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STOCK ASSESSMENT TRAWL SURVEYS FOR PANDALID SHRIMPS IN THE
KODIAK ISLAND, CHIGNIK, AND SOUTH PENINSULA DISTRICTS OF
ALASKA, 1984

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February 1986

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Commissioner

ADF&G TECHNICAL DATA REPORTS

This series of reports is designed to facilitate prompt reporting of data from studies conducted by the Alaska Department of Fish and Game, especially studies which may be of direct and immediate interest to scientists of other agencies.

The primary purpose of these reports is presentation of data. Description of programs and data collection methods is included only to the extent required for interpretation of the data. Analysis is generally limited to that necessary for clarification of data collection methods and interpretation of the basic data. No attempt is made in these reports to present analysis of the data relative to its ultimate or intended use.

Data presented in these reports is intended to be final, however, some revisions may occasionally be necessary. Minor revision will be made via errata sheets. Major revisions will be made in the form of revised reports.

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ABSTRACT

Four shrimp trawl surveys (two spring, two fall) were conducted among select bays in Alaska Shellfish Fishing Districts of Kodiak, Chignik, and South Peninsula in 1984. Pink shrimp (*Pandalus borealis*) were the target species for the stratified systematic surveys. Ancillary information on the biomass of fish and other decapods was obtained along with data on water temperatures. Detailed descriptions of the trawling gear, onboard procedures, and sampling and survey designs are given. Biomass indices for all major taxa caught in the trawls (with variances for shrimp) and abundance indices for pink shrimp by age and sex are given for each surveyed area.

KEY WORDS: pink shrimp, *Pandalus borealis*, trawl surveys, sampling and survey designs, abundance indices, Kodiak, Chignik, South Peninsula.

INTRODUCTION

This report is the first in a series that documents data obtained through annual trawl surveys to assess the abundance of pandalid shrimps for fisheries management in Westward Region. For each fishing area, surveys provide a series of indices of stock abundance and information on size composition which is used to monitor recruitment, growth, and the effects of fishing in overall age structure of pandalid shrimps. Information on both abundance and size are used to open and close fishing areas according to criteria in the management plan reported in Jackson et al. (1983) and adopted by the Board of Fisheries (ADF&G 1984). This report contains the results from four surveys conducted in the Kodiak Island and Alaska Peninsula waters during 1984.

DESCRIPTION OF SURVEYED AREAS

The shrimp fishery in Westward Region includes all Pacific Ocean waters south of Cape Douglas, west of Cape Fairfield, east of 172° E. seaward to the 300 fathom contour, and all Bering Sea waters east of 172° E. This area, referred to as Statistical Area J by the Board of Fisheries (ADF&G 1984), is divided into five fishing districts: Kodiak, Chignik, South Peninsula, North Peninsula, and Aleutian. All districts except the North Peninsula contain several fishing sections within which the majority of commercial trawling occurs. All references to shrimp districts and sections throughout this report is according to these geographical units as shown in Figure 1.

HISTORY OF SURVEY PROGRAM

Shrimp stock assessment surveys have been conducted in Westward Region since April 1971 (Gaffney 1977, Jackson 1981, 1980, 1975, 1974, 1973). The first two years of surveys concentrated on obtaining information on the inshore life history and stock distribution of pandalid shrimp on the east side of Kodiak Island. Since 1973, the surveys have been used to obtain indices of abundance of major pandalid shrimp stocks in the Westward Region. An informal cooperative agreement was reached with the National Marine Fisheries Service (NMFS) to share survey efforts with the Alaska Department of Fish and Game (ADF&G); ADF&G focused its efforts on the Kodiak District while NMFS concentrated on Chignik, South Peninsula, and Aleutian Districts. The two agencies split coverage of the Chignik District from 1974 to 1978 with ADF&G surveying in the spring and NMFS in the fall. Since 1979, ADF&G has assumed responsibility by surveying all fishing sections in the Westward Region with the exception of Pavlof Bay which NMFS surveys annually in the fall.

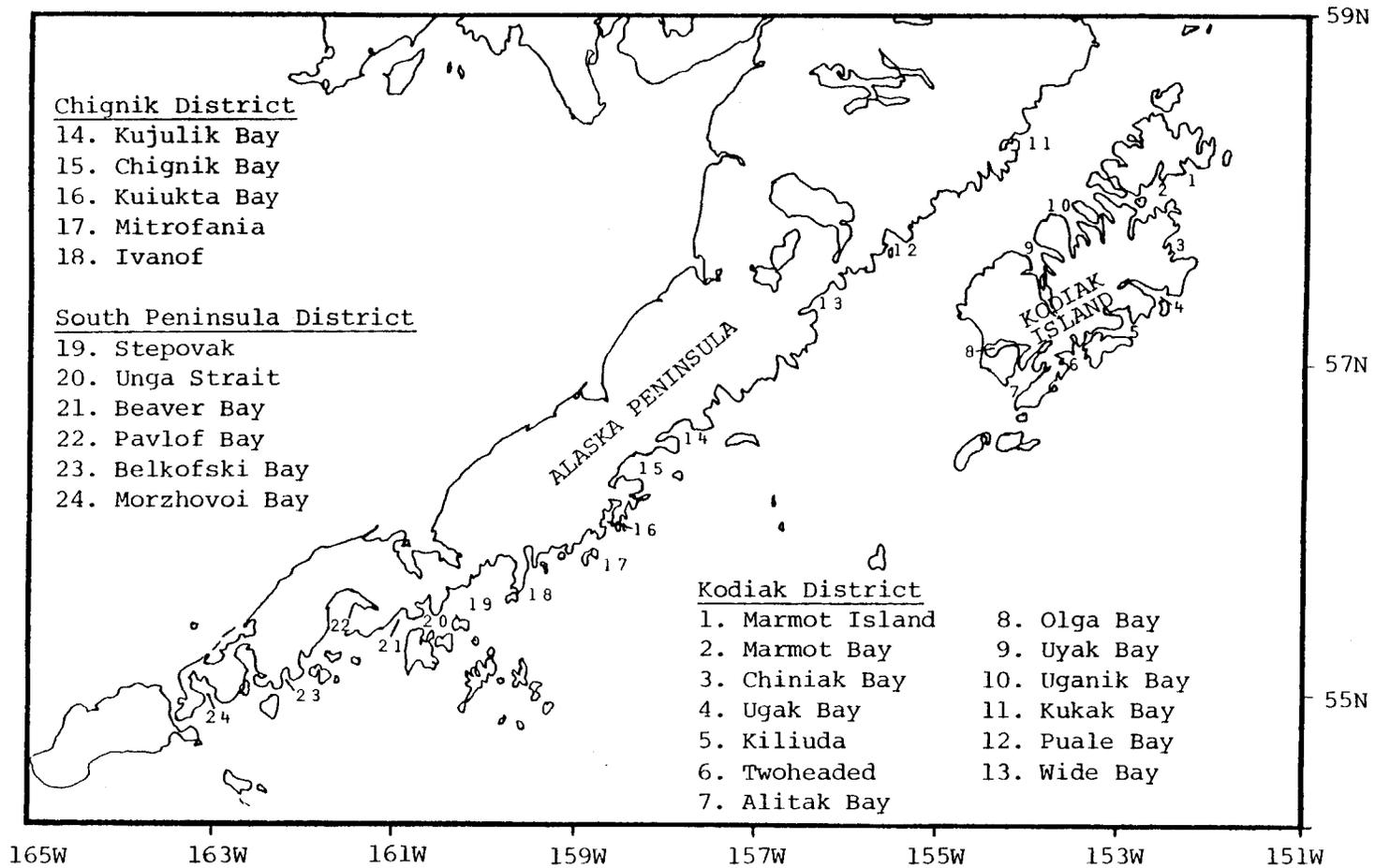


Figure 1. Shrimp fishing districts and areas surveyed in 1984 around Kodiak Island and across Shelikof Strait near the mainland, in the Chignik District, and in the South Peninsula District.

METHODS

Trawling Procedure

For each standard tow, the net (see Appendix A for gear description) was kept on the bottom for about 30 minutes and was pulled at a speed of 2 knots along a straight path into the tide and parallel to (but not on) a bottom edge. Warp lengths were set at a 3:1 ratio with depth. Tows were made during full daylight hours during periods of normal tides and weather when pink shrimp (*Pandalus borealis*), the target species, can be expected near the bottom (Parsons and Sandeman 1981, Frechette et al. 1981). In the event a tow was unsuccessful (i.e., net snagged the bottom, twisted, or was improperly set), the net was retrieved and mended, chains were adjusted to standard lengths, and the set was repeated or dropped from the schedule. For each successful tow, the codend was brought aboard and weighed with a 10 k load cell before and after release of the catch into deck bins.

Survey Design

Four surveys were conducted in 1984, two in the spring and two in the fall. Each survey was a series of stratified-systematic designs with random selection of tows stations (see Cochran 1977) with the objective of estimating a biomass index for pink shrimp each of a series of fishing grounds. Each surveyed area was divided into strata based on past information on distribution of biomass from previous surveys, from past commercial catches, and the size of the surveyed area (the surveys in small bays and inlets were not stratified). Within each stratum, one tow was made for every two to four-square nautical miles; previous surveys have shown that this density of tows would produce indices of biomass of pink shrimp that were within $\pm 25\%$ of the true values 80% of the time (Jackson et al. 1983). Tow stations were selected from grids drawn over nautical charts within each stratum.

Biomass indices were calculated as scaled estimates of pounds per stratum through an area-swept calculation. The weight of each taxon in all tows was adjusted for deviations from standard procedures:

$$1) \quad W(ijkx) = 30 \frac{S(ijx)W'(ijkx)}{(2) T(ijx)}$$

where $W'(ijkx)$ is the unadjusted weight of taxon k caught in stratum j in area i during tow x , and $W(ijkx)$ is the same weight after adjustment (units are pounds per nautical mile towed); 30 is the number of minutes in a standard tow, while T is the number of minutes in tow ijx ; 2 kn is the standard speed during tows, while S is the actual, average surface speed of the vessel during the ijx tow. The biomass index for each stratum is a scaled estimate of the biomass swept up by the trawl and expanded by the area of the stratum $A(ij)$:

$$2) \quad I(ijk) = \bar{W}(ijk.)A(ij) \left[\frac{6076}{32} 10^{-7} \right]$$

where $\bar{W}(ijk.)$ is the adjusted weights averaged over the replicate tows in area i stratum j for taxon k ; I is the index for area i , stratum j , and taxon k ; 6076 is the number of feet in a nautical mile; and 32 is the estimated number of feet swept by the net during an instant of time. The biomass index for each area i is the sum of all indices over strata:

$$3a) I(ik) = \sum_j I(ijk)$$

where $I(ik)$ is the index for species k in area i . The mean weight in pounds trawled per nautical mile is the sum of the means for each stratum weighted by its area:

$$3b) \bar{W}(ik) = \frac{\sum_j \bar{W}(ijk.)A(ij)}{A(i)}$$

where $A(i)$ is the square nautical miles in area i . The variances of $I(ijk)$, $\bar{W}(ik)$, and $I(ik)$ were calculated according to equations:

$$4) V[I(ijk)] = \left[\frac{6076}{32} 10^{-7} \right]^2 V[\bar{W}(ijk.)]A(ij)^2$$

$$5a) V[\bar{W}(ik)] = \frac{\sum_j V[\bar{W}(ijk.)]A(ij)^2}{A(i)^2}$$

$$5b) V[I(ik)] = \left[\frac{6076}{32} 10^{-7} \right]^2 \sum_j V[\bar{W}(ijk.)]A(ij)^2$$

where $V[\bar{W}(ijk.)]$ is the mean square error for $\bar{W}(ijk.)$. Indices were calculated for pink shrimp, humpy shrimp (*P. goniurus*), coonstripe shrimp (*P. hypsinotus*), sidestripe shrimp (*Pandalopsis dispar*), and several taxa of fish incidentally caught in the trawls. Calculations based on Eq. 1-5 were made with a series of FORTRAN programs in the library DGGAFFNEY on the Honeywell Computer at the University of Alaska Computer Network.

Sampling Design

Each trawl catch was processed using the basic shipboard procedures described in Hughes (1976). First, all halibut (*Hippoglossus stenolepis*), skate (*Raja* sp.), crab (*Paralithodes camtschatica* and *Chionoecetes bairdi*), rockfish (*Sebastes* sp.), and blackcod (*Anoplopoma fimbria*) were counted and weighed by taxon. Next, a 50-100 pound sample of shrimp and fish was taken randomly from the remaining catch; all animals in the sample except shrimp were counted and weighed by taxon. The weight of a taxon in the tow was estimated as:

$$W' (ijkx) = \frac{(\text{Weight of taxon in the sample}) (\text{Weight of tow})}{\text{Weight of sample}}$$

where $W'(ijk)$ is the unadjusted weight that is first described in Eq. 1. Then, the first of several, systematically drawn five-pound subsamples of shrimp was sorted and weighed by species. On board, the carapace was measured on 200-300 shrimp of each species that comprised at least 30% by weight of this subsample. Each carapace was measured to the nearest .5 mm from the posterior margin of the eye socket to the posterior mid-point of the carapace. Several other systematically drawn five-pound subsamples, one for each 500 pounds of shrimp in the tow, were mixed with similar subsamples drawn from other replicate tows in the stratum to form a total subsample (hereafter called a composite subsample) from the entire stratum. When less than five pounds of shrimp were available from the sample, all remaining shrimp were put in the composite subsample.

After each replicate tow had been made in a stratum, five to ten pounds of shrimp were systematically selected from the composite subsamples and were preserved in isopropyl alcohol. After the survey, these preserved shrimp were counted, weighed, and measured (carapace length as on the vessel) by species and by sex. Sex was determined using the progression outlined in Allen (1959).

Sex and Age Composition

Sex composition of each stratum was estimated with one of two procedures. If length-frequency information is available for each tow made in a stratum, the sex composition of each length category of the composite subsample was used to estimate abundance by sex (the combination method):

$$6) N(ijkl_s) = \frac{m(ijkl_s)}{m(ijkl)_d} \sum_x \frac{W(ijkx)}{w(ijkx)} n(ijkl_x)$$

where $N(ijkl_s)$ is the estimated number of individuals in the taxon per nautical mile of tow with length l and sex s in the stratum, $m(ijkl_s)$ is the number with length l and sex s in the composite subsample from the stratum, $m(ijkl)$ is the number with length l in the composite subsample, $w(ijkx)$ is the weight of the taxon in the composite subsample from tow x , $W(ijkx)$ is the weight of the taxon in tow x , $n(ijkl_x)$ is the number individuals in the taxon of length l in tow x in of those shrimp measured onboard, and d is the sum of the nautical miles towed in the stratum.

When tow-by-tow information is not available for use in the combination method (usually because of too few shrimp per tow to meet the sampling goal for measurement of length frequency), the length frequency of the composite subsample was used (the simple method):

$$7) N(ijkl_s) = \frac{m(ijkl_s)}{d w(ijk)} \sum_j \sum_x W(ijkx)$$

where $w(ijk)$ is the weight of the composite subsample for taxon k from stratum j in area i , $m(ijk)$ is the number of shrimp in the composite subsample from the stratum. Because the combination method produced estimates with better precision than did the simple method (Appendix B), the combination method was used whenever possible. An estimate of sex composition by length for each area is the sum of $N(ijkl)$ over all strata within an area.

Basic calculations of $N(ijkl)$ for each stratum were made with a series of FORTRAN programs named ESTIMATE on a Honeywell Computer at University of Alaska. The ESTIMATE program is part of a library of programs named DGGAFFNEY.

The abundance of pink shrimp by age in an area was estimated by separating modes in histograms $N(ijkl)$ over lengths by sex (Anderson 1981, Frechette and Parsons 1983, Tesch 1971) (Appendix C). Modes for male frequencies were assigned ages as I, II, or III relative to similar assignments made for histograms from past surveys (Jackson 1981, 1980) and for histograms of samples taken from commercial catches (McCrary and Petersen 1970, Petersen 1969, Petersen and McCrary 1969). Modes for transitional shrimp (stage intermediate between males and females in protandrous hermaphrodites) were assigned ages as II, III, or IV according to their positions relative to modes for males. Because larger males in an age group are the first to become transitionals (Rasmussen 1953), the modes for transitionals are slightly larger than modes for males of the same age. However, modes at about the same lengths for females and for transitionals were assigned the same ages. Females were assigned ages as II, III, IV, V, or VI. Whenever adjacent modes within a sex could be separated by eye, the frequencies were summed over the separate ranges to obtain estimates of abundance by mode (age). Whenever adjacent modes within a sex could not be separated by eye, the computer routine NORMSEP developed by Tomlinson (1971), after the procedure outlined in Hasselblad (1966), was used to estimate the fraction of $N(ijkl)$ for each length category in the overlapping zone between the modes. The $N(ijkl)$ were then prorated by the fractions and summed accordingly to estimate abundance for each age (mode). The program NORMSEP was used on an IBM PC-2 microcomputer.

RESULTS

Kodiak Stocks

Thirteen fishing areas were surveyed in the Kodiak District during 1984 with 172 tows successfully completed. A spring survey was conducted in Puale Bay and fall surveys were conducted in Marmot Island, Uyak, and Uganik fishing sections. Both spring and fall surveys were conducted in the remaining areas; Inner Marmot, Chiniak, Uyak, Kiliuda, Twoheaded, Alitak, Kukak, and Olga Bays.

Biomass Indices:

Biomass indices were generated for each shrimp species and for all fish as a group for each survey and for each area (Table 1). More detailed information on biomass indices of shrimp species as well on water temperatures, strata sizes, and towing history is in Appendix D.

Table 1. Summary of biomass indices for shrimp and fish by area, cruise, and stratum for the surveys in the Kodiak District in 1984.

Fishing Section/ Survey Date	Pink		Humpy		Coonstripe		Sidestripe		Other		Total		Fish	
	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE
Inner Marmot (Area 102)														
23 June, 1984	0.98	0.32	.00	.00	0.00	0.00	0.05	0.03	0.03	0.01	1.06	0.35	3.90	1.13
17 September, 1984	1.01	0.34	.00	.00	.00	.00	0.02	0.01	0.05	0.02	1.08	0.34	10.41	2.29
Marmot Island (Area 103)														
19 September, 1984	1.31	0.47	0.00	0.00	0.00	0.00	0.05	0.03	0.09	0.06	1.45	0.46	6.62	0.73
Chiniak Bay (Area 104)														
6 June, 1984	0.82	0.06	.00	.00	.00	.00	0.01	0.00	0.04	.00	0.87	0.06	1.53	0.18
9 October, 1984	0.30	0.03	.00	0.00	0.00	0.00	0.01	.00	0.04	0.02	0.35	0.05	4.56	0.05
Ugak Bay (Area 106)														
5 June, 1984	0.02	0.01	0.00	0.00	.00	.00	0.00	0.00	.00	.00	0.02	0.01	1.26	0.25
12 September, 1984	0.06	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.03	3.78	0.64
Kiliuda Bay (Area 107)														
10 June, 1984	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.99	0.29
11 September, 1984	0.47	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.47	0.16	9.86	1.58
Twoheaded (Area 108)														
9 June, 1984	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.01	13.21	11.89
9 September, 1984	0.30	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.01	.00	0.31	0.09	12.01	1.68
Alitak (Area 109)														
3 June, 1984	4.00	2.16	0.03	0.02	0.01	.00	0.03	0.07	0.04	0.02	4.97	2.24	19.12	5.35
7 September, 1984	3.12	1.18	0.31	0.26	0.01	.00	0.05	0.03	0.05	0.02	3.52	1.20	4.89	1.66
Uyak Bay (Area 110)														
16 September, 1984	0.49	0.17	0.00	0.00	0.00	0.00	0.06	0.06	0.01	0.01	0.56	0.21	3.11	0.68
Uganik Bay (Area 112)														
14 September, 1984	1.50	0.33	0.00	0.00	0.00	0.00	0.04	0.02	0.02	0.01	1.55	0.34	3.54	0.60

-Continued-

Table 1. Summary of biomass indices for shrimp and fish by area, cruise, and stratum for the surveys in the Kodiak District in 1984 (continued).

Fishing Section/ Survey Date	Pink		Humpy		Coonstripe		Sidestripe		Other		Total		Fish	
	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE
Kukak Bay (Area 114)														
22 June, 1984	0.55	0.27	.00	.00	.00	.00	0.03	0.02	.00	.00	0.58	0.28	1.06	0.14
22 October, 1984	0.16	0.16	0.00	0.00	.00	.00	.00	.00	.00	.00	0.16	0.16	0.78	0.44
Wide Bay (Area 119)														
20 June, 1984	0.34	0.11	0.91	0.44	0.07	0.02	0.05	0.03	0.02	0.01	1.39	0.33	0.41	0.15
20 October, 1984	0.82	0.20	0.84	0.28	0.33	0.16	0.05	0.02	0.06	0.03	2.09	0.52	1.10	0.15
Puale Bay (Area 122)														
21 June, 1984	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	.00	.00	0.02	0.02	0.99	0.30
Olga Bay (Area 124)														
6 June, 1984	.00	.00	1.25	0.35	0.17	0.03	.00	.00	0.02	0.02	1.44	0.35	0.27	0.06
2 September, 1984	0.01	0.01	0.74	0.29	0.42	0.10	.00	.00	0.03	0.02	1.21	0.34	0.36	0.07

Relative to the variances of the indices, biomass of pink, humpy, and coonstripe shrimp generally did not change significantly from spring to fall in the Kodiak District (Table 1). Surveys in Inner Marmot, Ugak, Alitak, and Kukak Bays showed no significant change in biomass for pink shrimp while surveys showed increases in Kiliuda Bay, Twoheaded Island, and Wide Bay and decreases in Chiniak Bay. Surveys in Olga and Wide Bays registered no significant changes in the biomass of humpy shrimp. Surveys did indicate an increase in coonstripe shrimp in Olga Bay.

Biomass indices were also generated for major fish and invertebrate taxa and are summarized in Appendix E.

Sex and Age Composition:

Sex and age composition data were collected from two sources: 1) 99 station catch samples including pink shrimp (72 samples; 16,066 individuals), humpy shrimp (22 samples; 5,814 individuals), and coonstripe shrimp (5 samples; 1,306 individuals), and 2) 27 composite subsamples including pink shrimp (21 subsamples; 5,982 individuals) and humpy shrimp (5 subsamples; 1,409 individuals) (Appendix F).

All age groups increased in abundance from spring to fall in the Kodiak District (Table 2). Two-year-old pink shrimp dominated both spring and fall survey catches. Three- and four-year-old pink shrimp ranked second and third in both spring and fall survey catches. Male pink shrimp were the most abundant sex in spring and fall. Transitionals ranked second in the spring and third in the fall. Female pink shrimp ranked third in the spring and second in the fall.

