

Fishery Data Series No. 11-70

**Summary of Observer Data Collected During the
2009/10 Alaska Weathervane Scallop Fishery**

by

Gregg E. Rosenkranz

and

Marsha Spafard

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Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



Symbols and Abbreviations

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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 (multiple)	R
milliliter	mL	west	W	correlation coefficient (simple)	r
millimeter	mm	copyright	©	covariance	cov
		corporate suffixes:		degree (angular)	°
Weights and measures (English)		Company	Co.	degrees of freedom	df
cubic feet per second	ft ³ /s	Corporation	Corp.	expected value	E
foot	ft	Incorporated	Inc.	greater than	>
gallon	gal	Limited	Ltd.	greater than or equal to	≥
inch	in	District of Columbia	D.C.	harvest per unit effort	HPUE
mile	mi	et alii (and others)	et al.	less than	<
nautical mile	nmi	et cetera (and so forth)	etc.	less than or equal to	≤
ounce	oz	exempli gratia	e.g.	logarithm (natural)	ln
pound	lb	(for example)		logarithm (base 10)	log
quart	qt	Federal Information Code	FIC	logarithm (specify base)	log ₂ , etc.
yard	yd	id est (that is)	i.e.	minute (angular)	'
		latitude or longitude	lat. or long.	not significant	NS
Time and temperature		monetary symbols (U.S.)	\$, ¢	null hypothesis	H_0
day	d	months (tables and figures): first three letters	Jan, ..., Dec	percent	%
degrees Celsius	°C	registered trademark	®	probability	P
degrees Fahrenheit	°F	trademark	™	probability of a type I error (rejection of the null hypothesis when true)	α
degrees kelvin	K	United States (adjective)	U.S.	probability of a type II error (acceptance of the null hypothesis when false)	β
hour	h	United States of America (noun)	USA	second (angular)	"
minute	min	U.S.C.	United States Code	standard deviation	SD
second	s	U.S. state	use two-letter abbreviations (e.g., AK, WA)	standard error	SE
				variance	
Physics and chemistry				population sample	Var var
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				

FISHERY DATA SERIES NO. 11-70

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ALASKA WEATHERVANE SCALLOP FISHERY**

by

Gregg E. Rosenkranz

Alaska Department of Fish and Game, Division of Commercial Fisheries, Kodiak

and

Marsha Spafard

Alaska Department of Fish and Game, Division of Commercial Fisheries, Kodiak

Alaska Department of Fish and Game
Division of Sport Fish, Research and Technical Services
333 Raspberry Road, Anchorage, Alaska, 99518-1565

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Gregg E. Rosenkranz
Alaska Department of Fish and Game, Division of Commercial Fisheries
211 Mission Road, Kodiak, AK 99615, USA

and

Marsha Spafard
Alaska Department of Fish and Game, Division of Commercial Fisheries
211 Mission Road, Kodiak, AK 99615, USA

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TABLE OF CONTENTS

LIST OF TABLES.....	ii
LIST OF FIGURES.....	ii
LIST OF APPENDICES.....	iii
ABSTRACT.....	1
INTRODUCTION.....	1
METHODS.....	2
Observer Sampling.....	2
Scallop Catch Sampling.....	2
Haul Composition Sampling.....	3
Scallop Shell Aging.....	3
Vessel Operator Logbooks.....	3
Estimation of Bycatch and Discarded Scallop Catch.....	3
Scallop Shell Height Frequency Distributions.....	4
RESULTS AND DISCUSSION.....	4
Observer Sampling Effort.....	4
Fishery Catch And Effort.....	5
Discarded Scallop Catch.....	5
Scallop Shell Height And Age Distributions.....	6
Bycatch.....	7
Bycatch Estimates.....	7
Size Distributions of Incidentally Caught Tanner and Snow Crabs.....	7
Tanner Crab and Halibut Mortality.....	8
Haul Composition.....	8
ACKNOWLEDGEMENTS.....	8
REFERENCES CITED.....	9
TABLES AND FIGURES.....	11
APPENDIX A. HISTORICAL ALASKA SCALLOP OBSERVER PROGRAM SUMMARY STATISTICS.....	41
APPENDIX B. HISTORICAL ALASKA SCALLOP FISHERY SUMMARY STATISTICS.....	49
APPENDIX C. HISTORICAL ALASKA SCALLOP FISHERY BYCATCH STATISTICS.....	57
APPENDIX D. TERMS COMMONLY USED IN THE ALASKA SCALLOP FISHERY.....	65

LIST OF TABLES

Table	Page
1. Observer program statistics by management area from the 2009/10 weathervane scallop fishing season.	12
2. Fishery statistics by management area from the 2009/10 weathervane scallop fishing season.	12
3. Depth-range fished, distance towed, and area dredged by management area during the 2009/10 weathervane scallop fishing season.	13
4. Estimated weight of discarded scallops and proportion of intact and broken scallops to total catch (retained and discarded scallops) by management area during the 2009/10 weathervane scallop fishing season.	13
5. Average scallop shell heights and sample sizes by management area from the 2009/10 weathervane scallop fishing season.	14
6. Crab and halibut bycatch estimates by management area for the 2009/10 weathervane scallop fishing season.	14
7. Release condition of Tanner crabs and halibut by management area sampled by observers during the 2009/10 scallop fishery.	15
8. Top 20 dredge contents by percent weight from haul composition sampling during the 2009/10 Yakutat Area D weathervane scallop fishery.	16
9. Top 20 dredge contents by percent weight from haul composition sampling during the 2009/10 Yakutat District 16 weathervane scallop fishery.	17
10. Top 20 dredge contents by percent weight from haul composition sampling during the 2009/10 Prince William Sound Area weathervane scallop fishery.	18
11. Top 20 dredge contents by percent weight from haul composition sampling during the 2009/10 Kodiak Northeast District weathervane scallop fishery.	19
12. Top 20 dredge contents by percent weight from haul composition sampling during the 2009/10 Kodiak Shelikof District weathervane scallop fishery.	20
13. Top 20 dredge contents by percent weight from haul composition sampling during the 2009/10 exploratory Kodiak Southwest District weathervane scallop fishery.	21
14. Dredge contents by percent weight from haul composition sampling during the 2009/10 Dutch Harbor weathervane scallop fishery. A total of 13 species/items were encountered.	22
15. Top 20 dredge contents by percent weight from haul composition sampling during the 2009/10 Bering Sea Area weathervane scallop fishery.	23

LIST OF FIGURES

Figure	Page
1. Dorsal (left) valve of weathervane scallop shell showing orientation of shell height measurement.	25
2. Map showing Alaska scallop fishery registration areas. General areas of effort during the 2009/10 season are overlaid by black polygons.	26
3. Retained scallop catch (top), dredge-hrs (center), and CPUE (bottom) by management area during the 2009/10 statewide weathervane scallop fishery.	27
4. Estimated scallop shell height distributions from resampling observer measurements from 2002/03–2009/10 Yakutat Area D fishing seasons.	28
5. Estimated scallop shell height distributions from resampling observer measurements collected during 2004/05–2006/07 and 2008/09–2009/10 Yakutat District 16 fishing seasons. Sample sizes from 2007/08 were not sufficient to create a plot.	29
6. Estimated scallop shell height distributions from the 2002/03–2009/10 Prince William Sound Area fishing seasons.	30
7. Estimated scallop shell height distributions from the 2002/03–2009/10 Kodiak Northeast District fishing seasons.	31
8. Estimated scallop shell height distributions from the 2002/03–2009/10 Kodiak Shelikof District (KSH) fishing seasons.	32
9. Estimated shell height distribution of discarded and retained scallops from the 2009/10 exploratory Kodiak Southwest District scallop fishery.	33

LIST OF FIGURES (Continued)

Figure	Page
10. Estimated shell height distribution of scallops retained (upper plot) and discarded (lower plot) during the 2009/10 Dutch Harbor Area scallop fishery.	34
11. Estimated scallop shell height distributions from the 2002/03–2009/10 Bering Sea Area fishing seasons.	35
12. Estimated Tanner crab bycatch (upper plot) and bycatch rates (lower plot) by management area during the 2009/10 scallop fishing season.	36
13. Tanner crab carapace width distribution from catch sampling during the 2009/10 Yakutat Area D scallop fishery. Sample sizes were 415 males and 434 females.	37
14. Tanner crab carapace width distribution from catch sampling during the 2009/10 Yakutat District 16 scallop fishery. Sample sizes were 28 males and 31 females.	37
15. Tanner crab carapace width distribution from catch sampling during the 2009/10 Prince William Sound Area scallop fishery. Sample sizes were 25 males and 9 females.	38
16. Tanner crab carapace width distribution from catch sampling during the 2009/10 Kodiak Northeast District scallop fishery. Sample sizes were 1,914 males and 1,785 females.	38
17. Tanner crab carapace width distribution from catch sampling during the 2009/10 Kodiak Shelikof District scallop fishery. Sample sizes were 924 males and 920 females.	39
18. Tanner crab carapace width distribution from catch sampling during the exploratory 2009/10 Kodiak Southwest District scallop fishery. Sample sizes were 491 males and 331 females.	39
19. Tanner crab carapace width distribution from catch sampling during the 2009/10 Bering Sea Area scallop fishery. Sample sizes were 723 males and 646 females.	40
20. Combined snow crab and hybrid snow crab × Tanner crab carapace width distribution from bycatch sampling during the 2009/10 Bering Sea Area scallop fishery. Sample sizes were 1,271 males and 225 females.	40

LIST OF APPENDICES

Appendix	Page
A1. Historical scallop fishery observer program summary statistics from Yakutat Area D.	42
A2. Historical scallop fishery observer program summary statistics from Yakutat District 16.	43
A3. Historical scallop fishery observer program summary statistics from Prince William Sound Area. The area was not opened for fishing during 1994 and 1996.	44
A4. Historical scallop fishery observer program summary statistics from Kodiak Northeast District. The area was not opened for fishing during 1995/96.	45
A5. Historical scallop fishery observer program summary statistics from Kodiak Shelikof District. The area was not opened for fishing during 1995/96.	46
A6. Historical scallop fishery observer program summary statistics from Kodiak Semidi Island District. 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.	47
A7. Historical scallop fishery observer program summary statistics from Alaska Peninsula Area. 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.	47
A8. Historical scallop fishery observer program summary statistics from Dutch Harbor Area. 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.	48
A9. Historical scallop fishery observer program summary statistics from Bering Sea Area. Fishing was not opened during the 1995/96 season.	48
B1. Historical scallop fishery summary statistics from Yakutat Area D.	50
B2. Historical scallop fishery summary statistics from Yakutat District 16.	51
B3. Historical scallop fishery summary statistics from Prince William Sound Area.	52
B4. Historical scallop fishery summary statistics from Kodiak Northeast District. Fishing was not opened during the 1995/96 season.	53

LIST OF APPENDICES (Continued)

Appendix	Page
B5. Historical scallop fishery summary statistics from Kodiak Shelikof District. Fishing was not opened during the 1995/96 season.	54
B6. Historical summary statistics from 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.	54
B7. Historical scallop fishery summary statistics from Alaska Peninsula Area. The area was not opened for fishing during the 1995/96, 2001/02, 2002/03, and 2009/10 seasons. No effort occurred during the 2003/04–2005/06, and 2007/08 seasons.	55
B8. Historical scallop fishery summary statistics from Dutch Harbor Area. Fishing was not opened during the 2000/01–2001/02 and 2003/04–2007/08 seasons. No effort occurred during the 1996/97 season.	55
B9. Historical scallop fishery summary statistics from Bering Sea Area. Fishing was not opened during the 1995/96 season.	56
C1. Historical scallop fishery bycatch statistics from Yakutat Area D. Crab bycatch limits have not been established for the Yakutat scallop fishery.	58
C2. Historical scallop fishery bycatch statistics from Yakutat District 16. Crab bycatch limits have not been established for the Yakutat scallop fishery.	59
C3. Historical scallop fishery bycatch statistics from Prince William Sound Area.	60
C4. Historical scallop fishery bycatch statistics from Kodiak Northeast District.	61
C5. Historical scallop fishery bycatch statistics from Kodiak Shelikof District.	61
C6. Historical scallop fishery bycatch statistics from Kodiak Semidi Island District. 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.	62
C7. Historical scallop fishery bycatch statistics from Alaska Peninsula Area.	62
C8. Historical scallop fishery bycatch statistics from Dutch Harbor Area.	63
C9. Historical scallop fishery bycatch statistics from Bering Sea Area. Fishing was not opened during the 1995/96 season.	63
D1. Commonly used terms, acronyms and corresponding definitions related to scallops and the scallop fishery that are used in this report.	66

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 2009/10 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 scallop, 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 until 1993, when an influx of scallop vessels from the east coast of the United States caused concerns about overfishing. At that time, ADF&G officially designated the fishery a “high impact emerging fishery” and subsequently developed 5 AAC 38.076 *Alaska Scallop Fishery Management Plan* adopted by the Alaska Board of Fisheries in 1994. The management plan included provisions designed to limit fishing efficiency, provided a framework for establishing crab bycatch limits, and gave ADF&G authority to establish an onboard scallop fishery observer program. Observers have since been required on all vessels fishing for weathervane scallops in all Alaska waters excluding Cook Inlet. We note that the Cook Inlet weathervane scallop fishery is limited by a gear restriction requiring a single dredge with maximum width of six feet, and all fishing activity is closely monitored by Homer ADF&G staff.

Primary goals of the observer program are collection of biological information on the scallop population and monitoring bycatch of commercially important species such as crabs. Further information on the Alaska scallop fishery, its management, and detailed descriptions of registration areas are available from ADF&G (e.g., Barnhart et al. 2008, ADF&G 2009) and in North Pacific Fishery Management Council (NPFMC) publications such as the Federal Fisheries Management Plan for the Scallop Fishery off Alaska (FMP)¹.

Scallop fishery observers are employed by independent agents who contract with scallop vessel operators for their services. ADF&G coordinates and monitors all observer activities such as training, deployments, briefings, debriefings, and observer certification. ADF&G stores all data collected by scallop observers in a database maintained at the Kodiak office.

This report summarizes data collected by scallop fishery observers during the 2009/10 Alaska statewide scallop fishing season for all areas excluding Cook Inlet. 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. Tables of time series data that provide historical perspective on the scallop fishery and observer program for each management area since 1993 are presented in Appendices. Appendix A summarizes observer program statistics such as fishing dates and number of tows sampled by observers, Appendix B summarizes fishery performance with statistics such as catch and catch per unit effort (CPUE), and Appendix C contains tables contain estimates of crab and halibut bycatch. Appendix D

¹ <http://www.fakr.noaa.gov/npfmc/fmp/scallop/ScallopFMP2006.pdf>

provides definitions of terms used in this report to describe scallop fishing operations and scallop fishery data.

METHODS

Scallop fishery observers were trained prior to the 2009/10 season at University of Alaska's North Pacific Fisheries Observer Training Center using materials prepared by ADF&G including the Scallop Observer Training and Deployment Manual (ADF&G 2009). Observers were deployed on all scallop fishing trips in all Alaska scallop fishing areas excluding Cook Inlet during the 2009/10 season. Description of scallop fishing gear and fishing methods not provided in this report may be found in ADF&G (2009) and NPFMC publications.

OBSERVER SAMPLING

Observer-collected data summarized in this report were obtained through *scallop catch sampling* and *haul composition sampling* described in detail below. Observed vessels typically fished "around the clock" during the season and often deployed two dredges simultaneously. To obtain representative samples, observers were instructed to sample a single dredge from different tows at different times throughout the day and to make the decision to sample a dredge prior to viewing its contents.

Scallop Catch Sampling

Scallop observers' catch sampling goal for the 2009/10 season was a single dredge from five separate hauls on each full day of fishing. After dredge contents were emptied on deck, observers monitored the vessel crew as they sorted the scallop catch to ensure that no animals were discarded from the sample and to count the number of baskets of retained scallops. When present in sampled dredges, Pacific halibut *Hippoglossus stenolepis* were measured and released as soon as possible. Observers obtained 3 full baskets of retained scallops (if catch was sufficient) from the crew to calculate average basket weight. Scallops in the first weighed basket were also counted.

After the crew finished removing the retained scallops catch from deck, observers collected and weighed all remaining (discarded) scallops. One basket of discarded scallops was subsampled to determine the ratio by weight of intact to broken scallops. Twenty scallops were randomly selected from both the retained catch and the intact discarded catch and scallop shell height (SH) was measured (Figure 1). Dorsal valves of selected scallops were collected for return to the Kodiak ADF&G office for visual shell aging. All clappers (see definition in Appendix D) in the sampled dredge were collected, counted, broken apart, and then discarded overboard. Clappers provide information on natural mortality because scallops shucked by vessel crews are broken apart prior to discarding overboard.

All incidentally caught commercially important crabs were identified by species, the number of individuals of each species was counted, and samples of up to 10 each Tanner crab *Chionoecetes bairdi*, Dungeness crab *Cancer magister*, *Chionoecetes* sp. (snow crabs *C. opilio* and all *Chionoecetes* hybrids), red king crab *Paralithodes camtschaticus*, blue king crab *Paralithodes platypus*, and hair crab *Erimacrus isenbeckii* were examined (if present in the sampled dredge) in detail. Carapace size of these individuals was measured with Vernier calipers, and sex and condition of each animal were noted. Carapace length (CL) of king and hair crabs was measured and carapace width (CW) was measured on Tanner, Dungeness, snow, and *C.* hybrid crabs.

Haul Composition Sampling

From one of the dredges selected each day for scallop catch sampling, observers also weighed all other dredge contents to document haul composition. Weights were obtained for most species or items caught using a hanging spring scale and baskets. Observers were instructed to clean mud from all items before weighing. Animals and animal parts such as shells were identified to the lowest taxonomic rank possible, and the remaining catch was sorted into natural debris (e.g., kelp, wood, or rocks) and man-made debris (e.g., discarded plastics or fishing gear). Crabs were weighed by species and scallop clappers were weighed with other empty bivalve shells. Species or debris encountered in small quantities were weighed separately and recorded to the nearest whole pound.

