

KODIAK MANAGEMENT AREA
HERRING FISHERIES
ANNUAL MANAGEMENT REPORT, 2003



By

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ABSTRACT

The Kodiak Management Area (KMA) 2003 commercial Pacific herring *Clupea pallasii* sac roe fishery extended from April 15 through June 30. A total of 31 purse seine and 11 gillnet fishermen harvested 1,992 tons, compared to the preseason guideline harvest level (GHL) of 2,600 tons. A total of 45 sections were open to fishing and harvests occurred within 18 sections. This was the fourth season of management under the allocative harvest strategy that provides 75% of the total Kodiak GHL to seine gear and 25% to gillnet gear. Purse seine gear accounted for 87% of the total catch at 1,738 tons. Roe recovery percentages averaged 11.3% for seine gear and 10.3% for gillnet gear. The total exvessel value of the fishery was \$996,000. Age-4 (28%) and age-6 (26%) herring were the dominant age classes harvested, representing an estimated 54% of the purse seine harvest.

The KMA herring food/bait fishery was designated a limited entry fishery in 2001. A cooperative fishery was conducted in 2003 that allowed one catcher vessel to fish with a department observer onboard. There was no allocation of Lower Cook Inlet, Kamishak stock herring, allowed for the Shelikof Strait fishery due to concerns for the low stock status and young age classes of Kamishak herring. To facilitate bait market needs the department opened that portion of the Uganik District south of the latitude of Miners Point on September 21 and 116 tons (122 ton GHL) were harvested. The Eastside District was opened to fishing on November 14 and 83 tons (75 tons GHL) were harvested.

A total of 12 subsistence herring permits were returned with herring harvest information in 2003. The total subsistence herring harvest for the KMA was 1,170 pounds.

INTRODUCTION

This report presents information concerning the commercial Pacific herring *Clupea pallasii* sac roe, food/bait, and subsistence fisheries that occur in the Kodiak Management Area (KMA). This information includes a regulatory history, historical harvest data by fishery, age and weight data of the commercial harvest, and a summary of fishery management activity. This report is intended as a reference document; interpretation and discussion of the data are therefore limited.

The KMA comprises the entire Kodiak Archipelago and that portion of the Alaska Peninsula that extends from Cape Douglas southwest to Kilokak Rocks at Imuya Bay. The archipelago is approximately 150 miles long, extending from Shuyak Island south to the Trinity Islands. The Alaska Peninsula portion of the KMA is about 160 miles long and is separated from the archipelago by Shelikof Strait that averages 30 miles in width (Figure 1).

HERRING SAC ROE FISHERY

Historical Perspective (1964-2003)

The commercial herring sac roe fishery began in Kodiak in 1964. From 1964 through 2003 herring sac roe harvests averaged 1,916 short tons (Table 1; Figure 2). From 1964 through 1977 purse seine gear was used exclusively, with an average annual harvest of 898 tons. Prior to 1974 the sac roe fishery was unregulated with regard to harvest quotas, gear types, seasons, and fishing periods. Annual harvests, along with effort levels, herring abundance, prices, and processor interest, fluctuated greatly between 1964 and 1977. Improved market conditions in 1978 prompted increased effort in this fishery with 28 purse seiners and 7 gillnetters participating. Between 1977 and 1982 the regulatory and management strategy went through a rapid development phase. It was during this period that spotter aircraft and tenders were incorporated into the fishery. Regulatory changes focused on gear efficiency, gear conflicts between seiners and gillnetters, and gear restrictions (exclusive registration and limited entry).

In the 1990s, closures of the Prince William Sound and Kamishak herring sac roe fisheries and increases in the Kodiak herring stocks resulted in increases in seine effort in the Kodiak fishery. Many of the inactive Kodiak seine permits were purchased by “circuit seiners” (individuals who fish all of Alaska’s major herring fisheries from Sitka Sound to Bristol Bay). These circuit seiners had experienced skippers and were equipped with high quality sonar electronics, nets, and vessels. With the addition of the circuit seiners to the already efficient local Kodiak seine fleet, effort levels grew with 73 vessels making landings in 1995 (Table 2). The increased seine effort made controlling harvests difficult. Regulatory changes involved several seine depth reductions and shorter seine fishing periods, to reduce harvest rates. Herring prices dropped from a record \$2,000 per ton in 1996 to a record low of \$300 per ton in 1997 and 1998 (Table 2). With the sharp decline in prices, effort levels also dropped and gillnet gear accounted for a diminishing percent of the total harvest in the late 1990s. In 2000, an allocative harvest strategy, including separate gear areas and harvest opportunity allocations, was established in regulation.

Season Dates

From 1974 through 1978 the season extended from March 1 through June 30. From 1979 through 1981 it was reduced to May 1 through June 30. In 1982 the season opening date was changed to April 15. The April 15 to June 30 season dates remain in effect.

Fishing Periods

Fishing periods from 1964 through 1978, for both gear types, were 24 hours per day, seven days per week. In 1979 and 1980 the fishing periods were 48-hour openings followed by 24-hour closures. In 1981 the fishing periods were further reduced to 24-hour openings followed by 24-hour closures (NOON on odd-numbered days of the month to NOON on even-numbered days of the month), which remained in effect through 1994. In 1995 fishing periods were reduced for both gear types to 10 hours from April 21 to May 2, to reduce harvest rates.

From 1996 through 1999 fishing periods for purse seiners were limited to 13 hours in duration from April 15 through May 4 and beginning on May 5 fishing periods were 24 hours in duration followed by 24-hour closures for the remainder of the season. In 2000 and 2001 fishing periods were 12 hours in duration from April 15 through May 7 and from May 8 through June 30 they were 13 hours in duration, with 24-hour closures between periods. In 2002 and 2003 the department used emergency order authority to reduce fishing period duration in sections that had high effort levels and a large available biomass, in order to control harvests.

Since 1981 gillnet fishing periods have been set at 24-hour openings followed by 24-hour closures for the duration of the season, except in 1995.

Gear

Purse seine gear was unrestricted in this fishery through 1973. In 1974 it was limited to 150 fathoms in length and 1,000 meshes in depth. In 1979 gillnet lengths were first limited to a maximum of 300 fathoms with no depth restriction. In 1981 the maximum lengths were reduced to 150 fathoms for gillnets and 100 fathoms for purse seines; these regulations remained in effect through 1995. Also, in 1981 trawls and beach seines were eliminated as legal gear for the sac roe fishery. In 1996 purse seine depths were restricted to a maximum of 20 fathoms and gillnet depths were restricted to 230 meshes. In 2000 the seine depth was reduced to a maximum of 18 fathoms.

Gear Levels

Beginning in 1979 combined gear levels increased substantially from historic levels, reaching a high of 201 units (92 seine and 109 gillnet) in 1980 and 193 units (79 seine and 114 gillnet) in 1981 (Table 2; Figure 3). With the implementation of limited entry following the 1981 sac roe season, entry into the fishery was restricted to past participants until permanent transferable permits could be awarded. From 1982 through 1993 gear levels were relatively constant with 29 to 45 seiners and 62 to 86 gillnetters participating. With an increase in herring abundance and prices, and the closure of the Prince William Sound herring fishery, seine gear participation increased abruptly during the 1994 through 1997 seasons, with 74 purse seine permit holders fishing in 1997. The escalation in

seine gear participation resulted in increased competition among seiners and between seiners and gillnetters. In 1997 and 1998 herring prices declined. After 1997 seine participation fell over 50% (average 32 vessels). Gillnet gear participation took an even sharper drop, with 59 permit holders fishing in 1997 but only an average of 9 gillnet fishermen participating annually since 1997.

Guideline Harvest Levels

From 1974 through 1978 there was an area-wide harvest quota of 3,400 tons. From 1979 through 1984 the area-wide harvest quota was reduced to 2,400 tons and GHGs were established for four large geographical areas. Descriptions of districts and sections were established in regulation in 1981, with 7 districts and 46 sections identified that year. Starting in 1985 GHGs were established by section on an annual basis and were based on stock status trends. From 1985 through 2001 the combined annual GHGs of all sections ranged from a high of 4,550 tons in 1994 to a low of 1,495 tons in 1999. From 1999 through 2002 GHGs for the fishery were at low levels, based on more conservative management and, for some sections, declines in herring abundance. In 2003 the stock status for most districts improved with good recruitment and the GHG was raised to 2,600 tons.

Harvest Strategy

Overall, the regulatory effect of the developmental phase of the fishery (1977 to 1982) was the emergence of a relatively stable herring sac roe fishery through 1991. Two strong year classes, from the 1987 and 1988 brood years, resulted in a dramatic biomass increase of some stocks and record to near-record harvests in the 1992 through 1995 seasons, ranging from 4,283 to 5,893 tons (Table 2). The increase in herring abundance occurred during years of high prices and fishery participation grew. With the crash in prices, followed by herring stock declines, gillnetters had little harvest opportunity when competing against seiners and they promoted a change in fishery management.

An allocative harvest strategy was developed through the efforts of an Alaska Board of Fisheries (BOF) Herring Task Force (established in 1999) that consisted of purse seine permit holders, gillnet permit holders, and Alaska Department of Fish and Game (ADF&G) staff. The task force developed a harvest strategy that provides opportunity for gillnet permit holders to harvest approximately 25% and purse seine permit holders to harvest approximately 75% of the total preseason GHG for the management area (5 AAC 27.535).

The harvest strategy requires the department to establish GHGs by section, based on historical harvest data, current and past fishery performance, commercial catch samples, and aerial surveys. The department is then required, for each district that has more than one section open to fishing, to assign by section 20% to 30% of the GHG to gillnet permit holders and 70% to 80% of the GHG to purse seine permit holders.

An additional conservation provision of the allocative harvest strategy provides for district GHGs. If the harvest from an individual section exceeds the section GHG then the overage is applied to the district GHG. The actual section harvests are summed and if the harvest from any number of sections within a district meets the aggregate GHG for that district, then the remaining open sections in that district are closed to further fishing, regardless of the remaining sections GHGs. This action may result in reduced harvests in sections that have later returning and spawning herring stocks.

During the 2002 BOF meeting only one change was made to the allocative harvest strategy. That change combined the three Afognak Districts, treating them as one district, for allocation purposes.

Fishery Management

Districts and Management Sections

The KMA is divided into 13 districts, which define geographical areas used in managing both the herring sac roe and food/bait fisheries (Figure 4). For the sac roe fishery each district is divided into management sections that are intended to define the spawning area used by a stock of herring or define a geographical area. There are a total of 82 management sections.

GHL Criteria

Preseason GHLs are established for all management sections that have produced consistent herring harvests in previous seasons. These GHLs reflect the status of a particular stock of herring, by management section. The section GHLs have ranged from 10 to 800 tons by section. Criteria for establishing the 2003 GHLs involved evaluation of a variety of information to determine stock status trends and conservative adjustment of GHLs, including: 1) fishery performance during preceding season or seasons (i.e., harvest timing, harvest duration, average school size); 2) trends in age composition (i.e., level of recruitment of age-3 herring, the proportion of age-5 and younger herring, and the proportion of age-2 herring as an indicator of future recruit strength); 3) observations of spawn and juvenile herring; 4) industry and department aerial surveys; 5) hydroacoustic surveys; 6) test fishery data including age composition and biomass estimates; and 7) aged-structured analysis (ASA) modeling. Preseason GHLs have generally reflected the actual harvests (Figure 5) and have aided fishermen and processors in planning prior to the start of each season.

Fishery Characteristics

The KMA herring sac roe fishery currently occurs in approximately 30 bays and coastal locations. The fishery opens at NOON on April 15, with most of the management area opening concurrently. In 2003 the department delayed opening the fishery in the Village Islands Section in an attempt to increase the quality and value of the catch. Several sections that are known to have later spawning and larger stocks were also opened at a later date when a department management crew was available to monitor the fishery.

To reduce operational costs and to cover more areas, many purse seiners form combines of 2 to 10 permit holders. These combines usually include one or more tenders and spotter aircraft. Light airplanes have been a very productive way to locate harvestable herring and direct seiners to those locations.

Gillnet permit holders generally work independently and deliver their fish directly to the processor. A few gillnetters are equipped with scanning sonar but the majority use color down-sounding sonar to locate herring schools.

The department historically relied on the fishing industry to establish roe recovery and minimum size standards. Competition among shorebased processors has resulted in this fishery having one of the highest per ton exvessel values in Alaska. The quality of Kodiak herring is generally high, due to inseason processing of relatively small amounts of herring over long time periods. In 2003 the department took a more active role in the Village Islands Section to manage for quality. For the remaining sections it was left up to the permit holders on the grounds to determine if herring were marketable.

Fishery Monitoring

This fishery is primarily monitored on the fishing grounds by department management personnel stationed aboard state vessels or at shorebased tent/cabin field camps. The field crews are stationed in management sections that have historically produced the largest harvests for a district. These field crews are positioned in remote bays by chartered floatplanes or vessel and are equipped with an inflatable raft or skiff. Daily contact with fishermen, spotters, and tender operators is maintained in order to acquire fishery data. Management biologists receive reports from field personnel several times daily that include current harvests, effort levels, and fleet movements. Information is reported by single side band (SSB) radio or satellite phone systems. The use of field personnel has been a key element in supporting this fishery's harvest strategy and preventing excessive harvests. Field personnel also identify herring spawning areas and collect age-weight-length (AWL) samples from the commercial harvest. Department aerial surveillance of the entire area supplements fishery monitoring and often directs the placement of field personnel.

Inseason Fishery Management

Processors and independent tender operators are required to provide daily tallies of herring deliveries by management section, as well as accurate estimates of herring onboard tenders that have not yet delivered to the processor. Management biologists tally reports from field personnel, processors, and tenders, to assess herring harvests. Generally, once the harvest estimate meets or approaches the GHL, a management section is closed for the season by emergency order. Due to the rapid pace at which some harvests occur, inperiod closures are frequent. In management sections that have field personnel present on the grounds, inperiod closures may occur with only a few minutes of advance notice. In management sections that do not have field personnel present, inperiod closures may occur by either an announcement broadcast on SSB frequency 4.125 MHz following the marine weather forecast (8:00 AM or 6:00 PM daily), or by field announcement with the arrival of department staff on the fishing grounds.

Timely and accurate harvest reports, from department field personnel, permit holders, spotters, and processors, are critical for assessing herring harvests and managing the fishery. To date, industry cooperation has greatly aided managers.

Enforcement Issues

The Alaska Department of Public Safety, Fish and Wildlife Protection (FWP), provides enforcement coverage of the KMA herring fishery during the first two weeks of the season when effort levels are the greatest. The FWP utilized a vessel and an aircraft to monitor the 2003 fishery and worked closely with the department during the fishery.

The presence of FWP greatly reduces the enforcement burden on department field crews, especially during openings, closures, and inperiod emergency closures. During the fishery, the majority of enforcement problems concern purse seine sets that are made early (prior to the NOON or 9:00 AM openings) or late (after the closure time). With the new harvest strategy, gear conflicts, though minor in the past, are now non-existent.

2003 Season Summary

The 2003 sac roe season opened at 12:00 NOON April 15 (Appendix A.1.). The last harvest occurred on May 26 (Figure 6). The total 2003 KMA guideline harvest level (GHL) was 2,600 tons (Tables 2 and 3; Gretsches 2003a). The 2003 harvest was 1,992 tons, approximately 28% (608 tons) below the GHL.

From 1994 to 2003 the annual GHL has averaged 2,791 tons and from 1999 to 2003 averaged 1,846 tons (Table 2). The GHL has ranged from a low of 1,495 tons in 1999 to a high of 4,550 tons in 1994. From 1994 to 2003 the annual harvest has averaged 2,756 tons and from 1999 to 2003 averaged 1,677 tons. The harvest has ranged from a low of 1,370 tons in 2000 to a high of 5,893 tons in 1994.

