Fishery Management Report No. 18-23

Kodiak Management Area Herring Fisheries Annual Management Report, 2016

by

Geoff Spalinger

December 2018

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat or long
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

FISHERY MANAGEMENT REPORT NO. 18-23

KODIAK MANAGEMENT AREA HERRING FISHERIES ANNUAL MANAGEMENT REPORT, 2016

by
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ABSTRACT

This report presents information concerning the commercial Pacific herring *Clupea pallasii* sac roe, food and bait, and subsistence fisheries in the Kodiak Management Area (KMA) in 2016.

The KMA 2016 herring sac roe fishery was open from April 15 through June 30. Fishermen harvested 365 tons, compared to the preseason guideline harvest level (GHL) of 1,670 tons. Prior to May 1, the herring sac roe fishery is managed under an allocative harvest strategy that provides approximately 75% of the total Kodiak GHL to seine gear and approximately 25% to gillnet gear. From May 1 through June 30, the Alaska Department of Fish and Game (ADF&G) may open any area with a remaining GHL to any gear group if the fishery is unlikely to result in overharvest. There was no effort by gillnetters in 2016 and purse seine fishermen harvested all 365 tons. Roe recovery percentages averaged 10.3% for the fishery. The total exvessel value of the fishery was an estimated $47,450. The majority of herring sampled were age-4 herring.

A combine fishery was attempted for the KMA herring food and bait fishery due to the small GHLs. The Eastside District had a GHL of 57 tons and the South Afognak District opened with a GHL of 44 tons. No harvest occurred during the food and bait fishery.

Subsistence herring harvests were reported from a total of 15 subsistence permits. The total subsistence herring harvest for the KMA in 2016 was 1,800 pounds.

Key words: Kodiak, Herring, *Clupea pallasii*, sac roe commercial fishery, food and bait commercial fishery, subsistence fishery, stock status, GHL, KMA, AMR

INTRODUCTION

This report presents information on the commercial Pacific herring *Clupea pallasii* sac roe, food and bait and subsistence fisheries in the Kodiak Management Area (KMA) in 2016. This includes harvest data by fishery, age and weight data collected from the commercial harvest, stock status, and a summary of fishery management activity.

The KMA comprises the waters of the Kodiak Archipelago and that portion of the Alaska Peninsula extending from Cape Douglas southwest to Kilokak Rocks (Figure 1). The archipelago is approximately 250 kilometers (150 miles) long, extending from Shuyak Island in the north, to the Trinity Islands in the south. The Alaska Peninsula portion of the KMA is about 267 kilometers (160 miles) long and is separated from the archipelago by Shelikof Strait (Figure 1).

The KMA is divided into 13 districts which define geographical areas used to manage both the herring sac roe and the food and bait fisheries (Figures 2–10). For the sac roe fishery, each district is divided into sections that define the spawning area used by specific herring stocks or a geographical area.

HERRING SAC ROE FISHERY

FISHERY CHARACTERISTICS

The KMA herring sac roe fishery began in 1964 (Table 1; Figure 11) and occurs in approximately 30 bays and coastal locations. The fishery currently opens at noon on April 15, with most of the management area opening concurrently. This opening, prior to any major buildup of herring, was historically intended to distribute effort and harvest; however, in recent years, purse seine fishermen have concentrated in areas known to have early spawning herring and the largest guideline harvest levels (GHLs). The fishery ends on June 30 (5 AAC 27.510(a)).

Gear

Purse seines and gillnets are the only gear types allowed in the commercial sac roe fishery. Purse seines may not exceed 18 fathoms stretch measure in depth or 100 fathoms in length (5 AAC 27.525(a)). Gillnets may not exceed an aggregate length of 150 fathoms (5 AAC 27.520(a)).

Fishing Periods

From April 15 through May 7, fishing periods for purse seiners are from noon until 9:00 p.m. on odd-numbered days and from 9:00 a.m. to noon on even-numbered days. From May 8 through June 30, fishing periods for purse seiners are from noon until 10:00 p.m. on odd-numbered days and from 9:00 a.m. to noon on even-numbered days (5 AAC 27.510(a)(1)). For gillnets, fishing periods are from noon on odd-numbered days until noon on even-numbered days (5 AAC 27.510(a)(2)).

Harvest Strategy

The herring sac roe fishery is managed under an allocative harvest strategy that has been in effect since 2000 with some modifications in 2008 and 2009. The harvest strategy requires the Alaska Department of Fish and Game (ADF&G) to establish GHLs by section based on historical harvest data, current and past fishery performance, age composition of commercial catch samples, aerial surveys, and hydroacoustic biomass assessments. For each district that has more than one section open to fishing, ADF&G is required to assign 20% to 30% of the GHL to gillnet permit holders and 70% to 80% of the GHL to purse seine permit holders (5 AAC 27.535(e)(2)(D)). This is accomplished by designating one gear type for each section with a GHL. In districts where assigning one gear type for each section would not achieve the required allocation, the department establishes GHLs for both gear types, within a section, and fishing is separated by time or area. Adjacent sections may be combined and managed as a single section if the same stock is present or moves between sections (5 AAC 27.535(e)(1)(A)). ADF&G may also use emergency order (EO) authority to restrict fishing time in any section if overharvest concerns exist or to open additional areas during the season.

Regulation changes made by the Alaska Board of Fisheries (BOF) in 2009 allow ADF&G, from May 1 through June 30, to open any area with a remaining GHL to any gear group if the fishery is not likely to result in overharvest (5 AAC 27.535(e)(1)(C)). Also, after April 30, permit holders must be registered with ADF&G before participating in the fishery (5 AAC 27.510(a)(4)).

FISHERY MANAGEMENT

Establishing GHLs

Preseason GHLs are established for all sections that have produced consistent herring harvests in previous seasons. These GHLs reflect the status of a particular herring stock by section, but are conservative in nature due to the uncertainty in assessing biomass in the KMA. In 2016, section GHLs ranged from 10 to 400 tons (short; Table 2). Establishing the 2016 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. ADF&G and industry aerial surveys;
5. hydroacoustic surveys; and
6. test fishery data including age composition and biomass estimates.

Preseason GHLs have generally reflected the actual harvests and have aided fishermen and processors in planning prior to the start of each season.

ADF&G has historically relied on the fishing industry to establish roe recovery and minimum size standards. The quality of Kodiak herring has generally been high and met industry standards due to selective harvest of mature herring by fishermen and the inseason processing of relatively small amounts of herring over long time periods by local processors. In the 1990s, competition in the purse seine fishery intensified and fishermen were less selective in harvesting high-quality herring. In 2003 and 2004, ADF&G took a more active role in some sections to manage for roe quality, which resulted in delayed openings of sections and an increase in roe quality. During the 2005 BOF meeting, the harvest strategy was changed so that ADF&G is directed to strive for the highest quality product (5 AAC 27.535(e)(6)).

Inseason Fishery Management

Inseason, processors and independent tender operators are required to provide daily tallies of herring tonnage and deliveries by section, as well as accurate estimates of herring tonnage onboard tenders that have not yet delivered to the processor. Reports from field personnel, processors, permit holders, spotter pilots, and tenders are tallied by ADF&G to assess herring harvests. Generally, once the harvest estimate draws near, meets, or exceeds the GHL, a section is closed for the season by EO. Due to the rapid pace at which some harvests occur, inperiod closures are frequent. In sections that have field personnel present on the grounds, inperiod closures may occur with only a few minutes of advance notice. Industry cooperation has greatly aided managers.

2016 SEASON SUMMARY

The 2016 sac roe season opened at noon April 15. The last harvest occurred on May 8 and 8 EOs were issued during the season (Figure 12; Appendix A1). The total 2016 KMA GHL was established at 1,670 tons and 365 tons were harvested (Table 3; Figure 13).

Spawn was reported and observed in several locations before the fishery began. When the season began, fishermen had trouble finding herring in several areas. Herring that were found were often of mixed size and roe quality. Throughout the season, herring were only harvested in the Inner Ugak Bay, Outer Ugak Bay, and Outer Kiliuda Bay sections of the Eastside District, the combined Izhut, Kitoi, MacDonalds Lagoon sections of the Afognak District, and the Kizhuyak Bay Section of the Inner Marmot District (Table 2).

Effort was extremely low and only 3 purse seine permit holders made 15 landings harvesting 365 tons. No gillnet permit holder made a landing in 2016 (Table 3; Figures 14 and 15). The 2016

average individual harvest was 122 tons for purse seiners (Table 3). Three processing facilities bought and processed herring.

The fishery was monitored by two ADF&G vessels, which were stationed in anticipated herring harvest locations. Vessels 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 41 sections open to fishing; however, 13 sections were exploratory and had little or no historic harvests. Harvests occurred within just 3 sections. There were 8 EOs issued concerning the fishery (Appendix A1).

Purse Seine Fishery

Participation was down and harvests by purse seine gear occurred in only 5 sections: the Outer Kiliuda Bay, Inner Ugak Bay, and Outer Ugak Bay sections of the Eastside District; the Kizhuyak Bay Section of the Inner Marmot District; and the combined Kitoi, Izhut, and MacDonalds Lagoon sections of the South Afognak District (Table 2). The largest harvest occurred in the Outer Ugak Bay Section when 128 tons were harvested on April 19. The Inner Ugak Bay Section had 61 tons harvested from it and was closed on May 2. The Outer Kiliuda Bay section closed on May 3 when 68 tons were harvested. The combined Kitoi, Izhut, and MacDonalds Lagoon sections had 80 tons harvested from them and was closed on May 4. The Kizhuyak Bay Section closed May 8 when 28 tons were harvested. The total KMA purse seine harvest was 365 tons and roe recovery averaged 10.3%.

The combined Village Islands/Uganik Bay sections and the Danger Bay Section have recently been the most consistent herring producers. The observed biomass for these sections was less than expected and composed mostly of juvenile herring. These areas are managed by EO and remained closed.

Gillnet Fishery

Gillnet effort was expected to be minimal in 2016. As a result, ADF&G opened areas initially allocated to the gillnet fleet by EO to continuous fishing beginning at noon on April 15 (Appendix A1). Normally gillnet areas follow a fishing schedule that allows them to fish from noon on even-numbered days until noon on odd-numbered days (24-hour open periods followed by 24-hour closed periods).

No gillnet permit holders participated in the 2016 fishery.

Inseason Gear Changes

After April 30, ADF&G has the authority to allow any gear group access to a section with a remaining GHL, if the fishery is unlikely to result in overharvest (5 AAC 27.535(e)(1)(C)). Beginning noon May 1, the following sections were opened to both gear types: the Inner Alitak and Inner/Outer Deadman bays, Sulua Bay, East Upper Olga Bay, Lower Olga Bay, West Upper Olga Bay, Three Saints Bay, West Sitkalidak Strait, Barling Bay, East Sitkalidak Strait, Shearwater Bay, Outer Kiliuda Bay, Inner Kiliuda Bay, Inner Ugak Bay, Kizhuyak Bay, and Kitoi/Izhut/MacDonalds Lagoon sections.

Exvessel Value of the Fishery

In 2016 the exvessel price paid for 10% roe recovery herring was approximately $130 per ton at the dock, slightly higher than the previous year (Table 3). The estimated average exvessel earnings per purse seine permit holder was $15,817 (Table 3; Figure 17). The total exvessel value of the 2016 fishery was an estimated $47,450 (Table 3; Figure 18), which does not include any adjustments in value for roe recovery above or below 10% recovery, herring that are sold as bait, or herring that were discarded. Roe recovery averaged 10.3% (Figure 16).

STOCK ASSESSMENT

ADF&G evaluates fishery performance and survey information to assess trends in stock status. Hydroacoustic and aerial surveys are conducted by ADF&G to assess herring abundance prior to, during, and after the commercial fishery and to survey closed sections. Herring samples come from commercial harvests and from research vessels (using a mid-water trawl). Age composition information from these samples provides insight into recruitment and aid managers in making GHL adjustments. For example, areas with strong percentages of age-4 and younger herring (recruitment) will not be aggressively fished and will have conservative GHLs established, whereas areas with older age classes (9 or more years old) will be more aggressively fished with higher GHLs.

Industry aerial observers and permit holders have aided managers by providing biomass estimates, spawn observations, fleet movements, and harvest estimates. Although aerial and hydroacoustic assessments provide an evaluation of the biomass, there are problems associated with herring assessment in the KMA. These problems include the following:

1. Herring tend to be deeper during the day and rise toward the surface during the evening and early morning hours, limiting the time fish are observable from the air.
2. Most fishing sections have several distinct aggregations of herring that spawn from April through June, making complete biomass estimates difficult.
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.
5. Adverse weather conditions limit the extent of surveys.
6. Hydroacoustic surveys are limited in shallower waters, and vessel avoidance by herring is known to occur (Hjellvik et al. 2008).
7. A substantial amount of subtidal spawning may occur in water 10 to 20 fathoms in depth, which is not detectable from aerial surveys.

Catch Sampling

A total of 3,709 herring were collected and analyzed for AWL data from harvests and ADF&G trawl samples during the 2016 sac roe season. Samples were taken from 11 sections, 5 of which had commercial harvests. Age-4 herring were the dominant age class, representing approximately 58% of the sampled herring (Table 4). The sample consisted of 10% age-2, 13% age-3, 58% age-4, 3% age-5, 2% age-6, 1% age-7, 0% age-8, 1% age-9, 1% age-10, and 12%

age-11 and older herring (Table 4). Herring sizes from the Eastside were larger at age than samples taken throughout the rest of the KMA (Table 5).

Stock Status by District

Herring can generally be found seasonally in all bays of the KMA (Figure 2). ADF&G monitors approximately 70 sections that are known to have spawning populations of herring, with the majority of effort spent on 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 areas, such as in the Mainland districts, several years may elapse before new information becomes available. ADF&G also considers information provided by commercial herring fishermen, spotter pilots, air taxi operators, and remote area residents concerning herring distribution, biomass estimates, and spawn sightings.

North Afognak District

Five sections compose the North Afognak District. Spawning stocks of herring occur in all 5 sections, although these stocks tend to be small (Figure 3). The Tonki Bay Section had a GHL of 30 tons, the Perenosa Bay Section was open to gillnet gear with a 10-ton GHL, and the Delphin Bay Section was open as exploratory. No harvest occurred in the North Afognak District.

West Afognak District

The West Afognak District has six sections, five of which are known to have spawning stocks of herring (Figure 3). Paramanof Bay has the largest spawning stock within this district; however, this stock has been at low levels since 2005 and no herring have been harvested since 2004 and no fish were observed in 2016. The Malina Bay and Raspberry Strait sections each had a 10-ton GHL. No harvest occurred in either section; however, 50 tons were observed in Raspberry Strait.