Subsampling was used to estimate weight when large quantities of a single item were present. First, all individuals or items were collected in baskets. Next, three baskets were weighed to obtain average basket weight. Finally, total weight of the species or item was calculated by multiplying the average basket weight by the total number of baskets.

Scallop Shell Aging

Dorsal valves of scallops (Figure 1) collected from the retained catch were visually aged by ADF&G staff at the Kodiak office following the season. Shells were examined under a microscope to study growth patterns of circuli and to count the annuli (compressed circuli) which allowed age to be estimated. Growth increments between annuli from the umbo to the outer shell margin perpendicular to the hinge were measured to the nearest millimeter with calipers on a subsample from the retained shell collection. In addition, a sample of small (<100 mm SH) intact shells that were collected by observers from the discarded catch were aged and measured. Growth increments from the small shells were compared with growth increments from retained-catch shells because the first three annuli were more distinct on younger animals. Growth increment measurements were used to establish categories defined by an upper and a lower limit of size-at-age for each scallop fishing area to aid in age estimation.

VESSEL OPERATOR LOGBOOKS

Scallop vessel operators were required by regulation 5 AAC 38.076 (0) to complete logbooks supplied by ADF&G to collect detailed information on each tow. Observers were instructed to regularly check to assure that these forms were accurate, legible, and completed in a timely manner. Data recorded for each haul included date, time, starting latitude and longitude, ADF&G statistical area, average depth, tow duration, average speed, number and width of dredges fished, gear performance, estimated round weight of retained scallops, percent of tow in state waters, and number of king crab caught.

ESTIMATION OF BYCATCH AND DISCARDED SCALLOP CATCH

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

$$\hat{B}_{vd} = \frac{c}{t} \cdot T, \quad (1)$$

where

- \hat{B}_{vd} = estimated number of crab of each species or halibut caught during vessel-day,
- c = number crabs or halibut counted in sampled dredges during vessel-day,
- t = sampled dredge-hrs during vessel-day,
- T = total dredge-hrs during vessel-day.

For vessel-days without sampling, bycatch was estimated by multiplying the overall bycatch rate (number/dredge-hr) for the same vessel in the same registration area or district by dredge-hrs fished without sampling during the vessel-day. Ninety-five percent confidence intervals for all bycatch estimates were calculated using percentile-method bootstrapping (Barnhart et al. 1996).

Weight of discarded scallops was similarly estimated by summing estimates for each vessel-day,

$$\hat{X}_{vd} = \frac{x_{vd}}{t} \cdot T, \quad (2)$$

where

- \hat{x}_{vd} = estimated round weight of scallops discarded during the vessel-day,
- x_{vd} = round weight of discarded scallops in sampled dredges during vessel-day,
- t = sampled dredge-hrs during vessel-day,
- T = total dredge-hrs during vessel-day.

Days with no observer sampling were handled as above, using the overall discard rate (weight/dredge-hr) for the same vessel in the same area. Estimation of weight of intact and broken scallops was based on the ratio of intact and broken scallop weight observed in all subsampled discarded scallop baskets from the same vessel in the same registration area or district. Confidence intervals were calculated using percentile-method bootstrapping.

SCALLOP SHELL HEIGHT FREQUENCY DISTRIBUTIONS

Histograms depicting estimated scallop shell height (SH) distributions of the combined retained and discarded scallop catch were created for all fishing area where at least 200 measurements of both retained and discarded scallops were collected during the season. This was accomplished by resampling observer-collected SH measurements based on the estimated proportion by weight of retained and discarded scallops in the catch. Multiple-year plots of multiple years of SH histograms were included to illustrate changes in SH distributions over time.

RESULTS AND DISCUSSION

OBSERVER SAMPLING EFFORT

Four vessels participated in the 2009/10 statewide scallop fishery between July 1, 2009 and January 18, 2010 (Table 1). Four observers were deployed during the season and sampled on 234 of 310 vessel-days on which fishing occurred (Table 1). Days without sampling were attributed to rough sea conditions, observer illness, or when fishing occurred during only part of the day.

Observer sampling effort was proportional to fishing effort, with the largest number of observed hauls in Yakutat Area D followed by Kodiak Shelikof District and Kodiak Northeast District

(Table 1). ADF&G Scallop Observer Program Coordinator Ryan Burt was onboard FV *Provider* during the exploratory fishery in Kodiak Southwest District and assisted the observer in sampling 20 of 125 hauls (Table 1). Just 10% of 2009/10 Bering Sea scallop hauls were sampled due to inclement weather and safety concerns of the observer. Overall, 1,128 or 17% of the 6,632 hauls recorded in vessel operator logbooks were sampled by observers during the season (Table 1).

FISHERY CATCH AND EFFORT

A total of 486,748 lbs of weathervane scallop meats were harvested in Alaska waters excluding Cook Inlet during the 2009/10 season (Table 2, Figures 2–3). The Alaska Peninsula Area was not opened during the 2009/10 season to allow stocks to rebuild, while an exploratory fishery was opened by commissioner's permit in the Kodiak Southwest District (Figure 2). Harvests for the season were 169,877 lbs from Kodiak Shelikof District, 158,225 lbs from Yakutat Area D, 69,090 lbs from Kodiak Northeast District, 48,855 lbs from the Bering Sea, 19,350 lbs from Prince William Sound, 11,791 lbs from Yakutat District 16, 6,080 lbs from Dutch Harbor, and 3,480 lbs from Kodiak Southwest District (Table 2, Figure 3).

Scallop harvest totals were near 2009/10 GHGs for Yakutat Area D, Prince William Sound, Kodiak Shelikof District, and the Bering Sea (Table 2). Vessels harvested only 47% of the Yakutat District 16 GHG due to low catch rates and small-sized scallops. In Kodiak Northeast District, fishing was closed before the GHG was harvested because fishery managers were concerned about declines in CPUE observed during the season. In the Dutch Harbor Area, where the GHG was evenly split between Bering Sea and Pacific Ocean waters (Figure 2), scallop CPUE was much higher on the Bering Sea side than the Pacific side, and about 61 percent of the GHG was landed. Harvest from the exploratory fishery in Kodiak Southwest District was 3,480 lbs (Table 2), and the vessel operator reported high incidental catches of basket stars (*Gorgonocephalus eucnemis*) and Tanner crab that affected scallop fishing operations.

Scallop fishery CPUE for the 2009/10 season ranged from a high of 59 lbs meat/dredge-hr in the Dutch Harbor Area to 22 lbs meat/dredge-hr in Kodiak Southwest District (Table 2, Figure 3). Statewide scallop CPUE for the season was 44 lbs meat/dredge-hr (Table 2), a reduction from 49 lbs meat/dredge-hr during the 2008/09 season.

Scallop fishing depths during the 2009/10 season ranged from 51–146 m, with about 90 percent of hauls occurring in depths 70–115 m. Average depth fished during the season was 88 m, close to the 2008/09 average of 82 m (Rosenkranz and Spafard, 2010).

Distances towed and area dredged (Table 3) corresponded to fishing effort (Table 2), with the highest values recorded in Yakutat Area D and Kodiak Shelikof District. An average tow during the season was 53 minutes at 4.8 knots, covering a distance of 5.1 nmi and sweeping an area of 0.020 nmi².

DISCARDED SCALLOP CATCH

Estimated round weight of scallops discarded during the 2009/10 season in all areas excluding Cook Inlet was 1.32 million lbs (Tables 2 and 4), accounting for 19 percent of total round weight landed. Of the discarded scallops subsampled by observers, 55 percent by weight were intact and 45 percent were broken. Scallops were discarded due to small size or because they were broken or crushed, which made shucking difficult.

Discard rates varied between areas, with over 36 percent of total scallop weight landed discarded in the Yakutat District 16 fishery and less than 4 percent discarded in the Dutch Harbor fishery. Scallop discard rates were highest in areas with the largest retained catches; 622,055 lbs (22.1 percent of total) were discarded in Yakutat Area D, and 349,952 lbs (18.1 percent) were discarded in Kodiak Shelikof District (Table 4).

SCALLOP SHELL HEIGHT AND AGE DISTRIBUTIONS

Observers measured shell height (SH) of over 41,000 scallops captured in sampled dredges during the 2009/10 season (Table 5). Average retained scallop SH was highest in Kodiak Southwest District (161 mm) and lowest in Yakutat District 16 (121 mm). Average SH of discarded scallops varied from 101 mm in Yakutat District 16 to 118 mm in Prince William Sound (Table 5). Average SH of discarded scallops was dependent on proportions of intact and broken discards, as intact discarded scallops were on average smaller than broken discards (e.g., see Rosenkranz, 2010, Table 4).

Histograms of estimated scallop SH distributions from recent seasons (Figures 4–11) illustrate geographic differences in scallop populations as well as changes over time. Interpretation of these figures is affected by size selectivity of scallop dredges, which by Alaska regulation are required to be constructed with 4 in (101.6 mm) rings in the bag section. This allows smaller scallops to pass through and can affect capture efficiency for scallops less than 120 mm SH (Deborah Hart, National Marine Fisheries Service, personal communication). Hence, size distributions depicted in Figures 4–11 are representative of catch but provide an incomplete picture of size distributions of scallops on the seafloor.

ADF&G research on scallop aging and growth shows that eastern Gulf of Alaska (GOA) scallops caught in the Yakutat and Prince William Sound fisheries (Figures 4–6) grow slower and attain lower asymptotic sizes than scallops found in the western GOA and Bering Sea (Figures 5–11). For example, about 90 percent of scallops retained in the 2009/10 Yakutat Area D fishery (Figure 4) were less than 140 mm SH, whereas only about 42 percent of retained scallops in the 2009/10 Kodiak Shelikof District fishery (Figure 8) were less than 140 mm SH. Average estimated age of retained scallops from the 2009/10 Area D fishery was 11 years compared with 8 years for the Shelikof fishery. Additionally, average SH of 104 Area D scallops retained in the 2009/10 fishery with estimated age 8 years was 132 mm (range 115–146 mm), while 80 individuals with estimated age 8 years from the 2009/10 Shelikof fishery averaged 151 mm SH (range 138–165 mm).

The 2009/10 Yakutat District 16 SH histogram (Figure 5) reflects the small sizes of scallops and large proportion of discards that led the fleet to terminate fishing with less than half the GHL harvested (Table 2). Retained scallop SHs from the 2009/10 Prince William Sound fishery (Figure 6) were somewhat larger, with about 90 percent of the retained catch 125–150 mm SH. Shell aging of retained scallops from these two areas was not completed in time for inclusion in this report.

SH histograms for 2009/10 Kodiak scallop fisheries (Figures 7–9) displayed wide size ranges, with many large scallops with SH greater than 140 mm retained in the exploratory Southwest District fishery (Figure 9). We attributed a distinct mode with SH 105–120 in the 2009/10 Shelikof District data (Figure 8) to a cohort of 4-yr old scallops; aging results showed that retained 4-yr old Shelikof District scallops were on average 118 mm SH (n = 51, range 106–

128). We note that this mode was present but much less distinct in the 2009/10 Northeast District SH data (Figure 7).

For the Dutch Harbor Area (Figure 10), SH sample sizes (Table 5) were not sufficient for constructing a combined plot; separate SH plots show that most retained scallops were greater than 130 mm SH. The 2009/10 Bering Sea scallop SH plot (Figure 11) shows a retained catch dominated by individuals greater than 140 mm SH. Average age of 122 scallops from the retained catch was 14 years, and only 4 of these had estimated age less than 10 yrs.

BYCATCH

Bycatch Estimates

An estimated 104,975 Tanner crab, 111 Dungeness crab, and 1,171 halibut, were incidentally landed by vessels fishing for scallops during the 2009/10 season (Table 6, Figure 12). Additionally, 15 red king crab were incidentally caught in the exploratory Kodiak Southwest District fishery, and 106 were caught in the Bering Sea scallop fishery which causing the vessel to change fishing locations.

Estimated 2009/10 Tanner crab bycatch was highest in Kodiak Northeast District (38,411 crab) and the Bering Sea (27,430 Tanner crab plus 36,786 snow crab and *Chionoecetes* hybrids). For other areas, estimates ranged from a low of 26 Tanner crab in the Dutch Harbor fishery to 18,589 Tanner crab in Kodiak Shelikof District. Estimated Tanner crab bycatch rate (Figure 12 lower plot) was highest for Kodiak Southwest District, a factor that led the single vessel participating to cease fishing with less than 4,000 lbs scallop meats landed. The estimated 11,609 Tanner crab incidentally caught in the Yakutat Area D fishery was a substantial increase from the 2008/09 estimate of 2,416 crab. Average estimated Area D Tanner crab bycatch over the 10 previous scallop seasons was about 6,900 crab. Time series of bycatch estimates for all areas are presented in Appendix C.

Dungeness crab did not appear in sampled dredges from most fishing areas during 2009/10. Estimates were 88 crab from Kodiak Shelikof District, 23 from Yakutat District 16, and zero for all other areas. For halibut, estimated bycatch was highest in Yakutat Area D (530 individuals) and Kodiak Shelikof District (252).

Size Distributions of Incidentally Caught Tanner and Snow Crabs

Plots of size distributions of Tanner crab incidentally caught in each fishing area during the 2009/10 scallop season show that most crab caught in Yakutat and Prince William Sound areas were less than 30 mm CW, with wider size ranges for crab sampled around Kodiak and in the Bering Sea (Figures 13–19). No plot was constructed for the Dutch Harbor Area because only two Tanner crab were found in sampled dredges.

For Yakutat and Prince William Sound, a distinct mode of crab about 20 mm CW was apparent in each plot (Figures 13–15). In Kodiak Northeast and Shelikof Districts (Figures 16–17), 369 male Tanner crab greater than 100 mm CW were measured, but more than 66 percent of all crabs measured were less than 55 mm CW. In the Bering Sea, about half of the male Tanner crab sampled were greater than 100 mm CW, and male snow crab were much more prevalent in sampled dredges than females (Figures 19–20).

Tanner Crab and Halibut Mortality

Observers examined 4,318 incidentally caught Tanner crab, snow crab, and hybrid crab during the 2009/10 season and classified 39 percent as dead (Table 7). Rosenkranz (2002) reviewed scallop observer data collected between 1993 and 2000 and noted highly variable Tanner crab bycatch mortality rates both between years and between vessels. Ninety-six halibut were encountered by observers during 2009/10 catch sampling of which 29 percent were reported as dead.

HAUL COMPOSITION

Haul composition samples by weight for each scallop fishing area (Tables 8–16) documented species and items commonly found in scallop dredges during the 2009/10 season. Statewide, over 80 percent of the total weighed during haul composition sampling was attributed to weathervane scallops and scallop shells (Table 16).

Commonly caught invertebrates included sunflower sea stars (*Pycnopodia helianthoides*), brittle stars (family *Ophiuroidea*), basket stars (*Gorgonocephalus eucnemis*) and sea anemones (Order *Actinaria*). Elasmobranchs such as longnose skates (*Raja rhina*) and Bering skates (*Bathyraja interrupta*) amounted to about 3 percent of total weight in sampled dredges statewide, while flatfish including arrowtooth flounder (*Atheresthes stomias*), flathead sole (*Hippoglossoides elassodon*), and Alaska plaice (*Pleuronectes quadrituberculatus*) accounted for just over 1 percent of total weight in sampled dredges. *Chionoecetes* crabs were also commonly encountered in haul composition samples. In the Bering Sea (Table 15), Tanner and snow crabs made up 4.4 percent of weight. In other areas, Tanner crabs accounted for less than 1 percent of total dredge contents by weight.

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TABLES AND FIGURES

Table 1.—Observer program statistics by management area from the 2009/10 weathervane scallop fishing season.

Area/District	Start of fishing	End of fishing	Number vessels	Fishing days ^a	Observed days ^b	Number hauls	Hauls sampled
Yakutat Area D	7/1/2009	9/25/2009	2	83	71	2,580	412
Yakutat District 16	7/4/2009	9/2/2009	2	17	16	299	48
Prince William Sound Area	9/19/2009	10/6/2009	2	17	10	279	40
Kodiak Northeast District	9/17/2009	11/28/2009	1	47	33	625	116
Kodiak Shelikof District	7/1/2009	11/9/2009	3	92	74	1,921	408
Kodiak Southwest District ^c	8/25/2009	8/30/2009	1	6	5	125	20
Dutch Harbor Area	10/24/2009	10/31/2009	1	7	3	77	14
Bering Sea Area	11/3/2009	1/18/2010	1	41	22	726	70
Statewide Total	7/1/2009	1/18/2010	3	310	234	6,632	1,128

^a Number vessel days with at least one haul.

^b Number vessel days with at least one sampled haul.

^c Opened for limited exploratory fishery by Commissioner's Permit.

Table 2.—Fishery statistics by management area from the 2009/10 weathervane scallop fishing season.

Area/District	GHL ^a (lbs meat)	Retained Catch (lbs meat)	Retained Catch (est. lbs whole)	Dredge hours	CPUE ^b	Discarded scallops (est. lbs whole) ^c	
						Intact	Broken
Yakutat Area D	160,000	158,225	2,193,282	3,919	40	329,952	292,103
Yakutat District 16	25,000	11,791	185,089	437	27	43,972	60,662
Prince William Sound	20,000	19,350	279,800	419	45	644	58,366
Kodiak Northeast District	75,000	69,090	786,978	1,210	57	50,137	70,884
Kodiak Shelikof District	170,000	169,877	1,579,723	3,447	49	268,151	81,801
Kodiak Southwest District	25,000	3,480	59,082	159	22	1,340	2,399
Dutch Harbor	10,000	6,080	55,361	104	59	424	1,658
Bering Sea	50,000	48,855	568,454	1,270	38	29,603	28,380
Statewide Total	535,000	486,748	5,707,769	10,965	44	724,223	596,253

^a Guideline harvest level, 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 by management area during the 2009/10 weathervane scallop fishing season.

