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NORTON SOUND - PORT CLARENCE - KOTZEBUE

By
Charles F. Lean
Fredrick J. Bue
Tracy L. Lingnau

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INTRODUCTION

This is a catch-up report which addresses the 1992 season and historical information concerning management of the commercial and subsistence fisheries of the Norton Sound, Port Clarence and Kotzebue Sound districts. Data from special management and research projects are included in this report, but complete documentation of project results will be presented in separate reports.

Data presented in this report supersedes information found in previous management reports. An attempt has been made to correct errors presented in earlier reports. Previously unreported data has been included and is indicated by appropriate footnotes. Current year catch data presented has been derived from seasonal field data.

This report is organized into the following major sections:

(1) Salmon
(2) Herring
(3) King Crab
(4) Miscellaneous species

In order to facilitate use of this report, tabular data has been separated into two categories: 1) tables presenting annual data; 2) appendix tables which present historic comparisons. The text for each major section is followed by tables, figures, and appendices.

SECTION 1: SALMON
(Includes Norton Sound, Port Clarence
and Kotzebue Districts)

AUTHORS

Charles F. Lean is the AYK Region Western Arctic Area Management Biologist for the Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, P.O. Box 1148, Nome, AK 99762.

Fredrick J. Bue is the AYK Region Norton Sound Assistant Area Management Biologist for the Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, P.O. Box 1148, Nome, AK 99762.

Tracy L. Lingnau is the AYK Region Kotzebue Assistant Area Management Biologist for the Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, P.O. Box 689, Kotzebue, AK 99752.

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SECTION 1 - SALMON

INTRODUCTION

Boundaries

The Norton Sound, Port Clarence and Kotzebue salmon management districts include all waters from Canal Point in southern Norton Sound to Point Hope and includes St. Lawrence Island. These management districts comprise over 65,000 square miles, with a coastline exceeding that of California, Oregon, and Washington combined.

Salmon Resources

Five species of Pacific salmon are indigenous to the area with chum (Oncorhynchus keta) and pink salmon (O. gorbuscha) historically being the most abundant. Chum, pink, and chinook (king) salmon (O. tschawytscha) have been found as far north as Barrow; however, these species are uncommon north of the Kotzebue Sound drainages. The northernmost large concentrations of chum salmon are found within the Kotzebue Sound drainages, while large numbers of pink, chinook and coho (O. kisutch) salmon are not found north of Norton Sound. Very small sockeye (red) salmon (O. nerka) populations exist within a few Seward Peninsula drainages.

Commercial Fishery

In 1959 and 1960, Department biologists conducted resource inventories which indicated harvestable surpluses of salmon available in several areas. The Department liberalized various regulations and encouraged processors to explore and develop new fishing grounds. As a result, commercial salmon fishing activity has grown significantly since statehood, enabling many local residents to obtain a cash income.

The majority of commercial fishermen and many buying station workers are resident Eskimos. Commercial fishermen operate set gill nets from outboard powered skiffs to capture salmon. All commercial salmon fishing is done in coastal marine waters.

Salmon effort and catch per unit effort data (CPUE) presented throughout this section have been derived as follows. Boat (or fisherman) hours have been computed after assuming that if a fishing boat delivers during a fishing period, it fished the entire period. The total number of individual boats delivering in any period is multiplied by the number of hours open to commercial fishing. Catch per fisherman (or boat) hour is obtained by dividing the total fishermen hours into the catch for the corresponding period of time. Total fishermen (or boats) is the total number of fishermen making deliveries, regardless of how many deliveries were made or days fished during a particular period or season. There are a number of fishermen who deliver only once or twice during the entire

season. Total days fished is the total number of hours open to commercial fishing during the season divided by 24 hours.

Subsistence Fishery

There are approximately 16,000 people in the area, the majority of whom are Eskimos, residing in more than 26 small villages scattered along the coast and the major river systems. Nearly all of the local people are dependent to varying degrees on the fish and game resources for their livelihood.

Subsistence fishermen operate gill nets or seines in the main rivers and, to a lesser extent, in the coastal marine waters capturing primarily salmon, whitefish, arctic char and inconnu (sheefish). Beach seines are used near the spawning grounds to catch schooling or spawning salmon and other species of fish. The major portion of fish taken during the summer months is air dried or smoked for later consumption by villagers or their dogs.

Subsistence catch information has been derived from interviews of fishermen, actual counts of fish, and subsistence catch calendars returned by fishermen. Subsistence salmon catches in the Nome subdistrict (subdistrict 1) have been determined from the return of catch calendars as required under a permit system.

The Department conducted annual surveys of the important subsistence salmon fisheries from the early 1960's until 1982. The majority of salmon taken are pinks and chums. Subsistence harvest information prior to 1960 is incomplete or entirely lacking for many years. Beginning in 1983 budgetary restrictions have made it impossible to conduct systematic surveys in each village as was done from 1964 to 1982. For the last 5 years that complete surveys were conducted for Norton Sound (1978-1982) the average subsistence catch was 73,000 salmon including all species (Appendix Table A8). Subsistence surveys for the Kotzebue area were less complete. Documented surveys from several years for different villages indicate total subsistence salmon harvest for the Kotzebue Sound area to be around 75,000. These reported harvests are primarily based on village household surveys. Since not all fishermen are contacted, these harvests should be considered minimum figures. More recent surveys have been conducted on individual areas and will be noted in the following sections.

Management

The Division of Commercial Fisheries of the Alaska Department of Fish and Game is responsible for the management of commercial and subsistence fisheries in this vast area. The permanent full-time staff assigned to this area during 1992 consisted of an area management biologist stationed in Nome, one assistant area biologist stationed in Nome and one assistant in Kotzebue, and two half-time Field Office Assistants (FOA's) assigned to the Nome office. In addition, summer seasonal assistance in conducting various management and research activities was provided by eleven seasonal biologists and technicians in Norton Sound and Kotzebue Sound. Additional assistance was provided by biologists from the regional staff.

The main objective of the Department's program is to manage the commercial salmon fisheries on a sustained yield basis. Various field projects are conducted to provide information on salmon abundance, migration and stock composition. Summaries of these projects are presented in Appendix G2.

Management of the salmon fishery is complicated by the difficulty in obtaining valid escapement data in this large area and by insufficient comparative catch and return information. Management problems are compounded by the need to provide not only for adequate escapements, but for the needs of several different user groups. Past Alaska Department of Fish and Game policy has been to provide for subsistence as the primary beneficial use of the fishery resource. This policy is now State law. If the subsistence harvest or demands increase, commercial fishing may be restricted. It should be pointed out that increases in commercial fishing efficiency are expected and may balance any immediate decline in subsistence utilization or increase in run size with the result that present regulations will be maintained or made even more restrictive.

The basic regulation that governs the commercial salmon harvest in all districts is the scheduled weekly fishing period. Commercial fishing regulations provide for a total of two to four days of fishing per week during the open season depending on area and season. The Department attempts to distribute fishing effort throughout the entire return to avoid harvesting only particular segments of the return. Occasionally, fishing time is increased or decreased by emergency order, depending upon fishing conditions and the strength of the returns or spawning escapements, as determined by special studies conducted by the Department. Emergency orders issued during the 1992 seasons are presented in Appendix G3.

Weekly fishery reports, which give information on fishery status and fishing schedules, are broadcast during the fishing season over radio KICY and KNOM in Nome, and KOTZ in Kotzebue. In addition, fishery news articles are published in the Nome Nugget and the Arctic Sounder.

NORTON SOUND DISTRICT

District Boundaries

The Norton Sound District includes all waters from Canal Point Light north to Cape Douglas. This district is subdivided into six subdistricts: Nome (Subdistrict 1), from Penny River to Topkok Head; Golovin Bay (Subdistrict 2), from Rocky Point to Cape Darby; Moses Point (Subdistrict 3), from Elim Point to Kwik River; Norton Bay (Subdistrict 4), from Kuiuktulik River to Island Point; Shaktoolik (Subdistrict 5), from Cape Denbigh to Junction Creek; and Unalakleet (Subdistrict 6), from Junction Creek to Black Point (Figure 1).

Each of these subdistricts contain at least one major salmon spawning stream. All commercial fishing is conducted in marine waters and usually concentrated near stream mouths. Subdistrict boundaries were established around the major salmon producing local streams to minimize interception of stocks bound for other areas.

Historical Fishery Use

Fishing has been a part of life for Norton Sound residents for many centuries as indicated by archeological evidence dating back 2,000 years (Bockstoce, 1979). There were only a few actual pre-contact settlements like Shishmaref and Wales which still exist today. They were located where marine mammals were the primary subsistence resource. The rest of the population lived in small groups scattered along the coast and often moved on a seasonal basis prior to the introduction of western civilization (Thomas 1982). During summer months residents would disperse, usually in groups comprised of one or two families, and setup camps near the mouths of streams. Harvest levels of fish on any one stream were relatively small because of the low concentrations of people who caught only what they needed to carry their families and one or two dogs through the winter (Thomas 1982).

A large scale fur trade had been developed by the Russians in the late 1800's which continued after the American purchase (Magdanz 1981). Hundreds of commercial whalers and trading ships caused trading to increase in the region around 1848 (Ray 1975). The increased competition for walrus, caribou, and other species from outsiders may have increased the importance of salmon to area residents (Magdanz 1981). In the late 1890's gold was discovered on the Seward Peninsula and boom-towns sprang up with thousands of new immigrants flocking to the region. Commerce developed which drew people to central locations that evolved into year-round communities. Other reasons for communities to become established stemmed from the operation of missions.

The effects of mining had to be enormous on fish populations. Nearly every stream on the Seward Peninsula had some sort of mining operation working on it which ranged from simple gold panning to sluice boxes to hydraulic giants to bucket line dredges. One example of extreme impact was on the Solomon River which is only 30 miles long but had 13 dredges working at one time. Another obvious affect was simply the sheer number of people who came to live in the region between 1900 and 1930. Many places like Nome, with a population of 30 thousand and Council with 10 thousand people at one time, did not exist before gold was discovered.

It was in the late 19th century when the size of the dog teams increased from two or three to perhaps ten to twenty. At about the same time wooden boats began to replace kayaks (Thomas 1982). Consequently, the demand for dry fish to feed the dog teams increased along with the development of better means to harvest those fish. Winter transportation throughout the region was done with hired dog teams and drivers who carried mail or freight along the coast and across the state to the ice-free port at Seward. Dry fish became a major barter item in response to the great demand for dog food which consisted of primarily chum and pink salmon (Thomas 1982).

Local residents would spend most of their summers catching and drying large amounts of salmon, some of which they kept for themselves and the rest would be bartered or sold to mining camps, roadhouses, and trading posts or stores. For example the Haycock mining camp on the Koyuk River would buy about two tons of

dry fish each year. There were roadhouses at Golovin, Walla, Moses Point, Isaac's Point, Ungalik, Robertvale, foothills (south of Shaktoolik), Egavik, and many other locations. Dry fish was bought in units of bundles (50 dry fish tied together) at a typical price of 10 cents per pound from the fishermen. One elder in the area felt that more fish were retained for their own use as compared to the amount sold which may have averaged five to ten bundles per household (Thomas 1982).

After the gold rush the number of people gradually decreased over the next twenty years as the gold deposits were worked out. The number of dog teams diminished by the mid 1930's with the introduction of the mail plane. The last mail team contract ended in 1962 at Savoonga. Local stores continued to trade in dry fish at Shaktoolik, Saint Michael, Unalakleet, and Golovin. An example of quantity was the Shaktoolik store that had a cache 8x20x40 feet which would be filled to the top with dry fish. One elder said the stores would buy the fish for 6 cents a pound and sell them for 10 cents a pound or their equivalent in groceries and supplies (Thomas 1982). By the early 1960's, commercial salmon fishing developed into a source of summer cash and snowmachines were replacing the need for dog teams (Thomas 1982). Dry fish was no longer needed to feed dogs and cash was becoming more available for trading at stores.

Commercial Fishery Overview

Commercial salmon fishing in this district first began in the Unalakleet and Shaktoolik Subdistricts in 1961. Most of the early interest involved chinook and coho salmon which were flown in dressed condition to Anchorage for further processing. A single U.S. freezer ship also purchased and processed chum and pink salmon during 1961. In 1962, two floating cannery ships operated in the district and the commercial fishery was extended into the Norton Bay, Moses Point and Golovin Bay Subdistricts. The peak in salmon canning operations occurred during 1963.

Since then, markets have been sporadic and some subdistricts have often been unable to attract buyers for entire seasons. A joint venture between KEG (Koyuk-Elim-Golovin) Fisheries and NPL Alaska, Inc., operated from 1984 until mid-season in 1988. A permit issued by the Governor allowed two Japanese freezer ships to buy directly from domestic fishermen and was limited to salmon caught in the internal waters of Golovin and Norton Bays. Currently, the most consistent markets are at Unalakleet and Shaktoolik where fish are purchased, iced, and flown directly to Anchorage for processing and resale.

The commercial salmon fishing season opens by emergency order between June 8 and July 1, depending on run timing within each subdistrict. The season closes by regulation on August 31 in Subdistricts 1, 2, and 3, and on September 7 in Subdistricts 4, 5, and 6, but processors often terminate their operations prior to the regulatory closure dates. Two 48 hour fishing periods normally occur each week unless changed by emergency order with the exception of the Nome and Moses Point Subdistricts, where two 24 hour fishing periods are scheduled each week.

Commercial fishing gear is restricted to set gill nets, with a maximum aggregate length of 100 fathoms allowed for each fisherman. There are no mesh size or depth restrictions during the normally scheduled periods. The majority of the

gill nets fished are approximately 5 3/4 inch stretched measure. In the Unalakleet and Shaktoolik Subdistricts, 8 1/4 inch stretched mesh gill nets are commonly used during the chinook salmon run in June through early July. During years when large pink salmon runs occur, the Department provides fishing periods when only 4 1/2 inch mesh nets or less may be set or drifted. These special small mesh periods are an attempt to target pink salmon without overharvesting the larger sized salmon species.

Most fishermen do not tend their nets continuously once they are set, leaving them unattended overnight. Fish quality suffers due to the length of time fish may be left in the nets and is especially poor when storms prevent fishermen from checking their gear for extended periods of time.

Commercial Fishery Management

The Norton Sound District is managed on the basis of comparative commercial catch data, escapements and weather conditions. A single factor or combination of factors may result in issuance of emergency orders affecting seasons, fishing periods, allowable mesh size, and areas.

Aerial surveys are used to monitor escapements in the majority of the Norton Sound streams. Weather conditions, time of day, type of aircraft, water conditions, bottom conditions, date of survey, and efficiency of the surveyor and pilot must be taken into account when making inter-annual aerial survey comparisons. A counting tower on the Kwiniuk River has been operated since 1965. A second counting tower was also operated on the North River, a major tributary of the Unalakleet River, from 1972-1974 and 1984-1986.

Commercial fishing starts for king salmon in mid June, emphasis switches to chum around June 25, then gradually shifts to coho during the third week in July. Pink salmon are abundant on even years, but there is often essentially no market. The southern Subdistricts 5 and 6 (Shaktoolik and Unalakleet) are sustained fisheries. They target king, chum, and coho salmon, with king and coho catches remaining fairly stable while chum catches have been declining since the early 1980's. Management has consisted of a series of Emergency Orders that open the season, adjust fishing time, restrict mesh size, and occasionally eliminate a fishing period.

Commercial fisheries in Subdistricts 2 and 3 (Golovin and Moses Point) target chum salmon. The commercial chum harvest has dropped dramatically since the mid 1980's. Poor returns has caused very restrictive management actions recently where the seasons have been closed by E.O. to allow for escapement and subsistence needs.

There has been little or no commercial salmon harvests in Subdistricts 1 and 4 (Nome and Koyuk). In the Nome Subdistrict this is due to very depressed stocks which in some years require closure or severe restrictions on the fishery. Conversely, the Koyuk Subdistrict has healthy stocks with no markets willing to set up in such a remote area.

Subsistence Fishery Overview

Household subsistence surveys have not been conducted since 1985 in Norton Sound villages due to budgetary restrictions. Daily surveys of Unalakleet River and ocean subsistence fishermen have been conducted annually since 1985 during the chinook salmon run. Although total harvests by subsistence fishers were not documented, effort and catch information were used to judge timing and magnitude of the chinook salmon return. The commercial fishery is delayed until it becomes apparent subsistence needs are being met and chinook salmon are beginning their upstream migration as indicated by the Department of Fish and Game test net in the lower Unalakleet River. There is a growing trend to move subsistence nets from the river mouth out to the ocean in order to avoid large debris loads from spring runoff. It is presently unclear what changes this fishing technique will have on chinook salmon escapement.

Low salmon stock levels in the Nome Subdistrict combined with a large concentration of users has required issuing subsistence harvest permits for the area since 1974. These are issued by regulation to each household and designated fishing location. Each location may have its own catch limit per permit and the fisherman is allowed to change locations after notifying the local Fish and Game office.

Regulatory Actions in Nome Subdistrict

Although pink salmon are usually the most abundant species of salmon in Subdistrict 1 streams, the commercial fishery has targeted chum salmon. The relatively large chum salmon catches in this subdistrict in conjunction with weak local stock abundance implied that the fishery intercepts non-local stocks. A 1978-79 Norton Sound stock separation study tends to confirm this view. Salmon tagged near Nome were re-captured in fisheries from Golovin (Subdistrict 2) to Kotzebue. In an attempt to provide for spawning requirements in addition to an important subsistence fishery that targets local stocks, a commercial harvest guideline of 5,000-15,000 chum salmon was adopted as a regulation.

Due to poor chum salmon escapement during the 1982 and 1983 seasons, the Board of Fisheries, in response to an advisory committee petition, directed the Department to manage the commercial fishery so that chum salmon escapement could be optimized. During the 1984 fall Board of Fisheries meetings, these directives became regulation. In response to public and advisory board proposals, the following commercial fishery restrictions were adopted as regulations:

1) Salmon may be taken commercially only from July 1 through August 31.

2) Fishing periods were restricted to two 24 hour periods per week.

3) Waters west of Cape Nome were closed to commercial salmon fishing.

The Department was also directed to allow a harvest at the lower end of the guideline harvest range of 5,000 to 15,000 chum salmon, as stipulated in 5AAC 04.360.

In addition to these commercial fishing restrictions, a proposal to restrict the sport fishery in the Nome and Snake Rivers was adopted in 1984:

> With a bag and possession limit of 15 salmon, other than king salmon, only 5 could be chum and coho, in combination.

Subsistence permit limits in the Nome and Snake Rivers were restricted to 20 chum and 20 coho salmon. The remainder of the permit limit could be filled with salmon other than chum or coho.

However, even with these restrictive regulations in place, chum escapement goals were difficult to attain. The 1987 fishing season experienced poor returns of both chum and pink salmon to Nome Subdistrict streams. Numerous management actions were made which curtailed commercial fishing activities, and later, sport, personal use, and subsistence efforts as well. Even with such drastic fishery restrictions, escapement goals for chum salmon were not attained during 1987 in the Nome, Eldorado, Flambeau, Bonanza, Snake, and Solomon Rivers. In response to this continuing trend of decreasing chum and pink salmon returns to the Nome Subdistrict, several new regulations were adopted during the 1987 Alaska Board of Fisheries meetings.

With the commercial fishery all but eliminated in recent years, proposals affecting the sport, personal use, and subsistence fisheries were considered. The following new sport fish regulations were adopted for all Nome area road system streams (Seward Peninsula drainages from Cape Prince of Wales to Cape Darby):

1) For salmon other than chinook, 10 per day, 10 in possession, only 3 which may be chum salmon and coho salmon, in combination.

2) For chinook salmon, 1 per day, 1 in possession.

These new regulations superseded those adopted during 1984. Additional new regulations affecting personal use and subsistence fishermen which were adopted in 1987 were:

1) In the Nome River, no person may operate more than 50 feet of gill net in the aggregate.

2) The Nome River was added to the regulation 5AAC 01.170 (e) which states that small mesh gill nets (less than 4 1/2 inch mesh) and beach seines may not be used in specific Nome Subdistrict streams.

The latest round of regulation changes, which occurred during the spring of 1992, further restricting the use of beach seines in the Nome subdistrict. The managers now have the authority to allow the subsistence harvest of chum or pink salmon by beach seine if escapement needs are likely to be met. Beginning in 1991, no chum salmon harvests have been allowed until escapement goals were likely to be met or conservative management actions were judged to be no longer effective. During 1992, a record pink salmon return effectively stopped the harvest of chum salmon in early July. Unfortunately, aerial survey escapement indices were generally overwhelmed by the extremely high pink to chum ratios present in most streams (Table 3).

1992 NORTON SOUND SALMON FISHERY

Commercial Fishery Overview

The Norton Sound commercial salmon fishing season typically begins on a date established by emergency order between June 8 and June 20 in Subdistricts 2, 3, 4, 5, and 6 and on July 1 in Subdistrict 1 as specified in regulation. Unusually late ice conditions delayed opening commercial fishing until July 2 in the Moses Point(3), Norton Bay(4), Shaktoolik(5), and Unalakleet(6) Subdistricts while the Golovin(2) Subdistrict opened July 3. The Nome(1) Subdistrict was delayed until August 1 due to chum salmon management concerns. The season usually ends by regulation on August 31 in Subdistricts 1, 2, and 3, and September 7 in Subdistricts 4, 5,and 6, However, the 1992 fishing season in Subdistrict 1 was extended through September 5 and through September 3 in Subdistrict 3. This was done to take advantage of an exceptional coho salmon return.

The 1992 Norton Sound commercial salmon harvest totaled 199,933 fish, which was comprised of 4,541 chinook, 296 sockeye, 105,418 coho, 6,284 pink, and 83,396 chum salmon (Table 1). The chinook harvest was 29% below the previous 5-year average (1987-1991) and 45% below the previous 10-year average (1982-1991). The coho harvest set a new record which was 133% above the previous 5-year average and 114% above the previous 10-year average. The pink salmon harvest of 6,284 was 60% below the previous 5-year average and 89% below the previous 10-year average. The chum salmon harvest was 3% and 38% below the previous 5 and 10-year averages, respectively. Historical catch data for the Norton Sound District is presented in Appendix Tables A1, A8, A12.

A total of 201 CFEC permits were renewed, of which 110 actually fished during the 1992 season. The number of participating fishermen this season tied for the lowest effort on record since total effort has been documented (1977 to present) and was well below the average effort for the previous 10 years which is 151 fishermen. The low effort during the 1992 season is attributed to the combination of expected below average chum salmon returns to northern Norton Sound and low market prices for all salmon species. The northern subdistricts had historically landed approximately 50% of the total commercial chum salmon harvest as compared to 3% this year.

One domestic seafood buying company which based its operations in Unalakleet purchased the majority of commercially caught salmon in Norton Sound during 1992. A second domestic buyer operated in the Moses Point Subdistrict for four periods during the coho salmon run. In addition, a few individual fishermen sold their catches of fresh salmon locally and to wholesale distributors, as permitted under the catcher-seller status.

Commercial fishermen received approximately $448,395 for their catch in 1992. These earnings rank as the third lowest value on record since 1976, and were 11% below the previous 5 year average of $503,673. This low fishery value is attributed to the lack of competitive markets resulting in low prices paid per pound for all salmon species. Prices paid to the fishermen averaged $0.66 per pound for chinook, $0.80 per pound for sockeye, $0.33 per pound for coho, $0.22 per pound for chum, $0.16 per pound for pink, and $1.50 per pound for coho salmon roe. These data are summarized in Appendix Table A10 and A11.

Subsistence Fishery Overview

Household subsistence surveys were not conducted by the Commercial Fisheries Division during the 1992 season in Norton Sound villages due to budgetary restrictions, however the Subsistence Division did survey the village of Elim in late October. Twenty seven of the 75 households comprising the community were surveyed. The households that were surveyed were thought to account for 96 percent of the subsistence salmon harvest in that community. During 1991, the community was estimated to have harvested 312 chinook, 2,153 coho, 3,555 pink and 2,660 chum salmon. During 1992, the harvests were estimated to be 100 chinook, 1,281 coho, 6,152 pink and 1,260 chum salmon. Only the chum harvests are significantly below those recorded in the early 1980s.

Daily interviews of Unalakleet River and ocean subsistence fishermen were conducted at Unalakleet during the early portion of the fishing season in order to monitor the chinook salmon return. Total harvest by subsistence fishermen was not documented, however, daily effort and catch information was used, in combination with the Department's test net catches from the lower Unalakleet River and commercial catch information, to judge the timing and magnitude of the chinook salmon return.

Subsistence fishing permits are required by regulation for each household that fishes in the Nome Subdistrict. These permits identify the body of water to be fished, the type of gear used, and the bag limit which is specific to that body of water. In addition, each permit holder is given a catch calendar on which the permit holder records daily catches in numbers of each species of fish. If the subsistence fishers have filled their bag limits or would like to fish another location, they can be issued another permit generally for another area after the previous one has been returned. A preliminary summary of these data are presented in Table 2. A total of 163 salmon subsistence fishing permits were issued to families in the Nome area during the 1992 season.

Season Summary by Subdistrict

Nome - Subdistrict 1

The commercial salmon season was closed by E.O. prior to July 1, the day that it normally opens by regulation, and remained closed until August 1. This management action was taken in order to protect the expected low return of chum salmon to the subdistrict. Similar action was taken to close subsistence and sport fishing in the area. As the season progressed, subsistence regulations were liberalized on a stream by stream basis. Fishing was allowed when there became little chance for removing significant portions of the chum return from each system and at the same time allowing the harvest of other species.

The pink salmon return was so unusually large that an E.O. was issued that allowed beach seining in previously closed areas with the condition that all chum salmon were to be returned to the water. In addition the subsistence and sport fishing bag limits were both doubled for pink salmon.

The coho salmon return also appeared strong in the Nome Subdistrict. The subsistence coho salmon bag limit was doubled and an E.O. was issued that increased the commercial fishing period length from 24 to 48 hours on August 14. The length of the commercial season was also extended by two additional 48 hour periods through September 5.

Two commercial fishermen caught and sold their catches as allowed by Catcher/Seller Permits. The total commercial harvest for the Nome Subdistrict was 1 chinook, 693 coho, and 185 chum salmon (Tables 1 and 4). One hundred sixty-two subsistence permits were issued for the Nome area in 1993. The reported harvest from the 138 permits returned were 152 chinook, 163 sockeye, 1,482 coho, 7,351 pink, and 1,684 chum salmon for a total of 10,831 fish (Table 2). The total reported subsistence salmon harvest was above the recent 5-year average of 7,610 salmon (Appendix Table A2).

Golovin - Subdistrict 2

Since the Golovin Subdistrict has been experiencing decreasing chum salmon returns over the past 5 years, the 1992 Salmon Management Plan stated that the Golovin Subdistrict chum salmon commercial harvest would be limited to 10,000 chum in an attempt to protect the stock. The subdistrict was opened by emergency order July 3 for a single 24 hour period in order to test run strength and level of fishing effort. There was no reported harvest and no fish buyers expressed intentions of operating in the subdistrict. On July 6 a second E.O. was issued which placed the subdistrict on the standard two 48 hour periods per week schedule because the fishing effort was low and it was unlikely the anticipated harvestable surplus of chum salmon that would be harvested. One commercial fisherman began fishing and sold his own catch as allowed under the Catcher/Seller permit.

On August 13 a third E.O. was issued that increased the fishing period length to 7 days per week through the remainder of the season with the justification that the bulk of the chum salmon run was past, the coho return appeared strong, and

the fishing effort was very low. The total season harvest for the Golovin Subdistrict was taken by one fisherman who sold 6 chinook, 9 sockeye, 2,085 coho, and 1,002 chum salmon (Tables 1, 5,, Appendix Table 3). The fish were iced, flown to Nome and then on to Anchorage. The season closed by regulation August 31.

Moses Point - Subdistrict 3

The Moses Point Subdistrict has also experienced a decrease in size of the chum salmon return in recent years despite conservative management actions. The 1992 Management plan allowed for only one 24 hour commercial fishing period which was scheduled to open by emergency order on July 2. No fish were harvested commercially due to lack of market. As the season progressed the Department's counting tower on the Kwiniuk River closely monitored salmon passage. The chum salmon return was very low and therefore no additional openings were allowed until the bulk of the chum salmon had entered the river.

Beginning on August 21 four special fishing periods were allowed which targeted coho salmon. Emergency Orders were used to set period dates and duration that fit into the buyer's schedule since he had irregular freight connections and limited hauling capacities. Twenty-one fishermen harvested 3,531 coho and 6 chum salmon (Tables 1, 6 and Appendix Table 4).

Norton Bay - Subdistrict 4

Initially the chinook salmon return to southern Norton Sound was thought to be late due to the slow movement of sea-ice out of the area, but was later concluded to be poor as indicated by subsistence fisherman interviews at Unalakleet and the Department's test net in the Unalakleet River. Consequently, commercial fishing did not begin in the Norton Bay Subdistrict until July 2. The season opened by Emergency Order which placed the fishery on the standard two 48 hour period fishing schedule with a six inch maximum mesh size restriction. At the request of the only fish buyer operating in the subdistrict, a second E.O. was issued that changed the fishing schedule to three 24 hour periods per week. Salmon that were caught in the Norton Bay Subdistrict had to be tendered over 50 miles to Unalakleet where they were transferred and flown to Anchorage for processing. The buyer had only operated in the Norton Bay Subdistrict for three periods when he decided that it was no longer economical to continue. The total commercial harvest by 9 fishermen was 27 chinook and 1,787 chum salmon (Table 1, 7, Appendix Table A5).

Shaktoolik - Subdistrict 5

Like the Norton Bay Subdistrict, the Shaktoolik Subdistrict commercial fishery was delayed until July 2. The fishery was initially opened by Emergency Order for one 48 hour period with a six inch maximum mesh size restriction. The reason for this action was to test the run strength of the chinook salmon which were slow in arriving. The fear was that chinook salmon were possibly holding or milling off the mouths of streams where they would be unusually vulnerable to the

commercial fishery. The period did not harvest a large number of chinook which indicated that the return was late and expected to be weak.

A second E.O. was issued that reopened the subdistrict on July 6 and placed it on the standard two 48 hour periods per week fishing schedule with the mesh restriction continued. Both the opening and closing times for the period differed from most years, where it was changed to 8 a.m. rather than the typical 6 p.m. times. This was done at the request of the only major fish buyer operating in the area which allowed him to coordinate better freight connections and reduce waste. The salmon were iced in the round and tendered to Unalakleet where they were transferred to aircraft to be flown to Anchorage for processing. The Shaktoolik Subdistrict closed by regulation on September 7, however harvest records actually ended August 19 when fish buying operations ceased. It is likely some fishermen continued to fish and delivered their catch to Unalakleet where it was assigned incorrectly to that subdistrict's harvest values.

Twenty-five fishermen harvested 1,098 chinook, 56 sockeye, 14,660 coho, and 27,867 chum salmon for a combined total harvest of 43,681 fish (Tables 1, 8, Appendix Table A6). The chinook harvest was 32% below the previous 5 year average and 47% below the previous 10 year average catch. The coho salmon harvest was 100% and 60% above the previous 5 and 10 year average catches respectively. The chum salmon harvest was also good with 28% and 6% above respectively the previous 5 and 10 year average catches.

Unalakleet - Subdistrict 6

The Unalakleet Subdistrict supports the largest fishing effort in Norton Sound, and historically has not had problems obtaining buyers for any salmon species with the exception of pink salmon . The commercial fishing management actions that opened periods and restricted mesh size were the same as those for the Shaktoolik Subdistrict because of their close proximity (shared boundary). However fishing times varied throughout the season to accommodate buyers and fishermen. The Unalakleet subsistence fisherman interviews and the Fish and Game test net in the Unalakleet River were used as indicators of salmon abundance and escapement in both Subdistricts 5 and 6.

One exception to the standard fishing schedule was when an E.O. was issued for a special pink salmon period in the Unalakleet Subdistrict on July 19. The period was at the request of a fish buyer that had a fish processing facility at St. Paul Island. The pink salmon were to be purchased at Unalakleet, tendered to St. Paul, then test processed through their pollack processing equipment. The period was originally to be open for 12 hours with a maximum mesh size restriction of 4 1/2 inches. Poor weather conditions delayed fishermen in setting their nets so a second E.O. was issued that extended the period an additional 12 hours.

During most years the standard fishing period opens and closes at 6 p.m.. This year that time was changed to 12 noon to accommodate the only fish buyer in the subdistrict who was attempting to minimize costs and spoilage by consolidating the various subdistrict's catches in one shipment. Many fishermen and their helpers objected to the new fishing time and circulated a petition in favor of

changing the time back to 6 p.m. The issue was discussed with both parties and a compromise was reached. An E.O. was issued that changed the fishing time to 3 p.m. beginning July 23. On August 1 an unanticipated large harvest of coho salmon was landed and the buyer was unable to ship the entire catch. Approximately 12,000 pounds of fish spoiled. Both the local buyer and the parent company stated that they could not continue to buy salmon until 3 p.m. on Saturdays. Therefore another E.O. was issued that returned the fishing times to 12 noon beginning August 6 through the remainder of the season in order to prevent spoilage.

A total of 71 fishermen harvested 3,409 chinook, 229 sockeye, 84,440 coho, 6,284 pink, and 52,547 chum salmon for a total combined harvest of 146,918 fish (Tables 1, 9, Appendix Table A7). The chinook salmon harvest was 17% below the previous 5 year average and 38% below the previous 10 year average catch. The coho harvest was 135% and 134% above the previous 5 and 10 year average catches, respectively. The chum salmon harvest was also good at 107% and 39% above their respective previous 5 and 10 year average catches.

Only one primary domestic buyer operated through nearly the entire season, ceasing operations August 31. Most of the salmon were flown out of Unalakleet, iced in-the-round, to Anchorage and bound for fresh markets or for further processing. The Norton Sound Fishermen's Co-op plant did not operate, however, this facility was leased to receive and ice the salmon delivered dockside. In addition, a few fishermen sold some of their catch to individuals and local businesses as permitted under the catcher-seller regulations.

Escapement

Table 3 lists aerial survey and tower escapement counts in the major index streams of Norton Sound. Surveying conditions were generally good through most of the chum salmon season. Unfortunately record setting numbers of pink salmon in the rivers led to species identification problems which resulted in low or unacceptable chum salmon surveys. The weather turned rainy in the late summer which created marginal counting conditions and resulted in surveys that varied between fair to poor throughout Norton Sound. The Nome Subdistrict received the most intensive survey efforts because salmon stocks local to the Nome area are limited, easily accessed by road system, and exposed to extensive subsistence and sport fishing pressure. Several aerial and boat surveys were conducted on the Nome River. The counting tower on the Kwiniuk River in the Moses Point Subdistrict operated as usual and had good counting conditions with no breaks in the regular counting schedule.

Chinook

The Unalakleet and Shaktoolik Subdistricts are the primary chinook salmon producers in Norton Sound. Although on a smaller scale, the Norton Bay, Moses Point and Golovin Subdistricts have experienced gradually increasing chinook returns in recent years. Chinook salmon escapement surveys were below average in the Unalakleet and Shaktoolik Subdistricts. Daily interviews conducted with

subsistence fishermen at Unalakleet and the Department's test fish project in the Unalakleet River also suggested below average escapement levels.

Chum

Chum salmon escapements in the Nome Subdistrict were very difficult to quantify due to the large numbers of pink salmon. An example is the Nome River where the chum salmon escapement goal is 2,000 fish and the estimated number of pink salmon in the river was 255,700. One possible indicator of how the subdistrict did was the Eldorado River which receives very few pink salmon. Its chum salmon escapement estimate was 7% below its goal. Therefore, the chum salmon run strength to the subdistrict were assumed to be near adequate levels.

Chum salmon escapements in the Golovin and Moses Point Subdistrict streams were also difficult to determine from aerial surveys due to the large number of pink salmon. Fortunately the Department has a counting tower on the Kwiniuk River located in the Moses Point Subdistrict. Expanded tower count was 12,077 chum salmon. The count was approximately 38% below the revised escapement goal target of 19,500 chum salmon past the tower.

Aerial surveys for chum salmon in the Norton Bay Subdistrict were mixed with the Inglutalik River below it's escapement goal and the Ungalik River above it's chum escapement goal. The Shaktoolik and Unalakleet River systems also had the species identification problem due to high pink returns. With both the commercial catches above average and the Department's test fish catch, which set a new record for chum salmon, the escapement was assumed to be adequate.

Coho

Coho salmon are found in nearly all of the chum producing streams throughout Norton Sound with the major commercial producers being the Unalakleet and Shaktoolik Subdistricts. Because of the inclement weather normally experienced in this area during August and September, escapement data for all subdistricts is intermittent. Most streams in the Nome Subdistrict were flown under fair conditions while the rest of Norton Sound was flown under poor conditions or not attempted due to unacceptable conditions.

Overall, coho salmon escapements appeared to be good. Streams surveyed in the Nome Subdistrict were above average and fishermen reports from the Nome and Golovin Subdistricts indicate at least average coho salmon returns. The Kwiniuk River had a low aerial count, but was surveyed under poor conditions. However the commercial fishery, that took place in the Moses Point Subdistrict well after the peak of the coho run, had better than expected catches over a longer period of time which indicates good coho salmon returns to that subdistrict. Survey conditions were also poor in the Shaktoolik and Unalakleet Subdistricts, but unusually high commercial catches in both subdistricts and record test fish catches indicate a strong coho salmon return and good escapement.

Pink

Pink salmon returns to Norton Sound have been on an odd/even year cycle with the even years typically much larger than the odd years for the past 10 years. This year the pink salmon escapement levels were one to two orders of magnitude above even year averages throughout the District. Both the Kwiniuk River counting tower and the Unalakleet River test fish project set new pink salmon records as did several aerial survey indices on other systems.

Management Concerns

Chum salmon stocks have declined throughout Norton Sound over the past five years with escapements in the northern subdistricts continuing to be a major concern. Good chum salmon indices were not available this season for the Nome and Golovin Subdistricts, but even optimistic estimates of escapements near the respective goals would reflect very poor returns. Most of the opportunity for subsistence chum harvest was eliminated in the Nome Subdistrict and there was a very limited commercial chum harvest in the Golovin Subdistrict.

The recent attention given to the low levels of chum salmon stocks in Norton Sound at the 1991/1992 Board of Fish meetings initiated a re-evaluation of the Kwiniuk River chum salmon escapement goal. The net result of the study was to reduce the chum salmon escapement goal from 25,000 fish to a goal of 19,500 chum salmon past the counting tower. This year's preliminary expanded tower count of 12,077 is approximately 38% below the revised target goal and 70% below the previous escapement goal.

There were only 6 chum salmon commercially harvested in the Moses Point Subdistrict and subsistence fishermen had little success catching chum due to the large number of pink salmon. Management must continue to be conservative since spawner/recruit relationships do not seem to predict run strength adequately in the subdistrict. There is also the possibility that this season's pink salmon return may adversely affect chum salmon spawning success in a way similar to over-escapement where there may have been too much competition for space on the spawning grounds.

The Unalakleet Subdistrict has experienced a strip market fishery for king salmon over the past several years especially in the river where fish mill. In order to maintain escapement and provide subsistence opportunity, the traditional commercial fishery has been cut back by delaying the opening and keeping fishing periods to 24 hours in length. Subsistence fishing has also been restricted during early summer to the lower section of the river in order to prevent the untraditional seining of pools where king salmon mill. More recently there have been complaints that coho salmon strips are now being illegally marketed outside of the local area. The illegal sale of salmon strips will continue to be a matter of concern in upcoming years.

1993 Outlook

Run forecasts and harvest projections for the 1993 commercial salmon season are based on qualitative assessments of brood year returns, subjective determinations of fresh water over-wintering survival and ocean survival, and projections of local market conditions. Salmon buyers will probably operate in only half the subdistricts of Norton Sound during 1993. The chinook return is expected to be average. Chinook commercial harvests are expected to range from 6,000 to 8,000. Pink salmon are expected to be strong particularly for the odd year cycle. In recent years, there has been no market for Norton Sound pink salmon and none is expected during 1993. Should a market develop for pink salmon or for any species where a surplus exists, harvests could markedly increase. Chum and coho salmon escapements were not observed during the 1993 brood's parent year (1989) due to high water and inclement weather conditions. A weak return of chum salmon is expected, but the 1992 return and age composition of the coho return indicates an above average coho return. Harvests of chum are expected to range from 50,000 to 80,000. Commercial coho harvests are expected to range from 50,000 to 80,000.

Table 1. Norton Sound commercial salmon catch by subdisrtict, 1992.

Subdistrict	Chinook	Sockeye	Coho	Pink	Chum	Total
Nome	1	2	693	0	185	881
Golovin	6	9	2,085	0	1,002	3,102
Moses Point	0	0	3,531	0	6	3,537
Norton Bay	27	0	0	0	1,787	1,814
Shaktoolik	1,098	56	14,660	0	27,867	43,681
Unalakleet	3,409	229	84,449	6,284	52,547	146,918
District Totals	4,541	296	105,418	6,284	83,394	199,933

Table 2. Nome area subsistence salmon catches, Norton Sound, 1992. [a]

Location	Permits Issued	Permits Returned	Permits Fished	Chinook	Sockeye	Coho	Pink	Chum	Totals
Nome River	29	25	18	1	2	236	1,769	41	2,049
Marine Waters	77	66	47	143	147	827	3,605	1,610	6,332
Sinuk River	0	0	0	0	0	0	0	0	0
Eldorado River	11	8	4	0	0	91	0	12	103
Flambeau River	4	2	1	1	2	89	0	6	98
Snake River	6	6	2	1	0	46	35	6	88
Solomon River	13	13	12	0	0	0	1,320	0	1,320
Bonanza River	9	8	5	6	0	81	445	1	533
Safety Sound	3	3	2	0	0	0	176	1	177
Niukluk/Fish Rivers	2	2	2	0	0	111	0	0	111
Port Clarence[b]	9	5	3	0	12	0	1	7	20
Totals	163	138	96	152	163	1,481	7,351	1,684	10,831

[a] Preliminary summary table includes permits returned as of 2/2/93.
[b] Port Clarence location includes the Pilgrim and Kuzitrin Rivers.

Table 3. Salmon survey counts of Norton Sound streams and associated chum salmon escapement goals, 1992.[ab]

Stream Name	Chinook	Coho	Sockeye	Pink	Chum	Chum Goal
Salmon L.			1,500			
Glacial L.			510			
Sinuk R.		422		292,400	470	4,500
Cripple R.		272		13,650		
Penny R.		53		8,300		
Snake R.		92		24,700	943	1,000
Nome R.	3	691	5	255,700	813	2,000
Flambeau R.				180	606	3,250
Eldorado R.		113		6,615	4,887	5,250
Bonanza R.		1,209		799,000	80	1,500
Solomon R.		443		37,250	25	550
Fish R.	4			1,387,000	390	17,500
Boston Cr.	68			50,850	1,540	2,500
Niukluk R.		812	2	803,200	7,770	8,000
Ophir Cr.		224				
Kwiniuk R.	479 [c]	532		1,464,717 [c]	12,077 [c]	19,500 [d]
Tubutulik R.	260			138,600	2,595	12,000
Inglutalik R.	282			27,650	5,739	8,500
Ungalik R.	111			154,000	10,310	2,500
Shaktoolik R.	132	219		310,000	790	11,000
Unalakeet R.						
North R.	329	398		631,140		3,500
Old Woman R.		24				2,000

[a] Species identification difficult where large numbers of pinks salmon were observed.
[b] Counts should be considered minimums due to variable counting conditions.
[c] Expanded tower counts.
[d] Chum goal for expanded tower count.

Table 4. Commercial salmon catches from Nome, Subdistrict 1, set gill nets, 1992.

Period Number	Period Dates	Hours Fished	No. of Fishermen	Period Catch and Catch Per Unit Effort						Cumulative Catch and Catch Per Unit Effort					
				Chinook	CPUE	Sockeye	Coho	CPUE	Chum	CPUE	Chinook	CPUE	Sockeye	Coho	CPUE	Chum	CPUE
1	8/03–8/04	24	0														
2	8/06–8/07	24	1	1	0.04	0	91	3.79	22	0.92	1	0.04	0	91	3.79	22	0.92
3	8/10–8/11	24	0								1	0.04	0	91	3.79	22	0.92
4	8/13–8/15	48	2	0	0.00	0	409	4.26	59	0.61	1	0.01	0	500	4.17	81	0.68
5	8/17–8/19	48	1	0	0.00	0	35	0.73	10	0.21	1	0.01	0	535	3.18	91	0.54
6	8/20–8/22	48	0								1	0.01	0	535	3.18	91	0.54
7	8/24–8/26	48	2	0	0.00	2	124	1.29	79	0.82	1	0.00	2	659	2.50	170	0.64
8	8/27–8/29	48	0						0		1	0.00	2	659	2.50	170	0.64
9	8/31–9/02	48	1	0	0.00	0	34	0.71	15	0.31	1	0.00	2	693	2.22	185	0.59
10	9/03–9/05	48	0								1	0.00	2	693	2.22	185	0.59

All salmon sold as permited under Catcher/Seller status.
No pink salmon were sold.
Total hours fished = 216
Total number of permits used = 2

Table 5. Commercial salmon catches from Golovin, subdistrict 2, Norton Sound, set gill nets, 1992.

Period Number	Period Dates	Hours Fished	No. of Fishermen	Period Catch and Catch Per Unit Effort								Cumulative Catch and Catch Per Unit Effort						
				Chinook		Sockeye		Coho	CPUE	Chum	CPUE	Chinook	CPUE	Sockeye	Coho	CPUE	Chum	CPUE
1	7/03–7/04	24	0															
2	7/06–7/08	48	0															
3	7/09–7/11	48	0															
4	7/13–7/15	48	1	1	+	1	+			221	4.60	1	0.02	1	0		221	4.60
5	7/16–7/18	48	1	0	+	0	+			262	5.03	1	0.02	1	0		483	5.03
6	7/20–7/22	48	1	1	+	3	+	6	0.13	97	2.02	2	0.02	4	6	0.13	580	4.03
7	7/23–7/25	48	1	1	+	1	+	9	0.19	72	1.50	3	0.02	5	15	0.16	652	3.40
8	7/27–7/29	48	1	0		0		15	0.31	53	1.10	3	0.02	5	30	0.21	705	2.94
9	7/30–8/01	48	1	1	+	0		168	3.50	35	0.73	4	0.02	5	198	4.12	740	2.57
10	8/03–8/05	48	1	0		1	+	212	4.42	76	1.58	4	0.02	6	410	4.27	816	2.43
11	8/06–8/08	48	1	2	0.04	3	0.06	347	7.23	87	1.81	6	0.03	9	757	5.25	903	2.35
12	8/10–8/12	48	1	0		0		305	6.35	26	0.54	6	0.02	9	1062	5.53	929	2.15
13	8/13–8/17	96	1	0		0		284	2.96	18	0.19	6	0.02	9	1346	4.67	947	1.79
14	8/17–8/20	96	1	0		0		510	7.08	26	0.36	6	0.02	9	1856	5.15	973	1.62
15	8/20–8/24	96	1	0		0		152	1.58	27	0.28	6	0.02	9	2008	4.40	1,000	1.44
16	8/24–8/27	96	1	0		0		77	1.07	2	0.03	6	0.02	9	2085	3.95	1,002	1.30
17	8/27–8/31	96	0									6	0.02	9	2085	3.95	1,002	1.30

All salmon sold as permitted under Catcher/Seller status.
Total hours actually fished = 816
Total number of permits used = 1

Table 6. Commercial salmon set gillnet catches from Moses Point, Subdistrict 3, Norton Sound, 1992.