South Afognak District

The South Afognak District comprises six sections and the Danger Bay Section currently has the largest stock of herring in this district (Figure 3). A 400-ton GHL was established for purse seine permit holders (Table 2). The fishery was not opened as the biomass was less than expected. Samples collected from test sets were composed of 1% age-2, 8% age-3, 87% age-4, 2% age-5, 1% age-10, and 1% age-11 and older herring (Table 4). Aerial surveys estimated approximately 1,000 tons.

The MacDonalds Lagoon, Kitoi Bay, and Izhut Bay sections were combined and managed as one unit allocated to gillnet gear with a 40-ton GHL (Table 2). These sections were closed on May 4 and 80 tons were harvested (Table 2). Samples from the harvest were composed of 1% age-2, 8% age-3, 90% age-4, and 1% age-5 herring (Table 4). Approximately 200 tons were observed during aerial surveys.

Uganik District

The Uganik District consists of nine sections on the northwest side of Kodiak Island (Figure 4). During the last 10 years this district had the largest harvests in the KMA. The 2016 GHL for the combined Village Islands/Uganik Bay sections was 250 tons for purse seine gear (Table 2). Hydroacoustic surveys estimated only 200 tons of herring at one time. The fishery was not opened and only 46 trawl samples were collected from North East Arm. Samples were

composed of 2% age-1, 4% age-2, 52% age-3, 39% age-4, and 2% age-11 and older herring (Table 4).

The West Uganik Passage, Terror Bay, and Viekoda sections all had established GHLs but no harvest occurred (Table 2). Approximately 200 tons were observed during a hydroacoustic survey of Viekoda Bay.

Uyak District

The Uyak District is made of seven sections located on the west side of Kodiak Island (Figure 5). Through the 1980s, the Uyak District was the largest herring producing district in the KMA. In the early 1990s these stocks began declining and were at low levels for several years. In 2002, aerial surveys indicated that these stocks were improving, and by 2004 several sections were reopened for the first time since 1994. Since 2012 not enough herring have been observed to open any sections in this district. In 2016, approximately 650 tons were observed in the Browns Lagoon Section and approximately 225 tons in the Inner Uyak Bay Section. Trawl samples from Browns Lagoon were composed of 6% age-2, 13% age-3, 74% age-4, 2% age-5, 2% age-6, 1% age-7, 1% age-9, and 1% age-11 and older herring (Table 4). Small numbers of herring were also observed in the Spiridon Bay and Zachar Bay sections.

Alitak District

All sections in the Alitak District (Figure 6), except the Outer Alitak Section, are known to have herring stocks. Herring stocks began to decline in the early 1990s, and by 1998 most sections were closed. In 2002, aerial survey reports indicated an increase in herring abundance. In 2003 and 2004 some sections were opened to gillnet gear to act as test fisheries. By 2005, several sections that had been closed were reopened.

The Inner and Outer Deadman Bay sections currently have the largest biomass and were combined and managed as one section in 2016. These combined sections had a GHL of 90 tons, but no fish were harvested (Table 2).

The East Upper Olga Bay and West Upper Olga Bay sections were each open in 2016 with a 25-ton GHL, but no harvest occurred. The Inner Alitak and Sulua Bay sections each had a 25-ton GHL and no harvest occurred (Table 2). Herring samples showed young fish in Sulua Bay. The sample consisted 43% age-2, 27% age-3, 24% age-4, 3% age-5, 1% age-6, and 1% age-7 herring (Table 4).

Eastside District

The Eastside District is composed of four bay complexes: Ugak Bay, Kiliuda Bay, East Sitkalidak Strait, and West Sitkalidak Strait (Figure 7). Sixteen sections have been established and only one, the Outer Sitkalidak Section, has no history of herring sac roe harvests. Hydroacoustic surveys in this district are conducted less frequently than other portions of the KMA. Sections in the Eastside District have historically been areas where purse seiners concentrate for the initial April 15 opening.

Generally, the East and West Sitkalidak sections have the earliest spawning herring in the KMA, with initial spawns sometimes occurring in March. In 2016, the GHL for the East Sitkalidak Section was established at 100 tons for purse seine gear, but no herring were harvested (Table 2). The GHL for the West Sitkalidak Section was established at 75 for purse seine gear, but no

herring were harvested (Table 2). Hydroacoustic surveys found approximately 120 tons in the East Sitkalidak Section.

The Barling Bay Section, adjacent to the West Sitkalidak Section, had a 40-ton GHL open to purse seine gear (Table 2). No harvest occurred in this section and no herring were observed during hydroacoustic or aerial surveys.

The Inner and Outer Kiliuda Bay sections also have some of the earliest spawning herring in the KMA. The GHL for the Outer Kiliuda Bay Section was set at 75 tons, and 68 tons were harvested by purse seine fishermen (Table 2). Age composition of the harvest was 17% age-2, 4% age-3, 66% age-4, 4% age-5, 3% age-6, 1% age-10, and 5% age-11 and older herring (Table 4). The Inner Kiliuda Bay Section was opened as a gillnet section with a 40-ton GHL but no harvest occurred (Table 2). Approximately 250 tons were observed in the Inner Kiliuda Section during hydroacoustic surveys.

The Inner and Outer Ugak Bay sections have recently been strong herring producers. The GHL for the Outer Ugak Bay Section was 125 tons and allocated to purse seiners, 128 tons were harvested on April 19 (Table 2). Samples from the harvest consisted of 7% age-2, 10% age-3, 61% age-4, 1% age-5, 2% age-6, 1% age-7, 1% age-8, 1% age-10, and 16% age-11 and older herring (Table 4). The Inner Ugak Bay Section was allocated to the gillnet fleet with a 50-ton GHL and 61 tons were harvested on May 2 by purse seine gear after it was opened to both gear groups (Table 2). The harvest for the Inner Ugak Bay Section consisted of 1% age-2, 2% age-3, 16% age-4, 1% age-5, 5% age-6, 4% age-7, 2% age-8, 1% age-9, 3% age-10, and 65% age-11 and older herring (Table 4). Hydroacoustic surveys estimated approximately 800 tons in the Inner and Outer Ugak Bay sections.

The Shearwater Bay Section was allocated to the gillnet fleet with a 40-ton GHL and no herring were harvested (Table 2). A hydroacoustic survey documented approximately 600 tons of herring.

The Pasagshak Bay Section has a small stock of herring that hasn't been fished since the late 1990s. This section was closed in 2016; however, large schools of herring were observed during an aerial survey in May. Approximately 3,500 tons of herring were documented. These herring were likely spawn outs from other sections in the Eastside District that congregated in Pasagshak Bay after spawning.

Northeast District

The Northeast District is composed of five sections, four of which have known spawning stocks of herring (Figure 8). The Womens Bay and Kalsin Bay sections currently have the largest stocks of herring in this district. Each section was allocated to the gillnet fleet with a 10-ton GHL; however, no herring were harvested (Table 2). Approximately 130 tons were observed in the Kalsin Bay Section during an aerial survey.

Inner Marmot District

There are five sections within the Inner Marmot District. All have known spawning stocks of herring, although most stocks are small (Figure 9). The Kizhuyak Bay Section has the largest stock of herring in the district. This section was opened to purse seine gear with a 50-ton GHL and purse seine fishermen harvested 28 tons (Table 2). Samples from the harvest were consisted of 6% age-2, 18% age-3, 29% age-4, 4% age-5, 1% age-6, 1% age-9, 2% age-10, and 40% age-11 and older herring (Table 4).

Mainland District

There are three Mainland districts comprising 12 sections (Figure 10). The last commercial herring harvest from the Mainland districts occurred in 1997. In 2016 seven sections were open as exploratory; however, no effort occurred. The Inner Kukak Bay Section currently has the largest known biomass in the Mainland districts. Between 20,000 and 30,000 tons were estimated in this section based on hydroacoustic surveys. Samples taken by trawl net were composed of 2% age-2, 27% age-3, 52% age-4, 11% age-5, 4% age-6, 1% age-7, 1% age-8, and 1% age-9 herring (Table 4).

HERRING FOOD AND BAIT FISHERY

FISHERY CHARACTERISTICS

Harvest Strategy

The herring food and bait season currently opens September 1 and lasts until February 28 (5 AAC 27.510(b)). GHLs for the fishery are established by district and are based upon 10% of the GHLs established for the preceding sac roe fishery by section (5 AAC 27.535(b)).

Combine Fisheries

The KMA herring food and bait fishery was closed for the 1999 and 2000 seasons because of low potential GHLs and ADF&G's concern for manageability of a competitive fishery on a highly aggregated stock. In 2001, the Commercial Fisheries Entry Commission (CFEC) designated the KMA herring food and bait fishery a limited entry fishery and issued 13 interim use permits to those fishermen who made landings between 1994 and 1998 (Gretsch 2001). Because of the relatively low GHLs available (60 tons in the Uganik District and 47 tons in the Eastside District), ADF&G did not allow a competitive fishery in 2001. As an alternative, the interim permit holders formed a combine, and ADF&G and CFEC agreed to allow a combine fishery to occur. The 13 interim permit holders determined which vessel would conduct the harvest, all marketing aspects, and all costs associated with harvesting and tendering the herring. In July 2002, the CFEC made a final determination on these limited entry permits. Nine permanent limited entry permits were issued, consisting of five purse seine/gillnet permits and four trawl permits.

Combine fisheries have been conducted under similar conditions each season since 2002. Generally, one purse seine vessel is used to harvest herring that are then loaded onto a tender for transport. Fishing efforts have been focused mainly in the Uganik and South Afognak districts in recent years. Only purse seine vessels have been used to harvest herring for the combine.

Kamishak Stock

During the fall and winter months of the early 1980s, large 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 and bait fishermen targeted these herring, but the stock composition was unknown. 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 (unpublished ADF&G report by Johnson et al., Kodiak, Alaska). Results of the study indicated that at least 80% of the Shelikof herring catch sampled were Kamishak Bay stocks, which spawn within the Lower Cook

Inlet (LCI) Management Area. The current harvest strategy alleviates the problem of identifying the spawning stock of a harvest in areas where intermixing may occur by closing the food and bait fishery north of the latitude of Miners Point (Uganik Bay) when the Kamishak spawning biomass falls below 6,000 tons (5 AAC 27.535(d)). No surveys of Kamishak Bay were conducted in 2016 and the current spawning biomass is unknown. The areas north of Miners point remained closed due to low abundance of Kodiak stocks.

2016/2017 SEASON

The biggest obstacle to a competitive fishery is how to determine an equitable fishing period for the two gear types. Permit holders again requested a combine fishery for the 2016/2017 season. ADF&G accommodated the permit holders' request, and the Eastside District (57-ton GHL) and the South Afognak District (44-ton GHL) opened on November 3 (Table 6). No harvest occurred for the 2016/2017 season (Table 7). Only one EO was issued concerning the food and bait fishery (Appendix A1).

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, under 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; Gretsch 2001). A subsistence permit was 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 2000, herring subsistence harvests increased due to bait needs created with the reopening of the commercial tanner crab fishery in the KMA. ADF&G was concerned about the increased herring subsistence harvest and the appropriateness of taking subsistence herring for use as bait in a commercial fishery. ADF&G proposed regulation changes to the BOF in 2001, which were approved to allow for both types of historic harvests. The current subsistence regulation allows for the harvest of up to a total of 500 pounds of herring annually and requires that fishermen obtain a permit prior to fishing (5 AAC 01.530. (d)). Herring were included on the existing KMA salmon and crab subsistence permit. Another permit was also created which allows for the harvest of up to 1,000 pounds of herring by commercial permit holders to be used as bait in commercial fisheries (5 AAC 27.545).

2016 SEASON SUMMARY

A total of 15 KMA subsistence permits were returned to ADF&G, as required for reporting purposes, with herring subsistence harvest data. The reported subsistence herring harvests totaled 1,800 pounds (Table 8). The majority of the harvest occurred in the Afognak and Inner Marmot districts.

REFERENCES CITED

Gretsch, D. 2001. Kodiak management area annual herring management report, 1999. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K01-28.

Hjellvik, V., N.O. Handegard., and E. Ona. 2008. Correcting for vessel avoidance in acoustic-abundance estimates for herring. ICES Journal of Marine Science 65: 1036-1045.

TABLES AND FIGURES

Table 1.–Annual harvests by weight and percent in the KMA commercial herring sac roe and food and bait fisheries, from 1964 through 2016.

Year	Sac roe harvest (tons)	Food/bait harvest (tons)	Total herring harvest (tons)	Sac roe % of total harvest	Food/bait % 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%
2004	3,167	190	3,357	94%	6%
2005	3,463	168	3,631	95%	5%
2006	2,643	169	2,812	94%	6%

-continued-

Table 1.–Page 2 of 2.

Year	Sac roe harvest (tons)	Food/bait harvest (tons)	Total herring harvest (tons)	Sac roe % of total harvest	Food/bait % of total harvest
2007	2,546	154	2,700	94%	6%
2008	3,099	202	3,301	94%	6%
2009	4,759	263	5,022	95%	5%
2010	5,701	191	5,892	97%	3%
2011	2,957	212	3,169	93%	7%
2012	4,260	299	4,559	93%	7%
2013	4,447	291	4,738	94%	6%
2014	2,463	124	2,587	95%	5%
2015	357	106	463	77%	23%
2016	365	0	365	100%	0%
Average 1964 to 2015	2,241	213	2,453	90%	10%
10-year average 2006 to 2015	3,323	201	3,524	93%	7%
5-year average 2011 to 2015	2,897	206	3,103	91%	9%

Table 2.–Herring sac roe fishery GHLs by section and gear type, harvest by section and gear type, and date sections were closed, KMA, 2016.

