

41092-43

ESTIMATION OF THE MAJOR SOCKEYE SALMON STOCKS
CONTRIBUTING TO THE NORTH SHELIKOF STRAIT FISHERY OF
JULY 6-25, 1988-1992

By

Bruce M. Barrett
and
Charles O. Swanton

Regional Information Report¹ No. 4K92-43

Alaska Department of Fish and Game
Division of Commercial Fisheries
211 Mission Road
Kodiak, Alaska 99615

December 1992

¹The Regional Information Report Series was established in 1987 to provide an information access system for all unpublished division reports. These reports frequently serve diverse ad hoc informational purposes or archive basic uninterpreted data. To accommodate timely reporting of recently collected information, reports in this series undergo only limited internal review and may contain preliminary data; this information may be subsequently finalized and published in the formal literature. Consequently, these reports should not be cited without prior approval of the author or the Division of Commercial Fisheries.

ACKNOWLEDGEMENTS

The authors thank Central Region staff Ken Tarbox, Jeff Fox, and Dave Waltemyer for their timely response in supplying Cook Inlet sockeye age, length, and weight data. Patricia Roche was responsible for age designation of a majority of Kodiak sockeye scales, data tabulation and all graphics. David Owen aged all sockeye scales from Chignik and provided run data. Pat Holmes, Tom Emerson, Ed Sampson, and Dave Sarafin collected scale samples from the North Shelikof Strait fishery. Lucinda Neel added publication expertise.

TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES	i
LIST OF FIGURES	i
LIST OF APPENDICES	ii
INTRODUCTION	1
METHODS	1
Timing and Estimation of Run Potential	1
1988	1
1990	2
1991-1992	2
Escapement and Catch Sampling for Age and Length	3
1991-1992	3
Catch Weight	3
1990	3
1991-1992	4
Age	4
Scale Pattern Analysis	4
RESULTS AND DISCUSSION	5
1988	5
1990	6
1991	7
1992	8
SUMMARY	9
LITERATURE CITED	11
APPENDIX	18

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Estimated relative abundance by major stock group of the North Shelikof Strait catch, 1988-1992	13

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. Map of the Kodiak Management Area and adjacent areas	16
2. Map of the area addressed in the North Shelikof Strait Management Plan, with seaward and shoreward zones defined	17

LIST OF APPENDICES

<u>Appendix</u>	<u>Page</u>
A.1. Estimated timing of early and late run Karluk, and Upper Cook Inlet sockeye salmon in the North Shelikof Strait relative to the timing of the North Shelikof Strait catch, 1988	18
A.2. Estimated sockeye salmon harvest by stock, area, and date based on scale pattern analysis of age-1.3 and age-2.3 fish within the North Shelikof Strait, 6 July through 25 July, 1990	19
A.3. Estimated run timing of Thorsheim and Malina Lake sockeye salmon in the North Shelikof Strait	20
A.4. Estimated run timing of Litnik sockeye salmon in the North Shelikof Strait	21
A.5. Estimated run timing of Karluk River and Red River sockeye salmon in the North Shelikof Strait	22
A.6. Estimated run timing of Frazer Lake and Upper Station sockeye salmon in the North Shelikof Strait	23
A.7. Desired escapement goal, estimated run timing, and run potential of selected Kodiak salmon stocks during the North Shelikof fishery	24
A.8. Estimated sockeye salmon run strength of selected Kodiak systems adjusted to the North Shelikof Strait fishery of 6 July through 25 July	25
A.9. Estimated run timing of Cook Inlet late run sockeye salmon in the North Shelikof Strait	26
A.10. Estimated run timing of Chignik sockeye salmon in the North Shelikof Strait	27
B.1. Mean length and standard error of age-1.3, -2.3, and -2.2, sockeye salmon sampled from selected fisheries and escapements, 1991	28
B.2. Mean length of age-2.2 sockeye salmon sampled from selected stocks and the North Shelikof Strait catch, 1991	29
B.3. Mean length of age-1.3 sockeye salmon sampled from selected stocks and the North Shelikof Strait catch, 1991	30
B.4. Mean length of age-2.3 sockeye salmon sampled from selected stocks and the North Shelikof Strait catch, 1991	31

LIST OF APPENDICES (Cont.)

<u>Appendix</u>	<u>Page</u>
B.5. Average weight, in pounds, of sockeye salmon sampled from Kodiak, Cook Inlet, and Chignik fisheries and escapements, 1991 and 1992	32
B.6. Average weight, in pounds, of sockeye salmon sampled from selected fisheries and escapements, 1991 and 1992	33
C.1. Estimated age composition of the North Shelikof Strait sockeye catch by area and week, 6 July through 25 July, 1991	34
C.2. Estimated age composition of sockeye salmon sampled from selected stocks during the North Shelikof Strait fishery of 6 July through 25 July, 1991 and 1992	35
C.3. Estimated age composition of selected sockeye salmon stocks during the North Shelikof Strait fishery, 1991	36
C.4. Estimated age composition of the North Shelikof Strait sockeye catch by area and week, 6 July through 25 July, 1992	37
C.5. Estimated age composition of selected sockeye salmon stocks during the North Shelikof Strait fishery, 1992	38

INTRODUCTION

The Kodiak Salmon Management Area is all inland and State marine waters on the south side of the Alaska Peninsula from Kilokak Rocks on the south to Cape Douglas on the north (Figure 1). The Kodiak Island group is included. The area is managed exclusively for local stocks. The exceptions are the Cape Igvak Section of the Mainland District which is managed for Chignik sockeye salmon pre 26 July, and North Shelikof Strait (NSS) which is regulated to limit the interception of Upper Cook Inlet sockeye salmon from 6-25 July. The NSS encompasses the Alaska Peninsula from Dakavak Bay to Cape Douglas, and the west sides of Raspberry, Afognak, and Shuyak Islands (Figure 2).

The NSS sockeye salmon management plan was established in November 1989 by the State Board of Fisheries. The plan restricts the 6-25 July harvest of sockeye salmon to a 50,000 fish limit in the Southwest Afognak Section and a 15,000 fish limit for remainder of the area. When these limits are reached, fishing in the shoreward zones is permitted but prohibited in the seaward zones. When adopting the plan, the board recognized that some incidental harvest of other stocks has and will occur in this area while the seine fishery is prosecuted for local stocks. The Board's intent was to prevent a repetition of the non-traditional harvest pattern which they judged to have occurred in 1988.

Numerous sockeye stocks use the NSS as a migration pathway. Tagging has shown the June occurrence of the Kodiak stocks (Karluk, Uganik, and Frazer) and the presence of Upper Cook Inlet fish (Bevan 1948; Tyler et al. 1986). Post June tagging information is limited. A total of 1,641 sockeye salmon were tagged in Malina Bay from 23 June through 3 July, 1949 (Bevan 1949). Of the 669 recoveries, 97% were in Kodiak and 2% were in Upper Cook Inlet. Unfortunately, no consistent tagging or stock assessment programs have been conducted, past or present, which definitively estimate the stock aggregations during July in the NSS.

This report will summarize stock composition findings from the 6-25 July NSS sockeye catch (1988-1990) and present, the 1991 and 1992 information. Inseason management of the NSS fishery, including catch numbers, for 1988 is in Malloy (1988) and for 1990 through 1992 in Prokopowich (1992).

METHODS

Timing and Estimation of Run Potential

1988

To determine whether the NSS catch was mainly Kodiak or Upper Cook Inlet fish, Barrett (1989a) compared timing of the Karluk River and Upper Cook Inlet runs with timing of the NSS catch. Karluk run timing was determined from weir escapement counts adjusted back in time 7 days (d) for the early run and 14 d for the late run. Upper Cook Inlet run timing was based on Central District catch per unit effort (cpue) adjusted back in time 10 d.

1990

Timing of the NSS catch during 6 through 25 July, was compared to run timing of various local (Ayakulik, Karluk, Litnik, Uganik, and Alitak Bay) and non-local (Upper Cook Inlet and Chignik) sockeye stocks. For local stocks, run timing was determined from 1990 daily escapement and terminal catch numbers, while for non-local stocks daily terminal catch and run numbers were utilized. The migration time adjustments used for the various stocks were:

Days Back in Time

Kodiak Stocks

Ayakulik Escapement:	8
Ayakulik Catch:	6
SW Kodiak District Catch (Ayakulik Stock):	6
Karluk Escapement:	10
Litnik Escapement:	5
Uganik Escapement:	5
Alitak Catch (Olga Bay Stocks):	7

Non-Local Stocks:

Cook Inlet Central District Catch:	6
Chignik River Run:	10

1991-1992

Local stock run timing was determined using escapement count data to estimate average percent escapement by day from a minimum of 10-years of weir counts. Stocks included were: Ayakulik, Karluk, Frazer (Dog Salmon weir), Upper Station, and Litnik. Thorsheim and Malina run timing was estimated from average percent escapement by day for the few years (< 3) where weir counts were available. Cook Inlet run timing was determined using daily Central District drift gillnet catch numbers 1983-1992, while Chignik run timing was derived from estimated run numbers by day 1987-1991, adjusted to Chignik Lagoon time. Migration time adjustments used for each stock were the same as for 1990. All daily estimates of run timing were smoothed using a 3 d moving average.

An estimate of the total run potential, in numbers of fish, was determined for several Kodiak stocks. For each stock, the estimate was made by multiplying the desired escapement goal by an assumed 2.5:1 return per spawner. The fraction of the estimated run potential for the NSS fishery period was then estimated. This was accomplished by multiply the average percent escapement for the time adjusted to the NSS fishery by the estimated total run potential of the system. The adjustment times used were the same as those cited for estimating run timing.

Escapement and Catch Sampling for Age and Length

During 1988-1992, sockeye age and length (mid-eye-to-fork-of-tail) data were collected from Kodiak salmon escapements monitored by weirs. Generally, 240 fish were sampled per system and week beginning in late May and terminating in late August through late September. For 1988, only late run stocks were included in the analyses, so timing adjustments to age composition data were not made. In 1990, escapement age and length data were adjusted to the NSS 6-25 July management period using stock specific migration times.

Commercial catch sampling for age and length during 1988-1990, by fishing period and district was performed within the Kodiak, Cook Inlet, and Chignik Management Areas. Sampling procedures, sample sizes, and targeted catch districts by specific management area can be found in Holmes (1991) for Kodiak; Waltemyer (1989) for Upper Cook Inlet; Barrett (1989b) for Chignik; and Barrett and Swanton (1990) for the NSS during 1990.

1991-1992

During 1991-1992, scale sampling for age composition estimation within the NSS Mainland and Afognak Districts was accomplished by opportunistically collecting about 600 scales by area and fishing period. Sampling took place on tenders as individual purse seine vessels made deliveries. Length data was collected in concert with scale sampling during 1991, however no length data was collected from the fishery in 1992. Age composition estimates from Kodiak escapements, Cook Inlet catches, and Chignik catches (for comparison to the NSS age composition) were derived by applying migration times to the respective sample dates to approximate the dates when these fish would have been present in the NSS area.

Catch Weight

Average weight of commercial catch landings for specific fishing periods and areas were extracted from the fish ticket (individual harvest receipts) system for fish landed within the Kodiak (KMA), Upper Cook Inlet (UCIMA), and Chignik (CMA) Management Areas. Fish ticket data, along with numbers and weights to the nearest pound by species, also provided catch location, date, and gear type.

1990

Average whole fish weights from the NSS catch were compared to weights of terminal catches from the KMA, UCIMA, and CMA. Weight data from these areas was adjusted in time to the NSS 6 through 25 July, management period. Average weight of sockeye caught within the Ayakulik Section of the Southwest Kodiak and Alitak Bay Districts by purse seine (KMA), Central District by drift gillnet (UCIMA), and Chignik Bay District by purse seine (CMA) were computed.

1991-1992

Average whole fish weights from the NSS catch during 6-25 July were compared to fish weights adjusted to this period from districts within the Kodiak, Cook Inlet and Chignik Management Areas. Adjustments used for 1991 were 6 and 7 days prior for the Southwest (Ayakulik Section) and Alitak Bay Districts (KMA), 6 d for the Central District (UCIMA), and 10 d for the Chignik District (CMA). For 1992, the dates were: mid-August for the Ayakulik Section and Alitak Bay District catches, late July for Central District catch and Kenai and Kasilof escapements, and late July-early August for Chignik District catch.

Age

Age of individual sockeye salmon was determined from interpreting and counting freshwater and marine annular growth phases. All age composition data reported herein have been presented in European notation with the integer left of the decimal point referring to freshwater age, and to the right, marine age (Koo 1962). Total age is the sum of freshwater and marine ages plus one which accounts for the time elapsed prior to scale formation.

For 1988, age markers or unique age classes were used to estimate the contribution of Kodiak and Cook Inlet sockeye salmon to the NSS catch. It was assumed that these age classes were only present in their respective areas. The formula employed was: $X=B/A$; where X is the estimated percentage of the stock, with the age marker, in the catch; A is the estimated percentage of the age marker in the escapement or run; and B is the estimated percentage of the age marker within the NSS catch (Roche 1992).

Scale Pattern Analysis

Scale pattern analysis (SPA) on age-1.3 and -2.3 sockeye salmon caught during 6-25 July, 1990 within the NSS was used to estimate local and non-local stock contributions. The process entailed measuring scales from stocks considered probable contributors (from run timing data) to determine each individual stock's freshwater growth characteristics. The next step involved statistical evaluation (model building) which permitted the classification of scales collected from a mixed stock fishery to stock of origin.

In the age-1.3 analyses, a four stock model including Ayakulik, Upper Station-late run, Cook Inlet 1 (drift gillnet catch 7/14-7/17) and Cook Inlet 2 (drift gillnet catch 7/21-7/23) was initially developed. This model was rejected due to misclassification of Upper Station scale patterns to Cook Inlet. The model selected for classifying the NSS age-1.3 sockeye catch included Ayakulik, Cook Inlet 1 and Cook Inlet 2. Mean classification accuracy (how well a model correctly identifies the stocks) was 75.5% (Barrett and Swanton 1990).

An initial age-2.3 model was developed to classify scales collected from the catch to stock of origin based upon their scale patterns. There were seven stocks included: Ayakulik, Karluk (late run), Frazer, Malina, Cook Inlet 1&2, and Chignik (late run). This model was rejected due to poor classification accuracy (59.1%) and large misclassification error between Cook Inlet 1&2 and Ayakulik-Karluk. Statistical tests determined there was no difference between the scale patterns of Cook Inlet 1&2, but a significant difference between scale patterns from Ayakulik and Karluk. Karluk age-2.3 strongly misclassified to Ayakulik and to a lesser extent to Cook Inlet, so to minimize misclassification error between local and non-local stocks, the Karluk stock was excluded. The model employed for classifying age-2.3 NSS sockeye catch scales included Ayakulik, Frazer, Malina, Cook Inlet 1, and Chignik stocks. Mean correct classification accuracy was 88.8% (Barrett and Swanton 1990).

RESULTS AND DISCUSSION

1988

The 1988 NSS catch occurred primarily during a two week period from 10 July through 23 July. The closest major Kodiak stock (Karluk) was estimated to be abundant in the NSS pre-late June and from late July through late September with a peak in late August (Appendix A.1). The closest non-local stock (late run Upper Cook Inlet) was potentially present in the NSS from late June through mid July with the peak in early July.

The configuration of the NSS sockeye catch curve was suspiciously similar to the estimated Upper Cook Inlet timing curve while dissimilar to the Karluk curve (Barrett 1989a). Based on the run timing of the Karluk run, it was unlikely that Kodiak stocks contributed much to the NSS fishery. Likely, Upper Cook Inlet sockeye salmon were the major component of the NSS catch.