Period Number	Period Dates	Hours Fished	No. of Fishermen	Period Catch and Catch Per Unit Effort						Cumulative Catch and Catch per Unit Effort				
				Chinook	CPUE	Coho	CPUE	Chum	CPUE	Chinook	Coho	CPUE	Chum	CPUE
1	7/02–7/03	24	0	NO BUYER										
2	8/21–8/22	34	11	0		934	2.50	0		0	934	2.50	0	
3	8/24–8/26	48	13	0		1,145	1.83	6	0.01	0	2,079	2.08	6	+
4	8/28–8/29	34	13	0		709	1.60	0		0	2,788	1.94	6	+
5	9/02–9/03	33	9	0		743	2.50	0		0	3,531	2.03	6	+

Number of hours actually fished = 149
Number of permits used = 21
21 fishermen sold 2,641 pounds of coho roe which recovered from same fish reported in catch.

Table 7. Commercial salmon set gillnet catches from Norton Bay, Subdistrict 4, Norton Sound, 1992.

Period Number	Period Dates	Hours Fished	No. of Fishermen	Period Catch and Catch Per Unit Effort						Cumulative Catch and Catch Per Unit Effort					
				Chinook	CPUE	Coho	CPUE	Chum	CPUE	Chinook	CPUE	Coho	CPUE	Chum	CPUE
1	7/02–7/04	48	0							0					
2	7/06–7/07	24	2	3	0.06			257	5.35	3	0.06			257	5.35
3	7/08–7/09	24	9	14	0.06			1,027	4.75	17	0.06			1,284	4.86
4	7/10–7/11	24	8	10	0.05			503	2.62	27	0.06			1,787	3.92
5	7/13–7/14	24	0							27	0.06			1,787	3.92
6	7/15–7/16	24	0							27	0.06			1,787	3.92
7	7/17–7/18	24	0	No fish buyer operated during most of season.						27	0.06			1,787	3.92
8	7/20–7/21	24	0							27	0.06			1,787	3.92
9	7/22–7/23	24	0							27	0.06			1,787	3.92
10	7/24–7/25	24	0							27	0.06			1,787	3.92
11	7/27–7/28	24	0							27	0.06			1,787	3.92
12	7/29–7/30	24	0							27	0.06			1,787	3.92
13	7/31–8/01	24	0							27	0.06			1,787	3.92
14	8/03–8/04	24	0							27	0.06			1,787	3.92
15	8/05–8/06	24	0							27	0.06			1,787	3.92
16	8/07–8/08	24	0							27	0.06			1,787	3.92
17	8/10–8/11	24	0							27	0.06			1,787	3.92
18	8/12–8/13	24	0							27	0.06			1,787	3.92
19	8/14–8/15	24	0							27	0.06			1,787	3.92
20	8/17–8/18	24	0							27	0.06			1,787	3.92
21	8/19–8/20	24	0							27	0.06			1,787	3.92
22	8/21–8/22	24	0							27	0.06			1,787	3.92
23	8/24–8/25	24	0							27	0.06			1,787	3.92
24	8/26–8/27	24	0							27	0.06			1,787	3.92
25	8/28–8/29	24	0							27	0.06			1,787	3.92
26	8/31–9/01	24	0							27	0.06			1,787	3.92
27	9/02–9/03	24	0							27	0.06			1,787	3.92
28	9/04–9/05	24	0							27	0.06			1,787	3.92

No pink or sockeye salmon were sold.
Total hours fished = 72
Total number of permits used = 9

Table 8. Commercial salmon set gillnet catches from Shaktoolik, Subdistrict 5, Norton Sound, 1992.

Period Number	Period Dates	Hours Fished	No. of Fishermen	Period Catch and Catch Per Unit Effort								Cumulative Catch and Catch Per Unit Effort						
				Chinook	CPUE	Sockeye	CPUE	Coho	CPUE	Chum	CPUE	Chinook	CPUE	Sockeye	Coho	CPUE	Chum	CPUE
1	7/02–7/04	48	14	188	0.28					3,349	4.98	188	0.28				3,349	4.98
2	7/06–7/08	48	17	314	0.38					5,671	6.95	502	0.34				9,020	6.06
3	7/09–7/11	48	20	152	0.16					5,314	5.54	654	0.27	0	0		14,334	5.86
4	7/13–7/15	48	16	243	0.32	2	0.00	33	0.04	3,976	5.18	897	0.28	2	33	0.04	18,310	5.69
5	7/16–7/18	48	18	72	0.08	0	0.00	97	0.11	1,894	2.19	969	0.24	2	130	0.15	20,204	4.95
6	7/20–7/22	48	23	48	0.04	1	0.00	302	0.27	2,689	2.44	1,017	0.20	3	432	0.22	22,893	4.42
7	7/23–7/25	48	21	36	0.04	2	0.00	525	0.52	1,712	1.70	1,053	0.17	5	957	0.32	24,605	3.97
8	7/27–7/29	48	17	20	0.02	7	0.01	1,030	1.26	1,130	1.38	1,073	0.15	12	1,987	0.52	25,735	3.67
9	7/30–8/01	48	17	13	0.02	16	0.02	1,380	1.69	994	1.22	1,086	0.14	28	3,367	0.73	26,729	3.42
10	8/03–8/05	48	0	DID NOT FISH								1,086	0.14	28	3,367	0.73	26,729	3.42
11	8/06–8/08	48	19	6	0.01	23	0.03	5,547	6.08	701	0.77	1,092	0.13	51	8,914	1.61	27,430	3.14
12	8/10–8/12	48	11	0	0.00	4	0.01	1,817	3.44	157	0.30	1,092	0.12	55	10,731	1.77	27,587	2.98
13	8/13–8/15	48	11	2	0.00	0	0.00	2,093	3.96	80	0.15	1,094	0.11	55	12,824	1.95	27,667	2.83
14	8/17–8/19	48	10	4	0.01	1	0.00	1,836	3.83	200	0.42	1,098	0.11	56	14,660	2.08	27,867	2.71
15	8/20–8/22	48	0	NO BUYER								1,098	0.11	56	14,660	2.08	27,867	2.71
16	8/24–8/26	48	0	NO BUYER								1,098	0.11	56	14,660	2.08	27,867	2.71
17	8/27–8/29	48	0	NO BUYER								1,098	0.11	56	14,660	2.08	27,867	2.71
18	8/31–9/02	48	0	NO BUYER								1,098	0.11	56	14,660	2.08	27,867	2.71
19	9/03–9/05	48	0	NO BUYER								1,098	0.11	56	14,660	2.08	27,867	2.71

No pink salmon were sold.
Total hours actually fished = 624
Total number of permits used = 25
Cumulative coho boat hours began when 100 coho were caught.

Table 9. Commercial salmon set gillnet catches from Unalakleet, Subdistrict 6, Norton Sound, 1992.

Period Number	Period Dates	Hours Fished	No. of Fishermen	Period Catch and Catch Per Unit Effort						Cumulative Catch and Catch Per Unit Effort						
				Chinook	CPUE	Sockeye	Coho	CPUE	Chum	CPUE	Chinook	CPUE	Sockeye	Coho	CPUE	Chum	CPUE
1	7/02–7/04	48	40	819	0.43	16			12,416	6.47	819	0.43	16	0		12,416	6.47
2	7/06–7/08	48	44	1,416	0.67	10	1	0.00	16,407	7.77	2,235	0.55	26	1		28,823	7.15
3	7/09–7/11	48	44	550	0.26	19	6	0.00	8,293	3.93	2,785	0.45	45	7		37,116	6.04
4	7/13–7/15	48	24	219	0.19	5	40	0.03	2,059	1.79	3,004	0.41	50	47		39,175	5.37
5	7/16–7/18	48	20	80	0.08	2	101	0.11	932	0.97	3,084	0.37	52	148	0.15	40,107	4.86
6	7/20–7/22	48	35	81	0.05	14	1,138	0.68	2,240	1.33	3,165	0.32	66	1,286	0.49	42,347	4.26
7	7/23–7/25	48	32	65	0.04	8	1,734	1.13	1,424	0.93	3,230	0.28	74	3,020	0.72	43,771	3.82
8	7/27–7/29	48	39	44	0.02	19	4,230	2.26	1,636	0.87	3,274	0.25	93	7,250	1.20	45,407	3.40
9	7/30–8/01	48	47	44	0.02	18	11,489	5.09	2,014	0.89	3,318	0.21	111	18,739	2.26	47,421	3.04
10	8/03–8/05	48	47	22	0.01	13	6,625	2.94	1,430	0.63	3,340	0.19	124	25,364	2.40	48,851	2.74
11	8/06–8/08	48	37	11	0.01	19	6,072	3.42	952	0.54	3,351	0.17	143	31,436	2.55	49,803	2.54
12	8/10–8/12	48	39	11	0.01	24	11,906	6.36	905	0.48	3,362	0.16	167	43,342	3.05	50,708	2.36
13	8/13–8/15	48	45	5	0.00	5	11,168	5.17	628	0.29	3,367	0.14	172	54,510	3.33	51,336	2.17
14	8/17–8/19	48	45	4	0.00	5	7,842	3.63	354	0.16	3,371	0.13	177	62,352	3.37	51,690	2.00
15	8/20–8/22	48	53	13	0.01	14	8,399	3.30	406	0.16	3,384	0.12	191	70,751	3.36	52,096	1.84
16	8/24–8/26	48	44	21	0.01	27	9,034	4.28	355	0.17	3,405	0.11	218	79,785	3.44	52,451	1.72
17	8/26–8/28	48	42	4	0.00	11	4,535	2.25	96	0.05	3,409	0.10	229	84,320	3.35	52,547	1.62
18	8/28–8/31	112	1	0	0.00	0	129	1.15	0	0.00	3,409	0.10	229	84,449	3.34	52,547	1.61
19	8/31–9/05	144	0	No Buyer							3,409	0.10	229	84,449	3.34	52,547	1.61

9 fishermen sold 6,284 pink salmon on 7/20 during a special pink period.
Total hours fished = 928
Total number of permits used = 71
Cumulative coho boat hours began when 100 coho were caught.
Salmon buyer did not operate during periods 18 and 19. Fish sold as permitted under Catcher/Seller status during period 18.

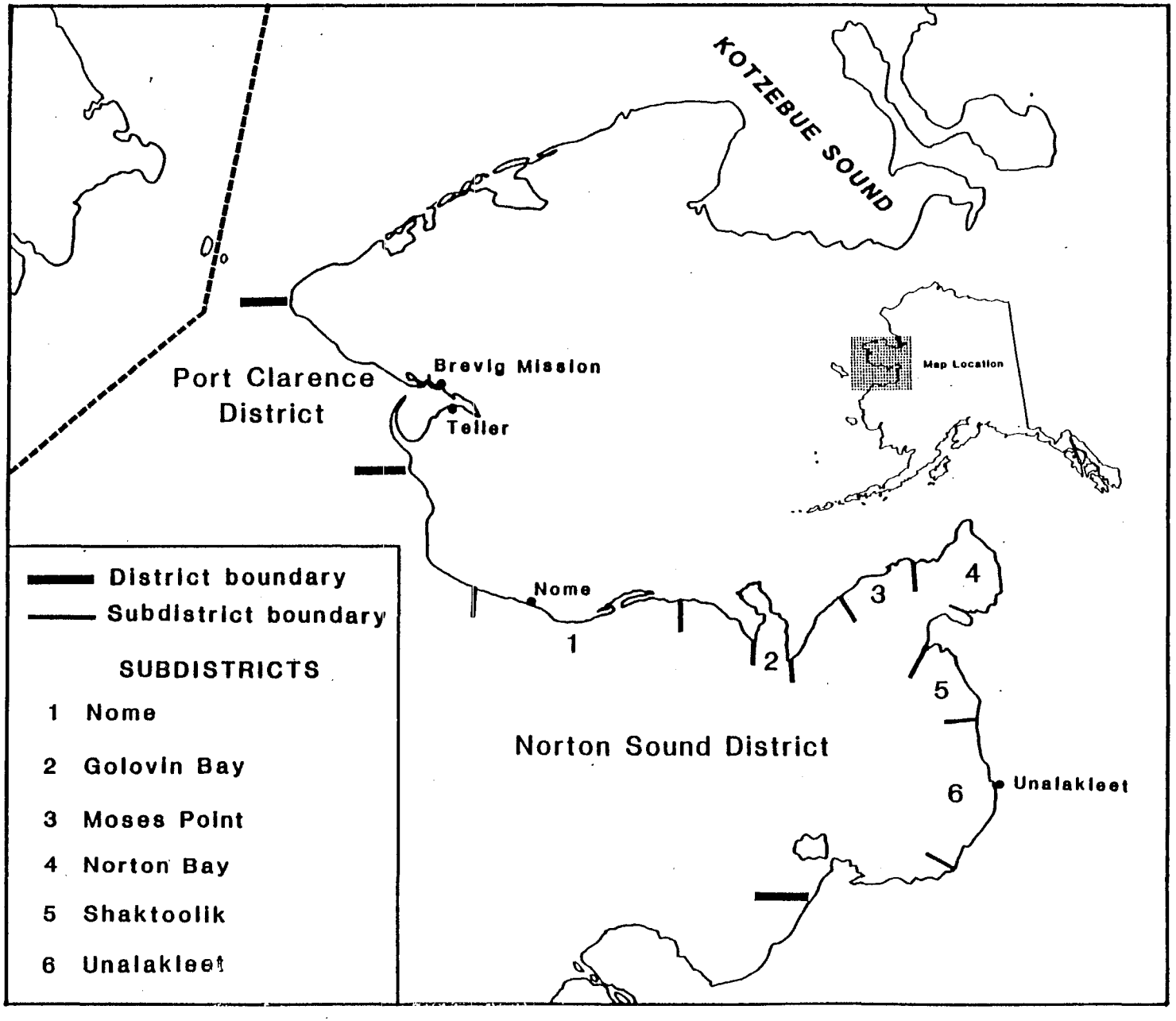


Figure 1. Norton Sound commercial salmon fishing subdistricts.

Appendix Table A1. Number of commercial salmon fishermen fishing in Norton Sound, 1970-1992.

Year	SUBDISTRICT 1	2	3	4	5	6	DISTRICT [a] Totals
1970	6	33	21	0	12	45	[b]
1971	7	22	45	6	19	72	[b]
1972	20	20	48	32	20	71	[b]
1973	21	34	57	30	27	94	[b]
1974	25	25	60	8	23	53	[b]
1975	24	42	67	42	39	61	[b]
1976	21	22	54	27	37	60	[b]
1977	14	25	52	24	30	45	164
1978	16	24	44	26	26	51	176
1979	15	21	41	22	29	63	175
1980	14	17	26	13	26	66	159
1981	15	19	33	10	26	73	167
1982	18	17	28	10	32	68	164
1983	19	21	39	15	34	72	170
1984	8	22	25	8	24	74	141
1985	9	21	34	12	21	64	155
1986	13	24	34	9	30	73	163
1987	10	21	34	12	39	65	164
1988	5	21	36	13	21	69	152
1989	2	0	13	0	26	73	110
1990	0	15	23	0	28	73	128
1991	0	16	24	0	25	75	126
1992	2	1	21	9	25	71	110

[a] District total is the number of fishermen that actually fished in Norton Sound; some fishermen may have fished more than one subdistrict.

[b] Data not available.

Appendix Table A2. Commercial and subsistence salmon catches by species, by subdistrict, Norton Sound District, 1964-1992.

Year	Commercial						Subsistence						Combined					
	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Coho	Pink	Chum	Sockeye	Total	Chinook	Sockeye	Coho	Pink	Chum	Total
NOME (SUBDISTRICT 1)																		
1964	5	-	-	1	1194	1200	-	-	-	-		-	5	-	-	1	1194	1200
1965	1	-	-	193	1941	2135	-	-	780	1825		2605	1	-	-	973	3766	4740
1966	1	-	32	1	581	615	12	192	1794	1762		3760	13	-	224	1795	2343	4375
1967	-	-	-	72	406	478	11	36	349	627		1023	11	-	36	421	1033	1501
1968	-	-	-	50	102	152	7	108	6507	621		7243	7	-	108	6557	723	7395
1969	-	-	63	330	601	994	2	27	3649	508		4186	2	-	90	3979	1109	5180
1970	-	-	6	55	960	1019	-	35	5001	458		5494	-	-	41	5056	1418	6513
1971	11	-	-	14	2315	2340	-	122	5457	2900		8479	11	-	122	5471	5215	10819
1972	15	-	-	12	2643	2670	19	52	4684	315		5070	34	-	52	4696	2958	7740
1973	-	-	-	321	1132	1453	14	120	5108	1863		7114	14	-	129	5429	2995	8567
1974	19	-	123	7722	10431	18295	8	5	3818	183		4014	27	-	128	11540	10614	22309
1975	2	-	319	2163	8364	10848	2	97	6267	2858		9224	4	-	416	8430	11222	20072
1976	2	10	26	1331	7620	8989	13	189	5492	1705		7399	15	10	215	6823	9325	16388
1977	8	-	58	65	15998	16129	35	498	2773	12192		15498	43	-	556	2838	28190	31627
1978	19	-	-	22869	8782	31670	35	225	13063	4295		17618	54	-	225	35932	13077	49288
1979	9	-	29	5860	5391	11289	11	1120	6353	3273		10757	20	-	1149	12213	8664	22046
1980	8	-	-	10007	13922	23937	129	2157	22246	5983		30515	137	-	2157	32253	19905	54452
1981	4	-	508	3202	18666	22380	35	1726	5584	8579	14	15938	39	14	2234	8786	27245	38318
1982	20	-	1183	18512	13447	33162	21	1829	19202	4831	6	5889	41	6	3012	37714	18278	59051
1983	23	-	261	308	11691	12283	74	1911	8086	7091	53	17215	97	53	2172	8394	18782	29498
1984	7	-	820	-	3744	4571	83	1795	17182	4883	16	23949	90	16	2615	17182	8627	28520
1985	21	-	356	-	6219	6596	56	1054	2117	5667	114	9008	77	114	1410	2117	11886	15604
1986	6	-	50	-	8160	8216	150	688	8720	8085	107	17750	156	107	738	8720	16245	25966
1987	3	-	577	-	5646	6226	200	1100	1251	8394	107	11052	203	107	1677	1251	14040	17278
1988	2	-	54	182	1628	1866	63	1076	2159	5952	133	9250	65	169	1130	2341	7580	11285
1989	2	-	-	123	492	619	24	469	924	3399	131	4816	26	127	469	1047	3891	5562
1990	0	-	0	0	0	0	58	510	2233	4246	234	7280	58	233	510	2233	4246	7280
1991	0	0	0	0	0	0	83	1279	194	3715	166	5652	45	56	1148	172	3348	4769
1992	1	2	693	185	881	1762	152	1481	7351	1684	163	10831	153	165	2174	7536	2656	12593
5-year avg. [a]	1	-	126	61	1553	1742	85	886	1352	5141	154	7610	79	138	987	1408	6621	9235
10-year avg. [b]	8	-	330	1913	5103	7354	81	1216	6207	5626	107	11186	85	98	1488	8117	10692	20481

[a] 1987-1991
[b] 1982-1991

Appendix Table A3. Commercial and subsistence salmon catches by species, by subdistrict, Norton Sound District, 1962-1992.

Year	Commercial						Subsistence					Combined					
	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total
							GOLOVIN BAY (SUBDISTRICT 2)										
1962	45	11	264	10276	68720	79316	-	-	-	-	-	45	11	264	10276	68720	79316
1963	40	40	-	19677	49850	69607	-	118	5702	9319	15139	40	40	118	25379	59169	84746
1964	27	40	3	7236	58301	65607	-	-	-	-	-	27	40	3	7236	58301	65607
1965	-	-	-	-	-	-	2	49	1523	3847	5421	2	-	49	1523	3847	5421
1966	17	14	584	4665	29791	35071	4	176	1573	3520	5273	21	14	760	6238	33311	40344
1967	10	-	747	5790	31193	37740	3	185	2774	4803	7765	13	-	932	8564	35996	45505
1968	12	-	205	18428	10011	28656	4	181	4955	1744	6884	16	-	386	23383	11755	35540
1969	28	-	1224	23208	20949	45409	2	190	2760	2514	5466	30	-	1414	25968	23463	50875
1970	13	-	3	18721	20566	39303	4	353	2046	2614	6017	17	-	356	20767	23180	45320
1971	37	-	197	2735	33824	36793	7	191	1544	1936	3678	44	-	388	4279	35760	40471
1972	36	-	20	6562	27097	33715	4	62	1735	2028	3829	40	-	82	8297	29125	37644
1973	70	-	183	14145	41689	56087	1	48	9	74	132	71	-	231	14154	41763	56219
1974	30	-	3	28340	30173	58546	3	-	967	205	1175	33	-	3	29307	30379	58722
1975	17	-	206	10770	41761	52754	-	1	2011	2025	4037	17	-	207	12781	43786	56791
1976	12	-	1311	24051	30219	55593	-	-	1995	1128	3123	12	-	1311	26046	31347	58716
1977	26	-	426	7928	53912	62292	3	80	703	2915	3701	29	-	506	8631	56827	65993
1978	22	-	94	72033	41462	113611	1	-	2470	1061	3532	23	-	94	74503	42523	117143
1979	75	49	1606	45948	30201	77879	-	845	2546	2840	6231	75	49	2451	48494	33041	84110
1980	36	36	328	10774	52609	63783	12	692	10727	4057	15488	48	36	1020	21501	56666	79271
1981	23	5	13	49755	58323	108119	8	1520	5158	5543	12229	31	5	1533	54913	63866	120348
1982	78	5	4281	39510	51970	95844	7	1289	4752	1868	7916	85	5	5570	44264	53838	103760
1983	52	10	295	17414	48283	66054	-	-	-	-	- [c]	-	-	-	-	-	-
1984	31	-	2462	88588	54153	145234	-	-	-	-	- [c]	-	-	-	-	-	-
1985	193	113	1196	3019	55781	60302	12	430	1904	9577	11925 [d]	205	115	1626	4923	65358	72227
1986	81	8	958	25425	69725	96197	-	-	-	-	- [c]	-	-	-	-	-	-
1987	166	51	2203	1579	44334	48333	-	-	-	-	- [c]	-	-	-	-	-	-
1988	108	921	2149	31559	33348	68085	-	-	-	-	- [c]	-	-	-	-	-	-
1989	0	0	0	0	0	0	-	-	-	-	- [c]	-	-	-	-	-	-
1990	52	21	0	0	15993	16066	-	-	-	-	- [c]	-	-	-	-	-	-
1991	49	1	0	0	14839	14889	-	-	-	-	- [c]	-	-	-	-	-	-
1992	6	9	2085	0	1002	3102	-	-	-	-	-	-	-	-	-	-	-
5-Year avg. [a]	25	199	807	6628	21703	29475	-	-	-	-	-	-	-	-	-	-	-
10-Year avg. [b]	81	113	1354	20710	38843	61100	-	-	-	-	-	-	-	-	-	-	-

[a] 1987-1991
[b] 1982-1991
[c] Subsistence surveys not conducted.
[d] Total includes 2 sockeye.

Appendix Table A4. Commercial and subsistence salmon catches by species, by subdistrict, Norton Sound District, 1962-1992.

	Commercial						Subsistence					Combined					
Year	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total
							MOSES POINT (SUBDISTRICT 3)										
1962	27	-	-	11100	50683	61810	-	-	-	-	-	27	-	-	11100	50683	61810
1963	15	-	-	2549	46274	48838	5	-	5808	8316	14129	20	-	-	8357	54590	62967
1964	32	3	-	3372	28568	31975	-	-	63	348	411	32	3	-	3435	28916	32386
1965	-	-	-	-	-	-	16	72	1325	9857	11270	16	-	72	1325	9857	11270
1966	17	-	-	2745	24741	27503	14	250	2511	5409	8184	31	-	250	5256	30150	35687
1967	-	-	-	-	-	-	39	116	1322	9913	11390	39	-	116	1322	9913	11390
1968	12	-	1	9012	17908	26933	2	80	6135	2527	8744	14	-	81	15147	20435	35677
1969	29	-	-	11807	26594	38430	9	109	1790	1303	3211	38	-	109	13597	27897	41641
1970	39	-	-	13052	29726	42817	16	160	4661	6960	11797	55	-	160	17713	36686	54614
1971	95	-	4	922	43831	44852	16	271	1046	2227	3560	111	-	275	1968	46058	48412
1972	190	-	11	5866	30919	36986	44	108	1579	2070	3801	234	-	119	7445	32989	40787
1973	134	-	-	10603	31389	42126	2	-	-	298	300	136	-	-	10603	31687	42426
1974	198	-	9	12821	55276	68304	3	-	2382	1723	4108	201	-	9	15203	56999	72412
1975	16	-	-	4407	46699	51122	2	6	1280	508	1796	18	-	6	5687	47207	52918
1976	24	-	232	5072	10890	16218	22	-	5016	1548	6586	46	-	232	10088	12438	22804
1977	96	-	6	9443	47455	57000	22	225	1145	1170	2562	118	-	231	10588	48625	59562
1978	444	-	244	39694	44595	84977	38	407	1995	1229	3669	482	-	651	41689	45824	88646
1979	1035	-	177	40811	37123	79146	16	890	6078	1195	8179	1051	-	1067	46889	38318	87325
1980	502	-	-	1435	14755	16693	131	229	4232	1393	5985	633	-	230	5667	16148	22678
1981	198	-	5	26417	29325	55945	32	2345	6530	2819	11726	230	-	2350	32947	32144	67671
1982	253	-	318	9849	40030	50450	1	1835	3785	3537	9158	254	-	2153	13634	43567	59608
1983	254	-	-	17027	65776	83057	-	-	-	-	- [c]	-	-	-	-	-	-
1984	-	-	5959	28035	9477	43471	-	-	-	-	- [c]	-	-	-	-	-	-
1985	816	32	1803	559	24466	27676	67	1389	1212	947	3615	883	32	3192	1771	25413	31291
1986	600	41	5874	15795	20668	42978	-	-	-	-	- [c]	-	-	-	-	-	-
1987	907	15	64	568	17278	18832	-	-	-	-	- [c]	-	-	-	-	-	-
1988	663	93	3974	13703	18585	37018	-	-	-	-	- [c]	-	-	-	-	-	-
1989	62	-	-	-	1667	1729	-	-	-	-	- [c]	-	-	-	-	-	-
1990	202	-	-	501	3723	4426	-	-	-	-	- [c]	-	-	-	-	-	-
1991	161	0	0	0	804	965	312	2153	3555	2660	8680 [d]	473	-	2153	3555	3464	9645
1992	0	0	3531	0	6	3537	100	1281	6152	1260	8793 [d]	100	-	4812	6152	1266	12330
5-Year avg. [a]	487	30	1982	6113	12384	20997											
10-Year avg. [b]	396	18	1800	11245	23100	36558											

[a] 1987-1991
[b] 1982-1991
[c] Subsistence surveys not conducted.
[d] Subsistence survey conducted by Subsistence Division.

Appendix Table A5. Commercial and subsistence salmon catches by species, by subdistrict, Norton Sound District, 1962-1992.

Year	Commercial						Subsistence					Combined					
	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total
NORTON BAY (SUBDISTRICT 4)																	
1962	387	7	40	4402	24380	29216	-	-	-	-	-	387	7	40	4402	24380	29216
1963	137	2	-	17676	12469	30284	-	-	5097	-	5097	137	2	-	22773	12469	35381
1964	50	3	-	988	5916	6957	-	-	-	-	-	50	3	-	988	5916	6957
1965	-	-	-	-	-	-	4	22	252	3032	3310	4	-	22	252	3032	3310
1966	-	-	-	-	-	-	7	41	929	3612	4589	7	-	41	929	3612	4589
1967	-	-	-	-	-	-	12	14	1097	2945	4068	12	-	14	1097	2945	4068
1968	-	-	-	-	-	-	28	71	1916	1872	3887	28	-	71	1916	1872	3887
1969	26	-	-	4849	3974	8849	59	189	2115	3855	6218	85	-	189	6964	7829	15067
1970	-	-	-	-	-	-	3	10	840	3500	4353	3	-	10	840	3500	4353
1971	-	-	-	-	-	-	5	47	92	2619	2763	5	-	47	92	2619	2763
1972	43	-	-	1713	7799	9555	30	44	2089	2022	4185	73	-	44	3802	9821	13740
1973	28	-	-	1645	4672	6345	1	-	10	130	141	29	-	-	1655	4802	6486
1974	21	-	-	654	3826	4501	-	-	17	900	917	21	-	-	671	4726	5418
1975	68	-	89	1137	17385	18679	1	-	93	361	455	69	-	89	1230	17746	19134
1976	102	-	95	4456	7161	11814	2	-	41	236	279	104	-	95	4497	7397	12093
1977	158	-	1	2495	13563	16217	14	-	420	2055	2489	172	-	1	2915	15618	18706
1978	470	-	144	8471	21973	31058	12	21	1210	1060	2303	482	-	165	9681	23033	33361
1979	856	-	2547	6201	15599	25203	12	697	735	1400	2844	868	-	3244	6936	16999	28047
1980	340	-	-	47	7855	8242	22	33	4275	1132	5462	362	-	719	5052	16158	22268
1981	63	-	-	177	3111	3351	7	82	2314	3515	5918	70	-	82	2491	6626	9269
1982	96	-	2332	2535	7128	12091	1	484	2600	2485	5570	97	-	2816	5135	9613	17661
1983	215	-	204	3935	17157	21511	-	-	-	-	- [c]	-	-	-	-	-	-
1984	-	-	-	1162	3442	4604	-	-	-	-	- [c]	-	-	-	-	-	-
1985	528	-	384	68	9948	10928	-	-	-	-	- [c]	-	-	-	-	-	-
1986	139	2	1512	40	1994	3687	-	-	-	-	- [c]	-	-	-	-	-	-
1987	544	-	145	16	3586	4291	-	-	-	-	- [c]	-	-	-	-	-	-
1988	434	2	709	1749	7521	10415	-	-	-	-	- [c]	-	-	-	-	-	-
1989[d]	0	0	0	0	0	0	-	-	-	-	- [c]	-	-	-	-	-	-
1990[d]	0	0	0	0	0	0	-	-	-	-	- [c]	-	-	-	-	-	-
1991[d]	0	0	0	0	0	0	-	-	-	-	- [c]	-	-	-	-	-	-
1992	27	0	0	0	1787	1814	-	-	-	-	-	-	-	-	-	-	-
5-Year avg. [a]	196	-	171	353	2221	2941	-	-	-	-	-	-	-	-	-	-	-
10-Year avg. [b]	196	-	529	951	5078	6753	-	-	-	-	-	-	-	-	-	-	-

[a] 1987-1991
[b] 1982-1991
[c] Subsistence surveys not conducted.
[d] No commercial harvest reported.

Appendix Table A6. Commercial and subsistence salmon catches by species, by subdistrict, Norton Sound District, 1961-1992.

	Commercial						Subsistence					Combined					
Year	Chi-nook	Sock-eye	Coho	Pink	Chum	Total	Chi-nook	Coho	Pink	Chum	Total	Chi-nook	Sock-eye	Coho	Pink	Chum	Total
							SHAKTOOLIK (SUBDISTRICT 5)										
1961	140	-	-	29075	24746	53961	-	-	-	-	-	140	-	-	29075	24746	53961
1962	1738	-	2113	640	8718	13209	-	-	-	-	-	1738	-	2113	640	8718	13209
1963	480	11	563	5138	19153	25345	-	-	-	-	-	480	11	563	5183	19153	25345
1964	631	79	16	1969	35272	37967	77	340	2132	5412	7961	708	79	356	4101	40684	45928
1965	127	30	-	3	8356	8516	31	107	3763	3420	7321	158	30	107	3766	11776	15837
1966	310	-	956	344	8292	9902	142	762	1445	4183	6532	452	-	1718	1789	12475	16434
1967	43	-	88	1050	1655	2836	262	387	2010	4436	7095	305	-	475	3060	6091	9931
1968	61	-	130	2205	2504	4900	10	458	6355	1915	8738	71	-	588	8560	4419	13638
1969	33	-	276	6197	8645	15151	40	193	4018	3439	7690	73	-	469	10215	12084	22841
1970	197	-	155	2301	15753	18406	43	210	2474	2016	4743	240	-	365	4775	17769	23149
1971	284	-	238	28	13399	14949	87	329	494	5060	5970	371	-	567	522	18459	20919
1972	419	-	11	2798	12022	15250	64	235	939	3399	4637	483	-	246	3737	15421	19887
1973	289	-	177	6450	14500	21416	51	130	3410	1397	4988	340	-	307	9860	15897	26404
1974	583	-	179	5650	26391	32803	93	353	1901	358	2705	676	-	532	7551	26749	35508
1975	651	2	812	1774	49536	51963	18	14	1394	334	1760	669	2	826	3108	49870	54535
1976	892	-	129	15803	15798	32622	24	121	1188	269	1602	916	-	250	16991	16067	34224
1977	1521	4	418	7743	36591	46277	49	170	585	2190	2994	1570	4	588	8328	38781	49271
1978	1339	7	1116	46236	35388	84086	81	15	3275	1170	4541	1420	7	1131	49511	36558	88627
1979	2377	-	3383	18944	22030	46734	62	1605	2575	1670	5912	2439	-	4988	21519	23700	52646
1980	1086	-	8001	1947	27453	38488	57	756	3227	1827	5867	1143	1	8757	5174	29280	44355
1981	1484	4	1191	29695	21097	53471	8	525	2225	3490	6248	1492	4	1716	31920	24587	59719
1982	1677	3	22233	17019	26240	67172	68	2138	3865	1165	7236	1745	3	24371	20884	27405	74408
1983	2742	4	12877	12031	67310	94964	-	-	-	-	-	- [c]	-	-	-	-	-
1984	1613	-	10730	1596	32309	46248	-	-	-	-	-	- [c]	-	-	-	-	-
1985	5312	-	2808	-	13403	21523	298	1379	24	298	1999	5610	-	4187	24	13701	23522
1986	1075	29	6626	-	16126	23856	-	-	-	-	-	- [c]	-	-	-	-	-
1987	2214	-	6193	-	14088	22495	-	-	-	-	-	- [c]	-	-	-	-	-
1988	671	79	6096	3681	21521	32048	-	-	-	-	-	- [c]	-	-	-	-	-
1989	1241	43	8066	-	19641	28991	-	-	-	-	-	- [c]	-	-	-	-	-
1990	2644	49	4695	-	21748	29136	-	-	-	-	-	- [c]	-	-	-	-	-
1991	1324	55	11614	-	31619	44612	-	-	-	-	-	- [c]	-	-	-	-	-
1992	1098	56	14660	-	27867	43681	-	-	-	-	-	- [c]	-	-	-	-	-
5-Year avg. [a]	1619	45	7333	736	21723	31456	-	-	-	-	-	-	-	-	-	-	-
10-Year avg. [b]	2051	26	9194	3436	26401	41105	-	-	-	-	-	-	-	-	-	-	-

[a] 1987-1991 [b] 1982-1991 [c] Subsistence surveys not conducted.

Appendix Table A7. Commercial and subsistence salmon catches by species, by subdistrict, Norton Sound District, 1961-1992.

Year	Commercial Chinook	Commercial Sockeye	Commercial Coho	Commercial Pink	Commercial Chum	Commercial Total	Subsistence Chinook	Subsistence Coho	Subsistence Pink	Subsistence Chum	Subsistence Total	Combined Chinook	Combined Sockeye	Combined Coho	Combined Pink	Combined Chum	Combined Total
							UNALAKLEET (SUBDISTRICT 6)										
1961	5160	35	13807	5162	23586	47750	-	-	-	-	-	5160	35	13807	5162	23586	47750
1962	5089	-	6739	6769	30283	48880	-	-	-	-	-	5089	-	6739	6769	30283	48880
1963	5941	18	16202	11140	27003	60304	-	-	-	-	-	5941	18	16202	11140	27003	60304
1964	1273	1	79	1	19611	20965	488	2227	7030	6726	16471	1761	1	2306	7031	26337	37436
1965	1321	-	2030	24	26498	29873	521	4562	11488	8791	25362	1842	-	6592	11512	35289	55235
1966	1208	-	4183	5023	16840	27254	90	789	6083	3387	10349 [f]	1298	-	4972	11106	20227	37603
1967	1751	-	1544	21961	8502	33758	490	484	9964	-	10938 [f]	2241	-	2028	31925	8502	44696
1968	960	-	6549	41474	14865	63848	186	1493	11044	2982	15705 [f]	1146	-	8042	52518	17847	79553
1969	2276	-	5273	40558	22032	70139	324	1483	4230	4196	10233 [f]	2600	-	6756	44788	26228	80372
1970	1604	-	4261	30779	40029	76673	495	3907	10104	7214	21720 [f]	2099	-	8168	40883	47244	98393
1971	2166	-	2688	1196	37543	43593	911	3137	2230	7073	13351 [f]	3077	-	5825	3426	44616	56944
1972	2235	-	412	28231	20440	51318	643	1818	3132	4132	9725	2878	-	2230	31363	24572	61043
1973	1397	-	8922	13335	25716	49370	323	213	6233	3426	10195	1720	-	9135	19568	29142	59565
1974	2100	-	1778	93332	36170	133380	313	706	7341	588	8948	2413	-	2484	100673	36758	142328
1975	1638	-	3167	12137	48740	65682	163	74	4758	2038	7033	1801	-	3241	16895	50778	72715
1976	1211	1	5141	37203	24268	67824	142	694	4316	2832	7984	1353	1	5835	41519	27100	75808
1977	2691	1	2781	21001	32936	59410	723	1557	8870	6085	17235	3414	1	4338	29871	39021	76645
1978	7525	5	5737	136200	37079	186546	1044	2538	13268	3442	20292	8569	5	8275	149468	40521	206838
1979	6354	8	23696	49647	30445	110150	640	3330	6960	1597	12527	6994	8	27026	56607	32042	122677
1980	4339	3	21512	203142	64198	293194	1046	4758	19071	5230	30105	5385	3	26270	222213	69428	323299
1981	6157	47	29845	123233	39186	198468	869	5808	5750	4235	16686 [c]	7026	71	35650	128983	43421	215154
1982	3768	2	61343	142856	44520	252489	913	7037	20045	4694	32691 [d]	4681	4	68380	162901	49214	285090
1983	7022	13	36098	26198	109220	178551	1868	6888	13808	4401	26998 [e]	8890	46	42986	40006	113621	205549
1984	6804	6	47904	-	43317	98031	1650	6675	17418	3348	29092 [g]	8454	7	54579	17418	46665	127123
1985	12621	21	15421	1	25111	53175	1397	2244	55	1968	5667 [h]	14018	24	17665	56	27079	58842
1986	4494	153	20580	-	30239	55466	-	-	-	-	- [i]	-	-	-	-	-	-
1987	3246	141	15097	97	17525	36106	-	-	-	-	- [i]	-	-	-	-	-	-
1988	2218	157	24232	23730	25363	75700	-	-	-	-	- [i]	-	-	-	-	-	-
1989	4402	222	36025	-	20825	61474	-	4681	17500	1388	- [j]	-	-	-	-	-	-
1990	5998	358	52015	-	23659	82030	2476[j]	-	-	-	-	-	-	-	-	-	-
1991	4534	147	52033	-	39609	96323	-	-	-	-	- [i]	-	-	-	-	-	-
1992	3409	229	84449	6284	52547	146918	-	-	-	-	- [i]	-	-	-	-	-	-
5-Year avg. [a]	4080	205	35880	4765	25396	70327	-	-	-	-	-	-	-	-	-	-	-
10-Year avg. [b]	5511	122	36075	19288	37939	98935	-	-	-	-	-	-	-	-	-	-	-

[a] 1987-1991
[b] 1982-1991
[c] Includes 24 sockeye salmon
[d] Includes 2 sockeye salmon
[e] Includes 33 sockeye salmon
[f] Subsistence catches from 1966-72 includes fish taken at St. Michael
[g] Includes 1 sockeye salmon
[h] Includes 3 sockeye salmon
[i] Subsistence surveys not conducted
[j] In-depth survey by Subsistence Division

Appendix Table A8. Commercial and subsistence salmon catches by species, all subdistricts, Norton Sound District, 1961-1992.

	Commercial						Subsistence					Combined					
Year	Chinook	Sockeye	Coho	Pink	Chum	Total	Chinook	Coho	Pink	Chum	Total	Chinook	Sockeye	Coho	Pink	Chum	Total
									ALL SUBDISTRICTS								
1961	5300	35	13807	34327	48332	101801	-	-	-	-	-	5300	35	13807	34327	48332	101801
1962	7286	18	9156	33187	182784	232431	-	-	-	-	-	7286	18	9156	33187	182784	232431
1963	6613	71	16765	55625	154789	233863	5	118	16607	17635	34365	6618	71	16883	72232	172424	268228
1964	2018	126	98	13567	148862	164671	565	2567	9225	12486	24843	2583	126	2665	22792	161348	189514
1965	1449	30	2030	220	36795	40524	574	4812	19131	30772	55289	2023	30	6842	19351	67567	95813
1966	1553	14	5755	12778	80245	100345	269	2210	14335	21873	38687	1822	14	7965	27113	102118	139032
1967	1804	-	2379	28879	41756	74818	817	1222	17516	22724	42279	2621	-	3601	46395	64480	117097
1968	1045	-	6885	71179	45300	124409	237	2391	36912	11661	51201	1282	-	9276	108091	56961	175610
1969	2392	-	6836	86949	82795	178972	436	2191	18562	15615	36804	2828	-	9027	105511	98410	215776
1970	1853	-	4423	64908	107034	178218	561	4675	26127	22763	54126	2414	-	9098	91035	129797	232344
1971	2593	-	3127	4895	131362	141977	1026	4097	10863	21815 [a]	37801	3619	-	7224	15758	153177	179778
1972	2938	-	454	45182	100920	149494	804	2319	14158	13966 [b]	31247	3742	-	2773	59340	114886	180741
1973	1918	-	9282	46499	119098	176797	392	520	14770	7185	22867	2310	-	9802	61269	126283	199664
1974	2951	-	2092	148519	162267	315829	420	1064	16426	3958	21868	3371	-	3156	164945	166225	337697
1975	2393	2	4593	32388	212485	251861	186	192	15803	8124 [c]	24305	2579	2	4785	48191	220609	276166
1976	2243	11	6934	87919	95956	193060	203	1004	18048	7718	26973	2446	11	7938	105964	103674	220033
1977	4500	5	3690	48675	200455	257325	846	2530	14296	26607	44279	5346	5	6220	62971	227062	301604
1978	9819	12	7335	325503	189279	531948	1211	2981	35281	12257	51730	11030	12	10316	360784	201536	583678
1979	10706	57	31438	167411	140789	350401	747	8487	25247	11975	46456	11453	57	39925	192658	152764	396857
1980	6311	40	29842	227352	180792	444337	1397	8625	63778	19622	93422	7708	40	38467	291130	200414	537759
1981	7929	56	31562	232479	169708	441734	2021	13416	28741	32866	77082 [f,g]	9950	94	44978	261220	202574	518816
1982	5892	10	91690	230281	183335	511208	1011	14612	54249	18580	88460 [f,h]	6903	18	106302	284530	201915	599668
1983	10308	27	49735	76913	319437	456420	-	-	-	-	- [i]	-	-	-	-	-	-
1984	8455	6	67875	119381	146442	342159	-	-	-	-	- [i]	-	-	-	-	-	-
1985	19491	166	21968	3647	134928	180200	-	-	-	-	- [i]	-	-	-	-	-	-
1986	6395	233	35600	41260	146912	230400	-	-	-	-	- [i]	-	-	-	-	-	-
1987	7080	207	24279	2260	102457	136283	-	-	-	-	- [i]	-	-	-	-	-	-
1988	4096	1252	37214	74604	107966	225132	-	-	-	-	- [i]	-	-	-	-	-	-
1989	5707	265	44091	123	42625	92811	-	-	-	-	- [i]	-	-	-	-	-	-
1990	8895	434	56712	501	65123	131665	-	-	-	-	- [i]	-	-	-	-	-	-
1991	6068	203	63647	-	86871	156789	-	-	-	-	- [i]	-	-	-	-	-	-
1992	4541	296	105418	6284	83394	199933	-	-	-	-	- [i]	-	-	-	-	-	-
5-Year avg.[d]	6369	472	45195	15542	81009	148587	-	-	-	-	-	-	-	-	-	-	-
10-Year avg.[e]	8239	280	49284	54919	133610	246332	-	-	-	-	-	-	-	-	-	-	-

[a] Includes 197 recorded sockeye salmon in all subdistricts
[b] Includes 93 recorded sockeye salmon in all subdistricts
[c] Includes 11 recorded sockeye salmon in all subdistricts
[d] 1987-1991
[e] 1982-1991
[f] These figures also include data from Stebbins and St. Michael.
[g] Includes 38 sockeye salmon.
[h] Includes 8 sockeye salmon.
[i] Incomplete subsistence surveys.

Appendix Table A9. Mean salmon weights, Norton Sound District, 1962-1992.[a]

Year	Mean Round Weight in Pounds[b] Chinook	Coho	Pink	Chum
1962	-	-	-	-
1963	-	-	-	-
1964	-	-	-	7.0
1965	-	-	2.3	7.1
1966	-	-	3.5	7.8
1967	23.7	7.0	3.6	7.2
1968	20.0	7.0	4.0	7.5
1969	19.3	7.5	3.6	6.4
1970	20.0	7.0	3.5	7.8
1971	23.7	7.0	3.6	7.2
1972	20.0	7.3	2.8	6.9
1973	20.3	6.8	3.9	7.1
1974	18.2	6.7	3.4	6.6
1975	10.8	7.4	2.9	6.5
1976	15.2	7.2	3.1	7.0
1977	22.7	7.6	3.3	7.0
1978	22.8	6.9	3.6	7.4
1979	22.9	7.1	3.6	7.2
1980	21.5	6.8	3.2	7.2
1981	20.7	6.7	3.5	7.6
1982	16.5	7.1	2.9	7.3
1983	17.4	7.2	3.6	7.4
1984	20.0	7.7	2.9	7.0
1985	21.5	7.7	3.1	7.0
1986	20.8	6.9	3.2	6.9
1987	20.0	7.3	3.0	7.1
1988	16.4	7.5	3.0	7.1
1989	18.4	7.6	3.6	7.0
1990	19.0	7.5	-	7.4
1991	17.7	7.4	-	6.9
1992	12.7[c]	7.8	2.9	7.1

[a] Information not available for some species.
[b] Based on age-weight-length samples or fish tickets.
[c] Low chinook weight due to restricted mesh size.

Appendix Table A10. Estimated mean prices paid to commercial salmon fishermen, Norton Sound District, 1962-1992.[a]

Year	Chinook	Coho	Pink	Chum
		Price Per Fish		
1962	$3.85	$ .60	$ .25	$ .35
1963	3.85	.60	.25	.35
1964	4.50	--	.25	.40
1965	3.75	.45	--	.40
1966	4.80	1.05	.25	.65
		Price Per Pound		
1967	.20	.14	.07	.09
1968	.25	.14	.06	.10
1969	.22	.14	.06	.11
1970	.25	.14	.06	.10
1971	.25	.14	.07	.10
1972	.27	.16	.06	.11
1973	.40	.16	.07	.32
1974	.40	.16	.13	.32
1975	.40	.16	.13	.24
1976	.50	.32	.17	.30
1977	.65	.40	.16	.30
1978	.65	.35	.20	.30
1979	.88	.66	.16	.41
1980	.74	.63	.07	.23
1981	$1.25	.62	.13	.26
1982	$1.25	.57	.12	.32
1983	$1.13	.39	.11	.28
1984	$1.20	.45	.11	.24
1985	$1.08	.48	.20	.31
1986	.88	.52	.15	.27
1987	$1.11	.57	.20	.33
1988	$1.26	$1.13	.19	.39
1989	.73	.43	.10	.18
1990	$1.01	.50	.75[b]	.23
1991[c]	.87	.36	-	.27
1992[d]	.66	.33	.16	.22

[a] Information is not available for some species.
[b] Price paid per pound of roe.
[c] Price paid for coho and chum roe was $3.00 per pound.
[d] Price paid for coho roe was $1.50 per pound.