Statistical area	Management section	GHL	Initial gear type[a]	Harvest		Date closed	
				Purse seine	Gillnet	Purse Seine	Gillnet
NORTH AFOGNAK DISTRICT							
NA10	Shuyak Island	Closed	-	-	-	-	-
NA20	Delphin Bay	Exploratory	Both	0	0	6/30	6/30
NA30	Perenosa Bay	10	Gillnet	-	0	-	6/30
NA40	Seal Bay	Closed	-	-	-	-	-
NA50	Tonki Bay	30	Gillnet	-	0	-	6/30
WEST AFOGNAK DISTRICT							
WA10	Raspberry Strait	10	Gillnet	-	0	-	6/30
WA20	Malina Bay	10	Gillnet	-	0	-	6/30
WA31[b]	Paramanof Bay	Closed	-	-	-	-	-
WA32[b]	Foul Bay	Closed	[b]	[b]	[b]	[b]	[b]
WA40	Bluefox Bay	Exploratory	Both	0	0	6/30	6/30
WA50	Offshore W. Afognak	Closed	-	-	-	-	-
SOUTH AFOGNAK DISTRICT							
SA10[c]	Izhut Bay	40	Gillnet	80	0	5/4	5/4
SA20[c]	Kitoi Bay	[c]	[c]	[c]	[c]	[c]	[c]
SA30[c]	MacDonald Lagoon	[c]	[c]	[c]	[c]	[c]	[c]
SA40	Danger Bay	400	Purse Seine	-	-	-	-
SA50	Litnik	Closed	-	-	-	-	-
SA60	Duck Bay	Closed	-	-	-	-	-
TOTAL ALL AFOGNAK DISTRICTS		500		80	0		
UGANIK DISTRICT							
UG10	Kupreanof	Closed	-	-	-	-	-
UG20	Viekoda Bay	15	Gillnet	-	0	-	6/30
UG21	Terror Bay	15	Gillnet	-	0	-	6/30
UG30[d]	Village Islands	250	Purse Seine	-	-	-	-
UG31	West Uganik Passage	35	Gillnet	-	0	-	6/30
UG32[d]	NE Arm Uganik Bay	[d]	[d]	[d]	[d]	[d]	[d]
UG33[d]	East Arm Uganik Bay	[d]	[d]	[d]	[d]	[d]	[d]
UG34[d]	South Arm Uganik Bay	[d]	[d]	[d]	[d]	[d]	[d]
UG40	Offshore Uganik	Closed	-	-	-	-	-
DISTRICT TOTAL		315		0	0		
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	Closed	-	-	-	-	-
UY50	Spiridon Bay	Closed	-	-	-	-	-
DISTRICT TOTAL							

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Table 2.–Page 2 of 3.

Statistical area	Management section	GHL	Initial gear type [a]	Harvest		Date Closed	
				Purse seine	Gillnet	Purse seine	Gillnet
ALITAK DISTRICT							
AL10	Outer Alitak	Closed	-	-	-	-	-
AL20	Inner Alitak	25	Purse Seine	0	0	6/30	6/30
AL21[e]	Inner Deadman Bay	90	Purse Seine	0	0	6/30	6/30
AL22[e]	Outer Deadman Bay	[e]	[e]	[e]	[e]	[e]	[e]
AL30	Sulua Bay	25	Gillnet	0	0	6/30	6/30
AL40	Lower Olga-Moser	25	Gillnet	0	0	6/30	6/30
AL41	East Upper Olga Bay	25	Purse Seine	0	0	6/30	6/30
AL50	West Upper Olga Bay	25	Purse Seine	0	0	6/30	6/30
AL60	Geese/Twoheaded	Exploratory	Both	0	0	6/30	6/30
DISTRICT TOTAL		215		0	0		
STURGEON/HALIBUT DISTRICT							
SH10	Sturgeon/Halibut	CLOSED	CLOSED	CLOSED			
EASTSIDE DISTRICT							
EA10	Kaiugnak	Exploratory	Both	0	0	6/30	6/30
EA20	SW. Sitkalidak	Exploratory	Both	0	0	6/30	6/30
EA21	Three Saints Bay	25	Purse Seine	0	0	6/30	6/30
EA22	Newman Bay	Exploratory	Both	0	0	6/30	6/30
EA23	W. Sitkalidak Strait	75	Purse Seine	0	0	6/30	6/30
EA24	Barling Bay	40	Purse Seine	0	0	6/30	6/30
EA30	E. Sitkalidak Strait	100	Purse Seine	0	0	6/30	6/30
EA31	Tanginak Anchorage	Exploratory	Both	0	0	6/30	6/30
EA40	Outer Sitkalidak	Closed	-	-	-	-	-
EA41	Boulder Bay	Closed	-	-	-	-	-
EA42	Shearwater Bay	40	Gillnet	0	0	6/30	6/30
EA43	Outer Kiliuda Bay	75	Purse Seine	68	0	5/3	5/3
EA44	Inner Kiliuda Bay	40	Gillnet	0	0	6/30	6/30
EA50	Outer Ugak Bay	125	Purse Seine	128	-	4/19	-
EA51	Inner Ugak Bay	50	Gillnet	61	0	5/2	5/2
EA52	Pasagshak Bay	Closed	-	-	-	-	-
DISTRICT TOTAL		570		257	0		
NORTHEAST DISTRICT							
NE10	Womens Bay	10	Gillnet	-	0	-	6/30
NE20	Kalsin Bay	10	Gillnet	-	0	-	6/30
NE30	Middle Bay	Closed	-	-	-	-	-
NE40	Inshore Chiniak	Closed	-	-	-	-	-
NE50	Offshore Chiniak	Closed	-	-	-	-	-
DISTRICT TOTAL		20		0	0		
INNER MARMOT DISTRICT							
IM10	Monashka Bay	Closed	-	-	-	-	-
IM20	Anton Larsen Bay	Closed	-	-	-	-	-
IM30	Sharatin Bay	Closed	-	-	-	-	-
IM40	Kizhuyak Bay	50	Purse Seine	28	0	5/8	5/8
IM50	Spruce Island	Closed	-	-	-	-	-
NE AND IM DISTRICT TOTAL		50		28	0		

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Table 2.–Page 3 of 3.

Statistical area	Management section	GHL	Initial gear type [a]	Harvest		Date closed	
				Purse seine	gillnet	Purse seine	gillnet
NORTH MAINLAND DISTRICT							
NM10	Hallo Bay	Closed	-	-	-	-	-
NM20	Inner Kukak	Exploratory	Both	0	0	6/30	6/30
NM30	Outer Kukak	Closed	-	-	-	-	-
NM40	Missak Bay	Closed	-	-	-	-	-
MID MAINLAND DISTRICT							
MM10	Inner Katmai	Exploratory	Both	0	0	6/30	6/30
MM20	Outer Katmai	Closed	-	-	-	-	-
MM30	Alinchak	Exploratory	Both	0	0	6/30	6/30
MM40	Puale Bay	Exploratory	Both	0	0	6/30	6/30
MM50	Portage Bay	Exploratory	Both	0	0	6/30	6/30
MM60	Outer Portage	Closed	-	-	-	-	-
SOUTH MAINLAND DISTRICT							
SM10	Wide Bay	Exploratory	Both	0	0	6/30	6/30
SM20	Lower Shelikof	Closed	-	-	-	-	-
MAINLAND DISTRICTS TOTAL				0	0		
GRAND TOTAL		1,670		365	0		

[a] Beginning May 1, ADF&G may open any area to any gear group.

[b] WA31 and WA32 were combined and managed as one section.

[c] SA10, SA20, and SA30 were combined and managed as one section.

[d] UG30, UG32, UG33, and UG 34 were combined and managed as one section.

[e] AL21 and AL22 were combined and managed as one section.

Table 3.–Summary of season length, GHL, harvest by gear type, percentage of harvest by gear type, number of landings, and estimated exvessel earnings for the herring sac roe fishery in the KMA, from 1979 through 2016.

				Harvest (tons)		Percent harvest by		Number of landings by						Estimated average			
	Season length	GHL	Total harvest	by gear type		gear type		gear type		Units of gear fished		Average catch (tons) by gear		earnings[a]		Price per	Estimated exvessel
Year	(days)	(tons)	(tons)	Seine	Gillnet	Seine	Gillnet	Seine	Gillnet	Seine	Gillnet	Seine	Gillnet	Seine	Gillnet	ton [a]	total value [a]
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	$34,758	$7,537	$850	$1,911,650
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	$20,539	$5,136	$500	$1,617,500
1998	50	2,030	2,057	1,954	103	95%	5%	110	26	35	7	56	15	$27,914	$7,357	$500	$1,028,500
1999	38	1,495	1,651	1,589	62	96%	4%	94	16	31	5	51	12	$33,984	$8,221	$663	$1,094,613
2000[b]	37	1,735	1,370	1,290	80	94%	6%	57	23	31	10	42	8	$29,129	$5,600	$700	$959,000
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

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Table 3.–Page 2 of 2.

Year	Season length (days)	GHL (tons)	Total harvest (tons)	Harvest (tons) by gear type		Percent harvest by gear type		Number of landings by gear type		Units of gear fished		Average catch (tons) by gear		Estimated average earnings [a]		Price per ton [a]	Estimated exvessel total value [a]
				Seine	Gillnet	Seine	Gillnet	Seine	Gillnet	Seine	Gillnet	Seine	Gillnet	Seine	Gillnet		
2004	42	2,850	3,167	2,894	273	91%	9%	95	36	27	11	107	25	$53,593	$12,409	$500	$1,583,500
2005	37	3,475	3,463	2,932	531	85%	15%	134	61	32	12	92	44	$45,813	$22,125	$500	$1,731,500
2006	34	3,705	2,643	2,617	26	99%	1%	86	[c]	21	[c]	125	[c]	$34,270	[c]	$275	$726,825
2007	37	4,000	2,546	2,510	36	99%	1%	105	8	21	3	120	12	$47,810	$4,800	$400	$1,018,400
2008	38	4,290	3,099	3,086	13	99.6%	0.4%	108	[c]	22	[c]	140	[c]	$73,643	[c]	$525	$1,626,975
2009	54	4,765	4,759	4,549	210	96%	4%	218	19	31	6	147	35	$77,040	$18,375	$525	$2,498,475
2010	48	6,075	5,701	5,538	163	97%	3%	277	14	36	7	154	23	$61,533	$9,314	$400	$2,280,400
2011	48	6,135	2,957	2,937	20	99%	1%	95	6	14	3	210	7	$41,957	$1,333	$200	$591,400
2012	72	5,355	4,260	4,253	7	99.8%	0.2%	164	[c]	23	[c]	185	[c]	$55,474	[c]	$300	$1,278,000
2013	65	5,410	4,447	4,298	149	97%	3%	189	18	33	5	130	30	$29,956	$6,854	$230	$1,022,810
2014	28	5,830	2,463	2,463	0	100%	0%	99	0	21	0	117	0	$11,729	$0	$100	$246,300
2015	15	3,190	357	357	0	100%	0%	19	0	9	0	40	0	$4,363	$0	$110	$39,270
2016	24	1,670	365	365	0	100%	0%	15	0	3	0	122	0	$15,817	$0	$130	$47,450
Average 1979 to 2015	53	3,198	2,809	2,406	403	85%	15%	145	261	38	46	75	14	$40,147	$8,765	$671	$1,857,218
10-year avg. 2006 to 2015	44	4,876	3,323	3,261	62	99%	1%	136	9	23	3	137	15	$43,777	$5,811	$307	$1,132,886
5-year avg. 2011 to 2015	46	5,184	2,897	2,862	35	99%	1%	113	6	20	2	136	9	$28,696	$2,047	$188	$635,556

[a] Exvessel values are based on dock delivered herring and inseason data.

[b] Beginning in 2000, an allocative harvest strategy was in effect.

[c] Confidential.

Table 4.–Age composition of herring samples from the commercial sac roe fishery, by section in the KMA, 2016.

		Percent at Age									
	n	age-2	age-3	age-4	age-5	age-6	age-7	age-8	age-9	age-10	age-11+
Browns Lagoon	472	6%	13%	74%	2%	2%	1%	0%	1%	0%	1%
Danger Bay	223	1%	8%	87%	2%	0%	0%	0%	0%	1%	1%
East Sitkalidak	47	83%	4%	11%	0%	0%	0%	0%	0%	0%	2%
Inner Kukak	345	2%	27%	52%	11%	4%	1%	1%	1%	0%	0%
Inner Ugak	196	1%	2%	16%	1%	5%	4%	2%	1%	3%	65%
Izhut/Kitoi/MacDonalds	572	1%	8%	90%	1%	0%	0%	0%	0%	0%	0%
Kizhuyak	520	6%	18%	29%	4%	1%	0%	0%	1%	2%	40%
NE Arm	46	4%	52%	39%	0%	0%	0%	0%	0%	0%	2%
Outer Kiliuda	640	17%	4%	66%	4%	3%	0%	0%	0%	1%	5%
Outer Ugak	363	7%	10%	61%	1%	2%	1%	1%	0%	1%	16%
Sulua	285	43%	27%	24%	3%	1%	1%	0%	0%	0%	0%
All Samples Combined	3709	10%	13%	58%	3%	2%	1%	0%	1%	1%	12%

Table 5.–Average weight of herring samples from the commercial sac roe fishery, by age and section in the KMA, 2016.

	Weight at Age (grams)									
	age-2	age-3	age-4	age-5	age-6	age-7	age-8	age-9	age-10	age-11+
Browns Lagoon	50	89	112	138	172	196	0	192	0	218
Danger Bay	58	98	124	143	170	0	0	0	218	224
East Sitkalidak	62	86	144	0	0	0	0	0	0	257
Inner Kukak	36	65	84	102	131	148	186	174	197	0
Inner Ugak	71	111	155	186	201	234	216	246	251	279
Izhut/Kitoi/MacDonalds	43	88	117	169	166	0	0	0	0	302
Kizhuyak	56	95	119	153	179	200	0	225	228	251
NE Arm	32	74	89	0	0	0	0	0	0	152
Outer Kiliuda	60	91	154	179	197	237	0	243	268	272
Outer Ugak	63	101	147	175	206	181	251	0	291	272
Sulua	62	98	132	157	182	195	300	271	0	334

Table 6.–Herring food and bait commercial fishery GHLs and harvest (tons) by district, KMA, 2016.

Management District	GHL	Harvest
F/B 3 - South Afognak	44	0
F/B 8 - Eastside	57	0
Total	101	0

Table 7.–Herring food and bait commercial fishery GHLs and harvest (tons), KMA, 2001 through 2016.

Year	GHL	Harvest
2001	107	114
2002	134	135
2003	197	199
2004	225	190
2005	302	168
2006	342	169
2007	370	154
2008	351	202
2009	420	263
2010	555	191
2011	405	212
2012	404	299
2013	454	291
2014	310	124
2015	113	106
2016	101	0
Average 2006 to 2015	372	201

Table 8.–Subsistence herring harvest summary for the KMA, 1991 through 2016.

