Fishery Data Series No. 24-25

Southeast Alaska and Yakutat 2024 Herring Stock Assessment Surveys

by

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

Symbols and Abbreviations

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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 DATA SERIES NO. 24-25

SOUTHEAST ALASKA AND YAKUTAT 2024 HERRING STOCK ASSESSMENT SURVEYS

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ABSTRACT

Pacific herring *Clupea pallasii* are important prey for many marine species found in Southeast Alaska and are harvested in fisheries for subsistence, personal use, commercial, and research purposes. The Southeast Alaska Herring Management plan (5 AAC 27.190(3)) requires the Alaska Department of Fish and Game to assess the abundance of mature herring for each stock before allowing commercial harvest. Included here are results of stock assessment surveys completed primarily during 2024, including summaries of herring spawn deposition surveys and age-weight-length sampling, which are the principal model inputs used to forecast herring abundance. In 2024, spawn deposition surveys were conducted for Sitka Sound, Craig, Kah-Shakes/Cat Island, and Tenakee area stocks. Spawn deposition surveys were not conducted in several other traditionally major spawning areas due to low levels of observed spawn, although aerial surveys of some spawning areas were continued on a limited basis. Spawn was documented on a total of 143.8 nautical miles of shoreline in Southeast Alaska and Yakutat during 2024 surveys of major spawn areas. Post-fishery spawn deposition biomass estimates totaled 254,024 tons. During the 2023–2024 season, a commercial winter bait fishery was opened in Craig with a guideline harvest level (GHL) of 4,030 tons. A commercial purse seine sac-roe fishery was opened in Sitka Sound with a record high GHL of 81,246 tons. A commercial spawn-on-kelp fishery was open in Craig, which allowed for the highest possible kelp allocation for pounds. There were no other commercial fisheries opened during the 2023–2024 season. Herring harvested commercially during the 2023–2024 season, not including the weight of herring impounded for spawn-on-kelp fisheries or the weight of spawn-on-kelp products, exceeded 12,000 tons; the exact value is confidential due to fewer than 3 participants in the Craig winter bait fishery.

Keywords: Pacific herring, *Clupea pallasii,* Southeast Alaska, spawning populations, dive surveys, stock assessment, fishery

INTRODUCTION

Pacific herring *Clupea pallasii* have been the target of commercial fisheries in Alaska since 1878, with harvests growing to millions of pounds annually by 1882 (Cobb 1905). As fisheries developed, the desire for better knowledge and understanding of herring populations grew, leading to the initiation of research programs. Initially, study was focused on observations made from trends in commercial catch, especially during the height of the large-scale reduction fishery that peaked in 1930. As questions arose about the cause of fluctuations in catch, the lack of herring availability, and the impact of commercial fishing on herring, and as fishery science theory developed worldwide, scientific techniques were applied to herring populations in Alaska. Quantitative, fishery-independent study of herring began in Alaska by the early 1930s, and research was carried out by the U.S. Department of Commerce, Bureau of Fisheries. Rounsefell and Dahlgren (1935) measured spawning levels by area and attempted to differentiate spawning populations in Southeast Alaska through analyzing vertebrae counts and growth rates and through tag-recapture studies. By the 1940s, the importance of age-class strength became recognized for monitoring and predicting herring abundance, and research was largely conducted by the U.S. Department of the Interior, Fish and Wildlife Service (USFWS). Estimates and forecasts of abundance and yield by age became mainstays of management during this time. By 1953, programs were in place for standardized, detailed collection of data from spawning grounds; these programs included aerial surveys, measurements of spawn along shoreline, egg density, and egg mortality, which enabled estimation of spawning biomass (Grice and Wilimovsky 1957). The USFWS continued to lead herring research in Alaska after statehood in 1959, operating under a cooperative agreement with the State of Alaska during 1960 and 1961. However, in 1962 the cooperative agreement was discontinued, and herring spawn surveys conducted by USFWS were suspended. Starting in 1963 the Alaska Department of Fish and Game (ADF&G) began conducting aerial surveys in the Craig/Hydaburg and Sitka areas, which were later expanded to other important herring spawning areas.

The Alaska Department of Fish and Game instituted a full research project in 1971 to evaluate herring stocks in Southeast Alaska. This project was developed in response to greater demands on the resource by the commercial bait and developing sac roe fisheries. The goal of the project was to provide the biological data necessary for science-based fishery management of the region's herring stocks.

A variety of survey techniques have been used in the past to assess herring stocks in Southeast Alaska, including aerial visual estimates, vessel-based hydroacoustic surveys, and spawn deposition surveys using scuba gear. Data generated during these stock assessment surveys—along with data collected for age, weight, and length estimates—are used directly in the management of all commercial herring fisheries conducted in Southeast Alaska. Data are currently analyzed using 1 of 2 different stock assessment models to estimate and to forecast mature herring abundance and biomass, depending on the length and quality of datasets available. These models include an integrated statistical catch-at-age model (SCAA, historically known as age-structured analysis, or ASA, model) and a biomass accounting model.

Currently, the SCAA model is used for herring populations with longer (i.e., generally a minimum of 10 years) time series of stock assessment data, and the biomass accounting model may be used for all other stocks where fisheries occur or on occasion when time constraints prevent use of the SCAA model. These 2 models are not mutually exclusive of the spawn deposition method. Spawn deposition data (i.e., total egg deposition estimates) are an important element of both SCAA and biomass accounting models. A primary difference between the 2 approaches is the number and type of data inputs required to conduct the respective analyses and the model outputs. Biomass estimates derived from the spawn deposition method use only the most recent spawn deposition data, and do not factor in trends in age composition or weight-at-age. A conversion factor based on an estimate of the number of eggs per ton of herring is applied to the total egg estimate to compute spawning biomass. In contrast, the SCAA model uses a time series of age compositions, weight-at-age, total egg deposition, and catch, along with fecundity relationships to estimate biomass. Other outputs of the model include estimates of mean survival, maturity, selectivity, and recruitment. Biomass accounting, which does not require a data time series, is based on spawn deposition estimates adjusted for natural mortality, age-specific growth, and recruitment. These estimates are generally taken from an SCAA model's output of a nearby herring stock. A more detailed explanation of the SCAA and biomass accounting models and how the objective estimates are used in these models are provided by Carlile et al. (1996).

Statistical catch-at-age and biomass accounting models are mentioned here to provide historical perspective and because they are important elements of the overall stock assessment of herring in Southeast Alaska. Although results from these models are not discussed in this report, the key data inputs for these models are presented. The primary intent of this report is to document data collected during fall 2023 through spring 2024 and to provide historical perspective by presenting general trends in Southeast Alaska herring populations. Since 1993, and when data has allowed, the SCAA model has been used to estimate and forecast the abundance of herring for 4 major Southeast Alaska herring stocks: Sitka, Craig, Seymour Canal, and Kah Shakes–Cat Island (sometimes called Revillagigedo Channel area or "Revilla Channel," which refers to the greater Kah-Shakes/Cat Island and Annette Island spawning areas). The SCAA model has also been used for Tenakee Inlet since 2000. For these 5 potential commercial harvest areas or spawning populations, the time series of data has been sufficient to permit the use of SCAA for hindcasting historical biomass and forecasting future biomass. Other areas, which may support significant herring fisheries but lack data time series suitable for SCAA, are candidates for biomass accounting. This simpler modeling approach began in 1996 and has been used to generate forecasts for West Behm Canal, Ernest Sound, Hobart Bay–Port Houghton, and Hoonah Sound.

The principal outputs from all models are forecasts of mature herring biomass and age compositions for the ensuing year. Biomass forecasts are compared to stock-specific threshold biomass levels to determine whether a fishery will be allowed in a particular area. Biomass forecasts are coupled with appropriate exploitation rates (maximum of 20%) to determine the allowable harvest levels, and allocations for commercial quotas for each fishery are then determined by the appropriate regulations and management plans.

METHODS AND PROCEDURES

AERIAL AND SKIFF SURVEYS

Several historically important spawning areas (Figure 1) and several minor spawning areas in Southeast Alaska were surveyed using a combination of aerial and skiff surveys; these surveys recorded spring spawning activities, documented spawn timing, and estimated the distance of shoreline that received herring spawn. Aerial surveys typically commenced prior to the historical first date of spawning for each stock. Historical spawning dates by stock are presented in Figures 2–11. In addition to documenting herring spawn and herring schools, estimates of numbers and locations of herring predators—such as birds, sea lions, and whales—were recorded as an additional means for gauging the presence of herring or spawn. Once concentrations of predators were observed, aerial and skiff surveys were conducted more frequently (e.g., daily or sometimes multiple flights per day) to ensure accurate accounting of herring distribution and herring spawn. The shoreline where herring spawn (milt) was observed was documented on a paper chart or electronic handheld device during each survey and then later uploaded to computer mapping software to measure the shoreline distance that received spawn. A chart depicting the total unique shoreline where spawn was documented at any time during the duration of the spawning event was used as the basis for targeting and designing the spawn deposition dive surveys.

SPAWN DEPOSITION SURVEYS

Optimal timing of spawn deposition surveys is about 10 days after the first significant spawning day of the season in each spawning area. This usually allows adequate time for herring to complete spawning and marine mammals to leave the area while minimizing the time eggs are subjected to predation or wave action that may remove eggs from the spawning area. A significant first spawning level depends on the size of the spawning stock but is typically at least 1 nautical mile and may be a few nautical miles. To account for egg loss from the study site prior to the survey, a 10% correction factor is applied the estimate of observed egg deposition. The 10% correction factor is an estimate based on several studies that have been conducted to estimate herring egg loss from deposition areas in British Columbia (for example, see Schweigert and Haegele [2001]; Haegele [1993a–b]) and in Prince William Sound. These studies found that the extent of egg loss due to predation and physical environmental stresses depends upon several things, including length of time since deposition, depth, and kelp type. Although some more recent studies suggest that 30% egg loss prior to survey may be more accurate (Rooper et al. (1998), to maintain time series consistency a correction factor based on 10% egg loss continues to be used in Southeast Alaska, British Columbia, and Prince William Sound. Because length of time since egg deposition is a key factor contributing to egg loss, a serious attempt was made to conduct surveys within 10 days;

however, at times surveys were delayed in order to balance survey schedule times for overlapping spawning events in multiple areas, or to accommodate availability of survey participants. Surveys conducted substantially after the 10-day period may tend to result in underestimates of egg deposition and therefore mature biomass. Historical dates of spawn deposition surveys are presented in Table 1.

Shoreline Measurement and Transect Orientation

Spawn documented during aerial surveys was transcribed in ArcMap (version 10.3) over raster images of nautical charts published by the National Oceanic and Atmospheric Administration, using the NAD 1983 datum and State Plane Alaska FIPS 5001 (ft) Projected Coordinate System. Spawn was drawn to conform to the shoreline such that any given segment of shoreline that received spawn had an approximately equal chance of being sampled during the dive survey. This required a tradeoff so that shoreline features could be smoothed without adhering too closely to the shore on a small scale, but also without drawing sweeping straight lines that did not adequately capture enough detail to design a meaningful survey.

Shoreline measurement, and consequently transect placement, can be subjective at times. Measurements vary depending on the location of spawn deposition relative to the shoreline, bottom contour and depth, and map resolution. Fine measurement of a convoluted shoreline may substantially increase measurements of spawn but may not be appropriate for instances when spawn deposition does not closely follow the shoreline. In such situations, less resolution is used for measurements and transects are placed perpendicular to a "theoretical" shoreline, so they intersect the spawn in a meaningful way to sample across the spawn zone. Conversely, spawn may closely follow a convoluted shoreline, requiring finer resolution of measurements, and transects are placed perpendicular to the actual shoreline contingent upon physical features such as depth, bottom slope, and distance to the opposite shore. For example, a steeply sloped shoreline with a narrow band of spawn habitat (e.g., typical of Sitka Sound) requires finer resolution for shoreline mapping as opposed to an area with a broad gentle slope (e.g., Craig) interspersed with rocks and reefs at some distance from shore. For some spawning areas (e.g., Sitka), a "base map" is used, which depicts a standardized shoreline used to draw spawn and which has been developed by considering many years of spawning. Base maps are intended to reduce among-year variability associated with drawing spawn on shoreline and therefore reduce variability in egg deposition estimates.

Another consideration is that termination of transects while still in the egg zone may be necessary if spawn is present on the opposing shoreline. Transects are halted at the midpoint of opposing shoreline to prevent oversampling areas where a potential transect might have been placed. Similarly, transects that are surveyed within small coves are terminated at a central convergence point where potential transects would intersect. Transects are terminated for these 2 situations to minimize bias due to unequal sampling probability of the spawn zone, although it is unlikely that bias would be eliminated without further corrections (Li et al. 2011). A theoretical example of a spawn line drawn along the shore, and how the layout of potential transects are considered for these instances, is presented in Figure 12.

The same procedure and patterns of drawing spawn lines were followed in 2024 as in past years; however, the process requires that judgment be used based on experience and knowledge of the local spawning areas. The intent of drawing a smoothed spawn line is to produce a survey area that is oriented along the spawn and is such that transects laid perpendicularly to the spawn line will sample egg density throughout the entire width of the spawn, while minimizing bias to the estimate of egg abundance. A second objective of measuring the spawn observed along shorelines is to obtain an estimate of spawn length, which factors into the estimate of overall spawn area, and is discussed more below. For the Sitka Sound and Craig areas, standardized baseline representations of herring spawn shoreline have been developed and were used for analyses presented here. These baseline maps provide a predetermined line for drawing spawn in the current year that is consistent with prior years. The baseline maps were developed using documented historical spawn and local knowledge of the area to produce what was deemed the most sensible representation of shoreline for repeated use in herring aerial surveys and spawn deposition surveys.

Once the spawn shoreline was established, a single linear measurement of the shoreline was made using XTools Pro, a measuring tool extension used within ArcMap. The shoreline was divided evenly into 0.10 nautical mile segments, which were then randomly selected for transect placement. Therefore, transects were placed no closer than 0.10 nmi to each other, which was done to prevent adjacent transects from unintentional crossing due to slight errors in compass bearing or while navigating underwater.

Sample Size

The number of transects selected was proportional to the linear distance of spawn and followed, at a minimum, the average of suggested sampling rates listed in Table 2. Sampling rates in Table 2 were estimated using data from previous surveys. The statistical objective of the spawn deposition sampling was to estimate herring egg densities (per quadrate) such that the lower bound of a 90% confidence interval was at least within 30% of the mean egg density estimate. This method would also achieve the objective of estimating the total egg deposition at a particular location with the specified precision. A one-sided confidence interval was used because there is more concern for avoiding overestimation than underestimation of the densities of spawn deposition. The number of actual transects selected for a survey are frequently increased beyond the minimum suggested rate to increase transect spatial distribution, potentially reduce variance, and make efficient use of scheduled vessel time.

The minimum target number of transects is estimated as follows:

$$n = \frac{\left(S_b^2 - \frac{S_2^2}{\overline{M}} + \frac{S_2^2}{\overline{m}} \right)}{\left(\frac{x\bar{d}}{t_\alpha} \right)^2 + \frac{S_b^2}{N}}; \tag{1}$$

where

n = number of transects needed to achieve the specified precision;

S_b^2 = estimated variance in egg density among transects;

S_2^2 = estimated variance in egg density among quadrates within transects;

$\overline{M}$ = estimated mean width of spawn;

$\overline{m}$ = estimated mean number of 0.1 m quadrates per transect;

x = specified precision, expressed as a proportion (i.e., 0.3 = 30%);

$\overline{d}$ = overall estimated mean egg density;

t_a = critical t value for a one-sided, 90% confidence interval; and

N = estimated total number of transects possible within the spawning area.

Field Sampling

Transect direction was determined by comparing the physical features of the actual dive location to a chart depicting the spawn along the shoreline, and then setting a compass bearing perpendicular to the spawn shoreline. Transects began at the highest point of the beach where eggs were observed and continued down to the depth in the subtidal zone where no further egg deposition was observed, which is typically above 21 m (70 ft) of depth. The section of each transect that was above the waterline was surveyed by walking until reaching a depth in the water that required diving (usually about 2 feet), at which point diving commenced. All diving was conducted in compliance within limits and guidelines outlined in the ADF&G Dive Safety Manual (Hebert 2023). Normally, little if any herring egg deposition occurs deeper than 21 m, although occasionally eggs will occur to or below 24 m (80 ft).

A 2-stage sampling design, similar to that of Schweigert et al. (1985), was used to estimate the density of herring eggs. The field sampling procedure entailed 2-person dive teams swimming along transects and recording visual estimates of the number of eggs within a 0.1 m^2 sampling frame placed on the bottom at 5-meter intervals. Eggs throughout the entire water column were included if they were within the dimensions of the frame. Situations where eggs were found on vertical canopy kelps such as *Macrocystis* spp. required divers to swim up along the length of the kelp to estimate eggs while maintaining reference to the sampling frame. To help estimate the number of eggs, estimators used the standard reference of 40,000 eggs per single layer of eggs within the sampling frame, which was determined mathematically using measurements of average egg diameter and frame dimensions. Additional data recorded included bottom substrate type, primary vegetation type upon which eggs were deposited (Appendices A and B, respectively), percent vegetation coverage within the sampling frame, and frame depth. Since sampling frames were spaced equidistant along transects, the record of the number of frames was also used to compute transect length.

VISUAL ESTIMATE CORRECTION

Because visual estimates rather than actual counts of eggs within the sampling frame are recorded, measurement error occurs. To minimize bias and the influence of measurement error on estimates of egg deposition within each frame, estimator-specific correction coefficients were applied to adjust egg estimates either up or down depending on an estimator's tendency to underestimate or overestimate. Correction coefficients were estimated by double sampling (Jessen 1978) frames independent of those estimates obtained along regular spawn deposition transects. Samples for correction coefficients were collected by visually estimating the number of eggs within a 0.1 m^2 sampling frame and then collecting all the eggs within the frame for later more precise estimation in a laboratory. First, eggs on a variety of vegetation (e.g., algae, kelp, sea grass) were collected and at the surface assembled into a variety of sample sizes among vegetation categories. Approximately 10 samples for each of 5 vegetation categories were created, and attempts were made to create samples of varying egg density and varying total egg abundance within each vegetation type. Vegetation categories included eelgrass (ELG), fir kelp (FIR), large/leafy brown kelp (LBK), rockweed (FUC), and hair kelp (HIR; see Appendix A1 for species included within each category). Next, divers placed individual samples within sampling frames that were longlined along a shallow depth contour of about 10 ft. Estimators (while diving) then passed over the longline, making estimates of each sample, recording estimates on sample labels, and placing them in a mesh bag attached to each sampling frame. To collect the samples after estimation, divers removed the vegetation (e.g., algae, kelp, sea grass) along with the eggs and preserved them in 100% salt brine solution in heavy grade plastic zip sealing bags. Samples were transported to the ADF&G Mark, Tag and Age Laboratory in Juneau, where analysis was conducted within the following few months. Lab estimates were made for each sample by stripping eggs from vegetation, counting the number of eggs within 2 or 3 subsamples (typically about 1,000 eggs each), and then measuring the volumes of subsamples and full samples to calculate total eggs by proportion.

Correction coefficients were calculated as the ratio of sums of all laboratory estimates to all visual estimates, within each kelp type, for each estimator. To reduce potential of highly variable correction coefficients, minimum sample size guidelines were used. Data from the last 3 years were pooled if there were at least a total of 6 samples for each estimator and kelp type, with at least 3 samples in at least 2 of the 3 years. If this was not satisfied, then samples from prior years were added until the minimum sampling guideline was met. The intent of these sampling guidelines was to achieve a reasonably adequate sample size to minimize variation, but also to develop correction coefficients that reflected an estimator's tendency to estimate high or low in the most recent years.

Estimator/vegetation-specific correction coefficients were applied to egg estimates when the appropriate vegetation type matched. For example, the "large/leafy brown kelp" correction coefficient was applied when kelp types that fit that description were encountered on transect, and the "eelgrass" correction coefficient was applied when eelgrass was encountered. When eggs were encountered on transect that were loose in the water column, were adhering to bare rock, or were on vegetation types that were not like the categories sampled for calibration of egg estimates, an estimator-specific correction coefficient based on the average of all estimator/vegetation-specific correction coefficients was applied.

ESTIMATES OF TOTAL EGG DEPOSITION

Total egg deposition for each spawning area (t_i) was estimated as follows:

$$t_i = a_i \bar{d}_i, \qquad (2)$$

where a_i is the estimated total area (m^2) on which eggs have been deposited; and $\bar{d}_i$ is the estimated mean density of eggs per 0.1 m^2 quadrate, extrapolated to 1 m^2 area (eggs/m^2) at spawning area i. The total area on which eggs have been deposited (a_i) is then estimated as

$$a_i = l_i \bar{w}_i, \qquad (3)$$

where l_i is the total length of shoreline (m) that received spawn (determined from aerial and skiff surveys); and w_i is the mean width of spawn (m), as determined by the mean length of transects conducted at spawning area i.