Most of the NSS catch (60%) was age-1.3 fish. The average length of these fish was about 592 mm. Average age-1.3 lengths from six local Kodiak stocks ranged from 525 mm at Little River to 583 mm at Upper Station. Upper Cook Inlet age-1.3 length also varied between systems. Kenai fish averaged 586 mm, Kasilof 552 mm, and Susitna 568 mm. The Kodiak Upper Station and Upper Cook Inlet Kenai River fish were about the same approximate length as the NSS age-1.3 fish. Since Upper Station age-1.3 fish were relatively few (53,000 run) compared to the Kenai River run (4.5 million), most of the larger fish in the NSS catch were probably bound for the Kenai River (Barrett 1989a).

Although weight data were available from the 1988 NSS catch, the information was not cited (Barrett 1989a).

The age composition of the 1988 NSS catch was estimated to be 60% age-1.3, 17% age-2.3, 1% age-0.2, and 22% other ages (Barrett 1989a). Kodiak late run stocks were 5% age-1.3, 13% age-2.3, 21% age-0.2 and 61% other ages. Upper Cook Inlet sockeye salmon were: 65% age-1.3, 5%

age-2.3, 0% age-0.2, and 30% other ages. The NSS catch age composition strongly aligned to Upper Cook Inlet, an indication that Upper Cook Inlet fish probably dominated the NSS catch.

Using age 0. as a marker of Kodiak stock abundance, the 1988 NSS catch was estimated to be 4% (95% conf. limits: 2-7%) Kodiak fish and 96% non local fish (Barrett 1989a). Alternatively, the age-1.3 marker provided an estimate of 92% Upper Cook Inlet and 8% other stocks.

The most accurate stock composition estimate obtained was from the age-1.3 marker. The problem with the age 0. marker was two fold. The size of the NSS catch samples was not large enough to accurately define an age composition as low as that found for age 0. fish in the NSS catch (1%). Secondly, Kodiak age 0. fish were limited to only the late Upper Station run, the farthest Kodiak system from the NSS. Because of obvious location differences between the Kodiak stocks, an equal mixing of all Kodiak stocks does not nor would be expected to occur within the KMA. Therefore, no Kodiak system by itself could provide a marker for generically identifying all Kodiak stocks.

The age-1.3 marker provided a reasonably true measure of Upper Cook Inlet sockeye abundance in the NSS catch due to: (1) the Kodiak run was nearly devoid of age-1.3 fish; (2) most of the Cook Inlet run was age-1.3 fish; and (3) the NSS age samples were robust enough to accurately describe the age-1.3 component.

1990

Based upon run timing information the Uganik and Litnik runs were over, while Karluk was between runs during the time of the NSS fishery (Barrett and Swanton 1990). Conversely, the Ayakulik and Alitak Bay District (collectively) stocks were relatively strong during this fishery. Non-local potential contributors (Upper Cook Inlet and Chignik) were also strong and at peak abundance during the adjusted time to the NSS fishery. The 1990 timing information was not decisive enough to identify any one stock as being a major contributor to the NSS sockeye catch.

Median age-1.3 sockeye lengths measured from the NSS Mainland and Afognak Districts differed by 12 mm. The Mainland District median length was closely approximated by the Cook Inlet median; Kodiak stocks (Ayakulik and Alitak) were disparate to the Mainland District but matched closely, median length from sockeye harvested within the Afognak District. Comparisons of age-2.3 sockeye caught within the same areas depicted a similar pattern. The length information suggested that sockeye salmon caught in the Mainland District were mainly Upper Cook Inlet fish, while the Afognak District catch was mainly Kodiak fish.

Average whole fish weight from the Mainland District was 6.3 lbs and for the Afognak District 5.3 lbs. Kodiak sockeye salmon averaged 5.2 lbs, Upper Cook Inlet 6.5 lbs, and Chignik 7.1 lbs, showing that the closest alignment between average weights were Mainland District-Cook Inlet and Afognak District-Kodiak stocks.

The NSS sockeye catch was comprised of 35% age-1.3, 18% age-2.2, 23% age-2.3, and 24% other age class fish. Age class compositions from Kodiak and Cook Inlet terminal catch areas were not dissimilar enough to provide clear qualitative differences between areas. However, 3-

ocean year components (i.e., relative frequency of age-1.3 and -2.3 fish) indicated a difference among the major stock groupings of Kodiak, Cook Inlet, and Chignik. The relative frequency of these age classes in the North Shelikof Strait Mainland and Afognak Districts more closely approximated the Cook Inlet stock than the Kodiak and Chignik stock groupings.

Using age-1.3 and -2.3 scale pattern analysis, it was estimated that the Mainland District catch during 6-25 July was 8% Kodiak, 80% Cook Inlet, and 12% Chignik bound sockeye salmon. The harvest from the Afognak District was an estimated 32% Kodiak and 68% Cook Inlet origin fish. Overall, the NSS sockeye harvest was estimated to be 76% Cook Inlet, 16% Kodiak, and 8% Chignik bound fish (Appendix A.2).

The scale pattern analysis generated stock composition estimates with Cook Inlet sockeye salmon being the dominant stock within the Mainland District were substantiated by length and weight data. However, a similar comparison for the Afognak District suggests that with a sockeye harvest of 68% Cook Inlet bound fish, length and weight data should be more aligned with Cook Inlet, which was not the case. We do not feel this disparity is a function of SPA but rather that the scale samples collected within the Afognak District may not have been representative of the overall catch as assumed. We have no quantitative information indicating that the scale samples were biased, however it is probable.

1991

In 1991, the run timing of several Kodiak sockeye stocks extended into the NSS 6-25 July period (Appendices A.3-A.6). These included: Thorsheim, Malina, and Litnik in the Afognak District; Karluk and Ayakulik in the Northwest and Southwest Kodiak Districts; and Frazer and Upper Station in the Alitak Bay District. The most abundant, in order of potential contribution, were Ayakulik, late run Karluk, late run Upper Station, and Frazer sockeye salmon. The potential contribution of these stocks during the NSS fishery period was about 0.5 million sockeye salmon (Appendices A.7 and A.8), of which approximately 20 thousand were assigned to the terminal NSS systems of Thorsheim and Malina.

Although Kodiak stocks potentially amount to about 0.5 million sockeye salmon during the NSS fishing period, only a fraction of these fish would have been present in NSS during the 1991 fishery. This is because previous tagging studies indicate that the NSS is one of several migration paths used by Kodiak stocks enroute to their natal streams (Tyler et al. 1986). To illustrate, Frazer and Upper Station sockeye salmon probably would have used several routes to their natal streams in 1991 including south along the east side of Kodiak and south following the west side of Kodiak from Kupreanof Strait.

Two major non-local sockeye salmon runs in proximity to Kodiak overlapped the timing of the NSS fishery in 1991. This amounted to about 71% of the Upper Cook Inlet run and 22% of the Chignik run (Appendices A.9 and A.10). As with Kodiak stocks, not all of the Cook Inlet and Chignik fish would have migrated through the NSS in 1991. For example, previous tagging studies indicate that Upper Cook Inlet sockeye salmon commonly migrate from the Gulf of Alaska into Cook Inlet through Stevenson and Kennedy Entrances (Ken Tarbox, Alaska Department of Fish and Game, Soldotna, personal communication).

Mean lengths of age-2.2, -1.3, and -2.3 fish sampled from the NSS catch were too similar to Kodiak, Chignik, and Upper Cook Inlet to determine the dominant stock in the NSS catch or exclude any stock from consideration (Appendices B.1-B.4).

Average sockeye weight in the NSS Southwest Afognak Section averaged 5.2 lbs and in the remainder of the NSS 5.5 lbs (Appendices B.5 and B.6). Kodiak stocks as represented by Ayakulik and Alitak Bay fish, averaged from 5.1 lbs to 5.3 lbs, while Cook Inlet and Chignik fish averaged 6.0 lbs each. Based on the similarity in average weights, Kodiak stocks were likely the major catch component.

However, there is some indication that Cook Inlet sockeye salmon may have averaged well less than 6.0 lbs in 1991 and if so, may have contributed more to the NSS catch than previously indicated. The Cook Inlet average of 6.0 lbs was derived from the Central District drift gillnet catch which reportedly had an usually high gear selectivity bias in 1991. This was attributed to a preponderance of 2-ocean age fish instead of the usual 3-ocean age fish (Ken Tarbox, Alaska Department of Fish and Game, Soldotna, personal communication). As an indication, the average weight of Cook Inlet, Kenai and Kasilof sockeye escapement was 5.1 lbs and 4.1 lbs, respectively.

The 1991 NSS catch was predominately age-1.3 and -2.3 fish based on limited sampling (Appendix C.1). These age classes were also represented in several Kodiak systems including Karluk and Ayakulik, and they were common in the Cook Inlet and Chignik runs (Appendix C.2). Age 0. and age 3. fish comprised a relatively minor fraction (<5%) of the samples collected from the Mainland and Afognak Districts of NSS. These age classes were essentially present only in the Kodiak late Upper Station and Karluk runs. However, these markers were not useable for estimating the probable contribution of Kodiak stocks to the NSS fishery because the frequency of the age 0. and age 3. fish in the NSS samples, in combination with the size of the NSS age samples, was too low (<10%). Nevertheless, the low frequency of these age classes does indicate that Kodiak fish were not likely a major component of the NSS catch. Overall, the closest alignment to the age composition of the NSS catch samples was the Cook Inlet run (Appendix C.3).

1992

Based on average run timing, the 1992 NSS sockeye salmon catch was potentially comprised of Kodiak, Chignik, and Upper Cook Inlet fish (Appendices A.3-A.10). The major Kodiak stocks potentially contributing to the catch included Karluk, Ayakulik, Frazer, and Upper Station. The run potential of these stocks for the NSS fishery period was an estimated 0.5 million fish (Appendix A.7). However, owing to the existence of alternate migration routes, all these fish would not be in the NSS.

While length data was not collected from the NSS catch in 1992, average fish weight statistics were available from fish tickets (Appendices B.5 and B.6). Average fish weights for the NSS Mainland District and NW Afognak Districts combined was 6.6 lbs and for the Southwest Afognak Section 6.3 lbs. Kodiak stocks represented by Ayakulik and Alitak Bay stocks averaged from 5.1 lbs to 5.0 lbs, respectively. In comparison, the average for Cook Inlet was 6.7 lbs and

for Chignik 6.3 lbs. Based on average weights, Kodiak stocks were a minor component of the NSS catch.

The 1992 NSS catch was mainly age-1.3 and -2.2 fish as determined from the few samples collected (Appendix C.4). Most of the local and non-local stocks included fish of these ages (Appendix C.2). The strongest component of age-1.3 fish was in the Cook Inlet run and for age-2.2 fish in the Kodiak run. The low frequency of age 0. and age 3. fish in the NSS catch samples indicated that Kodiak fish as represented by Upper Station and late run Karluk fish were not a major fraction of the NSS catch. The occurrence of age-1.3 and -2.2 fish in the Kodiak and Cook Inlet runs precluded the use of these age classes for a biological marker to quantify stock contribution levels. The closest match to the NSS age composition was the Upper Cook Inlet run (Appendix C.5). The differences indicated that while Cook Inlet likely dominated the catch, other stocks also contributed, especially Kodiak stocks based on the relative abundance of age-2.2 fish in the NSS samples.

SUMMARY

During the 6-25 July period of 1988, an estimated 478,000 sockeye salmon were harvested in the NSS. Timing, length, and age composition data indicated that most of the catch was Upper Cook Inlet, Kenai River fish. From the frequency of age 1.3 in the catch, it was estimated that 92% of the NSS harvest was of Upper Cook Inlet origin.

In 1989, there was no NSS fishery due the M/V Exxon Valdez oil spill.

During 1990, 80,658 sockeye salmon were harvested in the 6-25 July fishery. The run timing data indicated that Kodiak (Ayakulik), Upper Cook Inlet, and Chignik stocks all potentially contributed to the fishery. Average fish weights and age specific length data suggested that the NSS Mainland District component was chiefly Upper Cook Inlet fish, while the Afognak District catch was mainly Kodiak stocks. Analysis of the scale patterns of two age groups sampled indicated that the NSS catch was dominated by Upper Cook Inlet fish followed by Kodiak and Chignik fish. In the Mainland District, all three stock groups contributed. On the Afognak District side, the contributing stocks were estimated to be Upper Cook Inlet as the dominant and Kodiak as the secondary. The difference in the Afognak District stock composition estimates by scale pattern analysis and average fish weights indicated that the catch samples may have been biased. However, without additional samples this could not be tested.

The 1991 NSS catch amounted to about 53,000 sockeye salmon. Timing information indicated that Kodiak, Upper Cook Inlet, and Chignik were potential contributors. The major Kodiak stocks likely involved were Ayakulik, late run Karluk, late run Upper Station, and Frazer. The estimated run potential of selected Kodiak stocks during the 6-25 July fishery period was 0.5 million fish. Age specific average fish lengths proved unusable in determining the stock composition of the NSS catch. Average fish weights from the NSS Mainland and Afognak Districts catch aligned strongly to Kodiak. However, there was evidence that the Upper Cook Inlet average fish weight, derived from drift gillnet catch, did not represent the run average. Age composition of the NSS catch samples more closely matched Upper Cook Inlet than Kodiak and

Chignik samples. The relatively low frequency of age 0. and age 3. fish in the NSS catch samples indicated that Kodiak stocks were not a major component of the catch.

In 1992, a total of 178,685 sockeye salmon were caught during the 6-25 July NSS fishery. Average run timing indicated that the NSS catch was potentially comprised of sockeye salmon of Kodiak, Upper Cook Inlet, and Chignik origin. The suspected major Kodiak stocks were Ayakulik, late run Karluk, late run Upper Station, and Frazer. Average fish weights from the NSS Mainland and Afognak Districts catch indicated that Kodiak stocks were a minor component of the catch. Age samples taken from the NSS catch were not definitive as to the stock composition but did indicate that Upper Cook Inlet was likely a major component and Kodiak a minor fraction.

In the 1988-1992 NSS fishery, the Mainland District sockeye catch has been mainly Upper Cook Inlet with Kodiak and to a lesser extent Chignik stocks contributing (Table 1). In the NSS Afognak District, the sockeye catch has been more of a blend of Upper Cook Inlet and Kodiak fish.

LITERATURE CITED

- Barrett, B.M. 1989a. North Shelikof Strait 1988 catch distribution, timing, and stock composition. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K88-6, Kodiak.
- Barrett, B.M. 1989b. Chignik Management Area salmon catch and escapement statistics, 1987. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Fishery Report 89-05, Juneau.
- Barrett, B.M. and C.O. Swanton. 1990. Origins of sockeye salmon in the Kodiak Management Area North Shelikof Strait Fishery, 6 July through 25 July, 1990. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K91-3, Kodiak.
- Bevan, D.E. 1948. Tagging experiments in the Kodiak Island Area. 1948. In L.D. Nicholson 1978. A summary of all known red salmon (*Oncorhynchus nerka*) tagging conducted on Kodiak Island, Alaska. Alaska Department of Fish and Game, Division of Commercial Fisheries, unpublished report, Kodiak.
- Bevan, D.E. 1949. Tagging experiments in the Kodiak Island Area with reference to the estimation of salmon (*Oncorhynchus*) populations. In L.D. Nicholson 1978. A summary of all known red salmon (*Oncorhynchus nerka*) tagging conducted on Kodiak Island, Alaska. Alaska Department of Fish and Game, Division of Commercial Fisheries, unpublished report, Kodiak.
- Holmes, P.B. 1991. Kodiak Management Area salmon catch and escapement statistics, 1987. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Fishery Report 91-14, Juneau.
- Koo, T.S.Y. 1962. Studies of Alaska red salmon. University of Washington, Publications in Fisheries, New series, Volume I. Seattle.
- Malloy, L. 1988. Interception of Cook Inlet-bound sockeye in the 1988 Kodiak commercial salmon fishery: An in-season management perspective. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K88-7, Kodiak
- Prokopowich, D. 1992. 1992 Kodiak Management Area commercial salmon fishery management report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K92-42, Kodiak.
- Roche, P.A. 1992. The estimated incidence of Upper Station Late run sockeye salmon in the Alitak Bay District, Inner Akalura Section fishery of 20 August 1992. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K92-34, Kodiak.