Year	Permits Issued	Permits Returned	Estimated Harvest in Pounds by District								
			Afognak	Northeast	Inner Marmot	Uganik	Uyak	Eastside	Alitak	Other	Total
1991	50	9	2,110	1,745	1,745	1,000	0	0	0	0	6,600
1992	45	10	120	250	250	1,000	0	0	320	0	1,940
1993	50	16	90	3,000	3,910	550	50	0	0	0	7,600
1994	47	14	90	740	1,350	2,000	200	0	0	0	4,380
1995	20	6	75	0	500	0	340	0	175	0	1,090
1996	23	10	550	180	140	0	590	0	0	0	1,460
1997	16	7	0	200	350	50	1,325	0	0	0	1,925
1998	18	10	1,240	0	0	50	0	0	0	0	1,290
1999	15	9	0	200	350	0	425	0	0	0	975
2000	39	21	575	21,150	0	1,825	0	0	700	0	24,250
2001	48	19	3,000	0	875	0	1,015	10,500	0	0	15,390
2002	[a]	23	1,170	1,150	420	0	200	903	0	0	3,843
2003	[a]	16	0	220	300	0	420	1,210	30	0	2,180
2004	[a]	24	200	580	465	206	1,580	1,142	0	0	4,173
2005	[a]	37	300	850	1,070	160	550	2,300	155	0	5,385
2006	[a]	33	600	1,109	1,175	250	415	1,650	0	0	5,199
2007	[a]	37	200	912	1,430	5	1,470	850	300	0	5,167
2008	[a]	21	100	1,134	1,110	50	1,020	610	0	0	4,024
2009	[a]	36	625	660	520	400	451	980	0	330	3,966
2010	[a]	26	401	527	650	200	250	595	150	0	2,773
2011	[a]	27	10	425	355	550	310	505	200	30	2,385
2012	[a]	24	262	1,508	25	0	330	920	200	15	3,260
2013	[a]	24	615	668	50	75	200	585	200	0	2,393
2014	[a]	17	232	682	0	0	150	500	500	100	2,164
2015	[a]	13	0	100	20	150	150	745	350	0	1,515
2016	[a]	15	500	195	500	140	30	135	300	0	1,800

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

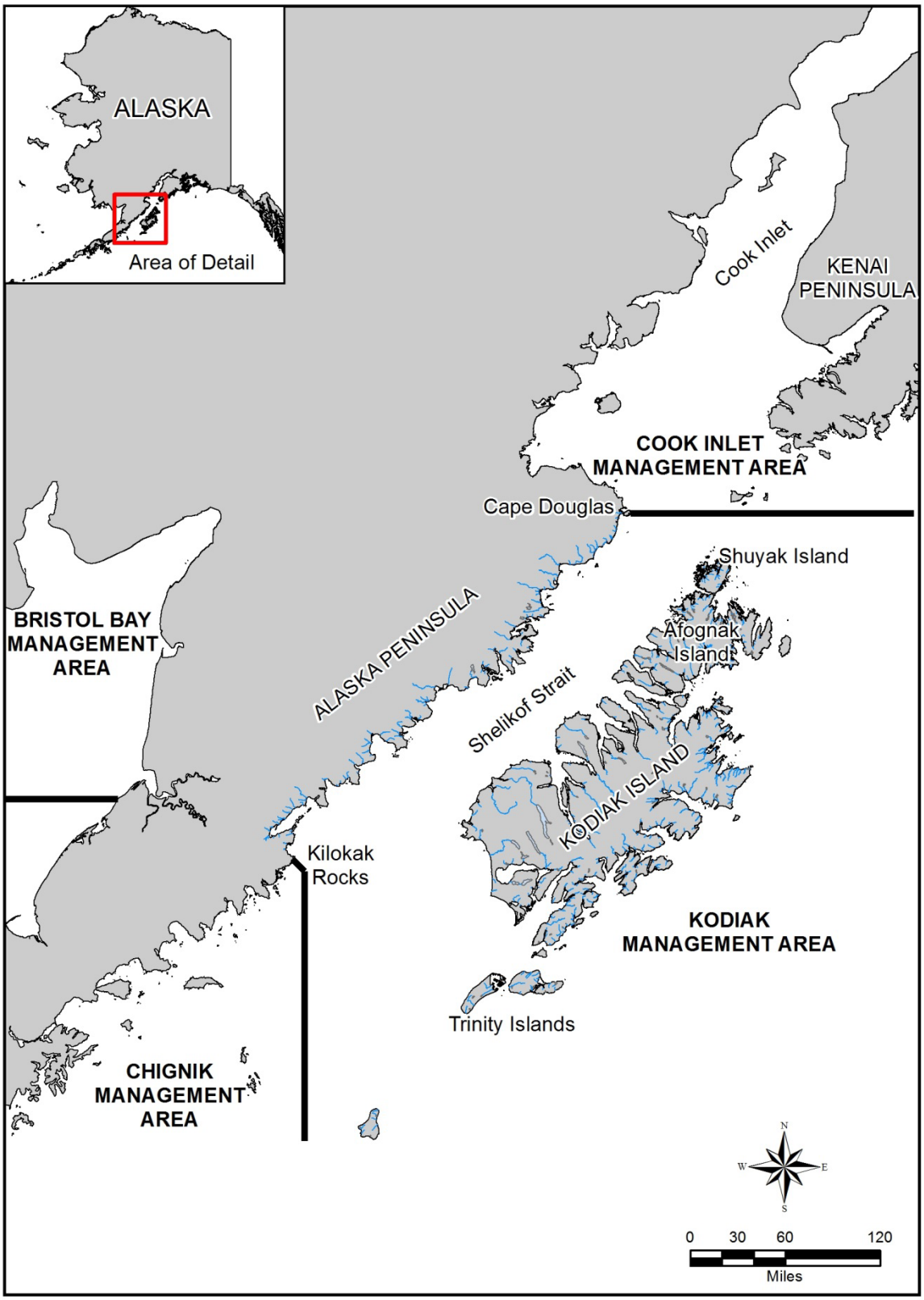


Figure 1.–Map of southwestern Alaska showing the KMA and surrounding management areas.

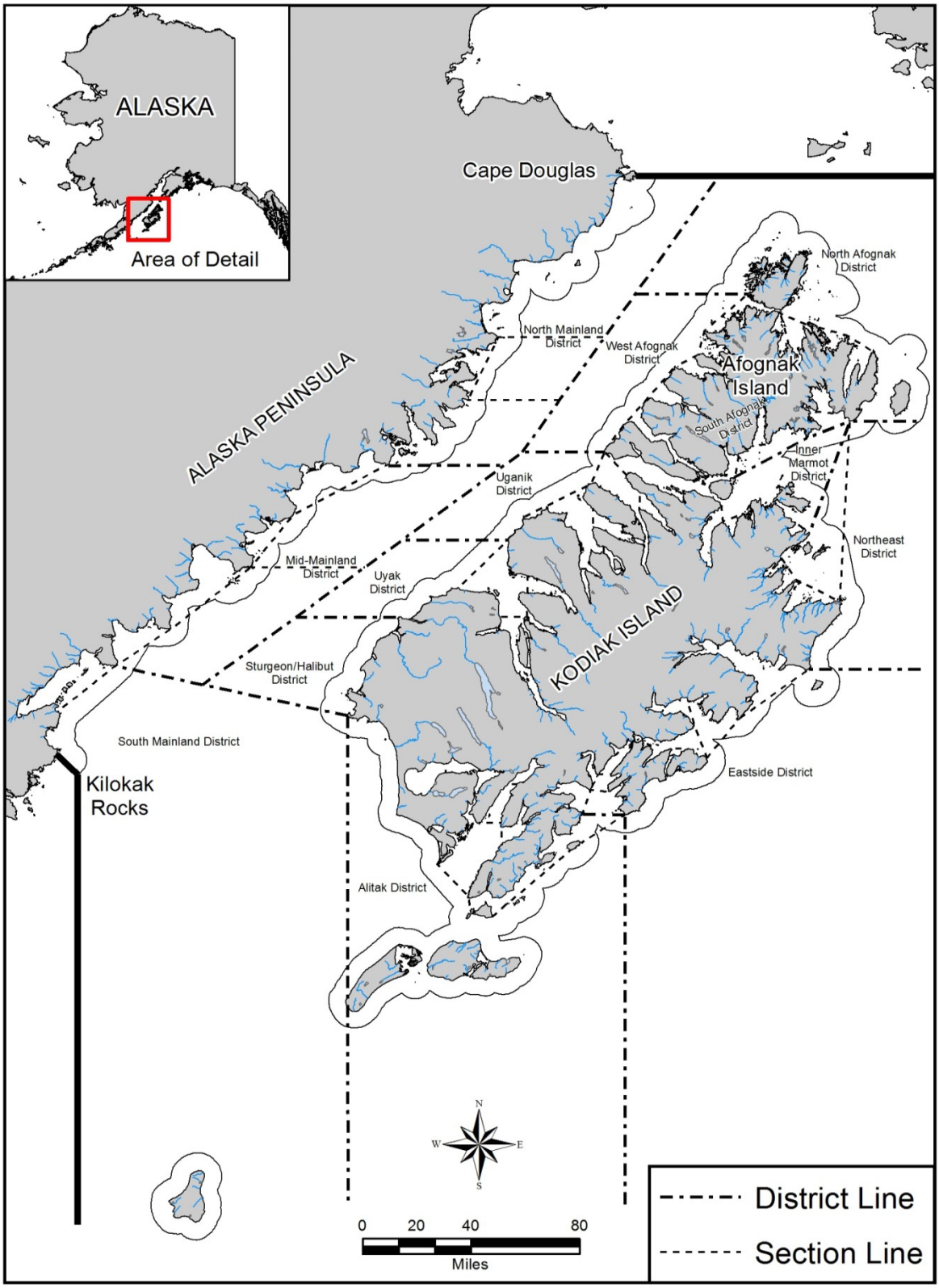


Figure 2.–Map of the KMA illustrating the herring commercial fishery districts.

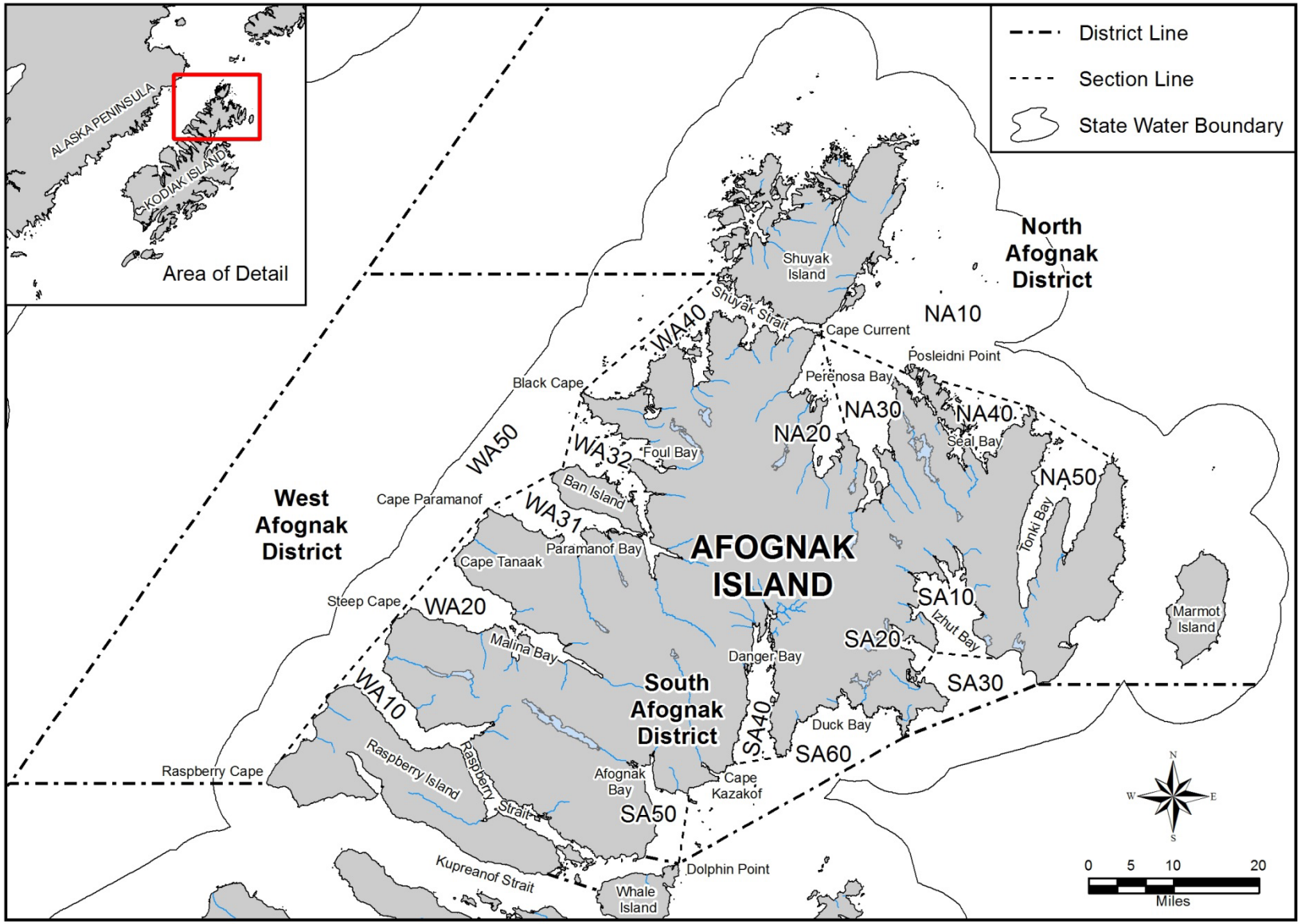


Figure 3.–Map showing the Afognak districts.

