Fishery Data Series No. 10-36

Summary of Observer Data Collected during the 2007/08 Alaska Weathervane Scallop Fishery

by

Gregg E. Rosenkranz

May 2010

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

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

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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ABSTRACT

Onboard fishery observers have been required on all commercial vessels fishing for weathervane scallops *Patinopecten caurinus* in Alaska waters excluding Cook Inlet since 1994. Observer sampling provides biological information on the scallop population and tracks bycatch in the fishery. This report summarizes data collected by scallop fishery observers during the 2007/08 Alaska weathervane scallop fishing season. Observer sampling effort and fishery data are summarized, and estimates of crab and halibut bycatch are presented. Time series of scallop observer data that begin in 1993 are included as appendices.

Key words: weathervane scallops, Alaska, *Patinopecten caurinus*, fishery observer, marine fishery, bycatch

INTRODUCTION

Commercial fishing for weathervane scallops *Patinopecten caurinus* in Alaska began in 1967, when two Kodiak-based vessels were converted for scallop dredging (Kruse et al. 2005). The weathervane scallop fishery was passively managed by Alaska Department of Fish and Game (ADF&G) using measures such as seasons and area closures from the late 1960s through 1993, when an influx of scallop vessels from the United States east coast caused concerns about overfishing. This led ADF&G to officially designate the fishery a 'high impact emerging fishery.' ADF&G subsequently developed the Alaska Scallop Fishery Management Plan, which became regulation 5 AAC 38.076 adopted by Alaska Board of Fisheries in 1994.

The new management plan included provisions designed to limit efficiency and slow the scallop harvest. Additionally, it provided a framework for establishing crab bycatch limits and gave ADF&G authority to establish an onboard scallop fishery observer program. Observers have been required onboard all vessels fishing for scallops in Alaska waters outside Cook Inlet since that time, with primary goals of collecting biological information on the scallop population and monitoring bycatch. Alaska scallop fishery regulations, detailed descriptions of registration areas, and additional management information are available from ADF&G (e.g., Barnhart et al. 2008), and in the Fisheries Management Plan for the Scallop Fishery off Alaska (FMP)[1], a federal document approved by the North Pacific Fishery Management Council that grants authority to the state of Alaska to manage the scallop fishery in federal waters between 3 and 200 nautical miles offshore.

Scallop fishery observers are employed by independent agents who contract with scallop vessel operators for their services. ADF&G coordinates observer activities including training, deployment, briefing, debriefing, and certification, and maintains a database of observer-collected data at the Kodiak ADF&G office.

This report summarizes data collected by scallop fishery observers during the 2007/08 Alaska statewide scallop fishing season. Biological data on the scallop catch and on other species incidentally caught by scallop dredges (bycatch) are presented as are summaries of logbook data recorded by scallop vessel operators. Time series data in tabular form that provide historical perspective on the scallop fishery and observer program are presented in appendices.

METHODS

Scallop fishery observers were trained prior to the 2007/08 season at University of Alaska's North Pacific Fisheries Observer Training Center using materials prepared by ADF&G including

[1] http://www.fakr.noaa.gov/npfmc/fmp/scallop/ScallopFMP2006.pdf

the Weathervane Scallop Observer Manual (Barnhart 2004). Observers were deployed on all trips of all vessels fishing scallops outside Cook Inlet during the 2007/08 season. Participants in the Cook Inlet scallop fishery are not required to carry observers but are limited to a single 6 ft dredge, and the fishery is closely monitored by ADF&G Central Region staff.

COMMONLY USED TERMS

The following terms, abbreviations and definitions related to scallops and the scallop fishery are used in this report:

bycatch	non-target species and other items incidentally caught in dredges during scallop fishing operations
CPUE	catch per unit effort, fishery performance statistic expressed in pounds meat per dredge hour (lbs mt/dredge-hr)
CW	carapace width, size measurement for *Chionoecetes* spp. crabs
discarded scallop catch	small and/or broken scallops captured by the dredge that are not removed from deck by vessel crew for shucking
dredge-hr	fishery effort unit; one scallop dredge towed one hour
GHL	guideline harvest level; anticipated scallop catch in a given area established prior to season
observer	onboard scallop fishery observer
retained scallop catch	whole scallops caught in dredge and removed from deck by vessel crew for shucking
SH	scallop shell height in mm measured as in Figure 1
shucking	process of removing adductor muscle (scallop meat) from shell and viscera
vessel-day	24-hr period beginning at midnight for a specific vessel

CATCH SAMPLING

Data summarized in this report were obtained through two types of catch sampling: *bycatch sampling* provided counts of incidentally caught crabs and halibut as well as weights and numbers of the retained and discarded scallop catch, and *haul composition sampling* documented all dredge contents by weight. Alaska scallop vessels typically fish almost 24 hours per day and most deploy two dredges simultaneously. Observers were instructed to sample a single dredge from different tows at different times throughout the day and to choose the port or starboard dredge (if available) for sampling prior to viewing dredge contents.

Bycatch Sampling

Scallop observers' bycatch sampling goal for the 2007/08 season was a single dredge from five separate tows on each full day of fishing. After dredge contents were emptied on deck and the

scallop vessel crew removed the retained catch of scallops for shucking, observers examined the remaining contents of the selected dredge.

Pacific halibut *Hippoglossus stenolepis* were counted, measured, examined, and returned to the sea. All incidentally caught crabs were identified by species, the number of individuals of each species was counted, and samples of up to 20 each Dungeness crabs *Cancer magister*, red king crabs *Paralithodes camtschaticus*, Tanner crabs *Chionoecetes bairdi*, and snow crabs *C. opilio* (the first 20 encountered by the observer) were examined in detail. Carapace sizes of these individuals were measured with vernier calipers, and sex, shell condition (intact or broken/crushed), and injuries were noted. Crabs that were crushed, dismembered, exhibited no movement, or that appeared to be severely injured and not likely to survive, were coded as dead. Carapace length (CL) of king crabs was measured, and carapace width (CW) was measured on all other crab species.

The scallop catch was also examined during bycatch sampling. Twenty scallops were selected from the retained catch via a systematic sampling procedure detailed in the Weathervane Scallop Observer Manual (Barnhart, 2004). The sample was weighed and shell height (SH) of each scallop was measured. The discarded scallop catch, consisting of broken scallops and scallops judged by vessel crew members to be too small for shucking, was collected into baskets. One basket was sorted based on shell condition, with intact scallops separated from broken/crushed scallops. These intact scallops and broken/crushed scallop samples were weighed separately with a hanging spring scale and individuals were counted. Broken/crushed scallops with half or more of the soft body tissue attached were counted as one scallop. Shell height was measured on a systematic sample of 20 intact discarded scallops.

Haul Composition Sampling

Scallop observers targeted one dredge from one tow for haul composition sampling on each full day of fishing. After the retained scallop catch was collected in baskets by the crew, the scallop observer would sort the remaining contents to the lowest taxonomic level possible. Natural debris such as kelp, wood, and rocks was separated from man-made items such as plastics and derelict fishing gear. Complete weights were obtained for most species or items caught by the dredge using a hanging spring scale and baskets. Pacific halibut were measured to the nearest centimeter (cm) from the tip of the snout to the end of the central rays of the caudal fin, and weights were determined using a length/weight conversion table. Subsampling was used to estimate weight when large quantities of a single species or item were present. This was accomplished by weighing three baskets on a spring scale, then multiplying the average weight by the observer's visual estimate of the total number of baskets of the species or item.

To estimate the weight of retained scallops in the haul composition sample, the average weight of three baskets of retained scallops was obtained using the spring scale then multiplied by the total number of baskets of retained scallops. All discarded scallops were weighed with the spring scale, then discarded and retained scallop weights were summed to obtain total weight of scallops in the sampled dredge.

VESSEL OPERATOR LOGBOOKS

Scallop vessel operators were required to complete logbooks supplied by ADF&G that detailed information on each tow. Observers were instructed to check regularly to assure that these forms were completed accurately, legibly, and in a timely manner. Data recorded for each tow included

date, time, number and width of dredges fished, starting latitude and longitude, tow duration, average depth, average speed, ADF&G statistical area, and estimated round weight of retained scallops.

ESTIMATION OF BYCATCH AND DISCARDED SCALLOP CATCH

Bycatch of Tanner and snow crabs, Dungeness crabs, and Pacific halibut was estimated using data collected during bycatch sampling. For each fishing area or district, estimated total number of individuals of each species incidentally caught, $\hat{B}$, was obtained by summing bycatch estimates for each vessel-day calculated as

$$\hat{B}_{vd} = \frac{c}{t} \cdot T \cdot D, \tag{1}$$

where

c = number crabs or halibut counted in sampled dredges during the vessel-day,

t = sampled dredge-hrs during the vessel-day,

T = total dredge-hrs during the vessel-day, and

D = average number of dredges fished during the vessel-day.

For vessel-days when no dredges were sampled, bycatch was estimated by multiplying the average catch rate (number/hr) for the same vessel in the same area by total dredge-hrs and average number of dredges fished during the vessel-day for which no samples were taken. Ninety-five percent confidence intervals for the bycatch estimates were calculated using percentile-method bootstrapping (Barnhart et al. 1996).

Methods for estimating the number and weight of discarded scallops in each fishing area were similar to those used for bycatch estimation. Estimated number or weight ($\hat{X}$) of intact (or broken) scallops in the sampled dredges each vessel-day were estimated by

$$\hat{X}_{vd} = \frac{x}{W}(W + R), \tag{2}$$

where

x = number (or weight) of intact (or broken) scallops in subsampled baskets during the vessel-day,

W = weight of subsampled baskets during the vessel-day, and

R = weight of remaining scallops in sampled dredges during the vessel-day.

Estimates of daily totals for each vessel were obtained by substituting $\hat{X}$ for c in equation (1), and area estimates were obtained by summing estimates for each vessels and days. Days with no sampling were handled as above, using average catch rates (number or weight per dredge-hr) by the same vessel in the same area. Confidence intervals were calculated using percentile-method bootstrapping.

SCALLOP SHELL HEIGHT FREQUENCY DISTRIBUTIONS

Histograms depicting estimated SH distributions of the combined retained and discarded scallop catch were created for fishing areas with at least 200 measurements of both retained and discarded scallops. This was accomplished by resampling observer-collected SH measurements based on the estimated proportion of retained and discarded scallops in the catch. Plots of multiple years of SH histograms are presented to document changes in SH distributions over time.

RESULTS AND DISCUSSION

OBSERVER SAMPLING EFFORT

Three vessels participated in the 2007/08 statewide scallop fishery between July 2, 2007 and February 13, 2008 (Table 1). Four observers were deployed during the season, and they sampled on 275 of 301 vessel-days on which fishing occurred (Table 1).

Observer sampling effort was proportional to vessel fishing effort, with the largest number of samples taken in the Kodiak Shelikof District and in Yakutat Area D. Only 8 tows were made in Yakutat District 16, five of which were sampled. Overall, 1,410 or 31% of the 4,611 tows recorded in vessel operator logbooks were sampled by observers during the season.

FISHERY CATCH AND EFFORT

Scallop fishing effort during the 2007/08 season occurred in traditional fishing areas documented in observer program logbooks dating back to 1993 (Figure 2). A total of 458,313 lbs of scallop meats were harvested during the season (Table 2, Figure 3). In declining order, catches were approximately 170,000 lbs from Kodiak Shelikof District, 126,000 lbs from Yakutat Area D, 75,000 lbs from Kodiak Northeast District, 50,000 lbs from the Bering Sea Area, and 37,000 lbs from the Prince William Sound Area. A small harvest of 180 lbs of scallop meats was taken from Yakutat District 16, while no effort occurred in the Alaska Peninsula Area. The Dutch Harbor Area was not opened during the 2007/08 season.

Catches were close to GHLs in the 2007/08 Prince William Sound, Kodiak Shelikof District, and Bering Sea scallop fisheries (Table 2). In Kodiak Northeast District, 15,000 lbs of the GHL were assigned to an exploratory area north of traditional fishing areas that saw no effort during the season. The scallop fleet harvested 84% of the GHL in Yakutat Area D and chose not to continue fishing Yakutat District 16 after making 8 exploratory tows.

Scallop fishing CPUE for the 2007/08 season was highest in Prince William Sound at 87 lbs meat/dredge-hr and lowest in Yakutat District 16 at 30 lbs meat/dredge-hr (Table 2, Figure 3). Statewide scallop CPUE for the season was 56 lbs meat/dredge-hr, a reduction from 61 lbs meat/dredge-hr during the 2006/07 season.

Estimated round weight of 2007/08 scallop discards (Table 2) totaled 1.2 million pounds statewide, accounting for 19% of the total round weight landed. By area, discard proportion was highest in Yakutat Area D at 25% and lowest in the Bering Sea at 7%.

Depths fished during 2007/08 were similar to depths fished during previous seasons. Fishing occurred in depths 59–137 m (Table 3), with over 90% of effort in 60–120 m depths statewide.

Distances towed and area dredged (Table 3) were proportional to dredge-hrs (Table 2), with the highest values recorded in Kodiak Shelikof District. During the 2007/08 season, an average tow was 56 minutes at 4.8 nmi/hr (8.9 km/hr); with the legal maximum combined dredge width of 30 ft (9.14 m), an average tow swept an area of about 75,800 m^2 (0.02 nmi^2).

DISCARDED SCALLOP CATCH

Observers sampled about 55,000 lbs of discarded scallops during 2007/08 bycatch sampling (Table 4). Of the total sample, 29% by weight was comprised of broken scallops, with the highest proportion of broken discards from Kodiak Northeast District at 58%.

Estimated numbers, round weight, and associated confidence intervals for discarded intact and broken scallops are presented in Tables 5 and 6. Expressed as a percentage of estimated round weight catch, discard rates varied from a high of 25% in Yakutat Area D to 7% in the Bering Sea. Statewide, an estimated 1.24 million lbs (95% confidence interval 1.07–1.44 million lbs) or 19% of the estimated total round weight catch was discarded during the 2007/08 season.

SCALLOP SHELL HEIGHT DISTRIBUTIONS

Observers measured SH of about 45,000 scallops during the 2007/08 season (Table 7). Average SH for retained scallops was highest in the Bering Sea at 152 mm, while highest average discarded scallop SH was 118 mm for Kodiak Northeast District. Average SH of both retained and discarded scallops was lowest for Yakutat District 16, but note that District 16 sample sizes were much lower than SH sample sizes from other areas (Table 7).