The mean egg density (eggs/m^2) at area i ($\overline{d_i}$) is calculated as

$$\overline{d}_i = 10 \cdot \left[\frac{\sum_h \sum_j \sum_k v_{hijk} c_{hk}}{\sum_h m_{hi}} \right], \tag{4}$$

where v_{hij} is the visual estimate of egg numbers by estimator h, at area i, quadrate j, on vegetation type k. The c_{hk} term refers to a diver-specific, vegetation-specific correction coefficient to adjust visual estimates made by estimator h on vegetation type k; m_{hi} is the number of quadrates visually estimated by estimator h at area i. Because egg estimates are made within 0.1 m quadrates, multiplying by 10 expresses the mean density in per 1.0 m^2. Estimator/vegetation-specific correction coefficients (c_{hk}) are calculated as follows:

$$c_{hk} = \frac{r_{hk}}{q_{hk}}, \tag{5}$$

where r_{hk} is the sum of laboratory estimates of eggs collected from quadrates that were visually estimated by estimator h on vegetation type k, and q_{hk} is the sum of visual estimates of eggs for estimator h on vegetation type k.

SPAWNING BIOMASS ESTIMATION

The total number of eggs per spawning area is a key element used in assessing and forecasting herring spawning biomass. Although spawning biomass calculated directly from egg deposition is not an input for the SCAA or biomass accounting models, it does provide a static value each year (unlike SCAA-derived hindcasted estimates, which change with each model run as new data is added) and can be useful for comparison among years to track general trends in abundance.

The conversion of eggs to spawning biomass is calculated either using the stock-specific fecundity-to-weight relationship for the areas where fecundity estimates are available (Sitka Sound, Seymour Canal, Craig, Kah Shakes–Cat Island), or for all other stocks, the fecundity-to-weight relationship from the closest spawning stock where fecundity estimates are available (Table 3). The estimate for each area is calculated as follows:

$$b = h_{\bar{g}} * \bar{g}, \tag{6}$$

where

b = estimated total spawning biomass;

$h_{\bar{g}}$ = number of fish of mean weight in the area; and

$\bar{g}$ = mean weight of fish for each area, weighted by age composition.

The number of fish of mean weight ($h_{\bar{g}}$) is calculated as follows:

$$h_{\bar{g}} = \frac{\left(\frac{t}{L}\right) * 2}{f_{\bar{g}}}, \tag{7}$$

where

L = egg loss correction factor (0.9), which accounts for an estimated 10% egg mortality between the time eggs are deposited and spawn deposition surveys are conducted; and

$f_{\bar{g}}$ = estimated fecundity of fish of mean weight, using equations listed in Table 3.

AGE AND SIZE

Herring samples were collected from a combination of skiff/spawn surveys, aerial/spawn surveys, commercial fisheries, and test fisheries (when prosecuted) from several stocks or spawning areas located throughout Southeast Alaska. Sample collection gear varied with location and may have included purse seines, gillnets, cast nets, or trawls. Cast nets were used when fish were in shallow water during active spawning. Herring sampled from commercial fisheries were collected from individual harvesters or tenders while on the fishing grounds. Dates, gear used, and geographic locations of all samples were recorded.

Based on multinomial sampling theory (Thompson 1987), a sample size of 511 ages is considered sufficient to provide age composition estimates that deviate no more than 5% (absolute basis) from the true value, with an alpha level of 0.10 (i.e., the chance of rejecting a true value is about 10 percent). The minimum sampling goal was set at 525 fish to ensure that at least 500 readable scales would be obtained for aging from each commercial fishery (i.e., purse seine or gillnet samples) and each spawning stock (i.e., cast net samples).

All samples were packaged and labeled in 5-gallon buckets and frozen for later processing at the ADF&G Mark, Tag and Aging Laboratory in Juneau, Alaska. After thawing samples in the laboratory, the standard length (mm) of each fish (tip of snout to posterior margin of the hypural plate) was measured. Fish were weighed on an electronic balance to the nearest 10th of a gram.

A scale was removed from each fish for age determination. The preferred location is on the left side anterior to the dorsal fin or beneath the left pectoral fin. Scales were cleaned and dipped in a solution of 10% mucilage glue and placed unsculptured side down on glass slides. Aging was conducted by viewing scale images on a microfiche projector to count annuli. Age data for early years (1980–1998) were obtained by viewing scales through a dissecting microscope, varying the light source for an optimum image of the annuli. Ages from 1999 to present were determined by mounting scales on a microfiche reader to project a larger scale image to see annuli more easily. Each fish was assigned an anniversary date for each completed growing season. Samples were generally collected before growth resumed in the spring, and scales were aged based on the number of summer growth periods observed. For example, if a herring hatched in the spring of 2011 and was collected in the fall of 2012, then 2 growing seasons had occurred (age-2). If the herring had been collected in the spring of 2013 before growth had resumed, it was also recorded as age-2. Occasionally spawning occurs late (e.g. June) after growth resumes, producing "plus growth" on scales, which is ignored as it does not represent a full growth period. Scales were spot-checked by a second reader for age verification, and if agreement between readers was less than 80%, the entire sample was re-aged.

Condition Factor

Condition factor (CF) was calculated to provide a general indication of overall condition of fish based on body proportion. Condition factor was based on the method described in Nash et al. (2006) and was estimated as follows:

$$CF = \left(\frac{w}{l^3}\right) * 100, \tag{8}$$

where

w	=	whole body wet weight in grams, and
l	=	standard length in millimeters.

Sea Temperature

Daily sea surface temperature was recorded in spawning areas for most stocks using Onset HOBO StowAway TidbiT temperature loggers. For each stock a single temperature logger was placed at a location central to historical spawning at a depth between about 10 ft mean lower low water (MLLW) and 20 ft MLLW. Temperature has been recorded daily at 6-hour intervals for up to 20 years in some spawning areas. Daily mean, minimum, and maximum sea temperature was calculated for each spawning area. Overall annual mean temperature was calculated as the mean of all averaged daily values. Mean annual minimum temperatures and mean annual maximum temperatures were calculated as the mean of the minimum or maximum values that occurred during each annual cycle.

HARVEST STRATEGY

Allowable harvest levels for commercial herring fisheries in Southeast Alaska are set based on a harvest strategy that involves a graduated harvest rate paired with a minimum threshold of mature herring. When herring biomass is forecasted to be at or above threshold, a harvest rate between 10–20% is applied to the biomass forecast. For most herring stocks, the harvest rate may be set at 10% when the biomass forecast is at threshold up to a maximum of 20% when the forecast is 6 times the threshold or greater. The one exception is the Sitka Sound area, where the harvest rate is set at 12% when the forecast is at threshold, and at a maximum of 20% when the forecast is twice the threshold or greater. Maximum harvest rates used for herring in Southeast Alaska are based on studies in Alaska and elsewhere that concluded a maximum 20% harvest rate is sufficiently conservative to maintain healthy stocks of herring when paired with appropriate thresholds (Zheng et al. 1993; Doubleday 1985). The sliding scale element of the harvest rate calculation used for Southeast Alaska herring was included as an additional precautionary measure to reduce the harvest rate as stock biomass declines toward the threshold.

Threshold biomass levels have been established for each commercially exploited stock in Southeast Alaska. These thresholds are intended to reduce the risk of sharp declines in abundance due to recruitment failure and to maintain adequate herring abundance for predators. Commercial harvest of herring is not permitted unless the forecast of mature herring meets or exceeds the threshold. For Sitka Sound and West Behm Canal, threshold levels were based on analyses using simulation models to estimate 25% of the average unfished biomass (Carlile 1998a, 2003). In the case of Sitka Sound, the threshold was subsequently increased by the Board of Fisheries on two occasions (1997 and 2009) to provide additional protection to the stock and to help alleviate concerns over adequate subsistence opportunities to harvest the resource. For the Tenakee Inlet stock, 25% of the average unfished biomass was estimated using the same methods; however, because the resulting value was lower than the 3,000-ton threshold that existed at that time, the existing threshold was retained as a precaution (Carlile 1998b). For all other stocks in Southeast Alaska, thresholds were established using a less quantitative approach, which entailed reviewing historical estimates of abundance, historical knowledge of stock size fluctuation and distribution, and manageability of minimum quotas. Threshold levels during the 2023–2024 season ranged from 2,000 tons (Hoonah Sound and Hobart Bay) to 25,000 tons (Sitka Sound).

Management Plan

The following management plan was in place for the 2023–2024 Southeast Alaska commercial herring fisheries. It was adopted by the Alaska Board of Fisheries at its January 1994 meeting.

5 AAC 27.190. Herring Management Plan for Southeastern Alaska Area. For the management of herring fisheries in the Southeastern Alaska Area, the department

(1) shall identify stocks of herring on a spawning area basis;

(2) shall establish minimum spawning biomass thresholds below which fishing will not be allowed;

(3) shall assess the abundance of mature herring for each stock before allowing fishing to occur;

(4) except as provided elsewhere, may allow a harvest of herring at an exploitation rate between 10 percent and 20 percent of the estimated spawning biomass when that biomass is above the minimum threshold level;

(5) may identify and consider sources of mortality in setting harvest guidelines;

(6) by emergency order, may modify fishing periods to minimize incidental mortalities during commercial fisheries.

Additionally, the following regulation was in effect to set harvest levels in Sitka Sound:

5 AAC 27.160 Quotas and guideline harvest levels for Southeastern Alaska Area.

(g) The guideline harvest level for the herring sac roe fishery in Sections 13-A and 13-B shall be established by the department and will be a harvest rate percentage that is not less than 12 percent, not more than 20 percent, and within that range shall be determined by the following formula:

$$\text{Harvest Rate Percentage} = 2 + 8\left[\frac{\text{Spawning Biomass (in tons)}}{20{,}000}\right]$$

The fishery will not be conducted if the spawning biomass is less than 25,000 tons.

Although there are several other regulations within the Alaska Administrative Code that pertain to specific herring fisheries in Southeast Alaska, the above general management plan represents the over-arching requirements for setting harvest levels for herring fisheries in the region.

RESULTS

Aerial and Skiff Surveys

Aerial and skiff surveys of herring activity, herring spawn, and marine mammal/bird activity were conducted beginning on March 15, 2024, in Sitka Sound and ending on May 2, 2024, in Seymour Canal and Tenakee Inlet areas. Notes of activity related to herring or herring spawning were recorded in aerial survey logs (see Appendix C). Surveys or observations were conducted by staff from each area office (Ketchikan, Petersburg, Sitka, Juneau, Haines, and Yakutat) and covered important or traditional herring spawning locations within each management area. Occasionally, private pilots or local residents may report observations of active spawning. Spawning timing for each monitored spawning area, including dates of first, last, and major spawning events, is summarized in Figure 13. ADF&G may also at times complete aerial surveys of Annette Island Reserve while en route to other spawning areas located in state waters.

The total documented spawn for major spawning areas (see Table 1) in state waters where aerial and skiff surveys were conducted in Southeast Alaska and Yakutat in 2024 was 143.8 nmi. This did not include spawning around numerous minor spawning areas in Southeast Alaska or Yakutat (see Appendix C for a detailed accounting of other minor spawn areas throughout Southeast Alaska). The highest levels of spawn were observed in the Sitka Sound area (85.2 nmi) and in the Craig area (23.8 nmi). Spawning observed in other survey areas ranged from 0 nmi in Hoonah Sound to 10.6 nmi for the Tenakee Inlet spawning stock.

SPAWN DEPOSITION SURVEYS

During spring 2024, spawn deposition dive surveys were conducted only in Sitka Sound, Craig, Kah-Shakes/Cat Island, and Tenakee Inlet spawning areas. The first survey was conducted in the Kah Shakes/Cat Island area April 4-5, followed by the Craig area April 6-7, Sitka Sound April 9-15, and Tenakee Inlet on April 5 (Table 1). Egg estimates by transect for each spawning area are presented in Table 4.

Due to low levels of observed spawning or suspended surveys due to funding constraints, spawn deposition surveys were not conducted in 2024 in several historically surveyed areas, including Seymour Canal, Lynn Canal, Hoonah Sound, West Behm Canal, Ernest Sound, and Hobart Bay–Port Houghton. Additionally, there are several other minor spawning areas where partial aerial surveys may have been conducted but no spawn deposition dive surveys were completed due to the low level of spawning, or in the case of some areas, because surveys conducted in previous years (e.g., Bradfield Canal) revealed that only a narrow band of spawning habitat exists resulting in relatively low egg deposition and little chance for finding a significant biomass (see Appendix C).

In the Sitka Sound and Craig areas, egg deposition estimates in 2024 were relatively high—each the 5th highest on record. In Sitka Sound the decrease from 19.9 trillion eggs to 14.8 trillion eggs was due primarily to small to moderate decreases in egg density, which decreased from 1,395,411 eggs/m^2 in 2023 to 1,099,510 eggs/m^2 in 2024, and egg deposition area, which decreased from 12,837,517 m^2 in 2023 to 12,129,835 m^2 in 2024. In Craig, the egg deposition estimate increased in 2024 from 4.0 trillion to 4.5 trillion eggs, which was attributable to small increases in both spawn zone area (4,043,624 m^2 to 4,088,777 m^2), and egg density, from 887,127 eggs/m^2 in 2023 to 991,899 eggs/m^2 2024. In the Kah Shakes/Cat Island area the egg deposition estimate of 0.7 trillion eggs was well above the recent 20-year mean of 0.4 trillion, but well below historical estimates of the 1980s which commonly were 1 trillion or greater. In the Tenakee Inlet area, the egg deposition estimate of 0.7 trillion eggs was also well above the recent 20-year mean of 0.4 trillion, but well below the historical peak of 1 trillion in 1998. A summary of the 2024 survey results, including spawn mileage, average transect length, area of egg deposition, egg density, estimated egg deposition, and estimated spawning biomass is presented in Table 5. For comparison of 2024 spawning stock abundance to prior years, estimates of historical spawning biomass are presented in Figures 14–19.

Visual Estimate Correction

Minimum sample size guidelines (at least 6 samples per vegetation type for 2 of last 3 years) were met for all estimators. Correction coefficients applied to 2024 spawn deposition visual estimates ranged from 0.60 to 1.82 and are presented in Table 6.

Visual review of plots depicting observed versus laboratory estimates of eggs suggest there exist linear relationships for some estimators, but nonlinear relationships for others caused by a tendency to underestimate when egg numbers in sample frames are high. A similar nonlinear pattern has been observed for aerial estimates of salmon in streams (see Jones et al. 1998); however, correction coefficients in that study were calculated as straight ratios of known to estimated values. For herring egg correction coefficients presented here, values were calculated as an overall ratio of values summed across the entire range of lab-estimated and visually estimated values, which was considered to adequately correct visual estimates. If nonlinear relationships exist, the result would be that estimates of egg abundance may be underestimated.

AGE AND SIZE

A combined total of 6,038 herring were sampled from all stocks and gear types (cast net, purse seine, and pound) during the 2023–2024 season. Of those, 5,936 herring were processed to determine age, weight, length, and sex, for those herring age-3 or greater. The reduction of sample size was due to exclusion of age-1 and age-2 herring, the occurrence of fish that could not be aged due to regenerated scales, or data that was otherwise unusable.

Samples of the spawning herring at Sitka Sound, Craig, Kah Shakes/Cat Island, Seymour Canal, Ernest Sound, Tenakee Inlet, Yakutat, Chilkoot Inlet were taken using cast nets. Samples from Craig and Sitka Sound were collected throughout the geographic extent of the active spawn (Figures 20, 22), and throughout the duration of spawning (Figure 13), focusing on the most intense spawning events when feasible. Other spawning areas were sampled less frequently and more sporadically, as weather and time permitted, and may not have captured the full spatial or temporal range of spawning (Figures 24-30).

Samples were also obtained from all commercial fisheries that were conducted in 2023–2024. Fisheries sampled included Sitka Sound sac-roe, Craig winter bait, and Craig spawn on kelp. Samples were obtained opportunistically from vessels or tenders during, or shortly after, the fishery openings. Sample locations during fisheries are shown in Figures 20 and 22.

The minimum sample goal of 500 aged fish per sampling event (gear-fishery combination) was met or exceeded for most areas/fisheries where samples were obtained but was not achieved for Seymour Canal, Ernest Sound, Tenakee Inlet, Chilkoot Inlet or Yakutat (Table 7). For Tenakee Inlet and Chilkoot Inlet areas, sample sizes were far below the minimum and therefore age composition results are not reported.

Age Composition

Age composition samples were obtained for 8 spawning areas in the region in 2024: Sitka Sound, Craig, Revilla Channel, Seymour Canal, Ernest Sound, Tenakee Inlet, Chilkoot Inlet, and Yakutat Bay. However, the sampling goal was not achieved for 4 of these areas (Seymour Canal, Tenakee Inlet, Chilkoot Inlet, and Yakutat). Of these, only data for Seymour Canal and Yakutat are presented, because sample sizes were at least 300 fish, which do not meet the sample goal of 500 but were deemed large enough to provide informative age compositions—albeit interpreted with caution. Because sample sizes for Tenakee Inlet and Chilkoot Inlet were well below 300, the data are not presented. Samples were not obtained from Hobart Bay-Port Houghton, Hoonah Sound, Lynn Canal, or West Behm Canal due to low levels of observed spawn, funding constraints, or inability to sample due to weather or other circumstances. Frequency distributions of herring ages from sampled spawning areas are presented in Tables 8–14 and Figures 31–35.

Observed age distributions among sampled areas share a high proportion of age-4 herring, indicating that the 2020-year class was relatively strong throughout Southeast Alaska. In some areas the 2016 age class was still very prominent as age-8 in 2024, particularly for outer coastal stocks including Sitka, Craig, and Yakutat. In other areas, the proportion of age-4 herring exceeded age-8 (such as Kah Shakes–Cat Island, Ernest Sound, and Seymour Canal). For several areas, there appears to have been substantial age-3 recruitment, including Sitka, Craig, Kah Shakes–Cat Island, Tenakee Inlet, and Seymour Canal. For perspective, historical age compositions of spawning populations are presented in Figures 36–45.

Based on observed proportions of age-3 herring in 2024, recruitment appears to have been relatively low among areas. In 2024, age-3 proportions observed in sampled spawning populations ranged from 3–18%. It is important to differentiate between the proportion of age-3 herring and absolute recruitment; the proportion may be an indicator of recruitment but cannot accurately describe the absolute numbers of newly recruited fish because it is relative to all other age groups. Therefore, what appears to be low recruitment based on the proportion of age-3 herring, may be misleading due to the strong age-4 age class (and high proportion). The strength of the 2024 recruitment will only be known through population modeling (which is not the focus of this report) and waiting to observe the year class from future sampling.

The proportions of age-3 herring entering the mature population each year seem to fluctuate in a similar, cyclical pattern among stocks in the region; high and low years are synchronized in many instances in magnitude, trajectory, or both (Figure 46). When northern and southern stocks are considered separately, the synchronized pattern is even more apparent within each group. For example, in 2015 a very high proportion of age-3 herring was observed for all stocks; however, in 2016 a relatively low to moderate proportion of mature age-3 herring were observed in most spawning areas. It appears that age-3 proportions for spawning areas in 2024 were considerably lower than those observed in 2023, and in all cases were below the median recruitment observed over the last few decades.

Size at Age

Based on cast net samples in 2024, there remains a clear distinction between mean weight-at-age for Sitka Sound and other spawning stocks of herring in Southeast Alaska (Figure 47). Although several stocks had similar weight at age-3, including Sitka Sound, by age 5 Sitka Sound herring attained a higher average weight than other stocks and the divergence increased with each age group. In 2024 herring samples from another outer coastal stock, Yakutat Bay, were obtained, revealing the most comparable weight at age to Sitka Sound herring.

Mean length-at-age among spawning areas has a similar pattern to weight-at-age. Although the distinction between Sitka Sound herring mean length-at-age and other Southeast Alaska stocks is visually apparent, it is not as great as observed for mean weight-at-age (Figure 48). Length at age for Sitka Sound and Yakutat Bay herring is very similar, especially for younger age groups.

Trends in weight-at-age over time are variable among stocks (Figures 49–58). For most stocks, a common pattern is evident: weights of age-3 herring have been relatively stable over the past few decades, whereas those of older ages appear to have gradually declined. The decline appears to be more pronounced for the oldest age classes. The current range of mean weight among age classes appears narrower than what it was 3 decades ago. Although the mean weight-at-age of herring is less now than it was 30 years ago, weight generally declined during the late 1980s to the early to mid-2000s but then appears to have stabilized over the past 15 years for most stocks. The exception is Sitka Sound, where weight-at-age appears to have remained relatively stable over the past 20 years; however, this followed a period of low weight-at-age in the early 1990s, a time when anecdotally herring had been described as “pencil herring”. Data presented here only date back to the late 1980s, which coincided with the period of low weight and low condition of Sitka area herring. Observed weight at age in 2024 appears to be similar to 2023 for most stocks and age classes.

