AN OVERVIEW OF THE KODIAK MANAGEMENT AREA COMMERCIAL SALMON FISHERIES WITH EMPHASIS ON MANAGEMENT ACTIVITIES, HARVEST STRATEGIES, AND STOCK STATUS, 1998

By

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INTRODUCTION

The intent of this report is to provide an overview of the Kodiak Management Area (KMA) commercial salmon fisheries, stock status, a brief review of the 1998 season, and to explain the various harvest strategies which are in effect throughout the season.

When reviewing the tables and graphics provided in this report it is important to realize that due to the 1989 EXXON VALDEZ oil spill most of the KMA remained closed to commercial salmon fishing for the entire season. Where average harvest information is used, 1989 is not included.

KODIAK MANAGEMENT AREA DESCRIPTION

Location and Boundaries

The Kodiak Management Area (KMA) encompasses waters of the western Gulf of Alaska surrounding the Kodiak Archipelago, and along that portion of the Alaska Peninsula which drains into Shelikof Strait between Cape Douglas and Kilokak Rocks at Imuya Bay (Figure 1). The archipelago is approximately 150 miles long extending from Shuyak Island south to the Trinity Islands. The Alaska Peninsula portion is about 160 miles long and is separated from the archipelago by Shelikof Strait which averages 30 miles in width. Chirikof Island, located approximately 40 miles south southwest of the Trinity Islands, is also included in the Kodiak Management Area. The regulatory description of the KMA is all waters of Alaska south of a line extending east from Cape Douglas at 58°51.10' North latitude, west of 150° West longitude, north of 55°30' North latitude, and east of a line extending south from the southern entrance of Imuya Bay near Kilokak Rocks at 156°20.22' West longitude[1].

Physical Description

Glaciation shaped the Kodiak Archipelago. Kodiak's topography ranges from sharp crested alpine peaks (which run down the northeast-southwest axis of the island), to broad U-shaped alpine valleys, to low flat bottomed wetlands. The coastline is mostly rocky and irregular, deeply indented by numerous glacially scoured straits, inlets, and branching fjords (which provide excellent sanctuaries for salmon prior to entering fresh water to spawn). Though the archipelago covers approximately 5,000 square miles of land area, there is no place on Kodiak Island that is more than 15 miles from the ocean (Buck et al. 1975). The southwest end of the island is lower with more subdued topography and a relatively smooth rounded coastline. Streams are generally short and steep, draining deep mountain lakes or small glaciers. In the southwest part of Kodiak

[1] All latitudes and longitudes currently used in ADF&G Commercial Fishing Regulations (ADF&G 1996) are based on North American datum of 1983 (5 AAC 39.997(b)). This document also follows that system.

streams are somewhat longer, flowing along wide valleys (the longest rivers, the Karluk, Sturgeon, and Ayakulik, are located in this zone and each extend about 30 miles). The western portion of the Kodiak Management Area lies along the Alaska Peninsula. While similar in many ways to the Kodiak Archipelago, and also shaped by glaciation, it is an area strongly influenced by volcanism. The rugged Aleutian Range dominates the topography, running in a northeast-southwest direction down the peninsula, and forms the boundary of the watersheds which drain into Shelikof Strait. The mountains are higher than those of the Kodiak Archipelago, with many large glaciers. Generally, temperatures are lower on average with less annual precipitation. Again, streams are relatively short and steep. Because of the local occurrence of deep beds of volcanic ash some streams are unstable with shifting stream channels.

The marine waters of the area are influenced by the Alaska Current, which moves north along the Southeast Alaska panhandle, west by the north shore of the Gulf of Alaska (past Yakutat and Prince William Sound), then south and west past Kodiak Island. The current narrows and intensifies near the archipelago, and becomes the Alaska Stream, which passes down along the Alaska Peninsula. Actual surface currents are greatly influenced by tides and strong winds associated with frequent storms in the gulf. The climate of the Kodiak region is dominated by this strong marine influence. It is characterized by mild temperatures (the overall mean annual temperature is 40 degrees F), predominantly cloudy skies (days are overcast more than half the year) with moderate to heavy precipitation (averaging over 68 inches per year, with up to 200 inches per year documented in specific locations).

The marine waters around Kodiak are among the most productive in the North Pacific. Offshore upwelling combines with abundant freshwater runoff to make near shore waters rich in nutrients. There are hundreds of species of marine fish native to the KMA, including 5 species of salmon: chinook *Oncorhynchus tshawytscha*, sockeye *O. nerka*, pink *O. gorbuscha*, chum *O. keta*, and coho *O. kisutch* salmon. In addition, healthy populations of steelhead trout *O. mykiss* are supported by the Karluk and Ayakulik River systems.

Population and Communities

Approximately 13,850 people currently reside within boundaries of the Kodiak Management Area. The majority of area residents reside in the city of Kodiak (approximately 6,860) and along the connecting road system (approximately 5,900; including the U.S. Coast Guard Base adjacent to town, and outlying communities of Monashka Bay, Bell's Flats, Pasagshak, and Chiniak). The remaining 1,090 people reside in small communities scattered around the island, including the cities of Akhiok, Larsen Bay, Old Harbor, Ouzinkie, Port Lions, the village of Karluk, and a logging camp located in Danger Bay (Figure 2).

Commercial fishing and processing can account for up to 55% of the private sector work force (Northern Economics 1991). During the commercial salmon fishing season (approximately June through September) 4,000 to 5,000 people may be involved in the commercial salmon fishery. This includes approximately 1,600 to 2,000 fishers and crew, 200 to 300 tender operators and

crew, and 2,200 to 2,700 processing personnel (based on ADF&G estimate and Alaska Department of Labor statistics). The economic value of the commercial salmon fishery, based solely on the average price paid to fishers (exvessel value), has averaged about $36,000,000 annually since 1990 (Figure 3).

SALMON RESOURCES

Salmon Producing Streams

There are approximately 800 streams in which salmon migration or spawning has been documented (ADF&G 1993a). Of these, 440 streams are shown on the current Kodiak Area Salmon Statistical Area Map. Four streams support chinook salmon runs, 39 streams support sockeye salmon runs of varying size, 174 have coho salmon runs, approximately 150 have chum salmon runs, and all 440 streams support pink salmon runs. Of these streams, 92 are located in the Mainland District on the Alaska Peninsula, 18 are on Shuyak Island, 84 are on Afognak Island, 234 are on Kodiak Island, and 12 are on the Trinity Island group (Table 1).

Biological Escapement Goals

The Alaska Department of Fish and Game (ADF&G) Division of Commercial Fisheries (DCF) has established biological escapement goals, or the annual number of spawning salmon required inriver to sustain production levels, for each salmon species. Escapement goals are generally expressed as a range, referred to as the lower and upper goals (Table 2). These escapement goals have been formulated for sockeye, pink, and chum salmon by major river system. Escapement goals have also been prepared for most major coho and chinook salmon producing streams. The KMA commercial salmon fisheries are managed to achieve escapement levels which are within the biological escapement goal range. The "targeted" escapement goals for KMA salmon, area wide, are: 15,000 chinook, 1,700,000 sockeye, 3,000,000 to 4,500,000 pink[2], 546,000 chum and 150,000 coho salmon (Table 3).

Salmon Production Potential (Wild Stocks)

An "average salmon production potential" for the KMA can be calculated by multiplying the escapement goal by an assumed average return per spawner, for each species (Table 3). The annual "potential harvest" is calculated by subtracting the targeted escapement goal. Assuming that escapement requirements are achieved, and that the actual return per spawner values for

[2] Pink salmon production in individual systems can be large one year, then small the next. On Kodiak there has been an "even year dominance"; that is, during even numbered years several major pink salmon systems produce larger returns. Hence the escapement goal is different between odd and even years, with odd numbered years having lower goals, and even years having higher goals.

each species are near the assumed values, the potential annual salmon harvest should average 22,500 chinook, 4,590,000 sockeye, 6,000,000 to 9,000,000 pink (depending on the cycle year), 982,000 chum, and 225,000 coho salmon. However, due to variable environmental conditions encountered throughout the life cycle of these species, fluctuations in salmon production do and will continue to occur.

Supplemental Production

There are two hatcheries located in the KMA which produce salmon to supplement natural salmon production (Figure 2). Both hatcheries, Kitoi Bay and Pillar Creek, are operated by the Kodiak Regional Aquaculture Association (KRAA). Kitoi Bay hatchery has an incubation capacity of 242,000,000 eggs, and is located on the east side of Afognak Island. The Kitoi Bay facility produces primarily pink salmon. Sockeye, chum, and coho salmon are also produced. Some outstocking of coho and sockeye fry or smolt occurs, but the majority of the salmon are intended to return to the hatchery for common property harvest. Pillar Creek hatchery, with an incubation capacity of 20,000,000 eggs, is located north of the city of Kodiak at Monashka Bay. It is utilized primarily as an incubation facility for sockeye salmon outstocking projects.

The Kodiak Regional Planning Team (KRPT) identified sockeye salmon as the priority species for supplemental production. KRAA and ADF&G are involved in limnological monitoring studies of KMA lakes and ongoing lake fertilization to increase sockeye salmon fry growth and survival. Lake fertilization is currently being conducted on Afognak, Malina, Laura, and Little Waterfall Lakes. Through the use of remote egg takes and hatchery incubation, sockeye salmon fry and presmolt are being stocked to enhance future sockeye salmon harvests through put and take projects, broodstock development, and also to restore systems with existing runs. Stocking of sockeye salmon for put and take fisheries occurs at Spiridon, Hidden, Crescent, Ruth, and Waterfall Lakes. Sockeye salmon stocking for broodstock development occurs in Little Kitoi Lake while backstocking for rehabilitation purposes takes place in Malina and Pauls/Laura Lakes.

The Kitoi Bay Hatchery coho and pink salmon production has seen excellent results with adult returns. Coho salmon are also outstocked into Crescent Lake near the city of Port Lions, and into Katmai Lake on Spruce Island near the city of Ouzinkie. The chum salmon production has seen variable results to date.

ADF&G Sport Fish Division has stocked coho salmon fingerlings and chinook smolt to enhance sport fishing opportunities (Schwarz 1995). Chinook salmon smolt were stocked into Island and Mission Lakes near the city of Kodiak until 1995, when Buskin River was stocked for two years. Coho salmon fry have been stocked into Island, Pony, Southern, Mayflower, Dark, Mission, Orbin, and Potato Patch Lakes near the city of Kodiak. The coho and chinook salmon stocking is intended to produce put-and-take fisheries.

Supplementing KMA salmon fisheries is an ongoing long term project. The first harvestable adult sockeye returns occurred in 1994 at Telrod Cove/Spiridon Bay. In 1999, supplemental harvests of sockeye, pink, coho, and chum salmon are expected (Table 4). The Kodiak Regional Comprehensive Salmon Plan (KRPT 1992) states an objective of increasing the harvest of salmon (over and above the KMA wild salmon harvest) by an additional 3,000 chinook, 1,700,000 sockeye, 383,000 coho, 11,500,000 pink, and 1,100,000 chum salmon by the year 2002. To date, the peak years of supplemental production have produced an additional 12 million pink, 215,000 chum, 150,000 coho, 400,000 sockeye, and an undetermined number of chinook salmon to the annual harvest.

"Non Local" Salmon in the Kodiak Management Area

Salmon tagging studies have been conducted in the KMA to aid in management of commercial fisheries by estimating the stock composition present at a particular time and place, and to determine average travel time of major stocks through fishery management units. The earliest tagging study was done in 1927 (Rich and Morton 1929) and there were intermittent tagging studies through 1981 (Bowe 1941; Bevan 1959; Simon et al. 1969; Tyler et al. 1986). Most occurred along the south and west sides of the Kodiak Archipelago to learn more about the migration pathways of sockeye salmon travelling to the major systems of Kodiak (Karluk, Ayakulik, Upper Station, and Frazer). Some sockeye salmon tagging was done along the north and east sides of the archipelago (Tyler et al. 1986) and at the south west end of the KMA, along the Alaska Peninsula near Wide Bay (Simon et al. 1969). Salmon migrating through KMA waters to the Chignik and Cook Inlet Management Areas were documented. Salmon migrating through portions of Cook Inlet and South Peninsula, to Kodiak were documented in other tagging studies(Tyler and Norenburg 1957 and Eggers et al. 1987).

Based on coded wire tag recoveries, chinook salmon originating from outside the KMA have contributed to the annual harvest. Coded wire recovery sampling projects have been conducted in 1994, 1997, and 1998. The last two years are part of a three year project with the final year of sampling to be completed in 1999. The only "local" chinook stock within the KMA that has been marked with coded wire tags were the chinook fry released into the Buskin River.

Recent attempts at estimating sockeye salmon stock composition within the KMA have involved studies that used scale pattern analysis, run timing, and analysis of shifts in average weights of commercial catches (Barrett and Swanton 1992; Barrett and Nelson 1994; Swanton and Nelson 1994; Vining and Barrett 1994). Samples of KMA spawning chinook, sockeye, and chum salmon have been collected to establish baseline data for genetic stock identification.

SALMON FISHING ACTIVITY

The salmon resources of the KMA have been exploited commercially for over 150 years (Roppel 1986). The first commercial fisheries were small salted salmon ventures by the occupying Russians in the early 1800's. Salmon streams were blocked and salmon captured as they became schooled behind these barriers. Sockeye salmon returning to the Karluk River brought fishermen and processors to Kodiak soon after the territory was transferred from Russia in 1867. A record of commercial sockeye salmon harvest dating back to 1882 exists (Table 5). Intense competition led to expansion of the fishery to other areas and species. By the early 1900's fisheries for coho, pink, and chum salmon had developed.

Commercial Gear Use

Beach seines were the first gear type effectively used commercially. In the late 1800's, beach seines 40 fathoms in length were used to harvest sockeye salmon in Karluk Lagoon. As competition for fish grew the primary harvest location for Karluk sockeye salmon moved outside the lagoon, using heavily manned beach seines averaging 450 fathoms in length. The first fish trap was built in Kodiak in 1896. Until the late 1950's, the Kodiak commercial salmon fishery was dominated by cannery owned fish traps, with some independent fishers owning purse seine, beach seine and set gillnet operations. When Alaska was granted statehood in 1959, fish traps were prohibited, and the KMA commercial salmon fishery was conducted by purse seine, set gillnet, and beach seine gear (in decreasing order of abundance). In 1974 a "limited entry system" was adopted by the State of Alaska which restricted the number of individuals allowed to participate in commercial salmon fisheries. This system formally established maximum numbers of purse seine, beach seine, and set gillnet gear that could participate annually.

There are 607 commercial salmon permits for the KMA: 384 purse seine (making this the second largest purse seine fleet in the state), 34 beach seine, and 189 set gillnet. Actual numbers of set gillnet permits fished annually varies slightly. However, there is a continuing downward trend in the number of active beach seine and purse seine permits fished in recent years (Table 6). Seventy-four percent of KMA permits are owned by Alaska state residents (Table 7).

Management Units

The KMA is one of 13 designated salmon net registration areas in the State of Alaska. Inseason management of the commercial salmon fishery is structured around 7 districts subdivided into 52 sections (Figure 4). These sections are occasionally subdivided inseason to adjust fishing effort on unexpected salmon surpluses or deficits. There are also four terminal harvest areas designated in regulation to ensure orderly fisheries on salmon produced from enhancement projects. Each management unit (section) defines a traditional geographic harvest area, managed for specific stocks or traditional fishing patterns (Appendices A.1-A.6).

Legal Commercial Gear Areas

In the KMA there are restrictions on which gear types can operate in specific management units, based on historical gear use patterns. Both purse and beach seine gear are allowed to operate in the entire management area, except for the Moser-Olga Bay Section of the Alitak Bay District, where set gillnets are the only legal gear[3]. In the Central Section of the Northwest Kodiak District both set gillnet and seine gear are allowed. Since 1974, the geographical areas currently open to specific gear types have, with few exceptions, remained unchanged.

In the mid 1970's, a portion of the old Karluk District between Rocky Point and Cape Uyak was closed to set gillnet gear in an attempt to accelerate the rebuilding of the Karluk sockeye and pink salmon stocks. No gillnet gear had fished there since the early 1960's. Several purse seine locations within this area, which could impact Karluk stocks, were brought under direct management control. This area was used to provide an expanded closed water sanctuary for severely depleted Karluk sockeye and pink salmon stocks.

In the late 1970's, a gear and area adjustment occurred in the Alitak District. The common boundary between the Cape Alitak, Moser-Olga Bay, and Humpy-Deadman Sections was adjusted in an effort to reduce gear conflicts caused by an unclear boundary description. The area open to set gillnet gear was reduced from Cape Alitak to Tanner Head and was increased in Deadman Bay to a point northwest of Fox Island.

A gear and area adjustment was made in Zachar Bay to alleviate fixed and mobile gear conflicts. In the late 1970's closed water sanctuary markers were reduced (moved further into the bay) and the new area was designated "seine gear only". The creation of this small area adjacent to the closed waters within Zachar Bay was consistent with that of other major westside Kodiak bays.

In the mid to late 1980's, there were two adjustments made to boundaries in the Moser-Olga Bay Section to allow for continued use of set gillnet sites; one adjustment was in the closed water portion of Chip Cove and the other at the north end of the "Fox Island line".

In the early 1990's there was a slight adjustment to the gillnet boundary in Spiridon Bay to allow for a setnet to be fished at Hook Point.

Also, as a result of purse seine fishing activity in Shelikof Strait in 1988, the Alaska State Board of Fisheries stated that commercial salmon fishing activities will be restricted to those waters located within the State of Alaska territorial sea boundary (three mile limit). Due to conflicts between state and federal regulations, Kodiak ADF&G staff issued an emergency order closing all waters of the KMA seaward of the state territorial sea boundary for the 1991 and 1992

[3] Prior to Alaska being granted statehood, this management unit was designated set gillnet only. In 1970 this rule was amended such that the Moser-Olga Bay Section remains gillnet only prior to September 5. Seine gear is then legal in the entire Alitak Bay District. The Dog Salmon Flats, Inner and Outer Akalura, and the Inner and Outer Upper Station Sections are normally closed to commercial fishing. In the event of over escapement "mop up" fisheries can occur in these sections prior to September 5 only set gillnet gear would be allowed in these sections.

seasons. Beginning in 1993, a new regulation was in effect which states that all KMA district and section boundaries do not extend beyond the three mile limit. However, due to a conflict in the district and section descriptions, this three mile limit closure was further clarified in 1995 by simply listing those waters seaward of the state territorial sea boundary as closed to fishing under the 5 AAC 18.350 closed waters regulation.

Commercial Salmon Processing

Commercial salmon processing within the KMA began in the late 1860's with small salting and pickling operations located around Kodiak Island near major harvest areas. In 1882 processing evolved to canning, when the first cannery was built at Karluk. Kodiak's processing plants have further evolved from those scattered, seasonally operated, canning operations to today's efficient multi-tasked plants, mainly congregated within the city of Kodiak. The majority of these plants are now year-round operations, processing crab and groundfish in addition to salmon. Kodiak's processors produce fresh and frozen salmon products, supplemental to canned salmon. Recent technology used in processing other fish species has been adapted to salmon processing, yielding new, diverse salmon products (such as fillets, surimi, hams, nuggets, burgers, and salmon in a pouch).

Up to 15 salmon buyers or processors participate annually in KMA salmon fisheries. Processing plants are located in the city of Kodiak, Port Bailey, Uganik Bay, Larsen Bay, and Alitak Bay (Figure 2). The latest estimate of the sustained processing capacity of Kodiak's shorebased salmon processors is approximately 900,000 salmon (3.6 million pounds) per day. With this high processing capacity, it is common for Kodiak processors to "import" salmon harvested elsewhere in the state. At times, salmon from Bristol Bay, Cook Inlet, Prince William Sound, Alaska Peninsula, and Chignik Management areas are processed in Kodiak plants.

Subsistence Salmon Fishery

The KMA staff issues subsistence salmon permits annually to obtain harvest data. Only residents of the state of Alaska are eligible to take salmon for subsistence purposes. Since 1989 ADF&G staff have mailed out permits, regulations, and a map showing closed water areas to past participants. Additional permits are issued to Alaska residents at the Kodiak ADF&G office. Subsistence fishermen are requested to return their permits to ADF&G after the salmon season, listing areas fished by date and salmon harvested by species.

With few restrictions, the entire KMA is open to subsistence salmon fishing. Reported harvests have averaged 29,000 fish annually for the 10 year period 1988-1997 (Table 8). Sockeye salmon accounts for 69% of the harvest, followed by coho salmon at 23%. The most utilized subsistence fishing areas include the north end of Kodiak Island and the southeast side of Afognak Island. The highest reported subsistence harvest occurred in 1997 when 41,264 salmon (80% sockeye) were caught.

In addition to the state subsistence regulations, there are federal subsistence regulations that apply to the federal lands and waters located within the KMA. Only people who reside in the Kodiak Island Borough (except for those who reside on the US Coast Guard Base) are qualified to participate in the federal subsistence fishery. The federal regulations allow the use of a fishing pole for taking subsistence salmon with no record of how many fish are harvested using this gear type. All other salmon harvested under the federal regulations are required to be recorded on a state subsistence permit.

Salmon Sport Fishery

The excellent salmon sport fishing opportunities within the KMA continue to be discovered. Since the early 1980s commercial sport fishing activities have been increasing area wide. Commercial sport activity includes lodge operations, charter vessels, guiding, and directed air charter flights. Although sport caught salmon may not be sold, the lodge, guiding, and charter activities are considered commercial uses since the owner is compensated monetarily for directing and providing fishing opportunities. Most charter boat operations are based out of the city of Kodiak. Remote lodges are currently being operated at Karluk Lagoon, Ayakulik River mouth, Olga Bay, Larsen Bay, Old Harbor, Saltery Lake, Port Lions, Raspberry Strait, Seal Bay, Port Williams, Zachar Bay, Uyak Bay, Ugak Bay, Uganik Bay, and Kukak Bay. Floating cabins are located in Paramanof Bay and Karluk Lagoon. Fly in sport fishing areas include virtually all KMA chinook and sockeye salmon systems, and most major coho salmon systems.

Sport fishing activities are regulated by ADF&G's Sport Fish Division. The KMA sport fishery salmon harvest is estimated by an annual Sport Fish Division statewide mailout survey and does not include harvests from the Alaska Peninsula portion of the KMA. Sport fish salmon harvest estimates for Kodiak include both guided and non-guided combined. Over the last 21 years (1977-1997) an increasing trend is evident in the harvests of chinook and coho while there appears to be decreasing trend in the number of pink salmon harvested. Sockeye salmon harvests have also shown an overall increase. Reported annual harvests have ranged from 327 to 5,221 chinook (1980; 1997), 1,255 to 12,505 sockeye (1977; 1994), 4,716 to 23,763 coho (1977; 1997), and 5,336 to 19,044 pink salmon (1994; 1988). Annual harvests of chum salmon are generally less than 1,000 fish. (Table 9).

ADF&G STAFF INVOLVEMENT

The ADF&G, Division of Commercial Fisheries is responsible for the management of commercial and subsistence harvest activities on Alaska's salmon stocks. KMA staff responsible for regulation of the commercial salmon fishery consists of an Area Management Biologist, two Assistant Area Management Biologists, and approximately 15 seasonal employees. The Kodiak salmon research staff includes two Biologists and approximately 7 seasonal employees. A

Regional Finfish Management Biologist and a Regional Finfish Research Supervisor oversee these operations. The Kodiak salmon development staff (formerly the Fisheries Rehabilitation, Enhancement, and Development Division) includes an Area Biologist, and Assistant Area Biologist, and approximately 13 seasonal employees. Biologists and technicians from the Division of Sport Fish, Alaska State Parks, U.S. Fish and Wildlife Service (Kodiak National Wildlife Refuge), and KRAA, aid in the collection of data at various times during the salmon fishing season.

Preseason Activities

Forecasts

Preseason salmon forecasts are developed jointly by management and research biologists. Pink salmon returns to the KMA have been predicted by broad geographic area, while individual forecasts are made for major sockeye salmon stocks. In addition, supplemental production forecasts are prepared by hatchery managers and development staff. Projected harvests are estimated by fishery and area (Table 10).

The KMA pink salmon forecast has been based on a preemergent pink salmon sac fry survival study. This study had been conducted each spring by the KMA management staff since 1966. This annual program examined pink salmon overwinter egg to fry survival in specific streams during March and April. Due to budget cuts, this sampling project was not conducted in 1998. The overall 1999 wild stock pink return has been forecasted utilizing a spawner-recruit analysis approach.

System-specific sockeye salmon forecasts are developed for major stocks. Information that is used to develop these forecasts are: previous run strength information (escapement and catch); sockeye salmon smolt outmigration data; and samples of sockeye salmon escapement and commercial catch age data.