Histograms of estimated scallop SH distributions from recent seasons (Figures 4–8) illustrate geographic differences in size frequency as well as changes over time. Interpretation of these figures is made more difficult by size selectivity of dredges used in the fishery; dredge bags are required by Alaska law to be constructed from 4-in (101.6 mm) rings. Hence, scallops less than about 100 mm SH are caught with lower efficiency than larger scallops. In general, large scallops dominated Bering Sea catches, wide ranges of scallop sizes were present in catches from Kodiak Area, and Yakutat catches featured smaller scallops and narrower size ranges. These results were consistent with results from ADF&G shell-aging work that show slower growth and lower asymptotic sizes for Yakutat and Prince William Sound scallops than for those from the Kodiak vicinity and the Bering Sea. No SH histogram was constructed for Yakutat District 16 due to small sample size (Table 7).

BYCATCH

Bycatch Estimates

Approximately 144,000 Tanner crabs (95% confidence interval 108,000–226,000), 680 Dungeness crabs (95% confidence interval 378–1,017), and 685 halibut (95% confidence interval 300–1,146), were incidentally landed by scallop vessels during the 2007/08 statewide scallop fishing season (Table 8).

Estimated 2007/08 Tanner crab bycatch was highest in Kodiak Northeast District at about 77,350 animals (Table 8, Figure 9 upper plot). Increasing abundance of Tanner crabs on the east side of Kodiak Island has also been documented by ADF&G Westward Region trawl surveys (e.g., Spalinger 2009). Tanner crab bycatch in the Bering Sea was about 35,000 animals, with an

additional 19,400 snow crabs and snow crab × Tanner crab hybrids also incidentally caught in the 2007/08 scallop fishery.

Estimated Tanner crab bycatch rate (Figure 9 lower plot) was also highest in Kodiak Northeast District at 66 crabs/dredge-hr; in decreasing order, rates from other areas were 33 crabs/dredge-hr in the Bering Sea, 6 crabs/dredge-hr in Kodiak Shelikof District, 5 crabs/dredge-hr in Yakutat Area D, and <1 crab/dredge-hr in Yakutat District 16 and Prince William Sound.

Dungeness crab bycatch during the 2007/08 scallop season occurred in Kodiak Shelikof District and Yakutat Area D, with no Dungeness crabs encountered by observers in Yakutat District 16, Prince William Sound, Kodiak Northeast District, or Bering Sea fisheries (Table 8). Halibut bycatch was highest in Kodiak Northeast District at an estimated 299 individuals (Table 8).

Size Distributions of Incidentally Caught Tanner and Snow Crabs

Size distributions of Tanner crabs incidentally caught during the 2007/08 scallop season in each area are shown in Figures 10–15. In general, fewer and smaller crabs were caught in Yakutat and Prince William Sound than in the Kodiak and Bering Sea Areas. Bycatch of Tanner crabs from Yakutat Area D (Figure 10), Prince William Sound (Figure 11), and Kodiak Shelikof District (Figure 13) consisted primarily of crabs <50 mm CW. A wider size range of crabs was encountered by observers in the Kodiak Northeast District (Figure 12) and Bering Sea (Figures 14–15) scallop fisheries.

Tanner Crab and Halibut Mortality

Observers examined about 5,500 incidentally caught Tanner crabs, snow crabs, and hybrid snow × Tanner crabs statewide during 2007/08 bycatch sampling and classified 75% as dead (Table 9). Rosenkranz (2002) reviewed scallop observer data collected between 1993 and 2000 and noted high variability in Tanner crab bycatch mortality rates both between years and between vessels. Of the 66 halibut encountered by observers during 2007/08 bycatch sampling, 27 (36%) were reported as dead.

HAUL COMPOSITION

Scallops were the most abundant species by weight in dredges sampled for haul composition, comprising 81% of the total weight in 207 dredges sampled statewide during the 2007/08 season (Tables 10–13). Commonly caught invertebrates included sea stars such as sunflower sea stars (*Pycnopodia helianthoides*) and brittle starfish (family *Ophiuroidae*), *Chionoecetes* crabs, and sea anemones (Order *Actinaria*). Various skate species, a variety of flatfish, and natural debris including empty weathervane scallop shells, kelp, wood, and rocks, were also frequently encountered by observers during haul composition sampling (Tables 10–13).

HISTORICAL SUMMARY INFORMATION

Historical scallop observer program time series data are presented in appendices to this annual report. Appendix A contains tables summarizing observer program statistics such as fishing dates, vessel days, and number of tows sampled by observers. Appendix B tables summarize fishery performance with statistics such as catch and CPUE. Appendix C contains tables summarizing bycatch of crabs and halibut. In each of these appendices, tables dating back to inception of the scallop observer program in 1993 are presented for each fishing area.

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TABLES AND FIGURES

Table 1.–Observer program statistics from the 2007/08 weathervane scallop fishing season.

Area/District	Start of fishing	End of fishing	Number vessels	Fishing days[a]	Observed days[b]	Bycatch samples	Haulcomp samples
Yakutat Area D	8/14/2007	2/13/2008	2	92	84	369	67
Yakutat District 16	8/15/2007	11/27/2007	2	4	2	3	2
Prince William Sound Area	7/7/2007	8/11/2007	2	20	20	66	16
Kodiak Northeast District	9/29/2007	2/3/2008	2	47	37	125	24
Kodiak Shelikof District	7/2/2007	11/29/2007	3	105	101	479	93
Bering Sea Area	9/10/2007	12/17/2007	2	33	31	141	25
Statewide Total	7/2/2007	2/13/2008	3	301	275	1,183	227

[a] Number vessel days with at least one haul.
[b] Number vessel days with at least one sampled haul.

Table 2.–Fishery statistics from the 2007/08 weathervane scallop fishing season.

Area/District	GHL[a] (lbs meat)	Catch (lbs meat)	Catch (lbs whole)	Dredge hours	CPUE[b]	Discarded scallops[c] Number	Discarded scallops[c] Weight (lbs)
Yakutat Area D	150,000	125,960	1,593,223	2,601	48	2,123,698	524,172
Yakutat District 16	21,000	180	8,888	14	30	9,158	1,925
Prince William Sound Area	37,000	37,105	570,972	428	87	198,591	79,645
Kodiak Northeast District	90,000	75,105	822,697	1,170	64	536,296	201,327
Kodiak Shelikof District	170,000	169,968	1,695,563	2,937	58	1,330,266	382,589
Alaska Peninsula Area	10,000			0			
Bering Sea Area	50,000	49,995	697,288	1,084	46	126,779	49,723
Dutch Harbor Area	Closed						
Statewide Total	518,000	458,313	5,388,631	8,233	56	4,324,788	1,239,381

[a] Upper catch target set prior to season.
[b] Catch per unit effort in lbs meat/dredge-hr.
[c] Estimated from bycatch samples.

Table 3.–Depth-range fished, distance towed, and area dredged during the 2007/08 weathervane scallop fishing season.

Area/District	Depths fished (m)			Distance towed (nmi)	Area dredged (nmi^2)[a]
	Minimum	Maximum	Average		
Yakutat Area D	60	137	82	6,271	31
Yakutat District 16	69	93	81	33	<1
Prince William Sound Area	64	99	82	1,041	5
Kodiak Northeast District	73	128	93	2,844	14
Kodiak Shelikof District	59	137	104	7,852	34
Bering Sea Area	91	106	95	2,634	13
Statewide Total	59	137	93	20,675	96

[a] Calculated from logbook data by summing tow duration × average speed × dredgewidth for each tow.

Table 4.–Number and weight of discarded scallops sampled by observers during the 2007/08 weathervane scallop fishing season.

Area/District	Number scallops		Weight scallops (lbs)		Average weight (lbs)		
	Intact	Broken	Intact	Broken	Intact	Broken	Overall
Yakutat Area D	58,277	16,328	14,142	4,926	0.24	0.30	0.26
Yakutat District 16	306	371	65	85	0.21	0.23	0.22
Prince William Sound Area	3,237	3,778	1,331	1,604	0.41	0.42	0.42
Kodiak Northeast District	6,529	7,145	2,254	3,087	0.35	0.43	0.39
Kodiak Shelikof District	64,904	9,056	18,180	3,760	0.28	0.42	0.30
Bering Sea Area	9,100	4,980	3,103	2,344	0.34	0.47	0.39
Statewide Total	142,353	41,658	39,075	15,806	0.27	0.38	0.30

Table 5.–Estimated number and weight of intact scallops discarded during the 2007/08 weathervane scallop fishing season.

	Number intact scallops			Weight intact scallops (lbs)		
Area/District	Estimate	Lower c.i.[a]	Upper c.i.[a]	Estimate	Lower c.i.[a]	Upper c.i.[a]
Yakutat Area D	1,686,275	1,522,914	1,884,053	396,151	361,549	442,451
Yakutat District 16	1,878	931	2,643	395	197	624
Prince William Sound Area	98,941	61,917	132,311	38,074	26,242	48,561
Kodiak Northeast District	295,170	215,638	442,317	101,547	74,716	146,663
Kodiak Shelikof District	1,181,784	1,048,866	1,334,807	324,330	292,472	363,487
Bering Sea Area	83,482	71,741	92,819	29,297	24,978	32,735
Statewide Total	3,347,530	2,922,007	3,888,950	889,794	780,154	1,034,521

[a] 95% confidence intervals from bootstrapping.

Table 6.–Estimated number and weight of broken scallops discarded during the 2007/08 weathervane scallop fishing season.

	Number broken scallops			Weight broken scallops (lbs)		
Area/District	Estimate	Lower c.i.[a]	Upper c.i.[a]	Estimate	Lower c.i.[a]	Upper c.i.[a]
Yakutat Area D	437,423	389,134	491,274	128,021	113,734	143,340
Yakutat District 16	7,280	1,550	12,164	1,530	498	2,492
Prince William Sound Area	99,650	73,424	117,047	41,571	30,726	50,047
Kodiak Northeast District	241,126	195,495	308,262	99,780	78,790	119,826
Kodiak Shelikof District	148,482	129,483	171,124	58,259	50,382	67,412
Bering Sea Area	43,297	37,544	48,581	20,426	17,470	23,310
Statewide Total	977,258	826,630	1,148,452	349,587	291,600	406,427

[a] 95% confidence intervals from bootstrapping.

Table 7.–Average scallop shell heights and sample sizes from the 2007/08 weathervane scallop fishery.

	Retained catch		Discarded catch	
Area/District	Average SH (mm)	Sample size	Average SH (mm)	Sample size
Yakutat Area D	123	7,189	103	7,132
Yakutat District 16	119	60	97	60
Prince William Sound Area	135	1,315	113	1,161
Kodiak Northeast District	145	2,204	118	2,091
Kodiak Shelikof District	144	9,304	106	9,101
Bering Sea Area	152	2,660	114	2,558
Statewide Total	138	22,732	107	22,103

Table 8.–Crab and halibut bycatch estimates for the 2007/08 weathervane scallop fishing season.

	Tanner crabs			Dungeness crabs			Halibut		
Area/District	Est number	Lower 95% c.i.[a]	Upper 95% c.i.[a]	Est number	Lower 95% c.i.	Upper 95% c.i.	Est number	Lower 95% c.i.	Upper 95% c.i.
Yakutat Area D	13,429	11,357	16,971	145	68	233	186	96	309
YakutatDistrict 16	12	6	19	0			7	1	13
Prince William Sound Area	205	68	343	0			27	3	63
Kodiak Northeast District	77,348	51,394	148,370	0			299	127	476
Kodiak Shelikof District	17,454	14,836	20,963	535	310	784	155	72	250
Bering Sea Area[b]	35,288	30,411	39,604	0			11	1	35
Statewide	143,736	108,072	226,270	680	378	1,017	685	300	1,146

[a] 95% confidence intervals from bootstrapping.

[b] An estimated 19,367 snow crabs and snow crab × Tanner crab hybrids (95% confidence interval 15,659 – 22,753) and one red king crab were also incidentally caught in the Bering Sea.

Table 9.–Release condition of Tanner crabs and halibut sampled by observers during the 2007/08 scallop fishery.

	Tanner crabs			Halibut		
Area/District	Number dead	Number alive	Percentage dead	Number dead	Number alive	Percentage dead
Yakutat Area D	987	372	73	5	21	19
Yakutat District 16	2	3	40	0	1	0
Prince William Sound Area	20	5	80	0	3	0
Kodiak Northeast District	779	385	67	20	6	77
Kodiak Shelikof District	1,420	812	64	2	16	11
Bering Sea Area[a]	2,313	303	88	0	2	0
Statewide Total	5,521	1,880	75	27	49	36

[a] Includes Tanner crabs, snow crabs, and hybrid snow × Tanner crabs.

Table 10.–Dredge contents from haul composition sampling during the 2007/08 Yakutat Area D weathervane scallop fishery.

Rank	Common name	Scientific name	Percentage weight
1	weathervane scallop	*Patinopecten caurinus*	80.2
2	empty weathervane shells	*P. caurinus*	5.1
3	kelp, wood, rocks, etc.		4.8
4	sunflower sea star	*Pycnopodia helianthoides*	3.5
5	sand star	*Luidia foliata*	1.2
6	big skate	*Raja binoculata*	1.1
7	longnose skate	*Raja rhina*	0.5
8	English sole	*Parophrys vetulus*	0.4
9	brittle star	*Ophiura sarsi*	0.4
10	lingcod	*Ophiodon elongatus*	0.3
11	skate egg case	*Family Rajidae*	0.2
12	arrowtooth flounder	*Atheresthes stomias*	0.2
13	Alaska skate	*Bathyraja parmifera*	0.2
14	spiny dogfish	*Squalus acanthias*	0.2
15	sea anemone unidentified	*Order Actiniaria*	0.2
16	basket star	*Gorgonocephalus caryi*	0.1
17	brittlestarfish unidentified	*Family Ophiuroidae*	0.1
18	skate unidentified	*Family Rajidae*	0.1
19	rex sole	*Glyptocephalus zachirus*	0.1
20	Pacific halibut	*Hippoglossus stenolepis*	0.1

Table 11.–Dredge contents from haul composition sampling during the 2007/08 Prince William Sound Area weathervane scallop fishery.