In 2003, a total of 42 permit holders made 104 deliveries during the sac roe season, with 31 purse seiners harvesting 1,738 tons and 11 gillnetters harvesting 254 tons. Two vessels fished both purse seine and gillnet gear by individuals that had both types of limited entry permits. Purse seine gear harvested 87% and gillnet gear 13% of the total KMA harvest in 2003 (Figure 7). A total of 28 tenders were registered to transport herring to processors. Seven shore-based plants registered to process herring.

The 2003 fishery was monitored by three ADF&G shore-based field crews and two vessels that were stationed in anticipated herring harvest locations. Crews monitored the fishery to gather effort and harvest data used to manage the fishery and collected commercial catch samples to obtain age, weight, and length (AWL) data.

There were a total of 45 sections open to fishing (Table 3). Harvests occurred within 18 sections, 17 sections were not fished, and the remaining sections were fished with no harvest. The bulk of the sections that were not fished were within the three Mainland Districts. The department opened five sections to gillnetting that had previously remained closed due to low stock status; the Zachar Bay (Uyak District) and Izhut Bay Sections (South Afognak District), closed since 1995; and the Womans Bay (Northeast District), Inner Deadman, and Outer Deadman Bay Sections (Alitak District), closed since 1998. Fishery performance was excellent in the Zachar and Womans Bays Sections, while the other three sections were not fished.

Purse Seine Fishery

The largest herring biomass in the KMA is found in the vicinity of Village Islands in the Uganik District. The 2003 fishery in the Village Islands Section was managed much differently than in the past. The bulk of the KMA seine fleet was present in the Village Islands Section on April 15, likely because this section had the largest GHL (800 tons) and historically has good quality herring early in the season. The seine fleet requested that the fishery remain closed in Village Islands Section until herring samples could be tested for roe quality. The department and seine fleet worked together to develop and implement a testing program. Both processors and permit holders supported more active management of the fishery, to include consideration for roe recovery and size of fish to be harvested. Herring were present in large amounts in the Village Islands Section on April 15 and test fishing occurred daily. Roe quality remained poor through the early portion of the season. The goal was to target the harvest on fish of at least 11% roe recovery with a minimum average size of 130 grams. Twenty-three purse seiners waited in the Village Islands for the herring to ripen. By April 23 the roe quality had improved and the Village Islands Section was opened to commercial fishing. Openings were generally 10 minutes long and only portions of this section opened in order to slow the pace of the harvest. These limited fishing periods occurred over several days until the GHL was approached. The Village Islands Section was closed for the season on April 28. The harvest was 756.5 tons and roe recovery averaged 10.6%.

Most of the remaining sections of the KMA opened as scheduled on April 15. The initial fishing period resulted in good catches of high roe quality herring from the Paramanof Bay Section in the West Afognak District on April 15 and 16. Five vessels harvested 308 tons that averaged 9.9% roe recovery. Fishing was also excellent in the Eastside District (East and West Sitkalidak Strait Sections and Barling Bay Section) with 233 tons harvested from April 15 to 21. Effort was low and roe recovery was excellent, ranging from 13.2 to 14.3%.

Another exception to the standard April 15 opening was the Ugak Bay Sections of the Eastside District. The Inner and Outer Ugak Bay and Pasagshak Sections remained closed until April 25, when ADF&G was able to station a fishery monitoring crew in the bay to aid with management of the fishery. Purse seiners fished the Outer Ugak Bay and Kiliuda Bay Sections of the Eastside District from April 25 to 29. Fishery performance was excellent in both sections, with 356 tons harvested at an average roe recovery of 12.6%.

As purse seine sections closed, the bulk of the seine fleet departed for the Togiak herring fishery. After April 28, only five to ten seiners remained in the KMA. Only a couple of purse seiners fished into early May, with a 77 ton harvest coming from the Inner Alitak Bay Section and a small harvest from the West Uganik Passage Section.

Gillnet Fishery

Gillnetters had a difficult season. The South Arm Uganik Bay Section (Uganik District) was nearly 30% of their allocation and fishery performance was poor with only 1.8 tons harvested (200 ton GHL). The Viekoda Bay Section provided the best fishing in the Uganik District for gillnetters with 46.2 tons harvested (80 ton GHL) and the roe recovery averaged 11.3%.

Roe recovery problems contributed to the reduced gillnet harvest. For example, the harvest in the Inner Ugak Bay Section was 64.5 tons (110 ton GHL) but roe recovery averaged 8%. A high numbers of males and spawned out herring lowered roe percentages, and gillnetters left the area. This section represented 16% of the total KMA gillnet allocation.

Although gillnet effort was at low levels, the small fleet was very effective. For example, 91 tons were harvested by seven gillnet permit holders from the Danger Bay Section, which had a 50 ton GHL. Roe recovery from Danger Bay averaged 11.2%. Gillnetters had excellent fishing in several of the smaller fisheries (10 to 15 ton GHL sections) with good harvest coming from the Kizhuyak Bay, Zachar Bay, and Womans Bay Sections. Small harvests occurred through late May, though only four permit holders fished past the first week in May.

Two fishing vessels were operated using both gear types, seining during the early portion of the season and switching to gillnet gear later.

Exvessel Value of the Fishery

The price paid for 10% roe recovery herring was approximately \$500 per ton, at the dock. Roe recovery from this year's seine fishery was excellent. From fish ticket data, roe recovery averaged 11.3% for seine gear and 10.3% for gillnet gear. Some of the best roe came from the Eastside District seine fisheries. The estimated average exvessel earnings for purse seiners was \$28,000 and for gillnetters \$11,550 (Figure 8). The total exvessel value of the 2003 fishery was an estimated \$996,000 (Figure 9).

Catch Sampling

A total of 1,980 herring were collected for AWL analysis from purse seine harvests, representing all nine purse seine sections that had a harvest in 2003 (Table 4). Age-4 herring were the dominant age class harvested in the 2003 season, representing an estimated 27.9% of the total purse seine harvest (Table 4). The remaining age classes represented the following percentage of the seine harvest: age-2 (0.5%), age-3 (11.0%), age-5 (9.7%), age-6 (26.4%), age-7 (2.8%), age-8 (1.3%), age-9 (3.8%), age-10 (11.9%) and age-11 and older combined (3.8%).

A total of 419 herring were collected for AWL analysis from the gillnet harvest in four sections. These four sections accounted for 49% of the total KMA gillnet harvest. Age-4 herring were the dominant age class harvested representing 35.9% of the gillnet harvest (Table 5). The remaining age classes represented the following percentage of the gillnet harvest: age-3 (9.9%), age-5 (22.0%), age-6 (19.5%), age-7 (2.3%), age-8 (0.4%), age-9 (2.0%), age-10 (6.5%) and age-11 and older combined (1.0%).

Generally, the herring from the eastside of Kodiak Island (Eastside District) were significantly larger at age than those found on the west side of Kodiak and Afognak Islands (Uganik and West Afognak Districts; Tables 6 and 7). Weight-at-age of the younger age classes in 2003 were similar to those observed in recent years (Gretsch 2003b).

Stock Assessment

The department evaluates fishery performance and survey information to assess trends in stock status. Hydroacoustic and aerial surveys, conducted by commercial fisheries biologists, are utilized to assess herring abundance prior to, during, and after the commercial fishery and to survey closed sections. ADF&G research vessels are used to collect samples by trawl, gillnet, or jig gear.

Industry spotters and permit holders have greatly aided managers during past seasons by providing biomass estimates, spawn observations, fleet movements, and harvest estimates. These spotters are very experienced and have been involved for several seasons in the KMA and other statewide herring fisheries. The department has also received excellent assistance from air charter pilots that also provide herring and spawn observations.

The result of aerial and hydroacoustic assessments provide a limited evaluation of the total biomass. Problems associated with herring assessment in the KMA include: 1) herring tend to be near the surface, and hence more visible, during the evening and early morning hours, which limits the time fish are observable from the air; 2) most management sections have several distinct schools of herring that spawn from April through June; 3) herring may stay within an area for the duration of the sac roe season or may move to another district, which may lead to duplicated or incomplete biomass estimates, or incorrect assignment to a spawning stock location; 4) the KMA encompasses a large geographical area (82 sections); 5) differential spawn timing of various KMA herring stocks; and 6) adverse weather conditions. Hydroacoustic surveys are also limited in shallower waters, and the extent of herring avoidance to vessel noise is unknown. There also appears to be a significant amount of subtidal spawning, occurring in water 10 to 20 fathoms in depth, which is not detectable from aerial surveys.

Due to the low gillnet effort since 1998 it is difficult to use fishery performance as an indicator of stock status within the gillnet sections, except in those sections where the performance has been very good.

Stock Status by District

The following is a review of stock status that summarizes recent fishery performance, age composition data, recruitment trends, and survey data by district. Herring can generally be found seasonally in all bays of the KMA. The department currently monitors approximately 70 sections that are known to have spawning populations of herring. Management biologists greatly rely on fishery performance and catch samples to evaluate trends in stock status. The majority of the department's assessment efforts target larger herring stocks. Generally, there is less information available for the smaller stocks of herring so the evaluation of these stocks is more tenuous. In some cases, such as sections of the Mainland District, several years may elapse before new information becomes available. The department also considers information provided by commercial herring fishermen and spotters, air taxi operators, and remote area residents, concerning herring distribution, biomass estimates, and spawn sightings, when determining stock status.

West Afognak District

There are six sections in the West Afognak District, and five have spawning stocks of herring. Paramanof Bay has the largest spawning stock within this district. The Paramanof Bay fishery performance has been excellent during the last 10 years and harvests have ranged from 223 to 709 tons. The large increase in this herring stock and associated harvests in the late 1990s was related to the very strong 1988 brood year. Since 1999 the department has maintained GHs in the 225 to 350 ton range for this section since the spawning biomass of the older age classes has declined. Large spawns have occurred annually since 1994. Age compositions from 2003 commercial catch samples show the dominant age classes were age-4 (28.6%), age-6 (28.6%), age-9 (7.4%), and age-10 (6.2%, Table 4). Age-3 (recruit) herring looked good in 2003 and represented 6.2% of the harvest.

The Foul Bay Section is adjacent to Paramanof Bay. Age compositions and recruitment events tend to be similar between these two sections, though the Foul Bay spawning stock is much smaller than that of Paramanof Bay. Foul Bay was designated as a gillnet section from 2000 through 2002. It was designated as a purse seine section for the 2003 season. However, the harvest in Paramanof Bay (308 tons) resulted in a closure of the remaining Afognak purse seine sections (a district closure); there was no harvest from the Foul Bay Section in 2003. Age compositions from the 2002 gillnet fishery consisted primarily of age-5 (60.1%) and age-9 (10.5%) herring, with a mix of other age classes (Gretsch 2003b).

The Malina Bay Section was closed to commercial fishing from 1997 through 2000. Aerial and hydroacoustic surveys (1998, 1999, and 2000) and AWL samples (2000) indicated that the spawning biomass was increasing and this section was opened to gillnetting in 2001, with a 15 ton GH. Fishery performance seemed poor in 2002 and 2003. However, few permit holders participated or spent a significant amount of time fishing this section. In both 2002 and 2003 this section was closed due to excessive gillnet harvests in the Danger Bay Section that resulted in district closures for the Afognak Districts. Age compositions from 2002 Malina Bay Section commercial catch samples show the predominant age classes were age-4 (10.3%), age-5 (27.5%), age-7 (10.3%), age-8 (13.7%), and age-9 (13.7%; Gretsch 2003b). The department conducted a hydroacoustic survey of Malina Bay prior to the start of the 2003 season, and estimated that there was at least 200 to 300 tons of herring present.

The Raspberry Strait Section was open to fishing in 2001 after being closed since 1997. Fishery performance in 2001 was poor and hydroacoustic surveys in April 2001 indicated low herring abundance. This section was closed for the 2002 and 2003 seasons, and spring hydroacoustic surveys in 2002 and 2003 continued to indicate low herring abundance.

North Afognak District

Five sections compose the North Afognak District. Spawning stocks of herring occur in all five sections though these stocks tend to be small (less than 20 tons). Historically, small harvests have come from all five sections. The Perenosa Bay Section had the largest spawning stock and had a 56 ton catch in 1990. Declines in stock abundance and fishery performance prompted the department to close three sections to herring fishing in 1995, and a fourth section was closed in 1998. Due to occasional aerial observation of small schools of herring, the Tonki Bay Section has

been open to commercial fishing since 1998. However, fishery participation has been low (one vessel or less annually) and no catch has occurred.

South Afognak District

The South Afognak District comprises six sections. The Danger Bay Section was open to fishing during the 2001, 2002, and 2003 seasons. In 2003 the Izhut Bay Section was also open to gillnetting, with a 10 ton GHL. The remaining South Afognak sections have been closed since 1995. Aerial and hydroacoustic surveys in recent years have shown a steady increase of herring biomass in Danger Bay. An observed increase in the Danger Bay stock prompted the department to open this section to gillnetting in 2001, with a small, 15 ton GHL. Fishery performance was excellent in 2001, and the department increased the GHL in 2002 (30 tons) and in 2003 (50 tons). Fishery performance was excellent both seasons. The 2003 Danger Bay Section harvest (95 tons) exceeded the section and district GHL, and led to the closure of all remaining Afognak sections to further gillnetting (a district closure). Age compositions from 2003 Danger Bay Section commercial catch samples indicated that the predominant age classes were age-4 (40.6%), age-5 (26.6%), and age-6 (14.5%, Table 5). Age-3 (recruit) herring looked good for 2003 and represented 10.3% of the harvest. For the Izhut Bay Section, the department received several reports from cod fishermen that indicated that a sizeable herring biomass was present in the spring, and this section was opened in 2003 as a test fishery. However, due to the district closure, no fishing effort occurred in the Izhut Bay Section during the 2003 season.

Uganik District

The Uganik District consists of nine sections on the northwest side of Kodiak Island. During the last 10 years this district has been the most productive in the KMA. The Village Islands Section supports the largest herring spawning stock, followed by South Arm Uganik, Terror, and Viekoda Bays. Small stocks are also found in the West Uganik Passage, Northeast Arm Uganik Bay, and the East Arm Uganik Bay Sections. The Village Islands stock tends to move throughout the Uganik Bay complex (five sections) prior to spawning and historically has been harvested within sections in or adjacent to the Village Islands. Commercial catches in adjacent sections were at times high, which reflects the strength of the Village Islands stock.

Hydroacoustic and aerial survey information indicate that the Village Islands spawning biomass is currently the largest in the KMA. The total biomass of herring observed in the Village Islands, South Arm, Northeast Arm and East Arm (Uganik Bay) is estimated to be at least 10,000 tons and could range as high as 30,000 tons (herring congregate in Uganik Bay for a month or longer, complicating biomass estimation). Age composition data from the 2003 Village Islands Section commercial catch samples show the predominant age classes were age-4 (50.4%), age-5 (8.8%), and age-6 (15.8%; Table 4). Age-3 (recruit) herring looked strong in 2003 and represented 18.8% of the harvest. A bait herring fishery that occurred in September near Village Islands was also sampled and consisted of age-2 (14%), age-3 (22.8%), age-4 (39.7%), age-5 (4.0%), age-6 (9.3%), age-7 (3.5%), and age-8 through age-13 (6.2%) herring. The age composition of the bait fishery sample would be similar to that of the sac roe fishery if not for the large increase in age-2 herring. Recruitment of age-3 herring in the 2004 sac roe fishery will likely be strong. Small spot spawns occurred in the Village Islands from April 23 and into May, and large spawns occurred from April 27 through 29, 2003.