Area/District	Depths fished (m)			Distance towed (nmi)	Area dredged (nmi ²) ^a
	Minimum	Maximum	Average		
Yakutat Area D	58	128	80	9,683	47.3
Yakutat District 16	58	84	74	1,092	5.2
Prince William Sound Area	64	104	81	1,034	5.0
Kodiak Northeast District	51	146	100	2,937	14.5
Kodiak Shelikof District	73	130	89	9,317	39.4
Kodiak Southwest District	53	124	74	465	1.9
Dutch Harbor Area	57	91	78	264	1.2
Bering Sea Area	95	108	98	3,111	15.2
Statewide Total	51	146	88	27,903	129.7

^a Calculated from logbook data by summing tow duration × average speed × dredge width for each tow; does not account for overlap between tows.

Table 4.—Estimated weight of discarded scallops and proportion of intact and broken scallops to total catch (retained and discarded scallops) by management area during the 2009/10 weathervane scallop fishing season.

Area/District	Weight discarded scallops (lbs whole)			Estimated percentage ^b	
	Estimate	Lower bound. ^a	Upper bound ^a	Intact	Broken
Yakutat Area D	622,055	528,057	695,297	11.7	10.4
Yakutat District 16	104,634	81,299	130,549	15.2	20.9
Prince William Sound	59,010	36,167	81,197	0.2	17.2
Kodiak Northeast District	121,021	112,277	141,807	5.5	7.8
Kodiak Shelikof District	349,952	310,879	392,059	13.9	4.2
Kodiak Southwest District	3,738	3,064	4,772	2.1	3.8
Dutch Harbor	2,082	189	3,313	0.7	2.9
Bering Sea	57,984	47,693	67,846	4.7	4.5
Statewide Total	1,320,476	1,119,625	1,516,840	11.2	7.6

^a Bounds from bootstrapped 95% confidence intervals.

^b Percentage of total catch (retained whole lbs plus discarded whole lbs).

Table 5.—Average scallop shell heights and sample sizes by management area from the 2009/10 weathervane scallop fishing season.

Area/District	Retained catch		Discarded catch	
	Average SH (mm)	Sample size	Average SH (mm)	Sample size
Yakutat Area D	131	8,082	112	7,805
Yakutat District 16	121	879	101	859
Prince William Sound Area	137	759	118	466
Kodiak Northeast District	145	2,300	111	2,081
Kodiak Shelikof District	145	7,752	108	7,635
Kodiak Southwest District	161	311	112	200
Dutch Harbor Area	142	160	108	33
Bering Sea Area	155	1,220	116	1,202
Statewide Total	139	21,463	110	20,281

Table 6.—Crab and halibut bycatch estimates by management area for the 2009/10 weathervane scallop fishing season.

Area/District	Tanner crabs			Dungeness crab			Halibut		
	Est	Lower	Upper	Est	Lower	Upper	Est	Lower	Upper
	number	95% c.i. ^a	95% c.i. ^a	number	95% c.i.	95% c.i.	number	95% c.i.	95% c.i.
Yakutat Area D	11,609	6,475	18,147	0			530	279	784
Yakutat District 16	1,009	549	1,680	23	2	47	123	59	201
Prince William Sound Area	316	93	548	0			34	6	69
Kodiak Northeast District	38,411	33,890	64,711	0			223	138	357
Kodiak Shelikof District	18,589	15,483	22,337	88	27	153	252	128	425
Kodiak Southwest District	7,585	3,046	13,907	0			9	1	24
Dutch Harbor Area	26	1	42	0			0		
Bering Sea Area ^b	27,430	25,330	35,377	0			0		
Statewide Total	104,975	84,867	156,749	111	29	200	1,171	611	1,860

^a 95% confidence intervals from bootstrapping.

^b An estimated 36,786 snow crabs and snow crab × Tanner crab hybrids (95% confidence interval 30,782–41,180) were also incidentally caught in the Bering Sea.

Table 7.—Release condition of Tanner crabs and halibut by management area sampled by observers during the 2009/10 scallop fishery.

Area/District	Tanner crabs			Halibut		
	Number	Number	Percentage	Number	Number	Percentage
	dead	alive	dead	dead	alive	dead
Yakutat Area D	262	266	50	10	29	26
Yakutat District 16	57	20	74	5	6	45
Prince William Sound Area	9	23	28	0	1	0
Kodiak Northeast District	374	509	42	9	14	39
Kodiak Shelikof District	716	872	45	4	17	19
Kodiak Southwest District	15	91	14	0	1	0
Dutch Harbor Area	1	1	50	0	0	
Bering Sea Area ^a	234	868	21	0	0	
Statewide Total	1,668	2,650	39	28	68	29

^a Includes Tanner crabs, snow crabs, and hybrid snow × Tanner crabs.

Table 8.—Top 20 dredge contents by percent weight from haul composition sampling during the 2009/10 Yakutat Area D weathervane scallop fishery.

Rank	Common name	Scientific name	Percentage weight
1	weathervane scallop	<i>Patinopecten caurinus</i>	79.3
2	natural debris		5.9
3	sunflower sea star	<i>Pycnopodia helianthoides</i>	2.8
4	empty bivalve shells		2.8
5	arrowtooth flounder	<i>Atheresthes stomias</i>	1.6
6	leafy flat star	<i>Luidia foliolata</i>	0.9
7	longnose skate	<i>Raja rhina</i>	0.6
8	big skate	<i>Raja binoculata</i>	0.5
9	basket star	<i>Gorgonocephalus eucnemis</i>	0.5
10	notched brittlestar	<i>Ophiura sarsi</i>	0.4
11	flathead sole	<i>Hippoglossoides elassodon</i>	0.4
12	<i>Raja binoculata</i> egg case	<i>Raja binoculata</i> egg case	0.4
13	Dover sole	<i>Microstomus pacificus</i>	0.3
14	lingcod	<i>Ophiodon elongatus</i>	0.3
15	sea anemone unidentified	Order Actiniaria	0.3
16	Aleutian skate	<i>Bathyraja aleutica</i>	0.3
17	English sole	<i>Parophrys vetulus</i>	0.3
18	Alaska skate	<i>Bathyraja parmifera</i>	0.3
19	spiny dogfish shark	<i>Squalus acanthias</i>	0.2
20	rex sole	<i>Glyptocephalus zachirus</i>	0.2

Table 9.–Top 20 dredge contents by percent weight from haul composition sampling during the 2009/10 Yakutat District 16 weathervane scallop fishery.

Rank	Common name	Scientific name	Percentage weight
1	weathervane scallop	<i>Patinopecten caurinus</i>	83.6
2	sunflower sea star	<i>Pycnopodia helianthoides</i>	6.7
3	English sole	<i>Parophrys vetulus</i>	1.5
4	arrowtooth flounder	<i>Atheresthes stomias</i>	1.4
5	longnose skate	<i>Raja rhina</i>	1.3
6	empty bivalve shells		1.1
7	sea anemone unidentified	<i>Order Actiniaria</i>	0.9
8	leafy flat star	<i>Luidia foliolata</i>	0.8
9	<i>Raja binocularata</i> egg case	<i>Raja binocularata</i> egg case	0.5
10	unsorted shab		0.5
11	flathead sole	<i>Hippoglossoides elassodon</i>	0.3
12	big skate	<i>Raja binocularata</i>	0.3
13	empty gastropod shells		0.2
14	spiny dogfish shark	<i>Squalus acanthias</i>	0.2
15	rex sole	<i>Glyptocephalus zachirus</i>	0.1
16	notched brittlestar	<i>Ophiura sarsi</i>	0.1
17	Dover sole	<i>Microstomus pacificus</i>	0.1
18	prickleback unidentified	Family <i>Stichaeidae</i>	0.1
19	bristle worm	<i>Aphrodita negligens</i>	0.1
20	sea pen or sea whip unidentified	<i>Pennatulacea</i>	0.1

Table 10.—Top 20 dredge contents by percent weight from haul composition sampling during the 2009/10 Prince William Sound Area weathervane scallop fishery.

Rank	Common name	Scientific name	Percentage weight
1	weathervane scallop	<i>Patinopecten caurinus</i>	89.5
2	empty bivalve shells		2.2
3	sunflower sea star	<i>Pycnopodia helianthoides</i>	1.7
4	big skate	<i>Raja binoculata</i>	0.8
5	natural debris		0.8
6	notched brittlestar	<i>Ophiura sarsi</i>	0.8
7	leafy flat star	<i>Luidia foliolata</i>	0.7
8	spiny dogfish shark	<i>Squalus acanthias</i>	0.4
9	Pacific cod	<i>Gadus macrocephalus</i>	0.4
10	English sole	<i>Parophrys vetulus</i>	0.3
11	longnose skate	<i>Raja rhina</i>	0.3
12	rex sole	<i>Glyptocephalus zachirus</i>	0.3
13	Dover sole	<i>Microstomus pacificus</i>	0.2
14	arrowtooth flounder	<i>Atheresthes stomias</i>	0.2
15	flathead sole	<i>Hippoglossoides elassodon</i>	0.1
16	butter sole	<i>Isopsetta isolepis</i>	0.1
17	sea anemone unidentified	Order Actiniaria	0.1
18	bristle worm	<i>Aphrodita negligens</i>	0.1
19	leather sea star	<i>Dermasterias imbricata</i>	0.1
20	<i>Solaster</i> sp.	<i>Solaster</i> sp.	0.1

Table 11.–Top 20 dredge contents by percent weight from haul composition sampling during the 2009/10 Kodiak Northeast District weathervane scallop fishery.

Rank	Common name	Scientific name	Percentage weight
1	weathervane scallop	<i>Patinopecten caurinus</i>	67.5
2	natural debris		15.8
3	sunflower sea star	<i>Pycnopodia helianthoides</i>	6.2
4	empty bivalve shells		2.4
5	Alaska skate	<i>Bathyraja parmifera</i>	0.7
6	empty gastropod shells		0.7
7	rock sole unidentified	<i>Lepidopsetta</i> sp.	0.7
8	sea anemone unidentified	Order Actiniaria	0.7
9	basket star	<i>Gorgonocephalus eucnemis</i>	0.5
10	<i>Solaster</i> sp.	<i>Solaster</i> sp.	0.5
11	arrowtooth flounder	<i>Atheresthes stomias</i>	0.4
12	Tanner crab	<i>Chionoecetes bairdi</i>	0.3
13	big skate	<i>Raja binoculata</i>	0.3
14	longnose skate	<i>Raja rhina</i>	0.3
15	butter sole	<i>Isopsetta isolepis</i>	0.2
16	Pacific cod	<i>Gadus macrocephalus</i>	0.2
17	box crab	<i>Lopholithodes foraminatus</i>	0.2
18	octopus unidentified	<i>Octopodidae</i>	0.2
19	notched brittlestar	<i>Ophiura sarsi</i>	0.1
20	flathead sole	<i>Hippoglossoides elassodon</i>	0.1

Table 12.—Top 20 dredge contents by percent weight from haul composition sampling during the 2009/10 Kodiak Shelikof District weathervane scallop fishery.

Rank	Common name	Scientific name	Percentage weight
1	weathervane scallop	<i>Patinopecten caurinus</i>	80.8
2	natural debris		4.6
3	empty bivalve shells		3.0
4	sunflower sea star	<i>Pycnopodia helianthoides</i>	1.7
5	longnose skate	<i>Raja rhina</i>	1.3
6	Alaska plaice	<i>Pleuronectes quadrituberculatus</i>	1.1
7	Alaska skate	<i>Bathyraja parmifera</i>	1.0
8	Bering skate	<i>Bathyraja interrupta</i>	0.9
9	big skate	<i>Raja binoculata</i>	0.8
10	arrowtooth flounder	<i>Atheresthes stomias</i>	0.6
11	sea anemone unidentified	Order Actinaria	0.4
12	sun sea star	<i>Solaster stimpsoni</i>	0.4
13	flathead sole	<i>Hippoglossoides elassodon</i>	0.3
14	hairy triton (or Oregon triton)	<i>Fusitriton oregonensis</i>	0.2
15	<i>Solaster</i> sp.	<i>Solaster</i> sp.	0.2
16	Tanner crab	<i>Chionoecetes bairdi</i>	0.2
17	giant octopus	<i>Octopus dofleini</i>	0.2
18	Pacific cod	<i>Gadus macrocephalus</i>	0.1
19	bristle worm	<i>Aphrodita negligens</i>	0.1
20	empty gastropod shells		0.1

Table 13.—Top 20 dredge contents by percent weight from haul composition sampling during the 2009/10 exploratory Kodiak Southwest District weathervane scallop fishery.

Rank	Common name	Scientific name	Percentage weight
1	weathervane scallop	<i>Patinopecten caurinus</i>	80.7
2	empty bivalve shells		3.9
3	basket star	<i>Gorgonocephalus eucnemis</i>	2.3
4	big skate	<i>Raja binoculata</i>	1.7
5	flathead sole	<i>Hippoglossoides elassodon</i>	1.4
6	arrowtooth flounder	<i>Atheresthes stomias</i>	1.4
7	Dover sole	<i>Microstomus pacificus</i>	1.2
8	<i>Solaster</i> sp.	<i>Solaster</i> sp.	0.7
9	sunflower sea star	<i>Pycnopodia helianthoides</i>	0.5
10	rex sole	<i>Glyptocephalus zachirus</i>	0.5
11	natural debris		0.5
12	yellowfin sole	<i>Limanda aspera</i>	0.5
13	Alaska skate	<i>Bathyraja parmifera</i>	0.5
14	green sea urchin	<i>Strongylocentrotus droebachiensis</i>	0.3
15	giant octopus	<i>Octopus dofleini</i>	0.3
16	Tanner crab	<i>Chionoecetes bairdi</i>	0.2
17	<i>Volutopsius</i> sp. eggs	<i>Volutopsius</i> sp. eggs	0.2
18	longnose skate	<i>Raja rhina</i>	0.1
19	notched brittlestar	<i>Ophiura sarsi</i>	0.1
20	sea anemone unidentified	<i>Order Actiniaria</i>	0.1

Table 14.–Dredge contents by percent weight from haul composition sampling during the 2009/10 Dutch Harbor weathervane scallop fishery. A total of 13 species/items were encountered.

Rank	Common name	Scientific name	Percentage weight
1	weathervane scallop	<i>Patinopecten caurinus</i>	74.3
2	natural debris		21.5
3	<i>Solaster</i> sp.	<i>Solaster</i> sp.	1.2
4	arrowtooth flounder	<i>Atheresthes stomias</i>	0.6
5	empty bivalve shells		0.4
6	notched brittlestar	<i>Ophiura sarsi</i>	0.4
7	flathead sole	<i>Hippoglossoides elassodon</i>	0.4
8	sun sea star	<i>Solaster stimpsoni</i>	0.4
9	sea anemone unidentified	Order <i>Actiniaria</i>	0.2
10	Debris		0.2
11	Pacific lyre crab	<i>Hyas lyratus</i>	0.2
12	hairy triton (or Oregon triton)	<i>Fusitriton oregonensis</i>	0.2
13	rose sea star	<i>Crossaster papposus</i>	0.2

Table 15.–Top 20 dredge contents by percent weight from haul composition sampling during the 2009/10 Bering Sea Area weathervane scallop fishery.

Rank	Common name	Scientific name	Percentage weight
1	weathervane scallop	<i>Patinopecten caurinus</i>	85.2
2	Tanner crab unidentified	<i>Chionoecetes</i> sp.	3.0
3	Tanner crab	<i>Chionoecetes bairdi</i>	1.4
4	barrel sponge	<i>Halichondria panicea</i>	1.2
5	Alaska skate	<i>Bathyraja parmifera</i>	1.2
6	sponge unidentified	Phylum <i>Porifera</i>	0.8
7	<i>Halipteris</i> sp.	<i>Halipteris</i> sp.	0.8
8	empty bivalve shells		0.7
9	arrowtooth flounder	<i>Atheresthes stomias</i>	0.6
10	Bering skate	<i>Bathyraja interrupta</i>	0.4
11	Pacific cod	<i>Gadus macrocephalus</i>	0.4
12	empty gastropod shells		0.3
13	Neptune snail unidentified	<i>Neptunea</i> sp.	0.3
14	sea anemone unidentified	Order <i>Actiniaria</i>	0.3
15	red king crab	<i>Paralithodes camtschaticus</i>	0.3
16	flathead sole	<i>Hippoglossoides elassodon</i>	0.3
17	jellyfish unidentified	Class <i>Scyphozoa</i>	0.2
18	sea whip unidentified	Order <i>Pennatulacea</i>	0.2
19	basket star	<i>Gorgonocephalus eucnemis</i>	0.2
20	big skate	<i>Raja binoculata</i>	0.2

Table 16.—Comparison of haul composition sampling results by percent weight for each fishing area during the 2009/10 weathervane scallop fishery. High proportions of ‘natural debris’ in Kodiak’s Northeast and Shelikof Districts and Dutch Harbor were attributed to large rocks found in a limited number of sampled dredges. Scientific species names are provided in Tables 8–15.