Rank	Common name	Scientific name	Percentage weight
1	weathervane scallop	*Patinopecten caurinus*	86.8
2	brittlestarfish unidentified	Family *Ophiuroidae*	4.5
3	empty weathervane shells	*P. caurinus*	2.9
4	sunflower sea star	*Pycnopodia helianthoides*	2.2
5	kelp, wood, rocks, etc.		0.8
6	Dover sole	*Microstomus pacificus*	0.5
7	big skate	*Raja binoculata*	0.3
8	English sole	*Parophrys vetulus*	0.2
9	lingcod	*Ophiodon elongatus*	0.2
10	sand star	*Luidia foliata*	0.2
11	arrowtooth flounder	*Atheresthes stomias*	0.2
12	flathead sole	*Hippoglossoides elassodon*	0.2
13	spiny dogfish	*Squalus acanthias*	0.1
14	sea anemone unidentified	Order *Actiniaria*	<0.1
15	skate unidentified	Family *Rajidae*	<0.1
16	Pacific halibut	*Hippoglossus stenolepis*	<0.1
17	Pacific cod	*Gadus macrocephalus*	<0.1
18	empty gastropod shells		<0.1
19	Hermit crab	*Pagurus ochotensis*	<0.1
20	crab barnacle	*Balanus hesperius*	<0.1

Table 11.–Dredge contents from haul composition sampling during the 2007/08 Kodiak Northeast District weathervane scallop fishery.

Rank	Common name	Scientific name	Percentage weight
1	weathervane scallop	*Patinopecten caurinus*	74.5
2	kelp, wood, rocks, etc.		9.0
3	sunflower sea star	*Pycnopodia helianthoides*	7.5
4	empty weathervane shells	*P. caurinus*	3.3
5	sea anemone unidentified	Order *Actiniaria*	1.2
6	rock sole	*Pleuronectes bilineatus*	0.8
7	Alaska skate	*Bathyraja parmifera*	0.6
8	Tanner crab	*Chionoecetes bairdi*	0.6
9	brittlestarfish unidentified	Family *Ophiuroidae*	0.5
10	butter sole	*Isopsetta isolepis*	0.4
11	longnose skate	*Raja rhina*	0.3
12	sand star	*Luidia foliata*	0.2
13	rex sole	*Glyptocephalus zachirus*	0.1
14	Pacific halibut	*Hippoglossus stenolepis*	0.1
15	flathead sole	*Hippoglossoides elassodon*	<0.1
16	arrowtooth flounder	*Atheresthes stomias*	<0.1
17	hermit crab	*Pagurus ochotensis*	<0.1
18	solaster dawsoni	*Solaster dawsoni*	<0.1
19	sponge unidentified	Phylum *Porifera*	<0.1
20	*Chlamys* scallops	*Chlamys* sp.	<0.1

Table 12.–Dredge contents from haul composition sampling during the 2007/08 Kodiak Shelikof District weathervane scallop fishery.

Rank	Common name	Scientific name	Percentage weight
1	weathervane scallop	*Patinopecten caurinus*	81.2
2	empty weathervane shells	*P. caurinus*	3.9
3	kelp, wood, rocks, etc.		3.4
4	sunflower sea star	*Pycnopodia helianthoides*	1.9
5	Alaska plaice	*Pleuronectes quadrituberculatus*	1.1
6	Alaska skate	*Bathyraja parmifera*	1.0
7	arrowtooth flounder	*Atheresthes stomias*	0.9
8	Oregon triton	*Fusitriton oregonensis*	0.9
9	longnose skate	*Raja rhina*	0.7
10	flathead sole	*Hippoglossoides elassodon*	0.6
11	big skate	*Raja binoculata*	0.5
12	Pacific sleeper shark	*Somniosus pacificus*	0.4
13	Bering skate	*Bathyraja interrupta*	0.4
14	sea anemone unidentified	Order *Actiniaria*	0.3
15	Pacific halibut	*Hippoglossus stenolepis*	0.2
16	tunicate unidentified	*Ascidian unidentified*	0.2
17	bristle worm	*Aphrodita negligens*	0.2
18	Aleutian hermit crab	*Pagurus aleuticus*	0.1
19	Dover sole	*Microstomus pacificus*	0.1
20	longnose skate	*Raja rhina*	0.1

Table 13.–Dredge contents from haul composition sampling during the 2007/08 Bering Sea Area weathervane scallop fishery.

Rank	Common name	Scientific name	Percentage weight
1	weathervane scallop	*Patinopecten caurinus*	82.8
2	empty weathervane shells	*P. caurinus*	1.9
3	arrowtooth flounder	*Atheresthes stomias*	1.3
4	Tanner crab	*Chionoecetes bairdi*	1.2
5	Aleutian skate	*Bathyraja aleutica*	1.1
6	Oregon triton	*Fusitriton oregonensis*	1.0
7	empty gastropod shells		0.9
8	sea whip unidentified	*Halipteris* sp.	0.8
9	basket star	*Gorgonocephalus caryi*	0.8
10	rock sole	*Pleuronectes bilineatus*	0.7
11	Tanner crab unidentified	*Chionoecetes* sp.	0.6
12	Aleutian hermit crab	*Pagurus aleuticus*	0.6
13	rex sole	*Glyptocephalus zachirus*	0.5
14	lyre whelk	*Neptunea lyrata*	0.5
15	Pacific cod	*Gadus macrocephalus*	0.5
16	sponge unidentified	Phylum *Porifera*	0.4
17	bigmouth sculpin	*Hemitripterus bolini*	0.4
18	kelp, wood, rocks, etc.		0.4
19	flathead sole	*Hippoglossoides elassodon*	0.3
20	sea anemone unidentified	Order *Actiniaria*	0.3

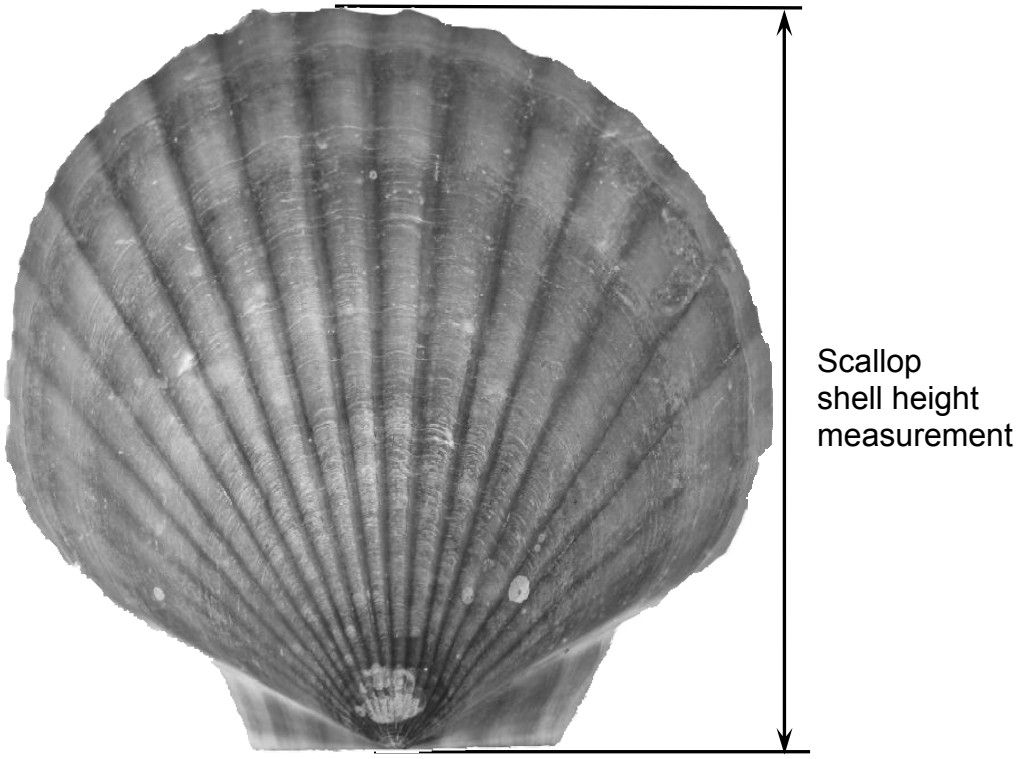


Figure 1.–Left (upper) valve of scallop shell showing orientation of shell height measurement.

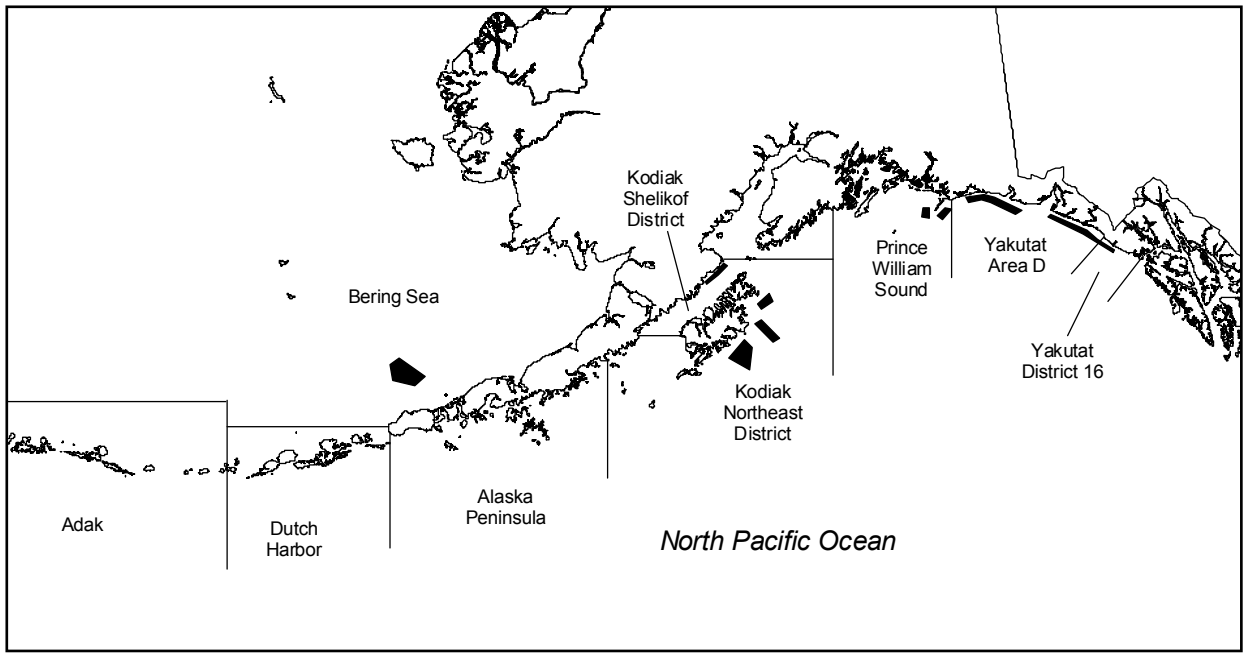


Figure 2.–Map showing Alaska scallop fishery registration areas. General areas of effort during the 2007/08 season are overlaid by dark polygons.

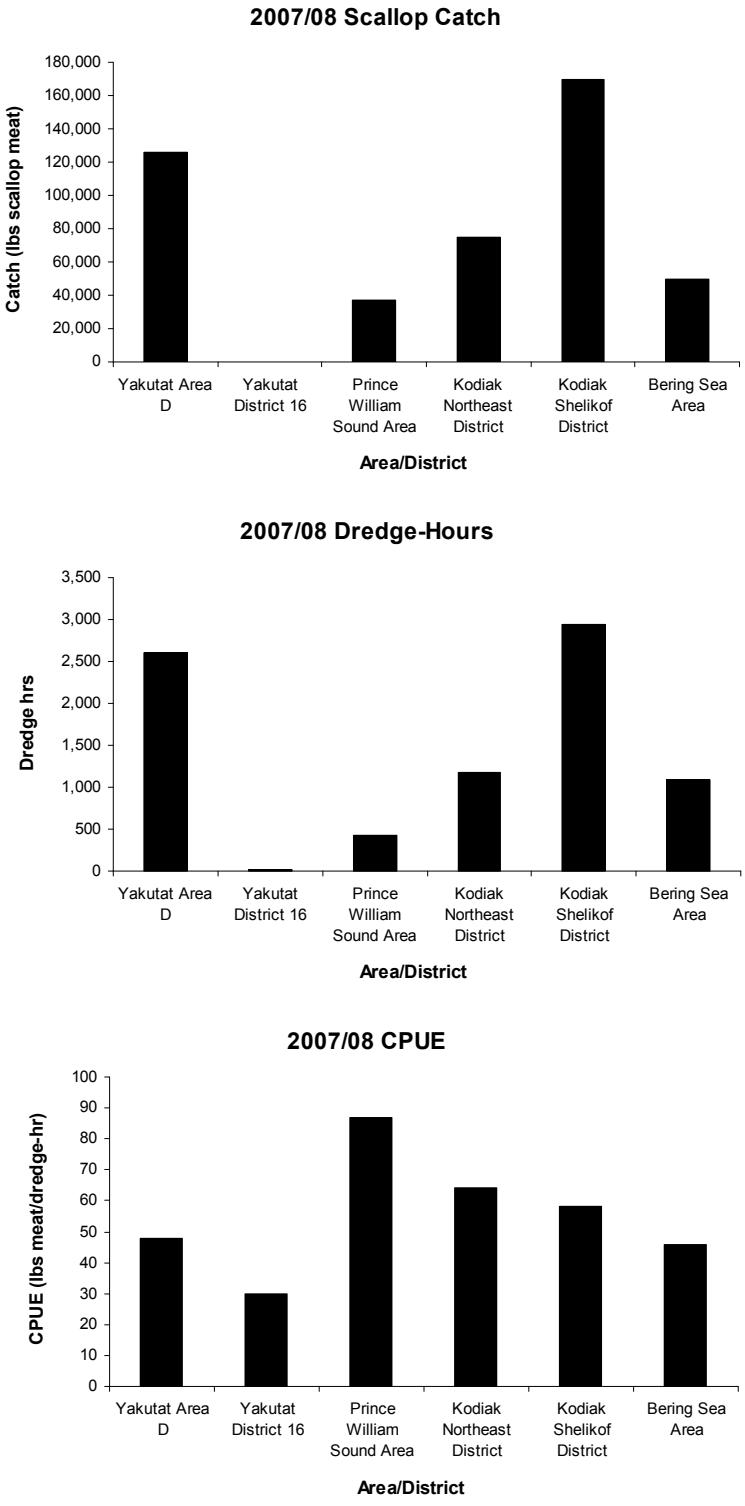


Figure 3.–Scallop catch (top), dredge-hrs (center), and CPUE (bottom) during the 2007/08 statewide weathervane scallop fishery.