There were two hydroacoustic surveys of the South Arm Uganik Section in late April, 2003. During both surveys, scattered schools of herring were found in the outer portions of the bay and were estimated to range from 500 to 1,000 tons total. Jigging on these schools produced small samples that consisted of age-3 and age-4 herring that were ripe. The gillnet harvest for this section was only 1.8 tons and there was a 200 ton GHL (Table 3). The poor gillnet harvest in South Arm and other sections of the Uganik District may be partially explained by the age compositions data collected from the adjacent purse seine fishery. In the Uganik District purse seine fishery, up to 19% of the herring sampled were age-3 fish and averaged 96 grams in weight. Herring in the gillnet sections would likely be similar in size, and herring this small would not be harvestable by gillnet gear. For the South Arm Uganik Section, it also appears that herring did not return to the head of the bay to spawn in the shallows, as in previous seasons. With low gillnet effort in 2003, it is difficult to use fishery performance as an indicator of stock status in the South Arm Uganik Section.

A hydroacoustic survey of the inner portion of the Terror Bay Section was completed in late April, 2003. There were small scattered schools of herring present in the bay and the only concentration of herring was found near the head of the bay (estimated at 50 tons). Jigging on these herring produced a small sample that consisted of age-2 and age-3 herring. This section was open to purse seine fishing and several boats fished the section, though no harvest occurred.

The Viekoda Bay Section was designated a gillnet gear section in 2003. Fishery performance was good with 46.2 tons harvested (80 ton GHL; Table 3). No herring samples were collected, but fishermen reported that their harvest consisted of primarily smaller, younger herring. It was further reported that the volume of herring seen in the inner bay was quite good, however it was suspected that most of the herring present were small and not harvestable with gillnet gear. A hydroacoustic survey of the outer portion of the bay in mid-April, 2003, estimated 250 tons of herring.

The West Uganik Passage and was open to purse seine gear in 2003 and had a 7.5 ton harvest (60 ton GHL; Table 3). Age compositions from 2003 commercial catch samples indicated that the predominant age classes were age-3 (12.9%) and age-4 (58.4%; Table 4). During the first week of the season a large volume of herring was present within this section, however the fish were green and unmarketable. In late April herring were again found in this section; these fish consisted of younger age classes and were ripe, but did not meet the minimum size criteria that processors had established (130 grams).

The 2003 gillnet harvest from the Northeast Arm Uganik Section was 0.2 tons and from the East Arm Uganik Section there was no harvest; both sections had 10 ton GHLs (Table 3). There has been very little fishing activity in either section since the 1999 season. Due to low fishing effort, fishery performance is not a good gauge of stock status for these sections. Hydroacoustic surveys in the spring of 2003 estimated at least 500 to 600 tons of herring in the Northeast Arm Section and 50 to 75 tons of herring in East Arm Uganik Section. Jigged samples from the Northeast Arm Section suggested that the bulk of the herring were juvenile age-2 fish.

Uyak District

Through the 1980s, the Uyak District was the largest herring producing district in the KMA. In the early 1990s, fishery performance and spotter observations indicated a decline in herring abundance. The department responded to this decline by reducing the GHLS within this district for the 1992 through 1994 seasons, but stocks continued to decline. In 1995 the entire district was closed to fishing, to promote the recovery of these stocks. The department proposed studies to assess the biomass and the age compositions of the herring stocks within this district, but funding has been limited. The Uyak District remained closed to fishing through 2002.

In recent years, both department and contracted vessels have been used to conduct limited hydroacoustic surveys in this area. These surveys indicated the Uyak herring stocks status remained depressed, though the 2000 and 2001 survey results were encouraging especially for the Zachar and Spiridon Bay Sections. No hydroacoustic surveys were conducted in 2003.

In 2003, the department opened the Zachar Bay Section to gillnetting as a test fishery to further evaluate stock status. The fishery performance was excellent with 18.9 tons harvested (15 ton GHL; Table 3). Age composition from 2003 commercial catch samples indicated that the predominant age classes were age-4 (22.6%) and age-6 (50.0%; Table 5).

Historically, the commercial fishery in the Uyak District took place throughout the month of May, with the Inner Uyak Section fishery generally occurring in late May. In mid-April 2002, a local air taxi pilot reported seeing a large biomass of herring present in the flats of Uyak Bay and another near Browns Lagoon. A large biomass was again observed in 2003 in mid-April by the same air taxi operator and was confirmed by industry spotters and a department management biologist. The biomass observed was estimated to range from 600 to 2,000 tons. An industry spotter was able to jig a small sample that indicated the fish were ripe adults of mixed age classes (predominately age-6). At least 600 tons of herring were observed spawning within this section in late April.

Northeast District

There are five sections in the Northeast District and four have known spawning stocks of herring. The Womens Bay Section had the largest stock of herring and commercial fishery harvests ranged from 74 to 149 tons from 1990 through 1992 (Prokopowich et al. 1992; Gretsche et al 1992, 1993). Declines in fishery performance from 1995 to 1997 prompted the closure of this district to commercial fishing from 1998 through 2002. This section is near the city of Kodiak and has remained open to subsistence herring fishing, which generally occurred during the winter months. Subsistence fishery regulations became more restrictive in 2001, which resulted in reduced catches in 2001 through 2003, (the harvest decline was not related to a decrease in herring abundance).

The Womens Bay Section was opened to gillnet gear in 2003 as a test fishery, with a 10 ton GHL (Table 3). Though only one gillnetter fished this section, fishery performance was excellent with 7.3 tons of herring harvested. Age composition from 2003 commercial catch samples show the predominant age classes were age-4 (31.7%), age-5 (30.7%), age-6 (16.3%), and age-10 (14.4%, Table 5).

Inner Marmot District

There are five sections within the Inner Marmot District. All sections have known spawning stocks of herring though most are small. The Kizhuyak Bay Section has had the largest stock of herring in the district with commercial harvests ranging from 102 to 117 tons from 1990 through 1992 (Prokopowich et al. 1992; Gretsches et al 1992, 1993). Declines in fishery performance occurred from 1993 through 1995, and prompted a closure of the entire district from 1996 through 2001. Aerial surveys have consistently documented herring in this section in recent years, with 400 tons observed in 2003 by an industry spotter.

The Kizhuyak Bay Section was opened to gillnetting in 2002 as a test fishery, with a 10 ton GHL (Gretsches 2003b). Fishery performance was excellent, with 14 tons of herring harvested. The GHL was increased to 15 tons in 2003 and fishery performance was again excellent with 23.4 tons harvested (Table 3). No herring samples were collected in 2003 from the Kizhuyak Bay Section. Age composition from 2002 Kizhuyak Bay Section commercial catch samples showed the predominant age classes were age-7 (17.3%), age-8 (16.3%), and age-9 (38.0%; Gretsches 2003b).

Eastside District

Four bay complexes comprise the Eastside District: Ugak Bay, Kiliuda Bay, East Sitkalidak Strait, and West Sitkalidak Strait. Sixteen sections have been established for the Eastside District and only one, the Outer Sitkalidak Section, has no history of herring sac roe harvest. Due to the reduced gillnet fleet and low herring prices, the smaller and more distant gillnet sections of this district have not been fished in recent years, resulting in a lack of fishery performance information to help guide stock evaluations.

Generally, the East and West Sitkalidak Sections have the earliest spawning herring in the KMA, with initial spawn occurring in late March. In the mid-1990s the East and West Sitkalidak Sections were the major herring producers of the district, but stock abundance and fishery performance decreased in 1996 and 1997. Part of the fishery performance problem was the difficulty fishermen had in finding marketable quality herring, as the stocks were generally mixed with ripe, green, and spawned out herring. The department reacted to the changes in the stocks by reducing the GHLs. Since 1998 the GHLs have been set low (30 to 50 tons) and the stocks have shown improvement. The age composition of 2003 East Sitkalidak Section commercial catch was predominantly composed of age-5 (11.4%), age-6 (56.1%), and age-10 (7.0%) herring based on catch samples (Table 4). Recruitment appears to be strong, with age-3 herring composing 6% of the harvest samples. West Sitkalidak Section age composition is similar, with samples from the 2003 harvest consisting of age-5 (12.3%), age-6 (59.0%), and age-10 (5.7%) herring (Table 4). Recruitment appears good in this section also, with age-2 herring composing 4.7% and age-3 herring composing 3.8% of the harvest samples.

The Barling Bay Section, adjacent to the West Sitkalidak Section, has been the most consistent herring producer in the Eastside District. GHLs have ranged from 40 to 50 tons during the last 10 years and harvests have ranged from 36 to 74 tons. Commercial catch samples in 2003 were primarily composed of age-5 (13.5%), age-6 (42.7%), age-10 (17.4%), and age-14 and older (11.4%) herring (Table 4). The Three Saints Bay Section, also adjacent to the West Sitkalidak

Section, is designated as a gillnet section, but no permit holders have fished this section during the past four years.

The Inner Kiliuda Bay, Outer Kiliuda Bay, and Shearwater Bay Sections have been consistent and strong herring producers during the last 10 years. Fishery performance was excellent in the two Kiliuda Bay Sections and fair in the Shearwater Bay Section in 2003. Only two gillnetters fished the Shearwater Bay Section in 2003, so fishery performance likely wasn't a good indicator of stock status. The department managed the Inner and Outer Kiliuda Bay Sections as a single section in 2003. These two sections have previously been managed as separate spawning stocks, however considering harvest timing, harvest location (adjacent to the section boundary between these sections), and age composition data, they are likely the same spawning stock of herring. Age composition of commercial catch samples from the Kiliuda sections was predominantly age-3 (8.2%), age-6 (21.4%), and age-10 (46.7%; Table 4). Samples from the gillnet catch from Shearwater Bay included age-3 (30.3%), age-4 (15.1%) and age-10 (42.4%) herring (Table 5). Recruitment of age-3 herring looked strong within these three sections in 2003.

The Inner and Outer Ugak Bay Sections also continued to be strong herring producers in 2003. Fishery performance has been excellent in the Outer Ugak Section (a purse seine section) during the past six years and for the previous seven years in the Inner Ugak Bay Section (a gillnet section). Fishery performance diminished in the Inner Ugak Section in 2003, due to the high percentage of males in the spawning stock. With high male abundance it is difficult to obtain a marketable roe percentage. No samples were collected in 2003, however the commercial catch samples (gillnet) from in the Inner Ugak Bay Section in 2002 consisted primarily of age-9 herring (83.5%), of which 59% were males (Gretsch 2003b). Aerial surveys of prespawning herring concentrations in Outer Ugak Bay indicated that between 2,000 and 3,000 tons were present in 2003. The age composition of the 2003 Outer Ugak Bay commercial catch samples (seine) included primarily age-5 (8.6%), age-6 (32.7%), age-9 (9.4%), and age-10 (43.1%) herring (Table 4). Recruitment appears to be poor as no age-3 or age-4 herring were found in the catch samples. No new information is available for the Pasagshak Bay Section, a gillnet section adjacent to the Outer Ugak Bay Section. No one fished this section in 2003, nor has there been a harvest during the past four years.

Alitak District

The Alitak District comprises 10 sections and all but the Outer Alitak Section are known to have a stock of herring. Large stocks of herring were once found in Olga, Deadman, and Sulua Bays and commercial harvests ranged from 500 to 900 tons annually for 1991 through 1994 (Gretsch et al 1992, 1993, 1994, 1995). Based on fishery performance from 1991 through 1993, the Upper Olga Bay stock was the first large stock of the district that experienced declines in abundance. The department reacted by reducing the GHL, but by 1995 the catch had dropped to zero. By 1995 the Inner and Outer Deadman Bay Sections were also experiencing declining fishery performance and, similarly, the GHLs were reduced in 1996 and 1997. In 1997 the last large herring stock of the district, in Sulua Bay, also appeared to be declining, based on fishery performance, aerial surveys, and hydroacoustic surveys. In 1998, seven sections of the Alitak District were closed to fishing and since the department has relied on aerial surveys to assess changes in stock status. Three sections were opened (two are seine areas) to act as test fisheries. This kept industry spotters looking

for herring in this district, not only in the open sections but also in closed sections (due to the geographic proximity).

In 2002 industry spotter reports indicated a major increase in herring abundance in the Alitak District (Gretsch 2003b). Stock in the Inner Deadman Bay, Outer Deadman Bay, Inner Alitak Bay, Portage Bay, and Upper Olga Bay Sections improved. In 2003 similar spotter reports indicated continued improvements in the Alitak District. However, the Sulua Bay Section stock status still remains poor, with no herring observed. In 2003, the Inner and Outer Deadman Bay Sections were opened to gillnetting as a test fishery, with a combined GHL of 10 tons (Table 3). The Upper Olga Bay Section was also open to gillnetting, with a 10 ton GHL. No one fished the district in 2003.

For the 2003 season, the department opened the Inner Alitak and Portage Bay Sections to purse seine gear, with a combined GHL of 60 tons (Table 3). Fishery performance was excellent with 77.3 tons harvested. Commercial catch samples included age-5 (22.7%), age-6 (38.6%), and age-7 (15.8%) herring (Table 4). Recruitment appears to be strong for these sections with age-2 herring composing 4.8% and age-3 herring composing 10.8% and of the harvest. This fishery is relatively new, occurring during the last three years in the vicinity of Akhiok Reef, on the west side of Alitak Bay. Previous harvests within these sections occurred on the eastside of Alitak Bay, near Portage Bay. The remaining section open to seine gear, the Geese-Twoheaded Section, had no harvest in 2003 and has not been fished for the past four years.

Mainland Districts

There are three Mainland Districts, comprising 12 sections. These districts experience more extreme weather than other districts around Kodiak and Afognak Islands. Conditions frequently consist of high winds, low ceilings, and limited visibility, greatly reducing the effectiveness of spotters. The severity of the weather in the spring likely reduces the productivity of these herring stocks, compared to the more protected waters of Kodiak and Afognak Islands. Five sections in the southern portion of the Mainland District have been designated as exploratory and are open to both gear types. Fishing effort in these three districts generally involves only one or two seine combines and a few gillnet vessels annually; fishery performance is not a good indicator of stock status. No one fished the Mainland Districts in 2003 and only two harvests have occurred in the last six years. There is no new information concerning herring stocks in the Mainland Districts.

Sturgeon/Halibut District

The Sturgeon/Halibut District is located on the southwest side of Kodiak Island, and has no management sections. This district consists mostly of offshore areas that are not known to have, or are not likely to have, a spawning stock of herring; no GHL has been established. Herring are found in this district during the summer months.

HERRING FOOD/BAIT FISHERY

Historical Perspective

The earliest recorded commercial herring food/bait harvest in the KMA occurred in 1912 (Table 8). In the early 1920s, the fishery expanded and large herring were sought for food products, such as salted and pickled herring, which were in high demand after World War I. By the late 1920s the demand for herring food products had declined and the fishery switched to reduction products, such as fishmeal and oil. During the peak years of the reduction fishery (1934 to 1950) the average harvest was 31,600 tons, which vastly surpasses recent food/bait herring harvests (Figure 10). During the reduction fishery the major harvest areas were located in eastern Shelikof Strait and adjacent bays and straits along the west side of Kodiak and Afognak Islands. Quotas and harvest weights were measured by barrels (250 lbs. of herring equaled one barrel) until 1956 when the unit of measure was changed to short tons. Large (approximately 70 foot) "sardine seiner" type vessels were used in conjunction with holding pounds to supply herring to five major reduction plants. In addition, small seine and gillnet vessels participated in a portion of the food fishery and delivered to floating and shorebased salting and pickling operations.

From the early 1960s to 1973 there were no harvest quotas or closed seasons. From 1974 through 1980 an open fishing season was established between July 1 and February 28. In 1979 and 1980, GHLS for the food/bait season were established at 12,600 tons. The season opening date for the fishery changed from July 1 to August 15 for the years 1981 through 1984. As a result of the rapidly developing sac roe fishery, the GHLS for the food/bait season was reduced to 1,000 tons in 1981 and remained at that level through 1987. In 1985 the season opening date was moved to August 1. Regulatory GHLS for the herring food/bait fishery were replaced with a regulatory harvest strategy in 1988 that established variable GHLS based on herring stock status. The season opening date was moved to October 1 in 1999. The herring food/bait season closing date has remained February 28.

