

Fishery Management Report No. 12-28

**Southeast Alaska Northern Southeast Inside Sablefish
Fishery Information Report, With Outlook for the
2011 Fishery**

by

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and

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June 2012

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	AAC	<i>all standard mathematical signs, symbols and abbreviations</i>	
deciliter	dL	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	H_A
gram	g	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	e
hectare	ha	at	@	catch per unit effort	CPUE
kilogram	kg	compass directions:		coefficient of variation	CV
kilometer	km	east	E	common test statistics	(F, t, χ^2 , etc.)
liter	L	north	N	confidence interval	CI
meter	m	south	S	correlation coefficient	
milliliter	mL	west	W	(multiple)	R
millimeter	mm	copyright	©	correlation coefficient	
		corporate suffixes:		(simple)	r
		Company	Co.	covariance	cov
Weights and measures (English)		Corporation	Corp.	degree (angular)	$^\circ$
cubic feet per second	ft ³ /s	Incorporated	Inc.	degrees of freedom	df
foot	ft	Limited	Ltd.	expected value	E
gallon	gal	District of Columbia	D.C.	greater than	>
inch	in	et alii (and others)	et al.	greater than or equal to	≥
mile	mi	et cetera (and so forth)	etc.	harvest per unit effort	HPUE
nautical mile	nmi	exempli gratia		less than	<
ounce	oz	(for example)	e.g.	less than or equal to	≤
pound	lb	Federal Information Code	FIC	logarithm (natural)	ln
quart	qt	id est (that is)	i.e.	logarithm (base 10)	log
yard	yd	latitude or longitude	lat. or long.	logarithm (specify base)	log ₂ , etc.
		monetary symbols		minute (angular)	'
		(U.S.)	\$, ¢	not significant	NS
Time and temperature		months (tables and figures): first three letters	Jan,...,Dec	null hypothesis	H_0
day	d	registered trademark	®	percent	%
degrees Celsius	°C	trademark	™	probability	P
degrees Fahrenheit	°F	United States (adjective)	U.S.	probability of a type I error	
degrees kelvin	K	United States of America (noun)	USA	(rejection of the null hypothesis when true)	α
hour	h	U.S.C.	United States Code	probability of a type II error	
minute	min	U.S. state	use two-letter abbreviations (e.g., AK, WA)	(acceptance of the null hypothesis when false)	β
second	s			second (angular)	"
				standard deviation	SD
Physics and chemistry				standard error	SE
all atomic symbols				variance	
alternating current	AC			population	Var
ampere	A			sample	var
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				

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ABSTRACT

The purpose of this document is to provide information on the state managed Northern Southeast Inside sablefish fishery. This report is designed to be used in conjunction with the 2010–2011 Commercial Groundfish Fishing Regulations and active News Releases and Emergency Orders, as these inseason actions will supersede information provided in this document.

Keywords: Sablefish, blackcod, *Anoplopoma fimbria*, Chatham Strait, Northern Southeast Inside Subdistrict, NSEI, Fishery, Management, Outlook Regulations, Quotas, CPUE, Equal Quota Share, EQS, Alaska.

INTRODUCTION

The sablefish (*Anoplopoma fimbria*) fishery is the oldest and most lucrative groundfish fishery managed by the State of Alaska. Sablefish, also known as black cod, is a commercially important species throughout its range, and is typically harvested using longline or pot gear. The Alaska Department of Fish and Game Southeast Region (ADF&G) manages the sablefish fishery in the Northern Southeast Inside (NSEI) subdistrict (Figure 1), commonly known as the Chatham sablefish fishery.

The NSEI sablefish fishery is currently a limited entry, Equal Quota Share (EQS) longline fishery, with 83 permit holders in 2011 (Table 1). While the annual harvest objective (AHO) has decreased from 4,761,905 round pounds at the beginning of the EQS system to 880,000 round pounds in 2011 the price of sablefish has increased fairly consistently and remains high (Table 1). Equal quota shares have ranged from 38,889 round pounds per permit in 1994 to 10,602 in 2011. This report summarizes the commercial longline fishery and the management of sablefish in NSEI from the early years of the fishery through the present and details the recent overall harvest, biological data, catch per unit of effort (CPUE), longline fishing patterns and fishery bycatch. Relevant Alaska Board of Fisheries (board) decisions from 2003 through 2010 and recent department biological research activities are also summarized.

SABLEFISH LIFE HISTORY

Sablefish are one of two species that make up the Anoplopomatidae family that also includes skillfish (*Erilepis zonifer*). They occur only in the North Pacific Ocean, the Bering Sea, and adjacent waters from Hokkaido, Japan to Baja California. Their greatest abundance is in the Gulf of Alaska (Wolotira et al. 1993). Sablefish are divided into two populations. The northern population extends from northern British Columbia through the Gulf of Alaska and west to Japan. The southern population extends from southern British Columbia to the Baja peninsula. These populations were divided based on differences in size at maturity, growth, and movement (McDevitt 1990). Sablefish are known to be highly migratory and commonly travel over 1000 miles from where they were born (Maloney and Sigler 2008).

Adult sablefish are demersal (Krieger 1997) and inhabit the deeper water areas of the continental shelf, slope, and deep-water coastal fjords. Most adults live at depths between 200 and 500 fathoms (366 m and 915 m), although they have been found at depths ranging from 100 to 1000 fathoms (183 m to 1,830 m) (Allen and Smith 1988). Fish generally move to deeper depths as they age (Maloney and Sigler 2008).

Adult sablefish are opportunistic feeders, preying on fishes (including pollock (*Theragra chalcogramma*), eulachon (*Thaleichthys pacificus*), capelin (*Mallotus villosus*), herring (*Clupea pallasii*), sandlance (family Ammodytidae), Pacific cod (*Gadus macrocephalus*), and flatfish),

squid, euphausiids (also known as krill), Pandalid shrimps and jellyfish (Yang and Nelson 2000). Yearling sablefish feed primarily on euphausiids (Sigler et al. 2001b).

Juvenile sablefish are preyed upon by adult coho and Chinook salmon (*Oncorhynchus kisutch* and *Oncorhynchus tshawytscha*). ADF&G commercial salmon troll logbooks from 1977 through 1984 reported young sablefish as the fourth most common species in the stomach contents of both species (Wing 1985). Pacific halibut (*Hippoglossus stenolepis*) have also been documented to eat adult sablefish although sablefish make up a minor proportion of the total halibut diet (Yang and Nelson 2000). Cod (*Gadus spp.*), lingcod (*Ophiodon elongatus*), hagfishes (class Myxini), sharks, and killer whales (*Orcinus orca*) have also been reported to eat adult sablefish (Kruse et al. 2000).

Sablefish recruitment is marked by periodic exceptional year classes interspersed with periods of relatively low recruitment. Strong cohorts are apparent when large numbers of one-year old sablefish are observed distributed across many different shallow water areas. During years of typical recruitment, one and two-year old sablefish are found in a few specific shallow water areas. Recruitment is thought to be strongest when periodic global weather events such as El Niño or Pacific Decadal Oscillation (PDO) phase changes lead to above average sea surface temperatures (Sigler et al. 2003).

Sablefish spawn in pelagic waters at depths of 300–500 m (164–273 fathoms) in the late winter and early spring, in areas near the edge of the continental slope (Sigler et al. 2001, McFarlane and Nagata 1988). One study has found that fifty percent of females are ready to spawn when they are 6.5 years old and fifty percent of males are mature at 5 years old (Sasaki 1985), but there may be regional variability in growth and maturity rates (McDevitt 1990). Eggs develop at depth and larvae develop near surface waters. Juveniles exhibit rapid growth, growing an average of 1.19 mm per day during their first spring and summer. Juvenile sablefish reside in continental shelf waters, often in bays and nearshore waters, and move deeper with age.

In the Gulf of Alaska, adult male sablefish average fork length (FL) is 69 cm and average weight is 3.4 kg. Adult females average 83 cm FL and 6.2 kg (Sigler et al. 2003). Sablefish randomly sampled from 1997 through 2010 in NSEI during ADF&G surveys had a maximum length of 111 cm for females and 95 cm for males. Survey males averaged 65 cm in FL and females averaged 71 cm FL.

Sablefish are relatively long lived. Fish over age 40 are commonly found in commercial fishery samples, and the average age of sablefish sampled from the 2010 NSEI commercial fishery is 60. The maximum reported age for sablefish in Alaska is 94 years (Kimura et al. 1998), and for NSEI, 79 years. As sablefish are difficult to age, these ages should be considered approximate (Pearson and Shaw 2004).

The current National Marine Fisheries Service (NMFS) stock assessment for the Gulf of Alaska estimates the sablefish mortality rate at 0.10 (Hanselman et al. 2010). This is similar to several other published estimates for the Gulf of Alaska (Sigler et al. 2001, Johnson and Quinn 1988), although 0.112 (Funk and Bracken 1984) has been used by federal managers in the past (Sigler et al. 2003). Hoenig's formula for estimating natural mortality yields a rate of 0.05 (5%) for NSEI sablefish (Hoenig 1983).

FISHERY HISTORY

SUMMARY

Although directed fishing for sablefish in NSEI waters was recorded as early as 1913, the majority of sablefish landed in the early 20th century were taken as bycatch in the halibut fishery (Kolloen 1944). Directed effort peaked during both World Wars. Other early harvest peaks are associated with demand from the vitamin industry (Figure 2) (Bracken 1983). The 1940s brought the beginning of localized depletions and more active fishery management in NSEI (Appendix A). After a period of decline in price and effort during the 1950s and 1960s, the sablefish export market to Japan developed in the 1970s, fueling the next period of fishery growth (Turriss 2000). Harvest has been substantial since the 1970s despite some fluctuations in price (Table 1). The primary management tools used by ADF&G and its pre-statehood predecessor Alaska Department of Fisheries (ADF) were guideline harvest ranges (GHRs) and season limitations until 1994, when the fishery became an EQS fishery. This occurred after a series of years in which the GHR was exceeded and seasons were limited to 24 hours in length. The EQS system remains in place in 2011, with 83 current participants (Table 1). The fishery has been limited to longline gear since 1981.

HARVEST AND REGULATION HISTORY, 1906–2010

Similar to the majority of early sablefish landings, the first recorded commercial sablefish landing in Southeast inside waters occurred as bycatch in the halibut fishery in 1906 (Kolloen 1944), like. Directed landings were recorded as early as 1913. Effort and prices increased during World War I, when the market name “sablefish” was introduced in favor of “black cod,” but the fishery declined after the war (Figure 2; Bracken 1983).

The 1940s saw a major spike in sablefish fishing effort (Figure 2), due in large part to vitamin industry demand for sablefish livers (Bracken 1983), and military demand for vitamin A supplements to enhance soldiers’ night vision (United Press 1942). In 1943, the price per pound for sablefish was 10 cents for the flesh, 35 cents for the viscera and \$1.65 for the liver (Kolloen 1944). The highest estimated sablefish harvest recorded in the NSEI area was in 1947, at 6.5 million round pounds. During this time, fishermen experimented with halibut gear modifications to specifically target sablefish. In 1948, the fishing vessel *Wolverine* began targeting sablefish with small-eyed hooks and 9 to 13 foot hook spacing (Bracken 1983). It was believed that the smaller hooks would reduce the loss of fish due to spin-off as the gear was hauled to the surface. The Alaska Department of Fisheries conducted a gear comparison survey in Chatham Strait in 1949 and concluded that catch per skate of sablefish was greatly improved when using the new gear compared to standard halibut gear (Edson 1954).

Along with the increased effort and efficiency that occurred during the 1940s, there were declines in CPUE and average fish weight. The fleet moved out of Frederick Sound, once a prime fishing ground, due to diminished catch, and into Chatham Strait (Figure 1). The commercial fleet expressed concern that the spawning stock was being heavily harvested and requested a season limitation (Appendix A; Kolloen 1944). The season was reduced in 1945 from year round to between mid-March and late November. ADF&G did not establish a quota.

Harvest levels and prices slumped after the 1940s (Figure 2) due to the end of the war, development of synthetic vitamins, and a surplus of sablefish meat in cold storage facilities. The fishery continued to be slow through 1971 as prices remained low (Turriss 2000), CPUE

remained low, weather reduced fishing opportunity, and development of other fisheries drew vessels away from the sablefish fishery (Bracken 1983). During the 1970s, the sablefish export market to Japan began developing and interest in sablefish fishing increased again (Turris 2000). At the same time there was a large international (Canadian and Japanese) sablefish fishery in the waters offshore from Southeast Alaska (Bracken 1983).

ADF&G shortened fishing seasons and implemented GHRs as effort escalated in the 1970s and 1980s (Figure 2, Appendix A; Bracken 1983). The fishery which had been open to both longline and pot gear was restricted to longline gear in 1981. An industry recommended harvest limit of 1 million dressed pounds was implemented in 1973. ADF&G recommended a reduction in quota to 850,000 dressed pounds in 1979 and then moved to a guideline harvest range of 500,000 to 900,000 dressed pounds in 1980 based on historic catches. Fleet effort and efficiency continued to increase and by 1984 season length was reduced to five days in NSEI. In 1985, a limited entry program was implemented for the sablefish fishing fleet in NSEI and the GHR was set at 500,000 to 1,500,000 dressed pounds. The overall operating efficiency of the NSEI longline fleet increased seven-fold after the limited entry program was established, the average number of hooks set per vessel per day increased from 4,791 in 1984 to 28,514 in 1993. In order to stay within harvest objectives, ADF&G continued to reduce the number of fishing days. Season length was reduced from 76 days in 1980 to one day in 1987. A one-day season length continued until 1993. In that year, the fleet harvested 3,640,000 dressed pounds, 2,140,000 pounds over the upper bound of the 1,500,000 dressed pound GHR.

