

Fishery Management Report No. 19-30

**Kodiak Management Area Herring Fisheries Annual
Management Report, 2019**

by

Geoff Spalinger

December 2019

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)		General		Mathematics, statistics	
centimeter	cm	Alaska Administrative Code	AAC	<i>all standard mathematical signs, symbols and abbreviations</i>	
deciliter	dL	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	H_A
gram	g	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	e
hectare	ha	at	@	catch per unit effort	CPUE
kilogram	kg	compass directions:		coefficient of variation	CV
kilometer	km	east	E	common test statistics	(F, t, χ^2 , etc.)
liter	L	north	N	confidence interval	CI
meter	m	south	S	correlation coefficient	
milliliter	mL	west	W	(multiple)	R
millimeter	mm	copyright	©	correlation coefficient (simple)	r
		corporate suffixes:		covariance	cov
Weights and measures (English)		Company	Co.	degree (angular)	$^\circ$
cubic feet per second	ft ³ /s	Corporation	Corp.	degrees of freedom	df
foot	ft	Incorporated	Inc.	expected value	E
gallon	gal	Limited	Ltd.	greater than	>
inch	in	District of Columbia	D.C.	greater than or equal to	\geq
mile	mi	et alii (and others)	et al.	harvest per unit effort	HPUE
nautical mile	nmi	et cetera (and so forth)	etc.	less than	<
ounce	oz	exempli gratia (for example)	e.g.	less than or equal to	\leq
pound	lb	Federal Information Code	FIC	logarithm (natural)	ln
quart	qt	id est (that is)	i.e.	logarithm (base 10)	log
yard	yd	latitude or longitude	lat or long	logarithm (specify base)	log ₂ , etc.
		monetary symbols (U.S.)	\$, ¢	minute (angular)	'
Time and temperature		months (tables and figures): first three letters	Jan,...,Dec	not significant	NS
day	d	registered trademark	®	null hypothesis	H_0
degrees Celsius	°C	trademark	™	percent	%
degrees Fahrenheit	°F	United States (adjective)	U.S.	probability	P
degrees kelvin	K	United States of America (noun)	USA	probability of a type I error (rejection of the null hypothesis when true)	α
hour	h	U.S.C.	United States Code	probability of a type II error (acceptance of the null hypothesis when false)	β
minute	min	U.S. state	use two-letter abbreviations (e.g., AK, WA)	second (angular)	"
second	s			standard deviation	SD
Physics and chemistry				standard error	SE
all atomic symbols				variance	
alternating current	AC			population sample	Var
ampere	A			sample	var
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				

FISHERY MANAGEMENT REPORT NO. 19-30

**KODIAK MANAGEMENT AREA HERRING FISHERIES
ANNUAL MANAGEMENT REPORT, 2019**

by
Geoff Spalinger
Alaska Department of Fish and Game, Division of Commercial Fisheries, Kodiak

Alaska Department of Fish and Game
Division of Sport Fish, Research and Technical Services
333 Raspberry Road, Anchorage, Alaska, 99518-1565

December 2019

The Fishery Management Reports series was established in 1989 by the Division of Sport Fish for the publication of an overview of management activities and goals in a specific geographic area, and became a joint divisional series in 2004 with the Division of Commercial Fisheries. Fishery Management Reports are intended for fishery and other technical professionals, as well as lay persons. Fishery Management Reports are available through the Alaska State Library and on the Internet: <http://www.adfg.alaska.gov/sf/publications/>. This publication has undergone regional peer review.

Geoff Spalinger
Alaska Department of Fish and Game, Division of Commercial Fisheries,
351 Research Court, Kodiak, AK 99615, USA

This document should be cited as follows:

Spalinger, G. 2019. Kodiak management area herring fisheries annual management report, 2019. Alaska Department of Fish and Game, Fishery Management Report No. 19-30, Anchorage.

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

If you believe you have been discriminated against in any program, activity, or facility please write:

ADF&G ADA Coordinator, P.O. Box 115526, Juneau, AK 99811-5526

U.S. Fish and Wildlife Service, 4401 N. Fairfax Drive, MS 2042, Arlington, VA 22203

Office of Equal Opportunity, U.S. Department of the Interior, 1849 C Street NW MS 5230, Washington DC 20240

The department's ADA Coordinator can be reached via phone at the following numbers:

(VOICE) 907-465-6077, (Statewide Telecommunication Device for the Deaf) 1-800-478-3648,

(Juneau TDD) 907-465-3646, or (FAX) 907-465-6078

For information on alternative formats and questions on this publication, please contact:

ADF&G Division of Sport Fish, Research and Technical Services, 333 Raspberry Road, Anchorage AK 99518 (907) 267-2375

TABLE OF CONTENTS

	Page
LIST OF TABLES.....	ii
LIST OF FIGURES.....	ii
LIST OF APPENDICES.....	ii
ABSTRACT.....	1
INTRODUCTION.....	1
HERRING SAC ROE FISHERY.....	1
Fishery Characteristics.....	1
Gear.....	2
Fishing Periods.....	2
Harvest Strategy.....	2
Fishery Management.....	2
Establishing GHGs.....	2
Inseason Fishery Management.....	3
2019 Season Summary.....	3
Inseason Gear Changes.....	4
Exvessel Value of the Fishery.....	4
Stock Assessment.....	4
Catch Sampling.....	5
Stock Status by District.....	5
HERRING FOOD AND BAIT FISHERY.....	8
Fishery Characteristics.....	8
Harvest Strategy.....	8
Combine Fisheries.....	8
Kamishak Stock.....	9
2018/2019 Season.....	9
HERRING SUBSISTENCE FISHERY.....	9
Fishery Characteristics.....	9
2018 Season Summary.....	10
REFERENCES CITED.....	10
TABLES AND FIGURES.....	11
APPENDIX A: SUMMARY OF EMERGENCY ORDERS ISSUED FOR THE HERRING COMMERCIAL FISHERIES IN THE KODIAK MANAGEMENT AREA, 2019.....	41

LIST OF TABLES

Table	Page
1. Annual harvests by weight and percent in the KMA commercial herring sac roe and food and bait fisheries, from 1964 through 2019.	12
2. Herring sac roe fishery GHLS by section and gear type, harvest by section and gear type, and date sections were closed, KMA, 2019.	14
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 2019.	17
4. Age composition of herring samples from the commercial sac roe fishery, by section in the KMA, 2019.	19
5. Average weight of herring samples from the commercial sac roe fishery, by age and section in the KMA, 2019.	20
6. Herring food and bait commercial fishery GHLS and harvest (tons) by district, KMA, 2018.	21
7. Herring food and bait commercial fishery GHLS and harvest (tons), KMA, 2001 through 2018.	21
8. Subsistence herring harvest summary for the KMA, 1991 through 2018.	22

LIST OF FIGURES

Figure	Page
1. Map of southwestern Alaska showing the KMA and surrounding management areas.	23
2. Map of the KMA illustrating the herring commercial fishery districts.	24
3. Map showing the Afognak districts.	25
4. Map showing the Uganik District.	26
5. Map showing the Uyak District.	27
6. Map showing the Alitak District.	28
7. Map showing the Eastside District.	29
8. Map showing the Northeast District.	30
9. Map showing the Inner Marmot District.	31
10. Map showing the Mainland districts.	32
11. Herring sac roe commercial fishery harvest in the KMA, 1964 through 2019.	33
12. Comparison of herring sac roe GHLS to harvest, KMA, 1979 through 2019.	34
13. Herring sac roe fishery, roe recovery in the KMA, 189 through 2019.	35
14. Herring sac roe commercial fishery participation, by gear type in the KMA, 1979 through 2019.	36
15. Percent of the total harvest taken by gear type in the herring sac roe commercial fishery, KMA, 1979 through 2019.	37
16. Average earnings by gear type for herring sac roe commercial fisheries, KMA, 1979 through 2019.	38
17. Total exvessel value for herring sac roe commercial fisheries, KMA, 1979 to 2019.	39

LIST OF APPENDICES

Appendix	Page
A1. Summary of emergency orders issued for the herring commercial fisheries in the Kodiak Management Area, 2019.	42

ABSTRACT

This report presents information concerning the commercial Pacific herring *Clupea pallasii* sac roe fishery in 2019 and the 2018 food and bait and subsistence fisheries in the Kodiak Management Area (KMA).

The KMA 2019 herring sac roe fishery was open from April 15 through June 30. Prior to May 1, the herring sac roe fishery is managed under an allocative harvest strategy that provides approximately 75% of the total Kodiak guideline harvest level (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 2019, and less than three purse seine permit holders harvested herring. The preseason GHL was 1,405 tons.

The 2019–2020 herring food and bait season was not concluded at the time of this report. For the 2018–2019 fishery, a combine fishery was conducted due to the small GHLs. The Eastside District had a GHL of 51 tons, the South Afognak District opened with a GHL of 19 tons, and the Uganik District had a GHL of 21 tons. A total of 59 tons were harvested during the food and bait fishery.

The 2019 subsistence data were not summarized at the time of this report. In 2018, a total of 8 KMA subsistence permits were returned to ADF&G. The reported subsistence herring harvests totaled 1,302 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 2019. 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 seiners 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 2019, section GHLS ranged from 10 to 150 tons (short; Table 2). Establishing the 2019 GHLS involved evaluation of a variety of information to determine stock status trends and conservative adjustment of GHLS, including the following:

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 GHGs have generally reflected the actual harvests and have aided fishermen and processors in planning prior to the start of each season (Figure 12).

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 GHG, 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.

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 (Figure 13). 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)).

2019 SEASON SUMMARY

The 2019 sac roe season opened at noon April 15. No gillnet permit holders and less than three purse seine permit holders participated (Figure 14; Table 3). A small harvest occurred in Outer Ugak Bay, and all herring were taken as personal use (Table 2). The total 2019 KMA GHG was established at 1,405 tons, and the entire harvest was taken by purse seine gear and is confidential (Table 3; Figures 12 and 15).

Effort was expected to be minimal, and 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). By regulation, 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). On April 16, ADF&G opened areas allocated to the purse seine fleet

from 9:00 a.m. to 9:00 p.m. every day (Appendix A1). Normal 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.

Spawn was reported and observed in several locations before the fishery began. Large concentrations of herring were also documented prior to the season with the largest observations occurring in Kiliuda and Uganik bays. Due to high proportions of age-2 herring in 2018, it was expected that there would be a large presence of age-3 herring in 2019. When the season opened, it quickly became apparent that the majority of herring were young fish. Large amounts of herring were present throughout the KMA; however, participating fishermen reported catching fish that were too small for market. As a result, no fish were sold in 2019 (Table 3).

The fishery was monitored by two ADF&G vessels and one field crew stationed in anticipated herring harvest locations. Vessels and crew 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 was a total of 41 sections open to fishing; however, 13 sections were exploratory and had little or no historic harvests. There were 4 EOs issued concerning the fishery (Appendix A1).

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, all open sections were opened to both gear types; no harvest occurred in any of these sections.

Exvessel Value of the Fishery

No herring were sold in 2019 (Table 3; Figure 16). The previous 10- and 5-year average exvessel values of the fishery were an estimated \$806,931 and \$79,644, respectively (Table 3; Figure 17), which do 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.

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 aids 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 4,819 herring were collected and analyzed for AWL data. Most samples were collected by ADF&G with trawl gear aboard the R/V Resolution. One sample from the Inner Ugak Section was collected by purse seine gear. Samples were taken from 14 sections. Age-3 herring were the dominant age class, representing approximately 89% of the sampled herring (Table 4). The samples consisted of 4% age-1, 4% age-2, 89% age-3, 2% age-4, and 1% age-5 herring (Table 4). Herring sizes from the Eastside were generally 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 open to gillnet gear, 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. In

2019, hydroacoustic surveys estimated nearly 2,000 tons in Paramanof, and trawl samples were composed of 99% age-3 and 1% age-4 herring (Table 4). The Malina Bay and Raspberry Strait sections each had a 10-ton GHL, but no herring were harvested. Approximately 215 tons were observed in Malina Bay, and 300 tons in Raspberry straits during hydroacoustic surveys.

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 150-ton GHL was established for purse seine permit holders (Table 2). No harvest occurred, but approximately 1,000 tons were observed during a hydroacoustic survey. Samples collected were composed of 96% age-3, 2% age-4, 1% age-5, and 1% age-7 herring (Table 4).

The MacDonalds Lagoon, Kitoi Bay, and Izhut Bay sections were combined and managed as one unit allocated to gillnet gear with a 65-ton GHL (Table 2). Approximately 650 tons were estimated by hydroacoustic surveys, but no samples were collected.