Formal forecasts are not prepared for chinook, coho, or chum salmon. Potential harvest is estimated by the Area Management Biologist based on previous escapements and observed escapement/return relationships. Similarities exist between pink and chum salmon freshwater and early marine survival. Pink salmon forecasting information (egg to fry overwinter survival estimates) have been used along with escapement data to predict chum salmon production.

Inseason Activity

By regulation, the commercial salmon fishing season in the Kodiak Management Area extends from June 5 through October 31 with actual fishing periods and areas open being set by emergency order (EO) (ADF&G 1996a). Inseason management activities focus around daily evaluations of actual run strength combined with constant monitoring of escapement levels by

species. Commercial salmon fisheries may be allowed if there are salmon surplus to escapement needs.

Escapement Estimation

The majority of sockeye and all chinook salmon escapement counts are obtained with the use of fish weirs. Weirs are used on up to 12 different spawning systems (Table 11; Figure 2). Escapement counts through fish weirs are hand tallied total counts, by species. Escapement gates are closed when personnel are not present to count. All four major sockeye salmon systems and several of the minor sockeye salmon systems escapements are monitored with fish weirs manned by ADF&G employees. The remainder are monitored by aerial observation using small fixed wing aircraft. Escapement counts are collected daily from fish counting weir sites by single side band radio. The timely and accurate data from weir camps allows for more precise stock specific management.

While some pink, chum, and coho salmon escapement counts are obtained from weirs, most counts for these species are estimated by aerial survey, and a few streams are surveyed by foot. Aerial survey and foot survey counts are considered an index of the actual escapement, for use inseason to aid fishery management[4]. Salmon buildup estimates and escapement index counts are collected from frequent fixed wing aircraft surveys of bays and streams (Table 12).

Commercial Salmon Harvest Strategy

There is a general chronology related to salmon run timing by species within the KMA (Figure 5). There are "early run" sockeye salmon present throughout June to about mid July, and "late run" sockeye salmon are available from mid July through late September. Pink and chum salmon are available and targeted during July through early September. Coho salmon are present from about August through October. Commercial salmon fisheries are structured around the seasonal abundance of salmon. Inseason management actions follow a plan described in an annual harvest strategy (Prokopowich et al. 1998). This strategy recognizes a specific chronology of management actions related to run timing by species. Included in this annual harvest strategy are descriptions of the nine BOF approved regulatory management plans which also guide inseason management actions.

During the first decade of statehood (1960's), weekly fishing periods were set preseason and usually ran from Monday through Friday. As part of a major effort in the early 1970's to start rebuilding Kodiak's depleted sockeye salmon stocks, the method of adjusting fishing time was changed from emergency order (E.O.) closures to emergency order openings. This use of the emergency order changed the actual regulatory announcement for fishing time from preseason to inseason.

[4] Expansion of index counts to estimate total return strength can be accomplished by various methods, and is done postseason by research staff. All escapement values in past Annual Management Reports are total counts from weir plus index counts, and this document follows that pattern.

Switching to emergency order openings was a monumental step in allowing for orderly inseason adjustments of fishing time based on observed run strength and was a key factor in leading to the success of Kodiak's escapement based management program. Another basic element of the current management program is that whenever possible, specific fisheries are coordinated to occur simultaneously, in order to provide for less concentrated fishing conditions which in turn lessen the potential for gear and allocative conflicts (Figure 5a).

Currently, there are four instances when fishing time is set preseason; (1) the very limited commercial test fisheries that occur in the Alitak Bay and Westside Kodiak Districts in June, (2) the two 33 hour periods for selected minor sockeye runs in June, (3) fishing schedules for terminal fisheries on enhanced salmon runs, and (4) the initial weekly periods of the general pink salmon fishery which begins on July 6. The remaining fisheries are dependent on specific escapement requirements being assured or in some cases are based on meeting the allocative requirements specified in regulatory management plans.

As mentioned earlier, there are currently nine regulatory management plans in effect for the KMA. The *Cape Igvak Salmon Management Plan* (5 AAC 18.360), in effect from June 5 though July 25, provides both allocative and biological guidelines for a directed fishery on sockeye salmon bound for Chignik. The *North Shelikof Strait Sockeye Salmon Management Plan* (5 AAC 18.361), in effect from July 6 through July 25, reduces directed fishing opportunities on migrating sockeye salmon (potentially bound for Cook Inlet streams) through the use of specific sockeye salmon harvest levels, which trigger closures of specific seaward zones while still providing harvest opportunities on local Kodiak bound stocks. Both the *Crescent Lake Coho Salmon Manage Plan* (5 AAC 18.364) and the *Spiridon Lake Sockeye Salmon Management Plan* (5 AAC 18.366) relate to the management of terminal harvest fisheries on returns from salmon enhancement projects.

The remaining five regulatory plans, the *Alitak Bay District Salmon Management Plan* (5 AAC 18.361), the *Westside Kodiak Management Plan* (5 AAC 18.352), the *Eastside Afognak Management Plan* (5 AAC 18.365), the *Eastside Kodiak Salmon Management Plan* (5 AAC 18.367), and the *North Afognak/Shuyak Island Salmon Management Plan* (5 AAC 18.368) are all plans that are in effect for the entire season. These plans specify which species throughout the season affect fisheries in specific sections. The plans, when originally adopted into regulation, recognized a historical chronology of management actions and fishing patterns. Forty-two out of the KMA total of fifty-two sections (over 80%) are covered under one of the five, season long, regulatory plans. The department has proposals before the Board to include the remaining ten sections under season long regulatory management plans.

SALMON STOCK STATUS

Chinook Salmon

The Kodiak area has two naturally occurring chinook salmon populations, in the Ayakulik and Karluk Rivers. A small introduced chinook salmon run occurs in the Dog Salmon River. There are no directed commercial fisheries targeting these stocks and any commercial harvest occurs incidentally in fisheries targeting sockeye and pink salmon. Sport fishing pressure on chinook salmon runs in the Ayakulik and Karluk Rivers appears to have remained fairly stable over the past three years. In the Dog Salmon River, to aid establishment of a viable spawning stock, sport fishing for chinook salmon is prohibited.

There are two other chinook runs in the KMA, both introduced. One is at Pasagshak River (Lake Rose Tead), where in the late 1970's eggs taken from Chignik River chinook salmon were used to establish a chinook run accessible by road to Kodiak sport fishers. The productivity of this run has been less than expected, and chinook sport fishing has remained closed in Pasagshak River. The second introduced chinook salmon run was located at Mill Bay near the city of Kodiak. This introduction was designed to support put-and-take recreational fisheries. Since 1989 ADF&G Sport Fish Division has stocked up to 100,000 chinook salmon presmolt from the Elmendorf Hatchery in Anchorage into Island Lake annually. In 1995 and 1996 the chinook salmon stocking location was moved to the Buskin River. However, 1996 was the last year that chinook salmon fry were stocked on Kodiak.

Kodiak's natural chinook salmon stocks are considered healthy. Minimum escapement requirements (11,110 fish) have been met annually since 1981, while the upper end of the escapement goal range (18,330 fish) has been exceeded each year since 1987 (Table 12, Figure 6). Harvests have increased as well, for the subsistence, sport, and commercial fisheries (Tables 5, 8, and 9). Over the 10 year period (1988-1998), the commercial harvest has averaged approximately 22,000 chinook salmon (Table 5, Figure 7).

Sockeye Salmon

There are 39 known sockeye salmon runs in the KMA. Large runs (greater than 500,000 fish) occur in four lake systems: Karluk, Ayakulik, Upper Station, and Frazer (Dog Salmon River). The first three support naturally occurring runs, while the Frazer Lake sockeye stock is a very successful introduced run. There is a large set of falls below Frazer Lake which blocks natural migration; this run is maintained through the use of a large "fish ladder".

These systems provide approximately 80% of the current KMA sockeye salmon production. Directed fisheries on these stocks are intense and require extensive management activities from June 5 through September 20. The Karluk and Upper Station systems have distinct early (May 25 through July 15) and late runs (July 16 through September 20). Frazer is primarily an early

returning stock with most sockeye entering fresh water by July 20. The Ayakulik sockeye run starts in early June but has a more protracted run timing which continues into mid August. The overall escapement goals for these four major systems have been achieved annually since 1988.

Twelve sockeye systems in the KMA have minor but significant runs. These include the Afognak, Uganik, Akalura, Saltery, Kaflia, Pauls, Buskin, Swikshak, Little River, Malina, Thorsheim, and Perenosa systems. These systems annually account for approximately five percent of KMA's current sockeye salmon production. Escapement into each system is generally less than 60,000 sockeye salmon. Most systems support very limited commercial fisheries annually. The exception is the sockeye salmon run into Buskin Lake, which is not targeted by a commercial fishery. Fish surplus to the Buskin Lake escapement requirements are currently harvested in a subsistence fishery and, to a lesser degree, in a recreational sport fishery. The Buskin Lake sockeye stock receives substantial subsistence effort due its proximity to the city of Kodiak. This system may be approaching maximum exploitation from subsistence effort alone. Sport fish interest in the Buskin sockeye run increased during the late 1980s, but appears to have stabilized in recent years. This system will continue to require close monitoring in the future to ensure that escapement requirements are met so that future subsistence use will not be jeopardized.

The remaining 23 systems are comparatively minor systems and are not usually exploited by directed commercial effort.

Overall, KMA sockeye stocks are healthy. The lower escapement goal (1.34 million fish) for sockeye salmon has been met or exceeded annually since 1984 (Table 12, Figure 8). Commercial harvests have averaged 4,065,900 sockeye salmon over the 1988-1998 period (Table 5, Figure 9).

As mentioned previously, the Kodiak Regional Planning Team (KRPT)[5] established sockeye as the priority species for supplemental production (Kodiak Regional Planning Team 1992). Currently, the Kodiak Regional Aquaculture Association (KRAA) in conjunction with ADF&G is active in providing additional sockeye salmon production, both by introducing sockeye runs into previously unutilized lakes and by enhancing weak natural runs. In recent years the supplemental production of sockeye salmon has contributed up to 400,000 fish to the annual commercial harvest.

Pink Salmon

All salmon streams within the KMA support pink salmon runs. Pink salmon represent the foundation of Kodiak salmon production, and may comprise over 80% of the total annual harvest (Table 5). Primarily due to the cyclic production from Ayakulik and Karluk Rivers, pink salmon

[5] The RPT is a group consisting of representatives of ADF&G, regional aquaculture associations, and the public, mandated by Alaska Statutes (16.10.375-470) to develop and amend comprehensive salmon production plans for salmon production regions.

runs are usually larger during the even numbered years. However from 1989 through 1997 odd year production has surpassed even year production[6]. With the new record even year harvest in 1998, even year production may be returning to being the dominate harvest cycle.

Except for occasional local variations, KMA pink salmon stocks are considered very healthy. Escapement goals (1.0 to 6.0 million fish) have been met or exceeded in each year since 1975 (Table 12, Figure 10). Over the last 10 year (1988-1998) period, the annual harvest has averaged 16,194,000 pink salmon. The even year pink salmon harvest has averaged 9,568,000, while the odd year pink salmon harvest averaged 21,921,000 (Table 5; Figure 11). Pink salmon survival and subsequent returns are strongly influenced by environmental factors (Groot and Margolis 1991). Given the existing harvest strategy for Kodiak pink salmon, the long term outlook for Kodiak's wild pink salmon stocks is very good.

In recent years, pink salmon returns to the Kitoi Bay Hatchery have added 1,000,000 to 12,000,000 fish, annually, to the commercial harvest.

Chum Salmon

Chum salmon are present in at least 150 streams of the KMA. KMA chum salmon production has been variable, and has been at low levels for the past 6 years. The minimum escapement goal (273,000 fish) has been achieved in 9 of the past 10 years[7] (Table 12; Figure 12). The annual commercial harvest for the last 10 years (1988-1998) has averaged 794,000 chum salmon (Table 5; Figure 13).

Chum salmon management continues to receive increasing emphasis. Efforts to harvest better quality fish (bright vs. dark fish) has required more intensive chum salmon stock management strategies to be developed. In the Kodiak area, chum salmon are the most difficult salmon to obtain consistent escapement estimates from year to year. This is mainly due to the variability in aerial survey (visibility) conditions from year to year due to murky water conditions. For example, in 1998, the USF&W Service operated a weir to enumerate chum salmon escapements into the Sturgeon River. The highest aerial escapement estimate was 9,000 fish while the actual weir count was 24,000 fish.

The Kitoi Bay Hatchery has developed an early run chum salmon return. In recent years the majority of chum salmon returning to the hatchery have been needed for brood stock. However, significant supplemental production has and is expected to occur. To date, the highest hatchery contribution of chum salmon (215,000 fish) to the annual commercial harvest occurred in 1995.

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[6] Kodiak odd year pink salmon production was generally greater than even year production prior to 1948. The mechanism which has led to switches in odd vs. even year dominance is not known.

[7] Low escapement counts for chum salmon may be related to factors other than absolute abundance. Complete estimations may be hampered by difficulties associated with surveying chum salmon populations.

Coho Salmon

About 174 systems have been identified which support coho runs in the KMA. Twenty percent of KMA coho salmon systems (35 streams) produce 80% of the total KMA production. Concern exists for the other 80 percent (139 streams) where coho runs are relatively small and maybe more susceptible to overexploitation. To provide adequate protection for these smaller runs the harvests from all user groups must be monitored inseason.

Beginning in the early 1980s, coho salmon have experienced an increase in exploitation by commercial, sport, and subsistence users within the KMA (Tables 5, 8, and 9). The escapement goal (90,500 to 150,000 fish) for coho has been met or exceeded annually since 1983 (Table 12; Figure 14). Over the past 10 years (1988-1998) commercial harvests have averaged 312,700 coho salmon (Table 5; Figure 15). The future status of this species is expected to be very good.

The Kitoi Bay Hatchery produces coho salmon for returns to the hatchery. To date, these hatchery produced coho have contributed up to an estimated 150,000 fish to the annual commercial harvest. Coho salmon smolt are also produced for out stocking, to provide additional sport and subsistence fishing opportunities. These are mostly put-and-take fisheries located near the communities of Port Lions and Ouzinkie with all returning adults expected to be harvested.

1998 COMMERCIAL SALMON FISHERY SEASON SUMMARY

The 1998 commercial salmon fishery occurred over a 119 day period beginning with the initial opening on June 9 and ending when the last delivery was made on October 5 (Figure 5). This year's fishery was unusual in that the pink salmon return was about four times greater than expected which resulted in all major buyers instituting some type of daily harvest limits on their respective fleets in August. In addition, the June sockeye fisheries were extremely challenging to manage due to the record levels of high water which prevented the normal operation of the Karluk, Ayakulik, and Dog Salmon weirs for a good portion of the month.

Of the 611 eligible permit holders, only 390 participated this season. By gear type, a total of 2 beach seine, 171 set gillnet, and 217 purse seine permit holders fished (Table 6; Figure 16). This year's purse seine effort was the lowest on record since limited entry has been in effect and has continued a decreasing trend which began in 1996. Throughout the season 13 different buyers operated 14 processing plants (all of which were shorebased).

Listed below are the 1998 harvests (in numbers of fish) along with average weights. The 1998 preseason harvest expectations are also listed below (Table 10).

1998 Actual Harvest

	Chinook	Sockeye	Coho	Pink	Chum	Total
	17,300	3,623,000	425,000	22,056,000	316,000	26,437,300
Avg. Wt. (lbs.)	14.4	4.8	8.4	3.7	7.8	

1998 Preseason Harvest Projections

Chinook	Sockeye	Coho	Pink	Chum	Total
20,000	2,352,000	300,000	6,348,000	650,000	9,670,000

The estimated exvessel value of the 1998 fishery is approximately 30 million dollars. Although the exvessel value of this years fishery is about 11 million dollars more than last year, it is still well below the last 10 years (1987-1997, excluding 1989) average of 43 million dollars (Table 13). Average earnings by gear type by permit fished are estimated at $103,000 for purse seine, $43,700 for set gillnet, and $3,900 for beach seine (Table 14). Even with a record pink salmon harvest, sockeye salmon continue to contribute to a major portion of the annual exvessel value of the fishery (Figure 17). Final exvessel values will not be available until the final price adjustments are made in accordance to the contracts signed between the major buyers and permit holders.

This year's chinook salmon harvest (17,300 fish) is below the last ten year average (1987-1997, excluding 1989) harvest of 20,800 fish. The largest chinook salmon harvest on record (42,000 fish) occurred in 1993.

The sockeye salmon harvest (3.6 million fish), although better than expected this year, was still less than the last ten year average harvest of 3.9 million sockeye salmon. The highest sockeye harvest on record (5.7 million fish) occurred in 1991. This year's sockeye harvest includes an estimated 260,000 fish produced by supplemental and enhancement projects sponsored by the Kodiak Regional Aquaculture Association.

The coho salmon harvest this year (425,000 fish) is the highest on record mainly because of the supplemental production from Kitoi Bay Hatchery estimated at 148,000 fish. The last ten year average harvest is 289,000 coho.

The pink salmon harvest this season (22 million fish) set a new record high harvest for "even years" (1980, previous high at 17.3 million). The recent ten year average is 14.5 million fish while the last five even years average harvest is only 7.1 million pink salmon. The all time

record harvest of 42.8 million fish occurred in 1995. Included in this year's harvest are approximately 6.3 million pink salmon that were caught near the Kitoi Bay Hatchery.

This year's chum salmon harvest (316,000 fish) was the lowest since 1975 when less than 100,00 fish were caught and well below the last ten year average harvest of 831,000 fish. Approximately 38,000 chum salmon were caught near Kitoi Bay Hatchery this year. The highest chum salmon harvest on record occurred in 1970 when 1.54 million fish were caught.

Escapement

Salmon counting weirs were operated on twelve different spawning systems this year (Table 11). Escapement counts for all major sockeye and chinook salmon systems were enumerated through the use of salmon counting weirs. Weirs were operated from late May to late September. Aerial surveys and to a lessor degree foot surveys were utilized to estimate escapements into most pink, chum, coho, and minor sockeye systems.

Sockeye salmon escapements, overall, were excellent with 1.78 million fish counted as escapement. Approximately 1.66 million sockeye salmon (93% of the total escapement estimate) were counted into systems with fish weirs. The overall biological escapement goal (BEG) for sockeye ranges from 1.34 to 2.0 million fish (Figure 8).

Pink salmon escapements levels and distribution, geographically, were excellent. The indexed pink salmon escapement totals 7.09 million fish. The area wide BEG for even year pink salmon returns ranges from 2.4 to 6.0 million fish (odd years 1-3 million fish) (Figure 10).

Chum salmon escapement estimates varied considerably depending on geographic location. Due to the large numbers of pink salmon and poor visibility in some major mainland chum systems, this years estimates are not as indicative of the actual escapement as during a more normal year. However, it still appeared that overall chum salmon production for the Kodiak area was at relatively low levels. Area wide, 374,500 chum salmon were counted as an indexed escapement. The current area wide BEG ranges from 273,000 to 819,000 fish (Figure 12).

Coho salmon escapements area wide were excellent with 88,000 out of a total indexed escapement of 235,000 being counted into systems with fish counting weirs. The overall BEG for coho salmon ranges from 90,475 to 150,000 fish.

A total of 24,650 chinook salmon were estimated as escapement, through fish weirs, into the Ayakulik, Karluk, and Dog Salmon rivers. Escapement counts were 10,240 chinook salmon into the Karluk River and 14,040 chinook salmon into the Ayakulik River. An additional 290 chinook salmon entered Dog Salmon river. The overall BEG for chinook salmon ranges from 11,110 to 18,330 fish (Figure 6).

1998 Summary of the Cape Igvak Salmon and North Shelikof Strait Sockeye Salmon Management Plans

As mentioned earlier, there are two Alaska State Board of Fisheries approved management plans which affect Kodiak seine permit holders ability to target their fishing activities on sockeye salmon bound to other net registration areas.

Cape Igvak Salmon Management Plan

The Cape Igvak Salmon Management Plan covers the time period from June 5 through July 25 for fishing activity in the Cape Igvak Section of the Mainland District. This plan has been in effect since 1978 and allocates a percentage of the available Chignik sockeye harvest (approximately 15%) to Kodiak seine permit holders when specific biological and harvest criteria are met in Chignik.

In order to comply with the biological (achieving escapement goals for the Chignik Lakes System) and allocative requirements (minimum harvest levels in Chignik assured) only very limited fishing was allowed (7/21-7/25) this year. The percentage of the available Chignik sockeye harvest through July 25 caught in the Cape Igvak Section this year was 1% (Figure 18). Nine purse seiners harvested a total of 76 chinook, 11,016 sockeye, 625 coho, 38,954 pink, and 2,863 chum salmon. Of the sockeye salmon harvest, 80 percent (8,813 fish) are attributed to Chignik.

North Shelikof Strait Sockeye Salmon Management Plan

The North Shelikof Strait Sockeye Salmon Management Plan covers the time period from July 6 through July 25. Purse seine fishing opportunities in the Southwest Afognak Section and North Shelikof units are restricted in designated seaward zones through the use of sockeye harvest triggers. These restrictions when implemented, are intended to protect sockeye salmon bound to Cook Inlet which are migrating through management units located in Shelikof Strait from Dakavak Bay to Cape Douglas in the Mainland District and from Raspberry Cape to Shuyak Island in the Afognak District (Figure 19). This plan has been in effect since 1990 (Table 15).

By regulation, the seaward zone of the Southwest Afognak Section will close to fishing if more than 50,000 sockeye salmon are harvested during the July 6 through July 25 time period. Also by regulation, the seaward zone of the Dakavak Bay, Outer Kukak Bay, Hallo Bay, Big River, Shuyak Island, and Northwest Afognak Sections will close to fishing if more than 15,000 sockeye salmon are harvested during the same time period.

Permit holders who intend to fish in management units covered by this plan are advised that in period closures of the seaward zones may occur. To provide for an orderly in period closure,

permit holders are notified of specific times to listen for closure announcements. In 1990 those times were at 8:00 a.m. and 6:00 p.m. daily. Beginning in 1991, to provide for more timely zone closures, initial announcement times were changed to 8:00 a.m., 10:00 a.m., 2:00 p.m., or 6:00 p.m. daily.

The ADF&G vessel, K-Hi-C, was utilized again this year to monitor on the grounds effort and harvest levels in order to implement the regulatory intent of this plan.

In the Southwest Afognak Section (50,000 sockeye trigger), the seaward zone remained open the entire time period in 1998. The total harvest by the 22 purse seiners who fished during the 7/6-7/25 time period was 239 chinook, 10,339 sockeye, 2,292 coho, 82,683 pink , and 1,899 chum salmon.

In the North Shelikof management units (15,000 sockeye trigger), a closure of the seaward zones occurred on July 16 at 9:00 p.m. The actual sockeye salmon harvest (from fish ticket totals) at the time of the closure was 17,812 fish. The total harvest by the 39 purse seiners who fished during the 7/6-7/25 time period was 141 chinook, 40,631 sockeye, (22,819 sockeye caught 7/17-7/25), 5,381 coho, 59,536 pink, and 6,368 chum salmon.

Outlook for the 1999 Season

The harvest projections for Kodiak's 1999 commercial salmon fishery indicate that from wild and enhancement production sources combined, approximately 9.5 million pink, 3.5 million sockeye, 350,000 coho, 500,000 chum, and 20,000 chinook salmon should be available to harvest. Included in the harvest projections, are 2.4 million pink, 155,000 chum, 111,000 coho, and 93,000 sockeye salmon produced by the Kitoi Bay Hatchery and 263,000 sockeye salmon from Kodiak Regional Aquaculture Association stocking projects. In addition, the harvest projection for sockeye salmon also includes 266,000 fish to be harvested in the Cape Igvak fishery (based on the 1999 Chignik sockeye forecast and the allocative requirements specified in the Cape Igvak Salmon Management Plan).

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Table 1. Estimated number of anadromous streams with significant salmon production by district, with species distribution, in the Kodiak Management Area, 1998.

Management District	Number of Streams[a]	Number of Streams with Each Species[b]				
		Chinook	Sockeye	Coho	Pink	Chum
Afognak	102	0	13	48	102	5
Northwest Kodiak	63	0	4	22	63	23
Southwest Kodiak	11	2	2	10	11	6
Alitak	30	1	5	15	30	14
Eastside Kodiak	116	1	8	32	116	47
Northeast Kodiak	26	0	1	20	26	9
Mainland	92	0	6	27	92	46
TOTAL	440	4	39	174	440	150

[a] The State of Alaska's Habitat Division identifies over 800 streams in the Kodiak Management Area which have documented use by anadromous fish (ADF&G 1993). Many of these streams are very small and may only be used by pink salmon in years with very large returns. The streams identified in this table are depicted on the 1998 Kodiak Area salmon statistical map and have documentable use each year.