Appendix Table A11. Dollar estimates of Norton Sound District commercial salmon fishery, 1961-1992.

Year	Gross Value of Catch to Fishermen	Wages Earned[b]	License and Tax Revenues to State (License Fees Only)
1961	$ [a]	$ [a]	$ 2,010.00
1962	105,800.00	[a]	16,341.00
1963	104,000.00	[a]	18,009.00
1964	51,000.00	[a]	11,305.00
1965	21,483.00	[a]	5,084.00
1966	68,000.00	[a]	4,680.00
1967	44,038.00	58,000.00	3,500.00
1968	63,700.00	[a]	4,000.00
1969	95,297.00	72,145.00	[a]
1970	99,019.00	55,100.00	5,595.00
1971	101,000.00	65,500.00	5,730.00
1972	102,225.00	68,700.00	7,000.00
1973	308,740.00	81,000.00	15,400.00
1974	437,127.00	129,600.00	20,028.00
1975	413,255.00	172,800.00	28,230.00
1976	285,283.00	[a]	10,133.00
1977	528,610.00	[a]	11,386.00
1978	814,221.00	[a]	12,002.00
1979	876,547.00	[a]	11,780.00
1980	583,388.00	[a]	11,640.00[c]
1981	758,471.00	[a]	11,940.00
1982	988,588.00	[a]	7,155.00[c] [d]
1983	1,038,967.00	[a]	10,700.00[c]
1984	721,055.00	[a]	9,690.00[c]
1985	822,056.00	[a]	5,820.00[e]
1986	539,576.00	[a]	5,970.00[e]
1987	504,631.00	[a]	5,940.00[e]
1988	754,751.00	[a]	10,050.00[e] [f]
1989	335,928.00	[a]	10,300.00[e]
1990	497,623.00	[a]	10,350.00[e]
1991	425,430.00	[a]	10,250.00[e]
1992	448,395.00	[a]	10,200.00[e]

[a] Information not available.
[b] Includes wages paid to tender boat operators, processing plant employees in district.
[c] Includes only permit renewals and vessel license fees.
[d] The Alaska state legislature lowered all resident permit renewal fees and vessel license fees to poverty level fees for 1982.
[e] Includes only permit renewal fees.
[f] The Alaska state legislature raised resident permit renewal fee to $50.00 in 1988.

Appendix Table A12. Round weight of commercially caught salmon by species, Norton Sound District, 1961-1992.

Year	Pounds Caught (Round Wt. in Lbs) Chinook	Coho	Pink	Chum	Salmon Roe (lbs)
1961	120,405	96,649	102,711	347,990	
1962[a]	157,000	--	10,569	221,645	
1963[a]	89,700	51,750	--	--	
1964[a]	39,169	686	--	249,890	
1965	33,327	14,210	660	264,924	[b]
1966	35,259	40,285	38,334	577,764	16,901
1967	41,854	15,944	100,913	289,473	21,429
1968[c]	22,954	50,665	250,044	306,871	20,381
1969[d]	51,441	50,461	312,836	529,235	5,578
1970	38,103	25,000	156,313	610,588	1,345
1971	43,112	22,078	15,377	857,014	1,122
1972	57,675	3,257	133,389	710,853	1,083
1973	38,935	63,812	185,799	845,596	[b]
1974	54,433	15,023	511,737	1,082,575	39,876
1975	25,964	32,345	87,586	1,318,111	46,470
1976	34,095	49,822	271,867	669,728	[b]
1977	102,341	28,254	162,457	1,415,981	[b]
1978	222,974	50,872	1,164,174	1,389,806	[b]
1979	231,988	251,129	598,785	1,001,548	[b]
1980	135,646	204,498	719,368	1,301,693	[b]
1981	164,182	212,065	719,102	1,284,193	[b]
1982	97,255	648,212	659,171	1,338,788	95
1983	179,666	360,264	274,568	2,352,104	239
1984	169,104	523,310	343,685	1,020,635	0
1985	419,331	169,413	11,458	939,885	0
1986	133,161	247,333	133,319	1,011,824	0
1987	141,494	177,569	6,691	731,597	0
1988	67,148	280,658	226,966	767,168	0
1989	104,829	336,652	439	297,156	0
1990	168,745	426,902	--	482,060	75
1991	107,541	469,495	--	597,272	221
1992	57,571	820,406	18,230	595,345	2,641

[a] Does not include canned salmon cases (48#)
1962: 29 chinook, 883 coho, 927 pink, 12,459 chum
1963: 604 chinook, 808 coho, 1,918 pink, 13,308 chum
1964: 75 chinook, 452 pink, 9,357 chum

[b] Information not available

[c] Includes about 48,000 lbs of salted coho, about 150,000 lbs. of salted pink, and 150,000 lbs of salted chum.

[d] Includes about 598 lbs. of salted chinook, about 48,092 lbs. of salted pink and about 117,664 lbs. salted chum.

Appendix Table A13. Comparative salmon escapement estimates of Norton Sound streams, 1961-1991.[a]

Year	Chinook	Chum	Pink	Pink & Chum[b]	Coho
			Sinuk River		
1975	--	4,662	5,390	--	--
1977	--	5,207	1,302	--	--
1978	--	8,756	22,435	--	--
1980	3	2,022	199,000	--	1,002
1981	--	5,579	350	--	--
1982	--	638	148,800	--	--
1983	48	2,150	10,770	--	96
1984	7[h]	493[h]	284,400[h]	--	192
1985	4	1,910	8,860	--	33
1986	4	1,960	28,690	--	--
1987	5	4,540	30	--	230
1988	3	2,070	4,652[i]	--	563
1989	--	1,025	26,850	--	75
1990	--	95	29,040	--	161
1991	3	5,420	14,680	--	701
1992	--	470	292,400	--	422
			Nome River		
1971	--	75	7,765	--	--
1972	--	710	14,960	--	--
1973	6	1,760	14,940	--	--
1974	--	854	17,832	--	--
1975	1	2,161	3,405	--	--
1977	5	3,046	1,726	--	--
1978	2	5,242	34,900	--	--
1980	5	--	--	179,095	920
1981	15	1,195	12,565	--	--
1982	--	700	327,570	--	--
1983	2	198	9,170	--	365
1984	--	2,084[h]	178,870	--	839
1985	7	1,967	2,250	--	242
1986	2	1,150	13,580	--	--
1987	3	1,646	1,400[h]	--	419
1988	3	973	2,490[i]	--	1,280[h]
1989	2	72	1,365	--	375
1990	--	541	13,085	--	617
1991	9	3,520	4,690	--	611
1992	3	813	255,700	--	691
			Flambeau River		
1976	--	375	1,994	--	--
1977	--	1,275	10	--	--
1978	--	7,110	--	--	--
1979	--	283	291	--	--
1980	--	--	--	29,190	--
1981	1	12,031	2,710	--	--
1982	1	5,097	25,001	--	--
1983	2	1,195	200	--	--
1984	1	3,150[g]	20,200[g]	--	--
1985	1	3,215	260	--	--
1986	2	3,075	300	--	--
1987	0	115	0	--	--
1988	3	765	10	--	--
1989	--	--	--	--	--
1990	--	--	--	--	--
1991	2	1,564	570	--	--
1992	--	606	180	--	--

-Continued-

Appendix Table A13. (page 2 of 5).

Year	Chinook	Chum	Pink	Pink & Chum[b]	Coho
			Eldorado River		
1974	13	2,143	6,185	--	--
1977	--	1,835	125	--	--
1978	--	10,125	12,800	--	--
1980	6	9,900	55,520	--	--
1981	--	15,605	495	--	--
1982	2	1,095	163,300	--	--
1983	11	994	270	--	100
1984	14[1]	4,361[a,1]	1,924,935[a,1]	--	261
1985	8	6,090	150	--	67
1986	9	3,490	18,200	--	--
1987	6	3,860	0	--	108
1988	17	2,645	1,045	--	78
1989	--	350	1,550	--	87
1990	17	884	2,050	--	44
1991	76	5,755	1,590	--	98
1992	--	4,887	6,615	--	113
			Fish River		
1961	1	--	--	14,100	--
1962	48	--	--	28,918	--
1963	21	--	--	25,728	--
1964	--	18,670	10,935	14,550	--
1966	7	--	--	17,955	--
1967	20	--	--	13,610	--
1968	10	--	--	164,000	--
1969	--	2,080	124,000	--	--
1970	33	76,550	198,000	--	--
1971	1	13,185	1,670	--	--
1972[b]	--	3,616	13,050	--	--
1973	31	6,887	15,564	--	--
1974	7	10,945	15,690	--	--
1975	26	20,114	15,840	--	--
1976	1	8,390	15,850	8,550	--
1977	9	9,664	2,430	--	--
1978	29	26,797	140,640	--	--
1979	11	6,893	9,132	--	--
1980	--	19,100	33,500	--	--
1981	90	24,095	450	--	--
1982	--	--	--	241,700	--
1983	87	20,037	300	--	--
1984	42	--	--	293,245	--
1985	303	21,080	7,365	--	--
1986	200	25,190	140	--	--
1987	193	7,886	0	--	--
1988	36	1,240	29,950[1]	--	--
1989					
1990					
1991	58	10,190	51,190	--	--
1992	4	390	1,387,000	--	--
			Kachavik Creek		
1963	--	16,000	16,000	--	--
1964	--	5,284	3,675	--	--
1966	--	758	1,788	--	--
1967[c]	--	--	--	1,780	--
1969	--	600	4,525	--	--
1970	--	500	--	--	--
1971	--	1,000	5,323	--	--
1972	--	3,100	16,950	--	--
1973	--	10,325	22,275	--	--
1974	--	1,645	2,723	--	--
1975	--	1,735	23,360	--	--
1977[d]	--	9,564	30,432	--	--
1978[d]	--	3,481	26,533	--	--
1979	--	2,650	23,850	--	--
1982	--	1,111	72,235	--	--
1988	--	1,440	3,130	--	--

-Continued-

Appendix Table A13. (Page 3 of 5).

Year	Chinook	Chum	Pink	Pink & Chum[b]	Coho
		Boston Creek			
1963	67	1,669	--	--	--
1964	10	3,315	--	--	--
1966[c]	153	761	--	--	--
1968	7	2,500	2,500	--	--
1969	100	7,000	16,000	--	--
1970	246	8,200	12,900	--	--
1971	42	7,045	80	--	--
1972	57	4,252	3,950	--	--
1973	153	3,014	3,213	--	--
1974	231	2,426	749	--	--
1975	147	1,885	2,556	--	--
1977	76	1,325	385	--	--
1978	136	2,655	74,221	--	--
1979	58	882	271	--	--
1980	16	2,450	1,510	--	--
1982	10	1,730	22,020	--	--
1983	154	704	--	--	--
1984	35	--	--	47,850	--
1985	243	3,450	--	--	--
1986	2	220	0	--	--
1987	583	3,640	0	--	--
1988	163	1,040	7,400[i]	--	--
1989	--	--	--	--	--
1990	--	1,455	8,440	--	--
1991	152	2,550	3,210	--	--
1992	68	1,540	803,200	--	--
		Niukluk River			
1962	11	--	--	27,879	--
1963	1	13,687	4,103	--	--
1964	--	8,395	10,495	--	--
1966	--	21,300	8,600	4,700	--
1967	--	20,546	--	--	--
1968	--	--	--	87,085	--
1969	--	10,240	92,650	--	--
1970	--	7,300	60,350	--	--
1971	--	22,605	8,370	--	--
1972[c]	--	10,500	22,600	--	--
1973	--	14,365	14,790	--	--
1974	1	8,720	8,915	--	--
1975	--	10,089	16,258	--	--
1976	--	4,130	7,190	--	--
1977	19	10,456	4,150	--	--
1978	2	14,365	208,300	--	--
1979[d]	8	10,127	30,147	--	--
1980	--	8,915	75,770	--	--
1981	--	7,249	--	--	--
1982	20	2,557	227,540	--	--
1983	54	8,886	50	--	--
1984[j]	6	--	--	57,208	3,072
1985	25	11,140	--	--	332[k]
1986	2	2,442	0	--	--
1987	10	4,145	0	--	257[k]
1988	18	6,501	8,160[i]		1,095[k]
1989	--	--	--	--	182
1990	--	6,200	--	--	170
1991	24	10,660	37,410	--	1,783
1992	--	7,770	803,200	--	812

-Continued-

Appendix Table A13. (page 4 of 5).

Year	Chinook	Chum	Pink	Pink & Chum[b]	Coho
			Kwiniuk River		
1962	3	--	--	23,249	--
1963	2	11,340	3,779	--	--
1964	--	14,533	--	--	--
1965[a]	14	26,634	8,301	--	--
1966[a]	7	32,786	10,629	--	--
1967[a]	13	24,444	3,508	--	--
1968[a]	27	18,813	126,764	--	--
1969[a]	12	19,687	56,683	--	--
1970[a]	--	68,004	235,131	--	--
1971[a]	37	39,046	16,742	--	--
1972[a]	65	30,686	62,461	--	--
1973[a]	57	28,617	38,420	--	--
1974[a]	62	35,899	40,816	--	--
1975[a]	44	14,344	57,317	--	--
1976[a]	12	6,977	29,471	--	--
1977[a]	84	22,757	46,234	--	--
1978[c,a]	74	14,408	72,270	--	--
1979[a]	107	12,355	167,492	--	--
1980[a]	177	19,374	320,389	--	--
1981[a]	136	34,561	566,417	--	--
1982[a]	138	44,036	469,674	--	--
1983[a]	267	56,907	251,965	--	--
1984[a]	736	54,043	736,544	--	983[r]
1985[a]	712	9,912	22,548	--	673[r]
1986[a]	653	24,704	241,446	--	421
1987[a]	314	16,134	5,567	--	819[r]
1988[a]	321	13,301	187,904	--	444[r]
1989[a]	282	13,689	30,275	--	--[e]
1990[a]	744	13,735	404,452	--	746[e]
1991[a]	587	18,802	54,591	--	809[e]
1992[a]	479	12,077	1,464,717	--	532[e]
			Tubutulik River		
1962	3	--	--	16,690	--
1963	9	16,069	4,355	--	--
1964	--	15,469	10,043	3,420	--
1966	--	5,514	26,000	--	--
1967	1	--	--	22,475	--
1969	3	12,040	12,788	3,045	--
1970	--	53,290	136,590	--	--
1971	--	16,820	7,500	5,065	--
1972[c]	--	8,070	21,100	--	--
1973	131	5,383	15,665	--	--
1974	136	9,560	17,940	--	--
1975	7	17,141	38,003	--	--
1976	--	1,095	6,095	2,600	--
1977	--	8,540	4,685	--	--
1978	2	5,865	1,364	--	--
1979	--	812	1,624	--	--
1980[e]	405	21,616	663,937	--	--
1982[c]	49	2,044	53,605	--	--
1983	135	16,345	40,790	--	--
1984	139	56,210	93,600	--	--
1985	472	13,645	8,940	--	--
1986	453	5,975	35,680	--	--
1987	474	9,605	580	--	--
1988	561	4,660	114,150[1]	--	--
1989[c]	--	--	--	--	--
1990	397	4,350	186,400	--	--
1991	661	7,085	26,870	--	--
1992	260	2,595	138,600	--	--

-Continued-

Appendix Table A13. (Page 5 of 5).

Year	Chinook	Chum	Pink	Pink & Chum[b]	Coho
			North River		
1962	162	--	--	16,087	--
1963[c]	287	--	--	73,274	--
1964	23	--	--	5,981	--
1965	153	--	--	16,600	--
1970[c]	1	20,655	12,400	--	--
1971[c]	256	--	--	1,047	--
1972[d]	561	2,332	54,934	--	--
1973[d]	298	4,332	26,542	--	--
1974[d]	220	861	154,285	--	--
1975[c]	60	5,237	17,885	--	--
1976[c]	66	196	10,606	--	--
1977	1,275	8,139	4,565	--	--
1978	321	9,349	21,813	--	--
1979	735	1,130	9,500	--	--
1980	61	2,300	127,900	--	204
1981	68	405	575	--	263
1982	8	599	173,352	--	4,145
1983	347	4,135	4,980	--	--
1984[d]	2,844	2,915	458,387	--	152[f]
1985[d]	1,426	4,567	4,360	--	2,045
1986[d]	1,613	3,738	236,487	--	--
1987	445	392	0	--	680
1988	202	30	112,770[l]	--	240
1989[c]	--	--	--	--	--
1990	255	510	25,685	--	--
1991	656	2,435	118,720	--	2,510
1992	329	--	631,140	--	398

[a] Represents "high count" for season.
[b] Surveyor unable to distinguish between the two species.
[c] Poor survey conditions or partial survey, poor counting tower conditions.
[d] Total counts obtained from counting tower.
[e] Combined tower and aerial survey counts below the tower.
[f] Aerial survey; not tower count.
[g] Helicopter survey.
[h] Boat survey.
[i] Foot survey.
[j] Includes counts from Casadepaga and Ophir Creeks.
[k] Includes counts from Ophir Creek.
[l] Numerous pink salmon made enumerating of chum salmon difficult; pink count may include some chum.

PORT CLARENCE DISTRICT

District Boundaries

The Port Clarence district encompasses all waters from Cape Douglas north to Cape Prince of Wales including the Salmon Lake and Pilgrim River drainage (Figure 3). Salmon, saffron cod, whitefish and herring are the major subsistence species; however, other fishery resources are also utilized.

Commercial Fishery

Commercial salmon fishing in this district has been prohibited since 1967. In 1966 a total of 1,216 salmon consisting of 93 sockeye, 131 pinks and 922 chums was taken commercially in the Grantley Harbor/Tuksuk Channel area. A few salmon are sold or bartered each year in Teller and Nome. Due to the relatively small runs in this area and the existence of an important subsistence fishery, commercial salmon fishing has not been reopened.

Subsistence Fishery

A traditional subsistence salmon fishery has probably occurred within this district for centuries; however, subsistence fishing has only been monitored at Salmon Lake since the 1930's and in the upper Pilgrim River since 1962. Data collected by Department personnel has indicated a majority of the fishermen of Brevig Mission fish the northern and northeastern sections of Port Clarence, while Teller fishermen utilize Grantley Harbor and Tuksuk Channel. Interviews with local residents have also indicated substantial fishing effort within the Agiapuk River. Village surveys have not been conducted by Commercial Fisheries Division since 1983. Subsistence Division conducted a partial survey of Brevig Mission in 1989 where 15 of 43 households were interviewed (Appendix Table B1). Personal interviews with fishermen seem to indicate a decline in subsistence fishing effort, due primarily to the absence of younger fishermen entering the fishery. A majority of the subsistence fishing effort appears to be conducted by elder residents who gather fish for an entire family.

Salmon Lake and Pilgrim River stocks have been utilized primarily by Nome residents. The Alaska Board of Fisheries adopted a regulation in 1972 which closed Salmon Lake and it's tributaries to subsistence salmon fishing from July 15 through August 31 to conserve declining sockeye salmon stocks. Subsistence fishing permits are required for the Pilgrim and Kuzitrin Rivers. Beginning in the 1991 season, a dramatic increase in the number of subsistence permits issued to Nome residents intending to fish in the area was observed (Table 2C). This was due in part due to a strong sockeye salmon return. Another reason was the extensive subsistence fishing closures in the Nome area which made the Pilgrim River an alternative location to obtain their subsistence needs.

Escapement

Aerial surveys were not flown in this district, with the exception of Salmon Lake, due to the low priority assigned to districts which do not support commercial fisheries. Aerial surveys show an increasing trend of sockeye returns to Salmon Lake since 1986 (Appendix Table B2). The 1992 aerial survey count of 1500 red salmon reflects a low abundance for the year and survey flown under less than ideal conditions.

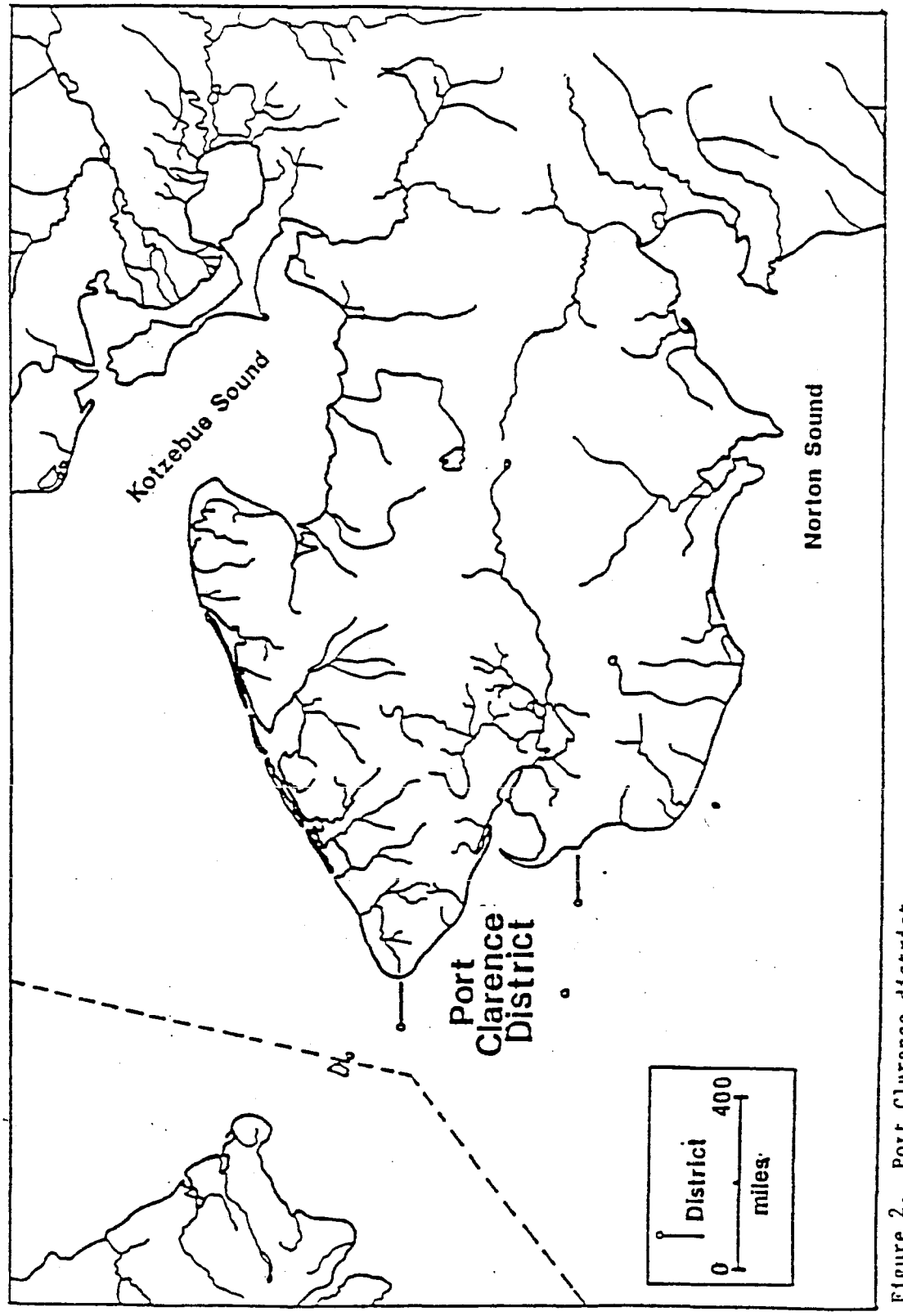


Figure 2. Port Clarence district

Appendix Table B1. Subsistence salmon catches for Port Clarence District, 1963-1992.

Year	Number of Fishing Families Interviewed	Chinook	Sockeye	Coho	Pink	Chum	Total
1963	19	9	4866	25	1061	1279	7440
1964	22	17	1475	227	371	1049	3139
1965	29	36	1804	639	1854	1602	5935
1966	26	10	1000	896	859	2875	5640
1967	19	12	2068	232	767	1073	4152
1968	24	40	688	133	1906	904	3671
1969	13	2	180	27	548	932	1582
1970	18	4	588	1071	1308	4231	7202
1971	22	31	850	959	1171	3769	6780
1972	8	4	68	388	75	2806	3341
1973	4	22	46	280	424	1562	2334
1974	13	0	28	62	14	2663	2767
1975	17	0	244	5	743	1589	2581
1976	15	7	291	20	436	6026	6780
1977[a]	13	-	-	-	-	-	5910
1978	26	1	392	0	7783	705	8881
1979	26	0	320	35	741	1658	2720
1980	22	7	3195	5	3170	1715	8092
1981	10	8	255	110	765	5845	6983
1982	27	23	405	100	4345	684	5557
1983[b]	3	17	261	--	615	299	1192
1984[c]							
1985[c]							
1986[c]							
1987[c]							
1988[c]							
1989[d]	15	28	535	472	395	410	1840
1990[c]							
1991[c]							
1992[c]							

[a] Species composition estimated at 75% chum, 10% pink, 10% sockeye and 5% chinook and coho combined.

[b] Data collected from returned catch calendars. Due to low return of calendars and absence of household surveys, the resultant catches are incomplete and not comparable to past years.

[c] Surveys not conducted.

[d] Survey conducted by Subsistence Division and contacted 15 of 43 households in Brevig Mission.

Appendix Table B2. Comparative sockeye salmon aerial survey estimates, Port Clarence District, 1963-1992.

Year	Salmon Lake	Grand Central River	Total
1963	866	620	1486
1964[c]	76	590	666
1965	250	160	410
1966	1120	370	1490
1967	129	280	409
1968[c]	830	645	1475
1969	24	171	195
1970[a]	-	-	-
1971	538	512	1050
1972[c]	680	300[b]	980
1973	1747	607	2354
1974	820	0	820
1975	537	123	660
1976	132	22	154
1977	317	235	552
1978	822	280	1102
1979	1250	261	1511
1980[c]	512	175	687
1983	970	-	970
1984	445	30	475
1985	730	250	980
1986	2,125	160	2,285
1987	4,040	530	4,570
1988	1,195	6	1,201
1989	3,055	525	3,591
1990	2,834	926	3,760
1991	3,790	1,570	5,360
1992	1,500	-	1,500

[a] No survey made.

[b] Boat survey.

[c] Poor survey.

Table 10. Kotzebue District commercial catches of chum salmon, chinook salmon, and Dolly Varden by period, 1992.

Period	Dates	Hours	Number of Fishermen	Chum			Chinook			Dolly Varden		
				Number	Pounds	Avg. Wt.	Number	Pounds	Avg. Wt.	Number	Pounds	Avg. Wt.
1	7/09–7/10	24	38	5,605	48,607	8.7	14	174	12.4	0	0	
2	7/13–7/14	24	51	3,979	34,643	8.7	11	180	16.4	0	0	
3	7/16–7/17	24	85	5,857	52,142	8.9	21	294	14.0	0	0	
4	7/20–7/21	24	100	20,566	183,638	8.9	23	391	17.0	0	0	
5	7/23–7/24	36	111	27,342	236,979	8.7	27	370	13.7	0	0	
6	7/27–7/28	36	91	18,048	156,394	8.7	10	113	11.3	0	0	
7	7/30–7/31	36	114	53,356	464,804	8.7	20	320	16.0	0	0	
8	8/03–8/04	36	97	22,437	185,247	8.3	19	227	11.9	0	0	
9	8/06–8/07	36	108	50,664	410,090	8.1	25	241	9.6	0	0	
10	8/10–8/11	36	107	35,645	284,107	8.0	13	131	10.1	149	887	6.0
11	8/13–8/14	24	93	17,640	133,364	7.6	11	136	12.4	335	2,173	6.5
12	*Closed Period*											
13	8/21–8/22	24	75	15,160	112,778	7.4	1	9	9.0	891	4,842	5.4
14	8/24–8/25	24	75	9,672	71,029	7.3	6	80	13.3	530	3,564	6.7
15	8/27–8/28	24	54	3,213	23,480	7.3	3	48	16.0	72	485	6.7
Totals	7/09–8/28	408	149	289,184	2,397,302	8.3	204	2,714	13.3	1,977	11,951	6.0

Table 11. Kotzebue District commercial chum salmon, chinook salmon, and Dolly Varden catch by statistical area, 1992.

Statistical Area	Number of Fishermen	Chum			Chinook			Dolly Varden		
		Number	Pounds	Avg. Wt.	Number	Pounds	Avg. Wt.	Number	Pounds	Avg. Wt.
331-01	133	133,917	1,102,612	8.2	45	547	12.2	492	3,082	6.3
331-02	58	29,190	233,518	8.0	60	738	12.3	1,117	6,385	5.7
331-03	21	4,456	34,719	7.8	1	24	24.0	62	418	6.7
331-04	56	46,993	392,788	8.4	14	188	13.4	22	127	5.8
331-05	26	10,197	84,409	8.3	14	176	12.6	200	1,326	6.6
331-06	55	64,434	549256	8.5	70	1041	14.9	84	613	7.3
Totals	149	289,187	2,397,302	8.3	204	2,714	13.3	1,977	11,951	6.0

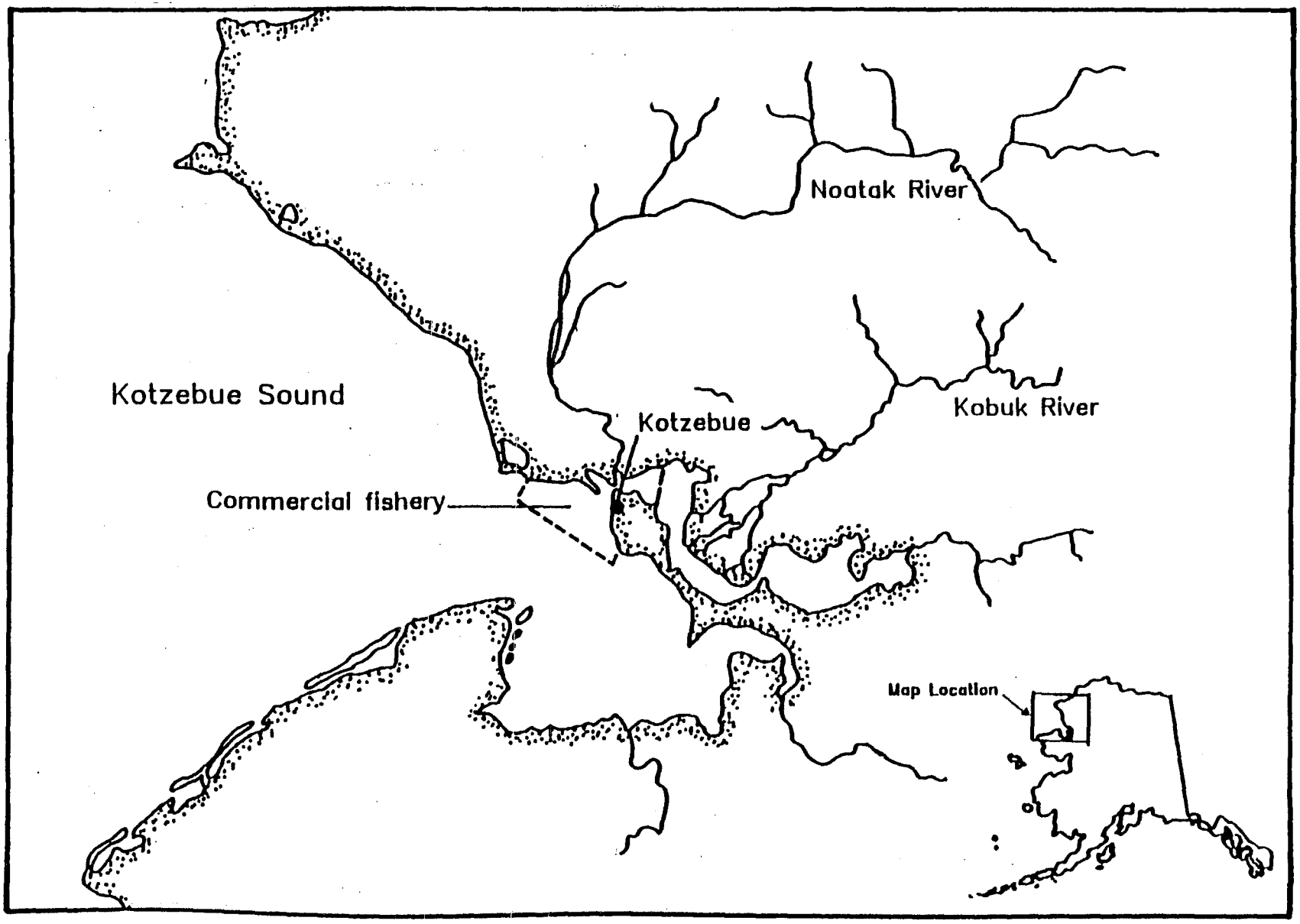


Figure 3. Kotzebue commercial fishing district and major chum salmon spawning streams.

KOTZEBUE SOUND

General Information

The Kotzebue District supports the northernmost commercial salmon fishery in Alaska (Figure 3). The recent commercial fishery opened under state management in 1962. Salmon harvests consist primarily of chum salmon, although a few chinook salmon and Dolly Varden are incidentally harvested. There are 218 commercial permit holders, of which 171 were active over the recent 10 year period. Eighty-seven percent are residents of the district and 97 percent are state residents.

Earliest sales of salmon goes back to 1909 when Lockhart's store handled 21,906 pounds of salmon purchased from Eskimos and was resold at $.05/lb. Of this, 21,366 lbs. was sold to gold miners up the Kobuk River and 540 lbs. was sold to Seattle markets. A commercial fishery occurred between 1914-1918 when salmon was canned and the bulk of it was also thought to have been sold to miners working in the Upper Kobuk. It took until the mid 1970's for the Kotzebue salmon fishery to become fully developed after the state reinitiated it in 1962. Since that time, the fishery has displayed a cyclic pattern of harvest with alternating and declining strong and weak returns over four year intervals (Appendix Table C.1., Figure 4). In 1987, the Department refocused its management program with an emphasis on attaining escapement goals. Prior to 1987, commercial harvest were more in proportion to the annual chum return. Current fisheries management is based on comparisons of age composition and catch rate in the commercial fishery to history averages.

Gear is limited to set nets with an aggregate of no more than 150 fathoms per fisherman. Most fishermen operated with one end on or near shore and with all three shackles (50 fathoms per shackle) connected. A few fishermen attempt to fish deeper channels in the mud flats further out from shore. Most gear used in the district is 5-7/8 in (14.9 cm) stretched measure multi-filament gill net.

Inseason Management

The primary fishery management objectives are to provide adequate chum salmon escapement through the district to ensure sustained runs by allowing adequate natural escapement, and meeting subsistence harvest needs. Fishery management is dependent on comparing period and cumulative inseason catch rates to prior years. The comparative data base was limited to the period 1979 to present in order to account for increased fleet efficiency and to encompass the range of years when similar fishing schedules were in effect.

Weekly meetings throughout the season are held with fishermen to distribute catch statistics and gain input from local fishermen for management decisions. Because there is no Department operated escapement index on the Kobuk River, subsistence fishermen that can be contacted by phone are called several times during the season to get an idea of run strength. Alaska Department of Fish and Game personnel also make person to person contact with some Kobuk Delta subsistence fishermen to gain further knowledge of the run strength and timing.

Commercial Season Summary

The Kotzebue Sound commercial salmon season was opened July 9 by emergency order as established by regulation. The first 4 periods were above or near the recent 13 year average (Table 12, Figure 5). With above average catch rates for the first 4 periods, the fifth period was extended to 36 hours in length.

The next 6 commercial openings were 36 hours in length. Catch rates of periods 5 through 10 were very erratic ranging from a lower than average catch rate for Period 6 to more than twice the average for Period 9. Even though there were fewer than normal permits fishing, commercial catches for the most part were near average.

Noatak River sonar daily counts during the first two weeks of August were very similar to 1990 when only about half of the escapement goal was met (Table 13, Figure 6). With the low counts, fishing time for Period 11 was reduced to 24 hours. During this time, sonar counts remained low and with anticipated high water due to rain, fish which were in the lower portion of Noatak were expected to retreat back into Kobuk Lake and Kotzebue Sound. With salmon counts remaining low and high water expected, Period 12 was pulled in order to boost salmon escapement into the Noatak. A fishery announcement was issued stating that escapement indices would be re-evaluated before reopening the district to commercial fishing.

The surge of high water did occur. At Kelly River, water rose 4 feet overnight. Noatak Sonar camp reported a rise of 5 feet of water and a decrease in water temperature. Salmon indeed backed out into Kotzebue Sound. There were visual reports and subsistence catches of good numbers of salmon in the Kotzebue boat harbor. Long time local residents had never seen anything like this before.

Fish passage began to increase at the sonar site. It was decided that the last three commercial periods would be fished with 24 hour openings. The opening of the thirteenth period would be delayed 14 hours (Friday morning at 0800 instead of Thursday night at 1800) for two reasons. The eruption of Mt. Spur curtailed airline traffic to and from Anchorage where fish are processed. This delay would give the airlines a chance to normalize flights. A delayed opening would also allow the continuation of fish passage from the pulled period. Periods 14 and 15 were normally scheduled fishing periods on Monday and Thursday beginning at 1800. Commercial catches for the last three periods were at or near average with catch rates above normal.

The older age class (age-5) of fish tend to dominate the earlier commercial openings with the younger age classes moving through during the latter part of the fishery. There was a higher percent of 5 year old fish for the first 7 periods than average and were more dominant than the age-4 fish during the first three openings (Appendix Table C5, Figures 7,8). Age-5 fish contribution were near average for the rest of the season. Age-4 fish were near average for Periods 5-10 and 15. This age group had a higher percent than average for Periods 11, 13, and 14. This may be a reflection of the lack of age-3 fish in the latter part of the run. There was an increase of age-3 fish in the last period and a subsequent decrease in age-4 fish. Historically, three year old

fish has made up a third of the catch with a 13 year average between 15-20 percent for periods 11-14.

Three buyers purchased a total of 289,184 chum salmon (2,397,302 pounds, average weight 8.3) at $.22 per pound, 204 chinook salmon (2,714 pounds, average weight 13.3) at an average of $1.89 per pound, and 1,977 Dolly Varden (11,951 pounds, average weight 6.0) at an average of $.10 per pound (Table 10, Appendix Tables C2, C4). The total value was $533,731 to Kotzebue area fishermen with an average of $3,582 for each participating permit holder (Appendix Table C3). All buyers ice packed their fish and flew them to Anchorage for processing.

Dolly Varden were purchased near the end of the fishery when a small market was found. The first trout were sold during Period 10, however fishermen had been catching trout prior to that time.

Subsistence Fishery

Door to door subsistence fishing interviews were conducted in villages of Noorvik, Noatak and Shungnak during December (Table 12). Fishermen were satisfied with their catches of salmon. The general feeling was there were enough salmon but catch rates were reduced because of weather. At the time of harvest, rivers were high. As the water dropped creating better opportunities for fishing, an early freeze occurred and people had to quit fishing. Effort was not as high in Noorvik later in the season as some fishermen were participating in a search effort. Fishermen in Noatak noted that the salmon run seemed later than usual.

Fishermen from the three villages also catch a significant amount of whitefish, sheefish, Northern Pike and Dolly Varden. Catches of species tend to village specific such as Dolly Varden for Noatak. Noatak fishermen were happy with their catch of Dolly Varden as were Shungnak fishermen with their catches of whitefish and sheefish.

Escapement

The lower Kobuk River tributaries (Squirrel, Salmon, and Tutuksuk) were flown on August 4. This was the first of three surveys during a normal year. Due to poor weather conditions, it was the only survey. Comparing to previous years, these tributaries had roughly half of the normal amount of salmon they should have at that point in the season. The Tutuksuk was the exception with more than half of the escapement goal (Appendix Table C8).

Poor surveys persisted for the Noatak River and Upper Kobuk. Surveys on September 8 and 9 found high turbid or tannic stained water. A Survey conducted 10 days later on the Noatak was also poor due to wind chop and ice flows creating shadows on the bottom of the river. Even though both Noatak surveys were nearly identical in numbers of salmon, 60 to 70 percent of the salmon seen on the second survey were thought to be new fish. Considering the poor conditions, the sonar escapement of about 75,000 salmon is thought to be a better index than the aerial

surveys. The count of 75,000 by the sonar compared well with the 1991 sonar count when the escapement goal was met.

The peak survey on the Upper Kobuk was very near the escapement objective even though it was conducted under poor conditions. The second survey enumerated an estimated 8,500 salmon and was conducted with fair conditions. This survey was past the peak of the run.

Hatchery Contribution

Preliminary figures estimate the hatchery contribution to the 1992 commercial catch was 40,000. The total 1993 Sikusuilaq Hatchery return is expected to be roughly 60,000 chum salmon.

Dolly Varden

Incidental catch of Dolly Varden (locally called trout) for 1992 was one-third of the 1991 catch of 6,136 (Appendix Table F4). Spawners and wintering Dolly Varden normally migrate through the district during the third week of August. With Period 12 pulled and reduced fishing time for Periods 11 and 13-15, incidental catch of trout was limited. When trout can not be sold, most are kept for subsistence purposes. The majority of the trout were taken from statistical areas 2 and 5 (Tables 9, 10, Figure 9).

Freshwater Fisheries

Limited commercial harvest of miscellaneous finfish has been allowed since statehood, normally under the auspices of a permit which delineates harvest levels, open areas, legal gear, etc. There was no reported commercial harvest of whitefish, pike, or burbot during the 1992 commercial salmon season. Sheefish are caught and sold predominantly between late October and late March.

There were 5 freshwater permit holders in 1992, compared with 11 for 1991. Of these 5, four were registered and 4 sold 365 sheefish fish weighing 3,597 pounds with an average price of $0.58 per pound (Appendix Tables C4, F1).

Table 12. Kotzebue Area villages of Noatak, Noorvik and Shungnak subsistence harvest of chum salmon, Dolly Varden, whitefish, sheefish, and Northern Pike, 1992.

Village	Number of Households Interviewed That Fished	Total Household Members	Average Members per Household	Number of Fish				
				Chum Salmon	Dolly Varden	Whitefish	Sheefish	Northern Pike
Noatak	23	133	6	2,043	4,395	1,175		
Noorvik	27	148	5	8,370	250	12,160	1,966	1,710
Shungnak	16	86	5	3,890		4,150	855	
Total [a]	66	367	6	14,303	4,645	17,485	2,821	1,710

[a] Subsistence catch estimates represent only households interveiwed that fished.

Table 13. Kotzebue District 1992 commercial and 13 year average catch statistics (1979–1991).

13 Year Average					Cumulative		
Period	Hours	Number Permits	Catch (x 1,000)	CPUE	Catch (x 1,000)	CPUE	Prop. Catch
1	24	44	3.2	2.8	2.9	2.8	0.009
2	24	73	5.5	2.9	8.4	2.8	0.027
3	24	100	10.4	4.1	18.8	3.4	0.062
4	25	121	19.3	6.0	38.1	4.4	0.123
5	27	134	24.4	6.5	62.4	5.0	0.204
6	29	142	31.9	7.5	91.8	5.6	0.302
7	38	147	39.5	7.1	128.3	5.9	0.428
8	40	151	44.0	7.0	172.3	6.1	0.572
9	44	145	41.1	6.1	213.5	6.2	0.709
10	42	147	47.7	7.4	257.5	6.3	0.832
11	45	137	27.2	4.4	280.5	6.1	0.913
12	45	117	15.7	2.9	295.0	5.8	0.960
13	43	90	9.6	2.4	303.0	5.6	0.985
14	41	63	5.5	2.0	306.4	5.5	0.995
15	43	37	2.7	1.7	307.9	5.4	1.000

Year:	1992				Cumulative		
Period	Hours	Number Permits	Catch (x 1,000)	CPUE	Catch (x 1,000)	CPUE	Prop. Catch
1	24	38	5.6	6.1	5.6	6.1	0.019
2	24	51	4.0	3.3	9.6	4.5	0.033
3	24	85	5.9	2.9	15.4	3.7	0.053
4	24	100	20.6	8.6	36.0	5.5	0.125
5	36	111	27.3	6.8	63.4	6.0	0.219
6	36	91	18.0	5.5	81.4	5.9	0.282
7	36	114	53.4	13.0	134.8	7.5	0.466
8	36	97	22.4	6.4	157.2	7.3	0.544
9	36	108	50.7	13.0	207.9	8.2	0.719
10	36	107	35.6	9.3	243.5	8.3	0.842
11	24	93	17.6	7.9	261.2	8.3	0.903
12	*Closed Period*				261.2	8.3	0.903
13	24	75	15.2	8.4	276.3	8.3	0.955
14	24	75	9.7	5.4	286.0	8.2	0.989
15	24	54	3.2	2.5	289.2	8.0	1.000

Table 14. Noatak River Sonar daily and cumulative chum salmon counts, 1990–199

	1990		1991		1992	
Date	Daily	Cum.	Daily	Cum.	Daily	Cum.
10–Jul			412	412		
11–Jul			275	687		
12–Jul			264	951		
13–Jul			289	1,239		
14–Jul			490	1,729		
15–Jul			785	2,514		
16–Jul			683	3,198		
17–Jul			133	3,330		
18–Jul			118	3,448		
19–Jul			82	3,531		
20–Jul	439	439	176	3,707		
21–Jul	861	1,301	170	3,876		
22–Jul	587	1,887	231	4,107		
23–Jul	509	2,396	292	4,399		
24–Jul	980	3,376	246	4,645		
25–Jul	615	3,991	543	5,188		
26–Jul	602	4,593	570	5,758		
27–Jul	587	5,180	850	6,608	1,795	1,795
28–Jul	2,469	7,649	707	7,314	860	2,655
29–Jul	1,432	9,081	1,038	8,353	253	2,908
30–Jul	756	9,837	1,419	9,772	355	3,263
31–Jul	1,174	11,011	678	10,450	351	3,614
01–Aug	626	11,637	1,292	11,742	710	4,324
02–Aug	390	12,027	1,464	13,205	1,482	5,806
03–Aug	647	12,674	1,917	15,123	485	6,291
04–Aug	445	13,119	5,009	20,132	282	6,573
05–Aug	941	14,060	2,746	22,878	1,499	8,072
06–Aug	1,076	15,135	2,087	24,966	1,835	9,907
07–Aug	1,903	17,039	2,002	26,968	1,161	11,068
08–Aug	1,366	18,404	1,563	28,531	3,837	14,905
09–Aug	1,594	19,998	890	29,420	1,305	16,210
10–Aug	2,086	22,084	744	30,164	1,205	17,415
11–Aug	1,983	24,067	1,839	32,003	3,142	20,557
12–Aug	2,067	26,134	2,346	34,350	1,474	22,031
13–Aug	2,343	28,477	2,837	37,187	1,763	23,794
14–Aug	1,982	30,460	6,264	43,451	548	24,342
15–Aug	757	31,217	7,087	50,537	1,475	25,817
16–Aug	810	32,026	5,963	56,500	4,667	30,484
17–Aug	1,626	33,653	2,852	59,352	4,986	35,470
18–Aug	1,770	35,422	2,237	61,589	2,804	38,274
19–Aug	1,270	36,692	2,291	63,879	3,652	41,926
20–Aug	886	37,578	3,068	66,948	4,873	46,799
21–Aug	468	38,046	1,928	68,876	4,444	51,243
22–Aug	635	38,681	2,215	71,091	1,429	52,672
23–Aug	644	39,325	1,933	73,025	1,080	53,752
24–Aug	535	39,860	1,410	74,435	2,561	56,313
25–Aug	993	40,853	1,320	75,755	2,204	58,517
26–Aug	1,078	41,931	1,464	77,219	3,724	62,241
27–Aug			1,747	78,966	5,077	67,318
28–Aug			1,385	80,351	1,428	68,746
29–Aug			1,147	81,498	1,319	70,065
30–Aug			1,241	82,739		

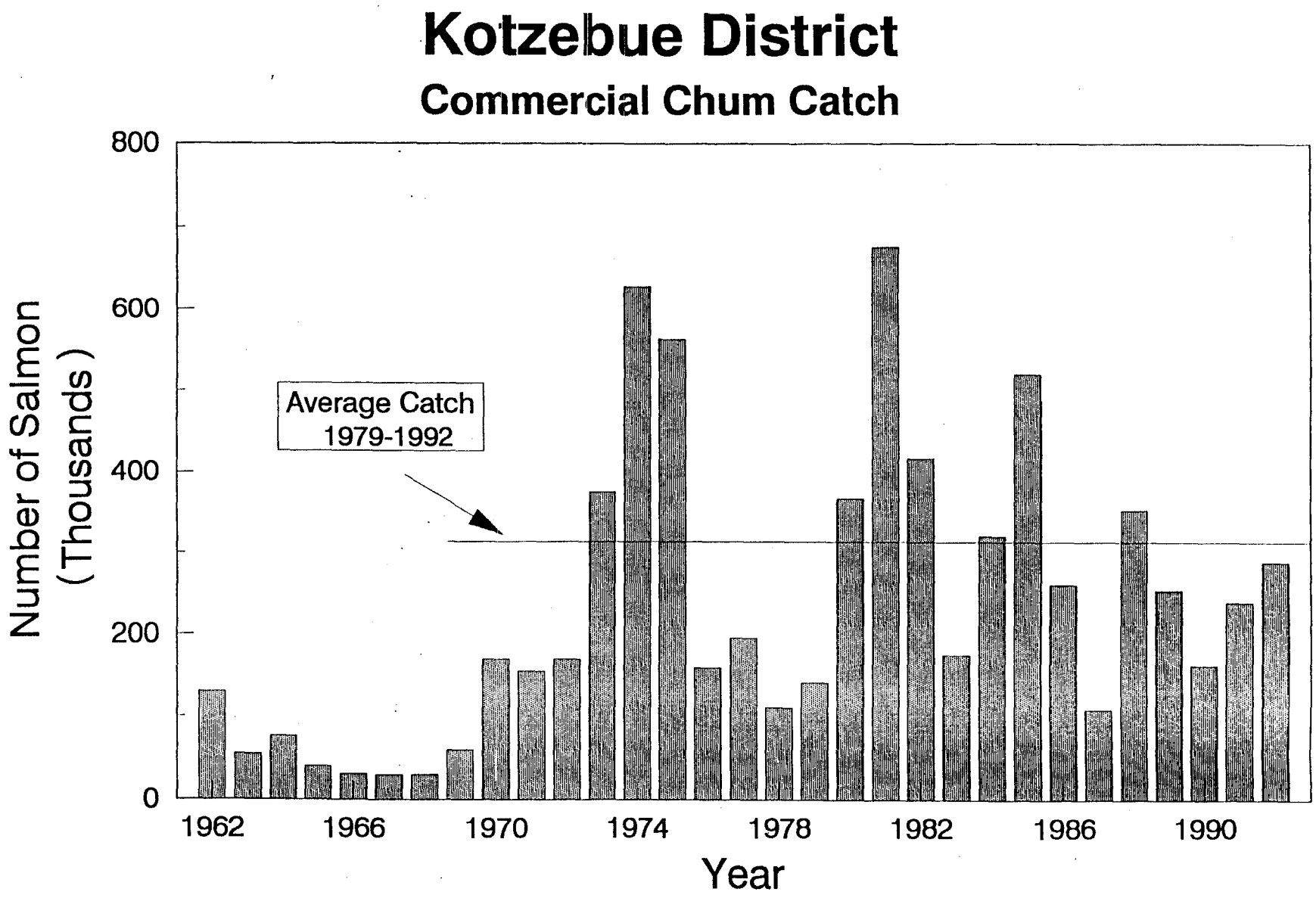


Figure 4. Kotzebue district chum salmon commercial catch by year, 1962-1992.