Uganik District

The Uganik District consists of nine sections on the northwest side of Kodiak Island (Figure 4). Recently this district had the largest harvests in the KMA. The 2019 GHL for the combined Village Islands/Uganik Bay sections was 150 tons for purse seine gear (Table 2). Aerial and hydroacoustic surveys estimated approximately 4,000 tons. Trawl samples were composed of 7% age-2, 90% age-3, and 2% age-4 herring (Table 4).

The West Uganik Passage, Terror Bay, and Viekoda sections all had established GHLS, but no harvest occurred (Table 2). Approximately 2,500 tons were observed during a hydroacoustic survey of Terror Bay and trawl samples collected were composed of 97% age-3 and 2% age-4 herring (Table 4). A large biomass was also observed in Viekoda Bay when 1,700 tons were detected during a hydroacoustic survey, and samples were composed of 97% age-3 and 2% age-4 herring (Table 4).

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 2019, large amounts of herring were observed during hydroacoustic surveys in several sections. Approximately 200 tons were observed in the Browns Lagoon Section, 1,800 tons in the Inner Uyak Section, 550 tons in the Zachar Bay Section, and 2,400 tons in the Spiridon Bay Section. Samples collected from the Inner Uyak Section were composed of 1% age-2, 98% age-3, and 1% age-4 herring. Young herring were also dominant in the Spiridon Bay Section with 1% age-1, 1% age-2, 95% age-3, 2% age-4, and 1% age-6 herring comprising the sample.

Alitak District

All sections in the Alitak District (Figure 6), except the Outer Alitak Section, are known to have herring stocks. These 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 2019. These combined sections had a GHL of 50 tons, but no fish were harvested (Table 2).

The East Upper Olga Bay and West Upper Olga Bay sections were each open in 2019 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).

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 2019, the GHL for the East Sitkalidak Section was established at 125 tons for purse seine gear, but no herring were harvested (Table 2). Hydroacoustic surveys estimated approximately 1,000 tons in the East Sitkalidak Section, and trawl samples consisted of 97% age-3, 2% age-4, and 1% age-5 herring (Table 4). The GHL for the West Sitkalidak Section was established at 75 tons for purse seine gear, but no herring were harvested (Table 2). Aerial surveys estimated approximately 300 tons in the West 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, but approximately 130 tons were observed during hydroacoustic surveys.

The Inner and Outer Kiliuda Bay sections also have some of the earliest spawning herring in the KMA. These sections were combined and managed as a single section with a 150-ton GHL (Table 2). No harvest occurred, but aerial and hydroacoustic surveys indicated a substantial biomass. Aerial surveys first detected over 6,000 tons of herring in early April. Hydroacoustic surveys later found approximately 2,500 tons. Age compositions from trawl samples were composed of 93% age-3, 4% age-5, 1% age-6, and 2% age-7 herring (Table 4).

The Inner and Outer Ugak Bay sections have recently been strong herring producers. The GHL for the Outer Ugak Bay Section was 150 tons and allocated to purse seiners, while the Inner Ugak Bay Section was allocated to the gillnet fleet with a 50-ton GHL (Table 2). Samples from Outer Ugak consisted of 97% age-3, 1% age-4, and 1% age-5 herring (Table 4). Approximately 1,000 tons were observed during aerial surveys, and a large spawn event was documented late March.

The Shearwater Bay Section was allocated to the gillnet fleet with a 75-ton GHL, and no herring were harvested (Table 2). A hydroacoustic survey documented approximately 350 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 2019; however, 160 tons of herring were documented during a hydroacoustic survey.

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 70 tons were observed in the Kalsin Bay Section during a hydroacoustic survey, and samples collected were composed of 2% age-2, 92% age-3, 4% age-4, and 1% age-5 herring (Table 4).

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 30-ton GHL, but no fish were harvested (Table 2). Aerial surveys documented approximately 215 tons, and trawl samples collected were composed of 92% age-1, 1% age-2, and 7% age-3 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 2019, 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, and between 20,000 and 30,000 tons has recently been estimated based on hydroacoustic surveys. In 2019, approximately 3,000 tons were observed; however, the survey was conducted earlier in the year than normal. Samples taken by trawl net were composed of 21% age-2, 78% age-3, and 1% age-4 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 B. A. Johnson, C. Burkey, and D. Gaudet, 1988, 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. Ten percent of the allowable harvest of Kamishak Bay herring are currently allocated to the Shelikof food and bait fishery (5 AAC 27.465(b)). To alleviate the problem of identifying the spawning stock of a harvest in areas where intermixing may occur, the harvest strategy combines the Kamishak stock GHL with the Kodiak stock GHL for food and bait management units along the Shelikof Strait. When this combined GHL is achieved the Shelikof Strait food and bait management units are closed collectively (5 AAC 27.535(a)). The harvest strategy also closes 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)). Surveys of Kamishak Bay were suspended in 2016 and the current spawning biomass is unknown. The last herring fishery to occur north of Miners Point was in 1997.

2018/2019 SEASON

The biggest obstacle to a competitive fishery is how to determine an equitable fishing period for the two gear types. The 2019/2020 season was not concluded at the time of this report. For the 2018/2019 season, permit holders again requested a combine fishery. ADF&G accommodated the permit holders' request, and the Eastside District (51-ton GHL), the South Afognak District (19-ton GHL), and the Uganik District (21-ton GHL) opened on November 27 (Table 6). Approximately 59 tons were harvested from the Danger Bay Section of the South Afognak District, and that district along with the Uganik District was closed on November 28. The harvest was composed of 92% age-2, 2% age-3, 4% age-4, 1% age-5, and 2% age-6 herring.

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; Gretsche 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).

2018 SEASON SUMMARY

The 2019 subsistence data were not summarized at the time of this report. In 2018, a total of 8 KMA subsistence permits were returned to ADF&G, as required for reporting purposes, with herring subsistence harvest data. The reported subsistence herring harvests totaled 1,302 pounds (Table 8). The majority of the harvest occurred in the Uganik, Uyak and Eastside districts.

REFERENCES CITED

- Gretsche, 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 2019.

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%
2017	125	77	202	62%	38%
2018	226	59	285	79%	21%
2019 ^a					
Average					
1964 to 2018	2,132	203	2,335	90%	10%
10-year average					
2009 to 2018	2,566	162	2,728	89%	11%
5-year average					
2014 to 2018	707	73	780	83%	17%

^a Confidential.

Table 2.–Herring sac roe fishery GHs by section and gear type, harvest by section and gear type, and date sections were closed, KMA, 2019.

Statistical area	Management section	GHL	Initial gear type ^a	Harvest		Date closed
				Purse seine	Gillnet	
NORTH AFOGNAK DISTRICT						
NA10	Shuyak Island	Closed	-	-	-	-
NA20	Delphin Bay	Exploratory	Both	0	0	6/30
NA30	Perenosa Bay	10	Gillnet	0	0	6/30
NA40	Seal Bay	Closed	-	-	-	-
NA50	Tonki Bay	30	Gillnet	0	0	6/30
WEST AFOGNAK DISTRICT						
WA10	Raspberry Strait	10	Gillnet	0	0	6/30
WA20	Malina Bay	10	Gillnet	0	0	6/30
WA31 ^b	Paramanof Bay	Closed	-	-	-	-
WA32 ^b	Foul Bay	Closed	-	b	b	b
WA40	Bluefox Bay	Exploratory	Both	0	0	6/30
WA50	Offshore W. Afognak	Closed	-	-	-	-
SOUTH AFOGNAK DISTRICT						
SA10 ^c	Izhut Bay	65	Purse Seine	0	0	6/30
SA20 ^c	Kitoy Bay	c	c	c	c	c
SA30 ^c	MacDonald Lagoon	c	c	c	c	c
SA40	Danger Bay	150	Purse Seine	-	-	-
SA50	Litnik	Closed	-	-	-	-
SA60	Duck Bay	Closed	-	-	-	-
TOTAL ALL AFOGNAK DISTRICTS				0	0	
UGANIK DISTRICT						
UG10	Kupreanof	Closed	-	-	-	-
UG20	Viekoda Bay	15	Gillnet	0	0	6/30
UG21	Terror Bay	15	Gillnet	0	0	6/30
UG30 ^d	Village Islands	150	Purse Seine	-	-	-
UG31	West Uganik Passage	30	Gillnet	0	0	6/30
UG32 ^d	NE Arm Uganik Bay	d	d	d	d	d
UG33 ^d	East Arm Uganik Bay	d	d	d	d	d
UG34 ^d	South Arm Uganik Bay	d	d	d	d	d
UG40	Offshore Uganik	Closed	-	-	-	-
DISTRICT TOTAL				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						

-continued-

Table 2.–Page 2 of 3.

Statistical area	Management section	GHL	Initial gear type ^a	Harvest		Date Closed
				Purse seine	Gillnet	Purse seine
ALITAK DISTRICT						
AL10	Outer Alitak	Closed	-	-	-	-
AL20	Inner Alitak	25	Purse Seine	0	0	6/30
AL21 ^e	Inner Deadman Bay	50	Purse Seine	0	0	6/30
AL22 ^e	Outer Deadman Bay	^e	^e	^e	^e	^e
AL30	Sulua Bay	25	Gillnet	0	0	6/30
AL40	Lower Olga-Moser	25	Gillnet	0	0	6/30
AL41	East Upper Olga Bay	25	Purse Seine	0	0	6/30
AL50	West Upper Olga Bay	25	Purse Seine	0	0	6/30
AL60	Geese/Twoheaded	Exploratory	Both	0	0	6/30
DISTRICT TOTAL		175		0	0	
STURGEON/HALIBUT DISTRICT						
SH10	Sturgeon/Halibut	CLOSED	CLOSED	CLOSED		
EASTSIDE DISTRICT						
EA10	Kaiugnak	Exploratory	Both	0	0	6/30
EA20	SW. Sitkalidak	Exploratory	Both	0	0	6/30
EA21	Three Saints Bay	30	Purse Seine	0	0	6/30
EA22	Newman Bay	Exploratory	Both	0	0	6/30
EA23	W. Sitkalidak Strait	75	Purse Seine	0	0	6/30
EA24	Barling Bay	40	Gillnet	0	0	6/30
EA30	E. Sitkalidak Strait	125	Purse Seine	0	0	6/30
EA31	Tanginak Anchorage	Exploratory	Both	0	0	6/30
EA40	Outer Sitkalidak	Closed	-	-	-	-
EA41	Boulder Bay	Closed	-	-	-	-
EA42	Shearwater Bay	75	Gillnet	0	0	6/30
EA43	Outer Kiliuda Bay	150	Purse Seine	0	0	6/30
EA44	Inner Kiliuda Bay ^f	^f	^f	^f	^f	^f
EA50	Outer Ugak Bay	150	Purse Seine	^g	-	6/30
EA51	Inner Ugak Bay	50	Gillnet	0	0	6/30
EA52	Pasagshak Bay	Closed	-	-	-	-
DISTRICT TOTAL		695		^g	0	
NORTHEAST DISTRICT						
NE10	Womens Bay	10	Gillnet	0	0	6/30
NE20	Kalsin Bay	10	Gillnet	0	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	30	Purse Seine	0	0	6/30
IM50	Spruce Island	Closed	-	-	-	-
NE AND IM DISTRICT TOTAL		50		0	0	

-continued-

Table 2.–Page 3 of 3.

Statistical area	Management section	GHL	Initial gear type ^a	Harvest		Date closed
				Purse seine	gillnet	Purse seine
NORTH MAINLAND DISTRICT						
NM10	Hallo Bay	Closed	-	-	-	-
NM20	Inner Kukak	Exploratory	Both	0	0	6/30
NM30	Outer Kukak	Closed	-	-	-	-
NM40	Missak Bay	Closed	-	-	-	-
MID MAINLAND DISTRICT						
MM10	Inner Katmai	Exploratory	Both	0	0	6/30
MM20	Outer Katmai	Closed	-	-	-	-
MM30	Alinchak	Exploratory	Both	0	0	6/30
MM40	Puale Bay	Exploratory	Both	0	0	6/30
MM50	Portage Bay	Exploratory	Both	0	0	6/30
MM60	Outer Portage	Closed	-	-	-	-
SOUTH MAINLAND DISTRICT						
SM10	Wide Bay	Exploratory	Both	0	0	6/30
SM20	Lower Shelikof	Closed	-	-	-	-
MAINLAND DISTRICTS TOTAL				0	0	
GRAND TOTAL		1,405		^g	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.

^g Confidential.

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 2019.