Fishery CPUE (round pounds per hook) was low in the early 1980s, increasing in the mid-1980s with the recruitment of very strong year classes (Figure 3; Carlile et al. 2002). Due to these strong year classes the CPUE remained above 1 pound per hook from 1982 through 1993. However, the CPUE began to decline after 1993.

In an effort to improve management and to promote a safer fishery, the Alaska Board of Fisheries (BOF) adopted an EQS system for the NSEI fishery beginning in 1994 and to be reevaluated in 1997 (Appendix A). The EQS approach was recommended by a working group of industry representatives and state fisheries managers after extensive negotiations (Carroll and Brylinsky 2010, Appendix B). Under the EQS system each permit holder was given an equal share of the annual quota and the season was extended. In addition, the upper end of the GHR was increased to 3 million dressed pounds (4.76 million pounds round weight) when the EQS system was implemented. The EQS system was made permanent in 1997 based on fleet and ADF&G recommendations. Logbooks detailing catch and effort by set became mandatory (Appendix B). In 1997 the season was set in regulation from September 1 through November 15 and until 2003 the GHR was set at 1.59 to 4.8 million round pounds. Beginning in 2003 the EQS has been based on the annual harvest objective (AHO) rather than the GHR and annual EQS amounts have ranged from 10,602 to 20,787 round pounds (Table 1). EQS vary annually based on the AHO and number of permit holders for that year. Total sablefish harvest has been extremely close to the AHO since the beginning of the EQS system. (Figure 2, Table 2).

In 1994 fishery CPUE began to show a marked decline (Figure 3). Fishery CPUE continued to decline until 1998 when it leveled off at 0.50 round pounds-per-hook, the lowest fishery CPUE on record (fishery CPUE estimation began in 1980). Fishery CPUE increased from 2002 through 2004 and held steady at about 0.71 round pounds per hook from 2004 to 2006. CPUE gradually rose and peaked to 0.92 in 2008 but dropped back to 0.74 round pounds per hook in 2010.

Due to poor fishery performance over the prior five years (Figure 3) and acknowledgement of the general decline in sablefish abundance coastwide (Sigler et al. 1997), the fishery AHO was lowered 35% in 1999 from 4.8 million round pounds to 3.120 million round pounds (Figure 2). ADF&G lowered the AHO an additional 30% in 2001 to 2.184 million round pounds based on fishery CPUE trends and an ADF&G mark-recapture-based estimate of exploitation rate. The 2002 AHO was set at 2.005 million round pounds based on an exploitable biomass estimate from the 2001 mark-recapture project and adjusted for bycatch mortality estimates (Richardson and O'Connell 2002, Carlile et al. 2002). An outside review panel of fishery experts met in 2002 to discuss the ADF&G stock assessment program and suggest changes for future years (Leaman et al. 2002). AHO was not modified prior to the 2003 season (Richardson and O'Connell 2003). The biomass and $F_{40\%}$ ($F_{40\%} = 0.137$) harvest rate estimates were updated for 2004, and AHO was increased to 2.245 million round pounds. The 2005 AHO was lowered to 2.053 million round pounds based on the same $F_{40\%}$ ($F_{40\%} = 0.137$) harvest rate applied to an updated biomass estimate from the 2004 mark-recapture project. The 2005 allowable biological catch (ABC) and AHO were carried forward and used to prosecute the 2006 fishery. An updated biomass estimate and updated $F_{40\%}$ harvest rate ($F_{40\%} = 0.116$) were used for the 2007 fishery, resulting in an AHO of 1.488 million round pounds. The 2007 biomass estimate and harvest rate ($F_{40\%} = 0.116$) were both carried forward for the 2008 fishery (Dressel 2009). Despite using the 2007 biomass estimate and harvest rate for the 2008 fishery, the 2008 AHO increased relative to the 2007 AHO because the decrement for sablefish mortality during the halibut fishery was reduced due to a decrease in International Pacific Halibut Commission (IPHC) Area 2C halibut quota. The 2008 AHO was 1.508 million round pounds. The 2009 AHO was based on an updated biomass estimate from the 2008 mark-recapture project, an $F_{45\%}$ (0.104) harvest rate, and decrements for sablefish mortality in other fisheries with the addition of a decrement for sablefish harvested during the annual ADF&G longline survey. The AHO for 2009 was 1.071 million round pounds.

In 2007 ADF&G hired a consultant to evaluate stock assessment methods for NSEI sablefish. Results of this work indicated that stock level in Chatham Strait was at a low level relative to the historic unfished biomass and that harvest rates used in 2007, 2008 (0.116), and 2009 (0.104) were not sustainable (Mueter 2010). Because of these results ADF&G reduced sablefish harvest rates in NSEI. A harvest rate of $F_{50\%}$ (0.071) was used in 2010, and in 2011 (0.070).

Despite reductions in AHO, the NSEI sablefish fishery remains important to the Southeast Alaska economy. The price of sablefish has been consistently high since the EQS system began (Table 1). 1994, 1995, and 1998 were the only years in which the price was less than \$2.00 per round pound.

Permits issued for NSEI by the Commercial Fisheries Entry Commission (CFEC) have steadily increased in value over time and are among the most valuable fishing permits statewide. CFEC estimated the value of a permit to be \$287,300 at the end of 2010. Permits are not administered by ADF&G. Detailed information regarding permits and licensing may be obtained directly from the CFEC by phone at (907) 789-6150 or online at <http://www.cfec.state.ak.us>.

ALASKA BOARD OF FISHERIES CHANGES IN NSEI SABLEFISH COMMERCIAL FISHING REGULATIONS, 2003–2010

During the January 2003 Alaska Board of Fisheries (BOF) meeting several regulatory changes were adopted for the NSEI sablefish fishery, notably:

- The opening date for the fishery was changed from September 1 to August 15.
- Randomly selected permit holders may fish outside of the regular season under terms of a commissioner's permit to gather biological and catch data during years when the final AHO is determined by January 1.
- Permit holders are allowed to release healthy sablefish but are required to document the number of fish released in their logbook. All injured or dead sablefish must be retained.
- The retention of sablefish for use as bait is prohibited in state waters.
- Permit holders are allowed to carry over up to 5% of their annual EQS as an overage or underage, adopted with a May 2006 sunset provision.
- Sablefish regulations were updated to clarify data sources used by ADF&G for setting the AHO.
- Record keeping requirements for permit holders specified they must maintain inseason records of their cumulative catch and provide this information to buyers.
- Thornyhead, shortraker, rougheye and redbanded rockfish may be taken only as bycatch.

In 2006, the ability of fishermen to transfer overages was allowed to sunset because it proved to be administratively problematic and difficult to enforce. The details of the transfer requirements, such as whether the overage recipient must be at the processor to receive the overage or whether transfer agreements must be reached before fishing, were not defined clearly in regulation. While the majority of permit holders did not utilize the provision, the few transfers that were made were difficult to track in the fish ticket system. The BOF did not adopt any regulations directly affecting the commercial sablefish during the 2009 meeting. However, regulations requiring that sablefish caught by sport fishermen be reported specifically in charter logbooks and creel surveys instead of being reported as "other" species was adopted to provide improved estimates of total sablefish mortality.

PARTICIPATION

Between 1975 and 1984, sablefish fleet size ranged from a low of 46 permits in 1982, to a high of 125 permits in 1976 (Table 1). In 1985 CFEC implemented the limited entry program for the NSEI sablefish fishery with the objective that there would eventually be approximately 73 permanent permit holders. As of early 2011, CFEC has 8 cases yet to be decided. Four of these cases are currently in litigation. Of the 83 permits that may fish in 2011, 71 are permanent permits and the remainders are interim use permits. Twenty six permanent permits remain in the name of the original issuer.

RESEARCH ACTIVITIES

STOCK ASSESSMENT

Since 1988, an annual longline survey (Richardson 2003a, Richardson 2003c, Richardson 2003e, Vaughn and Sayer 2007, Vaughn 2010) has provided ADF&G with fishery independent estimates of relative abundance measured at fixed survey stations, and measurements of fish age, weight, maturity and length (AWL). Fishery and biological information available to ADF&G prior to 1988 was derived from limited ADF&G surveys, at-sea sampling on those surveys and tagging efforts which were conducted opportunistically. Additional information was obtained from voluntary logbooks or dockside interviews provided by fishermen. Survey design was modified during the early years of implementation but has been consistent since 1997 (Appendix C). Current longline survey methods are also consistent with federal survey methods, allowing for comparison of sablefish CPUE between state and federal waters (Richardson 2003a).

Mark-recapture studies to estimate sablefish biomass in NSEI have been conducted since 1997 (Carlile et al. 2002, Richardson 2003b, Richardson 2003d, and Richardson 2001). These studies involve marking and releasing a subsample of sablefish and then using the proportion of recovered marked fish among the total number of fish captured in the commercial fishery to estimate the population size and/or exploitation rate. Fish were captured using longline gear from 1997 to 1999, but in 2000 ADF&G switched to pots to capture sablefish for marking. The switch to pot gear was made because fish captured with longline gear exhibited hook shyness making them less available for recapture by the longline fishery in that year. Marking occurs in NSEI during June, and marked fish are distributed among statistical areas in proportion to the commercial catch taken from each area during the previous three years. Sablefish are caught, marked, and released across different depth strata within each statistical area, in proportion to the commercial fishery sets from the previous three years. Fishery logbooks are used to determine the distribution of commercial sets by statistical area and depth strata. Marked and unmarked fish are counted by ADF&G personnel when fish are delivered to the processors. Fishermen and fish processors are encouraged to return tags and to note the recovery location of tagged fish in exchange for rewards. (For a detailed description of mark-recapture methodology see Carlile et al. 2002, and Stahl and Holum 2011).

In addition to the estimation of population size by mark-recapture methods, other sources of information used by ADF&G to assess population condition are biological data from a subsample of fish caught in the commercial fishery and longline survey (age, weight, length, and maturity (Appendix E)), logbooks (Appendix B), and fishermen observations. Dockside port sampling began in 2000. Logbooks became mandatory in 1997 and logbook required fields increased in detail in 2003. Fishery CPUE is calculated using commercial fish ticket records and commercial logbooks, adjusting for hook spacing in the manner of Sigler 2000 (Appendix E). All these data sources can influence management decisions regarding research design and quota in subsequent years.

ADDITIONAL RESEARCH

Sablefish are known to move extensively throughout their range. State, federal, and international agencies cooperate in order to track fish movement through tagging. ADF&G maintains a database of tag and recovery locations of fish tagged with ADF&G tags. ADF&G also returns other agency tags recovered in other fisheries or on ADF&G surveys to each appropriate agency.

In 2003, a regulation was implemented allowing limited fishing for sablefish, by commissioner's permit, outside of the commercial season for research purposes. This regulation was implemented as a result of a proposal requesting that the NSEI sablefish fishing season be concurrent with that of the federal Individual Fishing Quota (IFQ) halibut fishery, and because ADF&G did not have any data on stock condition during the first half of the proposed season. In 2004 and 2005 permit holders were randomly selected from a list of permit holders who expressed interest in fishing in winter and spring under terms specified by the commissioner for the purpose of gathering fishery and biological information outside of the commercial NSEI season. An ADF&G observer was on board each vessel to facilitate bycatch accounting and sablefish sampling, and to scan for passive integrated transponder (PIT) tags released by ADF&G the previous season.

Fishing was poor in January and early February during the experimental fisheries. Sablefish were less available to the gear than during the commercial NSEI sablefish season and there was a greater proportion of immature fish present. Potential hypotheses for the high proportion of immature fish in the catch were that mature sablefish were present but spawning and uninterested in the gear, mature fish were not residing in Chatham during spawning, or dogfish were outcompeting sablefish for the hooks. Of the mature fish that were caught, most were sexually mature. There was extremely high dogfish bycatch during January and February, and dogfish outnumbered sablefish on some sets.

Experimental fishery catch rates improved after late February and a greater proportion of large, mature fish were captured. In 2005, the experimental fishery tended to catch more, and smaller, males compared to the commercial fishery. The mean fork length of males was 64 cm in the experimental fishery and 65 cm in the commercial fishery, while it was 72 cm for females during both seasons.

To increase detection rate of marked fish landed, allow estimation of abundance by size strata, and increase efficiency of the recapture phase, ADF&G conducted a study to evaluate the use of PIT tags to mark sablefish in 2004. These are internal tags that can be automatically detected by receivers installed in processing plants. In June 2004, using a chartered pot vessel, ADF&G marked 6,357 sablefish with PIT tags in addition to external marks. Recovery of the PIT tags took place in Sitka throughout the 2004 season. Adequate detection rates could not be achieved and it was determined that the data gathered through PIT tag employment did not justify the cost.

A research study was performed by ADF&G to determine the accuracy of macroscopic maturity staging of sablefish (Appendix E). In August 2007 ovary samples and data including fork length, weight, and maturity stage were collected from 215 female sablefish during the ADF&G longline survey in NSEI. Maturity stage was determined based on gross morphology, such as color and size of the ovary and egg visibility. Ovary samples were preserved and later prepared for histological analysis by staining, embedding in wax, and thin slicing. Samples were then examined under a microscope to determine the maturity stage of each ovary. The maturity classification assigned based on microscopic analysis was compared to the macroscopic classification determined during the survey. The analysis confirmed macroscopic maturity staging is appropriate for assessing maturity. However, it is notable that at least half of the sablefish at the "maturing juvenile" stage appeared to be ready to spawn in the approaching season, as expected, but half of them may not spawn until the following spawning season.