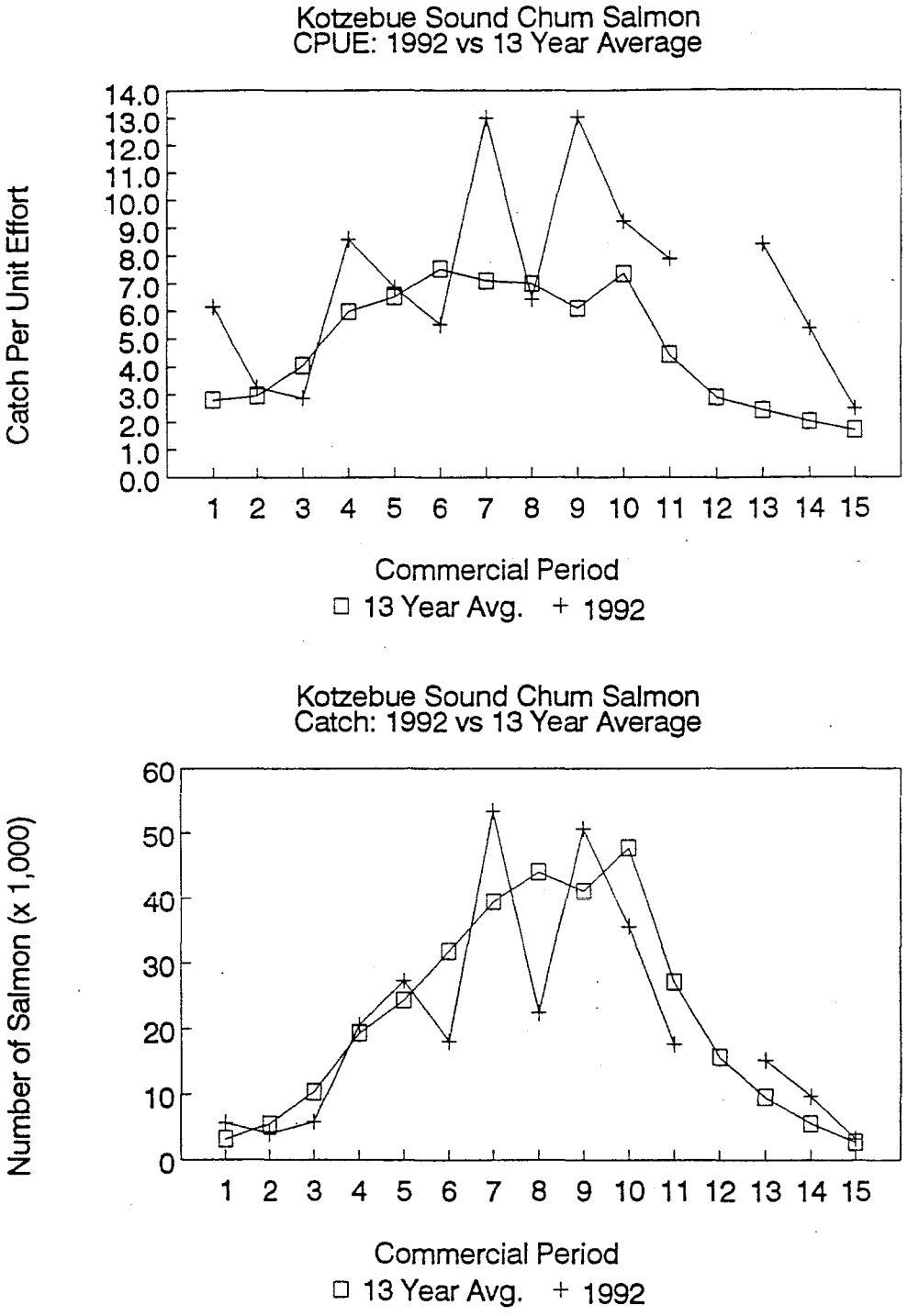


Figure 5. Kotzebue District commercial previous 13 year average (1979–1991) and 1992 catch and catch per unit effort comparisons.

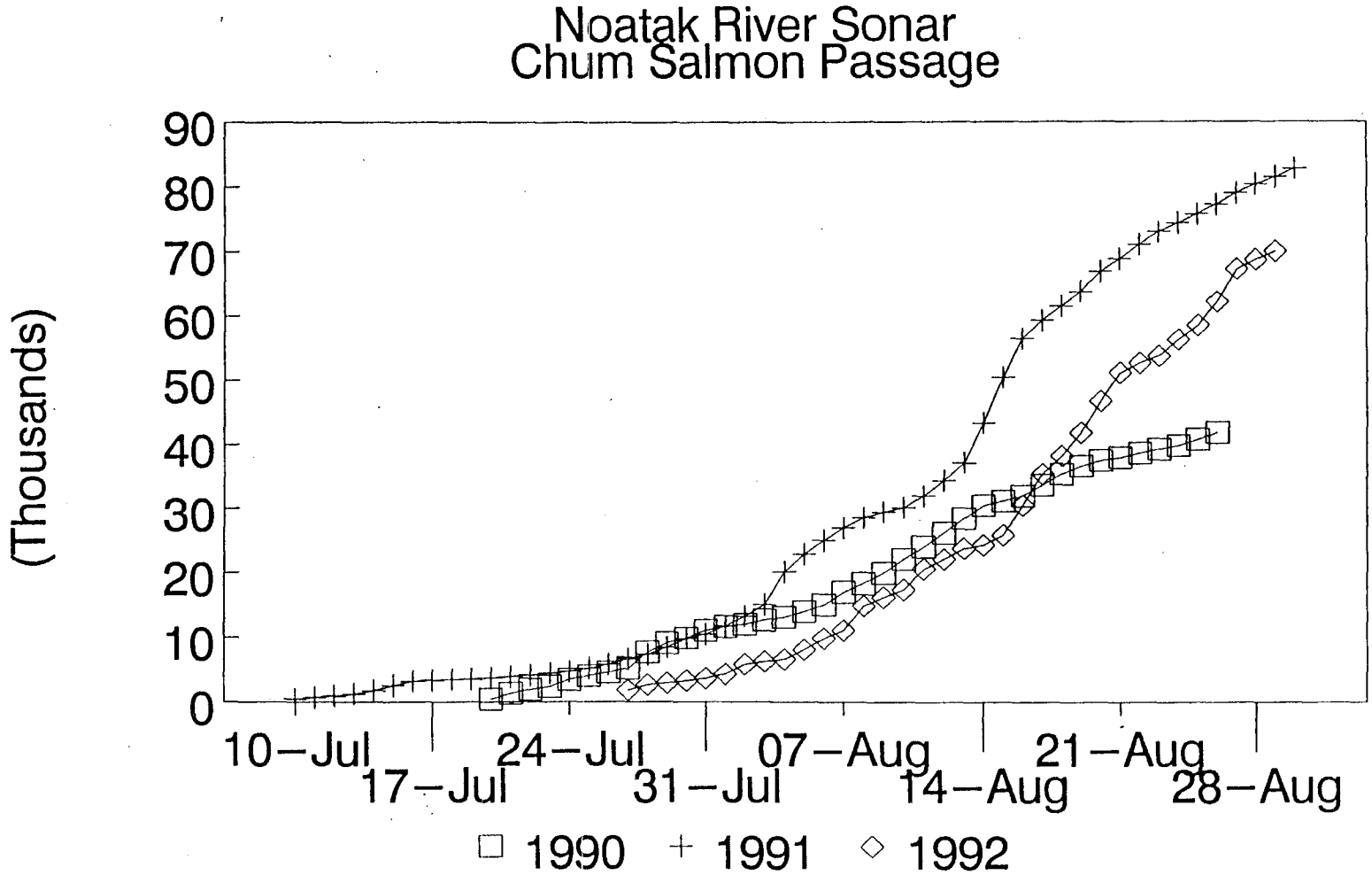
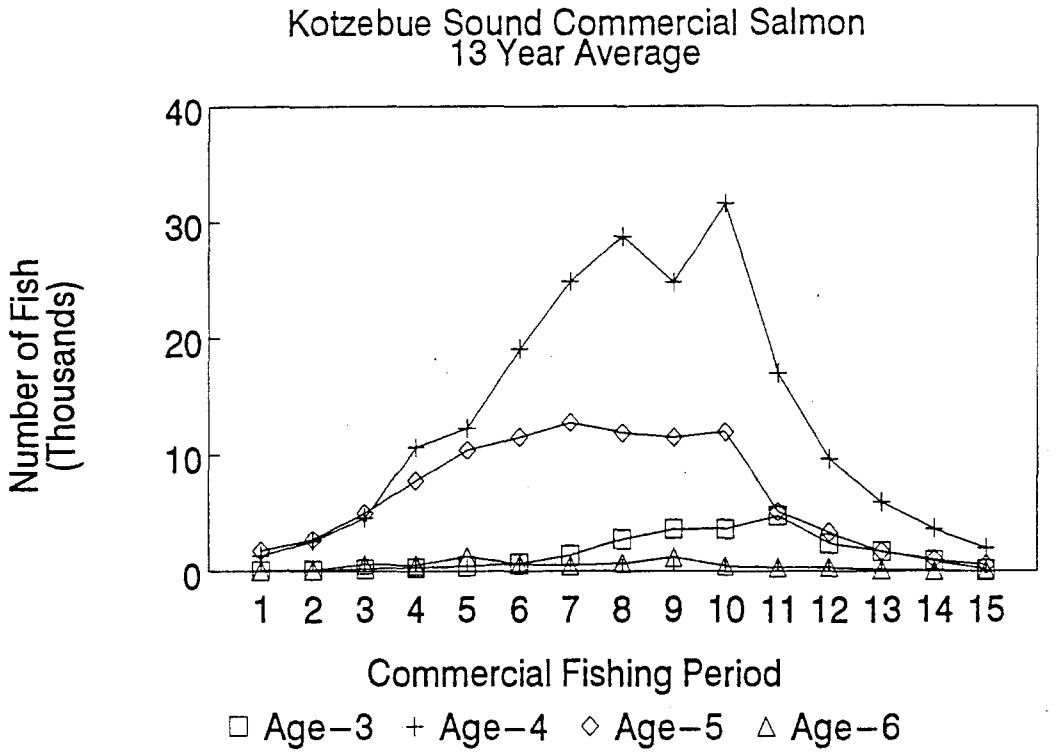


Figure 6. Noatak River Sonar daily and cumulative chum salmon counts, 1990–1992.



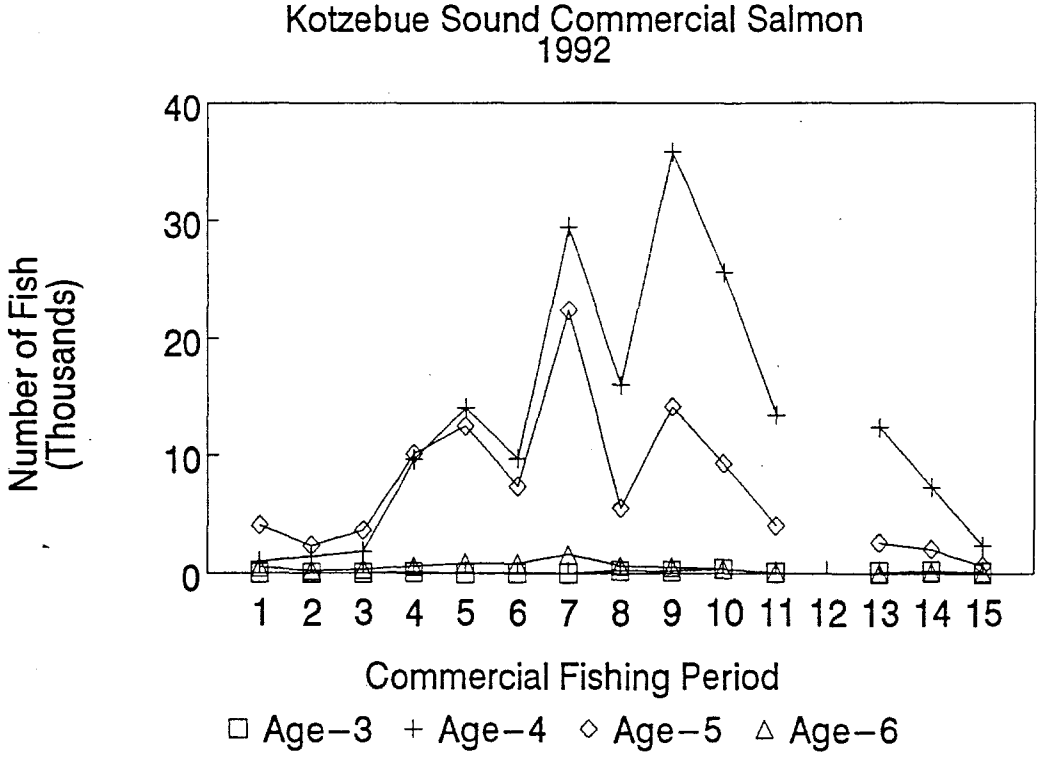
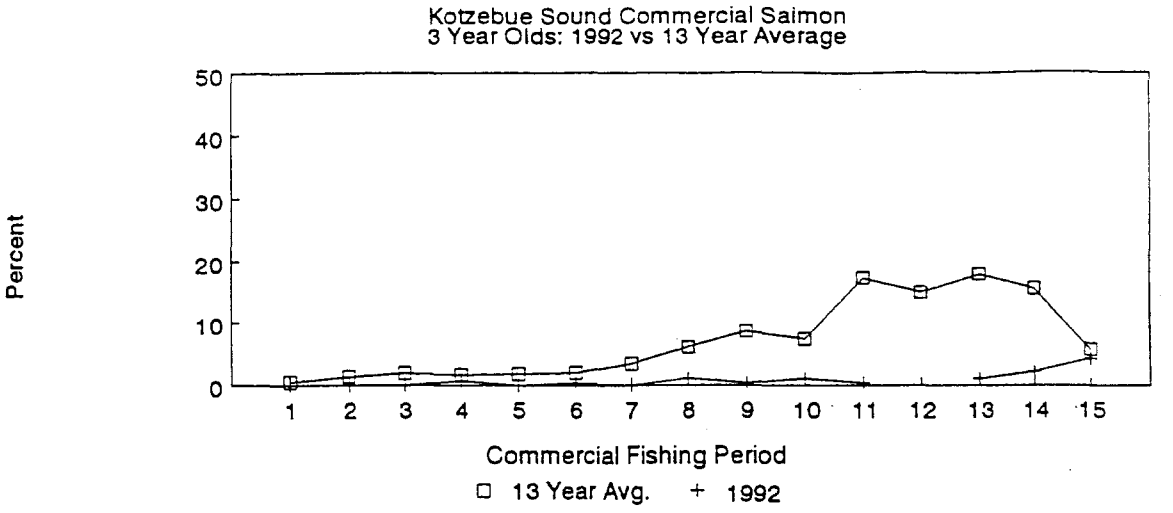
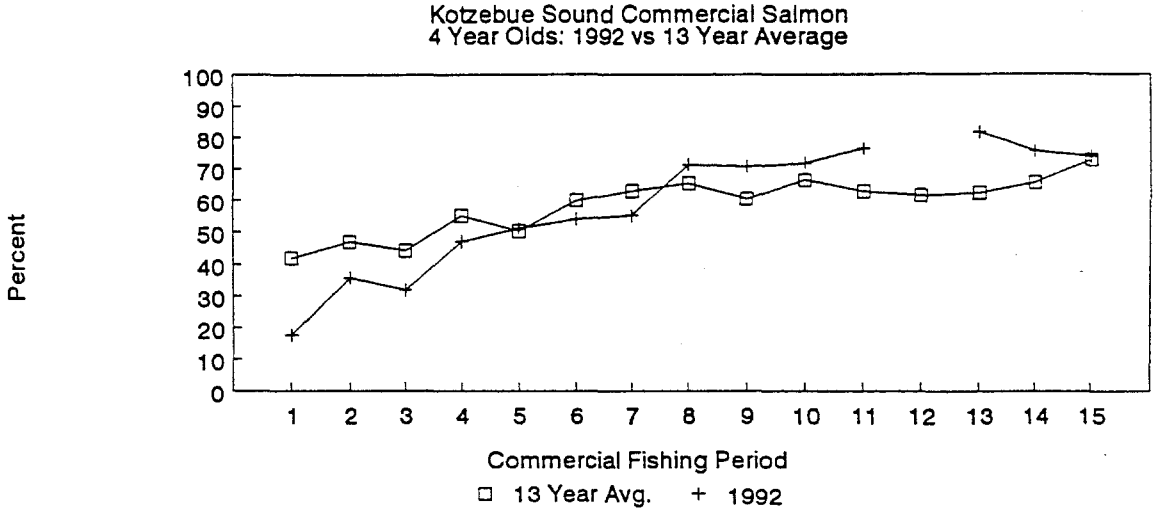


Figure 7. Age in numbers of chum salmon by period comparing recent 13 year average (1979–1991) to 1992.





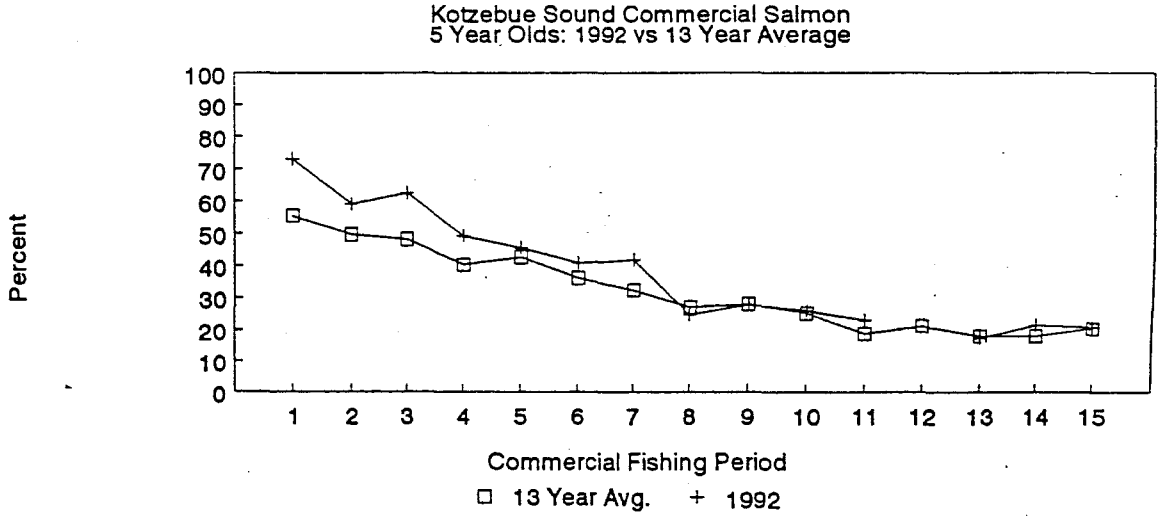


Figure 8. Age composition of chum salmon by period comparing recent 13 year average (1979–1991) to 1992.

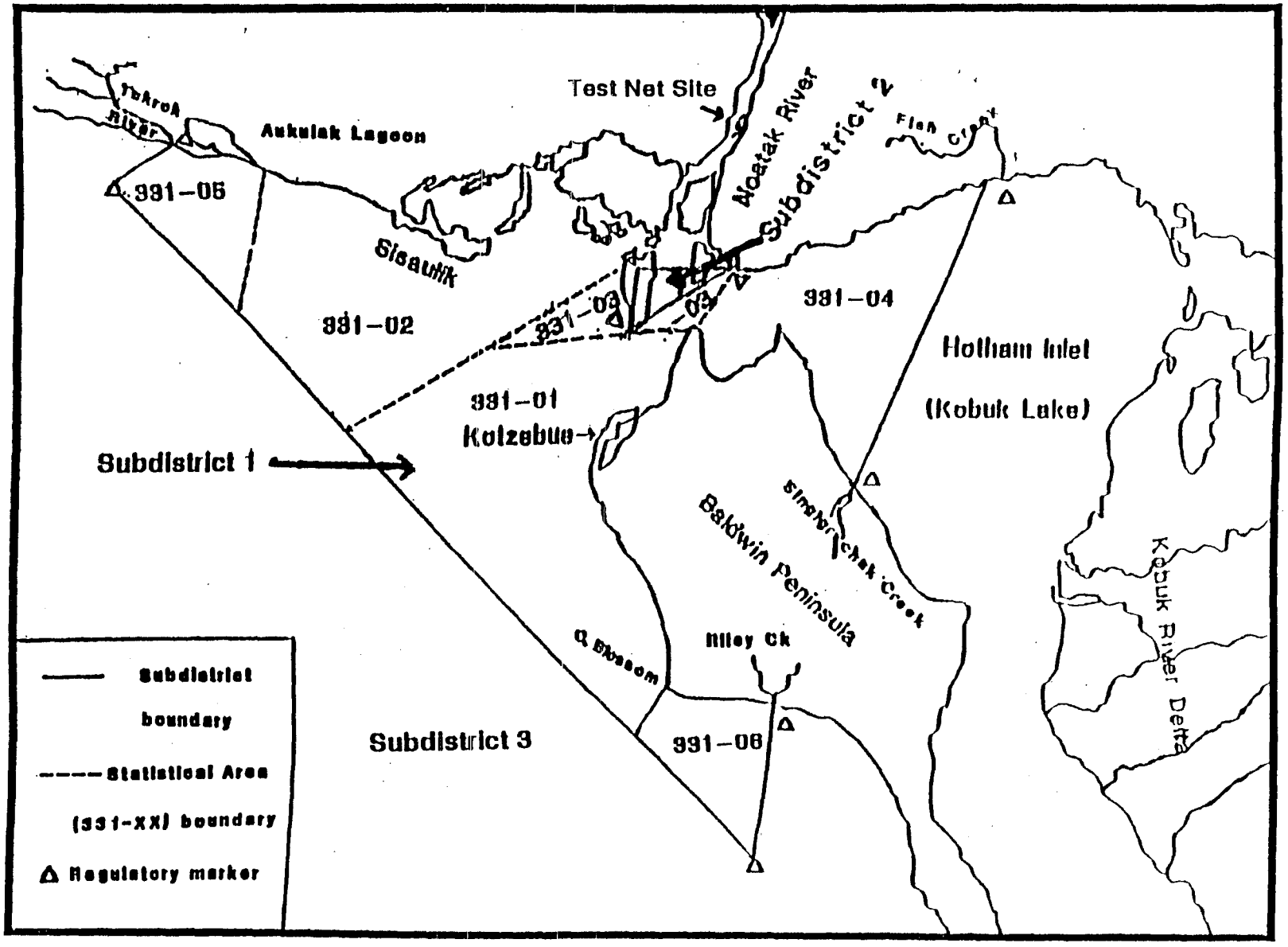


Figure 9. Noatak River and Kotzebue Sound commercial salmon fishing subdistricts and statistical area's.

Appendix Table C.1. Kotzebue District chum salmon commercial catch statistics, 1962–1992.

Year	Total Catch	Total Days [a]	Total Boat Days [b]	Average Catch per Boat Day	Number of Fishermen [c]	Average Seasonal Catch per Fishermen
1962	129,948	21.0	793	164	84	1,547
1963	54,445	20.0	693	79	61	893
1964	76,449	27.0	560	137	52	1,470
1965	40,025	32.0	410	98	45	889
1966	30,764	35.0	548	56	44	699
1967	29,400	33.0	556	53	30	980
1968	30,212	34.0	858	35	59	512
1969	59,335	40.0	798	74	52	1,141
1970	159,664	32.0	1,368	117	82	1,947
1971	154,956	29.0	1,468	106	91	1,703
1972	169,664	35.0	2,095	81	104	1,631
1973	375,432	25.0	2,217	169	148	2,537
1974 [d]	627,912	32.0	3,769	167	185	3,394
1975 [e]	563,345	39.0	4,301	131	267	2,110
1976	159,656	16.0	2,236	71	220	726
1977	195,895	21.0	2,353	83	224	875
1978	111,533	23.0	2,738	41	208	536
1979	141,545	21.0	2,462	57	181	782
1980	367,284	27.0	2,559	144	176	2,087
1981	677,239	27.0	3,336	203	187	3,622
1982	417,790	23.5	3,115	134	199	2,099
1983	175,762	12.5	1,557	113	189	930
1984	320,206	19.5	2,432	132	181	1,769
1985	521,406	25.5	3,376	154	189	2,759
1986	261,436	15.5	2,049	128	187	1,398
1987	109,467	11.5	1,160	94	160	684
1988	352,915	21.5	2,761	128	193	1,829
1989	254,617	22.2	1,961	130	165	1,543
1990	163,263	11.5	1,760	93	153	1,067
1991	239,923	22.5	1,795	134	142	1,690
1992	289,184	17.0	1,513	191	149	1,941

[a] Day = 24 hours of open fishing time.
[b] Boat days standarized in 1983 for all prior years. Boat days = number of boats fishing times period length in hours divided by 24. Total boat days = total season boat hours divided by 24.
[c] During 1962–1966 and 1968–1971 figures represent the number of vessels licensed to fish in Kotzebue District, not the number of fishermen.
[d] Includes 6,567 chum salmon from the Deering experimental fishery.
[e] Includes 10,704 chum salmon from the Deering experimental fishery.

Appendix Table C.2. Kotzebue District chum salmon type of processing and weights, 1962–1992.

Year	Chum Salmon				
	Cases (48lbs)	Fresh Frozen (Round weight in pounds)	Other [a]	Fresh Frozen Salmon Roe (pounds)	Cured Pounds
1962	14,500				
1963	5,396				
1964	5,421	202,993			
1965	1,929	207,350			
1966		310,716		13,600	3,065
1967		273,420			11,488
1968		288,500			11,850
1969		455,013			8,183
1970		1,240,000			48,377
1971		1,264,753			27,542
1972		1,547,041			55,376
1973		3,416,431			144,768
1974		5,361,130 [b]			
1975		4,877,313 [c]			
1976		1,415,549	487		
1977		1,846,340	1,075		
1978		1,009,121	32,419		
1979		1,236,429	6,155		
1980		3,160,948	7,828		
1981		6,139,518	2,210		
1982		3,833,051	790	100	
1983		1,647,160	2,449		
1984		2,631,582	1,593		
1985		4,528,379	1,106		
1986		2,271,320	1,691		
1987		900,405	597		
1988		3,060,292	2,120		
1989		2,163,174	1,426		
1990		1,453,040	538		
1991		1,951,041	714		
1992		2,397,302	2,714		

[a] Chinook and pink salmon.
[b] Includes 36,775 pounds from the experimental commercial fishery at Deering.
[c] Includes 80,801 pounds from the experimental commercial fishery at Deering.

Appendix Table C3. Kotzebue District commercial fishery dollar value estimates, 1962–1992.[a]

Year	Gross Value of Catch to Fishermen	Wholesale Value of Pack[b]	License and Tax Revenue to State
1962	$4,500	$304,500	$11,635
1963	$9,140	$113,316	$6,040
1964	$34,660	$158,020	$5,279
1965	$18,000	$83,294	$2,952
1966	$25,000	$84,630	$2,820
1967	$28,700	$100,450	$4,245
1968	$46,000	$62,000	$2,800
1969	$71,000	[f]	[c]
1970	$186,000	[f]	$5,520
1971	$200,000	[f]	$5,970
1972	$260,000	[f]	[c]
1973	$925,000	[f]	[c]
1974	$1,822,784	[f]	$18,121
1975	$1,365,648	[f]	$16,955
1976	$580,375	[f]	$15,364
1977	$1,033,950	[f]	$19,960
1978	$575,260	[f]	$9,913 [e]
1979	$990,263	[f]	$18,302 [e]
1980	$1,446,633	[f]	$11,820 [e]
1981	$3,246,793	[f]	$11,220 [e]
1982	$1,961,518	[f]	$7,085 [e]
1983	$420,736	[f]	$24,097
1984	$1,148,884	[f]	$39,696 [e]
1985	$2,137,368	[f]	$6,390 [h]
1986	$931,241	[f]	$5,610 [h]
1987	$515,000	[f]	$6,180 [h]
1988	$2,581,333	[f]	$11,150 [h,i]
1989	$613,823	[f]	$8,350 [h]
1990	$438,044	[f]	$7,650 [h]
1991	$437,948	[f]	$7,150 [h]
1992	$533,731	[f]	$7,450 [h]

[a] Some estimates between 1962 and 1981 include only chum value which in figures represent over 99% of the total value. Figures after 1981 represent the chum value as well as incidental species such as char, whitefish and other salmon species.
[b] Based on type of processing when fish were shipped out of the district.
[c] Includes $9,193 from the experimental commercial fishery at Deering.
[d] Includes $17,776 from the experimental commercial fishery at Deering.
[e] Includes permit and vessel fees only.
[f] Information not available.
[g] Includes tendering fees but not cash bonuses.
[h] Includes permit renewal fees only; vessels were not required.

Appendix Table C.4. Kotzebue District mean prices paid per pound to salmon fishermen by species, 1962–1992 [a]

Year	Chum Salmon		Chinook Salmon	Pink Salmon	Inconnu	Dolly Varden
	Average Weight	Average Price				
1962		$0.35 [c]				
1963		$0.35 [c]				
1964	8.3	$0.45 [c]				
1965	9.0	$0.45			$1.30 [3]	
1966	10.1	$0.11			$1.40 [3]	$0.55
1967	9.3	$0.11			$1.50 [3]	$0.75
1968	9.7	$0.14			$0.91 [3]	$0.98
1969	7.5	$0.15			$1.30 [3]	$2.84
1970	8.1	$0.15				
1971	8.1	$0.16			$0.16	$0.17
1972	9.1	$0.17			$0.20	$0.17
1973	9.1	$0.25			$0.30	$0.16
1974 [b]	8.5	$0.34			$0.30	$0.16
1975 [b]	8.6	$0.28			$0.30	$0.30
1976	8.9	$0.41			$0.30	$0.30
1977	9.6	$0.56			$0.30	
1978	9.1	$0.57			$0.30	$0.25
1979	8.8	$0.80				$0.25
1980	8.6	$0.46			$0.10	$0.20
1981	9.1	$0.53			$0.75 [d]	$0.17
1982	9.3	$0.51	$1.25	$0.15	$0.75 [d]	$0.20
1983	9.4	$0.25	$1.08	$0.13		$0.20 [d]
1984	8.2	$0.44	$1.03			$0.25 [d]
1985	8.7	$0.47	$1.25			$0.25
1986	8.7	$0.41	$1.25			$0.20
1987	8.2	$0.57	$1.25			$0.30
1988	8.7	$0.85	$1.98			$0.35
1989	8.5	$0.28	$1.72			$0.28
1990	8.9	$0.31	$2.00			$0.25
1991	8.1	$0.22	$1.64		$0.50	$0.18
1992	8.3	$0.22	$1.89		$0.58	$0.10

[a] Information not available for some species in some years.
[b] Includes price paid to fisherment of Deering during the experimental commercial fishery.
[c] Price per fish.
[d] Limited market with one buyer.

Appendix Table C5. Kotzebue District commercial age and sex compositon of chum salmon, 1962–1992.[a]

Year	Sample Size	Percent		Percent Age Class			
		Males	Females	Age–3	Age–4	Age–5	Age–6
1962	69	26.1	73.9	7.3	63.3	28.0	1.4
1963	255	35.0	65.0	30.1	50.9	18.6	0.4
1964	463	43.6	56.4	52.9	45.0	1.7	0.4
1965	480	42.1	57.9	2.3	91.0	6.7	0.0
1966	430	40.2	59.8	10.1	67.1	22.8	0.0
1967	1,865	37.3	62.7	8.8	72.2	18.5	0.5
1968	1,989	48.2	51.8	21.2	58.1	19.8	0.9
1969	1,125	53.7	46.3	36.8	58.3	4.9	0.0
1970	267	45.3	54.7	3.9	91.0	5.1	0.0
1971	1,105	54.6	45.4	7.1	66.8	26.1	0.0
1972	980	50.9	49.1	15.8	59.5	24.1	0.6
1973	598	46.0	54.0	16.7	69.5	13.8	0.0
1974	350	47.1	52.9	28.5	63.5	7.8	0.2
1975	340	46.4	53.6	2.5	86.8	10.7	0.0
1976	566	47.9	52.1	11.2	51.5	37.2	0.1
1977	446	49.3	50.7	6.7	73.0	18.6	1.7
1978	579	49.9	50.1	10.5	57.5	31.8	0.2
1979[b]	658	53.3	46.7	30.6	53.2	15.2	1.0
1980[c]	710	56.4	43.6	15.1	78.1	6.6	0.2
1981[d]	1,167	52.4	47.6	2.4	67.1	30.5	0.0
1982	983	48.8	51.2	5.9	48.3	40.3	5.5
1983[e]	1,979	43.4	56.6	5.8	57.7	34.2	2.3
1984[f]	2,933	50.2	49.8	14.6	64.4	19.7	1.3
1985[g]	3,293	47.8	52.2	0.4	83.7	15.5	0.4
1986[h]	3,095	46.0	54.0	0.3	18.6	78.9	2.2
1987[i]	1,987	52.0	48.0	15.0	43.0	31.0	11.0
1988[j]	3,324	48.0	52.0	6.5	74.9	16.9	1.7
1989	3,336	49.3	50.7	0.7	77.9	20.4	1.0
1990[k]	2,497	49.4	50.6	2.3	45.6	50.7	1.4
1991	3,292	46.4	53.6	2.9	60.4	35.8	0.9
13 Year Average (1979–1991)		48.6	51.4	5.6	60.1	32.2	2.1
1992[l]	3,706	39.6	60.4	0.9	58.5	37.5	3.1

[a] Commercial periods not sampled for years 1962 to 1978 are unknown.
[b] Commercial openings 1 and 10 not sampled due to period closure.
[c] Commercial openings 8, 13, and 15 not sampled due to period closure.
[d] Commercial openings 8, 10, 12, and 14 not sampled due to period closure.
[e] Commercial openings 11, 13, 14, and 15 not sampled due to period closure.
[f] Commercial openings 14 and 15 not sampled due to period closure.
[g] Commercial openings 1, 3, 5, 7, 9, 11, and 13 not sampled due to period closure.
[h] Commercial opening 15 not sampled due to period closure.
[i] Commercial openings 1, 2, 4, 6, 7, 8, 10, 11, 14, and 15 not sampled due to period closure.
[j] Includes 0.1 percent age–7 fish.
[k] Commercial openings 11 to 15 not sampled due to period closure.
[l] Commercial opening 12 not sampled due to period closure.

Appendix Table C6. Chum salmon aerial survey counts for the Kotzebue District, 1962–1992[a,h]. (p. 1 of 4)

Stream	1962	1963	1964	1965	1966	1967	1968	1969
Noatak Drainage								
Noatak River below Kelly River	168,000[d]	1,970[bj]	89,798	6,152[bj]	101,640	29,120[b]	39,394	33,945
Eli River	9,080[d]	35			120		5,502[f]	68[f]
Kelly River & Lake	1,818[d]	600		3,155	570	225	375	150
Noatak River System Total	178,898	2,605	89,798	9,307	102,330	29,345	45,271	34,163
Kobuk Drainage								
Mouth to Kobuk Village								
Kobuk to Pah River				1,750	266		530	
Pah River to just below Selby River		400		500			50	
Selby River mouth & Slough		2,575		500	630	1,625	70	
Selby R. mouth to just below Beaver C.						75	170	
Beaver Creek mouth		1,095			460	795	1,550	
Above Beaver Creek		465			118			
Kobuk River Total	9,224[d]	4,535	7,985[g]	2,750	1,474	2,495	2,370	7,500[e]
Squirrel River	5,834[d]	2,200	8,009	7,230	1,350	3,332	6,746	6,714
Salmon River	12,936[d]	1,535	9,353	1,500[b]	3,957	2,116	3,367	2,561
Tutuksuk River	10,841[d]	670	2,685		1,383	169	823[b]	159
Kobuk River System Total	62,977[e]	8,940	28,032	11,480	8,164	8,112[e]	13,306	16,934

[a] Three aerial surveys are attempted yearly at different intervals for each tributary to assess escapements prior to the peak, at the peak, and after the peak of the run. Indicies listed in this table are the largest survey observed for each tributary during the given year.
[b] Poor survey conditions or incomplete, early or late survey.
[c] Survey by foot or boat.
[d] These fish are unidentified salmon, mostly chums.
[e] This figure includes fish observed from just above Selby Slough to the mouth of the Reed River.
[f] Unresolvable discrepencies in historical data put this figure in question.
[g] Unclear where these fish were observed.
[h] The figures in this table have been corrected and supercede figures in previous reports.
[i] Surveyed well before peak of migration.
[j] Unacceptable conditions.

Appendix Table C6. (p. 2 of 4)

Stream	1970	1971	1972 [b]	1973 [b]	1974	1975	1976	1977 [b]	1978	1979
Noatak Drainage										
Noatak River below Kelly River	138,145	41,075	64,315	32,144	129,640	96,509	44,574	11,221	37,817	19,655 [b]
Eli River			3,286		22,249	1,302	1,205	742 [b]	5,525	1,794
Kelly River & Lake				2,590 [f]	1,381 [f]	3,937	217 [b]	290 [b]	168 [b]	3,200 [b]
Noatak River System Total	138,145	41,075	67,601 [b]	36,034	158,867	101,748	45,906	12,253 [b]	43,510	24,649
Kobuk Drainage										
Mouth to Kobuk Village					2,255					
Kobuk to Pah River	1,753	4,953				1,873	485		269	75
Pah River to just below Selby River	20	2,039	1,865		4,710	3,968	2,037		1,448	183
Selby River mouth & Slough	4,820	3,100	7,400		7,380				211	1,110
Selby R. mouth to just below Beaver C.	2,385	4,720	3,170	920	13,775 [e]	4,861 [e]			53	640
Beaver Creek mouth	4,930	2,000	3,000	850						
Above Beaver Creek			2,720	700						
Kobuk River Total	13,908	17,202	18,155	2,470 [b]	28,120	10,702	2,522 [b]		1,981 [b]	2,008
Squirrel River	4,418	6,628	32,126	12,345	32,523	34,236	7,229	1,964 [b]	1,863 [b]	1,500 [b]
Salmon River	3,000 [b]	5,453	2,073 [b]	6,891	29,190	9,721	1,161		814 [b]	674 [b]
Tutuksuk River	2,000 [b]	1,384 [f]			8,312	1,344 [b]	758		368 [b]	382 [b]
Kobuk River System Total	23,326	30,667	52,354	21,796	98,145	56,003	11,670	1,964	5,026	4,628

[a] Three aerial surveys are attempted yearly at different intervals for each tributary to assess escapements prior to the peak, at the peak, and after the peak of the run. Indicies listed in this table are the largest survey observed for each tributary during the given year.
[b] Poor survey conditions or incomplete, early or late survey.
[c] Survey by foot or boat.
[d] These fish are unidentified salmon, mostly chums.
[e] This figure includes fish observed from just above Selby Slough to the mouth of the Reed River.
[f] Unresolvable discrepencies in historical data put this figure in question.
[g] Unclear where these fish were observed.
[h] The figures in this table have been corrected and supercede figures in previous reports.
[i] Surveyed well before peak of migration.
[j] Unacceptable conditions.

Appendix Table C6. (p. 3 of 4)

Stream	1980	1981 [b]	1982 [b]	1983	1984	1985 [b]	1986 [b]	1987 [b]	1988 [b]	1989 [j]
Noatak Drainage										
Noatak River below Kelly River	164,474	116,352	20,682	79,773	67,873	45,529	37,227	5,565 [bj]	45,930 [bj]	
Eli River	10,277		295	3,044	5,027	855	4,608	2,780	8,639	
Kelly River & Lake	7,416	13,770	11,604	12,137	3,499	1,200	839	950	1,460	
Noatak River System Total	182,167	130,122	32,581	94,954	76,399	45,584	42,374	9,295	56,029	
Kobuk Drainage										
Mouth to Kobuk Village										
Kobuk to Pah River	1,694	18	2,643 [b]	2,147	402	2,048 [i]	531			
Pah River to just below Selby River	2,063	309	598 [b]	2,433	257	241 [i]	511	2,250	1,135 [b]	
Selby River mouth & Slough		8,321 [d,e]	2,454	11,683		711 [i]	673	1,470	820 [b]	
Selby R. mouth to just below Beaver C.	6,925 [d]		7,268	13,011	5,910	3,278 [i]	3,282	1,350	6,890 [b]	
Beaver Creek mouth	784		1,711	3,059						
Above Beaver Creek				1,413	4,052		1,018	3,140	3,050 [b]	
Kobuk River Total	11,466	8,648	14,674	33,746	10,621	6,278 [i]	6,015	8,210	11,895 [b]	
Squirrel River	13,536	9,854	7,690	6,075	5,473	6,145	4,982	3,400 [c]	4,848 [b]	
Salmon River	8,456	4,709	5,392 [c]	1,677	1,471	2,884	1,971	3,333	6,208	
Tutuksuk River	1,165	1,114	1,322	2,637	1,132	5,198	4,257	206	3,122	
Kobuk River System Total	34,623	24,325	29,078	44,135	18,571	20,405	17,225	15,149	26,073	

[a] Three aerial surveys are attempted yearly at different intervals for each tributary to assess escapements prior to the peak, at the peak, and after the peak of the run. Indicies listed in this table are the largest survey observed for each tributary during the given year.
[b] Poor survey conditions or incomplete, early or late survey.
[c] Survey by foot or boat.
[d] These fish are unidentified salmon, mostly chums.
[e] This figure includes fish observed from just above Selby Slough to the mouth of the Reed River.
[f] Unresolvable discrepencies in historical data put this figure in question.
[g] Unclear where these fish were observed.
[h] The figures in this table have been corrected and supercede figures in previous reports.
[i] Surveyed well before peak of migration.
[j] Unacceptable conditions.

Appendix Table C6. (p. 4 of 4)

Stream	1990 [b]	1991	1992 [b]	Aerial Escapement Goals
Noatak Drainage				
Noatak River below Kelly River	23,345 [b]	62,750	34,335	80,000
Eli River	3,000	2,940	701	
Kelly River & Lake	325 [i]	654	726	
Noatak River System Total	26,670	86,344	35,762	
Kobuk Drainage				
Mouth to Kobuk Village				
Kobuk to Pah River	4,610	9,840	1,030	
Pah River to just below Selby River	305	2,780	3,820	
Selby River mouth & Slough		1,040	1,500	
Selby R. mouth to just below Beaver C.	7,505	5,250	3,845	
Beaver Creek mouth				
Above Beaver Creek	2,515	4,155	740	
Kobuk River Total	14,935	23,065	10,935	10,000
Selby River	420	1,460	868	
Squirrel River	5,500	4,606	2,765	11,500
Salmon River	6,335	5,845	1,345	7,000
Tutuksuk River	2,275	744	1,162	2,000
Kobuk River System Total	29,465	35,720	17,075	

[a] Three aerial surveys are attempted yearly at different intervals for each tributary to assess escapements prior to the peak, at the peak, and after the peak of the run. Indicies listed in this table are the largest survey observed for each tributary during the given year.
[b] Poor survey conditions or incomplete, early or late survey.
[c] Survey by foot or boat.
[d] These fish are unidentified salmon, mostly chums.
[e] This figure includes fish observed from just above Selby Slough to the mouth of the Reed River.
[f] Unresolvable discrepencies in historical data put this figure in question.
[g] Unclear where these fish were observed.
[h] The figures in this table have been corrected and supercede figures in previous reports.
[i] Surveyed well before peak of migration.
[j] Unacceptable conditions.

Appendix Table C7. Kotzebue District commercial and subsistence salmon catches, 1914–1992.