More detailed information on age and sex composition of pink and humpy shrimp along with length-frequency histograms and means and modes of shrimp length is in Appendix C.

Species Composition:

Pink shrimp dominated shrimp catches in most survey areas. Humpy shrimp dominated catches in both spring and fall Wide Bay and Olga Bay surveys. Shrimp species composition data is summarized in Appendix D.

Flatfish ranked first in abundance (354.41 pounds per trawl mile [lbs/TM]) followed by shrimp (283.70 lbs/TM) and pollock (178.24 lbs/TM). Species composition data is summarized by area, cruise, and major taxa in Appendix E.

Chignik Stocks

Five fishing areas were surveyed in the Chignik District during 1984 with 47 tows successfully completed.

Biomass Indices:

Biomass indices were generated for each shrimp species and for all fish as a group for each survey and for each area (Table 3). Spring surveys were con-

Table 2. Summary of estimated indices of pink shrimp in numbers by sex and age per nautical miles towed for areas in the Kodiak District in the spring and autumn of 1984. Numbers were estimated with Eqs. 6 and 7 as described in the text and are unadjusted for trawl width. The symbol (+) following the number by age of females in the table below indicates that the number is for that age and all older. The term (ND) in place of a number indicates that no modes were present in the relevant portions of the length-frequency histogram.

	Ages						Transitionals		Totals	
	I	II	III	IV	V	VI	Males	Females		
Inner Marmot Bay (Area 102)										
23 June, 1984	0	4,877	2,300	769	22 +		3,393	3,398	1,185	7,976
17 September, 1984	31	6,841	1,701	665 +			4,611	1,720	2,907	9,238
Chiniak Bay (Area 104)										
6 June, 1984	0	7,993	5,773	251 +			3,659	9,338	1,020	14,017
9 October, 1984	129	2,693	779	138 +			1,249	578	1,912	3,739
Ugak Bay (Area 106)										
5 June, 1984	0	318	110	30 +			144	249	65	458
12 September, 1984	2	534	55	15 +			299	176	131	606
Kiliuda Bay (Area 107)										
11 September, 1984	0	826	223	11 +			621	187	252	1,060
Twoheaded Island (Area 108)										
9 September, 1984	0	425	38	88 +			264	82	205	551
Alitak Bay (Area 109)										
3 June, 1984	1,919	ND	ND +				3,050	2,141	2,449	7,640
7 September, 1984	5,747	4,577	3,475	1,486 +			7,624	4,126	3,535	15,285
Uyak Bay (Area 110)										
16 September, 1984	0	2,666	1,666	265	22 +		1,718	614	2,287	4,619
Uganik Bay (Area 112)										
14 September, 1984	0	20,456	3,007	1,644	259 +		17,252	1,615	6,499	25,366

-Continued-

Table 2. Summary of estimated indices of pink shrimp in numbers by sex and age per nautical miles towed for areas in the Kodiak District in the spring and autumn of 1984. Numbers were estimated with Eqs. 6 and 7 as described in the text and are unadjusted for trawl width. The symbol (+) following the number by age of females in the table below indicates that the number is for that age and all older. The term (ND) in place of a number indicates that no modes were present in the relevant portions of the length-frequency histogram (continued).

	Ages						Transitionals		Totals	
	I	II	III	IV	V	VI	Males	Females		
Kukak Bay (Area 114)										
22 June, 1984	0	14,676	3,003	819	141 +		14,786	3,097	756	18,639
22 October, 1984	47	4,250	3,603	261	104 +		4,489	667	3,109	8,265
Wide Bay (Area 119)										
20 June, 1984	0	24,365	1,322 +				20,934	4,247	506	25,687
20 October, 1984	513	46,916	3,156 +				36,325	883	13,377	50,585

Table 3. Summary of biomass indices for shrimp and fish by area, cruise, and stratum for the surveys in the Chignik District in 1984.

Fishing Section/ Survey Date	Pink		Humpy		Coonstripe		Sidestripe		Other		Total		Fish	
	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE
Mitrofanía (Area 201)														
27 May, 1984	0.39	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.39	0.09	12.82	3.59
Chignik Bay (Area 207)														
30 May, 1984	0.83	0.28	0.00	0.00	0.00	0.00	0.01	0.02	0.05	0.04	0.90	0.30	7.67	1.23
16 October, 1984	1.97	0.81	0.00	0.00	0.00	0.00	0.02	0.02	0.07	0.03	2.05	0.82	9.67	2.51
Kujulik Bay (Area 209)														
31 May, 1984	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00	.00	.00	0.04	0.04	3.67	1.40
19 October, 1984	0.23	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.01	.00	0.24	0.12	3.29	0.33
Ivanof (Area 217)														
26 May, 1984	0.08	0.05	0.00	0.00	0.00	0.00	0.00	0.00	.00	.00	0.08	0.05	10.94	0.00
Kuiukta Bay (Area 220)														
29 May, 1984	0.64	0.23	0.00	0.00	0.00	0.00	0.11	0.07	0.01	0.01	0.76	0.28	1.50	0.05

ducted in Mitrofanina, Ivanof, and Kuiukta Bays. Both spring and fall surveys were conducted in Chignik and Kujulik Bays. Significant increases in biomass from spring to fall were noted in both Chignik (from 0.83 to 1.97 million pounds) and Kujulik Bays (from .04 to 0.23 million pounds). More detailed information on biomass indices of shrimp species as well as water temperatures, strata sizes, and towing history is in Appendix D.

Biomass indices were also generated for major fish and invertebrate taxa and are in Appendix E.

Sex and Age Composition:

Sex and age composition data were collected from two sources: 1) 20 station catch samples (pink shrimp only) comprised of 4,116 individuals and 2) eight composite subsamples (2,295 individuals) (Appendix F).

Unlike trends in the Kodiak District, two-year-old pink shrimp were not always the most abundant age group in the surveys in the Chignik District (Table 4). Three-year-old pink shrimp ranked first in abundance in spring surveys and ranked second in fall surveys. Two-year-olds (and younger) and four-year-olds (and older) were equally abundant in spring survey catches. However, in fall survey catches, two-year-olds (and younger) were most abundant while three-year-olds (and older) were least abundant. Transitionals were most abundant in spring catches followed by females and males. Females were most abundant in fall catches followed by males and transitionals.

More detailed information on age and sex composition of pink and humpy shrimp along with length-frequency histograms and means and modes of shrimp length is in Appendix C.

Species Composition:

Pink shrimp dominated shrimp catches in all areas surveyed. Shrimp species composition data is summarized in Appendix D.

Flatfish ranked first in abundance (375.77 lbs/TM) followed by pollock (286.19 lbs/TM), and shrimp (110.34 lbs/TM). Species composition data are reported in Appendix E.

South Peninsula Stocks

Six fishing areas were surveyed in the South Peninsula District during 1984 with 42 tows successfully completed.

Biomass Indices:

Biomass indices were calculated for all shrimp species and for all fish as a group for each survey and for each area (Table 5). All fishing areas were surveyed in the spring only. More detailed information on biomass indices of shrimp species as well as water temperatures, strata sizes, and towing history is in Appendix D. Biomass indices were also generated for major fish and invertebrate taxa and are summarized in Appendix E.

Table 4. Summary of estimated indices of pink shrimp in numbers by sex and age per nautical miles towed for the areas in the Chignik District in the spring and autumn of 1984. Numbers were estimated with Eqs. 6 and 7 as described in the text and are unadjusted for trawl width. The symbol (+) following the number by age of females in the table below indicates that the number is for that age and all older.

	Ages						Transitionals		Totals	
	I	II	III	IV	V	VI	Males	Females		
Mitrofanina Bay (Area 206)										
27 May, 1984	0	310	794	147	14 +		129	861	275	1,265
Chignik Bay (Area 207)										
30 May, 1984	0	1,793	2,606	671	115 +		614	3,480	1,091	5,185
16 October, 1984	0	10,273	3,030	809	196 +		5,966	1,850	6,492	14,308
Kujulik Bay (Area 209)										
31 May, 1984	0	337	309	12 +			18	585	55	658
19 October, 1984	11	2,160	129	55 +			1,000	178	1,177	2,355
Ivanof Bay (Area 217)										
26 May, 1984	0	61	176	35 +			43	173	56	272
Kuiukta Bay (Area 220)										
29 May, 1984	0	1,957	5,740	1,682	1,200	377	1,713	5,806	3,438	10,956

Table 5. Summary of biomass indices for shrimp and fish by area, cruise, and stratum for the surveys in the South Peninsula District in 1984.

Fishing Section/ Survey Date	Pink		Humpy		Coonstripe		Sidestripe		Other		Total		Fish	
	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE
Stepovak (Area 202) 24 May, 1984	1.96	0.00	0.00	0.00	.00	.00	0.03	0.01	0.14	0.03	2.13	0.41	23.62	1.65
Unga Strait (Area 204) 22 May, 1984	0.22	0.07	0.00	0.00	.00	.00	0.00	0.00	0.05	0.02	0.27	0.00	4.61	1.01
Pavlof Bay (Area 206) 20 May, 1984	0.46	0.15	.00	.00	0.01	0.01	0.00	0.00	0.00	0.03	0.54	0.15	15.99	2.72
Beaver Bay (Area 211) 21 May, 1984	0.01	.00	0.00	0.00	.00	.00	0.00	0.00	0.01	0.01	0.02	0.01	7.11	5.61
Belkofski Bay (Area 212) 20 May, 1984	.00	.00	0.00	0.00	.00	.00	0.00	0.00	0.01	0.01	0.02	.00	2.51	0.83
Morzhovoi Bay (Area 221) 19 May, 1984	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.04	0.16	0.05	12.40	1.36

Sex and Age Composition:

Sex and age composition data were collected from two sources: 1) 24 station catch samples (pink shrimp only) comprised of 4,250 individuals and 2) six composite subsamples (1,398 individuals) (Appendix F).

As in the Chignik District, three-year-old pink shrimp dominated spring surveys in the South Peninsula District (Table 6). Two-year-olds and four-year-olds (and older) were equally abundant. Transitionals were most abundant followed by females and males.

More detailed information on age and sex composition of pink and humpy shrimp along with length-frequency histograms and means and modes of shrimp length is in Appendix C.

Species Composition:

Pink shrimp dominated catches in all survey areas with the exception of Belkofski Bay. Shrimp species composition data are summarized in Appendix D.

Flatfish ranked first in abundance (443.63 lb/TM) followed by pollock (288.77 lbs/TM) and Pacific cod (82.78 lbs/TM). Shrimp ranked seventh in abundance (22.58 lbs/TM).

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Table 6. Summary of estimated indices of pink shrimp in numbers by sex and age per nautical miles towed for the areas in the South Peninsula District in the spring of 1984. Numbers were estimated with Eqs. 6 and 7 as described in the text and are unadjusted for trawl width. The symbol (+) following the number by age of females in the table below indicates that the number is for that age and all older.

	Ages						Transitionals		Totals	
	I	II	III	IV	V	VI	Males	Females		
Stepovak Bay (Area 202)										
24 May, 1984	0	198	1,344	557	60	0	127	1,226	806	2,159
Unga Strait (Area 204)										
22 May, 1984	0	111	769	145 +			94	687	244	1,025
Pavlof Bay (Area 206)										
20 May, 1984	0	420	1,150	99	41 +		280	1,113	317	1,710
Morzhovoi Bay (Area 221)										
19 May, 1984	0	73	136	20 +			64	118	47	229

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APPENDIX A

Gear Description

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A1.	Dimensions of the 61-foot shrimp trawl used in the pandalid shrimp surveys for 1984	22

The trawl used in 1984 was developed in 1972-73 by the National Marine Fisheries Service and has been used by the Alaska Department of Fish and Game in stock assessment surveys since 1973. The trawl is a box-style, high-opening, net with a 61' footrope (Figures A2-3). The estimated fishing width is 32-34 feet; the estimated fishing height is 11.5-13.5 feet. The net is fished from paired 5-1/2 x 8-1/2 foot V-doors on 10 fathom triple dandilines (3/8" wire rope) which are attached to the headrope with a 24-inch extension chain, to the mid rib with an 18-inch extension chain and to the footrope directly. Twenty-nine 8-inch steel floats attached to the headrope provide flotation. A 55-foot tickler chain and a 61-foot height regulating chain are attached to the footrope wing tips. The height regulating chain is suspended under the footrope by six 12-inch dropper chains. The tickler chain may or may not be suspended from a single four-foot dropper chain at the mid point of the footrope. The dropper chain keeps the tickler chain directly under the height chain for towing into the tide. Both tickler and height regulating chains may be either of 3/8-inch or 5/16-inch (the lighter chain is more effective on muddy bottoms).

The wings, intermediate, and codends are all made of 1-1/4-inch stretch mesh nylon-cotton blend; the codend has an insert also made of the same material.

APPENDIX B

Variances of Age and Sex Composition

In an unpublished manuscript, Dr. Steven Thompson, formerly of ADF&G, showed that the "combination" method of estimating the length and sex composition of pink shrimp from subsamples from trawls provides lower variance than does the "simple" method. Two subsamples of shrimp were taken from each tow in the survey, shrimp from one were measured and shrimp in the other were thrown into a composite subsample. At the finish of surveying a stratum, a subsample was taken from the tow-by-tow subsample of all the tows and was preserved. Later in the laboratory, the lengths of shrimp in the preserved subsample were measured and their sexes were determined. Under these procedures, the sex and length composition can be estimated with two different procedures. Which is the more precise? Below is a paraphrasing of some of Dr. Thompson's unpublished manuscript.

In the combination method, tow-by-tow length frequencies are combined with sex frequencies for each length from the composite subsample (see Eq. 6 in text):

$$N(ls) = \frac{m(ls)}{m(l)d} \sum_x \frac{W(x)}{w(x)} n(lx)$$

where $N(ls)$ is the estimated number of individuals with length l and of sex s in the taxon per nautical mile of tow, $m(ls)$ is the number with length l and sex s in the composite subsample, $m(l)$ is the number in the composite subsample of length l , $w(x)$ is the weight of the taxon in the composite subsample from tow x , $W(x)$ is the weight of the taxon in tow x , $n(lx)$ is the number shrimp of length l in tow x of those shrimp measured onboard, and d is the sum of the nautical miles towed in the stratum. The value of $N(ls)$ from the combination method is an unbiased estimate of the true value. The variance of the estimated $N(ls)$ is:

$$V[N(ls)] = \left[\frac{1}{d} \right]^2 \left[\sum_x \frac{W(x)^2}{w(x)^2} n(x) p(lx)\{1 - p(lx)\} \right]$$

$$\left[\frac{p(s|l)}{m(l)} - \frac{p(s|l)^2}{m(l)} + p(s|l)^2 \right] + N(l)^2 \left[\frac{p(s|l)}{m(l)} - \frac{p(s|l)^2}{m(l)} \right]$$

where $p(s|l)$ is the proportion of sex s given that the length is l (i.e., an estimate of the conditional probability) in the composite subsample, $p(lx)$ is the true proportion of the subsample from the tow x that is of length l , $n(x)$ is the number of individuals of the taxon in the subsample from tow x that was measured on board, and $N(l)$ is the estimate of the abundance of shrimp of the taxon with length l over all the tows.

In the simple method, the composite subsample is the source of joint information on both the length/sex composition:

$$N(ls) = \frac{m(ls)}{d w} \sum_j \sum_x W(jx)$$

where w is the weight of the composite subsample of the taxon, m is the number of individuals in the composite subsample of the taxon, and $W(jx)$ is the weight of the taxon in stratum j ($W(jx) = W(ij kx)$ in Eq. 1). The value of $N(ls)$ from the simple method is an unbiased estimate of the true value. The variance of the estimate $N(ls)$ is:

$$V[N(ls)] = \left[\frac{\sum_j \sum_x W(jx)}{d w} \right]^2 m p(sl) \{1 - p(sl)\}$$

where $p(sl)$ is the estimated proportion of shrimp of sex s and of length l in the composite subsample (i.e., an estimate of the joint probability of length and sex).

Manipulations of the above equations show that when 1) the number of shrimp measured is the same for each tow and 2) when the size composition is the same from tow to tow, the simple method produces lower variances than does the combination method. However, data from past surveys indicates that size composition does vary greatly from tow to tow and is therefore the method of preference for this report.

APPENDIX C

Estimated Indices of Shrimp Abundance by Age and Sex

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Appendix Table C1. Estimated indices of pink shrimp in numbers by sex and age per nautical miles towed for the areas around Kodiak Island and across Shelikof Strait on the mainland in the spring and autumn of 1984. Numbers are estimated with Eqs. 6 and 7 as described in the text and are unadjusted for trawl width. The symbol (+) following the number by age of females in the table below indicates that the number is for that age and all older. The term (ND) in place of a number indicates that no modes were present in the relevant portions of the length-frequency histograms.

=====							
Inner Marmot Bay (Area 102)							
23 June, 1984	I	II	III	IV	V	VI	All Ages
Males		3,393					3,393
Transitionals		1,484	1,914				3,398
Females			394	769	22 +		1,185
All Sexes	0	4,877	2,308	769	22	0	7,976

17 September, 1984							
Males	31	4,580					4,611
Transitionals		918	802				1,720
Females		1,343	899	665 +			2,907
All Sexes	31	6,841	1,701	665	0	0	9,238
=====							
Chiniak Bay (Area 104)							
6 June, 1984	I	II	III	IV	V	VI	All Ages
Males		3,659					3,659
Transitionals		4,334	5,004				9,338
Females			769	251 +			1,020
All Sexes	0	7,993	5,773	251	0	0	14,017

9 October, 1984							
Males	129	1,120					1,249
Transitionals		286	292 *				578
Females		1,287	487	138 +			1,912
All Sexes	129	2,693	779	138	0	0	3,739
=====							

* Because sample distributions are not normal for this sex during this survey, the length frequency for this group was split at the minimum frequency between the two modes.

Appendix Table C1. Estimated indices of pink shrimp in numbers by sex and age per nautical miles towed for the areas around Kodiak Island and across Shelikof Strait on the mainland in the spring and autumn of 1984. Numbers were estimated with Eqs. 6 and 7 as described in the text and are unadjusted for trawl width. The symbol (+) following the number by age of females in the table below indicates that the number is for that age and all older. The term (ND) in place of a number indicates that no modes were present in the relevant portions of the length-frequency histogram (continued).

=====							
Ugak Bay (Area 106)							
5 June, 1984	I	II	III	IV	V	VI	All Ages

Males		144					144
Transitionals		174	75				249
Females			35	30 +			65

All Sexes	0	318	110	30	0	0	458

12 September, 1984							

Males	2	297					299
Transitionals		162	14				176
Females		75	41	15 +			131

All Sexes	2	534	55	15	0	0	606

=====							
Kiliuda Bay (Area 107)							
11 September, 1984	I	II	III	IV	V	VI	All Ages

Males		621					621
Transitionals		108	79				187
Females		97	144	11 +			252

All Sexes	0	826	223	11	0	0	1,060

=====							
Twoheaded Island (Area 108)							
9 September, 1984	I	II	III	IV	V	VI	All Ages

Males		264					264
Transitionals		64	18				82
Females		97	20	88 +			205

All Sexes	0	425	38	88	0	0	551

=====							

-Continued-

Appendix Table C1. Estimated indices of pink shrimp in numbers by sex and age per nautical miles towed for the areas around Kodiak Island and across Shelikof Strait on the mainland in the spring and autumn of 1984. Numbers were estimated with Eqs. 6 and 7 as described in the text and are unadjusted for trawl width. The symbol (+) following the number by age of females in the table below indicates that the number is for that age and all older. The term (ND) in place of a number indicates that no modes were present in the relevant portions of the length-frequency histogram (continued).

=====							
Alitak Bay (Area 109)							
3 June, 1984	I	II	III	IV	V	VI	All Ages
Males	1,919	648	483				3,050
Transitionals		ND	ND				2,141
Females			ND +				2,449
All Sexes	1,919	ND	ND	0	0	0	7,640

7 September, 1984	I	II	III	IV	V	VI	All Ages
Males	5,747	1,629	248				7,624
Transitionals		2,948	1,178				4,126
Females			2,049	1,486 +			3,535
All Sexes	5,747	4,577	3,475	1,486	0	0	15,285
=====							
Uyak Bay (Area 110)							
16 September, 1984	I	II	III	IV	V	VI	All Ages
Males		1,718					1,718
Transitionals		352	255	7			614
Females		596	1,411	258	22 +		2,287
All Sexes	0	2,666	1,666	265	22	0	4,619
=====							
Uganik Bay (Area 112)							
14 September, 1984	I	II	III	IV	V	VI	All Ages
Males		17,252					17,252
Transitionals		758	857				1,615
Females		2,446	2,150	1,644	259 +		6,499
All Sexes	0	20,456	3,007	1,644	259	0	25,366
=====							

-Continued-

Appendix Table C1. Estimated indices of pink shrimp in numbers by sex and age per nautical miles towed for the areas around Kodiak Island and across Shelikof Strait on the mainland in the spring and autumn of 1984. Numbers were estimated with Eqs. 6 and 7 as described in the text and are unadjusted for trawl width. The symbol (+) following the number by age of females in the table below indicates that the number is for that age and all older. The term (ND) in place of a number indicates that no modes were present in the relevant portions of the length-frequency histogram (continued).

=====							
Kukak Bay (Area 114)							
22 June, 1984	I	II	III	IV	V	VI	All Ages
Males		14,676	110				14,786
Transitionals			2,646	451			3,097
Females			247	368	141 +		756
All Sexes	0	14,676	3,003	819	141	0	18,639

22 October, 1984	I	II	III	IV	V	VI	All Ages
Males	47	4,250	192				4,489
Transitionals			667				667
Females			2,744	261	104 +		3,109
All Sexes	47	4,250	3,603	261	104	0	8,265
=====							
Wide Bay (Area 119)							
20 June, 1984	I	II	III	IV	V	VI	All Ages
Males		20,934					20,934
Transitionals		3,051	1,196				4,247
Females		380	126 +				506
All Sexes	0	24,365	1,322	0	0	0	25,687

20 October, 1984	I	II	III	IV	V	VI	All Ages
Males	513	35,812					36,325
Transitionals		774	109				883
Females		10,330	3,047 +				13,377
All Sexes	513	46,916	3,156	0	0	0	50,585
=====							

Appendix Table C2. Estimated indices of pink shrimp in numbers by sex and age per nautical miles towed for the areas in the Chignik District in the spring and autumn of 1984. Numbers were estimated with Eqs. 6 and 7 as described in the text and are unadjusted for trawl width. The symbol (+) following the number by age of females in the table below indicates that the number is for that age and all older.