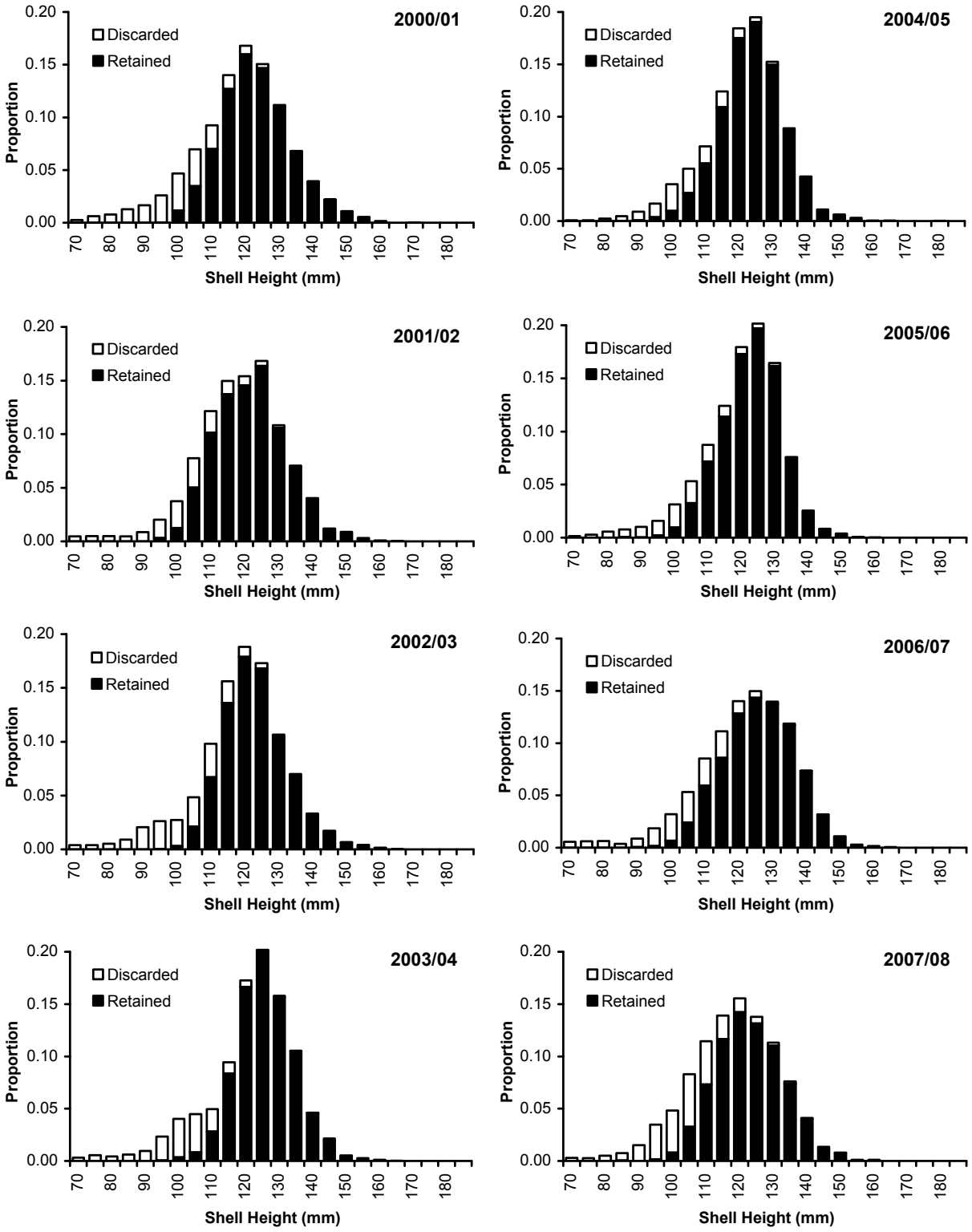


Figure 4.–Estimated scallop shell height distributions from the 2000/01 – 2007/08 Yakutat Area D fishing seasons.

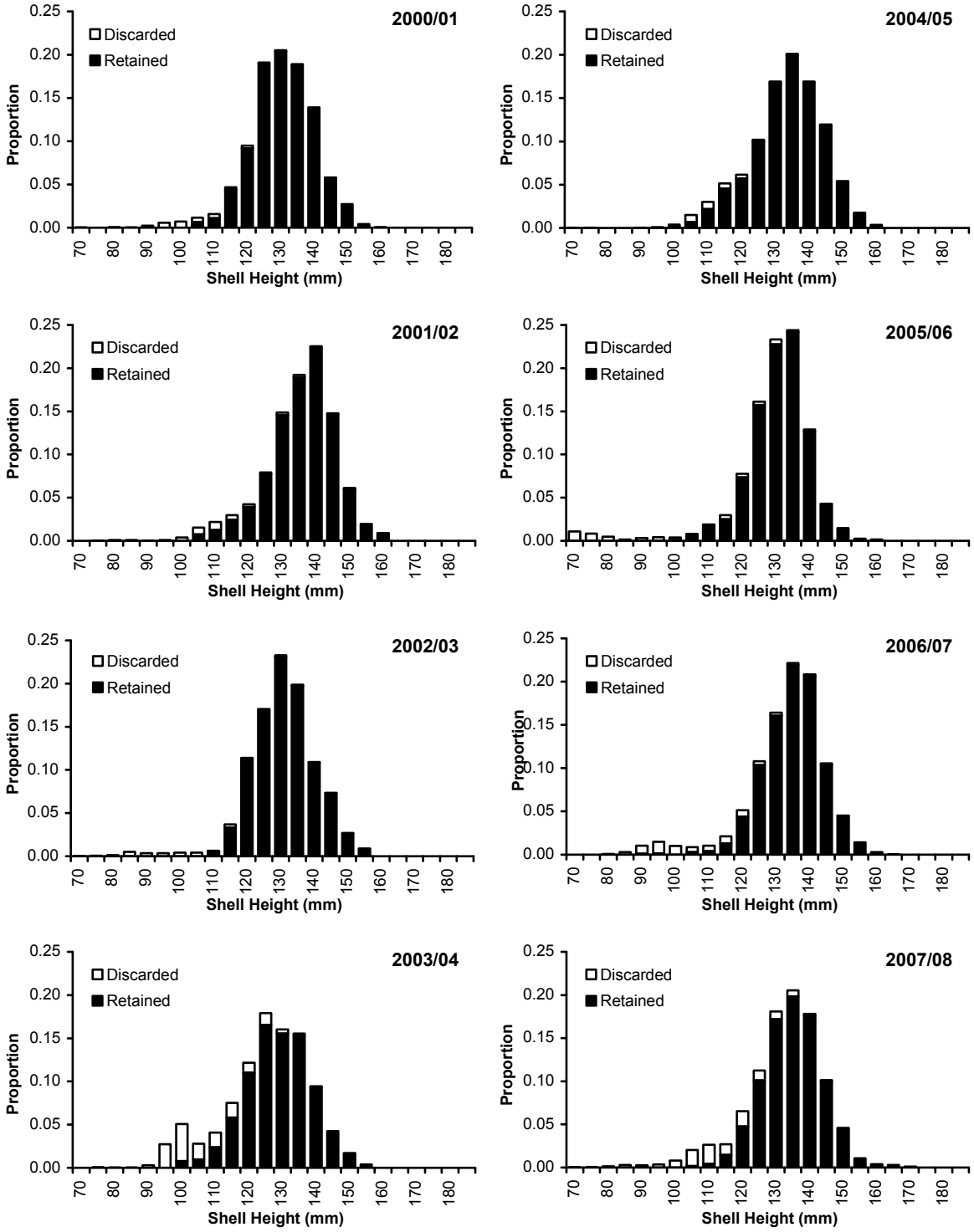


Figure 5.–Estimated scallop shell height distributions from the 2000/01 – 2007/08 Prince William Sound Area fishing seasons.

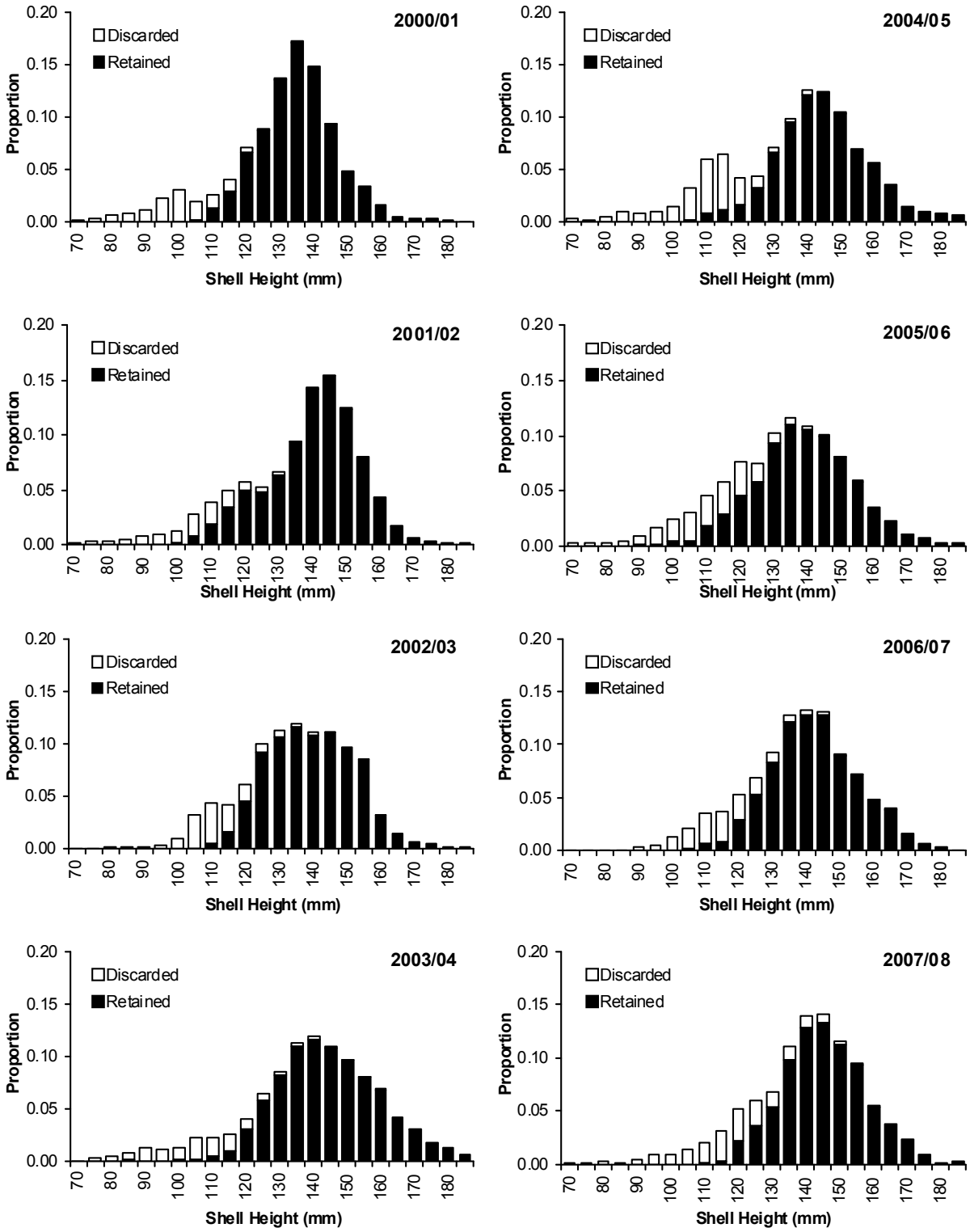


Figure 6.–Estimated scallop shell height distributions from the 2000/2001 – 2007/08 Kodiak Northeast District fishing seasons.

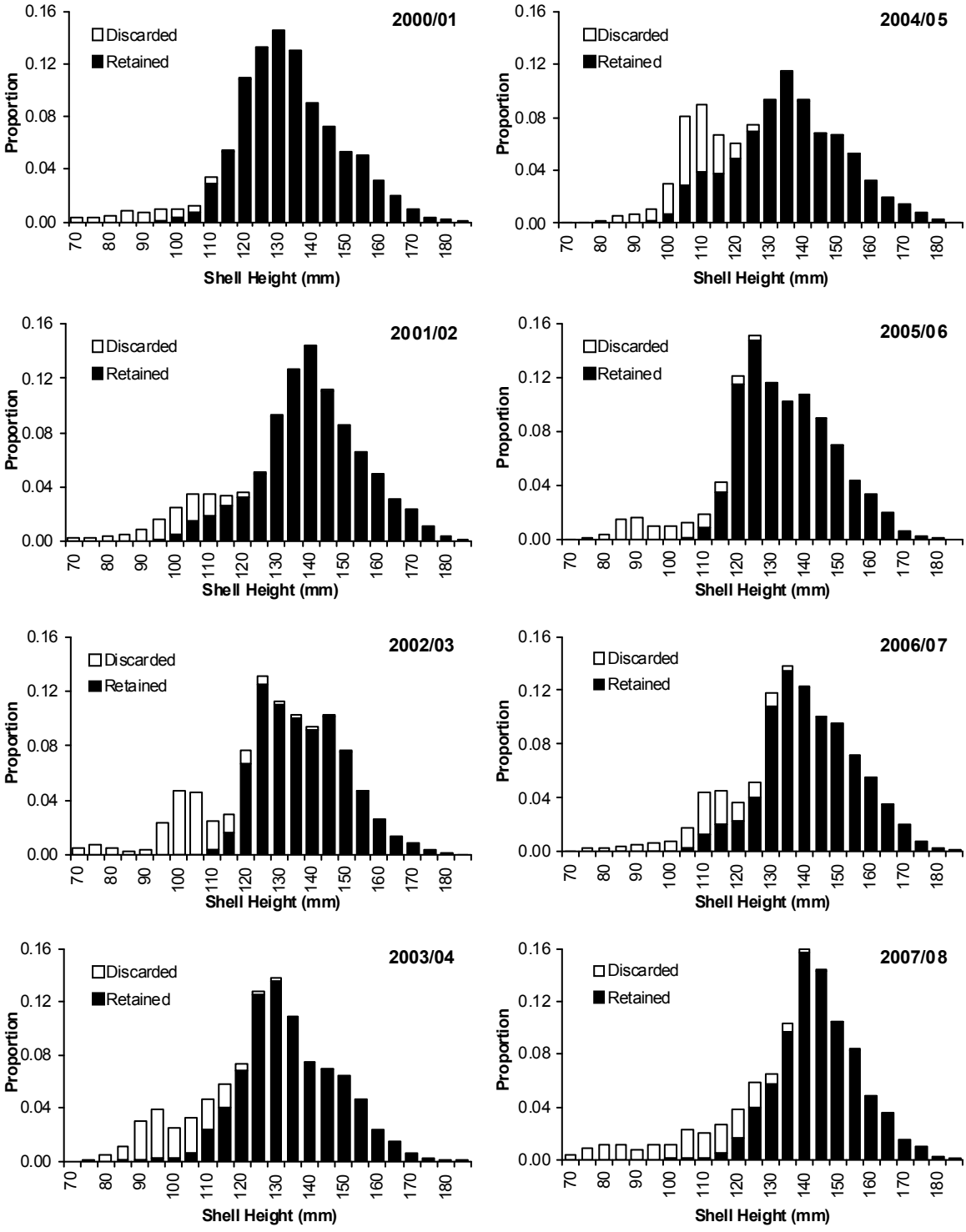


Figure 7.–Estimated scallop shell height distributions from the 2000/01 – 2007/08 Kodiak Shelikof District fishing seasons.