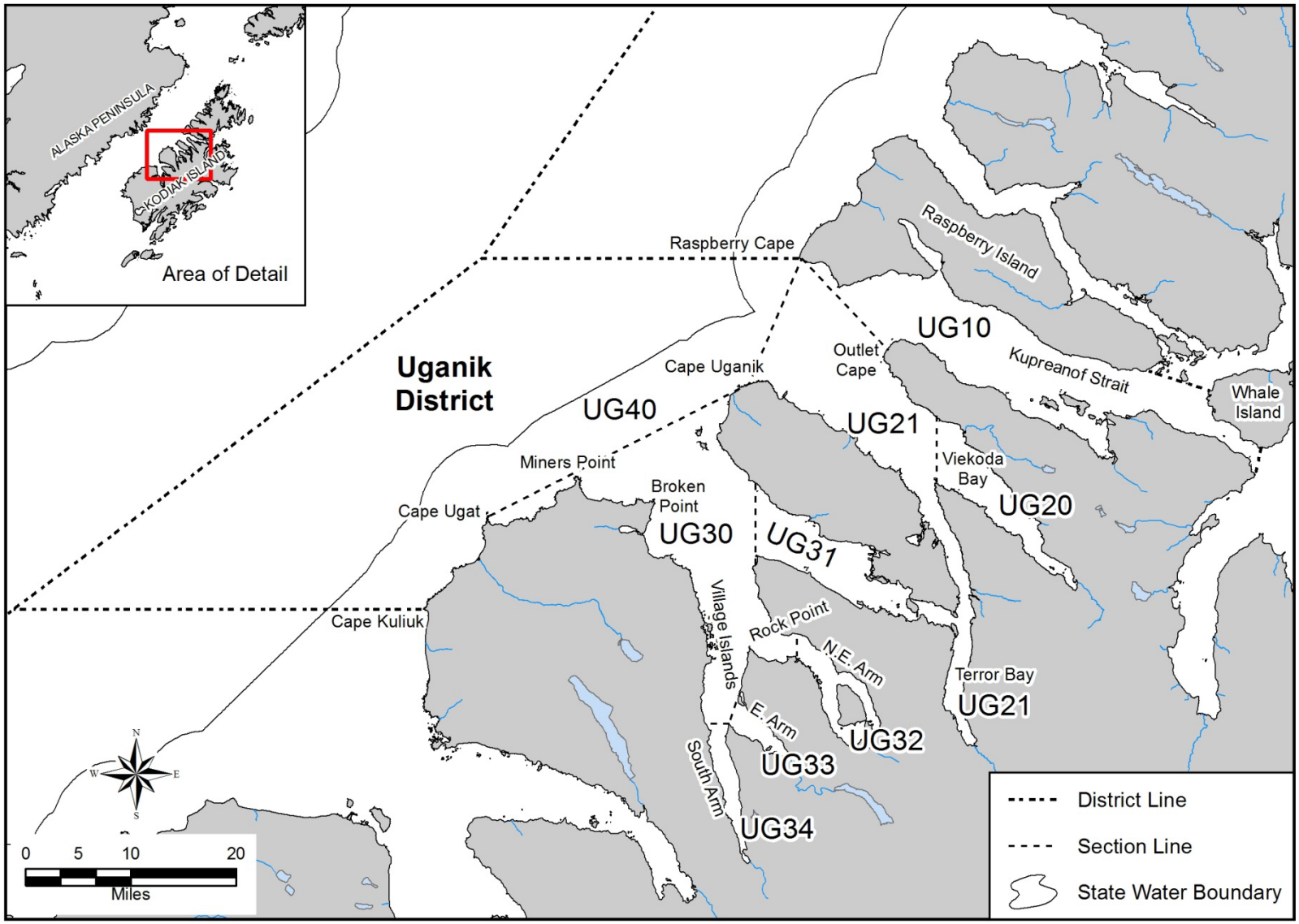


Figure 4.–Map showing the Uganik District.

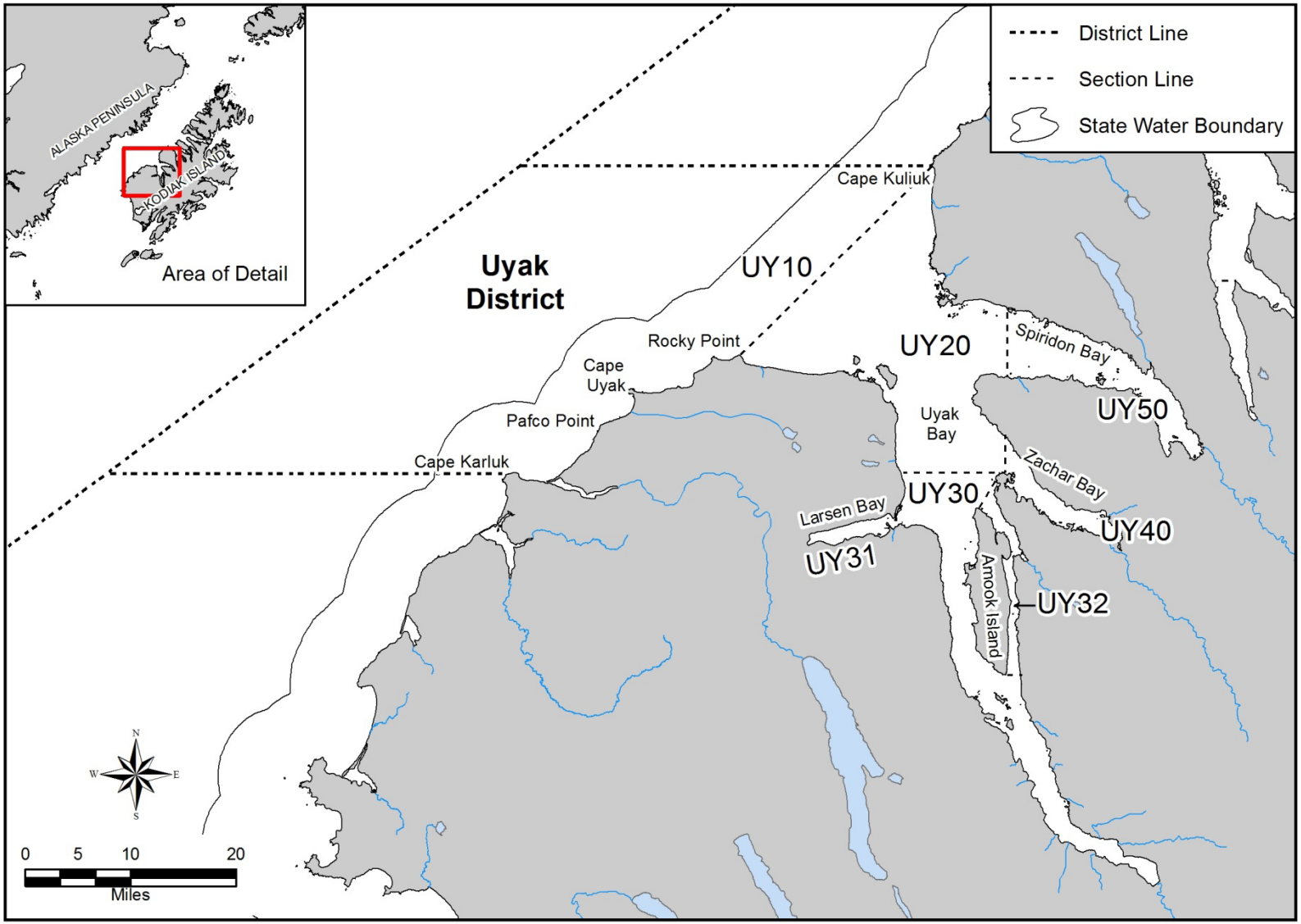


Figure 5.–Map showing the Uyak District.

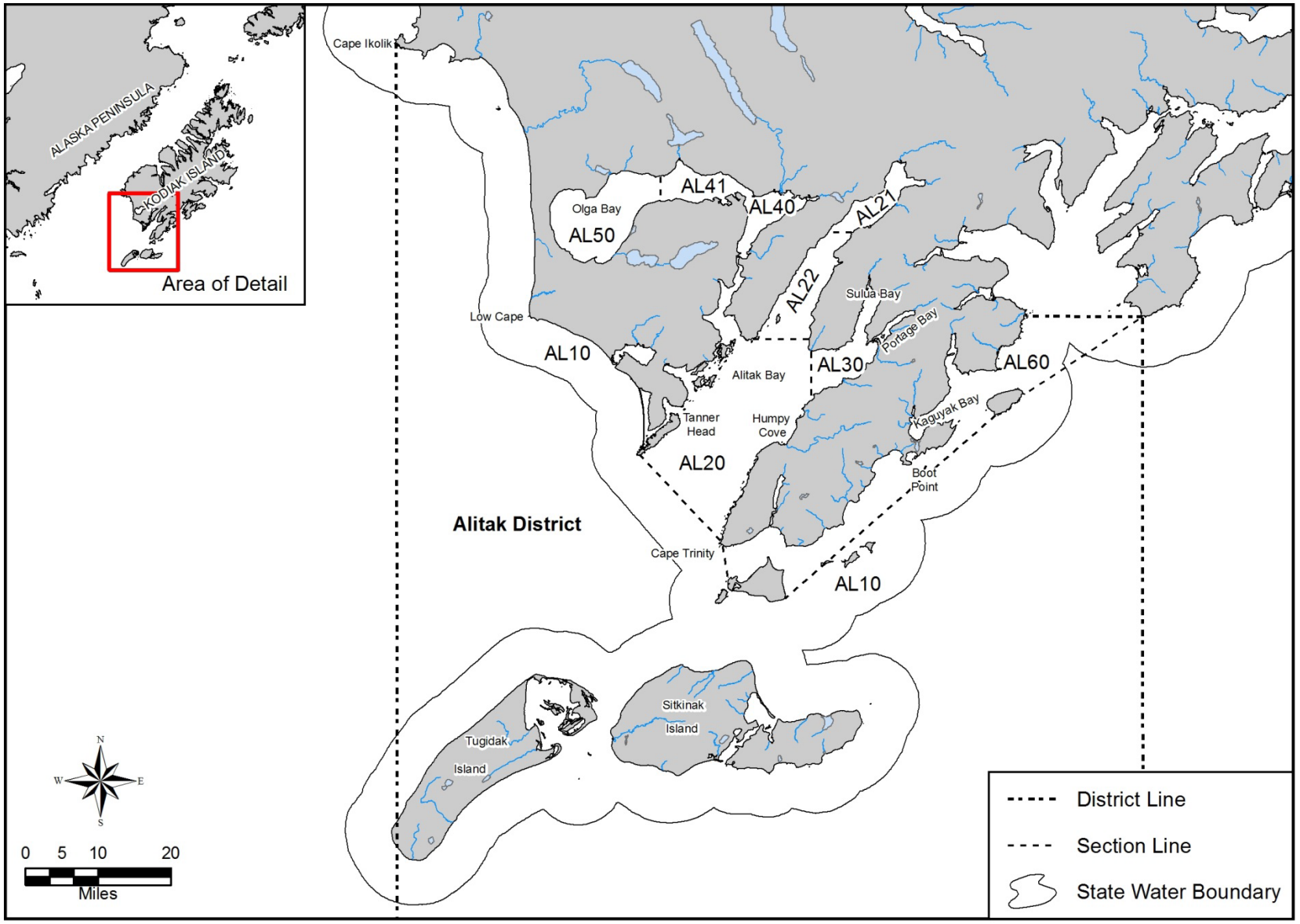


Figure 6.–Map showing the Alitak District.

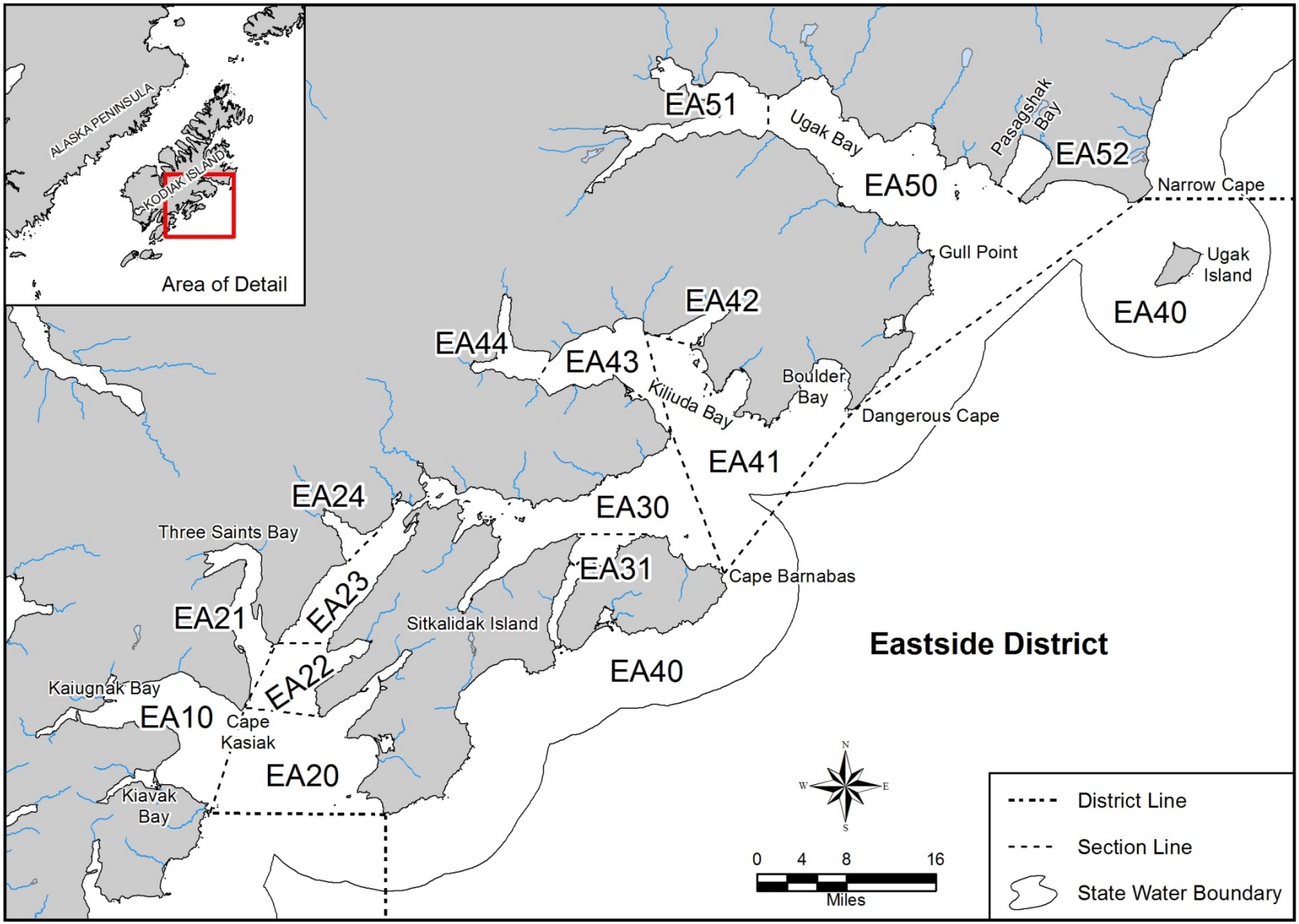


Figure 7.–Map showing the Eastside District.