Year	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		
1979	2,400	1,735	1,457	278	84%	16%	-	-	57	125	26	2	\$38,342	\$3,336	\$1,500	\$2,602,500
1980	2,400	2,383	2,009	374	84%	16%	-	-	92	109	22	3	\$15,068	\$2,368	\$690	\$1,644,270
1981	2,400	2,065	1,596	469	77%	23%	207	406	79	114	20	4	\$14,647	\$2,983	\$725	\$1,497,125
1982	2,400	1,771	1,447	324	82%	18%	138	191	45	67	32	5	\$17,686	\$2,660	\$550	\$974,050
1983	2,400	2,319	1,797	522	77%	23%	164	284	41	64	44	8	\$35,063	\$6,525	\$800	\$1,855,200
1984	2,400	2,163	1,691	472	78%	22%	138	212	39	69	43	7	\$34,687	\$5,472	\$800	\$1,730,400
1985	2,000	1,968	1,244	724	63%	37%	118	348	34	81	37	9	\$32,929	\$8,044	\$900	\$1,771,200
1986	1,690	1,558	1,110	448	71%	29%	132	385	31	71	36	6	\$34,016	\$5,994	\$950	\$1,480,100
1987	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	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	2,415	2,249	1,513	736	67%	33%	171	627	37	83	41	9	\$34,758	\$7,537	\$850	\$1,911,650
1990	2,375	2,347	1,644	703	70%	30%	156	544	27	63	61	11	\$51,756	\$9,485	\$850	\$1,994,950
1991	2,510	2,432	1,697	735	70%	30%	169	587	32	64	53	11	\$45,077	\$9,762	\$850	\$2,067,200
1992	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	3,525	4,929	4,203	726	85%	15%	237	294	41	86	103	8	\$56,382	\$4,643	\$550	\$2,710,950
1994	4,550	5,893	4,976	917	84%	16%	285	485	66	57	75	16	\$60,315	\$12,870	\$800	\$4,714,400
1995	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	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	3,435	3,235	2,629	606	81%	19%	183	418	64	59	41	10	\$20,539	\$5,136	\$500	\$1,617,500
1998	2,030	2,057	1,954	103	95%	5%	110	26	35	7	56	15	\$27,914	\$7,357	\$500	\$1,028,500
1999	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	1,735	1,370	1,290	80	94%	6%	57	23	31	10	42	8	\$29,129	\$5,600	\$700	\$959,000
2001	1,540	1,694	1,412	282	83%	17%	67	37	33	9	43	31	\$21,394	\$15,667	\$500	\$847,000
2002	1,860	1,677	1,274	403	76%	24%	37	50	30	14	42	29	\$21,233	\$14,393	\$500	\$838,500
2003	2,600	1,992	1,738	254	87%	13%	59	45	31	11	56	23	\$28,032	\$11,545	\$500	\$996,000

-continued-

Table 3.–Page 2 of 2.

Year	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	2,850	3,167	2,894	273	91%	9%	95	36	27	11	107	25	\$53,593	\$12,409	\$500	\$1,583,500
2005	3,475	3,463	2,932	531	85%	15%	134	61	32	12	92	44	\$45,813	\$22,125	\$500	\$1,731,500
2006	3,705	2,643	2,617	^c	99%	0%	86	^c	21	^c	125	^c	\$34,270	^c	\$275	\$726,825
2007	4,000	2,546	2,510	36	99%	1%	105	8	21	3	120	12	\$47,810	\$4,800	\$400	\$1,018,400
2008	4,290	3,099	3,086	^c	100%	0%	108	^c	22	^c	140	^c	\$73,643	^c	\$525	\$1,626,975
2009	4,765	4,759	4,549	210	96%	4%	218	19	31	6	147	35	\$77,040	\$18,375	\$525	\$2,498,475
2010	6,075	5,701	5,538	163	97%	3%	277	14	36	7	154	23	\$61,533	\$9,314	\$400	\$2,280,400
2011	6,135	2,957	2,937	20	99%	1%	95	6	14	3	210	7	\$41,957	\$1,333	\$200	\$591,400
2012	5,355	4,260	4,253	^c	100%	0%	164	^c	23	^c	185	^c	\$55,474	^c	\$300	\$1,278,000
2013	5,410	4,447	4,298	149	97%	3%	189	18	33	5	130	30	\$29,956	\$6,854	\$230	\$1,022,810
2014	5,830	2,463	2,463	0	100%	0%	99	0	21	0	117	0	\$11,729	\$0	\$100	\$246,300
2015	3,190	357	357	0	100%	0%	19	0	9	0	40	0	\$4,363	\$0	\$110	\$39,270
2016	1,670	365	365	0	100%	0%	15	0	3	0	122	0	\$15,817	\$0	\$130	\$47,450
2017	1,645	125	124	^c	99%	0%	6	^c	3	^c	41	^c	\$6,613	^c	\$160	\$20,000
2018	1,185	226	226	0	100%	0%	8	0	3	0	75	0	\$15,067	\$0	\$200	\$45,200
2019	1,405	^c	^c	0	100%	0%	^c	0	^c	0	^c	0	\$0	\$0	\$0	\$0
Average																
1979 to 2018	3,071	2,616	2,243	413	86%	14%	134	245	35	44	75	13	\$38,074	\$8,278	\$633	\$1,720,743
10-year avg.																
2009 to 2018	4,126	2,566	2,511	68	99%	1%	109	7	18	3	122	12	\$31,955	\$4,485	\$236	\$806,931
5-year avg.																
2014 to 2018	2,704	707	707	0	100%	0%	29	0	8	0	79	0	\$10,718	\$0	\$140	\$79,644

^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, 2019.

Section	<i>n</i>	Percent at age										
		age-1	age-2	age-3	age-4	age-5	age-6	age-7	age-8	age-9	age-10	age-11+
Danger Bay	293	0%	0%	96%	2%	1%	0%	1%	0%	0%	0%	0%
East Sitkalidak	389	0%	0%	97%	2%	1%	0%	0%	0%	0%	0%	0%
Inner Kiliuda	310	0%	0%	93%	0%	4%	1%	2%	0%	0%	0%	0%
Inner Kukak	634	0%	21%	78%	1%	0%	0%	0%	0%	0%	0%	0%
Inner Uyak	299	0%	1%	98%	1%	0%	0%	0%	0%	0%	0%	0%
Kalsin Bay	332	0%	2%	92%	4%	1%	0%	0%	0%	0%	0%	0%
Kizhuyak Bay	226	92%	1%	7%	0%	0%	0%	0%	0%	0%	0%	0%
Outer Ugak	344	0%	0%	97%	1%	1%	0%	0%	0%	0%	0%	0%
Paramanof Bay	283	0%	0%	99%	1%	0%	0%	0%	0%	0%	0%	0%
Spiridon Bay	293	1%	1%	95%	2%	0%	1%	0%	0%	0%	0%	0%
Terror Bay	308	0%	0%	97%	2%	0%	0%	0%	0%	0%	0%	0%
Three Saints Bay	35	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%
Viekoda Bay	323	0%	0%	97%	2%	0%	0%	0%	0%	0%	0%	0%
Village Islands/Uganik Bays	750	0%	7%	90%	2%	0%	0%	0%	0%	0%	0%	0%
All Samples Combined	4,819	4%	4%	89%	2%	1%	0%	0%	0%	0%	0%	0%

Table 5.—Average weight of herring samples from the commercial sac roe fishery, by age and section in the KMA, 2019.

Section	Weight at age (grams)										
	age-1	age-2	age-3	age-4	age-5	age-6	age-7	age-8	age-9	age-10	age-11+
Danger Bay	0	61	92	92	155	0	182	0	0	0	0
East Sitkalidak	13	0	97	117	147	196	0	0	0	0	0
Inner Kiliuda	0	60	93	0	195	198	224	0	0	0	0
Inner Kukak	0	26	41	94	0	0	220	0	0	0	0
Inner Uyak	0	48	85	95	0	0	0	0	0	0	0
Kalsin Bay	35	49	70	96	132	154	113	0	0	0	0
Kizhuyak Bay	10	42	78	0	0	0	155	0	0	0	0
Outer Ugak	0	57	97	131	165	0	206	0	0	0	0
Paramanof Bay	0	46	82	115	0	0	0	0	0	0	0
Spiridon Bay	20	60	78	100	0	157	175	0	0	0	0
Terror Bay	10	25	81	98	153	0	0	0	0	0	0
Three Saints Bay	0	0	70	0	0	0	0	0	0	0	0
Viekoda Bay	0	43	83	101	0	0	164	0	0	0	0
Village Islands/Uganik Bay	14	44	83	91	108	146	150	0	208	0	303

Table 6.–Herring food and bait commercial fishery GHLS and harvest (tons) by district, KMA, 2018.

Management District	GHLS	Harvest
F/B 3 - South Afognak	19	59
F/B 4 - Uganik	21	0
F/B 8 - Eastside	51	0
Total	91	59

Table 7.–Herring food and bait commercial fishery GHLS and harvest (tons), KMA, 2001 through 2018.

Year	GHLS	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
2017	129	77
2018	91	59
Average		
2008 to 2017	324	177

Table 8.—Subsistence herring harvest summary for the KMA, 1991 through 2018.

Year	Permits issued	Permits returned	Estimated harvest in pounds by district								Total
			Afognak	Northeast	Inner Marmot	Uganik	Uyak	Eastside	Alitak	Other	
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
2017	^a	11	0	140	900	89	200	510	424	0	2,263
2018	^a	8	0	245	17	365	350	325	0	0	1,302

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

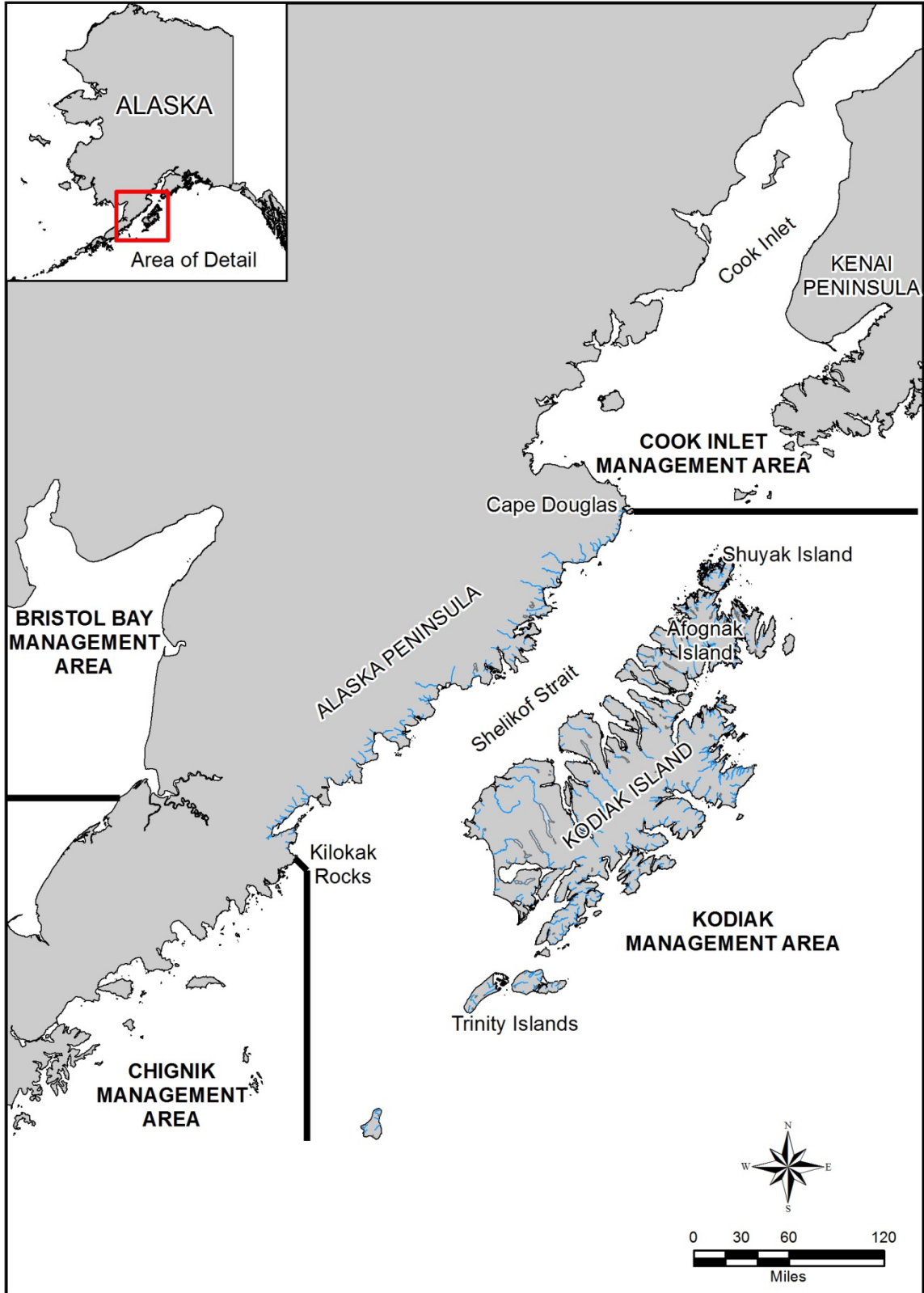


Figure 1.—Map of southwestern Alaska showing the KMA and surrounding management areas.