=====							
Mitrofanina Bay (Area 201)							
27 May, 1984	I	II	III	IV	V	VI	All Ages

Males		129					129
Transitionals		136	725				861
Females		45	69	147	14 +		275
All Sexes	0	310	794	147	14	0	1,265
=====							
Chignik Bay (Area 207)							
30 May, 1984	I	II	III	IV	V	VI	All Ages

Males		614					614
Transitionals		884	2,596				3,480
Females		295	10	671	115 +		1,091
All Sexes	0	1,793	2,606	671	115	0	5,185

16 October, 1984							
Males		5,966					5,966
Transitionals		374	1,476				1,850
Females		3,933	1,554	809	196 +		6,492
All Sexes	0	10,273	3,030	809	196	0	14,308

Kujulik Bay (Area 209)							
31 May, 1984	I	II	III	IV	V	VI	All Ages

Males		18					18
Transitionals		276	309				585
Females		43		12 +			55
All Sexes	0	337	309	12	0	0	658

19 October, 1984							
Males	11	989					1,000
Transitionals		173	5				178
Females		998	124	55 +			1,177
All Sexes	11	2,160	129	55	0	0	2,355
=====							

-Continued-

Appendix Table C2. Estimated indices of pink shrimp in numbers by sex and age per nautical miles towed for the areas in the Chignik District in the spring and autumn of 1984. Numbers were estimated with Eqs. 6 and 7 as described in the text and are unadjusted for trawl width. The symbol (+) following the number by age of females in the table below indicates that the number is for that age and all older (continued).

Ivanof Bay (Area 217)							
26 May, 1984	I	II	III	IV	V	VI	All Ages
Males		43					43
Transitionals		17	156				173
Females		1	20	35 +			56
All Sexes	0	61	176	35	0	0	272

Kuiukta Bay (Area 220)							
29 May, 1984	I	II	III	IV	V	VI	All Ages
Males		1,713					1,713
Transitionals		245	5,561				5,806
Females			179	1,682	1,200	377	3,438
All Sexes	0	1,957	5,740	1,682	1,200	377	10,956

Appendix Table C3. Estimated indices of pink shrimp in numbers by sex and age per nautical miles towed for the areas in the South Peninsula District in the spring of 1984. Numbers were estimated with Eqs. 6 and 7 as described in the text and are unadjusted for trawl width. The symbol (+) following the number by age of females in the table below indicates that the number is for that age and all older.

=====
 Stepovak Bay (Area 202)

24 May, 1984	I	II	III	IV	V	VI	All Ages
Males		127					127
Transitionals		53	1,173				1,226
Females		18	171	557	60 +		806
All Sexes	0	198	1,344	557	60	0	2,159

=====
 Unga Strait (Area 204)

22 May, 1984	I	II	III	IV	V	VI	All Ages
Males		94					94
Transitionals		17	670				687
Females			99	145 +			244
All Sexes	0	111	769	145	0	0	1,025

=====
 Pavlof Bay (Area 206)

20 May, 1984	I	II	III	IV	V	VI	All Ages
Males		268	12				280
Transitionals		152	961				1,113
Females			177	99	41 +		317
All Sexes	0	420	1,150	99	41	0	1,710

=====
 Morzhovoi Bay (Area 221)

19 May, 1984	I	II	III	IV	V	VI	All Ages
Males		64					64
Transitionals		9	109				118
Females			27	20 +			47
All Sexes	0	73	136	20	0	0	229

=====

Appendix Table C4. Estimated modes, means, and standard deviations of carapace lengths for ages and sexes of pink shrimp from around Kodiak Island and across Shelikof Strait on the mainland. Modes were picked off length-frequency histograms (Appendix Figure C1) while means were estimated with NORMSEP (Tomlinson 1971) from the length frequencies. Values for modes are the length-class (.0 = .00-->.49 and .5 = .50-->.99).

=====					
Inner Marmot Bay (Area 102)					
23 June, 1984	Age	Mode Mean	Std. Dev.	%	N
Males	II	14.0		100	3,393
Transitionals	II	14.5		44	1,484
	III	19.5		56	1,914
Females	III	19.5	0.7	33	394
	IV	22.1	1.0	65	769
	V+	25.3	0.1	2	22

17 September, 1984	Age	Mode Mean	Std. Dev.	%	N
Males	I	7.5		1	31
	II	15.5		99	4,580
Transitionals	II	18.4	0.6	53	918
	III	21.2	0.9	47	802
Females	II	18.5		46	1,343
	III	21.9	0.5	31	899
	IV+	23.3	0.7	23	665
=====					
Chiniak Bay (104)					
6 June, 1984	Age	Mode Mean	Std. Dev.	%	N
Males	II	13.0		100	3,659
Transitionals	II	15.0		46	4,334
	III	18.5		54	5,004
Females	III	19.7	1.0	75	769
	IV+	22.0	1.0	25	251

-Continued-

Appendix Table C4. Estimated modes, means, and standard deviations of carapace lengths for ages and sexes of pink shrimp from around Kodiak Island and across Shelikof Strait on the mainland. Modes were picked off length-frequency histograms (Appendix Figure C1) while means were estimated with NORMSEP (Tomlinson 1971) from the length frequencies. Values for modes are the length-class (.0 = .00-->.49 and .5 = .50-->.99) (continued).

=====					
Chiniak Bay (104)					
9 October, 1984	Age	Mode Mean	Std. Dev.	%	N

Males	I	10.5		10	129
	II	15.5		90	1,120
Transitionals	II	18.0		49	286
	III	21.0		51	292
Females	II	18.6	0.7	67	1,287
	III	21.3	0.6	25	487
	IV+	22.5	0.7	7	138
=====					
Ugak Bay (Area 106)					
5 June, 1984	Age	Mode Mean	Std. Dev.	%	N

Males	II	13.5		100	144
Transitionals	II	16.2	1.0	69	174
	III	20.1	0.9	31	75
Females	III	21	1	53	34
	IV+	23	1	47	31

12 September, 1984	Age	Mode Mean	Std. Dev.	%	N

Males	I	9.5		1	2
	II	15.5		99	297
Transitionals	II	18.0		92	162
	III	21.5		8	14
Females	II	18.4	0.6	57	75
	III	21.3	0.8	31	41
	IV+	24.2	0.5	12	15
=====					

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Appendix Table C4. Estimated modes, means, and standard deviations of carapace lengths for ages and sexes of pink shrimp from around Kodiak Island and across Shelikof Strait on the mainland. Modes were picked off length-frequency histograms (Appendix Figure C1) while means were estimated with NORMSEP (Tomlinson 1971) from the length frequencies. Values for modes are the length-class (.0 = .00-->.49 and .5 = .50-->.99) (continued).

=====					
Kiliuda Bay (Area 107)					
11 September, 1984	Age	Mode Mean	Std. Dev.	%	N

Males	II	15.5		100	621
Transitionals	II	18.2	0.8	58	108
	III	20.9	0.8	42	79
Females	II	18.2	0.5	38	97
	III	22.0	1.2	57	144
	IV+	25.4	0.4	4	11
=====					
Twoheaded Island (Area 108)					
9 September, 1984	Age	Mode Mean	Std. Dev.	%	N

Males	II	15.0		100	264
Transitionals	II	17.5		78	64
	III	20.5		22	18
Females	II	17.9	0.8	47	97
	III	20.6	0.8	10	20
	IV+	23.4	1.2	43	88
=====					
Alitak Bay (Area 109)					
3 June, 1984	Age	Mode Mean	Std. Dev.	%	N

Males	I	13.3	1.2	63	1,919
	II	17.6	0.7	21	648
	III	19.6	0.5	16	483
Transitionals	II - III	18.5		100	2,141
Females	III+	22.0		100	2,449

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Appendix Table C4. Estimated modes, means, and standard deviations of carapace lengths for ages and sexes of pink shrimp from around Kodiak Island and across Shelikof Strait on the mainland. Modes were picked off length-frequency histograms (Appendix Figure C1) while means were estimated with NORMSEP (Tomlinson 1971) from the length frequencies. Values for modes are the length-class (.0 = .00-->.49 and .5 = .50-->.99) (continued).

=====					
Alitak Bay (Area 109)					
7 September, 1984	Age	Mode Mean	Std. Dev.	%	N

Males	I	15.1	1.0	75	5,747
	II	18.5	0.8	21	1,629
	III	21.3	0.4	3	248
Transitionals	II	20.9	0.9	71	2,948
	III	23.1	0.5	29	1,178
Females	III	22.4	0.9	58	2,049
	IV+	24.5	0.8	42	1,486
=====					
Uyak Bay (Area 110)					
16 September, 1984	Age	Mode Mean	Std. Dev.	%	N

Males	II	14.5		100	1,718
	II	16.5		57	352
Transitionals	III	20.0		42	255
	IV	23.0		1	7
Females	II	17.1	0.8	26	596
	III	20.4	1.0	62	1,411
	IV	23.3	1.0	11	258
	V+	26.5		1	22
=====					
Uganik Bay (Area 112)					
14 September, 1984	Age	Mode Mean	Std. Dev.	%	N

Males	II	14.0		100	17,252
	II	17.0		47	758
Transitionals	III	21.0		53	857
	II	17.0		38	2,446
Females	III	20.8	0.6	33	2,150
	IV	22.6	0.9	25	1,644
	V+	25.4	0.5	4	259
=====					

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Appendix Table C4. Estimated modes, means, and standard deviations of carapace lengths for ages and sexes of pink shrimp from around Kodiak Island and across Shelikof Strait on the mainland. Modes were picked off length-frequency histograms (Appendix Figure C1) while means were estimated with NORMSEP (Tomlinson 1971) from the length frequencies. Values for modes are the length-class (.0 = .00-->.49 and .5 = .50-->.99) (continued).

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Kukak Bay (Area 114)					
22 June, 1984	Age	Mode Mean	Std. Dev.	%	N
Males	II	14.5		99	14,676
	III	18.0		1	110
Transitionals	III	19.7	0.7	85	2,646
	IV	21.8	0.6	15	451
Females	III	20.7	0.5	33	247
	IV	22.9	0.5	49	368
	V+	25.3	1.0	19	141

22 October, 1984	Age	Mode Mean	Std. Dev.	%	N
Males	I	9.5		1	47
	II	16.0		95	4,250
	III	19.0		4	192
Transitionals	III	22.0		100	667
Females	III	22.2	0.8	88	2,744
	IV	24.5	0.3	8	261
	V+	26.7	0.5	3	104
=====					
Wide Bay (Area 119)					
20 June, 1984	Age	Mode Mean	Std. Dev.	%	N
Males	II	12.5		100	20,934
Transitionals	II	14.0		72	3,051
	III	18.0		28	1,196
Females	II	13.5		75	380
	III	19.5		25	126

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Appendix Table C4. Estimated modes, means, and standard deviations of carapace lengths for ages and sexes of pink shrimp from around Kodiak Island and across Shelikof Strait on the mainland. Modes were picked off length-frequency histograms (Appendix Figure C1) while means were estimated with NORMSEP (Tomlinson 1971) from the length frequencies. Values for modes are the length-class (.0 = .00-->.49 and .5 = .50-->.99) (continued).

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Wide Bay (Area 119)					
20 October, 1984	Age	Mode Mean	Std. Dev.	%	N

	I	7.5		1	513
Males	II	15.0		99	35,812
Transitionals	II	17.5		88	774
	III	20.0		12	109
Females	II	17.0	0.7	77	10,330
	III	19.4	1.2	23	3,047
=====					

Appendix Table C5. Estimated modes, means, and standard deviations of carapace lengths for ages and sexes of pink shrimp from the Chignik District. Modes were picked off length-frequency histograms (Appendix Figure C2) while means were estimated with NORMSEP (Tomlinson 1971) from the length frequencies. Values for modes are the length-class (.0 = .00-->.49 and .5 = .50-->.99).

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Mitrofanina Bay (Area 201)					
27 May, 1984	Age	Mode Mean	Std. Dev.	%	N

Males	II	13.0		100	129
Transitionals	II	13.5		16	136
	III	18.0		84	725
Females	II	15.0		16	45
	III	20.2	0.8	25	69
	IV	22.3	0.9	53	147
	V+	24.3	0.1	5	14
=====					
Chignik Bay (Area 207)					
30 May, 1984	Age	Mode Mean	Std. Dev.	%	N

Males	II	11.5		100	614
Transitionals	II	13.4	0.93	25	884
	III	18.4	0.94	75	2,596
Females	II	13.5		27	295
	III	18.1	0.3	1	10
	IV	21.6	1.0	62	671
	V+	23.4	1.2	11	115

16 October, 1984	Age	Mode Mean	Std. Dev.	%	N

Males	II	15.0		100	5,966
Transitionals	II	16.7	0.3	20	374
	III	20.2	1.5	80	1,476
Females	II	18.0	0.7	61	3,933
	III	21.0	0.7	24	1,554
	IV	23.0	0.9	112	809
	V+	26.0	0.6	3	196
=====					

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Appendix Figure C5. Estimated modes, means, and standard deviations of carapace lengths for ages and sexes of pink shrimp from the Chignik District. Modes were picked off length-frequency histograms (Appendix Figure C2) while means were estimated with NORMSEP (Tomlinson 1971) from the length frequencies. Values for modes are the length-class (.0 = .00-->.49 and .5 = .50-->.99) (continued).

Kujulik Bay (Area 209)					
31 May, 1984	Age	Mode Mean	Std. Dev.	%	N
Males	II	12.5		100	18
Transitionals	II	13.5		47	276
	III	18.0		53	309
Females	II	14.0		78	43
	III	20.5		22	12
19 October, 1984					
Age	Mode Mean	Std. Dev.	%	N	
Males	I	8.0		1	11
	II	15.5		99	989
Transitionals	II	18.0		97	173
	III	22.0		3	5
Females	II	18.5	0.9	85	998
	III	21.7	0.5	11	124
	IV+	24.0	0.3	5	55
Ivanof Bay (Area 217)					
19 October, 1984	Age	Mode Mean	Std. Dev.	%	N
Males	I	8.0		100	43
Transitionals	II	15.1	0.9	10	17
	III	18.5	0.9	90	156
Females	II	14.0		2	1
	III	21.7		36	20
	IV+	24.0		63	35
Kuiukta Bay (Area 220)					
29 May, 1984	Age	Mode Mean	Std. Dev.	%	N
Males	II	12.0		100	1,713
Transitionals	II	13.0		4	245
	III	18.5		90	156
Females	III	18.5		19	179
	IV	20.1	0.6	49	1,682
	V	22.3	0.5	35	1,200
	VI+	24.1	0.7	12	377

Appendix Table C6. Estimated modes, means, and standard deviations of carapace lengths for ages and sexes of pink shrimp from the South Peninsula District. Modes were picked off length-frequency histograms (Appendix Figure C3) while means were estimated with NORMSEP (Tomlinson 1971) from the length frequencies. Values for modes are the length-class (.0 = .00-->.49 and .5 = .50-->.99).

=====					
Stepovak Bay (Area 202)					
24 May, 1984	Age	Mode Mean	Std. Dev.	%	N

Males	II	12.5		100	127
Transitionals	II	13.0	1.0	4	53
	III	18.5	1.0	96	1,173
Females	II	13.0		2	18
	III	20.4	1.5	22	171
	IV	22.1	1.0	70	557
	V+	24.6	0.4	6	49
=====					
Unga Strait (Area 204)					
22 May, 1984	Age	Mode Mean	Std. Dev.	%	N

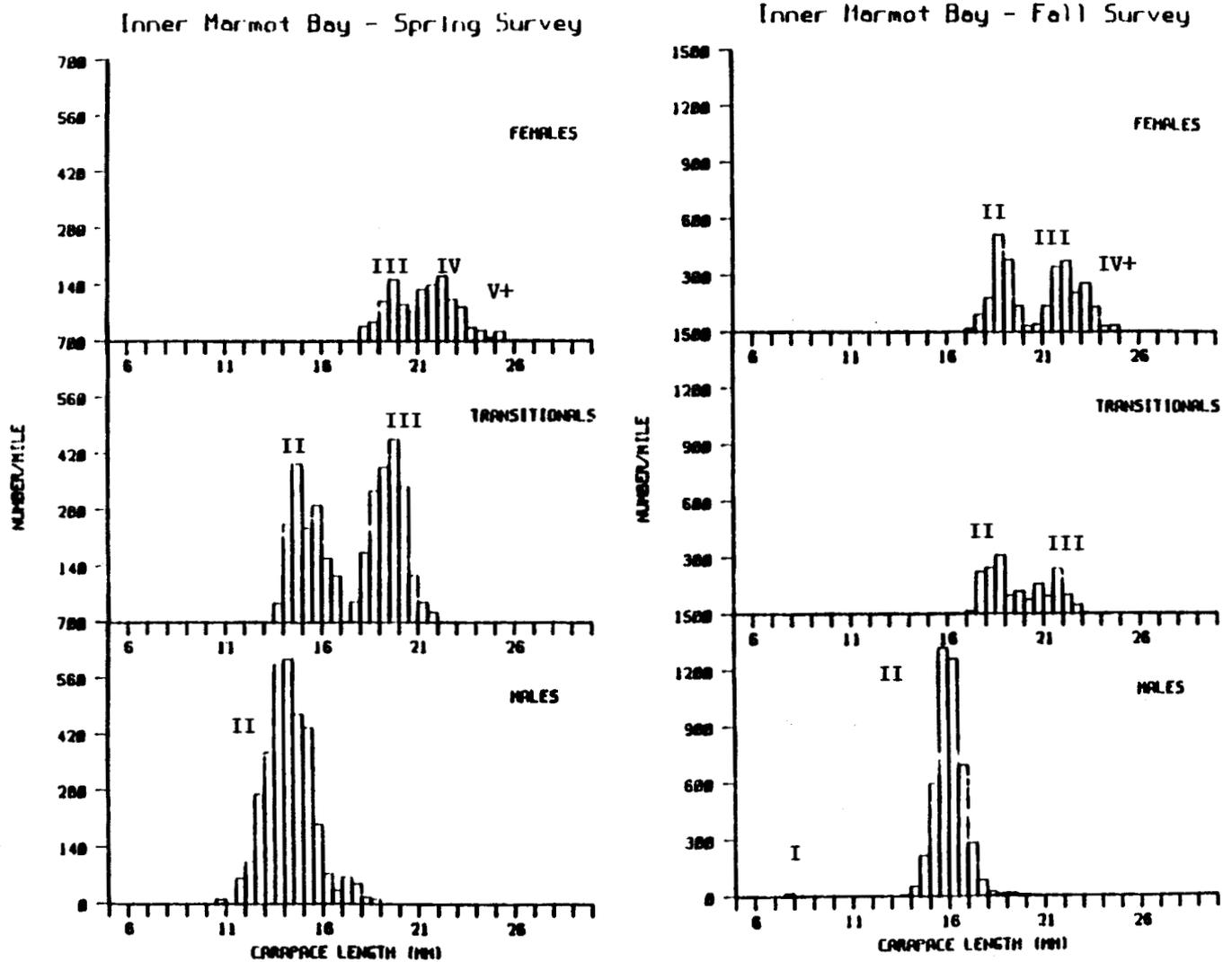
Males	II	13.0		100	94
Transitionals	II	13.5		2	17
	III	18.0		98	670
Females	III	18.7	1.1	41	99
	IV+	22.1	1.1	59	145
=====					
Pavlof Bay (Area 206)					
20 May, 1984	Age	Mode Mean	Std. Dev.	%	N

Males	II	12.5		96	268
	III	15.5		4	12
Transitionals	II	14.0		14	152
	III	17.5		86	961
Females	III	17.6	0.6	59	177
	IV	21.0	1.0	33	99
	V+	24.0	0.6	8	41
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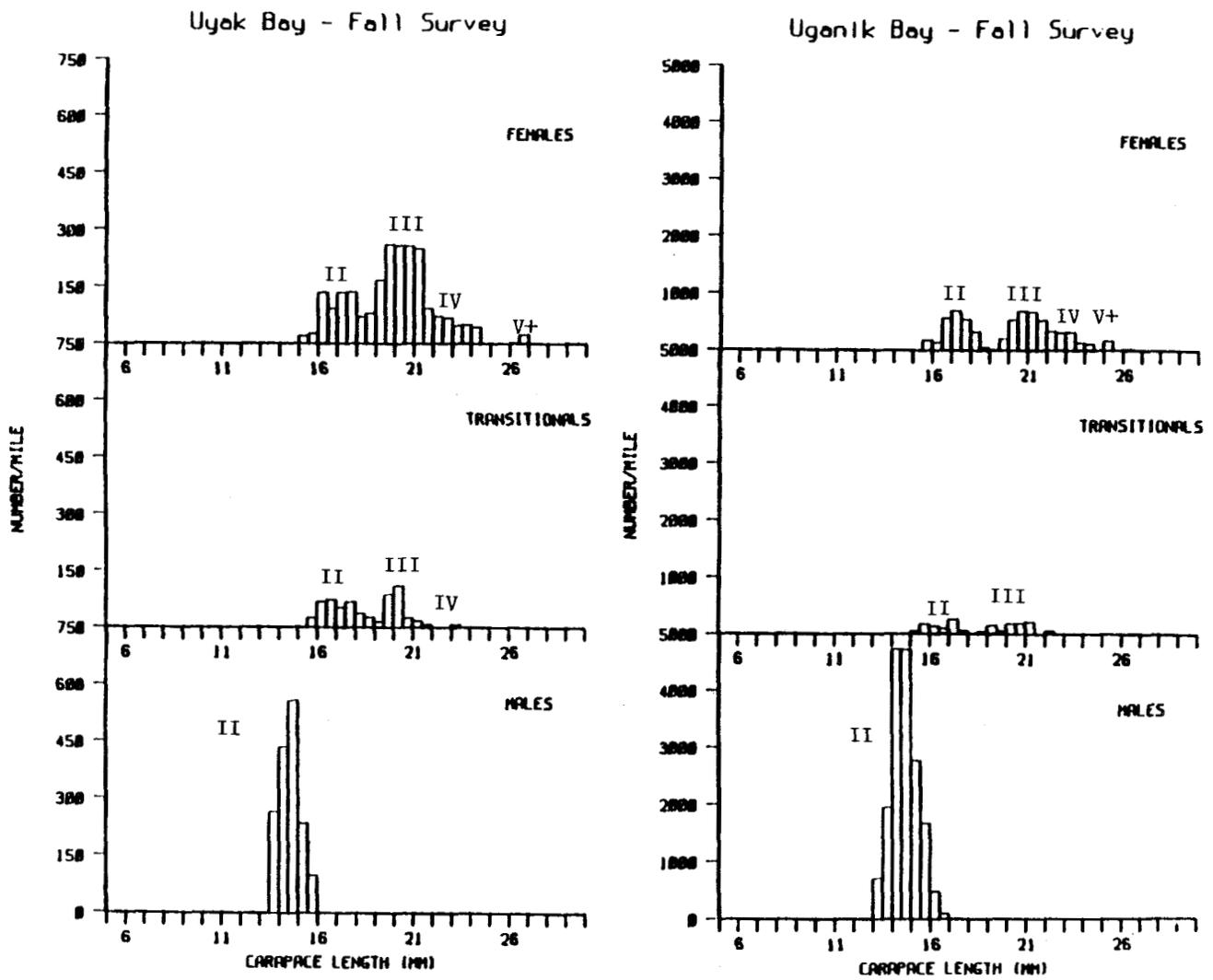
Appendix Table C6. Estimated modes, means, and standard deviations of carapace lengths for ages and sexes of pink shrimp from the South Peninsula District. Modes were picked off length-frequency histograms (Appendix Figure C3) while means were estimated with NORMSEP (Tomlinson 1971) from the length frequencies. Values for modes are the length-class (.0 = .00-->.49 and .5 = .50-->.99) (continued).