Fishing periods through 1996 were unrestricted, 24 hours per day, seven days per week. In 1997 fishing periods were reduced to 12 hours (8:00 AM to 8:00 PM), seven days per week. The restriction of fishing period length was intended to slow harvest rates in order to ensure that GHLS were not greatly exceeded.

Gear used in this fishery includes trawl, seine, and gillnet. Gear was first restricted for the 1986/87 season when seine gear was limited to 100 fathoms in length and 1,025 meshes in depth and gillnet gear was limited to 150 fathoms in length with no depth restrictions. For the 1993/94 season purse seine specifications were increased to 150 fathoms in length and 1,625 meshes in depth. These changes made seine gear more competitive with trawlers; seiners harvested an average of only 2% of the food/bait harvest from 1987 through 1992 compared to 54% of the total harvest from 1993 to 1998. There are no restrictions on trawl gear, which is fished mid-water with no bottom contact. All three gear types fished the same areas and were subject to the same fishing periods.

In 2001 this fishery was designated as a limited entry fishery by the Commercial Fisheries Entry Commission (CFEC) and a points system was developed to evaluate past fishery participation and

determine who would receive a limited entry permit. In 2002 CFEC issued limited entry permits that included five purse seine/gillnet permits and four trawl permits.

Management Plan History

During the fall and winter months of the early 1980s, major concentrations of herring were observed in eastern Shelikof Strait and adjacent bays along the west side of the Kodiak Archipelago. The biomass exceeded that of known KMA spawning stocks. Herring food/bait fishermen targeted these herring, but the origin of the stock was questioned. In 1986 a stock identification study, based on scale pattern analysis, was conducted on herring harvested from a large biomass located in the northeastern part of the Shelikof Strait (Johnson et. al. 1988). The study concluded that at least 80% of the Shelikof herring catch sampled were Kamishak Bay stocks, which spawn within the Lower Cook Inlet (LCI) Management Area.

In 1988 the BOF allocated not more than two percent of the previous season's total available Kamishak Bay spawning herring biomass for harvest during the Kodiak herring food/bait fishery. For local Kodiak spawning stocks, which were exploited during the sac roe fishery, the food/bait GHL was to be determined based on 10% of the harvest that occurred in the previous KMA herring sac roe season.

Problems subsequently developed after implementation of this management plan because it was difficult to assign harvest from the intermixed stocks to either Kodiak or Kamishak if the stocks from both areas had similar age compositions. This plan was in effect through the 1992/93 season.

In the fall of 1992 the BOF approved the Kamishak Bay District Herring Management Plan (5 AAC 27.465), which outlines criteria for the management of the Kamishak Bay herring sac roe and the Shelikof Strait herring food/bait fisheries (ADF&G 2002-2003). This plan defines allocations to each fishery based on biomass estimates.

In 1993 the BOF placed into regulation a harvest strategy defining the criteria for managing the Kodiak herring food/bait fishery (5 AAC 27.535). This strategy combines the Kamishak stock GHL with the Kodiak stock GHL for food/bait management districts FB 1 (West Afognak District), FB 4 (Uganik District), and FB 5 (Uyak District; Figure 4). This portion of the KMA bait fishery is referred to as the Shelikof Strait food and bait herring fishery. The Kamishak allocation to the Shelikof Strait food and bait herring fishery ranges from 1% to 2% of the Kamishak spawning biomass. When the combined GHL is achieved the Shelikof Strait food and bait management districts (West Afognak, Uganik, and Uyak) are closed collectively. This harvest strategy alleviates the problem of identifying the spawning stock of a harvest in areas where intermixing may occur. The plan also closed the Kamishak Bay sac roe fishery and the Shelikof Strait food and bait fishery north of the latitude of Miners Point (Uganik Bay) when the Kamishak spawning biomass fell below 8,000 tons (the minimum Kamishak spawning biomass threshold; ADF&G 2002-2003).

In 1999 the BOF made additional changes to the KMA herring food/bait fishery. The season opening date was changed to October 1 so department staff in the LCI would have additional time to complete the Kamishak herring forecast and determine the resulting allocation for the Shelikof

Strait food and bait fishery. Prior years' fisheries generally occurred based on preliminary Kamishak forecasts, and actual harvests were often either lower or higher than the final Kamishak allocation, which was sometimes completed weeks after the fishery occurred. The harvest strategy was also changed so that GHGs for KMA stocks were based upon 10% of the GHGs established for the preceding KMA sac roe fishery by section. The previous regulation based the food/bait GHG upon 10% of the actual KMA sac roe harvest by section. In cases where an excessive harvest occurred during the sac roe fishery, the related food/bait GHG would also be high. Lastly, changes to the plan clarified and put into regulation the previous practice of limiting a district harvest to no more than the sum of the individual section GHGs it contains. These changes promoted a more conservative approach to managing this fishery.

In November 2001 the BOF adopted changes to the Kamishak Bay District Herring Management Plan based on the results of a threshold analysis performed by LCI department staff. The analysis concluded that the minimum spawning biomass threshold should be 6,000 tons, below the previous minimum spawning biomass threshold (8,000 tons). Other changes to the plan included a reduction in the maximum exploitation rate for Kamishak herring, which in turn lowered the allowable exploitation rate of the Shelikof Strait fishery from 2% to 1.5% of the Kamishak spawning biomass. Last, a portion of the plan, which required adjustment of Shelikof Strait young age class harvests to reflect the estimated weight of an equal amount of older age class herring, was eliminated.

Kamishak Fishery Closure

The herring biomass forecast for Kamishak Bay herring in 2004 is approximately 3,550 tons, well below the minimum spawning biomass of 6,000 tons that must be met before a fishery may occur in the Kamishak sac roe or Shelikof Strait food and bait fisheries (L. Hammarstrom, Alaska Department of Fish and Game, Horner, personal communication.). Additionally, stock assessment surveys determined that only about approximately 40% of the population consisted of younger age class fish. The Kamishak Bay District Herring Management Plan states that commercial harvests must target older, repeat spawners in order to protect recruit-class herring. This was the sixth consecutive year that the Kamishak Bay District fishery has been closed and the population has sharply declined during the last four years (Otis and Cope 2004). Due to the low stock status, the Kamishak Bay sac roe fishery was closed for the 2004 season and the Shelikof Strait food and bait fishery north of the latitude of Miner's Point was closed for the 2003 season.

Food/Bait Cooperative Fisheries

The KMA herring food/bait fishery was closed for the 1999 and 2000 seasons, because of low potential GHGs and the department's concern for manageability of a competitive fishery. In 2001 the CFEC designated the KMA herring food/bait fishery a limited entry fishery and issued 13 interim use permits to those fishermen who made landings between 1994 and 1998. However, because of the relatively small GHGs available (60 tons in the Uganik District and 47 tons in the Eastside District) the department once again did not allow an open competitive fishery to occur even though the fishery was restricted to the 13 interim permit holders. As an alternative, the

interim permit holders formed a cooperative (co-op) arrangement and the department and CFEC agreed to allow a co-op fishery to occur. The 13 interim permit holders determined which vessel would conduct the co-op harvest, all marketing aspects, and all costs associated with harvesting or tendering the herring. The 2001 co-op fishery resulted in a harvest of 63 tons of food/bait herring from the Uganik District (Village Islands) and 52 tons from the Eastside District (Ugak Bay).

In July, 2002, the CFEC made a final determination on these limited entry permits. Nine permanent limited entry permits were issued; five purse seine/gillnet permits and four trawl permits. The Kamishak Bay District fishery was closed for 2003, due to below threshold stock abundance, so only a portion of the Uganik District (south of Miners Point; 72 ton GHL) and the Eastside District (62 ton GHL) could be opened to food/bait herring fishing (Gretsch 2003b). The department again had harvest concerns and the nine permit holders agreed to conduct a co-op fishery, as in 2001. The department allowed only one catcher vessel on the grounds and a department observer was present onboard the fishing vessel during the fishery. The 2002/2003 KMA herring food/bait co-op fishery resulted in a 74 ton harvest from the Uganik District, and a 61 ton harvest from the Eastside District.

Circumstances for the 2003/2004 season were much the same, and the department, once again, felt that the fishery could be unmanageable if all permit holders participated. Only two districts could be opened, including that portion of the Uganik District south of Miners Point, with a 122 ton GHL, and the Eastside District, with a 75 ton GHL (Gretsch 2003c). The limited entry permit holders asked the department to again allow a limited co-op fishery for the 2003 season.

The permit holders and area processors also requested that the department open the fishery prior to October 1, the regulatory season opening date. An earlier opening date provided a larger market and higher price for bait herring, as much of the catch could be used for the Bering Sea red king crab fishery that was to begin on October 15. Many of the Bering Sea crab vessels are based in or pass through the port of Kodiak prior to that fishery, and prefer to use fresh bait.

On September 18, 2003, a cooperative agreement was reached between all permit holders and the department. Again, only one catcher vessel was allowed to conduct the co-op harvest in each district, and a department biologist was on board the catcher or tender vessel before fishing occurred. The biologist opened and closed the fishery on the grounds.

To facilitate market needs the department opened that portion of the Uganik District south of the latitude of Miners Point (122 ton GHL) on September 21 for one hour, and 116 tons were harvested near Village Islands. The age composition of commercial catch samples was similar to samples taken near Village Islands during the sac roe season, except for an increase in the number of age-2 herring (14% of the harvest). The samples also included age-3 (22.8%), age-4 (39.7%), age-5 (4.0%), age-6 (9.3%), and age-7 and older (9.7%) herring. The Eastside District (75 ton GHL) was opened on November 14, for 12 hours, and 83 tons were harvested. This fishery took place in West Sitkalidak Strait. Commercial catch samples were collected but have not been analyzed at this time.

Processors paid \$450 per ton for food/bait herring, at the dock in Kodiak. The total exvessel value of this fishery was approximately \$89,500.

HERRING SUBSISTENCE FISHERY

Fishery Characteristics

Prior to 1999, the herring subsistence fishery was referred to as a Personal Use/Subsistence Fishery and had occurred for at least twenty years. The majority of the harvest occurred near the port of Kodiak in Womens Bay and was caught by gillnets. The herring were used primarily for bait in commercial longline and pot fisheries. Also, prior to 1999 this fishery was only regulated during the herring sac roe season, from April 15 to June 30, through the conditions of the subsistence permit issued in Kodiak. Gear was limited to a 25 fathom gillnet but there was no harvest limit. The remainder of the year there were no permit requirements, gear restrictions, or harvest limits.

In 1999 more restrictive regulations were approved by the BOF. These regulations allowed for a harvest of up to 500 pounds of herring with no permit requirements, except during the sac roe fishing season (April 15 to June 30). A subsistence permit was only required for those individuals that wished to fish during the sac roe season or intended to harvest more than 500 pounds of herring annually. The maximum annual harvest was limited to 2,000 pounds per permit. In recent years most of the herring caught for subsistence were used for bait (in sport or commercial fisheries), food, or fertilizer.

In 2000 herring subsistence harvests escalated due to bait needs created with the reopening of the commercial tanner crab fishery in the KMA. The department was concerned about the increased herring subsistence harvest and the appropriateness of taking subsistence herring for use as bait in a commercial fishery. The department submitted proposals for regulation changes to the BOF in 2001, and the BOF changed regulations to allow for both types of historic harvests. The new subsistence regulation allows for the harvest of up to 500 pounds of herring annually and requires that fishermen obtain a permit prior to fishing. Herring were included on the existing KMA salmon and crab subsistence permit.

A new regulation (5 AAC 27.545) allows for the harvest of up to 500 pounds of herring by commercial permit holders to be used as bait in commercial fisheries.

2003 Season Summary

Subsistence harvests reports for 2003 are still being collected. Through February 27, 2004, the reported subsistence herring harvest in 2003 was 2,180 pounds (Table 9). A total of 16 KMA subsistence permits were returned with herring harvest data, with most of the harvest coming from the Eastside and Uyak Districts. No harvest by commercial permit holders, to be used as bait in commercial fisheries, occurred in 2003.

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Table 1. Herring sac roe and food/bait commercial fisheries harvests and percent of the total annual herring harvest that occurs by fishery, Kodiak Management Area, 1964 to 2003.

Year	Sac Roe Harvest (Tons)	Food/Bait Harvest (Tons)	Total Herring Harvest (Tons)	Sac Roe Fishery Percent of Total Harvest (%)	Food/Bait Fishery Percent of Total Harvest (%)
1964	568	310	878	65%	35%
1965	657	35	692	95%	5%
1966	2,769	198	2,967	93%	7%
1967	1,662	300	1,962	85%	15%
1968	2,001	15	2,016	99%	1%
1969	1,130	11	1,141	99%	1%
1970	342	8	350	98%	2%
1971	284	44	328	87%	13%
1972	215	50	265	81%	19%
1973	831	178	1,009	82%	18%
1974	868	40	908	96%	4%
1975	8	5	13	62%	38%
1976	5	0	5	100%	0%
1977	338	0	338	100%	0%
1978	904	399	1,303	69%	31%
1979	1,735	125	1,860	93%	7%
1980	2,383	381	2,764	86%	14%
1981	2,065	18	2,083	99%	1%
1982	1,771	326	2,097	84%	16%
1983	2,318	33	2,351	99%	1%
1984	2,163	123	2,286	95%	5%
1985	1,968	102	2,070	95%	5%
1986	1,558	213	1,771	88%	12%
1987	2,146	217	2,363	91%	9%
1988	2,171	340	2,511	86%	14%
1989	2,249	345	2,594	87%	13%
1990	2,347	313	2,660	88%	12%
1991	2,432	215	2,647	92%	8%
1992	4,283	312	4,595	93%	7%
1993	4,929	837	5,766	85%	15%
1994	5,893	677	6,570	90%	10%
1995	4,604	507	5,111	90%	10%
1996	3,386	651	4,037	84%	16%
1997	3,235	756	3,991	81%	19%
1998	2,057	151	2,208	93%	7%
1999	1,651	0	1,651	100%	0%
2000	1,370	0	1,370	100%	0%
2001	1,694	115	1,809	94%	6%
2002	1,677	135	1,812	93%	7%
2003	1,992	199	2,191	91%	9%
Average					
1964 to 2003	1,916	217	2,134	90%	10%
10 Year					
1994 to 2003	2,756	319	3,075	91%	9%
5 Year					
1999 to 2003	1,677	90	1,767	95%	5%

Table 2. Herring sac roe fishery summary of season length, guideline harvest level (GHL), harvest data by gear type, percentage of harvest by gear type, number of landings, and estimated exvessel earnings, Kodiak Management Area, 1979 to 2003.