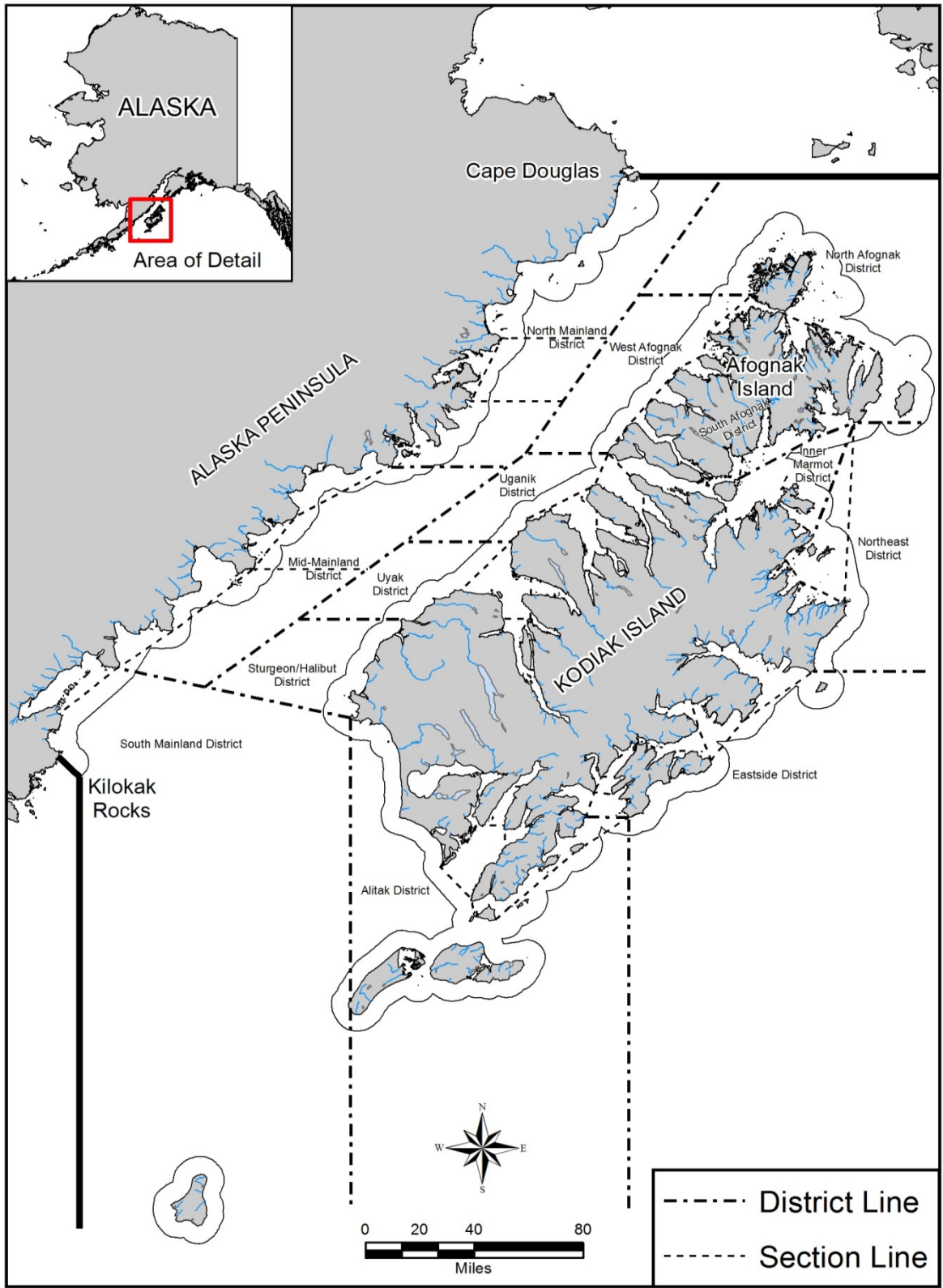


Figure 2.—Map of the KMA illustrating the herring commercial fishery districts.

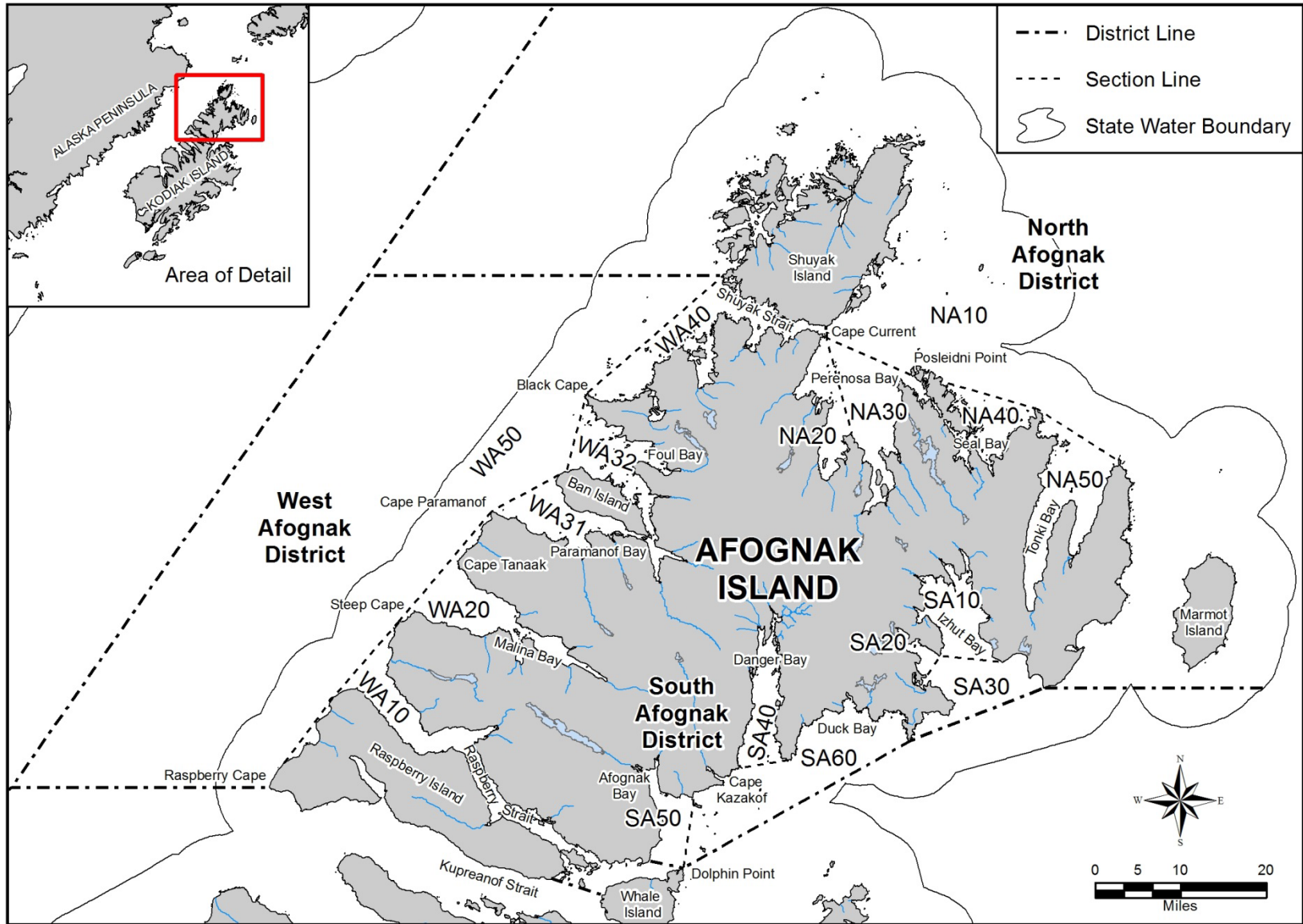


Figure 3.—Map showing the Afognak districts.

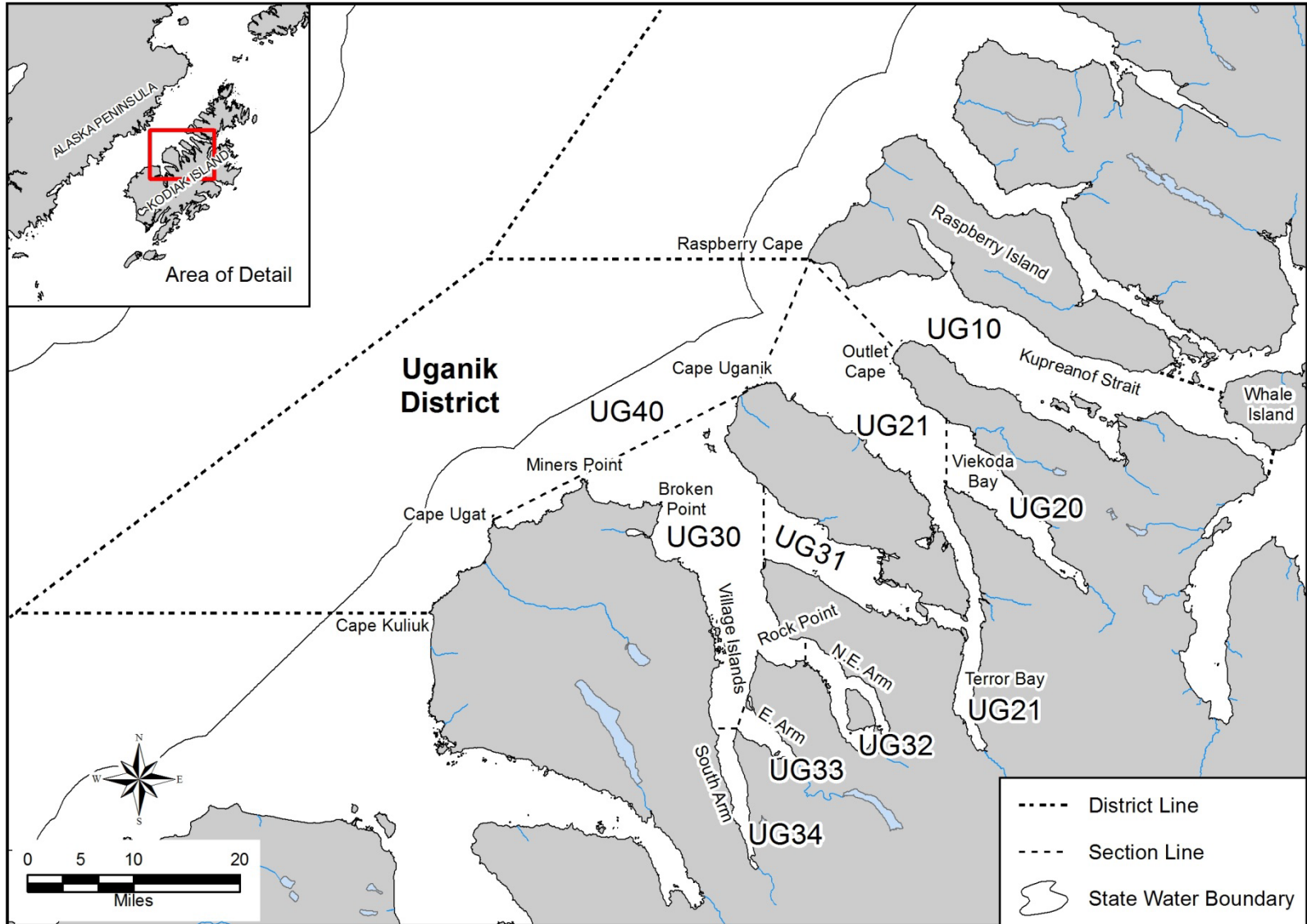


Figure 4.—Map showing the Uganik District.