Common name	Rank	Statewide	Yakutat Area D	Yakutat District 16	Prince William Sound	Kodiak Northeast District	Kodiak Shelikof District	Kodiak Southwest District	Dutch Harbor	Bering Sea
weathervane scallop	1	79.06	79.32	83.64	89.49	67.47	80.81	80.74	74.27	85.18
natural debris	2	6.05	5.92	0.45	0.77	15.76	4.55	0.51	21.47	0.08
sunflower sea star	3	2.83	2.79	6.70	1.65	6.23	1.75	0.55	<0.01	<0.01
empty bivalve shells	4	2.60	2.78	1.08	2.16	2.39	3.01	3.88	0.39	0.73
arrowtooth flounder	5	0.91	1.64	1.38	0.17	0.39	0.56	1.41	0.58	0.56
longnose skate	6	0.78	0.60	1.29	0.25	0.26	1.30	0.12	<0.01	<0.01
Alaska skate	7	0.63	0.28	<0.01	<0.01	0.68	0.96	0.47	<0.01	1.17
big skate	8	0.58	0.53	0.26	0.84	0.29	0.78	1.72	<0.01	0.15
Alaska plaice	9	0.42	<0.01	<0.01	<0.01	<0.01	1.11	<0.01	<0.01	0.03
sea anemone (unidentified)	10	0.41	0.30	0.85	0.11	0.66	0.41	0.12	0.19	0.30
Bering skate	11	0.36	<0.01	<0.01	0.07	<0.01	0.90	<0.01	<0.01	0.42
sand sea star	12	0.35	0.86	0.77	0.66	0.09	<0.01	<0.01	<0.01	<0.01
flathead sole	13	0.31	0.36	0.35	0.13	0.14	0.30	1.45	0.39	0.26
basket star	14	0.28	0.46	<0.01	<0.01	0.54	0.01	2.27	<0.01	0.16
Tanner crab	15	0.22	<0.01	0.04	0.01	0.34	0.19	0.16	<0.01	1.38
empty gastropod shells	16	0.21	0.13	0.18	0.04	0.67	0.10	0.12	<0.01	0.34
notched brittlestar	17	0.21	0.43	0.09	0.76	0.15	0.03	0.12	0.39	<0.01
<i>Solaster</i> sp. seastar	18	0.18	<0.01	<0.01	0.08	0.52	0.23	0.74	1.16	<0.01
Tanner crabs (unidentified)	19	0.17	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	3.02
English sole	20	0.17	0.29	1.48	0.29	<0.01	<0.01	0.04	<0.01	<0.01
Dover sole	21	0.17	0.32	0.08	0.24	0.04	0.07	1.17	<0.01	<0.01
Pacific cod	22	0.17	0.15	<0.01	0.36	0.19	0.14	<0.01	<0.01	0.39
big skate egg case	23	0.16	0.36	0.54	0.07	0.04	0.05	<0.01	<0.01	<0.01
sun sea star	24	0.16	<0.01	<0.01	<0.01	0.04	0.40	<0.01	0.39	<0.01
hairy triton	25	0.11	<0.01	<0.01	<0.01	0.09	0.24	0.08	0.19	0.13

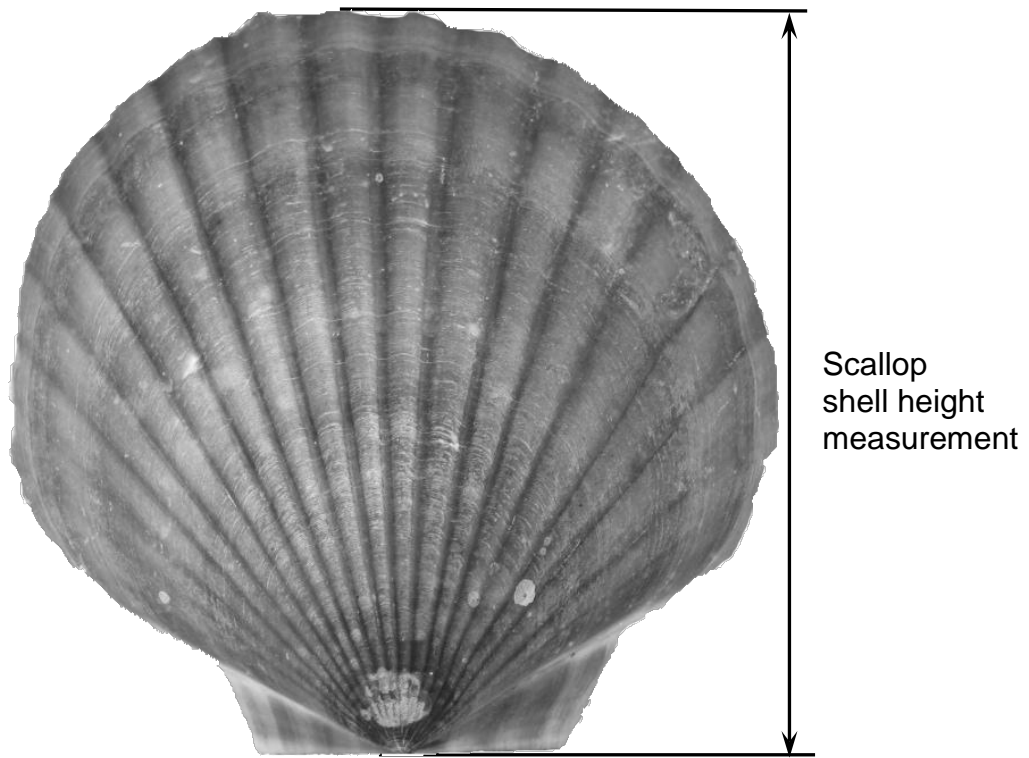


Figure 1.—Dorsal (left) valve of weathervane scallop shell showing orientation of shell height measurement.

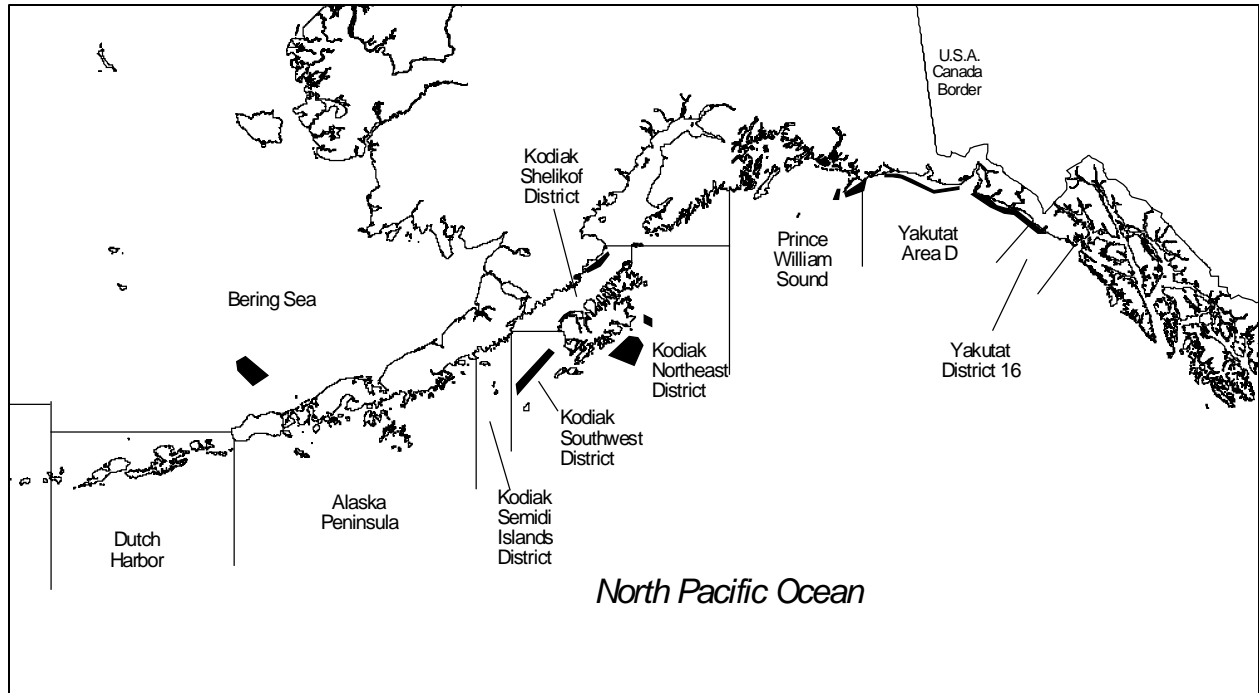


Figure 2.—Map showing Alaska scallop fishery registration areas. General areas of effort during the 2009/10 season are overlaid by black polygons.

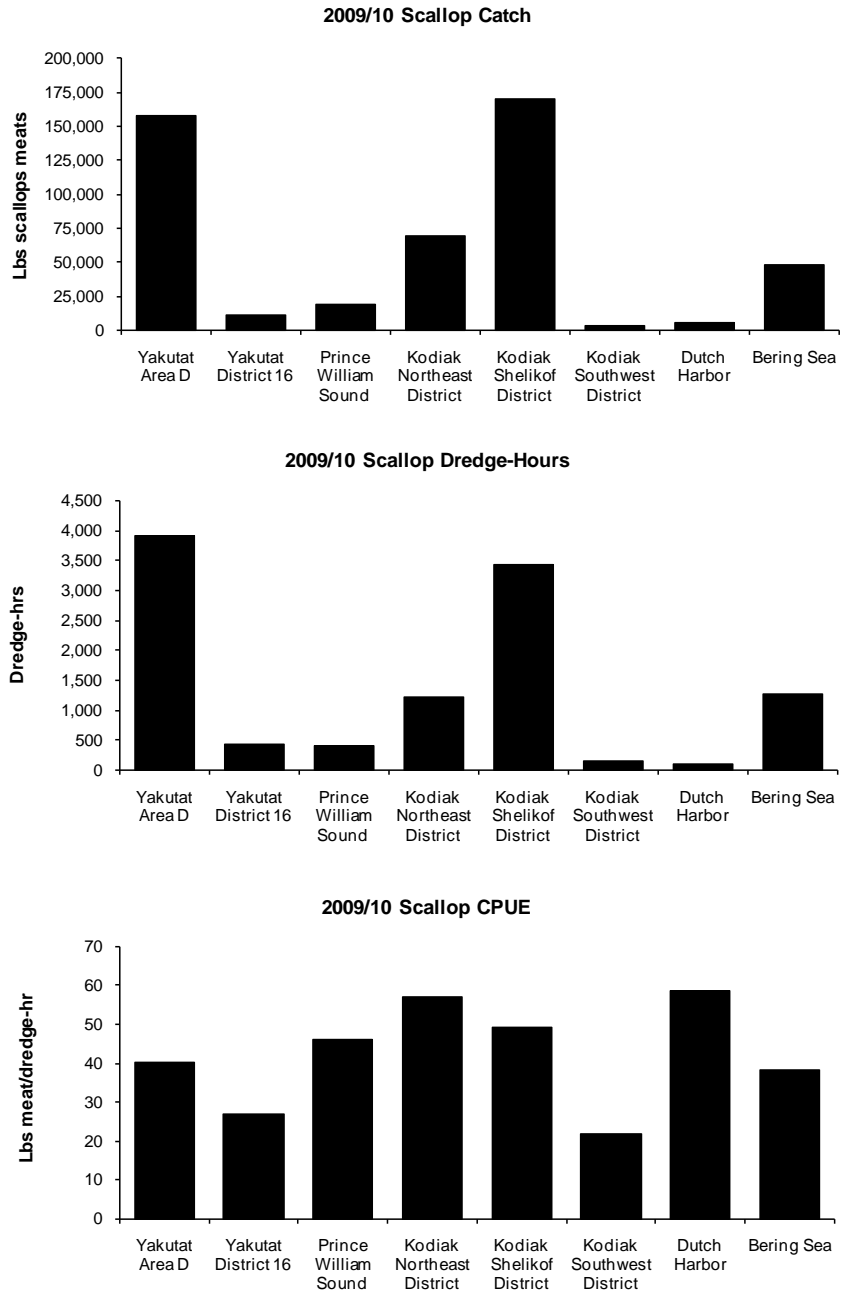


Figure 3.—Retained scallop catch (top), dredge-hrs (center), and CPUE (bottom) by management area during the 2009/10 statewide weathervane scallop fishery.

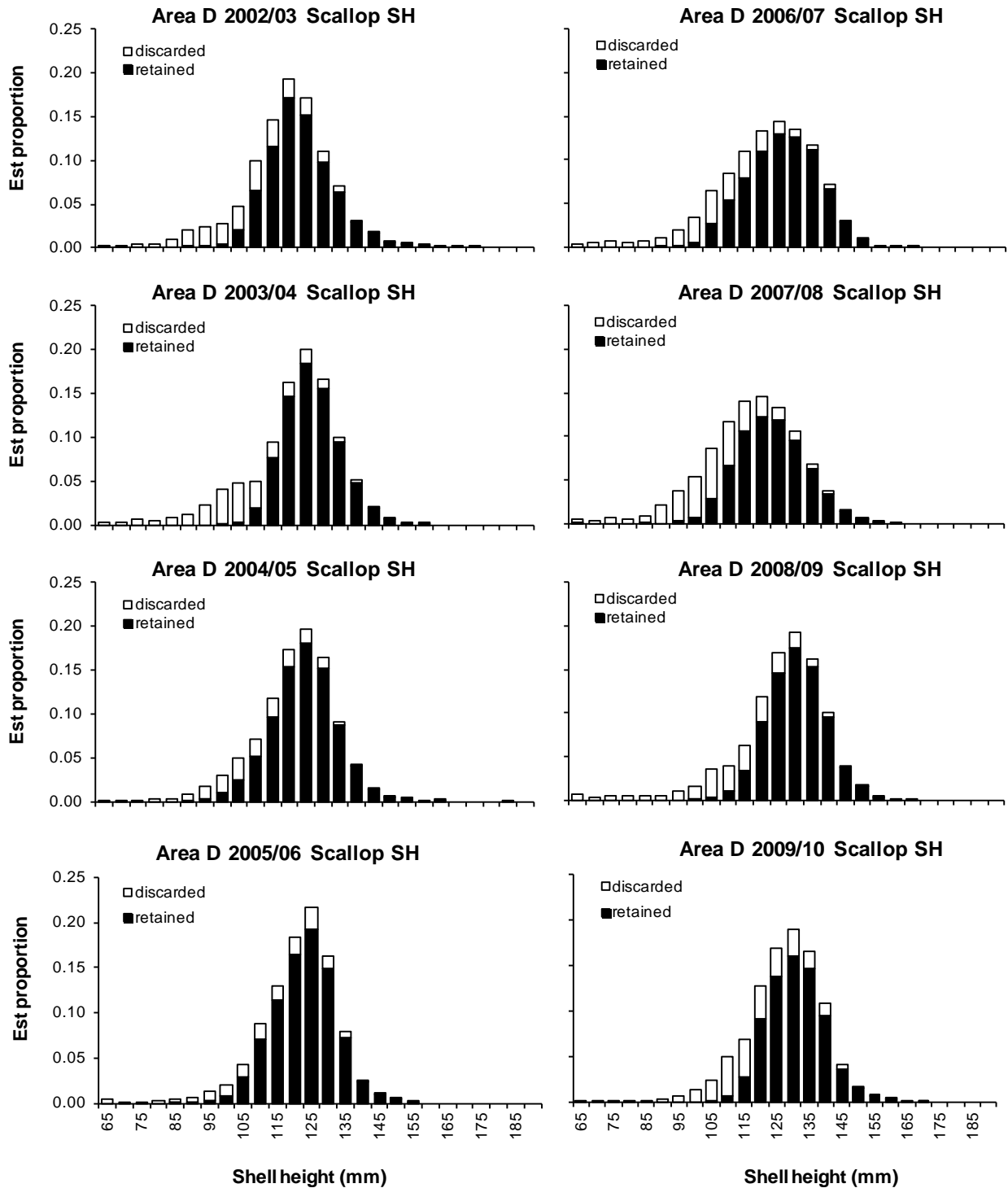


Figure 4.—Estimated scallop shell height distributions from resampling observer measurements from 2002/03–2009/10 Yakutat Area D fishing seasons.

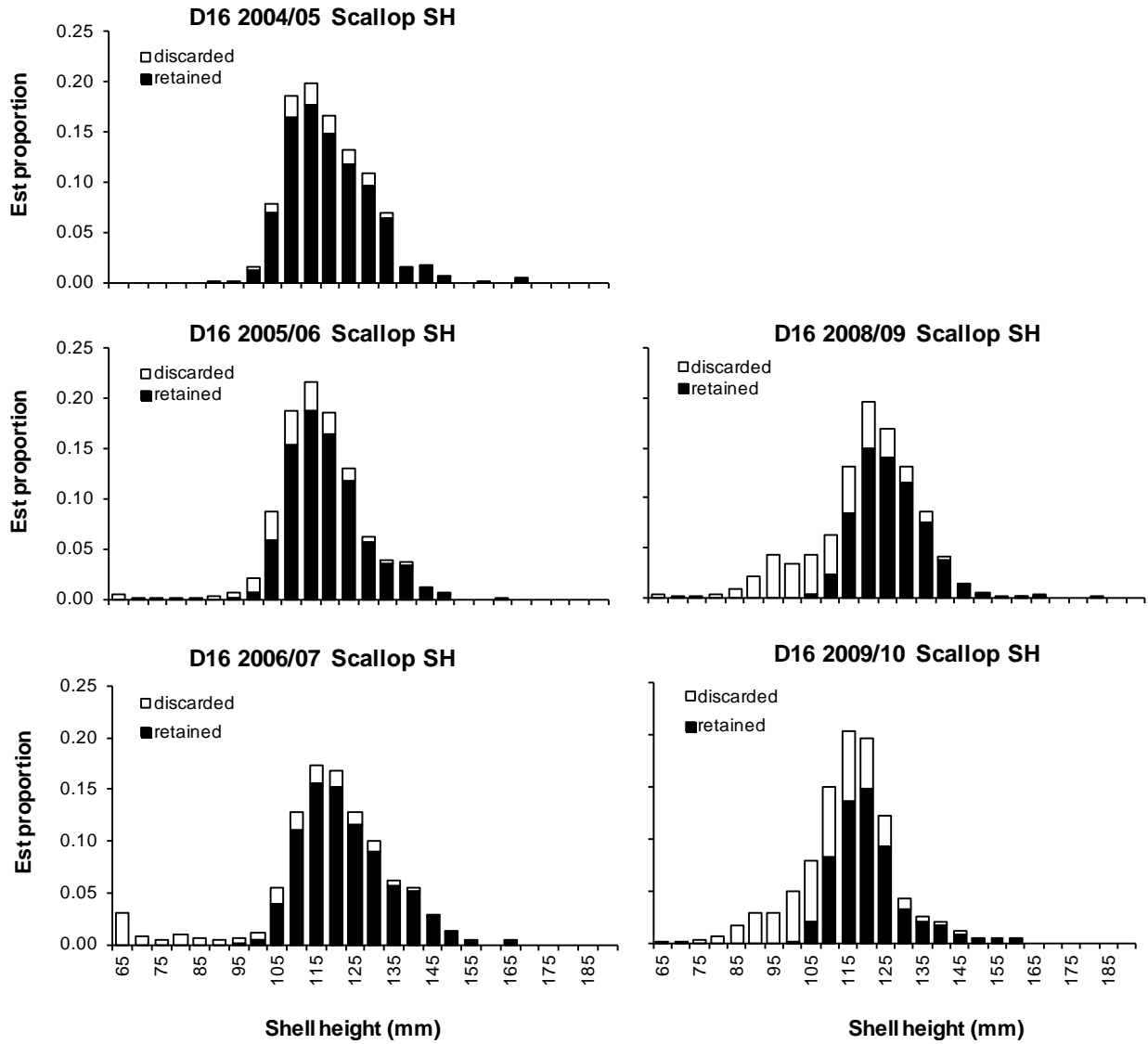


Figure 5.—Estimated scallop shell height distributions from resampling observer measurements collected during 2004/05–2006/07 and 2008/09–2009/10 Yakutat District 16 fishing seasons. Sample sizes from 2007/08 were not sufficient to create a plot.