Morzhovoi Bay (Area 221)					
19 May, 1984	Age	Mode Mean	Std. Dev.	%	N
Males	II	11.0		100	64
Transitionals	II	13.5		8	9
	III	16.5		92	109
Females	III	17.5		57	27
	IV+	21.0		43	20



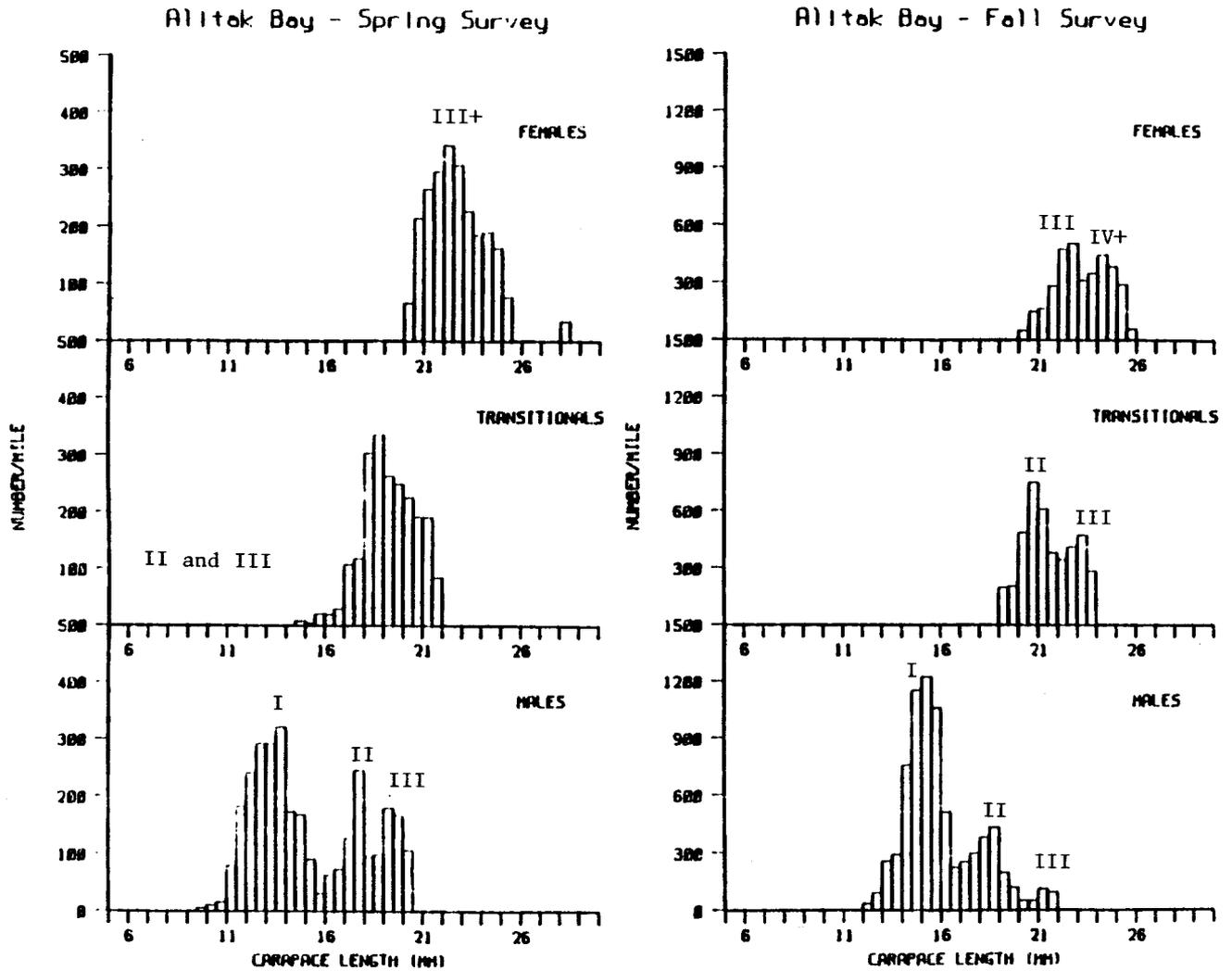
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Appendix Figure C1. Histograms of carapace lengths of pink shrimp by sex from around Kodiak Island and across Shelikof Strait on the mainland. Frequencies from the composite samples were expanded to number per trawl mile with Eqs. 6 and 7 in the text. The numbers have not been expanded for the area swept by the trawl. Roman numerals approximately flag lengths that correspond to ages.



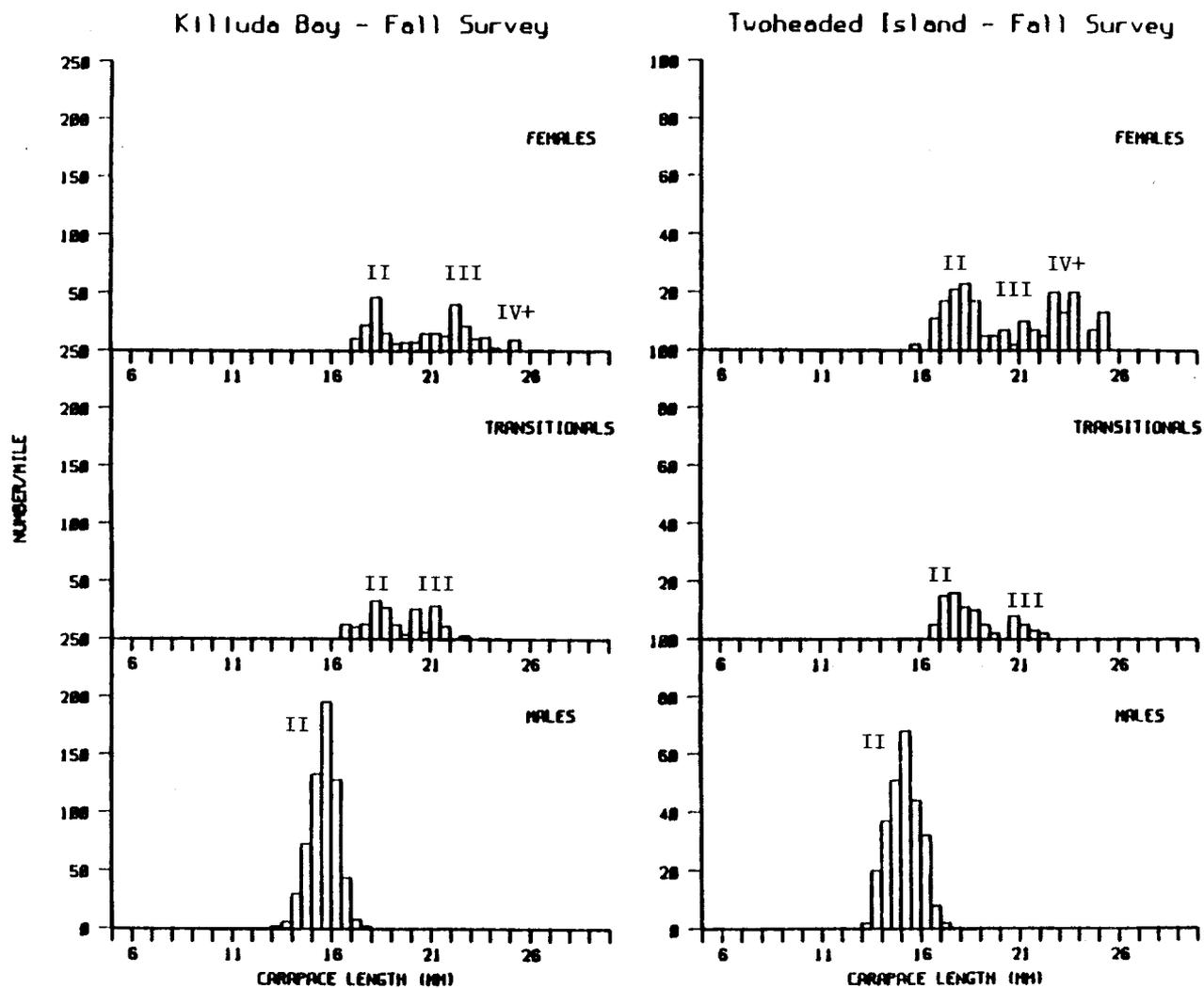
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Appendix Figure C1. Histograms of carapace lengths of pink shrimp by sex from Shelikof Strait on the mainland. Frequencies from the composite samples were expanded to number per trawl mile with Eqs. 6 and 7 in the text. The numbers have not been expanded for the area swept by trawl. Roman numerals approximately flag lengths that correspond to ages (continued).



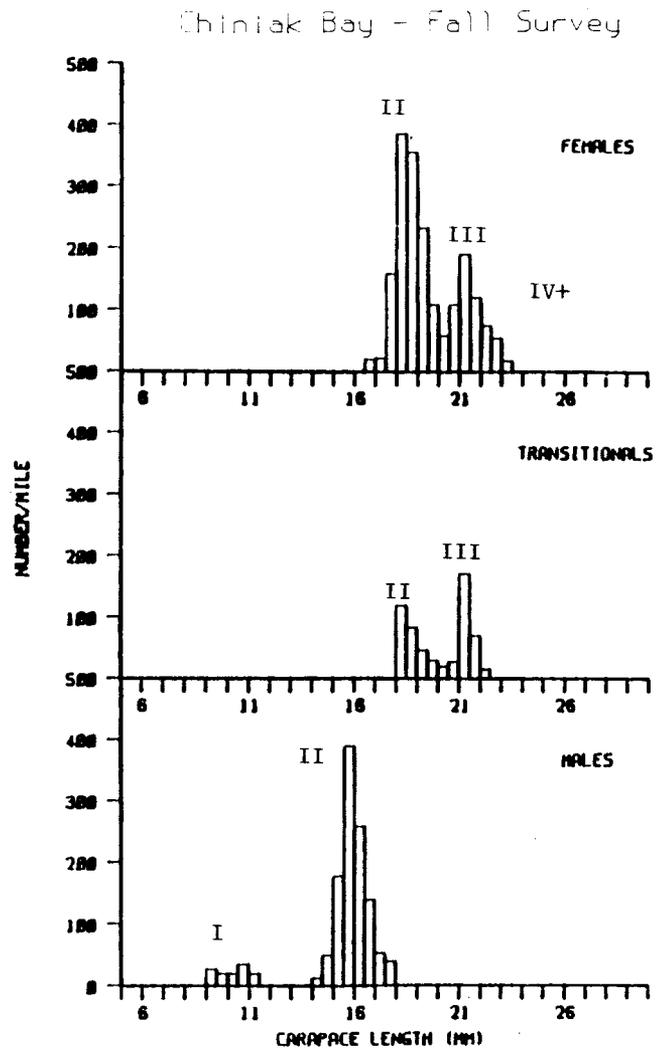
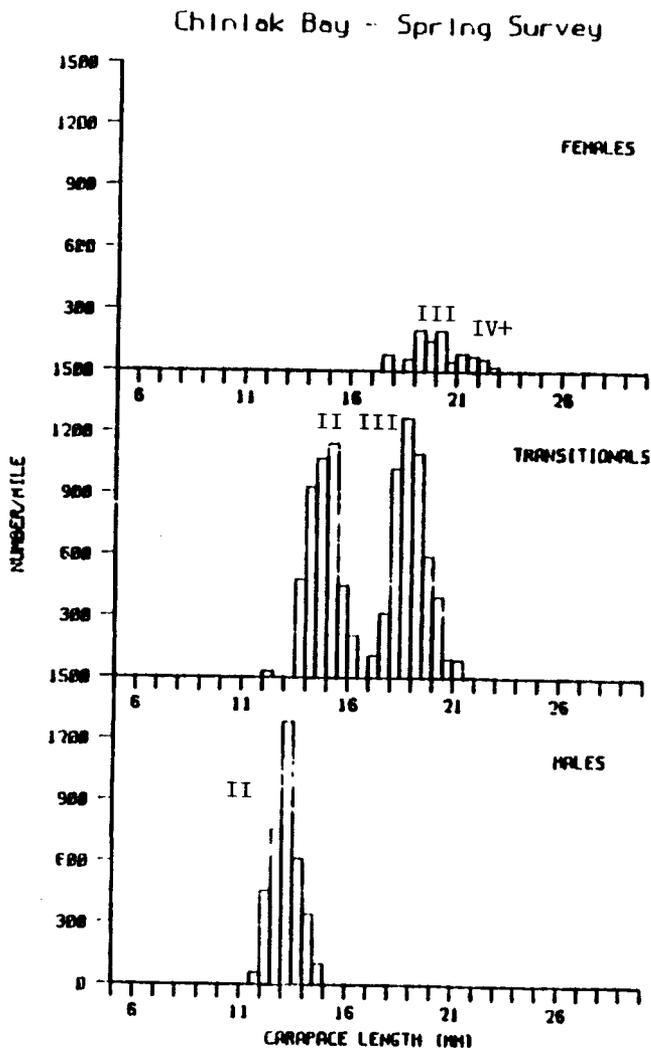
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Appendix Figure C1. Histograms of carapace lengths of pink shrimp by sex from around Kodiak Island and across Shelikof Strait on the mainland. Frequencies from the composite samples were expanded to number per trawl mile with Eqs. 6 and 7 in the text. The numbers have not been expanded for the area swept by trawl. Roman numerals approximately flag lengths that correspond to ages (continued).



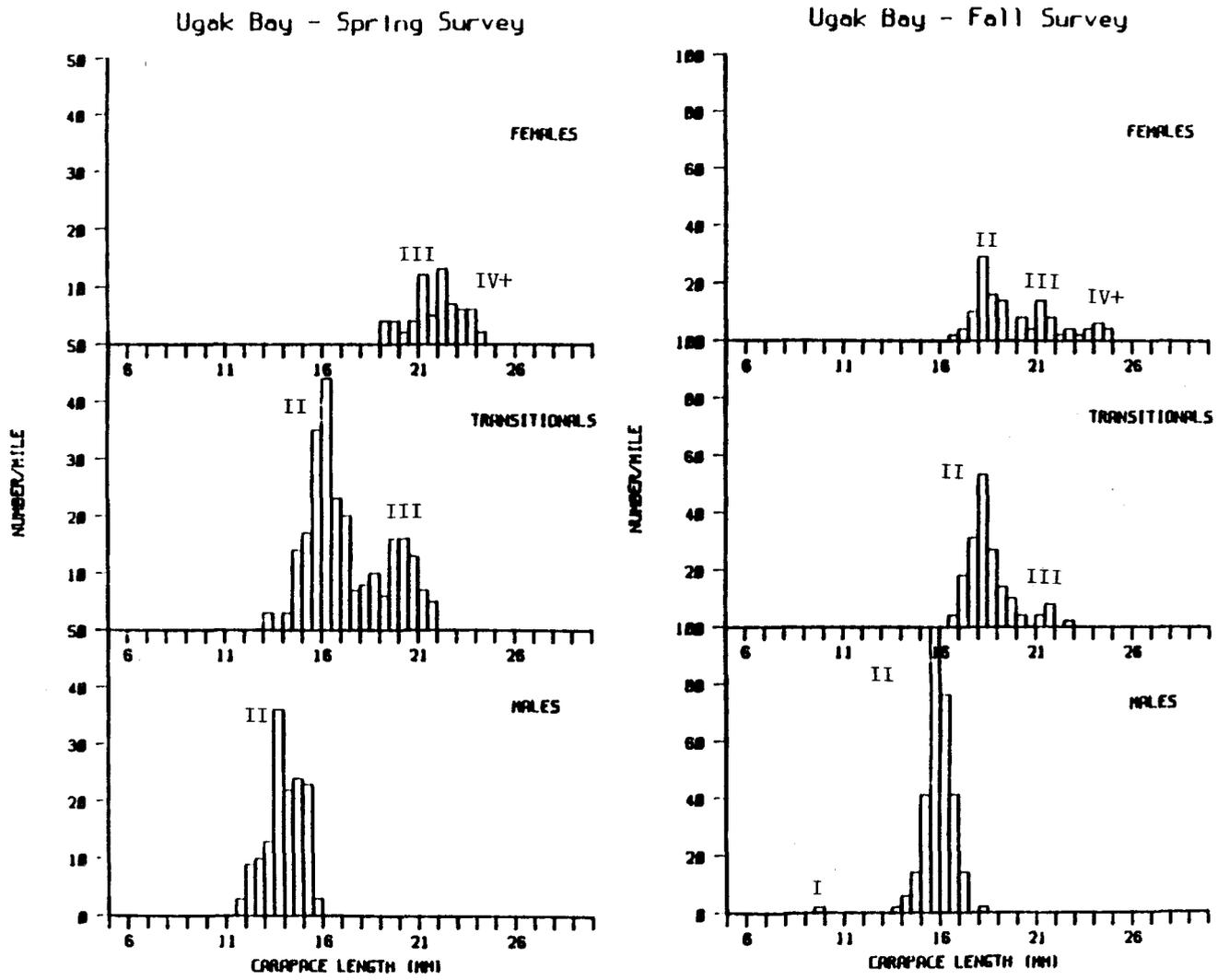
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Appendix Figure C1. Histograms of carapace lengths of pink shrimp by sex from around Kodiak Island and across Shelikof Strait on the mainland. Frequencies from the composite samples were expanded to number per trawl mile with Eqs. 6 and 7 in the text. The numbers have not been expanded for the area swept by trawl. Roman numerals approximately flag lengths that correspond to ages (continued).



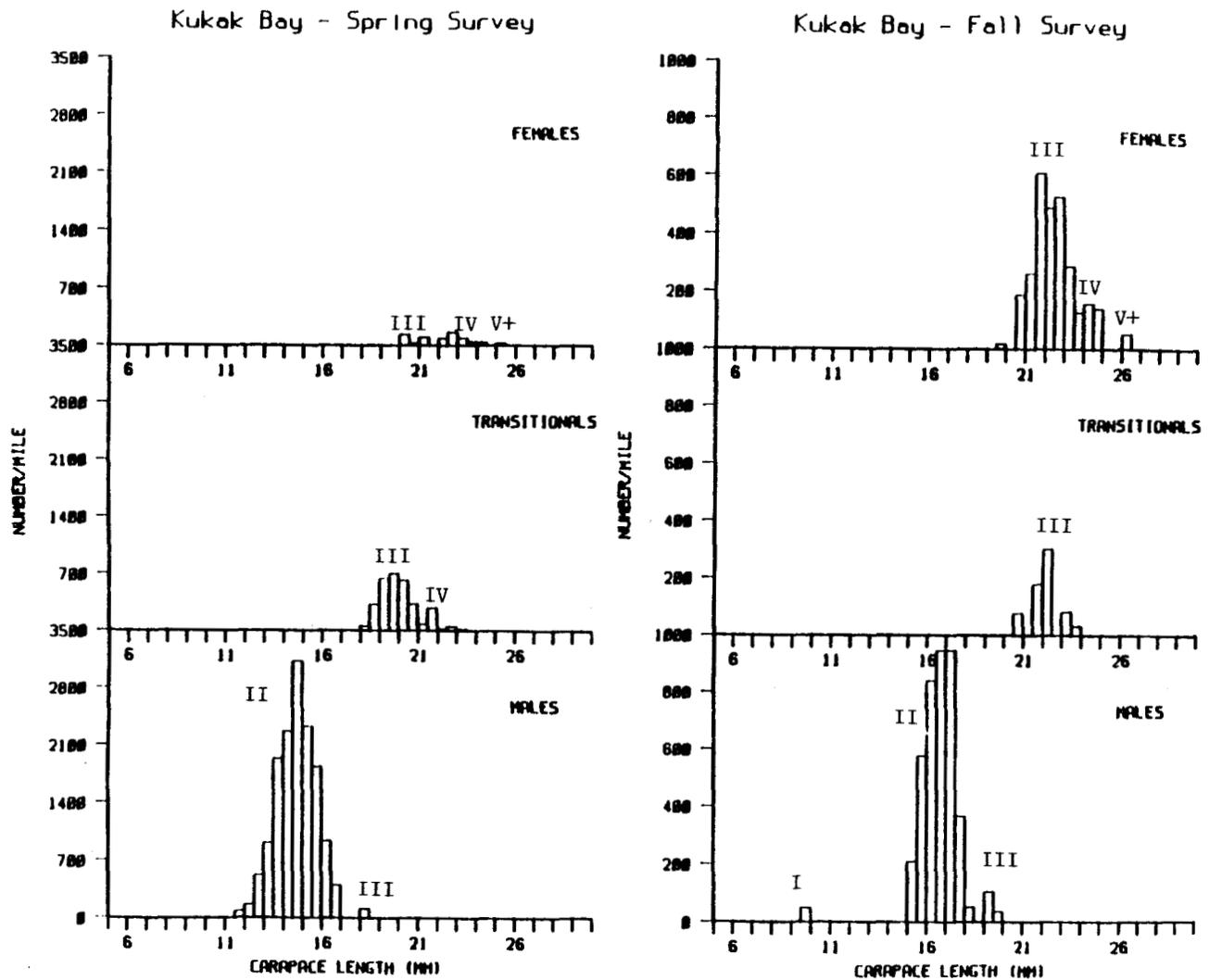
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Appendix Figure C1. Histograms of carapace lengths of pink shrimp by sex from around Kodiak Island and across Shelikof Strait on the mainland. Frequencies from the composite samples were expanded to number per trawl mile with Eqs. 6 and 7 in the text. The numbers have not been expanded for the area swept by the trawl. Roman numerals approximately flag lengths that correspond to ages (continued).