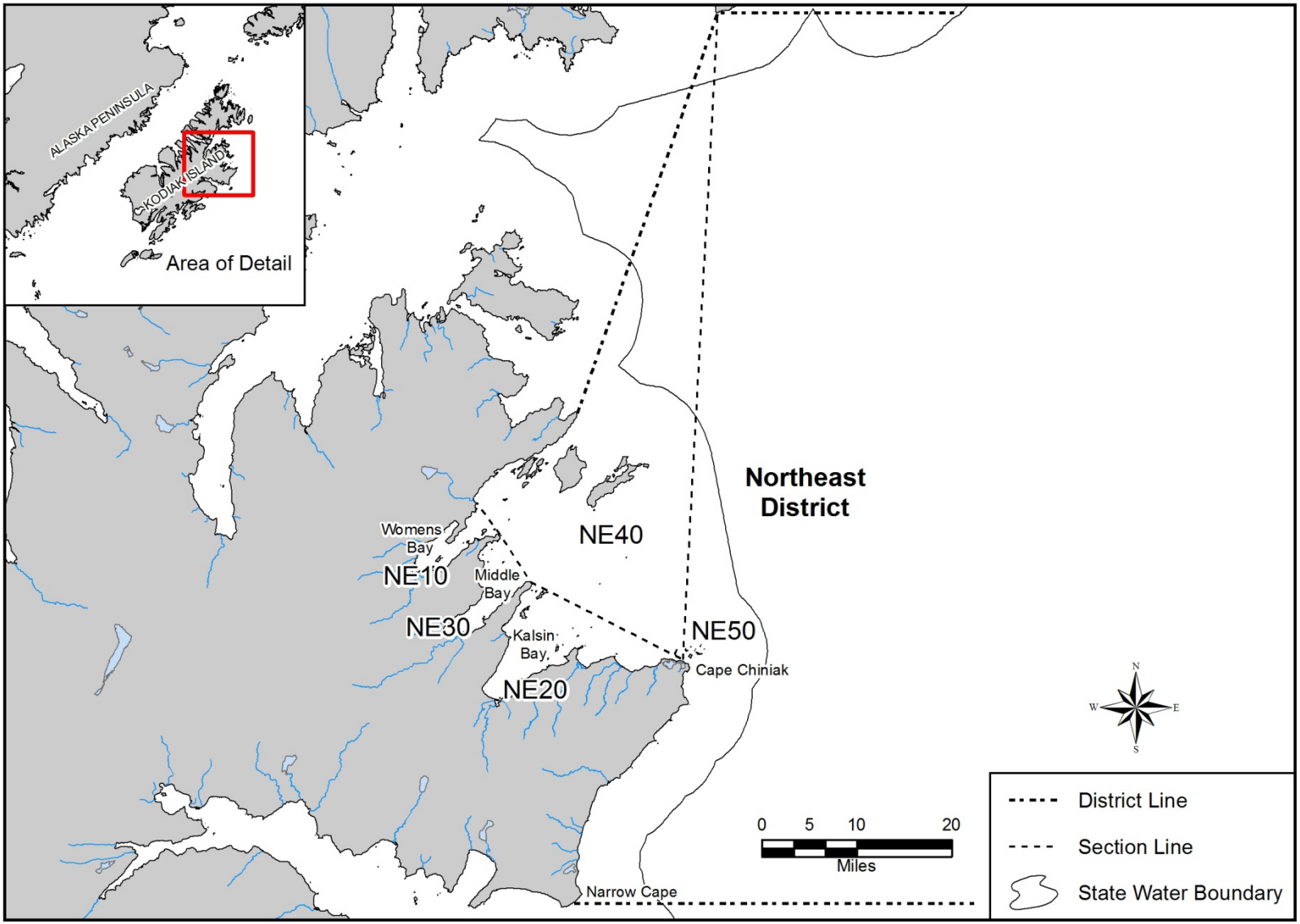


Figure 8.–Map showing the Northeast District.

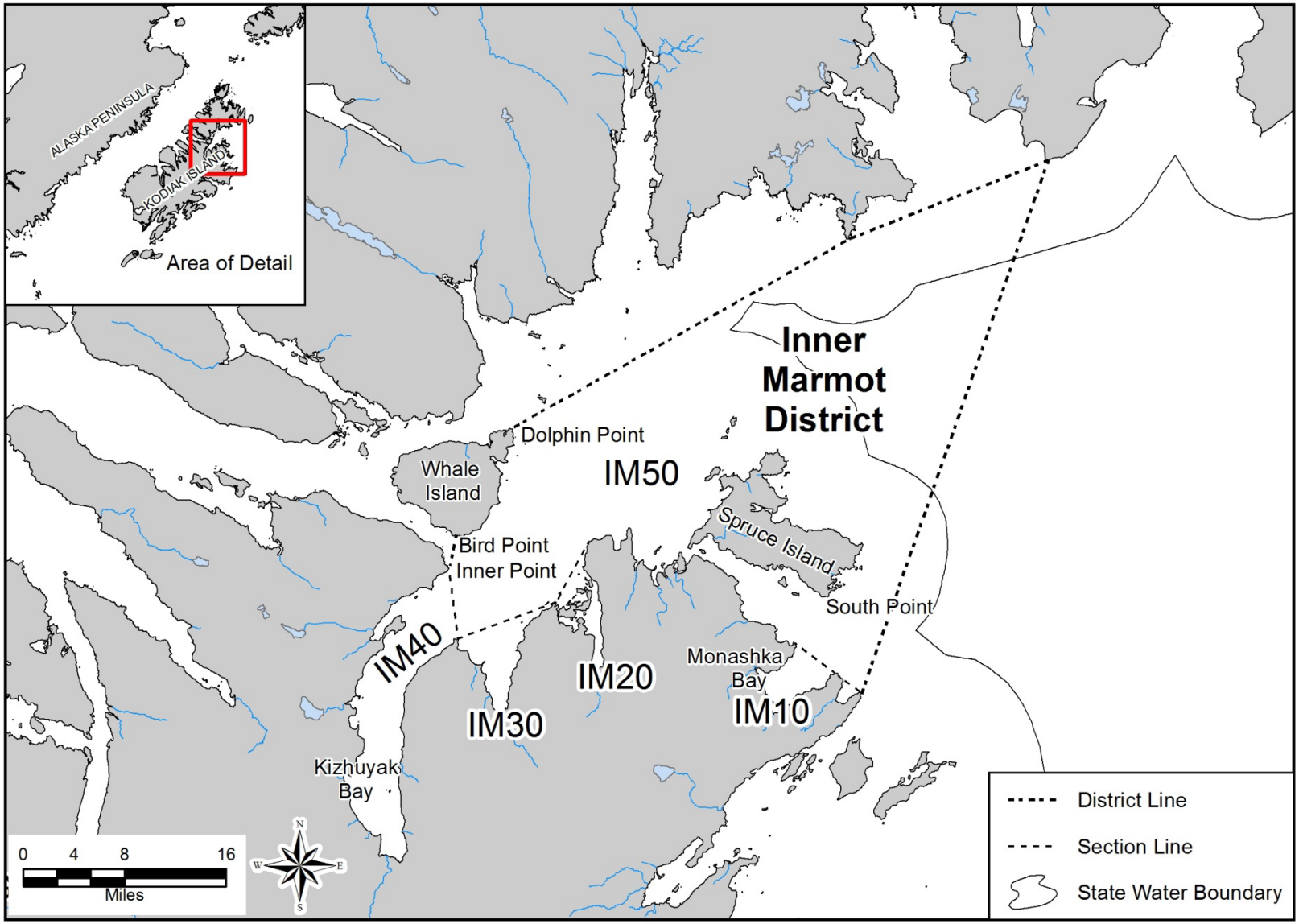


Figure 9.–Map showing the Inner Marmot District.

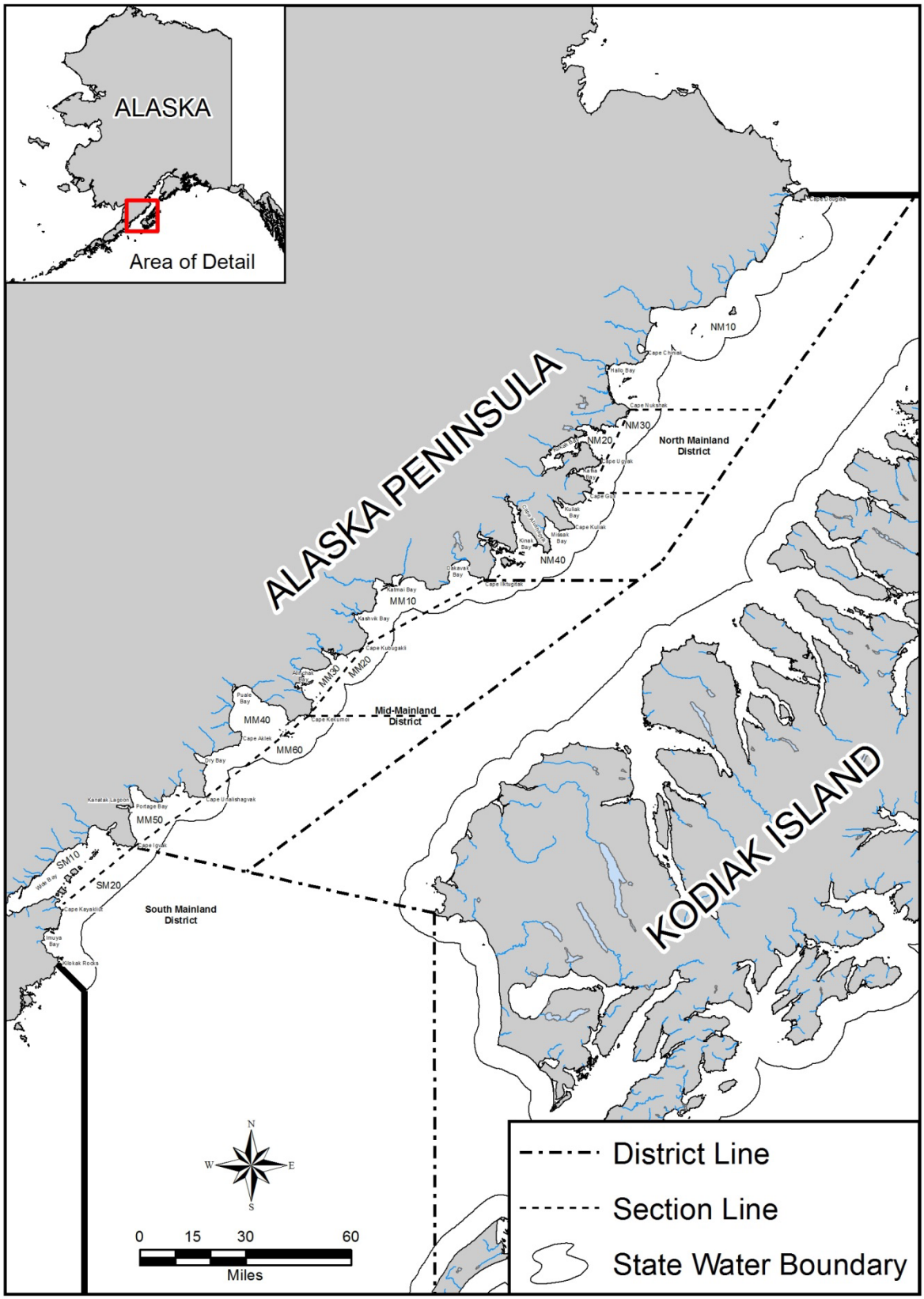


Figure 10.–Map showing the Mainland districts.

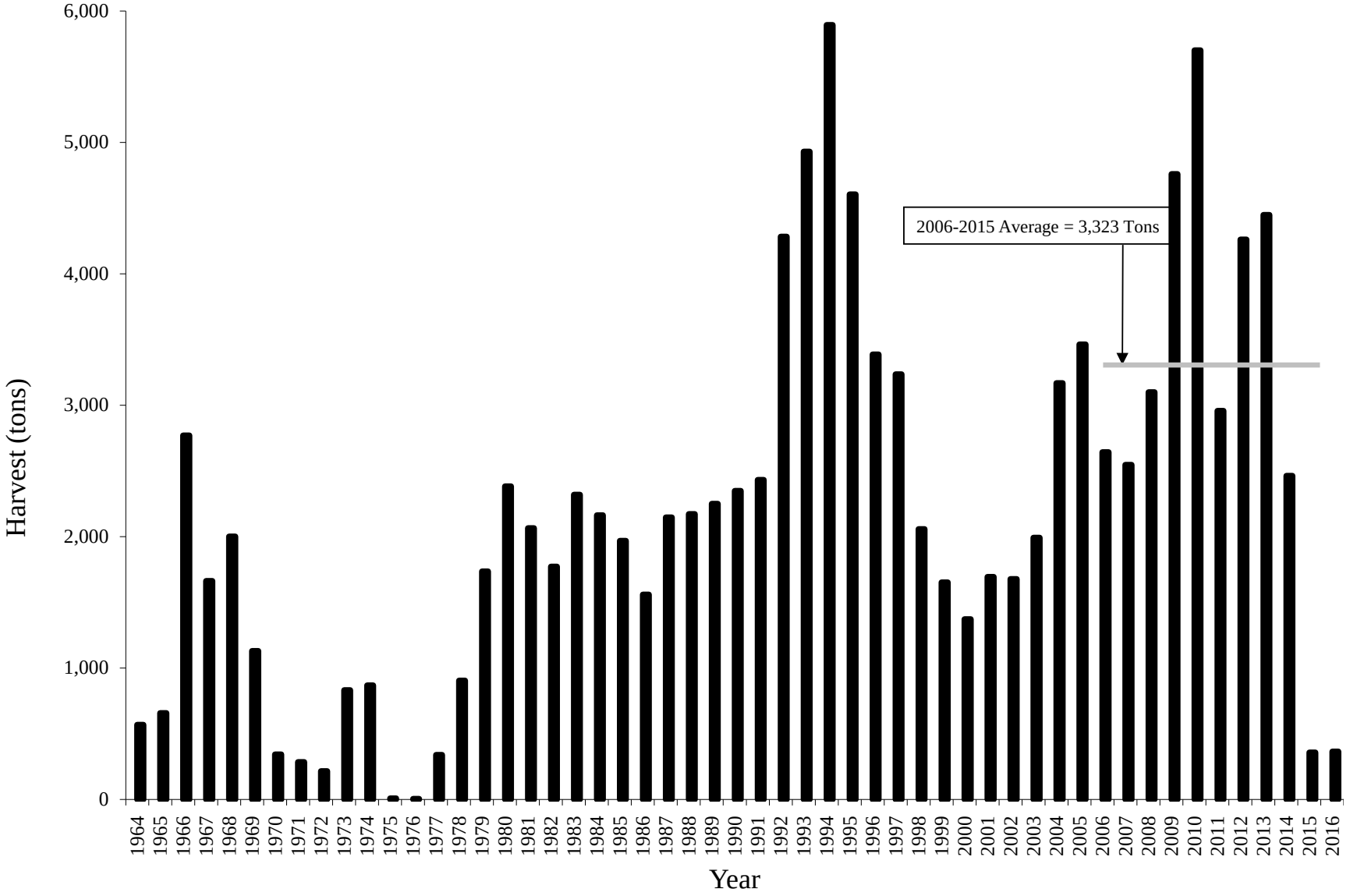


Figure 11.–Herring sac roe commercial fishery harvest in the KMA, 1964 through 2016.