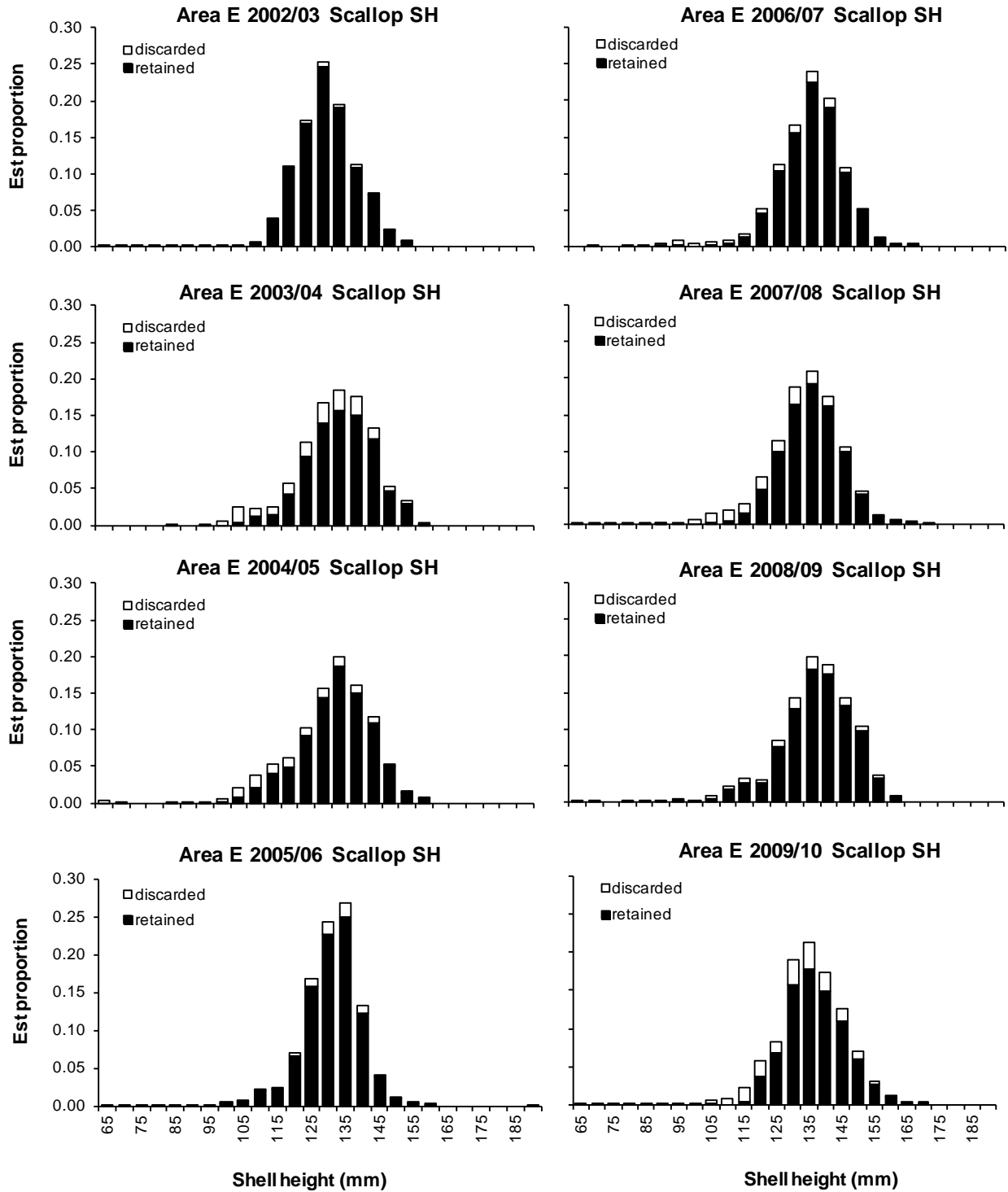


Figure 6.—Estimated scallop shell height distributions from the 2002/03–2009/10 Prince William Sound Area fishing seasons.

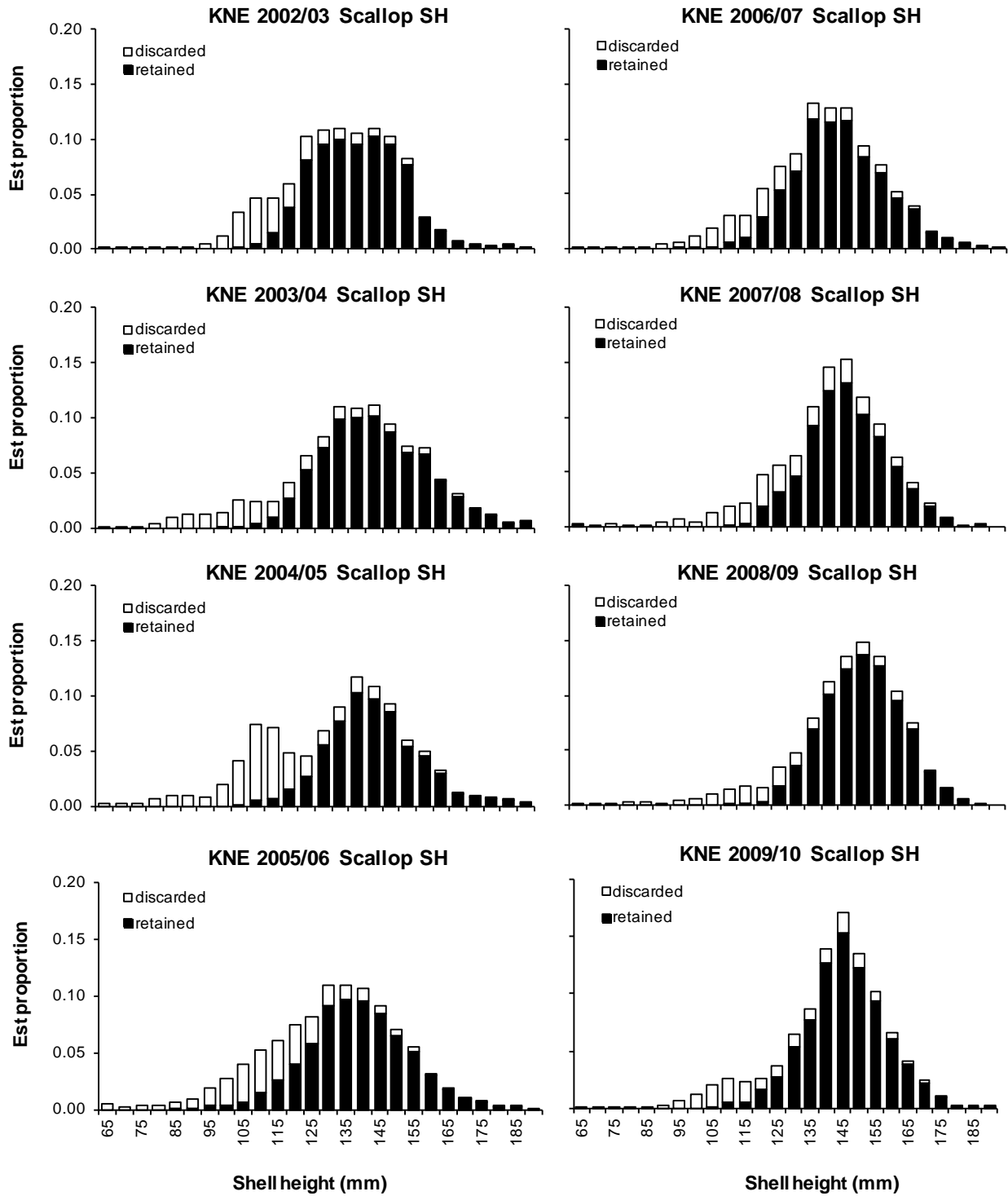


Figure 7.—Estimated scallop shell height distributions from the 2002/03–2009/10 Kodiak Northeast District fishing seasons.

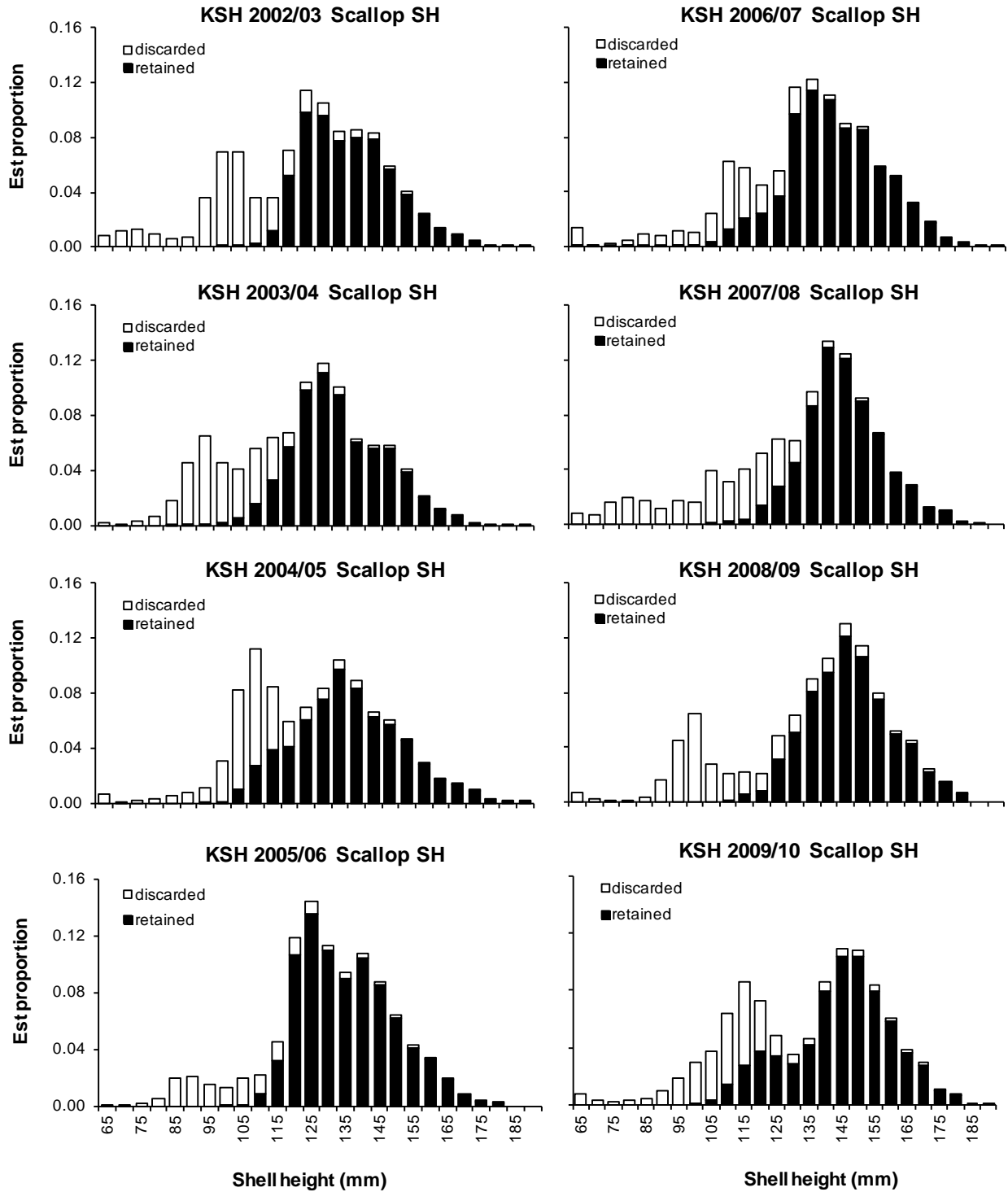


Figure 8.—Estimated scallop shell height distributions from the 2002/03–2009/10 Kodiak Shelikof District (KSH) fishing seasons.

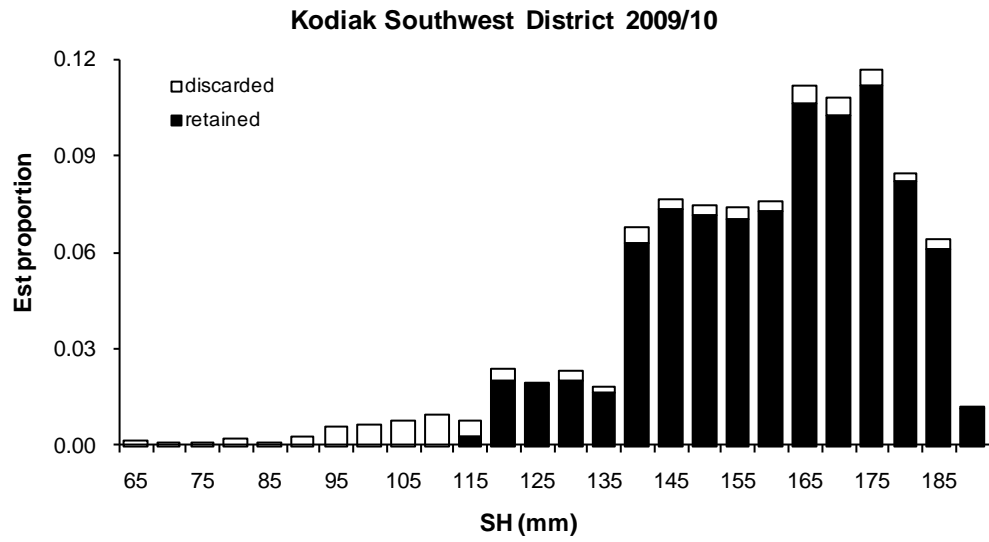


Figure 9.—Estimated shell height distribution of discarded and retained scallops from the 2009/10 exploratory Kodiak Southwest District scallop fishery.

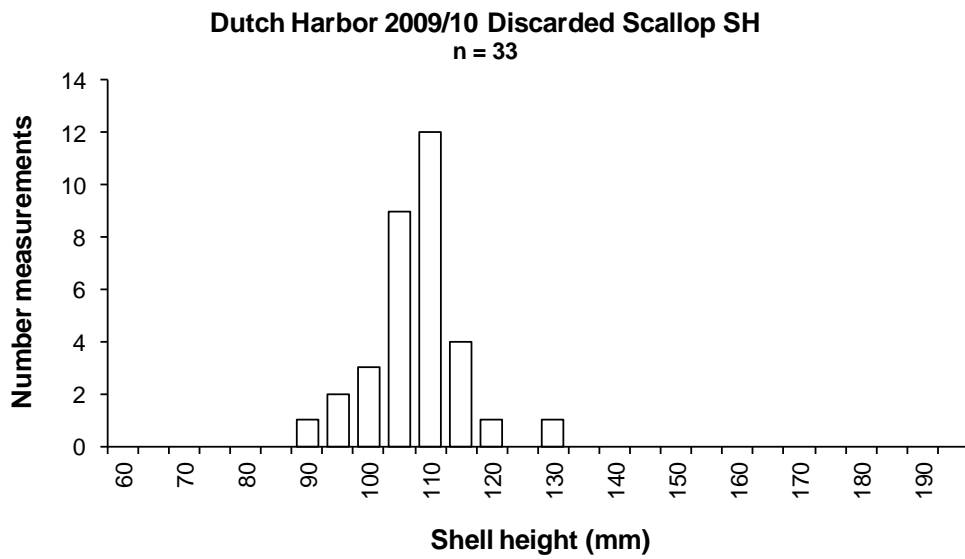
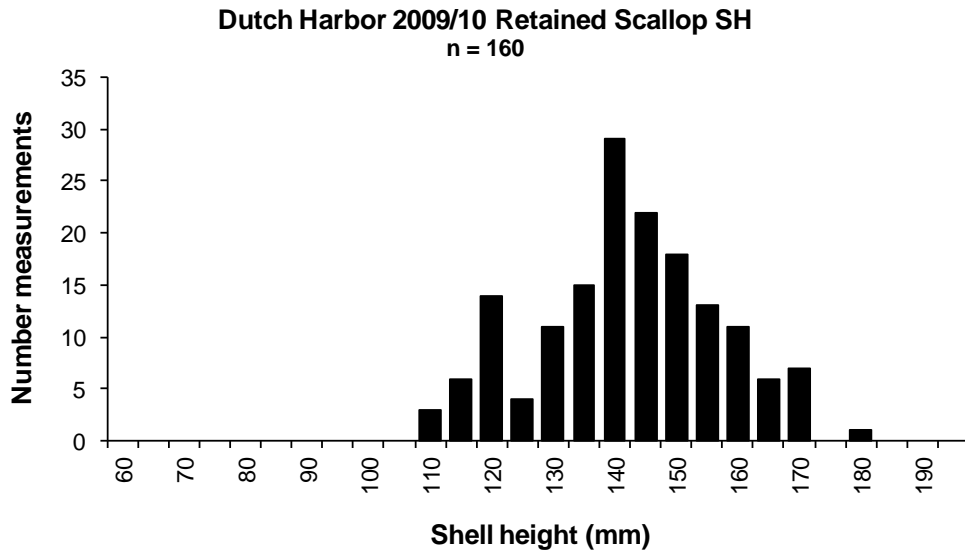


Figure 10.—Estimated shell height distribution of scallops retained (upper plot) and discarded (lower plot) during the 2009/10 Dutch Harbor Area scallop fishery.