[b] These estimates are based on current knowledge and are expected to change as more system specific data is collected.

Table 2. Salmon escapement goals vs. 1998 actual escapement, by species, by District, in the Kodiak Management Area.

DISTRICT	SOCKEYE ESCAPEMENT		PINK ESCAPEMENT		CHUM ESCAPEMENT		COHO ESCAPEMENT		CHINOOK ESCAPEMENT	
	GOAL	ACTUAL	EVEN YEAR GOAL	ACTUAL	GOAL	ACTUAL	GOAL	ACTUAL	GOAL	ACTUAL
	Lower Upper		Lower Upper		Lower Upper		Lower Upper		Lower Upper	
AFOGNAK	80,000	103,131	145,000	760,735		3,210	13,500	43,926		6
	146,000		435,000				23,600			
NORTHWEST	56,000	31,913	315,000	1,478,477	46,000	49,750	9,000	13,400		0
	90,000		945,000		138,000		14,000			
SOUTHWEST	750,000	1,064,354	1,250,000	1,825,589	25,000	25,730	33,000	54,815	11,000	24,279
	1,100,000		2,550,000		75,000		52,000		18,000	
ALITAK	386,000	490,220	162,000	1,282,196	26,000	57,722	10,500	52,941	110	294
	550,000		486,000		78,000		20,000		330	
EASTSIDE	27,000	28,763	150,000	331,025	35,000	26,634	10,000	23,673		6
	60,000		450,000		105,000		15,000			
NORTHEAST	8,000	14,775	120,000	515,903	8,000	7,760	10,475	13,579		69
	13,000		360,000		24,000		16,555			
MAINLAND	31,000	42,603	256,000	895,050	133,000	203,650	4,000	32,400		0
	55,000		768,000		399,000		9,000			
TOTAL	1,338,000	1,775,759	2,398,000	7,088,975	273,000	374,456	90,475	234,734	11,110	24,654
	2,014,000		5,994,000		819,000		150,155		18,330	

Table 3. Potential vs. actual salmon production (wild stock) in the Kodiak Management Area, 1998.

SPECIES	PRODUCTION POTENTIAL			HARVEST		
	LONG TERM AVERAGE			POTENTIAL	ACTUAL	
	Targeted Escapement Goal[a]	Return Per Spawner[b]	Potential Total Return	Long Term Average	50 Year Average (1948-1998)[c]	10 Year Average (1988-1998)[c]
CHINOOK	15,000	2.5	37,500	22,500	5,680	22,030
SOCKEYE	1,700,000	3.7	6,290,000	4,590,000	1,378,335	4,065,910
COHO	150,000	2.5	375,000	225,000	117,010	312,715
PINK						
Odd Year	3,000,000	3.0	9,000,000	6,000,000	8,828,200	21,921,160
Even Year	4,500,000	3.0	13,500,000	9,000,000	8,951,800	9,568,285
CHUM	546,000	2.8	1,528,000	982,000	763,390	794,285
TOTAL						
Odd Year	5,411,000	-	17,230,500	11,819,500	11,092,615	27,116,100
Even Year	6,911,000	-	21,730,500	14,819,500	11,216,215	14,763,225

[a] The expected indexed escapement within the biological escapement goal range. KMA fisheries are normally managed to achieve this level of escapement.

[b] Return per spawner (RPS) will vary each year. These values are averages around which natural survival and return will fluctuate. RPS for sockeye from Prokopowich, 1995, for pink salmon from Swanton et al, 1993, and all others from Barrett, Personal Communication, October 1993.

[c] 1989 harvest data not included in averages. Fisheries were severely restricted in 1989 due to the M/V Exxon Valdez oil spill. Harvests include supplemental production from enhancement projects. In the recent 10 year averages supplemental production has added 4.8 million fish to the odd year pink and 1.9 million fish to even year pink salmon harvests. Supplemental production of coho, sockeye, and chum salmon have contributed up to 150,000, 400,000, and 215,000 fish toward the annual harvests in recent years.

Table 4. Expected harvest from supplemental salmon production, by system and species for the Kodiak Management Area, 1999.

System	Early Sockeye[a]	Late Sockeye[a]	Pink[b]	Coho[c]	Chum[d]
Kitoi Bay Hatchery Complex	11,900	40,500	2,400,000	111,000	155,000
Spiridon Lake (Telrod Cove)	43,000	171,000	-	-	-
Hidden Lake (Foul Bay)	20,100	-	-	-	-
Waterfall Lake (Waterfall Bay)	12,900	-	-	-	-
Crescent Lake (Settler Cove)	15,800	-	-	6,500	-
Katmai Lake (Ouzinkie Cove)	-	-	-	1,500	-
Kodiak Road System Lakes	-	-	-	-	-
Total	103,700	211,500	2,400,000	119,000	155,000

[a] Approximate timing of early sockeye salmon is June to mid July, while late sockeye is mid July to early September. Lake enrichment of Afognak, Malina, Pauls, Portage, and Waterfall lake systems may yield additional sockeye salmon production. Spiridon early fish are from Saltery Lake broodstock.

[b] Approximate timing of Kitoi Bay pink salmon is late July to late August.

[c] Approximate timing of supplemental coho salmon is early August to early September. Supplemental coho returns to Crescent Lake, Katmai Lake, and Kodiak Road System Lakes are intended primarily for subsistence and sport harvest, and are not included in commercial harvest forecasts.

[d] Early chum salmon production at Kitoi Bay Hatchery is expected to exceed broodstock requirements.

Table 5. Historic salmon catch, by species, in the Kodiak Management Area, 1882-1998.

Year [a]	Chinook	Sockeye	Coho	Pink	Chum	TOTAL
1882		58,800				58,800
1883		188,706				188,706
1884		282,184				282,184
1885		468,580				468,580
1886		646,100				646,100
1887		1,004,500				1,004,500
1888		2,781,100				2,781,100
1889		3,754,735				3,754,735
1890		3,592,707				3,592,707
1891		3,846,388				3,846,388
1892		3,126,459				3,126,459
1893		3,244,609				3,244,609
1894		3,830,336				3,830,336
1895		2,246,966	8,321			2,255,287
1896		3,328,846				3,328,846
1897		2,785,515	1,500			2,787,015
1898		2,033,094	19,175			2,052,269
1899	1,104	1,934,771	32,475			1,968,350
1900	4,838	3,450,480	32,239			3,487,557
1901	3,838	4,826,159		2,015		4,832,012
1902	2,932	3,868,101	34,972			3,906,005
1903	1,187	1,826,163	119,541	10,000		1,956,891
1904	3,190	2,875,118	103,136	5,180		2,986,624
1905	2,496	2,142,367	86,913			2,231,776
1906	3,640	3,980,462	23,738			4,007,840
1907	4,015	4,232,454	38,059			4,274,528
1908	3,028	2,487,848	73,789	286,374		2,851,039
1909	3,907	1,915,230	51,500	153,595		2,124,232
1910	1,598	1,954,717	44,291	215,382		2,215,988
1911	689	2,685,949	21,870	229,551	6,492	2,944,551
1912	686	2,246,467	17,491	547,171	24,588	2,836,403
1913	1,082	1,663,163	27,634	590,039	3,822	2,285,740
1914	1,329	1,255,444	32,063	1,726,411	13,094	3,028,341
1915	939	1,664,426	51,819	252,073	20,331	1,989,588
1916	1,038	3,373,055	49,683	3,181,890	28,962	6,634,628
1917	1,457	3,645,914	30,485	225,335	15,961	3,919,152
1918	2,021	1,894,466	78,169	2,467,325	81,699	4,523,680
1919	1,831	1,619,101	104,233	282,715	60,102	2,067,982
1920	1,637	1,957,636	88,970	1,977,421	55,175	4,080,839
1921	660	2,857,922	45,764	67,688	24,779	2,996,813
1922	703	1,097,359	119,724	2,766,257	223,970	4,208,013
1923	1,915	1,090,117	77,554	928,510	38,653	2,136,749
1924	1,002	1,407,525	120,686	5,435,091	117,883	7,082,187
1925	1,911	1,693,057	92,960	2,673,675	212,492	4,674,095
1926	596	3,015,366	174,475	4,606,694	324,706	8,121,837
1927	4,358	1,155,202	151,548	5,297,305	417,956	7,026,369
1928	2,546	1,592,003	290,645	1,535,313	726,480	4,146,987
1929	3,200	712,126	144,226	6,108,402	1,057,662	8,025,616
1930	4,991	466,409	228,800	1,651,398	419,011	2,770,609

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Table 5. (page 2 of 3)

Year [a]	Chinook	Sockeye	Coho	Pink	Chum	TOTAL
1931	1,541	1,183,074	170,075	6,839,906	183,737	8,378,333
1932	1,873	1,058,446	52,192	4,719,939	237,023	6,069,473
1933	1,140	1,428,373	91,428	6,573,660	536,935	8,631,536
1934	1,300	1,828,953	89,588	7,641,891	661,341	10,223,073
1935	1,393	1,613,519	76,849	10,780,612	381,753	12,854,126
1936	2,548	2,657,195	183,903	5,647,726	328,218	8,819,590
1937	1,257	1,881,304	164,902	16,787,150	346,238	19,180,851
1938	1,232	1,965,943	154,959	8,397,981	640,119	11,160,234
1939	2,272	1,786,445	112,171	11,741,218	641,693	14,283,799
1940	1,233	1,318,233	148,016	9,997,899	673,265	12,138,646
1941	2,571	1,730,201	199,515	7,601,531	444,521	9,978,339
1942	1,329	1,281,529	106,865	6,092,526	564,924	8,047,173
1943	1,133	1,990,557	59,661	12,479,608	454,205	14,985,164
1944	668	1,817,875	51,675	4,955,354	506,703	7,332,275
1945	2,021	2,041,090	60,122	9,044,544	559,332	11,707,109
1946	129	838,863	56,425	9,545,871	298,486	10,739,774
1947	99	993,394	76,230	8,856,666	294,518	10,220,907
1948	1,401	1,260,465	32,364	5,968,487	330,795	7,593,512
1949	851	892,336	53,737	4,927,779	699,548	6,574,251
1950	2,127	920,885	40,653	5,304,701	685,109	6,953,475
1951	2,402	467,875	48,792	2,100,377	483,057	3,102,503
1952	1,081	603,677	51,567	4,576,726	1,243,227	6,476,278
1953	2,991	317,150	41,681	5,174,645	547,574	6,084,041
1954	942	325,157	66,430	8,439,231	1,250,833	10,082,593
1955	2,428	164,482	34,582	10,794,164	482,425	11,478,081
1956	1,123	271,249	52,844	3,318,841	705,047	4,349,104
1957	1,030	234,253	34,995	4,716,482	1,208,472	6,195,232
1958	1,942	288,014	20,555	4,038,938	930,698	5,280,147
1959	1,837	330,087	14,512	1,967,058	733,784	3,047,278
1960	1,238	362,525	54,308	6,737,817	1,300,386	8,456,274
1961	864	407,979	28,579	3,926,023	518,935	4,882,380
1962	1,095	784,664	54,583	14,113,851	794,727	15,748,920
1963	286	407,040	57,011	5,480,158	305,061	6,249,556
1964	1,306	498,488	35,535	12,044,341	1,134,163	13,713,833
1965	786	346,237	26,672	2,886,831	431,340	3,691,866
1966	599	631,646	67,700	10,755,582	762,766	12,218,293
1967	1,753	308,756	10,354	187,813	226,681	735,357
1968	1,936	760,393	56,629	8,768,122	750,428	10,337,508
1969	2,469	591,481	48,759	12,500,823	534,933	13,678,465
1970	1,089	917,045	66,421	12,036,598	919,102	13,940,255
1971	920	478,479	22,844	4,332,994	1,541,444	6,376,681
1972	1,300	222,800	16,588	2,485,802	1,163,772	3,890,262
1973	800	167,341	3,573	518,692	317,921	1,008,327
1974	545	418,761	13,631	2,646,087	249,294	3,328,318
1975	101	136,418	23,659	2,942,801	84,431	3,187,410
1976	766	641,484	23,714	11,077,992	740,495	12,484,451
1977	585	623,468	27,920	6,252,405	1,072,313	7,976,691
1978	3,228	1,071,782	48,795	15,004,083	814,345	16,942,233
1979	1,905	631,735	140,629	11,287,592	358,400	12,420,261
1980	529	651,394	139,154	17,290,615	1,075,557	19,157,249

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Table 5. (page 3 of 3)

Year [a]	Chinook	Sockeye	Coho	Pink	Chum	TOTAL
1981	1,418	1,288,980	121,544	10,336,829	1,345,328	13,094,099
1982	1,238	1,204,793	343,531	8,076,203	1,266,187	10,891,952
1983	3,839	1,231,989	157,612	4,603,371	1,085,165	7,081,976
1984	4,657	1,950,439	229,524	10,844,293	649,092	13,678,005
1985	4,970	1,843,185	284,166	7,334,815	430,757	9,897,893
1986	4,381	3,188,269	168,773	11,807,727	1,134,558	16,303,708
1987	4,612	1,792,819	192,540	5,076,002	681,982	7,747,955
1988	22,374	2,698,637	303,298	14,409,291	1,426,410	18,860,010
1989 [b]	4,851	2,628,565	141,433	22,648,511	835,734	26,259,094
1990	18,806	5,248,339	293,699	5,983,805	577,740	12,122,389
1991	22,233	5,704,041	324,860	16,642,804	1,029,070	23,723,008
1992	24,299	4,167,877	280,085	3,310,644	679,559	8,462,464
1993	42,199	4,377,688	313,387	34,019,420	588,331	39,341,025
1994	22,576	2,878,023	296,305	8,162,564	738,856	12,098,324
1995	18,704	4,485,321	307,729	42,832,437	1,522,705	49,166,896
1996	13,071	4,970,390	201,836	3,486,930	543,751	9,215,978
1997	18,728	2,505,660	380,925	11,035,128	520,329	14,460,770
1998	17,336	3,623,094	425,023	22,056,467	316,080	26,438,000
AVERAGES [b]						
All Years	3,800	1,758,613	102,501	6,690,001	568,088	9,123,002
1948-98	5,680	1,378,335	119,306	8,718,102	763,391	10,984,814
Odd Years, 1949-97				8,828,227		
Even Years, 1948-98				8,951,759		
1988-1998	22,033	4,065,907	312,715	16,193,949	794,283	21,388,886
Odd Years, 1987-1997				21,921,158		
Even Years, 1988-98				9,568,284		

[a] 1882-1947 data from processors case pack information, 1948-1998 data from ADF&G fish ticket summaries.

[b] Averages do not include 1989. Fisheries were severely limited due to the M/V Exxon Valdez oil spill, and the1989 catch data presented is the projected catch had there been no fishery restrictions (Barrett,1990).

Table 6. Summary of limited entry permit activity in the commercial salmon fishery, by gear type, in the Kodiak Management Area, 1975-1998

	Purse Seine[a]		Beach Seine[a]		Set Gillnet[a]		TOTAL[a]		
Year	Fishable	Fished	Fishable	Fished	Fishable	Fished	Fishable	Fished	Percent
1975	468	280	26	8	229	116	723	404	56
1976	394	325	23	17	187	140	604	482	80
1977	378	336	32	24	186	147	596	507	85
1978	389	372	34	29	188	160	611	561	92
1979	387	362	34	28	186	164	607	554	91
1980	387	370	35	33	187	168	609	571	94
1981	387	325	35	30	187	169	609	524	86
1982	386	345	35	30	187	170	608	545	90
1983	383	342	35	27	188	174	606	543	90
1984	384	296	35	25	188	168	607	489	81
1985	384	270	34	21	188	169	606	460	76
1986	385	287	34	14	187	174	606	475	78
1987	386	297	33	18	188	173	607	488	80
1988	387	323	33	21	188	179	608	523	86
1989[b]	388	4	33	1	189	87	610	92	15
1990	388	354	33	21	189	184	610	559	92
1991	388	348	33	17	189	185	610	550	90
1992	391	336	33	12	190	178	614	526	86
1993	387	324	36	9	190	176	613	509	83
1994	387	285	34	5	190	169	611	459	75
1995	386	312	34	8	189	173	609	493	81
1996	384	261	34	6	189	172	607	439	72
1997	384	261	34	5	189	174	607	440	72
1998	384	217	34	2	189	171	607	390	64
AVERAGES[c]									
All Years	390	314	33	18	190	168	613	500	82
1988-1998	387	302	34	11	189	176	610	489	83
1978-1987	386	327	34	26	187	169	608	521	84

[a] Fishable permits are those available for use, from Comercial Fisheries Entry Commission records. Fished permits are those actually reporting landings, from ADF&G Fish Ticket summaries.

[b] Commercial fisheries were severely restricted in 1989 due to the M/V Exxon Valdez oil spill.

[c] 1989 data is not included in averages.

Table 7. Resident vs. nonresident commercial salmon fishing limited entry permit ownership in the Kodiak Management Area, 1988-1998.

Year	Purse Seine		Beach Seine		Set Gillnet		TOTAL	
Permit Status[a]	Number[a]	%	Number[a]	%	Number[a]	%	Number[a]	%
1998								
Resident	285	74.2	31	91.2	134	71.3	450	74.3
Nonresident	99	25.8	3	8.8	54	28.7	156	25.7
Total	384		34		188		606	
1997								
Resident	286	74.5	31	91.2	133	70.7	450	74.3
Nonresident	98	25.5	3	8.8	55	29.3	156	25.7
Total	384		34		188		606	
1996								
Resident	287	74.7	31	91.2	135	71.4	453	74.6
Nonresident	97	25.3	3	8.8	54	28.6	154	25.4
Total	384		34		189		607	
1995								
Resident	290	75.1	31	91.2	137	72.5	458	75.2
Nonresident	96	24.9	3	8.8	52	27.5	151	24.8
Total	386		34		189		609	
1994								
Resident	290	74.9	31	91.2	136	72.0	457	74.8
Nonresident	97	25.1	3	8.8	54	28.6	154	25.2
Total	387		34		190		611	
1993								
Resident	285	73.6	31	91.2	141	74.2	457	74.8
Nonresident	102	26.4	3	8.8	49	25.8	154	25.2
Total	387		34		190		611	
1992								
Resident	282	72.9	30	90.9	139	73.5	451	74.1
Nonresident	105	27.1	3	9.1	50	26.5	158	25.9
Total	387		33		189		609	
1991								
Resident	283	72.9	30	90.9	140	74.1	453	74.3
Nonresident	105	27.1	3	9.1	49	25.9	157	25.7
Total	388		33		189		610	
1990								
Resident	285	73.5	29	87.9	143	75.7	457	74.9
Nonresident	103	26.5	4	12.1	46	24.3	153	25.1
Total	388		33		189		610	
1989								
Resident	289	74.7	29	87.9	145	76.7	463	76.0
Nonresident	98	25.3	4	12.1	44	23.3	146	24.0
Total	387		33		189		609	
1988								
Resident	291	75.2	29	87.9	151	80.3	471	77.5
Nonresident	96	24.8	4	12.1	37	19.7	137	22.5
Total	387		33		188		608	

[a] Data is from Commercial Fisheries Entry Commission records. Numbers reflect permit ownership only, not actual participation in Kodiak commercial salmon fisheries.

Table 8. Subsistence salmon fishery harvest, by species, for the Kodiak Management Area, 1962-1997.

Year	Permits Issued[a]	Permits Returned[a]	Percent Returned	Subsistence Harvest[a] Chinook	Sockeye	Coho	Pink	Chum	TOTAL
1962	74	13	18	0	0	433	397	20	850
1963	74	15	20	0	297	576	836	195	1,904
1964	43	9	21	6	332	184	88	71	681
1965	67	7	10	2	19	318	244	12	595
1966	48	13	27	0	295	331	334	393	1,353
1967	84	29	35	2	1,306	571	894	344	3,117
1968	132	28	21	0	658	433	529	45	1,665
1969	242	30	12	1	481	338	620	30	1,470
1970	213	49	23	1	959	939	797	265	2,961
1971	267	131	49	5	3,442	1,720	1,276	472	6,915
1972	329	176	53	11	3,633	1,531	2,516	2,729	10,420
1973	400	149	37	7	4,453	2,289	1,393	1,166	9,308
1974	367	90	25	1	1,909	846	1,094	128	3,978
1975	508	90	18	1	1,141	922	947	221	3,232
1976	536	243	45	4	4,338	962	2,275	370	7,949
1977	739	451	61	54	8,119	2,508	2,849	317	13,847
1978	860	539	63	50	7,239	3,699	2,747	572	14,307
1979	1,085	697	64	111	10,376	3,840	3,300	333	17,960
1980	1,239	756	61	67	13,746	4,407	2,755	566	21,541
1981	1,166	658	56	49	12,924	4,029	2,458	484	19,944
1982	1,276	993	78	110	16,615	7,192	3,558	667	28,142
1983	1,307	1,082	83	111	15,526	6,283	2,536	800	25,256
1984	1,240	1,061	86	265	17,620	5,808	1,877	720	26,290
1985	1,476	1,196	81	172	16,231	8,873	2,756	855	28,887
1986	1,244	1,049	84	91	14,451	7,087	2,371	605	24,605
1987	1,124	904	80	101	13,277	6,737	2,421	1,316	23,852
1988	1,098	706	64	108	10,142	4,291	1,320	366	16,227
1989[b,c]	2,800	716	N/A	43	12,638	4,123	1,553	419	18,776
1990[c]	2,900	1,181	N/A	131	17,972	8,646	1,605	655	29,009
1991	1,406	1,223	87	177	21,835	8,208	1,743	714	32,677
1992	1,561	1,193	76	318	20,684	8,643	1,646	643	31,934
1993	1,496	914	61	243	19,521	7,188	2,696	838	30,486
1994[d]	2,550	1,518	60	205	17,962	7,491	1,758	440	27,856
1995	1,949	1,218	62	175	19,416	5,603	1,548	293	27,035
1996	1,567	1,429	91	253	28,287	5,117	1,125	381	35,163
1997	2,120	1,618	76	383	33,056	6,142	1,449	234	41,264
AVERAGES									
All Years, 1962-97				91	10,303	3,842	1,675	519	16,429
1988-97				204	20,151	6,545	1,644	498	29,043
1978-87				113	13,801	5,796	2,678	692	23,078
1968-77				9	2,913	1,249	1,430	574	6,175

[a] Data is compiled from Kodiak Annual Management Reports and subsistence data base. This provides an estimate of reported subsistence harvests, but may not represent the total subsistence salmon harvest.

[b] This represents only the harvest for individuals returning permits to ADF&G. In 1989 there was also an Exxon sponsored subsistence fishery in Karluk Lagoon. Harvest totaled an additional 1 chinook, 13,329 sockeye, 523 coho, 47 pink, and 19 chum salmon.

[c] Permits were mailed to all previous applicants. Many were returned as undeliverable

[d] Salmon and shellfish subsistence permitting programs were merged.

Table 9. Sport fish salmon harvest and effort in the Kodiak regulatory area of the Kodiak Management Area, 1977-1997.

Year[a]	Chinook[b]	Sockeye[b]	Coho[b]	Pink[b]	Chum[b]	Total[b]
1977	483	1,255	4,716	14,519	1,645	22,135
1978	350	1,776	4,927	17,739	1,287	25,729
1979	752	2,436	11,522	15,871	500	30,329
1980	327	2,178	12,692	18,969	525	34,364
1981	789	1,620	10,584	12,259	637	25,100
1982	1,120	3,055	13,329	18,850	1,324	36,558
1983	729	3,150	7,823	8,936	816	20,725
1984	921	5,385	14,612	12,779	1,321	34,097
1985	762	7,536	13,625	13,423	865	35,449
1986	520	5,259	20,873	14,509	336	40,977
1987	379	4,165	16,912	11,662	560	33,299
1988	1,564	6,222	18,809	19,044	1,546	45,621
1989	1,087	6,789	19,802	17,794	631	45,016
1990	996	6,056	13,728	7,464	191	27,439
1991	2,508	5,049	17,691	12,106	1,517	36,363
1992	2,217	6,240	13,668	5,904	625	26,437
1993	5,092	7,849	21,241	12,324	504	41,918
1994	3,166	12,502	12,406	5,336	290	30,534
1995	2,662	7,994	13,236	11,926	981	34,137
1996	2,407	10,158	16,822	6,917	692	34,589
1997	5,221	8,259	23,763	5,873	235	38,130
AVERAGES						
Recent 10 Years						
1988-1997	2,692	7,712	17,117	10,469	721	36,018
Recent 5 Year Periods						
1993-1997	3,710	9,352	17,494	8,475	540	35,862
1988-1992	1,674	6,071	16,740	12,462	902	36,175
1983-1987	662	5,099	14,769	12,262	780	32,909
All Years						
1977-1997	1,622	5,473	14,418	12,581	811	33,283

[a] Data from Schwarz (1997) and Howe, et al. (1998). The Kodiak regulatory area encompasses only the Kodiak Archipelago. Estimated harvests from the Mainland District of the Kodiak Management Area are summarized in Alaska Peninsula/Aleutian Islands regulatory area statistics.