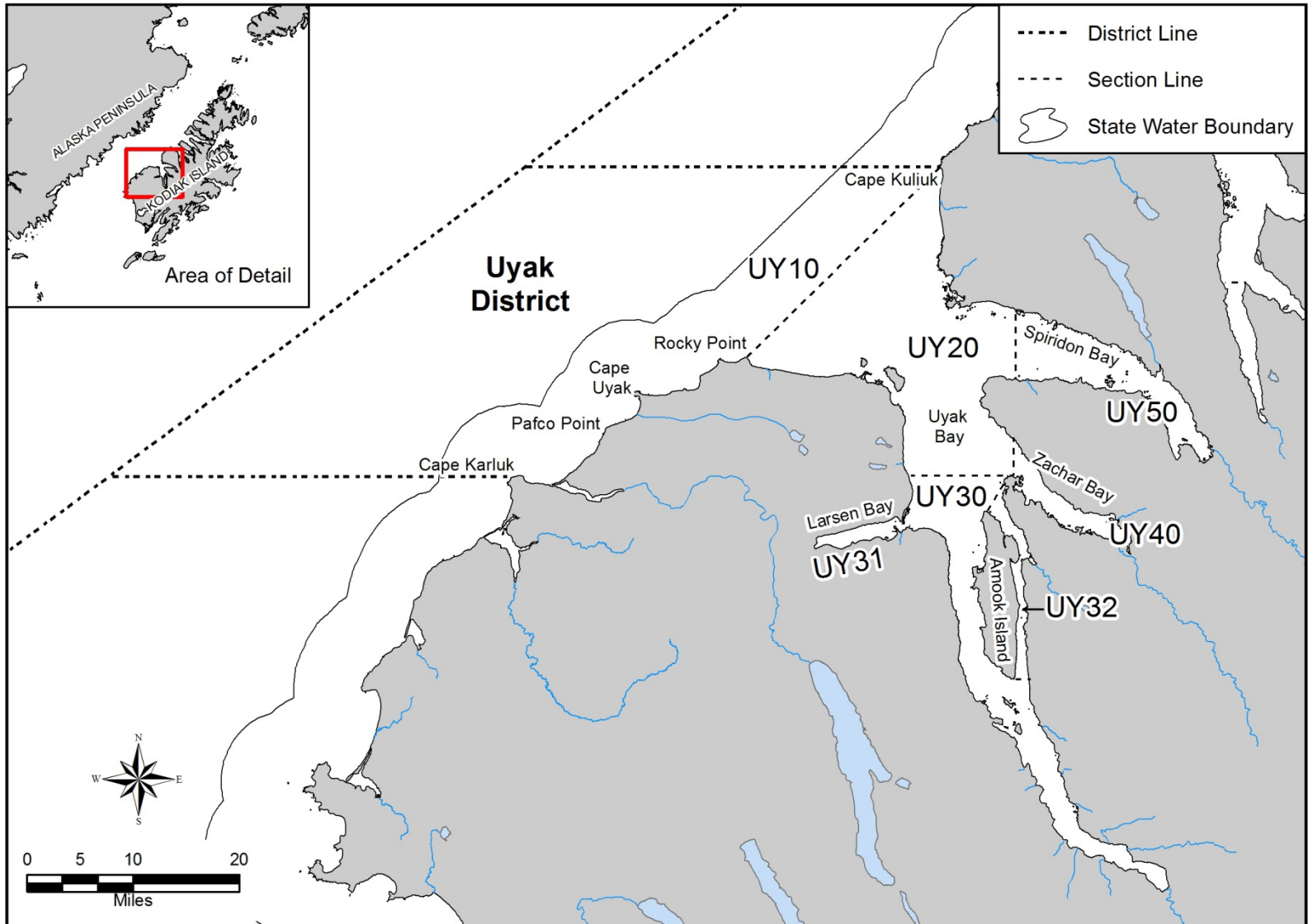


Figure 5.—Map showing the Uyak District.

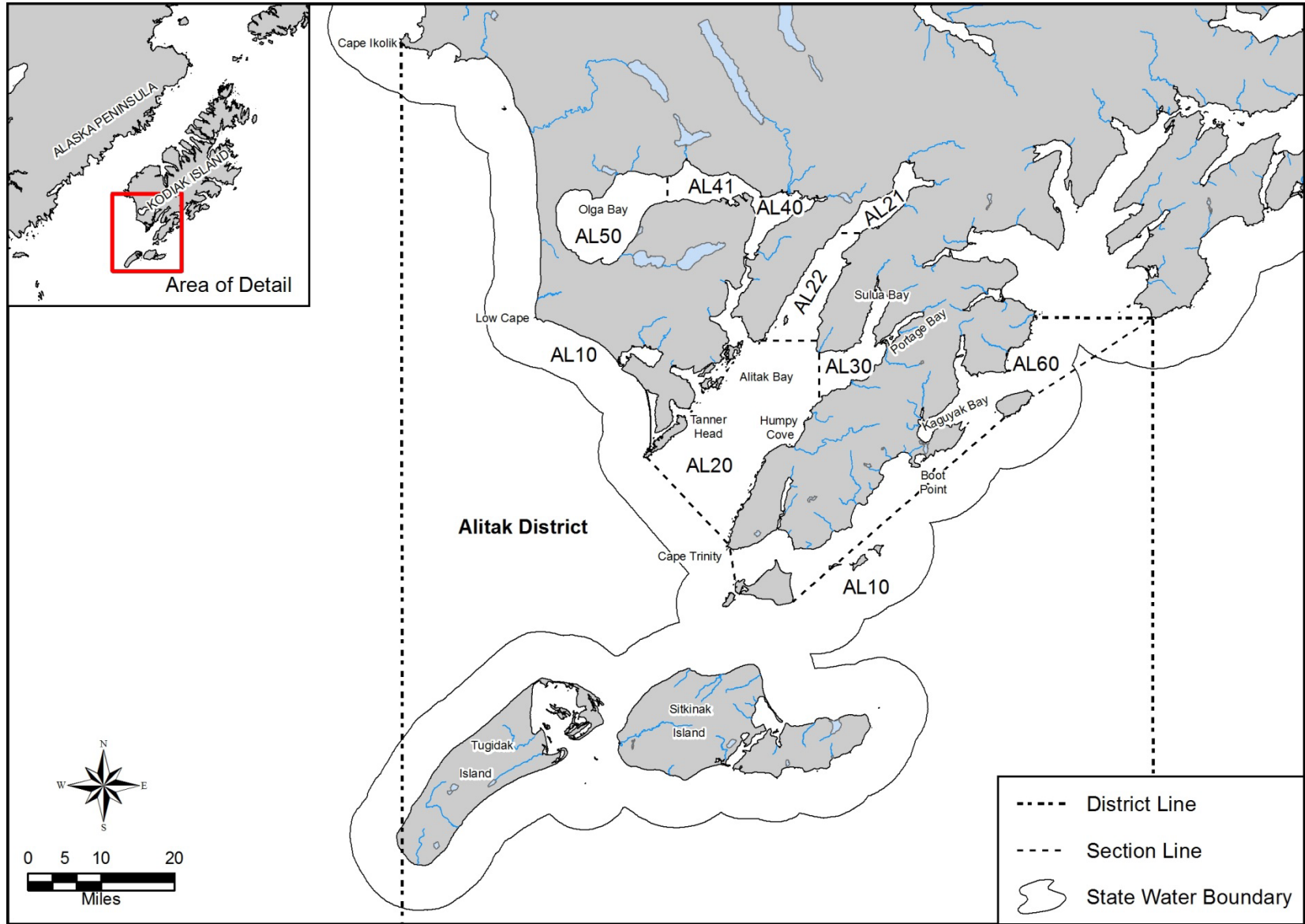


Figure 6.—Map showing the Alitak District.

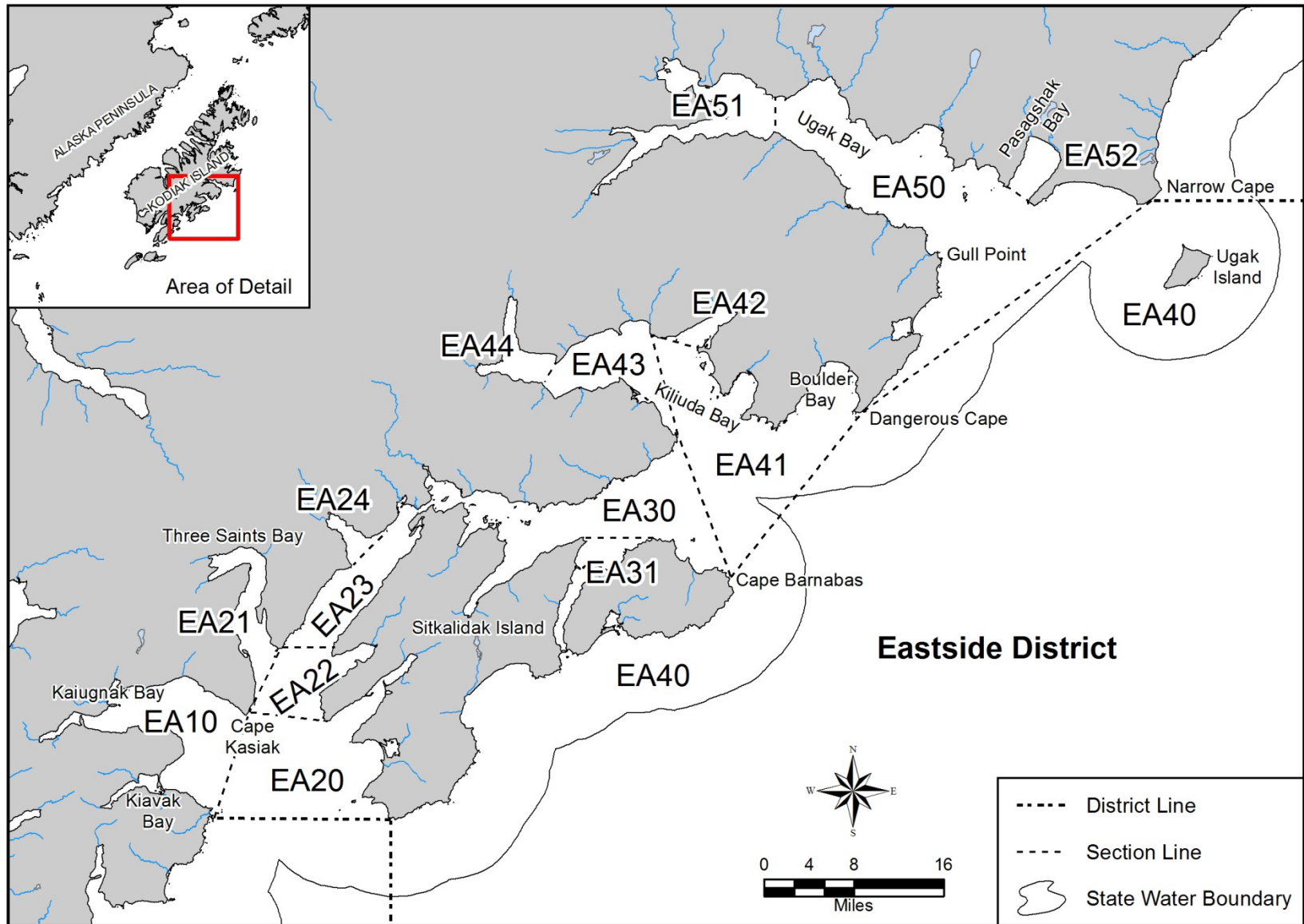


Figure 7.—Map showing the Eastside District.

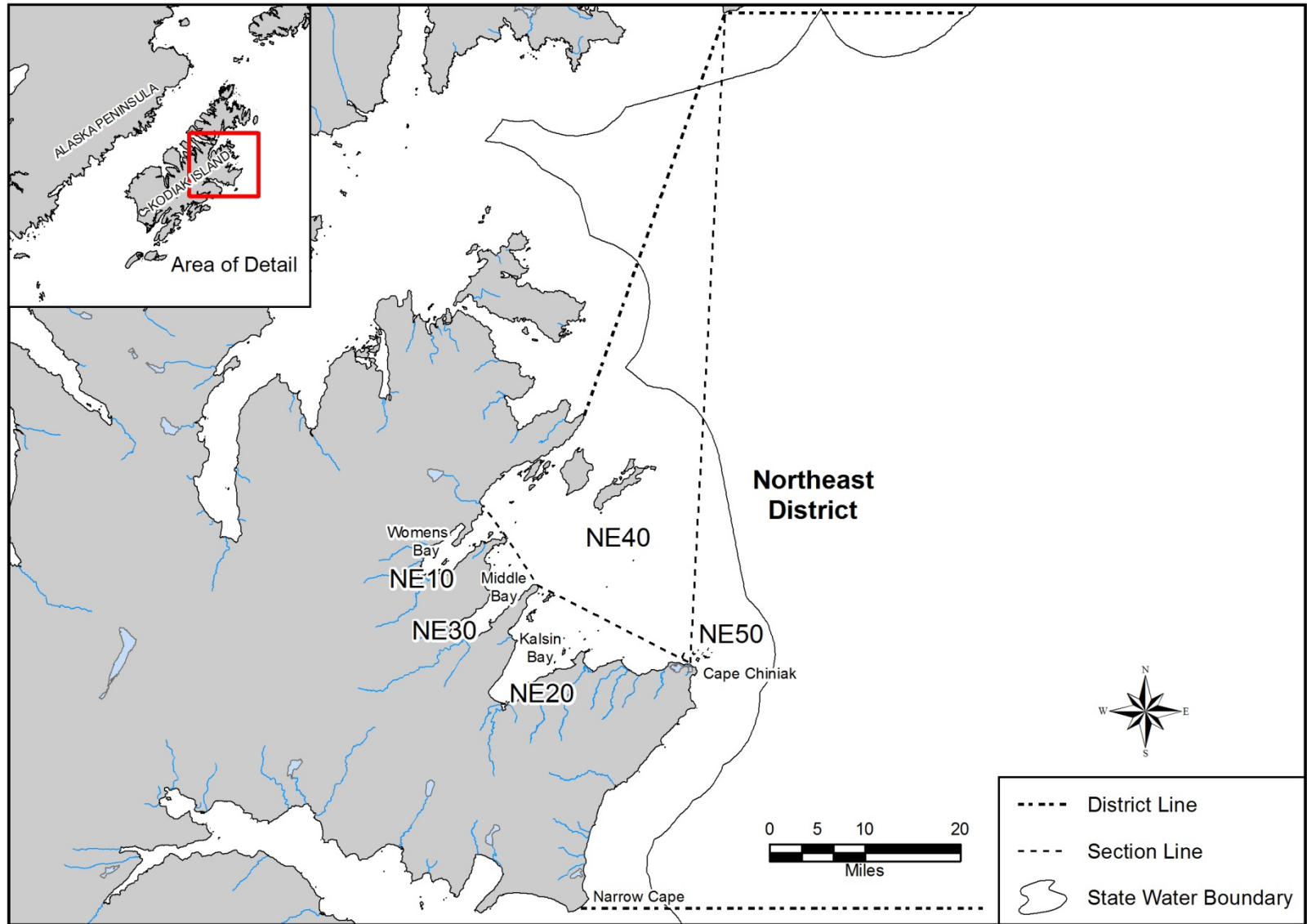


Figure 8.—Map showing the Northeast District.