To understand whether changes in weight-at-age are due solely to body mass or instead (or also) due to changes in length-at-age, it is helpful to calculate condition factors. Condition factors have been calculated to roughly gauge herring health using the physical dimensions of herring (i.e., weight-to-length ratio) over time (Figures 59–68). Data obtained from cast net samples during active spawn events were used to calculate condition factors, because a more complete and consistent data set exists for cast net samples than commercial samples, allowing easier comparison among stocks. Weight estimates derived from samples taking from actively spawning herring probably produce lower average values that contain more variability than would be expected from pre-spawning fish sampled during the commercial fishery; however, the overall trends in condition factor are expected to be the same. Another benefit of using data from cast net samples is that bias is expected to be lower than for fishery-dependent data that may be influenced by selection of larger fish.

Mean condition factors of herring from most stocks on Southeast Alaska follow the same general pattern over the last two decades: relatively low in the early 1990s and peaking in the early 2000s, followed by a decline until about 2007. Starting in 2008, condition factors for most stocks increased sharply, peaking in 2010, and then declined sharply to 2012. The condition factors calculated for 2024 for stocks where data was available are relatively high, comparable to those of 2023, and indicate a continued increase over the past few years.

COMMERCIAL FISHERIES

Commercial harvest was permitted in an area only if the forecasted spawning biomass met or exceeded a minimum threshold (Table 15). If that threshold was met or exceeded, then a sliding-scale harvest rate of between 10 and 20 percent of the forecasted spawning biomass was calculated to determine the appropriate harvest level. For Sitka Sound, the allowable harvest rate ranges from 12 to 20 percent of the forecasted spawning biomass.

During the 2023–2024 fishing season, only 3 commercial herring fisheries were conducted in Southeast Alaska, from two spawning areas, Sitka Sound and Craig. Products resulting from these fisheries included sac-roe, food and bait, and spawn on kelp. A summary of locations, harvest levels, and periods of harvest is presented in Table 16.

Sac Roe Fisheries

The only commercial sac roe fishery in 2024 was conducted in the Sitka Sound area. There were no sac-roe fisheries announced for Seymour Canal, West Behm Canal, Hobart Bay–Port Houghton, or Kah Shakes–Cat Island areas. The absence of fisheries in these areas was because estimates of spawning biomass and forecasts were not conducted, primarily due to low levels of observed spawn. Lynn Canal was historically a sac roe fishery area; however, the Board of Fisheries rescinded regulations allowing a fishery in that area at its January 2018 meeting in Sitka.

Sitka Sound

In Sitka Sound the 2024 forecast was 406,228 tons, and the guideline harvest level (GHL) was set at 81,246 tons; each of these values were record highs for the Sitka Sound sac roe fishery. The GHL was calculated based on the maximum allowable 20% of the SCAA-forecasted biomass. No decrements were made to the GHL, as had been done in recent years when GHLs were lowered as a precaution to account for the higher than usual uncertainty in the forecasted return of the unprecedented large 2016 age-class.

The fishery went on 2-hour notice on March 20, 2024, at 8:00am. Beginning with the first fishery opening on March 22, 2024, the fishery was opened for 14 days, closing on April 5, 2024. The landed catch totaled 12,678 tons, with an average mature roe percentage of 11.6%. The catch represented 16% of the GHL. Landings were made by 23 of the 47 active permit holders for the fishery.

Seymour Canal

There was no commercial fishery in the Seymour Canal area during the 2023–2024 season, because no stock assessment survey or forecast was conducted due to low levels of observed spawn.

West Behm Canal

There was no commercial fishery in the West Behm Canal area during the 2023–2024 season, because no stock assessment survey or forecast was conducted due to low levels of observed spawn.

Hobart Bay-Port Houghton

There was no commercial fishery in the Hobart Bay–Port Houghton area during the 2023–2024 season, because no stock assessment survey or forecast was conducted due to low levels of observed spawn.

Kah Shakes–Cat Island

There was no commercial fishery in the Kah Shakes–Cat Island area during the 2023–2024 season. A stock assessment survey was conducted and although results suggested that the biomass may be above threshold, a forecast was not conducted because there was no intention to open a commercial fishery without multiple years of biomass exceeding the threshold.

Winter Bait Fisheries

During the 2023–2024 season, the only winter food and bait fishery was in the Craig area. All other winter bait areas were closed due to low levels of observed spawn.

Craig

The fishery was opened in the Craig area on October 1, 2023, and was closed by regulation on February 28, 2024. The bait allocation was 4,030 tons, which was by regulation 60% of the total GHL of 6,716 tons. Harvest amount is confidential due to fewer than 3 participants in the fishery.

Ernest Sound

There was no commercial fishery in Ernest Sound during the 2023–2024 season due to low levels of observed spawn and reduced funding.

Tenakee Inlet

There was no commercial fishery in Tenakee Inlet during the 2023–2024 season due to low levels of observed spawn and reduced funding.

Spawn-on-Kelp Pound Fisheries

In the spawn-on-kelp (SOK) fisheries, closed-pound fishing involves capturing reproductively mature herring and releasing them into a net impoundment within which kelp is suspended. The herring are released from the pound after they spawn on the kelp and the kelp with eggs is then sold. Open-pound fishing involves suspending kelp from a floating frame structure in an area where herring are spawning. The herring are not impounded but instead they naturally spawn on the suspended kelp. The kelp blades with eggs are removed from the water then sold. In the Southeast Alaska herring SOK fisheries, a closed or an open pound may be operated by one or more Commercial Fisheries Entry Commission (CFEC) permit holders (Coonradt et al. 2017).

These fisheries present unique challenges to fishery management, primarily because herring are released alive after spawning in pounds, which makes determining herring usage and mortality difficult to estimate. Attempts have been made to estimate the amount of herring placed into pounds by brailing and weighing herring from pounds instead of releasing after spawning; however, these were largely unsuccessful due to low sample size of pounds and uncertainty about herring losses (e.g., to sea lion or eagle predation) prior to brailing. Estimates of herring use in SOK pounds have been completed in Prince William Sound (PWS) by measuring egg deposition on kelp and pound webbing, egg retention within herring, and herring fecundity to back calculate the number of herring (Morstad and Baker 1995; Morstad et al. 1992). These studies found that approximately 12.5 tons of herring are used for each ton of spawn-on-kelp product. However, because mean pound size in PWS fisheries is substantially larger than those used in Southeast Alaskan fisheries, this ratio may not be directly comparable. Nevertheless, because no studies have been completed in Southeast Alaska, this conversion is used to approximate herring usage for Southeast Alaska pound fisheries, particularly when reporting estimates over time, for comparability. Other estimates as to the amount of herring in pounds have also been used, which are based on observations of fishery managers during fisheries. These estimates have ranged from 10 to 20 tons of herring per closed pound structure and have been used as inputs to stock assessment models. To estimate herring dead loss from pounds, a mortality rate of 75% is assumed for herring that are placed into pounds. The 75% value is arbitrary but is intended to be conservative by assuming that a large proportion of impounded herring may die, but also recognize that some impounded herring that are eventually released will survive.

The only area open to the commercial harvest of SOK during the 2023–2024 season was Craig. The other SOK areas in the region, Hoonah Sound, Ernest Sound, and Tenakee Inlet, were not opened during the 2023–2024 season because surveys and forecasts were not conducted, primarily due to low levels of observed spawn in 2023.

Craig

A total of 33 closed pounds were actively fished by a total of 60 permit holders. Of the 33 closed pounds, there were 6 single and 27 double-permit pounds. No open pounds were fished. Total harvest was 93 tons of spawn on kelp.

Hoonah Sound

There was no commercial fishery in Hoonah Sound during the 2023–2024 season due to low level of observed spawn.

Ernest Sound

There was no commercial fishery in Ernest Sound during the 2023–2024 season due to low level of observed spawn.

Tenakee Inlet

There was no commercial fishery in Tenakee Inlet during the 2023–2024 season due to low level of observed spawn.

Bait Pound (Fresh Bait and Tray Pack) Fisheries

During the 2023–2024 season, there was one area with harvest of herring for fresh bait pounds or tray-pack in Southeast Alaska, which was Sitka Sound. A total of 2 tons of herring were harvested in this fishery.

Test Fisheries

There were 196 tons of herring harvested during a test fishery in Southeast Alaska during the 2023–2024. This fishery took place in Sitka Sound and herring were landed as winter bait.

DISCUSSION

SPAWN DEPOSITION

The combined observed spawning biomass estimated in 2024 for surveyed areas (Sitka Sound, Craig, Kah Shakes/Cat Island, and Tenakee Inlet), as converted from egg deposition estimates, was 254,024 tons. This estimate is about twice the mean biomass for all Southeast Alaska herring stocks combined and among the highest estimates of regional biomass since the department instituted a herring stock assessment program in 1971. This estimate is about 15% less than the 299,796 tons estimated for 2023. About 80% of the spawning biomass in Southeast Alaska has historically come from the Sitka Sound and Craig areas. Sitka Sound observed spawning biomass decreased by 26% in 2024 relative to 2023, and Craig increased by 13%, but they both remain at high levels relative to historical estimates made by ADF&G over the last several decades. Because error estimates surrounding the biomass estimates were not calculated, it is unknown if the magnitudes of these changes were large enough to reflect biologically and statistically significant changes in the spawning population levels.

The combined spawn deposition estimates for 2024 suggest that, as a whole, herring spawning biomass in Southeast Alaska remains among the highest levels since consistent regional estimates began around 1980. This supposition is made despite only surveying 4 stocks in 2024, considering that Sitka Sound and Craig have historically made up a large proportion of the region's biomass. However, other herring spawning areas in the region remain at low levels and in some cases very low levels compared to historical estimates. This is particularly true for inside water stocks.

The cause of disparate biomass levels observed for outside and inside water herring stocks remains unknown. Between about 2011 and 2016, herring spawning stocks located in inside waters collectively underwent a sharp decline in spawning levels and biomass, while spawning stocks along the outer coast did not undergo the same decline. This decline followed a period of building from about the late 1990s, which peaked during 2008–2011. Coincident with the decline were reductions to state budgets, which has prevented full annual stock assessment surveys for most herring stocks in the region beginning in 2016—although low spawning levels also contributed to the lack of traditional egg deposition dive surveys. Stock assessment surveys have continued uninterrupted for only the 2 largest stocks, Sitka Sound and Craig, and so firm conclusions cannot be made about broader herring biomass trends throughout the region. Limited aerial surveys have continued in most areas, which have provided some information about stock levels; however, miles of shoreline do not necessarily provide an accurate depiction of spawning biomass. Nonetheless, based on spawn mileage alone, herring stocks in the region other than Sitka and Craig continue to remain at low levels in 2024, relative to the past few decades. This continued pattern suggests that outer coastal stocks are faring far better than those located in inside waters, which are less exposed to open ocean influence. It is unclear why this pattern persists. Herring population abundance is known to fluctuate dramatically and is susceptible to environmental influences (e.g., Toresen 2001). The underlying causes for the simultaneous overall increase in herring biomass in Sitka Sound and Craig and the general decline in other stocks since 2011 may be due to multiple factors. Contributing factors may include increasing populations of predatory marine mammals, such as humpback whales and Stellar sea lions (Muto et al. 2016, Fritz et al. 2016); varying levels of predatory fish or possibly squid; or recent shifts in water temperatures, which could affect herring food sources, life history, spawn timing, and metabolism. Of course, another contributing factor may be lasting effects of commercial fishing. Although commercial fishing has occurred during some years for some inside water stocks, the similarity in declines of these stocks, which for some occurred in the absence of fishing (e.g. West Behm Canal, Lynn Canal), suggests that the declines may have a substantial environmental influence. Additionally, the fact that the Sitka and Craig stocks have not decreased as inside water stocks have (and have even been at record high levels in recent years), despite undergoing the most frequent fisheries and often the highest harvest rates allowable (unlike inside water stocks), further clouds the possibility that commercial harvest has been solely responsible for the decline of inside water stocks.

Although the changes observed for Sitka and Craig spawning biomass over the past year may be due to actual changes in the herring population levels, there is also a chance that the changes are at least partly a function of estimate variation, or a combination of both. Because error estimates were not calculated for spawn deposition estimates, it is possible that the changes in biomass were due, at least in part, to estimate error.

Estimates of observed spawning biomass presented in this report are based primarily on egg deposition estimates (as opposed to model-derived results), and are presented here solely to provide a general, broad-brush view of trends in mature herring biomass. These estimates should not necessarily be considered the most accurate estimate of biomass in any given year. For all herring stocks in Southeast Alaska, when available, the results of SCAA or biomass accounting models are considered to provide more reliable estimates of spawning biomass and are the basis for forecasting herring abundance and setting harvest levels. A primary reason that the SCAA model provides more reliable estimates is that it incorporates several other sources of data and information, such as age composition, catch, and fecundity, and it combines a long time series of data to estimate spawning biomass. Spawn deposition-derived estimates rely on only a single year of spawn deposition data. An advantage of using biomass estimates derived from spawn deposition is that they provide a time series of fixed historical values, as opposed to SCAA hindcast estimates derived from single-model runs, which may be less intuitive because they change with each model run. Additionally, in some years modeling may not be completed for some stocks due to inadequate data or a very low level of spawning, which may leave gaps in the time series of estimates. Because spawn deposition surveys are conducted annually, biomass estimates derived from egg deposition provide a consistent and comparable time series to gauge trends.

AGE COMPOSITION

Age compositions of most sampled spawning areas in 2024 revealed that the exceptionally strong 2016 age-class is no longer dominant but still prominent as age-8 herring. This very strong year class has been reported for herring populations in Kodiak and Prince William Sound, and historically similar broad-scale large recruitments have been observed in Sitka Sound and Prince William Sound (Carls and Rice 2007).

The specific mechanism that caused this recruitment spike over such a large scale is uncertain, but it was probably linked to a common pattern in ocean temperature. This cohort was hatched in spring 2016, which coincided with the tail end of an unusually warm water mass that circulated through the northern Pacific Ocean, commonly known as *the blob* (Gentemann et al. 2017). Although speculation, it is possible that elevated sea temperatures from the blob helped produce marine conditions favorable to larval and juvenile herring survival in 2016, ultimately leading to a large recruitment 3 years later when those fish first entered the spawning population. This "marine heatwave" was well known to have widespread effects on other species and marine communities across the North Pacific, although the implications to populations and the ecosystem are not yet fully understood (Ferriss and Zador 2020)

The relatively high proportions of mature age-8 herring observed in 2024 suggest that this cohort continues to be a large component of Southeast Alaska populations; however, this age-class is nearing the end of its prominence. In 2023 there appears to have been notable age-3 recruitment, with proportions of age-4 in 2024 approaching or exceeding those of age-8 herring for several stocks. One of the highest proportions of age-3 herring in 2023 was for the Sitka stock, where there was also an increase in observed spawning biomass, suggesting that this new age-class may replace the waning 2016 age-class as the most dominant. The high proportion of age-4 in 2024 confirms that this represents a strong year class. Age-3 proportions among sampled stocks in 2024 were generally low, suggesting that recruitment was not strong; however, over the next year or two, as more data is obtained, the strength of the recruitment should become more evident. Lacking biomass surveys, it is difficult to gauge the impacts of this new recruitment on inside water stocks.

For herring stocks sampled in 2024, estimates of age composition continued to follow patterns that are generally expected from tracking previous cohorts; that is, the proportion of cohort sizes either grew or declined because of increases due to maturation or decreases due to natural mortality and no surprising or abrupt changes were observed in relative cohort strength (see Figures 34–43). These patterns also lend support to the assumption that the method of aging scales from 2024 samples was consistent with those methods used in prior years, which has been a concern in prior years (see Hebert 2012a and 2012b).

Historical patterns of age composition, particularly proportions of age-3 herring, continue to be present among stock groups within the region, suggesting that similar marine conditions may be present among certain areas within the region (Figure 46). The proportion of mature age-3 herring within each stock appears to be correlated to the latitude of the spawning stock. There continues to be 2 broad areas within the region where the mean proportion of age-3 herring is similar. For stocks south of latitude 56 degrees (i.e., those in the lower half of the region: Craig, West Behm Canal, Ernest Sound, and Kah Shakes–Cat Island), the mean proportion of age-3 herring is relatively high, but for stocks at 57 degrees and northward (Sitka, Hobart Bay, Seymour Canal, Hoonah Sound, Tenakee Inlet, and Lynn Canal), the proportions are relatively low. The strength of the 2019 age-3 pulse overrode the usual pattern seen among stocks on separate sides of the latitudinal split, further indicating that this age-class was exceptional. Proportions of age-3 observed in 2023 also appear to depart from the historical pattern. For all spawning areas from where age data was collected, the proportion of age-3 herring exceeded, sometimes greatly, the median of the past few decades, whether north or south of the latitudinal split.

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TABLES AND FIGURES

Table 1.–Historical dates of herring spawn deposition surveys in Southeast Alaska.

Year	Sitka	Craig	Ernest Sound	West Behm Canal	Revilla Channel	Hobart Bay	Seymour	Tenakee	Hoonah Sound	Lynn Canal
1976	5/1–6	—	—	—	4/13–24	—	—	—	—	—
1977	4/26–28	—	—	—	4/13–19	—	—	—	—	—
1978	4/18–21	—	—	—	4/10–11	—	5/14–16	—	—	5/2–4
1979	—	—	—	—	4/9–12	—	–	—	—	—
1980	—	—	—	—	4/7–11	—	5/15–16	—	—	5/13–15
1981	4/10–11	—	—	—	4/1–4	—	5/14–15	—	5/4	—
1982	4/13–22	—	—	—	4/4–18	—	5/24–25	—	—	—
1983	4/13–17, 29	—	—	—	4/5–11	—	5/9–11	—	—	5/6
1984	4/10–17	—	—	—	4/10–15	—	5/4	5/5–7	5/8	5/4
1985	*	*	*	*	*	*	*	*	*	*
1986	*	*	*	*	*	*	*	*	*	*
1987	*	*	*	*	*	*	*	*	*	*
1988	4/15–20	3/24–25	—	—	4/8–12	—	5/5–7	5/10–11	—	5/14
1989	4/10–16	4/7–9	—	—	—	—	5/17–19	5/10–12	4/18–19	—
1990	4/15–18	4/14	—	—	3/29–4/12	—	5/7–10	5/5–6	5/20–23	—
1991	4/25–27	*	*	*	*	*	*	*	*	*
1992	4/23–26	3/30, 4/18–21	5/2	—	4/14–17	5/10–11	5/9–10	—	5/5	—
1993	4/10–13	4/8	4/29–30	4/25–26	4/22–24	5/5	5/10–11	5/7–8	5/6	—
1994	4/8–11	4/18–19	5/6	5/4–5	4/15–17	5/7–8	5/12, 19	—	4/29–30	—
1995	4/7–10	4/6	5/2–3	—	4/20–22	5/4–6	5/23–24	—	4/27–28	—
1996	3/29, 4/2–4, 23–24	4/17–18	5/1	4/21	4/19–20	5/10	5/16, 29	5/15–16	5/12–13	—
1997	4/7–9	4/22–23	—	4/29–5/1	4/16–17	5/9	5/12–13	5/10–11	5/6–8	—
1998	4/1–3	4/12–14	4/22–23	4/20, 22–23	4/9	4/29–30	5/2, 8–9	5/5–7	5/4–5	—
1999	4/7–9	4/10, 20	—	4/16–17	4/14–15	4/4–5	5/11–12	5/7–8	5/9	—
2000	4/4–6	4/13–14	4/25	4/17–18	4/16–17	5/11	5/12–13	5/3–4, 6	5/7	—
2001	4/9–10	4/18–19	4/24	4/21–22	4/20	5/11–12	5/21–22	5/8–9	5/6–7	—
2002	4/8–11	4/16–18	4/21	4/19–20	—	5/10–11	5/30–31	5/3–4, 6	5/7	—
2003	4/8–11, 22	4/13–14	4/27	4/24–26	—	5/8–9	5/10	5/7	5/5–6	—

-continued-

Table 1.–Page 2 of 2.

Year	Sitka	Craig	Ernest Sound	West Behm Canal	Revilla Channel	Hobart Bay	Seymour	Tenakee	Hoonah Sound	Lynn Canal
2004	4/15–19	4/8–9	4/11, 21	4/19–20	—	5/9–10	5/11–12	5/7–8	5/5	5/13
2005	4/9–12	4/17–19	5/4	4/21	—	5/9–10	5/10–11	5/7	5/5–6	5/18
2006	4/7–8	4/10–11	4/14–15	4/29	—	5/7	5/10	5/8	5/4–5	5/26
2007	4/13–16, 24	4/18–19	4/24–25	4/23, 5/4	—	5/22	5/21	5/5	5/7	5/25
2008	4/10–14	4/15–16	5/2–3	4/18	—	5/13	5/16	5/10	5/7–8	5/21
2009	4/18–20	4/15–16	4/23	4/21–22	—	5/14–15	5/13–14	5/8–9	5/6–7	5/11–12
2010	4/16–19	4/14–15	4/22	4/20	—	5/5–6	5/7–8	5/11	5/9–10	5/12–13
2011	4/18–20	4/14–15	4/24	4/23	—	5/8–9	5/9–10		5/5–6	—
2012	4/13–16	4/21–22	4/24	4/23	—	5/5	5/12–13	5/8	5/7	5/10–11
2013	4/8–12, 5/2–5	4/14–15	4/17	4/16	—	5/8	5/13–14	5/11	5/12	5/10
2014	4/7–11, 24–26	4/13	4/22	4/15	—	5/1	5/10	5/7	5/8	5/9
2015	4/10–13, 5/6–7	4/8	4/21–22	—	4/6	5/5	5/11	5/9	5/6	5/10
2016	4/1–3, 20–21	4/8–9	4/26–27	—	—	—	5/8	—	—	5/7
2017	4/12–14, 28	4/7–8	—	—	—	—	5/15	—	—	—
2018	4/8–11, 24–25	4/13–14	—	—	—	—	—	—	—	—
2019	4/12–15	4/9–10	—	—	4/6	—	—	—	—	—
2020	4/4–6, 8–9	4/13–14	—	—	4/11	—	—	—	—	—
2021	4/17–21	4/15–16	—	—	4/11–12	—	—	—	—	—
2022	4/13–16	4/17–18	—	—	4/9	—	—	—	—	—
2023	4/11–15	4/17–18	—	—	—	—	—	—	—	—
2024	4/9–15	4/6–7	—	—	4/4–5	—	—	5/5	—	—

Note: En dashes represent years without surveys. Asterisks represent years where surveys were completed but records of dates are missing.