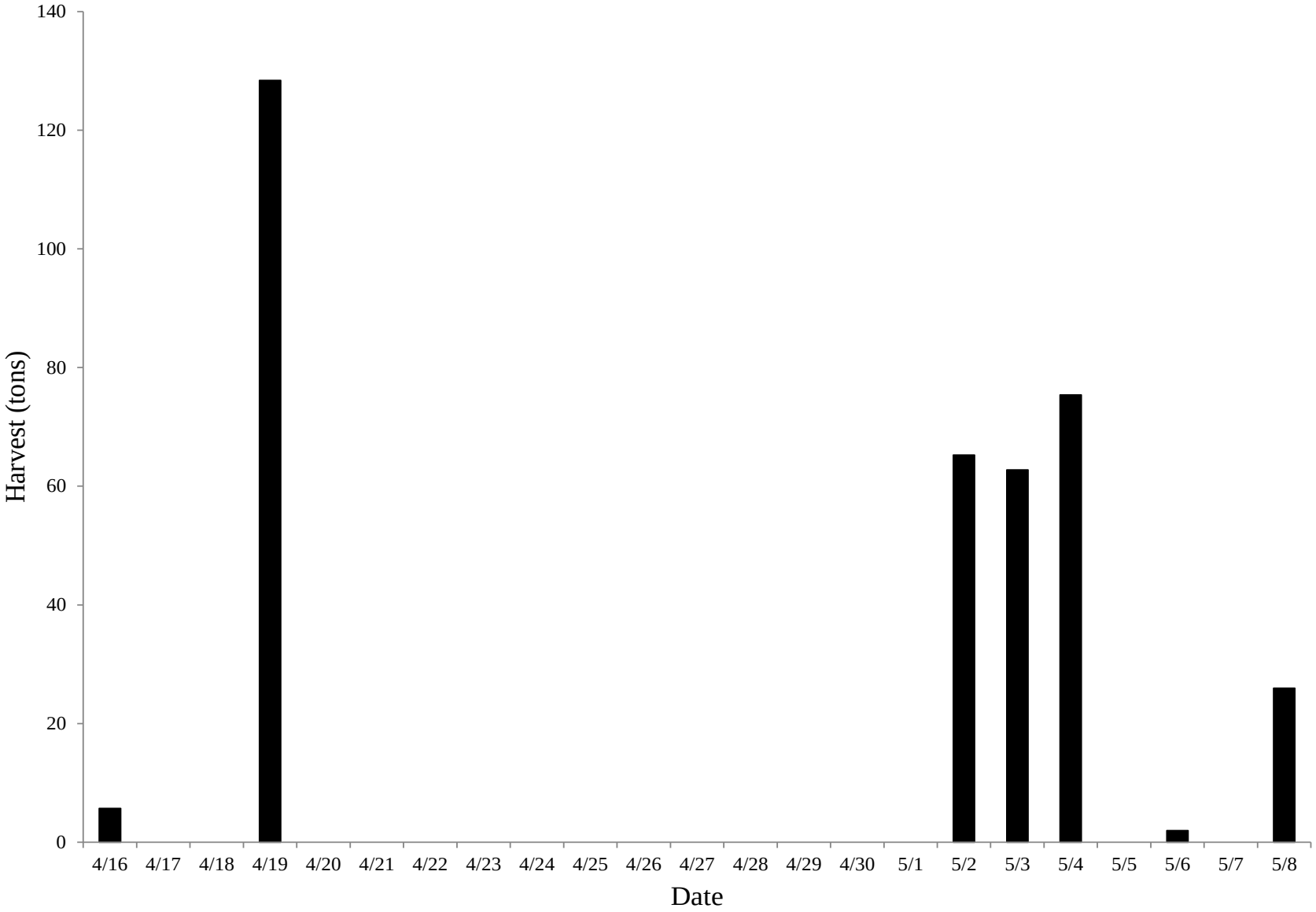


Figure 12.–Herring sac roe fishery harvest by day in the KMA, 2016.

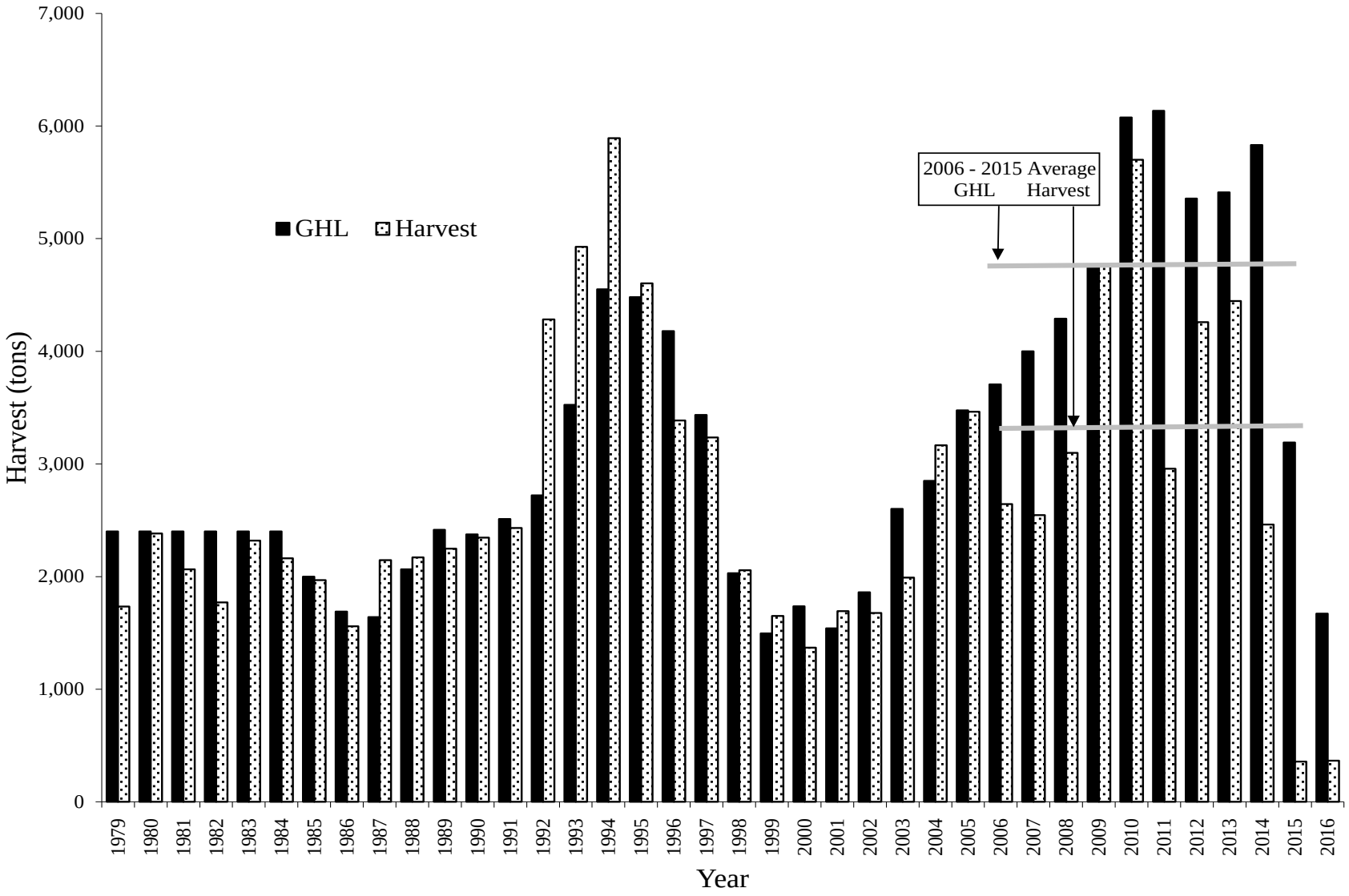
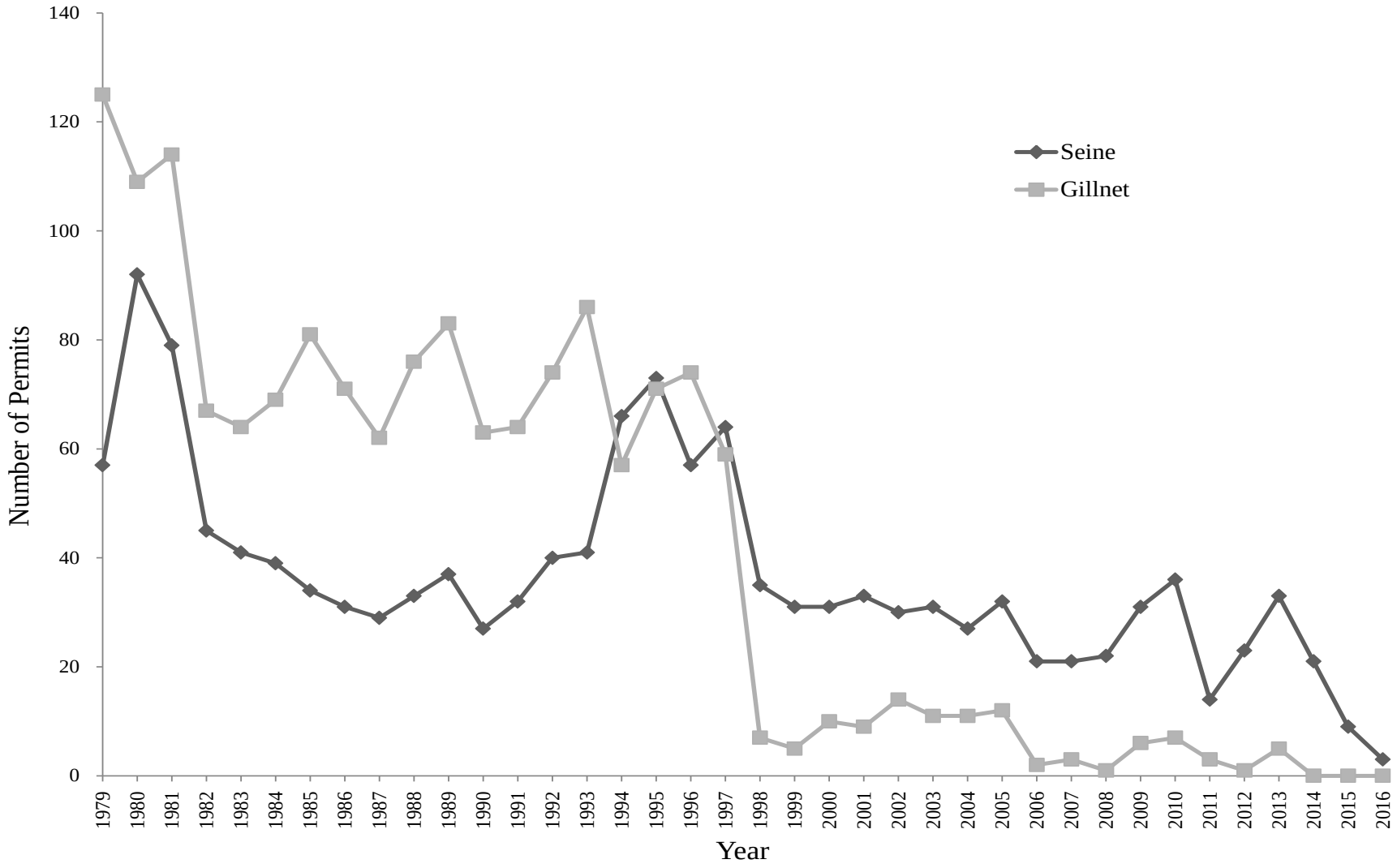


Figure 13.–Comparison of herring sac roe GHLs to harvest, KMA, 1979 through 2016.



*2006, 2008, and 2012 gillnet data is confidential

Figure 14.–Herring sac roe commercial fishery participation, by gear type in the KMA, 1979 through 2016.

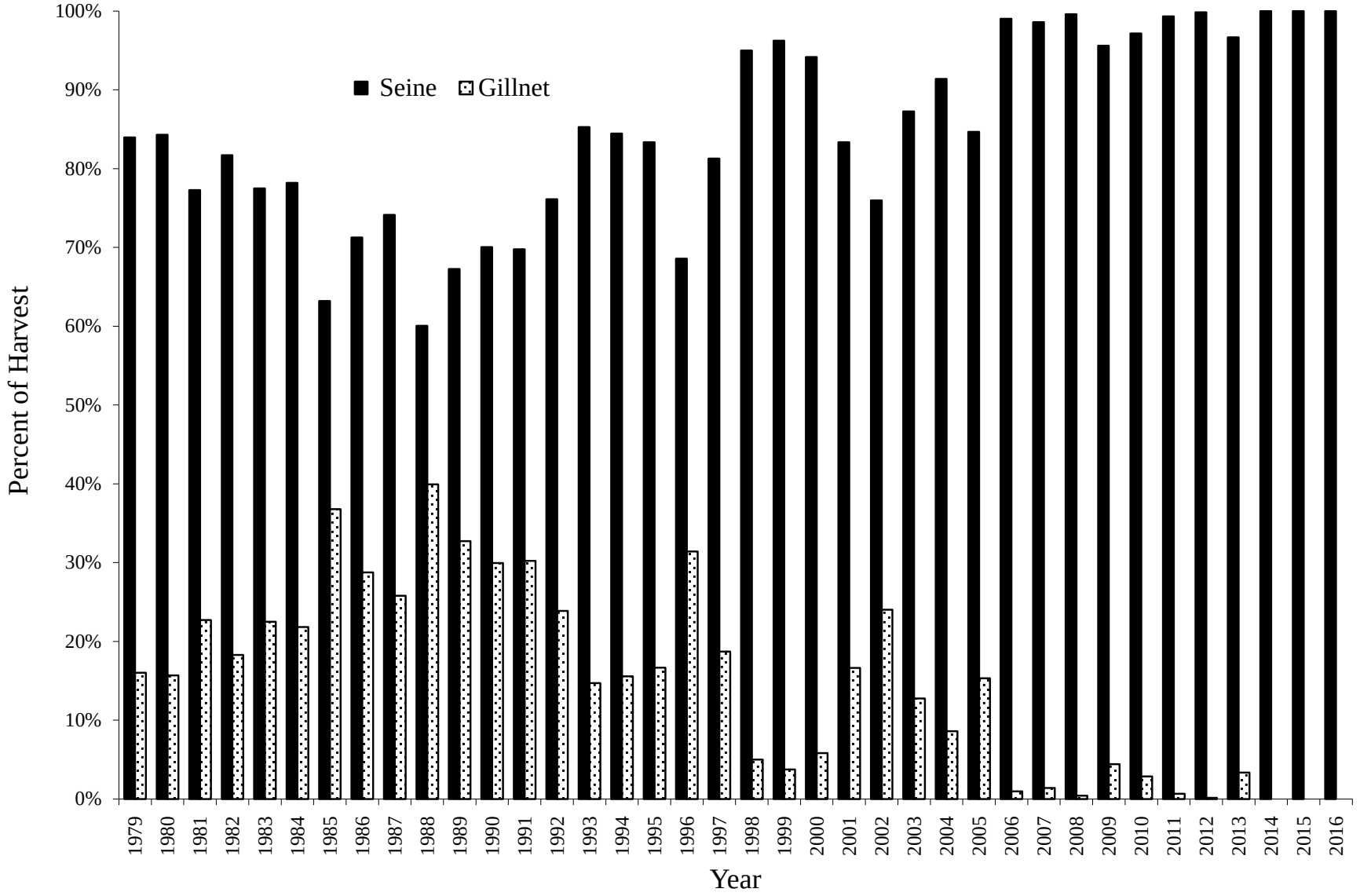


Figure 15.–Percent of the total harvest taken by gear type in herring sac roe commercial fishery, KMA, 1979 through 2016.