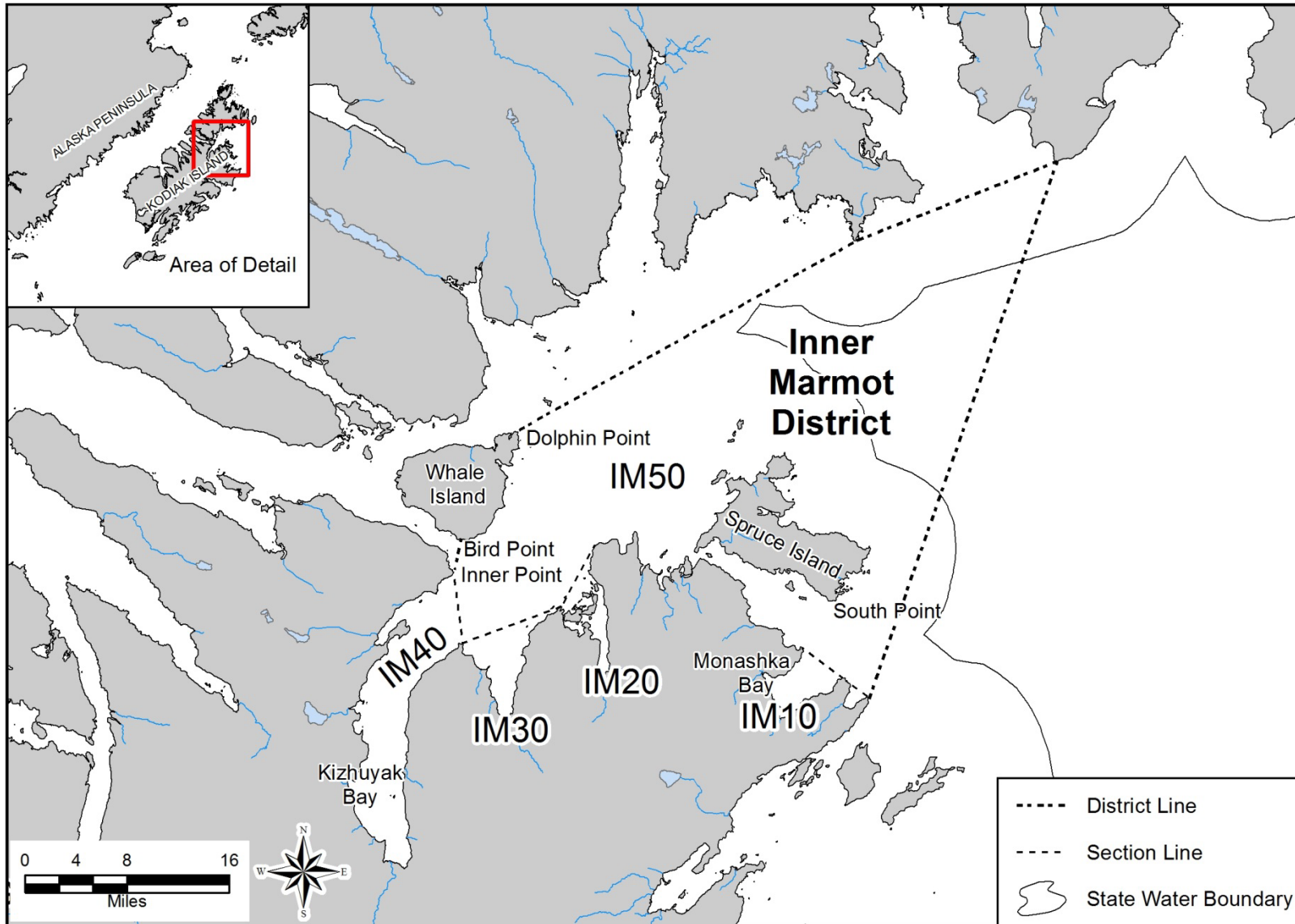


Figure 9.—Map showing the Inner Marmot District.

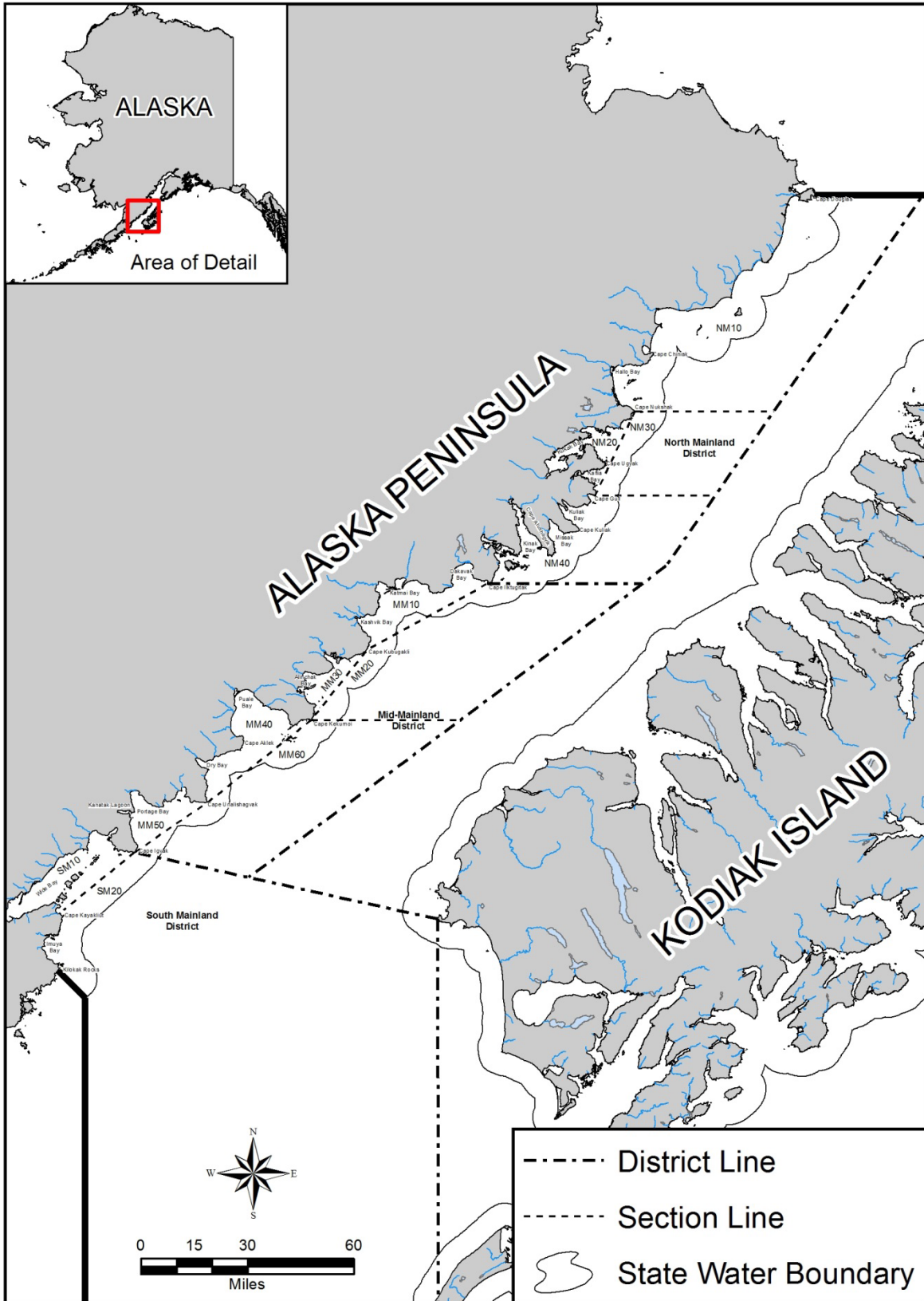


Figure 10.—Map showing the Mainland districts.

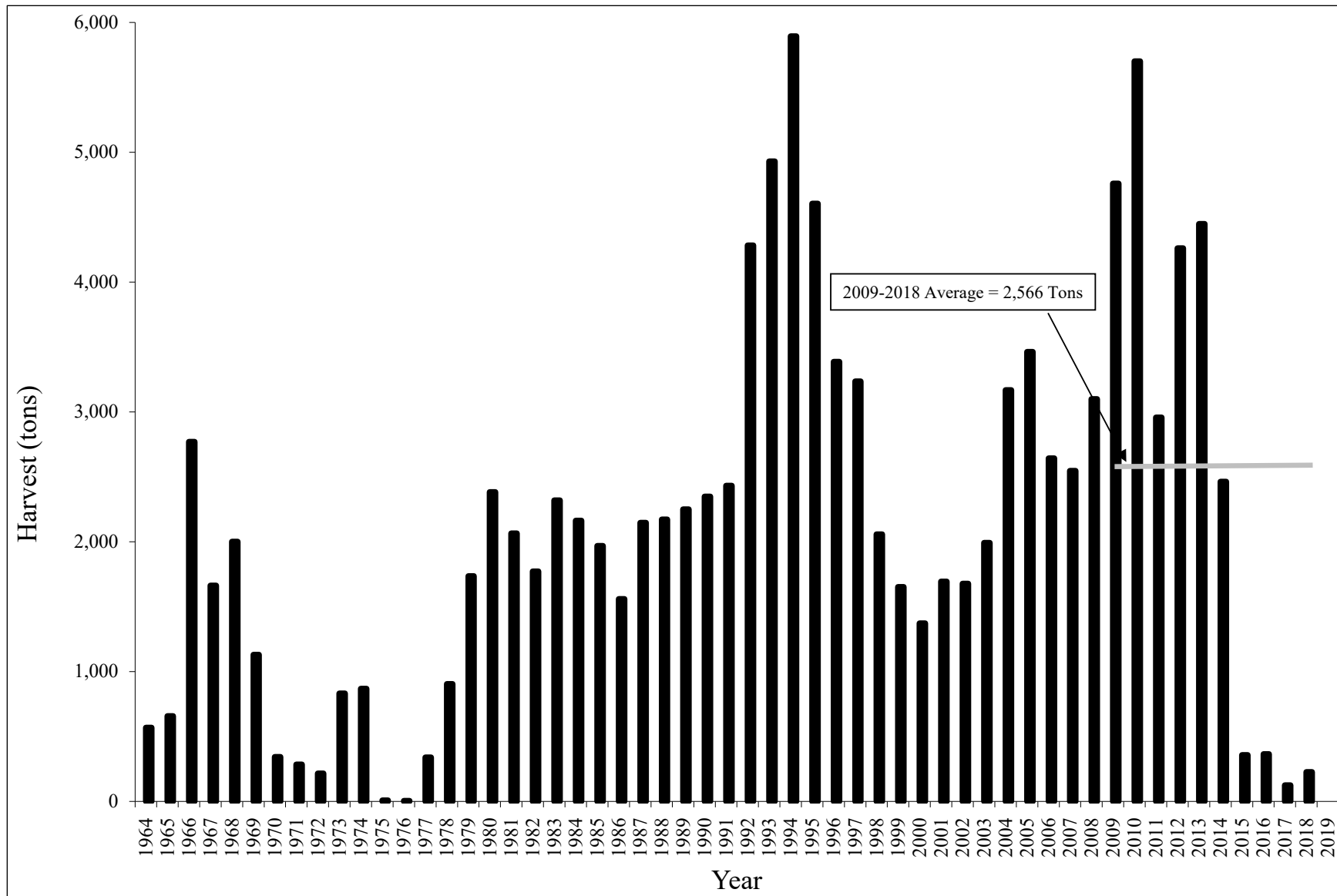


Figure 11.—Herring sac roe commercial fishery harvest in the KMA, 1964 through 2019.