LITERATURE CITED (Cont.)

- Tyler, R.W., L. Malloy, D. Prokopowich, and K. Manthey. 1986. Migration of sockeye salmon in the Kodiak Archipelago, 1981. Alaska Department of Fish and Game, Division of Commercial Fisheries, Informational Leaflet 254, Juneau.
- Waltemyer, D.L. 1989. Age and size composition of chinook, sockeye, coho, and chum salmon returning to Upper Cook Inlet, Alaska, in 1987. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Fishery Report 89-18, Juneau.

Table 1. Estimated relative abundance by major stock group of the North Shelikof Strait catch, 1988-1992.

YEAR	TOTAL CATCH	METHOD	STOCK COMPOSITION		
			RESULTS		
			MAINLAND	AFOGNAK	ENTIRE NORTH SHELIKOF
1988	478,000	TIMING	Cook Inlet -Major Kodiak -Minor	Cook Inlet -Major Kodiak -Minor	Cook Inlet -Major Kodiak -Minor
		LENGTH		Kodiak -Minor	Cook Inlet -Major
		AGE Composition	Cook Inlet -Major Kodiak -Minor	Cook Inlet -Major Kodiak -Minor	Cook Inlet -Major Kodiak -Minor
		Age-1.3 Marker	Cook Inlet -Major Kodiak -Minor	Cook Inlet -Major Kodiak -Minor	Cook Inlet -Major Kodiak -Minor
1990	81,000	TIMING			Potential Combination of Kodiak, Cook Inlet, and Chignik Stocks
		LENGTH	Cook Inlet -Major Kodiak -Minor	Kodiak -Major Cook Inlet -Minor	
		WEIGHT	Cook Inlet -Major Kodiak -Minor	Kodiak -Major Cook Inlet -Minor	
		AGE Composition	Cook Inlet -Major Kodiak -Minor Chignik-Minor	Cook Inlet -Major Kodiak -Minor Chignik-Minor	Cook Inlet -Major Kodiak -Minor Chignik-Minor

-Continued-

Table 1. (page 2 of 3)

YEAR	TOTAL CATCH	STOCK COMPOSITION			
		METHOD	RESULTS		
			MAINLAND	AFOGNAK	ENTIRE NORTH SHELIKOF
1991	53,000	Scale Patterns (1.3 & -2.3)	Cook Inlet -Major Kodiak -Minor Chignik-Minor	Cook Inlet -Major? Kodiak -Minor?	Cook Inlet -Major Kodiak -Minor Chignik-Minor
		TIMING			Potentially, Kodiak Cook Inlet, and Chignik Stocks
		LENGTH	Indefinite	Indefinite	Indefinite
		WEIGHT	Kodiak -Major Cook Inlet -Minor? Chignik- Minor	Kodiak -Major Cook Inlet -Minor? Chignik- Minor	Kodiak -Major Cook Inlet -Minor? Chignik- Minor
		AGE Composition			Cook Inlet -Major Kodiak -Minor Chignik-Minor
		Age Markers (age-0. & 3.)	Kodiak -Minor	Kodiak -Minor	Kodiak -Minor

-Continued-

Table 1. (page 3 of 3)

YEAR	TOTAL CATCH	STOCK COMPOSITION			
		METHOD	RESULTS		
			MAINLAND	AFOGNAK	ENTIRE NORTH SHELIKOF
1992	179,000	TIMING			Potentially, Kodiak Cook Inlet, and Chignik Stocks
		WEIGHT	Cook Inlet and Chignik - Major? Kodiak -Minor	Cook Inlet and Chignik - Major? Kodiak -Minor	Cook Inlet and Chignik - Major? Kodiak -Minor
		AGE Composition			Cook Inlet -Major Kodiak -Minor Chignik-Minor
		Age Markers (age-0. & 3.)	Kodiak -Minor	Kodiak -Minor	Kodiak -Minor
1988-92		ALL METHODS	Cook Inlet -Major Kodiak -Minor Chignik-Minor	Blend Cook Inlet and Kodiak	Cook Inlet -Major Kodiak -Minor Chignik-Minor

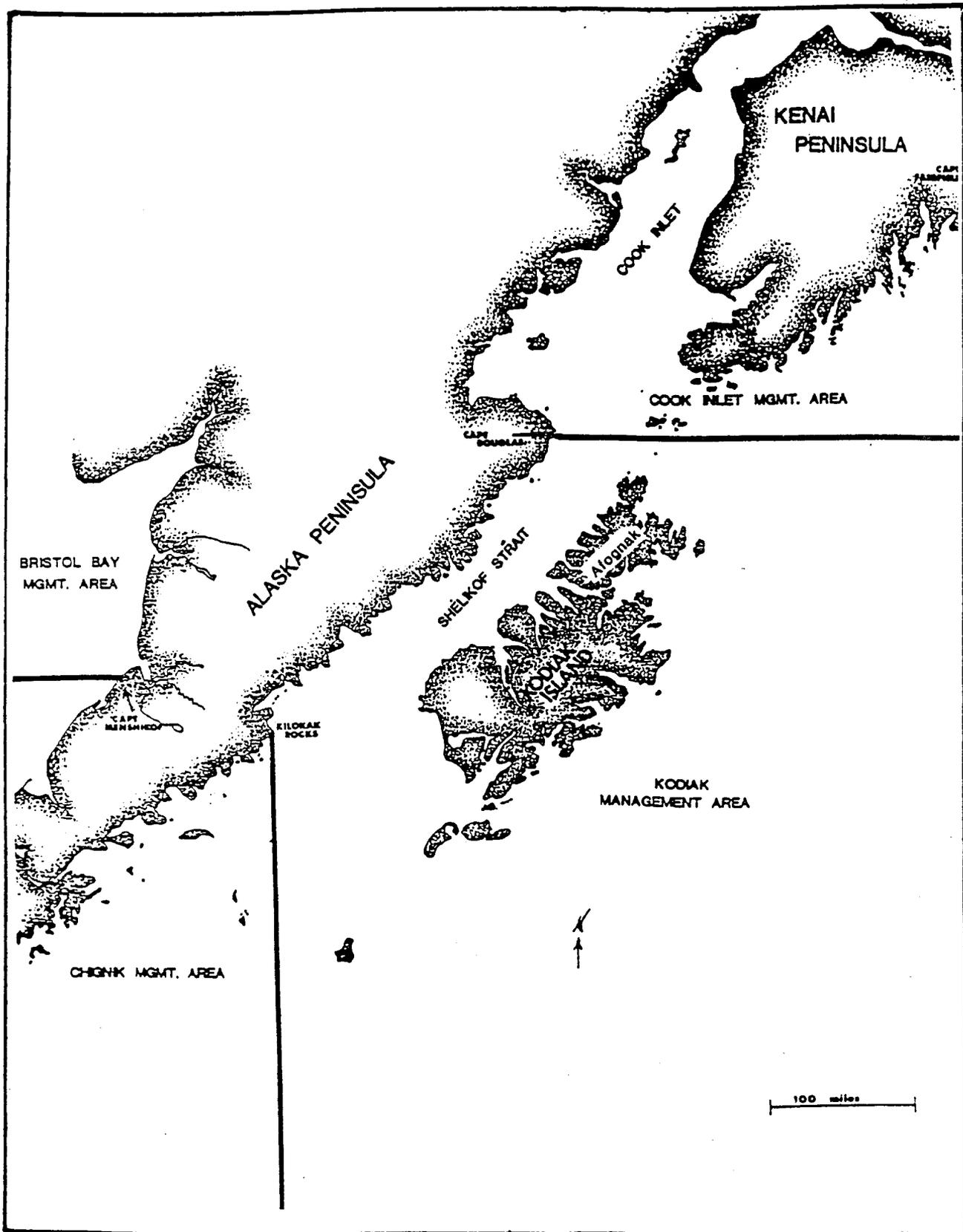


Figure 1. Map of the Kodiak Management Area and adjacent areas.

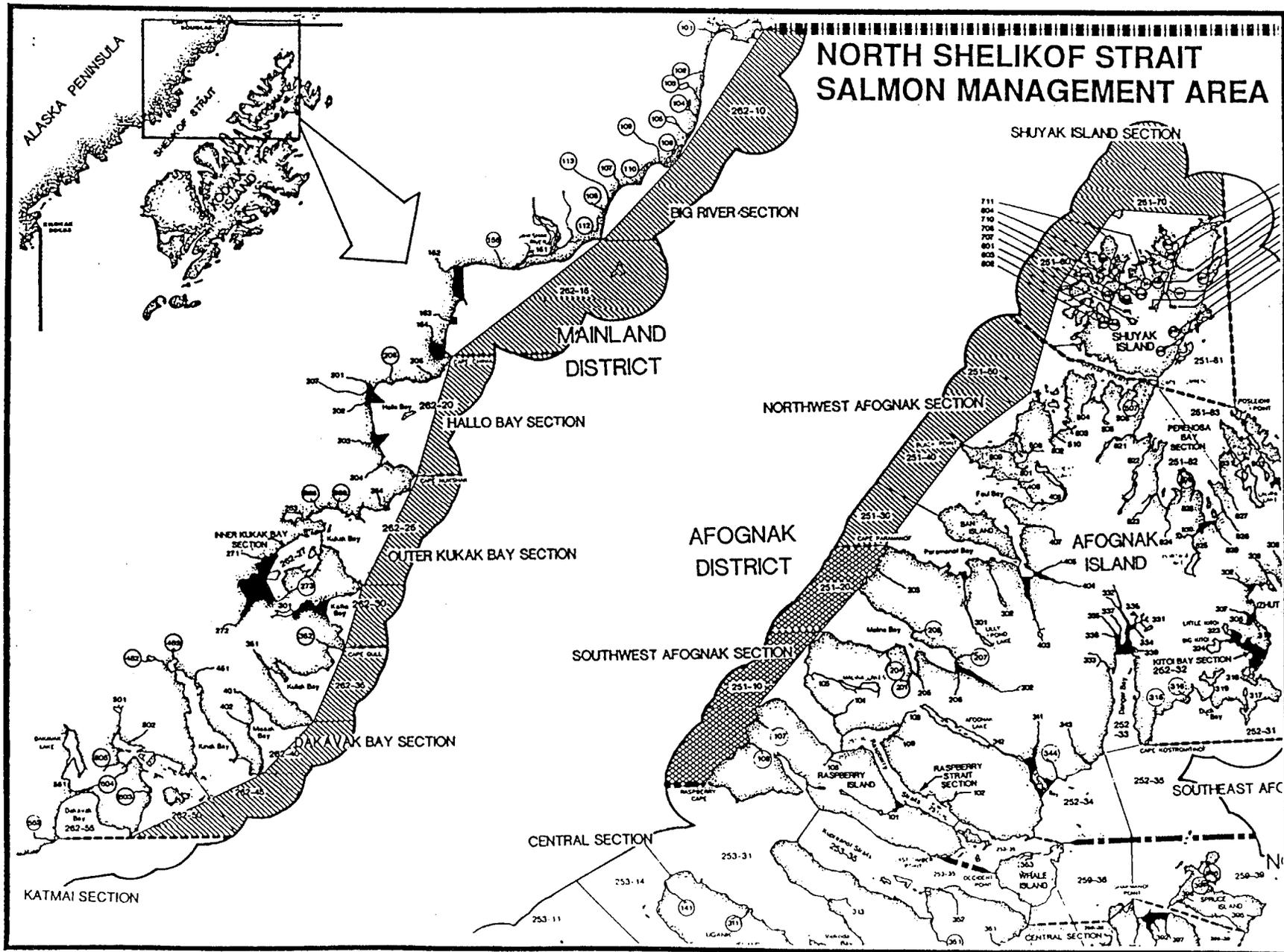
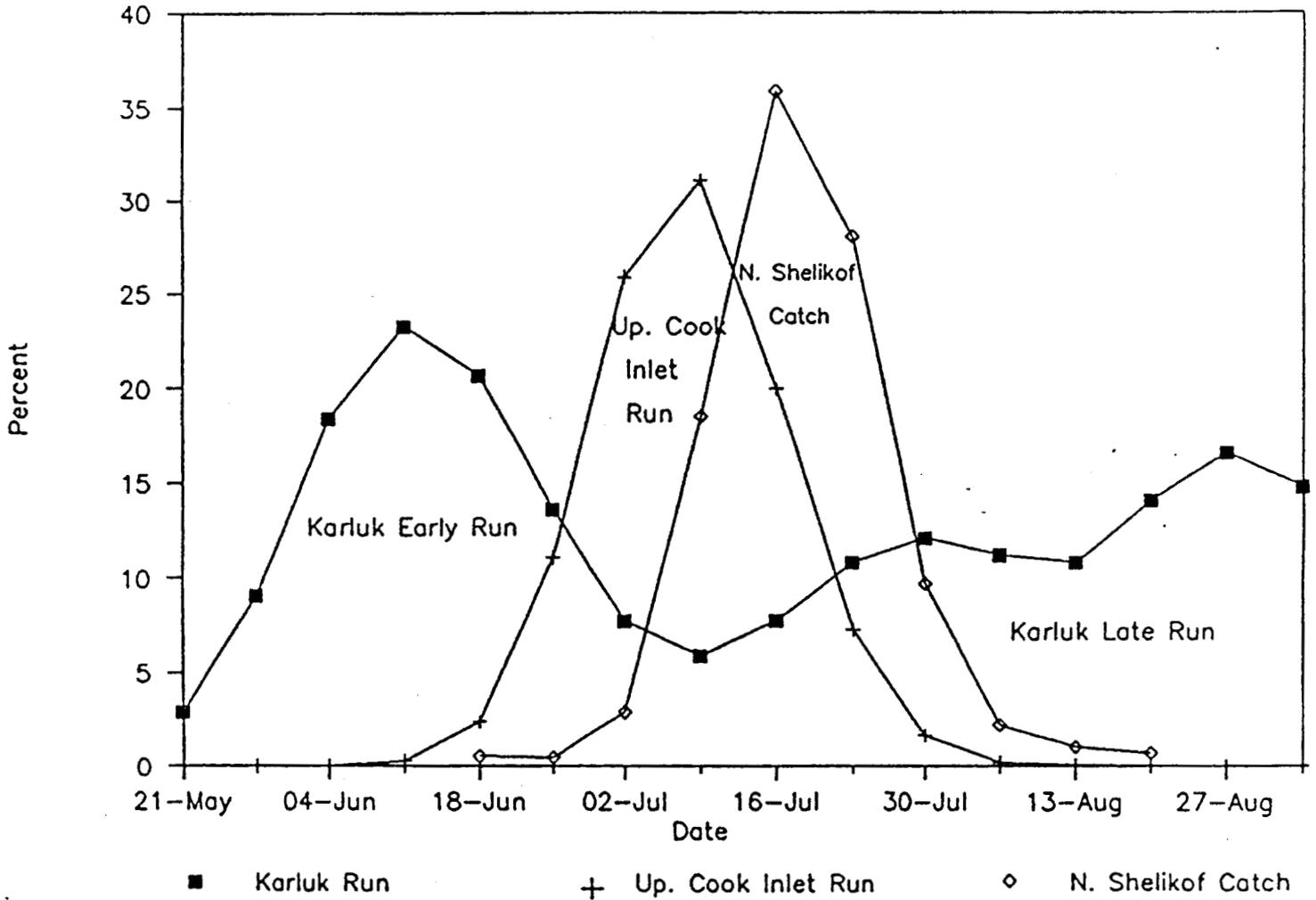