[b] Numbers includes harvest from both marine and freshwater fisheries. Does not include estimated number of salmon caught and released.

Table 10. Actual vs projected 1998 commercial salmon harvest, by species and fishery, and 1999 harvest projections, for the Kodiak Management Area.

		Chinook	Sockeye	Coho	Pink	Chum	Total
Projected	Harvest 98	20,000	2,352,000	300,000	6,348,000	650,000	9,670,000
Actual	Harvest 98	17,300	3,623,000	425,000	22,056,000	316,000	26,437,300
Projected	**Harvest 99**	**20,000**	**3,500,000**	**350,000**	**9,500,000**	**500,000**	**13,870,000**

	1998 Harvest[a]		1999 Harvest[a]
FISHERY	Projection	Actual[b]	Projection
(1999 Harvest Projections as of 12/9/98)			
Early Run Sockeye Salmon Fisheries (6/9-7/15)			
Kitoi Bay Hatchery	18,000	13,000	12,000
Cape Igvak	94,000	0	121,000
Karluk	208,000	357,000	157,000
Ayakulik	246,000	1,051,000	649,000
Frazer	319,000	456,000	305,000
Upper Station	48,000	68,000	95,000
Minor Systems	120,000	36,000	72,000
Minor Enhancement[c]	55,000	23,000	49,000
Spiridon	155,000	26,000	43,000
Other	70,000	99,000	70,000
Subtotal	**1,333,000**	**2,129,000**	**1,573,000**
Late Run Sockeye Salmon Fisheries (7/16-10/1)			
Kitoi Bay Hatchery	48,000	62,000	40,500
Cape Igvak	119,000	11000	145,500
Karluk	191,000	418,000	632,000
Ayakulik	164,000	321,000	433,000
Frazer	80,000	110,000	77,000
Upper Station	267,000	370,000	378,000
Minor Systems	20,000	23,000	20,000
Spiridon	100,000	124,000	171,000
Other	30,000	55,000	30,000
Subtotal	**1,019,000**	**1,494,000**	**1,927,000**
TOTAL SOCKEYE	**2,352,000**	**3,623,000**	**3,500,000**
Pink Salmon Fisheries (7/6-9/5)			
Kitoi Bay Hatchery	850,000	6,272,000	2,400,000
Afognak (Wild)	254,000	911,000	213,000
Westside Kodiak	2,750,000	12,057,000	4,757,000
Alitak	1,876,000	1,705,000	639,000
Eastside/Northend Kodiak	130,000	552,000	994,000
Mainland	488,000	559,000	497,000
Subtotal	**6,348,000**	**22,056,000**	**9,500,000**

-Continued-

Table 10. (page 2 of 2)

FISHERY	1998 Harvest[a] Projection	1998 Harvest[a] Actual[b]	1999 Harvest[a] Projection
Chum Salmon Fisheries (6/9-9/5)			
Kitoi Bay Hatchery	20,000	38,000	155,000
Afognak (Wild)	50,000	11,000	30,000
Westside Kodiak	300,000	173,000	140,000
Alitak	70,000	41,000	50,000
Eastside/Northend Kodiak	150,000	28,000	75,000
Mainland	60,000	25,000	50,000
Subtotal	**650,000**	**316,000**	**500,000**
Coho Salmon Fisheries (8/1-10/1)			
Kitoi Bay Hatchery	90,000	148,000	110,000
Afognak (Wild)	25,000	42,000	30,000
Westside Kodiak	90,000	155,000	110,000
Alitak	25,000	32,000	30,000
Eastside/Northend Kodiak	60,000	37,000	60,000
Mainland	10,000	11,000	10,000
Subtotal	**300,000**	**425,000**	**350,000**
GRAND TOTAL[d]	**9,670,000**	**26,437,300**	**13,870,000**

[a] Numbers of fish.

[b] Actual harvest estimates by fishery as of 11/2/98

[c] 1999 harvest projections for enhanced early run sockeye include the following expected returns: Waterfall Lake-12,900, Hidden Lake-20,100, and Crescent Lake-15,800 fish.

[d] Includes 20,000 chinook 1998 and 1999 projected harvest, and 17,300 chinook for 1998 actual harvest.

Table 11. Escapement summary for systems with fish weirs in the Kodiak Management Area, 1998.

Weir Locations	Dates		Salmon Species Enumerated					Totals
	Installed	Removed	Sockeye	Chinook	Pink	Coho	Chum	
1. Karluk	5/21	9/26	637,146	10,239	1,135,439	30,115	59	1,812,998
2. Ayakulik	6/10	8/19	427,208	14,038	576,150	2,043	53	1,019,492
3. Dog Salmon	6/17	8/27	245,393	293	525,944	5,042	3,222	779,894
4. Frazer Lake [a]	6/14	8/15	233,755[a]	147[a]	0	0	0	233,902[a]
5. Upper Station	5/24	9/7	201,927	1	5,762	7,024	0	214,714
6. Saltery	7/6	8/31	26,263	6	3,425	67	34	29,795
7. Buskin	5/28 8/14	7/27 9/29	14,767	69	134,403	9,062	24	158,325
8. Litnik	5/19	9/9	66,869	3	101,177	16,374	14	184,437
9. Paul's Bay	5/29	9/11	15,343	0	12,053	15,514	92	43,002
10 Malina Creek	5/12	8/7	14,917	3	14,097	0	3	29,020
11. Thorsheim	6/4	6/28	6,248	0	0	0	0	6,248
12. Big Creek (Shuyak)	8/8	9/13	7	0	7,054	1,494	0	8,555
13. Bear Creek (Shuyak)	8/9	9/12	0	0	2,873	1,202	0	4,075
14. Sturgeon	6/14	7/20	0	0	0	0	24,168	24,168
			1,656,088	24,652	2,518,377	87,937	27,669	4,314,723

[a] Numbers not used in totals as Frazer Lake salmon are initially counted through Dog Salmon weir.

Table 12. Historical indexed salmon escapements, by species, in the Kodiak Management Area, 1962-1998.

Year [a]	Chinook	Sockeye	Coho	Pink	Chum	TOTAL
1962		922,500		4,600,000	297,900	5,820,400
1963		502,227		1,026,075	75,520	1,603,822
1964		600,346		3,358,074	261,429	4,219,849
1965		561,980		772,874	67,156	1,402,010
1966		652,578		2,100,000	143,700	2,896,278
1967		720,683		698,710	136,079	1,555,472
1968	703	645,612		2,800,000	121,000	3,567,315
1969	7,752	592,020		1,581,335	77,285	2,258,392
1970	3,900	573,603		3,392,577	123,150	4,093,230
1971	4,524	456,197		1,070,173	249,327	1,780,221
1972	3,047	605,491		1,053,391	335,115	1,997,044
1973	4,762	543,111		604,592	258,044	1,410,509
1974	1,622	995,925	20,396	2,041,099	86,383	3,145,425
1975	3,059	704,801	29,634	1,100,555	156,761	1,994,810
1976	8,413	1,075,226	36,083	3,105,320	312,914	4,537,956
1977	13,804	1,269,374	59,095	2,212,488	742,384	4,297,145
1978	14,677	1,000,353	37,479	5,006,273	482,956	6,541,738
1979	14,445	1,410,800	93,940	3,067,647	607,430	5,194,262
1980	5,853	1,831,748	27,290	6,492,822	830,070	9,187,783
1981	15,657	1,391,593	58,729	3,188,869	741,981	5,396,829
1982	10,773	1,603,692	86,402	5,370,049	1,023,923	8,094,839
1983	27,445	1,304,233	101,950	2,090,104	824,754	4,348,486
1984	14,411	1,467,730	123,779	4,520,344	682,936	6,809,200
1985	13,877	2,554,067	191,406	3,204,316	723,390	6,687,056
1986	11,046	2,001,279	170,000	4,068,615	655,817	6,906,757
1987	23,744	1,551,543	153,000	2,978,510	641,579	5,348,376
1988	35,152	1,661,532	96,140	3,236,931	558,531	5,588,286
1989 [b]	26,131	3,022,886	166,622	14,642,587	1,432,609	19,290,835
1990	25,972	2,006,241	151,420	6,024,900	474,620	8,683,153
1991	27,306	2,515,659	259,850	4,317,610	934,336	8,054,761
1992	19,013	1,968,058	289,592	3,515,624	530,128	6,322,415
1993	22,113	1,705,440	159,996	4,291,581	234,381	6,413,511
1994	21,591	2,041,511	206,418	3,994,020	545,391	6,808,931
1995	30,843	1,840,112	231,175	10,498,232	469,856	13,070,218
1996	21,089	1,813,256	189,618	3,351,011	394,784	5,769,758
1997	28,534	1,787,611	225,938	3,217,075	454,980	5,714,138
1998 [c]	24,654	1,775,759	234,734	7,088,975	374,456	9,498,578
AVERAGES						
All Years	15,675	1,342,616	136,027	3,667,118	461,164	5,622,599
1989-1998	24,725	2,047,653	211,536	6,094,162	584,554	8,962,630
Odd Year, 1989-1997				8,167,797		
Even Year, 1990-1998				4,794,906		

[a] Indexed escapements include peak counts from aerial surveys and foot surveys, plus end of season totals from weired systems.

[b] Fisheries were severely restricted in 1989 due to the M/V Exxon Valdez oil spill.

[c] Preliminary Data.

Table 13. Estimated commercial salmon harvest and value, by gear type, in the Kodiak Management Area, 1970 - 1998.

Year	Total Catch [a]	Total Value [b]	Average Exvessel Value		
			Purse Seine	Beach Seine	Set Net
1970	13,949,206	21,658,000	41,880	10,470	21,083
1971	6,378,179	4,973,000	13,397	2,919	3,015
1972	3,883,197	3,909,000	9,233	647	1,451
1973	1,001,343	2,094,000	5,075	251	852
1974	3,329,427	4,808,000	15,993	4,406	4,828
1975	3,187,410	3,831,000	13,300	5,600	3,849
1976	12,484,451	16,976,000	43,017	11,035	14,481
1977	7,976,691	18,873,142	46,942	12,107	19,117
1978	16,942,215	30,357,179	70,685	14,772	22,711
1979	12,420,260	22,958,317	51,263	20,348	23,363
1980	19,157,249	27,410,296	62,363	23,385	21,215
1981	13,094,099	32,647,230	79,877	26,946	34,785
1982	10,891,952	18,803,822	39,309	11,038	28,889
1983	7,081,976	13,405,578	30,239	5,918	16,689
1984	13,678,005	25,948,012	71,550	12,341	26,552
1985	9,897,903	20,428,111	57,782	8,405	27,517
1986	16,304,165	38,723,961	92,696	11,885	68,700
1987	7,746,980	31,107,864	79,814	15,664	41,163
1988	19,009,757	103,816,936	252,403	47,017	119,013
1989 [c]	26,455,944	61,046,024	146,502	28,288	72,955
1990	12,122,389	52,611,882	113,326	10,424	66,715
1991	23,723,008	37,019,293	77,511	5,257	53,817
1992	8,462,464	40,498,352	98,388	5,436	41,984
1993	39,341,025	38,554,977	94,927	8,230	43,889
1994	12,098,324	27,103,339	67,545	9,392	46,189
1995	49,166,896	53,921,533	135,769	14,388	66,165
1996	9,215,978	25,755,502	66,171	2,810	49,232
1997	14,460,770	18,798,037	48,842	7,139	34,567
1998	26,438,000	29,806,247	102,897	3,874	43,684
Average [d] - Overall					
1970-1998	14,051,547	27,385,665	67,221	11,147	33,768
Average [d] - Previous Decades:					
1970-1979	8,155,238	13,043,764	31,079	8,256	11,475
1980-1988	12,984,676	34,699,090	85,115	18,067	42,725
Average [d] - Recent Decade:					
1990-1998	21,669,873	36,007,685	89,486	7,439	49,582
Average [d] - Recent 10 Years:					
1988-1998	21,403,861	42,788,610	105,778	11,397	56,526

[a] Number of fish. Includes commercial harvest, test fisheries, and Kitoi Hatchery cost recovery harvests.

[b] Exvessel values for 1970-76&96-98, are based on inseason price estimates, and do not include post season adjustments. Values from 1977-88 and 1990-95 are from Commercial Fisheries Entry Commission reports.

[c] In 1989 due to the presence of oil from the M/V Exxon Valdez spill there were extensive fishery closures. Harvest figures include actual and projected harvest of wild stocks and actual harvest of hatchery stocks from a supplemental cost recovery fishery. The 1989 exvessel value is estimated by multiplying price information from CFEC records for the limited fisheries that did occur by the projected total harvest had there been no oil spill. The 1989 exvessel value by gear type is estimated by using 1988 gear levels and proportional harvest by gear type, as if a normal fishery had occured on a normal distribution of fish.

1989 data not included in averages.

Table 14. Preliminary commercial salmon harvest and value, by gear type and species, in the Kodiak Management Area, 1998. (10/7/98)

Purse Seine		Chinook	Sockeye	Coho	Pink	Chum	Total	%
Total # [a]		15,099	2,547,228	348,147	18,993,198	236,949	22,140,621	83.75
Avg. Wt.		14.43	4.72	8.39	3.65	7.80		
Total Lbs. [a]		217,908	12,013,720	2,920,332	69,348,553	1,847,231	86,347,744	81.79
Avg. $/Lb. [b]		0.75	1.00	0.50	0.12	0.20		
Exvessel $		163,431.00	12,013,720.00	1,460,166.00	8,321,826.36	369,446.20	22,328,589.56	74.91
# of Permits=	217							
Average Value $		753.14	55,362.76	6,728.88	38,349.43	1,702.52	102,896.73	
Percent		0.73	53.80	6.54	37.27	1.65	100.00	

Beach Seine		Chinook	Sockeye	Coho	Pink	Chum	Total	%
Total # [a]		0	468	12	12,180	109	12,769	0.05
Avg. Wt.		0.00	4.71	9.83	3.64	7.79		
Total Lbs. [a]		0	2,205	118	44,282	849	47,454	0.04
Avg. $/Lb. [b]		0.75	1.00	0.50	0.12	0.20		
Exvessel $		0.00	2,205.00	59.00	5,313.84	169.80	7,747.64	0.03
# of Permits=	2							
Average Value $		0.00	1,102.50	29.50	2,656.92	84.90	3,873.82	
Percent		0.00	28.46	0.76	68.59	2.19	100.00	

Set Gillnet		Chinook	Sockeye	Coho	Pink	Chum	Total	%
Total # [a]		2,237	1,074,743	76,864	3,051,089	79,014	4,283,947	16.20
Avg. Wt.		13.97	5.12	8.74	4.05	7.80		
Total Lbs. [a]		31,243	5,505,263	671,601	12,351,616	616,102	19,175,825	18.16
Avg. $/Lb. [b]		0.75	1.00	0.50	0.12	0.20		
Exvessel $		23,432.25	5,505,263.00	335,800.50	1,482,193.92	123,220.40	7,469,910.07	25.06
# of Permits=	171							
Average Value $		137.03	32,194.52	1,963.75	8,667.80	720.59	43,683.68	
Percent		0.31	73.70	4.50	19.84	1.65	100.00	

Total All Gear	Chinook	Sockeye	Coho	Pink	Chum	Total	%
Total # [a]	17,336	3,622,439	425,023	22,056,467	316,072	26,437,337	100.00
Avg. Wt.	14.37	4.84	8.45	3.71	7.80		
Total Lbs. [a]	249,151	17,521,188	3,592,051	81,744,451	2,464,182	105,571,023	100.00
Avg. $/Lb. [b]	0.75	1.00	0.50	0.12	0.20		
Exvessel $	186,863.25	17,521,188.00	1,796,025.50	9,809,334.12	492,836.40	29,806,247.27	100.00
% of Total Value	0.63	58.78	6.03	32.91	1.65		100.00

Test Fishery	Chinook	Sockeye	Coho	Pink	Chum	Total	%
Total # [a]	0	655	0	0	8	663	0.00
Avg. Wt.	0.00	5.14	0.00	0.00	8.38		
Total Lbs. [a]	0	3,365	0	0	67	3,432	0.00
Avg. $/Lb. [b]	0.75	1.00	0.50	0.12	0.20		
Exvessel $	0.00	3,365.00	0.00	0.00	13.40	3,378.40	0.01

[a] Numbers and pounds of fish are derived from fish ticket summaries. There were 16,282 fish tickets generated in 1998; each ticket represents a landing. Each gear type had the following landings: Purse Seine - 8,388; Beach Seine - 36; Set Gillnet - 7,849; and Test Fishery - 9.

[b] Average price per pound figures are based on verbal end of season reports from processors. These average prices do not reflect payments made to fishers for iced fish, dock deliveries, and postseason

Table 15. Summary of fishing time, zone closures, effort, and harvest by species, for management units affected by the North Shelikof Strait Sockeye Salmon Management Plan for the Kodiak Management Area, 1990 - 1998

North Shelikof Units (15,000 Sockeye Harvest Trigger) [a/]

YEAR	MAINLAND		N. AFOGNAK		Zone Closure		Sockeye Harvest at Time of Zone Closure	Number of Vessels	Total Harvest By Species July 6 through July 25					Upper Cook Inlet Sockeye Harvest
	# of days open to Fishing	# of days Seaward zone Closed	# of days open to fishing	# of days Seaward zone Closed	Date	Time			CHINOOK	SOCKEYE	COHO	PINK	CHUM	
1990	7.1	2.4	9.1	4.4	7/15	9pm	36,800	69	140	57,700	3,900	18,600	19,400	3.6 MILLION
1991	7.1	0	13.1	0	none	none	n/a	42	2,500	18,800	2,700	44,800	3,800	2.2 MILLION
1992	7.1	5.1	9.1	7.1	7/8	1pm	13,500	77	900	128,400	3,100	24,300	12,000	8.9 MILLION
1993	7.1	4.7	13.8	8.9	7/10	5pm	15,220	89	1,200	78,400	2,000	75,600	4,200	4.7 MILLION
1994	7.1	2.8	9.1	4.8	7/14	11am	22,830	58	165	38,800	2,400	52,000	10,500	3.5 MILLION
1995	7.1	3.3	13.3	8.5	7/13	10pm	15,770	77	150	37,400	1,260	178,800	16,590	2.9 MILLION
1996	7.1	4.3	7.1	4.3	7/15	10pm	11,675	77	260	73,720	1,820	30,050	14,585	3.9 MILLION
1997	7.1	4.9	10.1	7.9	7/8	5pm	19,850	80	1,940	59,140	1,840	38,190	4,550	4.1 MILLION
1998	7.1	2.4	10.1	4.4	7/16	9pm	17,812	39	141	40,631	5,381	59,536	6,368	1.2 MILLION

[a] In 1988, from 7/6 - 7/25, with 6.9 days open to fishing 392,000 sockeye were harvested in the "North Shelikof Units". In Upper Cook Inlet 6,800,000 sockeye were harvested.

Southwest Afognak Section (50,000 Sockeye Harvest Trigger) [b/]

YEAR	# of Days Open to Fishing	# of Days Seaward zone Closed	Zone Closure		Sockeye Harvest at Time of Zone Closure	Number of Vessels	Total Harvest By Species July 6 through July 25					Upper Cook Inlet Sockeye Harvest
			Date	Time			CHINOOK	SOCKEYE	COHO	PINK	CHUM	
1990	9.1	0	none	none	N/A	64	300	22,900	3,600	53,800	6,000	3.6 MILLION
1991	13.1	0	none	none	N/A	55	300	34,200	3,600	100,700	4,000	2.2 MILLION
1992	9.1	4.7	7/14	1pm	48,200	84	300	50,600	600	30,000	6,800	8.9 MILLION
1993	13.1	7.7	7/14	1pm	45,900	87	860	74,000	7,100	243,000	7,400	4.7 MILLION
1994	9.1	0	none	none	N/A	45	360	13,600	1,000	64,300	3,100	3.5 MILLION
1995	13.3	0	none	none	N/A	64	760	21,360	1,750	490,510	22,220	2.9 MILLION
1996	7.1	0	none	none	N/A	32	185	10,510	803	79,205	10,785	3.9 MILLION
1997	10.1	0	none	none	N/A	61	1,500	18,120	1,760	62,730	8,440	4.1 MILLION
1998	10.1	0	none	none	N/A	22	239	10,339	2,292	82,683	1,899	1.2 MILLION

[b] In 1988, from 7/6 - 7/25, with 11.1 days open to fishing 86,000 sockeye were harvested in the "Southwest Afognak Unit". In Upper Cook Inlet 6,800,000 sockeye were harvested.

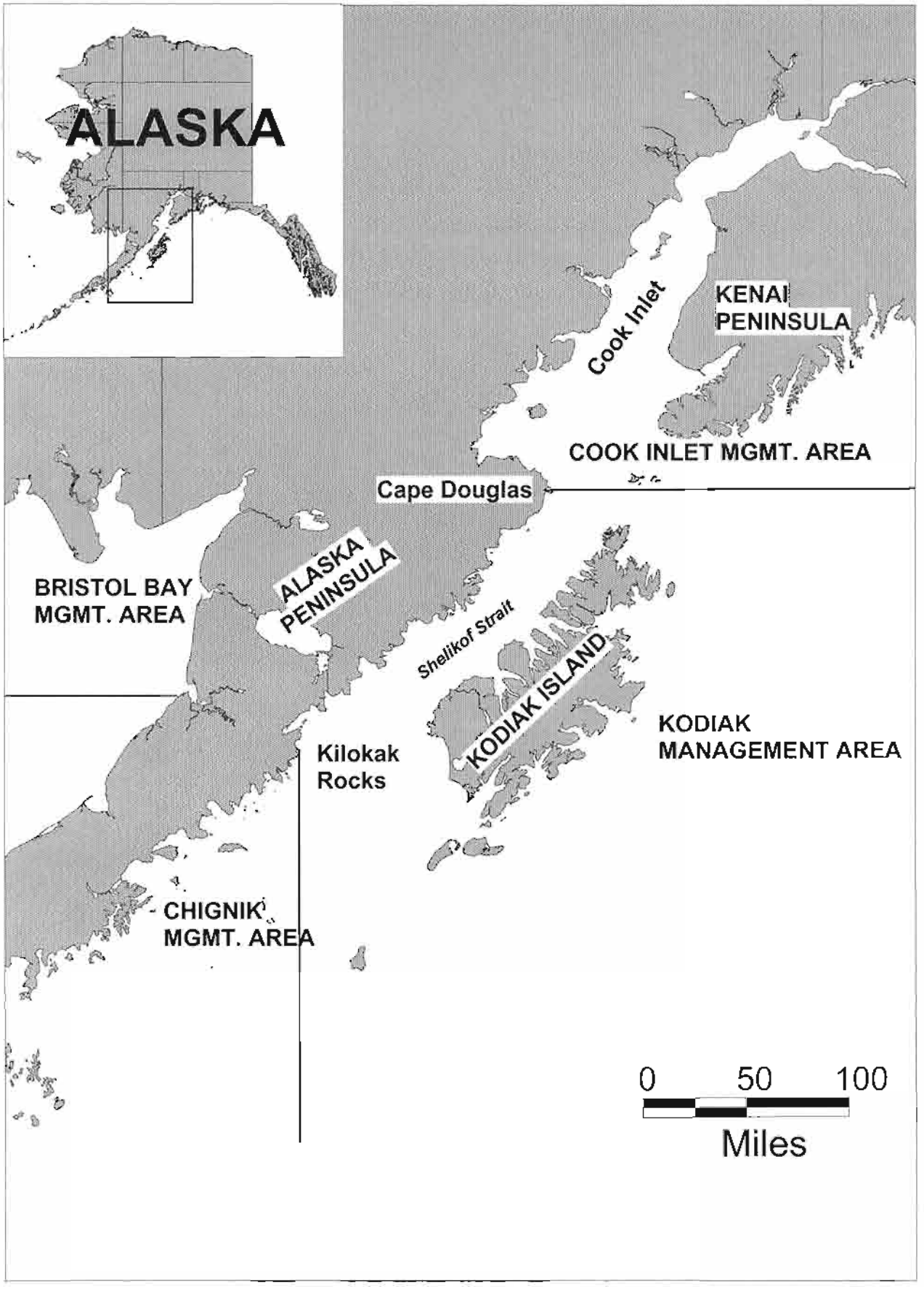


Figure 1. Location of the Kodiak Management Area in relation to the Cook Inlet and Chignik Management Areas.