	Commercial Catch			Subsistence Chum Catch			
Year [a]	Chum [b]	Other [c]	Total	Chum	Number of Fishermen Interveiw	Average Catch per Fishermen	Total Documented Catch
1914	8,550		8,550				
1915	4,750		4,750				
1916	19,000		19,000				
1917	44,612		44,612				
1918	27,407		27,407				
1957				298,430 [d]			
1962	129,948	27	129,975	70,283	81	868	200,258
1963	54,445	143	54,588	31,069	67	464	85,657
1964	76,499	5	76,504	29,762	58	513	106,266
1965	40,034		40,034	30,500	89	343	70,534
1966	30,764	1	30,765	35,588	121	294	66,353
1967	29,400		29,400	40,108	135	297	69,508
1968	30,384 [e]		30,384	20,814	65	320	51,198
1969	59,335	48	59,383	29,812	99	301	89,195
1970	159,664		159,664	28,486	164	174	188,150
1971	154,956	1	154,957	23,959	152	158	178,916
1972	169,664	3	169,667	11,085	96	115	180,752
1973	375,432	5	375,437	18,942	101	188	394,379
1974	634,479 [f]	48	634,527	26,729	88	304	661,256
1975	563,682 [g]	36	563,718	27,605	95	291	591,323
1976	159,796	2	159,798	15,765	91	173	175,563
1977	195,895		195,895	9,752	83	117	205,647
1978	111,533	7007	118,540	12,864	85	151	131,404
1979	141,623	910	142,533	14,605	97	151	157,138
1980	367,284	1654	368,938	10,945	111	99	379,883
1981	677,239	237	677,476	17,766	71	250	695,242
1982	417,790	57	417,847	30,133	204	148	447,980
1983	175,762	229	175,991	8,262 [h]	46	180	184,253
1984	320,206	107	320,313	15,508 [h]	66	235	335,821
1985	521,406	63	521,469	13,494 [i]	243	56	534,963
1986	261,436	106	261,542	36,311	837	43	297,853
1987	109,467	44	109,511	[j]	[j]	[j]	109,511
1988	352,915	152	353,067	[j]	[j]	[j]	353,067
1989	254,617	87	254,704	[j]	[j]	[j]	254,704
1990	163,263	32	163,295	[j]	[j]	[j]	163,295
1991	239,923	44	239,967	[j]	[j]	[j]	239,967
1992	289,184	204	289,388	[j]	[j]	[j]	289,388
1979–1992 Average		280	306,860				

[a] There was no commercial fishing during 1919–1961.
[b] Catches for 1914–1918 are from pack data only. Number of chum salmon estimate at 9.5 per case (#48) and 34 per barrel.
[c] Includes pink, chinook, and sockeye salmon.
[d] Estimated mean annual catches prior to 1957 (study by Raleigh).
[e] Corrected from 1968 annual report due to addition of late catches.
[f] Includes 6,567 chum salmon from the Deering experimental fishery.
[g] Includes 10,704 chum salmon from the Deering experimental fishery.
[h] Partial survey.
[i] Does not include harvest from the villages of Noatak and Kivalina.
[j] Not surveyed.

Appendix Table C8. Kotzebue District subsistence chum salmon catches by village, 1962–1992.

Year	Village							Village						District Total
	Noorvik	Kiana	Ambler	Shungnak	Kobuk	Kobuk River	Noatak Village	Kotzebue	Deering	Kivalina	Buckland	Candle	Shishmaref	
1962	15,934	3,139	[b]	[b]	2,321	21,394	48,890	[b]	[b]	[b]	[b]	[b]	[b]	70,284
1963	4,304	1,973	755	1,240	200	8,472	16,762	5,835	[b]	[b]	[b]	[b]	[b]	31,069
1964	2,167	783	2,142	3,134	1,020	9,246	12,763	7,753	[b]	[b]	[b]	[b]	[b]	29,762
1965	5,596	1,598	1,340	2,160	877	11,571	5,671	8,058	5,200	[b]	[b]	[b]	[b]	30,500
1966	3,141	433	912	899	625	6,010	19,700	3,640	6,238	[b]	[b]	[b]	[b]	35,588
1967	2,350	1,489	679	1,500	175	6,193	26,512	4,032	3,098	[b]	162	11	100	40,108
1968	2,424	2,488	457	1,600	1,030	7,999	5,490	4,324	2,838	[b]	37	89	37	20,814
1969	1,301	2,458	3,525	2,550	1,655	11,489	14,458	1,768	1,897	[b]	–	200		29,812
1970	6,077	3,457	2,899	3,450	600	16,483	4,120	6,814	1,242	[b]	344	113		29,116
1971	7,144	5,177	2,299	2,653	1,931	19,204	9,919	1,737	763	[b]	155	50	131	31,959
1972	1,744	1,435	1,469	2,665	2,119	9,432	741	1,151	369	[b]	59	113	29	11,894
1973	2,312	4,470	1,529	4,406	1,917	14,634	216	1,172	1,098	[b]	1,722	50	100	18,992
1974	6,809	2,726	1,651	6,243	2,251	19,680	4,330	[b]	1,880	[b]	639	15	200	26,744
1975	4,620	4,320	3,390	9,060	1,755	23,145	1,515	[b]	1,175	[b]	1,540	[b]	230	27,605
1976	1,555	1,579	2,000	4,213	562	9,909	4,448	[b]	1,358	[b]	[b]	[b]	[b]	15,715
1977	891	766	385	1,760	325	4,127	2,125	[b]	3,500	[b]	[b]	[b]	[b]	9,752
1978	2,034	1,493	2,224	4,766	852	11,369	1,495	[b]	[b]	[b]	[b]	50	[b]	12,914
1979	2,155	1,225	2,400	2,947	651	9,378	2,227	[b]	2,000	[b]	1,000	[b]	[b]	14,605
1980	2,229	2,551	660	2,704	350	8,494	2,135	[b]	[b]	[b]	[b]	[b]	[b]	10,629
1981	3,488	1,439	782	2,800	950	9,459	5,465	2,387	295	110	50	[b]	[b]	17,766 [c,e]
1982	7,433	4,918	2,506	4,191	600	19,648	5,479	4,099	807	210	[b]	[b]	[b]	30,243 [e]
1983 [c,d]	277	223	1,062	3,556	368	5,486	4,035	347	219	200	[b]	[b]	[b]	10,287
1984 [c,e]	[b]	[b]	2,990	4,241	[b]	7,231	6,049	88 [e]	1,940	200	[b]	[b]	[b]	15,508
1985	7,015	3,494	3,487	3,115	300	17,411	[b]	13,494	573	[b]	[b]	[b]	[b]	31,478
1986	8,418	[b]	[b]	4,483	[b]	12,901	1,246	36,311	[b]	[b]	[b]	[b]	[b]	50,458
1987	5,092	[b]	[b]	1,975	[b]	7,067	2,921	[b]	[b]	[b]	[b]	[b]	[b]	9,988
1988	7,500	[b]	[b]	6,223	[b]	13,723	[b]	[b]	[b]	[b]	[b]	[b]	[b]	13,723
1989	[b]	[b]	[b]	3,894	[b]	3,894	1,595	[b]	[b]	[b]	[b]	[b]	[b]	5,489
1990	4,353	[b]	[b]	[b]	[b]	4,353	3,915	[b]	[b]	[b]	[b]	[b]	[b]	8,268
1991	6,855	[b]	[b]	4,248	[b]	11,103	3,637	[b]	[b]	[b]	[b]	[b]	[b]	14,740
1992	8,370	[b]	[b]	3,890	[b]	12,260	2,043	[b]	[b]	[b]	[b]	[b]	[b]	14,303

[e] No household survey, information is from return of mail questionaires.
[b] Not surveyed.
[c] Does not include 310 chum salmon taken in Selawik.
[d] Household surveys were conducted in Noatak, Kivalina, and Shungnak only. Other harvest information is from limited return of mail–in calendars.
[e] Household surveys were conducted in Noatak, Kivalina, Ambler, and Deering. Other harvest information is from limited return of mail–in questionaires.

Appendix Table C9. Kotzebue District mean subsistence chum salmon catch per fishermen by village, 1962–1992.

Year	Kotzebue	Noatak	Noorvik	Kiana	Ambler	Shungnak	Kobuk	Deering
1962	[a]	1,190	665	350	[a]	[a]	335	[a]
1963	650	800	160	[b]	94	[b]	67	[a]
1964	515	710	220	260	310	[a]	205	[a]
1965	400	810	220	265	190	220	145	[a]
1966	158	820	137	62	76	45	104	[a]
1967	202	914	90	68	49	125	35	[a]
1968	135	220	84	96	33	114	206	[a]
1969	98	760	163	223	235	318	206	[a]
1970	187	242	132	138	242	182	150	[a]
1971	53	148	223	207	177	133	386	[a]
1972	63	74	84	84	244	266	302	[a]
1973	195	36	121	178	305	489	273	[a]
1974	[a]	393	324	181	165	891	450	[a]
1975	[a]	138	210	288	282	647	293	[a]
1976	[a]	212	259	79	250	281	70	[a]
1977	[a]	425	56	38	55	104	41	[a]
1978	[a]	79	88	71	131	265	142	[a]
1979	[a]	114	98	68	160	184	108	[a]
1980	[a]	164	318	213	132	246	88	[a]
1981	213	579	388	131	129	233	317	[a]
1982	84	189	323	246	167	262	200	81
1983 [c]	50	269	139	223	531	254	368	44
1984	44	173	[a]	[a]	214	303	[a]	194
1985	107	[a]	206	116	152	195	50	72
1986	47	69 [d]	271	[a]	[a]	195	[a]	[a]
1987	[a]	225 [d]	189	[a]	[a]	329	[a]	[a]
1988	[a]	[a]	300	[a]	[a]	389	[a]	[a]
1989	[a]	133	[a]	[a]	[a]	216	[a]	[a]
1990	[a]	135	198	[a]	[a]	[a]	[a]	[a]
1991	[a]	145	311	[a]	[a]	283	[a]	[a]
1992	[a]	89	310	[a]	[a]	243	[a]	[a]

[a] Not Surveyed.
[b] Number of fishermen not known.
[c] Means based on very limited number of mail–in calendars except for the villages of Noatak and Shungnak where interveiws were conducted.
[d] Partial harvest, fishermen were just beginning to fish.

Section 2: PACIFIC HERRING

(Includes Norton Sound and Port Clarence/Kotzebue Districts)

SECTION 2 - PACIFIC HERRING

INTRODUCTION

Boundaries

The Norton Sound District consists of all waters of Alaska between the latitude of the westernmost tip of Cape Douglas and the latitude of Canal Point Light (Figures 10). The Port Clarence District consists of all waters of Alaska between the latitude of Cape Douglas and the latitude of Cape Prince of Wales (Figure 11). The Kotzebue District consists of all waters of Alaska between the latitude of Cape Prince of Wales and the latitude of Point Hope (Figure 11).

Spawning Areas and Timing

The arrival of herring on the spawning grounds is greatly influenced by climate and oceanic conditions, particularly the extent and distribution of the Bering Sea ice pack. Most herring spawning populations appear near the eastern Bering Sea coast immediately after ice breakup between mid-May and mid-June. Spawning progresses in a northerly direction and may continue into July or August along portions of the Seward Peninsula or within the Chukchi Sea.

The primary spawning areas within Norton Sound have been from Stuart Island to Tolstoi Point. When sea ice has remained in this area into June, spawning has been more extensive along Cape Denbigh and several locations along the northern shore of Norton Sound between Bald Head and Bluff. More northerly spawning areas have been more difficult to identify due to small herring stock sizes and limited investigations. Likely spawning areas include Imuruk Basin, Shishmaref, Deering-Kiwalik, and Hotham Inlet.

NORTON SOUND DISTRICT

Fishing History

Pacific herring (Clupea harengus pallasi) have been utilized for subsistence purposes by coastal residents prior to the mid-1800's when their use was first documented by early explorers. The earliest American commercial effort on Bering Sea herring apparently took place in the early part of this century at Golovin Bay in Norton Sound (Appendix Table D1).

Food Herring

Early records indicate that about 3,200 short tons of "fall herring" were processed in Norton Sound from 1916 to 1941 (Appendix Table D1). This fishery was dependent on salt curing and declined because of poor marketing conditions arising from foreign competition. The Japanese began gillnetting in Norton Sound

during 1968 with three vessels. Effort was concentrated about 12 miles offshore between St. Michael and Golovin. Approximately 40 Japanese vessels reported harvesting a record 1,400 short tons (st) of herring during 1969 (Appendix Table D2). An average annual harvest of approximately 440 st was reported in Norton Sound by the Japanese during 1968-1974. The Japanese gill net fishery was prohibited in 1977.

Sac Roe

Domestic commercial effort resumed in Norton Sound in 1964 near Unalakleet and continued on a sporadic basis until 1979. Between 1964 and 1978 the fishery averaged about 14 short tons of herring annually and targeted on "spring herring" for sac roe extraction (Appendix Table D1). In 1979, a domestic herring fishery for sac roe began on a larger scale in Norton Sound when approximately 1,292 short tons (st) of herring were taken by 63 fishermen (13 purse seiners, 50 gillnetters). Purse seiners took 70% of the total catch.

After the 1979 season, the Alaska Board of Fisheries adopted a public proposal which made gill nets and beach seines the only legal commercial herring fishing gear within Norton Sound. A purse seine fishery could only be opened if the gill net fleet could not take the allowable harvest. This regulation was an attempt to encourage involvement of local fishermen in this developing fishery. During the 1980 season 294 gill net fishermen harvested 2,452 short tons of herring (Appendix Table D3). Because gill net fishermen demonstrated that they were capable of taking the available harvest a regulation was passed in 1981 which prohibited any purse seine gear within Norton Sound.

Prior to the 1984 season, the harvest by beach seine fishermen was negligible. During 1984, ten beach seine fishermen harvested 327 st. During their 1984 fall meeting, the Board of Fisheries set a beach seine gear limit of 100 fathoms and limited the harvest to "not exceed 10 percent of the total herring sac roe harvest projection as published by the department." During the fall 1987 Board of Fisheries meetings, beach seine gear was further restricted to a limit of 75 fathoms. Beach seine harvests in Norton Sound since 1985 have averaged 6.3% of the total reported harvest.

As with any developing fishery, fishing effort increased with each successive season. In 1984 Norton Sound became a Super-Exclusive Use herring fishing district in order to slow growth and bolster local involvement, but this strategy met with only limited success. The 1987 season had the highest level of fishing effort on record with a total of 564 fishermen making at least one delivery, where 559 were gillnet and 22 were beach seiner permits recorded landings. This was more than twice the average effort from 1980 through 1986. Local Norton Sound area residents accounted for 36% of the effort and 29% of the total harvest.

A public proposal to the Fall 1987 Board of Fish was adopted that changed the Norton Sound Herring Fishing District to Limited Entry status. Beginning with the 1988 season a moratorium was placed on Norton Sound where no new entrants were allowed into the fishery. The Limited Entry Commission is reviewing and awarding limited entry permits to fishermen based on fishing history and will

eventually reduce the total number to 301 gillnet and 4 beach seine permits as directed by the Board of Fish. Currently, some fishermen have already received limited entry permits and others are still fishing with interim-use permits while their eligibility is being evaluated on a case-by-case basis.

Commercial harvests from 1981-1984 averaged 4,137 st, and ranged from a low of 3,662 st in 1984 to 4,582 st in 1983 (Appendix Table D3). From 1985-1988, commercial herring harvests have averaged 4,374 st, ranging from a low of 3,548 st in 1985 to a high of 5,194 st in 1986. And more recently, from 1989-1991, harvests have averaged 5,596 st, ranging from 4,743 st in 1989 to 6,373 st in 1990. Level of commercial harvest is influenced by stock status, product value and climatic factors.

Spawn on Kelp

A small scale spawn-on-kelp (Fucus) fishery existed in Norton Sound from 1977 to 1984. Harvests during the 1977-1984 period ranged from less than one ton (1977) to approximately 46 st (1981) (Appendix Table D5). In addition, during the 1984 season, one ton of macrocystus kelp was imported into Norton Sound resulting in a harvest of approximately 3 st of product. In response to a public proposal, a Board of Fisheries action prior to the 1985 season resulted in the closure of all spawn-on-kelp fisheries in Norton Sound.

Management Strategies

The overall statewide management strategy is to annually harvest 0-20% of the herring biomass. The upper end of the exploitation range is applied to stocks in good condition. The lower end of the exploitation range is applied to stocks that are exhibiting a trend of decreasing abundance and poor recruitment. If a minimum threshold level is not achieved, 7,000 st for Norton Sound, no commercial fishery will be allowed.

Typically herring are long lived fish and will usually remain harvestable for at least 5 years after recruiting into the fishery. Harvesting only a percentage of the biomass ensures that some fish will be held over for following years. This type of strategy helps mitigate population fluctuations caused by successive years of poor recruitment, a common occurrence in marine spawning fish. Prior to 1983, harvests in Norton Sound were regulated on a subdistrict basis so harvests would be dispersed over the entire fishing grounds. This was to prevent harvest efforts from concentrating in one area on what was then thought to be a distinct stock of fish.

Since methods to reliably forecast herring returns are still being developed and estimates of recruitment are not available, in-season assessments of biomass supersede the projected biomass for management of the Norton Sound herring fishery. The herring biomass will be managed for a 20% exploitation rate if the in-season aerial biomass surveys and age class composition information indicate the run will achieve at least the preseason biomass projection. If the run does not materialize as projected, the harvest exploitation rate may be reduced to a lower level.

Generally, the fisheries management staff has tried to set fisheries openings to allow gillnetters to fish the flood tide as it crests. The belief that the ripe females approach the beach at that time to spawn figures heavily in that strategy. The Norton Sound fishery covers a large area with varying tides. Because the large gill net fleet can not "fit" into individual subdistricts, opening at the optimal time through out the district is not always possible. The fishing fleet must be flexible to maximize catches.

The beach seine openings are dependent on herring abundance near the beach and favorable weather conditions for spotters and fishing. Beach seiners prefer to work flood tides similar to those gillnetters favor, however, fisheries managers frequently provide less optimal fishing times. The beach seiners have shown the ability to harvest their allotment of 10% of the preseason harvest goal in a single three hour opening under ideal conditions. By the nature of the gear beach seiners have the potential to wrap up large numbers of fish greater than their allocation. Therefore, the management staff has often chosen to reduce the beach seine efficiency by allowing a gillnet opening to occur before the beach seine opening in order to break up school size and reduce the likelihood of a bonanza. Occasionally the beach seine fleet has been used to test the roe quality of herring newly arrived in nearshore waters prior to a gillnet opening where the potential for waste was great had the entire gillnet fleet fished on poor quality herring.

1992 SEASON SUMMARY

There was no 1992 commercial herring sac roe fishery in Norton Sound.

During the early spring, several large herring buying companies sent advance men to the Norton Sound communities to recruit fishermen. At least five companies (eg. Icicle, Trident, Lafayette, New West and Sno Pac) expressed an interest in participating in the fishery. This was a normal level of interest and typical timing for this activity.

As the Togiak fishery was completed at the end of May, several processors sent representatives up to prepare for the season. It was at that point that the local staff first sensed that the buying in Norton Sound might be diminished this season. The statewide herring harvest was very large and the pack ice covered over 80% of Norton Sound on June 10. Large vessel traffic was impossible from the Yukon River north and as it turned out a sac roe fishery could not have begun until June 17 or 18. Over the weekend of June 13 to 15, the three largest buyers considered their other commitments, the risk of moving their buying fleet through dense pack ice, and the ramifications of buying herring with less capacity than the probable harvest. By June 15, they all decided to pass on the Norton Sound fishery.

The Norton Sound projected harvest was the highest ever projection, at 5200 st. The peak aerial survey flown June 20 while heavy spawning was occurring sighted 57,974 st, which would have allowed a 20% harvest of 11,600 st (Tables 14, 15). The staff had good survey conditions for several days prior to June 20 and had already projected a biomass of 57,700 on June 19. In other words, had a fishery

been in progress, the staff was aware of the record biomass on the grounds and would have been in a position to adjust fishing time to take advantage of the situation.

As the buyers pulled out, several fishermen approached the Department about conducting a spawn on kelp fishery in order to recoup some of the lost sac roe fishery. This possibility was explored in some depth and the Department was prepared to conduct a fishery. Only sac roe card holders were to participate since they had suffered the loss. There was some local concern that nothing was being done to help the crewmembers and it was pointed out that during the early 1980s these same people had been allowed to participate. This all became a mute point when it was apparent that the fucus kelp in southern Norton Sound was suffering from the late spring and was by-in-large not suitable for harvest. The kelp frawns were brown and slimy which is typical of the early spring stage where an abundance of freshwater in the intertidal zone poisons the plant. The herring eggs appeared to be in good condition but the overall product was not marketable quality. On June 24, it was announced that there would be no spawn on kelp fishery either.

Herring Abundance

Seventeen aerial surveys were flown to assess the 1992 herring biomass present in Norton Sound from May 27 through June 29. It is apparent from Table 14 that sea ice obscured much of Norton Sound well into the second week of June and that it wasn't until the third week of June that the bulk of the spawning biomass was present in nearshore waters. The peak of spawning occurred on June 19 and 20. It can be assumed from the fact the peak biomass survey date and peak spawning dates overlapped in both time and area, a significant quantity of herring may not have been observed due to the milt laden water.

Two Department test-fish crews operated in Norton Sound during the 1992 season in order to monitor the age class structure of returning herring and the progress of egg maturation. In addition, the data collected is used in data analysis for estimating the following season's returning biomass. One crew was located at Cape Denbigh and the other worked out of the Unalakleet field office. Variable - mesh gillnets were used to collect 1,217 herring samples. The dominant age class composition by numbers of fish were 26% 4 year olds, 21% 6 year olds, and 19% 10 year olds. Test fishing and sampling began June 5 and was stopped on the evening of June 25 primarily because of staffing and budget considerations. Test fishing indicated there was still ripe fish in near shore waters. The result of no late season sampling may be an under estimation of young herring or a widening of the confidence limits in 1993. However, the large biomass and young population is good assurance that Norton Sound will have a healthy population for years to come.

Economic Concerns

Appendix Table D3 provides a basis to judge the lost opportunity and impact due to the loss of this fishery. By using the statistics for the recent five years, the lost revenue split between 350 fishermen and their crew members was approximately three million dollars. Roughly 60% of the permit holders affected live in Norton Sound.

Table 15. Daily observed peak biomass estimates of Pacific herring, Norton Sound District, 1992.

Date	Flight No.	Observer Initials A/	Survey Hours	Survey Rating	Spawn No.	Spawn Length (mi)	Estimated Biomass (ST) By Index Area KLK	UNK	CDB	NTB	ELM	GOL	NOM	TOTAL
5/27	1	FB		ice	0	0.0								0.0
6/03	2	FB		ice	0	0.0								0.0
6/08	3	FB		ice	0	0.0								0.0
6/10	4	FB/TL	1.1	3	0	0.0		ice	369.2					369.2
6/11	5	FB/TL	1.6	3	0	0.0		ice	778.7					778.7
6/12	6	FB/TL	1.8	4	0	0.0	ice	ice	976.7					976.7
6/13	7	FB/CL	2.2	4	0	0.0	0.0	0.0	583.3					583.3
6/14	8	CL/TL	1.5	4	0	0.0	0.0	113.0	223.3					336.3
6/15	9	CL/FB	1.7	4	7	0.3	2359.0							2359.0
6/16	10	CL/TL	5.2	4	69	3.8	5227.1		519.3		1072.9	116.6	5727.3	12663.2
6/16	10C	TL		4	33	3.3	4293.9	0.0	814.0	0.0	835.4	140.5	3116.6	9200.4
6/17	11A	CL	7.8	3	35	2.2	5308.4	16348.1	2541.5	3218.9	306.9	705.7	3243.5	31673.0
6/17	11B	FB	7.8	3	57	1.8	6102.9	5856.9	3129.6	1642.4	386.8	602.3	2714.6	20435.5
6/18	12	FB/CL	2.3	4	28	1.7	21868.0	1244.3	12659.2					35771.5
6/19	13	FB	3.0	4	186	17.2	30071.5	11312.1	6362.9					47746.5
6/19	13c	TL	3	4	66	13.6	9007.1	5313.0	3363.0					17683.1
6/20	14	CL/FB	5.0	4	161	11	17790.3	3901.2	21025.9	2691.5	3319.2	3137.3	6108.9	57974.3
6/22	15	FB	1.5	spawn	39	1.7								
6/23	16	CL	5.0	3	28	1.7	15950.8	2164.9	1624.2	0.0	4081.3	220.8	1087.5	25129.5
6/23	16C	TL	5.0	3	27	0.6	13632.0	1677.6	1554.9	0.0	2252.9	157.1	1044.7	20319.3
6/29	17	CL/FB	7.5	4	14	0.4	5190.3	748.9	6164.8	0.0	4707.7	265.6	3454.1	20531.5
							Peak Biomass (st) by Index Area							
			60.0		624.0	59.3	17790.3	3901.2	21025.9	2691.5	3319.2	3137.3	6108.9	57974.3

Survey Rating: 1=excellent
2=good
3=fair
4=poor
5=unacceptable

Index Areas: KLK = s.d.1
UNK = s.d.2
CDB = s.d.3
NTB = s.d.4
ELM = s.d.5
GOL = s.d.6
NOM = s.d.7

Total Biomass:	57974.3
Allowable Harvest:	11594.9
Total Harvest:	0.0
Exploitation Rate (%)	0.0

A/ The primary surveyor is listed first when two sets of initials are listed

Table 16. Norton Sound herring spawn estimates by subdistrict (s.d.), 1992.

Date	s.d. 1		s.d. 2		s.d. 3		s.d. 4		s.d. 5		s.d. 6		s.d. 7		Totals	
	#	Miles	#	Miles	#	Miles	#	Miles	#	Miles	#	Miles	#	Miles	#	Miles
5/27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/10	0		0	0	0	0	0	0							0	0
6/11	0		0	0	0	0	0	0	0	0					0	0
6/12	0	0	0	0	0	0									0	0
6/13	0	0	0	0	0	0									0	0
6/14	0	0	0	0	0	0									0	0
6/15	7	0.3	0	0											7	0.3
6/16	62	3.5	0	0	0	0	0	0	1	0.1	0	0	6	0.3	69	3.9
6/16*	31	3.2	0	0	1	0	0	0	1	0.1	0	0	0	0	33	3.3
6/17	27	2.1	0	0	0	0	1	0	0	0	0	0	7	0.1	35	2.2
6/17*	47	1.7	0	0	1	0	1	0	0	0	0	0	8	0.1	57	1.8
6/18	26	1.6			1	0.1									27	1.7
6/19	185	17.2	0	0	0	0									185	17.2
6/19*	66	13.6	0	0	0	0									66	13.6
6/20	153	10.7	0	0	0	0	0	0	3	0.3	4	0	1	0	161	11
6/22	39	1.7	0	0	0	0									39	1.7
6/23*	25	0.5	0	0	2	0.1	0	0	0	0	0	0	0	0	27	0.6
6/23	24	0.6	0	0	2	0	0	0	1	1	1	0	0	0	28	1.6
6/29	8	0.3	0	0	2	0.1			3	0	1	0	0	0	14	0.4
Totals	531	38	0	0	5	0.2	1	0	8	1.4	6	0	14	0.4	565	40

* Backup counts not used in season totals.

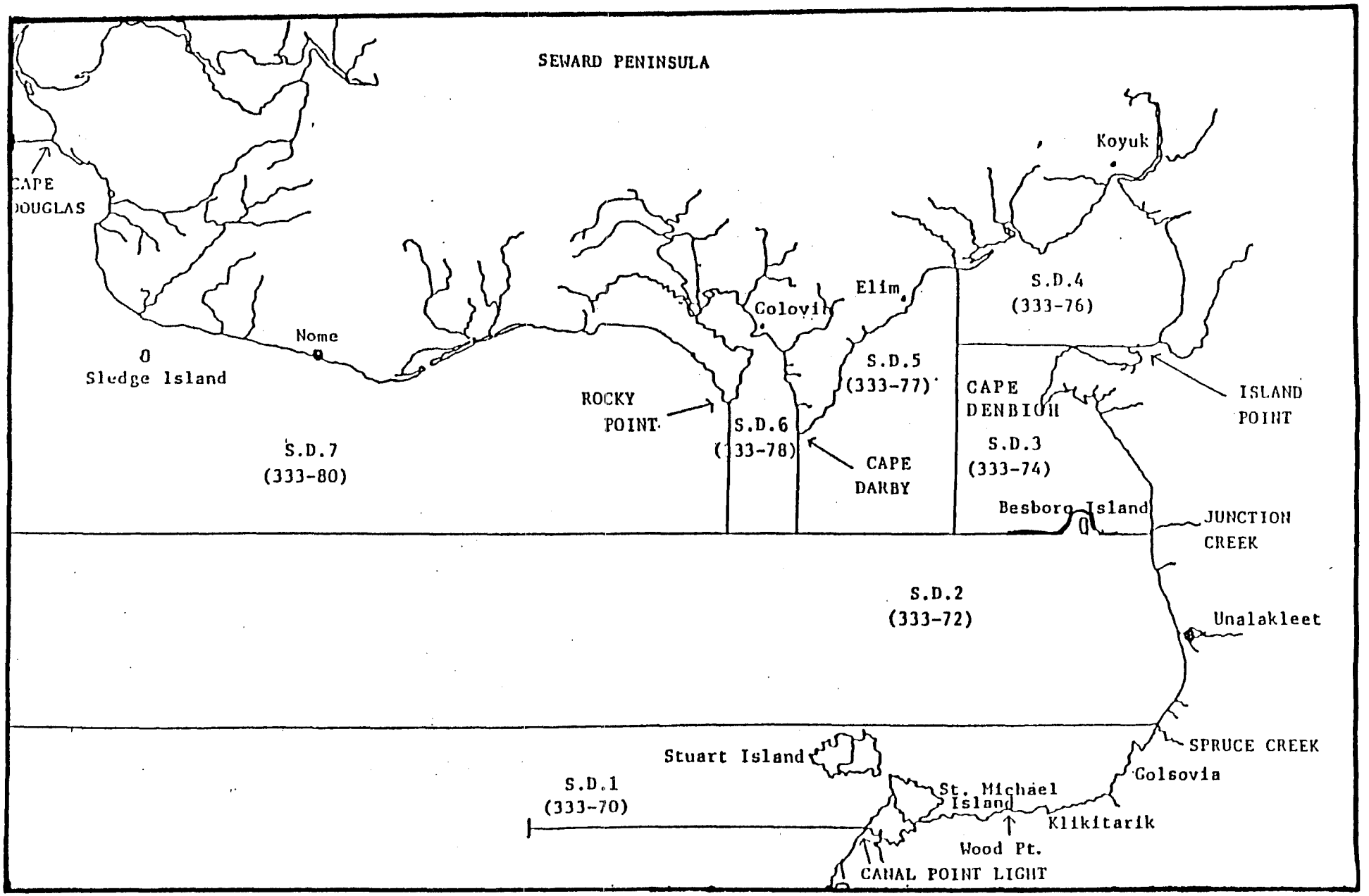


Figure 10. Norton Sound commercial herring district (333) and statistical boundary.

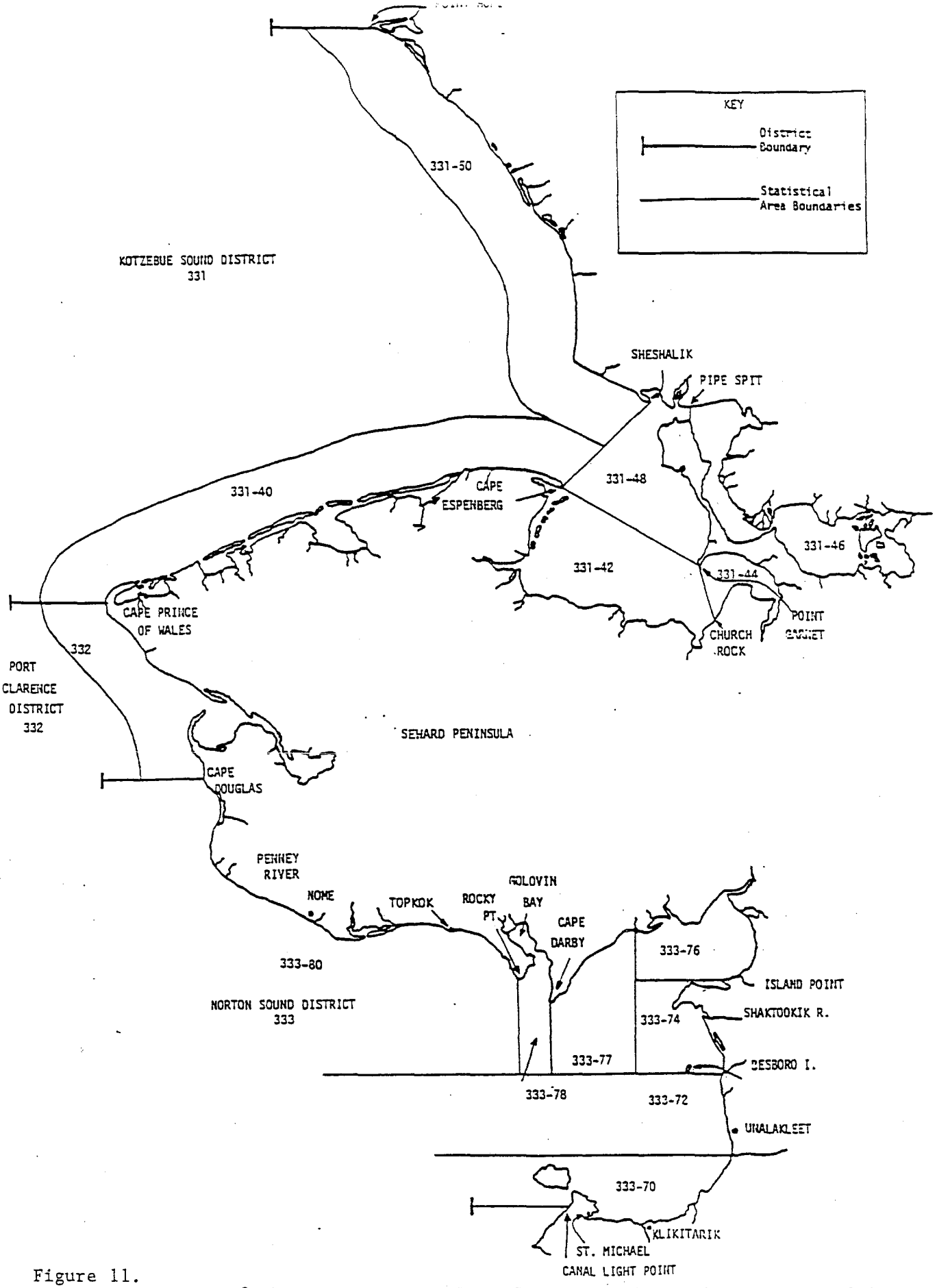


Figure 11.
Statistical areas of the Norton Sound, Port Clarence and Kotzebue commercial herring fishery districts.

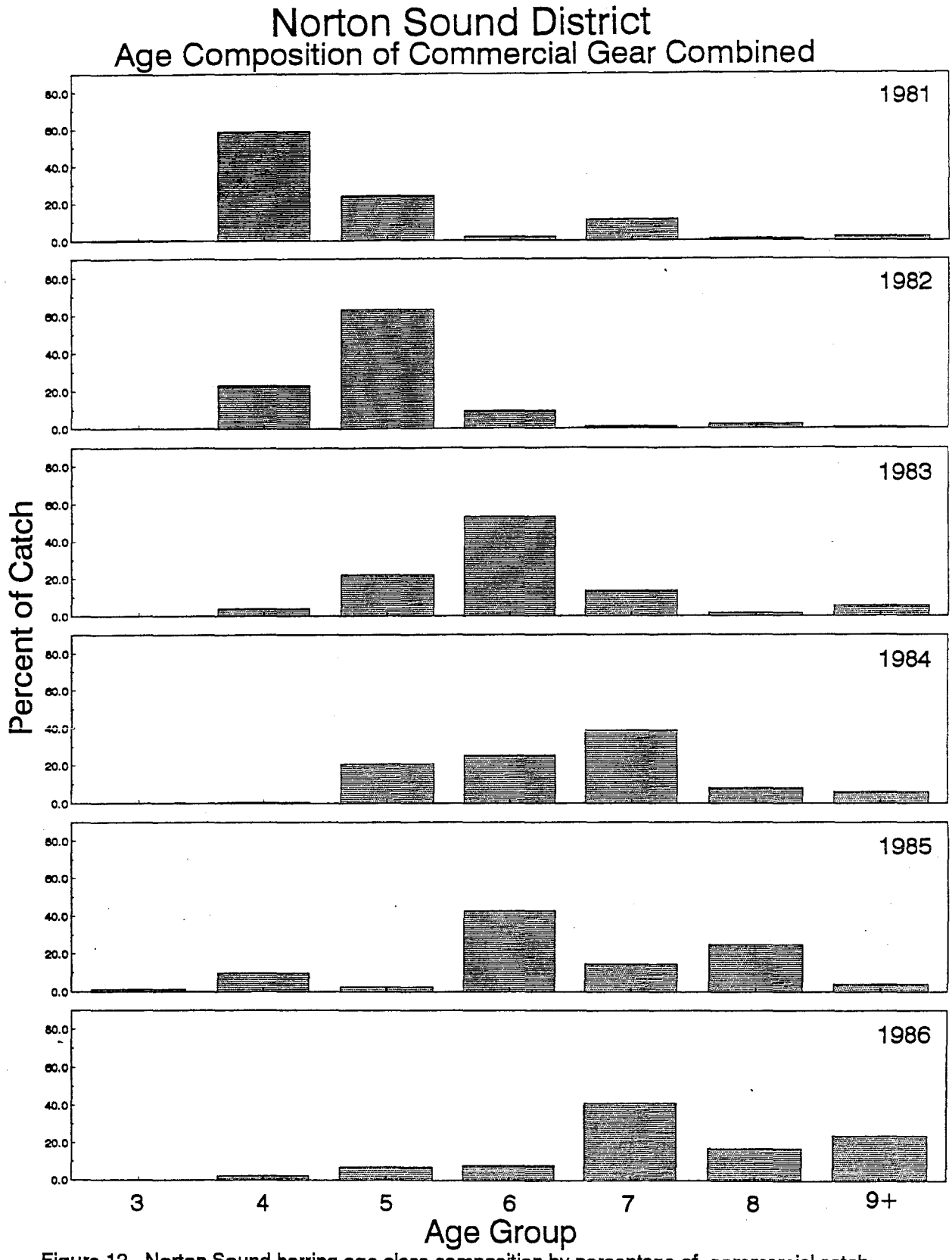


Figure 12. Norton Sound herring age class composition by percentage of commercial catch, commercial gear combined (beach seine and gill nets), 1981-1991. No commercial fishing occurred in 1992.

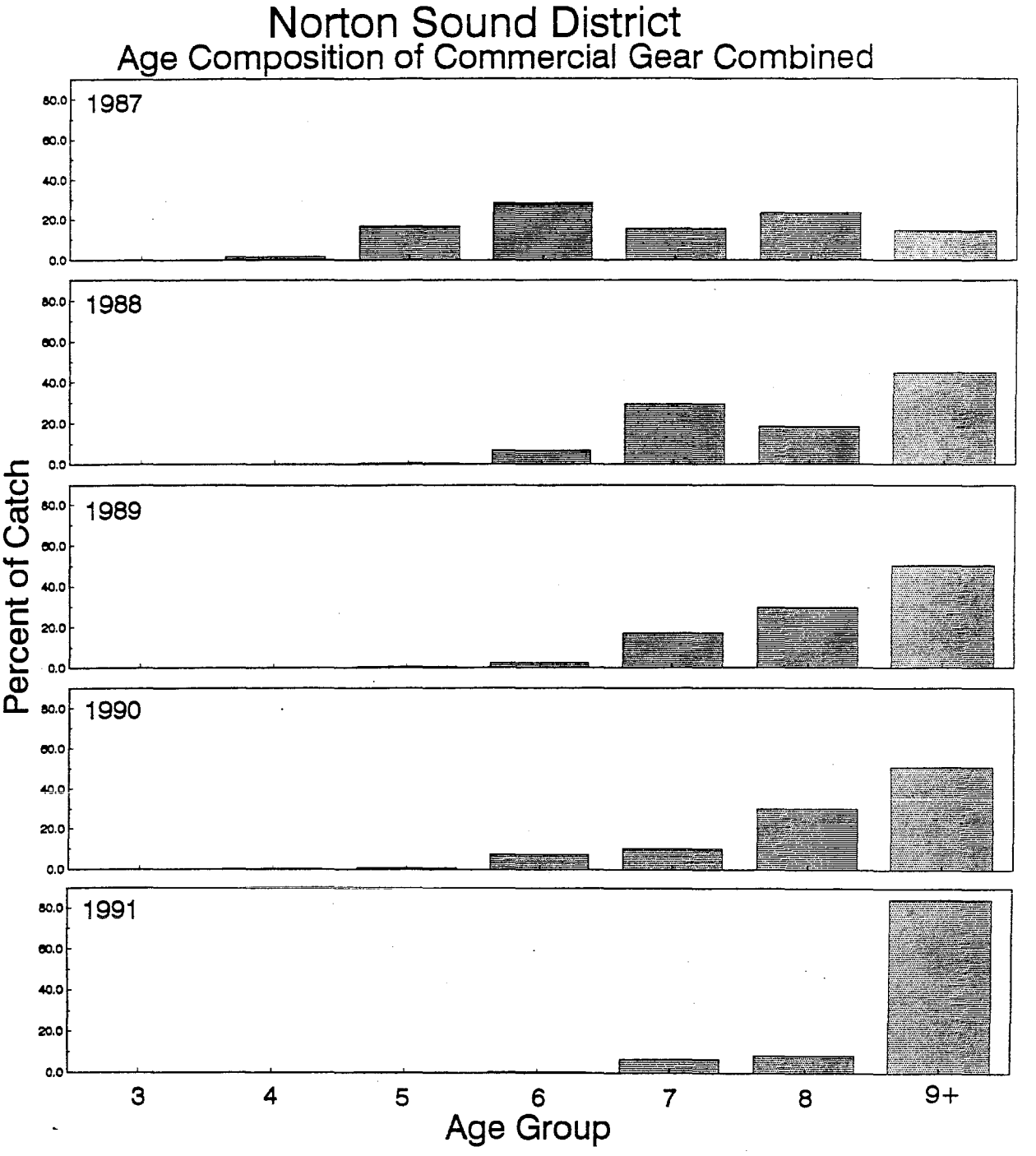


Figure 12. (page 2 of 2)

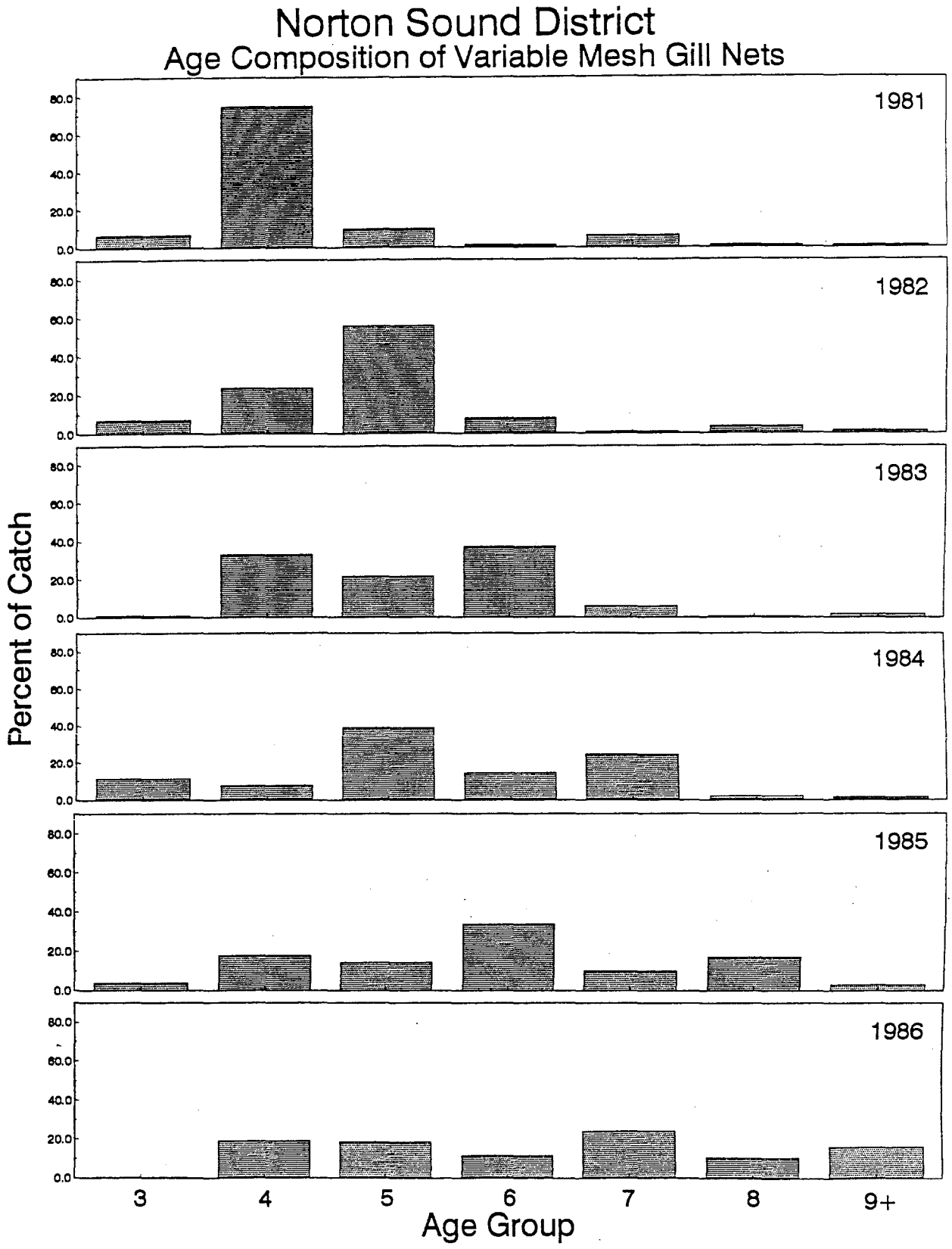


Figure 13. Norton Sound herring age class composition by percentage of total catch, variable mesh gill nets, 1981-1992.

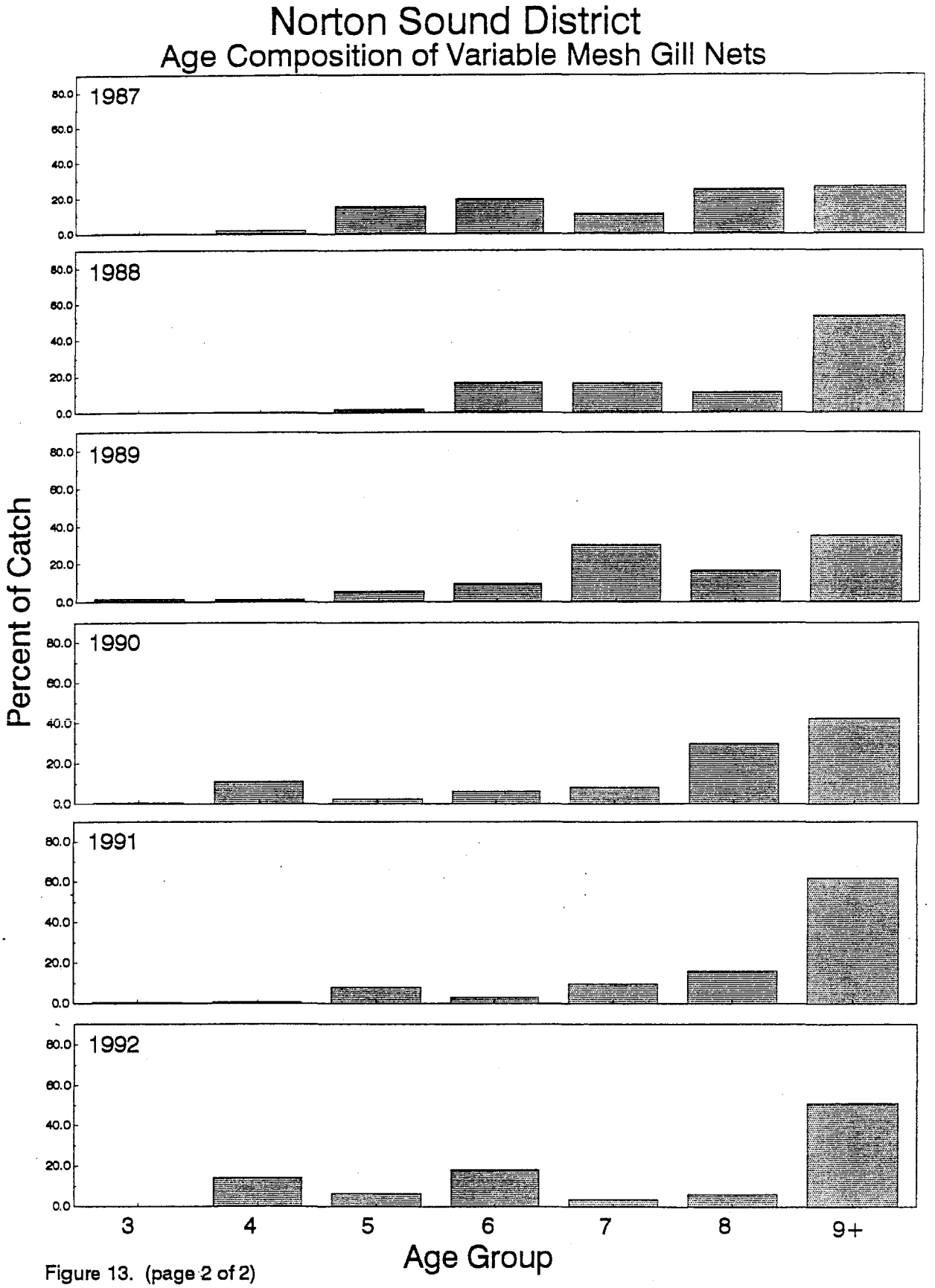


Figure 13. (page 2 of 2)

Appendix Table D1. Norton Sound herring and spawn-on-kelp harvests (in short tons) by U.S. commercial fishermen, 1909-1992.