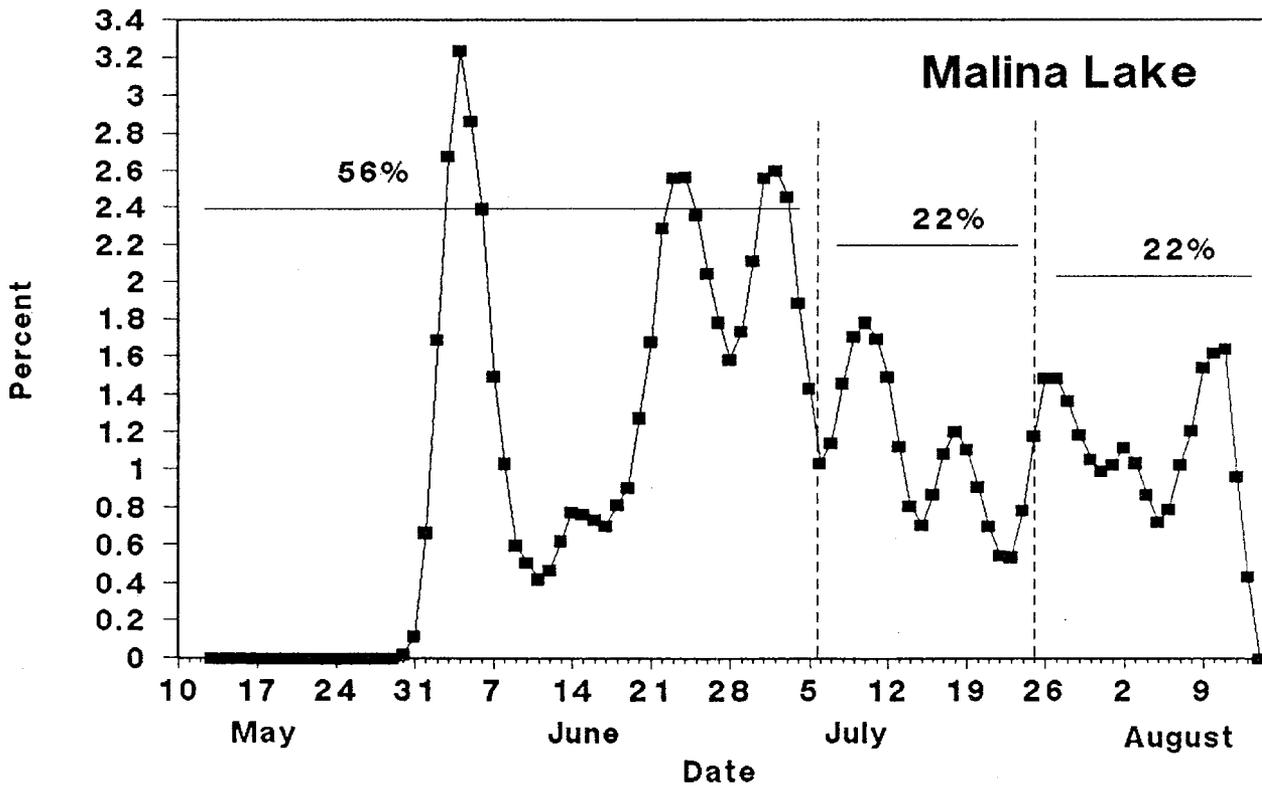
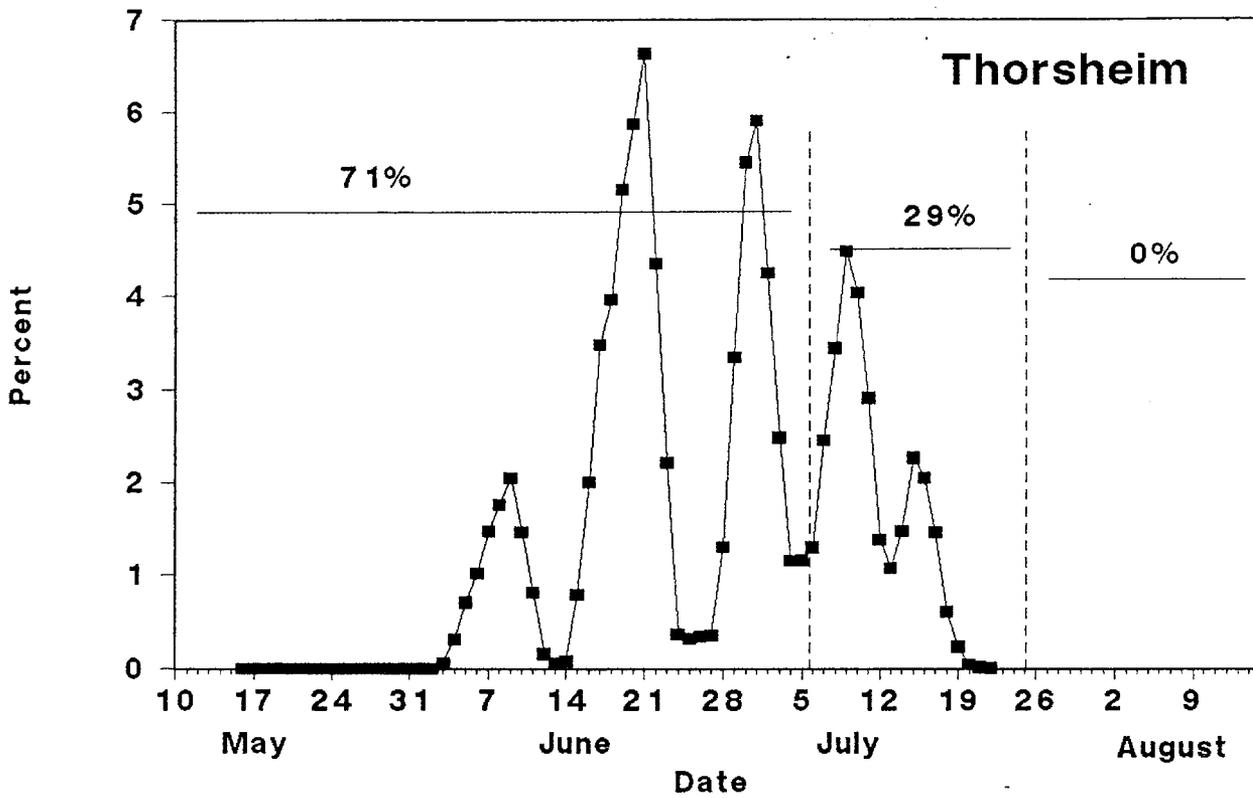
Figure 2. Map of the area addressed in the North Shelikof Strait Management Plan, with seaward and shoreward zones defined.



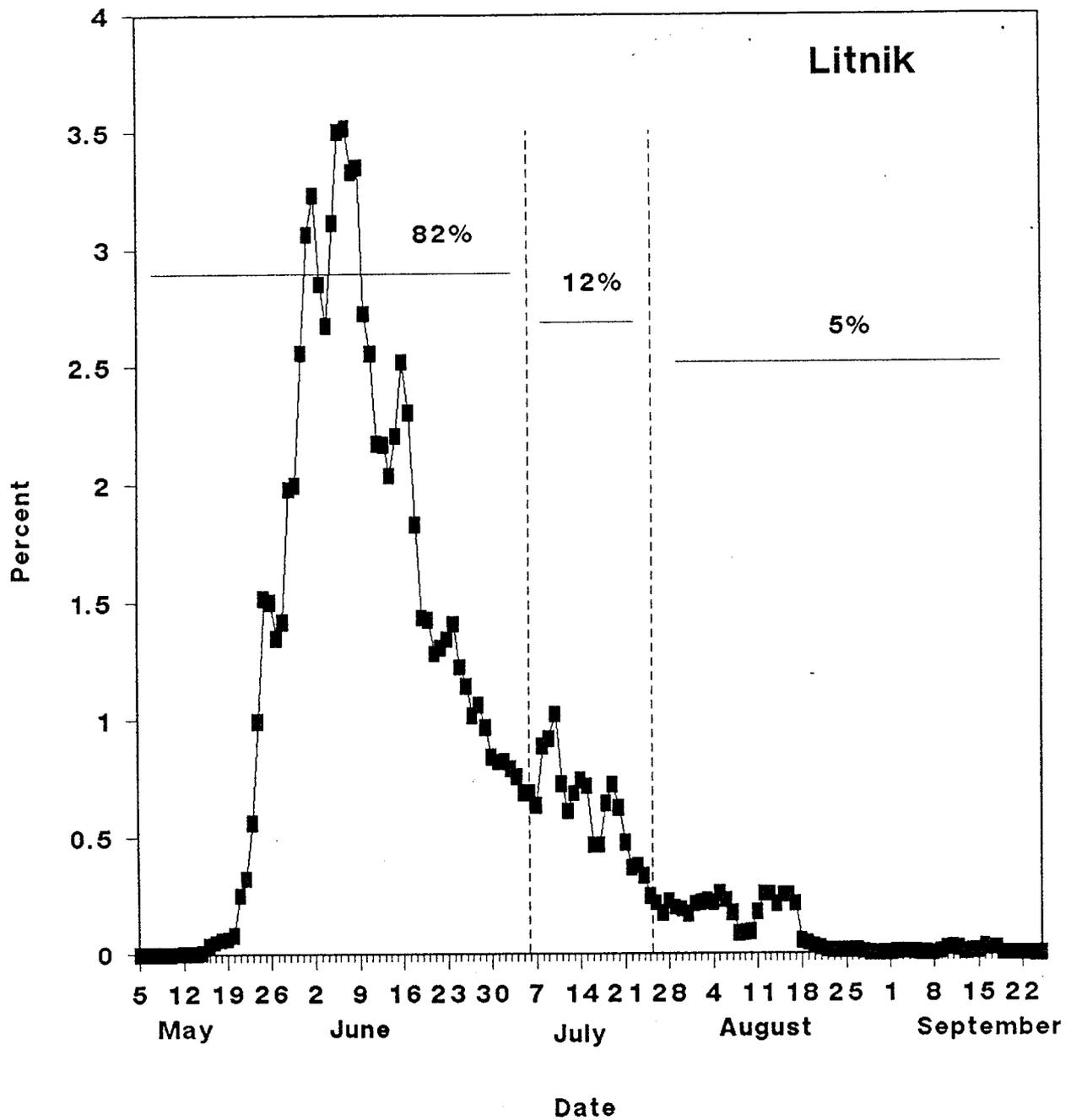
Appendix A.1. Estimated timing of early and late run Karluk, and Upper Cook Inlet sockeye salmon in the North Shelikof Strait relative to the timing of the North Shelikof Strait catch, 1988.

Appendix A.2. Estimated sockeye salmon harvest by stock, area, and date based on scale pattern analysis of age-1.3 and age-2.3 fish within the North Shelikof Strait, 6 July through 25 July, 1990.

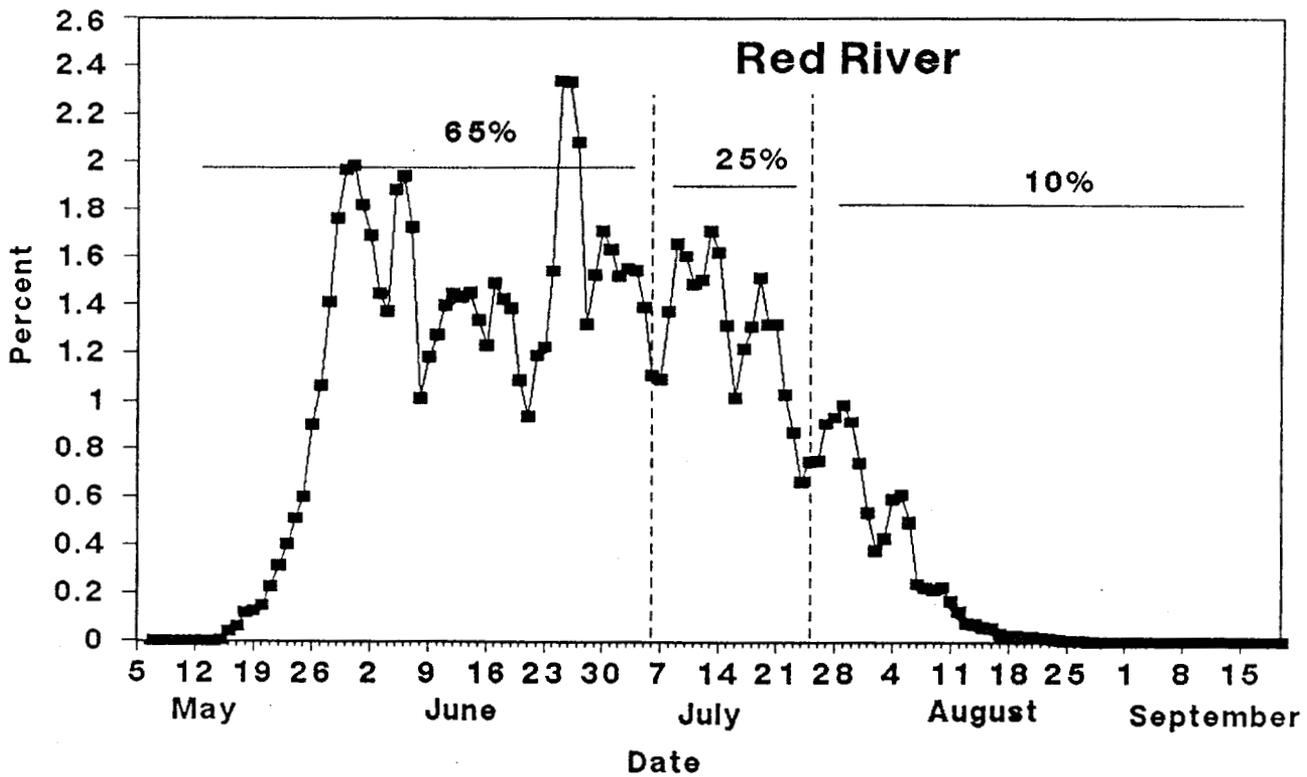
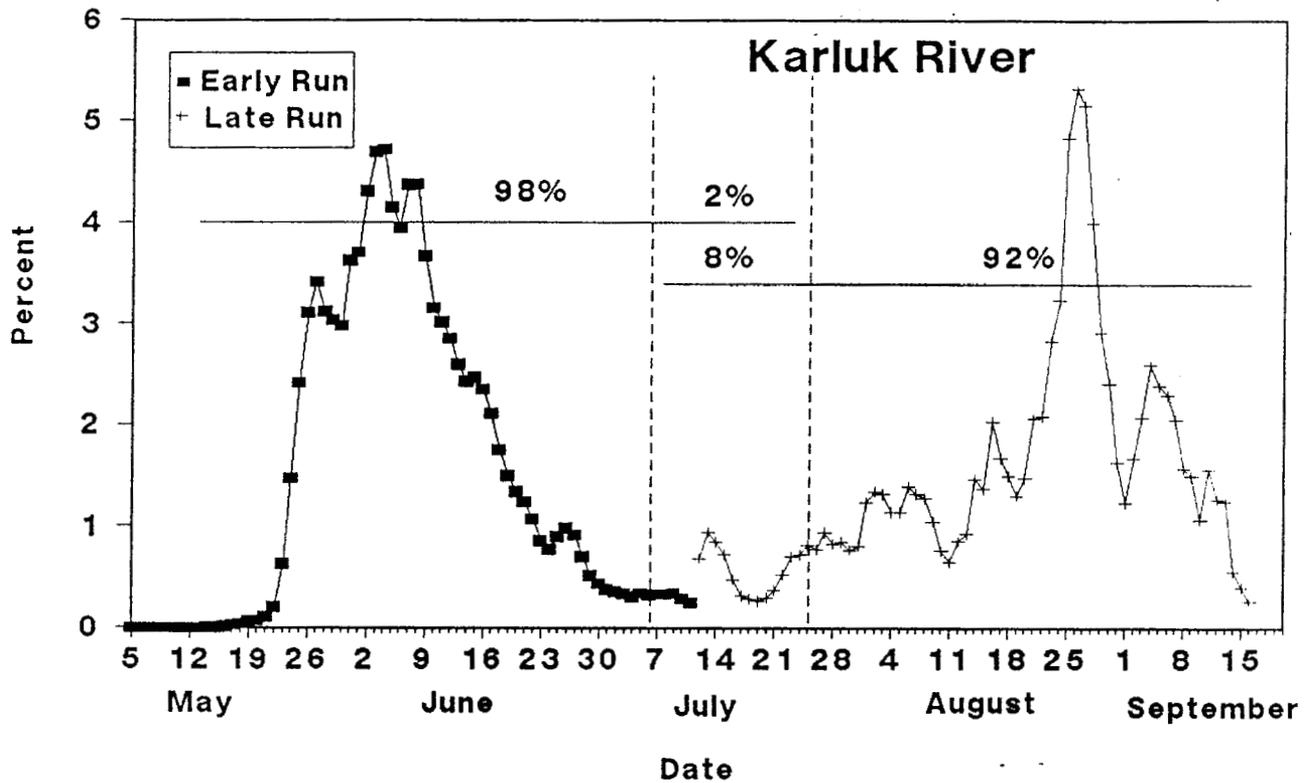
North Shelikof Area	Strait	Time Period	Stock of Origin			Total
			Cook Inlet	Kodiak	Chignik River	
<i>Mainland District</i>						
	6 July-17	July	# 24,705 % 73.8	3,958 11.8	4,796 14.4	33,458 100.0
	18 July-25	July	# 17,459 % 91.4	0 0.0	1,640 8.6	19,099 100.0
	6 July-25	July	# 42,164 % 80.2	3,958 7.5	6,435 12.3	52,557 100.0
<i>Afognak District</i>						
	6 July-17	July	# 10,929 % 59.7	7,391 40.3	0 0.0	18,320 100.0
	18 July-25	July	# 8,076 % 82.6	1,705 17.4	0 0.0	9,781 100.0
	6 July-25	July	# 19,005 % 67.6	9,096 32.4	0 0.0	28,101 100.0
Total	6 July-25	July	# 61,169 % 75.8	13,054 16.2	6,435 8.0	80,658 100.0