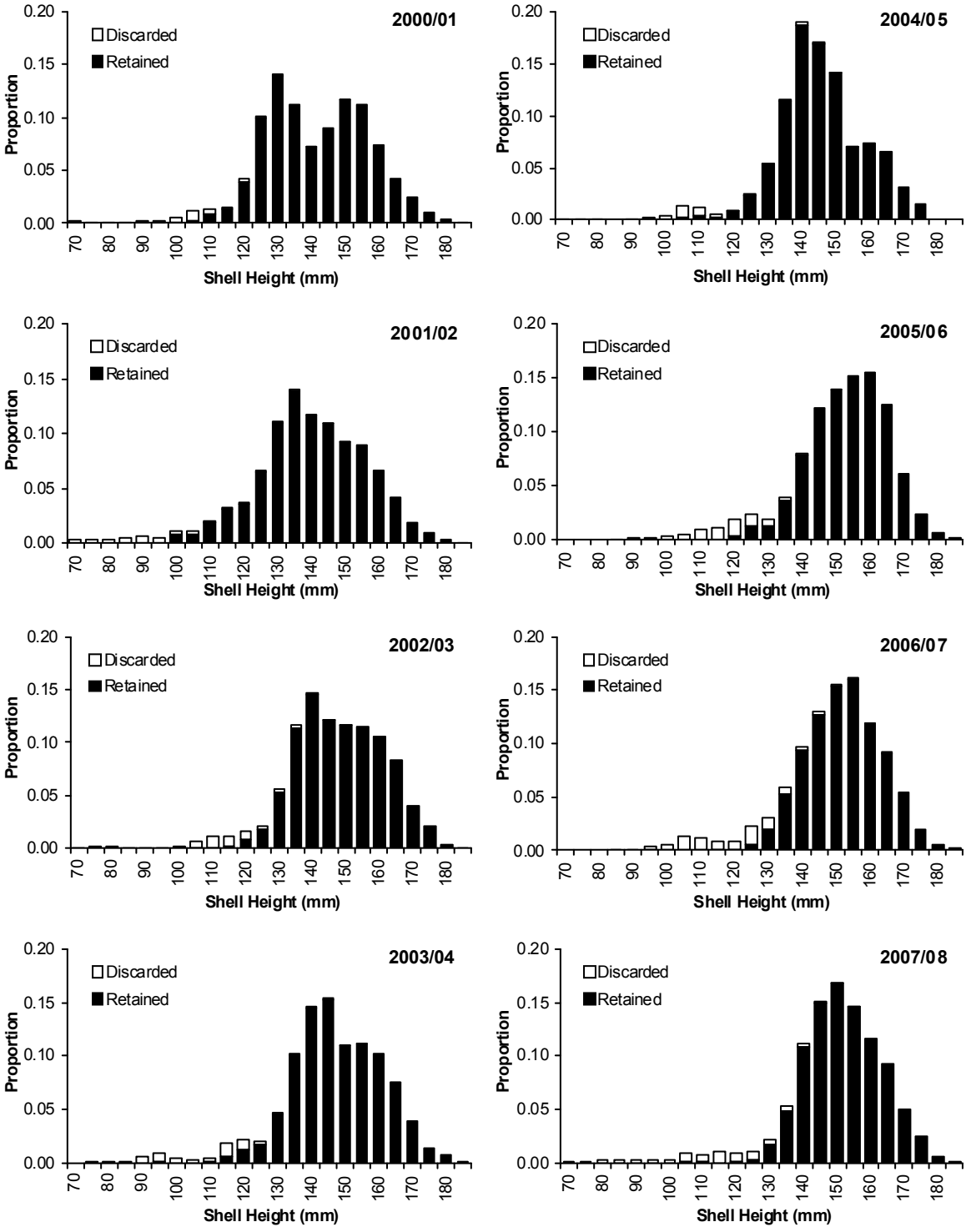
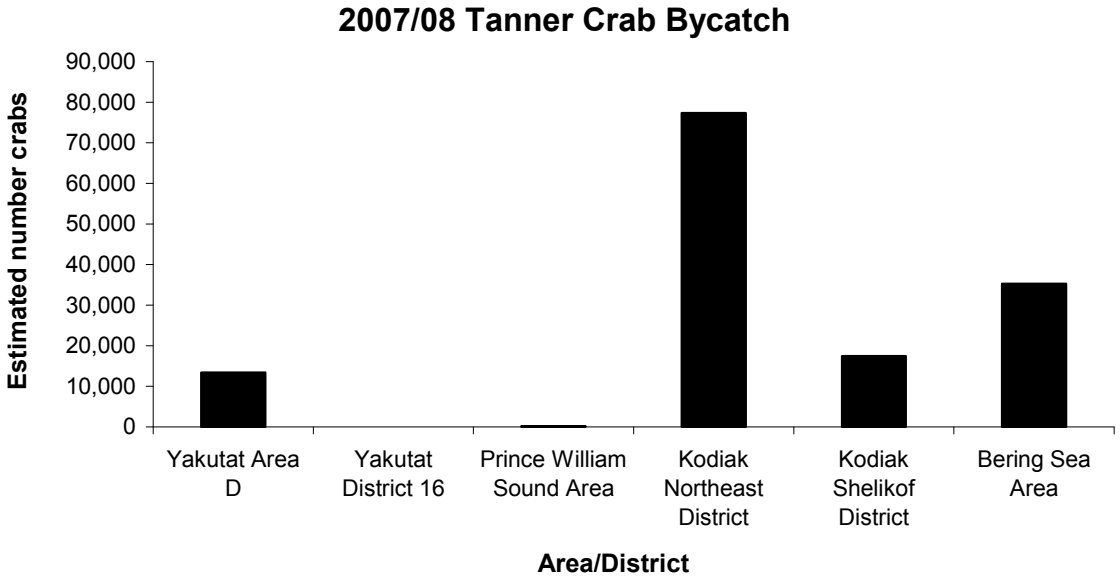


Figure 8.–Estimated scallop shell height distributions from the 2000/01 – 2007/08 Bering Sea Area fishing seasons.



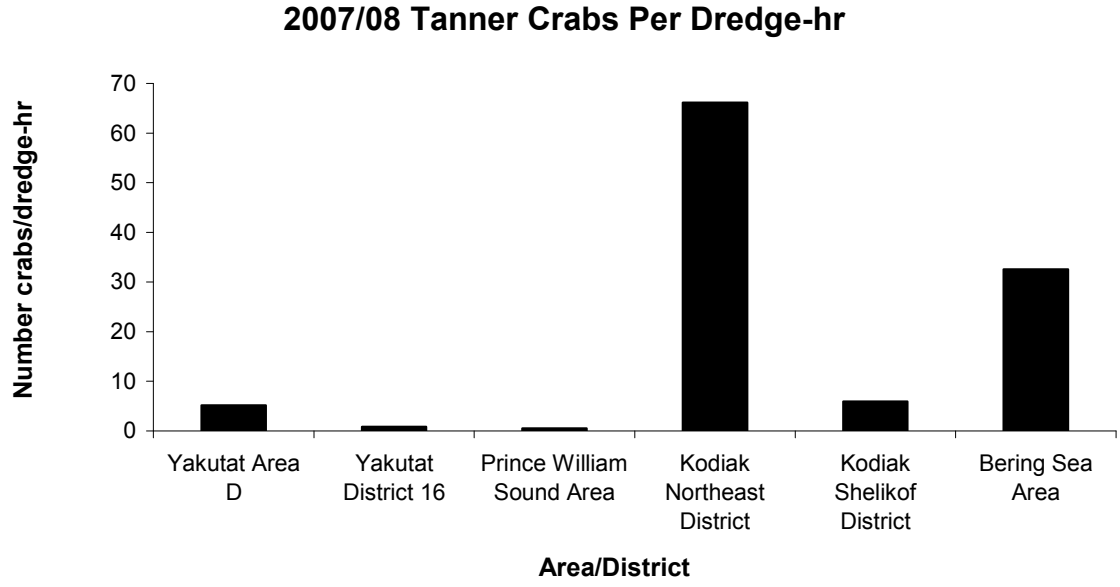


Figure 9.–Estimated Tanner crab bycatch (top) and bycatch rate (bottom) during the 2007/08 scallop fishing season.

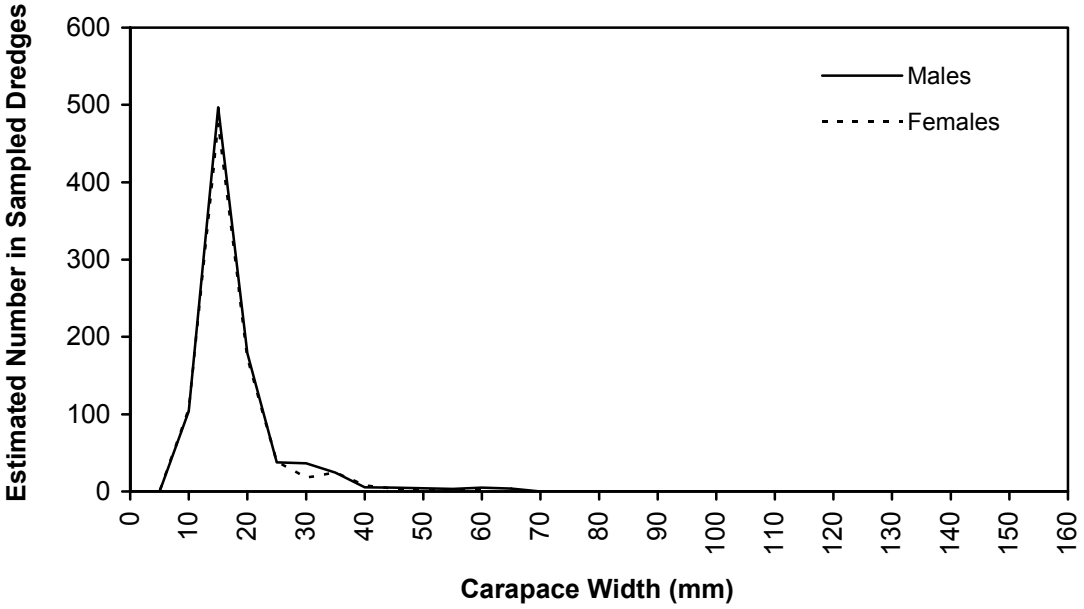


Figure 10.–Tanner crab carapace width distribution from bycatch sampling during the 2007/08 Yakutat Area D scallop fishery. Sample sizes were 688 males and 673 females.

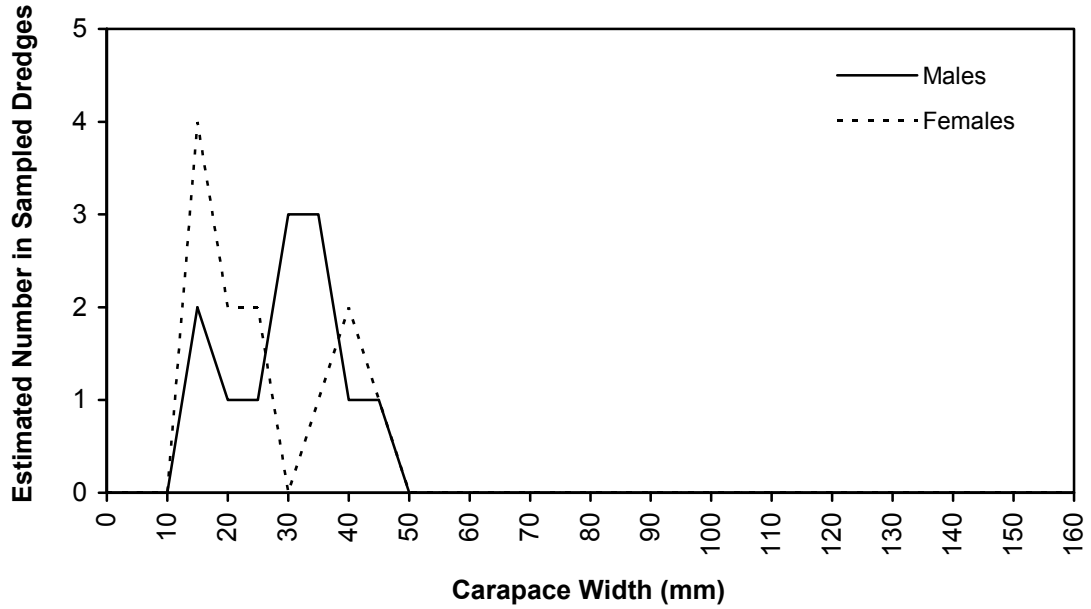


Figure 11.–Tanner crab carapace width distribution from bycatch sampling during the 2007/08 Prince William Sound scallop fishery. Sample sizes were 12 males and 12 females.