In an effort to reduce the department's testfish harvest in NSEI, ADF&G allowed three permit holders to harvest their personal quota share (PQS) during the department's annual NSEI longline survey. The decrement for sablefish anticipated to be harvested in the 2010 NSEI longline survey was reduced by the deduction of the round pound equivalent of the estimated permit holder's equal quota share (EQS). The department testfish harvest decrement was reduced by 33% than in recent years without permit holders harvesting their PQS during the survey.

2010 COMMERCIAL FISHERY

COMMERCIAL FISHERY

AHO for the 2010 NSEI sablefish fishery was 1,063,000 round pounds. The AHO was reduced slightly from the 2009 level due to a decrease in biomass and the use of a more conservative harvest rate than was applied in 2009.

EQS increased slightly in 2010 to 12,218 round pounds because of a reduction in the number of permit holders participating in the fishery and a change in method of accounting for ADF&G test fishery harvest. Total commercial harvest in 2010 was 1,054,276 round pounds, 99.2% of the AHO (Table 2). Total amount of Personal Quota Share (PQS) that could legally be harvested after accounting for legal overages and underages from the 2009 season was 1,058,362 pounds. There were 87 eligible permit holders in 2010, one less than in 2009 (Table 1). PQS are calculated to accommodate overages and underages from the previous year. Prior to the start of the commercial fishery ADF&G notified each permit holder of the number of pounds that would be added to or deducted from their 2010 season EQS. For 2010, the maximum amount that could be carried forward from 2009 was 609 round pounds, and the maximum amount that could be carried forward from 2010 was 611 round pounds (Table 2). Thirty-seven permit holders reported legal overages in 2010 totaling 11,687 round pounds. There were six permits with illegal overages, totaling 2,061 round pounds. Since the overage/underage provision was created in 2003, the amount of pounds landed illegally has fluctuated. The highest amount of pounds landed illegally since 2003 was 9,248 in 2005 and the lowest was 1,100 in 2003. In the years immediately prior to the overage/underage provision, over 10,000 round pounds of sablefish were landed illegally per year.

The average ex-vessel price reported at the time of landing for NSEI sablefish in 2010 was \$4.06 per round pound, up from \$3.34 in 2009. This yielded an ex-vessel value of approximately \$4.3 million dollars for the total harvest.

In 2010, 87 permit holders using 65 vessels made a total of 107 landings (Table 2). Seventy-five percent of permit holders made one landing and 24% made two landings. Over 52% of vessels that participated in the 2010 fishery have participated each of the past 10 years. Since implementation of the EQS system in 1994, the number of vessels participating in the fishery has decreased 42% and the number of permits has decreased 28%.

In 2003, start date of the NSEI fishing season was changed from September 1 to August 15. This change in season has had the effect of slowing participation on opening day (Table 2). The 2010 NSEI sablefish fishery opened at 8:00 a.m. August 15 and remained open, by regulation, through noon November 15.

The majority of the NSEI harvest continues to occur in two ADF&G statistical areas in central Chatham Strait, 345631 and 345701 (Figures 4 and 5). In 2010 the combined harvest from these

two statistical areas represented 69% of the total harvest, a slight increase from 68 % in 2009, and a decrease from 75% in 2008.

In 2010, the majority of landings (51%) were made in Sitka, 23% were made in Petersburg and 16% in Juneau. Small portions of the catch were landed in Hoonah and Wrangell, and processed onboard a floating catcher/processor.

The distribution of landings has changed since 2001. In 2001, 42% of sablefish landings were made in Petersburg and 32% were made in Sitka. Since then, the proportion of Petersburg landings has decreased each year except 2007 and 2008, and the proportion of landings in Sitka has increased every year except for 2009. The proportion of the catch landed in Juneau has fluctuated around an average of 15%, and in Hoonah around an average of 7%. At least one landing has been made in Kake, Wrangell, Ketchikan, Excursion Inlet, Pelican, at floating processors, at other Alaskan ports, or in Bellingham, WA since 2001. Landings at these minor ports make up less than 10% of the total landings every year. Landings made outside of Alaska require coordination with additional agencies and additional permits (Appendix C).

In 2010, less than 95% of the harvest was landed round, while over 5% was landed eastern cut similar to the 2007 through 2009 seasons. About 2,997 pounds in 2010 and 2,336 in 2009, or 0.22%-0.28% of the total commercial harvest each year, were retained as personal use. The proportion of the commercial catch reported to be retained for personal use has been gradually increasing since 2004.

CPUE

Both conventional and snap-on longline gear are used in the NSEI sablefish fishery. Over 90% of the hooks in this fishery are set using conventional gear. If not standardized for hook spacing, snap-on gear has a consistently higher CPUE than sets using conventional gear because of the considerably wider hook spacing. On the same trip, gear with different hook spacing is used for different sets. Fishery data are complex, and several steps were taken to filter fishery logbook data during 1997–2010 prior to inclusion in a general linearized model (GLM). The goal of the GLM was to provide a relative abundance index for sablefish.

First, hook spacing was standardized to 1m (Appendix D) to be comparable to survey CPUE. Second, fish-ticket landings by trip were apportioned to estimate landings by set. Third, sets shallower than 450 m were excluded.

In the second step, some sets where fishermen may have been targeting halibut rather than sablefish were excluded. Many sablefish permit-holders also own halibut permits, and thus make sablefish-target and halibut-target sets on a single trip. Excluding shallow sets can result in a higher CPUE than using sets across all depth ranges because shallow sets generally have lower sablefish catch rate. In order to create a relative abundance index that performs similarly across years, rather than an absolute index that may be affected by changes in fishery behavior (number of dual-target sets and target specification) or management actions over time, sets with target species other than sablefish were excluded from the sablefish fishery CPUE calculations. Although there is a “set target” field in the logbook, fishermen may record the target species as the species that was caught in the highest abundance rather than the originally-intended target. Using these incorrect set targets may positively bias CPUE. Halibut are generally found at shallower depths than sablefish, and a threshold depth of 450 m was used to exclude possible

halibut-target sets from sablefish-target sets. The threshold depth was based on the catch ratio of halibut to sablefish of all sets during 2007–2010; this excluded about 14% of the sets.

In recent years, fishery CPUE was at a relative low in 2000 of 0.44 round pounds per standardized hook, stabilized from 2004–2006, and then increased through 2008 (Figure 3). Since 2008 (0.89 round pounds per standardized hook), fishery CPUE has dropped to 0.78 in 2009 and 0.73 round pounds per standardized hook in 2010. CPUEs for 1999–2010 are still well below the extremely high CPUEs of the early 1980s that were supported by exceptionally strong year classes.

In addition to fishery CPUE, longline survey provides a fishery-independent abundance index. Longline survey was stratified by statistical area in NSEI. In each statistical area, a number of stations were randomly chosen. These fixed survey stations are fished each year. Two different hook spacings have been used on the Chatham Strait sablefish longline survey over the time period 1988–2010 (3 m hook spacing from 1988 to 1996 and 2 m hook spacing from 1997 to 2010). Hook spacing was also standardized to 1 m the same method used for fishery data. The 2010 and 2009 longline survey CPUE was 1.72 and 1.77 round pounds per hook respectively, a decrease from 1.79 in 2008 and the same in 2006, but lower than the 2005 CPUE of 1.97 round pounds per hook. The lowest survey CPUEs of the past ten years were 1.15 in 1999 and 1.11 in 2000 (Figure 3). Due to the difference in soak time between the time periods 1988–1996 (1-hour soak) and 1997–2010 (greater than 3 hour soak), CPUE from 1988 to 1996 was adjusted using the factor 0.43. The adjustment factor was calculated based on soak-time comparisons during the 1995 longline survey (Carlile et al. 2002).

Fishery CPUE has historically been lower than survey CPUE. Unlike the fishery where all discards are not fully accounted for, all catch on surveys is accounted for including fish that are small, predated, lost, etc., thus resulting in a higher CPUE. Other influencing factors may be that the skippers of the contracted vessels typically have extensive fishery experience, and the inclusion of dual target halibut trips are not influencing the results of the CPUE for the surveys as they do in the fishery.

BIOLOGICAL DATA

Biological data (age, weight, length, and maturity) are collected both from the fishery and survey. Fishery length frequency distribution has narrowed (i.e. fewer age classes are contributing to the catch) and length frequency mode has shifted to the right over time (Figures 6–7). Average fork length of harvested fish has increased from 67 cm in 2002 to 71 cm in 2007 through 2010. Length data have been separated by sex since 2002, and female and male length frequency distributions show the same trend as the overall fishery length distributions, although the trend is more apparent for females. (Figure 8). Length frequency data collected on the survey show a similar narrowing and shifting to the right over the same time period (Figures 6–7). Although smaller fish are caught on the survey than the in fishery due to the absence of high grading of small fish on the survey, strong recruitment has not been observed in either the survey or fishery since 2002.

Age data has been collected in the NSEI fishery since 2002. Similar to length distribution, commercial fishery age distribution has narrowed between 2002 and 2010 (Figure 9). The mode of the most abundant age-class in the fishery has increased from 7-year olds in 2002 to 9-year olds in 2007 to 12-year olds fish in 2010 (Figure 9).

There is a longer record of age samples from the longline survey than the commercial fishery. In the late 1980s, the age frequency histograms are narrow, but there is still evidence of older age classes in the survey. Age distributions in the 1990s show strong recruitment and a broad range of ages in the population (Figure 10). There is no evidence of strong recruitment after 2003–2010, and there are fewer age classes overall (Figure 10).

The sex ratio of the survey and of the fishery samples has varied since 2002, the first year from which sex data are available. The percentage of males in the regular season fishery decreased from 45% in 2002 to as low as 32% in 2005, up to 36% in 2006, although it remained steady around 34% through 2009 until an increase was seen in 2010 back to 36%. Longline survey sex ratio has also changed but not as dramatically, decreasing from 54% in 2002 to 41% male by 2009, increasing in 2010 to 47%. By comparison, the sex ratio data for sablefish sampled on the mark-tag pot survey was 45% male in 2002 and 37% male in 2009. Biological samples were not taken on the 2010 mark-tag survey. The longline survey may provide a more complete picture of the NSEI sablefish population than the fishery as the survey samples all of the exploitable population (i.e. individuals that are available to gear) and is constrained to random fixed stations through time. The fishery tends to select for larger fish (i.e. female fish) and differences in fishing effort location and depth from year to year may influence sex ratios of fish landed in the fishery. Longline gear generally selects for larger fish than does pot gear and females reach a larger maximum size and grow faster than males. Maturity data from port sampling has shown a steady decline in the proportion of immature and developing fish from 25% in 2002 to 3% in 2009 although in 2010 the proportion rose to 5% (Appendix E).

The average round weight of fish sampled from the 2010 commercial fishery was 8.8 lbs, the first decrease in average weight in 5 years. Average weight was stable at 9.0 lbs from 2007 through 2009.

FISHERY BYCATCH

There were 53,966 round pounds of thornyhead (*Sebastolobus alascanus*), 7,195 round pounds of shorttraker (*Sebastes borealis*), and 4,692 round pounds of rougheye (*Sebastes aleutianus*) rockfish landed as bycatch in the 2010 NSEI sablefish fishery (Figure 12). Other bycatch species landed, in order of abundance, were Pacific cod (*Gadus macrocephalus*), arrowtooth flounder (*Atheresthes stomias*), redbanded rockfish (*Sebastes babcocki*), yelloweye rockfish (*Sebastes ruberrimus*), tiger rockfish (*Sebastes nigrocinctus*) and quillback rockfish (*Sebastes maliger*). There were 4,472 round pounds of pacific cod, 1,282 round pounds of arowtooth flounder, 626 round pounds of redbanded rockfish, a little over 370 round pounds of yelloweye rockfish and less than 50 round pounds of each of the other species landed during the fishery. Skates (*Rajidae*), Dover sole (*Microstomus pacificus*), additional quantities of arrowtooth flounder and other flatfish, and Pacific sleeper sharks (*Somniosus pacificus*) are also caught as bycatch but are typically discarded at sea.

The combined total of thornyhead, shorttraker, and rougheye rockfish round pounds landed on trips targeting sablefish has been between 5% to 7% of the round pounds of sablefish landed on sablefish target trips since 2003 (Figure 11). This is a decline from 7% in 2002, 10% in 2001, and a peak of 15% in 2000. Prior to 2003, fish caught in excess of sablefish bycatch limits could be landed and sold on CFEC miscellaneous finfish interim use permits. Fish were considered bycatch in the sablefish fishery in this report if they were caught during trips in which sablefish

were targeted, regardless of the permit on which they were landed. In 2003, BOF required shortspine thornyhead, rougheye, and shortraker rockfish to be bycatch-only species.

Since July 2000, a full retention policy has been in place requiring all *Sebastes* rockfishes caught to be landed and weighed. Shortspine thornyhead (*Sebastolobus*) are not included in this requirement because they do have open swim bladders, do not incur embolism mortality, and can be released alive. *Sebastes* rockfish in excess of bycatch limits can be sold with the proceeds forfeited to the state or may be either retained for personal use or donated.

The catch of sharks or skates can occasionally be high, but the true magnitude of the bycatch is unknown because counts are estimated and fish are not weighed before being discarded. In addition, reporting diligence of at-sea discards is variable. Sharks and skates are rarely retained due to limited market interest.