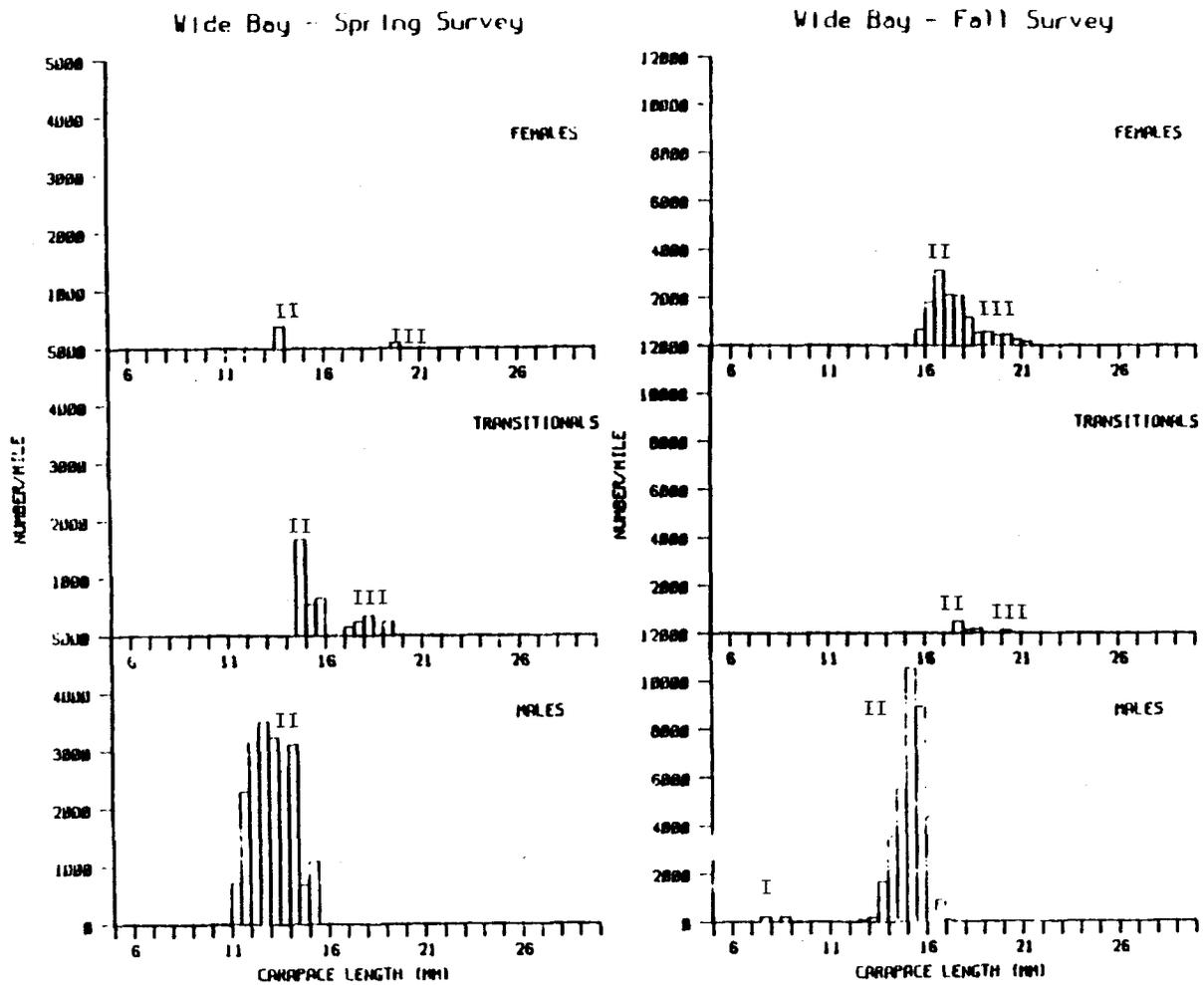
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Appendix Figure C1. Histograms of carapace lengths of pink shrimp by sex from around Kodiak Island and across Shelikof Strait on the mainland. Frequencies from the composite samples were expanded to number per trawl mile with Eqs. 6 and 7 in the text. The numbers have not been expanded for the area swept by the trawl. Roman numerals approximately flag lengths that correspond to ages (continued).



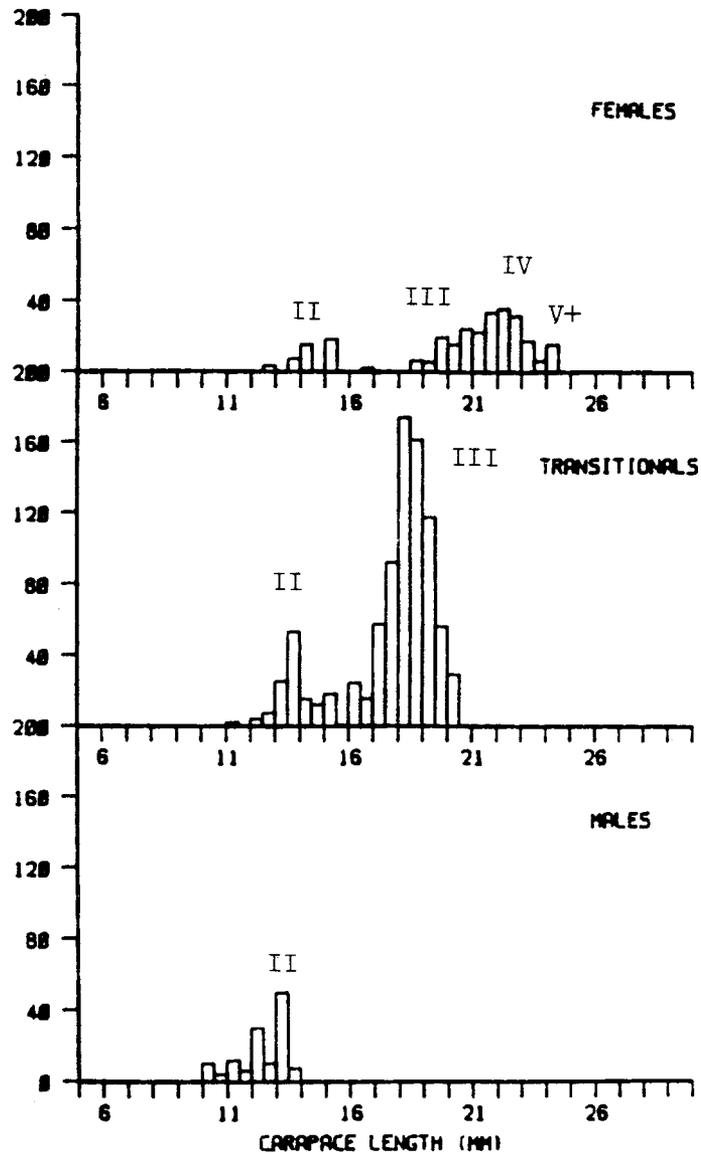
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Appendix Figure C1. Histograms of carapace lengths of pink shrimp by sex from around Kodiak Island and across Shelikof Strait on the mainland. Frequencies from the composite samples were expanded to number per trawl mile with Eqs. 6 and 7 in the text. The numbers have not been expanded for the area swept by the trawl. Roman numerals approximately flag lengths that correspond to ages (continued).



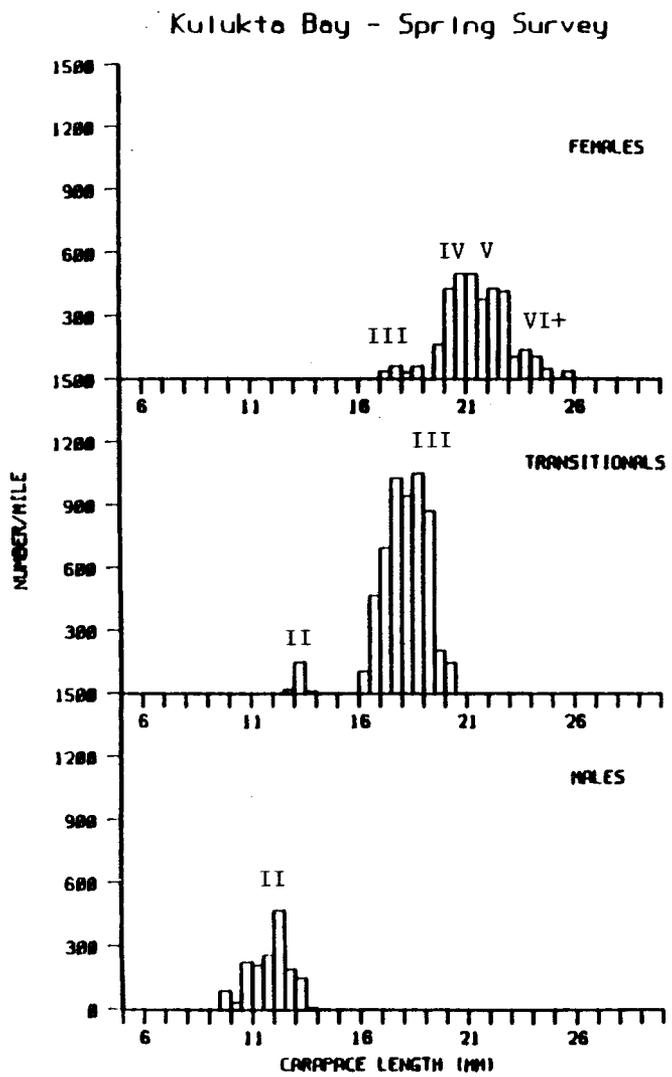
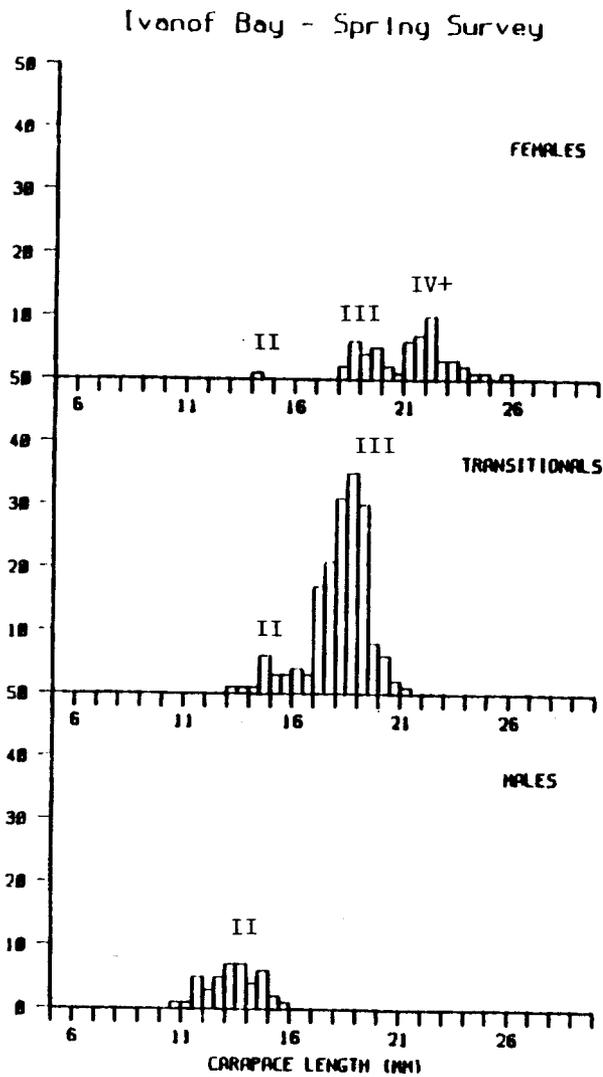
Appendix Figure C1. Histograms of carapace lengths of pink shrimp by sex from around Kodiak Island and across Shelikof Strait on the mainland. Frequencies from the composite samples were expanded to number per trawl mile with Eqs. 6 and 7 in the text. The numbers have not been expanded for the area swept by the trawl. Roman numerals approximately flag lengths that correspond to ages.

Mitrofanio Island - Spring Survey



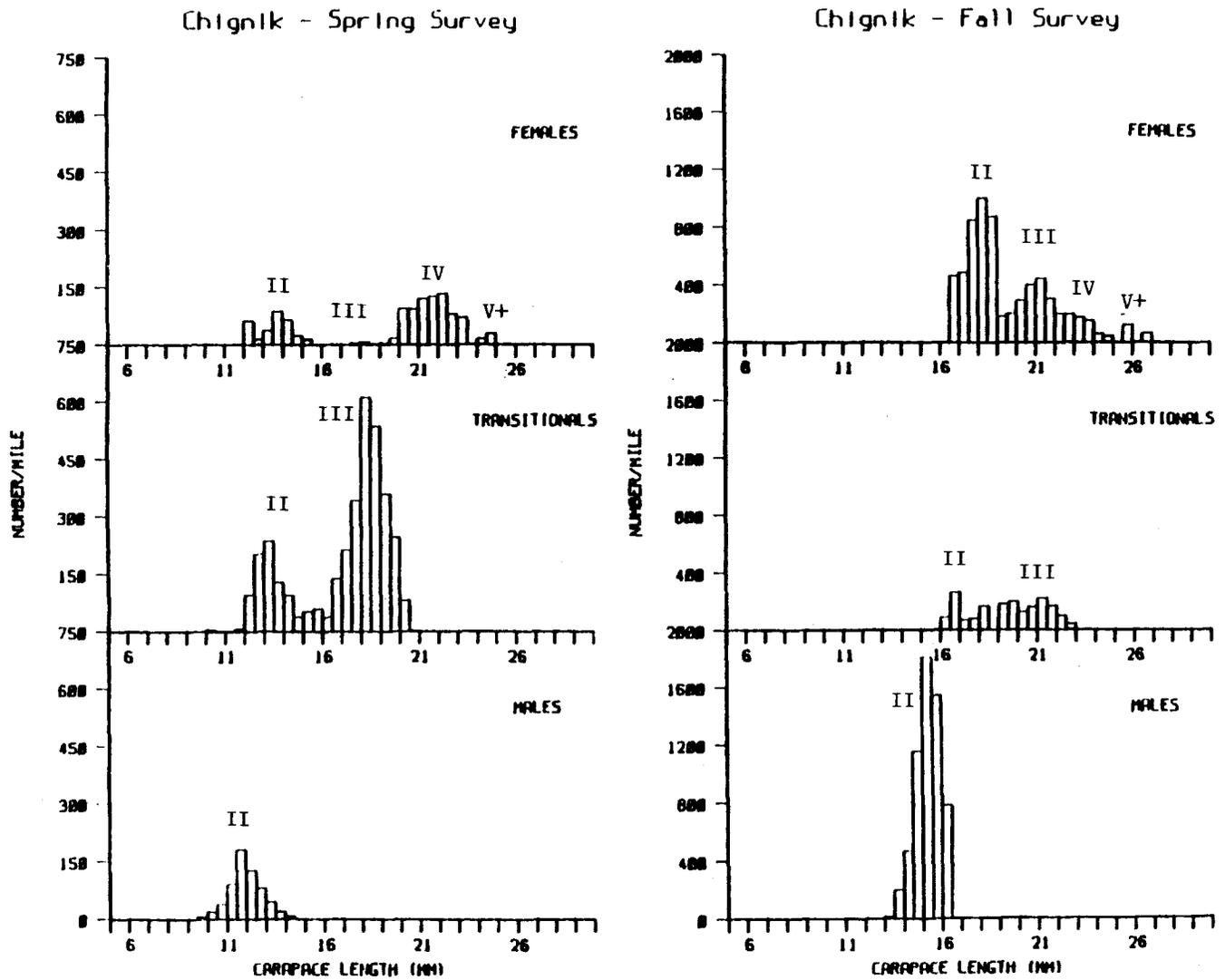
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Appendix Figure C2. Histograms of carapace lengths of pink shrimp by sex from the Chignik District. Frequencies from the composite samples were expanded to number per trawl mile with Eqs. 6 and 7 in the text. The numbers have not been expanded for the area swept by the trawl. Roman numerals approximately flag lengths that correspond to ages (continued).



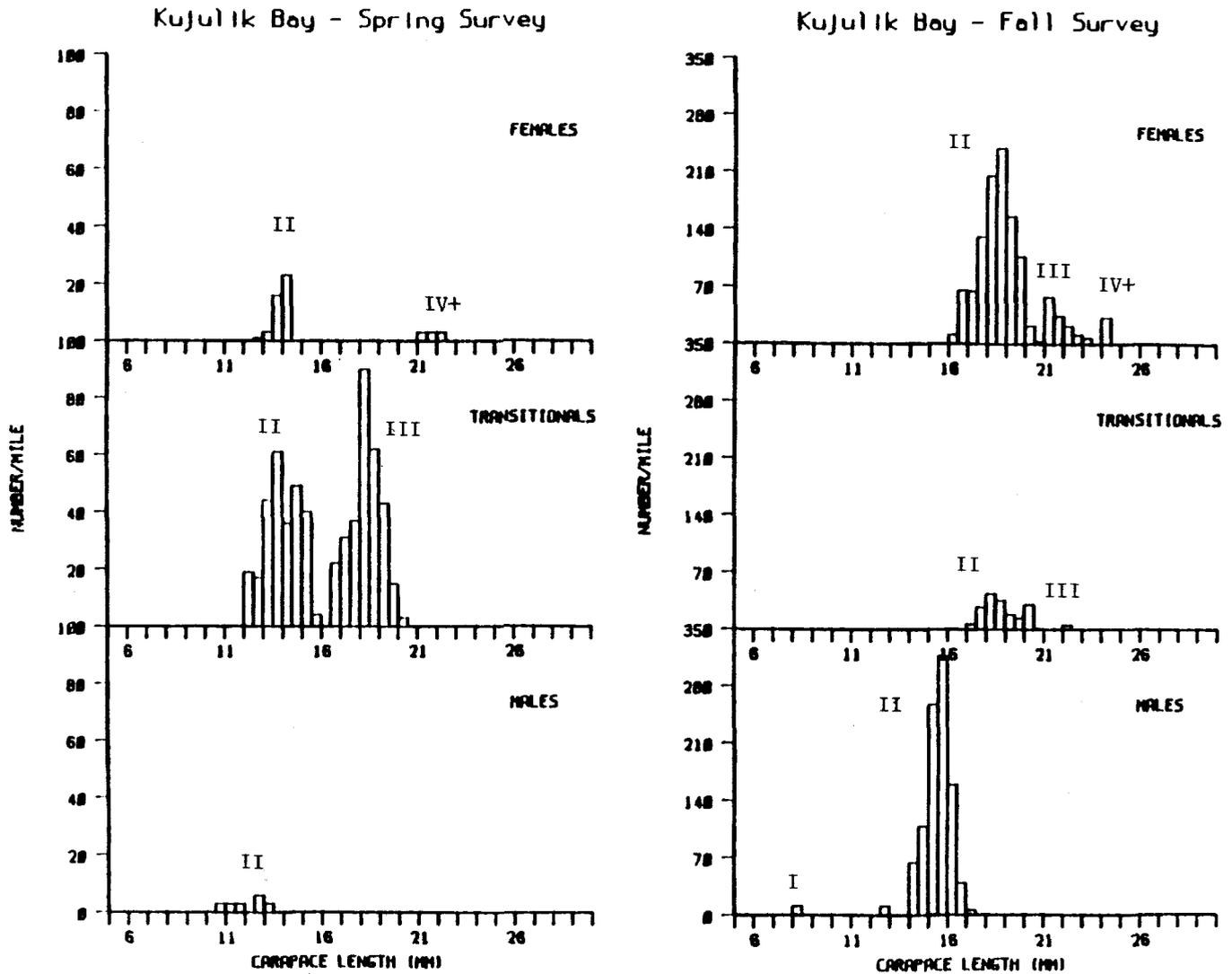
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Appendix Figure C2. Histograms of carapace lengths of pink shrimp by sex from the Chignik District. Frequencies from the composite samples were expanded to number per trawl mile with Eqs. 6 and 7 in the text. The numbers have not been expanded for the area swept by the trawl. Roman numerals approximately flag lengths that correspond to ages (continued).

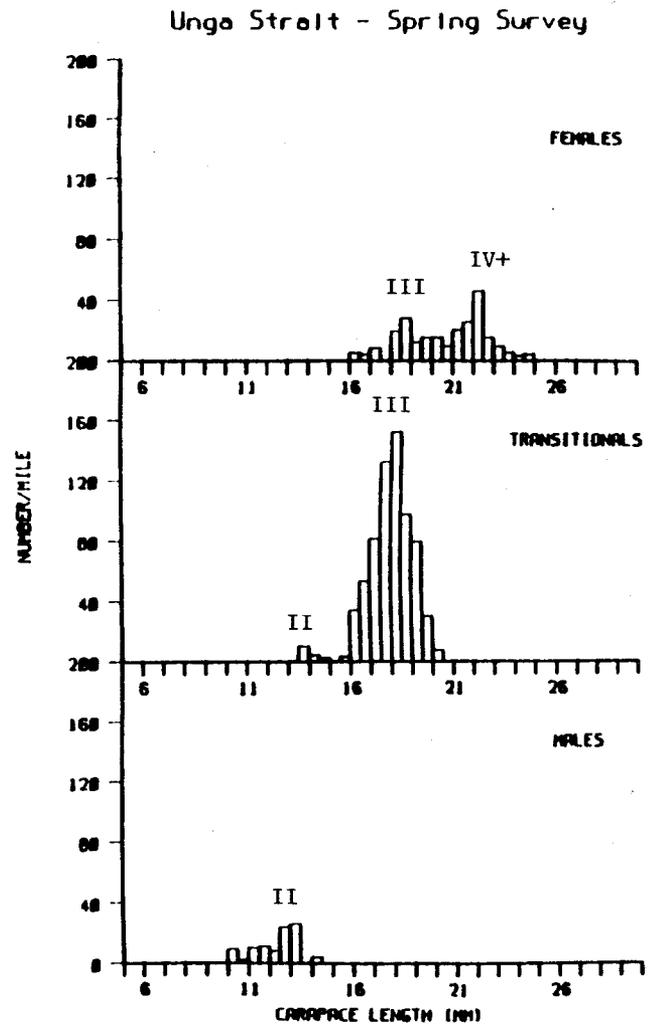
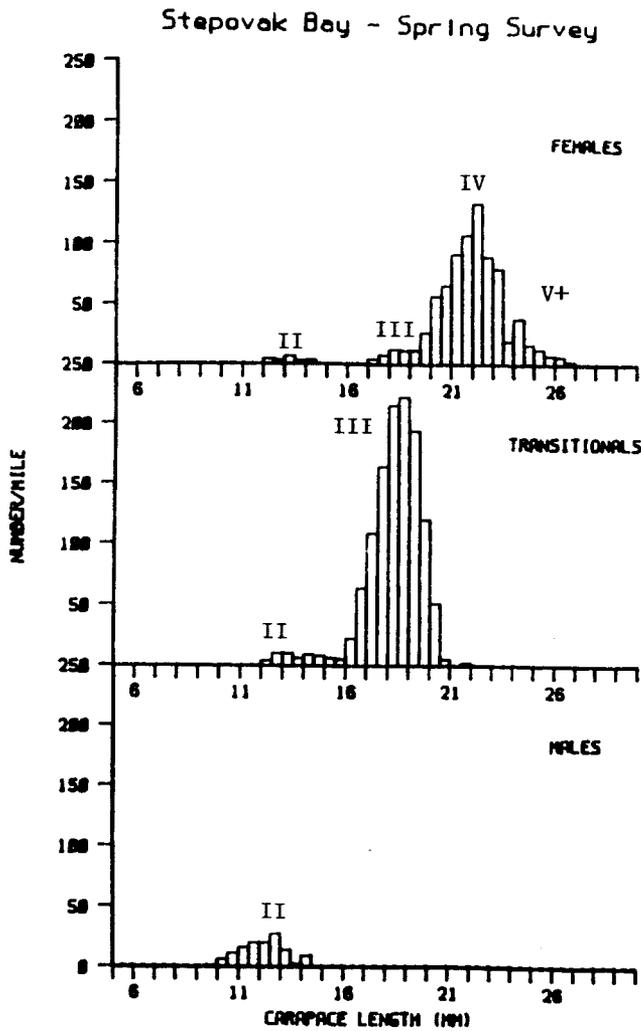


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Appendix Figure C2. Histograms of carapace lengths of pink shrimp by sex from the Chignik District. Frequencies from the composite samples were expanded to number per trawl mile with Eqs. 6 and 7 in the text. The numbers have not been expanded for the area swept by the trawl. Roman numerals approximately flag lengths that correspond to ages (continued).