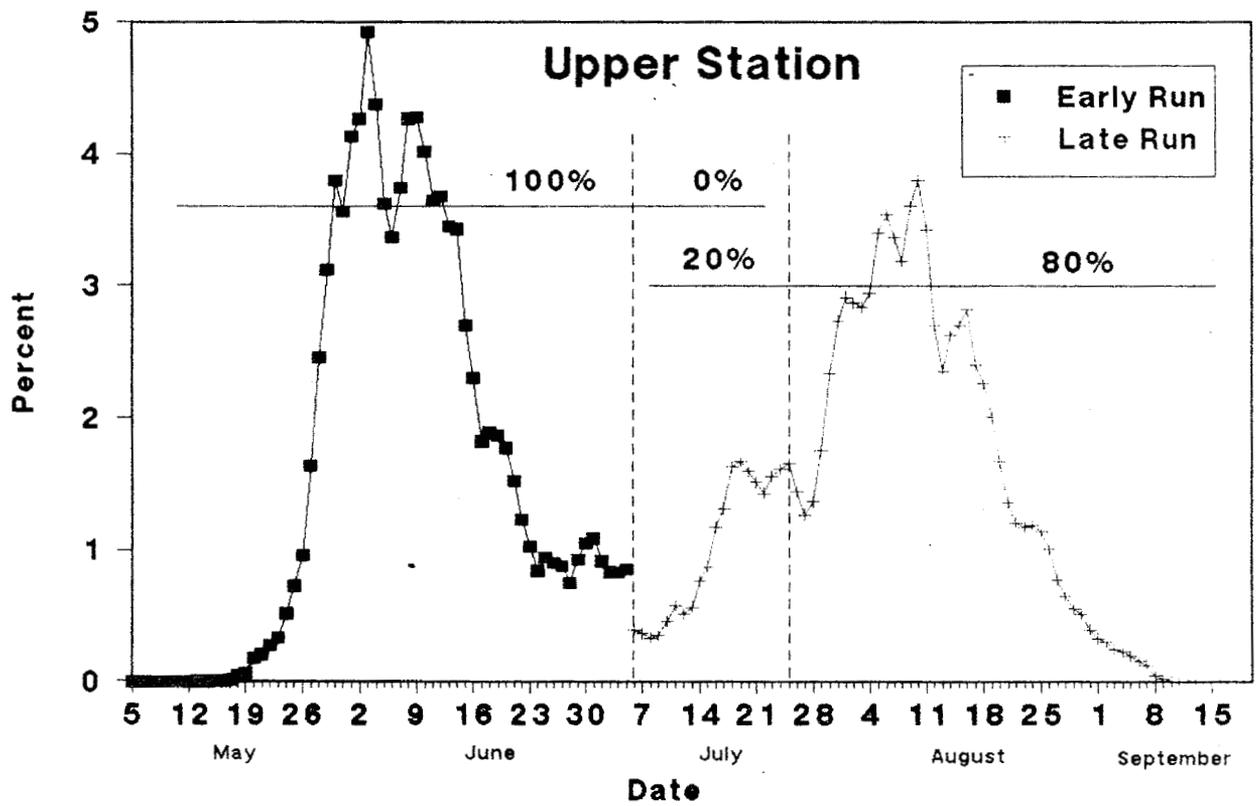
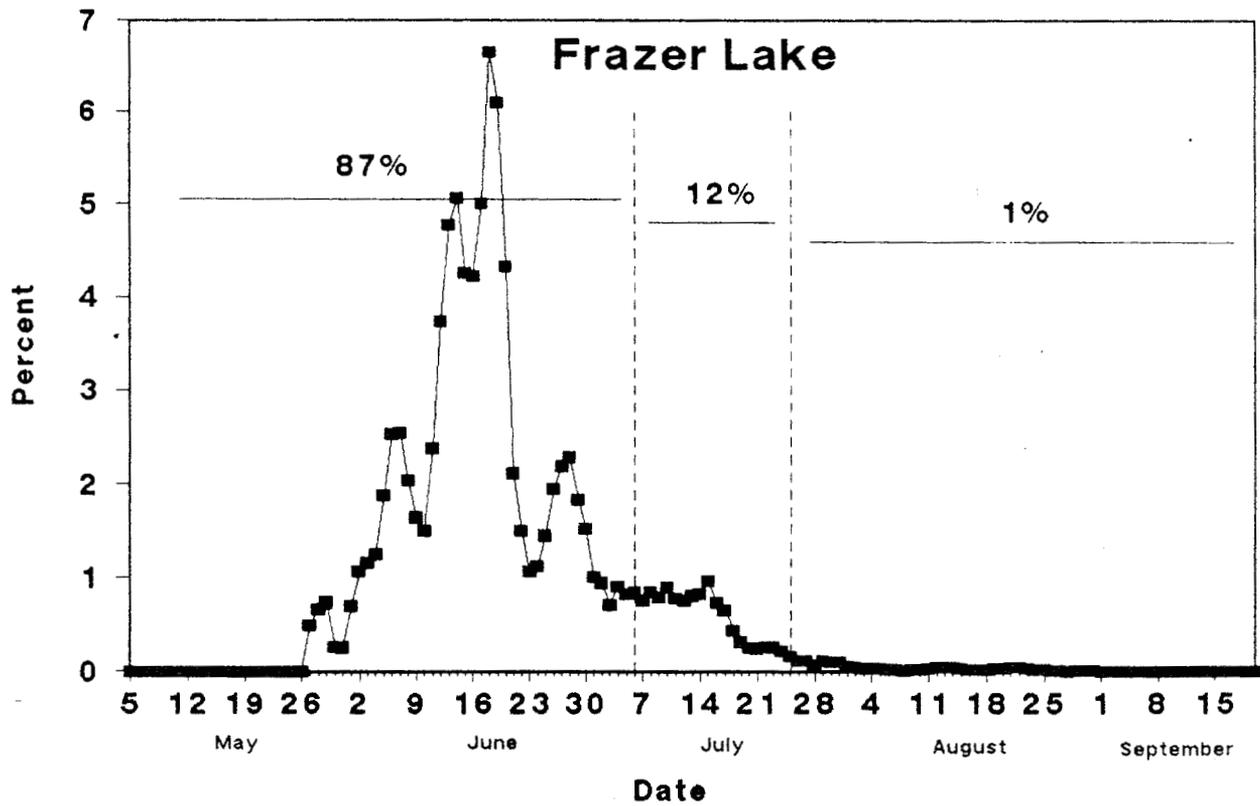
Appendix A. 3. Estimated run timing of Thorsheim and Malina Lake sockeye salmon in the North Shelikof Strait.



Appendix A.4. Estimated run timing of Litnik sockeye salmon in the North Shelikof Strait.



Appendix A.5. Estimated run timing of Karluk River and Red River sockeye salmon in the North Shelikof Strait.

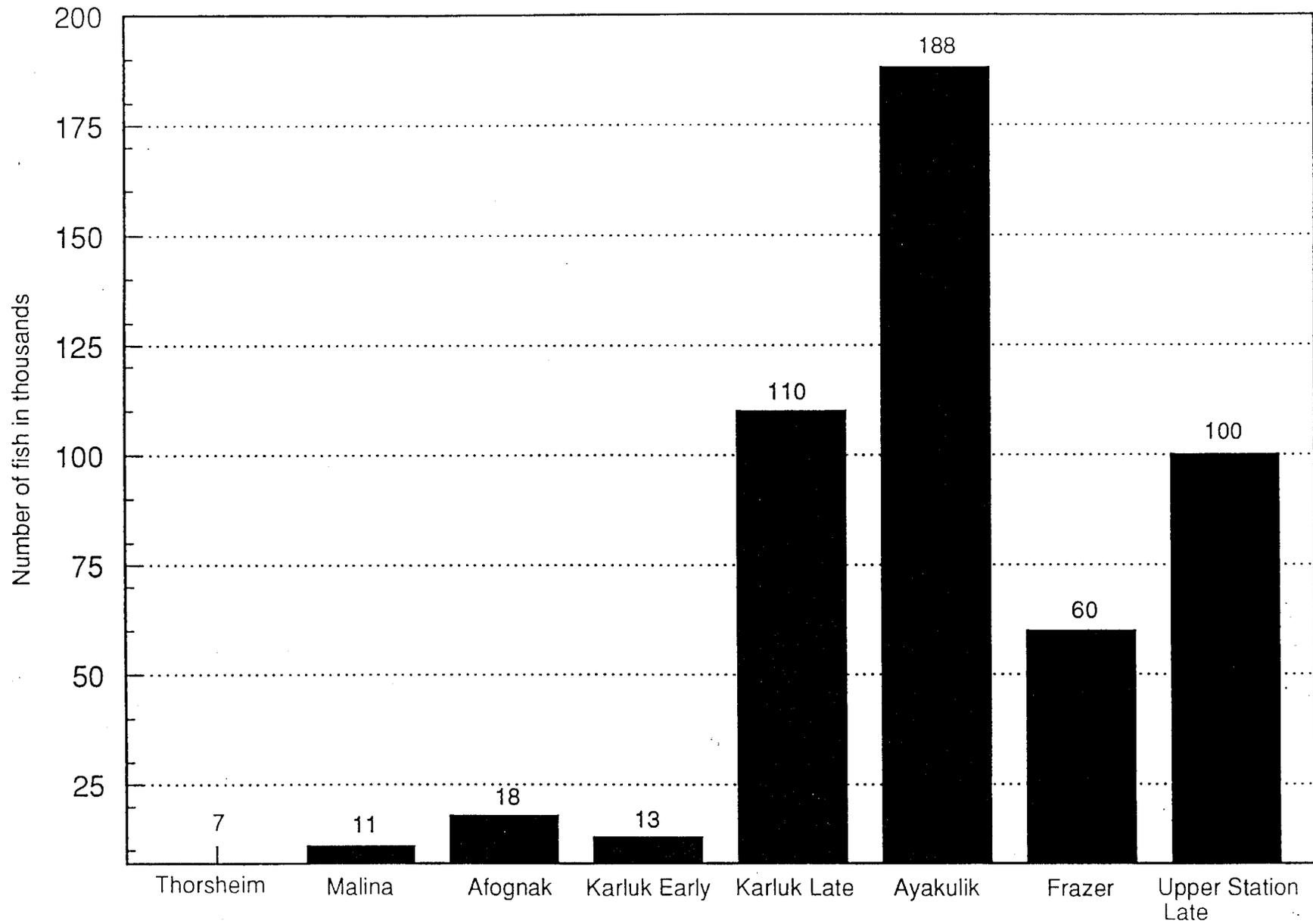


Appendix A. 6. Estimated run timing of Frazer Lake and Upper Station sockeye salmon in the North Shelikof Strait.

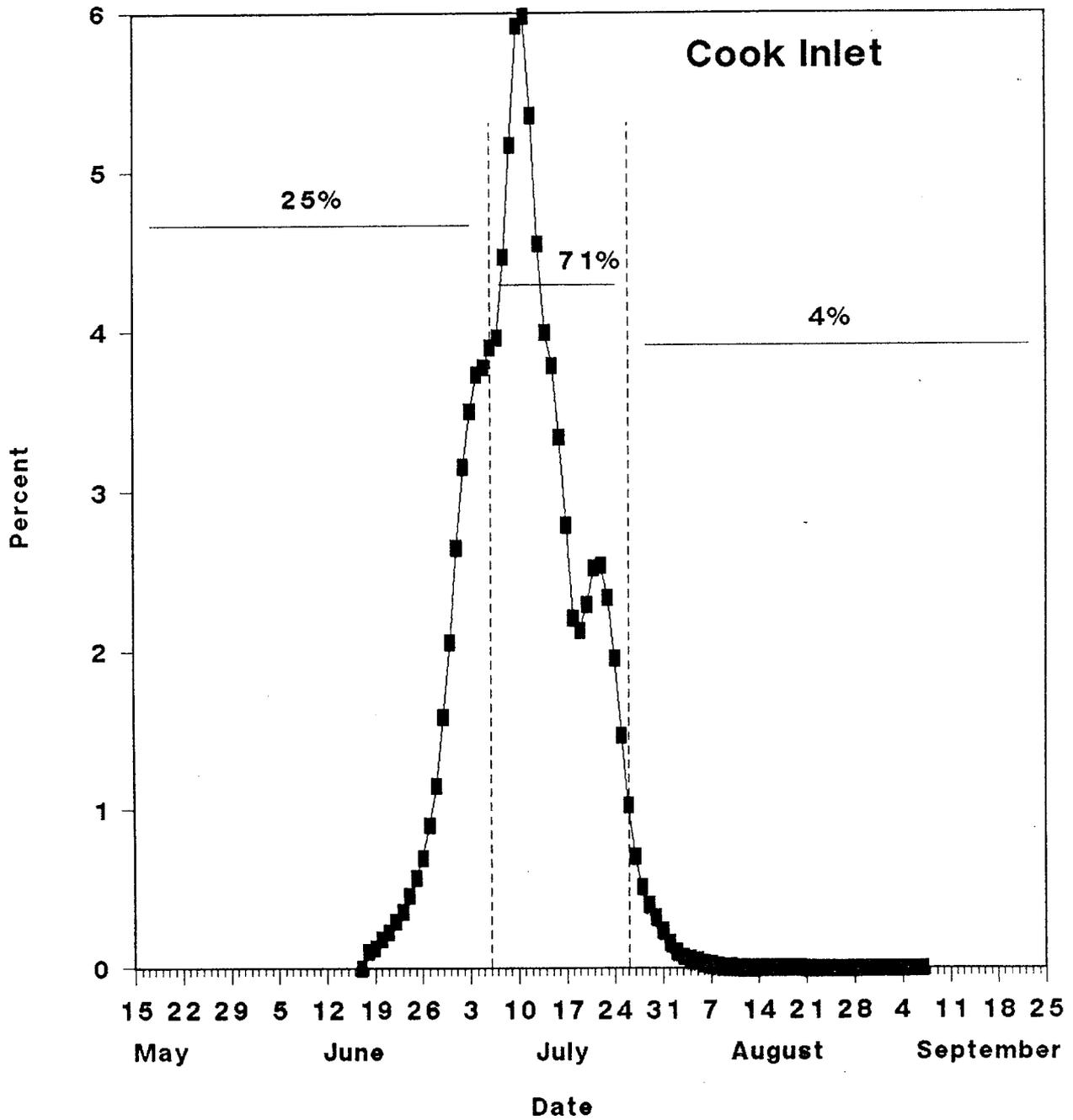
Appendix A.7. Desired escapement goal, estimated run timing, and run potential of selected Kodiak salmon stocks during the North Shelikof Strait fishery.