Table 2.–Transect minimum sampling rates used for 2024 herring spawn deposition surveys.

Area	Estimated target transects per nautical mile of spawn[a] Based on 1994 analysis	Based on 1997 analysis	Based on 2000 analysis	Average
Sitka	0.2	0.6	0.3	0.4
West Behm Canal	–	0.4	1.7	1.1
Seymour Canal	2.8	2.4	1.2	2.1
Craig	0.8	3.1	1.3	1.7
Hobart/Houghton	4.5	1.7	3.6	3.3
Ernest Sound	1.9	5.0	3.5	3.5
Hoonah Sound	2.9	1.0	0.7	1.5
Tenakee Inlet	5.1	1.2	1.6	2.6
Average	2.6	1.9	1.7	2.1

[a] Values represent the number of transects that will produce a lower bound of the one-sided 90% confidence interval that is within 30% of the mean egg density.

Table 3.–Fecundity relationships used for estimating 2024 herring spawning biomass for stocks in Southeast Alaska.

Sampling year	Stock sampled	Fecundity equation	Stocks to which fecundity equation is applied
2005	Sitka Sound	fecundity = –3032.0 + 198.8*weight	Sitka, Tenakee Inlet, Hoonah Sound
1996	Seymour Canal	fecundity = –1573.3 + 222.4*weight	Seymour Canal, Hobart Bay–Port Houghton, Lynn Canal
1996	Craig	fecundity = –1092.3 + 210.5*weight	Craig
1996	Kah Shakes–Cat Island	fecundity = –1310.0 + 202.1*weight	Ernest Sound, West Behm Canal

Table 4.–Herring egg estimates (in thousands) by transect for 2024 spawn deposition surveys conducted in Southeast Alaska. Frame counts are the number of quadrats estimated along each transect.

	Craig		Sitka Sound Kruzof Stratum		Sitka Sound Northern Stratum		Sitka Sound Southern Stratum		Revilla Channel		Tenakee	
Transect Number	Egg estimate	Frame count	Egg estimate	Frame count	Egg estimate	Frame count	Egg estimate	Frame count	Egg estimate	Frame count	Egg estimate	Frame count
1	6,916	65	846	38	1,424	20	0	1	1,586	32	1	2
2	2,350	25	480	21	4,940	11	3,002	28	2,467	34	247	5
3	2,432	36	6,709	53	2,641	14	78	1	272	4	0	1
4	1,478	31	8,118	64	4,024	16	483	10	120	15	222	7
5	5,879	45	7,747	74	774	11	22	3	1,355	31	1,995	40
6	7,042	35	0	1	3,569	17	192	8	111	6	2,756	20
7	230	16	5,840	44	4,464	22	0	1	0	1	3,451	41
8	9,752	34	0	1	68	5	0	1	1,942	18	564	17
9	2,726	44	3,071	59	12	3	33	3	0	1	0	1
10	905	37	2,533	12	94	4	51	5	366	13	912	16
11	9,635	32	1,539	29	177	5	29	5	624	19	901	9
12	6,103	48	11,857	47	122	12	6,843	30	121	4	1,127	13
13	453	11	1,848	29	2,111	11	1,319	16	981	31	0	1
14	1,460	14	5,430	80	946	12	846	18	771	20	30	9
15	1,422	16	4,179	62	354	11	2,679	6	1,970	35	0	1
16	46	11	6,948	32	337	8	2,372	17	394	18	21	5
17	539	4	2,557	38	1,694	17	1,820	23	1,787	19	226	6
18	322	6	862	17	394	4	4,947	56	276	20	65	5
19	472	21	1,197	41	568	15	782	10	1,640	33	1	3
20	3	4	4,527	77	733	14	1,590	10	102	14	97	6
21	582	7	286	12	656	17	179	5	11	11	—	—
22	281	7	485	34	326	11	2,020	26	2,683	22	—	—
23	82	21	0	1	503	26	89	4	94	9	—	—
24	579	10	0	1	1,111	14	2,082	15	171	4	—	—

-continued-

Table 4.–Page 2 of 2.

	Craig		Sitka Sound Kruzof Stratum		Sitka Sound Northern Stratum		Sitka Sound Southern Stratum		Revilla Channel		Tenakee	
Transect Number	Egg estimate	Frame count	Egg estimate	Frame count	Egg estimate	Frame count	Egg estimate	Frame count	Egg estimate	Frame count	Egg estimate	Frame count
25	364	2	898	12	158	10	202	7	239	6	—	—
26	240	12	—	—	15	4	2,062	23	593	12	—	—
27	146	3	—	—	99	8	14,072	27	454	12	—	—
28	0	1	—	—	675	17	1,030	11	426	17	—	—
29	0	1	—	—	0	1	4,346	14	1,381	22	—	—
30	793	19	—	—	150	7	1,319	13	6	4	—	—
31	1,865	21	—	—	—	—	—	—	—	—	—	—
32	28	3	—	—	—	—	—	—	—	—	—	—
33	25	5	—	—	—	—	—	—	—	—	—	—
35	62	4	—	—	—	—	—	—	—	—	—	—
35	381	6	—	—	—	—	—	—	—	—	—	—
36	441	11	—	—	—	—	—	—	—	—	—	—
37	1,303	29	—	—	—	—	—	—	—	—	—	—
38	2,593	8	—	—	—	—	—	—	—	—	—	—
39	—	—	—	—	—	—	—	—	—	—	—	—
40	—	—	—	—	—	—	—	—	—	—	—	—
Average	1,874	19	3,814	41	1,105	12	1,816	13	765	16	631	10
Total	65,592	657	76,287	819	33,140	347	54,487	397	22,942	487	12,616	208

Note: En dashes indicate no survey transects planned or completed.

Table 5.–Summary of results of herring spawn deposition surveys in Southeast Alaska for 2024.

Spawning stock	Number of transects completed	Average length of transects (m)	Observed spawn (nmi)	Area of survey (m^2)	Average egg density ($eggs/m^2$)	Total eggs in survey area (trillions)	Mean fish weight (g)[d]	Estimated fecundity of fish of mean weight	Estimated number of fish	Post-fishery mature biomass (tons)
Craig	38	93	23.8	4,088,777	991,899	4.506	109.8	22,010	409,474,622	49,538
Sitka Sound (total)[a]	85	76	85.2	12,129,835	1,099,510	14.819	127.7	22,352	1,325,961,545	186,644
Kruzof stratum	25	176	10.4	3,386,049	886,868	3.337	–	–	–	–
Northern stratum	30	58	33.9	3,630,939	955,037	3.853	–	–	–	–
Southern stratum	30	66	40.3	4,938,389	1,373,471	7.531	–	–	–	–
Post survey–Northern[b]	–	58	1.4	149,950	477,518	0.080	–	–	–	–
Post survey–Southern[b]	–	66	0.2	24,508	686,236	0.019	–	–	–	–
Kah Shakes/Cat Island	30	81	9.1	1,367,918	471,095	0.716	76.2	14,083	101,683,367	8,537
Seymour Canal	–	–	1.5	–	–	–	–	–	–	–
Ernest Sound	–	–	4.0	–	–	–	–	–	–	–
Hobart/Houghton[c]	–	–	0.5	–	–	–	–	–	–	–
Hoonah Sound[c]	–	–	0.0	–	–	–	–	–	–	–
Lynn Canal[d]	–	–	–	–	–	–	–	–	–	–
Tenakee Inlet[b]	20	52	10.6	1,020,822	606,537	0.688	84.7	13,808	99,648,755	9,305
West Behm Canal	–	–	4.2	–	–	–	–	–	–	–
Haines[e,f]	–		1.0	–	–	–	–	–	–	–
Yakutat Bay[d]	–	–	3.9	–	–	–	–	–	–	–
Total	173	–	143.8	18,607,352	–	20.729	–	–	1,936,768,290	254,024
Average	43	76	–	4,651,838	792,260	5.182	99.6	18,063	–	–

Note: En dashes indicate data not available due to lack of survey (no funding or little or no spawn observed), or a total/average is not appropriate.

[a] Observed spawn nm represents total unique shoreline with spawn; sum of 86.2 nm includes overlapping spawn between strata and post-survey.

[b] Not surveyed, but for Northern and Southern strata post survey spawn assumed 100% of transect length and 50% average egg density.

[c] Abbreviated spawn aerial survey conducted, so estimated mileage may not represent full spawning event.

[d] No spawn aerial survey conducted.

[e] Represents mean weight of fish (g) in spawning population, weighted by age composition.

[f] Spawn partially reported by public and partially confirmed by ADF&G observation.

Table 6.–Correction coefficients used for herring spawn deposition estimates in Southeast Alaska in 2024.

	Estimator[a]									
Kelp type	A	B	C	D	E	F	G	H	I	Average
Eelgrass	1.40	0.70	0.98	1.05	0.94	0.98	1.13	0.97	1.16	1.03
n =	30	20	30	30	30	30	30	30	30	29
Fucus	1.82	0.97	0.99	1.10	1.33	1.32	1.19	1.38	1.46	1.29
n =	30	21	30	30	30	30	29	31	30	29
Fir kelp	0.97	0.93	1.32	0.60	0.90	1.01	0.72	0.71	0.80	0.89
n =	27	18	27	27	27	27	27	28	27	26
Hair kelp	1.65	1.16	1.03	1.20	1.02	1.16	1.34	0.96	1.16	1.19
n =	30	20	30	30	30	30	30	30	30	29
Large brown kelp[b]	1.48	0.99	0.76	0.90	1.04	0.72	0.89	1.07	1.31	1.02
n =	26	19	29	28	29	29	29	26	29	27
Average	1.46	0.95	1.02	0.97	1.05	1.05	1.05	1.02	1.18	1.08

[a] Estimator identity is withheld to prevent results from altering estimating patterns in future years.

[b] Values are applied to genera *Agarum*, *Alaria*, *Costaria*, *Cymethere*, *Laminara*, *Saccharina*, and *Macrocystis*.

[c] Values are applied to estimates of eggs that are loose, on rock, or on unclassified kelp types.

Table 7.–Summary herring samples aged for Southeast Alaska stocks in 2023–2024.

	Commercial fishery			Survey	Test fishery	
Stock	Herring gillnet	Pound	Purse seine	Cast net	Purse seine	Total
Craig	–	543	610	729	–	1,882
Ernest Sound	–	–	–	479	–	479
Hobart/Houghton	–	–	–	–	–	–
Hoonah Sound	–	–	–	–	–	–
Lynn Canal	–	–	–	–	–	–
Seymour Canal	–	–	–	405	–	405
Sitka Sound	–	–	625	1,211	–	1,836
Tenakee Inlet	–	–	–	139	–	139
West Behm Canal	–	–	–	–	–	–
Revilla Channel	–	–	–	688	–	688
North Stephen Pass.	–	–	–	–	–	–
Chilkoot Inlet	–	–	–	190	–	190
Yakutat	–	–	–	317	–	317
Total	–	543	1,235	4,158	–	5,936

Note: En dashes indicate that no samples were collected due to lack of funding and/or observed spawning.

Table 8.–Summary of age, weight, and length for the Sitka Sound herring stock in 2023–2024.

		Age category						
Gear type/season	Parameter	3	4	5	6	7	8+	Total
Survey cast net – spring	number of fish	58	467	62	94	32	498	1,211
	percent age composition	5%	39%	5%	8%	3%	41%	100%
	average weight (g)	64.9	89.8	114.3	123.9	138.0	151.6	113.8
	standard dev. of weight (g)	12.6	20.5	22.5	23.1	18.3	26.9	20.6
	average length (mm)	169	184	199	203	211	215	197
	standard dev. of length (mm)	9.2	11.0	10.6	9.9	7.8	9.6	9.7
Commercial purse seine – spring	number of fish	36	280	32	50	15	212	625
	percent age composition	6%	45%	5%	8%	2%	34%	100%
	average weight (g)	69.8	96.9	115.5	136.4	151.3	161.7	121.9
	standard dev. of weight (g)	14.9	21.0	18.3	19.8	20.5	24.4	19.8
	average length (mm)	171	188	198	208	216	218	200
	standard dev. of length (mm)	10.7	12.0	8.7	7.9	8.2	9.7	9.5

Table 9.–Summary of age, weight, and length for the Craig herring stock in 2023–2024.

		Age category						
Gear type/season	Parameter	3	4	5	6	7	8+	Total
Survey cast net – spring	number of fish	23	295	42	64	13	292	729
	percent age composition	3%	40%	6%	9%	2%	40%	100%
	average weight (g)	64.1	83.5	94.0	102.3	109.7	119.8	95.6
	standard dev. of weight (g)	10.3	16.4	17.6	18.9	21.6	22.8	17.9
	average length (mm)	166	180	187	192	196	200	187
	standard dev. of length (mm)	6.9	9.1	9.6	8.7	11.2	10.0	9.3
Commercial pound – spring	number of fish	33	224	38	55	7	186	543
	percent age composition	6%	41%	7%	10%	1%	34%	100%
	average weight (g)	66.7	88.9	99.2	119.7	117.9	133.2	104.3
	standard dev. of weight (g)	9.7	16.6	18.6	23.5	20.2	25.9	23.9
	average length (mm)	166	182	188	198	196	203	185
	standard dev. of length (mm)	7.7	9.6	10.7	10.0	11.5	10.5	12.6
Commercial purse seine – winter	number of fish	39	265	50	74	7	175	610
	percent age composition	6%	43%	8%	12%	1%	29%	100%
	average weight (g)	60.8	87.1	102.4	117.7	103.4	135.5	101.2
	standard dev. of weight (g)	15.5	17.4	17.3	21.0	15.4	22.4	18.2
	average length (mm)	162	181	190	197	190	204	187
	standard dev. of length (mm)	13.0	11.1	9.4	9.8	6.7	9.6	9.9

Table 10.–Summary of age, weight, and length for the Seymour Canal herring stock in 2023–2024.

		Age category						
Gear type/season	Parameter	3	4	5	6	7	8+	Total
Survey cast net – spring	number of fish	48	144	131	19	3	60	405
	percent age composition	12%	36%	32%	5%	1%	15%	100%
	average weight (g)	52.1	72.9	72.3	86.0	73.4	89.5	74.4
	standard dev. of weight (g)	13.2	13.3	19.5	20.2	4.3	21.9	15.4
	average length (mm)	156	174	172	182	177	184	174
	standard dev. of length (mm)	11.1	8.5	13.6	12.7	3.6	12.0	10.2

Table 11.–Summary of age, weight, and length for the Kah Shakes/Cat Island herring stock in 2023–2024.

		Age category						
Gear type/season	Parameter	3	4	5	6	7	8+	Total
Survey cast net – spring	number of fish	93	363	43	144	4	41	688
	percent age composition	14%	53%	6%	21%	1%	6%	100%
	average weight (g)	54.9	71.0	85.3	90.0	110.2	108.5	86.7
	standard dev. of weight (g)	12.0	15.4	17.2	16.3	20.2	29.0	18.3
	average length (mm)	160	172	182	186	194	193	181
	standard dev. of length (mm)	10.2	10.2	8.0	9.6	8.3	12.3	9.8

Table 12.–Summary of age, weight, and length for the Tenakee Inlet herring spawning area in 2023–2024. Although samples were obtained, sample size was below that required for reliable estimate of age composition and therefore are not reported.

		Age category						
Gear type/season	Parameter	3	4	5	6	7	8+	Total
Survey cast net – spring	number of fish	–	–	–	–	–	–	139
	percent age composition	–	–	–	–	–	–	–
	average weight (g)	57.1	73.3	83.0	97.6	94.8	102.6	84.7
	standard dev. of weight (g)	10.3	10.7	14.1	20.2	10.7	19.0	14.2
	average length (mm)	163	176	183	192	187	194	182
	standard dev. of length (mm)	8.7	7.1	9.7	13.4	7.8	9.9	9.4

Table 13.–Summary of age, weight, and length for the Yakutat Bay herring spawning area in 2023–2024.

		Age category						
Gear type/season	Parameter	3	4	5	6	7	8+	Total
Survey cast net – spring	number of fish	34	86	56	29	16	96	317
	percent age composition	11%	27%	18%	9%	5%	30%	100%
	average weight (g)	66.3	90.2	110.0	117.4	133.7	131.8	108.2
	standard dev. of weight (g)	11.9	15.1	16.7	21.0	26.7	26.4	19.6
	average length (mm)	167	185	198	199	206	208	194
	standard dev. of length (mm)	8.1	9.0	8.2	8.0	10.0	10.4	9.0

Table 14.–Summary of age, weight, and length for the Ernest Sound herring spawning area in 2023–2024.

Gear type/season	Parameter	Age category 3	4	5	6	7	8+	Total
Survey cast net – spring	number of fish	85	325	33	23	2	11	479
	percent age composition	18%	68%	7%	5%	0%	2%	100%
	average weight (g)	46.8	53.7	62.8	65.4	83.4	66.5	63.1
	standard dev. of weight (g)	6.5	8.6	11.0	10.6	8.4	6.6	8.6
	average length (mm)	154	161	167	172	180	174	168
	standard dev. of length (mm)	6.4	6.8	8.6	6.6	1.4	4.8	5.8

Table 15.–Summary of age, weight, and length for the Chilkoot Inlet herring spawning area in 2023–2024. Although samples were obtained, sample size was below that required for reliable estimate of age composition and therefore are not reported.

Gear type/season	Parameter	Age category 3	4	5	6	7	8+	Total
Survey cast net – spring	number of fish	–	–	–	–	–	–	190
	percent age composition	–	–	–	–	–	–	–
	average weight (g)	52.8	73.7	81.4	87.9	92.7	96.8	80.9
	standard dev. of weight (g)	15.7	11.6	9.6	14.0	7.8	14.8	12.3
	average length (mm)	157	174	180	186	187	190	179
	standard dev. of length (mm)	12.0	8.9	7.9	10.0	7.2	8.5	9.1

Table 16.–Summary of Southeast Alaska herring target levels for the 2023–2024 season.

Area	Minimum spawning biomass threshold (tons)	Forecast (tons)	Target exploitation rate (%)[a]	Guideline harvest level (tons)
Craig	5,000	33,580	20.0	6,716
Ernest Sound	2,500	–	0.0	–
Hobart Bay–Port Houghton	2,000	–	0.0	–
Hoonah Sound	2,000	–	0.0	–
Seymour Canal	3,000	–	0.0	–
Sitka Sound	25,000	406,228	20.0	81,246
Tenakee Inlet	3,000	–	0.0	–
West Behm Canal	6,000	–	0.0	–
Lynn Canal	5,000	–	0.0	–
Kah Shakes–Cat Island	6,000	–	0.0	–

[a] Represents the total target exploitation for all fisheries on a particular stock; actual allocations by fishery are determined according to Alaska Administrative Code Title 5 under 5 AAC 27.160, 27.185, and 27.190.

Table 17.–Summary of commercial herring harvest during the 2023–2024 season. Confidential harvest due to fewer than three participants is indicated by "Confidential".

Fishery	Gear	Area	District	Opening[a]	Closing[b]	Harvest (tons)[c]
Winter food and bait	Purse seine	Craig	3/4	1 Oct 2023	28 Feb 2024	Confidential
Winter food and bait	Purse seine	Tenakee Inlet	12	Not open		–
Winter food and bait	Purse seine	Ernest Sound	7	Not open		–
Winter food and bait	Purse seine	Hobart Bay	10	Not open		–
Subtotal						Confidential
Sac roe	Purse seine	Sitka Sound	13	22 Mar 2024	5 Apr 2024	12,678
Sac roe	Purse seine	Lynn Canal	11	Not open		–
Sac roe	Gillnet	Seymour Canal	11	Not open		–
Sac roe	Gillnet	Hobart Bay	10	Not open		–
Sac roe	Gillnet	Kah Shakes	1	Not open		–
Sac roe	Gillnet	West Behm Canal	1	Not open		–
Subtotal						12,678
Spawn on kelp	Pound	Hoonah Sound	13	Not open		–
Spawn on kelp	Pound	Tenakee Inlet	12	Not open		–
Spawn on kelp	Pound	Ernest Sound	7	Not open		–
Spawn on kelp	Pound	Craig	3	17 Mar 2024	8 Apr 2024	93
Subtotal						93
Test fishery-bait	Purse seine	Sitka	13	31 Jan 2024	7 Feb 2024	196

[a] For spawn-on-kelp fisheries, represents when seining was opened.