Halibut are also taken in the sablefish fishery and are required to be landed as part of a permit holder's halibut IFQ if they have remaining IFQ quota available and the halibut is of legal size. If landed, they are considered a target species in a dual fishery.

2011 COMMERCIAL FISHERY

The 2011 NSEI sablefish fishery opened August 15 at noon and will run through noon on November 15. There are 83 permit holders eligible to fish during the 2011 season.

2011 ACCEPTABLE BIOLOGICAL CATCH

Sablefish biomass at the time of the 2010 commercial fishery in Chatham Strait was estimated using mark-recapture methods and the Petersen estimator. From this estimate, a forecast of biomass at the time of the 2011 fishery was developed by decrementing for natural mortality, adding for recruitment of age-4 sablefish in 2011, accounting for increased selectivity of cohorts from 2010 to 2011, and converting to biomass. As in 2010, a $F_{50\%}$ biological reference point was used to determine the 2011 ABC. The 2011 updated $F_{50\%}$ harvest rate (0.070) was applied to the point estimate of the 2011 forecasted biomass to obtain the 2011 ABC (1,046,873 round lb). The 2011 $F_{50\%}$ harvest rate was nearly identical to that of 2010 (0.071). Due to the similarities in harvest rate between years, the reduction in 2011 ABC is primarily due to a decrease in sablefish biomass in Chatham Strait.

For a detailed reporting of the stock assessment methods, refer to Dressel (2009). The methods outlined in Dressel (2009) were used for setting the 2007 NSEI sablefish AHO, but are similar to those used for 2011.

2011 ANNUAL HARVEST OBJECTIVE

The commercial AHO for 2011 is 880,000 round lb. In 2011, as in previous years, the AHO is determined after the department calculates the decrements to the ABC for sablefish mortality estimated from non-directed commercial harvest. Decrements for 2011 are listed in Table 3.

The EQS for 2011 is 10,602 round pounds (Table 3). PQS allowed for each permit holder fishing in 2011 is a combination of the 2011 EQS and the amount debited or credited based on their legal overage/underage during the 2010 fishery. The maximum amount of underage carried over to 2011 from 2010 was 611 round pounds.

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TABLES

Table 1.—Number of permits and vessels, catch, Equal Quota Share (EQS), and price in the NSEI sablefish fishery, 1975–2010.

Year	No. permits ^a	No. vessels	Round lbs landed ^b	EQS	Average price /round lb ^c
1975	110	—	984,179	—	—
1976	125	—	970,313	—	—
1977	95	—	559,031	—	\$0.70
1978	80	—	788,523	—	\$0.72
1979	110	—	1,190,356	—	\$0.76
1980	65	—	881,469	—	\$0.42
1981	53	—	710,147	—	\$0.58
1982	46	—	804,004	—	—
1983	68	—	1,165,871	—	—
1984	86	—	1,329,072	—	\$0.25
1985	105	107	2,951,056	—	—
1986	138	144	3,874,269	—	\$0.74
1987	158	163	3,861,546	—	\$0.91
1988	149	147	4,206,509	—	\$1.08
1989	151	149	3,767,518	—	\$0.77
1990	121	119	3,281,393	—	\$1.08
1991	127	122	3,955,189	—	\$1.74
1992	115	115	4,267,781	—	\$1.75
1993	120	114	5,795,974	—	\$0.97
1994	121	112	4,713,552	38,889	\$1.94
1995	121	116	4,542,348	38,889	\$1.70
1996	121	118	4,672,701	38,889	\$2.12
1997	122	111	4,753,394	39,300	\$2.43
1998	116	106	4,688,008	41,700	\$1.57
1999	112	98	3,043,273	28,000	\$2.18
2000	111	93	3,082,159	28,600	\$2.40
2001	111	87	2,142,617	19,600	\$2.13
2002	109	86	2,009,380	18,400	\$2.40
2003	108	88	2,001,643	18,565	\$2.39
2004	108	88	2,229,954	20,787	\$2.03
2005	106	82	2,026,131	19,400	\$2.49
2006	105	80	2,033,786	19,550	\$2.69
2007	103	77	1,501,478	14,500	\$2.67
2008	96	71	1,513,040	15,710	\$3.15
2009	88	69	1,071,554	12,170	\$3.34
2010	87	65	1,054,276	12,218	\$4.06
2011 ^d	83	—	880,000	10,602	—

^a Prior to 1985 there was not a NSEI sablefish permit card so the number of permits includes sablefish landings made on permit cards for other fisheries. Permit cards were not issued prior to 1975.

^b Records from prior to 1985 are incomplete; harvest levels were approximated using a variety of sources.

^c Based on price recorded on fish ticket at time of landing. Initial dock price adjustment payments are included though coop prices are preliminary.

^d Data for 2011 is preliminary and incomplete.

Table 2.—Summary of NSEI quota share fishery, 2002–2010. All fish quantities are in round pounds.

	2010	2009	2008	2007	2006	2005	2004	2003	2002
Annual Harvest Objective (AHO)	1,063,000	1,071,000	1,508,000	1,488,000	2,053,000	2,053,000	2,245,000	2,005,000	2,005,000
Equal Quota Share (EQS)	12,218	12,170	15,710	14,500	19,550	19,400	20,787	18,565	18,400
Sum of Personal Quota Shares ^a (PQS)	1,058,362	1,065,276	1,503,937	1,498,133	2,053,122	2,061,422	2,241,338	n/a	n/a
Allowable over/underage	611	609	786	723	978	970	1,039	n/a	n/a
Total directed harvest	1,054,276	1,071,554	1,513,040	1,501,478	2,033,786	2,026,131	2,229,954	2,001,643	2,009,380
Percentage of AHO harvested	99.2	100.1	100.3	100.9	99.1	98.7	99.3	99.8	100.2
Illegal overages	2,061	2,408	3,155	5,254	1,989	9,248	2,402	1,100	17,459
Permits with illegal overages	6	6	7	10	4	10	9	4	40
Legal overages	11,687	13,378	20,545	18,332	16,009	27,861	25,479	21,821	—
Permits with legal overages	37	41	50	45	39	45	46	49	—
CFEC permits eligible for EQS	87	88	96	103	105	106	108	108	109
CFEC permits fished	87	88	96	103	105	106	108	108	109
Permanent permits	71	59	54	43	41	41	41	40	39
Interim use permits	12	29	42	60	64	61	67	68	70
Permits under court appeal	4	4	4	4	4	4	5	4	—
Total number of vessels	65	69	71	77	80	82	88	88	86
Number of trips	107	114	123	140	175	168	203	—	—
Average no. landings per permit ^b	1.4	1.7	1.5	1.6	1.9	1.9	2	2.1	2.1
Permits finishing in one trip	63	57	55	61	44	49	44	41	34
Permits finishing in two trips	21	19	34	27	42	37	39	36	48
Vessels fishing opening day	10	12	12	16	20	38	26	25	52
CPUE standardized for hook spacing (rnd lbs/hook)	0.73	0.78	0.89	0.81	0.71	0.71	0.71	0.75	0.63
Average price of NSEI sablefish	\$4.06	\$3.34	\$3.15	\$2.67	\$2.69	\$2.49	\$2.03	\$2.39	\$2.40
Fishery ex-vessel value in millions	\$4.3	\$3.5	\$4.7	\$4.0	\$5.4	\$5.0	\$4.5	\$4.8	\$4.8

^a PQS is the EQS adjusted for each permit holder's use of the 5% overage/underage provision.

^b Number of landings is approximate.

Table 3.–Decrement types and amounts for 2011. Estimated catch is in round pounds of sablefish.

Decrement type	Approx. % of 2011 ABC	2011 Estimated Catch
Sablefish mortality in halibut fishery	5.6%	59,128
Testfish harvest (excluding permit holders)	4.9%	50,866
Sport-charter harvest	3.0%	31,109
Subs/ pers. use/non-guided sport harvest/removals in non-halibut fisheries	2.5%	26,172
Total Decrements		167,275
AHO*		880,000
# Permit Holders		83
EQS		10,602
% Decrease in EQS from 2010		-13%

*AHO is rounded to the nearest 1,000 round pounds.

FIGURES

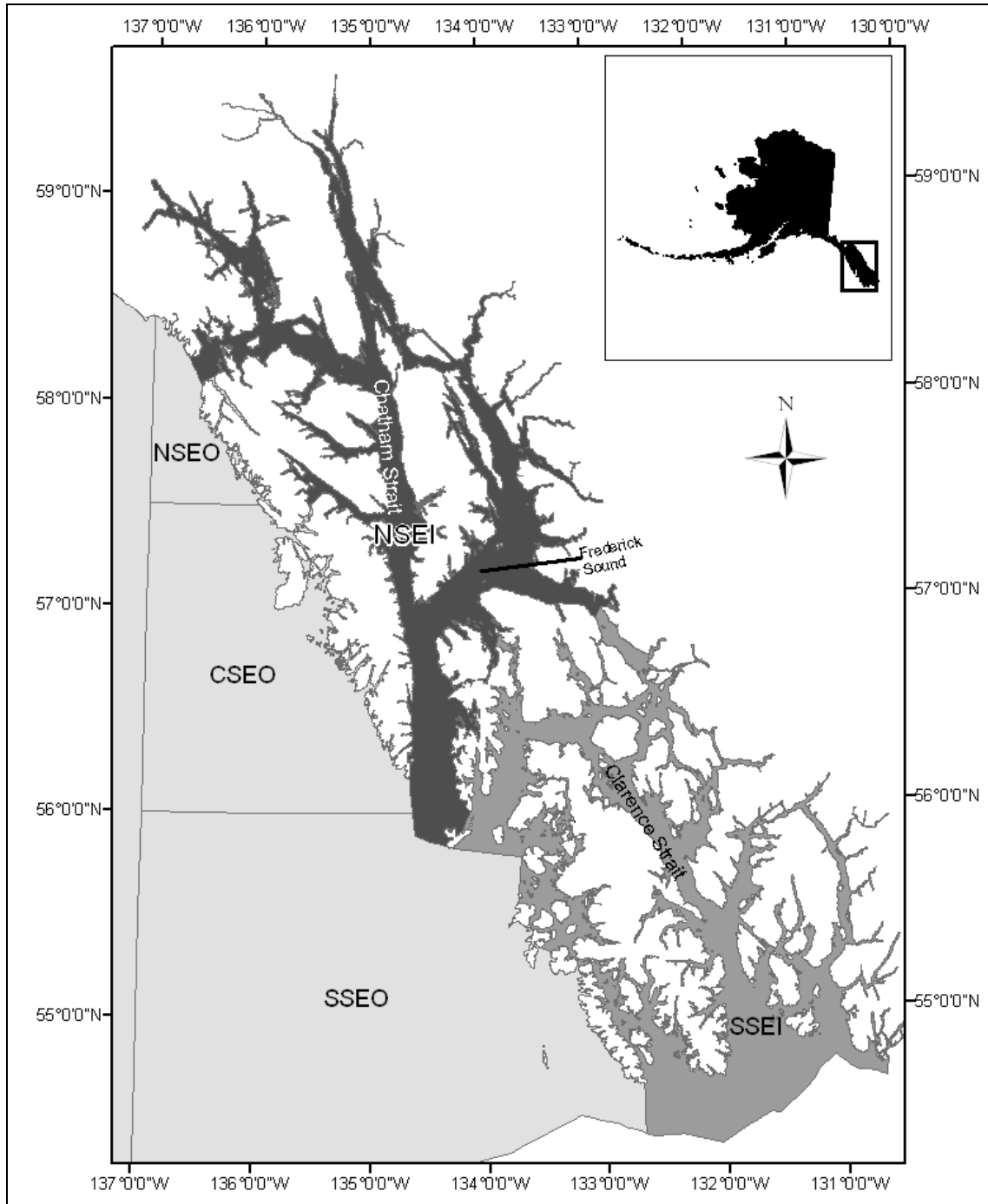


Figure 1.—Management areas for the state managed sablefish fisheries in Southeast Alaska, including Northern Southeast Outside (NSEO), Northern Southeast Inside (NSEI), Central Southeast Outside (CSEO), Southern Southeast Outside (SSEO), and Southern Southeast Inside (SSEI).