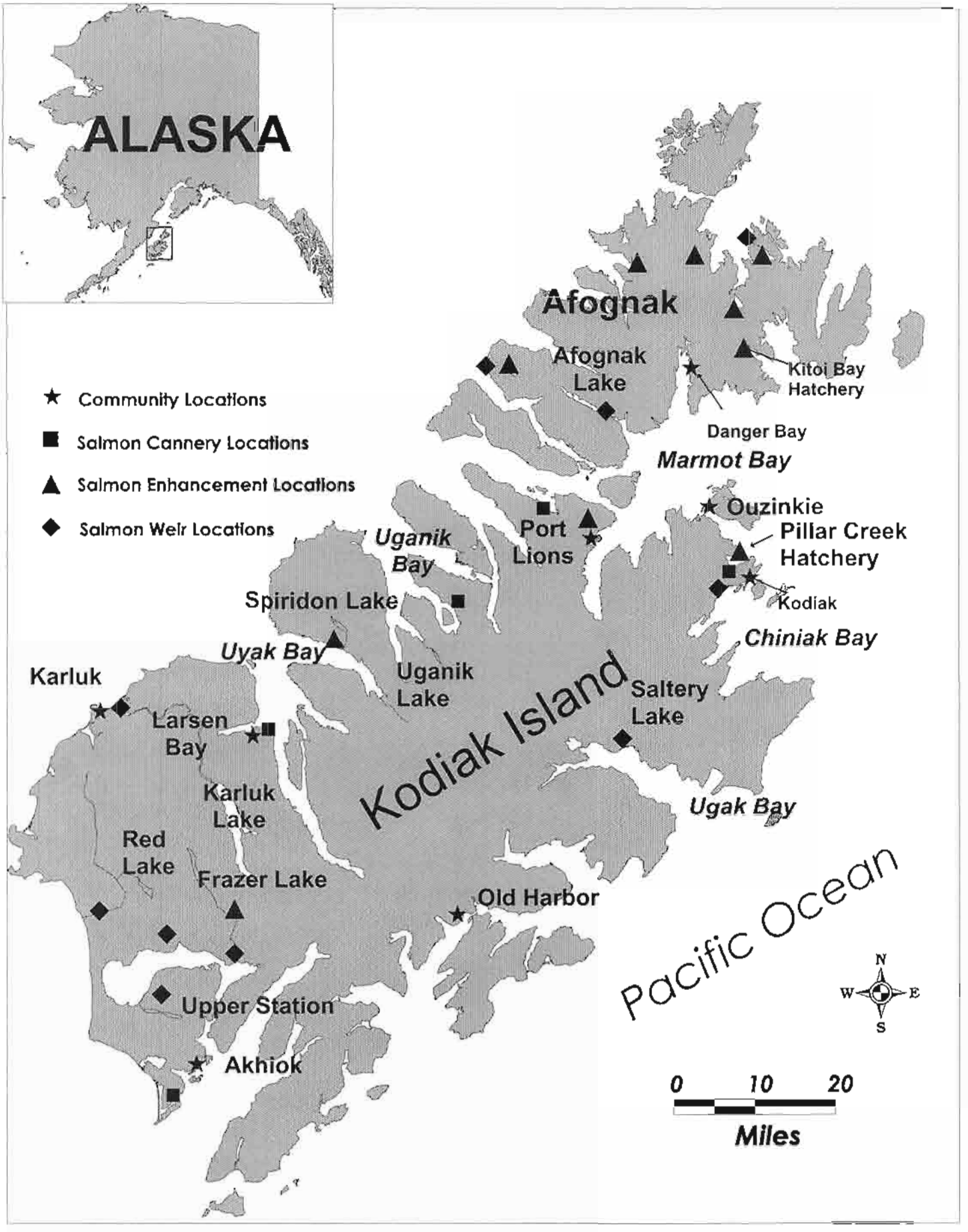


Figure 2. Map of Kodiak Island showing communities, processing plants, sockeye salmon weirs and enhancement locations, 1998.

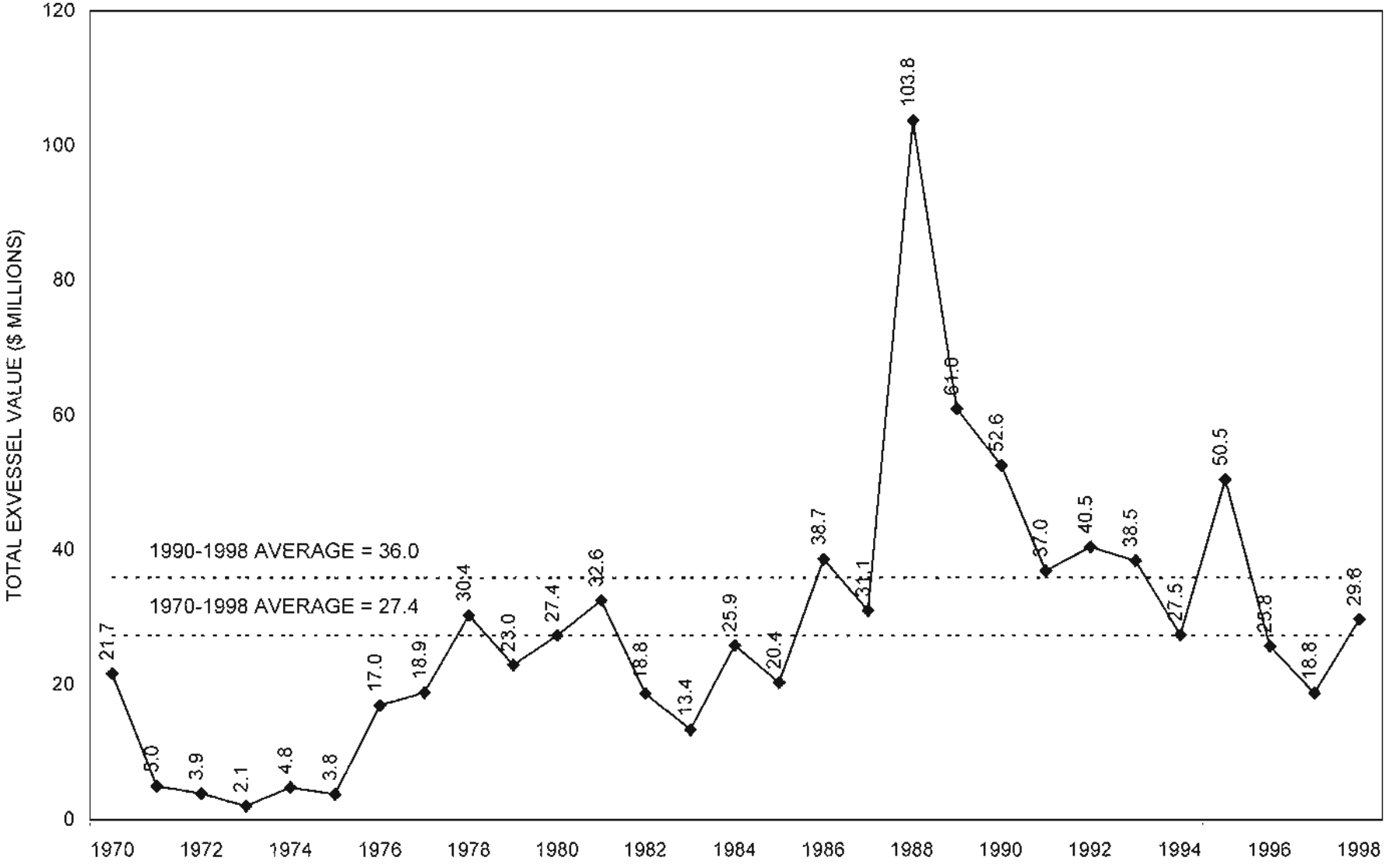


Figure 3. Average exvessel value of the commercial salmon fishery in the Kodiak Management Area, 1970-1998.

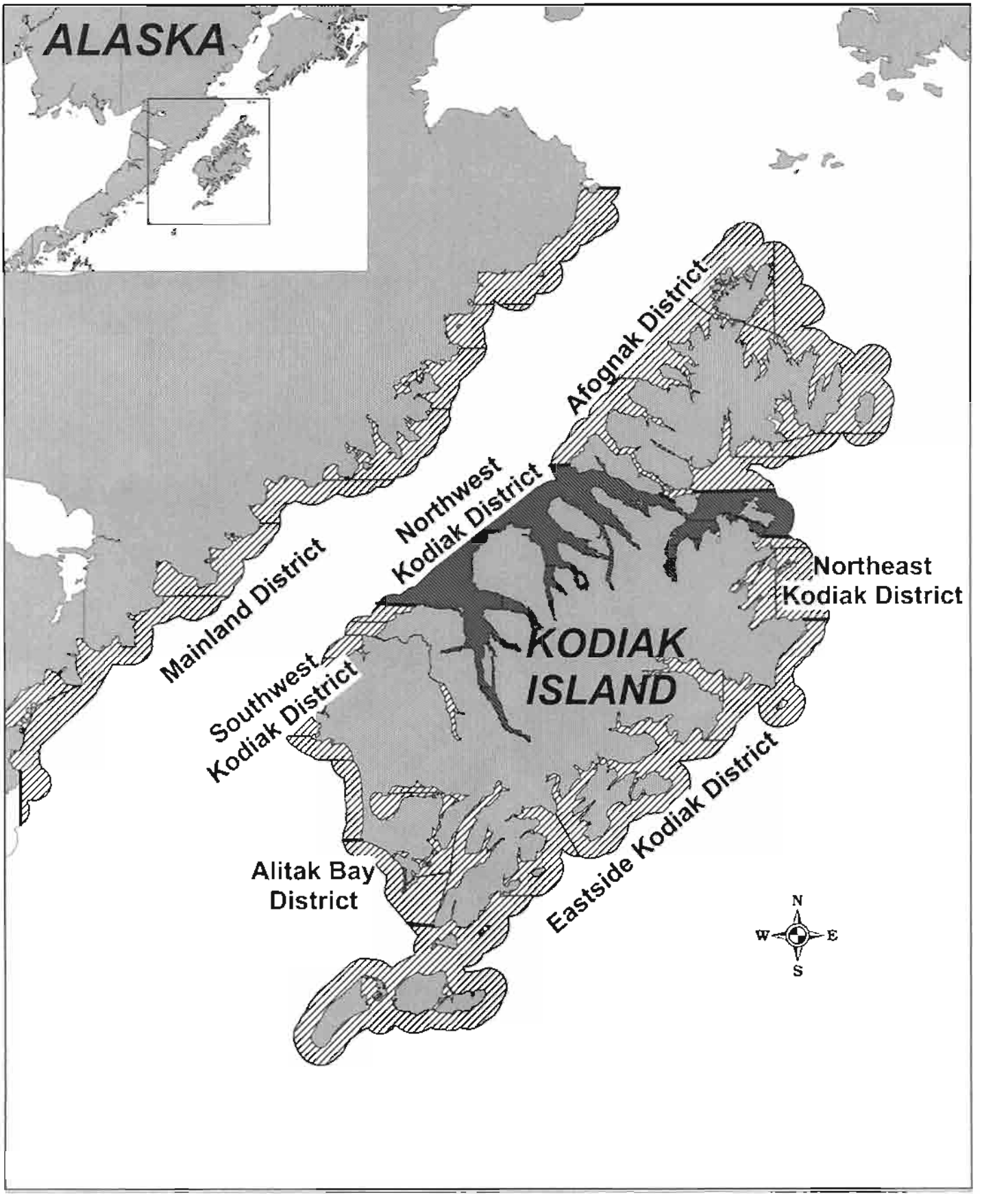
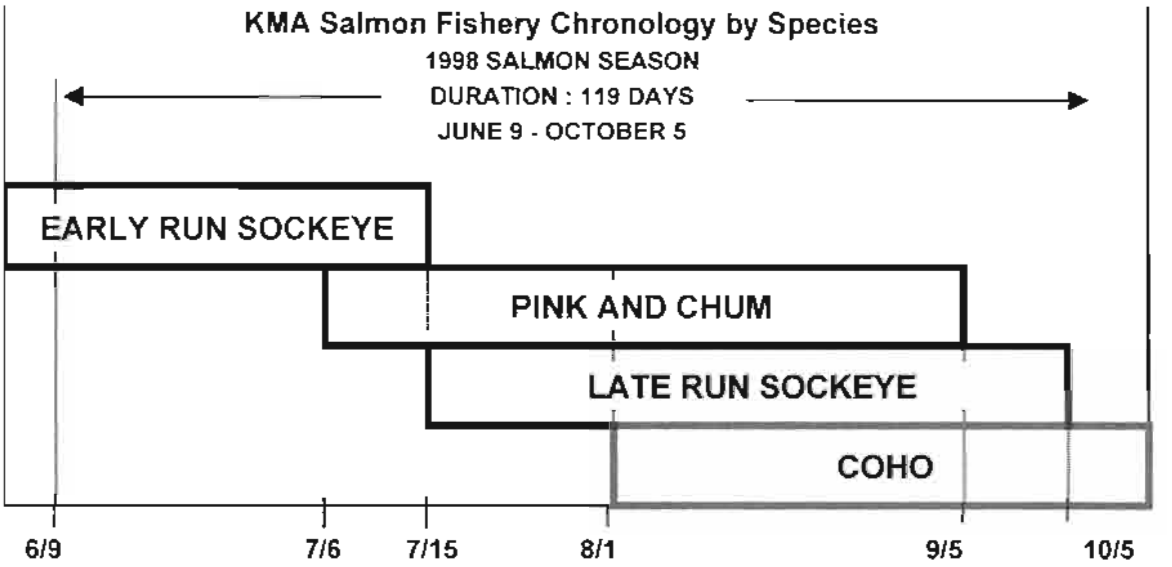


Figure 4. Map of the Kodiak Management Area, seven districts and 52 sections, 1998.



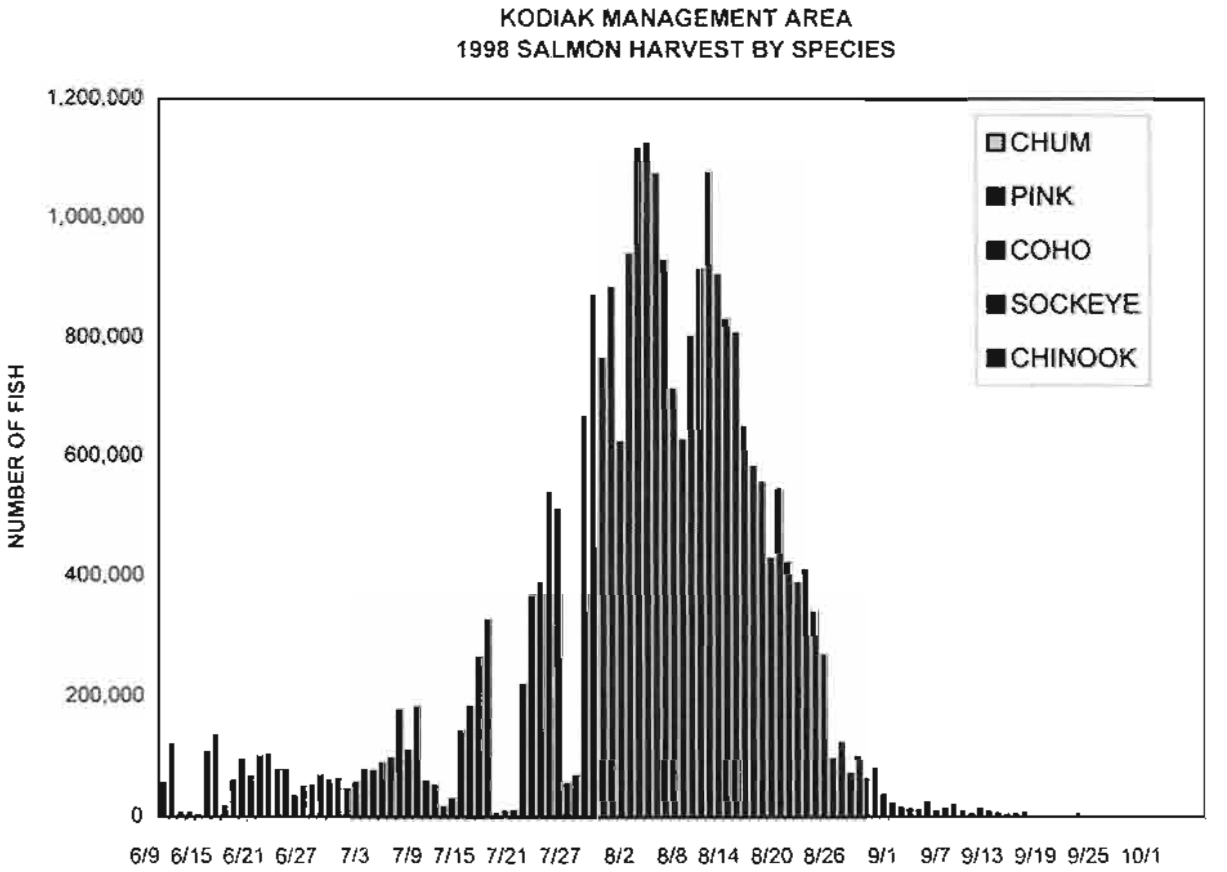


Figure 5. Commercial salmon fishery chronology, by species, in the Kodiak Management Area. 1998.

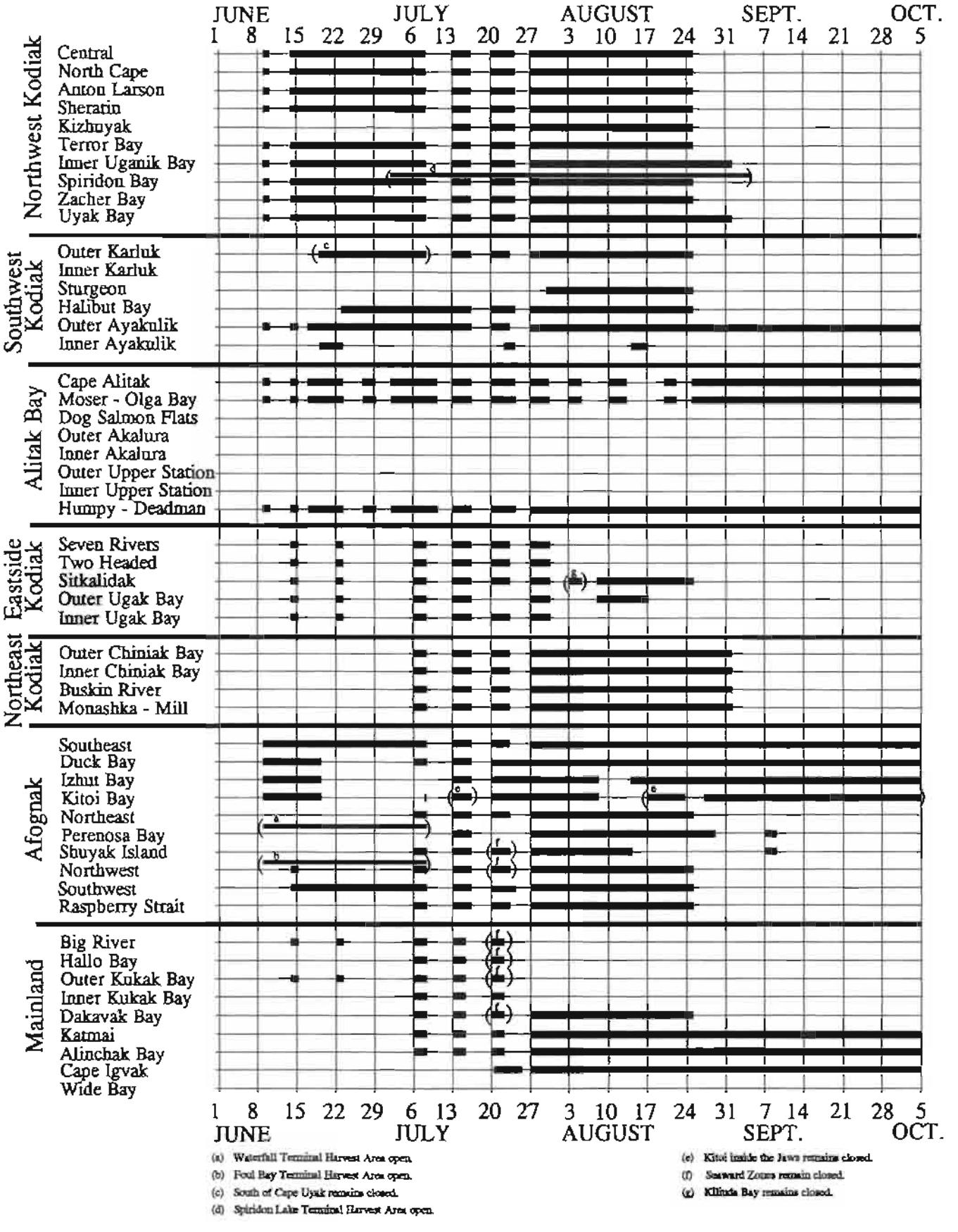


Figure 5a. Commercial salmon fishing time, by district and section, in the Kodiak Management Area, 1998.

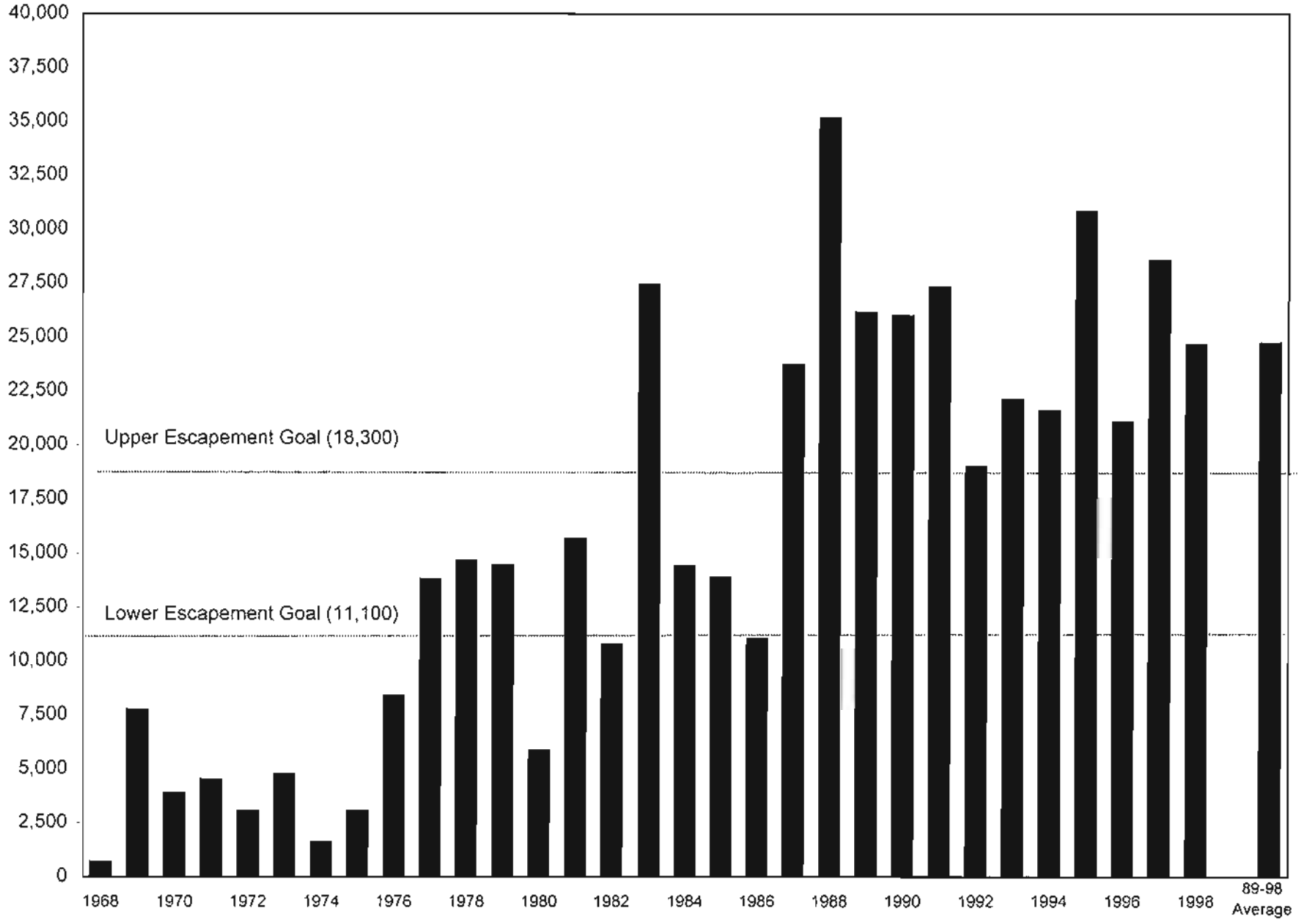


Figure 6. Historical indexed chinook salmon escapements in the Kodiak Management Area, 1968-1998.