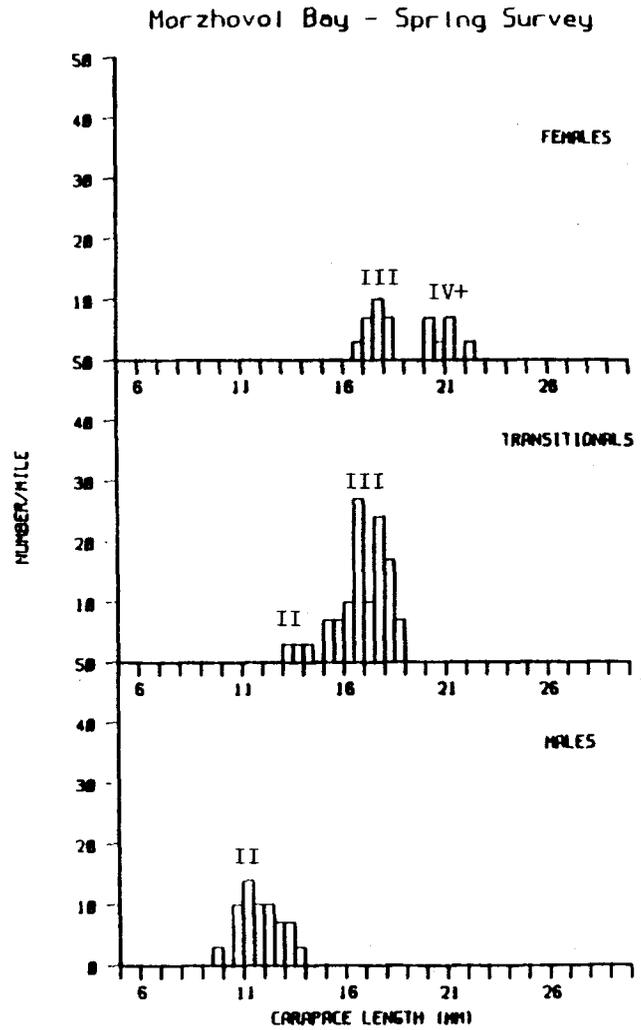
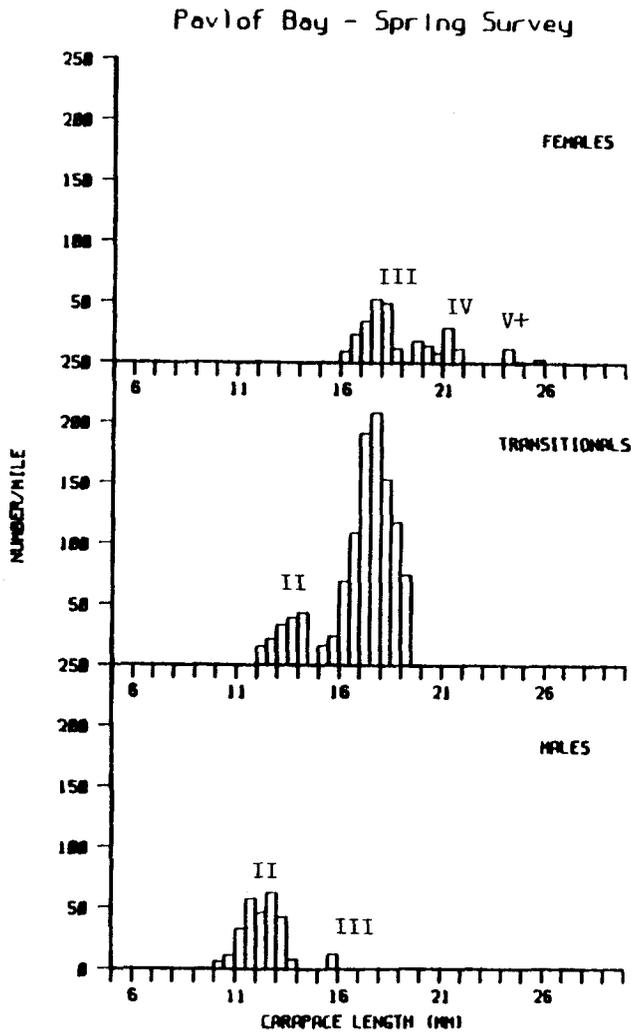


Appendix Figure C2. Histograms of carapace lengths of pink shrimp by sex from the Chignik District. Frequencies from the composite samples were expanded to number per trawl mile with Eqs. 6 and 7 in the text. The numbers have not been expanded for the area swept by the trawl. Roman numerals approximately flag lengths that correspond to ages.

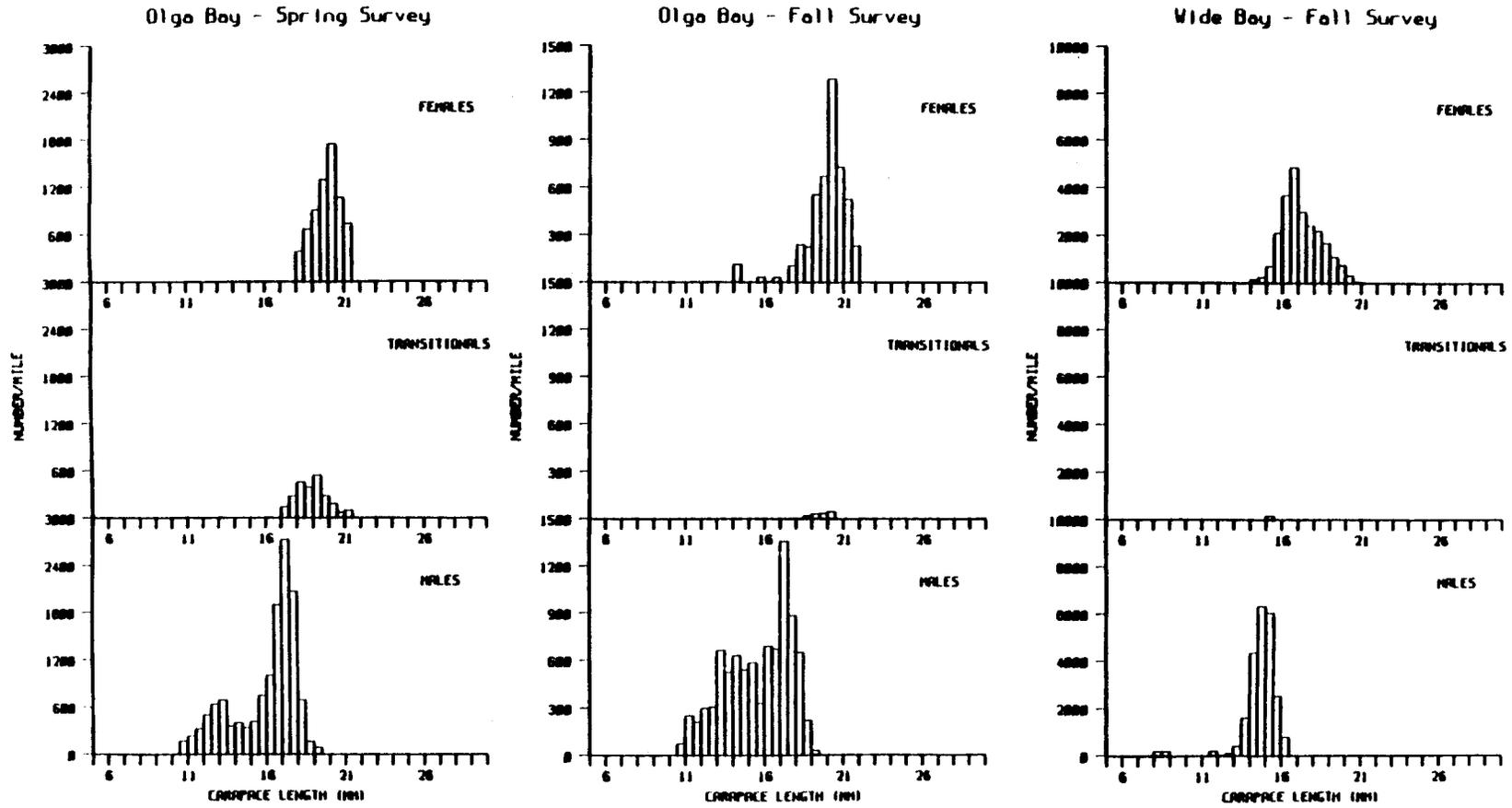


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Appendix Figure C3. Histograms of carapace lengths of pink shrimp by sex from the South Peninsula District. Frequencies from the composite samples were expanded to number per trawl mile with Eqs. 6 and 7 in the text. The numbers have not been expanded for the area swept by the trawl. Roman numerals approximately flag lengths that correspond to ages (continued).



Appendix Figure C3. Histograms of carapace lengths of pink shrimp by sex from the South Peninsula District. Frequencies from the composite samples were expanded to number per trawl mile with Eqs. 6 and 7 in the text. The numbers have not been expanded for the area swept by the trawl. Roman numerals approximately flag lengths that correspond to ages (continued).



Appendix Figure C4. Histograms of carapace lengths of humpy shrimp by sex from around Kodiak Island and across Shelikof Strait on the mainland. Frequencies from the composite samples were expanded to number per trawl mile with Eqs. 6 and 7 in the text. The numbers have not been expanded for the area swept by the trawl.

APPENDIX D

Biomass Indices for Shrimp and Fish by Area,
Cruise, and Stratum

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D3.	Biomass indices for shrimp by area, cruise, and stratum in the South Peninsula District	73

Appendix Table D1. Biomass indices for shrimp and fish by area, cruise, and stratum in the vicinity of Kodiak Island and across the Shelikof Strait on the mainland. Water temperatures from XBT casts are included where available. Information about each stratum in each area is given to the right of the name of the area, the cruise number, and the date the area was surveyed. Biomass estimates (calculated with Eq. 1) and indices of abundance (calculated with Eq. 3) for each taxa are listed for each stratum within an area the combined for an area total. Units are fathoms, knots, nautical miles, degrees Celsius, and pounds. Whenever an index or estimate is zero and its coefficient of variation is not, the value of the estimate is less than .005. The letters SE signify standard error of the estimates in the row immediately above.

Inner Marmot (Area 102) Cruise 8401 23 June, 1984	Stratum	Stratum	Tows	Depth of Tows	Water Temperatures		
	Number	Area	Made	Mean	SD	Surface	Bottom
	2	30.96	7	83	16.23		
	3	1.48	2	61	7.07	11.7	5
	Pink	Humpy Coonstripe	Sidestripe	Other	Total	Fish	
Mean Lbs/NM Towed (Stratum)	133	0	0	9	4	145	650
SE	53	0	0	6	2	60	195
Biomass Index (Stratum)	0.78	0.00	0.00	0.05	0.03	0.85	3.82
SE	0.31	0.00	0.00	0.03	0.01	0.35	1.15
CV	0.4	0	0	0.69	0.51	0.41	0.3
Mean Lbs/NM Towed (Stratum)	730	4	0	1	0	735	305
SE	37	4	0	1	0	22	18
Biomass Index (Stratum)	0.21	.00	0.00	.00	0.00	0.21	0.09
SE	0.01	.00	0.00	.00	0.00	0.01	0.01
CV	0.05	1.12	0	1.41	0	0.03	0.06
Mean Lbs/NM Towed (Total)	160	0	0	8	4	172	634
SE	51	0	0	6	2	57	184
Biomass Index (Total)	0.98	.00	0.00	0.05	0.03	1.06	3.90
SE	0.32	.00	0.00	0.03	0.01	0.35	1.13
CV	0.32	1.12	0	0.69	0.51	0.33	0.29
Inner Marmot (Area 102) Cruise 8403 17 September, 1984	Stratum	Stratum	Tows	Depth of Tows	Water Temperatures		
	Number	Area	Made	Mean	SD	Surface	Bottom
	2	30.96	8	74	10.73	10.6	8.4
	3	1.48	2	64	0	11	7.3
	Pink	Humpy Coonstripe	Sidestripe	Other	Total	Fish	
Mean Lbs/NM Towed (Stratum)	144	0	1	3	8	156	1,738
SE	56	0	1	2	3	58	382
Biomass Index (Stratum)	0.85	0.00	.00	0.02	0.05	0.92	10.21
SE	0.33	0.00	.00	0.01	0.02	0.34	2.25
CV	0.39	0	0.82	0.65	0.32	0.37	0.22
Mean Lbs/NM Towed (Stratum)	570	2	3	0	1	576	685
SE	274	2	2	0	1	276	68
Biomass Index (Stratum)	0.16	.00	.00	0.00	.00	0.16	0.19
SE	0.08	.00	.00	0.00	.00	0.08	0.02
CV	0.48	1.29	0.58	0	1.41	0.48	0.1

-Continued-

Appendix Table D1. Biomass indices for shrimp and fish by area, cruise, and stratum in the vicinity of Kodiak Island and across the Shelikof Strait on the mainland. Water temperatures from XBT casts are included where available. Information about each stratum in each area is given to the right of the name of the area, the cruise number, and the date the area was surveyed. Biomass estimates (calculated with Eq. 1) and indices of abundance (calculated with Eq. 3) for each taxa are listed for each stratum within an area the combined for an area total. Units are fathoms, knots, nautical miles, degrees Celsius, and pounds. Whenever an index or estimate is zero and its coefficient of variation is not, the value of the estimate is less than .005. The letters SE signify standard error of the estimates in the row immediately above (continued).

Inner Marmot (Area 102)		[Continue from Previous Page]						
Cruise 8403		Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish
17 September, 1984								
Mean Lbs/NM Towed (Total)		163	0	1	3	8	175	1,689
SE		55	0	0	2	3	56	372
Biomass Index (Total)		1.01	.00	.00	0.02	0.05	1.08	10.41
SE		0.34	.00	.00	0.01	0.02	0.34	2.29
CV		0.34	1.29	0.68	0.65	0.32	0.32	0.22
Marmot Island (Area 103)		Stratum	Stratum	Tows	Depth of Tows	Water Temperatures		
Cruise 8403		Number	Area	Made	Mean	SD	Surface	Bottom
19 September, 1984								
		1	23.7	6	92	5.42	10.8	8.2
		Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish
Mean Lbs/NM Towed (Total)		291	0	0	12	19	322	1,472
SE		105	0	0	7	13	103	162
Biomass Index (Total)		1.31	0.00	0.00	0.05	0.09	1.45	6.62
SE		0.47	0.00	0.00	0.03	0.06	0.46	0.73
CV		0.36	0	0	0.59	0.68	0.32	0.11
Chiniak Bay (Area 104)		Stratum	Stratum	Tows	Depth of Tows	Water Temperatures		
Cruise 8401		Number	Area	Made	Mean	SD	Surface	Bottom
6 June, 1984								
		2	3.05	3	54	18	9.7	6
		3	5.98	4	75	11.95		
		4	2.05	1	38	0		
		5	4.03	1	78	0		
		Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish
Mean Lbs/NM Towed (Stratum)		57	0.33	1	0	1	59.33	704
SE		57	1	1	0	1	59	113
Biomass Index (Stratum)		0.03	.00	.00	0.00	.00	0.03	0.41
SE		0.03	.00	.00	0.00	.00	0.03	0.07
CV		1	1.58	1.22	0	1.22	1	0.16
Mean Lbs/NM Towed (Stratum)		135	0	1	0	8	144	628
SE		45	0	1	0	4	48	157
Biomass Index (Stratum)		0.15	0.00	.00	0.00	0.01	0.16	0.71
SE		0.05	0.00	.00	0.00	.00	0.05	0.18
CV		0.33	0	1.29	0	0.48	0.33	0.25

-Continued-

Appendix Table D1. Biomass indices for shrimp and fish by area, cruise, and stratum in the vicinity of Kodiak Island and across the Shelikof Strait on the mainland. Water temperatures from XBT casts are included where available. Information about each stratum in each area is given to the right of the name of the area, the cruise number, and the date the area was surveyed. Biomass estimates (calculated with Eq. 1) and indices of abundance (calculated with Eq. 3) for each taxa are listed for each stratum within an area the combined for an area total. Units are fathoms, knots, nautical miles, degrees Celsius, and pounds. Whenever an index or estimate is zero and its coefficient of variation is not, the value of the estimate is less than .005. The letters SE signify standard error of the estimates in the row immediately above (continued).

Chiniak Bay (Area 104)							
Cruise 8401							
6 June, 1984							
	Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish
Mean Lbs/NM Towed (Stratum)	0	0	0	0	0	0	54
SE	0	0	0	0	0	0	0
Biomass Index (Stratum)	0.00	0.00	0.00	0.00	0.00	0.00	0.02
SE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CV	0	0	0	0	0	0	0
Mean Lbs/NM Towed (Stratum)	832	0	0	0	38	878	505
SE	0	0	0	0	0	0	0
Biomass Index (Stratum)	0.64	0.00	0.00	0.01	0.03	0.67	0.39
SE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CV	0	0	0	0	0	0	0
Mean Lbs/NM Towed (Total)	287	0	0	2	14	303	533
SE	20	0	0	0	1	21	64
Biomass Index (Total)	0.82	.00	.00	0.01	0.04	0.87	1.53
SE	0.06	.00	.00	0.00	.00	0.06	0.18
CV	0.07	1.58	0.89	0	0.11	0.07	0.12
Chiniak Bay (Area 104)							
Cruise 8403							
9 October, 1984							
	Stratum Number	Stratum Area	Tows Made	Depth of Tows Mean	SD	Water Temperatures Surface	Bottom
	2	3.05	2	61.5	10.61		
	3	5.98	2	70	22.63		
	4	2.05	1	40	0		
	5	4.03	1	95	0	9.2	8.1
	Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish
Mean Lbs/NM Towed (Stratum)	321	0	0	1.5	9	331.5	1488.5
SE	45	0	0	2	6	46	15
Biomass Index (Stratum)	0.19	0.00	0.00	.00	0.01	0.19	0.86
SE	0.03	0.00	0.00	.00	.00	0.03	0.01
CV	0.14	0	0	1.29	0.65	0.14	0.01
Mean Lbs/NM Towed (Stratum)	53	0	0	0	20	73	1,585
SE	19	0	0	0	20	38	48
Biomass Index (Stratum)	0.06	0.00	0.00	0.00	0.02	0.08	1.80
SE	0.02	0.00	0.00	0.00	0.02	0.04	0.05
CV	0.36	0	0	0	1.02	0.52	0.03

-Continued-

Appendix Table D1. Biomass indices for shrimp and fish by area, cruise, and stratum in the vicinity of Kodiak Island and across the Shelikof Strait on the mainland. Water temperatures from XBT casts are included where available. Information about each stratum in each area is given to the right of the name of the area, the cruise number, and the date the area was surveyed. Biomass estimates (calculated with Eq. 1) and indices of abundance (calculated with Eq. 3) for each taxa are listed for each stratum within an area the combined for an area total. Units are fathoms, knots, nautical miles, degrees Celsius, and pounds. Whenever an index or estimate is zero and its coefficient of variation is not, the value of the estimate is less than .005. The letters SE signify standard error of the estimates in the row immediately above (continued).

Chiniak Bay (Area 104)		[Continue from Previous Page]						
Cruise 8403								
9 October, 1984		Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish
Mean Lbs/NM Towed (Stratum)		0	1	0	0	22	23	1096
SE		0	0	0	0	0	0	0
Biomass Index (Stratum)		0.00	.00	0.00	0.00	0.01	0.01	0.43
SE		0.00	0.00	0.00	0.00	0.00	0.00	0.00
CV		0	0	0	0	0	0	0
Mean Lbs/NM Towed (Stratum)		74	0	0	8	10	92	1928
SE		0	0	0	0	0	0	0
Biomass Index (Stratum)		0.06	0.00	0.00	0.01	0.01	0.07	1.48
SE		0.00	0.00	0.00	0.00	0.00	0.00	0.00
CV		0	0	0	0	0	0	0
Mean Lbs/NM Towed (Total)		105	0	0	2	15	123	1,591
SE		12	0	0	0	0	17	16
Biomass Index (Total)		0.30	.00	0.00	0.01	0.04	0.35	4.56
SE		0.03	0.00	0.00	.00	0.02	0.05	0.05
CV		0.11	0	0	0.16	0.53	0.14	0.01
Ugak Bay (Area 106)		Stratum	Stratum	Tows	Depth of Tows	Water Temperatures		
Cruise 8401		Number	Area	Made	Mean	SD	Surface	Bottom
5 June, 1984		2	12.04	6	50	3.08	10.8	5.7
		Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish
Mean Lbs/NM Towed (Total)		8	0	0	0	1	9	552
SE		3	0	0	0	0	3	110
Biomass Index (Total)		0.02	0.00	.00	0.00	.00	0.02	1.26
SE		0.01	0.00	.00	0.00	.00	0.01	0.25
CV		0.36	0	1.48	0	0.77	0.32	0.2
Ugak Bay (Area 106)		Stratum	Stratum	Tows	Depth of Tows	Water Temperatures		
Cruise 8403		Number	Area	Made	Mean	SD	Surface	Bottom
12 September, 1984		1	27.85	5	52	2.49	11.4	10.2
		Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish
Mean Lbs/NM Towed (Total)		11	0	0	0	0	11	714
SE		6	0	0	0	0	6	121
Biomass Index (Total)		0.06	0.00	0.00	0.00	0.00	0.06	3.78
SE		0.03	0.00	0.00	0.00	0.00	0.03	0.64
CV		0.54	0	0	0	0	0.52	0.17

-Continued-

Appendix Table D1. Biomass indices for shrimp and fish by area, cruise, and stratum in the vicinity of Kodiak Island and across the Shelikof Strait on the mainland. Water temperatures from XBT casts are included where available. Information about each stratum in each area is given to the right of the name of the area, the cruise number, and the date the area was surveyed. Biomass estimates (calculated with Eq. 1) and indices of abundance (calculated with Eq. 3) for each taxa are listed for each stratum within an area the combined for an area total. Units are fathoms, knots, nautical miles, degrees Celsius, and pounds. Whenever an index or estimate is zero and its coefficient of variation is not, the value of the estimate is less than .005. The letters SE signify standard error of the estimates in the row immediately above (continued).