Year	Season Length (Days)	GHL (Tons)	Total Harvest (Tons)	Harvest by Gear Type		Percent Harvest by Gear Type		Number of Landings by Gear Type		Units of Gear Fished ^a		Average Catch by Gear		Estimated Average Earnings ^b		Price per Ton ^b (\$)	Estimated Exvessel Total Value ^b (\$)
				Seine (Tons)	Gillnet (Tons)	Seine	Gillnet	Seine	Gillnet	Seine	Gillnet	Seine (Tons)	Gillnet (Tons)	Seine (\$)	Gillnet (\$)		
1979	36	2,400	1,735	1,457	278	84%	16%	-	-	57	125	26	2	\$38,342	\$3,336	\$1,500	\$2,602,500
1980	35	2,400	2,383	2,009	374	84%	16%	-	-	92	109	22	3	\$15,068	\$2,368	\$690	\$1,644,270
1981	48	2,400	2,065	1,596	469	77%	23%	207	406	79	114	20	4	\$14,647	\$2,983	\$725	\$1,497,125
1982	59	2,400	1,771	1,447	324	82%	18%	138	191	45	67	32	5	\$17,686	\$2,660	\$550	\$974,050
1983	51	2,400	2,319	1,797	522	77%	23%	164	284	41	64	44	8	\$35,063	\$6,525	\$800	\$1,855,200
1984	54	2,400	2,163	1,691	472	78%	22%	138	212	39	69	43	7	\$34,687	\$5,472	\$800	\$1,730,400
1985	59	2,000	1,968	1,244	724	63%	37%	118	348	34	81	37	9	\$32,929	\$8,044	\$900	\$1,771,200
1986	61	1,690	1,558	1,110	448	71%	29%	132	385	31	71	36	6	\$34,016	\$5,994	\$950	\$1,480,100
1987	61	1,640	2,146	1,591	554	74%	26%	122	411	29	62	55	9	\$54,862	\$8,935	\$1,000	\$2,146,000
1988	59	2,065	2,171	1,304	867	60%	40%	169	555	33	76	40	11	\$51,370	\$14,830	\$1,300	\$2,822,300
1989	76	2,415	2,249	1,513	736	67%	33%	171	627	37	83	41	9	\$34,749	\$7,535	\$850	\$1,911,149
1990	75	2,375	2,347	1,644	703	70%	30%	156	544	27	63	61	11	\$51,756	\$9,485	\$850	\$1,994,950
1991	83	2,510	2,432	1,697	735	70%	30%	169	587	32	64	53	11	\$45,077	\$9,762	\$850	\$2,067,200
1992	77	2,720	4,283	3,260	1,023	76%	24%	185	706	40	74	82	14	\$40,750	\$6,912	\$500	\$2,141,500
1993	77	3,525	4,929	4,203	726	85%	15%	237	294	41	86	103	8	\$56,382	\$4,643	\$550	\$2,710,950
1994	71	4,550	5,893	4,976	917	84%	16%	285	485	66	57	75	16	\$60,315	\$12,870	\$800	\$4,714,400
1995	73	4,480	4,604	3,837	768	83%	17%	280	642	73	71	53	11	\$66,858	\$13,759	\$1,272	\$5,856,288
1996	69	4,180	3,386	2,322	1,064	69%	31%	202	890	57	74	41	14	\$81,474	\$28,757	\$2,000	\$6,772,000
1997	49	3,435	3,235	2,629	606	81%	19%	183	418	64	59	41	10	\$12,323	\$3,081	\$300	\$970,500
1998	50	2,030	2,057	1,954	103	95%	5%	110	26	35	7	56	15	\$16,749	\$4,414	\$300	\$617,100
1999	38	1,495	1,651	1,589	62	96%	4%	94	16	31	5	51	12	\$23,732	\$5,741	\$463	\$764,413
2000 ^c	37	1,735	1,370	1,290	80	94%	6%	57	23	31	10	42	8	\$20,806	\$4,000	\$500	\$685,000
2001	47	1,540	1,694	1,412	282	83%	17%	67	37	33	9	43	31	\$21,394	\$15,667	\$500	\$847,000
2002	46	1,860	1,677	1,274	403	76%	24%	37	50	30	14	42	29	\$21,233	\$14,393	\$500	\$838,500
2003	42	2,600	1,992	1,738	254	87%	13%	59	45	31	11	56	23	\$28,032	\$11,545	\$500	\$996,000
Average																	
1979 to 2003	57	2,530	2,563	2,023	540	79%	21%	151	356	44	61	48	12	\$36,412	\$8,549	\$798	\$2,096,404
10 Year																	
1994 to 2003	52	2,791	2,756	2,302	454	85%	15%	137	263	45	32	50	17	\$35,292	\$11,423	\$714	\$2,306,120
5 Year																	
1999 to 2003	42	1,846	1,677	1,461	216	87%	13%	63	34	31	10	47	21	\$23,040	\$10,269	\$493	\$826,183

^a From 1979 to 1998 fishery participation was based on vessels making landings; 1999 to 2003 data is based on actual fishery participation.

^b Exvessel values are based on inseason data.

^c Beginning in 2000, an allocative harvest strategy was in effect.

Table 3. Herring sac roe fishery guideline harvest levels (GHLs) by section and gear type, harvest by section, and date sections were closed, Kodiak Management Area, 2003.

Statistical Area	Management Section	Date Closed ^a	Purse Seine		Gillnet	
			GHL	Harvest	GHL	Harvest
NORTH AFOGNAK DISTRICT						
NA10	Shuyak Island	Closed	-	-	-	-
NA20	Delphin Bay	Closed	-	-	-	-
NA30	Perenosa Bay	Closed	-	-	-	-
NA40	Seal Bay	Closed	-	-	-	-
NA50	Tonki Bay	4/22/2003	CLOSED	-	10	0
WEST AFOGNAK DISTRICT						
WA10	Raspberry Strait	Closed	-	-	-	-
WA20	Malina Bay	4/22/2003	CLOSED	-	10	0
WA31	Paramanof Bay	4/15/2003	250	308.2	CLOSED	-
WA32	Foul Bay	4/15/2003	50	0	CLOSED	-
WA40	Blue Fox/Devil's Inlet	4/22/2003	CLOSED	-	10	0
WA50	Offshore W. Afognak	Closed	-	-	-	-
SOUTH AFOGNAK DISTRICT						
SA10	Izhut Bay	4/22/2003	CLOSED	-	10	0
SA20	Kitoi Bay	Closed	-	-	-	-
SA30	MacDonalds Lagoon	Closed	-	-	-	-
SA40	Danger Bay	4/22/2003	CLOSED	-	50	91.2
SA50	Litnik	Closed	-	-	-	-
SA60	Duck Bay	Closed	-	-	-	-
AFOGNAK DISTRICTS TOTAL			300	308.2	90	91.2
UGANIK DISTRICT						
UG10	Kupreanof	Closed	-	-	-	-
UG20	Viekoda	6/30/2003	CLOSED	-	80	46.2
UG21	Terror Bay	6/30/2003	60	0	CLOSED	-
UG30	Village Island	4/27/2003	800	756.5	CLOSED	-
UG31	West Uganik Pass	6/30/2003	60	7.5	CLOSED	-
UG32	NE Arm Uganik	6/30/2003	CLOSED	-	10	0.2
UG33	E. Arm Uganik	6/30/2003	CLOSED	-	10	0
UG34	S. Arm Uganik	6/30/2003	CLOSED	-	200	1.8
UG40	Offshore Uganik	Closed	-	-	-	-
UGANIK DISTRICT TOTAL			920	764.0	300	48.2
UYAK DISTRICT						
UY10	Offshore Uyak	Closed	-	-	-	-
UY20	Harvester Island	Closed	-	-	-	-
UY30	Inner Uyak	Closed	-	-	-	-
UY32	Browns Lagoon	Closed	-	-	-	-
UY31	Larsen Bay	Closed	-	-	-	-
UY40	Zachar Bay	5/4/2003	CLOSED	-	15	18.9
UY50	Spiridon Bay	Closed	-	-	-	-
UYAK DISTRICT TOTAL			CLOSED	-	15	18.9

-Continued-

Table 3. (page 2 of 3)

Statistical Area	Management Section	Date Closed ^a	Purse Seine		Gillnet	
			GHL	Harvest	GHL	Harvest
ALITAK DISTRICT						
AL10	Outer Alitak	Closed	-	-	-	-
AL20	Inner Alitak	5/4/2003	60	77.3	CLOSED	-
AL21	Inner Deadman Bay	6/30/2003	CLOSED	-	20	0
AL22	Outer Deadman Bay	Note: Sections AL21 and AL22 managed as one section, 20 ton GHL.				
AL30	Sulua Bay	Closed	-	-	-	-
AL31	Portage Bay	Note: Sections AL20 and AL31 managed as one section, 60 ton GHL.				
AL40	Lower Olga/Moser	Closed	-	-	-	-
AL41	No. Upper Olga Bay	Closed	-	-	-	-
AL50	Upper Olga Bay	6/30/2003	CLOSED	-	10	0
AL60	Geese/Twoheaded	5/4/2003	15	0	CLOSED	-
ALITAK DISTRICT TOTAL			75	77.3	30	0
STURGEON/HALIBUT DISTRICT						
SH10	Sturgeon/Halibut	Closed	CLOSED	-	CLOSED	-
EASTSIDE DISTRICT						
EA10	Kaiugnak	Note: Sections EA10 and EA20 managed as one section, 10 ton GHL.				
EA20	SW. Sitkalidak	4/29/2003	10	0	CLOSED	-
EA21	Three Saints Bay	6/30/2003	CLOSED	-	15	0
EA22	Newman Bay	Note: Sections EA22 and EA23 managed as one section, 50 ton GHL.				
EA23	W. Sitkalidak Strait	4/21/2003	50	51.4	CLOSED	-
EA24	Barling Bay	4/15/2003	50	73.8	CLOSED	-
EA30	E. Sitkalidak St.	4/15/2003	50	107.7	CLOSED	-
EA31	Tanginak Anchorage	Closed	-	-	-	-
EA40	Outer Sitkalidak	Closed	-	-	-	-
EA41	Boulder Bay	6/30/2003	CLOSED	-	10	0
EA42	Shearwater Bay	6/30/2003	CLOSED	-	50	6.8
EA43	Outer Kiliuda Bay	Note: Sections EA43 and EA44 managed as one section, 200 ton GHL.				
EA44	Inner Kiliuda Bay	4/29/2003	200	153.1	CLOSED	-
EA50	Outer Ugak Bay	4/25/2003	200	202.8	CLOSED	-
EA51	Inner Ugak Bay	6/30/2003	CLOSED	-	110	57.7
EA52	Pasagshak	6/30/2003	CLOSED	-	10	0
EASTSIDE DISTRICT TOTAL			560	588.8	195	64.5
NORTHEAST DISTRICT						
NE10	Womens Bay	5/8/2003	CLOSED	-	10	7.3
NE20	Kalsin Bay	Closed	-	-	-	-
NE30	Middle Bay	Closed	-	-	-	-
NE40	Inshore Chiniak	Closed	-	-	-	-
NE50	Offshore Chiniak	Closed	-	-	-	-
NORTHEAST DISTRICT TOTAL			CLOSED	-	10	7.3
INNER MARMOT DISTRICT						
IM10	Monashka Bay	Closed	-	-	-	-
IM20	Anton Larsen Bay	Closed	-	-	-	-
IM30	Sharatin Bay	Closed	-	-	-	-
IM40	Kizhuyak Bay	5/6/2003	CLOSED	-	15	23.4
IM50	Spruce Island	Closed	-	-	-	-
INNER MARMOT DISTRICT TOTAL			CLOSED	-	15	23.4

-Continued-

Table 3. (page 3 of 3)

Statistical Area	Management Section	Date Closed ^a	Purse Seine		Gillnet	
			GHL	Harvest	GHL	Harvest
NORTH MAINLAND DISTRICT						
NM10	Hallo Bay	Closed	-	-	-	-
NM20	Inner Kukak	6/30/2003	CLOSED	-	25	0
NM30	Outer Kukak	Closed	-	-	-	-
NM40	Missak Bay	Closed	-	-	-	-
NORTH MAINLAND DISTRICT TOTAL			CLOSED	-	25	0
MID MAINLAND DISTRICT						
MM10	Inner Katmai	6/30/2003	50	0	CLOSED	-
MM20	Outer Katmai	Closed	-	-	-	-
MM30	Alinchak	6/30/2003	15	0	CLOSED	-
MM40	Puale Bay	EXPLORATORY		0		0
MM50	Portage Bay	EXPLORATORY		0		0
MM60	Outer Portage	EXPLORATORY		0		0
MID MAINLAND DISTRICT TOTAL			65	0	0	0
SOUTH MAINLAND DISTRICT						
SM10	Wide Bay	EXPLORATORY		0		0
SM20	Lower Shelikof	EXPLORATORY		0		0
SOUTH MAINLAND DISTRICT TOTAL				0		0
GRAND TOTAL	Total GHL All Gear	Total Catch All Gear	Purse Seine		Gillnet	
			GHL	Harvest	GHL	Harvest
	2,600	1,991.8	1,920	1,738.3	680	253.5
			% of GHL	% Harvest	% of GHL	% Harvest
			74%	87%	26%	13%

^a Sections marked 'Closed' did not open during the 2003 sac roe season. Sections marked 'EXPLORATORY' were open to both gear types, with no set GHL.

Table 4. Age composition, by percent, of herring samples from the commercial purse seine sac roe fishery harvest, by section, Kodiak Management Area, 2003.

Section	Harvest (tons)	Percent at Age													n
		Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14+	
Paramanof Bay	308.2	0.0	6.2	28.6	9.1	28.6	3.3	2.9	7.4	6.2	2.2	1.6	1.6	1.6	481
Village Islands	756.5	0.2	18.8	50.4	8.8	15.8	1.5	0.8	1.2	0.7	0.4	0.1	0.4	0.2	701
W.Uganik Passage	7.5	0.0	12.9	58.4	6.4	7.7	6.4	3.8	2.5	1.2	0.0	0.0	0.0	0.0	77
Inner Alitak Bay	77.3	4.8	10.8	1.9	22.7	38.6	15.8	1.9	1.9	0.0	0.9	0.0	0.0	0.0	101
West Sitkalidak Straits	51.4	4.7	3.8	1.9	12.3	59.0	5.7	0.0	1.9	5.7	0.0	0.9	0.0	3.7	105
Barling Bay	73.8	0.0	0.0	0.0	13.5	42.7	0.9	0.0	5.8	17.4	3.8	2.9	0.9	11.4	103
E. Sitkalidak Straits	107.7	0.0	6.1	3.5	11.4	56.1	0.0	1.7	4.3	7.0	0.0	1.7	1.7	6.0	114
Inner/Outer Kiluida Bay	153.1	0.5	8.2	3.2	7.1	21.4	5.4	1.0	2.7	46.7	1.6	0.5	0.0	1.0	182
Outer Ugak Bay	202.8	0.0	0.0	0.0	8.6	32.7	1.7	1.7	9.4	43.1	1.7	0.8	0.0	0.0	116
All Samples Combined ^a	1,738.3	0.5	11.0	27.9	9.7	26.4	2.8	1.3	3.8	11.9	1.1	0.7	0.6	1.4	1,980

^a For 'All Samples Combined', the percent of the harvest by section is weighted to the age class data to estimate overall age composition of the purse seine harvest.

Table 5. Age composition, by percent, of herring samples from the commercial gillnet sac roe fishery harvest, by section, Kodiak Management Area, 2003.

Section	Harvest (tons)	Percent at Age													n
		Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14+	
Danger Bay	91.2	0.0	10.3	40.6	26.6	14.5	1.8	0.6	1.2	3.6	0.6	0.0	0.0	0.0	165
Womans Bay	7.3	0.0	2.8	31.7	30.7	16.3	0.9	0.0	0.9	14.4	1.9	0.0	0.0	0.0	104
Zachar Bay	18.9	0.0	3.5	22.6	3.5	50.0	5.9	0.0	7.1	4.7	1.1	1.1	0.0	0.0	84
Shearwater Bay	6.8	0.0	30.3	15.1	3.0	6.0	0.0	0.0	0.0	42.4	1.5	1.5	0.0	0.0	66
All Samples Combined ^a	124.2	0.0	9.9	35.9	22.0	19.5	2.3	0.4	2.0	6.5	0.8	0.2	0.0	0.0	419

^a For 'All Samples Combined', the percent of the harvest by section is weighted to the age class data to estimate overall age composition of the gillnet harvest.

Table 6. Average weight in grams by age class of herring samples from the commercial purse seine sac roe fishery harvest, by section, Kodiak Management Area, 2003.

Section	Average Weight at Age in Grams													n
	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14+	
Paramanof Bay	-	103	130	169	188	208	218	232	249	236	255	270	290	479
Village Islands	50	96	123	152	171	188	203	231	235	240	219	239	271	697
W.Uganik Passage	-	96	121	159	183	185	223	243	240	-	-	-	-	77
Inner Alitak Bay	66	121	160	201	216	256	268	333	-	366	-	-	-	101
West Sitkalidak Straits	75	159	175	244	282	320	-	398	355	-	275	-	410	105
Barling Bay	-	-	-	243	296	285	-	355	374	382	418	403	425	103
E. Sitkalidak Straits	-	135	191	246	276	-	364	354	358	-	350	365	407	114
Inner/Outer Kiluida Bay	67	144	194	230	278	290	343	342	364	386	463	-	-	182
Outer Ugak Bay	-	-	-	201	249	325	288	333	318	321	381	-	-	116

Table 7. Average weight in grams by age class of herring samples from the commercial gillnet sac roe fishery harvest, by section, Kodiak Management Area, 2003.