[b] For spawn-on-kelp fisheries, represents end of removing spawn on kelp from pounds; for purse seine fisheries represents date of last opening.

[c] Values expressed in tons of whole herring, except for spawn-on-kelp fisheries, where values are tons of eggs-on-kelp product.

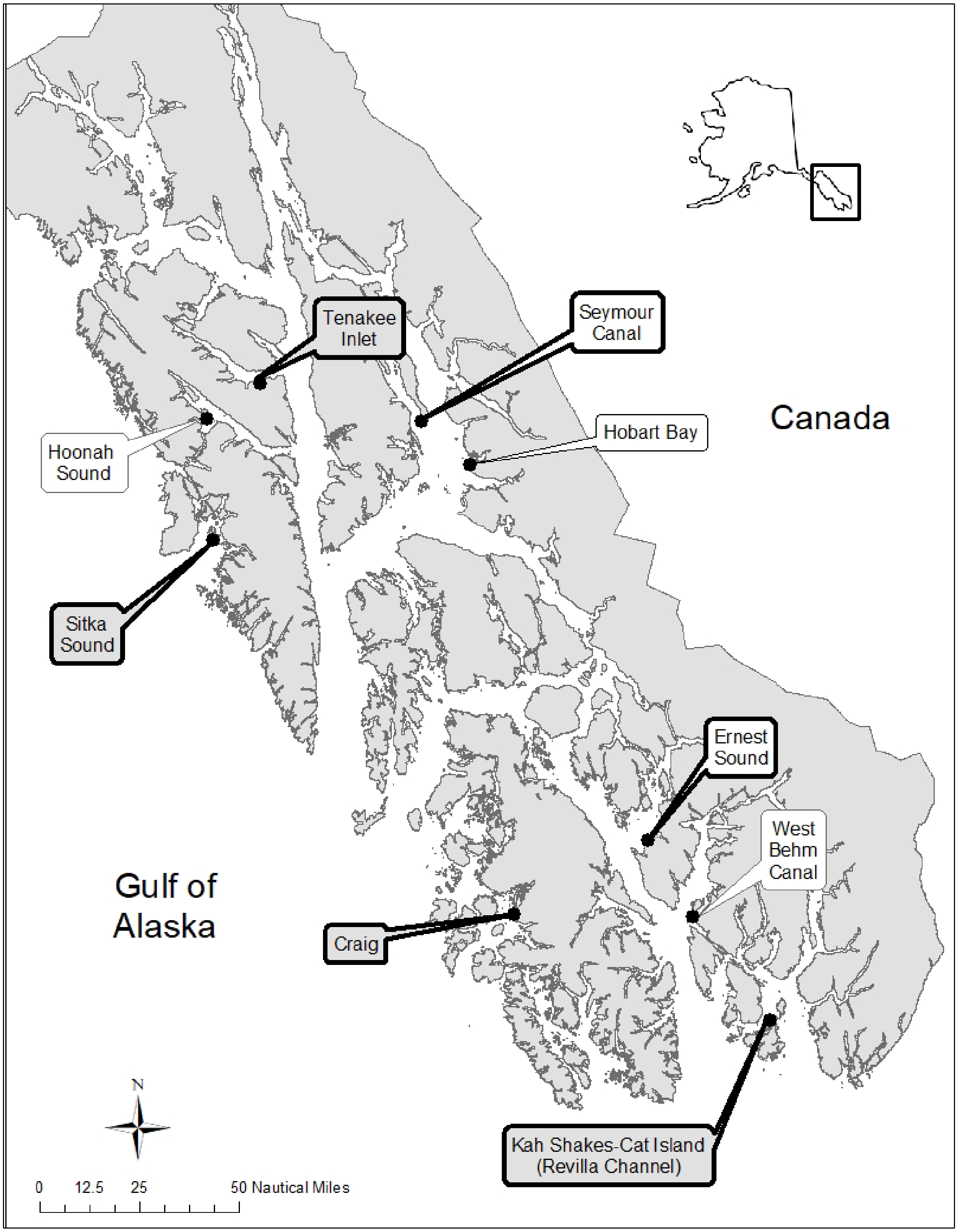

Figure 1.–Locations of monitored traditional herring spawning areas in Southeast Alaska. Labels with shading and bold outline indicate areas where spawn deposition surveys and age-size sampling were conducted during the 2024 spawning season; labels with only bold outline indicate only age-size sampling of herring was conducted during the 2024 spawning season; no sampling other than some aerial surveys were conducted in areas where labels have no shading or outline bolding.

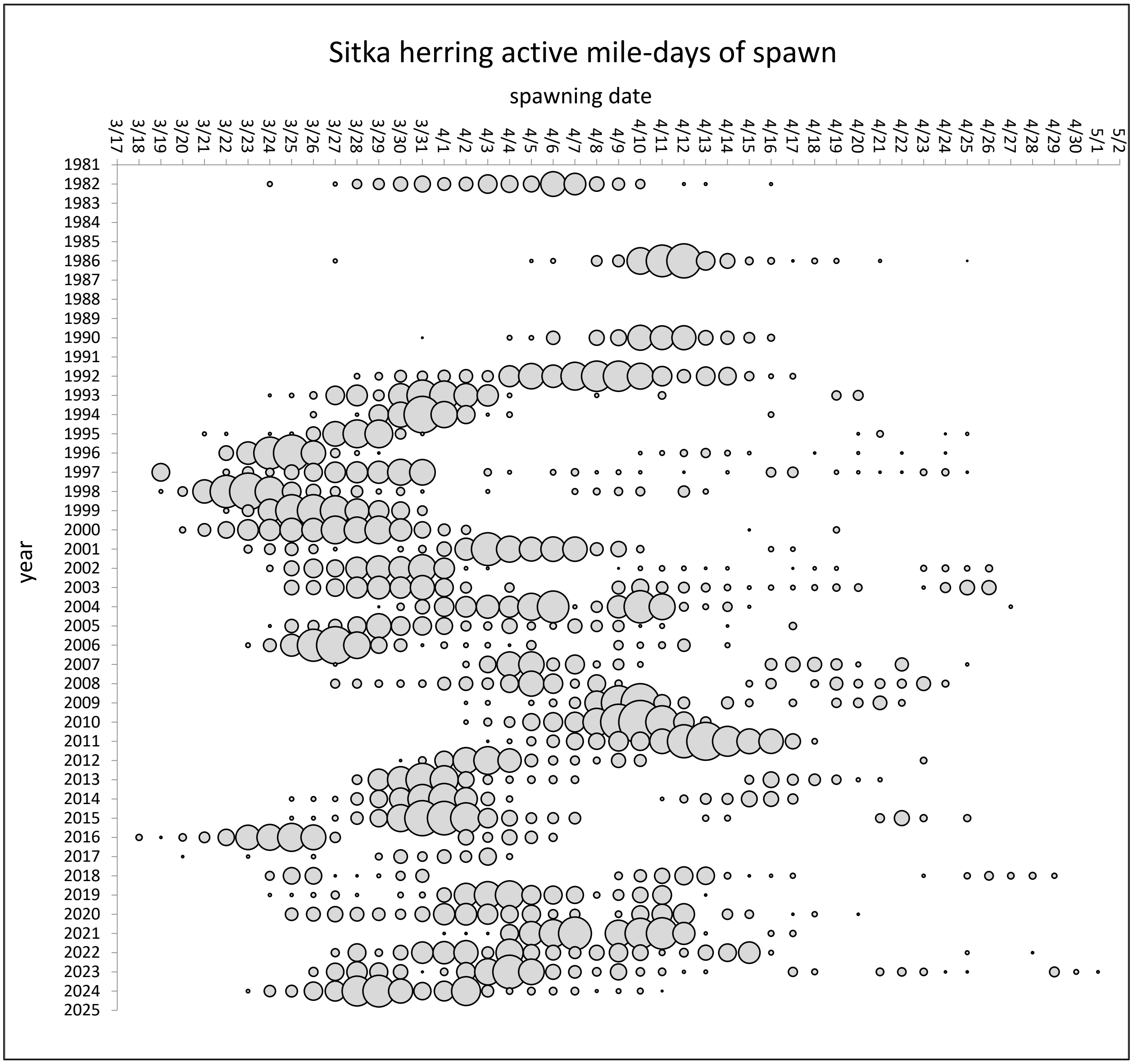

Figure 2.–Historical dates of active spawn observed for the Sitka Sound herring stock. The size of circles represents the total mileage of active spawn observed on each day, relative to all other days of spawn. For reference, the largest circle represents a day of 48 nautical miles of spawn and the smallest circles represent spot spawns, which here have been given an arbitrary value of 0.1 nautical mile. For entire years with blanks, data could not be located.

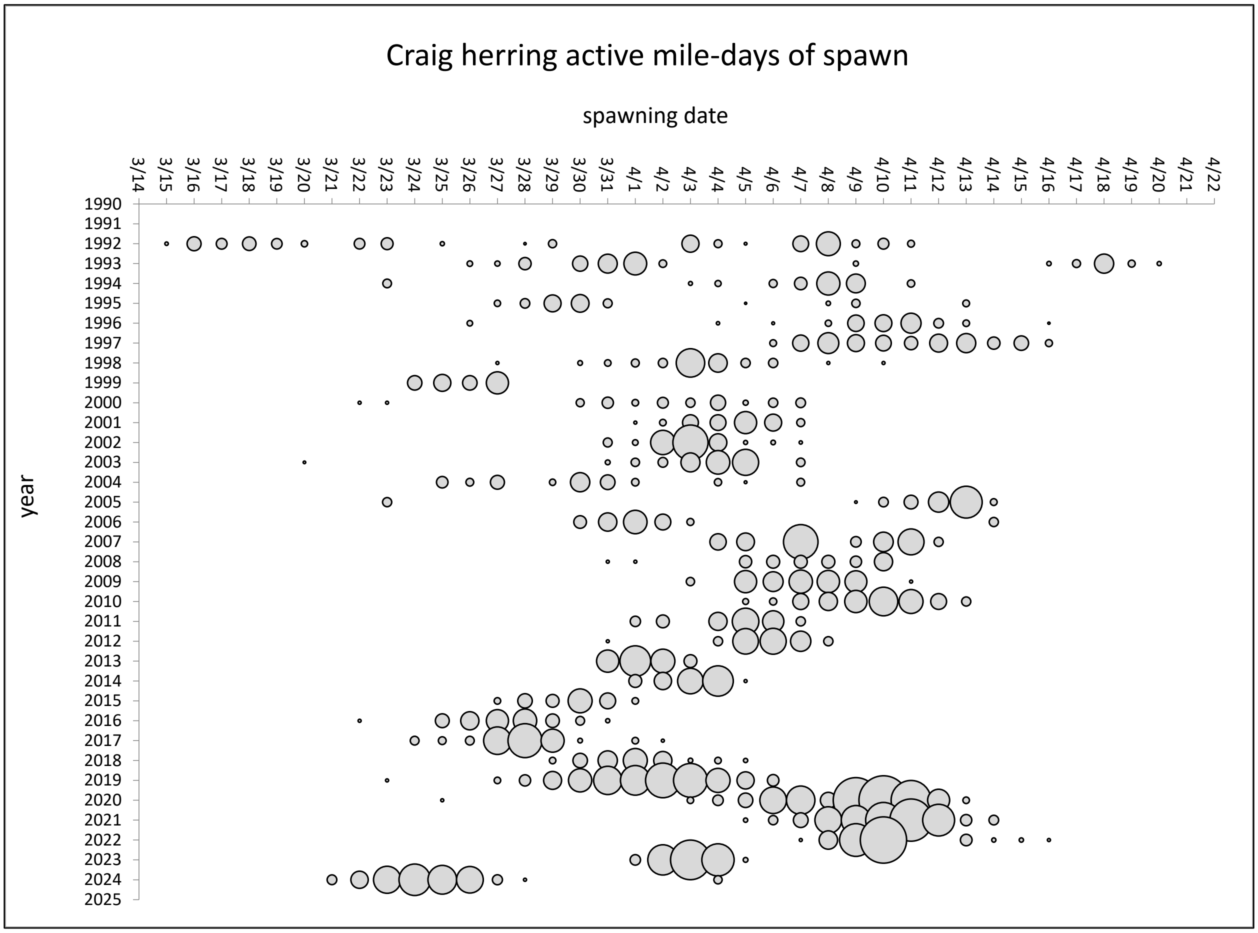

Figure 3.–Historical dates of active spawn observed for the Craig herring stock. The size of gray circles represents the total mileage of active spawn observed on each day, relative to all other days of spawn. For reference, the largest circle represents a day of about 30 nautical miles of spawn and the smallest circles represent *spot spawns*, which here have been given an arbitrary value of 0.1 nautical mile. Black circles represent days of active spawn, but for which no estimates of daily mileage are available.

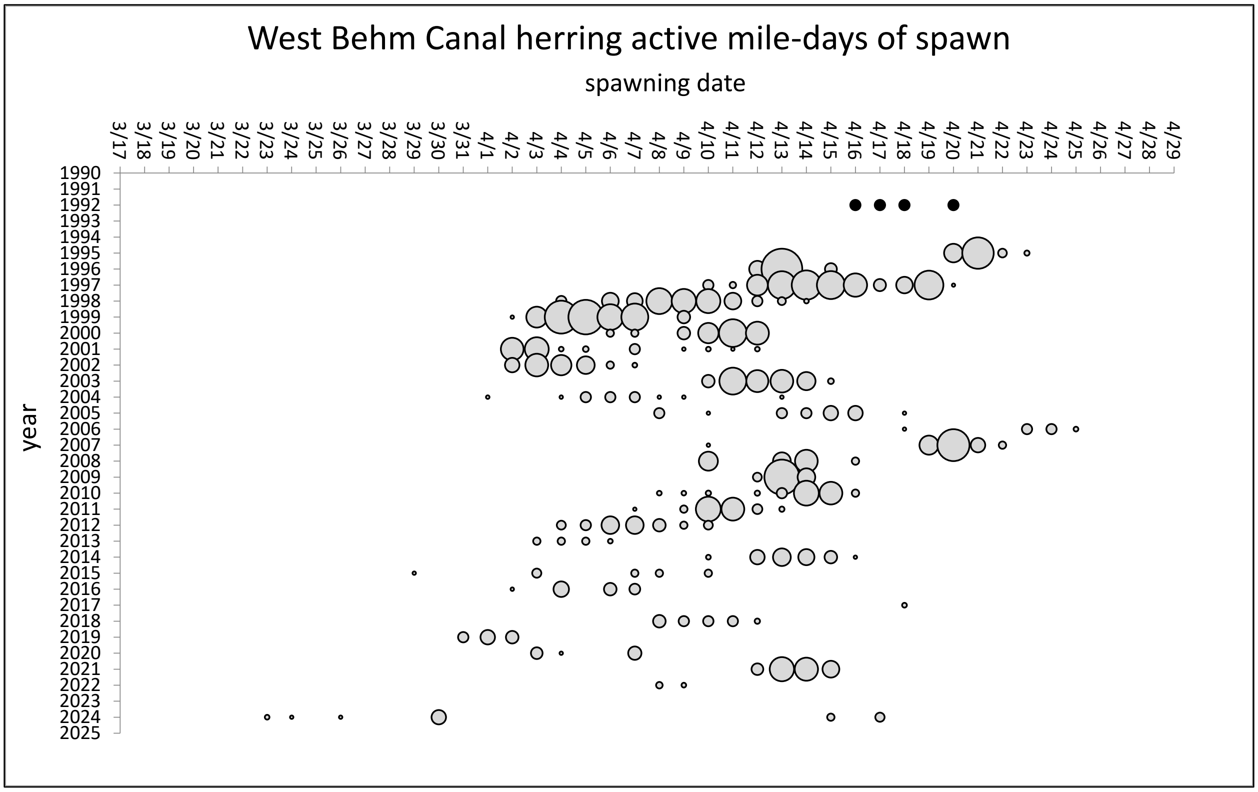

Figure 4.–Historical dates of active spawn observed for the West Behm Canal herring stock. The size of gray circles represents the total mileage of active spawn observed on each day, relative to all other days of spawn. For reference, the largest circle represents a day of 12 nautical miles of spawn and the smallest circles represent *spot spawns*, which here have been given an arbitrary value of 0.1 nautical mile. Black circles represent days of active spawn, but for which no estimates of daily mileage are available. For years with blanks, data could not be located.

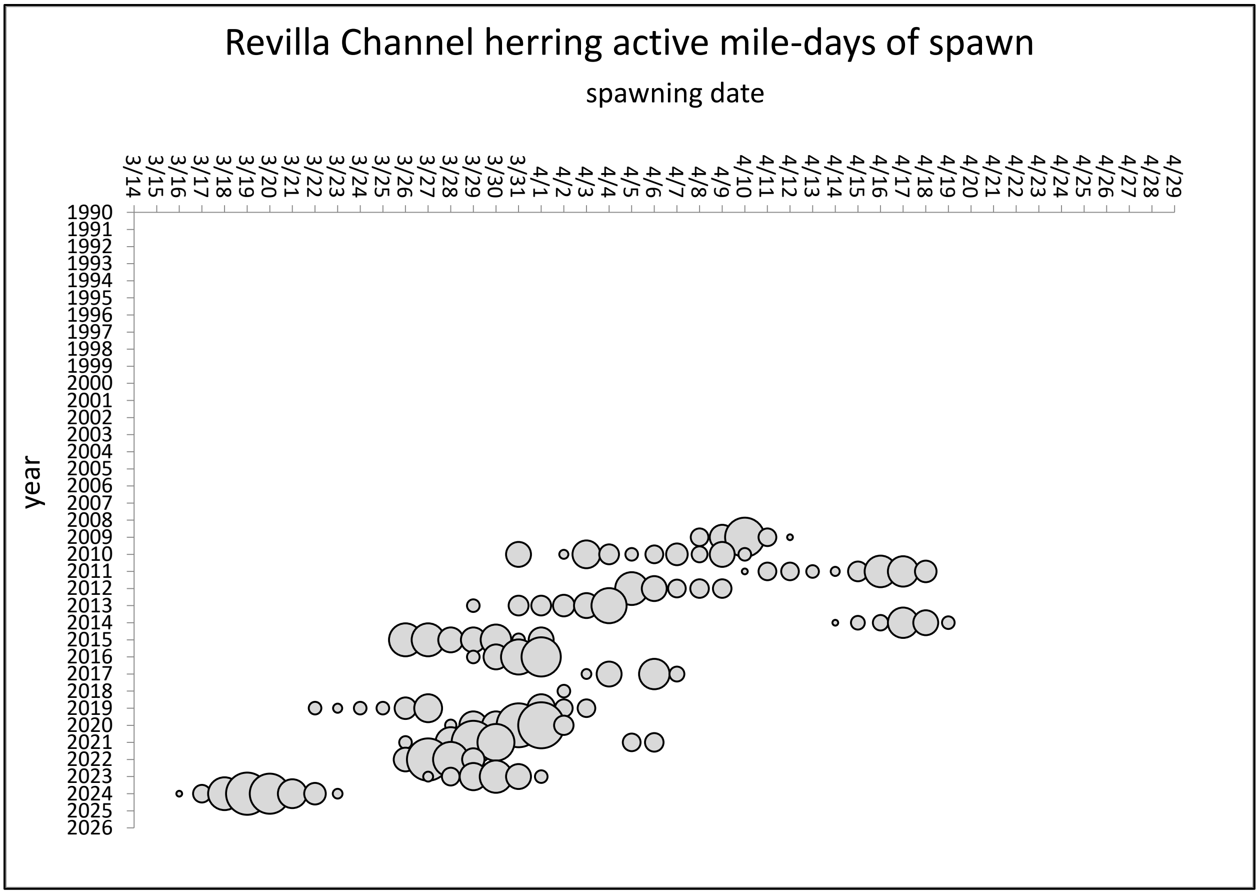

Figure 5.–Historical dates of active spawn observed for the Revilla Channel herring stock. The size of gray circles represents the total mileage of active spawn observed on each day, relative to all other days of spawn. For reference, the largest circle represents a day of about 7 nautical miles of spawn and the smallest circles represent *spot spawns*, which here have been given an arbitrary value of 0.1 nautical mile. For years with blanks, data could not be located or is not yet summarized.

