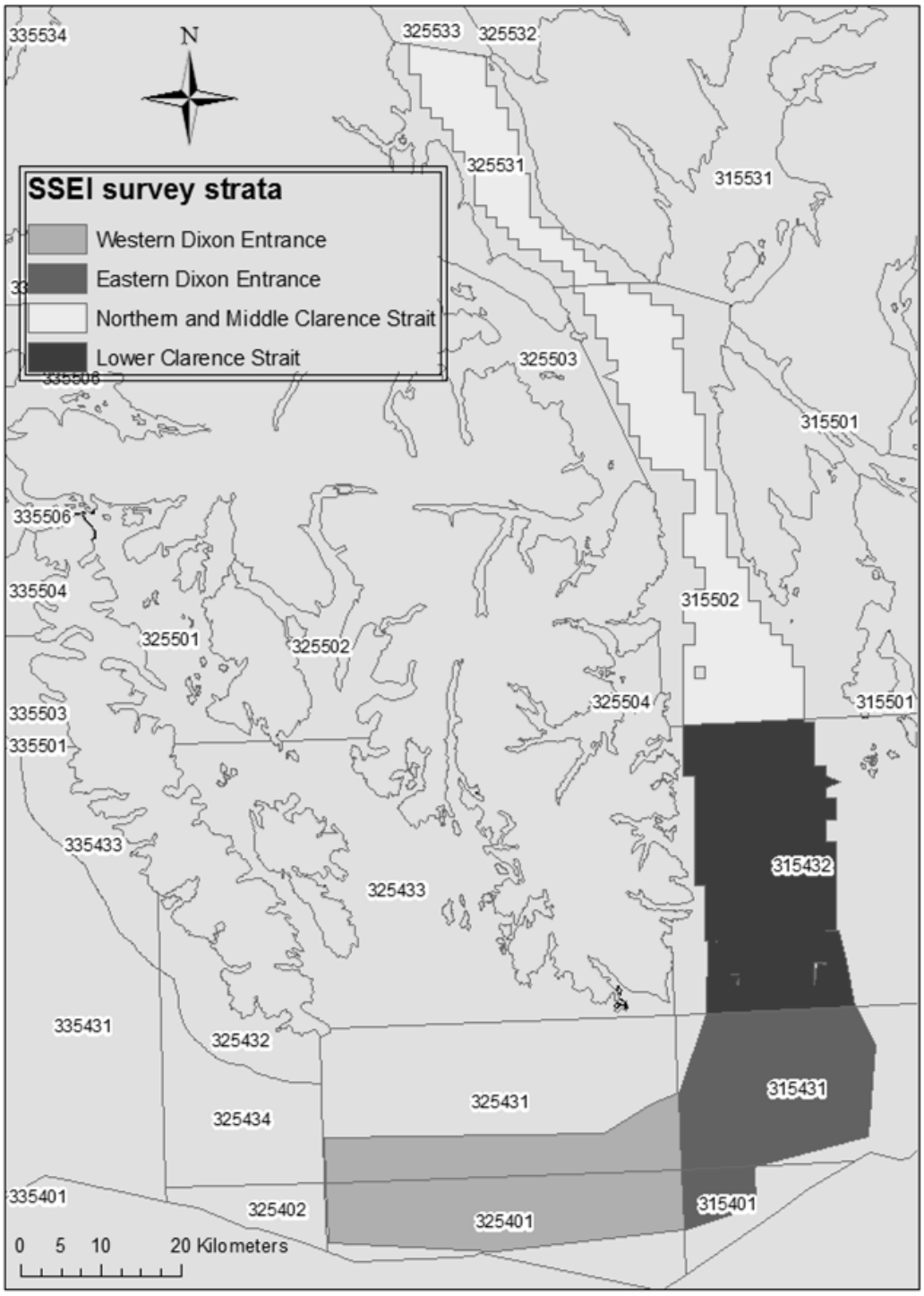

Figure 3.–Survey strata used to calculate CPUE for the SSEI survey: northern and middle Clarence Strait (315502 and 325531), lower Clarence Strait (315432), eastern Dixon Entrance (315401 and 315431), and western Dixon Entrance (325401 and 325431). Strata represent area considered sablefish habitat (>200 fm depth).