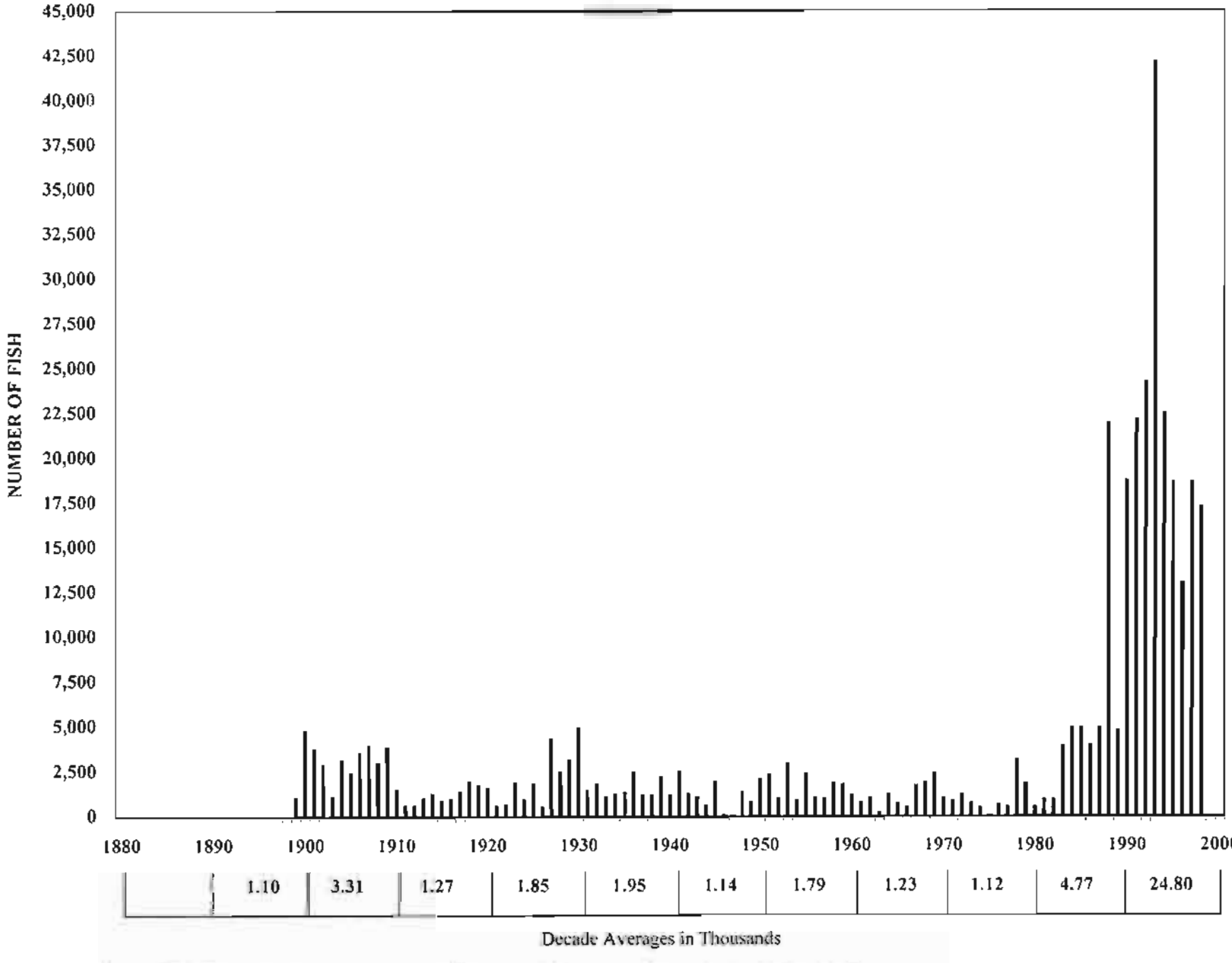


Figure 7. Chinook salmon commercial harvest, all gear combined in the Kodiak Management Area, 1899-1998.

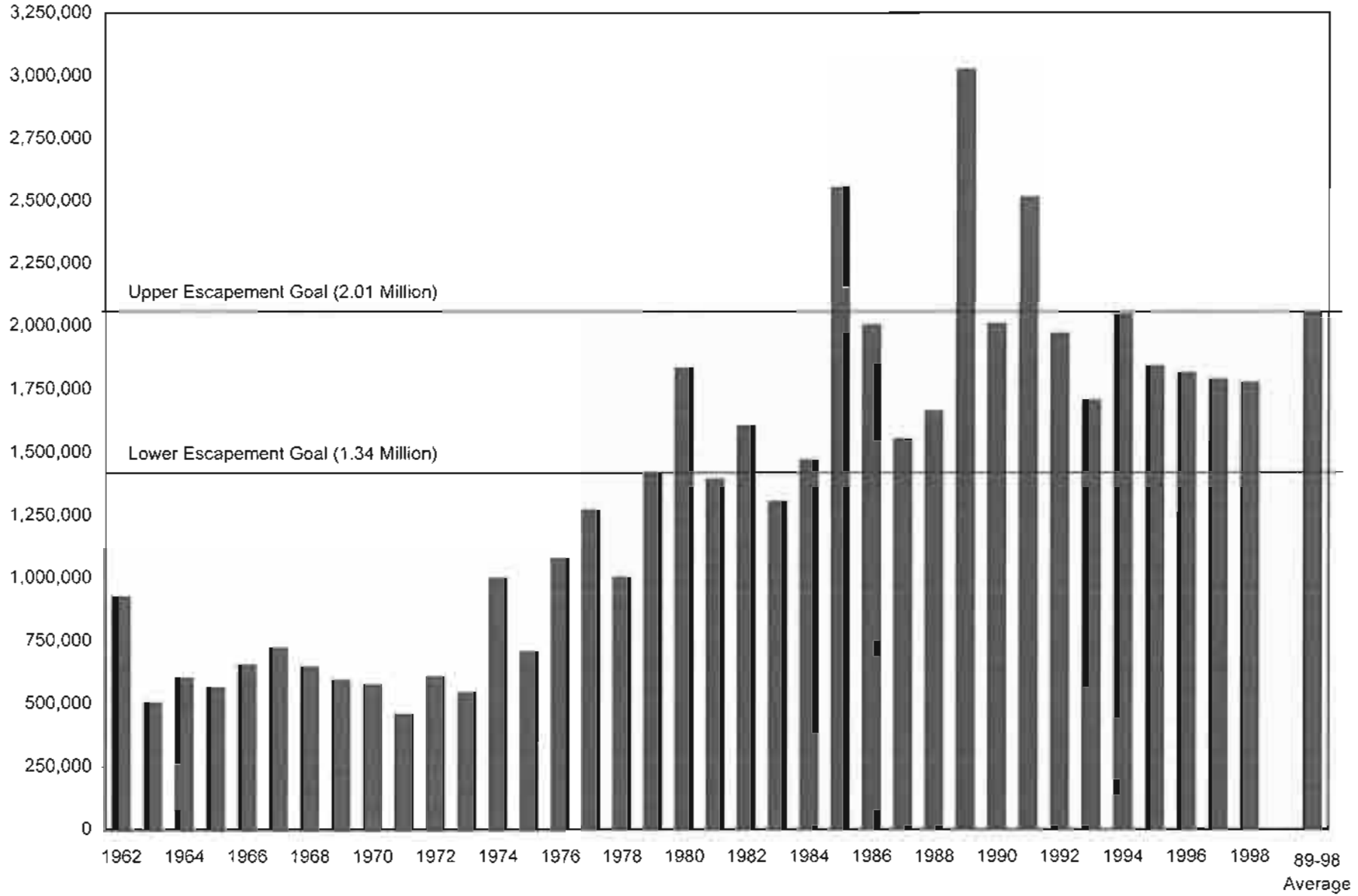


Figure 8. Historical indexed sockeye salmon escapements in the Kodiak Management Area, 1962-1998.

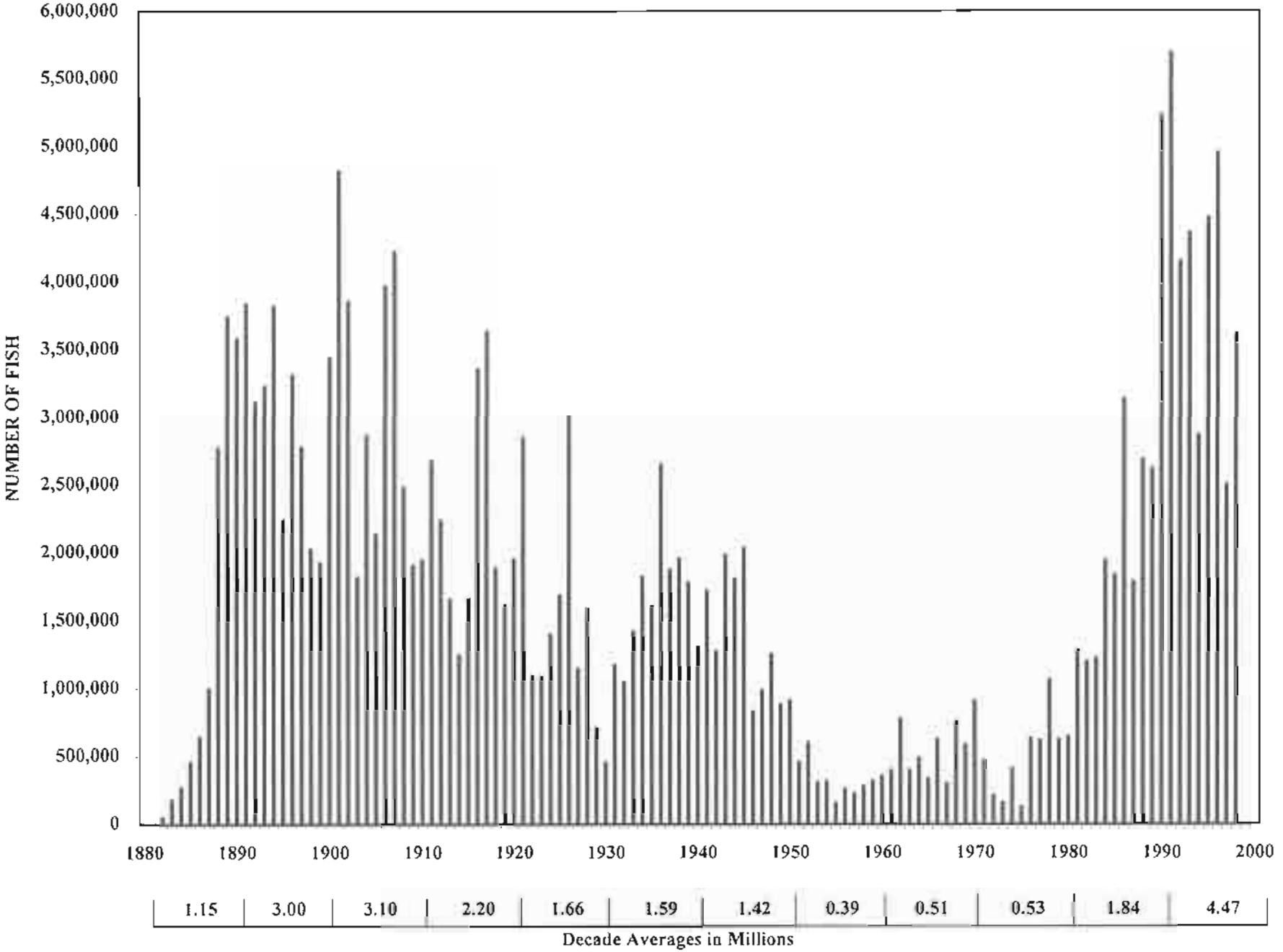


Figure 9. Sockeye salmon commercial harvest, all gear combined, in the Kodiak Management Area, 1882-1998.

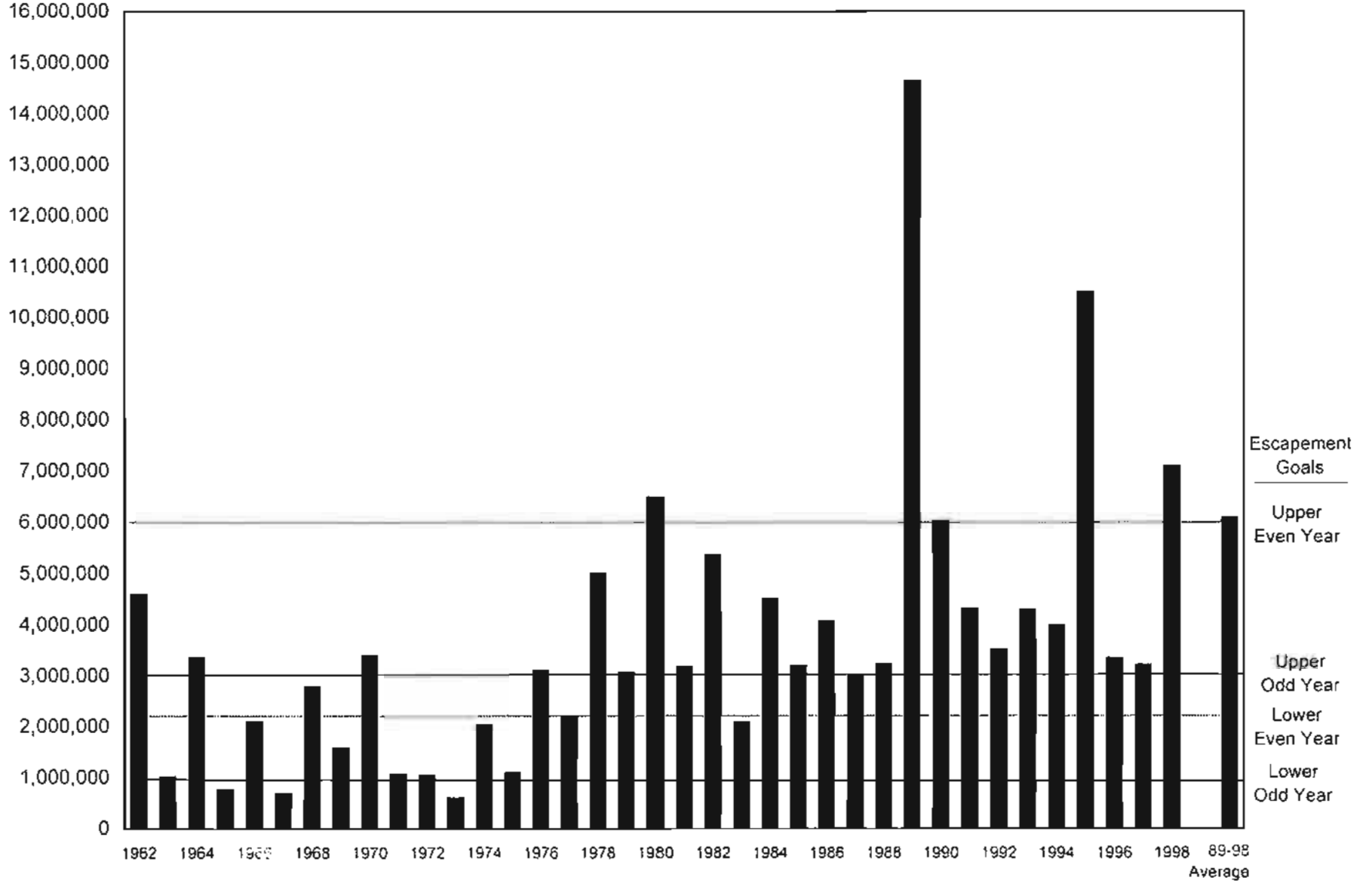


Figure 10. Historical pink salmon escapements in the Kodiak Management Area, 1962-1998.

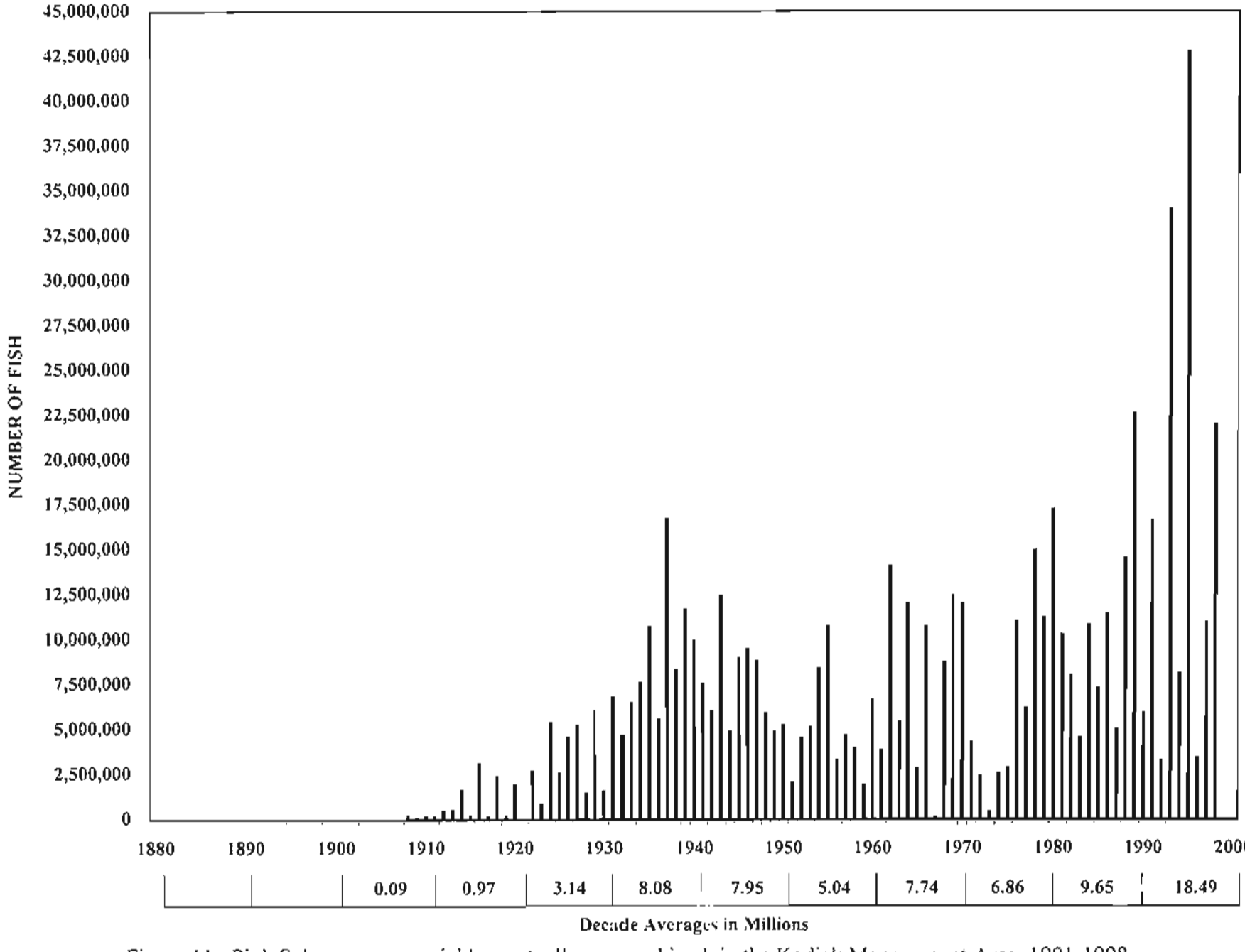


Figure 11. Pink Salmon commercial harvest, all gear combined, in the Kodiak Management Area, 1901-1998.

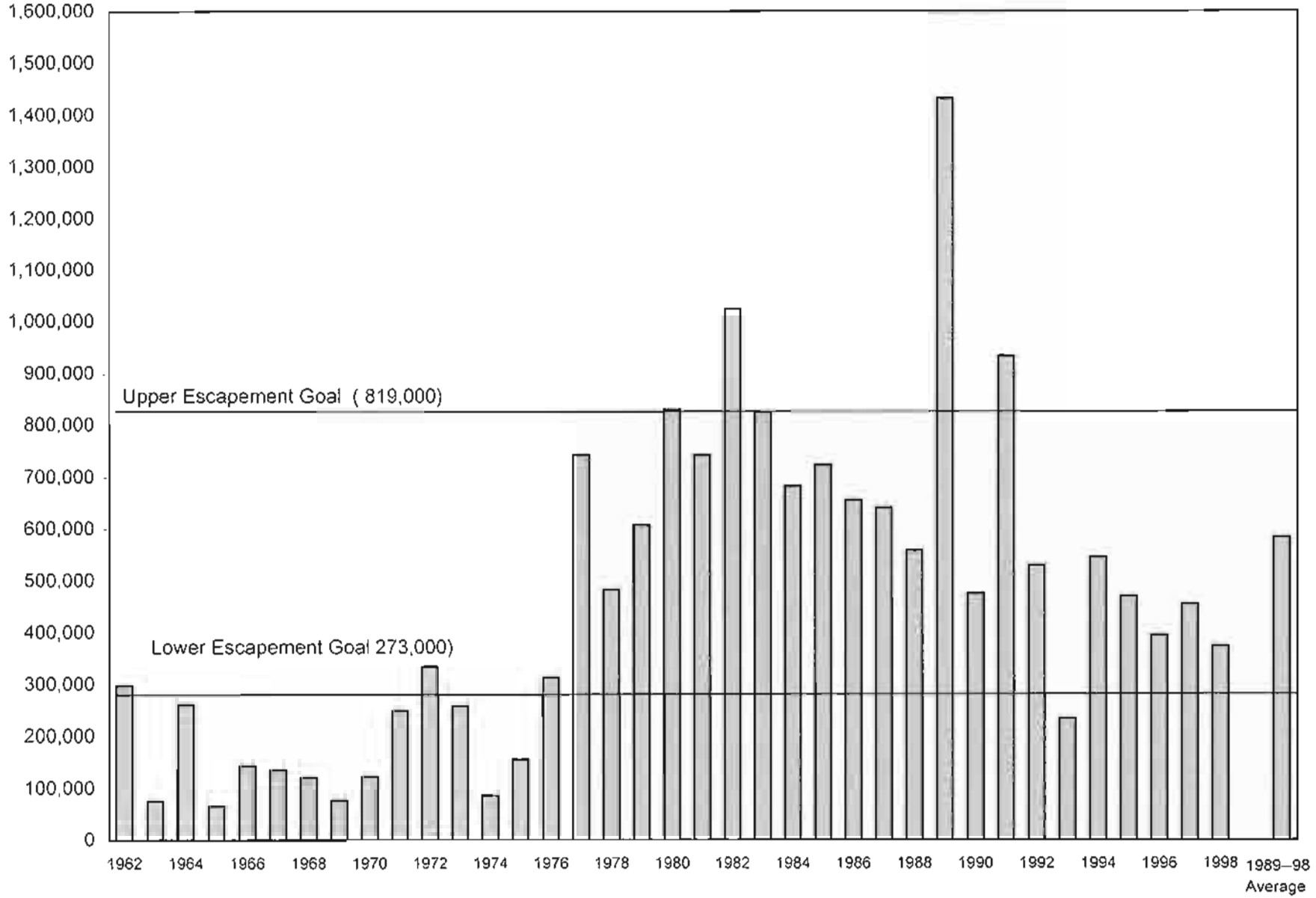


Figure 12. Historical indexed chum salmon escapements in the Kodiak Management Area, 1962-1998.