Stock	Adjustment Time From Escapement Destination (days prior)	Desired Escapement Goal	North Shelikof Strait Timing			Est. Total Run Potential (1,000's)	Est. Run Potential during 7/6-25 period (1,000's) ^a
			Pre. July 6	July 6-25	Post July 26		
Thorsheim	0	10	71%	29%	0%	25	7
Malina	2	20	56%	22%	22%	50	11
Litnik	5	60	82%	12%	5%	150	18
Karluk							
Early Run	10	250	98%	2%	0%	625	13
Late Run	10	550	0%	8%	92%	1,375	110
Ayakulik (Red)	8	300	65%	25%	10%	750	188
Frazer	10	200	87%	12%	1%	500	60
Upper Station							
Early Run	10	75	100%	0%	0%	188	0
Late Run	10	200	0%	20%	80%	500	100
Total		1,665				4,163	506

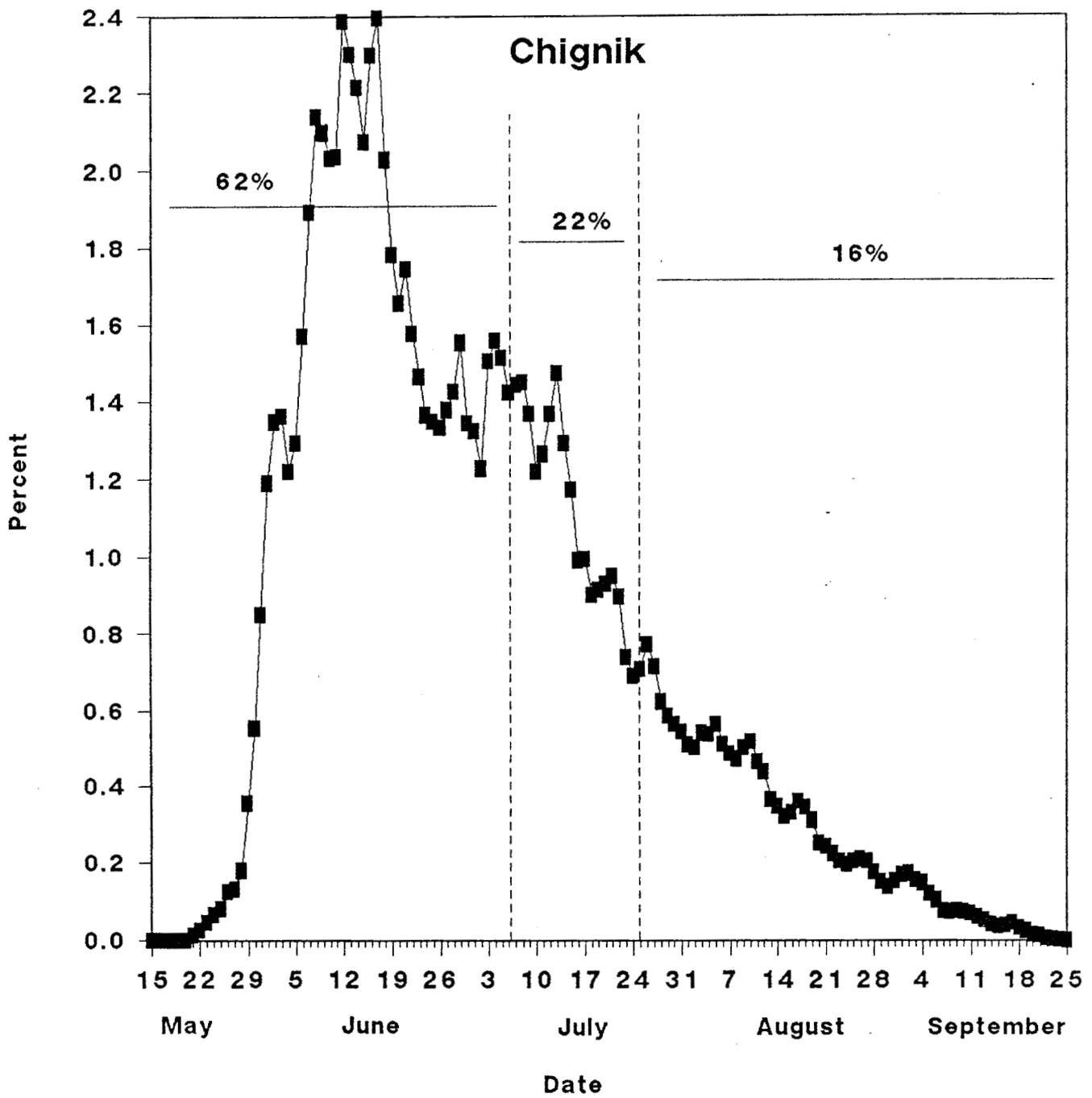
^a Only a fraction of these fish would be present in the NSS. This is based on previous tagging studies which indicate that NSS is one of the several migration paths used by Kodiak stocks enroute to their natal streams (Tyler et al. 1986).



Appendix A.8. Estimated sockeye salmon run strength of selected Kodiak systems adjusted to the North Shelikof Strait fishery of 6 July through 25 July.



Appendix A.9. Estimated run timing of Cook Inlet late run sockeye salmon in the North Shelikof Strait.

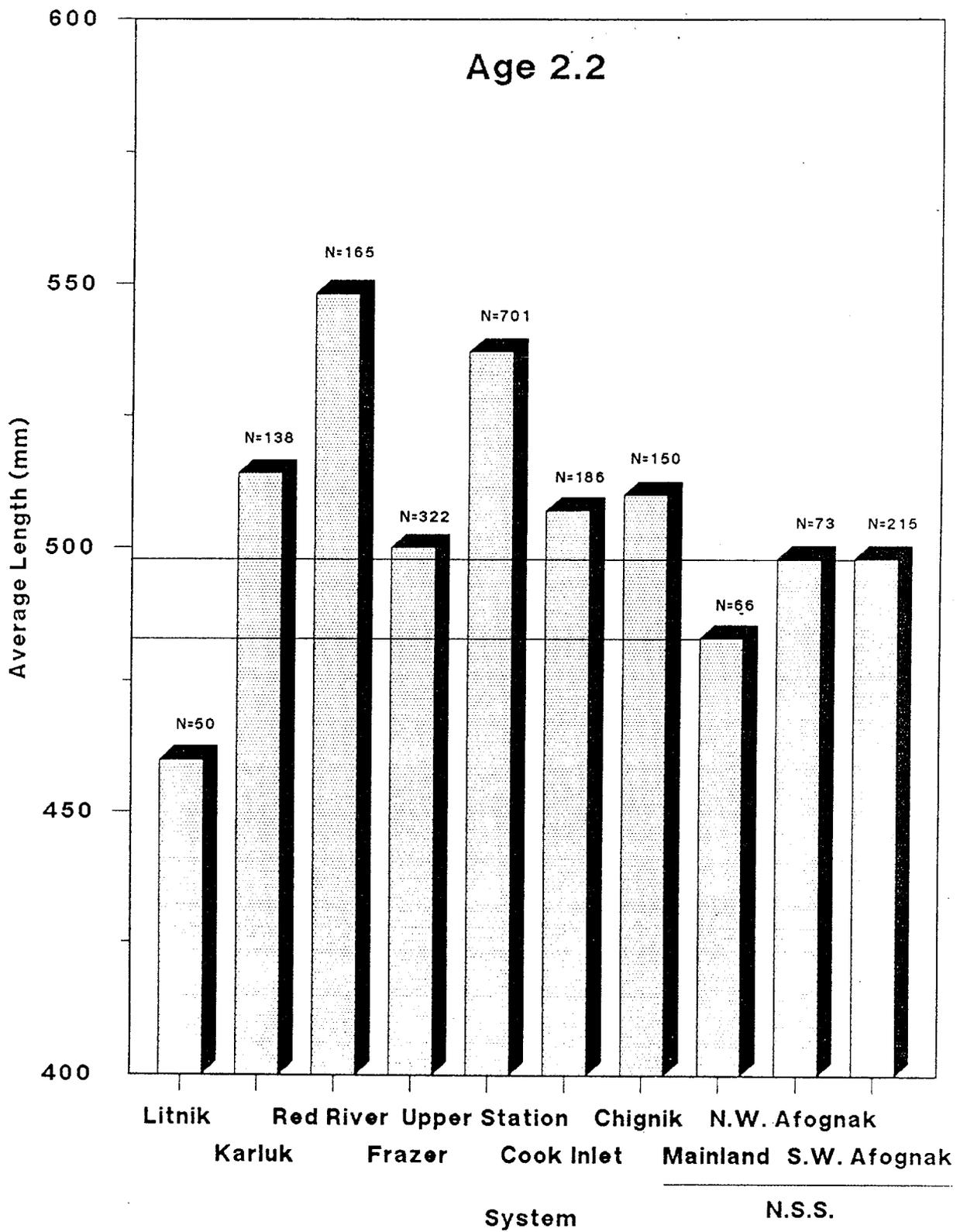


Appendix A.10. Estimated run timing of Chignik sockeye salmon in the North Shelikof Strait.

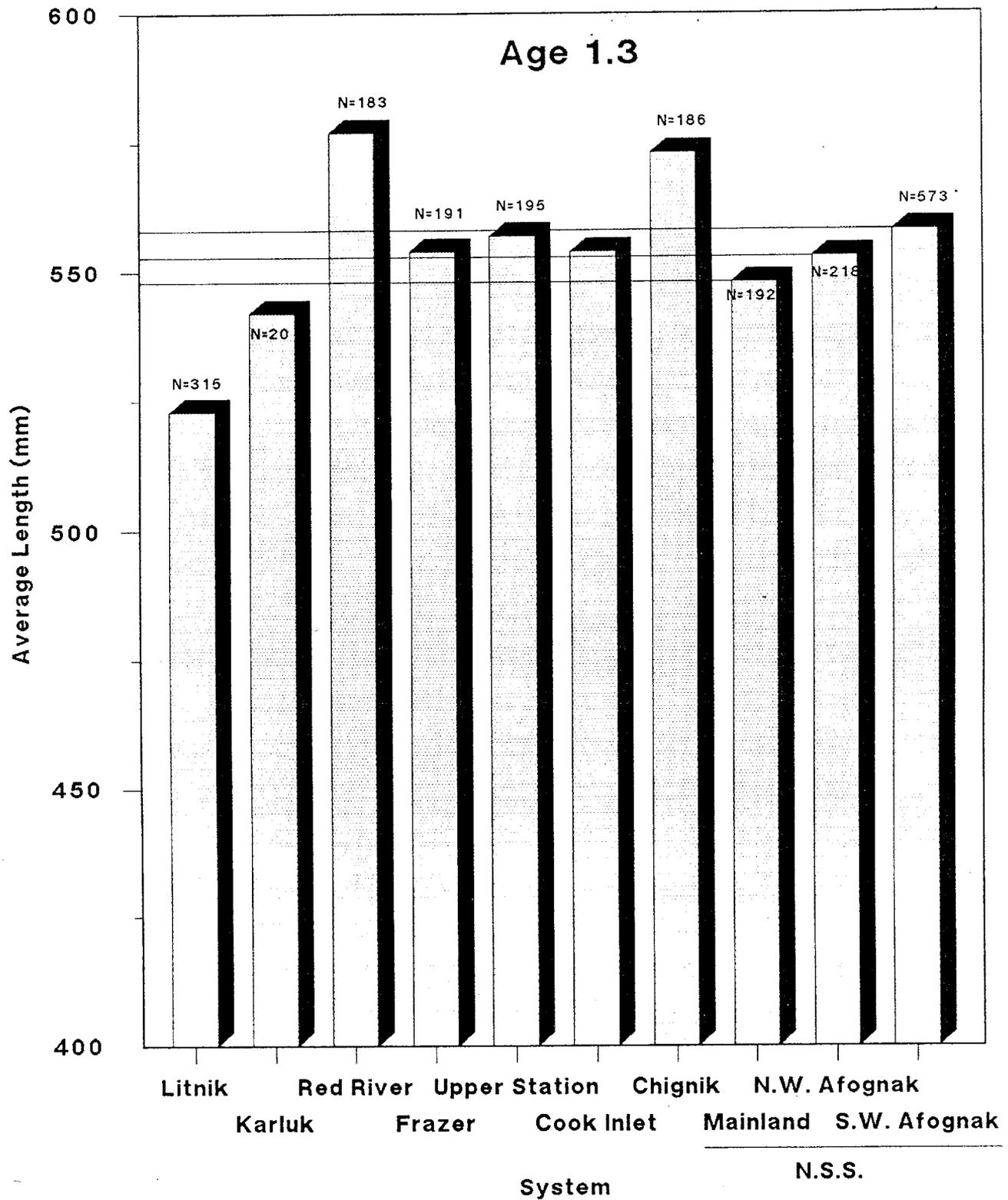
Appendix B.1.

Mean length and standard error of age-1.3, -2.3, and -2.2, sockeye salmon sampled from selected fisheries and escapements, 1991.