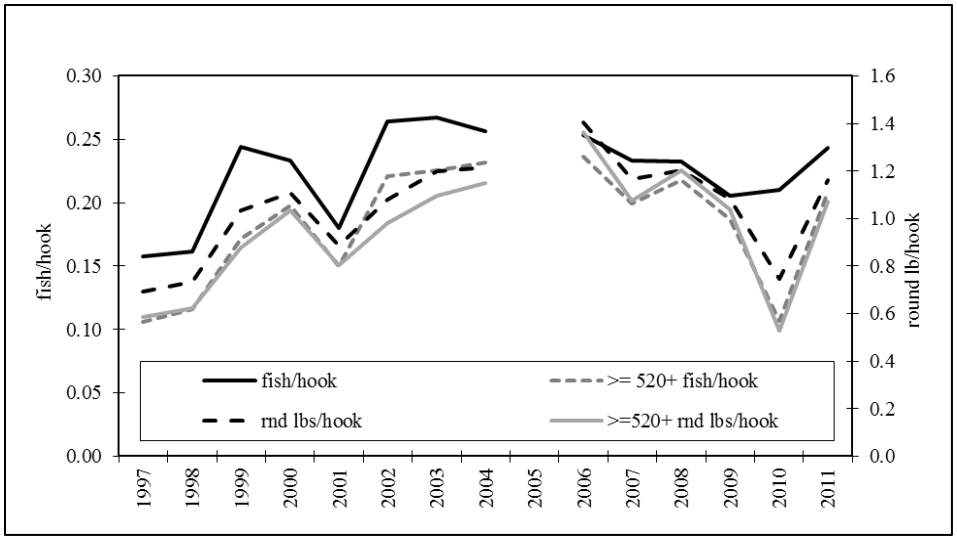

Figure 4.–Survey CPUE weighted by stratum area for all fish (# fish/hook and round lb/hook) and fish ≥ 520 mm (# fish/hook and round lb/hook) from 1997–2011.

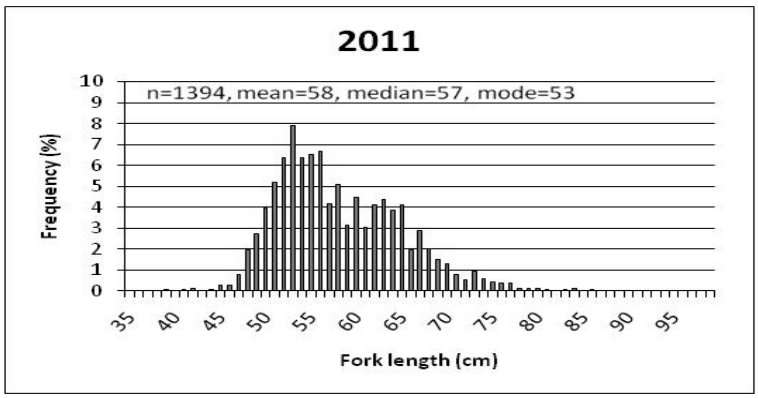

Figure 5.–Sablefish length frequency distribution from the 2011 Southern Southeast Inside (SSEI) Subdistrict sablefish longline survey.