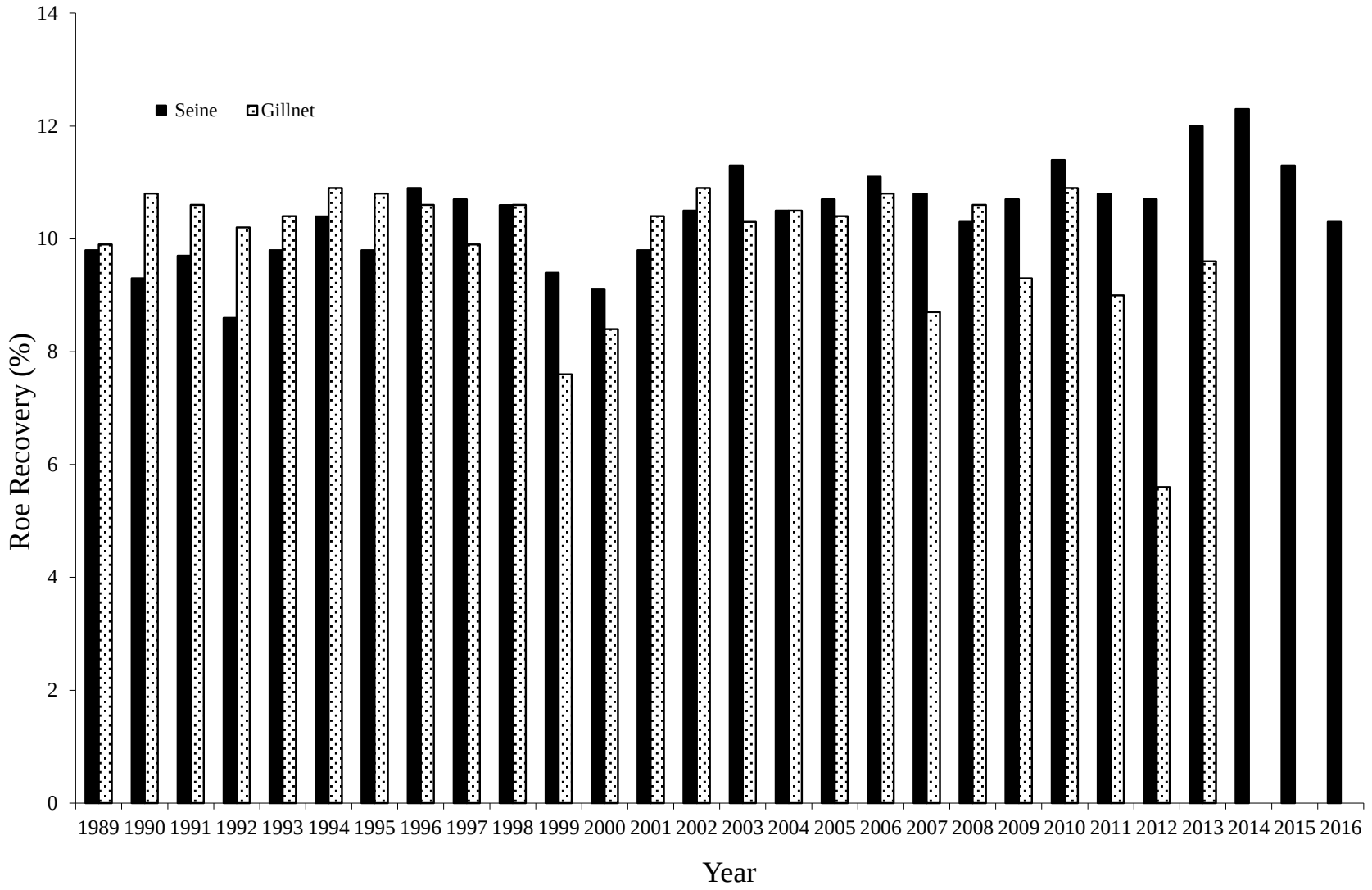
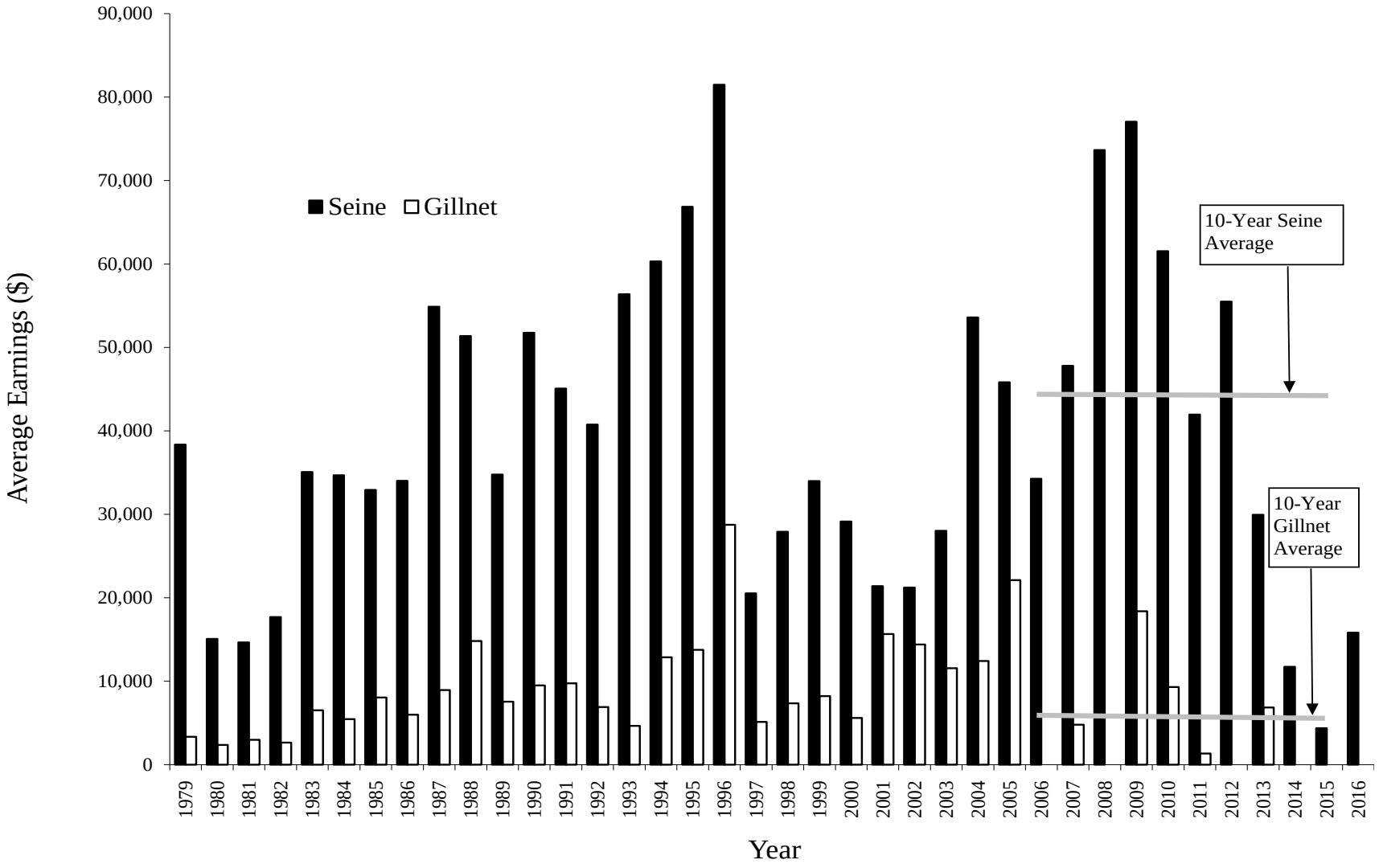


Figure 16.–Herring sac roe fishery, roe recovery in the KMA, 1989 through 2016.



* 2006, 2008, and 2012 gillnet data is confidential

Figure 17.–Average earnings by gear type for herring sac roe commercial fisheries, KMA, 1979 through 2016.

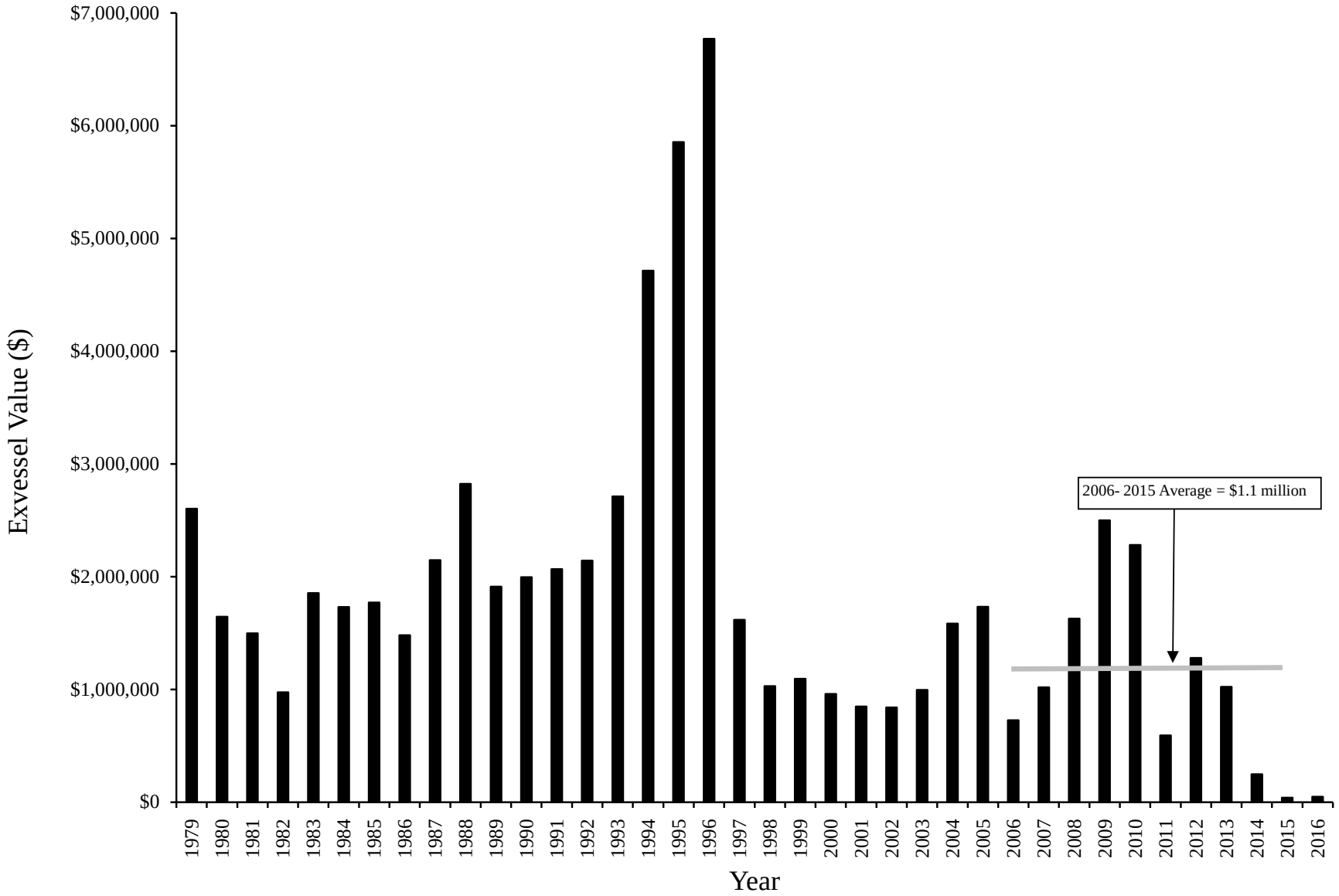


Figure 18.–Total exvessel value for herring sac roe commercial fisheries, KMA, 1979 to 2016.

APPENDIX A: SUMMARY OF EMERGENCY ORDERS ISSUED FOR THE HERRING COMMERCIAL FISHERIES IN THE KODIAK MANAGEMENT AREA, 2016

Appendix A1.–Summary of emergency orders issued for the herring commercial fisheries in the Kodiak Management Area, 2016.

Emergency Order #	Issued	Effective:	Action Taken:
1	3:00 p.m. April 5	noon April 15	Open Sac Roe Fishery: Initial opening times and fishing periods by gear and section for sac roe herring fishery announced.
2	3:00 p.m. April 16	9:00 a.m. April 18	Fishing Period: Commercial herring fishing opened at 9:00 a.m. April 18 for purse seine gear in the Outer Ugak Bay Section (EA50).
3	9:15 p.m. April 19	9:00 p.m. April 19	Closure: The Outer Ugak Bay Section (EA50) at 9:00 p.m. April 19.
4	11:30 a.m. April 29	noon May 1	Fishing Period: Establishes the sections that will be open to both gear types beginning May 1.
5	2:30 p.m. May 2	noon May 2	Closure: The Inner Ugak Bay Section (EA51) at noon May 2.
6	2:00 p.m. May 3	2:10 p.m. May 3	Closure: The Outer Kiliuda Bay Section (EA43) at 2:10 p.m. May 3.
7	9:40 a.m. May 4	9:45 a.m. May 4	Closure: The combined Kitoi, Izhut, MacDonalds Lagoon Section (SA10, 20, 30) at 9:45 a.m. May 4.
8	2:30 p.m. May 8	noon May 8	Closure: The Kizhuyak Bay Section (IM40) at noon May 8
9	11:00 a.m. November 3	noon November 3	Open Food and Bait Fishery: Initial opening of the food and bait combine fishery for the Eastside and South Afognak districts at noon November 3.