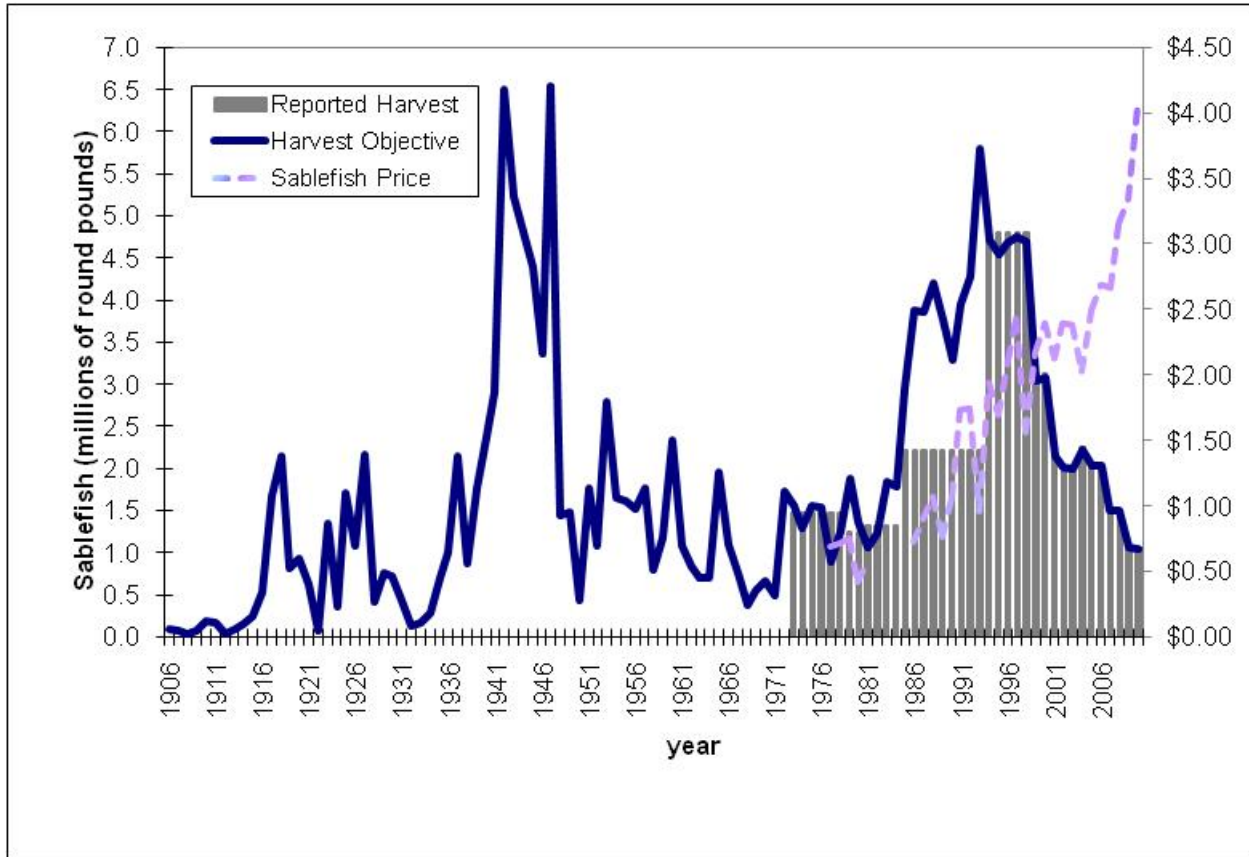


Figure 2.—Northern Southeast Inside (NSEI) sablefish reported catch and annual quota, 1906–2010, and average price per pound, 1977–2010. Records from prior to 1985 are incomplete; harvest levels were approximated using a variety of sources.

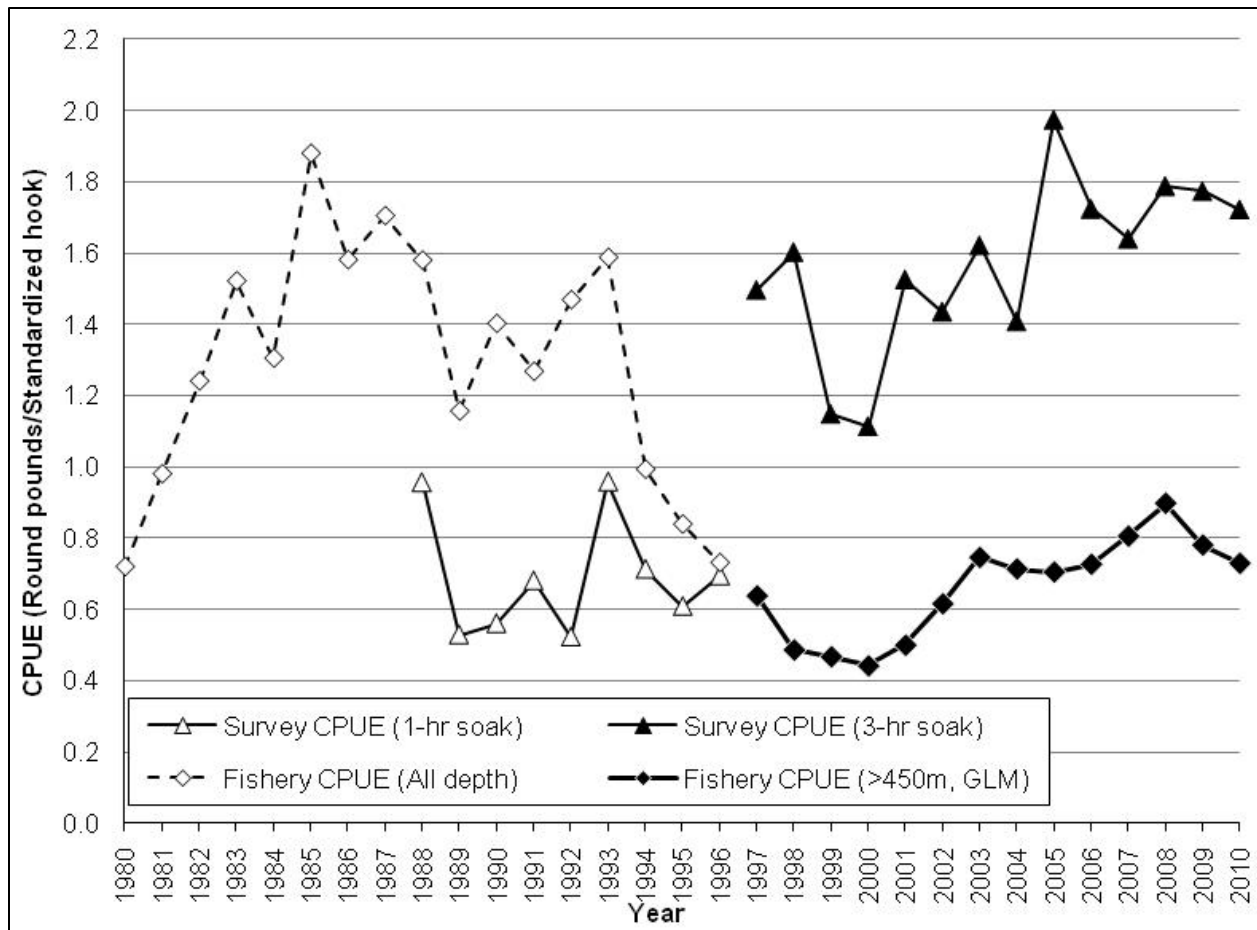


Figure 3.—Northern Southeast Inside (NSEI) commercial sablefish fishery and Alaska Department of Fish and Game (ADF&G) Chatham Strait longline survey CPUE, 1980–2010.

Note: Data used to estimate commercial fishery CPUE from 1997–2010 are from mandatory logbooks and fish tickets. Fish delivery condition (round vs. dressed) is documented on the fish ticket. For years 1997–2000 sets with no record of hook spacing or mixed hook spacing (about 5% of sets) were not included. Verification of some records from 1997–2001 is still underway. Data used to estimate commercial fishery CPUE from 1985–1997 are from voluntary dockside interviews and fish tickets. Fish delivery condition and hook spacing records are incomplete from this period. Landings where fish delivery condition or hook spacing could not be determined were excluded. Conversions were made to standardize j-hooks, which were obsolete by the mid-1980s, to circle hooks, currently used by the fleet. Fish catches caught with j-hooks were multiplied by 1.5 (Appendix D). Catch and effort data from prior to 1985 are estimated from a variety of records, some incomplete. Conversions were made to standardize j-hooks to circle hooks. Longline survey soaks during the 1988–1996 surveys were 1 hour long, as opposed to 3–11 hours long during 1997–2010.

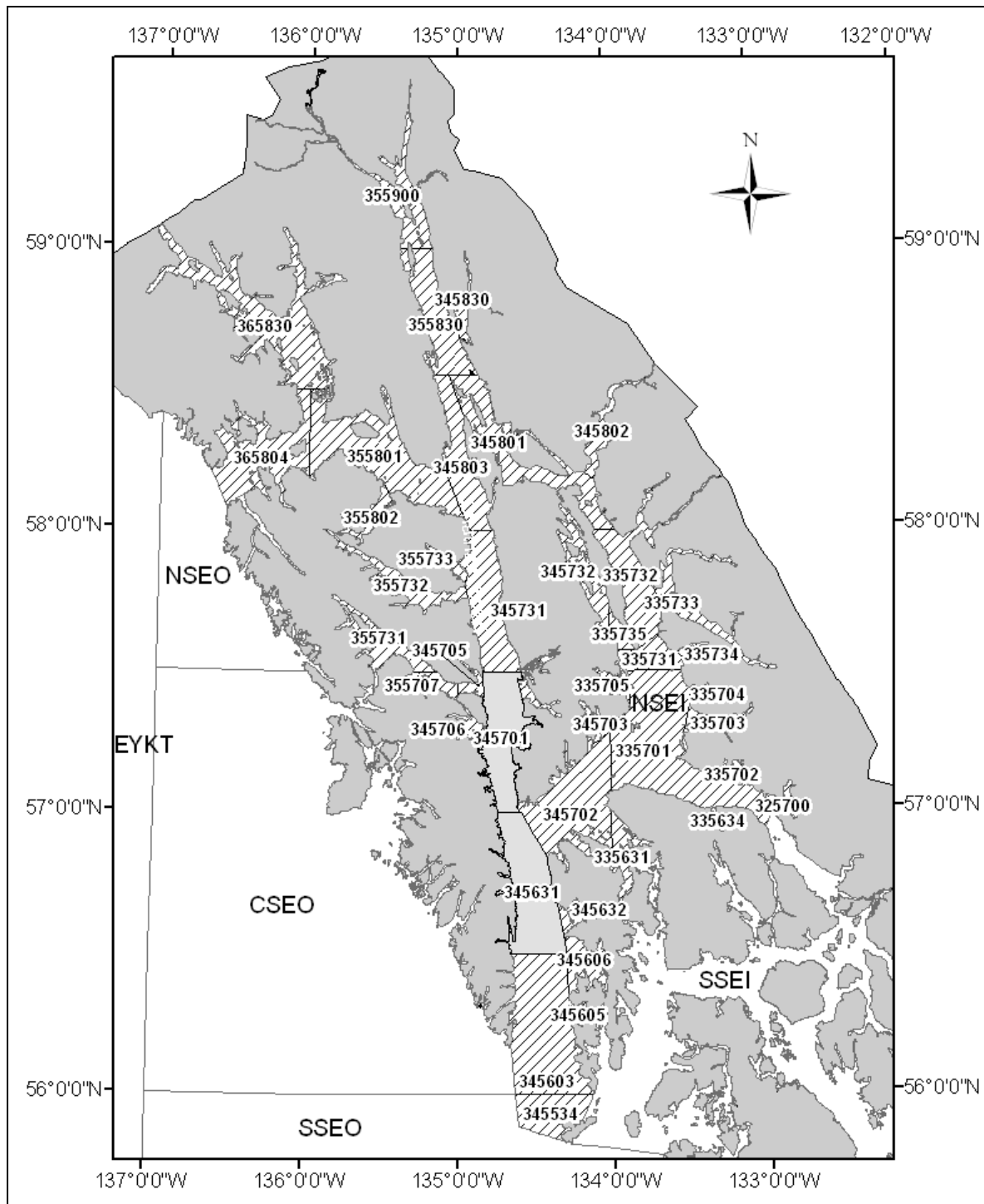


Figure 4.—Alaska Department of Fish and Game groundfish statistical areas in Northern Southeast Inside (NSEI). The majority of the harvest comes from statistical areas 345631 and 345701 which are shaded, with the remainder of the NSEI areas shown with stripes.

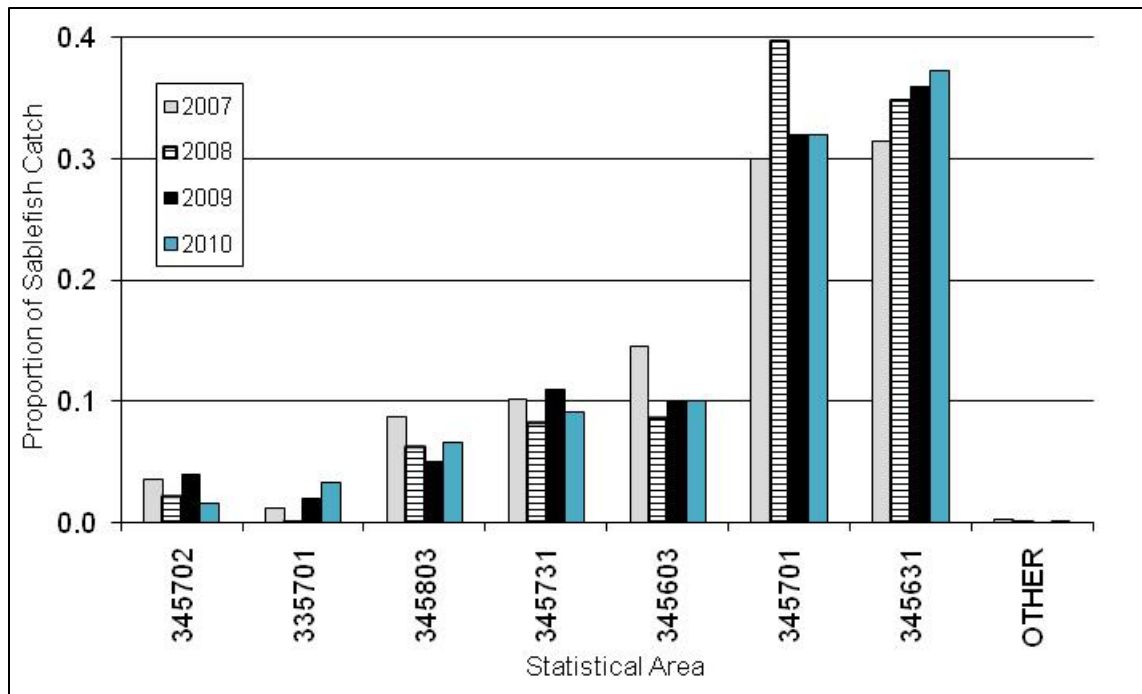


Figure 5.—Northern Southeast Inside (NSEI) sablefish fishery harvest distribution by statistical area and year, from 2007 to 2010. There was no commercial harvest in statistical areas 335731, 335732, 345705, 345534, 345706, 355707, or 365804 between 2006 and 2010. “OTHER” is combined sablefish harvests from statistical areas 355801, and 355830.