Year	Sac Roe Herring	Food or Bait Herring	Total	Spawn-on-kelp
1909-1916[a]	-	-	-	-
1916-1928	-	1881	1881	-
1929	-	166	166	-
1930	-	441	441	-
1931	-	86	86	-
1932	-	529	529	-
1933	-	31	31	-
1934	-	4	4	-
1935	-	15	15	-
1936	-	-	-	-
1937	-	6	6	-
1938	-	10	10	-
1939	-	6	6	-
1940	-	14	14	-
1941	-	3	3	-
1942-1963	-	-	-	-
1964	20	-	20	-
1965	-	-	-	-
1966	12	-	12	-
1967	-	-	-	-
1968	-	-	-	-
1969	2	-	2	-
1970	8	-	8	-
1971	20	-	20	-
1972	17	-	17	-
1973	35	-	35	-
1974	2	-	2	-
1975	-	-	-	-
1976	9	-	9	-
1977	11	-	11	trace
1978	15	-	15	4
1979	1292	-	1292	13
1980	2451	1	2452	24
1981	4371	-	4371	47[b]
1982	3864	69	3933	38
1983	4181	401	4582	29[c]
1984	3298	274	3662	19[d]
1985	3420	128	3548	-[e]
1986	4926	268	5194	-
1987	3779	303	4082	-
1988	4256	416	4672	-
1989	4494	247	4743	-
1990	5337	1036	6373	-
1991	5465	207	5671	-
1992[f]	-	-	-	-

[a] Fishery occurred some years, but harvest unavailable. Fishery from 1909-1941 occurred near Golovin; 1964 to present has occurred in southeast Norton Sound.
[b] Does not include approximately 6 st of wastage.
[c] Does not include approximately 2 st of wastage.
[d] Includes 3 st of spawn on Macrocystus kelp.
[e] All spawn-on-kelp fisheries closed by regulation prior to the 1985 season.
[f] No commercial fishery took place in 1992.

Appendix Table D2. Japanese gillnet herring catches in Norton Sound, 1968-1977. (North of 63 N. Latitude and East of 167 W. Longitude)

Year	Gillnet Catch (st)	Remarks
1968	131	First foreign effort on herring in Norton Sound
1969	1400	Peak catch with large effort (about 40 ships). Two vessels apprehended.
1970	69	
1971	703	
1972	15	
1973	38	
1974	764	
1975	0	
1976	-	Data unavailable.
1977	-	Herring fishery closed to foreign nations.
Total	3120	Excludes 1976 catches.

Appendix Table D3. Herring biomass estimates and commercial fisheries data for the Norton Sound District, 1979-1992.

Year	Biomass[a] (st)	Harvest[b] (st)	% Exploitation[c]	Percent Roe	Dollar Value (millions)	Number Fishermen
1979	7,700	1292	16.8	7.0	.6	67
1980[d]	8,400	2452	29.2	8.1	.5	294
1981	25,100	4371	17.3	8.8	1.5	332
1982[d]	17,400	3933	22.6	8.8	1.0	237
1983	28,100	4582	16.3	8.6	1.4	272
1984	23,100	3662[e]	15.8	10.3	.9	194
1985	20,000	3548	17.7	9.9	1.4	277
1986	28,062	5194	18.5	9.6	2.9	323
1987	32,370	4082	12.6[f]	8.6	2.6	564
1988	33,924	4672	13.8[g]	9.0	3.9	348
1989	23,857[h]	4771[i]	20.0[h]	9.2	2.3	357
1990	35,522	6,439[j]	18.0	8.7	3.6	365
1991	42,854	5,671[k]	13.6[f]	9.3	2.4	279
1992[l]	59,974	0	0	-	0	-

[a] Methods of calculating biomass have varied over the years. Biomass estimates listed follow methods used during that year.
[b] Includes both bait and sac roe harvests.
[c] Represents total District exploitation. During many years southern subdistricts are closed because exploitation of the local biomass reaches 20%, while northern subdistricts have remained open because little or no harvest has occurred.
[d] Minimal biomass estimates due to poor survey conditions.
[e] Includes an estimated 90 st of wastage.
[f] Peak estimate made after the commercial fishery; the fishery was not re-opened due to the high probability of spawnouts present after two consecutive days of heavy spawning.
[g] Peak biomass was sighted prior to arrival of the commercial buying fleet.
[h] Biomass spotting conditions very poor throughout herring season; peak biomass represents minimum estimate; exploitation rate based on observed biomass.
[i] Includes an estimated 30 st of wastage.
[j] Includes an estimated 60 st of wastage.
[k] Includes an estimated 125 st of wastage.
[l] No commercial fishery in 1992.

Appendix Table D4. Norton Sound commercial herring harvest (st) by subdistrict by year, 1979-1992.[a]

Year	Subdistricts							
	s.d. 1	s.d. 2	s.d. 3	s.d.4	s.d. 5	s.d.6	s.d. 7	Totals
1979	319	405	555	-	-	-	14	1293
1980	1176	632	632	5	-	7	-	2452
1981	3068	831	471	1	-	-	-	4371
1982	2062	946	925	-	-	-	-	3933
1983	434	1265	2733	-	65	85	-	4582
1984	-	-	3572	-	-	-	-	3572
1985	1538	188	1675	-	147	-	-	3548[b]
1986	2559	-	2450	-	185	-	-	5194
1987	2218	174	1690	-	-	-	-	4082
1988	3260	99	1307	-	6	-	-	4672
1989	3256	60	1425	-	-	-	-	4741
1990	4498	950	931	-	-	-	-	6379[c]
1991	-	880	4792	-	-	-	-	5672[d]
1992[e]	-	-	-	-	-	-	-	0

[a] Includes herring taken for sac roe and bait.
[b] Does not include an estimated 90 st of wastage.
[c] Does not include an estimated wastage of 60 st in abandoned gill nets.
[d] Does not include an estimated wastage of 125 st in abandoned gill nets.
[e] No commercial fishery in 1992.

Appendix Table D5. Norton Sound commercial spawn-on-kelp (Fucus) harvest, 1978-1984.[a]

Year	st	Fishermen
1978	4	9
1979	13	19
1980	24	20
1981	47	22
1982	38	44
1983	29	35
1984	19	32

[a] Norton Sound commercial spawn-on-kelp harvest closed by regulation prior to the 1985 season.

Table 17. Commercial harvest of red king crab from Norton Sound Section by statistical area, Northern Bering Sea District, 1992 (summer fishery only).

Statistical Area	# Vessels	Total Harvest Number	Total Harvest Pounds	Total Pots Lifted	Average Crab/Pot	Average Weight
656401	13	18,193	53,119	2,714	6.7	2.92
666401	8	3,351	10,632	1,804	1.9	3.17
636401	4	368	1,159	419	0.9	3.15
656330	3	1,646	4,814	421	3.9	2.92
666330	2	1,344	4,305	388	3.5	3.20
Totals		24,902	74,029	5,746	4.3	3.00

Table 18. Winter subsistence red king crab catches and effort by gear type, Nome area, Norton Sound Section, 1991–1992.

Gear Type	Number of Fishermen	# Males Caught	# Males Kept	# Females Caught	# Females Kept	Total Crab Captured	Total Crab Kept
Pots	88	11,085	9,046	1,556	119	12,641	9,165
Handlines	9	1,231	1,107	134	8	1,365	1,115
Both	8	825	1,454	220	2	1,045	1,456
Totals	105	13,141	11,607	1,910	129	15,051	11,736

PORT CLARENCE / KOTZEBUE DISTRICTS

Introduction

The regulation book states that in the Port Clarence and Kotzebue Districts, herring may be taken from April 15 through November 15, except that herring may not be taken during the open commercial salmon fishing season. However, prior to the 1987 season, no spring sac roe commercial fisheries had ever occurred within these districts. Interest in exploring these stocks has been expressed in recent years by industry personnel operating in the Norton Sound District. However, no large scale effort to develop the fishery has occurred due to the late ice breakup and fishery timing in the Port Clarence and Kotzebue Districts.

The Port Clarence and Kotzebue commercial herring fisheries have been in regulation since 1982. The 1983 and 1984 regulation books set a guideline harvest of 150 mt (165 st) for each district. Since the guideline harvest has never been changed or repealed by the Board of Fisheries, it is assumed 165 st guideline harvest is still in effect. Presently purse seines, beach seines, and gill nets are legal commercial gear within these districts.

Local fishermen from Teller, Shishmaref, and Kotzebue have also expressed increasing interest in exploiting these stocks. While small harvests of herring for food/bait have occurred during the fall, the fisheries in these districts have been limited by lack of markets. Local fishermen and fishery operators in Kotzebue, Brevig Mission and Nome have also expressed interest in developing a spawn-on-kelp fishery within these districts.

Resource Investigations

Resource investigations of Port Clarence and Kotzebue Sound area herring stocks were conducted by ADF&G from March 1976-September 1978 (Barton 1978). These studies indicated that herring populations from Golovin Bay (Norton Sound) northward differed significantly in size and behavioral characteristics from herring populations occurring in the southern Bering Sea. Differences between populations were summarized as follows (Barton, 1978).

Seward Peninsula Populations	Southern Norton Sound to Southern Bering Sea Pelagic Populations
Smaller herring at age with lower vertebral counts.	Larger herring with probable higher vertebral counts.
Lower abundance.	Higher abundance
Subtidal spawning (3m) in shallow bays, inlets and lagoons	Intertidal and shallow subtidal spawning along exposed rocky headlands.
Zosteria sp. primary spawning substrate.	Fucus sp. primary spawning substrate.
More euryhaline.	Less euryhaline.
Overwinter in shallow bays; water is warmed by river discharge under ice cover.	Overwinter in deep ocean layers near the Pribilof Islands.
Fall (non-spawning) runs documented	No fall runs documented
Larval development in brackish water	Larval development probable in more saline water.

Data collected from herring populations along the Seward Peninsula strongly indicated that a separate stock of herring occurs in the Port Clarence and Kotzebue Sound areas. This does not preclude the possibility of the occurrence of more southern stocks from utilizing this region, i.e, stocks which winter near the Pribilof Islands and migrate to the western Alaska coast to spawn. It is unlikely however, that herring stocks along the Seward Peninsula migrate to the central Bering Sea for wintering, but rather remain in coastal lagoons, bays or inlets which are warmed by river discharge under the ice (Barton 1978). This may be a major factor in explaining size differences, i.e., environmental conditions. Water temperatures and feeding conditions in deep ocean waters are probably more favorable for growth than those in herring winter habitats along the Seward Peninsula, which apparently have become adapted to Arctic conditions (Barton 1978).

Aerial surveys are very difficult in the Port Clarence District due to organic coloring of the waters of Imuruk Basin, Tuksuk Channel, Grantley Harbor and to a lessor extent, Port Clarence. Aerial surveys were impractical in Imuruk Basin and Tuksuk Channel. Additionally the presence of other species of fish caught in test commercial gear sets indicate the need for verifying any biomass sighted. A further complicating factor within Port Clarence is the spring ice conditions. The Port is a very sheltered body of water which becomes stained to a high degree over the winter and takes some time to clear once the ice melts. Typically, the

outside waters are significantly warmer than the inside waters which are covered by ice longer thereby slowing solar gain and water mixing. Soon after the ice begins to shift the herring move into the warm shallow lagoons to spawn. The herring are invisible to aerial observation once they enter the stained water. The best aerial survey conditions exist just outside the entrance to the Port, where the herring mass just prior to the ice moving. One or two surveys have been flown each of the past four years, but virtually no herring have been observed because the narrow window of time for seeing the fish has been missed.

Fall Food/Bait Fishery

Although a fall fishery has probably existed for subsistence use within these areas for many years, a commercial venture has only been attempted recently. During the fall of 1986, one fisherman sold 130 pounds of fall herring from the Port Clarence District for $1.00 per pound. In 1987, a total of 1,100 pounds of fall herring was sold at $.30 per pound for use as dog food and crab bait. Limited markets will most likely preclude expansion of a fall fishery. Only sporadic sales or exchanges of fall herring occurred in recent years.

Sac Roe Fishery

The Port Clarence fishermen have been unable to attract a sac roe buyer for their relatively late fishery. During 1991, one individual imported Macrocystis kelp and attempted an open pound. No herring spawned on the imported kelp, although ripe herring were found in close proximity and very light spawn was found on blades of Zosteria nearby.

INTRODUCTION

Norton Sound

The Norton Sound section of the Northern district in Area Q is described in the shellfish regulations as all waters east of 168 degrees W. long., between the latitudes of Cape Romanzof and Cape Prince of Wales (Figure 15). The only shellfish fishery in Norton Sound is for red king crab (Paralithodes camtschatica). Blue king crab (P. platypus) and Tanner crab (Chionoecetes opilio) also occur within this section but are very seldom caught by commercial or subsistence fishermen. Red king crab have been utilized for subsistence purposes by local residents for many years, but the commercial fishery was not initiated until 14 years ago. In April 1977, the Alaska Board of Fisheries opened an "exploratory" commercial fishery in order to increase the knowledge and commercial utilization of Norton Sound king crab. Since 1976 there have been six National Marine Fisheries Service (NMFS) research trawl studies in Norton Sound. The most recent survey was conducted in 1991 and has not been finalized yet. In addition, the State of Alaska Department of Fish and Game (ADF&G) has conducted four research pot fishing studies (Appendix Table E5). Data from population studies, from winter research studies, mining impact studies, and from 15 commercial fishing seasons has greatly increased the knowledge of the Norton Sound king crab. There are two seasons during which crab may be taken commercially: November 15 - May 15 and August 1 - September 3.

St. Lawrence Island

The St. Lawrence Island section lies immediately west and north of the Norton Sound Section (Figure 14). The St. Lawrence Island section has been managed by Westward Region's Dutch Harbor office since the Bering Sea crab fleet bases there and has been open to commercial fishing for the same amount of time as the Norton Sound section. The only reported commercial catches to date in the St. Lawrence Island section were made in 1983 when 52,557 pounds of blue king crab were delivered from 13 landings, in 1989, when 3,603 pounds of red king crab and 984 pounds of blue king crab were delivered from 8 landings and in 1992 when 53 pounds of blue crab were landed.

In 1983 the commercial crab fleet concentrated near the southeast shore of St. Lawrence Island. The following year a regulation proposal to close the waters within 10 miles of all inhabited islands within the section was adopted in an attempt to protect stocks targeted by local fishermen and reduce impacts on subsistence marine mammal harvests during the winter. During the 1989 season, relatively few blue king crab were taken near rocks and shoals still open to commercial fishing but red king crab were discovered in low densities near Kivalina, the northern boundary of the section. The villagers of Little Diomede Island have also traded and sold blue king crab with residents of Nome and other villages for years. The Department has not been able to obtain an accurate record of the magnitude of this trade. The remoteness of this village is also a factor contributing to the lack of catch records. Current regulation allows the commercial harvest and sale of king crab near shore during the winter. However, local residents of St. Lawrence Island had decided not to export any of their winter catch for commercial sale.

COMMERCIAL FISHERY

The Norton Sound section commercial red king crab season opened by regulation at noon, August 1. The 1992 commercial crab fleet consisted of five catcher-processor vessels which were all present for the scheduled tank inspection and registration, July 30 to the morning of August 1. Twenty-seven vessels, including the five catcher processors brought a total of 3,055 pots to fish in Norton Sound, but only reported fishing 2,635. All but 20 of the excess pots were onboard a single vessel which planned to participate in a brown king crab fishery immediately after the closure of the Norton Sound fishery. The season was open for 2 days and was closed by emergency order at noon ADT, Monday, August 3, when it was anticipated a harvest of 300,000 pounds of legal male king crab would be reached. The closure announcement was made as the tank inspection stickers were issued, between 8:00 and 10:00 a.m. August 1.

All but one of the fish tickets were received prior to vessel departures. The total reported harvest was 74,029 pounds with an estimated 1,800 pounds of deadloss (Table 16). The average price per pound of landed crab is thought to be $1.75 per pound, although a majority of vessels did not report price. The catches this season were reported from five statistical areas (656401, 666330, 666401 ,636401 and 656330). The fleet averaged 4.3 legal crab per pot pulled; a total of 24,902 crab were captured in 5,746 potlifts. The average weight of legal male crab was 3.0 pounds, 0.1 less than the previous two seasons. This small decline in average weight is most likely due to the water content of crab being reduced as they were transported by brailer from the catcher boat to the processing vessel, unlike earlier years when catcher processors composed the bulk of the fleet.

The single Department of Fish and Game and the five industry observers observed a total of 733 pot lifts during the fishery for catch composition. A total of 1,420 legal male, 459 sublegal male, and 147 female crab were recorded. A total of 2,566 legal male crab were measured for carapace length and condition; the mean carapace length was 119.7mm; the recruit and postrecruit proportions were respectively 28% to 72%.

The Norton Sound guideline harvest level of legal male red king crab for the 1992 season was 300,000 pounds. This conservative quota was set prior to the season using preliminary data from the fall 1991 National Marine Fisheries Service (NMFS) trawl survey, which placed the current population size at about 1/3 of the historic population level (Appendix Table E5). The population of legal male crab has remained fairly stable since 1985, with only a limited increase in the number of legal king crab. Exploitation levels were maintained near 15% until 1988 when a decline in the number of legal males caused the exploitation rate to be reduced. The guideline harvest level of 300,000 pounds equated to an exploitation of approximately 10%. Authority for establishing a lowered exploitation rate was set by the Alaska Board of Fisheries during the spring 1988 meeting, which amended the existing harvest strategy regulation 5AAC 34.080.

Board of Fisheries regulations specific to Norton Sound Section are:

1) 5AAC 34.915, which directs the Department to manage the Norton Sound summer king crab fishery for a harvest of one-half the exploitation rate determined under 5AAC 34.080.

2) 5AAC 34.935, which established a closed area with a defined boundary approximating 15 miles from the beach in the Norton Sound section, to protect a long established winter subsistence fishery.

Regulation 5AAC 34.935 (CLOSED WATERS) also allows the Department the flexibility to reduce the closed waters area to allow an efficient harvest of red king crab during the summer fishery. However, this action was not taken during the 1992 season due to the high potential harvest of both legal male and sublegal red king crab thought to be just inside the closed line.

3) 5AAC 39.141 which established the on board observer program for catcher-processors. Thus, all five catcher-processors were required by regulation to have an observer on board their vessels during the 1992 Norton Sound summer king crab fishery.

This was the third season that regulation 5AAC 39.141, the mandatory observer program, was in effect for the Norton Sound fishery. Preparation was made prior to orientation in order to prevent observer problems similar to previous seasons from happening again. Observer materials (manuals, codes, forms, etc.), and program coordination was provided by the Dutch Harbor staff member, Rance Morrison. Additional documentation and substitute forms were provided to the observers by the Nome staff in order to obtain pertinent information specific to the Norton Sound fishery. In addition to the required observers, the Department placed an observer on one catcher boat. Orientation for all observers took place in the Nome office the morning of July 31, prior to tank inspections.

During past years, there was a wide range of professionalism among observers; some collected less than the preferred data while others performed all tasks acceptably. Paperwork turned in ranged from very complete and comprehensive, to unusable. The quality of the observers during the 1992 season was good. This is the first season we were satisfied with the observer data.

4) 5 AAC 34.925 (i) and (j), requiring pot tags and limiting each vessel to 100 pots.

This new regulation, 5AAC 34.925, was responsible for the redistribution of fishing effort experienced during the 1992 season. The limit of 100 pots was only one-third the average number of pots fished per vessel during 1990, the last season held in Norton Sound. Apparently, many people felt their vessel would be able to compete economically under the new limit; however, neither the Department staff nor the fishing fleet anticipated the number of vessels making that same judgement.

The unexpectedly large number of vessels participating in the Norton Sound king crab fishery complicated fisheries management. Not since 1983 have as many crab pots been deployed in the Norton Sound red king crab fishery. Given the number of pots the fishermen intended to use and the average catch rate from the past fisheries, the 300,000 pound harvest goal was expected to be taken in 48 hours. Because of the large number of vessels and gear participating in this year's fishery and the short length of the anticipated opening, the closure was announced prior to the fishery's start. The harvest was anticipated to closely approach the harvest goal, so catch reporting was not expected to provide accurate enough data to finely tune the season closure. As a consequence, the closure was announced with no possibility of an extension. Even at the closure

it was not apparent how poor the harvest had been. An extension was considered, however, the slow catch rate indicated that only a small portion of the population was in open waters, continuing the fishery with a very slow catch rate did not seem appropriate. Relaxing the closure line was considered. The crab were necessarily in very high density just inside the closure line in about a ten mile wide band. Relaxing the line by a small amount was not feasible and the sublegal population would have been subject to significant handling mortality. The only enforcement available was a chartered aircraft of which 50% of the bills would be charged to the Department's limited Norton Sound crab budget. The decision was made to allow the closure to stand. There was a high potential harvest, the most pots since 1983 fishing on a concentrated mass of both legal and sublegal crab. Had the risk been less, an extension with a relaxed closure line would have been more appropriate.

Several crabbers expressed the opinion that they were cycling through their pots too frequently. Most operators checked all their pots in roughly 12 hours in contrast to past years when pots were allowed to "soak" roughly 30 hours. It must take crab some time to detect the scent of the bait and then find the pot. If pots are cycled to quickly the majority of the crab will not reach the pot before it is pulled, thus reducing the catch rate. The fact that several operators reported a high percentage of their harvest to be "riders", crab that came up on the outside of the pot, is evidence to suggest the pots were cycled too fast.

The late break-up and ice-out in Norton Sound during 1992 had an effect on the crab fishery as well as the salmon and herring fisheries. Egg development was delayed this year by roughly one month. Only a few females were carrying eyed eggs this season. Three boats fishing in eastern Norton Sound near Rocky Point lost crab in their holds due to temperature and possibly salinity shock. Surface temperatures were quite warm while water was quite cold at depth. The sea ice had been gone only one month and relatively calm weather had not mixed the waters much. It seems that the crab's annual migration was either delayed or shortened by these same climactic factors. The main concentration of king crab was apparently just north of the closure line.

The good weather allowed boarding for tank inspections and registrations of all vessels. Skipper cooperation and compliance with the verbal catch report was good. Fish and Wildlife enforcement support was only available when the Department assisted with logistical support during the season.

St. Lawrence Island Summer Commercial Fishery

On August 5, four vessels traveled to the St Lawrence Island Section and did some prospecting for about three days. Only one vessel reported a harvest of sixteen crab. Verbal reports indicated pots were deployed along the eastern boundary of the section and near the village of Gambell. Only small amounts of blue king crab were found near King Island and Gambell.

Norton Sound Winter Commercial Fishery

Regulation allows a winter thru-the ice commercial fishery in the Norton Sound Section from November 15 through May 15 which typically takes place near Nome.

During the winter of 1991-1992, thirteen commercial fishermen reported selling a total of 7,478 red king crab (Appendix Table E4). For the first time, a commercial fisherman operated from Unalakleet during the spring of 1992. With the one exception, the harvest is split between local Nome residents who buy crab directly from the fishermen and Anchorage or non local markets. Crab sell in Nome for five dollars a piece and Anchorage prices are around $3.50 per pound. The 1991-1992 winter catch of 21,177 pounds was estimated to be worth about 76,000 dollars, more than twice the previous year's harvest and value.

The winter crab fishermen generally use crab pots but some use hand lines to "prospect". Most fishermen consider commercial crabbing to be a sideline and hold other jobs. Usually, two or three fishermen sell the bulk of the crab. Because of the low volume of crab involved, no processor has found it profitable to operate locally. The crab sold locally are all sold fresh as are those shipped to Anchorage or other non local markets. During the mid-winter months fishermen find it difficult keeping the crab from freezing. Many Nome residents prefer to buy frozen crab since they are able to extract the meat prior to cooking. Fresh frozen crab are easily marketed in Nome but are not accepted in Anchorage.

SUBSISTENCE FISHERY

Red king crab are utilized by Norton Sound residents mainly during the winter. Fishing occurs through holes or cracks in the ice with the use of handlines and pots. In order to document trends in the subsistence harvest, the Board of Fisheries enacted a regulation in 1977 requiring subsistence fishermen in Norton Sound to obtain a permit prior to fishing and record daily effort and catches on these permits (Appendix Table E4).

The first year subsistence permits were required had the highest number of permits issued to date with a relatively high harvest rate. The fishery declined sharply the following year and remained at very depressed levels through the 1981-82 season. The lack of success in the winter crab fishery during some past years has been attributed to a declining crab population caused by removal of crab in the summer commercial fishery together with low recruitment, low effort due to poor ice conditions, and changes in the near shore winter distribution of crab. All of these factors probably had some effect on the success of the winter fishery in varying degrees. During the 1978-79 winter fishery, the king crab population was still relatively high. Despite this relatively large population, winter catches were the poorest on record indicating that the major factors limiting winter catches during 1978-79 were probably poor ice conditions and the distribution of crab. During the winter of 1981-82, poor winter catches could more reasonably be attributed to a declining crab population resulting from poor recruitment rather than the effects of commercial catch removals since the crab population was at its lowest documented level. Subsistence fishing success during the winters of 1982-83 through 1986-87 had improved due to a rebuilding of the population and increased use of more efficient gear (pots instead of handlines). Unstable ice conditions and record snowfalls adversely effected the 1987-88 and 1988-89 catches. In the last three years approximately 100 fishermen have averaged 100 crab each (Appendix Table E4).

The winter crab fishery is limited by extreme weather conditions. Shorefast ice can become unstable where crab pots may be carried away or fishermen are unable to cross open leads to get to their pots. Low air temperatures, wind and drifting snow are the primary factors that determine effort levels rather than crab densities.

STOCK STATUS / RESEARCH

In 1976 when monitoring of the Norton Sound king crab population first began, the population was mainly composed of prerecruit and recruit crab (Appendix Table E2, Figure 18). This first population assessment survey by the NMFS estimated the legal male king crab population at 8.1 million pounds (Appendix Table E3). The legal male crab population peaked in 1978 at an estimated 11 million pounds. During the 4 years following 1978, recruitment into the legal male crab population was very low. Subsequent NMFS surveys in 1979 and 1982 documented a population of predominantly postrecruit crab, and estimated a decline in the population to 2.6 million pounds by 1982. The Department of Fish and Game conducted their first population assessment survey in 1980, with subsequent surveys in 1981 and 1982 (Figure 19). These survey assessments documented a similar decline from 6.6 million pounds (1980) to 1.3 million pounds (1982). Beginning in 1981, sublegal crab abundance began to increase, and by 1983 recruitment into the legal male population also began to increase. No assessment work was conducted in 1983 or 1984. However, samples of the commercial catches indicated a significant increase of recruit crab into the legal male population; from a historic low of 10% in 1981 to 59% in 1984 (Appendix Table E5).

In 1985 both NMFS and ADF&G conducted population assessment surveys in Norton Sound (Appendix Table E5, Figure 18, 19). The Department fished 65 stations throughout Norton Sound capturing 4,645 legal males, of which one-third was tagged. Subsequent recapture of tagged crab by the commercial fleet in August of 1985 provided tag to untagged ratios, and the population prior to the fishery was estimated at 2.4 million pounds (Appendix Table E5). After the commercial fishery in 1985 NMFS conducted a population assessment survey using trawl gear over a slightly larger area than that surveyed by the Department. Catches of male king crab by NMFS were in the process of or had just molted with the result being that their estimate of 3.4 million pounds of legal male king crab included some recruitment. Adjusting this estimate for molting, and including the summer commercial harvest, the estimate became 3 million pounds present prior to the 1985 August fishery. Both surveys documented relatively substantial numbers of recruit crab and a healthy percentage of prerecruit crab.

During September of 1988 NMFS conducted a forth population assessment with trawl gear. They swept an area roughly the same as in 1985, but increased sampling frequency in the proposed mineral lease area near Nome. The timing of the study was almost a month earlier than similar surveys in the past, which occurred during the male molt. Nearly all the 1988 catch was in pre-molt condition. NMFS estimated 3.0 million pounds of legal male and 1.0 million pounds of prerecruit-one male red king crab; totaling 4.0 million pounds. Annual mortality is approximately 20% or in this case 0.8 million pounds. Ignoring growth and the winter harvests the population prior to the 1989 summer fishery would have been 3.2 million pounds, very close to the 1985 trawl estimate of 3.4 million pounds.

NMFS conducted a fifth trawl survey of Norton Sound during late August 1991 with a reduced number of tows from past surveys. Each station had only a single sampling tow as compared to each station having both a day and night tow during previous surveys. This reduction in sampling has the affect of introducing more variability into the estimate. The legal crab biomass in the summer fishing area was estimated to be 3,400,000 pounds and the total Norton Sound legal biomass was estimated to be 4,009,000 pounds. Since the survey occurred prior to the molt, a mortality of 10% was assumed for the year since estimate was made. With no summer or winter fishery data to check the survey results, the conservative biomass of 3,400,000 pounds was used as the basis for the 1992 harvest guideline. The Norton Sound red king crab population is thought to be quite stable when harvested near 10%.

FUTURE INVESTIGATIONS

In addition to the population surveys, the Department has run a winter crab tagging project through the ice near Nome from 1983 through 1991 (Appendix Table E6). The winter crab studies began as an index of near shore crab abundance during the season of heaviest local subsistence use. Today some of the controversy of mining impacts on crab distribution has taken the place of previous controversy over commercial versus subsistence use of the resource. From the perspective of the local management biologist this documentation of crab abundance is important because it was the most objective comparison of crab availability to local people. Controversy over this preferred subsistence personal use resource is likely to continue in the future especially if winter crab harvests decline even for a short time. Unfortunately, the winter project was dropped prior to the past winter due to budget cuts. The staff is currently working with past year's data to demonstrate how winter age/length data compares to commercial catch data.

The catch per pot lift had been declining in the winter study until the 1990 season when the CPUE increased to roughly twice the 1987 and 1989 levels. Although the Department has not had the project in operation these last two seasons, most public comment indicates a significant increase in the number of crab and a larger size of crab. Quite possibly this is due to the lack of a summer commercial fishery harvesting legal size crab. Without current research studies such as the ADF&G surveys conducted in 1980-82, and 1985, and the NMFS trawl surveys conducted in 1976,1979, 1982, 1985, 1988, and 1991 it will be very difficult to determine whether the legal male crab population of Norton Sound is being exploited at a level which will allow the population to stabilize and rebuild. The department has relied on age data collected during both the summer fishery and the winter study to track recruitment during the intervals between surveys since they each sample different portions of the population.

OUTLOOK FOR 1993

The outlook for 1993 is good in comparison to the past ten years. The NMFS trawl survey data indicates the Norton Sound red king crab population is stable and gradually rebounding. The fact that the commercial harvest has been minimal over

the last two years would indicate the legal crab population should be strong. Recruitment is expected to be weak during 1993, but to stronger the following year. It is expected that the fishery would concentrate on relatively old crab during 1993. The harvest goal will be set at 340,000 pounds for 1993.

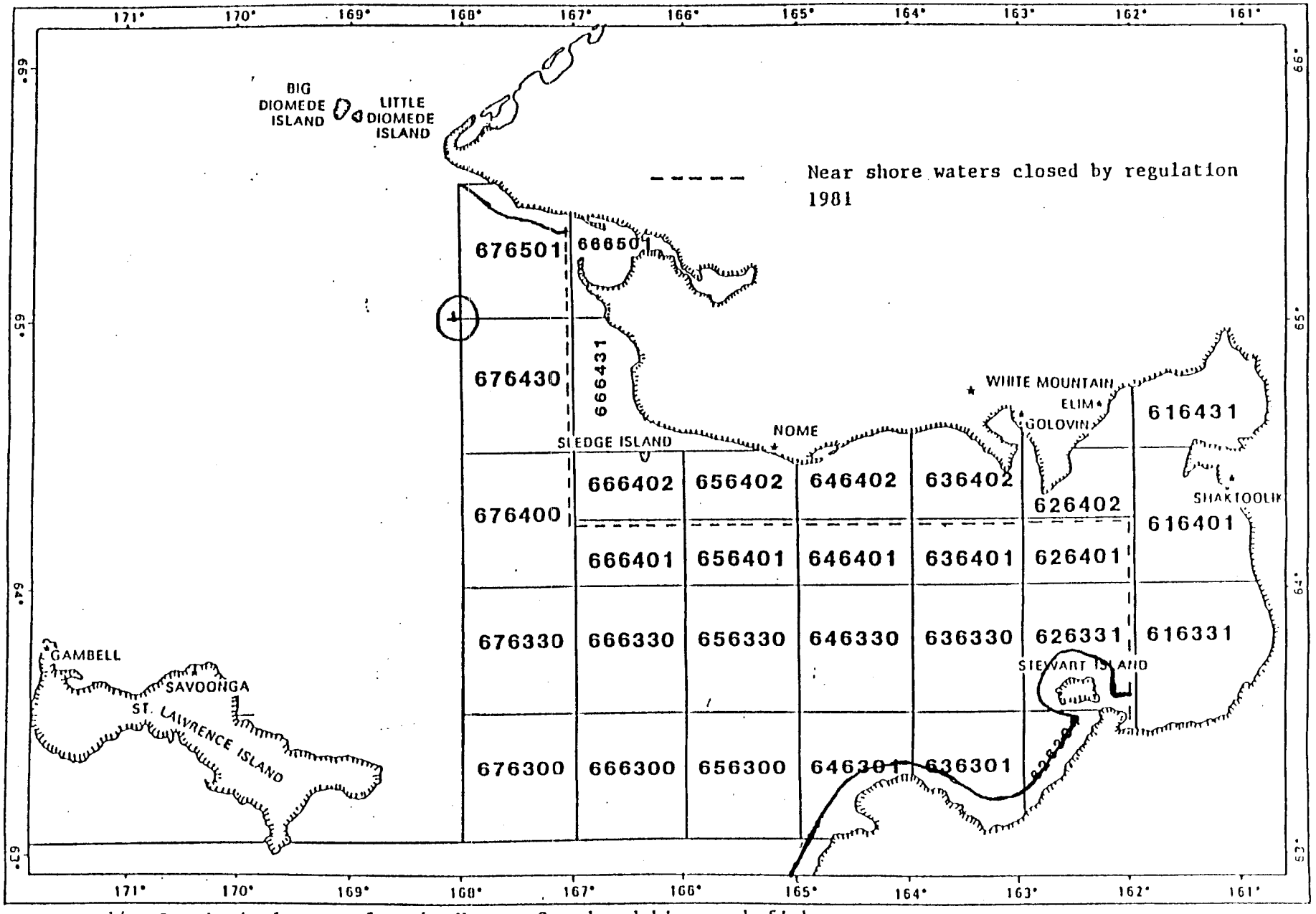


Figure 14. Statistical areas for the Norton Sound red king crab fishery.

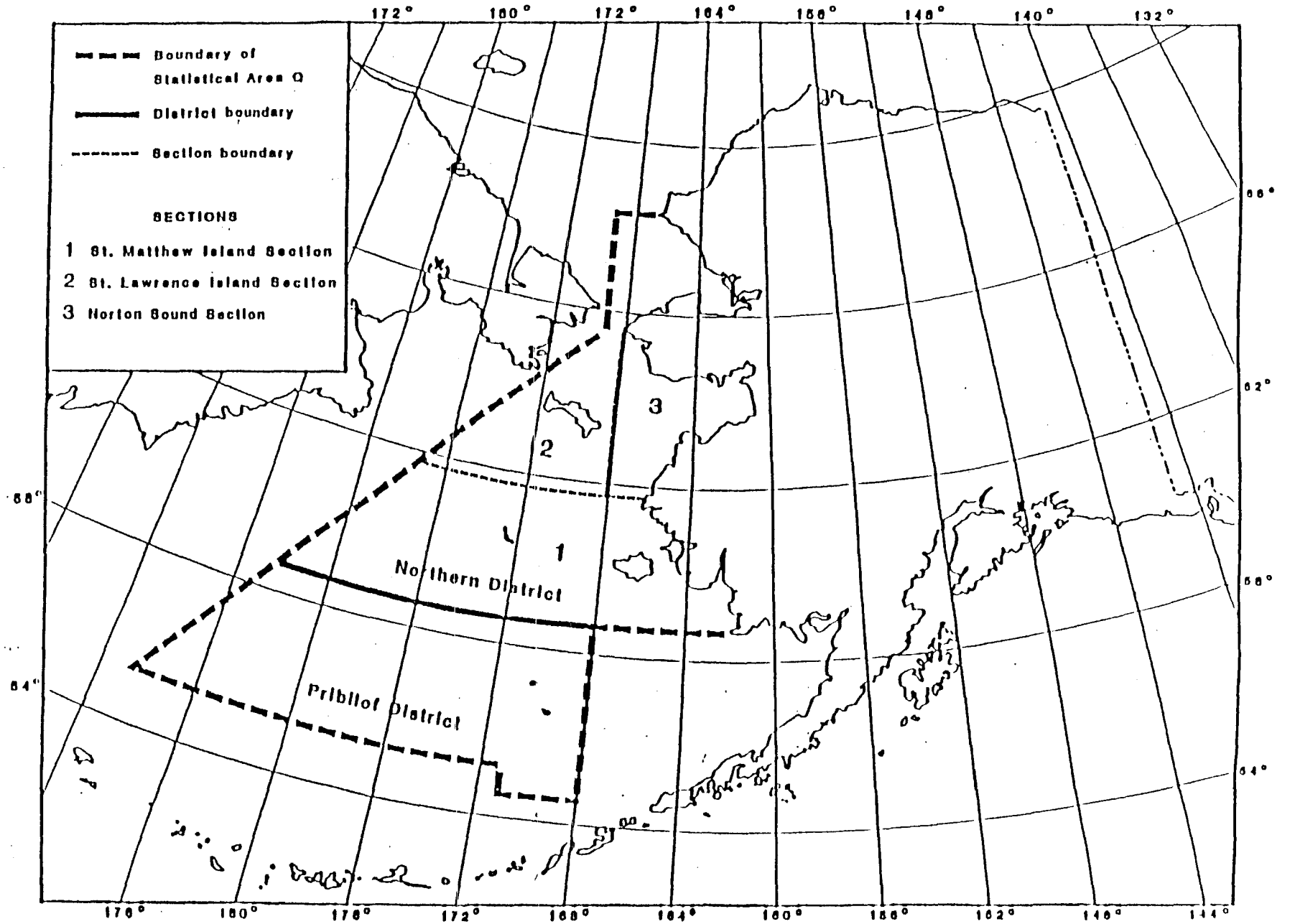


Figure 15. King crab fishing districts and sections of Statistical Area Q

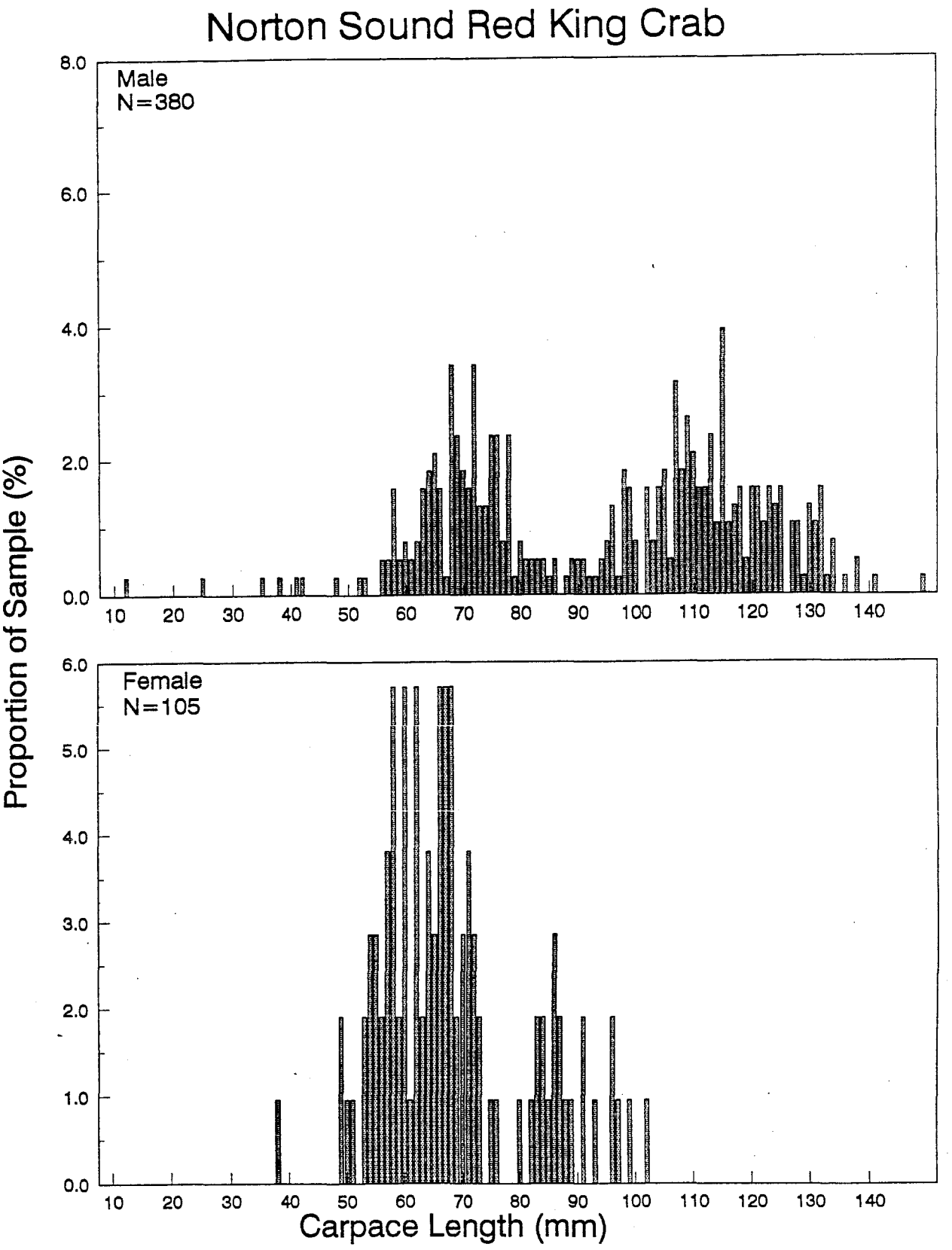


Figure 16. Norton Sound male and female red king crab size distribution from a trawl assessment survey conducted by the National Marine Fisheries Service, 1991.

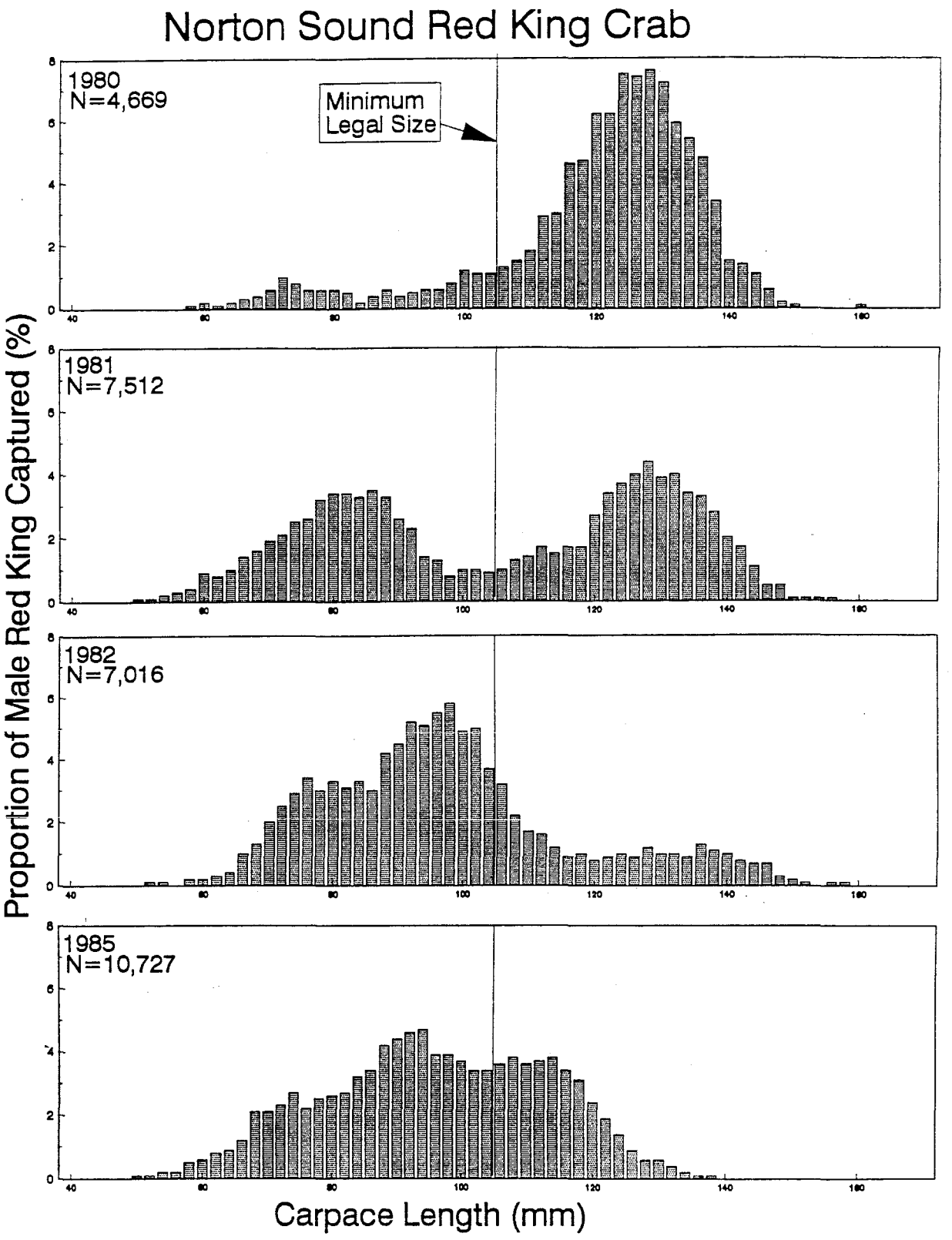


Figure 17.. Norton Sound male red king crab size distribution from pot assessment surveys conducted by the Alaska Department of Fish and Game, 1980, 1981, 1982, and 1985.