Section	Average Weight at Age in Grams													n
	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14+	
Danger Bay	-	145	175	210	240	294	298	309	285	319	-	-	-	164
Womans Bay	-	146	167	194	217	214	-	280	276	254	-	-	-	104
Zachar Bay	-	148	150	182	183	216	-	240	256	217	235	-	-	84
Shearwater Bay	-	153	188	187	213	-	-	-	313	317	449	-	-	66

Table 8. Herring food and bait commercial fishery harvest, Kodiak Management Area, 1912 to 2003.

Year	Tons	Year	Tons	Year	Tons
1912	20	1943	35,352	1974	40
1913	0	1944	26,835	1975	5
1914	0	1945	31,114	1976	No data
1915	0	1946	47,506	1977	No data
1916	70	1947	50,743	1978	399
1917	138	1948	46,428	1979	125
1918	118	1949	0	1980	381
1919	260	1950	44,133	1981	18
1920	46	1951	4,299	1982	326
1921	945	1952	1,389	1983	33
1922	1,483	1953	725	1984	123
1923	322	1954	0	1985	102
1924	4,823	1955	0	1986	213
1925	9,997	1956	13,524	1987	217
1926	2,681	1957	21,219	1988	340
1927	2,593	1958	1,711	1989	345
1928	625	1959	3,831	1990	313
1929	No data	1960	0	1991	215
1930	622	1961	0	1992	312
1931	1,000	1962	0	1993	784
1932	3,594	1963	0	1994	677
1933	2,313	1964	310	1995	507
1934	60,000	1965	35	1996	651
1935	No data	1966	198	1997	756
1936	24,748	1967	300	1998	151
1937	27,659	1968	15	1999	Closed
1938	24,522	1969	11	2000	Closed
1939	38,601	1970	8	2001	115
1940	22,677	1971	44	2002	135
1941	40,084	1972	50	2003	199
1942	16,791	1973	178		

Table 9. Herring subsistence fishery harvest, Kodiak Management Area, 1991 to 2003

Year	Permits Issued	Permits Returned	Estimated Harvest in Pounds by District							Total
			Afognak	Northeast	Inner Marmot	Uganik	Uyak	Eastside	Alitak	
1991	50	9	2,110	1,745	1,745	1,000	0	0	0	6,600
1992	45	10	120	250	250	1,000	0	0	320	1,940
1993	50	16	90	3,000	3,910	550	50	0	0	7,600
1994	47	14	90	740	1,350	2,000	200	0	0	4,380
1995	20	6	75	0	500	0	340	0	175	1,090
1996	23	10	550	180	140	0	590	0	0	1,460
1997	16	7	0	200	350	50	1,325	0	0	1,925
1998	18	10	1,240	0	0	50	0	0	0	1,290
1999	15	9	0	200	350	0	425	0	0	975
2000	39	21	575	21,150	0	1,825	0	0	700	24,250
2001	48	19	3,000	0	875	0	1,015	10,500	0	15,390
2002	^a	23	1,170	1,150	420	0	200	903	0	3,843
2003	^b	16	0	220	300	0	420	1,210	30	2,180

^a Beginning in 2002 herring was added to the Kodiak subsistence salmon and crab permit; no separate permit was required.

^b 2003 data is from permits returned through 2/27/04.

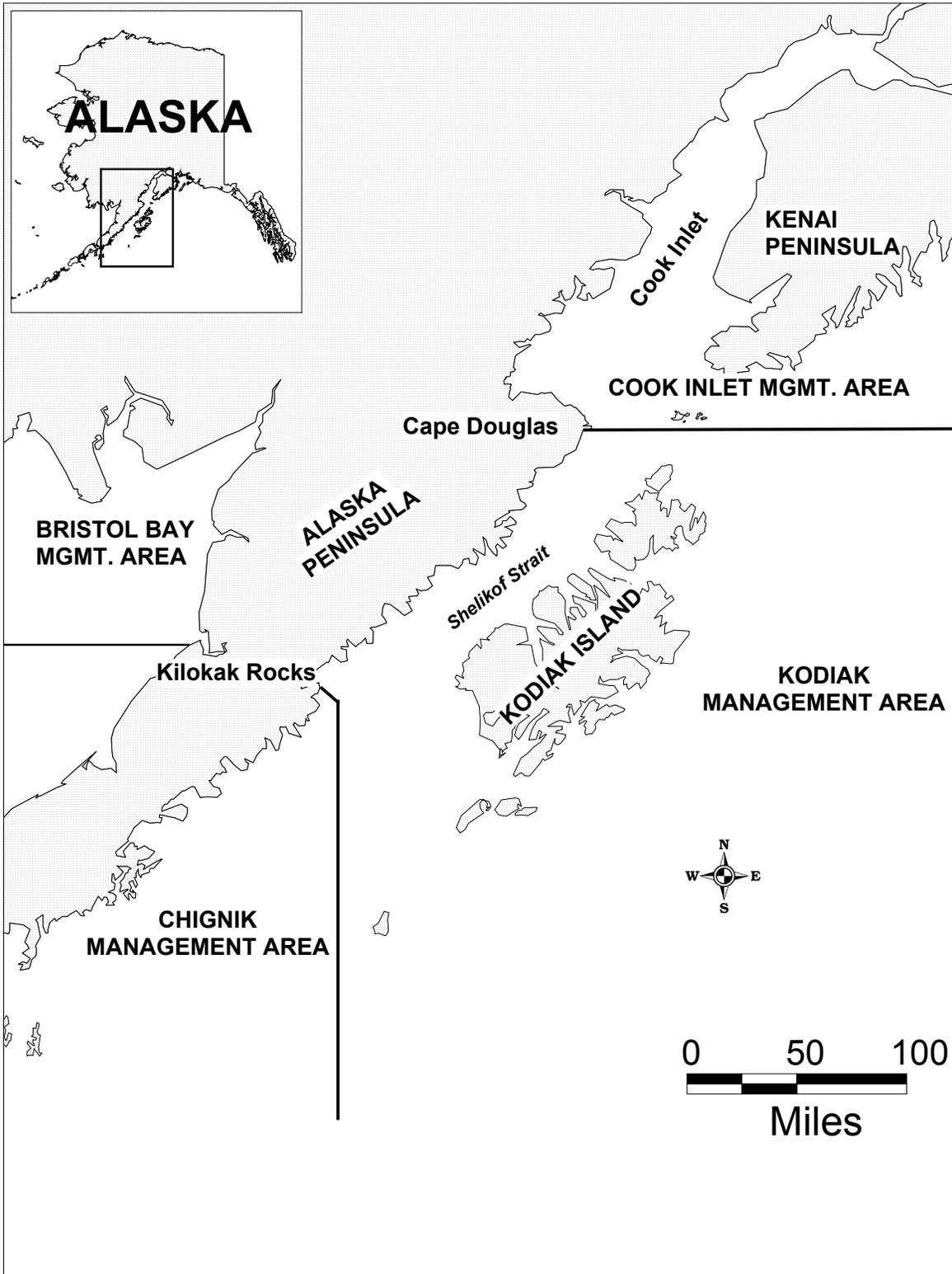


Figure 1. Map of southwestern Alaska emphasizing the Kodiak Management Area and its relationship to surrounding management areas.

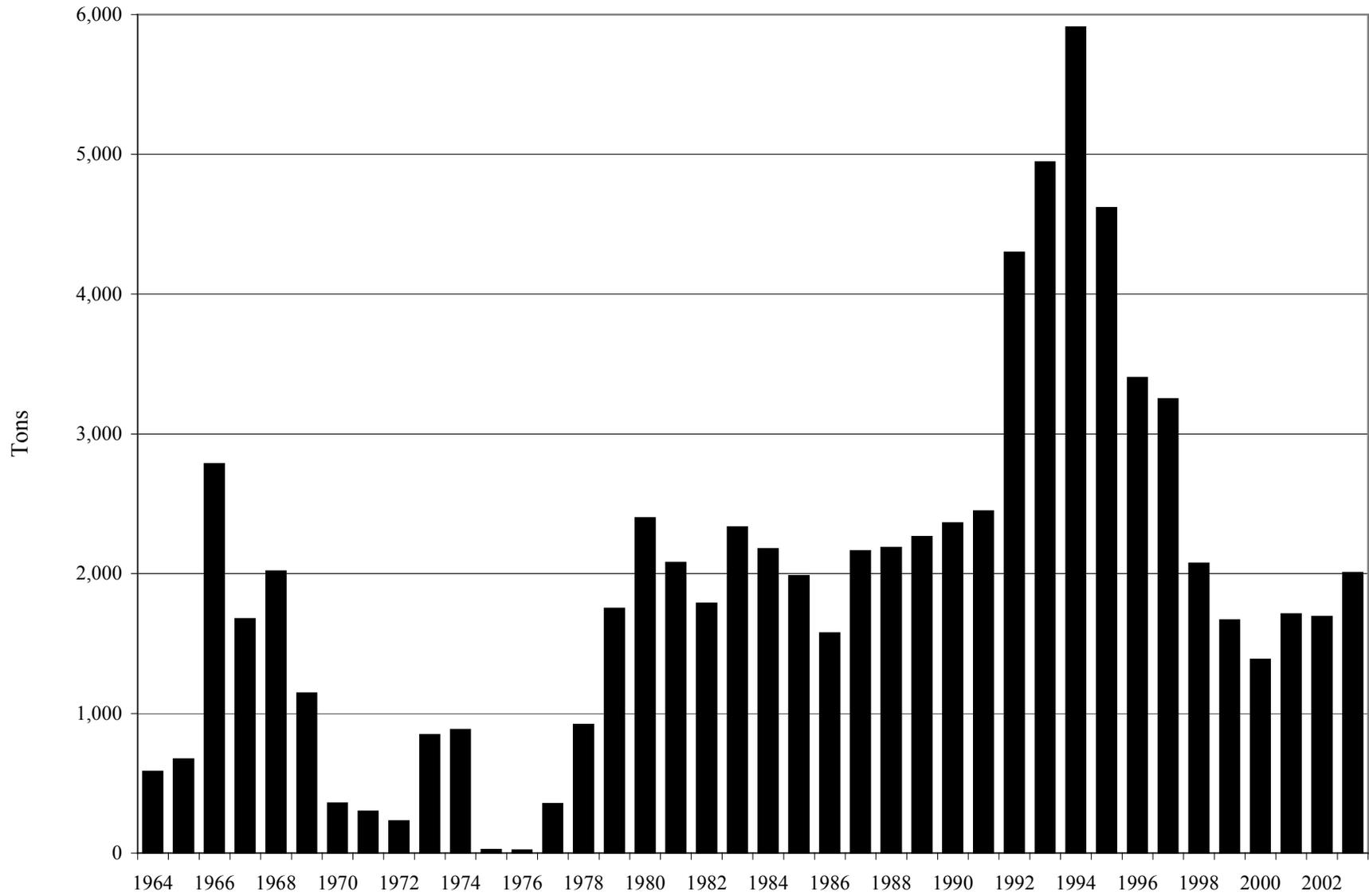


Figure 2. Herring sac roe commercial fishery harvest, Kodiak Management Area, 1964 to 2003

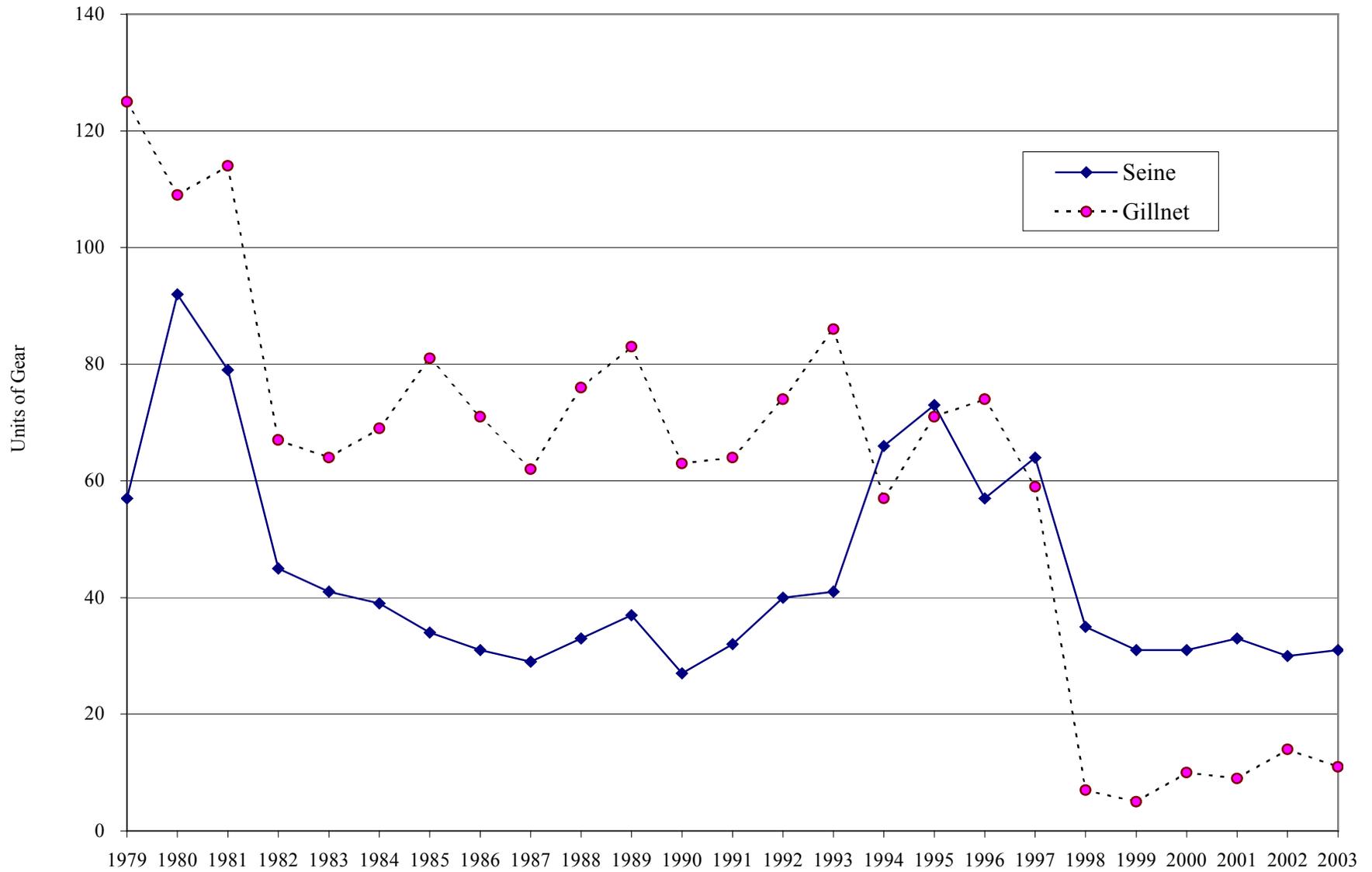


Figure 3. Units of gear that made a landing from 1979 to 1998 or participated in the 1999 to 2003 herring sac roe commercial fisheries, Kodiak Management Area.