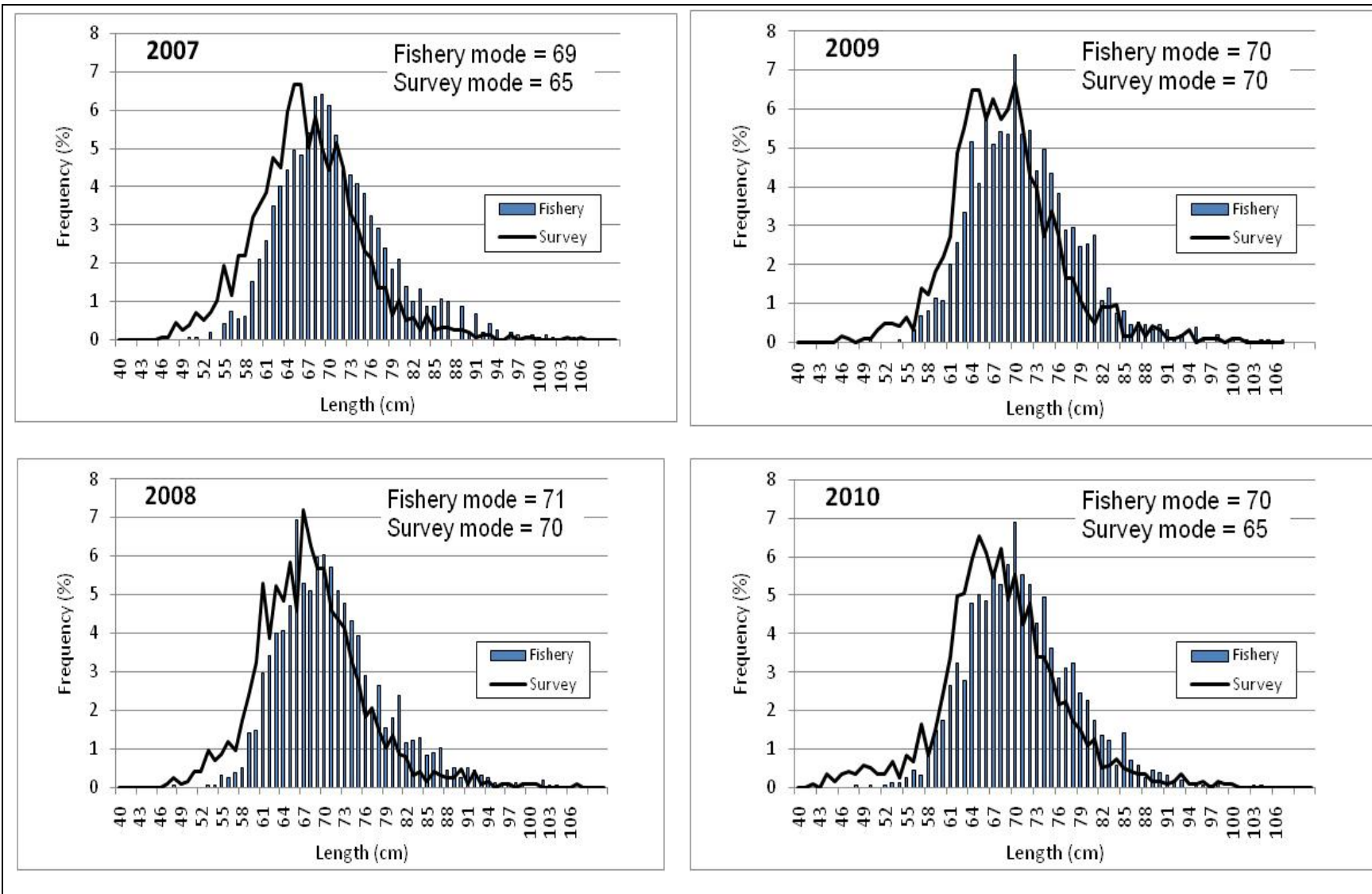


Figure 6.—Northern Southeast Inside (NSEI) sablefish fishery and survey length frequency distribution, 2007–2010.

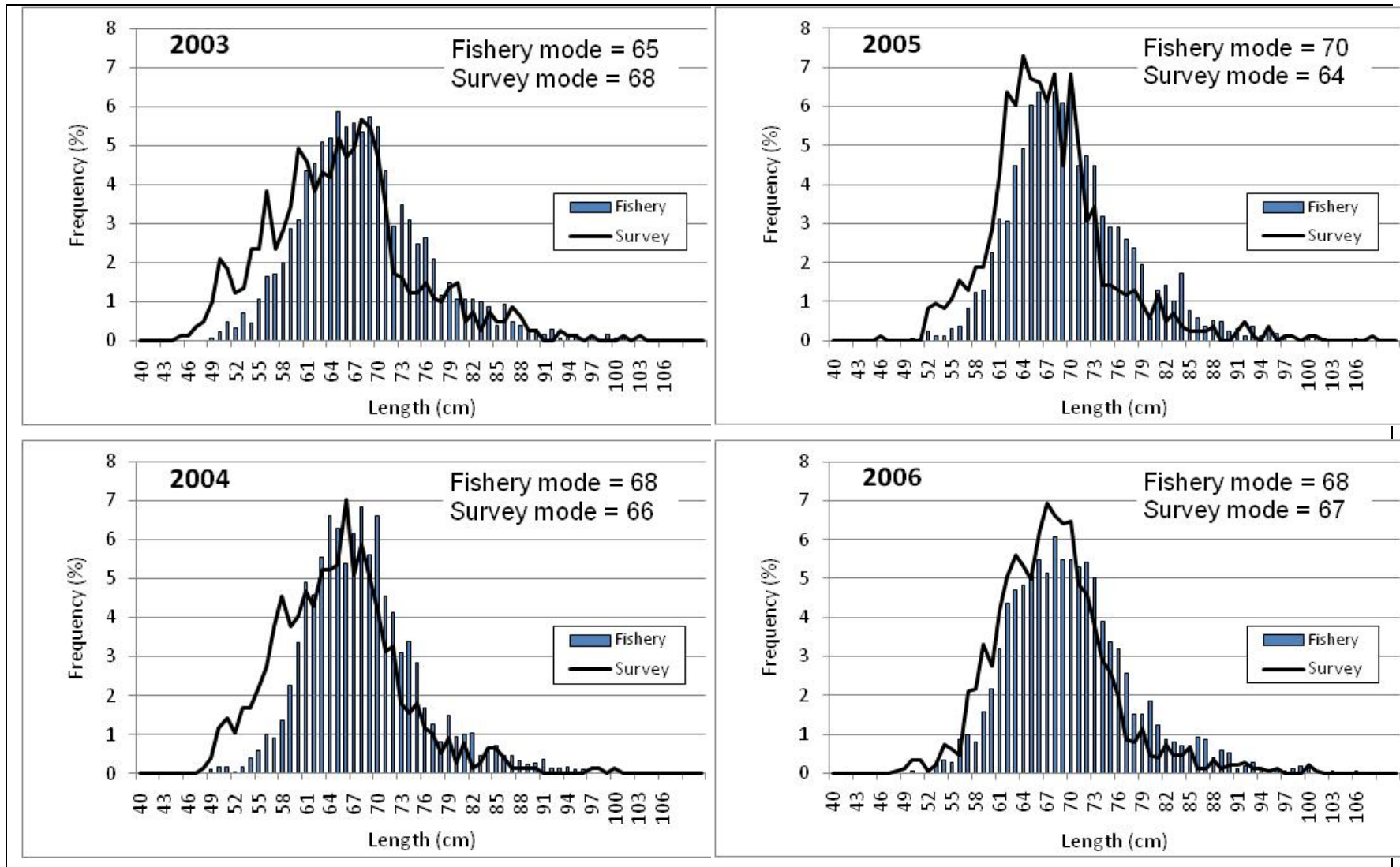


Figure 7.—Northern Southeast Inside (NSEI) sablefish fishery and survey length frequency distributions, 2003–2006.

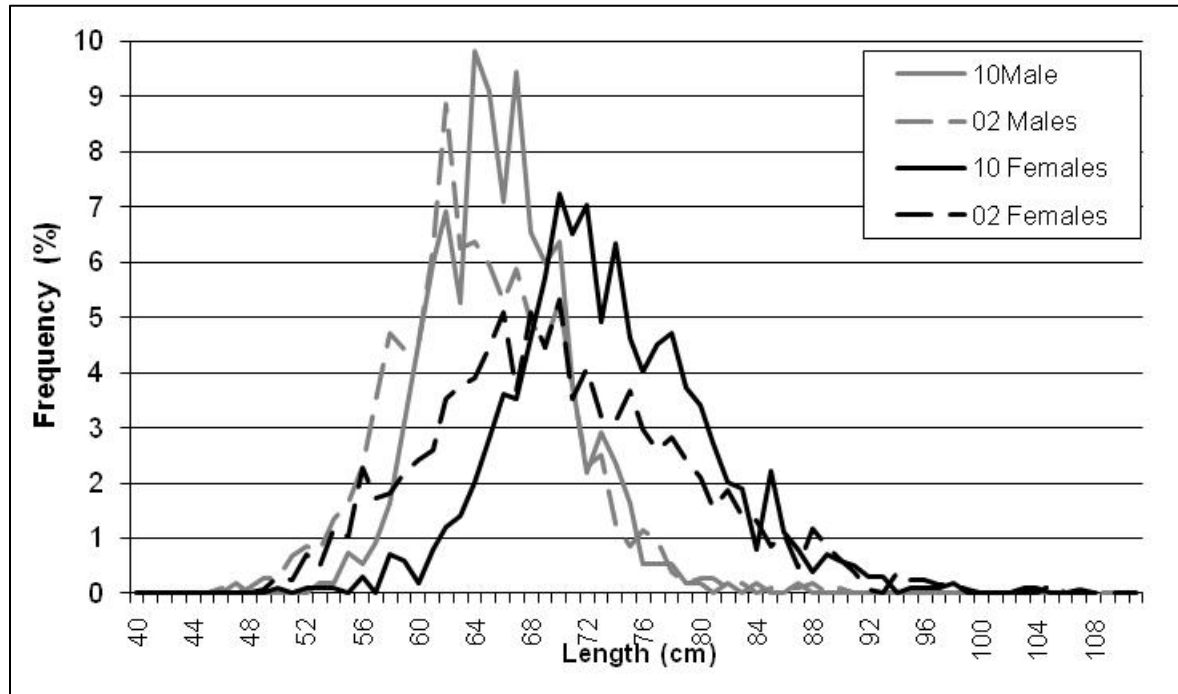


Figure 8.—Northern Southeast Inside (NSEI) sablefish fishery length frequency distributions of male and female sablefish in 2010 and 2002.

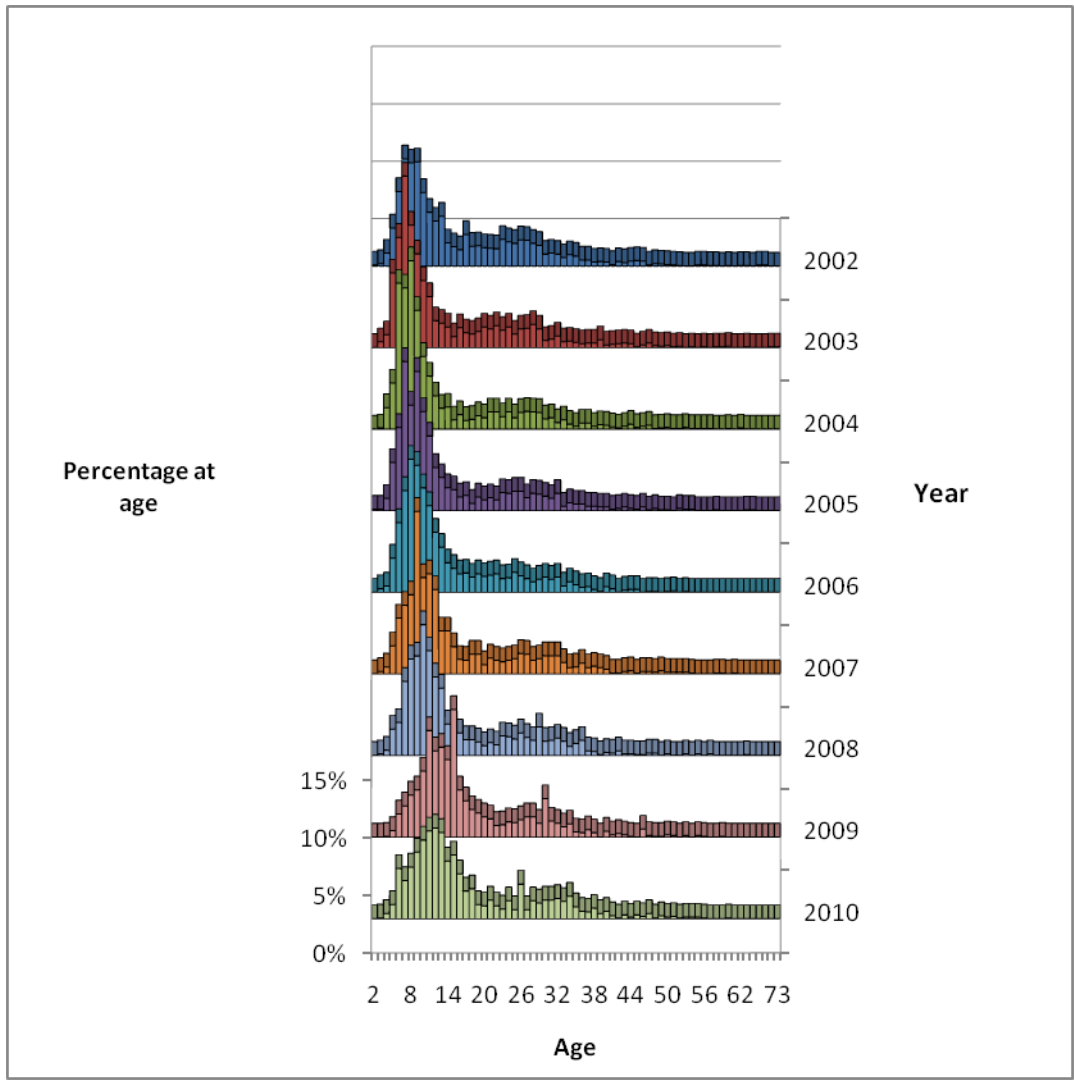


Figure 9.—Northern Southeast Inside (NSEI) sablefish fishery age frequency distributions, 2002 to 2010.