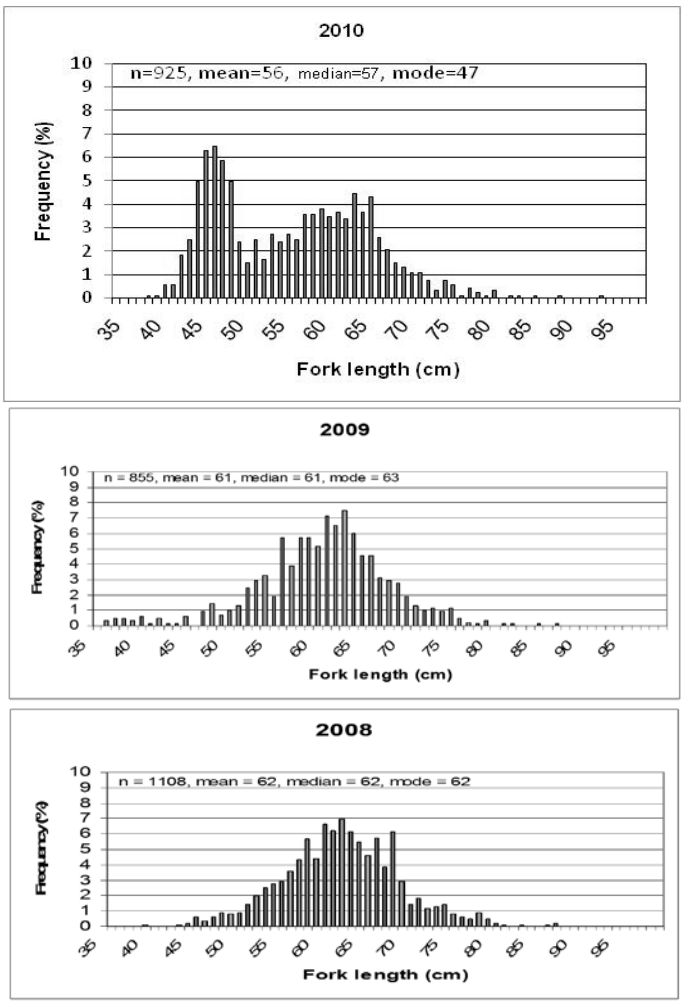

Figure 6.–Sablefish length frequency distributions from the 2008 to 2010 Southern Southeast Inside (SSEI) Subdistrict sablefish longline surveys

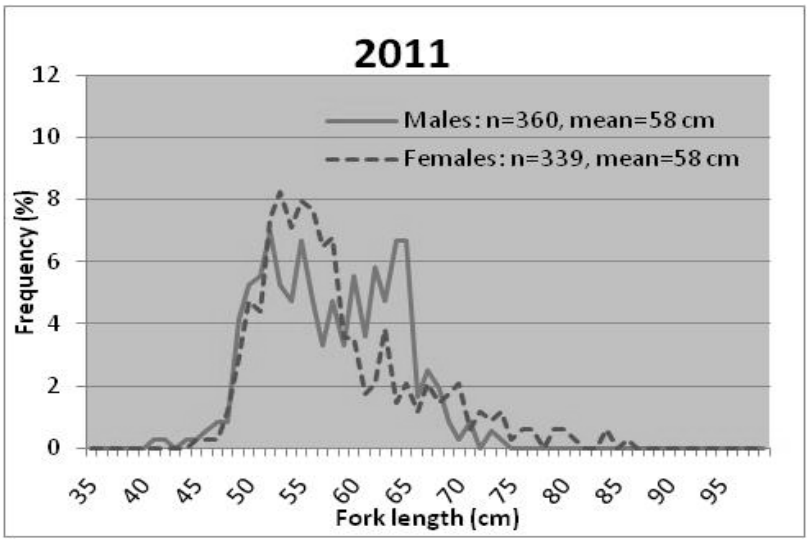

Figure 7.–Sablefish length frequency distribution by sex from the 2011 Southern Southeast Inside (SSEI) Subdistrict sablefish longline survey.

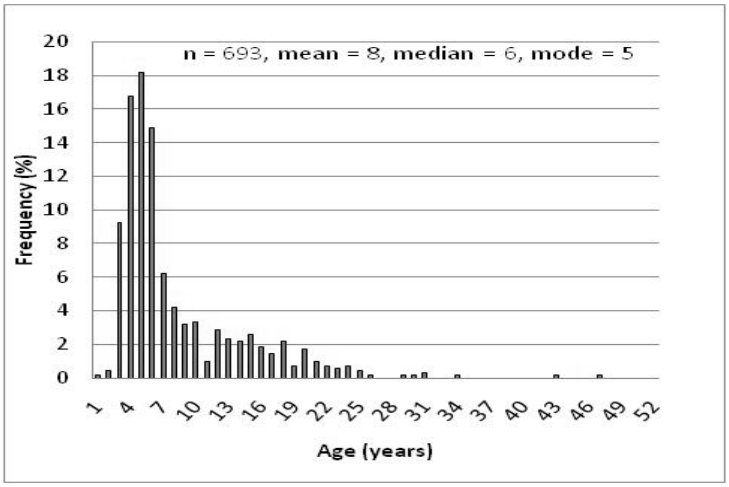

Figure 8.–Sablefish age frequency distribution from the 2011 Southern Southeast Inside (SSEI) Subdistrict sablefish longline survey

APPENDICES

Appendix A.–Set location information for the 2011 Southern Southeast Inside (SSEI) Subdistrict sablefish longline survey.