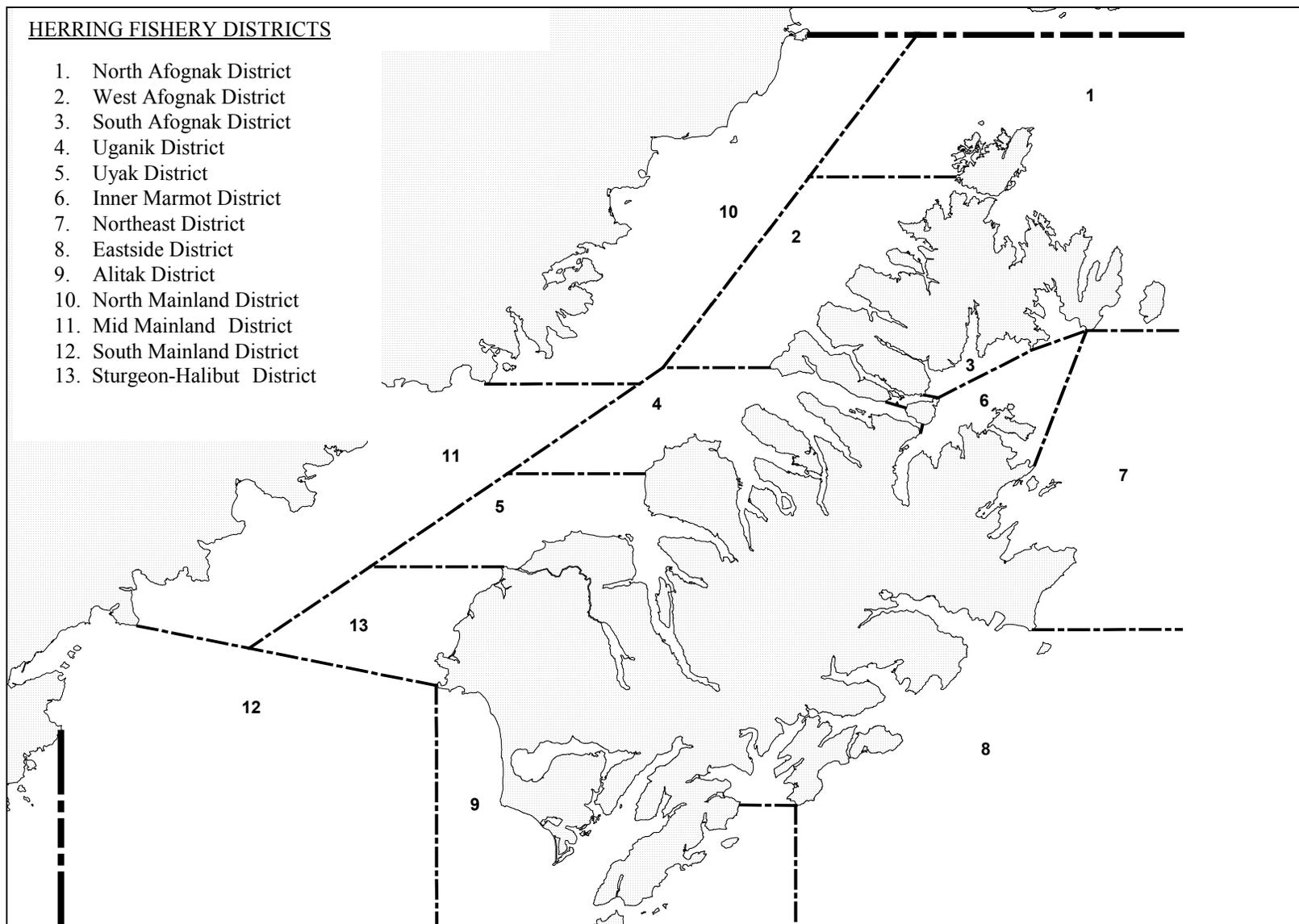


Figure 4. Map of the Kodiak Management Area illustrating the herring commercial fishing districts.

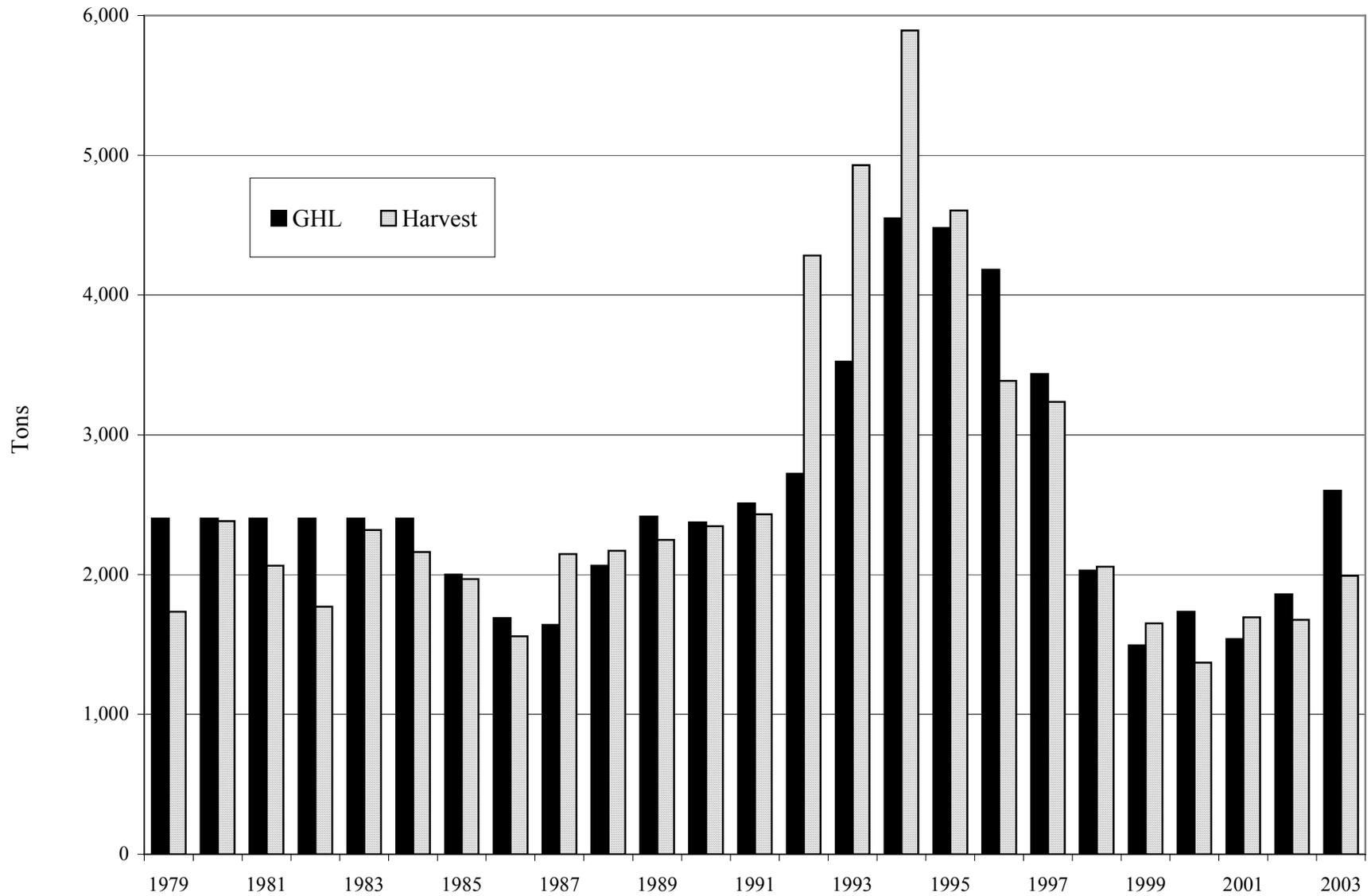


Figure 5. Comparison of guideline harvest levels (GHLs) to the herring sac roe commercial harvest, Kodiak Management Area, 1979 to 2003.

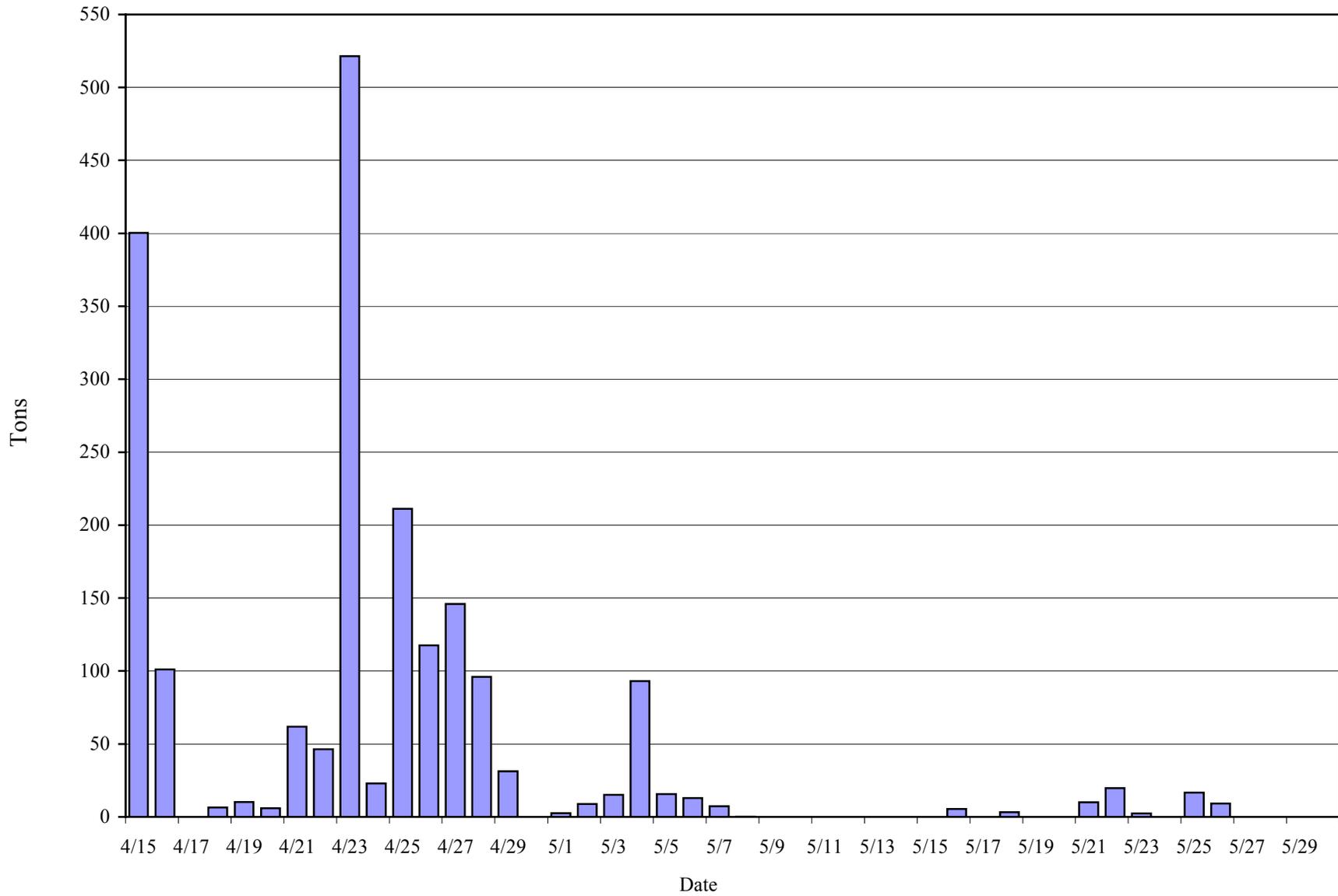


Figure 6. Herring sac roe commercial harvest by day, Kodiak Management Area, 2003.

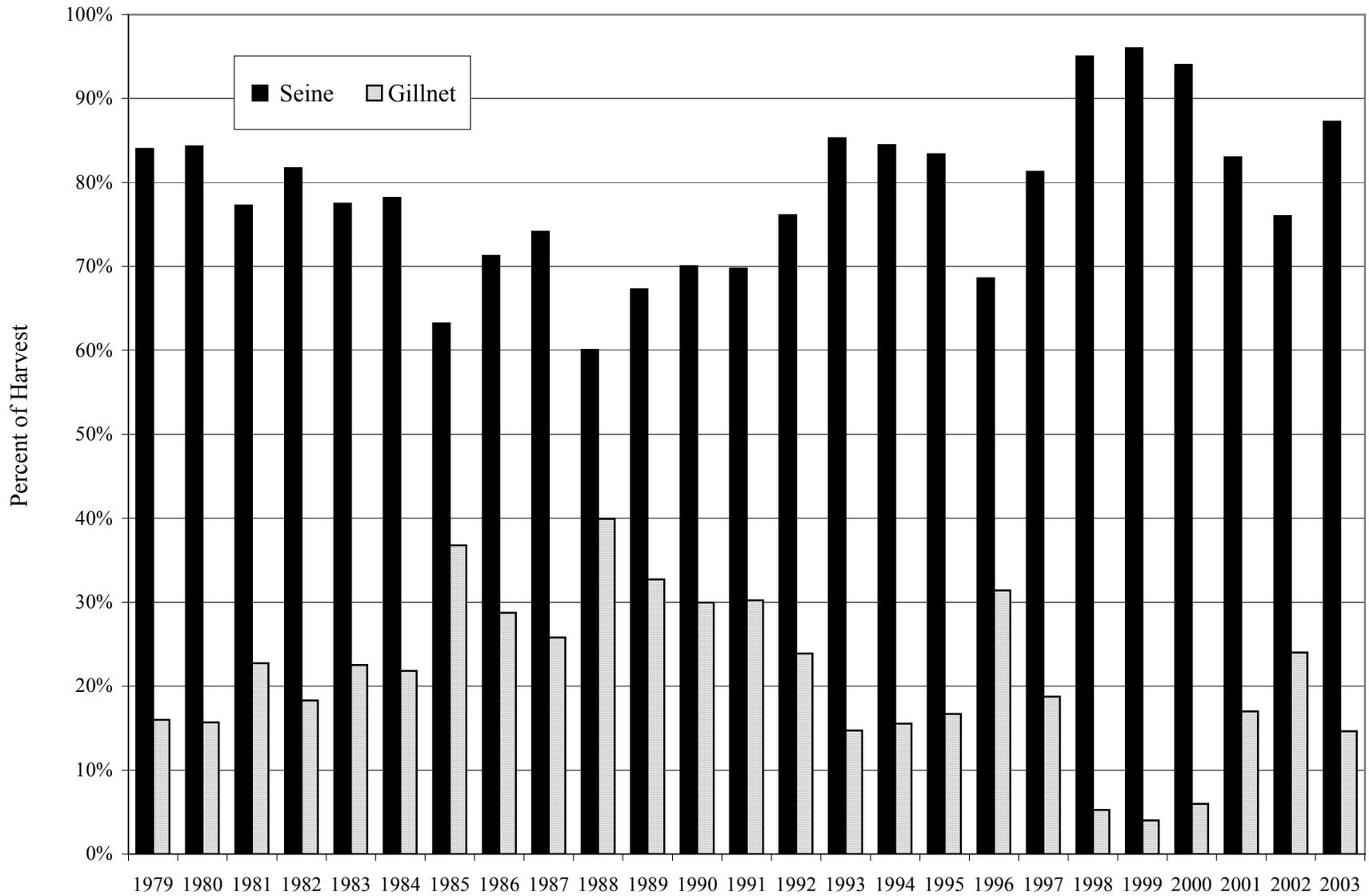


Figure 7. Percent of the total harvest taken by gear type in herring sac roe commercial fisheries, Kodiak Management Area, 1979 to 2003.