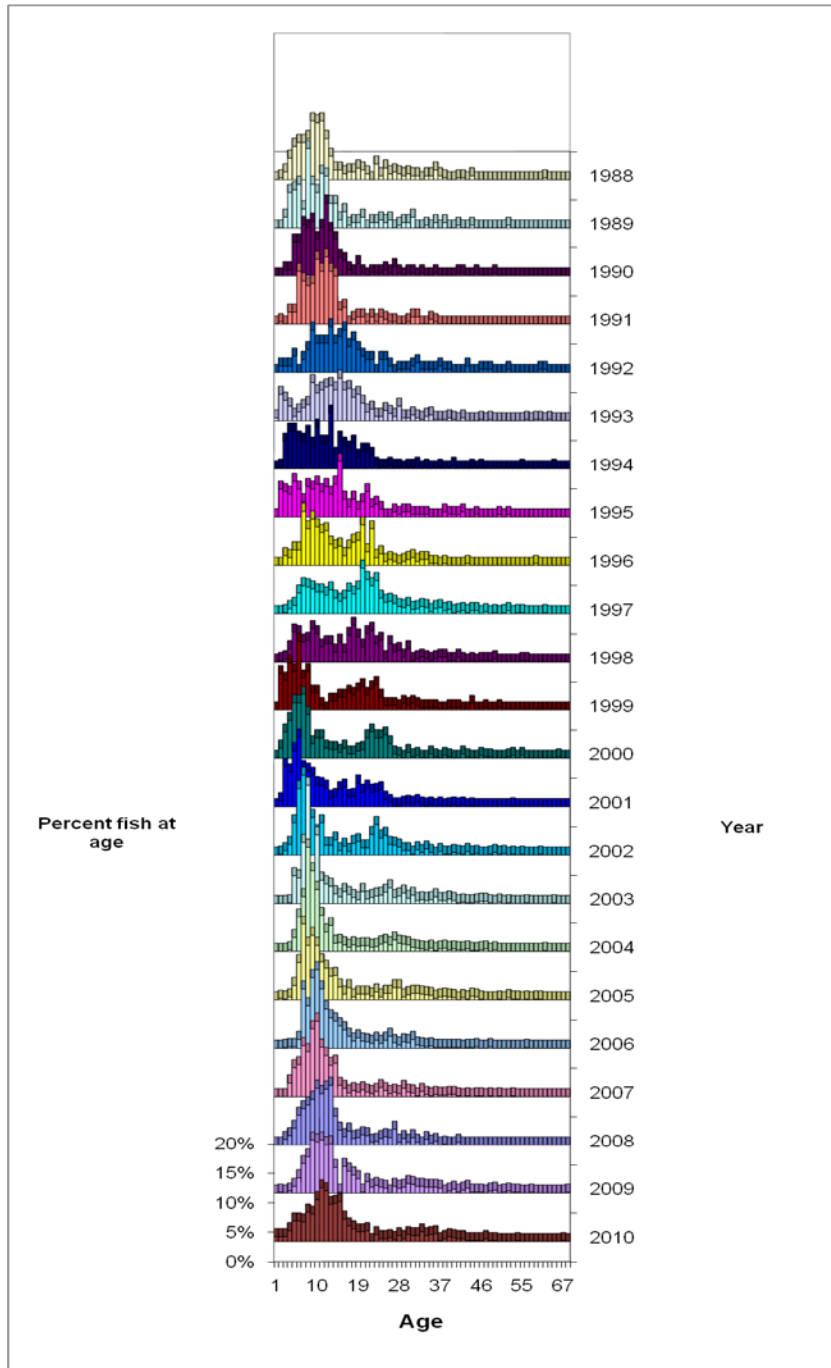


Figure 10.—Northern Southeast Inside (NSEI) sablefish longline survey age frequency distributions, 1988–2010.

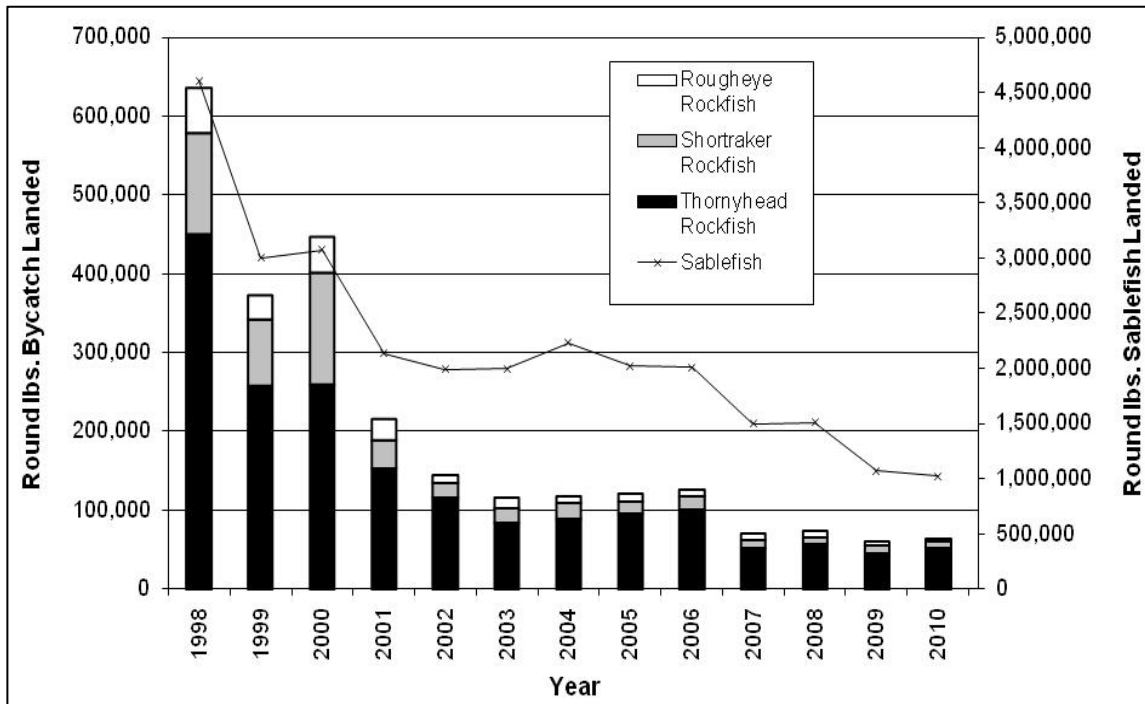


Figure 11.—Northern Southeast Inside (NSEI) round pounds of bycatch, by species, on trips targeting sablefish, 1998–2010.

APPENDICES

Appendix A.—Chronology of NSEI sablefish fishery management action and changes in season and harvest. dr = dressed pounds and rd = round pounds.

Year	Harvest Objective	Dates Fishery Open	Management Actions
1867	no quota	year round	Alaskan Territory purchase began Federal management of AK fisheries.
1871	“	“	US Commission of Fish and Fisheries established.
1903	“	“	US Bureau of Fisheries established.
1906	“	“	An Act for the Preservation and Regulation of the Fisheries of Alaska enacted.
1945	“	3/16–11/30	
1947	“	5/01–11/30	
1959	“	5/01–11/30	Alaska Statehood. Fisheries management transferred to the state. Alaska Board of Fish (BOF) maintained regulations already in place in 1959.
1963	“	8/15–10/15	
1970	“	9/15–11/15	Pot gear first allowed.
1972	“	9/01–11/15	Incidental catch allowance reduced to 20%.
1973	GHR: 1,000,000 dr	EO	Quota requested by industry. Fishery closed by Emergency Order (EO).
1974	“	9/01–11/15	
1976	“	“	Magnuson Fisheries Conservation and Management Act (MFCMA).
1978	“	“	Voluntary agreement by Japanese North Pacific Longline-Gillnet Association to withdraw from the area east of Yakutat Bay. Sablefish become prohibited species in US fisheries for other species.
1979	GHR: 850,000 dr	EO	Southeast Groundfish Project established. Quota reduced by department recommendation to account for portion of previous quota that came from outside waters. Season closed by EO. Closure to foreign fishery enforced by federal regulation.
1980	GHR: 500,000–900,000 dr	9/01–11/15	GHR based on harvest from previous ten years ± two standard deviations from mean. Registration 72 hours prior to fishing instituted for all vessels in NSEI by phone, in person, or by radio.
1981	“	9/01–10/10	Fishery closed by EO.
1982	GHR: 300,000–900,000 dr	9/01–9/15	Fishery restricted to longline only. Fishery closed by EO.
1983	“	9/01–9/07, 10/10–10/14	Fishery openings set by EO.
1984	“	1/01–3/03, 9/01–9/05	Groundfish management within the intrusion areas beyond the three-mile territorial limit formally conveyed to the state through an amendment to the MFCMA. (1/01–3/03 open period represents landings in this intrusion area during federal opening). Fishery openings set by EO.
1985	GHR: 500–1,500,000 dr	9/04–9/05, 10/04–10/06	Limited entry program adopted. Vessel operators who could demonstrate a landing prior to 12/31/1984 were eligible to apply. First year Chatham specific CFEC permits were issued (C61A). Registration requirement repealed due to enforcement difficulty. Groundfish management areas went from 5 digit salmon statistical areas to current 6 digit codes. Area boundaries remained the same. Requirement for NSEI fish to be unloaded prior to fishing another area and vice versa instituted.
1986	“	9/09–9/11	Fishery openings set by EO. No gear in water 72 hours prior to and 24 hours after fishery rule. Fishery openings set by EO.

–continued–

Appendix A.—continued (page 2 of 3)

Year	Harvest Objective	Dates Fishery Open	Management Actions
1987	“	9/15–9/16	Begin 24 hour opening by EO.
1988	GHR: 500– 1,500,000 dr	9/19–9/20	
1989		9/22–9/23	NSEI management area first described in Regulations, previously described as the northern sablefish area. Bait regulations instituted, include sablefish as bait. Up to 2,000 lbs. allowed annually, more with a permit.
1990	“	9/12–9/13	
1991	“	9/16–9/17	Statistical area line between Frederick Sound and Chatham Strait changed.
1992	“	9/17–9/18	
1993	“	9/25–9/26	
1994	GHR: 1,000,000– 3,000,000 dr AHO: 4,761,905 rd	9/22–10/22	First year of three year trial quota-share system. Regulations specify a single 30 day period during the 9/01–11/15 season. GHR increased and capped at 3,000,000 dr. Annual harvest limit to be set within the GHR based on survey information and divided equally among all eligible permit holders. Written registration required at least one week before season opening. Retention of tagged sablefish allowed. Sablefish taken for use as bait must be "mutilated" and reported on ADF&G fish tickets.
1995	“	9/13–10/13	In person written registration required prior to fishing. Applied .63 conversion to dressed wt for vessels landing fish round.
1996	“	9/08–11/8	
1997	GHR: 1,590,000– 4,800,000 rd AHO: 4,800,000 rd	9/01–11/15	Equal quota share system made permanent. Sablefish management based on round rather than dressed weight instituted. Confidential logbooks attached to fish tickets made mandatory. Season set in regulation as the entire period between 9/01 and 11/15.
1999	GHR: 1,590,000– 4,800,000 rd AHO: 3,120,000 rd	“	
2000	“	“	EYAK was deleted from 72–24 hr rule. Full retention of all rockfish (not including thornyheads) in inside waters in effect July 5th. CFEC review of optimum number of permits (re) confirmed 73 as optimum number.
2001	GHR: 1,590,000– 4,800,000 rd AHO: 2,184,000 rd	“	Sablefish harvest objective was decreased 30% with notification of indications showing further cut necessary to 1,700,000 for 2002. Public meetings were held in Petersburg, Sitka and Juneau.
2002	GHR: 1,590,000– 4,800,000 rd AHO: 2,005,000 rd	“	Outside review panel of fishery experts met in February to assess NSEI stock assessment program. Lowered AHO 8% based on a harvest rate applied to a mark-recapture estimate of biomass.
2003	AHO: 2,005,000 rd	8/15–11/15	5% overage/underage carry over from one season to the next permitted, including transfer of overage/underage to another permit holder. Discard of healthy fish permitted. Logbook reporting requirements tightened. Selected permit holders allowed to fish outside the regular season at department request to gather data. Sablefish use as bait prohibited. GHR eliminated for clarification purposes.