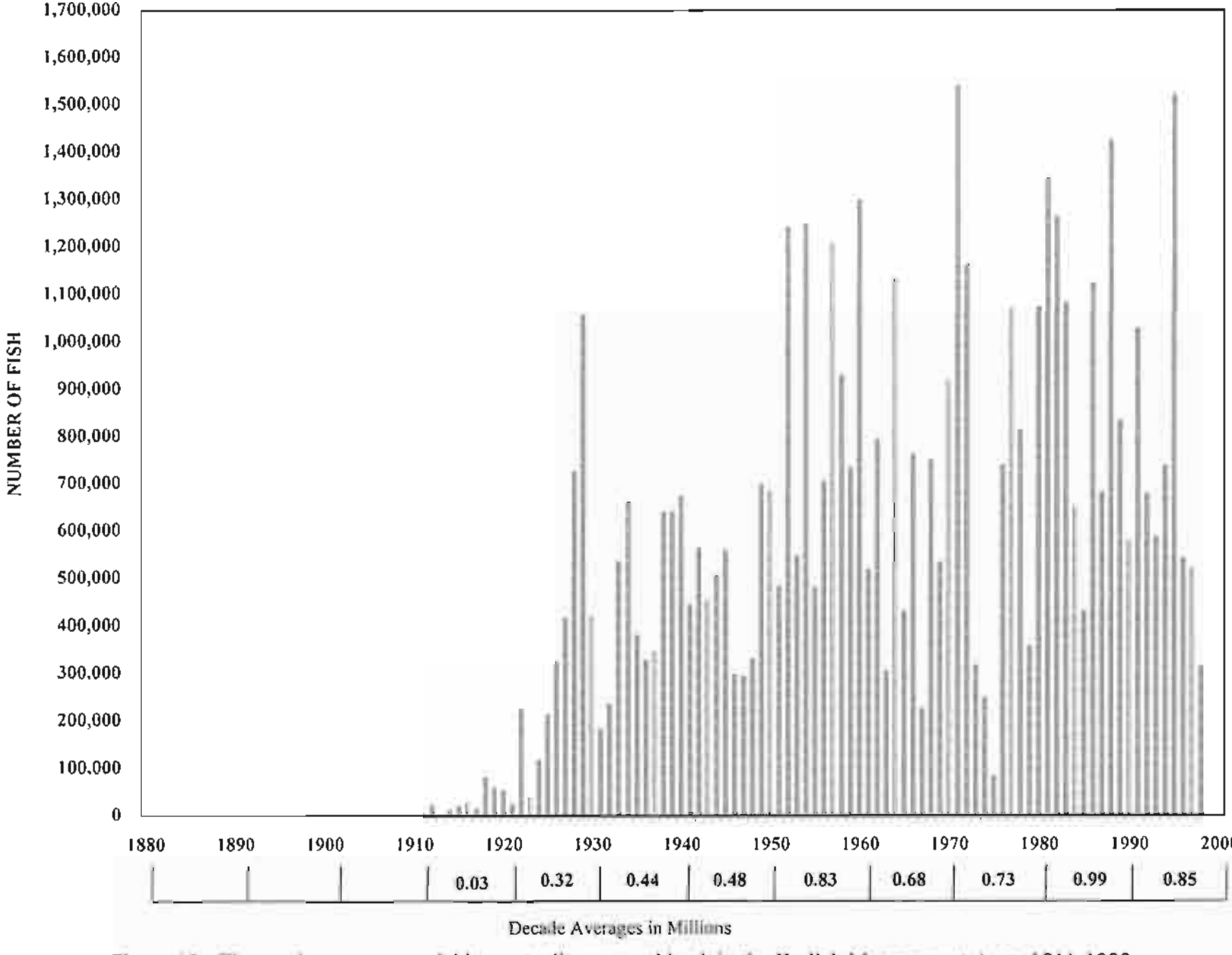


Figure 13. Chum salmon commercial harvest, all gear combined, in the Kodiak Management Area, 1911-1998.

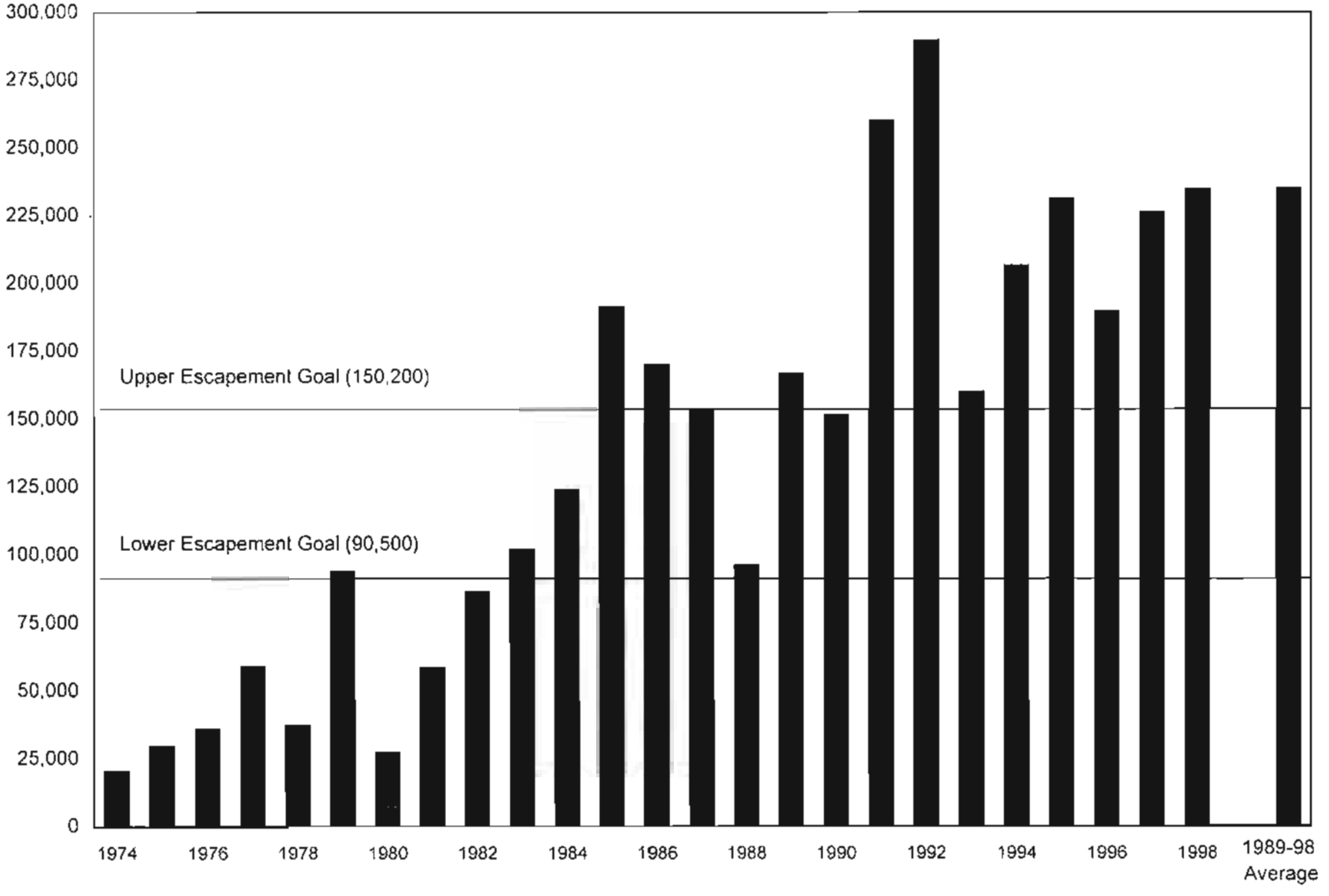


Figure 14. Historical indexed coho salmon escapements in the Kodiak Management Area, 1974-1998.

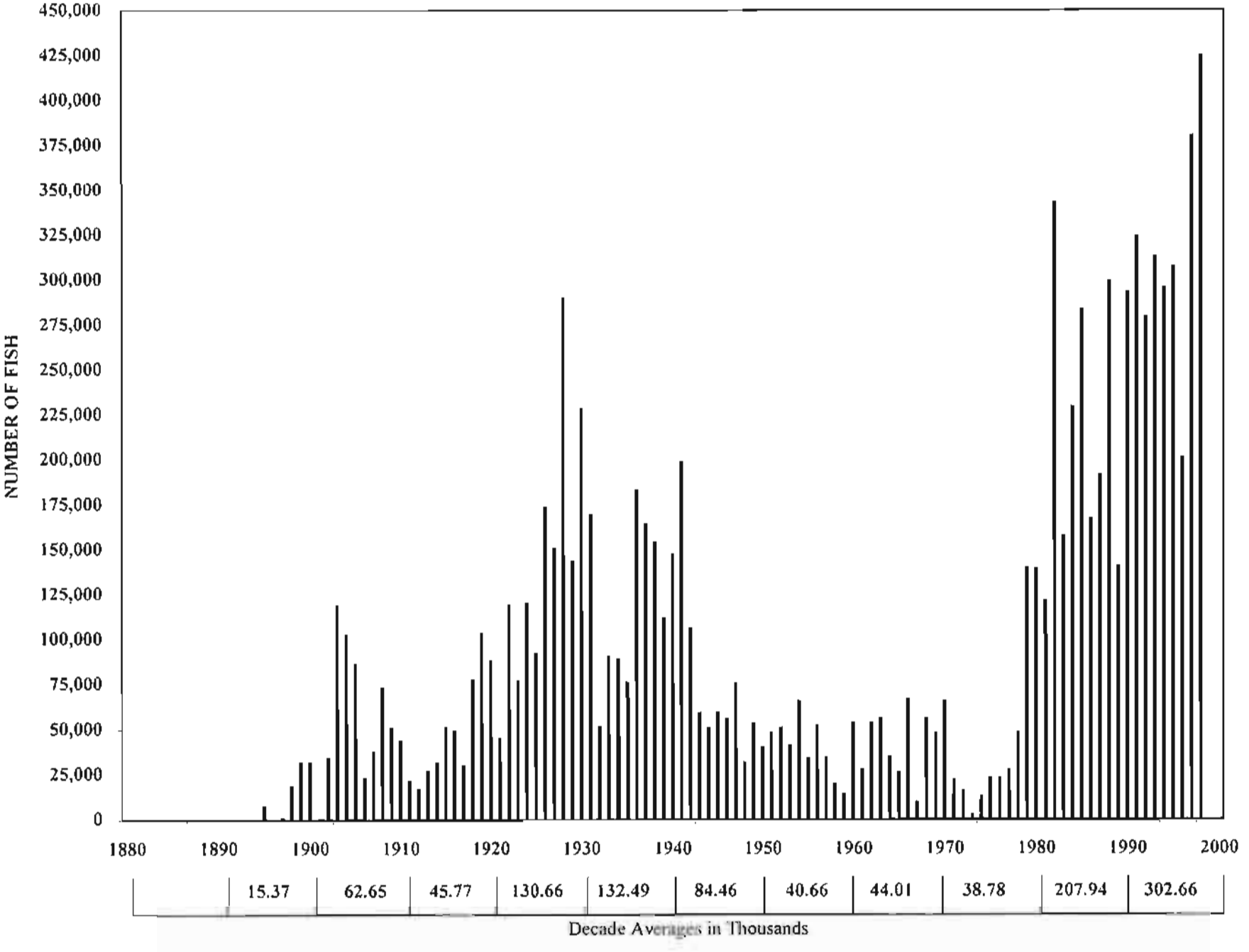


Figure 15. Coho salmon commercial harvest, all gear combined, in the Kodiak Management Area, 1895-1998.

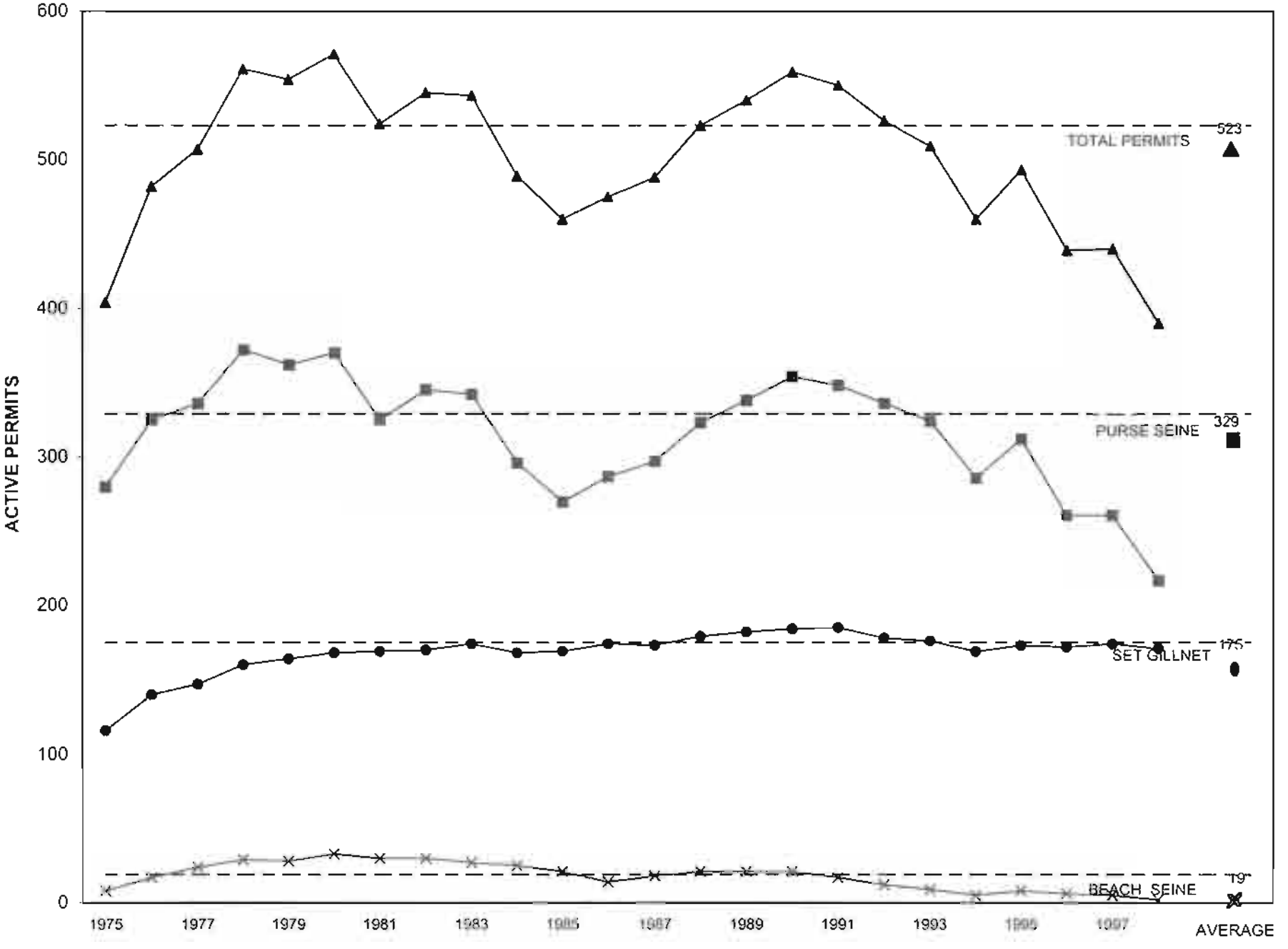


Figure 16. Number of active commercial salmon fishing permits, by year and gear type, in the Kodiak Management Area, 1975-1998.

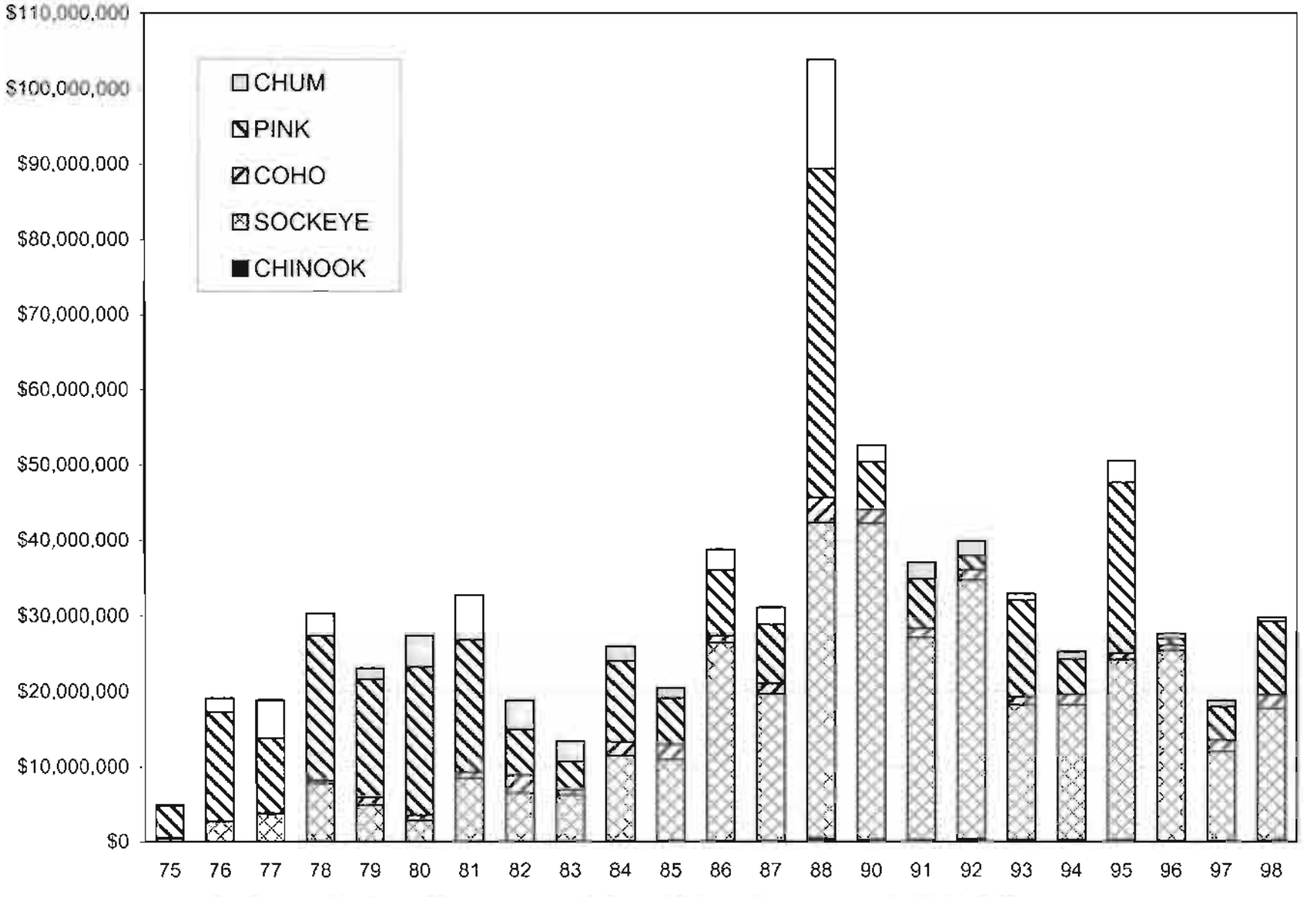


Figure 17. Exvessel value of the commercial salmon fishery, by species, in the Kodiak Management Area, 1975-1998.

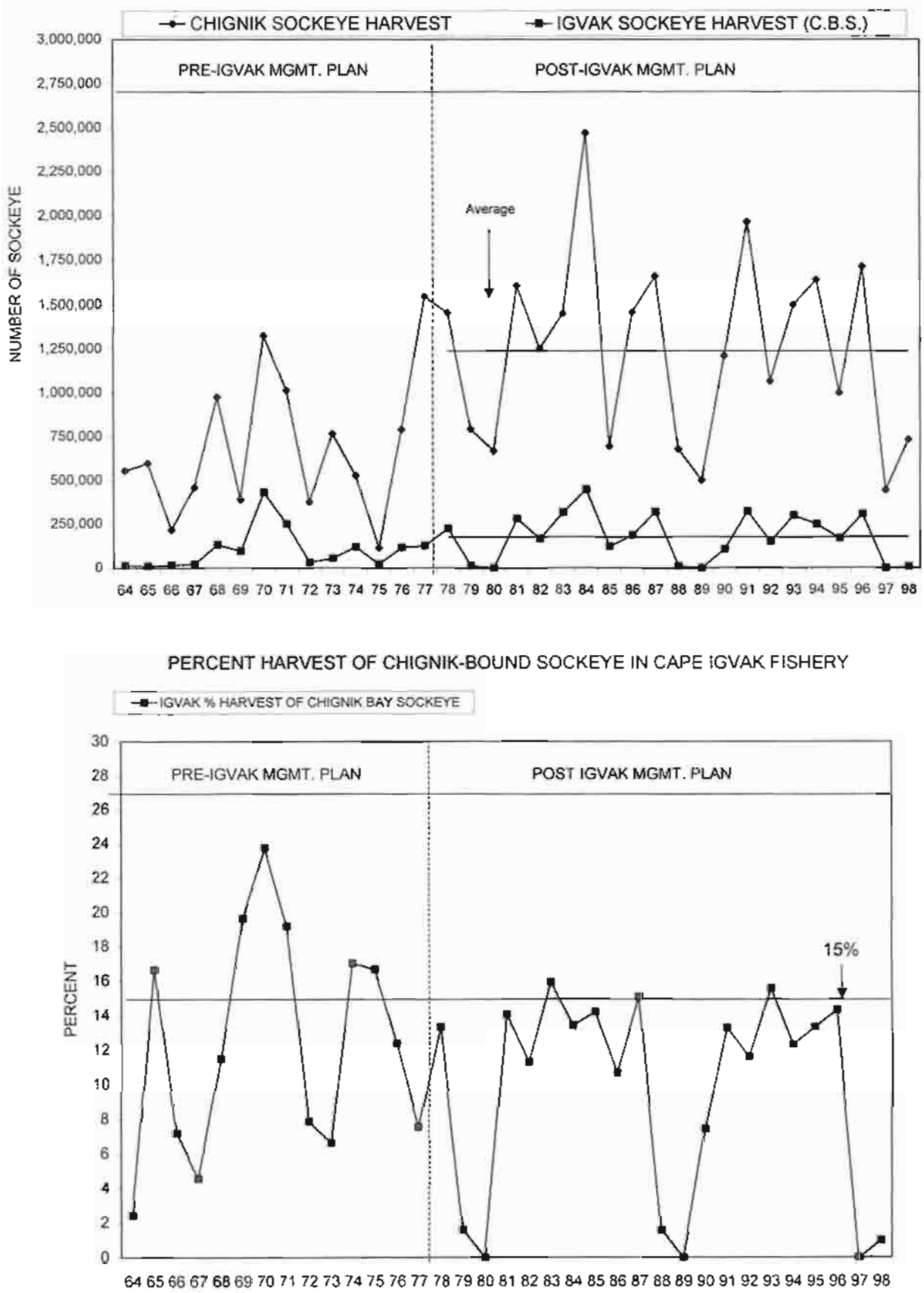


Figure 18. Impact of the Cape Igvak Management Plan on the Kodiak Management Area, 1964-1998.