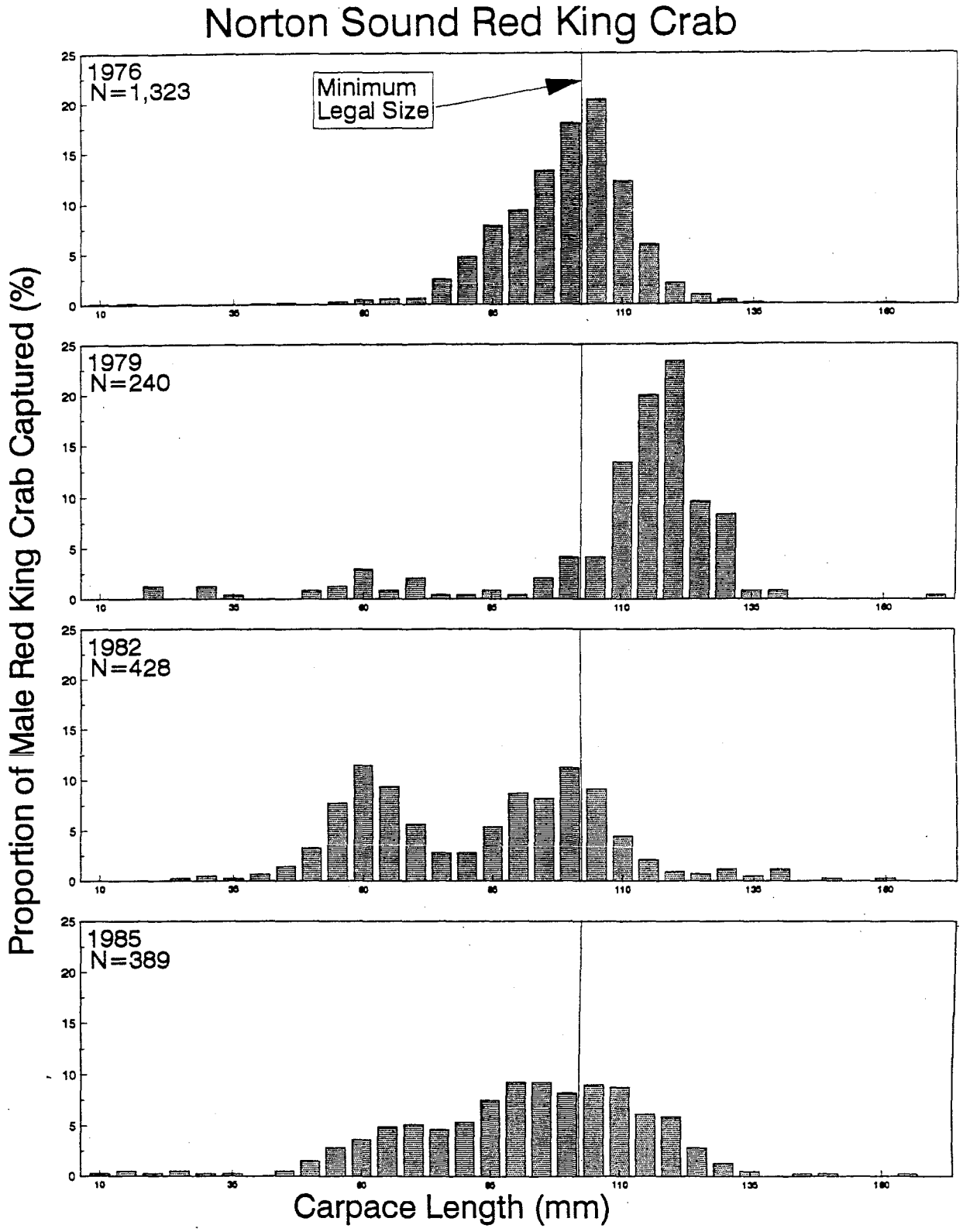


Figure 18. Norton Sound male red king crab size distribution from trawl assessment surveys conducted by the National Marine Fisheries Service, 1976, 1979, 1982, 1985, 1988, and 1991.

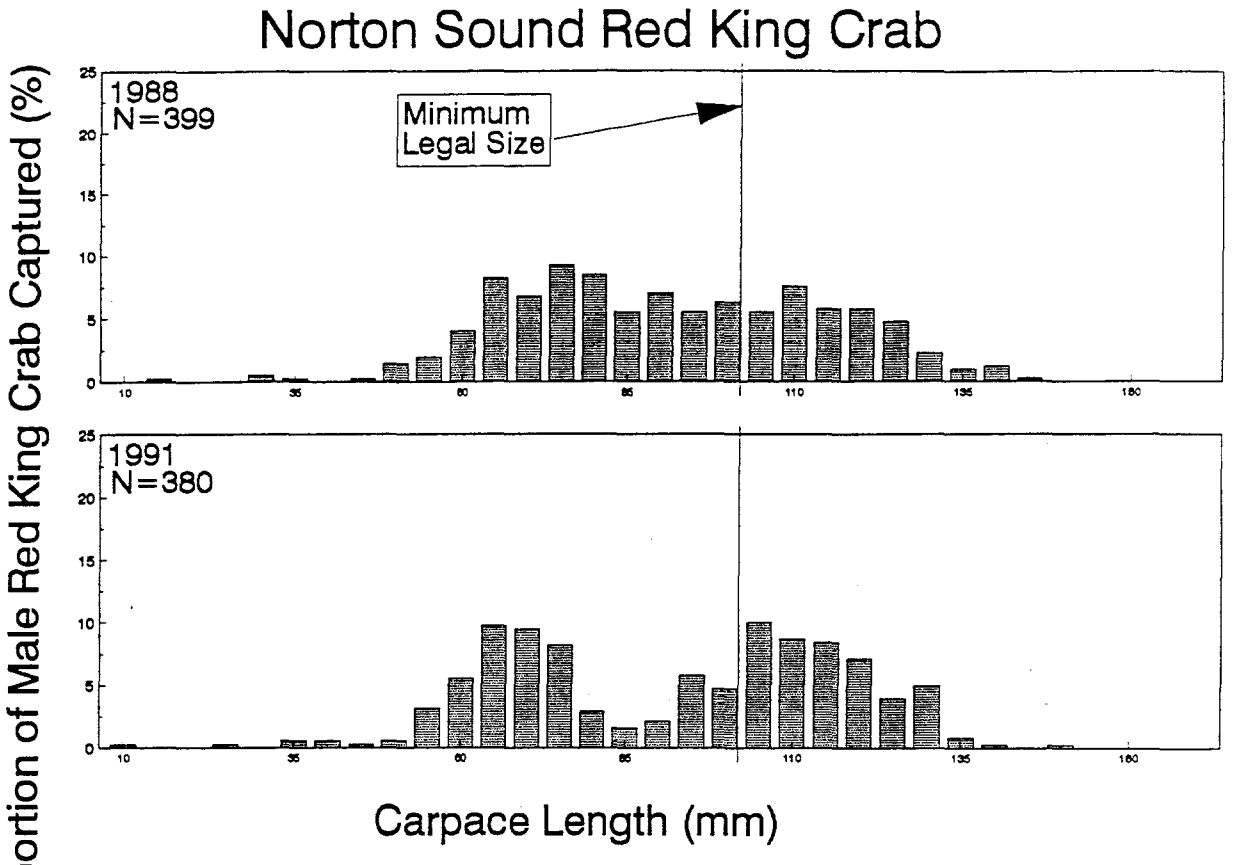


Figure 18. (Page 2 of 2)

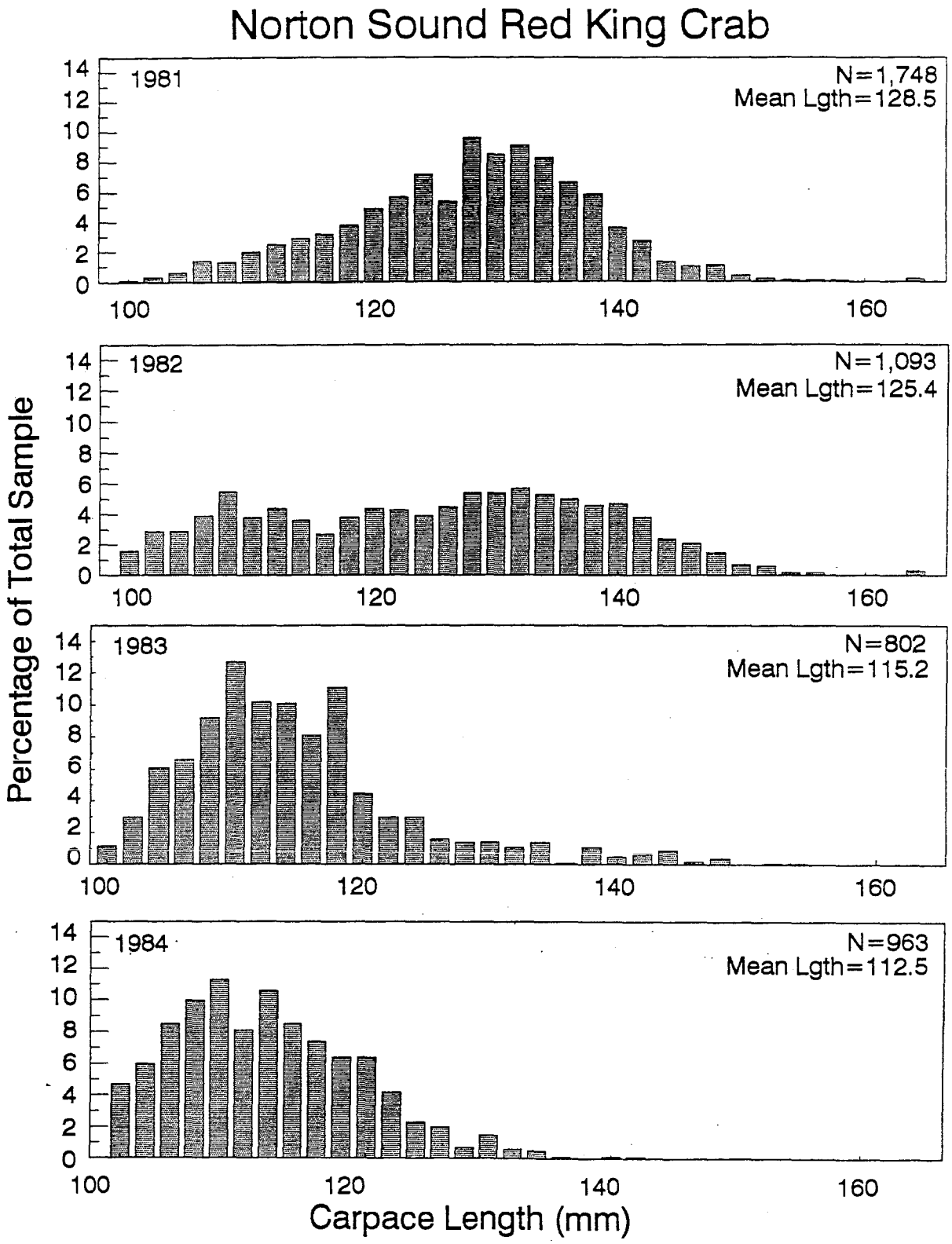


Figure 19. Norton Sound red king crab summer commercial catch samples, 1981-1992 (There was no commercial fishery in 1991).

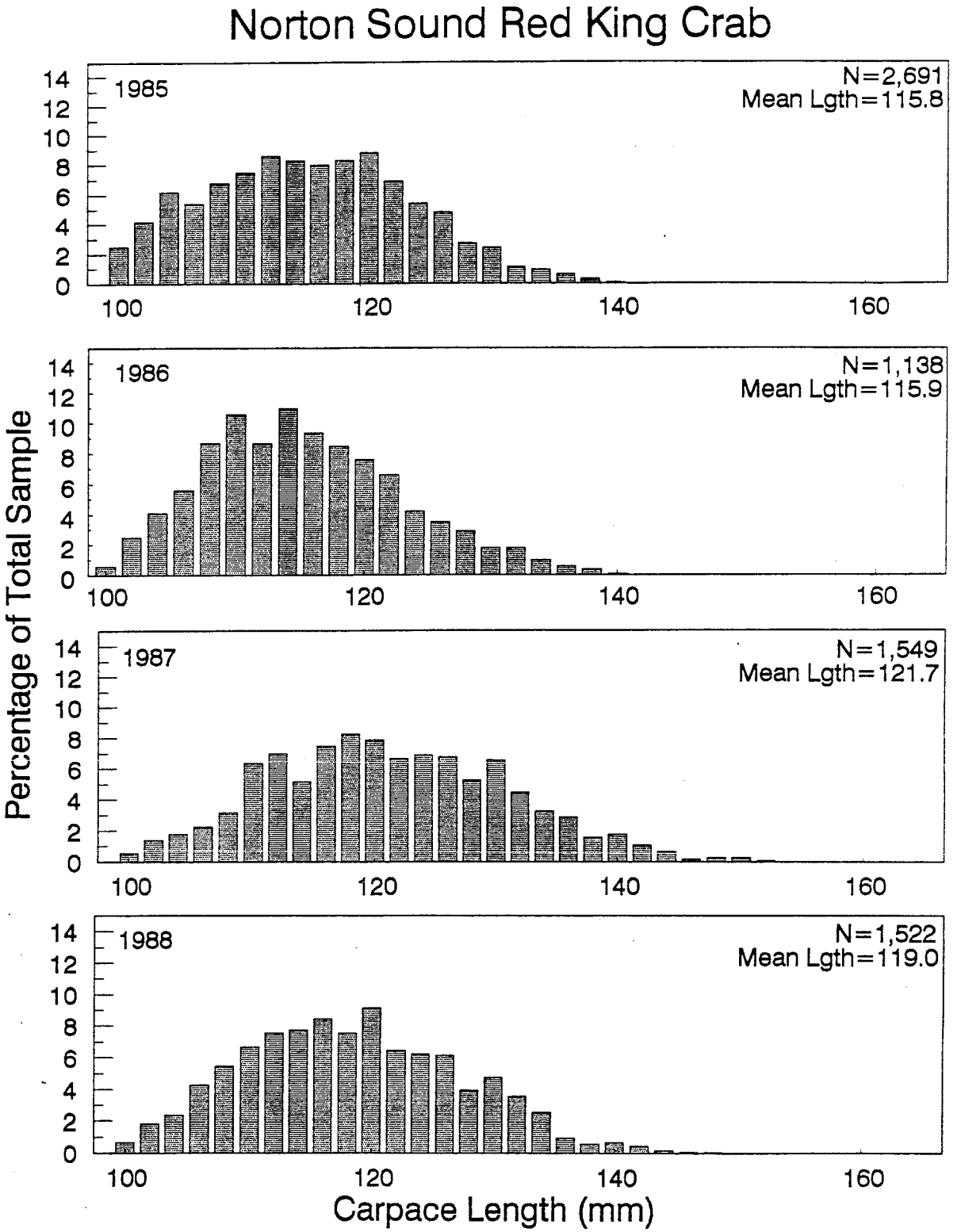


Figure 19 (page 2 of 3)

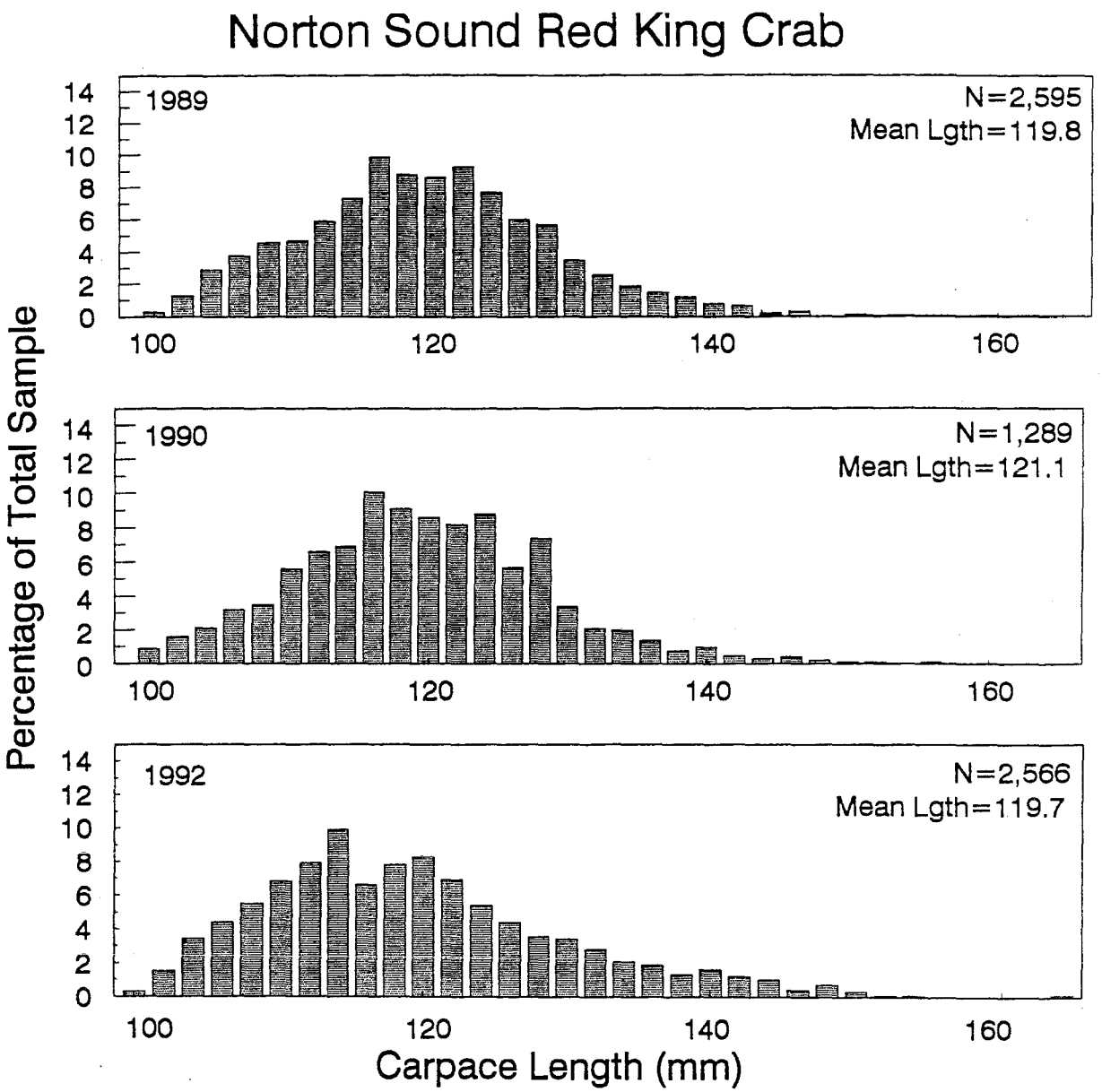


Figure 19 (page 3 of 3)

Appendix Table E1. Comparison of annual summer commercial harvest of red king crab from Norton Sound, Alaska by statistical areas, 1977–1992 (catch in pounds).*

Statistical Area	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1992	Tota
656402	306,302	90,187	288,869	918	3,098	2,832			132,363							824,56
646402	80,969					748										81,71
626402	38,995															38,99
656401			138,011	121,147	253,387	60,480	11,422	183,119	246,200		194,408	165,644	100,956	171	53,119	1,528,06
646401			155,972		1,319	17,532										174,82
636401				12,398	61,823	32,246	5,880	41	891				22,030		1,159	136,46
626401	31,572			4,830	399											36,80
656330			323,518	72,735	395,662	3,983	24,246	83,479	7,632		79,006	36,129	1,757		4,814	1,032,90
646330					4,716								5,212			9,92
626331	40,020					22										40,04
616331	7,893															7,89
656300			161,699		15,174											176,87
666431			146,029													146,02
676501					36											
666402	12,036	515,778	534,938	183,581		17,585			32,992							1,296,91
676430		3,811	12,309	–0–	373	3,513			1,171							21,17
666401		179,212	486,947	205,400	381,510	79,580	325,045	116,254	5,341	408,848	50,744	21,895	115,257	162,263	10,632	2,548,92
676400		667,130	33,856	274	92,026	1,315	247		32					3,212		798,04
666330		353,016	505,050	367,446	141,513	8,990	1,192		389	70,615	2,963	13,020	1,275	27,185	4,305	1,496,97
676330		51,304	81,798	6,762	18,734	–0–										158,57
686330			1,860													1,86
666300		162,795	60,816	84,874	9,167	95		4,534								322,27
676300		13,238		126,231												139,46
666230		55,490			77											55,57
Totals	517,787	2,091,961	2,931,672	1,186,596	1,379,014	228,921	368,032	387,427	427,011	479,463	327,121	236,688	246,487	192,831	74,029	11,075,03

* No commercial fishery occured in 1991.

Appendix Table E2. Percent recruit and postrecruit size male red king crab from commercial catch samples by by year, Norton Sound Section, Bering Sea.

Year	Recruits[a]	Postrecruits[b]
1977	53	47
1978	29	71
1979	33	67
1980	15	85
1981	10	90
1982	27	73
1983	55	45
1984	59	41
1985	45	55
1986	49	51
1987	22	78
1988	25	75
1989	23	77
1990	21	79
1991[c]	–	–
1992	28	72

[a] Percent Recruits = All new shell, legal size, male king crab of carapace length <116mm.

[b] Percent Postrecruits = All other, legal size, male king crab.

[c] No Summer Commercial Fishery in 1991.

Appendix Table E3. Summer commercial red king crab harvest, Norton Sound, Bering Sea, 1976–1992.

Year	Legal Male Pop. Est.[a]	Commercial Harvest[b]	Number of Vessels	Crab per Pot	Ave Wt per Crab(lb)	Exvessel Price / lb.	Fishery Value (millions $)
1976 [c&d]	8.1	–	–	–	–	–	–
1977 [e]	10.0	0.52	7	36	2.7	0.75	0.229
1978 [e]	11.0	2.09	8	64	3.0	0.95	1.897
1979 [d]	5.4	2.93	34	28	3.0	0.75	1.878
1980	6.6	1.19	9	29	3.6	0.75	0.890
1981	4.7	1.38	36	11	3.7	0.85	1.172
1982	1.3	0.23	11	6	3.6	2.00	0.405
1983	2.1	0.37	23	12	2.8	1.50	0.537
1984	2.7	0.39	8	14	2.8	1.02	0.395
1985	2.4	0.43	6	11	2.9	1.00	0.427
1986 [f]	2.8	0.48	3	38	2.9	1.25	0.600
1987 [g]	2.2	0.33	9	10	3.2	1.50	0.491
1988 [h]	3.2	0.24	2	32	3.1	[i]	[i]
1989	3.2	0.25	10	15	3.1	3.00	0.739
1990 [h]	3.2	0.19	4	19	3.1	[i]	[i]
1991 [c&d]	3.4	–	–	–	–	–	–
1992 [d]	3.4	0.07	27	4	3.0	1.75	0.130

[a] Population estimate prior to fishery in given year in millions of pounds.
[b] Millions of pounds.
[c] No summer commercial fishery.
[d] Population estimate derived by National Marine Fisheries Service.
[e] Population estimate derived from commercial harvest data.
[f] Population derived from 1985 ADF&G pot study.
[g] Population estimate based on 1985 assessment survey data and recruitment of current assessment data; estimate probably low due to lack of recent data.
[h] Population estimate based on 1988 NMFS post season trawl survey combined with summer fishery harvest.
[i] Data unavailable since all vessels were catcher/processors.

Appendix Table E4. Winter commercial and subsistence red king crab harvests, Norton Sound, Bering Sea, 1978–1992.

COMMERCIAL			SUBSISTENCE						
Year [a]	Number of Fishermen	# Crab Harvested	Winter [b]	Permits Issued	Permits Returned	Permits Fished	Total Crab Captured [c]	Total Crab Harvested [d]	Average Harvest/fm
1978	37	9,625	1977 –78	290	206	149	•	12,506	84
1979	1	221	1978 –79	48	43	38	•	224	6
1980	1	22	1979 –80	22	14	9	•	213	24
1981	0	0	1980 –81	51	39	23	•	360	16
1982	1	17	1981 –82	101	76	54	•	1,288	24
1983	5	549	1982 –83	172	106	85	•	10,432	123
1984	8	856	1983 –84	222	183	143	15,923	11,220	78
1985	9	1,168	1984 –85	203	166	132	10,757	8,377	63
1986	5	2,168	1985 –86	136	133	107	10,751	7,052	66
1987	7	1,040	1986 –87	138	134	98	7,406	5,772	59
1988	10	425	1987 –88	71	58	40	3,573	2,724	68
1989	5	403	1988 –89	139	115	94	7,945	6,126	65
1990	13	3,626	1989 –90	136	118	107	16,635	12,152	114
1991	11	3,800	1990 –91	119	104	79	9,295	7,366	93
1992	13	7,478	1991 –92	158	149	105	15,051	11,736	112

[a] Prior to 1985 the winter commercial fishery occured from January 1 thru April 30; as of March 1985, the winter commercial season was is open by regulation from November 15 thru May 15.
[b] The winter subsistence fishery occurs during months of two calendar years (as early as December, thru May).
[c] The number of crab actually caught; some crab may have been released.
[d] The number of crab "Harvested" is the number of crab caught and kept.
• Data unavailable.

Appendix Table E5. Results of the population assessment surveys conducted for red king crab in Norton Sound since 1976.

					Number of Red King Crab Captured[a]			Population Estimates of Legal Male Crab[c]	
Year	Date	Research Agency	Vessel	Gear Effort	Sublegal Males	Legal[b] Males	Females	Numbers	Pounds
1976	9/02 - 9/05 9/16 -10/07	NMFS	Miller-Freeman	Trawl 158 tows	768	555	180	3,119,800	8,111,480
1979	7/26 - 8/05	NMFS	Miller-Freeman	Trawl 71 tows	46	194	40	837,241	2,511,723
1980	7/04 - 7/14	ADF&G	Altair	Pots 397 lifts	443	3,290	158	1,900,000	6,600,000[d]
1981	6/28 - 7/14	ADF&G	Altair	Pots 718 lifts	4,097	3,415	1,933	1,285,195	4,755,221
1982	7/06 - 7/20	ADF&G	Aleutian #1	Pots 689 lifts	5,019	2,001	424	353,273	1,271,783
1982	9/05 - 9/11	NMFS	Miller-Freeman	Trawl 50 tows	322	107	265	970,646	2,620,744
1985	7/01 - 7/14	ADF&G	Arctic Sea	Pots 642 lifts	6,086	4,645	181	907,579	2,414,644
1985	9/16 -10/01	NMFS	Argosy	Trawl 78 tows	266	163	151	1,203,000	3,369,000
1988	8/16 - 8/30	NMFS	Miller-Freeman	Trawl 82 tows	258	141	218	1,037,000	3,038,000
1991	8/22 - 8/30	NMFS	Ocean Hope	Trawl 53 tows	202	178	105	1,384,000	4,009,000

[a] Number of crab captured on ADF&G surveys represent data standardized for a 24 hour soak.

[b] Legal male red king crab were defined as at least 106mm in carapace length for the 1976 NMFS survey; 105mm for the 1979 and 1985 NMFS survey; and at least 121mm in carapace width for all ADF&G surveys.

[c] Population est. are valid for the date of the survey, ie either before or after the summer commercial fishery.

[d] The 1980 estimate has been revised from the original estimate of 13.4 million pounds. The original estimate was thought inaccurate due to under-reporting of recovered tagged crab.

Appendix Table E6. Size composition by percent of red king crab from winter research pots near Nome, Norton Sound, Bering Sea. [a&b]

	SUBLEGAL			LEGAL		
Year	Prerecruit Twos	Prerecruit Ones	Totals	Recruits	Post–Recruits	Totals
1983	26	38	64	26	10	36
1984	35	31	66	19	16	35
1985	25	45	70	20	10	30
1986	26	35	61	22	17	39
1987	13	31	44	11	45	56
1988 [c]	–	–	–	–	–	–
1989	27	15	42	27	31	58
1990	16	33	49	25	26	51
1991	5	30	35	34	31	65

[a] Sublegals = male crab less than 4 3/4" carapace width.
Pre–recruit Ones = Sulegals greater than 89mm in carapace length.
Pre–recruit Twos = Sublegals smaller than 90mm in carapace length.

Legals = male king crab greater than 4 3/4" carapace width.
Recruits = Legal new shell crab smaller than 116mm in carapace length.
Post–recruits = all non–recruit legal males.

[b] No winter crab research study in 1992.

[c] No data collected in 1988 due to poor ice conditions.

Section 4: MISCELLANEOUS SPECIES

(Includes Norton Sound, Port Clarence and Kotzebue Districts)

Section 4 - MISCELLANEOUS SPECIES

INTRODUCTION

Several species other than salmon, crab and herring are utilized for commercial and subsistence purposes in the Norton Sound, Port Clarence and Kotzebue Districts. Primary species include inconnu or "sheefish" (Stenodus leucichthys), whitefish (Coregonus laurettae, Coregonus pidschian, Coregonus sardinella, Coregonus nasus, and Prosopium cylindraceum). (Coregonus sp., Prosopium sp.), Dolly Varden (Salvelinus malma) and saffron cod (Eleginus gracilis).

The fish are taken by set gill nets, beach seines, "jigging" through the ice, and rod and reel. Subsistence catches taken during the summer months are normally air dried, while winter catches are stored frozen. Fish are utilized both for human consumption and for dog feed. Fish taken for commercial purposes are mainly sold locally, although some are shipped from the area.

Subsistence harvest of most species is not limited by regulation. Commercial harvest may be prohibited in some freshwater areas, but limited commercial endeavors are allowed in many areas under terms of a permit.

INCONNU (Sheefish)

The distribution of inconnu includes the Kobuk-Selawik River drainages, and Hotham Inlet of Kotzebue Sound and some Norton Sound drainages, but the largest populations and harvests occur within the former area (Figure 20). In the Kotzebue Sound area, adult fish migrate to upriver spawning areas after ice breakup and to wintering areas within the Hotham Inlet/Selawik Lake area during October-November. Although inconnu are capable of consecutive spawning, most fish spawn every two to three years. Inconnu mature slowly with males reaching maturity at 5-7 years of age and females at 7-11 years.

The inconnu's spawning and overwintering migration behavior makes them available for harvest by the various fisheries throughout their life cycle, and increases their vulnerability to overharvest. In addition, the inconnu's slow maturation rate increases the time required to restore depleted populations.

During the 1960's, age, sex and length data indicated stocks were being overharvested by the commercial and subsistence fisheries in the Kotzebue district. Consequently, an annual area commercial harvest quota of 25,000 pounds of inconnu was instituted, although subsistence catches remained unrestricted.

Commercial Fishery

Most of the commercial fishing effort occurs near Kotzebue in Hotham Inlet. Fishermen use gill nets ranging from 5 1/2 inch - 7 inch stretched mesh which are set under the ice. Recorded commercial catches have remained relatively small; however, undocumented catches are believed to be significant and therefore, harvest totals should be considered minimum estimates. Restricted markets outside northwestern Alaska limits commercial activity greatly and most individuals who normally participate in the winter commercial fishery also fish for subsistence

purposes. During some years, incidentally caught inconnu are also sold by commercial salmon fishermen when there is a market, but only in small amounts.

The commercial sheefish catch for 1991-1992 was taken by 4 permit holders and totaled 365 fish (Appendix Table F1). The total weight was 3,597 pounds that averaged 9.9 pounds per fish. The average price per pound was $.58 for a total fishery value of $2,080.

Subsistence Fishery

Inconnu have long been utilized for subsistence purposes throughout the Kotzebue Basin. Fishermen along the upper Kobuk River fish for inconnu during June through October, while the lower Kobuk and Selawik River residents fish during April through June. Kotzebue and Selawik fishermen fish in the Hotham Inlet and Selawik Lake during the winter months.

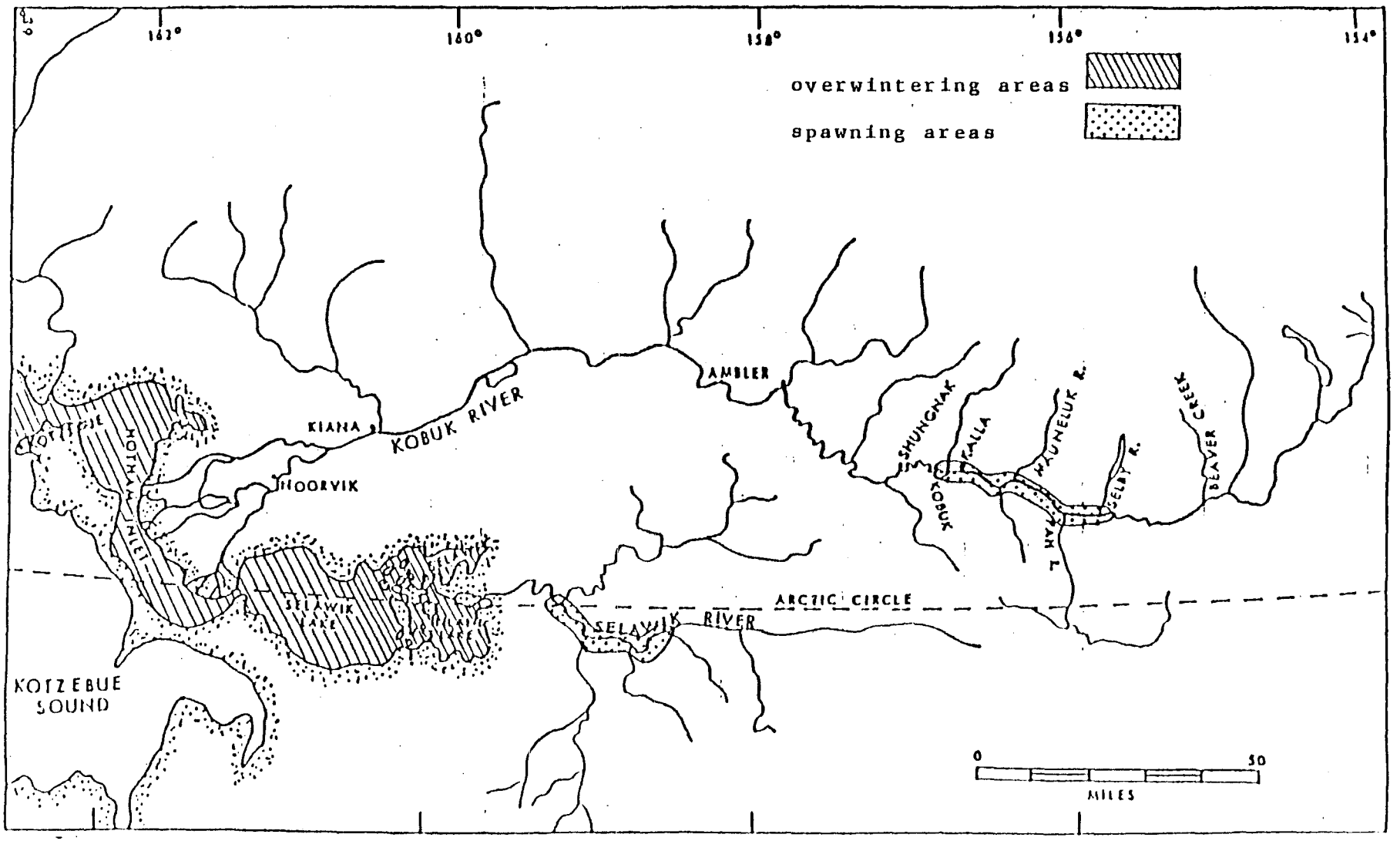
The 1992 winter subsistence harvests of inconnu in Kotzebue Sound and Selawik Lake was 2,821, 43 fishermen were interviewed, and the average catch per fisherman was 66. Historical reported catches are presented in Appendix Table F2.

During the fall of 1992, household interviews were conducted to document subsistence finfish catches, primarily salmon, by residents of the Kotzebue District. Household surveys were conducted in Shungnak, Noorvik, and Noatak. Other villages were not surveyed due to budget restrictions. Mail-in survey calendars were not distributed so subsistence harvest information should be considered very minimal. Few inconnu had been harvested at the time of the survey; many fishermen were still fishing.

Escapement

In recent years aerial surveys have been conducted on key inconnu spawning areas incidental to the effort of enumerating salmon. These surveys have primarily been conducted along the upper Kobuk River in September. Survey conditions historically result in either very few or no inconnu being observed (Appendix Table F3). During these surveys, species identification has been a problem in some years. Surveys were not conducted in 1985 thru 1990 due to high, turbid water, poor weather conditions, or lack of personnel. (*** The 1992 season had unusually good surveying conditions and counted an unusually high number of inconnu in the Kobuk River.***) Incomplete escapement and catch data provide little basis for assessing the current population status of inconnu in the Kotzebue district, however there is some local concern that the inconnu stocks are declining.

Figure 20. Kotzebue and Kobuk River Valley villages and their spatial relationship with Inconnu spawning and overwintering areas.



Appendix Table F.1. Kotzebue District winter commercial Sheefish harvest statistics, 1967–1992. [a]

Year [b]	No. of Fishermen	No. of Fish	Pounds		Price/ Pound	Estimated Value
			Total	Average		
1967 [c]		4,000	26,000	6.5	$0.20	$5,200
1968	10	792	4,752	6.0	$0.22	$1,045
1969	17	2,340	15,209	6.5	$0.25	$3,802
1970 [c]		2,206			$0.14	
1971	4	73	720	9.9	$0.13	$95
1972	5	456	4,071	8.9	$0.16	$651
1973	11	2,322	15,604	6.7	$0.20	$3,121
1974	6	1,080 [d]	6,265	5.8	$0.30	$1,880
1975	[c]	2,543 [d]	24,161	9.5	$0.30	$7,248
1976	14	2,633	19,484	7.4	$0.30	$5,845
1977	2	566	5,004	8.8	$0.30	$1,501
1978	11	2,879	26,200	9.1	$0.40	$10,480
1979 [e]						
1980	4	1,175	8,225	7.0	$0.50	$4,113
1981	1	278	1,836	6.6	$0.75	$1,377
1982	11	2,629 [f]	17,376	6.6	$0.75	$13,032
1983	8	1,424	13,395	9.4	$0.50	$6,698
1984	5	927 [d]	10,403	11.2	$0.55	$5,722
1985	4	342 [d]	3,902	11.4	$0.51	$1,990
1986	2	26	312	12.0	$0.75	$234
1987	3	670	5,414	8.1	$0.49	$2,653
1988	3	943	7,373	7.8	$0.45	$3,318
1989	8	2,335	16,749	7.2	$0.51	$8,542
1990 [c]	6	687	5,617	8.2		
1991	5	852	8,224	9.7	$0.50	$4,112
1992	4	365 [d]	3,597	9.9	$0.58	$2,080

[a] Data is not exact, in some instances total catch poundage was determined from average weight and catch data. Similarly, various price/pound figures were determined from price/fish and average weight data.

[b] Season was from October 1 to September 30. Year indicated would be the year the commercial season ended. For example, the year 1980 would represent October 1, 1979 to September 30, 1980.

[c] Data unavailable or incomplete.

[d] Number of fish not always reported. Estimates were based on average weight from reported sales which documented the number of fish.

[e] No reported commercial catches.

[f] Estimate based on historical average weight.

Appendix Table F2. Reported subsistence inconnu catches, Kotzebue District, 1966-1992. [a,d]

Year	Number of Fishermen Interviewed	Reported Harvest	Average Catch per Fisherman
1966-67	135	22,400	166
1967-68	146	31,293	214
1968-69	144	11,872	82
1970	168	13,928	83
1971	155	13,583	88
1972	79	3,832	49
1973	65	4,883	75
1974	58	1,062	18
1975	69	1,637	24
1976	57	966	17
1977	95	1,810	19
1978	95	1,810	19
1979	75	3,985	53
1980	74	3,117	42
1981	62	6,651	107
5/82-4/83 [b,c]	130	4,704	36
5/83-4/84 [b,c]	27	764	28
5/84-9/84 [b]	30	2,803	93
1985 [e]	2	60	30
1986 [c,e]	72	721	10
1987 [e]	46	276	6
1988 [e,f]	-	-	-
1989 [e]	-	-	-
1990 [e]	-	-	-
1991	40	2,180	55
1992	43	2,821	66

[a] To obtain individual village catches during years previous to 1982 refer to the 1982 Annual Management Report.
[b] Catch by village for these years are presented in separate tables in respective year annual management reports.
[c] Summer catches only; winter catches were not documented.
[d] Due to limited survey effort during many years total catch and effort should be regarded as minimum figures only and are not comparable from year to year.
[e] Villages were not surveyed for subsistence inconnu harvests from 1985 to present; figures shown are catches reported during the fall chum salmon subsistence surveys, and may include summer as well as winter catches.
[f] Subsistence inconnu catches not documented.

Appendix Table F3. Annual aerial survey counts of inconnu in the Kobuk and Selawik Rivers, 1966-1992.

Date	Kobuk River	Selawik River	Total
09/05/66	1,200	[b]	1,200
09/22/67	1,025	[b]	4,359
09/14/68	4,973	1,234	6,207
09/10/69	3,654	[b]	3,654
09/05/70	3,220	[b]	3,220
08/30/71	8,166	1,196	9,362
08/22/72	[a]	[b]	-
1973	[b]	[b]	-
08/21/74	[a]	[b]	-
08/24/75	[a]	[b]	-
09/02/76	73	[b]	73
1978	[b]	[b]	-
09/12/79	2,824	[b]	2,824
09/11/80	1,772	[b]	1,772
09/15/81	250 [c]	[b]	250
1982	[a]	[b]	[a]
09/19/83	1,009 [c]	[b]	1,009
09/05/84	2,604	[b]	2,604
1985	[b]	[b]	-
1986	[b]	[b]	-
1987	[b]	[b]	-
1988	[b]	[b]	-
1989	[b]	[b]	-
1990	[b]	[b]	-
1991	17,335	[b]	-
1992	3,310	[b]	-

[a] No fish reported.
[b] Not surveyed.
[c] Probably more inconnu than listed; species identification problems.

DOLLY VARDEN

Introduction

Dolly Varden (Salvelinus malma) are distributed throughout the Norton Sound, Port Clarence, and Kotzebue districts. Although taxonomists have disagreed on the distinguishing Dolly Varden characteristics and distribution of Arctic Char and Dolly Varden, most taxonomists now agree that char in this area are the northern form of Dolly Varden. In order to eliminate confusion, in this report these fish will be referred to as Dolly Varden, the common name for this species complex.

Dolly Varden in this area are primarily nonconsecutive spawners and spawn throughout the late summer and fall. Fry emerge in the spring and migrate to the ocean during early summer after spending from 1 to 6 (generally 2-5) years in freshwater. Since Dolly Varden are a late-maturing fish (generally age 6-7), they are susceptible to overfishing by commercial, subsistence, and/or sport fisheries. Consequently, commercial fisheries have been maintained at low levels or prohibited to both reduce the potential of overharvest and provide for reproductive and subsistence fishery needs.

Commercial Fishery

Dolly Varden are taken incidentally to chum salmon in the Kotzebue commercial fishery (Tables 10 A, B, C and 11 A, B, C). Regulation changes in 1976, which closed the commercial salmon fishery on August 31, have reduced the harvest of Dolly Varden since in most years Dolly Varden are primarily available for harvest during September. Dolly Varden generally appear in commercial catches during the last three weeks of August (Table 19). Reported Dolly Varden catches are dependent upon available markets. The typical season catch when buyers are purchasing Dolly Varden is between 1,000 to 3,000 fish (Appendix Table F4). (***The 1992 harvest was significantly higher at 1,977 due to a high Dolly Varden return with a strong pulse of fish that moved through the commercial fishery during an open period.***) Historically two-thirds of the catch is taken on the north side of the district near Sisaulik and the average weight was about 6.1 pounds in 1992.

There are several small quota (2,500 pounds) freshwater fisheries in Norton Sound but effort is inconsistent, varying from year to year and stream to stream. Fishermen often buy permits but seldom make commercial sales. In 1992 three fisherman sold 271 pounds of Dolly Varden caught in the Unalakleet River.

Subsistence Fishery

Dolly Varden are an important component in the diet of subsistence users in the Norton Sound-Kotzebue Sound areas. Subsistence fishermen catch Dolly Varden with seines in the fall, hook and line through the ice in the winter, and gill nets in the spring. The fall seine fishery contributes the greatest number of fish to the annual subsistence Dolly Varden harvest. Since 1962, seine catches made by the residents of Kivalina, within the Kotzebue District, have ranged from 12,000 to 49,000 Dolly Varden annually (Appendix Table F5)

Fall seine fishing is a group effort with several households comprising a fishing group. The catch is stored and allowed to freeze in willow cribs located near the seining site. These fish are used throughout the winter by the fishing group

(DeCicco 1985). It should be pointed out that the historical subsistence Dolly Varden catches that are summarized in Appendix Table F5 are very minimal figures due to the timing of the surveys conducted. Most Dolly Varden harvest take place prior to or just after freeze-up. The village of Noatak usually fishes prior to freeze-up, while the Kobuk River villages of Shungnak and Noorvik fish for Dolly Varden throughout the winter.

Most villagers in the Norton Sound District report incidental catches of Dolly Varden in their subsistence salmon nets. However, the bulk of the catch is taken by seining in the late fall, after Department subsistence surveys had been completed which made it difficult to estimate subsistence catches in the Norton Sound District. Due to budget restrictions, no subsistence surveys were conducted in the fishing villages of Norton Sound since 1985.

Sport Fishery

Residents of the Kotzebue area and nonlocal residents on wilderness boating trips on the Kobuk and Noatak Rivers are the primary participants in the Dolly Varden sport fishery in the Kotzebue area watershed. Approximately 1,500 Dolly Varden are taken in this fishery annually (Sport Fish Division surveys).

Overwintering Counts

Aerial survey counts of overwintering Dolly Varden on the Wulik River have ranged from 297,257 Dolly Varden in 1969 to 30,923 Dolly Varden in 1984 (Appendix Table F6). Weather and water conditions have precluded flying aerial surveys during many years. When weather permits, the Division of Sport Fisheries conduct aerial surveys of the spawning grounds on the Noatak River in the summer and the overwintering areas of the Kivalina and Wulik Rivers in the fall. During the fall of 1992, 135,000 overwintering Dolly Varden were counted on a survey of the Wulik River (Sport Fish Division survey). The 1992 survey was the second highest ever documented for the Wulik River. Additional surveys were conducted on the Noatak and Kivalina Rivers, but due to poor surveying conditions and timing, they were not used in assessing magnitudes or run strengths of Dolly Varden.

Table 19. Incidental Dolly Varden catches in the Kotzebue District commercial salmon fishery by fishing period, 1992.

Period	Dates	Hours Fished	Number of Fishermen	Dolly Varden		
				Number	Pounds	Avg. Wt.
10	8/10–8/11	36	107	149	887	6.0
11	8/13–8/14	24	93	335	2,173	6.5
12	closed period					
13	8/21–8/22	24	75	891	4,842	5.4
14	8/24–8/25	24	75	530	3,564	6.7
15	8/27–8/28	24	54	72	485	6.7
Totals		132		1,977	11,951	6.1

Appendix Table F4. Dolly Varden harvested incidentally during the commercial salmon fishery, Kotzebue District, 1966-1992.