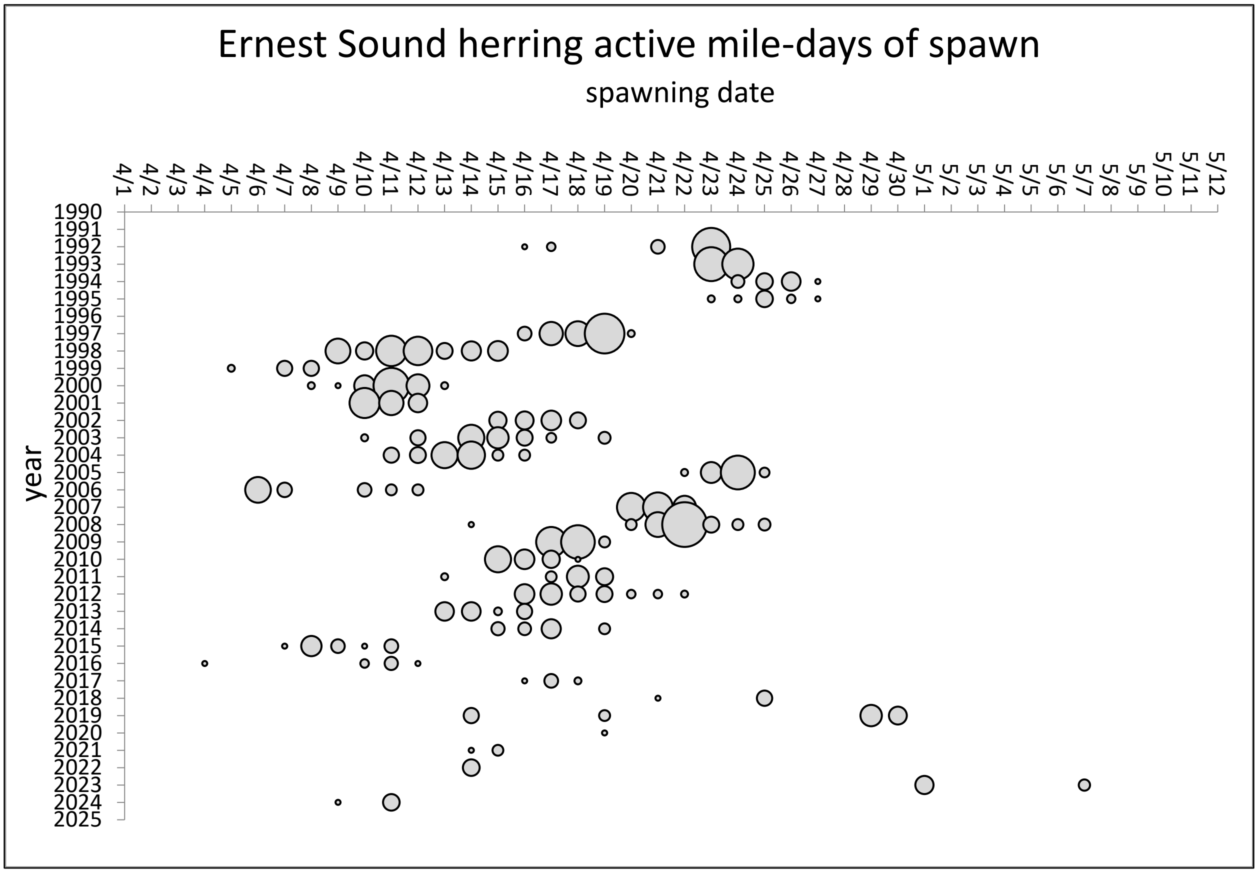

Figure 6.–Historical dates of active spawn observed for the Ernest Sound herring stock. The size of gray circles represents the total mileage of active spawn observed on each day, relative to all other days of spawn. For reference, the largest circle represents a day of about 9 nautical miles of spawn and the smallest circles represent *spot spawns*, which here have been given an arbitrary value of 0.1 nautical mile.

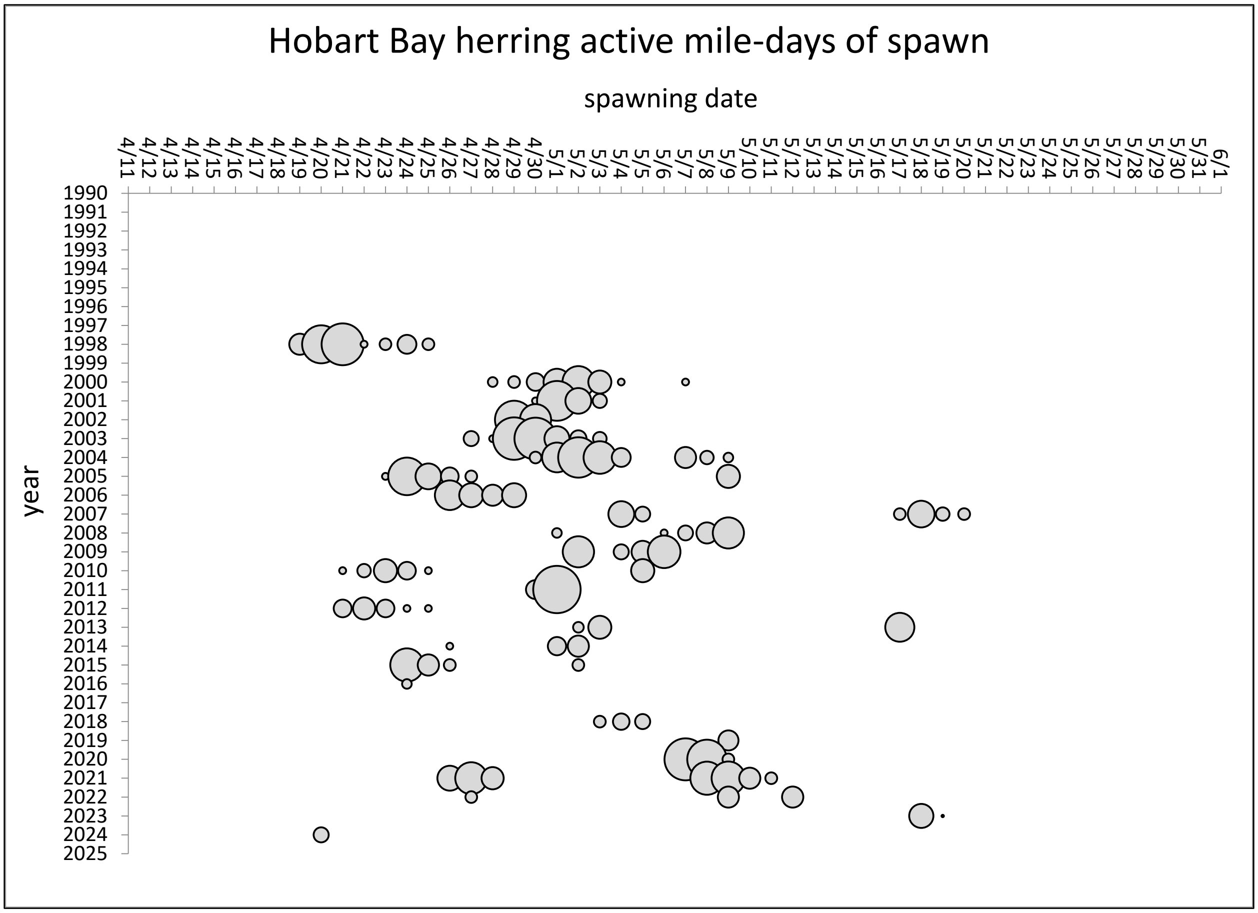

Figure 7.–Historical dates of active spawn observed for the Hobart Bay herring stock. The size of gray circles represents the total mileage of active spawn observed on each day, relative to all other days of spawn. For reference, the largest circle represents a day of about 6 nautical miles of spawn and the smallest circles represent *spot spawns*, which here have been given an arbitrary value of 0.1 nautical mile. For years with blanks, data could not be located.

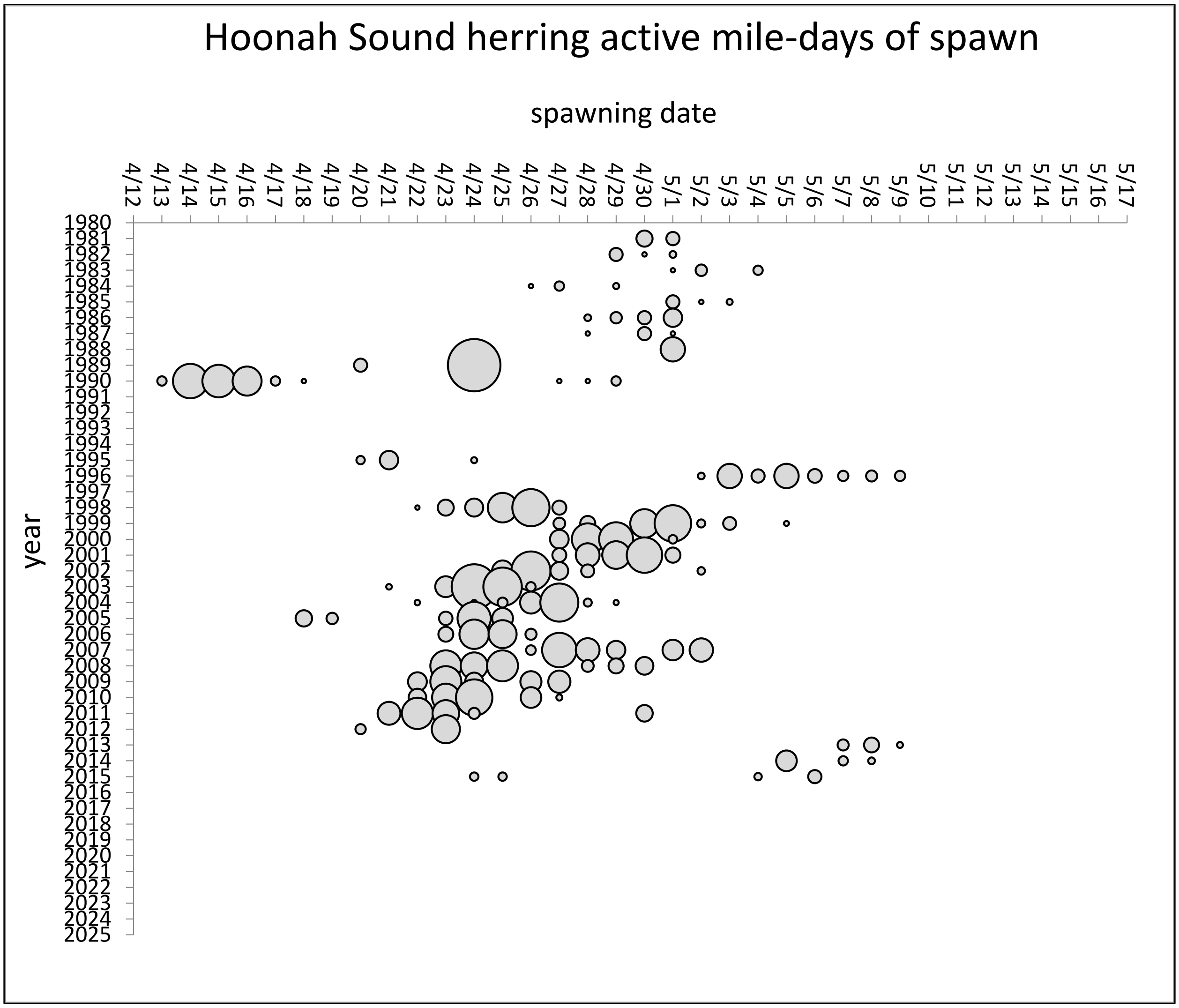

Figure 8.–Historical dates of active spawn observed for the Hoonah Sound herring stock. The size of gray circles represents the total mileage of active spawn observed on each day, relative to all other days of spawn. For reference, the largest circle represents a day of about 12 nautical miles of spawn and the smallest circles represent *spot spawns*, which here have been given an arbitrary value of 0.1 nautical mile. For years prior to 1995, data could not be located. For entire blank years since 2015 spawn has not been observed, although aerial survey flights have been much less frequent than were done in prior years.

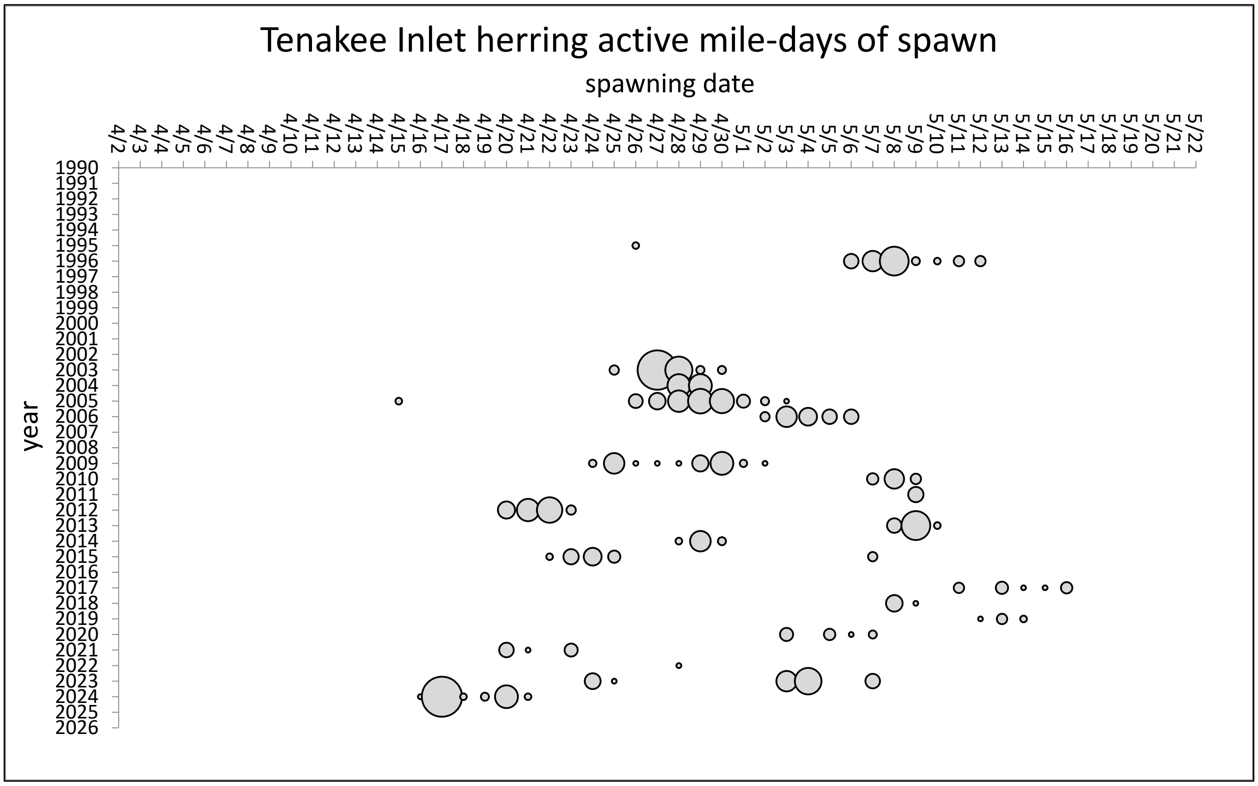

Figure 9.–Historical dates of active spawn observed for the Tenakee Inlet herring stock. The size of gray circles represents the total mileage of active spawn observed on each day, relative to all other days of spawn. For reference, the largest circle represents a day of about 8 nautical miles of spawn and the smallest circles represent *spot spawns*, which here have been given an arbitrary value of 0.1 nautical mile. For years with blanks, data could not be located.

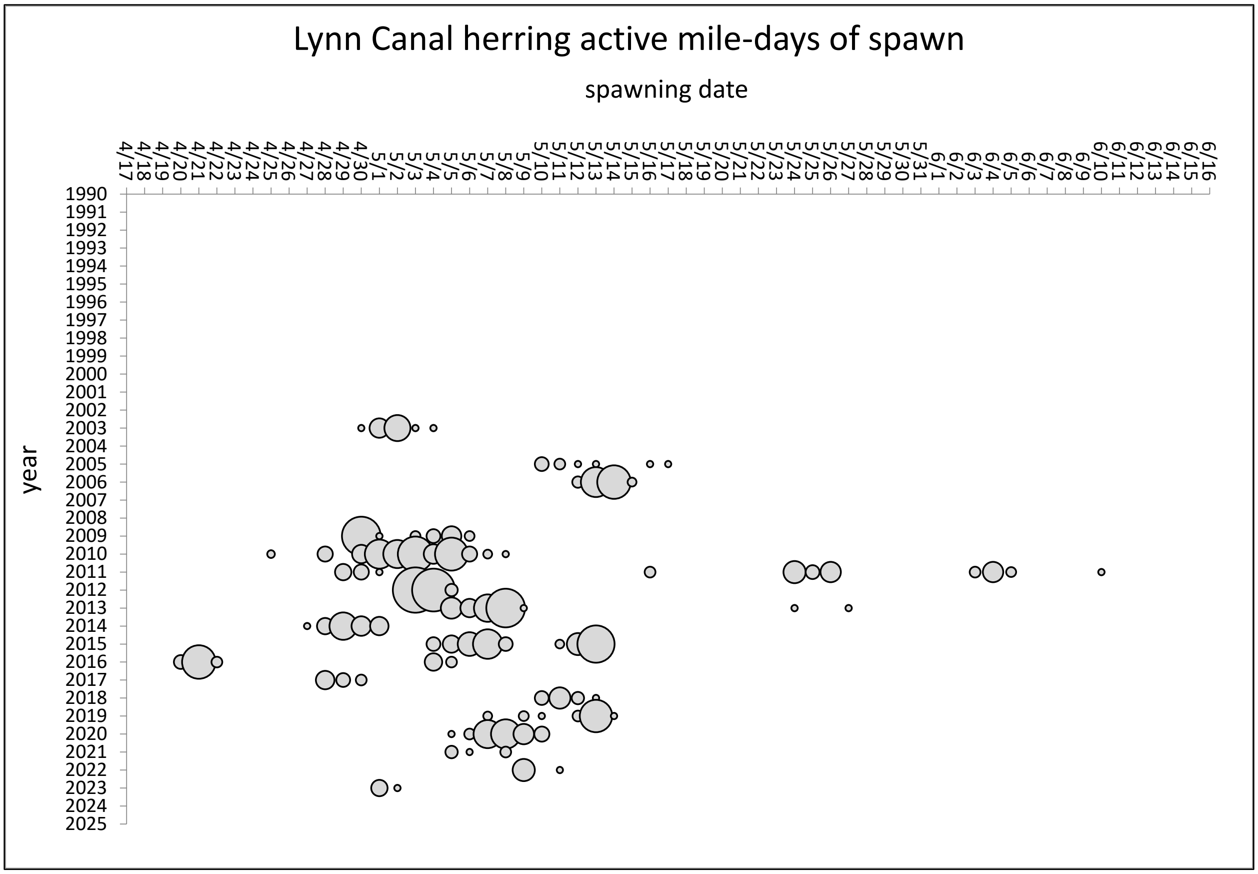

Figure 10.–Historical dates of active spawn observed for the Lynn Canal herring stock. The size of gray circles represents the total mileage of active spawn observed on each day, relative to all other days of spawn. For reference, the largest circle represents a day of about 5 nautical miles of spawn and the smallest circles represent *spot spawns*, which here have been given an arbitrary value of 0.1 nautical mile. For years with blanks, data could not be located or is not yet summarized.

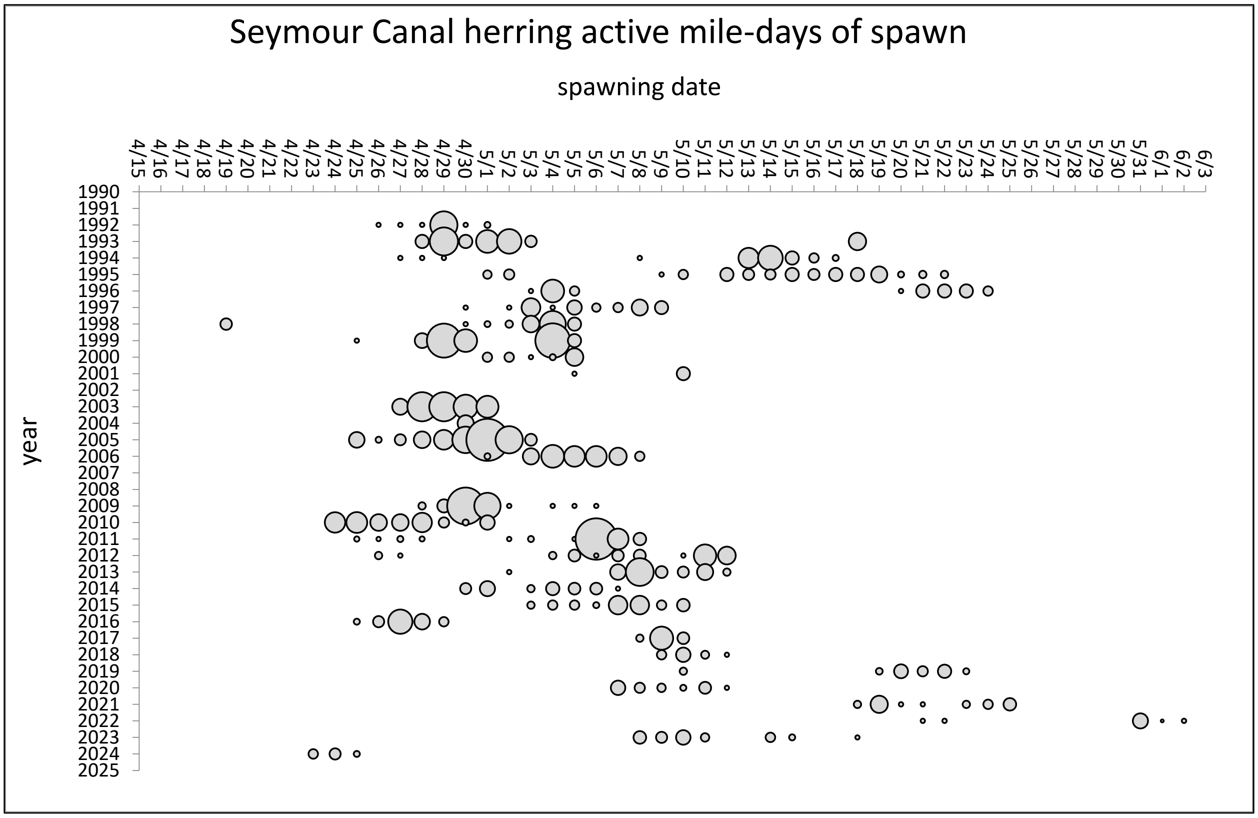

Figure 11.–Historical dates of active spawn observed for the Seymour Canal herring stock. The size of gray circles represents the total mileage of active spawn observed on each day, relative to all other days of spawn. For reference, the largest circle represents a day of about 10 nautical miles of spawn and the smallest circles represent *spot spawns*, which here have been given an arbitrary value of 0.1 nautical mile. For years with blanks, data could not be located.