Kiliuda Bay (Area 107) Cruise 8402 10 June, 1984	Stratum	Stratum		Tows	Depth of Tows		Water Temperatures	
	Number	Area		Made	Mean	SD	Surface	Bottom
	2	3.99		2	50	0.71		
	3	21.25		2	66	0.71		
		Pink	Humpy Coonstripe	Sidestripe	Other		Total	Fish
Mean Lbs/NM Towed (Stratum)	3	0	0	0	0		3	129
SE	3	0	0	0	0		2	3
Biomass Index (Stratum)	.00	0.00	0.00	0.00	0.00	0.00	.00	0.10
SE	.00	0.00	0.00	0.00	0.00	0.00	.00	.00
CV	1.18	0	0	0	0		1	0.02
Mean Lbs/NM Towed (Stratum)	5	0	0	0	0		5	220
SE	5	0	0	0	0		5	70
Biomass Index (Stratum)	0.02	0.00	0.00	0.00	0.00	0.00	0.02	0.89
SE	0.02	0.00	0.00	0.00	0.00	0.00	0.02	0.28
CV	1.1	0	0	0	0		1	0.32
Mean Lbs/NM Towed (Total)	5	0	0	0	0		5	206
SE	5	0	0	0	0		4	60
Biomass Index (Total)	0.02	0.00	0.00	0.00	0.00	0.00	0.02	0.99
SE	0.02	0.00	0.00	0.00	0.00	0.00	0.02	0.29
CV	1.01	0	0	0	0		0.92	0.29
Kiliuda Bay (Area 107) Cruise 8403 11 September, 1984	Stratum	Stratum		Tows	Depth of Tows		Water Temperatures	
	Number	Area		Made	Mean	SD	Surface	Bottom
	1	47.25		10	65.9	10.69		
		Pink	Humpy Coonstripe	Sidestripe	Other		Total	Fish
Mean Lbs/NM Towed (Total)	52	0	0	0	0		52	1,099
SE	17	0	0	0	0		17	176
Biomass Index (Total)	0.47	0.00	0.00	0.00	0.00	0.00	0.47	9.86
SE	0.16	0.00	0.00	0.00	0.00	0.00	0.16	1.58
CV	0.33	0	0	0	0		0.33	0.16
Twoheaded (Area 108) Cruise 8402 9 June, 1984	Stratum	Stratum		Tows	Depth of Tows		Water Temperatures	
	Number	Area		Made	Mean	SD	Surface	Bottom
	2	38.28		8	66	3.7		
		Pink	Humpy Coonstripe	Sidestripe	Other		Total	Fish
Mean Lbs/NM Towed (Total)	5	0	0	0	0		5	1,017
SE	1	0	0	0	0		1	1,636
Biomass Index (Total)	0.04	0.00	0.00	0.00	0.00	0.00	0.04	13.21
SE	0.01	0.00	0.00	0.00	0.00	0.00	0.01	11.89
CV	0.28	0	0	0	0		0.23	0.9

-Continued-

Appendix Table D1. Biomass indices for shrimp and fish by area, cruise, and stratum in the vicinity of Kodiak Island and across the Shelikof Strait on the mainland. Water temperatures from XBT casts are included where available. Information about each stratum in each area is given to the right of the name of the area, the cruise number, and the date the area was surveyed. Biomass estimates (calculated with Eq. 1) and indices of abundance (calculated with Eq. 3) for each taxa are listed for each stratum within an area the combined for an area total. Units are fathoms, knots, nautical miles, degrees Celsius, and pounds. Whenever an index or estimate is zero and its coefficient of variation is not, the value of the estimate is less than .005. The letters SE signify standard error of the estimates in the row immediately above (continued).

Twoheaded (Area 108) Cruise 8403 9 September, 1984	Stratum Number	Stratum Area	Tows Made	Depth of Tows Mean	SD	Water Temperatures Surface	Bottom
	1	51.75	12	69	8.85	11.4	8.5
	Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish
Mean Lbs/NM Towed (Total)	31	0	0	0	1	31	1,223
SE	9	0	0	0	0	9	171
Biomass Index (Total)	0.30	0.00	0.00	0.00	0.01	0.31	12.01
SE	0.09	0.00	0.00	0.00	.00	0.09	1.68
CV	0.3	0	0	0	0.84	0.3	0.14
Alitak (Area 109) Cruise 8401 3 June, 1984	Stratum Number	Stratum Area	Tows Made	Depth of Tows Mean	SD	Water Temperatures Surface	Bottom
	2	45.27	12	41	20.51	10.5	2.8
	3	78.3	9	34	4.51	8.5	5.8
	Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish
Mean Lbs/NM Towed (Stratum)	521	3	1	11	3	539	291
SE	250	2	1	8	2	259	64
Biomass Index (Stratum)	4.48	0.03	0.01	0.09	0.03	4.63	2.50
SE	2.15	0.02	.00	0.07	0.02	2.22	0.55
CV	0.48	0.58	0.85	0.7	0.81	0.48	0.22
Mean Lbs/NM Towed (Stratum)	22	0	0	0	1	23	1,118
SE	8	0	0	0	1	8	358
Biomass Index (Stratum)	0.33	.00	0.00	0.00	0.01	0.34	16.62
SE	0.12	.00	0.00	0.00	0.01	0.12	5.32
CV	0.37	1.46	0	0	0.58	0.35	0.32
Mean Lbs/NM Towed (Total)	205	1	0	4	2	212	815
SE	92	1	0	3	1	95	228
Biomass Index (Total)	4.80	0.03	0.01	0.09	0.04	4.97	19.12
SE	2.16	0.02	.00	0.07	0.02	2.24	5.35
CV	0.45	0.56	0.85	0.7	0.57	0.45	0.28
Alitak (Area 109) Cruise 8403 7 September, 1984	Stratum Number	Stratum Area	Tows Made	Depth of Tows Mean	SD	Water Temperatures Surface	Bottom
	2	45.27	12	42	24.25	11.6	8.5
						12.5	3.1
	Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish
Mean Lbs/NM Towed (Total)	363	36	1	5	6	410	569
SE	138	30	0	3	3	139	194
Biomass Index (Total)	3.12	0.31	0.01	0.05	0.05	3.52	4.89
SE	1.18	0.26	.00	0.03	0.02	1.20	1.66
CV	0.38	0.85	0.58	0.63	0.52	0.34	0.34

Appendix Table D1. Biomass indices for shrimp and fish by area, cruise, and stratum in the vicinity of Kodiak Island and across the Shelikof Strait on the mainland. Water temperatures from XBT casts are included where available. Information about each stratum in each area is given to the right of the name of the area, the cruise number, and the date the area was surveyed. Biomass estimates (calculated with Eq. 1) and indices of abundance (calculated with Eq. 3) for each taxa are listed for each stratum within an area the combined for an area total. Units are fathoms, knots, nautical miles, degrees Celsius, and pounds. Whenever an index or estimate is zero and its coefficient of variation is not, the value of the estimate is less than .005. The letters SE signify standard error of the estimates in the row immediately above (continued).

Uyak Bay (Area 110) Cruise 8403 16 September, 1984	Stratum	Stratum	Tows	Depth of Tows		Water Temperatures	
	Number	Area	Made	Mean	SD	Surface	Bottom
	1	16.95	3	77	17.32	10.6	7.0
	Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish
Mean Lbs/NM Towed (Total)	152	0	0	18	4	174	966
SE	52	0	0	19	3	66	212
Biomass Index (Total)	0.49	0.00	0.00	0.06	0.01	0.56	3.11
SE	0.17	0.00	0.00	0.06	0.01	0.21	0.68
CV	0.34	0	0	1.01	0.69	0.38	0.22
Uganik Bay (Area 112) Cruise 8403 14 September, 1984	Stratum	Stratum	Tows	Depth of Tows		Water Temperatures	
	Number	Area	Made	Mean	SD	Surface	Bottom
	1	20.49	6	83	16.45	11	6.6
	Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish
Mean Lbs/NM Towed (Total)	384	0	0	10	5	399	911
SE	85	0	0	5	3	88	155
Biomass Index (Total)	1.50	0.00	0.00	0.04	0.02	1.55	3.54
SE	0.33	0.00	0.00	0.02	0.01	0.34	0.60
CV	0.22	0	0	0.48	0.57	0.22	0.17
Kukak Bay (Area 114) Cruise 8401 22 June, 1984	Stratum	Stratum	Tows	Depth of Tows		Water Temperatures	
	Number	Area	Made	Mean	SD	Surface	Bottom
	2	6.42	4	49	7.41		
	3	6.19	3	42	5.69	13	5
	Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish
Mean Lbs/NM Towed (Stratum)	448	2	1	21	4	476	182
SE	219	1	1	18	2	233	16
Biomass Index (Stratum)	0.55	.00	.00	0.03	.00	0.58	0.22
SE	0.27	.00	.00	0.02	.00	0.28	0.02
CV	0.49	0.61	1.15	0.83	0.6	0.49	0.09
Mean Lbs/NM Towed (Stratum)	0	0	0	0	0	0	717.67
SE	0	0	0	0	0	0	115
Biomass Index (Stratum)	0.00	0.00	0.00	0.00	0.00	0.00	0.04
SE	0.00	0.00	0.00	0.00	0.00	0.00	0.13
CV	0	0	0	0	0	0	0.16
Mean Lbs/NM Towed (Total)	228	1	1	11	2	242	445
SE	112	1	1	9	1	119	58
Biomass Index (Total)	0.55	.00	.00	0.03	.00	0.58	1.06
SE	0.27	.00	.00	0.02	.00	0.28	0.14
CV	0.49	0.61	1.15	0.83	0.6	0.49	0.13

Appendix Table D1. Biomass indices for shrimp and fish by area, cruise, and stratum in the vicinity of Kodiak Island and across the Shelikof Strait on the mainland. Water temperatures from XBT casts are included where available. Information about each stratum in each area is given to the right of the name of the area, the cruise number, and the date the area was surveyed. Biomass estimates (calculated with Eq. 1) and indices of abundance (calculated with Eq. 3) for each taxa are listed for each stratum within an area the combined for an area total. Units are fathoms, knots, nautical miles, degrees Celsius, and pounds. Whenever an index or estimate is zero and its coefficient of variation is not, the value of the estimate is less than .005. The letters SE signify standard error of the estimates in the row immediately above (continued).

Kukak (Area 114) Cruise 8403 22 October, 1984	Stratum	Stratum	Tows	Depth of Tows		Water Temperatures	
	Number	Area	Made	Mean	SD	Surface	Bottom
	2	6.42	2	32	10.61		
	Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish
Mean Lbs/NM Towed (Total)	131	0	1	2	1	134	640
SE	130	0	1	2	1	133	365
Biomass Index (Total)	0.16	0.00	.00	.00	.00	0.16	0.78
SE	0.16	0.00	.00	.00	.00	0.16	0.44
CV	1	0	1.73	1.22	1.73	1	0.57
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Wide Bay (Area 119) Cruise 8401 20 June, 1984	Stratum	Stratum	Tows	Depth of Tows		Water Temperatures	
	Number	Area	Made	Mean	SD	Surface	Bottom
	2	7.33	6	29	6.18		
	3	0.92	1	29	0	11.7	8.2
	Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish
Mean Lbs/NM Towed (Stratum)	248	651	49	37	17	1,001	286
SE	79	313	14	19	9	240	106
Biomass Index (Stratum)	0.34	0.91	0.07	0.05	0.02	1.39	0.40
SE	0.11	0.44	0.02	0.03	0.01	0.33	0.15
CV	0.32	0.40	0.28	0.52	0.53	0.24	0.37
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Mean Lbs/NM Towed (Stratum)	0	0	0	0	2	2	00
SE	0	0	0	0	0	0	0
Biomass Index (Stratum)	0.00	0.00	0.00	0.00	.00	.00	0.01
SE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CV	0	0	0	0	0	0	0
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Mean Lbs/NM Towed (Total)	220	579	44	32	15	830	263
SE	70	278	12	17	8	214	95
Biomass Index (Total)	0.34	0.91	0.07	0.05	0.02	1.39	0.41
SE	0.11	0.44	0.02	0.03	0.01	0.33	0.15
CV	0.32	0.40	0.28	0.52	0.52	0.24	0.36
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Wide Bay (Area 119) Cruise 8403 20 October, 1984	Stratum	Stratum	Tows	Depth of Tows		Water Temperatures	
	Number	Area	Made	Mean	SD	Surface	Bottom
	2	7.33	6	31	2.8		
	Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish
Mean Lbs/NM Towed (Total)	586	602	236	35	43	1,502	789
SE	147	198	113	11	20	375	110
Biomass Index (Total)	0.82	0.84	0.33	0.05	0.06	2.09	1.10
SE	0.20	0.28	0.16	0.02	0.03	0.52	0.15
CV	0.25	0.33	0.48	0.31	0.46	0.25	0.14

Appendix Table D1. Biomass indices for shrimp and fish by area, cruise, and stratum in the vicinity of Kodiak Island and across the Shelikof Strait on the mainland. Water temperatures from XBT casts are included where available. Information about each stratum in each area is given to the right of the name of the area, the cruise number, and the date the area was surveyed. Biomass estimates (calculated with Eq. 1) and indices of abundance (calculated with Eq. 3) for each taxa are listed for each stratum within an area the combined for an area total. Units are fathoms, knots, nautical miles, degrees Celsius, and pounds. Whenever an index or estimate is zero and its coefficient of variation is not, the value of the estimate is less than .005. The letters SE signify standard error of the estimates in the row immediately above (continued).

Puale Bay (Area 122) Cruise 8401 21 June, 1984	Stratum	Stratum	Tows	Depth of Tows		Water Temperatures		
	Number	Area	Made	Mean	SD	Surface	Bottom	
	1	9.4	3	44	11.79	10.5	6.5	
	Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish	
Mean Lbs/NM Towed (Total)	12	0	0	0	0	12	554	
SE	11	0	0	0	1	11	156	
Biomass Index (Total)	0.02	0.00	0.00	0.00	.00	0.02	0.99	
SE	0.02	0.00	0.00	0.00	.00	0.02	0.30	
CV	0.9	0	0	0	1.58	0.88	0.3	
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Olga Bay (Area 124) Cruise 8402 6 June, 1984	Stratum	Stratum	Tows	Depth of Tows		Water Temperatures		
	Number	Area	Made	Mean	SD	Surface	Bottom	
	2	10.62	4	53	10.89			
	3	6.85	4	58	9.03			
	4	1.57	2	46	6.36			
	Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish	
Mean Lbs/NM Towed (Stratum)	0	272.25	37.75	0	0	310	102.5	
SE	0	65	15	0	0	71	22	
Biomass Index (Stratum)	0.00	0.55	0.08	0.00	0.00	0.63	0.21	
SE	0.00	0.13	0.03	0.00	0.00	0.14	0.04	
CV	0	0.24	0.39	0	0	0.23	0.21	
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Mean Lbs/NM Towed (Stratum)	1	515	39	1	19	575	42	
SE	1	242	11	1	15	241	29	
Biomass Index (Stratum)	.00	0.67	0.05	.00	0.02	0.75	0.05	
SE	.00	0.32	0.01	.00	0.02	0.31	0.04	
CV	1.13	0.47	0.29	1.13	0.8	0.42	0.69	
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Mean Lbs/NM Towed (Stratum)	2	87.5	135	0.5	1	226	13.5	
SE	2	76	27	1	1	47	9	
Biomass Index (Stratum)	.00	0.03	0.04	.00	.00	0.07	.00	
SE	.00	0.02	0.01	.00	.00	0.01	.00	
CV	1.22	0.87	0.2	1.73	1.41	0.21	0.7	
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Mean Lbs/NM Towed (Total)	1	344	46	0	7	398	73	
SE	1	96	9	1	5	96	16	
Biomass Index (Total)	.00	1.25	0.17	.00	0.02	1.44	0.27	
SE	.00	0.35	0.03	.00	0.02	0.35	0.06	
CV	0.89	0.28	0.2	1.04	0.79	0.24	0.22	

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Appendix Table D1. Biomass indices for shrimp and fish by area, cruise, and stratum in the vicinity of Kodiak Island and across the Shelikof Strait on the mainland. Water temperatures from XBT casts are included where available. Information about each stratum in each area is given to the right of the name of the area, the cruise number, and the date the area was surveyed. Biomass estimates (calculated with Eq. 1) and indices of abundance (calculated with Eq. 3) for each taxa are listed for each stratum within an area the combined for an area total. Units are fathoms, knots, nautical miles, degrees Celsius, and pounds. Whenever an index or estimate is zero and its coefficient of variation is not, the value of the estimate is less than .005. The letters SE signify standard error of the estimates in the row immediately above (continued).

Olga Bay (Area 124) Cruise 8404 2 September, 1984	Stratum	Stratum	Tows	Depth of Tows		Water Temperatures	
	Number	Area	Made	Mean	SD	Surface	Bottom
	2	10.62	4	48	11.98		3.9
	3	6.85	4	58	11.32		3.6
	4	1.57	2	47	9.19		
	Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish
Mean Lbs/MM Towed (Stratum)	0	183	115	0	5	303	62
SE	0	132	34	0	3	158	20
Biomass Index (Stratum)	.00	0.37	0.23	0.00	0.01	0.61	0.12
SE	.00	0.27	0.07	0.00	0.01	0.32	0.04
CV	1.53	0.72	0.3	0	0.64	0.52	0.33
Mean Lbs/MM Towed (Stratum)	5	288	110	2	17	421	129
SE	5	92	51	1	14	97	36
Biomass Index (Stratum)	0.01	0.37	0.14	.00	0.02	0.55	0.17
SE	0.01	0.12	0.07	.00	0.02	0.13	0.05
CV	1.04	0.32	0.46	0.68	0.84	0.23	0.28
Mean Lbs/MM Towed (Stratum)	4	2	155	0	1	161	239
SE	4	2	87	0	1	92	48
Biomass Index (Stratum)	.00	.00	0.05	0.00	.00	0.05	0.07
SE	.00	.00	0.03	0.00	.00	0.03	0.01
CV	1.13	1.22	0.56	0	1.73	0.57	0.2
Mean Lbs/MM Towed (Total)	2	206	116	1	3	334	101
SE	2	80	28	0	6	94	18
Biomass Index (Total)	0.01	0.74	0.42	.00	0.03	1.21	0.36
SE	0.01	0.29	0.10	.00	0.02	0.34	0.07
CV	0.84	0.39	0.24	0.68	0.61	0.28	0.18

Appendix Table D2. Biomass indices for shrimp and fish by area, cruise, and stratum in the Chignik District. Water temperatures from XBT casts are included where available. Information about each stratum in each area is given to the right of the name of the area, the cruise number, and the date the area was surveyed. Biomass estimates (calculated with Eq. 1) and indices of abundance (calculated with Eq. 3) for each taxa are listed for each stratum within an area then combined for an area total. Units are fathoms, knots, nautical miles, degrees Celsius, and pounds. Whenever an index or estimate is zero and its coefficient of variation is not, the value of the index or the estimate is less than .005. The letters SE signify standard error of the estimates in the row immediately above.

Mitrofanina (Area 201)		Stratum	Stratum	Tows	Depth of Tows	Water Temperatures		
Cruise 8401		Number	Area	Made	Mean	SD	Surface	Bottom
27 May, 1984								
		2	17.5	2	79	3.79	6.7	4.2
		3	24.6	3	56	9.84		
		4	35.18	3	69	2.08		
		Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish
Mean Lbs/NM Towed (Stratum)		112	0	0	0	2	113	657
SE		29	0	0	0	1	28	92
Biomass Index (Stratum)		0.37	0.00	0.00	0.00	.00	0.38	2.18
SE		0.10	0.00	0.00	0.00	.00	0.09	0.31
CV		0.26	0	0	0	0.88	0.25	0.14
Mean Lbs/NM Towed (Stratum)		0	0	0	0	0	0	1743.33
SE		0	0	0	0	0	0	645
Biomass Index (Stratum)		0.00	0.00	0.00	0.00	0.00	0.00	8.14
SE		0.00	0.00	0.00	0.00	0.00	0.00	3.01
CV		0	0	0	0	0	0	0.37
Mean Lbs/NM Towed (Stratum)		2	0	0	0	0	3	373
SE		2	0	0	0	1	1	261
Biomass Index (Stratum)		0.02	0.00	0.00	0.00	.00	0.02	2.49
SE		0.01	0.00	0.00	0.00	.00	0.01	1.74
CV		0.74	0	0	0	1.58	0.45	0.7
Mean Lbs/NM Towed (Total)		26	0	0	0	0	27	874
SE		7	0	0	0	0	6	245
Biomass Index (Total)		0.39	0.00	0.00	0.00	0.01	0.39	12.82
SE		0.10	0.00	0.00	0.00	0.01	0.09	3.59
CV		0.26	0	0	0	0.78	0.24	0.28
Chignik Bay (Area 207)		Stratum	Stratum	Tows	Depth of Tows	Water Temperatures		
Cruise 8401		Number	Area	Made	Mean	SD	Surface	Bottom
30 May, 1984								
		2	33.7	7	83	16.78		
		3	10.5	3	48	7.51		
		Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish
Mean Lbs/NM Towed (Stratum)		115	0	0	2	8	125	901
SE		42	0	0	2	6	44	144
Biomass Index (Stratum)		0.73	0.00	0.00	0.01	0.05	0.80	5.76
SE		0.27	0.00	0.00	0.02	0.04	0.28	0.92
CV		0.37	0	0	1.04	0.73	0.35	0.16

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Appendix Table D2. Biomass indices for shrimp and fish by area, cruise, and stratum in the Chignik District. Water temperatures from XBT casts are included where available. Information about each stratum in each area is given to the right of the name of the area, the cruise number, and the date the area was surveyed. Biomass estimates (calculated with Eq. 1) and indices of abundance (calculated with Eq. 3) for each taxa are listed for each stratum within an area then combined for an area total. Units are fathoms, knots, nautical miles, degrees Celsius, and pounds. Whenever an index or estimate is zero and its coefficient of variation is not, the value of the index or the estimate is less than .005. The letters SE signify standard error of the estimates in the row immediately above (continued).