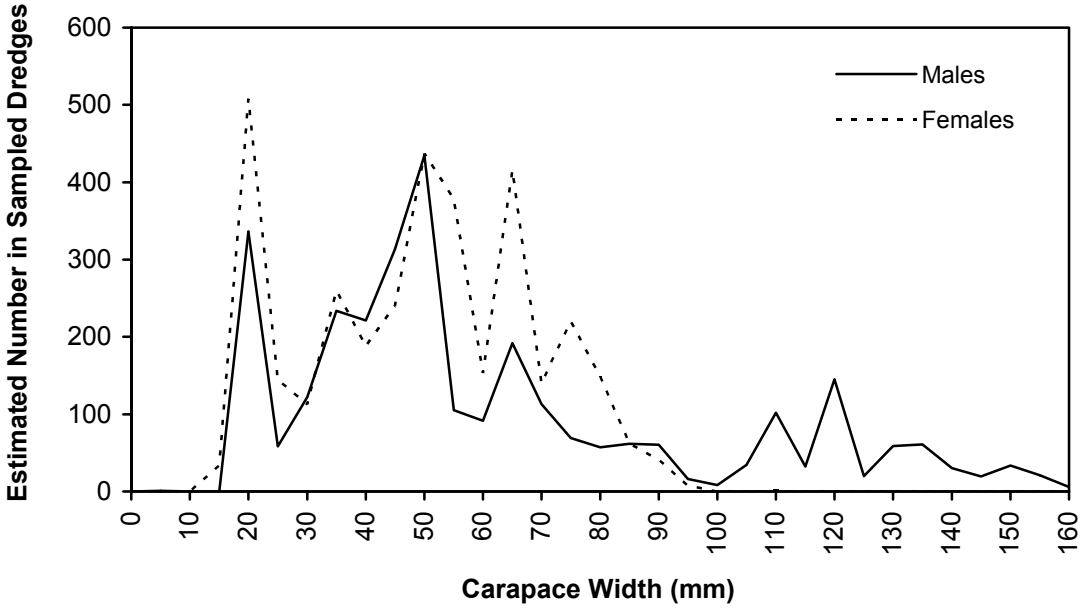


Figure 12.–Tanner crab carapace width distribution from bycatch sampling during the 2007/08 Kodiak Northeast District scallop fishery. Sample sizes were 567 males and 587 females.

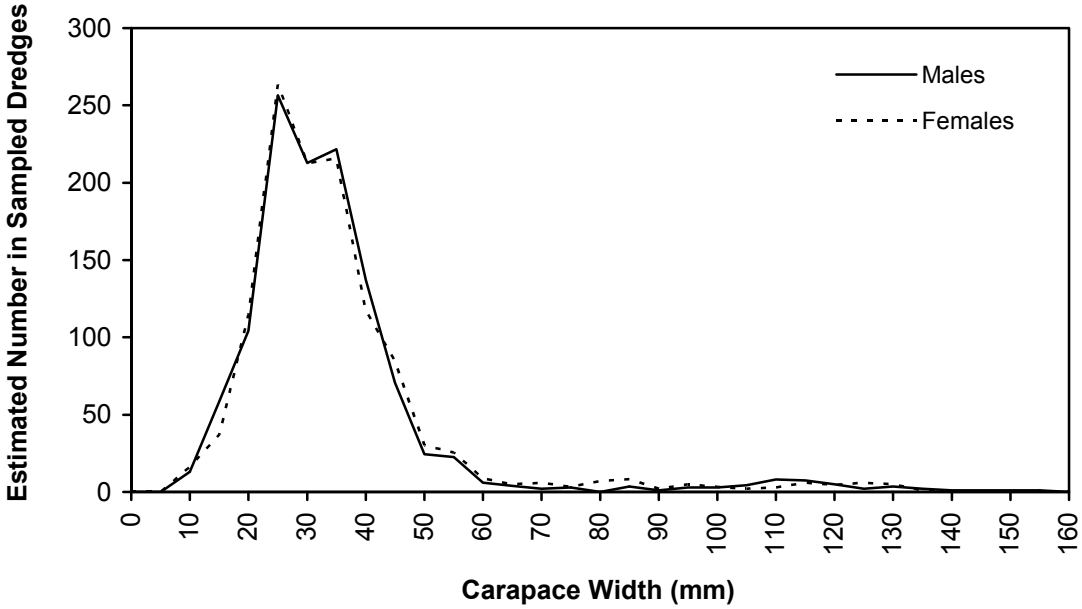


Figure 13.–Tanner crab carapace width distribution from bycatch sampling during the 2007/08 Kodiak Shelikof District scallop fishery. Sample sizes were 1,103 males and 1,112 females.

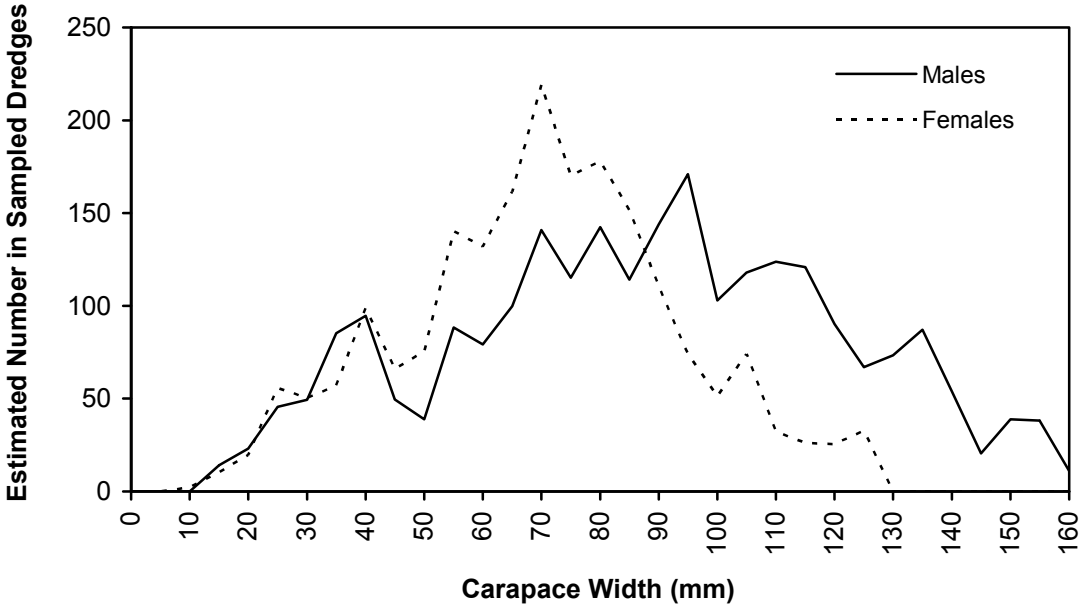


Figure 14.–Tanner crab carapace width distribution from bycatch sampling during the 2007/08 Bering Sea Area scallop fishery. Sample sizes were 951 males and 801 females.

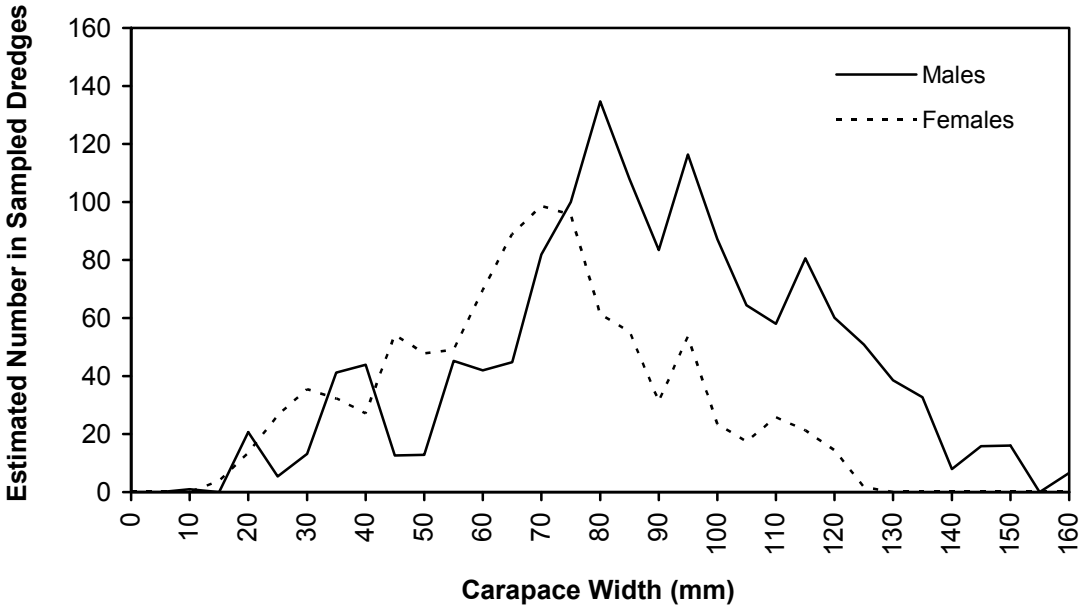


Figure 15.–Combined snow crab and hybrid snow crab × Tanner crab carapace width distribution from bycatch sampling during the 2007/08 Bering Sea Area scallop fishery. Sample sizes were 477 males and 347 females.

APPENDIX A: HISTORICAL ALASKA SCALLOP OBSERVER PROGRAM SUMMARY STATISTICS

Appendix A1.–Historical observer program summary statistics from the Yakutat Area D scallop fishery.

Season	Start of fishing	End of fishing	Number vessels	Fishing days[a]	Observed days[b]	Bycatch samples	Haulcomp samples[c]
1993	7/1/1993	7/11/1993	8	77	75	466	NA
1994	1/10/1994	1/20/1994	11	88	83	496	NA
1994	7/1/1994	7/12/1994	4	60	60	280	95
1995	1/10/1995	2/14/1995	10	166	134	429	71
1996	1/10/1996	1/25/1996	3	47	43	141	37
1996	8/1/1996	9/4/1996	3	82	80	424	69
1997	1/10/1997	2/19/1997	4	144	129	502	85
1998/99	7/1/1998	10/5/1998	8	160	148	767	121
1999/2000	7/1/1999	9/21/1999	3	132	123	616	104
2000/01	7/1/2000	2/14/2001	3	170	134	510	113
2001/02	7/7/2001	2/15/2002	2	86	81	318	66
2002/03	7/2/2002	8/29/2002	2	83	77	339	72
2003/04	8/10/2003	2/8/2004	2	105	85	354	67
2004/05	9/1/2004	2/15/2005	2	88	74	294	60
2005/06	8/5/2005	1/25/2006	2	162	137	574	104
2006/07	7/11/2006	10/24/2006	2	92	84	383	64
2007/08	8/14/2007	2/13/2008	2	92	84	369	67

[a] Number vessel days with at least one haul.

[b] Number vessel days with at least one sampled haul.

[c] Number haul composition samples. Haul composition sampling began in July, 1994.

Appendix A2.–Historical observer program summary statistics from the Yakutat District 16 scallop fishery.

Season	Start of fishing	End of fishing	Number vessels	Fishing days[a]	Observed days[b]	Bycatch samples	Haulcomp samples[c]
1993	7/17/1993	7/25/1993	1	9	9	28	NA
1994	1/20/1994	1/20/1994	7	7	7	48	NA
1994	7/13/1994	7/16/1994	1	4	3	16	6
1995	1/10/1995	2/13/1995	6	42	35	114	21
1996	1/15/1996	1/20/1996	1	6	5	8	2
1996	8/4/1996	11/28/1996	2	23	21	91	18
1997	1/21/1997	2/21/1997	3	27	14	71	11
1998/99	7/1/1998	10/6/1998	6	33	24	117	18
1999/2000	7/28/1999	9/26/1999	2	23	16	67	12
2000/01	9/17/2000	2/14/2001	4	29	23	83	16
2001/02	7/10/2001	10/8/2001	2	21	17	57	8
2002/03	7/1/2002	7/9/2002	2	6	4	10	1
2003/04	8/30/2003	2/8/2004	2	3	1	2	1
2004/05	9/3/2004	2/15/2005	2	18	18	33	12
2005/06	10/11/2005	1/30/2006	2	16	15	43	8
2006/07	8/19/2006	9/13/2006	2	12	11	47	6
2007/08	8/15/2007	11/27/2007	2	4	2	3	2

[a] Number vessel days with at least one haul.

[b] Number vessel days with at least one sampled haul.

[c] Number haul composition samples. Haul composition sampling began in July, 1994.

Appendix A3.–Historical observer program summary statistics from the Prince William Sound Area scallop fishery. The area was not opened for fishing during 1994 and 1996.

Season	Start of fishing	End of fishing	Number vessels	Fishing days[a]	Observed days[b]	Bycatch samples	Haulcomp samples[c]
1993	7/15/1993	7/19/1993	7	29	27	182	NA
1995	1/10/1995	1/26/1995	2	21	21	75	15
1997	1/12/1997	1/19/1997	1	8	7	37	7
1998/99	7/1/1998	7/4/1998	2	8	8	26	3
1999/2000	7/1/1999	7/4/1999	2	8	6	18	3
2000/01	7/6/2000	8/2/2000	3	30	28	71	20
2001/02	1/22/2002	2/11/2002	1	21	16	29	13
2002/03	7/28/2002	2/15/2003	2	17	16	55	11
2003/04	12/11/2003	1/24/2004	1	15	13	23	8
2004/05	8/21/2004	11/2/2004	2	28	26	84	22
2005/06	7/1/2005	8/22/2005	3	56	51	180	36
2006/07	7/2/2006	7/11/2006	2	15	15	66	9
2007/08	7/7/2007	8/11/2007	2	20	20	66	16

[a] Number vessel days with at least one haul.

[b] Number vessel days with at least one sampled haul.

[c] Number haul composition samples. Haul composition sampling began in July, 1994.

Appendix A4.–Historical observer program summary statistics from the Kodiak Northeast District scallop fishery. The area was not opened for fishing during 1995/96.

Season	Start of fishing	End of fishing	Number vessels	Fishing days[a]	Observed days[b]	Bycatch samples	Haulcomp samples[c]
1993/94	7/11/1993	11/24/1993	10	272	237	1,393	NA
1994/95	8/20/1994	11/11/1994	11	80	67	291	45
1996/97	10/31/1996	12/12/1996	3	29	19	73	12
1997/98	8/10/1997	12/8/1997	3	94	86	414	60
1998/99	7/6/1998	10/2/1998	4	89	80	418	55
1999/2000	7/1/1999	9/9/1999	3	40	38	197	30
2000/01	8/19/2000	9/26/2000	4	40	37	163	28
2001/02	8/8/2001	1/18/2002	3	45	39	166	33
2002/03	8/20/2002	2/10/2003	2	46	42	189	40
2003/04	7/18/2003	11/15/2003	2	42	40	166	31
2004/05	7/5/2004	8/9/2004	2	42	42	189	33
2005/06	7/7/2005	1/17/2006	3	63	53	199	63
2006/07	9/7/2006	12/2/2006	2	42	40	178	31
2007/08	9/29/2007	2/3/2008	2	47	37	125	24

[a] Number vessel days with at least one haul.