Year	Number of Fish Sold	Estimated Total Catch [g]	Pounds Sold [d]	Average Weight Pounds	Average Price per Pound
1966	3,325			7-10	.55 [f]
1967	367		2,606	7.1	.11
1968	3,181		21,949	6.9	.14
1969	1,089 [a]		-	-	2.84 [f]
1970	2,095		-	-	-
1971	3,828 [b]		23,353	6.4	.16
1972	7,746		56,545	7.3	.17
1973	640		4,608	7.2	.16
1974	2,605 [c]		20,580	7.9	.16
1975	-		-	-	-
1976	-		-	-	-
1977	-		-	-	-
1978	1,229		9,094	7.4	.15
1979	2,523		12,523	5.0	.25
1980	3,049		17,015	5.6	.20
1981	3 [e]		16	5.6	.17
1982	3,447		23,648	6.9	.20
1983	190 [e]	845	1,108	5.8	.20
1984	347 [e]	1,090	2,104	6.1	.25
1985	454	3,600	3,177	7.0	.25
1986	5 [e]	2,373	34	6.8	.20
1987	1,261	[h]	8,704	6.9	.30
1988	752	[h]	4,967	6.6	.35
1989	3,093	[h]	20,293	6.6	-
1990	604	[h]	4,219	7.0	.25
1991	6,136	[h]	40,747	6.6	.18
1992	1,977	[h]	11,951	6.1	.10

[a] Includes 269 taken by permit.
[b] Includes 179 taken by permit.
[c] Includes 234 taken during commercial inconnu fishery.
[d] Some data extrapolated from average reported weight.
[e] Limited char market; many fish used at home or dumped.
[f] Price per fish.
[g] Estimate includes fish caught but not sold based on interview of fishermen.
[h] Estimate of char caught (but not sold) not made.

Appendix Table F5. Fall subsistence catches of Dolly Varden documented in Kivalina and Noatak, 1959-1992.

Year	Kivalina Number	Kivalina Pounds	Noatak Number [d]
1959 [a]	34,240	85,600	-
1960 [a]	49,720	124,300	-
1962	-	-	27,623
1963	-	-	4,130 [e]
1968	49,512	120,214	
1969	64,970	152,750	32,350
1970	33,820	79,420	3,700
1971	29,281	68,518	5,320
1972	48,807	114,637	1,492
1973 [b]			
1979	14,600 [c]	-	9,060
1980	-		7,220
1981	15,000-18,000 [c]	-	3,056
1982	18,438 [e]	-	2,676 [b,f]
1983	16,270 [c]	-	4,545
1984	12,000 [c]	-	2,542
1985	10,500 [c]	-	[g]
1986	7,436 [c]	-	46 [h]
1987	[g]	-	1,376 [h]
1988	[g]	-	[g]
1989	[g]	-	[g]
1990	[g]	-	[g]
1991	[g]	-	4,814
1992	[g]	-	4,395

[a] From Saario, Doris J. and Brina Kessel, Environment of Cape Thompson Region, Alaska, published by the U.S. Atomic Energy Commission, 1966.

[b] Storm and ice conditions prevented fall harvest.

[c] Harvest data from Sport Fish Division survey.

[d] No data available on poundage.

[e] Harvest data from Stephen Braund and Associates.

[f] Expanded estimate (see text on subsistence fishery in 1982 Annual Management Report).

[g] Not surveyed.

[h] Subsistence fishermen just beginning to seine at time of the survey.

Appendix Table F6. Aerial survey counts of overwintering Dolly Varden in the Kotzebue District watershed, 1968-1992.

Year	Noatak River Drainage Index Streams [a]	Wulik River [b,e]	Kivalina River [b,e]
1968	-	90,236	27,640
1969 [b]	21,000 [c]	297,257	-
1976	-	68,300	12,600
1977 [d]	-	-	-
1978 [d]	-	-	-
1979	-	55,030	15,744
1980	45,185 [c]	113,553	39,692
1981	5,873	101,826	45,355
1982	6,088	65,581 [d]	10,932 [d]
1983	4,144 [c]		
1984	7,444	30,923	5,474
1985	-	-	-
1986	2,025 [f]	5,590 [g]	5,030 [g]
1987	[g]		
1988	[g]	80,000 [c]	[g]
1989	[g]	56,384 [g]	[g]
1990	5,484		
1991	7,208 [d]	126,985	35,275 [d]
1992		135,135	

[a] Includes July spawner count on the Kelly and Kugururok Rivers, tributaries of the Noatak.

[b] Overwintering char counts conducted in September.

[c] Incomplete survey.

[d] Poor weather hampered/prevented survey.

[e] Surveys conducted by Sport Fish Division since 1979.

[f] Summer spawner count only from the Kelly River. No other Noatak River drainages were surveyed due to poor weather in 1986.

[g] Not surveyed.

WHITEFISH

Introduction

Although inconnu belong to the whitefish family, this section deals with several smaller species of the genera Coregonus and Prosopium. The genus Coregonus contains the "broad" and "humpback" whitefish or C. nasus and C. pidschian, respectively. In addition, three whitefish species known as "ciscoes" belong to this genera; ie., the least cisco (C. sardinella), Arctic cisco (C. autumnalis) and Bering cisco (C. laurettae). "Round" whitefish (Prosopium cylindraceus) are the sole representatives of the genus Prosopium in this area. All species normally spawn in the fall in freshwater.

Whitefish occur throughout most bodies of freshwater in the Norton Sound/Port Clarence/Kotzebue areas and can also be found in inshore marine waters at various times of the year.

Whitefish are harvested to a very limited extent by the commercial and sport fisheries within the area, but are uniformly important to the various subsistence fisheries. Recently, there has been increasing interest in commercial development of this resource, especially in the Kotzebue district.

Commercial Fishery

Limited commercial whitefish harvests have been allowed since statehood, normally under the auspices of a permit which delineated harvest levels, open areas, legal gear, etc. Commercial whitefish fisheries have generally been limited to large open water areas (e.g. Grantley Harbor in the Port Clarence district) or ocean waters. Beach seines have been stipulated as legal gear in some instances in order to reduce the number of incidental species taken. Little comparative commercial catch and effort data have been recorded, but harvest levels have historically been low. A majority of the commercial catches have been made in Golovin Bay within Norton Sound, in the Kuzitrin River of the Port Clarence district, and in Hotham Inlet and Selawik River in the Kotzebue district. The fish have been sold to local markets for human consumption, dog food, or more recently, crab bait.

In the Kotzebue district, a permit to harvest up to 15,000 pounds of whitefish and 3,000 pounds each of pike and burbot was issued to Selawik Fish Project in 1986. The season extends from April to December. Fish sold during June and July of 1986 were purchased as dried fish with an assumed fresh weight of 3 pounds per whitefish (primarily broad and humpback whitefish). A total of 616 whitefish (1,848) pounds were landed by beach seine and gill net. Fishermen received $11 per string of 8 whitefish. Nine permit holders participated in this fishery. Burbot and pike sales were also reported from the Kotzebue district, but will be discussed in the Miscellaneous Finfish Species section. The Selawik whitefish project only operated during the 1984 thru 1987 seasons. In 1989 three fisherman from Kotzebue reported sales totalling 470 pounds of whitefish.

Subsistence Fishery

Whitefish have been taken mainly by beach seine or set gill nets. Catches are usually dried and used for human consumption or dog food. In some areas fish are "gutted" and dried early in the summer, while later in the summer the fish are filleted and dried with the eggs and viserca intact.

Subsistence catch enumeration is difficult since fishermen do not count fish individually, but by "tubs", "bags", "strings" or any other estimators of gross abundance. Additionally, many fish have been dried and consumed or stored in caches prior to the survey period. Reported subsistence harvests are the result of a limited and sporadic survey effort and should be regarded as minimum figures and not comparable from year to year. Recent and historical subsistence harvest figures for the Kotzebue district are presented in Appendix Table F7 by year.

Escapement

Whitefish escapements have not been monitored in the past, but there have been no indications from limited Department observations or fishermen interviews of declining populations.

Appendix Table F7. Subsistence whitefish catch and effort data, Kotzebue District, 1970-1992.[a]

Year	Fishermen Interviewed	Number of Fish
1970		58,165
1971		36,012
1974-1976	[b]	[b]
1977		30,810
1978		77,474
1979	123	43,653
1980	67	49,106
1981	71	37,746
1982	[b]	[b]
1983	47	16,389
1984	79	28,614
1985[c]	46	5,229
1986[d]	72	11,854
1987[d]	46	20,020
1988[e]	38	14,000
1989	[b]	[b]
1990	[b]	[b]
1991[d]	63	16,015
1992[d]	66	17,485

[a] Data unavailable prior to 1970. Systematic whitefish catch surveys have never been conducted in the area. This information was collected incidentally with late summer salmon surveys and probably represents only a small fraction of the catch made on a year round basis.

[b] Data unavailable.

[c] Data was expanded based on limited interviews and represents the approximate harvest of fishermen contacted in Kiana and Shungnak only. These figures should be considered very minimal.

[d] Data represents harvest reported from interviews of subsistence fishermen in Shungnak, Noorvik, and Noatak only. Since not all fishermen were contacted and fishing was still occurring at the time of the survey, these figures should be considered minimal.

[e] Data represents harvest reported during fall chum subsistence surveys in Noorvik and Shungnak only; most families still fishing.

SAFFRON COD

Saffron cod, or tomcod as they are called locally, are extensively utilized as a subsistence resource in the Norton Sound, Port Clarence and Kotzebue districts. Tomcod are taken through the ice by jigging as well as with gill nets in open water.

There has never been an extensive commercial fishery on tomcod in the Norton Sound, Port Clarence or Kotzebue areas. During 1980, one fisherman caught and sold 89 pounds (98 tomcod) in the Nome subdistrict. There were no commercial landings during 1982. In 1983, one Nome area fisherman caught and sold 2,548 pounds (4,348 tomcod) and in 1989 one fisherman sold 1,800 pounds locally. These fish were used for dog food, crab bait and human consumption. No commercial deliveries were reported in during 1984-1988.

The Alaska Native Foundation undertook a feasibility study for the development of a dried saffron cod fishery in the Port Clarence/Shishmaref area in 1980. Samples taken to prospective buyers and various markets proved that an economically viable commercial fishery does not exist for this species in this area. If marketing conditions improve and if local residents are willing to participate in a labor intensive dried saffron cod fishery, a commercial fishery for saffron cod could develop.

MISCELLANEOUS FINFISH SPECIES

Other finfish species taken for subsistence in the Norton Sound-Port Clarence-Kotzebue area include: rainbow smelt (boreal smelt), capelin, northern pike, starry flounders, yellow fin sole, arctic flounder, Alaska plaice, grayling, burbot, Pacific herring in the Fall, and halibut (Appendix G1).

Subsistence utilization of these species has been documented although effort and catch vary widely in scale and importance with locality. Some of these species are important to the subsistence community in certain localities during specific seasons of the year.

Until 1984, sale of any of these species had never been documented in this area, although unreported sales had occurred. The City of Selawik Cooperative Whitefish Project was issued a permit allowing a harvest and sale of up to 1,000 pounds each of burbot and pike as an incidental part of their commercial harvest of whitefish. A total of 1,232 pounds of pike were reported sold locally as dried fish. An amendment to the existing permit was granted allowing up to 1,332 pounds of pike to be harvested so a shipment of an additional 100 pounds could be allowed for a frozen fish market test. No sales of burbot from the Selawik area were reported in 1984.

In 1985, the City of Selawik was issued a permit allowing a harvest of up to 3,000 pounds each of burbot and pike as an incidental part of their commercial whitefish harvest. The total reported harvest of burbot was 81 fish weighing 607 pounds for which the fishermen received $.85 per pound. Pike were sold as fresh or dried fish. A total harvest of 1,228 pike was reported; 196 fish weighing 918 pounds were sold for $.85 per pound; 1,031 pike were sold as dried fish for which fishermen received $12.00 per string of 6 fish (no weights given). The dollar

value of the dried pike was thus $2,064.00; the total dollar value of burbot and pike combined was $3,360.00 during 1985.

In 1986, the City of Selawik was granted a permit to harvest 3,000 pounds each of pike and burbot. A total of 546 pike (approximately 4,368 pounds) were landed by beach seine and gill net and sold. Fishermen received $12 per string of 6 pike. An assumed weight of 8 pounds per pike was used since these fish were sold as dried fish. No burbot sales were reported. The City of Selawik terminated operations after the 1986 season.

Additionally, there were reported sales of 65 burbot (294 pounds) from the Noatak River in 1986 for $.75 a pound and one fisherman from Port Clarence sold 600 pounds of Fall herring at $.45 a pound.

No freshwater fishery permits for pike and burbot were requested in 1986 nor 1987 in the Norton Sound or Port Clarence districts. There is little information available on the population status and dynamics of many of these species, but there has been no evidence based on limited Department observations and interviews with fishermen, that any of these species are declining in numbers.

In 1992, one commercial fisherman reported selling 160 pounds of fall bait herring. One other fisherman reported the sale of three halibut totalling 185 pounds from the Nome area.

Appendix G1. List of common and scientific names of finfish species of the Norton Sound-Port Clarence-Kotzebue Districts.

Arctic lamprey	Lampetra japonica
Arctic char	Salvelinus alpinus
Arctic cod	Boreogadus saida
Arctic flounder	Liopsetta glacialis
Arctic grayling	Thymallus arcticus
Alaska plaice	Pleuronectes quadrituberculatus
Burbot	Lota lota leptura
Bering cisco	Coregonus laurettae
Bering poacher	Ocella dodecaedria
Bering wolffish	Anarhicas orientalis
Blackfish	Dallia pectoralis
Boreal smelt (rainbow-toothed)	Osmerus epselanus
Broad whitefish	Coregonus nasus
Capelin	Mallotus villosus
Dolly Varden	Salvelinus malma
Pond smelt	Hypomesus olidus
Humpback whitefish	Coregonus pidschian
Inconnu (sheefish)	Stenodus leucichthys
Lake trout	Salvelinus namaycush
Least cisco	Coregonus sardinella
Longhead dab	Liranda proboscidea
Ringtail snailfish	Liparis rutteri
Northern pike	Esox lucius
Longnose sucker	Catostomus
Pricklebacks	Stichaeidae
Pacific herring	Clupea harengus pallasi
Rock flounder	Lepidosetta bilineata
Rock greenling (terpug)	Hexagrammus lagocephalus
Round whitefish	Prosopium cylindraceum
Sculpins	Cottidae
Pink salmon	Oncorhynchus gorbuscha
Chum salmon	Oncorhynchus keta
Coho salmon	Oncorhynchus kisutch
Sockeye salmon	Oncorhynchus nerka
Chinook salmon	Oncorhynchus tshawytscha
Saffron cod	Eleginus gracilis
Starry flounder	Platichthys stellatus
Sandlance	Amrodytes hexapterus
Sturgeon poacher	Agonus acipenserinus
Threespine stickleback	Gasterocteus aculeatus
Ninespine stickleback	Pungitius
Tubenose poacher	Pallasina barbata aix
Whitespotted greenling	Hexagrammus stelleri
Yellowfin sole	Limanda aspera

Appendix G2. Studies conducted within the Norton Sound, Port Clarence, and Kotzebue Districts, 1992.

Kwiniuk River Salmon Counting Tower

a) Location: About five miles upstream from the mouth of the Kwiniuk River in Norton Sound.

b) Objectives: Determine daily and seasonal timing and magnitude of chum and pink salmon runs. Determine age, sex and size of chinook and chum salmon of the commercial harvest in Moses Point subdistrict.

c) Results: The 1992 total expanded tower count: 479 chinook, 1,646,717 pink, and 12,077 chum.

Unalakleet Salmon Escapement Studies

a) Location: Unalakleet River

b) Objective: To maintain an index of salmon migration up the Unalakleet River using test gill nets.

c) Results:

1) The mean day of catch for chinook, chum, pink, and coho salmon was 6/12, 7/11, 7/13, and 8/12, respectively. The peak daily catch of chinook, chum, pink, and coho salmon occurred on 7/16, 7/06, 7/13, and 8/11, respectively.

2) The predominant age class in the test fish catch by the European aging method, by species was: chinook salmon 1.2 (age 4), chum salmon 0.4 (age 5) and coho salmon 2.1 (age 4).

3) The predominant age class in the commercial catch by the European aging method, by species was: chinook salmon 1.2 (age 4), chum salmon 0.4 (age 5) and coho salmon 2.1 (age 4).

Noatak River Test Fish Project

a) Location: Lower Noatak River

b) Objectives:

1) To evaluate the feasibility of indexing chum salmon escapement in the Noatak River using systematic drift gill net catches.

2) Begin historical database of chum salmon escapement:

a. Index escapement abundance on a daily and seasonal basis for the Noatak River chum salmon return.

b. Describe the migratory timing of chum salmon in the Noatak River.

c. Estimate the age composition of the Noatak River chum salmon escapement.

c) Results:
1) Fishing began on July 19 and continued through August 25. The data collected was of minimal use for inseason management since just one other year (1987) of data from this fishing site exists for comparison.

2) A total of 1,409 chum salmon were caught in a total of 83 drift time periods.

3) Scale sample analysis from 1,259 chum salmon caught in test drift nets indicated an age composition of 11.5% 0.2 (age 3), 71.9% 0.3 (age 4), 14.9% 0.4 (age 5), 1.5% age 0.5 (age 6), and 0.2% 0.6 (age 7).

Subsistence Fishing Surveys

a) Location: Norton Sound and Kotzebue Districts.

b) Objectives: Determine subsistence utilization of salmon for formulating management procedures and goals. House-to-house surveys were conducted in the Kotzebue District villages of Noatak, Shungnak and Noorvik. Subsistence salmon permit returns in the Nome subdistrict was the only data collected in the Norton Sound District. The remaining fishing villages of the Norton Sound and Kotzebue Districts, and the Port Clarence District, were not surveyed due to budget limitations.

c) Results:
1) A total of 66 households were surveyed in the Kotzebue District villages of Shungnak, Noorvik, and Noatak. The total reported chum salmon harvest was 14,303 fish.

2) A total of 138 permits of 163 issued for the Nome subdistrict of Norton Sound were returned in 1992. Their reported catches totaled 152 chinook, 163 sockeye, 7,351 pink, 1,684 chum, and 1,481 coho salmon.

Commercial Catch Sampling

a) Locations: Norton Sound, Port Clarence and Kotzebue Sound.

b) Objective: Obtain age, sex, and size information for commercially caught salmon and king crab. No commercial herring samples were taken due to no commercial fishery occured in Norton Sound during 1992.

c) Results: Approximately 7,180 salmon and king crab were sampled in 1992. These data are being analyzed and will be presented in separate reports.

Nearshore Winter King Crab Tagging Study (project was not funded in 1992)

a) Location: Ocean waters of Norton Sound 1 to 2.5 miles south of Nome.

b) Objective: To observe the abundance and distribution of red king crab in

nearshore Nome waters. To study migration and estimate the number of repeat crab captures. Also to evaluate the effectiveness of the "15 mile summer commercial crab closure" in protecting inshore crab; to obtain basic life history data.

Herring Test Fishing

a) Location: Norton Sound ocean waters; one camp located at Cape Denbigh; a second test fish crew operated out of Unalakleet.

b) Objectives: To determine age class composition of the Norton Sound herring return through test fishing with variable mesh gill nets.

c) Results: Gill nets were operated from June 5 through June 25. Scale analysis of test fish catches has been completed; results are listed in Figure 13.

Appendix G3. Emergency orders issued during 1992.

Emergency Order Number	Effective Date	Action Taken	Comments
3-Z-S-1-92	June 24, 1992 11:59 pm ADT	Closed the Nome Subdistrict to subsistence salmon fishing in the Sinuk, Cripple, Penny, Snake, Nome, Flambeau, Eldorado, Bonanza, and Solomon Rivers. In addition the waters of Safety Sound and Bonanza Channel inside the barrier spit and Safety Bridge, as well as acean waters from the Cape Nome Jetty west to the Sinuk River mouth are closed to salmon fishing from June 24 through July 31.	During the four year period, 1987 to 1990 salmon escapements in the immediate Nome area were well below historic levels and the levels the department staff believes are needed to main tain the salmon runs. this is particularly true of the chum salmon stocks. During 1991, the trend of declining chum salmon escapements was broken. Most streams in the Nome area were judged to have adequate chum escapement levels. A similar management technique to what was used in 1991 is planned for the 1992 season, although the closures are not expected to last as long. Subsistence fishing will reopen as pink salmon become abundant. Various locations and streams will be judged individually and opened on the basis of their individual chum salmon escapement and pink salmon abundance. The staff will be flying frequent surveys and boating some of the rivers to track the salmon migration's strength and progress. If a stream appears to have adequate escapement, restrictions will be lifted in that area; otherwise, the restrictions will remain in place until they no longer benefit the species of concern.
3-Z-S-2-92	June 24, 1992 1:00 pm ADT	This emergency order moves the commercial fishing opening date for the Nome Subdistrict from July 1 to August 1.	The Nome Subdistrict commercial salmon fishery has always targeted chum salmon during the month of July. Because of the depressed state of the chum salmon stocks in the Nome area, severe restrictions in all forms of chum harvest are required to allow adequate chum salmon escapement in local streams. Until the subsistence chum salmon harvest needs are anticipated to be met, neither the commercial or sport fisheries will be opened. This emergency order provides for a commercial fishery targeting coho salmon during August.
3-Z-S-3-92	July 2, 1992 6:00 a.m. ADT	This emergency order restricts commercial salmon gill nets to not more than six inches mesh size through out Norton Sound effective July 2.	Commercial salmon regulations state that a six inch mesh limit must be placed on gill nets between July 1 and July 15. Since chinook salmon have only been caught and observed in very small numbers, no commercial openings have been allowed. It was assumed that because of the large value difference between chinook and chum salmon, chinook would have been targeted in a commercial fishery. Chum salmon are becoming more abundant each day and are migrating upstream in strong numbers indicating adequate escapement has occurred during the early portion of the migration in eastern Norton Sound streams. This emergency order will allow commercial fishing periods targeting chum salmon to occur.

Appendix G3. Emergency orders issued during 1992.

Emergency Order Number	Effective Date	Action Taken	Comments
3-Z-S-4-92	July 2, 1992 6:00 a.m. ADT	This emergency order opens the Norton Bay, Shaktoolik and Unalakleet Subdistricts to commercial salmon fishing for 48 hours beginning Thursday, July 2 until Saturday July 4. The commercial fishing period at Unalakleet will run from Noon Thursday until Noon Saturday, but in the Norton Bay and Shaktoolik Subdistricts the period will run from 8:00 a.m. Thursday until 8:00 a.m. Saturday.	Subsistence catch data and the Unalakleet test fishing data both indicate the chum salmon migration is now moving into the rivers. Chum salmon catches have been strong in the Unalakleet River for the past five days. This indicates a good start on escapement. The Fish and Game staff is concerned about the poor showing of king salmon and the incidental harvest that will occur in this opening. The scheduling of future openings will depend on how the king harvest compares with the escapement indices. The staggered periods announced in this action are in response to the only salmon buyer in Norton Sound's request. He hopes to minimize his costs and spoilage by consolidating the various subdistricts harvests in shipment. Commercial fishermen are reminded that unsold salmon caught in commercial gear must be reported on fish tickets.
3-Z-S-5-92	July 2, 1992 8:00 p.m. ADT	This emergency order opens the Moses Point Subdistrict to commercial salmon fishing for 24 hours beginning Thursday, July 2 at 8:00 p.m. until Friday July 3 at 8:00 p.m.	Chum salmon have been moving past the Kwiniuk River tower for the past five days. Currently there is no buyer in the Moses Point Subdistrict. The potential commercial harvest of this opening is small. By allowing an opportunity for commercial harvest at this time, chum escapement is not expected to be seriously affected. The opening will allow some fishermen to gain some income and will serve as means to evaluate the strength of the chum run. The opening is timed in such a way to allow the fishermen to sell their catch in neighboring subdistricts after the Moses Point closure.
3-Z-S-6-92	July 3, 1992 6:00 p.m. ADT	This emergency order opens the Golovin Bay Subdistrict to commercial salmon fishing for 24 hours beginning Friday, July 3 at 6:00 p.m. until Saturday July 4 at 6:00 p.m.	At least one Golovin Bay fisherman has found a market for his commercial catch. The chum salmon migration is under way and chums have had five days to move into the rivers in good numbers. Chum salmon are most valuable as ocean brights early in the season. Since markets for chum salmon are hard to find and the potential harvest is small a 24 hour test opening will be allowed. Fishermen are advised that other openings in Golovin Bay are anticipated and that before fishing they need to be sure they can sell their catch. A new regulation requires unsold commercially caught salmon to be reported on fish tickets.

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Emergency Order Number	Effective Date	Action Taken	Comments
3-Z-S-7-92	July 6, 1992 8:00 a.m. ADT	This emergency order opens the Shaktoolik and Unalakleet Subdistricts to a standard commercial salmon fishing schedule for two 48 hour openings each week beginning Monday, July 6 until further notice. The commercial fishing periods at Unalakleet will run from Noon Monday until Noon Wednesday and from Noon Thursday until Noon Saturday, but in the Shaktoolik Subdistrict the periods will run from 8:00 a.m. Monday until 8:00 a.m. Wednesday and from 8:00 a.m. Thursday until 8:00 a.m. Saturday.	Subsistence catch data and the Unalakleet test fishing data both indicate the king and chum salmon migration is continuing to move into the rivers. Both king and chum salmon catches have remained strong in the Unalakleet River since the first opening. This indicates continued escapement. King salmon escapement is still thought to be low but improving. The restriction of commercial gillnets to six inch or less mesh size seems to be allowing some escapement. The staggered periods announced in this action are in response to the request of the only salmon buyer in Norton Sound. He hopes to minimize his costs and spoilage by consolidating the various subdistricts harvests in shipment. Commercial fishermen are reminded that unsold salmon caught in commercial gear must be reported on fish tickets.
3-Z-S-8-92	July 6, 1992 8:00 a.m. ADT	This emergency order opens the Norton Bay Subdistrict to a standard commercial salmon fishing schedule for three 24 hour openings each week beginning Monday, July 6 until further notice. The commercial fishing periods in Norton Bay will run from 8:00 a.m. Monday until 8:00 a.m. Tuesday, from 8:00 a.m. Wednesday until 8:00 a.m. Thursday and from 8:00 a.m. Friday until 8:00 a.m. Saturday.	Salmon have been moving into the rivers of Norton Sound in strong numbers for well over a week now. For the first time in several years a salmon buyer has shown interest in buying salmon from the Norton Bay Subdistrict. Over the last several years salmon escapements in the Ungalik and Inglutalik Rivers have been strong. To accommodate both the commercial fishermen and the buyer three 24 hour opening each week will be allowed in order to harvest as many salmon as the buyer can transport in his tender. The staggered periods announced in this action are in response to the request of the only salmon buyer in Norton Sound. He hopes to minimize his costs and spoilage by consolidating the various subdistricts harvests in shipment. Commercial fishermen are reminded that unsold salmon caught in commercial gear must be reported on fish tickets.
3-Z-S-9-92	July 6, 1992 8:00 a.m. ADT	This emergency order opens the Golovin Bay Subdistrict to a standard commercial salmon fishing schedule for two 48 hour openings each week beginning Monday, July 6 until further notice. The commercial fishing periods at Golovin Bay will run from 6:00 p.m. ADT Monday until 6:00 p.m. ADT Wednesday and from 6:00 p.m. ADT Thursday until 6:00 p.m. ADT Saturday.	Some Golovin Bay fishermen are acting as catcher sellers and have found limited markets for their commercial catches. Prior to the season a harvestable surplus of 10,000 chum salmon was thought to occur during 1992. Since a harvestable surplus of salmon is thought to be present and only a limited harvest is occuring the standard fishing schedule will be allowed. Commercial fishermen are reminded that unsold salmon caught in commercial gear must be reported on fish tickets.

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Emergency Order Number	Effective Date	Action Taken	Comments
3-Z-S-10-92	July 9, 1992 6:00 p.m. ADT	This emergency order opens most waters of the Nome Subdistrict to subsistence fishing, while maintaining the closure of the Snake, that portion of the Nome River above the VOR site, Flambeau and Eldorado Rivers. In addition, the waters of Safety Sound up to the confluence of the Eldorado and Flambeau Rivers are open to Subsistence fishing.	Recent salmon surveys of the local Nome rivers indicate an abundance of pink salmon are present and that chum salmon are well up stream. Chum salmon escapements are roughly one-half to three-quarters of the goals set for the Nome and Sinuk Rivers. The large number of pink salmon present in the open areas is expected to reduce the chance of net fishing capturing other species. This emergency order has opened only the areas where the abundant pink salmon resource will protect the limited chum salmon. The closed waters are areas of concern because the chum salmon escapement there is judged to be more vulnerable to harvest than elsewhere. The staff will continue to fly frequent surveys and boat some of the rivers to track the salmon migration's strength and progress. Peak aerial surveys for chum and pink salmon are expected next week. As chum salmon escapement increases in the closed rivers the likelihood of subsistence openings increases.
3-Z-S-11-92	July 9, 1992 6:00 p.m. ADT	This emergency order allows beach seining of salmon other than chum salmon in waters open for subsistence fishing. Beach seining is not allowed upstream of the regulatory markers on the Sinuk River two miles above the mouth, in the Nome River above a marker at Osborne, and on the Solomon River upstream of a marker near Jerusalem Creek.	Recent salmon surveys of the local Nome rivers indicate pink salmon are near record levels, however chum salmon run strength is below normal. Other salmon species seem to be present in normal abundance. Beach seining is a customary and traditional method of harvesting salmon and the Board of Fisheries has directed the staff to allow normal subsistence practices to occur when fishery stocks are not threatened. Since beach seining is the preferred subsistence fishing method it will be allowed in areas where it is not likely to have a long term effect on salmon resources.
3-Z-S-12-92	July 13, 1992 6:00 p.m. ADT	This emergency order opens the Nome River to subsistence fishing from the marker at Osborn to a point 200 yards from the mouth, while maintaining the closure of the Snake, Flambeau and Eldorado Rivers. Subsistence fishers are reminded that while it is legal to keep chum salmon caught in gill nets; chum salmon caught in beach seines must be returned to the water.	Aerial salmon surveys flown today and last Thursday found numerous pink salmon in the Nome River. Chum salmon escapement in the Nome River is thought to be adequate. Aerial surveys flown on the Eldorado, Flambeau and Snake Rivers found relatively weak escapements of pink and chum salmon. The Snake, Flambeau and Eldorado Rivers will remain closed until salmon escapement increases.
3-Z-S-13-92	July 19, 1992 Noon ADT	This emergency order opens the Unalakleet Subdistrict to commercial salmon fishing with set gill nets of four and one-half inch mesh or less for twelve hours beginning noon Sunday July 19.	A market for 100,000 pounds of pink salmon has opened in the Unalakleet Subdistrict. The buyer must leave soon and wishes to fill his order rapidly. The pink salmon run has been strong for the last two weeks and pink salmon escapements have more than been met. By limiting gear size to four and one-half inch mesh incidental harvest of other salmon species is expected to be minimized.

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Emergency Order Number	Effective Date	Action Taken	Comments
3-Z-S-14-92	July 19, 1992 Noon ADT	This emergency order extends the special four and one-half inch or less mesh commercial salmon fishing opening that began noon Sunday July 19 until noon Monday July 20.	Poor weather has delayed fishermen in setting their nets. The limit of four and one-half inch mesh will minimize the incidental harvest of the other salmon species. The near record run of pink salmon can easily support the additional 12 hour harvest. Noon Monday marks the opening of the standard chum salmon opening, so fishing can be continuous. However, after noon Monday fishermen may use nets with up to six inch mesh if they wish.
3-Z-S-15-92	July 23, 1992 Noon ADT	This emergency order maintains the Shaktoolik and Unalakleet Subdistricts on a standard commercial salmon fishing schedule for two 48 hour openings each week until further notice, except the Unalakleet Subdistrict will open and close at 3:00 p.m.. The commercial fishing periods at Unalakleet will run from 3:00 p.m. Monday until 3:00 p.m. Wednesday and from 3:00 p.m. Thursday until 3:00 p.m. Saturday, and in the Shaktoolik Subdistrict the periods will continue to run from 8:00 a.m. Monday until 8:00 a.m. Wednesday and from 8:00 a.m. Thursday until 8:00 a.m. Saturday.	Subsistence catch data and the Unalakleet test fishing data both indicate the king and chum salmon migration is continuing to move into the rivers. Escapement indices for both king and chum salmon indicate strong escapements in the Unalakleet River. A group of commercial fishermen and their helpers have asked that the Unalakleet opening and closing times be set back to 3:00 p.m.. They felt they would be better able to fish at those times. The fish buyer did not express strong objections to the new timing, so the period was adjusted to benefit what seems to be a majority of the fishermen. The staggered periods announced in this action are in response to the request of the only salmon buyer in Norton Sound. He hopes to minimize his costs and spoilage by consolidating the various subdistricts harvests in shipment. Commercial fishermen are reminded that unsold salmon caught in commercial gear must be reported on fish tickets.
3-Z-S-16-92	August 6, 1992 Noon ADT	This emergency order maintains the Shaktoolik and Unalakleet Subdistricts on a standard commercial salmon fishing schedule for two 48 hour openings each week until further notice, except the Unalakleet Subdistrict will open and close at 12:00 noon. The commercial fishing periods at Unalakleet will run from 12:00 noon Monday until 12:00 noon Wednesday and from 12:00 noon Thursday until 12:00 noon Saturday, and in the Shaktoolik Subdistrict the periods will continue to run from 8:00 a.m. Monday until 8:00 a.m. Wednesday and from 8:00 a.m. Thursday until 8:00 a.m. Saturday.	Subsistence catch data and the Unalakleet test fishing data both indicate the coho salmon migration is strong. With the unanticipated large catch of coho salmon last period, the buyer was unable to ship all the harvest and 12,000 pounds of fish spoiled. Both the local buyer and the parent company have stated they can not continue to buy until 3:00 p.m. on Saturday. They have requested a change in periods to reflect that decision. The Department is obligated to maximize the benefit to the state from the abundant coho salmon resource and to avoid wasting fish. The Unalakleet fishing schedule is now set back to the original schedule of noon openings and closures that was feasible earlier in the season. The staggered periods announced in this action are in response to the request of the only salmon buyer in Norton Sound as well. He hopes to minimize his costs and spoilage by consolidating the various subdistrict's harvests in shipment. Commercial fishermen are reminded that unsold salmon caught in commercial gear must be reported on fish tickets.

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Emergency Order Number	Effective Date	Action Taken	Comments
3-Z-S-17-92	August 14, 1992 6:00 p.m. ADT	This emergency order increases the Nome Subdistrict commercial salmon fishing period length to two 48 hour periods per week until further notice. The commercial fishing periods will run from 6:00 p.m. Monday until 6:00 p.m. Wednesday and from 6:00 p.m. Thursday until 6:00 p.m. Saturday.	Recent Fish and Game aerial surveys and boat surveys of Nome area streams indicate the coho salmon return is strong and the chum salmon run is essentially over. Only three Catcher/Seller fishermen and no major fish buyers have registered to operate in the Nome Subdistrict. It is felt that increased fishing time on a small scale will have minimal affect on coho escapement to area streams and increase commercial fishing opportunity.
3-Z-S-18-92	August 14, 1992 6:00 p.m. ADT	This emergency order increases the Golovin Subdistrict commercial salmon fishing period length to seven days a week until further notice.	Recent Fish and Game aerial surveys of the Nome area, the Department test net in the Unalakleet River and commercial catches in the southern subdistricts indicate the coho salmon return is strong throughout Norton Sound and the chum salmon run is essentially over. Only one Catcher/Seller fisherman and no major fish buyers have registered to operate in the Golovin Subdistrict. It is felt that increased fishing time will have minimal affect on coho salmon escapement to the area streams and increase fishing opportunity.
3-Z-S-19-92	August 21, 1992 8:00 a.m. ADT	This emergency order opens the Moses Point Subdistrict of Norton Sound to commercial salmon fishing beginning at 8:00 a.m., Friday, August 21 and closes at 6:00 p.m., Saturday, August 22.	Recent Fish and Game aerial surveys of the Nome area, the Department test net in the Unalakleet River and commercial catches in the southern subdistricts indicate the coho salmon return is strong throughout Norton Sound and the chum salmon run is essentially over. There has been no commercial salmon harvest in the Moses Point Subdistrict this season due to lack of market. A commercial salmon buyer has expressed interest in operating in the Moses Point Subdistrict but has a limited capacity. This Emergency Order is to accommodate the buyers' schedule and allow fishing opportunity on a stock that is felt capable of handling this level of exploitation.
3-Z-S-20-92	August 26, 1992 12:00 noon ADT	This emergency order increases the Unalakleet and Shaktoolik Subdistrict commercial salmon fishing period lengths to seven days a week until further notice.	The coho salmon return to southern Norton Sound appears very strong as indicated by record commercial catches in the Unalakleet Subdistrict and record test fish catches in the Unalakleet River. Only one major commercial buyer is operating in these subdistricts and has announced that they will stop buying salmon Friday evening, August 28 for the season even though the commercial salmon season is scheduled to continue until September 5. By changing to a 7 day per week schedule beginning on Wednesday August 26, an additional 24 hours of fishing time is allowed, while the buyer is still operating, in order to compensate for the shortened season realized by the fishermen. The commercial catch is expected to be very limited after the buyer leaves because it will be restricted to only fishermen that are able to find there own markets as catcher/sellers.

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Emergency Order Number	Effective Date	Action Taken	Comments
			Commercial fishermen are expected to be assured of their own markets before they go fishing.
3-Z-S-21-92	August 24, 1992 6:00 p.m. ADT	This emergency order opens the Moses Point Subdistrict of Norton Sound to commercial salmon fishing beginning at 6:00 p.m. ADT, Monday, August 24 and closes at 6:00 p.m. ADT, Wednesday, August 26.	The coho salmon run is well beyond it's peak as indicated by the Department's test net in the Unalakleet River and the commercial fishery throughout Norton Sound. Catches continue to be good and have set new records. A fish buyer has decided that catches are good enough to make another trip to Moses Point to buy salmon. Since the coho salmon return appears strong and the exploitation level is expected to be low, this 48 hour period has been scheduled.
3-Z-S-22-92	August 28, 1992 8:00 a.m. ADT	This emergency order opens the Moses Point Subdistrict of Norton Sound to commercial salmon fishing beginning at 8:00 a.m., Friday, August 28 and closes at 6:00 p.m., Saturday, August 29.	Coho salmon catches continue to be good in the Moses Point Subdistrict with a cumulative total of 2100 fish. There has seldom been a directed commercial market for coho salmon in the subdistrict, but when it has taken place season totals have been around 5000 fish. The run is well beyond its peak and adequate escapement is believed to have already been achieved. It is felt that there is little risk in allowing this period.
3-Z-S-23-92	August 31, 1992 6:00 p.m. ADT	This emergency order extends the commercial fishing season in the Nome Subdistrict to September 5. There will be two 48 hour periods this week beginning at 6:00 p.m. Monday and 6:00 p.m. Thursday.	Several Nome Subdistrict streams were judged to have adequate silver salmon escapements three weeks ago. With the strong silver salmon run experienced in Norton Sound this season it is likely that silver salmon escapements are adequate in all streams. There are only two commercial fishermen operating in the Nome Subdistrict so commercial harvests are not impacting the local run too much. Some of the commercial harvest is sold locally and allows local people to enjoy salmon that might not otherwise. Since escapement seems strong and user group conflicts are minimal the commercial salmon season is extended to include the current week.
3-Z-S-24-92	September 2, 1992 9:00 a.m. ADT	This emergency order opens the Moses Point Subdistrict of Norton Sound to commercial salmon fishing beginning at 9:00 a.m., Wednesday, September 2 and closes at 6:00 p.m., Thursday, September 3.	Coho salmon catches continue to be good in the Moses Point Subdistrict with a cumulative total of 2800 fish. There has seldom been a directed commercial market for coho salmon in the subdistrict, but when it has taken place season totals have been around 5000 fish. The run is well beyond its peak and adequate escapement is believed to have already been achieved. The exploitation level is expected to be low, therefore it is felt that there is little risk in allowing this additional fishing time.

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Emergency Order Number	Effective Date	Action Taken	Comments
3-Z-H-1-92	July 28, 1992 6:00 p.m. ADT	This emergency order opens the Nome herring Subdistrict to commercial herring fishing, beginning 6:00 p.m. Tuesday until noon Saturday.	Commercial crab and halibut fishermen have requested that they be given an opportunity to catch herring for use as bait. The food and bait season is set in regulation to begin September 1 and the guideline harvest is ten metric tons. This food and bait allocation has not been taken since the regulation went into effect. Local subsistence fishermen report herring in the vicinity of Nome recently. Since the allocation has been set and there appears to be a reasonable chance of harvesting herring an experimental opening will be allowed. Fishermen are reminded that a license is required to commercially harvest herring and that herring used as commercial bait by the permit holder must be reported on fish tickets.
3-Z-H-2-92	August 25, 1992 5:00 p.m. ADT	This emergency order opens the Nome herring Subdistrict to commercial herring fishing, beginning 5:00 p.m. Tuesday August 25 until 5:00 p.m. Sunday November 15.	The fall food and bait fishery is scheduled to open September 1 with a harvest limit of 10 metric tons. Local fishermen have requested that the season be opened early to accommodate a bait market. An earlier opening demonstrated the availability of herring. There are no conservation concerns with the current population levels of herring or the small harvest limit. Species likely to be caught incidentally are not in short supply. Therefore, the fall herring fishery will be opened until the normal closure time to accommodate fishermen who might find markets for their catch.
3-Z-K-1-92	August 3, 1992 Noon ADT	This emergency order closes the summer commercial king crab fishery in the Norton Sound Section effective noon August 3.	A NMFS trawl study estimated 3,400,000 pounds of legal male red king crab to be in open waters during late August 1991. The Norton Sound red king crab stock has been exploited at 10% in recent years while maintaining a modest upward trend. Twenty-seven vessels have registered for the fishery. Each vessel is allowed 100 pots. From 1983 to 1990, the catch rate in the fishery has averaged 19 legal crab per pot per day. Using these figures, a two day harvest would produce 340,000 pounds of crab.
3-X-S-1-92	July 9, 1992 8:00 p.m. ADT	This emergency order places the Kotzebue District on the normal commercial salmon fishing schedule of two 24 hour periods per week beginning at 8:00 p.m. Thursday, July 9 until further notice. The commercial fishing periods will run from 8:00 p.m. Monday until 8:00 p.m. Tuesday and from 8:00 p.m. Thursday until 8:00 p.m. Friday.	In keeping with the management plan published prior to the season, the commercial fishery will open the evening of July 9. The most reliable index of chum salmon run strength is the commercial catch rate. Comparisons of catch rate trends over not less than three periods to the recent 12 year average will be the basis of management decisions made this year. Typically the fishing periods during July are held to 24 hours in length. Unless catch rates deviate significantly from the average, the normal July fishing schedule will continue until August 1.

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Emergency Order Number	Effective Date	Action Taken	Comments
3-X-S-2-92	July 20, 1992 6:00 p.m. ADT	This emergency order places the Kotzebue District on the normal commercial salmon fishing schedule of two 24 hour periods per week beginning at 6:00 p.m. Thursday, July 9 until further notice. The commercial fishing periods will run from 6:00 p.m. Monday until 6:00 p.m. Tuesday and from 6:00 p.m. Thursday until 6:00 p.m. Friday.	As a result of a majority vote at the Kotzebue Fishermen's Association meeting, the opening and closing time of the commercial fishery has been moved up two hours. The catch rates and total harvest to date do not indicate a chum salmon run strength significantly different from the 13 year average for the same dates. The fishing period length will remain at the usual 24 hours until further notice for that reason.
3-X-S-3-92	July 23, 1992 8:00 a.m. ADT	This emergency order places the Kotzebue District on a fishing schedule of two 36 hour periods per week beginning at 8:00 a.m. Thursday, July 23 until further notice. The commercial fishing periods will run from 8:00 a.m. Monday until 8:00 p.m. Tuesday and from 8:00 a.m. Thursday until 8:00 p.m. Friday.	The most reliable index of chum salmon run strength is the commercial catch rate. Fishing periods to date have shown an inconsistent trend in catch rates. A significant increase to an above average catch rate was seen in the fourth commercial period indicating an increase of chum salmon into the district. The cumulative catch rate to date is above the 13 year average. A lower than normal percent of four year old fish have been observed for the first three periods. This age group supports the bulk of the fishery in August and a lack of this age group is of great concern. An increase of four year old fish to near average levels was observed in the fourth period. With catch rates above average and age composition near average, additional fishing time is warranted.
3-X-S-4-92	August 12, 1992 6:00 p.m. ADT	This emergency order places the Kotzebue District on a fishing schedule of two 24 hour periods per week beginning at 6:00 p.m. Thursday, August 12 until further notice. The commercial fishing periods will run from 6:00 p.m. Monday until 6:00 p.m. Tuesday and from 6:00 p.m. Thursday until 6:00 p.m. Friday.	The Noatak River supports the majority of the Kotzebue commercial harvest. Catch rates are thought to be an indices of the escapement. Commercial periods 9 and 10 produced higher than average catch rates indicating a stronger than average run. However, the Noatak River Sonar counts to date are not indicating the run strength that the fishery is. Subsistence catches in both Noatak village and Kotzebue were indicating a weaker than normal run for this time of year. As the end of the commercial season nears, it will become more difficult to achieve our escapement objectives. If the escapement indices continues to be weak, the commercial salmon fishery may close.
3-X-S-5-92	August 17, 1992 6:00 p.m. ADT	This emergency order closes the Kotzebue District to commercial salmon fishing effective immediately.	The Noatak River supports most of the Kotzebue commercial salmon harvest at this time. The Noatak River Sonar chum salmon counts to date remain near the 1990 sonar counts when roughly half of the escapement goal was achieved. Heavy rains and consequent murky water have caused the Noatak River to become unsurveyable leaving the sonar to be the most reliable index. A period closure seems necessary to boost escapement levels. Escapement indices will be re-evaluated Wednesday August 19 and a decision will be made at that time to reopen the remainder of the season.

Appendix G3. Emergency orders issued during 1992.

Emergency Order Number	Effective Date	Action Taken	Comments
3-X-S-6-92	August 21, 1992 8:00 a.m. ADT	This emergency order places the Kotzebue District on a fishing schedule of two 24 hour periods per week beginning at 8:00 a.m. Friday, August 21 for the duration of the season. The commercial fishing periods will run from 8:00 a.m. Friday until 8:00 a.m. Saturday. Then from 6:00 p.m. Monday until 6:00 p.m. Tuesday and 6:00 p.m. Thursday until 6:00 p.m. Friday.	A period closure (Period 12) was necessary to boost escapement levels in the Noatak River. This period closure did allow additional fish passage as indicated by an increase of sonar counts. The delayed opening for Period 13 should allow additional escapement. Because of the period closure and restricted fishing time for the duration of the season, the Noatak River escapement goal should be met. The volcanic eruption of Mt. Spur has interupted scheduled flights that carry fish from Kotzebue for processing. If necessary, the department will close the fishery to prevent wasteage due to delays of airline schedules.

Appendix G4. Norton Sound–Port Clarence–Kotzebue Sound processors and associated data, 1992.

Company	Representative Address	Type of Processing	District
American Empire	Box 83 Vashon, WA 98070	King Crab	Norton Sound
Arctic Alaska Fish Company	Box 1388 Afton, WY 83110	King Crab	Norton Sound
Arctic Fish	PO Box 706 Kotzebue, AK 99752	Fresh Salmon	Kotzebue
Interior Alaska Fish Proc. Inc.	878 Lynwood Way North Pole, AK 99705	Fresh Salmon	Norton Sound
J.D. Ventures	HC–30 Box 5428 Wasilla, AK 99687	Fresh Salmon	Kotzebue
Karla Faye	4724 164th ST. SW Lynwood, WA 98037	King Crab	Norton Sound
Pacific Orion Seafoods	1700 Westlake Ave N. Suite 410 Seattle, WA 98109	Fresh Salmon	Norton Sound
Sjovind Fisheries Joint Venture	2020 235st SE Bothel,WA 98021	King Crab	Norton Sound
Whitney Foods	4401 W Intl Airport Rd Anchorage, AK 99502	Fresh Salmon	Norton Sound
Windance	20024 Palatine North Seattle, WA 98133	King Crab	Norton Sound

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