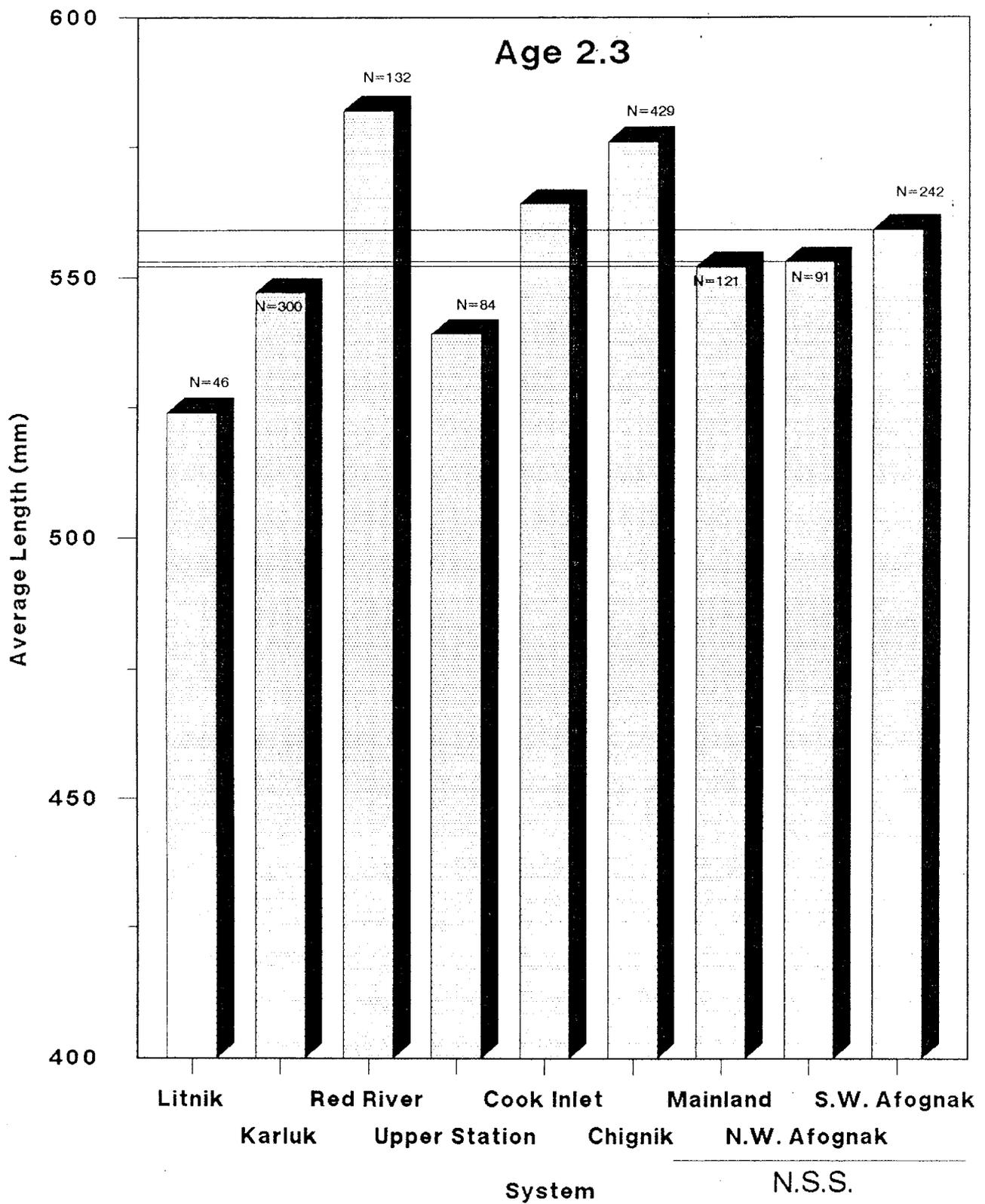
Location	AGE-2.2			AGE-1.3			AGE-2.3		
	N	Mean	SE	N	Mean	SE	N	Mean	SE
Escapement									
Litnik	50	460	6.5	315	523	2.1	46	524	4.6
Karluk	138	514	3.6	20	542	7.6	300	547	1.8
Red River	165	548	2.0	183	577	2.1	132	582	2.7
Frazer	322	500	1.3	191	554	2.0	N/A		
Upper Station	701	537	1.1	195	557	1.9	84	539	4.0
Catch									
Cook Inlet	186	507	2.8	1383	554	1.0	475	564	1.7
Chignik	150	510	4.2	186	573	2.1	429	576	2.5
North Shelikof									
Mainland	66	483	3.6	192	548	2.4	121	552	2.9
N.W. Afognak	73	498	4.0	218	553	2.0	91	553	3.4
S.W. Afognak	215	498	2.2	573	558	1.4	242	559	2.2



Appendix B.2. Mean length of age-2.2 sockeye salmon sampled from selected stocks and the North Shelikof Strait catch, 1991.



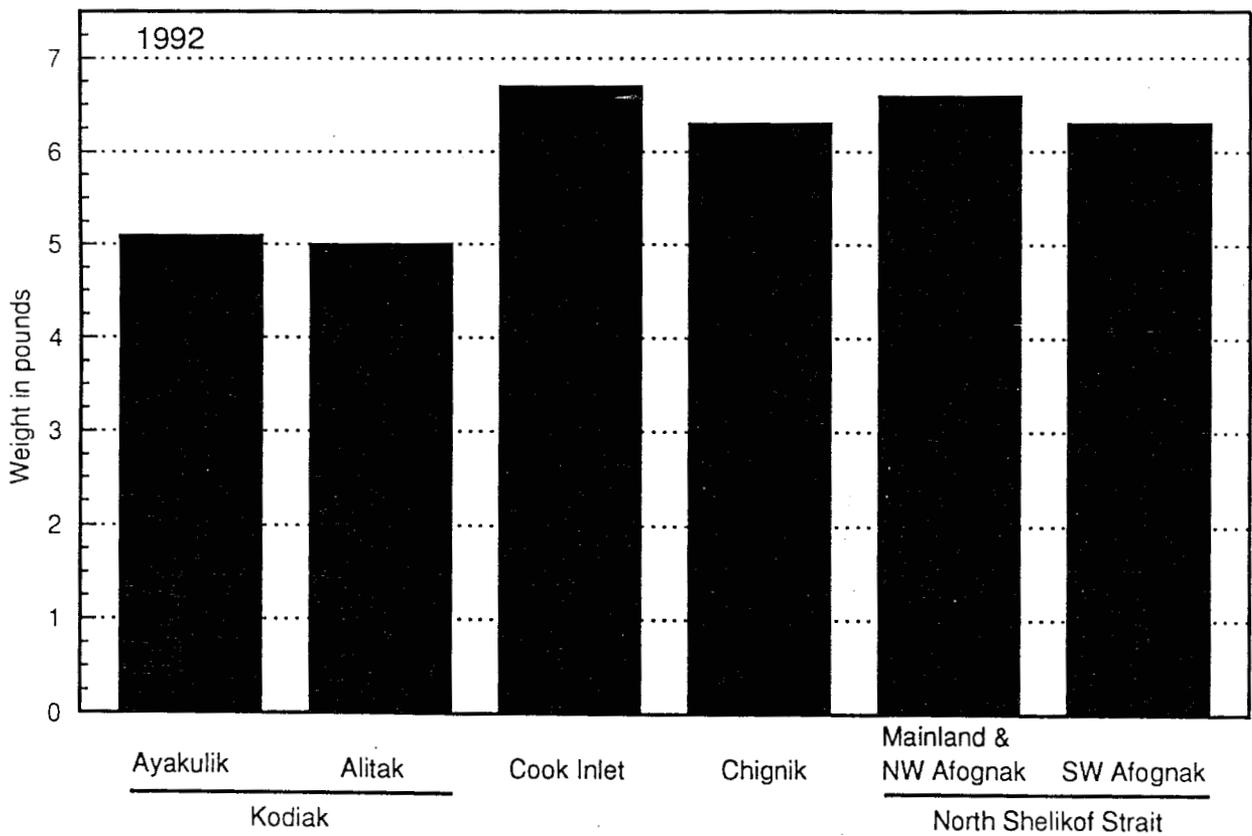
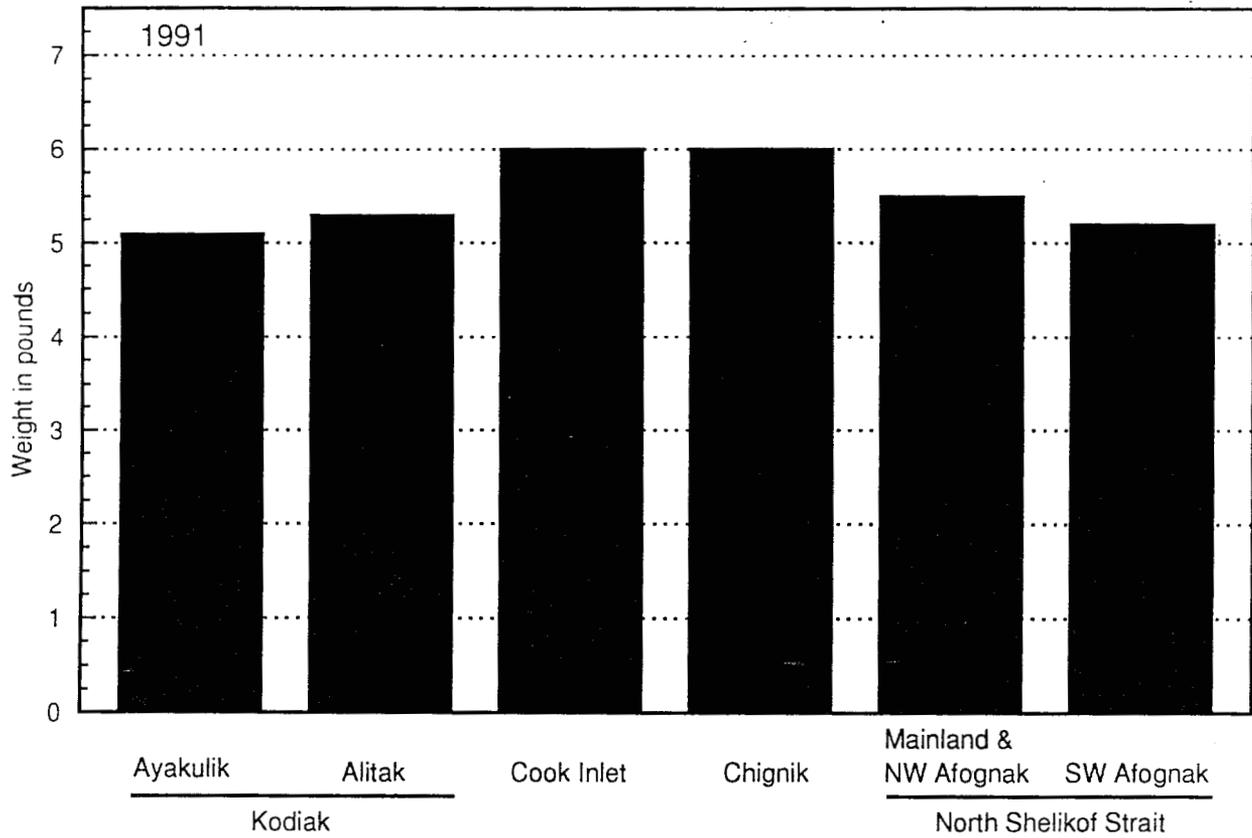
Appendix B.3. Mean length of age-1.3 sockeye salmon sampled from selected stocks and the North Shelikof Strait catch, 1991.



Appendix B.4. Mean length of age-2.3 sockeye salmon sampled from selected stocks and the North Shelikof Strait catch, 1991.

Appendix B.5. Average weight, in pounds, of sockeye salmon sampled from Kodiak, Cook Inlet, and Chignik fisheries and escapements, 1991 and 1992.

Location	Year	
	1991	1992
North Shelikof Strait Fishery		
Mainland & NW Afognak	5.5	6.6
Southwest Afognak	5.2	6.3
Kodiak Terminal Fisheries		
Ayakulik	5.1	5.1
Cape Alitak	5.3	5.0
Cook Inlet		
Drift Gillnet	6.0	6.7
Kenai River Escapement	5.1	N/A
Kasilof River Escapement	4.1	N/A
Chignik	6.0	6.3



Appendix B.6. Average weight, in pounds, of sockeye salmon sampled from selected fisheries, 1991 and 1992.

Appendix C.1.

Estimated age composition of the North Shelikof Strait, sockeye catch by area and week, 6 July through 25 July, 1991.

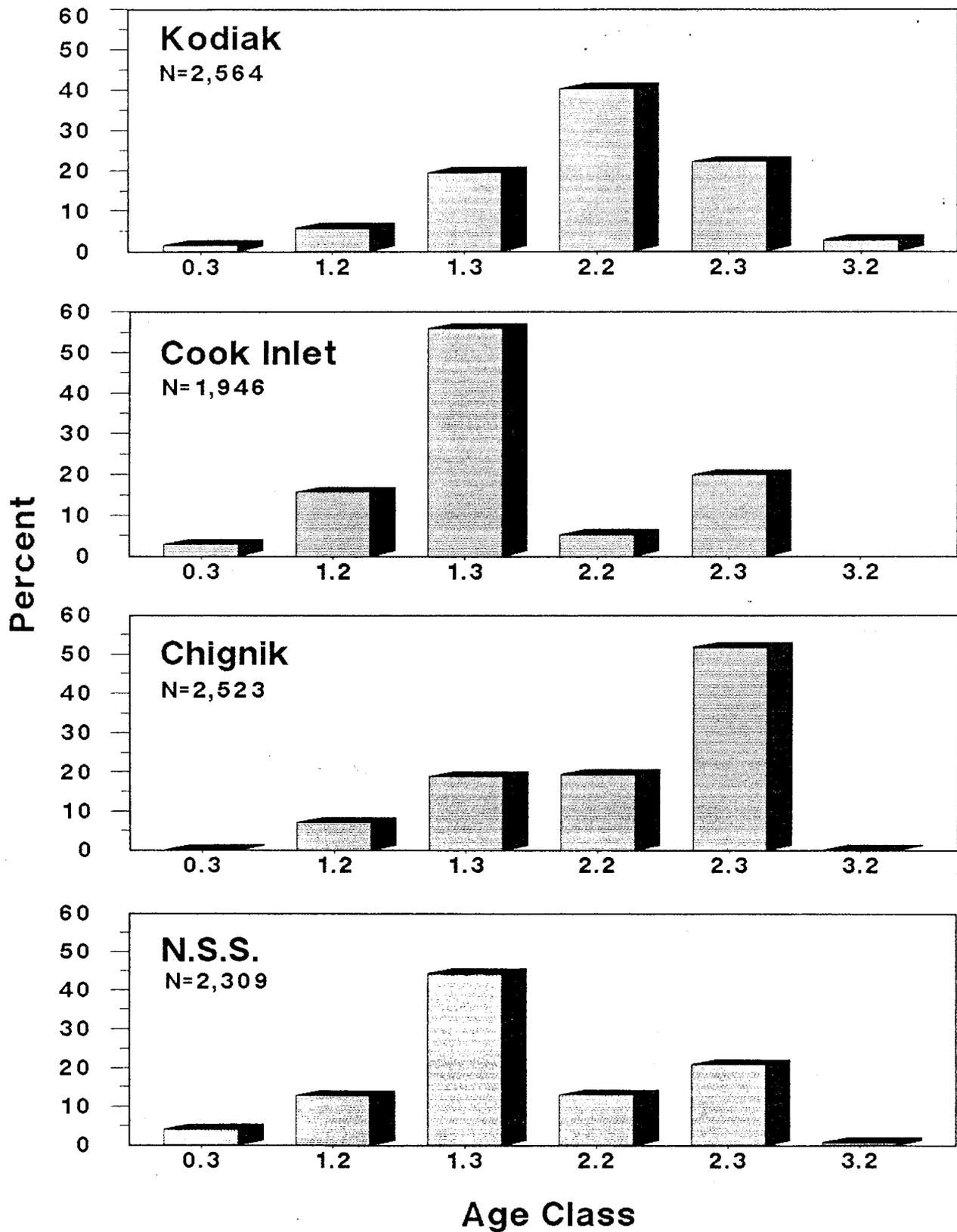
Area	Week	Sample Size	Age Classes													Total		
			0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	3.1	1.4	2.3	3.2	2.4		3.3	
Mainland District																		
	7/06-7/11	0	percent	0.4	0.2	1.8	16.1	0.6	0.6	38.7	13.3	0.0	2.2	24.4	0.2	1.2	0.2	100.0
		7	numbers	7	3	31	279	10	10	669	230	0	38	422	3	21	3	1,728
	7/12-7/18	496	percent	0.4	0.2	1.8	16.1	0.6	0.6	38.7	13.3	0.0	2.2	24.4	0.2	1.2	0.2	100.0
		13	numbers	13	7	61	539	20	20	1,293	444	0	74	815	7	40	7	3,340
	7/19-7/25	0	percent	0.4	0.2	1.8	16.1	0.6	0.6	38.7	13.3	0.0	2.2	24.4	0.2	1.2	0.2	100.0
		26	numbers	26	13	119	1,054	40	40	2,530	870	0	145	1,594	13	79	13	6,536
	Total	496	percent	0.4	0.2	1.8	16.1	0.6	0.6	38.7	13.3	0.0	2.2	24.4	0.2	1.2	0.2	100.0
		46	numbers	46	23	211	1,872	70	70	4,492	1,544	0	257	2,831	23	140	23	11,604
N.W. Afognak and Shuyak																		
	7/06-7/11	0	percent	0.0	7.7	0.0	23.1	0.0	0.0	30.8	23.1	0.0	0.0	15.4	0.0	0.0	0.0	100.0
		0	numbers	0	127	0	381	0	0	508	381	0	0	254	0	0	0	1,652
	7/12-7/18	13	percent	0.0	7.5	0.0	23.3	0.0	0.0	30.8	23.3	0.0	0.0	15.1	0.0	0.0	0.0	100.0
		0	numbers	0	11	0	34	0	0	45	34	0	0	22	0	0	0	146
	7/19-7/25	493	percent	0.8	0.4	2.8	13.6	3.2	0.4	43.4	14.4	0.2	0.4	18.3	1.2	0.4	0.4	100.0
		44	numbers	44	22	153	735	175	22	2,346	778	11	22	987	66	22	22	5,405
	Total	506	percent	0.6	2.2	2.1	16.0	2.4	0.3	40.2	16.6	0.2	0.3	17.5	0.9	0.3	0.3	100.0
		44	numbers	44	160	153	1,150	175	22	2,899	1,193	11	22	1,263	66	22	22	7,203
S.W. Afognak																		
	7/06-7/11	507	percent	0.2	0.6	1.5	8.9	5.6	0.0	36.2	28.5	0.4	0.6	13.6	3.5	0.0	0.4	100.0
		11	numbers	11	34	86	512	321	0	2,081	1,636	22	34	781	199	0	22	5,741
	7/12-7/18	489	percent	0.1	0.5	6.5	11.1	0.5	0.0	50.5	8.1	0.0	0.5	21.8	0.2	0.2	0.0	100.0
		17	numbers	17	101	1,347	2,315	109	0	10,504	1,674	4	95	4,543	37	37	9	20,793
	7/19-7/25	311	percent	0.9	1.2	4.2	13.2	1.2	0.0	45.5	10.8	0.0	0.9	21.6	0.3	0.0	0.3	100.0
		66	numbers	66	91	321	1,013	89	0	3,477	824	0	69	1,654	22	2	22	7,649
	Total	1,307	percent	0.3	0.7	5.1	11.2	1.5	0.0	47.0	12.1	0.1	0.6	20.4	0.8	0.1	0.2	100.0
		94	numbers	94	226	1,754	3,840	519	0	16,062	4,134	26	198	6,978	258	39	53	34,183
Grand Total																		
		2,309	percent	0.3	0.8	4.0	12.9	1.4	0.2	44.3	13.0	0.1	0.9	20.9	0.7	0.4	0.2	100.0
			numbers	184	409	2,118	6,862	764	92	23,453	6,871	37	477	11,072	347	201	98	52,990