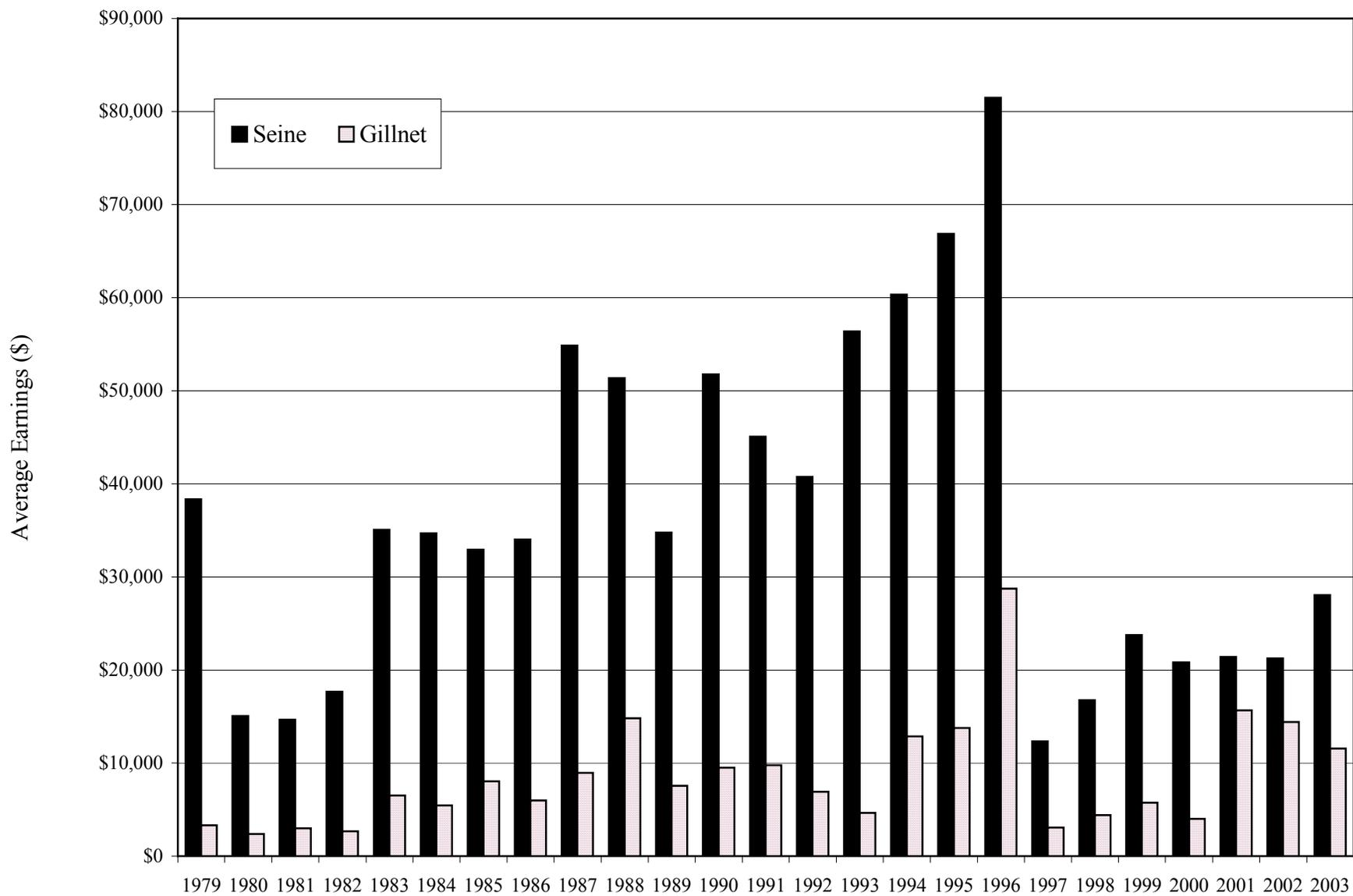


Figure 8. Average earnings by gear type for herring sac roe commercial fisheries, Kodiak Management Area, 1979 to 2003.

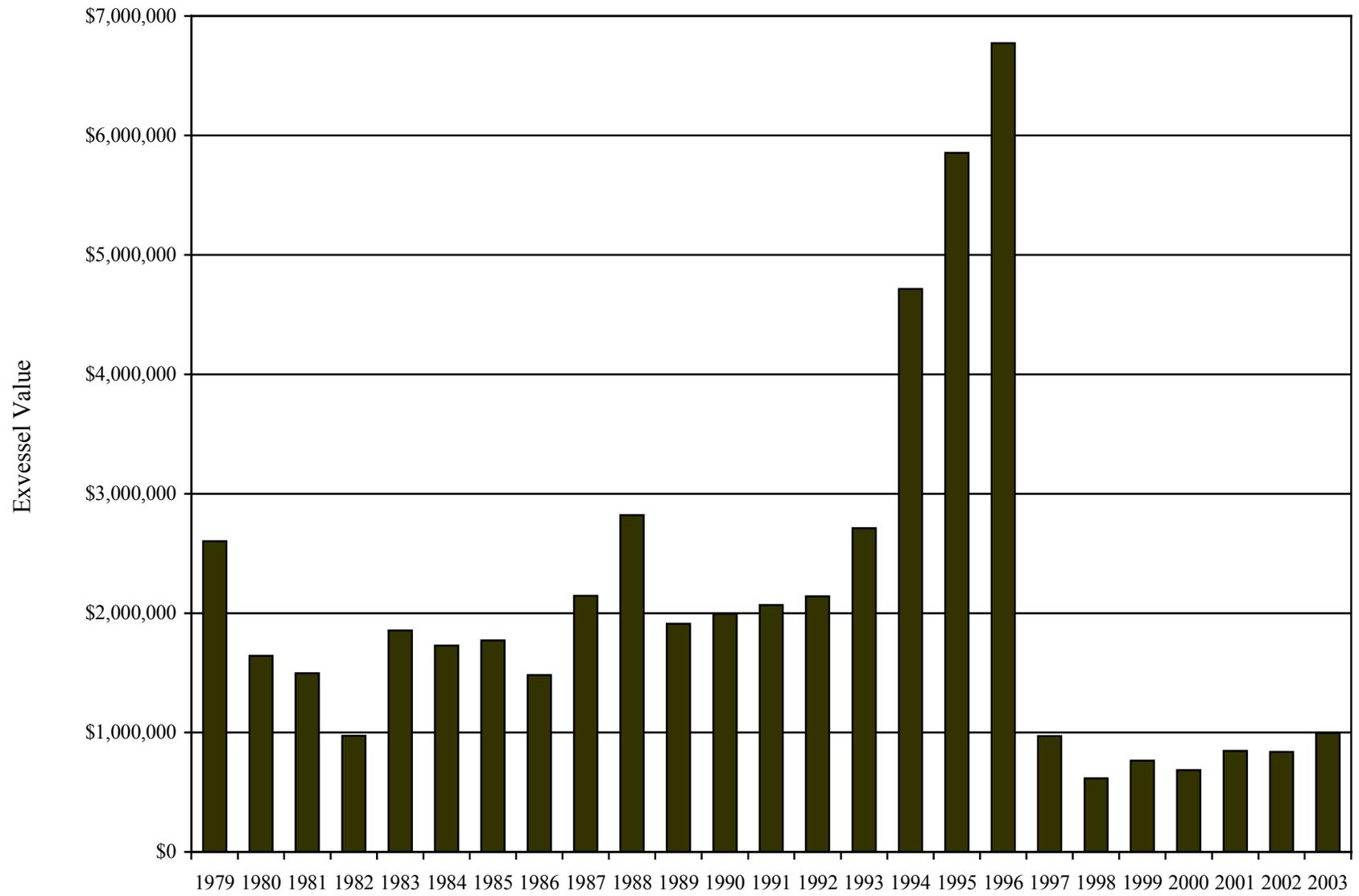


Figure 9. Total exvessel value for herring sac roe commercial fisheries, Kodiak Management Area, 1979 to 2003.

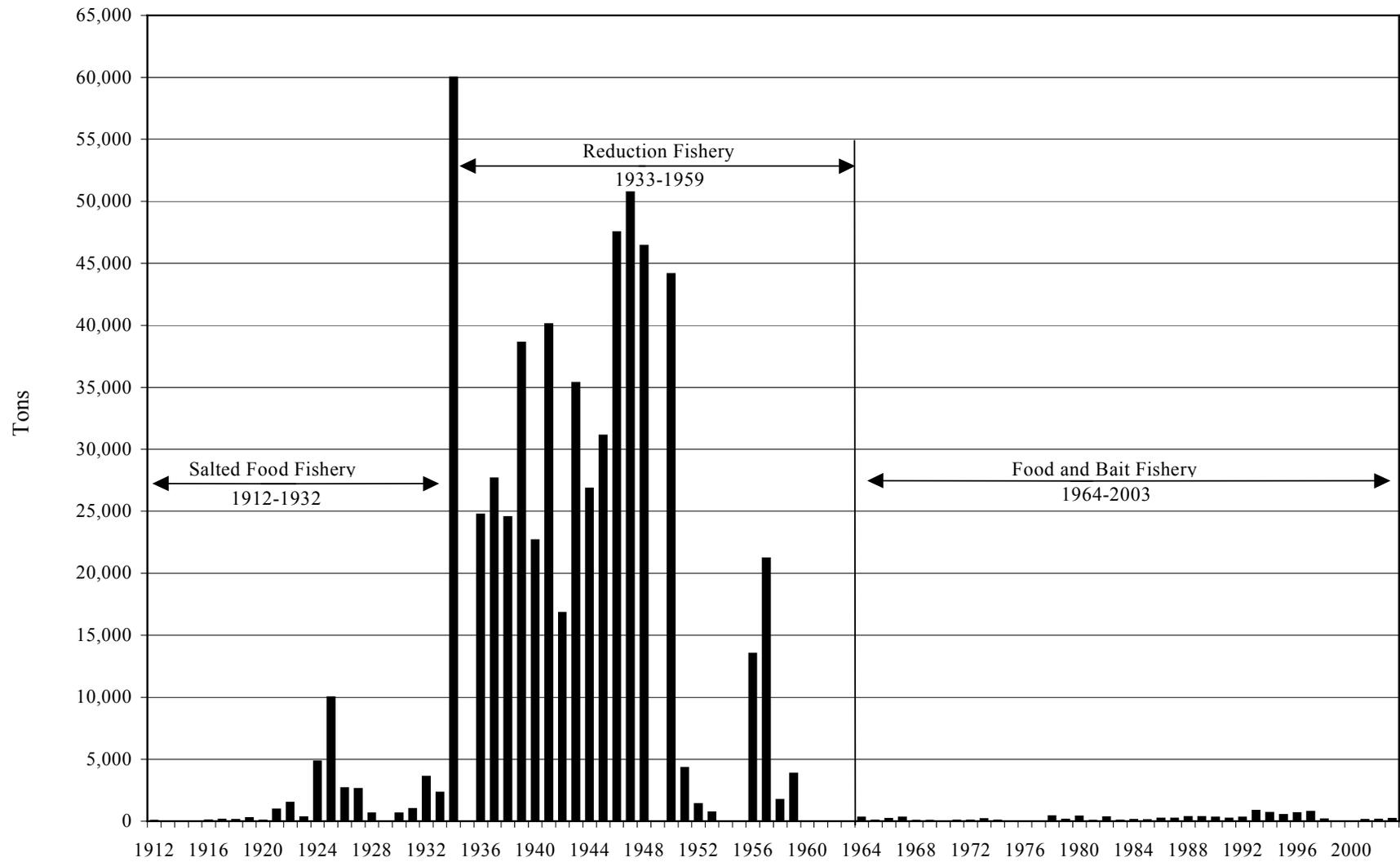


Figure 10. Herring food/bait commercial fishery harvest, Kodiak Management Area, 1912 to 2003.

APPENDIX

Appendix A.1. Summary of emergency orders issued for herring commercial fisheries, Kodiak Management Area, 2003.

Emergency Order #	Issued:	Effective:	Action Taken:
1	1:46 PM Feb. 16	1:46 PM Feb. 16	<u>Close:</u> Eastside District to herring food/bait fishing for the 2002/2003 season.
2	NOON April 10	NOON April 15	<u>Open:</u> initial opening times and fishing periods by gear and section for sac roe herring fishery announced. Delay opening Inner and Outer Ugak Bay Sections (EA50 and EA51) and the Pasagshak Bay Section (EA52) until further notice.
3	11:15 AM April 15	NOON April 15	<u>Delay Opening:</u> Village Islands Section (UG30) and manage fishery for 11% roe quality and fish 130 grams in average weight or larger.
4	1:12 PM April 15	1:15 PM April 15	<u>Close:</u> East Sitkalidak Strait Section (EA30).
5	4:42 PM April 15	4:45 PM April 15	<u>Close:</u> Barling Bay Section (EA24).
6	7:40 PM April 15	7:45 PM April 15	<u>Close:</u> Paramanof Bay (WA31) and the Foul Bay (WA32) Sections
7	5:45 PM April 21	6:00 PM April 21	<u>Close:</u> Newman Bay (EA22) and the West Sitkalidak Strait (EA23) Sections.
8	6:00 PM April 22	12:01 AM April 23	<u>Close:</u> Danger Bay (SA40), Malina Bay (WA20), Tonki Bay (NA50), Izhut Bay (SA10), and Bluefox Bay (WA40) Sections. (District Gillnet Closure).
9	3:40 PM April 23	3:50 PM April 23	<u>Open:</u> that portion of the Village Islands Section (UG 30) north of 57° 49.50' N. latitude from 3:50 PM to 4:00 PM, April 23. Also the Outer Ugak Bay (EA 50), Inner Ugak Bay (EA 51), and Pasagshak Bay (EA52) Sections open to fishing, effective at NOON, April 25.
10	11:45 AM April 25	NOON April 25	<u>Open:</u> that portion of the Village Island Section (UG 30) north of 57° 45.20' N. latitude and south of 57° 45.80 N. latitude from NOON to 12:10 PM, April 25.
11	7:14 PM April 25	7:20 PM April 25	<u>Open:</u> that portion of the Village Island Section (UG 30) south of 57° 44.50 N. latitude from 7:20 PM to 7:30 PM, April 25.

-Continued-

Appendix A.1. (page 2 of 2).

Emergency Order #	Issued:	Effective:	Action Taken:
12	7:45 AM April 26	9:00 AM April 26	<u>Close</u> : Outer Ugak Bay Section (EA 50).
13	9:15 AM April 26	9:30 AM April 26	<u>Open</u> : that portion of the Village Island Section (UG 30) south of 57° 44.50 N. latitude and north of 57° 43.80 N. latitude from 9:30 AM until NOON April 26, unless closed by emergency order.
14	11:55 AM April 27	NOON April 27	<u>Open</u> : that portion of the Village Island Section (UG 30) south of 57° 45.60 N. latitude from NOON until 9:00 PM April 27, unless closed by emergency order.
15	6:30 PM April 27	6:34 PM April 27	<u>Close</u> : the Village Island Section (UG30).
16	6:20 PM April 29	6:28 PM April 29	<u>Close</u> : the Inner and Outer Kiliuda Bay Sections (EA 43 and EA 44), the Kaiugnak Section (EA 10), and the Southwest Sitkalidak Section (EA 20). (District Purse Seine Closure).
17	11:45 AM May 4	NOON May 4	<u>Close</u> : the Zachar Bay (UY 40), Inner Alitak Bay (AL20), Portage Bay (AL31), and Geese/Twoheaded (AL60) Sections. (District Purse Seine Closure).
18	3:00 PM May 6	12:01 AM May 7	<u>Close</u> : the Kizhuyak Bay Section (IM 40).
19	1:30 PM May 8	12:01 AM May 9	<u>Close</u> : the Womans Bay Section (NE 10).
20	10:00 AM September 19	10:00 AM September 19	<u>Announce</u> : food/bait fishery will open for the 2003/2004 season as a co-op fishery and conditions for a fishery outlined. Only the Eastside District and a portion of the Uganik District will be opened by on the grounds emergency order announcements.
21	6:00 AM September 21	6:00 AM September 21	<u>Open</u> : that portion of the Uganik District south of the latitude of Miners Point at 6:00 AM September 21. <u>Close</u> : the Uganik District to herring fishing at 7:00 AM September 21.
22	11:45 AM November 14	NOON November 14	<u>Open</u> : the Eastside District from NOON through MIDNIGHT Friday, November 14.

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