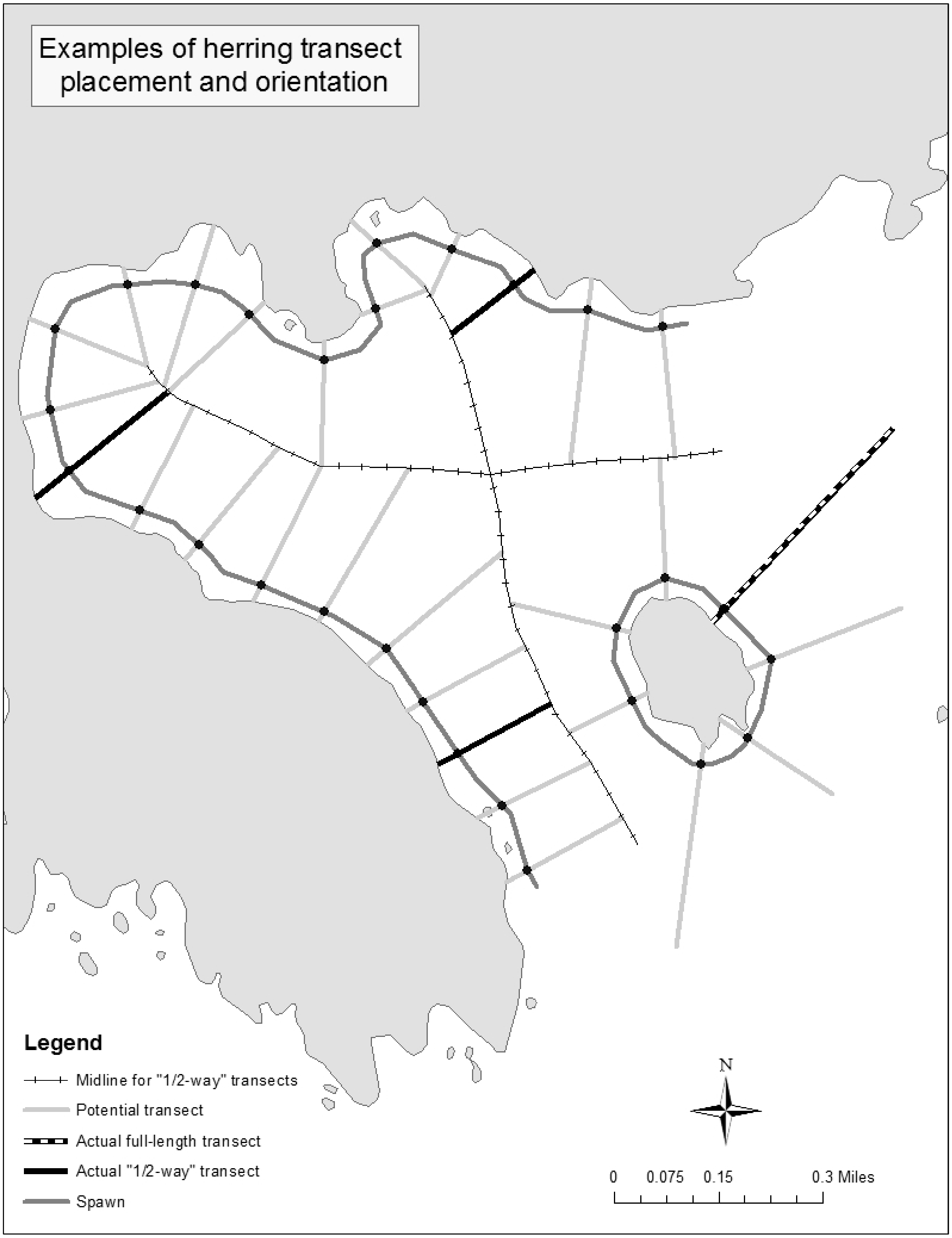

Figure 12.–Example of hypothetical herring transect placement and orientation, representing points at which transects should be halted to prevent oversampling.

Stock	8-Mar	9-Mar	10-Mar	11-Mar	12-Mar	13-Mar	14-Mar	15-Mar	16-Mar	17-Mar	18-Mar	19-Mar	20-Mar	21-Mar	22-Mar	23-Mar	24-Mar	25-Mar	26-Mar	27-Mar	28-Mar	29-Mar	30-Mar	31-Mar	1-Apr	2-Apr	3-Apr	4-Apr	5-Apr	6-Apr	7-Apr	8-Apr	9-Apr	10-Apr	11-Apr	12-Apr	13-Apr	14-Apr	15-Apr
Sitka Sound					ns	ns	ns	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	3.2	3.4	8.6	10.3	23.3	26.2	15.1	7.6	10.1	21.7	3.5	1.0	1.4	1.4	1.4	0.2	0.5	0.8	0.1	0.0	0.0	0.0	0.0
Revilla Channel						ns	ns	ns	0.1	1.0	3.5	5.8	5.2	2.7	1.5	0.3	ns	ns	ns																				
Craig									ns	ns	ns	0.0	ns	1.1	3.6	9.0	12.1	10.1	8.7	1.2	0.1	ns	ns	ns	ns	ns	ns	0.8	0.0	ns	ns								
West Behm Canal													ns	ns	ns	0.2	0.1	ns	0.1	ns	ns	ns	2.0	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	0.5
Ernest Sound																									ns	ns	ns	0.0	0.0	ns	ns	u	0.1	0.0	1.2	ns	0.0	ns	0.0
Haines																																ns	u	ns	ns	ns	ns	ns	u
Yakutat Bay																												u	ns	ns	u	ns	u	ns	u	ns	ns	u	u

continued	16-Apr	17-Apr	18-Apr	19-Apr	20-Apr	21-Apr	22-Apr	23-Apr	24-Apr	25-Apr	26-Apr	27-Apr	28-Apr	29-Apr	30-Apr	1-May	2-May	3-May	4-May	5-May	6-May	7-May	8-May	9-May	10-May	11-May	12-May	13-May	14-May	15-May	16-May	17-May	18-May	19-May	20-May	21-May	22-May	23-May	24-May
Sitka Sound	0.0	0.0	ns	ns	ns																																		
West Behm Canal	ns	0.8	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	0.1	ns	ns	ns																					
Hobart/Houghton		ns	ns	ns	0.5	ns	ns	ns																															
Ernest Sound	ns	0.0	ns	ns	ns																																		
Hoonah Sound	0.0	ns	ns	ns	ns																																		
Seymour Canal	0.0	ns	ns	0.0	0.0	ns	ns	0.5	0.7	0.2	0.0	ns	ns	0.0	ns	ns	0.0	ns	ns	ns																			
Tenakee Inlet	0.1	7.8	0.2	0.3	2.5	0.2	0.0	ns	ns	ns	ns	ns	ns	ns	ns	ns	0.0	ns	ns	ns																			
Haines	ns	0.8	ns	ns	ns																																		

Figure 13.–Spawn timing of herring stocks in Southeast Alaska during spring 2024. Values indicate daily measurements of nautical miles of active spawn recorded during aerial surveys. Shaded area depicts dates when cast-net samples were taken. Boxed areas indicate duration of spawning (first to last dates of observed spawn). Dates with no survey are depicted by *ns*. Blank dates indicate dates that are outside of historical spawning timing and so surveys had not commenced or were concluded. Dates with *u* signify spawn was reported but the extent of each day is unknown.

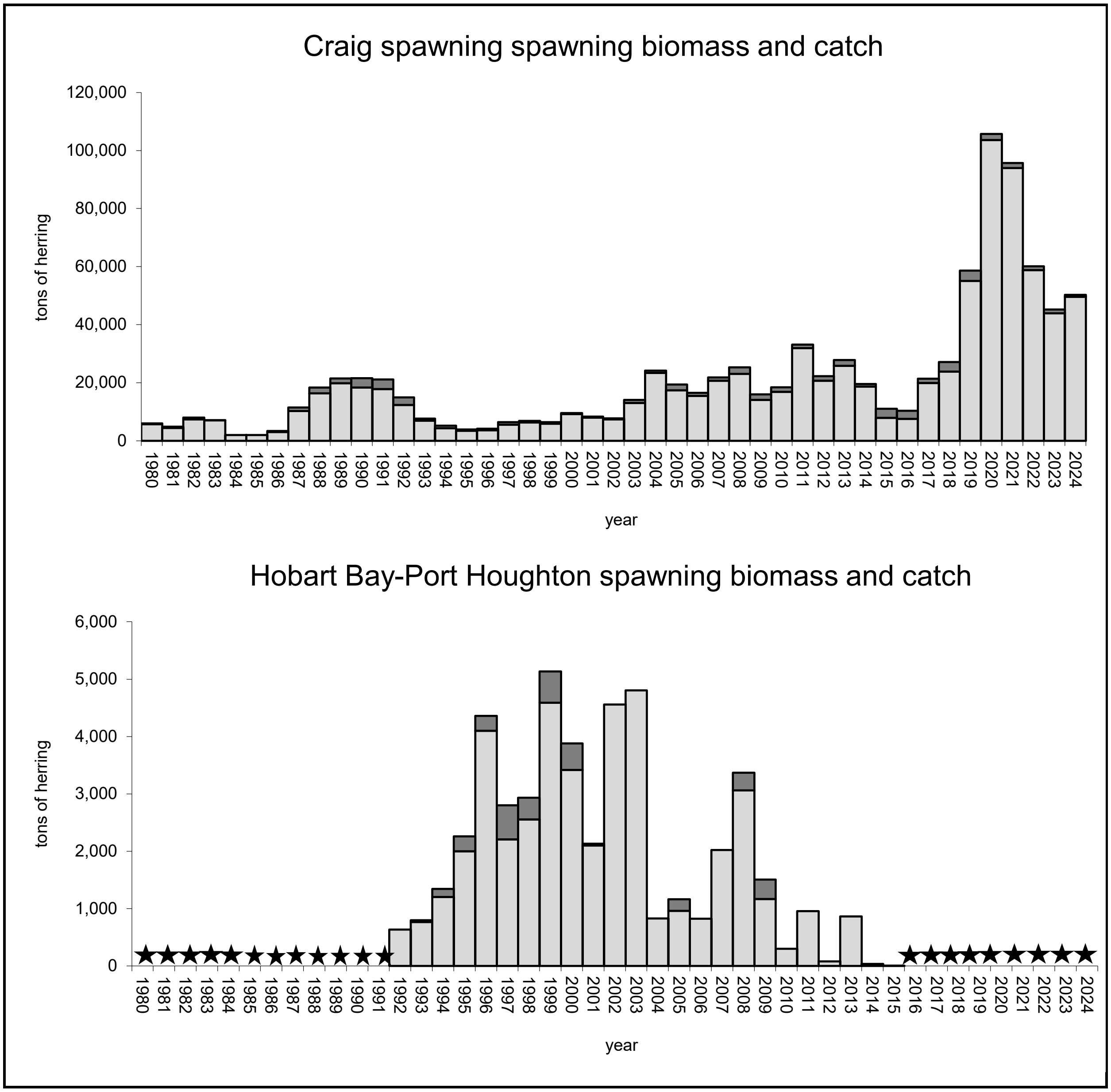

Figure 14.–Observed herring post-fishery spawning biomass (light gray bars), based on spawn deposition surveys, and catch (dark gray bars) for stocks in the Craig and Hobart Bay–Port Houghton areas, during 1980–2024. Stars represent years when spawn deposition surveys were not conducted.

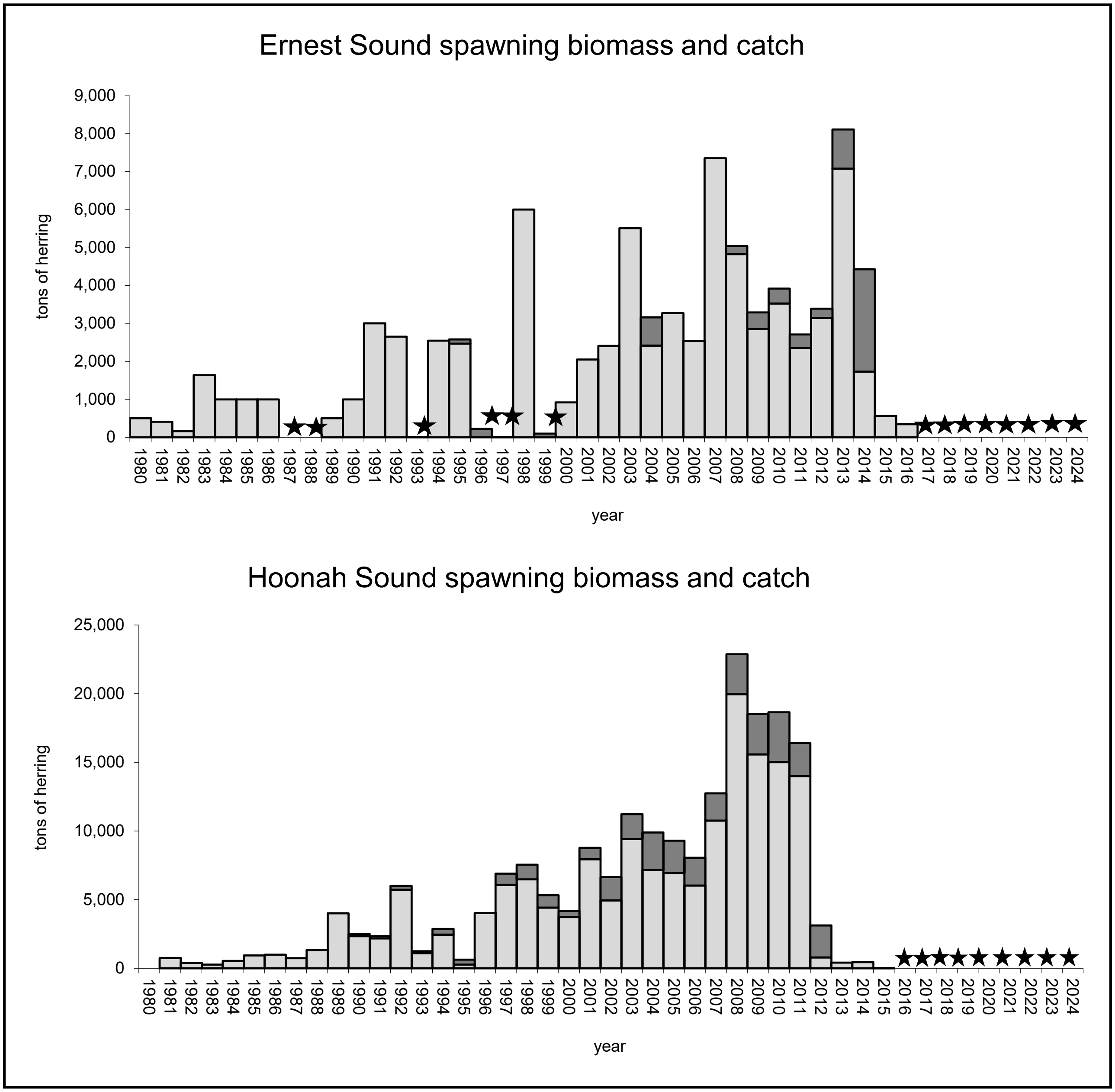

Figure 15.–Observed herring post-fishery spawning biomass (light gray bars), based on spawn deposition surveys or hydroacoustic surveys, and catch (dark gray bars) for stocks in the Ernest Sound and Hoonah Sound areas, during 1980–2024. Stars represent years when spawn deposition surveys were not conducted.

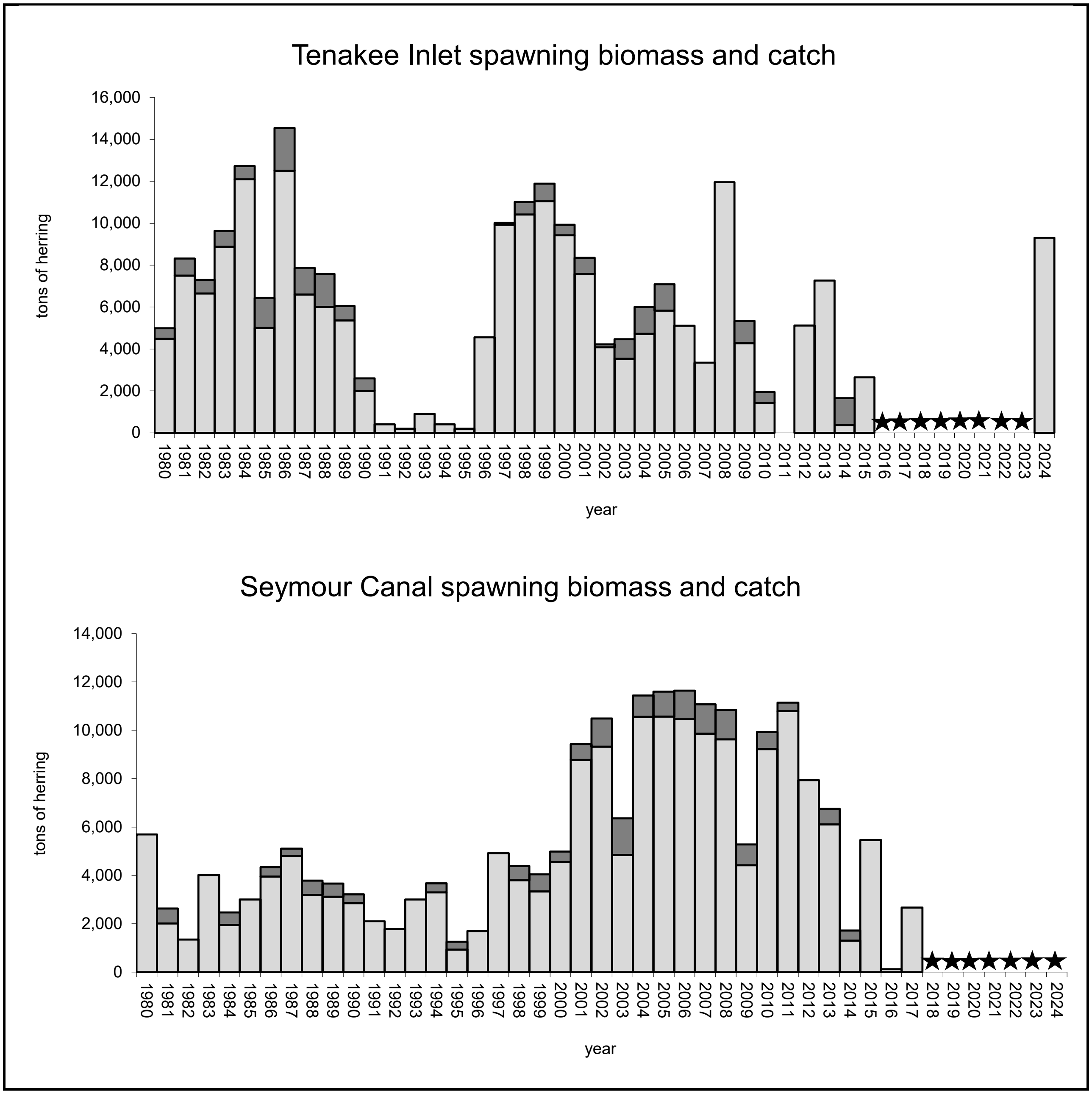

Figure 16.–Observed herring post-fishery spawning biomass (light gray bars), based on spawn deposition surveys or hydroacoustic surveys, and catch (dark gray bars) for stocks in the Seymour Canal and Tenakee Inlet areas, during 1980–2024. Stars represent years when spawn deposition surveys were not conducted.