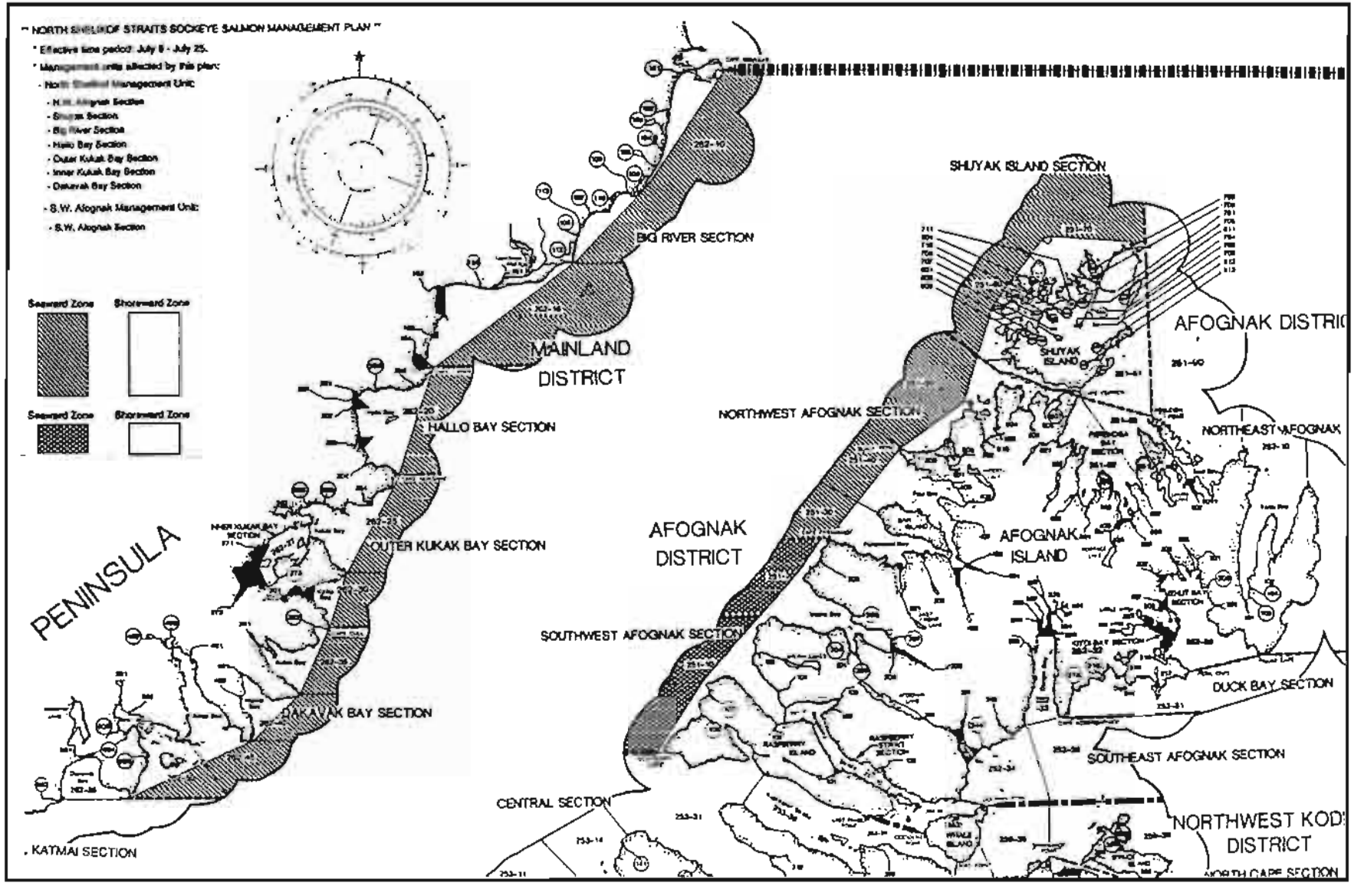
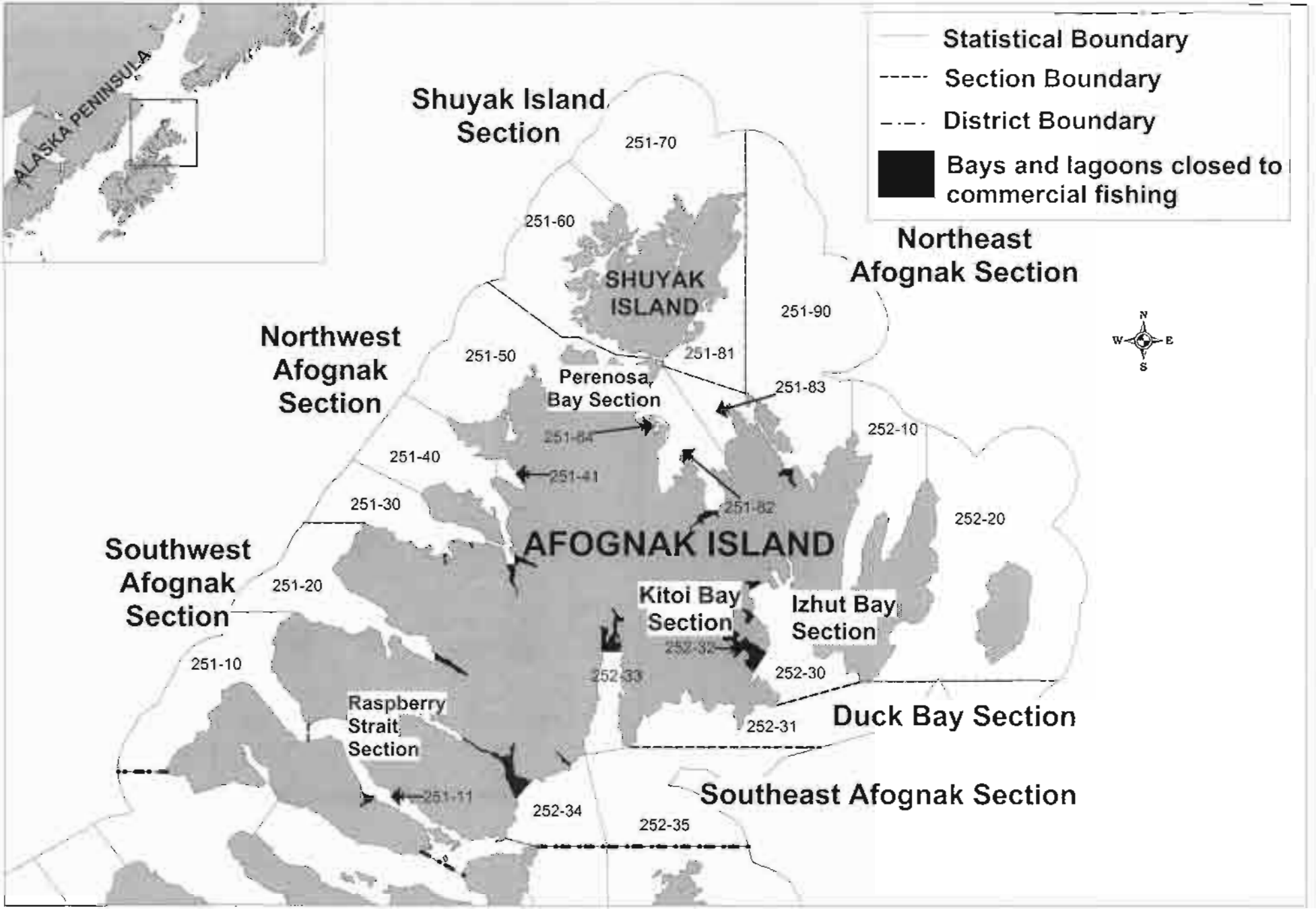
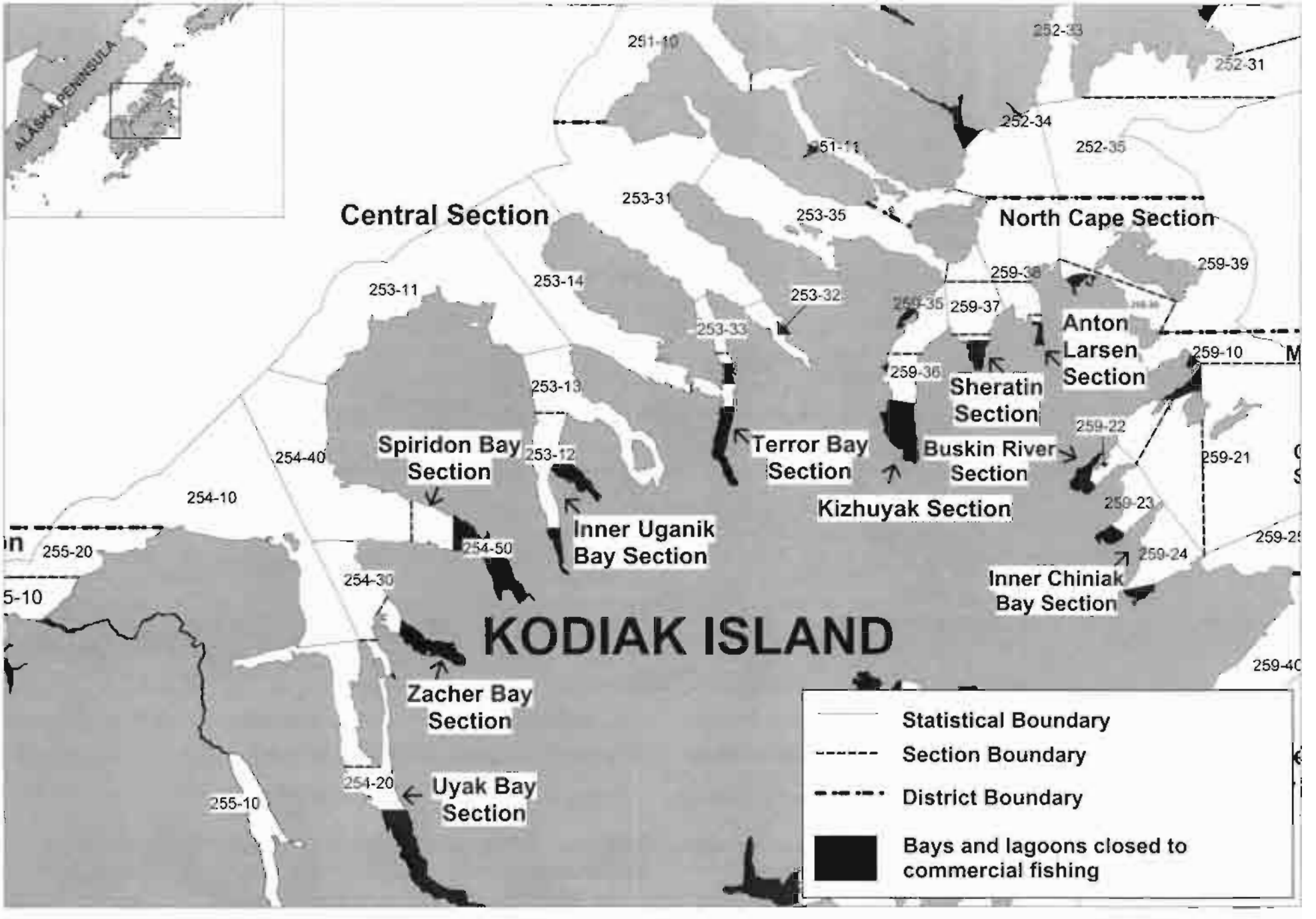


Figure 19. Map of the "North Shelikof Seaward Zone" and the "Southwest Afognak Seaward Zone" of the North Shelikof Strait Sockeye Salmon Management Plan for the Kodiak Management Area, 1998.

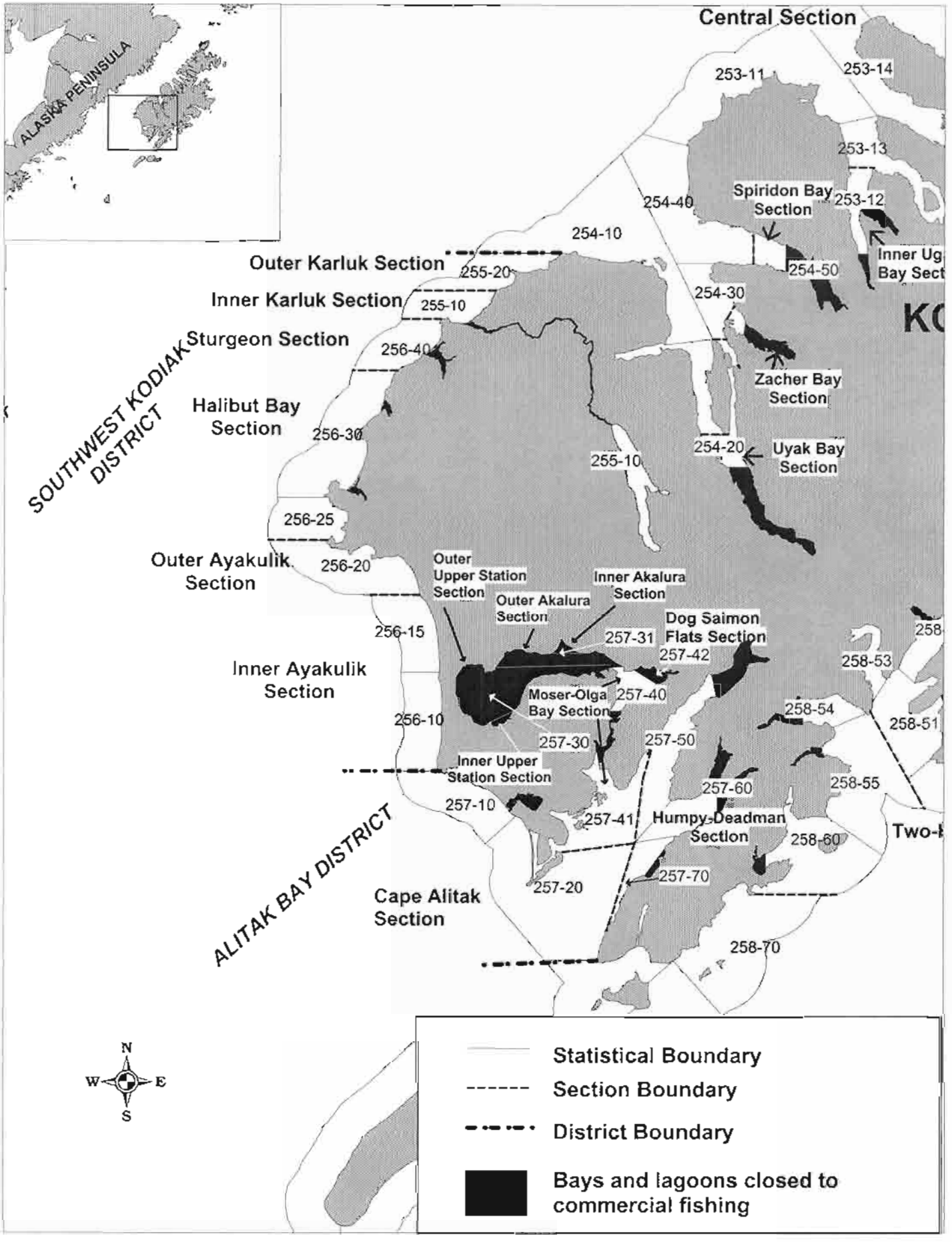
APPENDIX



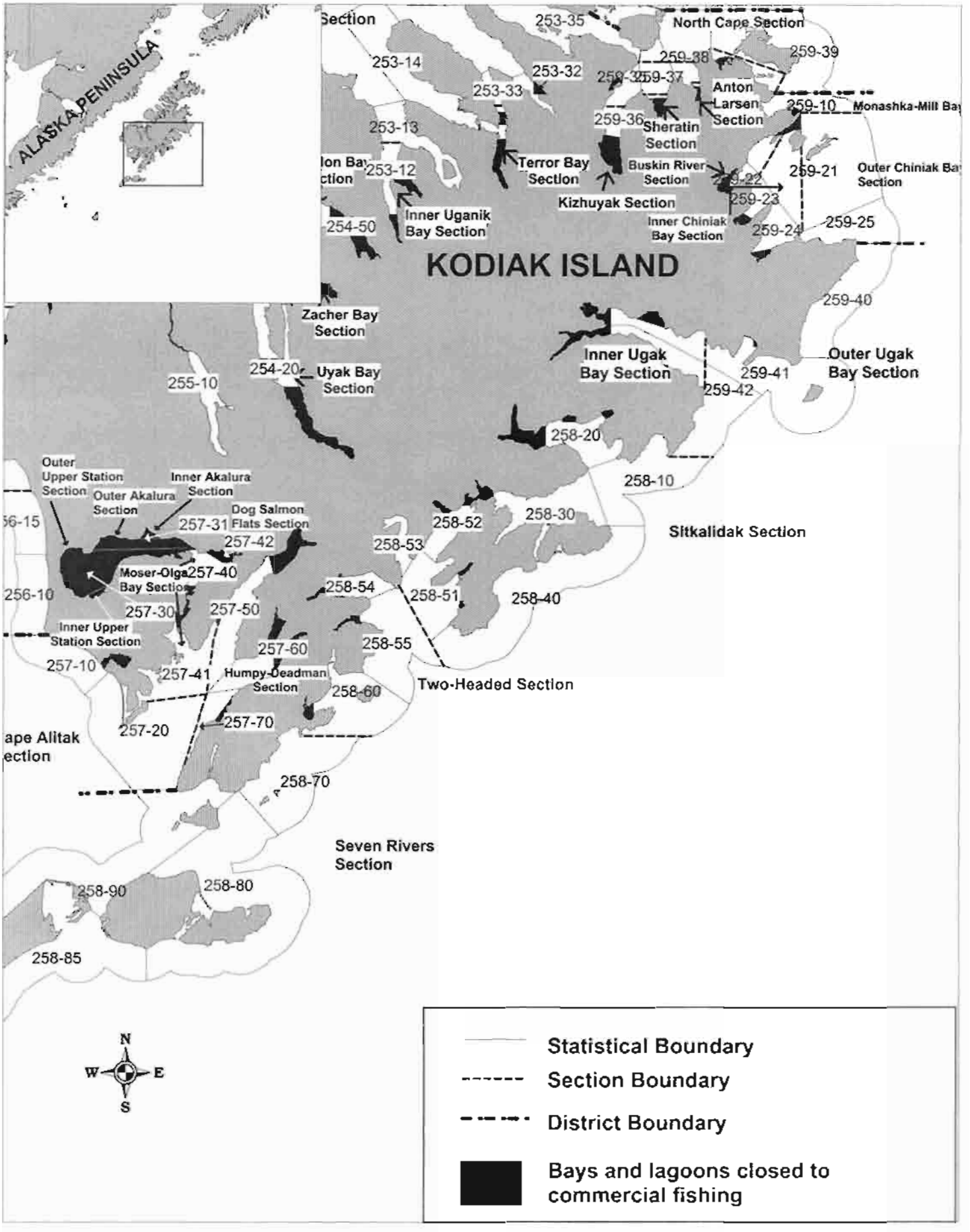
Appendix A.1. Afognak District of the Kodiak Management Area, 1998.



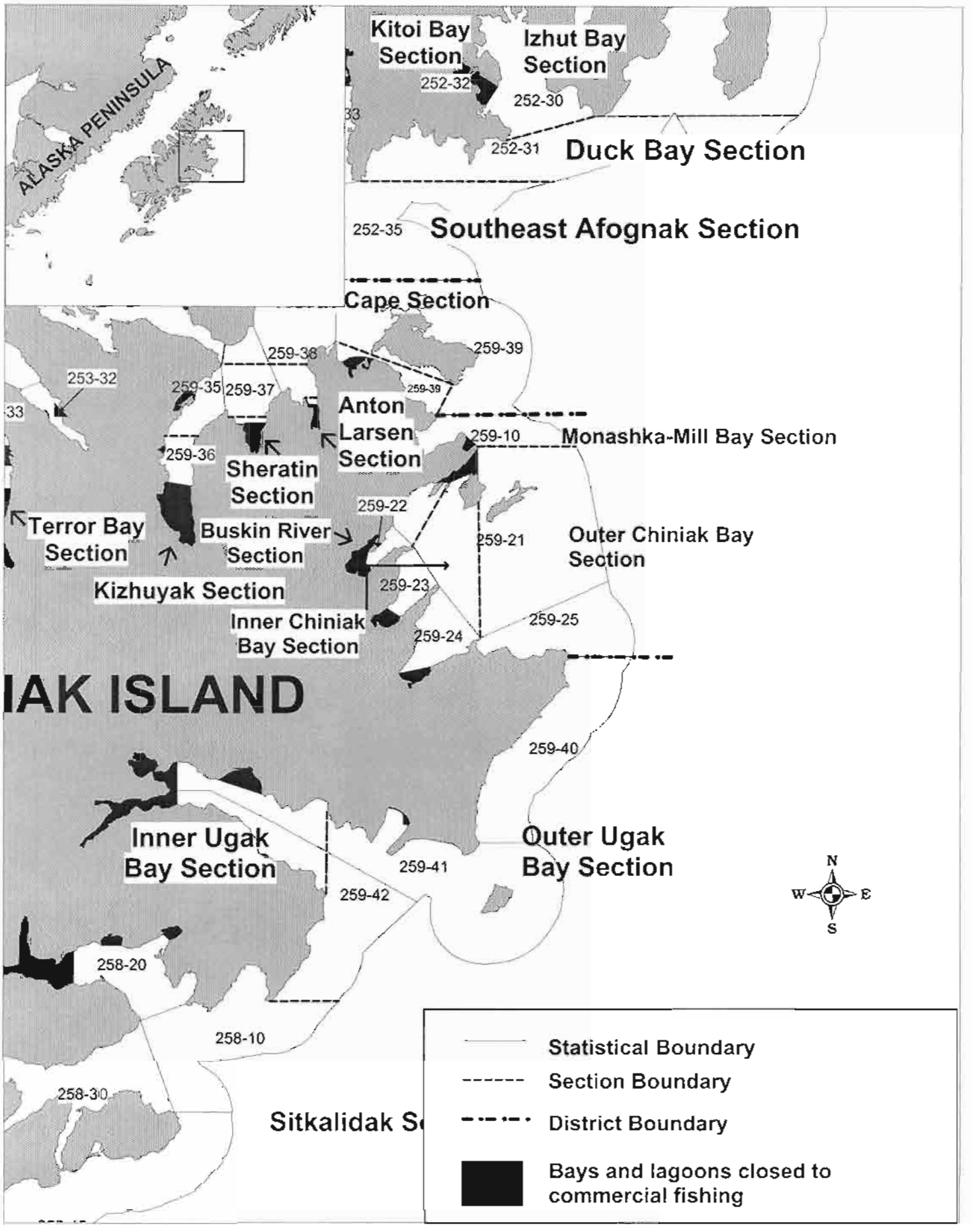
Appendix A.2. Northwest Kodiak District of the Kodiak Management Area, 1998.



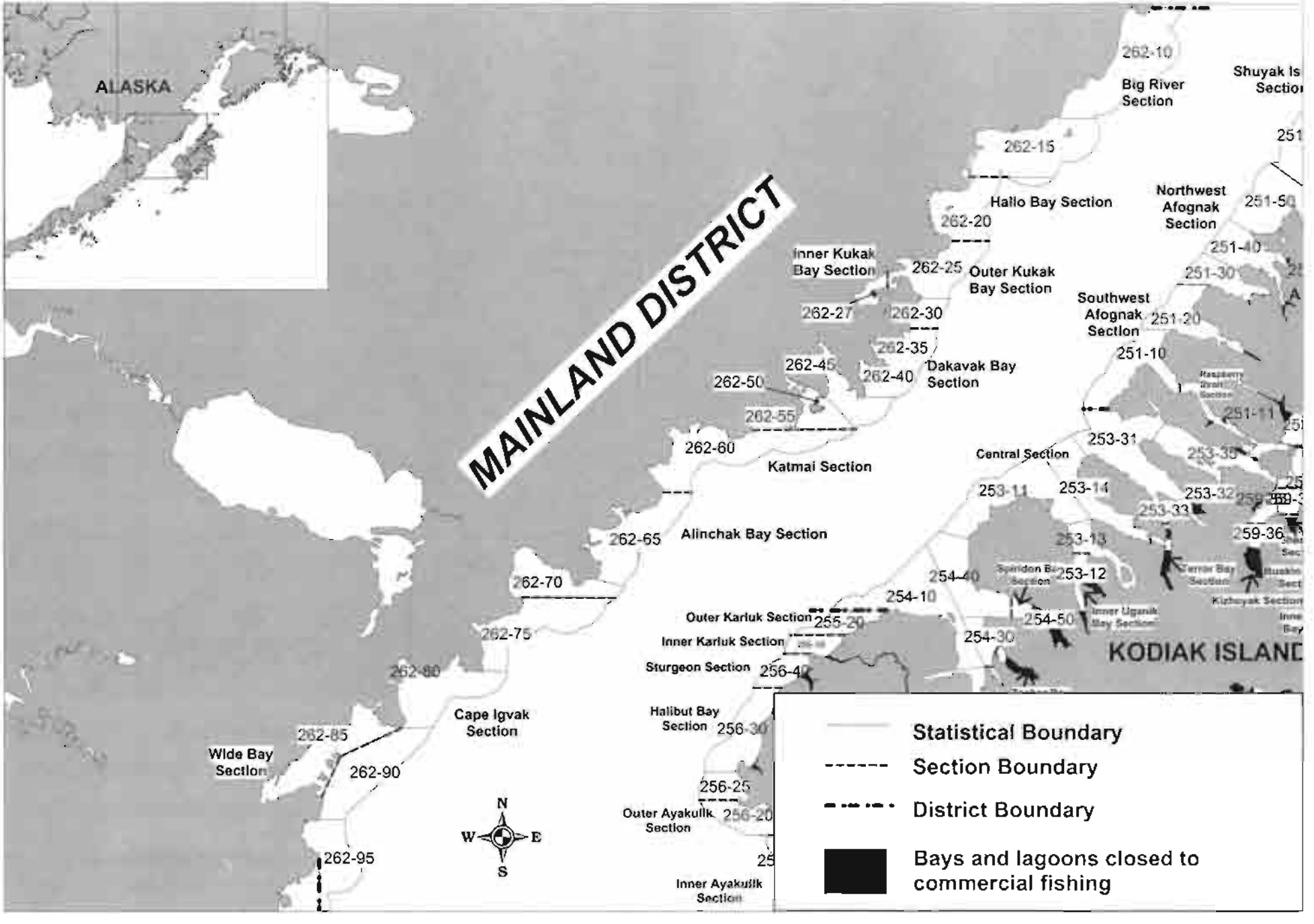
Appendix A.3. Southwest Kodiak and Alitak Bay Districts of the Kodiak Management Area, 1998.



Appendix A.4. Eastside Kodiak District of the Kodiak Management Area, 1998.



Appendix A.5. Northeast Kodiak District of the Kodiak Management Area, 1998.



Appendix A.6. Mainland District of the Kodiak Management Area, 1998.