		Start Position				End Position			
Station	Area description	Lat. deg.	Lat. min.	Long. deg.	Long. min.	Lat. deg.	Lat. min.	Long. deg.	Long. min.
2	Cape Chacon	54	39.66	131	54.32	54	41.00	131	54.11
3	W.Devil Rock	54	43.76	131	43.90	54	45.20	131	43.77
4	W.Devil Rock	54	41.91	131	44.12	54	43.56	131	43.99
5	West Rock	54	47.79	131	42.70	54	46.30	131	42.74
6	McLean Point	54	47.99	131	50.63	54	46.53	131	50.70
11	West Rock	54	48.36	131	41.67	54	49.83	131	41.78
12	Island Point	54	50.33	131	52.81	54	48.88	131	52.98
14	Hassler Reef	54	50.27	131	42.67	54	51.85	131	42.56
15	Kendrick Island	54	50.97	131	56.32	54	52.38	131	56.51
16	Kendrick Island	54	54.50	131	55.60	54	53.07	131	55.91
17	Hidden Bay	54	55.25	131	51.65	54	53.77	131	51.48
18	Hidden Bay	54	54.29	131	48.04	54	55.66	131	48.16
20	Point Davidson	55	0.82	131	43.32	54	59.26	131	42.72
21	Rip Point	55	4.07	131	49.41	55	2.62	131	48.98
26	Wedge Island	55	11.04	131	54.04	55	9.47	131	54.62
27	Wedge Island	55	15.31	131	55.76	55	13.80	131	56.24
30	Chasina Point	55	17.59	131	56.07	55	19.11	131	55.75
31	Skin Island	55	18.46	131	58.65	55	19.90	132	0.10
33	Grant Cove	55	22.11	131	58.94	55	20.58	131	58.89
35	Vallenar Point	55	24.34	131	58.91	55	25.80	131	59.21
36	Vallenar Point	55	24.05	131	56.03	55	25.47	131	56.96
37	Caamano Point	55	28.20	131	58.52	55	29.00	132	1.21
39	Street Island	55	30.07	132	8.06	55	31.48	132	8.59
41	Niblack Point	55	31.81	132	7.16	55	32.54	132	8.99
43	Niblack Point	55	31.07	132	9.62	55	32.50	132	10.49
44	Ship Island	55	35.40	132	15.02	55	34.14	132	13.57
46	Ship Island	55	36.35	132	16.46	55	35.18	132	15.35
47	Windfall Harbor	55	36.17	132	17.80	55	34.80	132	16.67
48	Ship Island	55	36.07	132	14.39	55	37.25	132	15.52
49	Windfall Harbor	55	38.91	132	17.04	55	37.47	132	16.41
50	Tolstoi Point	55	39.21	132	19.13	55	37.77	132	18.68
52	Cape Muzon	54	31.50	132	40.89	54	31.51	132	38.46
53	Cape Muzon	54	28.01	132	32.58	54	27.97	132	35.45
54	Cape Muzon	54	28.40	132	24.18	54	28.45	132	21.41
55	Celestial Reef	54	30.56	131	49.00	54	28.95	131	48.98
56	Celestial Reef	54	32.04	131	47.87	54	30.50	131	48.08
57	W.Devil Rock	54	37.60	131	41.62	54	39.12	131	41.34

Appendix B.–Vessels, vessel crew, and ADF&G staff for the 2011 Southern Southeast Inside (SSEI) Subdistrict sablefish longline survey.