Appendix C.2.

Estimated age composition of sockeye salmon sampled from selected stocks during the North Shelikof Strait fishery of 6 July through 25 July, 1991 and 1992.

System	Period	Sample Size	Age Class															Total
			0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	1.4	3.1	2.3	3.2	2.4	3.3	
1991																		
Kodiak Escapement																		
Litnik	7/11-7/30	519	0.0	0.0	0.3	0.0	20.0	0.4	0.0	67.0	6.5	0.0	0.0	5.8	0.0	0.0	0.0	100.0
		0	0	0	11	0	648	12	0	2,166	209	0	0	188	0	0	0	3,235
Karluk	7/16-8/04	789	0.0	0.0	0.3	0.3	0.3	0.4	0.0	2.2	27.4	0.0	0.9	51.3	9.0	0.5	7.3	100.0
		0	38	211	211	260	373	16	1,846	23,058	0	758	43,072	7,590	453	6,126	84,016	
Red River	7/14-8/02	558	0.0	0.1	0.6	0.2	11.0	0.7	0.0	31.2	29.2	0.2	0.0	25.2	1.4	0.0	0.3	100.0
		0	284	1,299	501	24,123	1,466	0	68,440	64,083	501	0	55,269	3,070	0	613	219,652	
Frazer Lake	7/11-7/15 ^a	424	0.0	0.0	0.9	0.0	0.0	20.5	0.0	7.0	71.0	0.0	0.0	0.0	0.6	0.0	0.0	100.0
		0	0	1,079	0	0	24,920	0	8,549	86,363	0	0	0	751	0	0	121,721	
Upper Station	7/16-8/04	274	0.0	0.6	0.0	25.8	1.6	0.8	0.0	29.6	36.2	0.0	0.0	4.3	1.0	0.0	0.0	100.0
		0	157	0	6,255	397	202	0	7,173	8,773	0	0	1,038	246	0	0	24,240	
Total		2,564	0.0	0.1	0.6	1.5	5.6	6.0	0.0	19.5	40.3	0.1	0.2	22.0	2.6	0.1	1.5	100.0
		0	479	2,600	6,967	25,428	26,973	16	88,174	182,486	501	758	99,567	11,657	453	6,739	452,864	
Cook Inlet Catch	7/12-7/29	1,946	0.0	0.0	0.0	2.9	15.6	0.0	0.0	55.9	5.3	0.3	0.0	20.0	0.0	0.0	0.0	100.0
Chignik Catch	7/16-8/04	2,523	0.0	0.0	0.2	0.1	7.1	0.1	0.0	18.9	19.4	0.1	0.0	51.7	0.1	1.1	1.2	100.0
1992																		
Kodiak Escapement																		
Litnik	7/11-7/30	519	0.0	0.0	49.1	0.0	9.2	21.2	0.0	11.7	2.7	0.4	0.0	5.4	0.0	0.2	0.0	100.0
		0	0	5,578	0	1,050	2,406	0	1,334	306	44	0	613	0	22	0	11,354	
Karluk	7/16-8/04	556	0.0	0.0	3.5	0.0	0.5	6.9	0.0	2.5	21.3	0.0	10.4	22.6	23.9	0.4	7.9	100.0
		0	0	525	0	83	1,051	0	376	3,227	0	1,581	3,416	3,616	64	1,194	15,131	
Red River	7/14-8/02	507	0.0	0.0	0.0	0.2	11.8	0.7	0.0	14.6	43.1	0.0	0.0	27.4	0.9	0.9	0.5	100.0
		0	0	0	93	5,620	317	0	6,983	20,601	0	0	13,117	431	410	229	47,801	
Frazer Lake	7/22-8/10	572	0.0	0.0	16.5	0.0	5.7	8.3	0.0	1.5	35.9	0.0	0.0	29.9	1.6	0.6	0.1	100.0
		0	0	4,182	0	1,437	2,100	0	388	9,135	0	0	7,590	396	165	20	25,411	
Upper Station	7/16-8/04	461	0.2	37.8	2.6	6.9	14.9	5.9	0.0	1.1	26.8	0.0	0.0	3.5	0.1	0.0	0.0	100.0
		36	5,706	398	1,041	2,253	893	0	170	4,052	4	0	533	9	0	0	15,093	
Total		2,615	0.0	5.0	9.3	1.0	9.1	5.9	0.0	8.1	32.5	0.0	1.4	22.0	3.9	0.6	1.3	100.0
		36	5,706	10,683	1,134	10,443	6,767	0	9,251	37,321	48	1,581	25,269	4,452	661	1,443	114,790	
Cook Inlet Catch	7/04-7/30	4,670	0.0	0.0	0.0	0.4	2.8	0.0	0.0	84.3	3.6	0.1	0.0	8.8	0.0	0.0	0.0	100.0
Chignik Catch	7/16-8/04	2,363	0.0	0.1	1.0	0.0	3.4	0.4	0.0	23.9	22.9	0.0	0.0	47.8	0.2	0.1	0.0	100.0

^a Last sample taken on 7/11-12, last escapement count on 7/15.

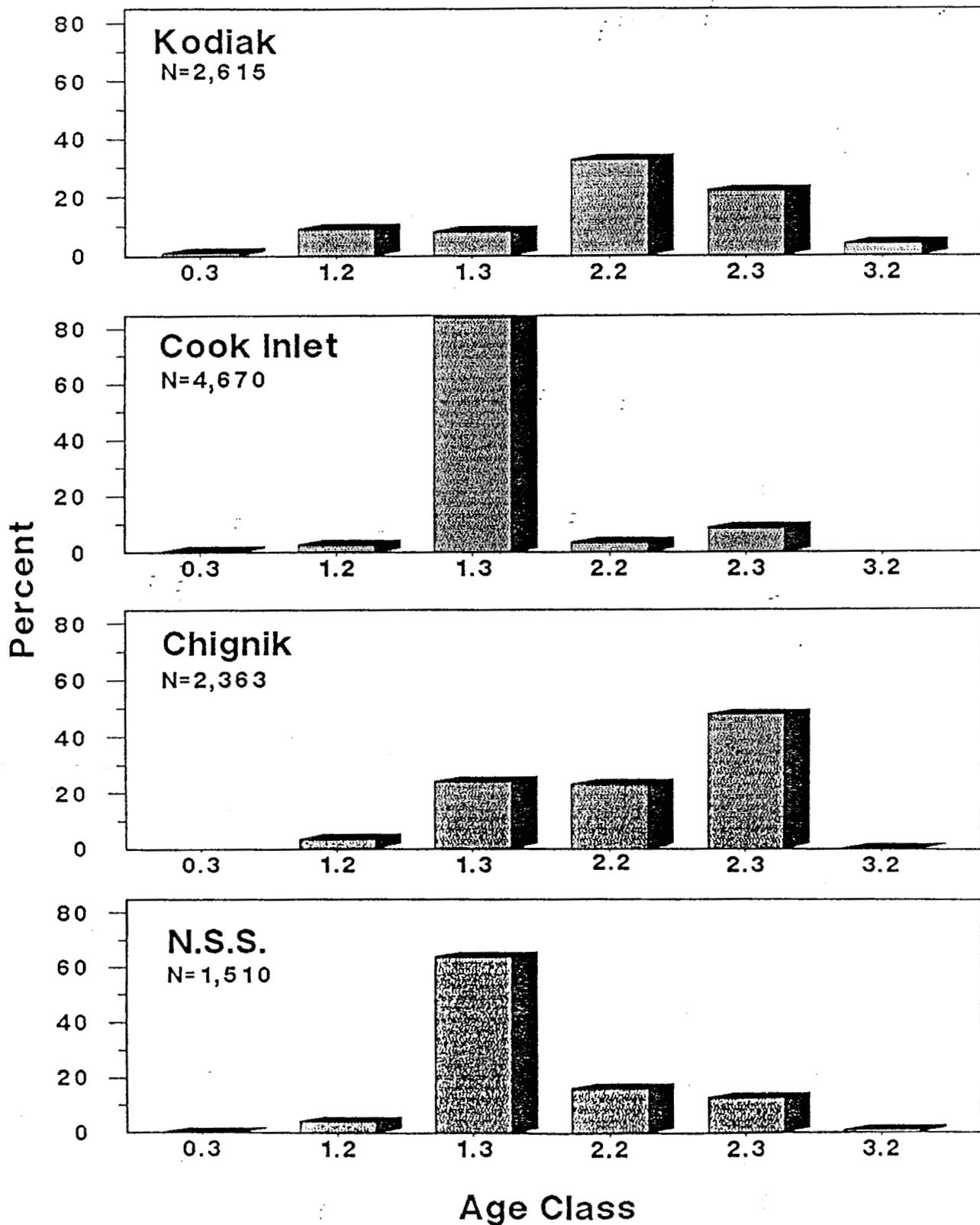


Appendix C. 3. Estimated age composition of selected sockeye salmon stocks during the North Shelikof Strait fishery, 1991.

Appendix C.4.

Estimated age composition of the North Shelikof Strait sockeye salmon catch by area and week, 6 July through 25 July, 1992.

Area	Week	Sample Size	Age Classes													Total		
			0.2	1.1	0.3	1.2	2.1	1.3	2.2	3.1	1.4	2.3	3.2	2.4	3.3			
Mainland District (262-10 - 262-55)																		
	7/06-7/11	502	percent	0.2	0.4	0	9.4	0.6	53.2	21.2	0.2	0.2	11.9	2.4	0.2	0.2	100	
			numbers	10	21	0	496	31	2,805	1,119	10	11	627	124	10	10	5,273	
	7/12-7/18	0	percent	0	0	0	7.3	0	61.8	16.4	0	0	10.9	1.8	0	0	98.2	
			numbers	0	0	0	4	0	34	9	0	0	6	1	0	0	55	
	7/19-7/25	0	percent	0.1	0.1	0	4.6	0.2	71	12.3	0.1	0.2	10.3	1	0.1	0.1	100	
			numbers	81	161	0	5,189	242	80,161	13,841	81	227	11,590	1,114	81	81	112,847	
	Total	502	percent	0.1	0.2	0	4.8	0.2	70.2	12.7	0.1	0.2	10.3	1	0.1	0.1	100	
			numbers	91	182	0	5,689	273	83,000	14,969	91	238	12,223	1,239	91	91	118,175	
N.W. Afognak																		
	7/06-7/11	0	percent	0.2	0.4	0.6	3	1	51.4	23.6	0	0.2	17.7	1	0.4	0.6	100	
			numbers	17	33	50	249	83	4,300	1,976	0	17	1,478	83	33	50	8,367	
	7/12-7/18	504	percent	0.2	0.4	0.6	3	1	51.4	23.6	0	0.2	17.6	1	0.4	0.6	100	
			numbers	2	4	5	27	9	458	210	0	2	157	9	4	5	891	
	7/19-7/25	0	percent	0.1	0.4	0.6	3	1	51.3	23.7	0	0.1	17.6	1	0.4	0.6	100	
			numbers	1	3	4	20	7	347	160	0	1	119	7	3	4	676	
	Total	504	percent	0.2	0.4	0.6	3	1	51.4	23.6	0	0.2	17.7	1	0.4	0.6	100	
			numbers	20	40	59	296	99	5,105	2,346	0	20	1,754	99	40	59	9,934	
S.W. Afognak																		
	7/06-7/11	0	percent	0.2	0.4	0.6	3	1	51.4	23.6	0	0.2	17.7	1	0.4	0.6	100	
			numbers	40	80	121	603	201	10,404	4,780	0	40	3,575	201	80	121	20,246	
	7/12-7/18	504	percent	0.2	0.4	0.6	3	1	51.4	23.6	0	0.2	17.7	1	0.4	0.6	100	
			numbers	57	114	171	854	285	14,738	6,772	0	57	5,065	285	114	171	28,680	
	7/19-7/25	0	percent	0.2	0.4	0.6	3	1	51.4	23.6	0	0.2	17.6	1	0.4	0.6	100	
			numbers	3	7	10	49	16	848	390	0	3	291	16	7	10	1,650	
	Total	504	percent	0.2	0.4	0.6	3	1	51.4	23.6	0	0.2	17.7	1	0.4	0.6	100	
			numbers	100	201	302	1,506	502	25,990	11,942	0	100	8,931	502	201	302	50,576	
Grand Total			1,510	percent	0.1	0.2	0.2	4.2	0.5	63.9	16.4	0.1	0.2	12.8	1.0	0.2	0.3	100
				numbers	211	423	361	7,491	874	114,095	29,257	91	358	22,908	1,840	332	452	178,685



Appendix C.5. Estimated age composition of selected sockeye salmon stocks during the North Shelikof Strait fishery, 1992.

The Alaska Department of Fish and Game administers all programs and activities free from discrimination based on race, color, national origin, age, sex, religion, marital status, pregnancy, parenthood, or disability. The department administers all programs and activities in compliance with Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, and Title IX of the Education Amendments of 1972.

If you believe you have been discriminated against in any program, activity, or facility, or if you desire further information please write to ADF&G, P.O. Box 25526, Juneau, AK 99802-5526; U.S. Fish and Wildlife Service, 4040 N. Fairfax Drive, Suite 300 Webb, Arlington, VA 22203 or O.E.O., U.S. Department of the Interior, Washington DC 20240.

For information on alternative formats for this and other department publications, please contact the department ADA Coordinator at (voice) 907-465-6077, (TDD) 907-465-3646, or (FAX) 907-465-6078.