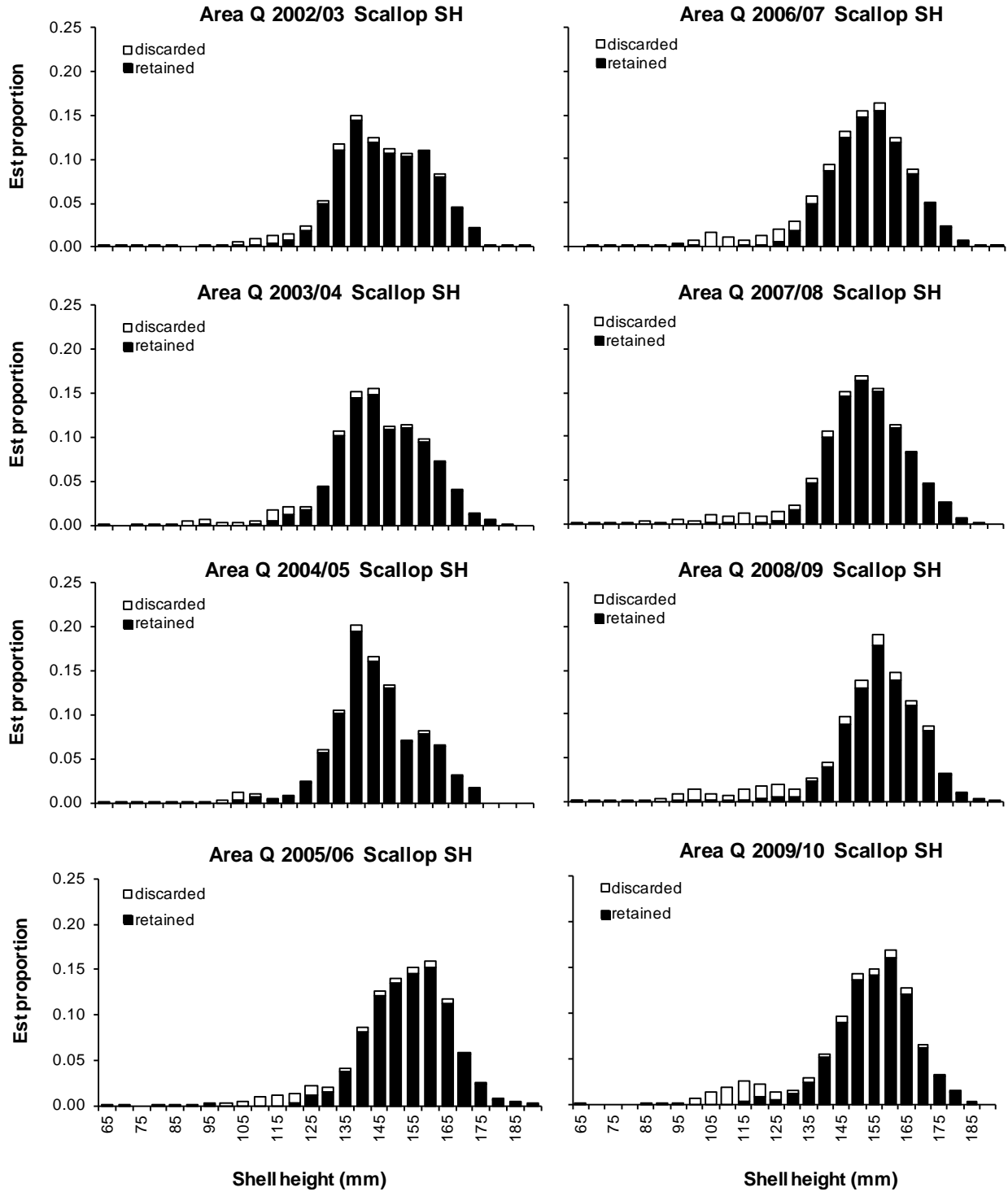


Figure 11.—Estimated scallop shell height distributions from the 2002/03–2009/10 Bering Sea Area fishing seasons.

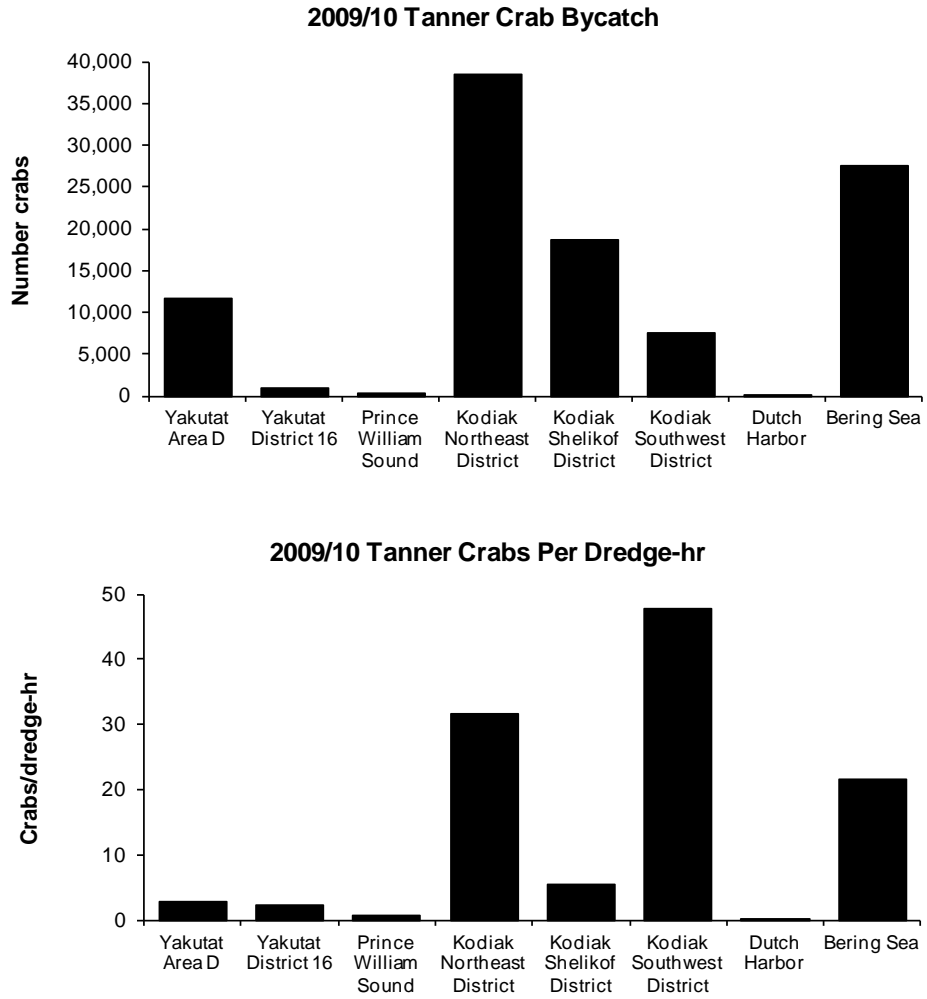


Figure 12.—Estimated Tanner crab bycatch (upper plot) and bycatch rates (lower plot) by management area during the 2009/10 scallop fishing season.

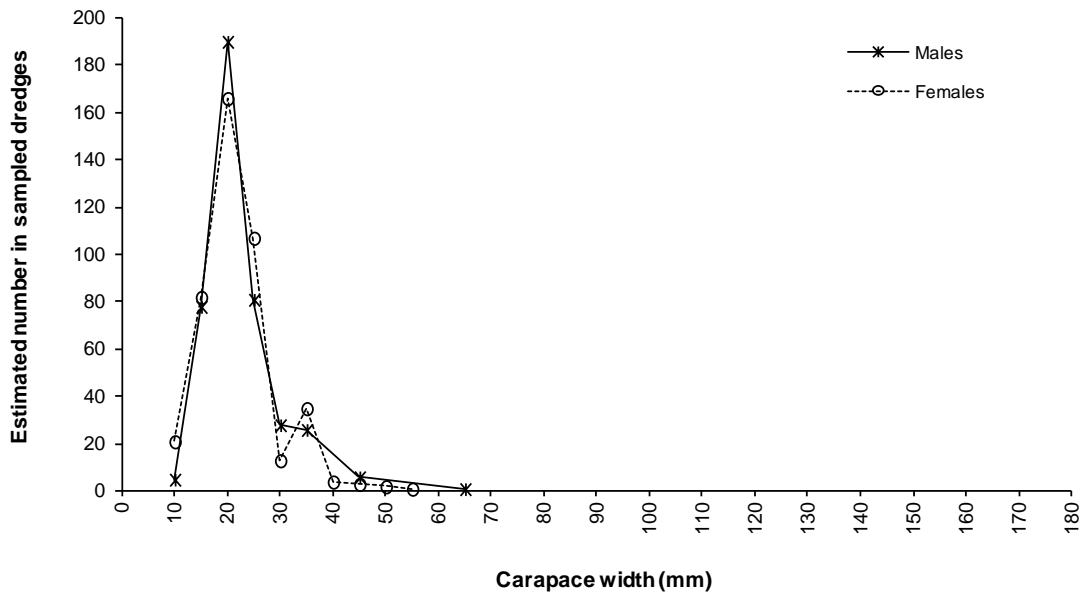


Figure 13.—Tanner crab carapace width distribution from catch sampling during the 2009/10 Yakutat Area D scallop fishery. Sample sizes were 415 males and 434 females.

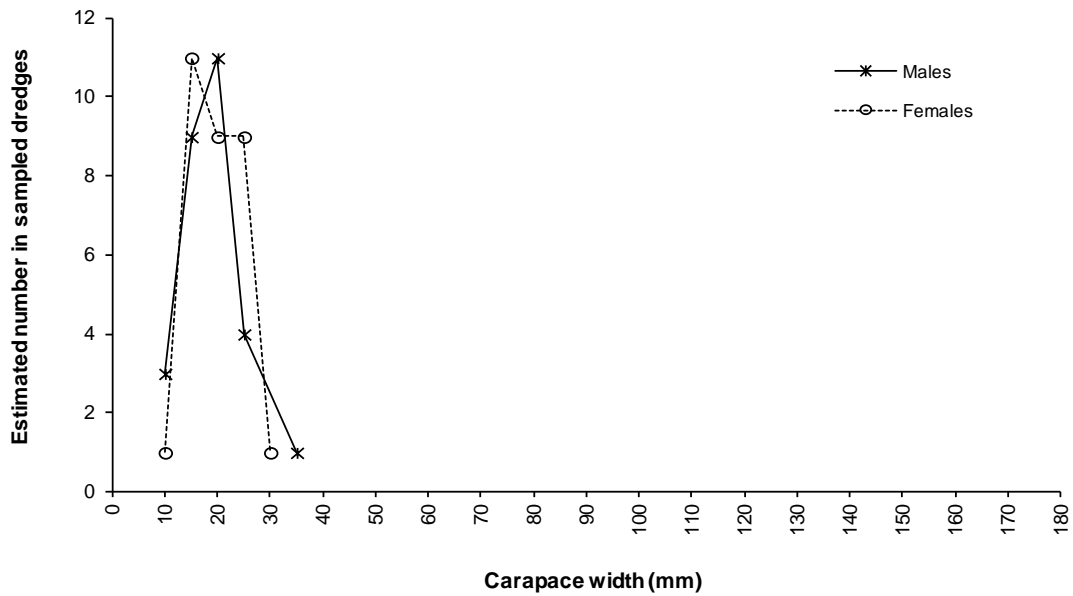


Figure 14.—Tanner crab carapace width distribution from catch sampling during the 2009/10 Yakutat District 16 scallop fishery. Sample sizes were 28 males and 31 females.

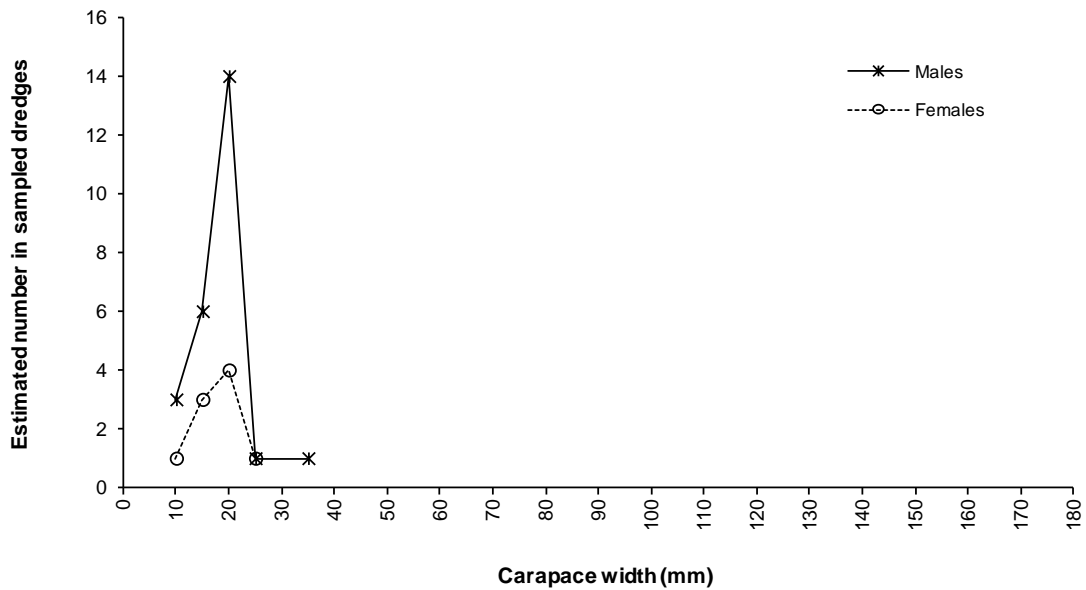


Figure 15.—Tanner crab carapace width distribution from catch sampling during the 2009/10 Prince William Sound Area scallop fishery. Sample sizes were 25 males and 9 females.

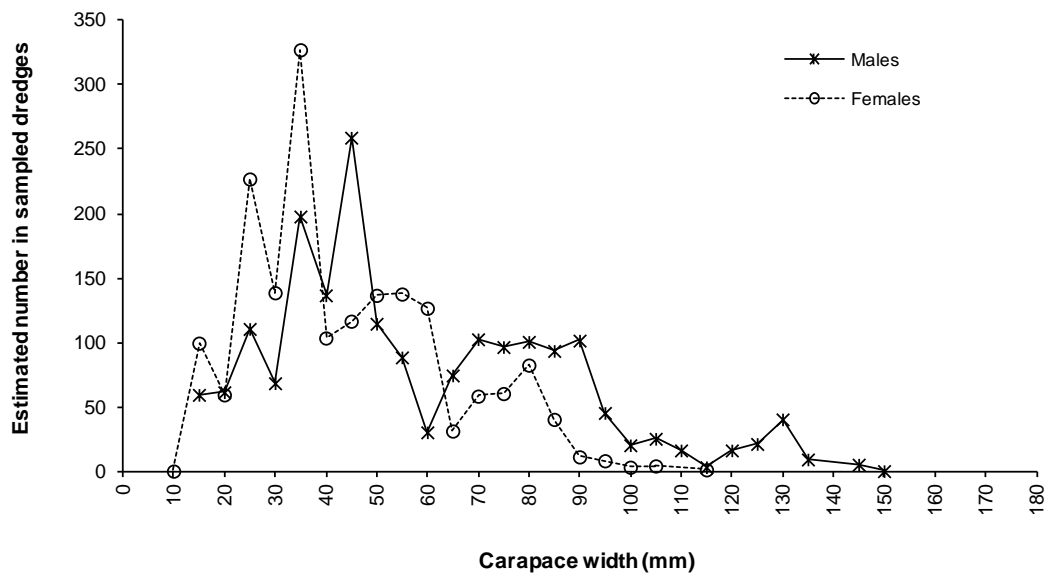


Figure 16.—Tanner crab carapace width distribution from catch sampling during the 2009/10 Kodiak Northeast District scallop fishery. Sample sizes were 1,914 males and 1,785 females.

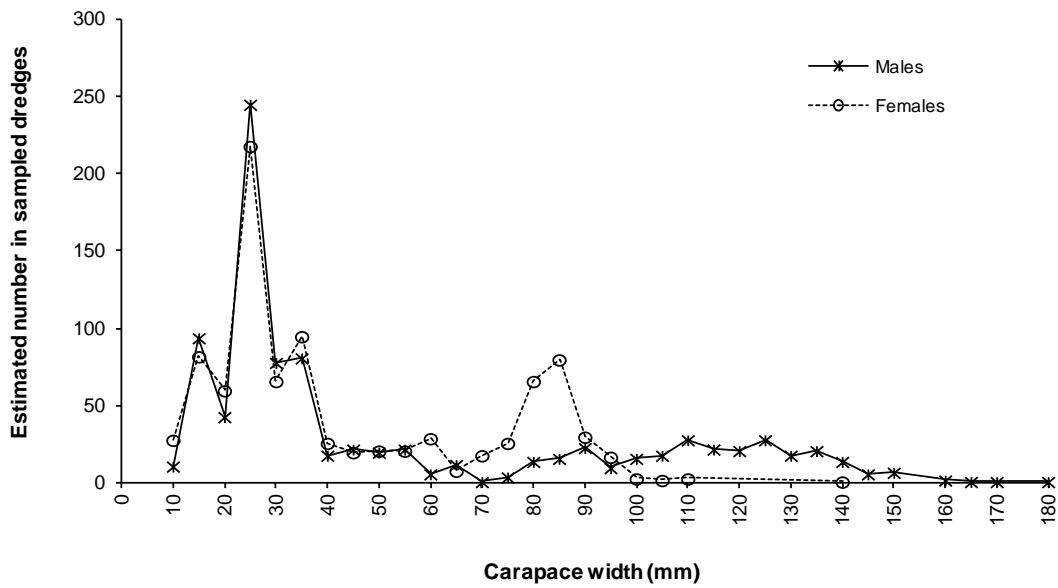


Figure 17.—Tanner crab carapace width distribution from catch sampling during the 2009/10 Kodiak Shelikof District scallop fishery. Sample sizes were 924 males and 920 females.