Trip No.	Vessel	Name	Affiliation
Trip 1	Masonic	Bill Lewis	Skipper
		Dane Lewis	Crew
		Katie Lewis	Crew
		Sumner Lewis	Crew
		Jordan Lewis	Crew
		Jodi Neil	Vessel lead, ADF&G
		Lyndsey Jensen	ADF&G
Trip 2	Viking Maid	Russell Cockrum	Skipper
		Casey Bass	Crew
		Alec Dyakanoff	Crew
		Maurice Alsup	Crew
		Kamala Carroll	Vessel lead, ADF&G
		Rhea Ehresman	ADF&G

Appendix C.–Tide table for Morse Cove, Duke Island, May 07–16, 2011

Date	AM High tide	Ft.	PM High tide	Ft.	AM Low tide	Ft.	PM Low tide	Ft.
May 07	3:29	14.7	4:36	12.4	10:20	-0.7	10:16	4.1
May 08	4:12	14.0	5:26	12.1	11:06	-0.1	11:09	4.4
May 09	5:04	13.2	6:23	11.9	12:00	0.5	–	–
May 10	6:09	12.5	7:27	12.2	12:16	4.6	1:01	1.1
May 11	7:27	12.0	8:30	13	1:35	4.2	2:07	1.3
May 12	8:49	12.0	9:29	13.9	2:54	3.2	3:12	1.5
May 13	10:03	12.6	10:22	15.2	4:04	1.6	4:12	1.4
May 14	11:06	13.3	11:11	16.2	5:03	-0.2	5:07	1.3
May 15	5:55	14.1	11:58	17.1	5:55	-1.7	5:58	1.2
May 16	–	–	12:55	14.7	6:44	-2.9	6:46	1.2

Appendix D.–Sablefish maturity stages and descriptions.

Maturity stage	Description of males at stage	Description of females at stage
Immature	Testes very narrow, parallel, flat and ribbon-like, almost clear in color. Longitudinal creases are easily discernable.	Ovaries appear as two narrow (slender) ovoids. May be veined. It may be easiest to determine immature from maturing juvenile ovaries while ovaries are intact in fish.
Maturing juvenile	Testes enlarging, not ribbon-like, with four discernable creases running full length. Light pink in color. Has not spawned before.	Ovaries enlarging, translucent and pinkish to clear: eggs not yet discernable. Has not spawned before. Will spawn in the coming year. More veined. Cloudy, but not necessarily throughout.
Mature/developing	Testes large and white, each with four distinct lobes. No milt present.	Ovaries large and becoming white to yellowish white with developing eggs discernable and firmly attached.
Spawning	Testes very large and white, extruding milt freely under slight pressure or when cut.	Ovaries very large with large translucent eggs loose within ovary or extruding from the oviduct.
Spent/post spawning	Testes large, shriveled, often with wrinkles, and bloodshot. No milt present.	Ovaries shriveled and opaque, soft and flaccid, often reddish in color.
Resting	Testes large and firm, light brown to off-white in color. No milt present. Has spawned previously. May have wrinkles.	Ovaries large, firm and opaque, not shriveled. No eggs discernable. Has spawned previously. Noticeable follicle structure.

Appendix E.–Winning fish buyer bid for the 2011 Southern Southeast Inside (SSEI) Subdistrict sablefish longline survey, Trident Seafoods—Ketchikan.

Species	Cut	Size lb.	Dressed lb.	Price per lb ($)	Extended price ($)
Sablefish	Eastern cut	< 2	2,079	$5.25	$10,914.75
Sablefish	Eastern cut	2–3	2,008	$5.75	$11,546.00
Sablefish	Eastern cut	3–4	3,552	$6.50	$23,088.00
Sablefish	Eastern cut	4–5	2,960	$7.35	$21,756.00
Sablefish	Eastern cut	5–7	1,624	$7.75	$12,586.00
Sablefish	Eastern cut	> 7	361	$8.25	$2,978.25
Sablefish-#2	Eastern cut	< 2	56	$4.20	$235.20
Sablefish-#2	Eastern cut	2–3	25	$4.60	$115.00
Sablefish-#2	Eastern cut	3–4	105	$5.20	$546.00
Sablefish-#2	Eastern cut	4–5	12	$5.88	$70.56
Sablefish-#2	Eastern cut	5–7	49	$6.20	$303.80
Sablefish-#2	Eastern cut	> 7	14	$6.60	$92.40
Shortraker rockfish	Head-on, split belly	n/a	870	$0.35	$304.50
Redbanded rockfish	Head-on, split belly	n/a	195	$0.35	$68.25
Rougheye rockfish	Head-on, split belly	n/a	577	$0.35	$201.95
Misc. rockfish	Eastern cut	n/a	5	$0.25	$1.25
Thornyhead	Round	n/a	5	$1.25	$6.25
Thornyhead	Eastern cut	n/a	5	$2.50	$12.50
Pacific Cod	Round	n/a	566	$0.20	$113.20
Total					$84,939.86