[b] Number vessel days with at least one sampled haul.

[c] Number haul composition samples. Haul composition sampling began in July, 1994.

Appendix A5.–Historical observer program summary statistics from the Kodiak Shelikof District scallop fishery. The area was not opened for fishing during 1995/96.

Season	Start of fishing	End of fishing	Number vessels	Fishing days[a]	Observed days[b]	Bycatch samples	Haulcomp samples[c]
1993/94	7/1/1993	8/5/1993	5	82	80	499	NA
1994/95	7/1/1994	10/25/1994	11	265	257	1,405	203
1996/97	8/28/1996	10/18/1996	4	104	99	544	85
1997/98	7/1/1997	8/10/1997	4	153	150	841	134
1998/99	7/9/1998	8/21/1998	8	121	112	607	88
1999/2000	7/3/1999	9/6/1999	6	117	111	627	98
2000/01	7/3/2000	10/2/2000	5	90	81	384	79
2001/02	7/3/2001	12/8/2001	4	103	97	458	96
2002/03	7/3/2002	2/9/2003	3	115	110	484	96
2003/04	8/11/2003	1/13/2004	2	95	88	394	78
2004/05	7/27/2004	12/9/2004	2	100	96	445	86
2005/06	7/1/2005	12/11/2005	2	70	65	263	54
2006/07	7/5/2006	9/7/2006	3	73	72	325	68
2007/08	7/2/2007	11/29/2007	3	105	101	479	93

[a] Number vessel days with at least one haul.

[b] Number vessel days with at least one sampled haul.

[c] Number haul composition samples. Haul composition sampling began in July, 1994.

Appendix A6.–Historical observer program summary statistics from the Kodiak Semidi Island District scallop fishery. The area was not opened for fishing in 1995. Regulatory changes in 2000 closed state waters in the Semidi District and no effort has occurred since.

Season	Start of fishing	End of fishing	Number vessels	Fishing days[a]	Observed days[b]	Bycatch samples	Haulcomp samples[c]
1993	11/5/1993	12/11/1993	3	27	26	180	NA
1994	1/26/1994	2/11/1994	6	48	44	260	NA
1994	7/18/1994	10/31/1994	2	10	10	51	7
1996/97	10/19/1996	12/1/1996	3	37	32	166	20
1997/98	11/26/1997	12/9/1997	1	14	14	64	14
1998/99	8/22/1998	9/25/1998	2	5	5	23	3
1999/2000	7/21/1999	9/17/1999	1	4	1	6	1

[a] Number vessel days with at least one haul.

[b] Number vessel days with at least one sampled haul.

[c] Number haul composition samples. Haul composition sampling began in July, 1994.

Appendix A7.–Historical observer program summary statistics from the Alaska Peninsula Area scallop fishery. The area was not opened for fishing during the 1995/96, 2001/02, and 2002/03 seasons. No effort occurred during the 2003/04 – 2005/06 and 2007/08 season seasons.

Season	Start of fishing	End of fishing	Number vessels	Fishing days[a]	Observed days[b]	Bycatch samples	Haulcomp samples[c]
1993/94	7/25/1993	10/21/1993	8	75	69	374	NA
1994/95	7/7/1994	9/21/1994	7	80	75	342	47
1996/97	10/21/1996	10/30/1996	2	13	12	47	9
1997/98	8/13/1997	2/10/1998	4	68	64	325	42
1998/99	8/28/1998	9/19/1998	4	48	46	228	31
1999/2000	8/23/1999	10/6/1999	5	73	65	343	46
2000/01	7/11/2000	8/28/2000	3	14	9	39	8
2006/07	10/26/2006	12/8/2006	2	7	5	21	1

[a] Number vessel days with at least one haul.

[b] Number vessel days with at least one sampled haul.

[c] Number haul composition samples. Haul composition sampling began in July, 1994.

Appendix A8.–Historical observer program summary statistics from the Bering Sea Area scallop fishery. Fishing was not opened during the 1995/96 season.

Season	Start of fishing	End of fishing	Number vessels	Fishing days[a]	Observed days[b]	Bycatch samples	Haulcomp samples[c]
1993/94	7/28/1993	9/5/1993	9	172	166	1,029	NA
1994/95	7/1/1994	9/7/1994	8	312	304	1,751	269
1996/97	8/1/1996	10/16/1996	1	63	54	204	35
1997/98	7/2/1997	8/11/1997	2	66	64	252	54
1998/99	7/16/1998	9/4/1998	4	73	64	293	39
1999/2000	7/1/1999	8/30/1999	2	94	76	440	60
2000/01	7/1/2000	8/23/2000	3	91	87	424	76
2001/02	7/1/2001	10/30/2001	3	84	82	372	72
2002/03	9/8/2002	1/2/2003	2	61	56	244	50
2003/04	7/2/2003	2/15/2004	2	28	26	127	18
2004/05	7/3/2004	7/9/2004	1	7	7	35	7
2005/06	12/18/2005	1/9/2006	1	21	18	77	17
2006/07	10/31/2006	12/13/2006	1	36	33	149	23
2007/08	9/10/2007	12/17/2007	2	33	31	141	25

[a] Number vessel days with at least one haul.

[b] Number vessel days with at least one sampled haul.

[c] Number haul composition samples. Haul composition sampling began in July, 1994.

Appendix A9.–Historical observer program summary statistics from the Dutch Harbor Area scallop fishery. No effort occurred during the 1996/97 season, and fishing was not opened during the 2000/01 – 2001/02 and 2003/04 – 2007/08 seasons.

Season	Start of fishing	End of fishing	Number vessels	Fishing days[a]	Observed days[b]	Bycatch samples	Haulcomp samples[c]
1993/94	7/2/1993	9/16/1993	3	38	26	91	NA
1994/95	7/23/1994	8/20/1994	3	6	6	23	1
1995/96	7/11/1995	9/9/1995	1	38	35	145	27
1997/98	8/18/1997	8/25/1997	1	8	8	22	6
1998/99	9/6/1998	11/12/1998	4	37	34	173	16
1999/2000	9/17/1999	9/30/1999	1	13	10	54	6
2002/03	10/10/2002	10/17/2002	1	8	7	30	6

[a] Number vessel days with at least one haul.

[b] Number vessel days with at least one sampled haul.

[c] Number haul composition samples. Haul composition sampling began in July, 1994.

APPENDIX B: HISTORICAL ALASKA SCALLOP FISHERY SUMMARY STATISTICS

Appendix B1.–Historical summary statistics from the Yakutat Area D scallop fishery.

Season	GHL	Catch (lbs meat)	Catch (lbs whole)	Dredge hours	CPUE[a]	Avg SH[b] (mm)	Est scallop discards	
							Number	lbs whole
1993	125,000	141,423	2,082,824	1,999	71	118	NA	NA
1994	250,000	158,660	2,085,942	2,547	62	121	NA	NA
1994	NA[c]	94,400	1,713,094	1,715	55	122	NA	NA
1995	250,000	242,491	3,214,968	4,712	51	124	NA	NA
1996	250,000	53,310	832,756	1,142	47	121	NA	NA
1996	NA[c]	185,426	2,362,498	2,840	65	122	1,166,422	295,933
1997	250,000	242,940	3,282,860	3,956	61	119	1,575,369	299,843
1998/99	250,000	241,678	3,475,996	4,192	58	123	1,175,158	271,506
1999/2000	250,000	249,681	3,119,103	3,840	65	124	2,165,570	533,172
2000/01	200,000	195,699	2,734,559	4,241	46	123	2,129,885	588,981
2001/02	200,000	103,800	1,521,537	2,406	43	121	1,070,516	272,300
2002/03	200,000	122,718	1,541,867	2,439	50	123	1,366,856	359,010
2003/04	200,000	160,918	1,939,004	3,358	48	126	1,675,817	397,504
2004/05	200,000	86,950	1,262,499	2,134	41	124	831,898	217,269
2005/06	200,000	199,351	2,662,031	5,089	39	123	1,633,961	407,441
2006/07	150,000	150,950	1,771,229	2,817	54	126	1,483,604	383,622
2007/08	150,000	125,960	1,593,223	2,601	48	123	2,123,698	524,172

[a] CPUE in lbs meat/dredge hr.

[b] Average shell height of retained scallop catch.

[c] Included in yearly GHL.

Appendix B2.–Historical summary statistics from the Yakutat District 16 scallop fishery.

Season	GHL	Catch (lbs meat)	Catch (lbs whole)	Dredge hours	CPUE[a]	Avg SH[b] (mm)	Est scallop discards	
							Number	lbs whole
1993	35,000	NA	55,576	159	NA	132	NA	NA
1994	35,000	13,301	150,962	276	48	147	NA	NA
1994	NA[c]	NA	88,905	132	NA	152	NA	NA
1995	35,000	33,302	447,469	1,095	30	132	NA	NA
1996	35,000	8,090	85,086	167	48	126	NA	NA
1996	NA[c]	25,970	336,978	750	35	133	707,236	159,899
1997	35,000	22,890	265,882	561	41	128	143,392	32,764
1998/99	35,000	34,153	384,286	702	49	123	119,414	25,292
1999/2000	35,000	34,624	292,625	674	51	125	216,600	57,718
2000/01	35,000	30,904	310,370	476	65	118	203,946	51,221
2001/02	35,000	20,398	245,319	417	49	119	164,073	48,879
2002/03	35,000	3,685	60,928	100	37	120	55,090	14,084
2003/04	35,000	1,072	16,780	18	60	121	4,828	1,136
2004/05	35,000	24,430	326,228	419	58	120	77,678	20,541
2005/06	35,000	13,650	209,487	407	34	119	93,888	24,385
2006/07	21,000	13,445	184,106	309	44	122	139,657	24,800
2007/08	21,000	180	8,888	14	30	119	9,158	1,925

[a] CPUE in lbs meat/dredge hr.

[b] Average shell height of retained scallop catch.

[c] Included in yearly GHL.

Appendix B3.–Historical summary statistics from the Prince William Sound Area scallop fishery. The area was not opened for fishing during 1994 and 1996.

Season	GHL	Catch (lbs meat)	Catch (lbs whole)	Dredge hours	CPUE[a]	Avg SH[b] (mm)	Est scallop discards	
							Number	lbs whole
1993	50,000	63,068	850,718	638	99	124	NA	NA
1995	50,000	108,000	736,455	NA	NA	125	NA	NA
1997	17,200	18,000	257,230	171	105	123	NA	NA
1998/99	20,000	19,650	334,152	179	110	132	15,457	12,789
1999/2000	20,000	20,410	211,140	149	137	132	46,502	18,500
2000/01	30,000	30,266	361,032	221	137	131	42,931	13,826
2001/02	30,000	30,090	511,761	263	114	136	68,454	23,824
2002/03	20,000	15,641	231,140	122	121	131	21,909	7,560
2003/04	20,000	19,980	261,720	216	93	136	123,031	49,963
2004/05	50,000	49,320	704,617	614	80	134	253,487	82,794
2005/06	50,000	49,205	818,741	491	100	131	171,902	64,092
2006/07	37,000	36,990	440,781	334	111	135	106,623	38,104
2007/08	37,000	37,105	570,972	428	87	135	198,591	79,645

[a] CPUE in lbs meat/dredge hr.

[b] Average shell height of retained scallop catch.

Appendix B4.–Historical summary statistics from the Kodiak Northeast District scallop fishery. Fishing was not opened during the 1995/96 season.

Season	GHL	Catch (lbs meat)	Catch (lbs whole)	Dredge hours	CPUE[a]	Avg SH[b] (mm)	Est scallop discards Number	Est scallop discards lbs whole
1993/94	NA[c]	155,122	2,214,427	6,940	22	144	NA	NA
1994/95	NA[c]	35,207	389,202	1,773	20	151	NA	NA
1996/97	NA[c]	11,430	147,269	581	20	144	22,076	8,355
1997/98	NA[c]	95,858	1,143,926	2,604	37	140	193,776	41,615
1998/99	NA[c]	120,010	1,365,836	2,749	44	127	800,629	190,480
1999/2000	75,000	77,119	952,972	1,384	56	132	410,193	113,349
2000/01	80,000	79,965	681,192	1,101	73	136	351,100	113,422
2001/02	80,000	80,470	822,110	1,142	70	140	305,047	108,835
2002/03	80,000	80,000	871,918	1,350	59	140	486,634	165,976
2003/04	80,000	79,965	747,517	1,248	64	145	364,548	113,023
2004/05	80,000	80,105	848,527	1,227	65	144	909,579	261,512
2005/06	80,000	79,990	831,378	1,759	45	139	716,148	217,355
2006/07	90,000	75,150	703,338	1,168	64	143	392,477	136,625
2007/08	90,000	75,105	822,697	1,170	64	145	536,296	201,327

[a] CPUE in lbs meat/dredge hr.

[b] Average shell height of retained scallop catch.

[c] Included in Kodiak Area GHL.

Appendix B5.–Historical summary statistics from the Kodiak Shelikof District scallop fishery. Fishing was not opened during the 1995/96 season.

Season	GHL	Catch (lbs meat)	Catch (lbs whole)	Dredge hours	CPUE[a]	Avg SH[b] (mm)	Est scallop discards Number	Est scallop discards lbs whole
1993/94	NA[c]	105,017	1,169,664	2,491	42	128	NA	NA
1994/95	NA[c]	314,051	3,522,517	8,662	36	131	NA	NA
1996/97	NA[c]	219,305	1,878,268	3,491	63	136	753,292	197,174
1997/98	NA[c]	258,346	3,101,152	5,492	47	139	427,756	93,221
1998/99	NA[c]	179,870	2,129,025	4,081	44	137	1,054,711	216,354
1999/2000	180,000	187,963	1,903,345	4,304	44	130	1,144,593	289,867
2000/01	180,000	180,087	1,768,376	2,907	62	134	569,722	128,614
2001/02	180,000	177,112	1,830,265	3,398	52	140	722,636	239,459
2002/03	180,000	180,580	1,857,466	3,799	48	138	1,827,306	492,954
2003/04	180,000	180,011	1,724,498	3,258	55	135	1,654,486	400,946
2004/05	180,000	174,622	1,641,608	3,467	50	137	1,563,694	434,807
2005/06	160,000	159,941	1,454,806	2,280	70	136	622,014	164,900
2006/07	160,000	162,537	1,405,382	2,183	74	142	761,724	241,414
2007/08	170,000	169,968	1,695,563	2,937	58	144	1,330,266	382,589

[a] CPUE in lbs meat/dredge hr.