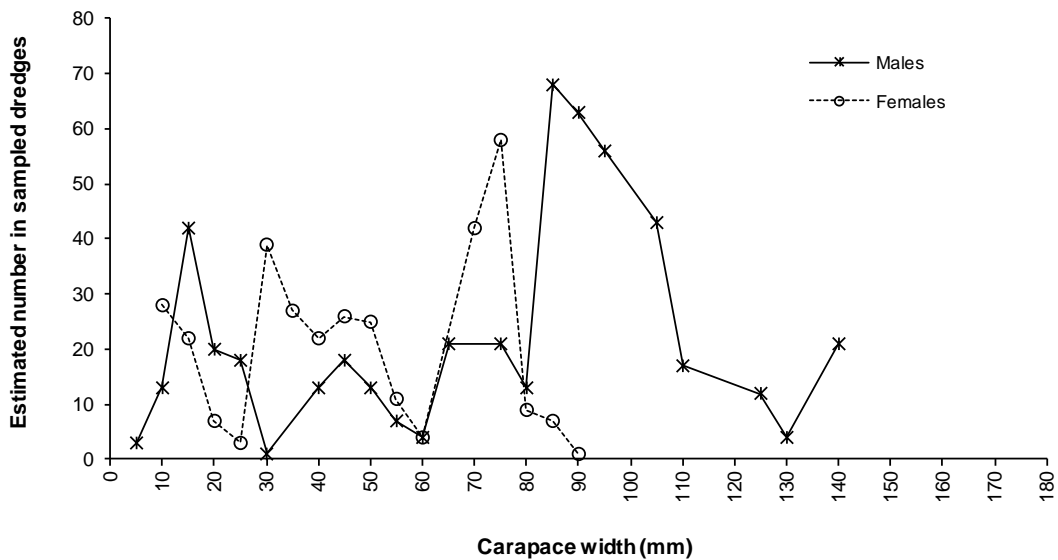


Figure 18.—Tanner crab carapace width distribution from catch sampling during the exploratory 2009/10 Kodiak Southwest District scallop fishery. Sample sizes were 491 males and 331 females.

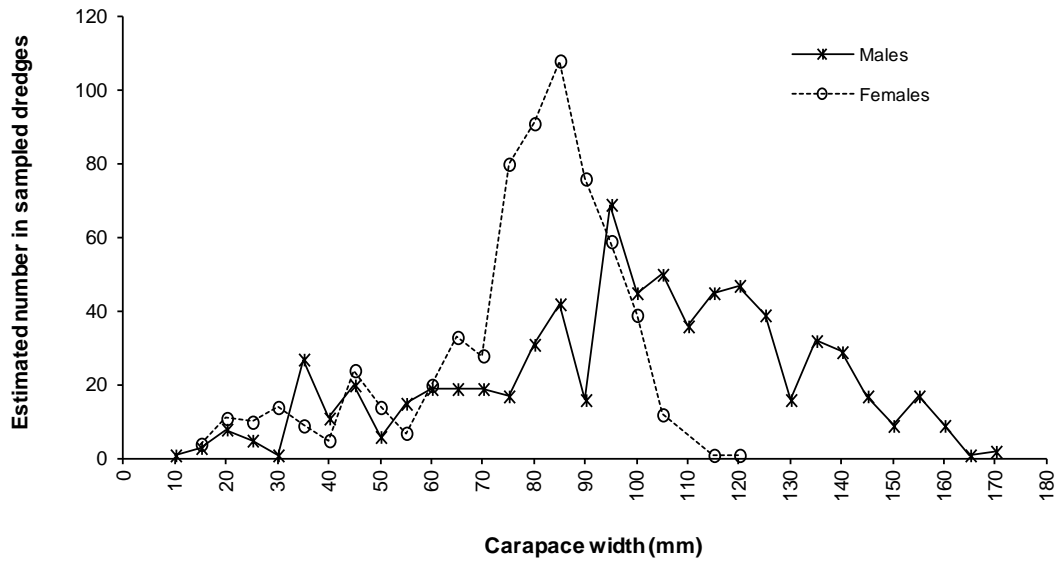


Figure 19.—Tanner crab carapace width distribution from catch sampling during the 2009/10 Bering Sea Area scallop fishery. Sample sizes were 723 males and 646 females.

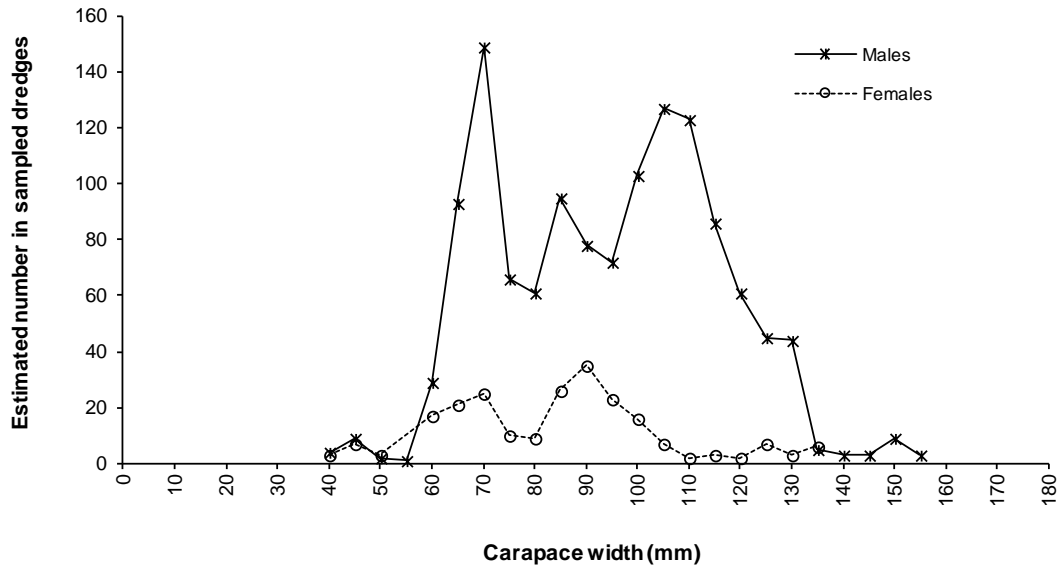


Figure 20.—Combined snow crab and hybrid snow crab x Tanner crab carapace width distribution from bycatch sampling during the 2009/10 Bering Sea Area scallop fishery. Sample sizes were 1,271 males and 225 females.

**APPENDIX A. HISTORICAL ALASKA SCALLOP
OBSERVER PROGRAM SUMMARY STATISTICS**

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

Season	Start of fishing	End of fishing	Number vessels	Fishing days ^a	Observed days ^b	Number tows	Number tows sampled
1993	7/1/1993	7/11/1993	8	77	75	1,160	466
1994	1/10/1994	1/20/1994	11	88	83	1,295	496
1994	7/1/1994	7/12/1994	4	60	60	801	375
1995	1/10/1995	2/14/1995	10	166	134	2,597	496
1996	1/10/1996	1/25/1996	3	47	43	706	178
1996	8/1/1996	9/4/1996	3	82	80	1,396	471
1997	1/10/1997	2/19/1997	4	144	129	1,958	589
1998/99	7/1/1998	10/5/1998	8	160	148	2,193	863
1999/2000	7/1/1999	9/21/1999	3	132	123	1,720	722
2000/01	7/1/2000	2/14/2001	3	170	134	2,111	558
2001/02	7/7/2001	2/15/2002	2	86	81	1,096	327
2002/03	7/2/2002	8/29/2002	2	83	77	1,243	343
2003/04	8/10/2003	2/8/2004	2	105	85	1,716	386
2004/05	9/1/2004	2/15/2005	2	88	74	1,194	335
2005/06	8/5/2005	1/25/2006	2	162	137	2,585	590
2006/07	7/11/2006	10/24/2006	2	92	84	1,533	398
2007/08	8/14/2007	2/13/2008	2	92	84	1,416	386
2008/09	7/11/2008	8/29/2008	3	115	94	1,825	420
2009/10	7/1/2009	9/25/2009	2	83	71	2,580	412

^a Number vessel days with at least one tow.

^b Number vessel days with at least one sampled tow.

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

Season	Start of fishing	End of fishing	Number vessels	Fishing days ^a	Observed days ^b	Number tows	Number tows sampled
1993	7/17/1993	7/25/1993	1	9	9	193	28
1994	1/20/1994	1/20/1994	7	7	7	160	48
1994	7/13/1994	7/16/1994	1	4	3	81	22
1995	1/10/1995	2/13/1995	6	42	35	599	135
1996	1/15/1996	1/20/1996	1	6	5	105	9
1996	8/4/1996	11/28/1996	2	23	21	449	105
1997	1/21/1997	2/21/1997	3	27	14	299	83
1998/99	7/1/1998	10/6/1998	6	33	24	359	131
1999/2000	7/28/1999	9/26/1999	2	23	16	291	78
2000/01	9/17/2000	2/14/2001	4	29	23	244	83
2001/02	7/10/2001	10/8/2001	2	21	17	193	58
2002/03	7/1/2002	7/9/2002	2	6	4	55	12
2003/04	8/30/2003	2/8/2004	2	3	1	12	3
2004/05	9/3/2004	2/15/2005	2	18	18	111	40
2005/06	10/11/2005	1/30/2006	2	16	15	197	55
2006/07	8/19/2006	9/13/2006	2	12	11	160	48
2007/08	8/15/2007	11/27/2007	2	4	2	8	3
2008/09	7/18/2008	8/29/2008	2	22	17	237	81
2009/10	7/4/2009	9/2/2009	2	17	16	299	48

^a Number vessel days with at least one tow.

^b Number vessel days with at least one sampled tow.

Appendix A3.—Historical scallop fishery observer program summary statistics from Prince William Sound Area. 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	Number tows	Number tows sampled
1993	7/15/1993	7/19/1993	7	29	27	379	182
1995	1/10/1995	1/26/1995	2	21	21	244	90
1997	1/12/1997	1/19/1997	1	8	7	99	42
1998/99	7/1/1998	7/4/1998	2	8	8	104	29
1999/2000	7/1/1999	7/4/1999	2	8	6	65	22
2000/01	7/6/2000	8/2/2000	3	30	28	201	81
2001/02	1/22/2002	2/11/2002	1	21	16	138	37
2002/03	7/28/2002	2/15/2003	2	17	16	150	57
2003/04	12/11/2003	1/24/2004	1	15	13	114	26
2004/05	8/21/2004	11/2/2004	2	28	26	336	94
2005/06	7/1/2005	8/22/2005	3	56	51	549	212
2006/07	7/2/2006	7/11/2006	2	15	15	173	71
2007/08	7/7/2007	8/11/2007	2	20	20	240	80
2008/09	7/5/2008	7/15/2008	1	11	9	160	54
2009/10	9/19/2009	10/6/2009	2	17	10	279	40

^a Number vessel days with at least one tow.

^b Number vessel days with at least one sampled tow.

Appendix A4.—Historical scallop fishery observer program summary statistics from Kodiak Northeast District. 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	Number tows	Number tows sampled
1993/94	7/11/1993	11/24/1993	10	272	237	4,099	1,393
1994/95	8/20/1994	11/11/1994	11	80	67	986	335
1996/97	10/31/1996	12/12/1996	3	29	19	319	84
1997/98	8/10/1997	12/8/1997	3	94	86	1,417	432
1998/99	7/6/1998	10/2/1998	4	89	80	1,331	457
1999/2000	7/1/1999	9/9/1999	3	40	38	673	203
2000/01	8/19/2000	9/26/2000	4	40	37	556	174
2001/02	8/8/2001	1/18/2002	3	45	39	591	188
2002/03	8/20/2002	2/10/2003	2	46	42	725	189
2003/04	7/18/2003	11/15/2003	2	42	40	684	197
2004/05	7/5/2004	8/9/2004	2	42	42	662	190
2005/06	7/7/2005	1/17/2006	3	63	53	881	218
2006/07	9/7/2006	12/2/2006	2	42	40	688	178
2007/08	9/29/2007	2/3/2008	2	47	37	671	131
2008/09	7/8/2008	10/12/2008	3	59	53	797	236
2009/10	9/17/2009	11/28/2009	1	47	33	625	116

^a Number vessel days with at least one tow.

^b Number vessel days with at least one sampled tow.

Appendix A5.—Historical scallop fishery observer program summary statistics from Kodiak Shelikof District. 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	Number tows	Number tows sampled
1993/94	7/1/1993	8/5/1993	5	82	80	1,693	497
1994/95	7/1/1994	10/25/1994	11	265	257	5,259	1,599
1996/97	8/28/1996	10/18/1996	4	104	99	1,939	621
1997/98	7/1/1997	8/10/1997	4	153	150	3,047	934
1998/99	7/9/1998	8/21/1998	8	121	112	2,111	663
1999/2000	7/3/1999	9/6/1999	6	117	111	2,012	686
2000/01	7/3/2000	10/2/2000	5	90	81	1,424	449
2001/02	7/3/2001	12/8/2001	4	103	97	1,830	522
2002/03	7/3/2002	2/9/2003	3	115	110	2,071	493
2003/04	8/11/2003	1/13/2004	2	95	88	1,722	452
2004/05	7/27/2004	12/9/2004	2	100	96	1,793	459
2005/06	7/1/2005	12/11/2005	2	70	65	1,218	296
2006/07	7/5/2006	9/7/2006	3	73	72	1,283	357
2007/08	7/2/2007	11/29/2007	3	105	101	1,736	534
2008/09	7/1/2008	7/12/2008 ^c	2	13	11	179	44
2009/10	7/1/2009	11/9/2009	3	92	74	1,921	408

^a Number vessel days with at least one tow.

^b Number vessel days with at least one sampled tow.

^c Season closed due to Tanner crab bycatch.

Appendix A6.—Historical scallop fishery observer program summary statistics from Kodiak Semidi Island District. 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	Number tows	Number tows sampled
1993	11/5/1993	12/11/1993	3	27	26	531	159
1994	1/26/1994	2/11/1994	6	48	44	745	245
1994	7/18/1994	10/31/1994	2	10	10	190	58
1996/97	10/19/1996	12/1/1996	3	37	32	625	186
1997/98	11/26/1997	12/9/1997	1	14	14	254	64
1998/99	8/22/1998	9/25/1998	2	5	5	68	25
1999/2000	7/21/1999	9/17/1999	1	4	1	29	7

^a Number vessel days with at least one tow.

^b Number vessel days with at least one sampled tow.

Appendix A7.—Historical scallop fishery observer program summary statistics from Alaska Peninsula Area. 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	Number tows	Number tows sampled
1993/94	7/25/1993	10/21/1993	8	75	69	957	374
1994/95	7/7/1994	9/21/1994	7	80	75	1,115	383
1996/97	10/21/1996	10/30/1996	2	13	12	177	52
1997/98	8/13/1997	2/10/1998	4	68	64	1,050	353
1998/99	8/28/1998	9/19/1998	4	48	46	681	253
1999/2000	8/23/1999	10/6/1999	5	73	65	1,099	379
2000/01	7/11/2000	8/28/2000	3	14	9	188	47
2006/07	10/26/2006	12/8/2006	2	7	5	73	21
2008/09	9/5/2008	9/12/2008	1	8	8	114	30

^a Number vessel days with at least one tow.

^b Number vessel days with at least one sampled tow.

Appendix A8.—Historical scallop fishery observer program summary statistics from Dutch Harbor Area. 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	Number tows	Number tows sampled
1993/94	7/2/1993	9/16/1993	3	38	26	535	84
1994/95	7/23/1994	8/20/1994	3	6	6	57	1
1995/96	7/11/1995	9/9/1995	1	38	35	747	172
1997/98	8/18/1997	8/25/1997	1	8	8	110	27
1998/99	9/6/1998	11/12/1998	4	37	34	464	189
1999/2000	9/17/1999	9/30/1999	1	13	10	166	54
2002/03	10/10/2002	10/17/2002	1	8	7	114	32
2008/09	9/15/2008	9/27/2008	1	13	12	179	53
2009/10	10/24/2009	10/31/2009	1	7	3	77	14

^a Number vessel days with at least one tow.

^b Number vessel days with at least one sampled tow.

Appendix A9.—Historical scallop fishery observer program summary statistics from Bering Sea Area. Fishing was not opened during the 1995/96 season.

Season	Start of fishing	End of fishing	Number vessels	Fishing days ^a	Observed days ^b	Number tows	Number tows sampled
1993/94	7/28/1993	9/5/1993	9	172	166	3,326	1,029
1994/95	7/1/1994	9/7/1994	8	312	304	6,508	1,954
1996/97	8/1/1996	10/16/1996	1	63	54	951	235
1997/98	7/2/1997	8/11/1997	2	66	64	1,280	307
1998/99	7/16/1998	9/4/1998	4	73	64	1,178	321
1999/2000	7/1/1999	8/30/1999	2	94	76	1,514	488
2000/01	7/1/2000	8/23/2000	3	91	87	1,564	506
2001/02	7/1/2001	10/30/2001	3	84	82	1,401	435
2002/03	9/8/2002	1/2/2003	2	61	56	1,010	247
2003/04	7/2/2003	2/15/2004	2	28	26	517	151
2004/05	7/3/2004	7/9/2004	1	7	7	145	38
2005/06	12/18/2005	1/9/2006	1	21	18	303	84
2006/07	10/31/2006	12/13/2006	1	36	33	583	150
2007/08	9/10/2007	12/17/2007	2	33	31	540	142
2008/09	8/18/2008	9/15/2008	1	29	28	642	123
2009/10	11/3/2009	1/18/2010	1	41	22	726	70

^a Number vessel days with at least one tow.

^b Number vessel days with at least one sampled tow.