Appendix F.–Set dates, times, soak and haul durations, haul order, and depths, 2011 Southern Southeast Inside (SSEI) Subdistrict sablefish longline survey.

					Time (hr:min)			Depth (fm)		
Trip	Effort	Station	Date	Set Time	Soak duration	Haul duration	Haul order	Start	End	Avg.
1	1	50	8-May	6:27	3:15	1:48	Same	340	358	344
1	2	49	8-May	7:19	6:41	1:45	Opposite	345	335	350
1	3	48	8-May	12:58	3:47	1:45	Same	328	341	337
1	4	46	9-May	6:29	3:00	1:25	Same	339	271	320
1	5	44	9-May	8:22	4:02	2:00	Opposite	313	263	283
1	6	47	9-May	11:47	3:12	1:46	Opposite	259	267	257
1	7	43	10-May	6:39	2:58	1:35	Same	219	211	213
1	8	41	10-May	8:58	3:46	1:26	Same	267	209	245
1	9	39	10-May	12:12	2:50	1:28	Same	271	272	268
1	10	37	11-May	13:01	3:13	1:26	Same	229	252	239
1	11	36	12-May	7:41	3:09	1:23	Same	250	245	257
1	12	35	12-May	10:15	3:59	1:31	Opposite	240	258	249
1	13	33	12-May	13:21	3:05	1:13	Same	218	220	226
1	14	31	13-May	7:07	3:03	1:27	Same	237	235	240
1	15	30	13-May	9:26	4:28	1:40	Opposite	218	240	232
1	16	27	13-May	12:58	3:15	1:32	Same	195	200	197
1	17	26	14-May	7:09	3:06	1:35	Opposite	235	225	213
1	18	21	14-May	8:37	6:20	1:33	Same	231	225	227
1	19	20	14-May	13:56	3:29	1:32	Same	217	226	218
2	1	52	8-May	5:50	3:20	2:06	Opposite	199	202	202
2	2	53	8-May	8:02	4:10	1:59	Opposite	203	208	205
2	3	54	8-May	15:10	3:16	1:54	Opposite	200	195	198
2	4	56	9-May	4:46	3:14	1:26	Same	189	190	190
2	5	55	9-May	6:31	3:30	1:28	Same	194	195	195
2	6	57	9-May	13:08	3:09	1:20	Same	225	233	228
2	7	18	10-May	6:55	3:22	1:20	Opposite	227	226	226
2	8	17	10-May	8:48	4:26	1:20	Opposite	228	227	227
2	9	16	10-May	12:40	3:10	1:17	Opposite	232	230	231
2	10	14	12-May	5:40	3:06	1:38	Opposite	225	232	228
2	11	11	12-May	8:09	4:05	1:28	Opposite	248	265	258
2	12	5	12-May	11:20	3:05	1:32	Same	227	227	226
2	13	2	13-May	4:54	3:14	1:43	Opposite	198	201	198
2	14	4	13-May	6:05	6:30	1:30	Same	210	210	210
2	15	3	13-May	11:48	3:19	1:26	Same	211	213	212
2	16	6	14-May	4:26	3:09	1:19	Opposite	217	214	216
2	17	12	14-May	6:41	4:06	1:20	Opposite	222	217	220
2	18	15	14-May	10:00	3:16	1:22	Opposite	232	236	237

Note: Set time is when the second anchor went overboard. Soak duration is between the set time and when the first anchor came aboard. Haul duration is between when the first and second anchors came aboard. Haul order indicates whether the gear was hauled the same or opposite direction as it was set.