[b] Average shell height of retained scallop catch.

[c] Included in Kodiak Area GHL.

Appendix B6.–Historical summary statistics from the Kodiak Semidi Island District scallop fishery. Fishing was not opened during the 1995/96 season. Regulatory changes that closed state waters to scallop fishing were enacted in 2000, and no effort has occurred since.

Season	Catch (lbs meat)	Catch (lbs whole)	Dredge hours	CPUE[a]	Avg SH[b] (mm)	Est scallop discards Number	Est scallop discards lbs whole
1993	55,487	261,910	1,819	31	145	NA	NA
1994	NA	317,926	990	NA	153	NA	NA
1994	NA	69,315	272	NA	153	NA	NA
1996/97	37,810	288,117	1,017	37	153	11,211	6,000
1997/98	6,315	61,320	349	18	147	5,831	2,716
1998/99	1,720	15,806	106	16	151	1,453	508
1999/2000	930	11,310	45	21	152	929	375

[a] CPUE in lbs meat/dredge hr.

[b] Average shell height of retained scallop catch.

Appendix B7.–Historical summary statistics from the Alaska Peninsula Area scallop fishery. The area was not opened for fishing during the 1995/96, 2001/02, and 2002/03 seasons. No effort occurred during the 2003/04 – 2005/06 and 2007/08 seasons.

Season	GHL	Catch (lbs meat)	Catch (lbs whole)	Dredge hours	CPUE[a]	Avg SH[b] (mm)	Est scallop discards Number	Est scallop discards lbs whole
1993/94	NA	112,152	1,061,925	1,847	61	119	NA	NA
1994/95	NA	65,282	619,473	1,664	39	127	NA	NA
1996/97	200,000	12,560	130,235	327	38	126	33,684	7,384
1997/98	200,000	51,616	654,960	1,752	29	135	56,654	38,219
1998/99	200,000	63,290	617,120	1,612	39	128	212,152	43,129
1999/2000	200,000	75,535	781,596	2,025	37	129	256,592	59,077
2000/01	33,000	7,660	95,510	320	24	119	18,633	4,538
2006/07	25,000	155	3,103	64	2	121	2,604	794

[a] CPUE in lbs meat/dredge hr.

[b] Average shell height of retained scallop catch.

Appendix B8.–Historical summary statistics from the Bering Sea Area scallop fishery. Fishing was not opened during the 1995/96 season.

Season	GHL	Catch (lbs meat)	Catch (lbs whole)	Dredge hours	CPUE[a]	Avg SH[b] (mm)	Est scallop discards Number	Est scallop discards lbs whole
1993/94	NA	284,414	3,447,681	5,763	49	146	NA	NA
1994/95	NA	505,439	5,942,912	11,113	45	147	NA	NA
1996/97	600,000	150,295	1,432,160	2,313	65	147	34,412	16,188
1997/98	600,000	97,002	1,082,825	2,246	43	151	114,614	38,262
1998/99	400,000	96,795	1,193,071	2,319	42	147	403,121	127,607
1999/2000	400,000	164,929	1,851,620	3,294	50	145	157,289	68,406
2000/01	200,000	205,520	2,376,601	3,355	61	142	298,483	97,994
2001/02	200,000	140,871	1,700,578	3,072	46	141	180,075	76,261
2002/03	105,000	92,240	952,958	2,038	45	149	135,276	55,165
2003/04	105,000	42,590	537,552	1,020	42	148	92,696	34,602
2004/05	105,000	10,050	129,220	275	37	146	15,076	5,622
2005/06	50,000	23,220	231,700	602	39	154	37,110	17,382
2006/07	50,000	48,246	529,590	1,138	42	152	131,115	55,562
2007/08	50,000	49,995	697,288	1,084	46	152	126,779	49,723

[a] CPUE in lbs meat/dredge hr.

[b] Average shell height of retained scallop catch.

Appendix B9.–Historical summary statistics from the Dutch Harbor Area scallop fishery. Fishing was not opened during the 2000/01 – 2001/02 and 2003/04 – 2007/08 seasons. No effort occurred during the 1996/97 season.

Season	GHL	Catch (lbs meat)	Catch (lbs whole)	Dredge hours	CPUE[a]	Avg SH[b] (mm)	Est scallop discards	
							Number	Weight (lb)
1993/94	170,000	38,731	432,970	838	46	128	NA	NA
1994/95	170,000	1,931	23,590	81	24	158	NA	NA
1995/96	170,000	26,950	289,398	1,047	26	134	NA	NA
1997/98	170,000	5,790	55,725	171	34	127	67,742	18,561
1998/99	110,000	46,432	427,422	1,025	45	128	92,270	29,348
1999/2000	110,000	6,465	68,070	273	24	135	11,459	4,284
2002/03	10,000	6,000	59,116	184	33	133	12,705	4,346

[a] CPUE in lbs meat/dredge hr.

[b] Average shell height of retained scallop catch.

APPENDIX C: HISTORICAL ALASKA SCALLOP FISHERY BYCATCH STATISTICS

Appendix C1.–Historical bycatch statistics from the Yakutat Area D scallop fishery. Crab bycatch limits have not been established for the Yakutat scallop fishery.

Season	Estimated bycatch (number animals)				Lbs meat per Tanner[a]
	Tanner	King	Dungeness	Halibut	
1993	1,700	40	351	99	83
1994	1,767	0	10	129	90
1994	603	0	169	522	157
1995	3,751	0	2,379	1,361	65
1996	2,591	0	2,320	237	21
1996	6,872	0	38	150	27
1997	5,884	0	277	353	41
1998/99	8,891	0	177	293	27
1999/2000	4,993	0	584	80	50
2000/01	17,395	0	313	65	11
2001/02	6,770	0	1,150	155	15
2002/03	8,423	0	779	291	15
2003/04	1,650	0	905	316	98
2004/05	863	0	223	247	101
2005/06	5,189	0	394	518	38
2006/07	7,961	0	159	366	19
2007/08	13,429	0	145	186	9

[a] Ratio of pounds scallop meat harvested for each incidentally caught Tanner crab.

Appendix C2.–Historical bycatch statistics from the Yakutat District 16 scallop fishery. Crab bycatch limits have not been established for the Yakutat scallop fishery.

Season	Estimated bycatch (number animals)				Lbs meat per Tanner[a]
	Tanner	King	Dungeness	Halibut	
1993	NA	NA	NA	NA	NA
1994	10	0	4	48	1,330
1994	0	0	11	236	NA
1995	469	0	93	719	71
1996	39	0	140	108	207
1996	669	0	1	68	39
1997	129	0	0	160	177
1998/99	273	0	0	24	125
1999/2000	48	0	0	111	721
2000/01	627	0	22	86	49
2001/02	833	0	32	86	24
2002/03	185	0	0	9	20
2003/04	0	0	21	10	NA
2004/05	0	0	170	110	NA
2005/06	175	0	0	0	78
2006/07	174	0	21	363	77
2007/08	12	0	0	7	15

[a] Ratio of pounds scallop meat harvested for each incidentally caught Tanner crab.

Appendix C3.–Historical bycatch statistics from the Prince William Sound Area scallop fishery.

Season	Tanner crab bycatch limit	Estimated bycatch (number animals)				Lbs meat per Tanner[a]
		Tanner	King	Dungeness	Halibut	
1993	500	200	0	0	27	315
1995	500	271	0	0	153	399
1997	500	0	0	0	8	NA
1998/99	500	20	0	0	0	983
1999/2000	500	6	0	0	0	3,402
2000/01	11,400	467	0	3	9	65
2001/02	11,400	43	0	0	5	700
2002/03	11,400	369	0	0	10	42
2003/04	11,400	8	0	8	2	2,489
2004/05	11,400	524	0	0	90	94
2005/06	11,400	465	0	0	32	106
2006/07	11,400	359	0	4	24	103
2007/08	11,400	205	0	0	27	181

[a] Ratio of pounds scallop meat harvested for each incidentally caught Tanner crab.

Appendix C4.–Historical bycatch statistics from the Kodiak Northeast District scallop fishery.

	Crab bycatch limits		Estimated bycatch (number animals)				Lbs meat
Season	Tanner	King	Tanner	King	Dungeness	Halibut	per Tanner[a]
1993/94	NA	NA	33,511	9	5	1,513	5
1994/95	143,000	123	2,054	190	0	577	17
1996/97	130,000	66	27,722	0	0	704	<1
1997/98	91,600	50	11,914	0	0	58	8
1998/99	46,500	21	13,887	1	0	309	9
1999/2000	66,500	150	13,886	0	0	158	6
2000/01	81,000	200	13,311	0	0	47	6
2001/02	425,000	15	20,362	0	100	94	4
2002/03	1,100,000	15	22,821	0	0	175	4
2003/04	606,991	17	18,230	0	0	197	4
2004/05	527,388	40	30,717	1	0	109	3
2005/06	449,403	45	29,264	0	0	211	3
2006/07	302,000	24	16,899	0	0	261	4
2007/08	220,000	100	77,348	0	0	299	<1

[a] Ratio of pounds scallop meat harvested for each incidentally caught Tanner crab.

Appendix C5.–Historical bycatch statistics from the Kodiak Shelikof District scallop fishery.

	Crab bycatch limits		Estimated bycatch (number animals)				Lbs meat
Season	Tanner	King	Tanner	King	Dungeness	Halibut	per Tanner[a]
1993/94	NA	NA	51,560	0	122	226	2
1994/95	98,000	219	64,444	29	1,097	851	5
1996/97	16,100	22	11,285	0	515	440	19
1997/98	51,000	35	36,744	0	4,359	448	7
1998/99	33,500	196	22,707	0	33	502	8
1999/2000	42,500	250	38,893	0	100	493	5
2000/01	49,000	125	15,133	2	54	366	12
2001/02	59,000	50	29,114	1	451	247	6
2002/03	67,500	50	51,165	0	2,704	301	4
2003/04	93,139	25	40,575	0	904	574	4
2004/05	35,069	25	33,338	1	1,647	579	5
2005/06	51,822	1,345	18,055	0	1,267	177	9
2006/07	66,132	76	27,688	0	2,078	260	6
2007/08	84,000	1.200	17,454	0	535	155	10

[a] Ratio of pounds scallop meat harvested for each incidentally caught Tanner crab.

Appendix C6.–Historical bycatch statistics from the Kodiak Semidi Island District scallop fishery. Fishing was not opened during the 1995/96 season. Regulatory changes that closed state waters to scallop fishing were enacted in 2000, and no effort has occurred since.

	Estimated bycatch (number animals)				Lbs meat
Season	Tanner	King	Dungeness	Halibut	per Tanner[a]
1993/94	67,726	29	12,905	136	<1
1994/95	984	22	64	21	NA
1996/97	8,902	9	0	79	4
1997/98	8,500	1	856	21	<1
1998/99	780	0	37	17	2
1999/2000	66	0	0	0	14

[a] Ratio of pounds scallop meat harvested for each incidentally caught Tanner crab.

Appendix C7.–Historical bycatch statistics from the Alaska Peninsula Area scallop fishery.

	Crab bycatch limits		Estimated bycatch (number animals)				Lbs meat
Season	Tanner	King	Tanner	King	Dungeness	Halibut	per Tanner[a]
1993/94	52,530	85	180,319	25	0	329	2
1994/95	44,000	119	25,287	0	73	157	2
1996/97	22,000	435	19,045	0	4	25	<1
1997/98	45,300	79	21,971	0	0	347	1
1998/99	48,500	900	47,780	0	140	226	1
1999/2000	75,500	300	28,160	1	2,349	178	1
2000/01	42,000	100	2,636	1	0	8	<1
2007/08	26,500	156	4,693	0	0	4	<1

[a] Ratio of pounds scallop meat harvested for each incidentally caught Tanner crab.

Appendix C8.–Historical bycatch statistics from the Bering Sea Area scallop fishery. Fishing was not opened during the 1995/96 season.

	Crab bycatch limits			Estimated bycatch (number animals)				Lbs meat per
Season	Tanner	King	Snow	Tanner	King	Snow	Halibut	Tanner/snow[a]
1993/94	260,000	17,000	NA	290,913	207	15,000	165	<1
1994/95	260,000	17,000	NA	220,710	22	34,867	3,513	2
1996/97	257,000	500	275,000	16,642	0	106,935	124	1
1997/98	238,000	500	172,000	28,446	0	195,345	98	<1
1998/99	215,000	500	130,000	39,363	146	232,911	98	<1
1999/2000	65,000	500	300,000	62,268	2	159,656	106	<1
2000/01	65,000	500	150,000	52,505	2	103,350	50	1
2001/02	65,000	500	300,000	48,718	2	68,458	76	1
2002/03	65,000	500	300,000	48,053	2	70,795	85	<1
2003/04	65,000	500	150,000	31,316	0	16,206	61	<1
2004/05	65,000	500	150,000	15,303	0	3,843	0	<1
2005/06	65,000	500	150,000	15,529	2	5,211	53	1
2006/07	260,000	24	300,000	45,204	10	8,543	82	<1
2007/08	260,000	500	300,000	35,288	1	19,367	11	<1

[a] Ratio of pounds scallop meat harvested for each incidentally caught Tanner crab or snow crab × Tanner crab hybrid.

Appendix C9.–Historical bycatch statistics from the Dutch Harbor Area scallop fishery.

	Crab bycatch limits		Estimated bycatch (number animals)				Lbs meat
Season	Tanner	King	Tanner	King	Dungeness	Halibut	per Tanner[a]
1993/94	50,500	45	69,354	35	0	270	<1
1994/95	87,000	47	757	7	0	0	3
1995/96	10,700	10	5,980	0	0	37	5
1997/98	10,700	10	12,582	1	0	22	<1
1998/99	10,700	10	6,479	0	23	35	7
1999/2000	10,700	10	4,274	0	0	39	2
2002/03	10,700	50	2,744	0	29	0	2

[a] Ratio of pounds scallop meat harvested for each incidentally caught Tanner crab.