**APPENDIX B. HISTORICAL ALASKA SCALLOP FISHERY
SUMMARY STATISTICS**

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

Season	GHL	Catch (lbs meat)	Catch (lbs whole)	Dredge hours	CPUE ^a	Estimated scallop discards		
						lbs whole	% intact ^b	% broken ^b
1993	125,000	141,423	2,082,824	1,999	71	NA	NA	NA
1994	250,000	158,660	2,085,942	2,547	62	NA	NA	NA
1994 ^c	NA	94,400	1,713,094	1,715	55	NA	NA	NA
1995	250,000	242,491	3,214,968	4,712	51	NA	NA	NA
1996	250,000	53,310	832,756	1,142	47	NA	NA	NA
1996 ^c	NA	185,426	2,362,498	2,840	65	295,933	6.0	5.2
1997	250,000	242,940	3,282,860	3,956	61	299,843	5.9	2.5
1998/99	250,000	241,678	3,475,996	4,192	58	271,506	3.5	3.8
1999/2000	250,000	249,681	3,119,103	3,840	65	533,172	9.6	5.0
2000/01	200,000	195,699	2,734,559	4,241	46	588,981	11.2	6.5
2001/02	200,000	103,800	1,521,537	2,406	43	272,300	7.3	7.9
2002/03	200,000	122,718	1,541,867	2,439	50	358,200	10.6	8.2
2003/04	200,000	160,918	1,939,004	3,358	48	392,993	11.5	5.4
2004/05	200,000	86,950	1,262,499	2,134	41	219,107	7.6	5.7
2005/06	200,000	199,351	2,662,031	5,089	39	395,686	4.4	8.5
2006/07	150,000	150,950	1,771,229	2,817	54	380,250	12.3	5.4
2007/08	150,000	125,960	1,593,223	2,601	48	520,017	18.4	6.2
2008/09	150,000	150,289	2,053,912	3,286	46	416,807	11.6	5.3
2009/10	160,000	158,225	2,193,282	3,919	40	622,055	11.7	10.4

^a CPUE in pounds meat/dredge hour.

^b Percentage of total (retained plus discarded) whole scallop pounds.

^c Two seasons fished during calendar year; under single guideline harvest level (GHL).

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

Season	GHL	Catch (lbs meat)	Catch (lbs whole)	Dredge hours	CPUE ^a	Estimated scallop discards		
						lbs whole	% intact ^b	% broken ^b
1993	35,000	NA	55,576	159	NA	NA	NA	NA
1994	35,000	13,301	150,962	276	48	NA	NA	NA
1994 ^c	NA	NA	88,905	132	NA	NA	NA	NA
1995	35,000	33,302	447,469	1,095	30	NA	NA	NA
1996	35,000	8,090	85,086	167	48	NA	NA	NA
1996 ^c	NA	25,970	336,978	750	35	159,899	27.2	5.0
1997	35,000	22,890	265,882	561	41	32,764	8.4	2.6
1998/99	35,000	34,153	384,286	702	49	25,292	3.5	2.7
1999/2000	35,000	34,624	292,625	674	51	57,718	10.0	6.5
2000/01	35,000	30,904	310,370	476	65	51,221	6.9	7.3
2001/02	35,000	20,398	245,319	417	49	48,879	4.6	12.1
2002/03	35,000	3,685	60,928	100	37	12,662	5.2	12.0
2003/04	35,000	1,072	16,780	18	60	1,079	0.6	5.5
2004/05	35,000	24,430	326,228	419	58	19,908	1.9	8.9
2005/06	35,000	13,650	209,487	407	34	35,791	5.8	8.8
2006/07	21,000	13,445	184,106	309	44	24,898	3.9	8.0
2007/08	21,000	180	8,888	14	30	2,020	4.8	13.7
2008/09	21,000	20,986	207,251	423	50	75,471	16.3	10.8
2009/10	25,000	11,791	185,089	437	27	104,634	15.2	20.9

^a CPUE in pounds meat/dredge hour.

^b Percentage of total (retained plus discarded) whole scallop pounds.

^c Two seasons fished during calendar year; under single guideline harvest level (GHL).

Appendix B3.—Historical scallop fishery summary statistics from Prince William Sound Area.

Season	GHL	Catch (lbs meat)	Catch (lbs whole)	Dredge hours	CPUE ^a	Estimated scallop discards		
						lbs whole	% intact ^b	% broken ^b
1993	50,000	63,068	850,718	638	99	NA	NA	NA
1995	50,000	108,000	736,455	NA	NA	NA	NA	NA
1997	17,200	18,000	257,230	171	105	NA	NA	NA
1998/99	20,000	19,650	334,152	179	110	12,789	0.8	2.8
1999/2000	20,000	20,410	211,140	149	137	18,500	1.0	7.1
2000/01	30,000	30,266	361,032	221	137	13,826	0.8	2.8
2001/02	30,000	30,090	511,761	263	114	23,824	2.0	2.5
2002/03	20,000	15,641	231,140	122	121	6,588	0.3	2.5
2003/04	20,000	19,980	261,720	216	93	53,591	4.1	12.9
2004/05	50,000	49,320	704,617	614	80	82,462	4.8	5.6
2005/06	50,000	49,205	818,741	491	100	62,627	0.3	6.8
2006/07	37,000	36,990	440,781	334	111	38,122	1.9	6.0
2007/08	37,000	37,105	570,972	428	87	79,886	5.6	6.7
2008/09	20,000	20,040	316,118	313	64	30,177	2.8	5.9
2009/10	20,000	19,350	279,800	419	45	59,010	0.2	17.2

^a CPUE in pounds meat/dredge hour.

^b Percentage of total (retained plus discarded) whole scallop pounds.

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

Season	GHL	Catch (lbs meat)	Catch (lbs whole)	Dredge hours	CPUE ^a	Estimated scallop discards		
						lbs whole	% intact ^b	% broken ^b
1993/94	NA ^c	155,122	2,214,427	6,940	22	NA	NA	NA
1994/95	NA ^c	35,207	389,202	1,773	20	NA	NA	NA
1996/97	NA ^c	11,430	147,269	581	20	8,355	1.7	3.7
1997/98	NA ^c	95,858	1,143,926	2,604	37	41,615	2.2	1.3
1998/99	NA ^c	120,010	1,365,836	2,749	44	190,480	8.9	3.3
1999/2000	75,000	77,119	952,972	1,384	56	113,349	5.2	5.4
2000/01	80,000	79,965	681,192	1,101	73	113,422	9.3	5.0
2001/02	80,000	80,470	822,110	1,142	70	108,835	5.9	5.8
2002/03	80,000	80,000	871,918	1,350	59	166,547	9.6	6.5
2003/04	80,000	79,965	747,517	1,248	64	113,536	6.1	7.1
2004/05	80,000	80,105	848,527	1,227	65	262,976	15.3	8.4
2005/06	80,000	79,990	831,378	1,759	45	209,906	13.4	6.7
2006/07	90,000	75,150	703,338	1,168	64	135,343	8.1	8.1
2007/08	90,000	75,105	822,697	1,170	64	203,059	8.5	11.3
2008/09	90,000	74,863	817,817	1,363	55	110,869	6.9	5.1
2009/10	75,000	69,090	786,978	1,210	57	121,021	5.5	7.8

^a CPUE in pounds meat/dredge hour.

^b Percentage of total (retained plus discarded) whole pounds.

^c Included in Kodiak Area guideline harvest level (GHL).

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

Season	GHL	Catch (lbs meat)	Catch (lbs whole)	Dredge hours	CPUE ^a	Estimated scallop discards		
						lbs whole	% intact ^b	% broken ^b
1993/94	NA ^c	105,017	1,169,664	2,491	42	NA	NA	NA
1994/95	NA ^c	314,051	3,522,517	8,662	36	NA	NA	NA
1996/97	NA ^c	219,305	1,878,268	3,491	63	197,174	4.3	5.2
1997/98	NA ^c	258,346	3,101,152	5,492	47	93,221	2.1	0.8
1998/99	NA ^c	179,870	2,129,025	4,081	44	216,354	7.1	2.1
1999/2000	180,000	187,963	1,903,345	4,304	44	289,867	9.3	3.9
2000/01	180,000	180,087	1,768,376	2,907	62	128,614	4.5	2.3
2001/02	180,000	177,112	1,830,265	3,398	52	239,459	8.2	3.4
2002/03	180,000	180,580	1,857,466	3,799	48	496,577	17.1	3.9
2003/04	180,000	180,011	1,724,498	3,258	55	402,800	15.2	3.7
2004/05	180,000	174,622	1,641,608	3,467	50	435,844	16.2	4.7
2005/06	160,000	159,941	1,454,806	2,280	70	233,911	6.1	3.1
2006/07	160,000	162,537	1,405,382	2,183	74	234,979	12.4	2.0
2007/08	170,000	169,968	1,695,563	2,937	58	377,063	17.2	1.0
2008/09	170,000	13,761	161,605	263	52	32,301	12.2	4.5
2009/10	170,000	169,877	1,579,723	3,447	49	349,952	13.9	4.2

^a CPUE in pounds meat/dredge hour.

^b Percentage of total (retained plus discarded) whole scallop pounds.

^c Included in Kodiak Area guideline harvest level (GHL).

Appendix B6.—Historical summary statistics from 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	GHL	Catch (lbs meat)	Catch (lbs whole)	Dredge hours	CPUE ^a	Estimated scallop discards		
						lbs whole	% intact ^b	% broken ^b
1993	NA ^c	55,487	261,910	1,819	31	NA	NA	NA
1994	NA ^c	NA	317,926	990	NA	NA	NA	NA
1994	NA ^c	NA	69,315	272	NA	NA	NA	NA
1996/97	NA ^c	37,810	288,117	1,017	37	6,000	0.4	1.6
1997/98	NA ^c	6,315	61,320	349	18	2,716	2.6	1.6
1998/99	NA ^c	1,720	15,806	106	16	508	1.7	1.4
1999/2000	NA ^c	930	11,310	45	21	375	1.8	1.4

^a CPUE in pounds meat/dredge hour.

^b Percentage of total (retained plus discarded) whole scallop pounds.

^c Included in Kodiak Area guideline harvest level (GHL).

Appendix B7.—Historical scallop fishery summary statistics from Alaska Peninsula Area. The area was not opened for fishing during the 1995/96, 2001/02, 2002/03, and 2009/10 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	Estimated scallop discards		
						lbs whole	% intact ^b	% broken ^b
1993/94	NA	112,152	1,061,925	1,847	61	NA	NA	NA
1994/95	NA	65,282	619,473	1,664	39	NA	NA	NA
1996/97	200,000	12,560	130,235	327	38	7,384	1.5	3.8
1997/98	200,000	51,616	654,960	1,752	29	38,219	3.6	1.9
1998/99	200,000	63,290	617,120	1,612	39	43,129	5.3	1.2
1999/2000	200,000	75,535	781,596	2,025	37	59,077	4.5	2.5
2000/01	33,000	7,660	95,510	320	24	4,538	3.0	1.5
2006/07	25,000	155	3,103	64	2	794	18.5	1.9
2008/09	10,000	2,460	30,686	151	16	4,101	9.3	2.1

^a CPUE in pounds meat/dredge hour.

^b Percentage of total (retained plus discarded) whole scallop pounds.

Appendix B8.—Historical scallop fishery summary statistics from Dutch Harbor Area. 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	Estimated scallop discards		
						lbs whole	% intact ^b	% broken ^b
1993/94	170,000	38,731	432,970	838	46	NA	NA	NA
1994/95	170,000	1,931	23,590	81	24	NA	NA	NA
1995/96	170,000	26,950	289,398	1,047	26	NA	NA	NA
1997/98	170,000	5,790	55,725	171	34	18,561	19.4	5.6
1998/99	110,000	46,432	427,422	1,025	45	29,348	4.0	2.4
1999/2000	110,000	6,465	68,070	273	24	4,284	1.4	4.5
2002/03	10,000	6,000	59,116	184	33	4,346	1.4	5.4
2008/09	10,000	10,040	93,957	225	45	32,584	16.0	9.8
2009/10	10,000	6,080	55,361	104	59	2,082	0.7	2.9

^a CPUE in pounds meat/dredge hour.

^b Percentage of total (retained plus discarded) whole scallop pounds.

Appendix B9.—Historical scallop fishery summary statistics from Bering Sea Area. Fishing was not opened during the 1995/96 season.

Season	GHL	Catch (lbs meat)	Catch (lbs whole)	Dredge hours	CPUE ^a	Estimated scallop discards		
						lbs whole	% intact ^b	% broken ^b
1993/94	NA	284,414	3,447,681	5,763	49	NA	NA	NA
1994/95	NA	505,439	5,942,912	11,113	45	NA	NA	NA
1996/97	600,000	150,295	1,432,160	2,313	65	16,188	0.4	0.7
1997/98	600,000	97,002	1,082,825	2,246	43	38,262	1.9	1.5
1998/99	400,000	96,795	1,193,071	2,319	42	127,607	7.0	2.6
1999/2000	400,000	164,929	1,851,620	3,294	50	68,406	1.3	2.3
2000/01	200,000	205,520	2,376,601	3,355	61	97,994	2.4	1.5
2001/02	200,000	140,871	1,700,578	3,072	46	76,261	1.6	2.7
2002/03	105,000	92,240	952,958	2,038	45	55,197	2.5	3.0
2003/04	105,000	42,590	537,552	1,020	42	34,327	2.9	3.1
2004/05	105,000	10,050	129,220	275	37	5,639	1.3	2.9
2005/06	50,000	23,220	231,700	602	39	17,433	2.9	4.1
2006/07	50,000	48,246	529,590	1,138	42	54,503	5.2	4.2
2007/08	50,000	49,995	697,288	1,084	46	49,356	4.3	2.3
2008/09	50,000	49,995	507,596	962	52	58,417	4.5	5.9
2009/10	50,000	48,855	568,454	1,270	38	57,984	4.7	4.5

^a CPUE in pounds meat/dredge hour.

^b Percentage of total (retained plus discarded) whole scallop pounds.

**APPENDIX C. HISTORICAL ALASKA SCALLOP FISHERY
BYCATCH STATISTICS**

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

Season	Estimated bycatch (number animals)				Lbs meat per Tanner crab ^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
2008/09	2,416	0	0	130	62
2009/10	11,609	0	0	530	14

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

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

Season	Estimated bycatch (number animals)				Lbs meat per Tanner crab ^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
2008/09	189	0	0	56	111
2009/10	1,009	0	23	123	12

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

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

Season	Tanner crab	Estimated bycatch (number animals)				Lbs meat per Tanner crab ^a
	bycatch limit	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
2008/09	11,400	424	0	0	16	47
2009/10	11,400	316	0	0	34	61

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

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

Season	Crab bycatch limits		Estimated bycatch (number animals)				Lbs meat per Tanner crab ^a
	Tanner	King	Tanner	King	Dungeness	Halibut	
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
2008/09	186,000	12	39,732	2	0	174	2
2009/10	217,000	7	38,411	0	0	223	2

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

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

Season	Crab bycatch limits		Estimated bycatch (number animals)				Lbs meat per Tanner crab ^a
	Tanner	King	Tanner	King	Dungeness	Halibut	
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
2008/09	16,900	3	26,845	0	13	0	<1
2009/10	25,000	96	18,589	0	88	252	9

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

Appendix C6.—Historical scallop fishery bycatch statistics from Kodiak Semidi Island District. 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	Estimated bycatch (number animals)				Lbs meat per Tanner crab ^a
	Tanner	King	Dungeness	Halibut	
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 scallop fishery bycatch statistics from Alaska Peninsula Area.

Season	Crab bycatch limits		Estimated bycatch (number animals)				Lbs meat per Tanner crab ^a
	Tanner	King	Tanner	King	Dungeness	Halibut	
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
2008/09	120,000	35	18,302	0	0	8	<1

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

Appendix C8.—Historical scallop fishery bycatch statistics from Dutch Harbor Area.

Season	Crab bycatch limits		Estimated bycatch (number animals)				Lbs meat per Tanner crab ^a
	Tanner	King	Tanner	King	Dungeness	Halibut	
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
2008/09	10,000	10	1,120	0	0	77	9
2009/10	10,000	10	26	0	0	0	234

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

Appendix C9.—Historical scallop fishery bycatch statistics from Bering Sea Area. Fishing was not opened during the 1995/96 season.

Season	Crab bycatch limits			Estimated bycatch (number animals)				Lbs meat per Tanner/snow crabs ^a
	Tanner	King	Snow	Tanner	King	Snow	Halibut	
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
2008/09	260,000	500	300,000	60,373	2	17,205	0	<1
2009/10	260,000	500	300,000	27,430	106	36,786	0	2

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

**APPENDIX D. TERMS COMMONLY USED IN THE
ALASKA SCALLOP FISHERY**

Appendix D1.–Commonly used terms, acronyms and corresponding definitions related to scallops and the scallop fishery that are used in this report.

<i>bycatch</i>	Non-target species and other items incidentally caught in dredges during scallop fishing operations.
<i>clapper</i>	Empty scallop shell connected at the hinge; upper and lower (dorsal and ventral) valves are separated during shucking.
<i>CPUE</i>	Catch per unit effort, fishery performance statistic expressed in pounds meat per dredge hour (lbs meat/dredge-hr).
<i>CW</i>	Carapace width, size measurement for <i>Chionoecetes</i> spp. crabs.
<i>discarded scallop catch</i>	Small and/or broken scallops captured by the dredge that are not removed from deck by vessel crew for shucking.
<i>dredge-hr</i>	Fishery effort unit; one scallop dredge of a given size towed one hour.
<i>GHL</i>	Guideline harvest level; anticipated scallop catch set prior to fishing for a given area that may be modified by fishery managers during season.
<i>haul</i>	Time period from when dredge/dredges is/are set overboard to catch scallops until retrieval and landing aboard vessel.
<i>observer</i>	Onboard scallop fishery observer.
<i>retained scallop catch</i>	Whole scallops caught in dredge and removed from deck by vessel crew for shucking.
<i>SH</i>	Scallop shell height measured in mm as shown in Figure 1.
<i>shucking</i>	Process of removing adductor muscle (scallop meat) from shell and viscera.
<i>vessel-day</i>	Midnight to midnight 24 hour time period for a specific vessel.