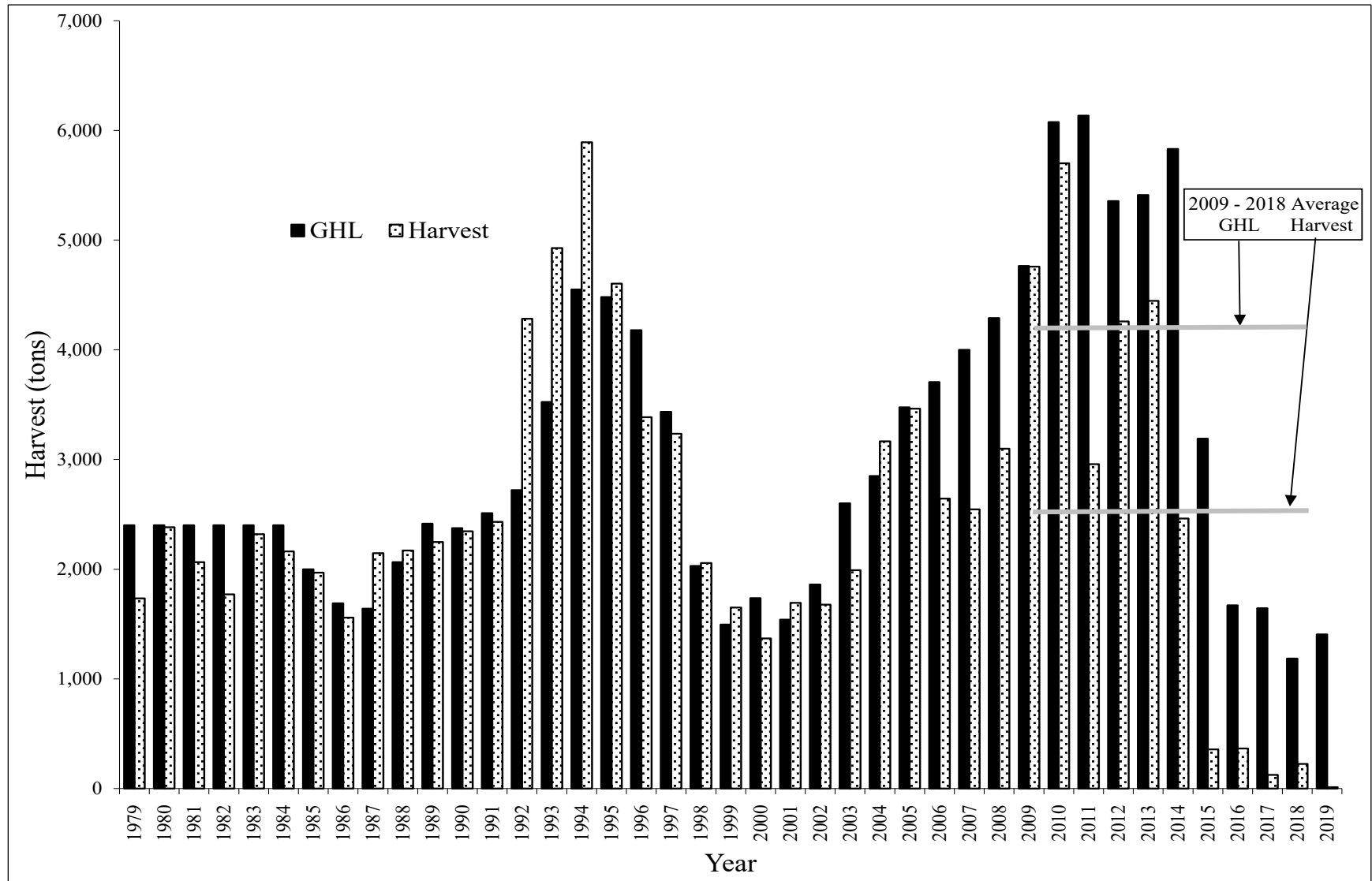


Figure 12.—Comparison of herring sac roe GHLs to harvest, KMA, 1979 through 2019.

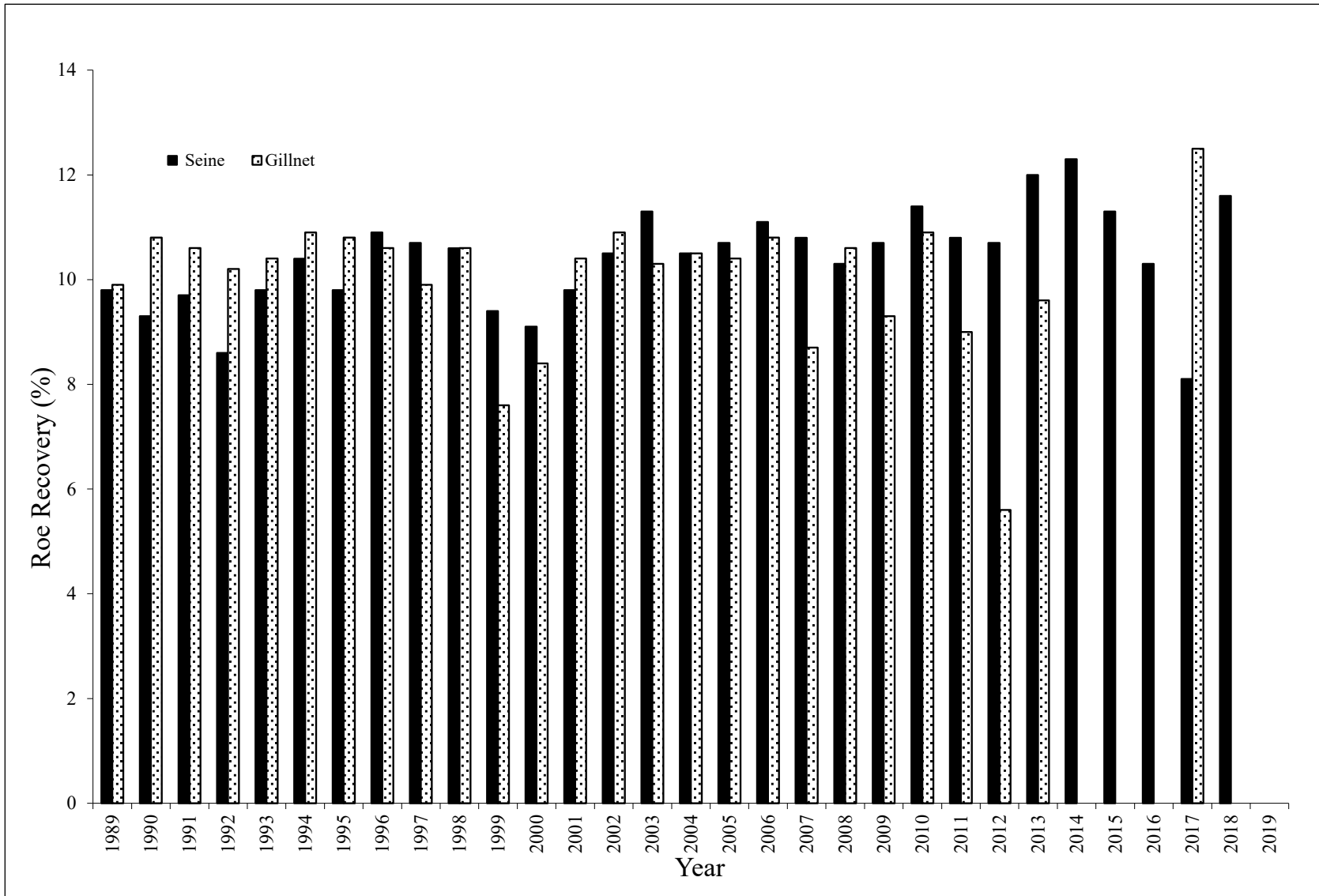


Figure 13.–Herring sac roe fishery, roe recovery in the KMA, 189 through 2019.

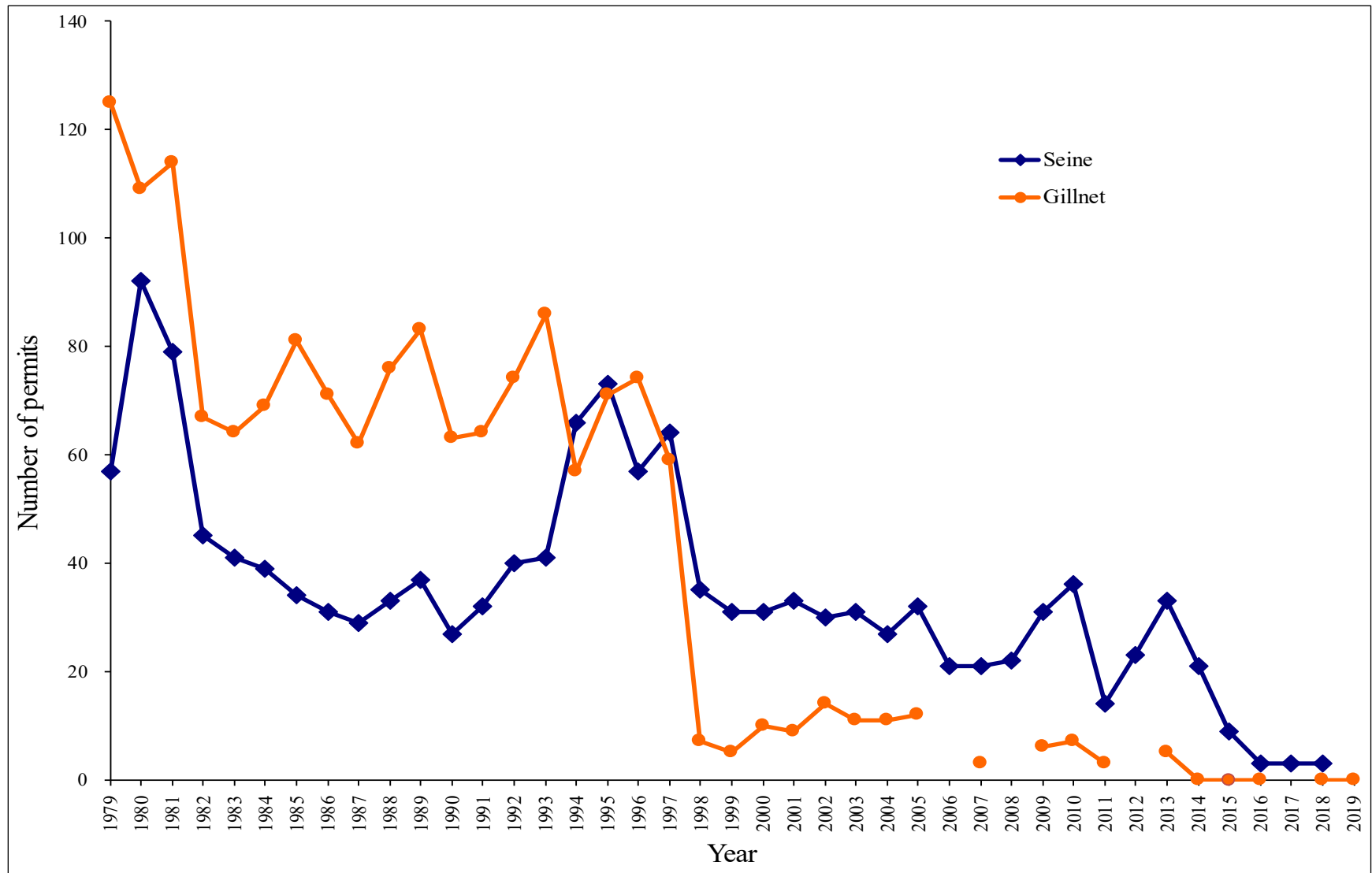


Figure 14.—Herring sac roe commercial fishery participation, by gear type in the KMA, 1979 through 2019.

Note: 2006, 2008, 2012, and 2017 gillnet data is confidential, 2019 purse seine data is confidential.