Kujulik Bay (Area 209) Cruise 8401 31 May, 1984		[Other Strata Totals on Previous Page]						
	Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish	
Mean Lbs/NM Towed (Total)	8	0	0	0	1	9	834	
SE	9	0	0	0	1	9	317	
Biomass Index (Total)	0.04	0.00	0.00	0.00	.00	0.04	3.67	
SE	0.04	0.00	0.00	0.00	.00	0.04	1.40	
CV	1.02	0	0	0	1.22	1	0.38	
Kujulik Bay (Area 209) Cruise 8403 19 October, 1984		Stratum Number	Stratum Area	Tows Made	Depth of Tows Mean	SD	Water Temperatures Surface	Bottom
		2	4.3	2	26	8.49	8.5	9.5
		3	18.9	4	56	6.45	9.4	8.9
	Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish	
Mean Lbs/NM Towed (Stratum)	0	0	0	0	0	0	1,022	
SE	0	0	0	0	0	0	378	
Biomass Index (Stratum)	0.00	0.00	0.00	0.00	0.00	0.00	0.83	
SE	0.00	0.00	0.00	0.00	0.00	0.00	0.31	
CV	0	0	0	0	0	0	0.37	
Mean Lbs/NM Towed (Stratum)	65	0	0	0	2	67	684	
SE	34	0	0	0	1	34	27	
Biomass Index (Stratum)	0.23	0.00	0.00	0.00	0.01	0.24	2.45	
SE	0.12	0.00	0.00	0.00	.00	0.12	0.10	
CV	0.52	0	0	0	0.79	0.51	0.04	
Mean Lbs/NM Towed (Total)	53	0	0	0	1	54	747	
SE	28	0	0	0	1	28	75	
Biomass Index (Total)	0.23	0.00	0.00	0.00	0.01	0.24	3.29	
SE	0.12	0.00	0.00	0.00	.00	0.12	0.33	
CV	0.52	0	0	0	0.79	0.51	0.1	
Ivanof (Area 217) Cruise 8401 26 May, 1984		Stratum Number	Stratum Area	Tows Made	Depth of Tows Mean	SD	Water Temperatures Surface	Bottom
		2	20.13	2	53	4.24		
		3	17.3	3	51	7.51	7.5	3.9
		4	24.75	3	59	2.65		
		5	28.02	1	54	0		
	Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish	
Mean Lbs/NM Towed (Stratum)	0	0	0	0	0	0	705	
SE	0	0	0	0	0	0	296	
Biomass Index (Stratum)	0.00	0.00	0.00	0.00	0.00	0.00	2.69	
SE	0.00	0.00	0.00	0.00	0.00	0.00	1.13	
CV	0	0	0	0	0	0	0.42	

Appendix Table D2. Biomass indices for shrimp and fish by area, cruise, and stratum in the Chignik District. Water temperatures from XBT casts are included where available. Information about each stratum in each area is given to the right of the name of the area, the cruise number, and the date the area was surveyed. Biomass estimates (calculated with Eq. 1) and indices of abundance (calculated with Eq. 3) for each taxa are listed for each stratum within an area then combined for an area total. Units are fathoms, knots, nautical miles, degrees Celsius, and pounds. Whenever an index or estimate is zero and its coefficient of variation is not, the value of the index or the estimate is less than .005. The letters SE signify standard error of the estimates in the row immediately above.

Ivanof (Area 217)		[Other Strata Totals on Previous Page]						
Cruise 8401		Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish
25 May, 1984								
Mean Lbs/NM Towed (Stratum)		26	0	0	0	1	27	860
SE		16	0	0	0	1	16	189
Biomass Index (Stratum)		0.00	0.00	0.00	0.00	.00	0.09	2.82
SE		0.05	0.00	0.00	0.00	.00	0.05	0.62
CV		0.64	0	0	0	0.79	0.61	0.22
Mean Lbs/NM Towed (Stratum)		0	0	0	0	0	0	1,100
SE		0	0	0	0	0	0	319
Biomass Index (Stratum)		0.00	0.00	0.00	0.00	0.00	0.00	5.17
SE		0.00	0.00	0.00	0.00	0.00	0.00	1.50
CV		0	0	0	0	0	0	0.29
Mean Lbs/NM Towed (Stratum)		0	0	0	0	0	0	47
SE		0	0	0	0	0	0	0
Biomass Index (Stratum)		0.00	0.00	0.00	0.00	0.00	0.00	0.25
SE		0.00	0.00	0.00	0.00	0.00	0.00	0.00
CV		0	0	0	0	0	0	0
Mean Lbs/NM Towed (Total)		5	0	0	0	0	5	639
SE		3	0	0	0	0	3	0
Biomass Index (Total)		0.00	0.00	0.00	0.00	.00	0.09	10.94
SE		0.05	0.00	0.00	0.00	.00	0.05	0.00
CV		0.64	0	0	0	0.79	0.61	0.18
Kuiuukta Bay (Area 220)		Stratum	Stratum	Tows	Depth of Tows	Water Temperatures		
Cruise 8401		Number	Area	Made	Mean	SD	Surface	Bottom
29 May, 1984								
		1	15.9	2	83	4.95	7.5	4
		Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish
Mean Lbs/NM Towed (Total)		214	0	0	37	2	252	498
SE		75	0	0	22	2	93	15
Biomass Index (Total)		0.64	0.00	0.00	0.11	0.01	0.76	1.50
SE		0.23	0.00	0.00	0.07	0.01	0.28	0.05
CV		0.35	0	0	0.61	1.22	0.37	0.03

Appendix Table D3. Biomass indices for shrimp and fish by area, cruise, and stratum in the South Peninsula District. Water temperatures from XBT casts are included where available. Information about each stratum in each area is given to the right of the name of the area, the cruise number, and the date the area was surveyed. Biomass estimated (calculated with Eq. 1) and indices of abundance (calculated with Eq. 3) for each taxa are listed for each stratum within an area the combined for an area total. Units are fathoms, knots, nautical miles, degree Celsius, and pounds. Whenever an index or estimate is zero and its coefficient of variation is not, the value of the index or the estimate is less than .005. The letters SE signify standard error of the estimates in the row immediately above.

Stepovak (Area 202) Cruise 8401 24 May, 1984	Stratum	Stratum	Tows	Depth of Tows		Water Temperatures	
	Number	Area	Made	Mean	SD	Surface	Bottom
	2	72	6	69	3.16	6.7	3.8
	3	32	4	97	4.57	6.6	4.3
	4	60	5	76	17.36		
	5	44	1	80	0		
	Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish
Mean Lbs/NM Towed (Stratum)	42	0	0	0	4	45	670
SE	6	0	0	0	1	5	40
Biomass Index (Stratum)	0.57	0.00	.00	0.00	0.05	0.62	9.16
SE	0.08	0.00	.00	0.00	0.02	0.07	0.55
CV	0.14	0	1.48	0	0.32	0.11	0.06
Mean Lbs/NM Towed (Stratum)	76	0	0	4	7	87	569
SE	36	0	0	2	2	4	63
Biomass Index (Stratum)	0.46	0.00	0.00	0.02	0.04	0.05	3.45
SE	0.22	0.00	0.00	0.01	0.01	0.02	0.38
CV	0.47	0	0	0.47	0.23	0.42	0.11
Mean Lbs/NM Towed (Stratum)	70	0	0	0	4	74	598
SE	29	0	0	1	2	30	126
Biomass Index (Stratum)	0.80	0.00	0.00	.00	0.04	0.84	6.81
SE	0.33	0.00	0.00	0.01	0.02	0.34	1.43
CV	0.41	0	0	1.27	0.55	0.4	0.21
Mean Lbs/NM Towed (Stratum)	17	0	0	0	1	18	502
SE	0	0	0	0	0	0	0
Biomass Index (Stratum)	0.14	0.00	0.00	0.00	0.01	0.15	4.19
SE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CV	0	0	0	0	0	0	0
Mean Lbs/NM Towed (Total)	50	0	0	1	4	54	598
SE	0	0	0	0	1	10	42
Biomass Index (Total)	1.96	0.00	.00	0.03	0.14	2.13	23.62
SE	0.00	0.00	.00	0.01	0.03	0.41	1.65
CV	0.2	0	1.48	0.45	0.21	0.19	0.07

-Continued-

Appendix Table D3. Biomass indices for shrimp and fish by area, cruise, and stratum in the South Peninsula District. Water temperatures from XBT casts are included where available. Information about each stratum in each area is given to the right of the name of the area, the cruise number, and the date the area was surveyed. Biomass estimated (calculated with Eq. 1) and indices of abundance (calculated with Eq. 3) for each taxa are listed for each stratum within an area the combined for an area total. Units are fathoms, knots, nautical miles, degree Celsius, and pounds. Whenever an index or estimate is zero and its coefficient of variation is not, the value of the index or the estimate is less than .005. The letters SE signify standard error of the estimates in the row immediately above (continued).

Unga Strait (Area 204) Cruise 8401 22 May, 1984	Stratum	Stratum		Tows	Depth of Tows		Water Temperatures	
	Number	Area		Made	Mean	SD	Surface	Bottom
	1	53.2		6	68	5.28	5.4	4.2
	Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish	
Mean Lbs/NM Towed (Total)	21	0	0	0	5	27	456	
SE	7	0	0	0	1	8	100	
Biomass Index (Total)	0.22	0.00	.00	0.00	0.05	0.27	4.61	
SE	0.07	0.00	.00	0.00	0.02	0.08	1.01	
CV	0.34	0	1.48	0	0.29	0.29	0.22	
Pavlof Bay (Area 206) Cruise 8401 20 May, 1984	Stratum	Stratum		Tows	Depth of Tows		Water Temperatures	
	Number	Area		Made	Mean	SD	Surface	Bottom
	1	88.4		8	55	5.73	5.3	3.6
	Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish	
Mean Lbs/NM Towed (Total)	27	0	1	0	5	32	953	
SE	9	0	0	0	2	9	162	
Biomass Index (Total)	0.46	.00	0.01	0.00	0.08	0.54	15.99	
SE	0.15	.00	0.01	0.00	0.03	0.15	2.72	
CV	0.32	1	0.76	0	0.38	0.28	0.17	
Beaver Bay (Area 211) Cruise 8401 21 May, 1984	Stratum	Stratum		Tows	Depth of Tows		Water Temperatures	
	Number	Area		Made	Mean	SD	Surface	Bottom
	1	24		3	49	21.83	5.6	4
	Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish	
Mean Lbs/NM Towed (Total)	1	0	0	0	3	5	1,560	
SE	1	0	1	0	2	3	1,232	
Biomass Index (Total)	0.01	0.00	.00	0.00	0.01	0.02	7.11	
SE	.00	0.00	.00	0.00	0.01	0.01	5.61	
CV	0.79	0	1.58	0	0.81	0.62	0.79	
Belkofski Bay (Area 212) Cruise 8401 20 May, 1984	Stratum	Stratum		Tows	Depth of Tows		Water Temperatures	
	Number	Area		Made	Mean	SD	Surface	Bottom
	1	11.5		3	37	3.21	4.5	3.9
	Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish	
Mean Lbs/NM Towed (Total)	1	0	2	0	5	8	1,148	
SE	1	0	1	0	3	2	379	
Biomass Index (Total)	.00	0.00	.00	0.00	0.01	0.02	2.51	
SE	.00	0.00	.00	0.00	0.01	.00	0.83	
CV	0.9	0	0.71	0	0.51	0.26	0.33	

-Continued-

Appendix Table D3. Biomass indices for shrimp and fish by area, cruise, and stratum in the South Peninsula District. Water temperatures from XBT casts are included where available. Information about each stratum in each area is given to the right of the name of the area, the cruise number, and the date the area was surveyed. Biomass estimated (calculated with Eq. 1) and indices of abundance (calculated with Eq. 3) for each taxa are listed for each stratum within an area the combined for an area total. Units are fathoms, knots, nautical miles, degree Celsius, and pounds. Whenever an index or estimate is zero and its coefficient of variation is not, the value of the index or the estimate is less than .005. The letters SE signify standard error of the estimates in the row immediately above (continued).

Morzhovoi Bay (Area 221) Cruise 8401 19 May, 1984	Stratum	Stratum	Tows	Depth of Tows		Water Temperatures	
	Number	Area	Made	Mean	SD	Surface	Bottom
	2	85.2	6	46	4.02	4.7	3.3
						4.8	3.8
	Pink	Humpy	Coonstripe	Sidestripe	Other	Total	Fish
Mean Lbs/NM Towed (Total)	3	0	0	0	8	10	767
SE	1	0	0	0	3	3	84
Biomass Index (Total)	0.04	0.00	0.00	0.00	0.12	0.16	12.40
SE	0.02	0.00	0.00	0.00	0.04	0.05	1.36
CV	0.54	0	0	0	0.37	0.31	0.11

APPENDIX E

Biomass Indices of Major Taxa

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Appendix Table E1. Biomass indices in pounds per trawl mile (TM) of major taxa by area and cruise for the surveys in the Kodiak District in 1984.

Fishing Section	Cruise	Date	Shrimp Pounds/TM	Pac cod Pounds/TM	Pollock Pounds/TM	Roundfish Pounds/TM	Halibut Pounds/TM	Flatfish Pounds/TM	King crab Pounds/TM	Tanner Pounds/TM	Misc Invt Pounds/TM	Total Pounds/TM
Inner Marmot (Area 102)	8401	6/84	172.33	126.04	236.93	38.95	1.36	164.58	0.00	0.00	65.99	806.18
	8403	9/84	174.90	82.02	258.61	99.54	17.98	1163.62	0.00	4.43	63.27	1864.36
Marmot Island (Area 103)	8403	9/84	321.50	147.78	248.89	57.11	33.00	872.56	0.00	43.28	68.94	1793.06
Chiniak Bay (Area 104)	8401	6/84	303.23	30.32	32.51	12.31	4.41	379.70	0.00	72.26	1.21	835.94
	8403	10/84	123.27	44.21	138.18	41.72	13.61	1240.26	35.82	28.35	48.51	1713.92
Ugak Bay (Area 106)	8401	6/84	8.83	61.50	175.83	38.00	3.50	203.17	3.67	45.33	21.17	561.00
	8403	9/84	10.60	35.40	44.00	57.40	18.60	469.40	0.00	0.00	89.40	724.80
Kiliuda Bay (Area 107)	8402	6/84	4.60	14.60	145.59	2.68	0.00	38.10	2.10	0.42	2.10	210.22
	8403	9/84	52.40	57.90	472.70	41.50	12.30	419.20	0.80	0.30	94.00	1151.10
Twoheaded (Area 108)	8402	6/84	4.88	43.75	96.13	7.50	0.63	30.88	0.00	0.00	1638.50	1822.25
	8403	9/84	31.17	101.42	311.42	77.75	21.83	648.17	0.00	9.50	52.50	1253.75
Alitak (Area 109)	8401	6/84	538.75	66.42	93.01	49.03	5.25	75.89	0.00	0.57	0.35	829.26
	8403	9/84	409.58	58.58	277.61	51.94	14.08	141.31	0.00	5.08	20.53	978.72
Uyak Bay (Area 110)	8403	9/84	174.33	18.67	87.33	106.00	26.00	666.00	0.00	59.33	2.33	1140.00
Uganik Bay (Area 112)	8403	9/84	398.83	34.33	179.67	38.83	12.33	601.83	5.83	2.67	35.33	1309.67
Kukak Bay (Area 114)	8401	6/84	242.34	45.54	312.37	5.91	0.00	80.58	0.00	0.29	0.00	687.03
	8403	10/84	133.50	0.00	18.00	115.00	13.50	276.50	0.00	94.50	122.00	773.00
Wide Bay (Area 119)	8401	6/84	889.74	27.10	49.85	151.94	15.92	13.63	0.00	0.15	4.15	1152.48
	8403	10/84	1501.83	60.00	248.00	184.00	16.00	262.17	0.00	9.33	9.17	2290.50
Puale Bay (Area 122)	8401	6/84	12.33	4.33	493.00	0.67	0.00	45.67	0.00	0.00	10.67	566.67
Olga Bay (Area 124)	8402	6/84	398.41	0.00	1.33	71.12	0.00	0.97	0.00	0.00	0.04	471.87
	8404	10/84	333.97	0.00	0.32	97.36	0.00	2.79	0.00	0.09	0.00	434.53
Average lbs/TM			283.70	48.18	178.24	61.19	10.47	354.41	2.19	17.09	106.83	1062.29
Rank			2	6	3	5	8	1	9	7	4	ND

Appendix Table E2. Biomass indices in pounds per trawl mile (TM) of major taxa by area and cruise for the surveys in the Chignik District in 1984.

Fishing Section	Cruise	Date	Shrimp Pounds/TM	Pac cod Pounds/TM	Pollock Pounds/TM	Roundfish Pounds/TM	Halibut Pounds/TM	Flatfish Pounds/TM	King crab Pounds/TM	Tanner Pounds/TM	Misc Invt Pounds/TM	Total Pounds/TM
Mitrofanina (Area 201)	8401	5/84	26.00	136.74	528.48	19.40	12.26	173.94	0.00	0.42	2.28	900.32
Chignik Bay (Area 207)	8401	5/84	107.26	70.16	463.48	25.03	21.90	331.00	0.00	1.63	0.22	1020.68
	8403	10/84	320.71	220.50	141.64	165.43	2.86	902.43	0.00	52.14	26.29	1832.00
Kujulik Bay (Area 209)	8401	5/84	9.23	112.01	398.42	26.46	58.41	236.61	0.00	0.00	1.99	843.13
	8403	10/84	51.18	12.20	25.65	116.76	12.58	467.04	0.00	0.60	77.10	763.12
Ivanof Bay (Area 217)	8401	5/84	5.18	48.28	375.68	12.49	25.99	175.84	0.00	0.00	0.37	643.82
Kurukta Bay (Area 220)	8401	5/84	252.00	40.00	70.00	18.50	15.00	343.50	0.00	2.00	0.00	750.00
Average lbs/TM			110.34	91.41	286.19	54.87	21.29	375.77	0.00	8.11	15.46	964.72
Rank			3	4	2	5	6	1	9	8	7	ND

Appendix Table E3. Biomass indices in pounds per trawl mile (TM) of major taxa by area and cruise for the surveys in the South Peninsula District in 1984.

Fishing Section	Cruise	Date	Shrimp Pounds/TM	Pac cod Pounds/TM	Pollock Pounds/TM	Roundfish Pounds/TM	Halibut Pounds/TM	Flatfish Pounds/TM	King crab Pounds/TM	Tanner Pounds/TM	Misc Invt Pounds/TM	Total Pounds/TM
Stepovak (Area 202)	8401	5/84	53.25	101.07	164.87	21.40	33.07	280.51	0.00	1.06	2.24	657.47
Unga Strait (Area 204)	8401	5/84	26.67	52.67	46.33	23.00	4.00	319.00	0.00	2.67	8.50	482.83
Pavlof Bay (Area 206)	8401	5/84	32.38	140.75	95.75	57.37	8.25	603.63	21.00	15.63	10.25	985.00
Beaver Bay (Area 211)	8401	5/84	4.67	39.00	1255.67	60.67	6.33	183.33	4.00	9.33	1.33	1564.33
Belkofski Bay (Area 212)	8401	5/84	8.33	103.33	64.67	22.67	3.67	828.33	0.00	12.33	113.33	1156.67
Morzhovoi Bay (Area 221)	8401	5/84	10.17	59.83	105.33	87.00	14.50	447.00	4.50	46.33	2.17	776.83
Average lbs/TM			22.58	82.78	288.77	45.35	11.64	443.63	4.92	14.56	22.97	937.19
Rank			7	3	2	4	8	1	9	6	5	ND

APPENDIX F

Station and Composite Length Frequency Sample Sizes

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Appendix Table F1. Station and composite length-frequency subsamples sizes for Kodiak District shrimp trawl surveys in 1984 by fishing section. Station subsamples were processed onboard while composite subsamples were preserved for later processing in the laboratory ("p" = pink shrimp; "H" = humpy shrimp; "C" = coonstripe shrimp).

Fishing Section	Station Catch						Composite					
	Number of Subsamples Taken			Subsample Size			Number of Subsamples Taken			Subsample Size		
	P	H	C	P	H	C	P	H	C	P	H	C
Inner Marmot	12			2,888			4			1,237		
Marmot Island	3			661			1			275		
Chiniak Bay	11			2,255			2			605		
Ugak Bay	ND			ND			2			592		
Kiliuda Bay	2			473			1			335		
Twoheaded	1			196			1			307		
Alitak Bay	21			4,272			3			824		
Uyak Bay	2			515			1			275		
Uganik Bay	5			1,254			1			364		
Kukak Bay	5			1,198			2			506		
Wide Bay	9	7		2,069	1,437		2	2		367	647	
Puale Bay	1			275			1			295		
Olga Bay		15	5	4,377	1,306			3			762	
Total	72	22	5	16,066	5,814	1,306	24	2		5,982	1,409	

Appendix Table F2. Station and composite length-frequency subsample sizes for Chignik District shrimp trawl surveys in 1984 by fishing section. Station subsamples were processed onboard while composite subsamples were preserved for later processing in the laboratory ("p" = pink shrimps; "H" = humpy shrimp; "C" = coonstripe shrimp).

Fishing Section	Station Catch						Composite					
	Number of Subsamples Taken			Subsample Size			Number of Subsamples Taken			Subsample Size		
	P	H	C	P	H	C	P	H	C	P	H	C
Chignik Bay	11			2,307			3			874		
Kujulik Bay	3			653			2			523		
Ivanof	2			336			1			309		
Kuiukta Bay	2			414			1			277		
Total	20			4,116			8			2,295		

Appendix Table F3. Station and composite length-frequency subsample sizes for South Peninsula District shrimp trawl surveys in 1984 by fishing section. Station subsamples were processed onboard while composite subsamples were preserved for later processing in the laboratory ("p" = pink shrimp; "H" = humpy shrimp; "C" = coonstripe shrimp).

Fishing Section	Station Catch						Composite					
	Number of Subsamples Taken			Subsample Size			Number of Subsamples Taken			Subsample Size		
	P	H	C	P	H	C	P	H	C	P	H	C
Unga Strait	4					734	1					315
Pavlof Bay	6					912	1					305
Beaver Bay	ND					ND	ND					ND
Belkofski Bay	ND					ND	ND					ND
Morzhovoi Bay	ND					ND	1					68
Total	24					4,250	6					1,398

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