–continued–

Appendix A.–continued (page 3 of 3)

Year	Harvest Objective	Dates Fishery Open	Management Actions
2004	AHO: 2,245,000 rd	8/15–11/15, offseason trips Jan– Apr	First year of allowable pre-season fishing with Commissioner’s Permit. First year with individual personal quota shares (PQS), Equal Quota Shares (EQS) adjusted for the permit holders’ share of the 5% overage/underage.
2005	AHO: 2,053,000 rd	8/15–11/15, offseason trips Feb– May	
2006	“	8/15–11/15	Overage/underage transfer repealed and the rest of overage/underage policy made permanent.
2007	AHO: 1,488,000 rd	“	
2008	AHO: 1,508,000 rd	“	Meetings with industry held in Sitka, Juneau, and Petersburg to discuss current stock assessment and declines in quota, January.
2009	AHO: 1,071,000 rd	“	
2010	AHO: 1,063,000 rd	“	Meetings with industry held in Sitka, Juneau, and Petersburg to discuss current research, including results from contract work. Three permit holders harvested their PQS in the 2010 NSEI longline survey.
2011	AHO: 880,000 rd	“	Six permit holders harvested their PQS in the 2011 NSEI longline survey.

Appendix B.—ADF&G logbook page used in the NSEI sablefish fishery.

ADF&G LONGLINE • POT FISHERY LOGBOOK

PERMIT HOLDER _____ TARGET SPECIES _____ CREW SIZE (including skipper) _____
 VESSEL NAME _____ PORT OF LANDING _____ SYSTEM USED
 ADF&G NUMBER _____ DATE LEFT PORT _____ CONV SNAP
 SKIPPER NAME _____ DATE OF LANDING _____ AUTOBAITER

LONGLINE GEAR				POT GEAR			BAIT(S) USED	
HOOK SIZE/TYPE	SKATE LINE LENGTH	HOOK SPACING	NUMBER OF HOOKS/SKATE	POT DIMENSIONS (ft)	GROUNDLINE WT. or DIAMETER	POT SPACING (ft)		%

SET NO.	DATE SET	TIME SET	Lat. X Long. Beginning	DATE HAULED	TIME HAULED	Lat. X Long. End	AVERAGE DEPTH (fm)	NO. SKATES or POTS SET	LOST SKATES Y/N—Amount?	COMMENTS ie. discards, whales, etc ATTACH TAGS HERE

CATCH and BYCATCH DATA please indicate if catch is in NUMBERS or POUNDS (round) List target species and gear by set if mixed			TARGET	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT

SET NO.	DATE SET	TIME SET	Lat. X Long. Beginning	DATE HAULED	TIME HAULED	Lat. X Long. End	AVERAGE DEPTH (fm)	NO. SKATES or POTS SET	LOST SKATES Y/N—Amount?	COMMENTS ie. discards, whales, etc ATTACH TAGS HERE

CATCH and BYCATCH DATA please indicate if catch is in NUMBERS or POUNDS (round) List target species and gear by set if mixed			TARGET	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT

SET NO.	DATE SET	TIME SET	Lat. X Long. Beginning	DATE HAULED	TIME HAULED	Lat. X Long. End	AVERAGE DEPTH (fm)	NO. SKATES or POTS SET	LOST SKATES Y/N—Amount?	COMMENTS ie. discards, whales, etc ATTACH TAGS HERE

CATCH and BYCATCH DATA please indicate if catch is in NUMBERS or POUNDS (round) List target species and gear by set if mixed			TARGET	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT

ADDITIONAL COMMENTS—Did you shake gear and/or sablefish due to reaching your limit? _____ Amount of gear? _____ Amount of fish? _____

PHONE NUMBER: _____

WHITE COPY MUST BE ATTACHED TO THE FISH TICKET AT THE TIME OF DELIVERY

Appendix C.–NSEI longline survey specifications, 1988–2011. In 1995 1- and 3-hr soaks were compared.

Year	Dates	Vessels	Hks/ set	Hk space	Hk size	Gangion length	Bait	Soak (hrs)	SkateWts (lbs)	No. Set
1988	8/14–8/26	<i>F/V Betty</i>	1000	3 m	13 C	NA	Herring	1	No	24
1989	8/07–8/25	<i>F/V Carrie</i>	500	3 m	13 C	NA	Herring	1	No	44
1990	8/26–9/10	<i>F/V Isis</i>	500	3 m	13 C	NA	Herring	1	No	40
1991	8/13–8/30	<i>R/V Stellar</i>	500	3 m	13 C	0.375 m	Herring	1	5	40
1992	8/17–8/31	<i>F/V Charles T</i>	500	3 m	13 C	0.375 m	Herring	1	5	40
1993	8/23–9/08	<i>R/V Medeia</i>	500	3 m	13 C	0.375 m	Herring	1	5	38
1994	8/23–9/05	<i>R/V Medeia</i>	500	3 m	13 C	0.375 m	Herring	1	5	38
1995	8/23–9/08	<i>R/V Medeia</i>	500	3 m	13 C	0.375 m	Herring	1	5	30
							Squid	3		6
							Squid	3		24
1996	8/17–8/31	<i>R/V Medeia</i>	500	3 m	13 C	0.375 m	Herring	1	5	38
	8/19–8/23	<i>F/V Ida June</i>	750	1 m	13 C	0.2 m	Squid	3–7	½	16
1997	8/07–8/13	<i>F/V Ida June</i>	923–	2 m	13 C	0.2–0.3 m	Squid	3–11	½–7	45
		<i>F/V Charles T</i>	1217							
		<i>F/V Kruzof</i>								
1998	8/13–8/19	<i>F/V Ida June</i>	831–	2 m	13 C	0.2–0.3 m	Squid	3–11	½–7	45
		<i>F/V Charles T</i>	1267							
		<i>F/V Ocean Cape</i>								
1999	8/15–8/23	<i>F/V Ida June</i>	1002–	2 m	13 C	0.2–0.3 m	Squid	3–11	3	45
		<i>F/V Charles T</i>	1129							
2000	8/16–8/23	<i>F/V Ida June</i>	1125	2 m	13 C	0.375 m	Squid	3–11	7	45
		<i>F/V Charles T</i>								
		<i>F/V Spirit</i>								
2001	8/08–8/13	<i>F/V Ida June</i>	1125	2 m	13 C	0.375 m	Squid	3–11	7	45
		<i>F/V Charles T</i>								
		<i>F/V Sylvia</i>								
2002	8/13–8/18	<i>F/V Ida June</i>	1125	2 m	13 C	0.375 m	Squid	3–11	7	44
		<i>F/V Charles T</i>								
		<i>F/V Archangel</i>								
2003	8/03–8/07	<i>F/V Masonic</i>	1125	2 m	13 C	0.375	Squid	3–11	7	44
		<i>F/V Ida June</i>								
		<i>F/V Archangel</i>								
2004	8/05–8/09	<i>F/V Masonic</i>	1125	2 m	13 C	0.375	Squid	3–11	7	44
		<i>F/V Charles T</i>								
		<i>F/V Archangel</i>								
2005	7/27–8/02	<i>F/V Charles T</i>	1125	2 m	13 C	0.375	Squid	3–11	7	44
		<i>F/V Seaview</i>								
		<i>F/V Masonic</i>								
2006	8/01–8/07	<i>F/V Charles T</i>	1125	2 m	13 C	0.375	Squid	3–11	7	44
		<i>F/V Seaview</i>								
		<i>F/V Masonic</i>								
2007	8/04–8/10	<i>F/V Charles T</i>	1125	2 m	13 C	0.375	Squid	3–11	7	44
		<i>F/V Seaview</i>								
		<i>F/V Masonic</i>								
2008	8/06–8/12	<i>F/V Charles T</i>	1125	2 m	13 C	0.375	Squid	3–11	7	44
		<i>F/V Seaview</i>								
		<i>F/V Masonic</i>								
2009	7/28–8/03	<i>F/V Ida June</i>	1125	2 m	13 C	0.375	Squid	3–11	7	44
		<i>F/V Sherrie Marie</i>								
		<i>F/V Seaview</i>								
2010	7/31–8/5	<i>F/V Ida June</i>	1125	2 m	13 C	0.375	Squid	3–11	7	44
		<i>F/V Seaview</i>								
		<i>F/V Masonic</i>								
2011	7/25–7/30	<i>F/V Kaia</i>	1125	2 m	13 C	0.375	Squid	3–11	7	44
		<i>F/V Seaview</i>								
		<i>F/V Pacific Dawn</i>								

Appendix D.—Calculations used by ADF&G to standardize commercial fishery sets for hook spacing. CPUE is affected by hook spacing and ADF&G adopted the formula used by NMFS for CPUE standardization for commercial sablefish catch data (Sigler 2000):

$$n_s = n_u * 2.2 * (1 - \exp(-0.57 * h)), \quad (1)$$

Where n_s is the number of standardized hooks, n_u is the number of unstandardized hooks fished, and h is the hook spacing in meters. This formula standardizes the hook spacing to 1 meter..

Hook type also affects CPUE. Historically j-hooks were considered the standard hook style for this fishery. Circle hooks, which dramatically increased catchability, were first reported in the NSEI sablefish fishery in 1983. CPUEs for j-hook interview data have been adjusted using a factor of 1.5. This rate is the rate NMFS uses as a conversion from the sharp tara hooks from the Japanese longline survey to circle hooks and should be considered a conservative adjustment factor for j-hooks as it is expected that tara hooks are more effective than j-hooks. No adjustments have been made for differences in bait use or hook size.

Appendix E.–Sablefish maturity stages and criteria used by the Alaska Department of Fish and Game.

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 F.–Instructions for delivering fish out of state.

Fishermen delivering unprocessed catch from a state managed sablefish fishery out of state are required to obtain a Catcher Exporter license. The Department of Revenue issues the Fisheries Business License for a Catcher/Exporter and then Fish & Game will issue the Intent to Operate permit. Contact the ADFG Seafood Industry Coordinator at (907) 465-6131 for more information on these requirements. The web link for the application for a Catcher/Exporter license is:

<http://www.adfg.alaska.gov/index.cfm?adfg=fishlicense.main>

Fishermen are required to complete a hailed weight fish ticket, and a physical copy of the fish ticket must be provided to ADF&G before the vessel leaves the state. When registering for the fishery you can request a hailed weight ticket from Fish and Game.

A completed fish ticket must include the following:

1. Weight of each species with the corresponding disposition (i.e., personal use, discards, or overage) and delivery condition code (i.e., round, bled, headed and gutted etc).
2. An imprint of the valid CFEC gear card.
3. An imprint of a valid Alaskan processor code.
4. A breakdown by percentage of the groundfish statistical areas fished.
5. Fishermen signature at bottom of fish ticket.
6. A completed logbook and the personal quota share form documenting the trip must be attached to the ticket.

If fish weights are estimated on the above fish ticket, a completed fish ticket with final weights must be returned to ADF&G within 7 days of landing. The original fish ticket and PQS form will then be edited to reflect final weights.

Appendix G.–Permits and paperwork needed to fish in the NSEI sablefish fishery.

1. CFEC limited entry permit card specific to the NSEI sablefish fishery.
2. ADF&G vessel license.
3. Vessel registration filed with ADF&G prior to fishing and kept onboard while fishing.
4. Logbook completed daily, copies kept on board the vessel for the duration of the fishery, including a record of the round weight delivered to date if multiple deliveries are made per season. Logbook pages documenting the landing must be attached to the fish ticket at the time of landing. Use of ADF&G Logbooks is requested. ADF&G logbooks are available at ADF&G offices.
5. Personal Quota Share Tracking Form with individual PQS adjustment for current season, available at ADF&G office.

CFEC permit cards, emergency transfer requests, and ADF&G vessel registrations are administered only by the CFEC and not by ADF&G. Applications for these permits are available at ADF&G area offices or on the web at <http://www.cfec.state.ak.us/>.

Fishermen are strongly advised to obtain current Statewide Commercial Groundfish Fishing Regulations books, available at ADF&G offices, and to refer to the regulations and any current news releases before fishing.

Appendix H.—Listing of ADF&G Region I Commercial Fisheries Groundfish Personnel, and addresses for commercial vessel license application processors.

Scott Kelley, Regional Supervisor	Douglas Office
Forrest Bowers, Marine Fisheries Supervisor	802 3 rd Street
Jennifer Stahl, Fishery Biologist II	Douglas, AK 99824
Deidra Holum, Fishery Technician V	(907) 465-4250
Martina Kallenberger, Research Analyst II	

Kristen Green, Groundfish Project Leader	Sitka Office
Mike Vaughn, Fishery Biologist II	304 Lake Street, Room 103
Kamala Carroll, Fishery Technician IV	Sitka, AK 99835
	(907) 747-6688

Rebecca Knight, Fishery Technician IV	Petersburg Office
	16 Sing Lee Alley
	Petersburg, AK 99833
	(907) 772-3801

For commercial permits and vessel license applications contact:	State of Alaska Commercial Fisheries Entry Commission (907) 789-6150
	National Marine Fisheries Service , Alaska Regional Office (907) 586-7229
	Restricted Access Management program (RAM), P.O. Box 21668, Juneau, AK 99802-1668, (907)-586-7202