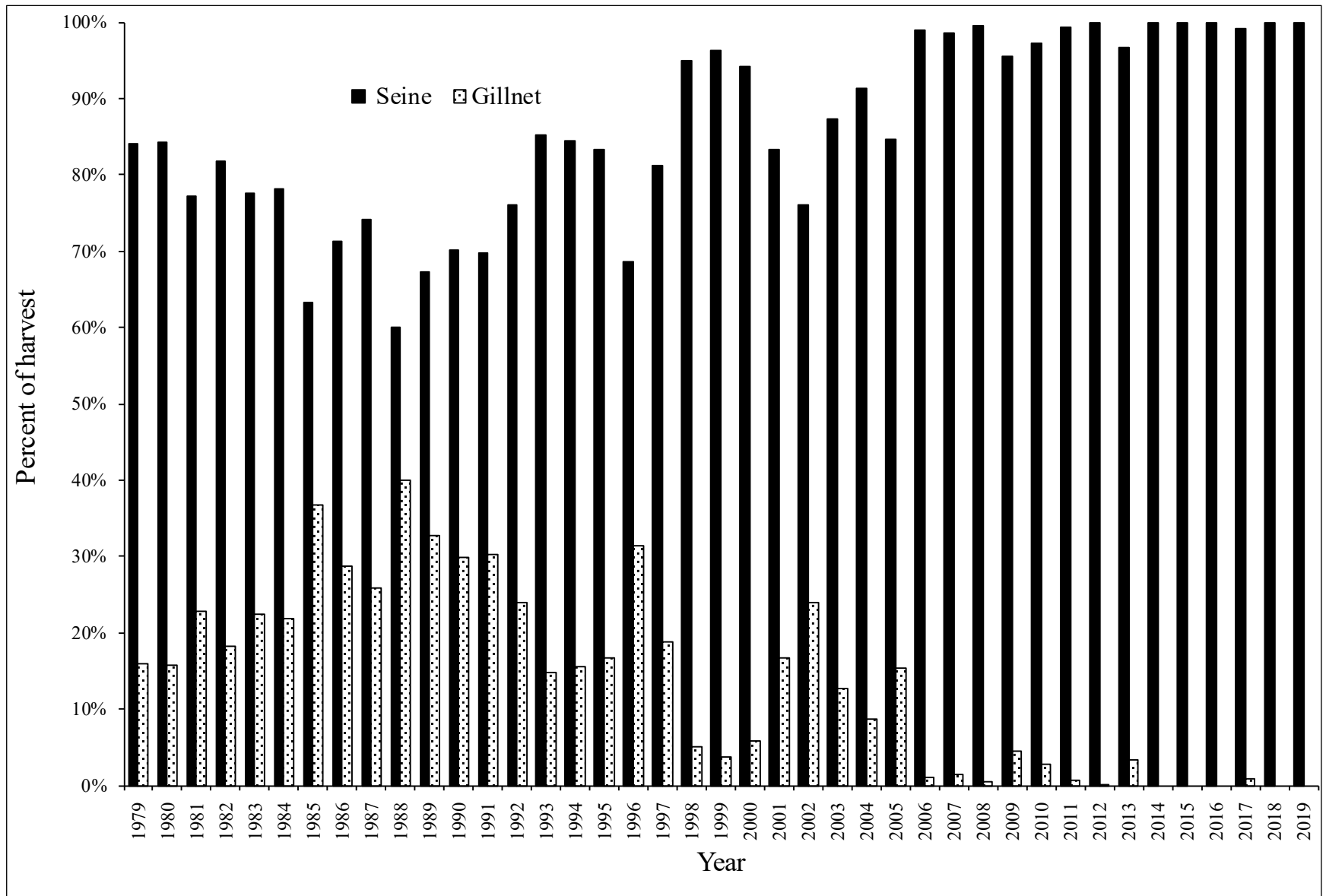


Figure 15.—Percent of the total harvest taken by gear type in the herring sac roe commercial fishery, KMA, 1979 through 2019.

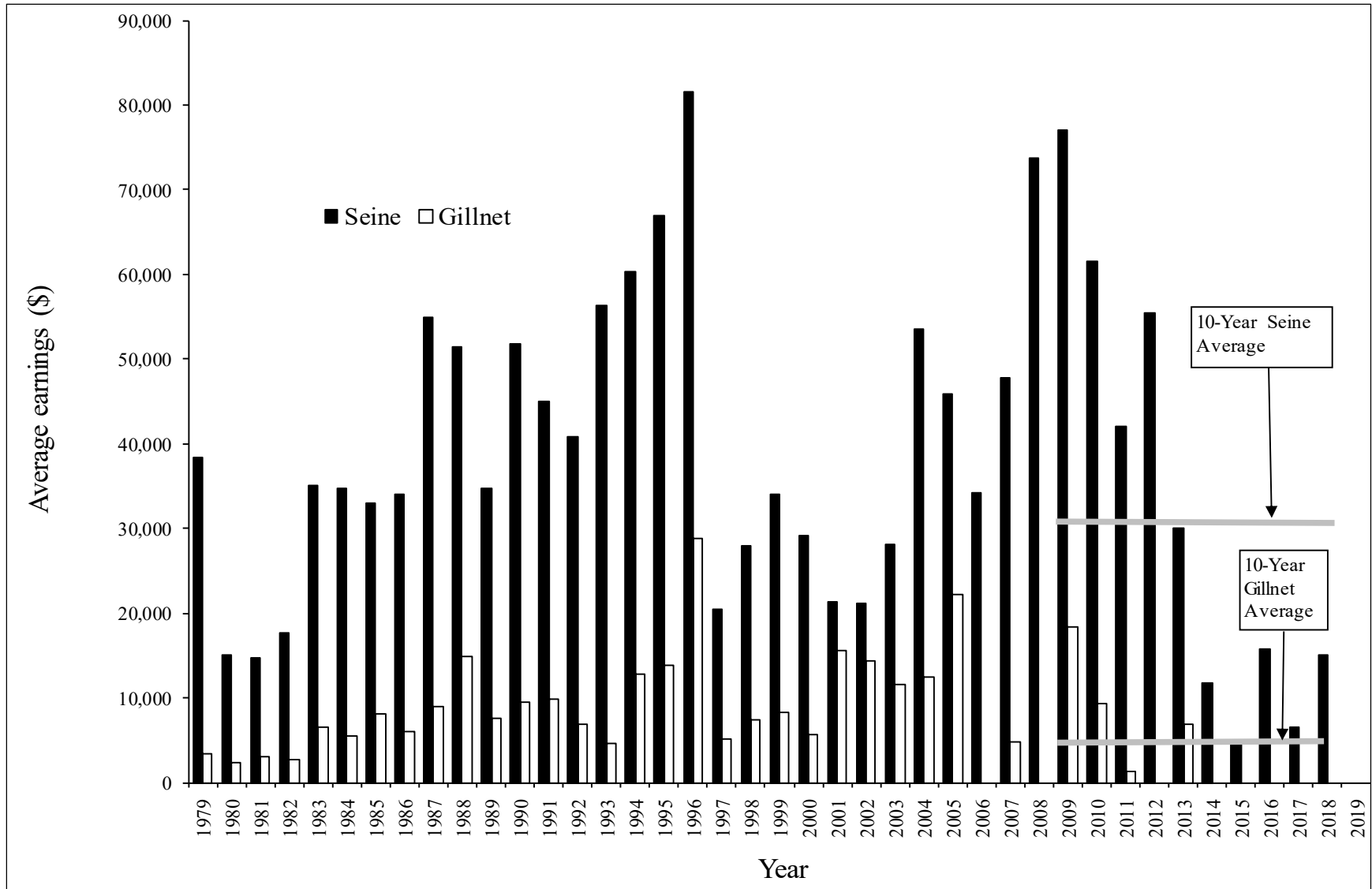


Figure 16.—Average earnings by gear type for herring sac roe commercial fisheries, KMA, 1979 through 2019.

Note: 2006, 2008, 2012, and 2017 gillnet data is confidential, 2019 purse seine data is confidential.

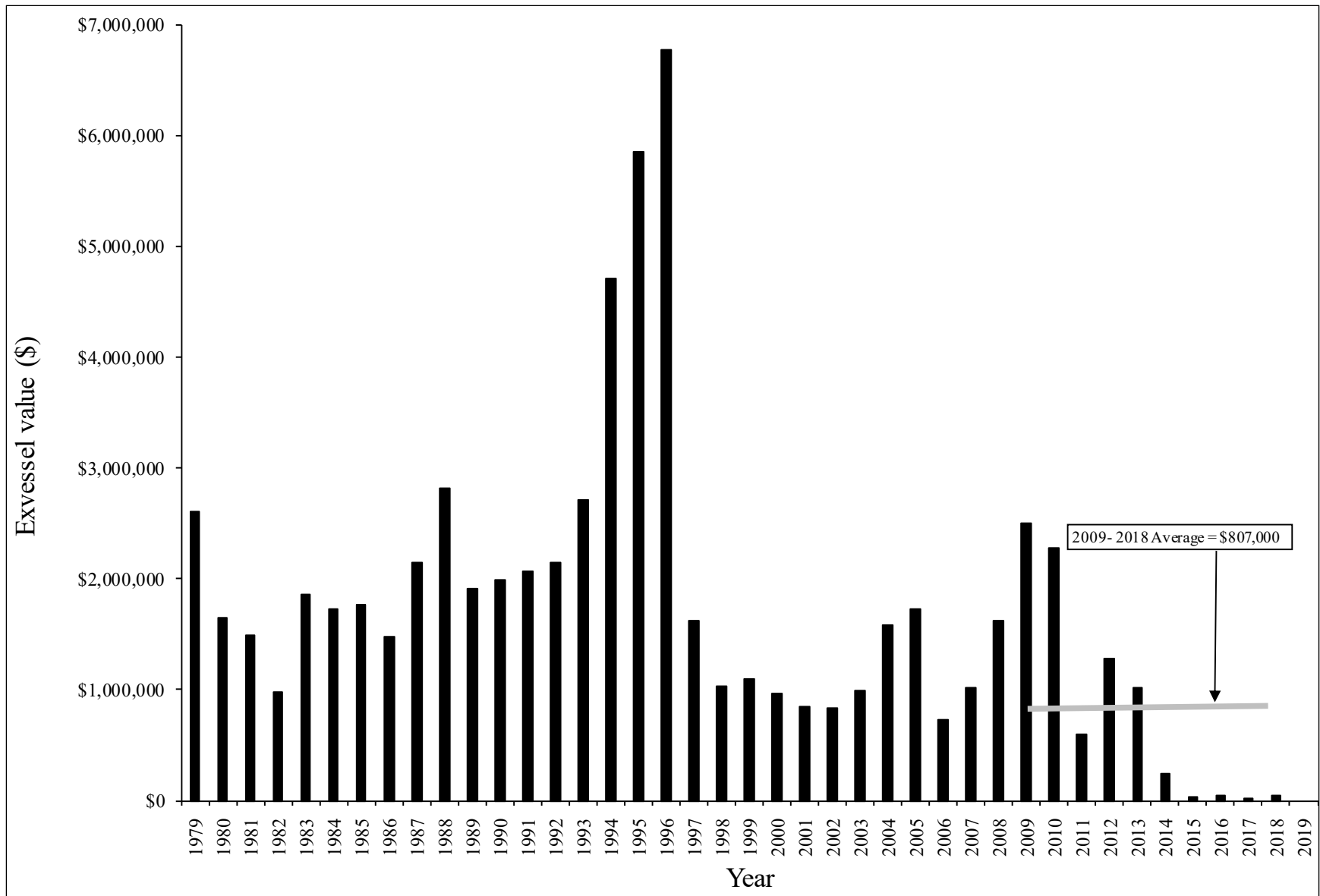


Figure 17.—Total exvessel value for herring sac roe commercial fisheries, KMA, 1979 to 2019.

**APPENDIX A: SUMMARY OF EMERGENCY ORDERS
ISSUED FOR THE HERRING COMMERCIAL FISHERIES
IN THE KODIAK MANAGEMENT AREA, 2019**

Appendix A1.–Summary of emergency orders issued for the herring commercial fisheries in the Kodiak Management Area, 2019.

Emergency Order #	Issued	Effective:	Action Taken:
1	3:00 p.m. April 8	noon April 15	<u>Open Sac Roe Fishery:</u> Initial opening times and fishing periods by gear and section for sac roe herring fishery announced.
2	11:30 p.m. April 16	noon April 16	<u>Fishing Periods:</u> Commercial herring fishing periods open from 9:00 a.m. to 9:00 p.m. on both even and odd numbered days for purse seine gear.
3	10:00 a.m. April 22	9:00 a.m. April 23	<u>Fishing Period:</u> The Danger Bay Section (SA40) at 9:00 a.m. April 23.
4	10:00 a.m. April 30	noon May 1	<u>Fishing Period:</u> Establishes the sections that will be open to both gear types beginning May 1.