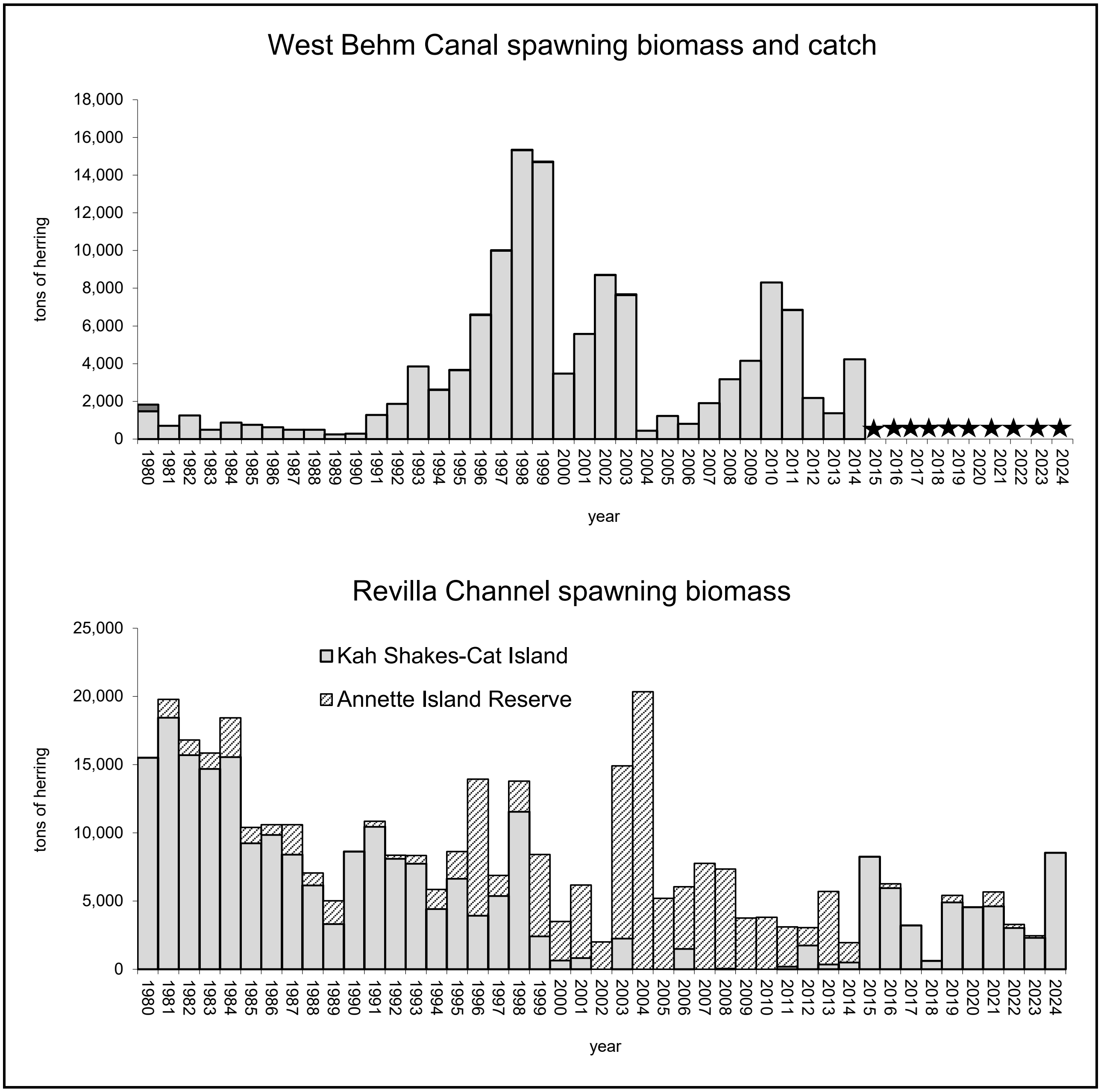

Figure 17.–Observed herring post-fishery spawning biomass, based on spawn deposition surveys or hydroacoustic surveys for stocks in the West Behm Canal and Revilla Channel (Kah Shakes–Cat Island–Annette Island) areas, during 1980–2024. Annette Island spawning biomass estimates were made as the product of the length of observed linear shoreline spawn mileage and a fixed approximated value of 500 tons of herring per nautical mileage of shoreline, based on the estimated mean value over the period 1991–2000; the same was done for Kah Shakes–Cat Island for years without a survey (2002–2014, 2017, 2018, 2023).

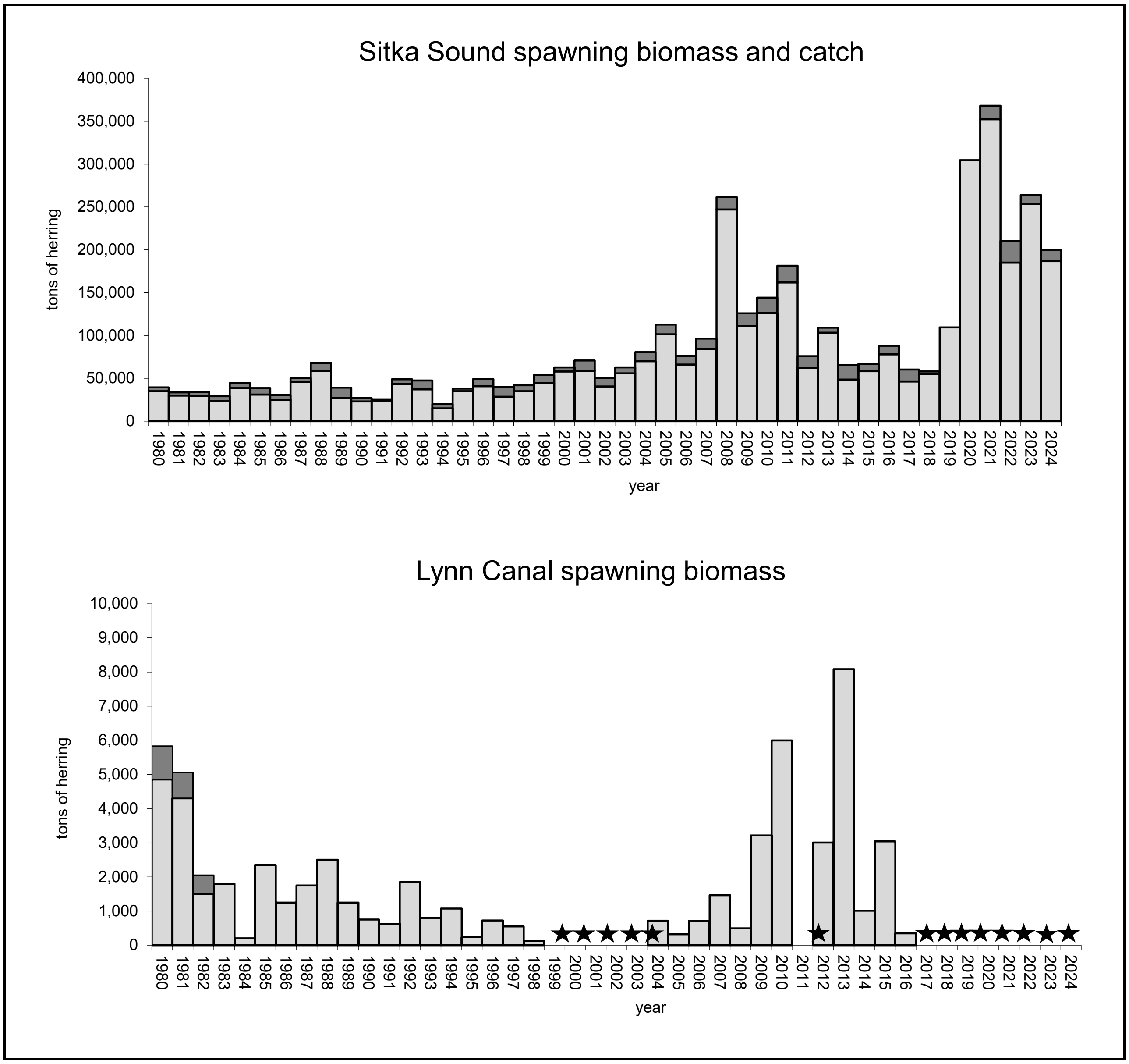

Figure 18.–Observed herring post-fishery spawning biomass (light gray bars), based on spawn deposition surveys, and catch (dark gray bars) for stock in the Sitka Sound and Lynn Canal areas, during 1980–2024. Estimates of spawning biomass for Lynn Canal prior to 2004 were made using a variety of methods (e.g., hydroacoustics or visual estimates of spawn density converted to biomass), and results should be viewed as approximations. Stars represent years when spawn deposition surveys were not conducted.

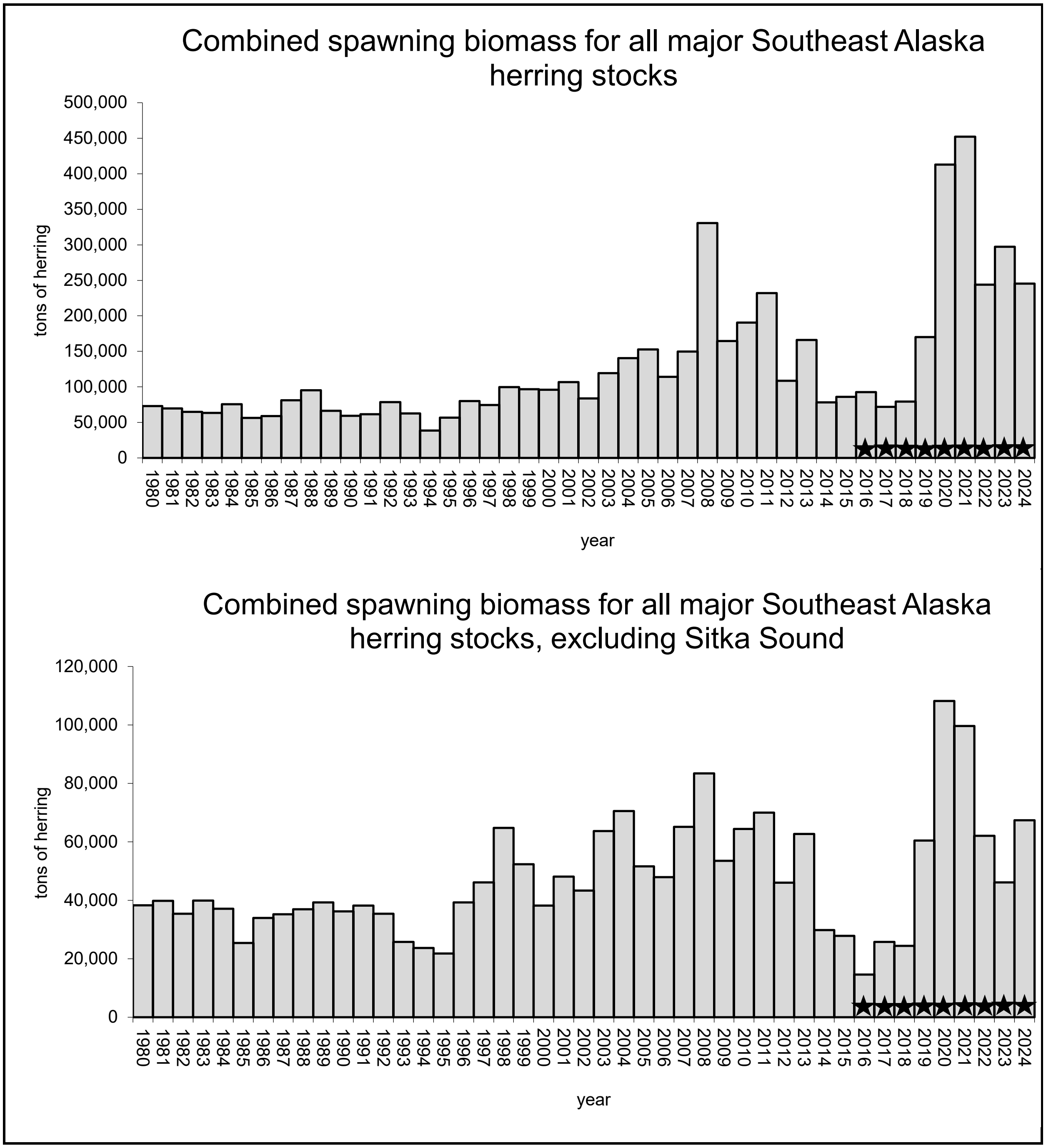

Figure 19.–Combined observed herring post-fishery spawning biomass, based on spawn deposition surveys or hydroacoustic surveys, for major herring stocks in Southeast Alaska, during 1980–2024. Recent years represent an underestimate of regional total biomass, because of the ten spawning areas that have been historically monitored, the following number of areas were surveyed in recent years: 2016, 6 areas; 2017, 7 areas; 2018, 2 areas; 2019–2022, 3 areas; 2023, 2 areas; 2024, 4 areas. Stars represent years when spawn deposition surveys were not conducted in at least one of the ten major spawning areas since 2016.

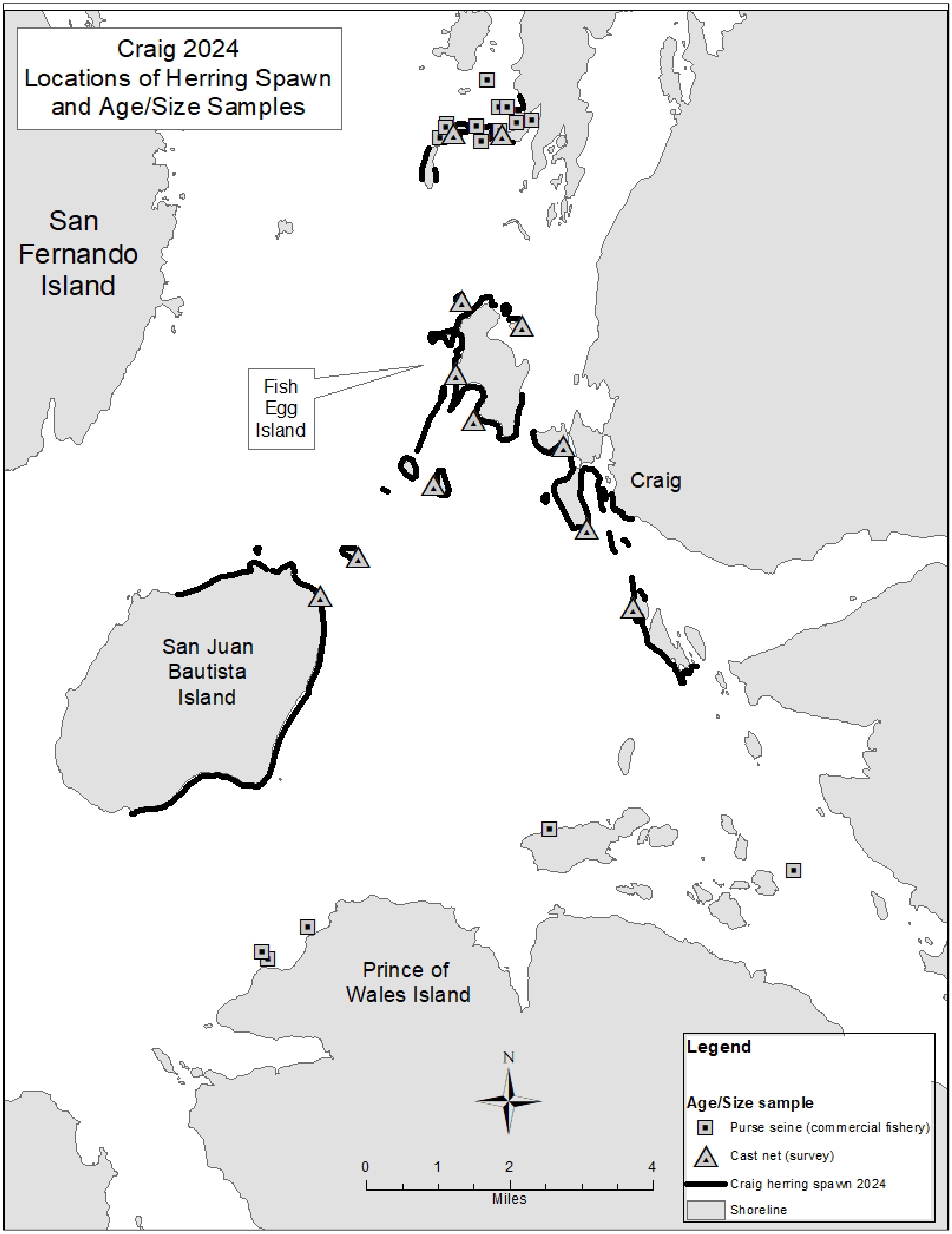

Figure 20.–Locations of herring spawn and samples for estimates of age and size for the Craig herring stock for the 2023–2024 season. Cumulative herring spawn denoted by thick black line along shoreline.

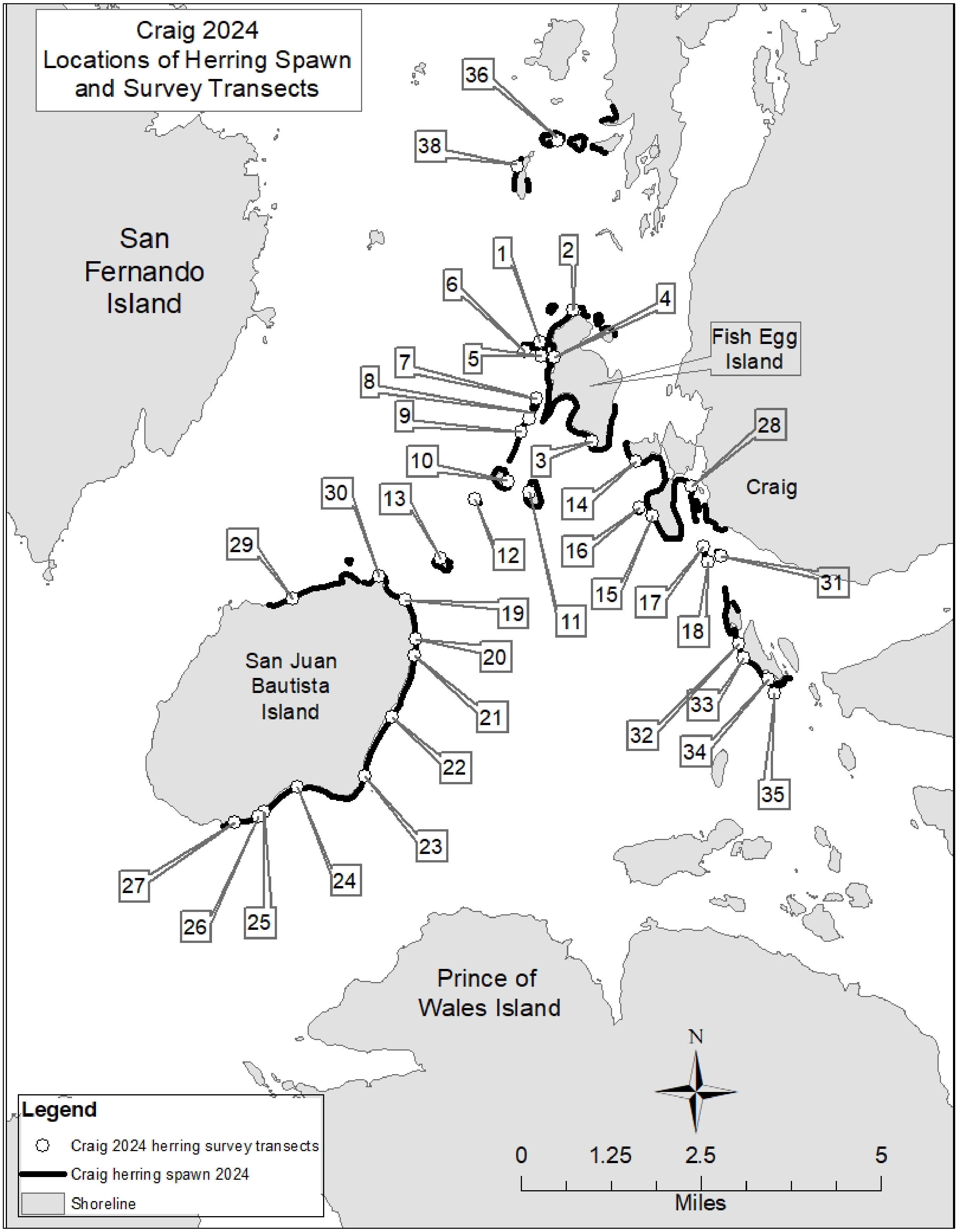

Figure 21.–Locations of herring spawn and egg deposition dive survey transects for the Craig herring stock for the 2023–2024 season. Cumulative herring spawn denoted by thick black line along shoreline.

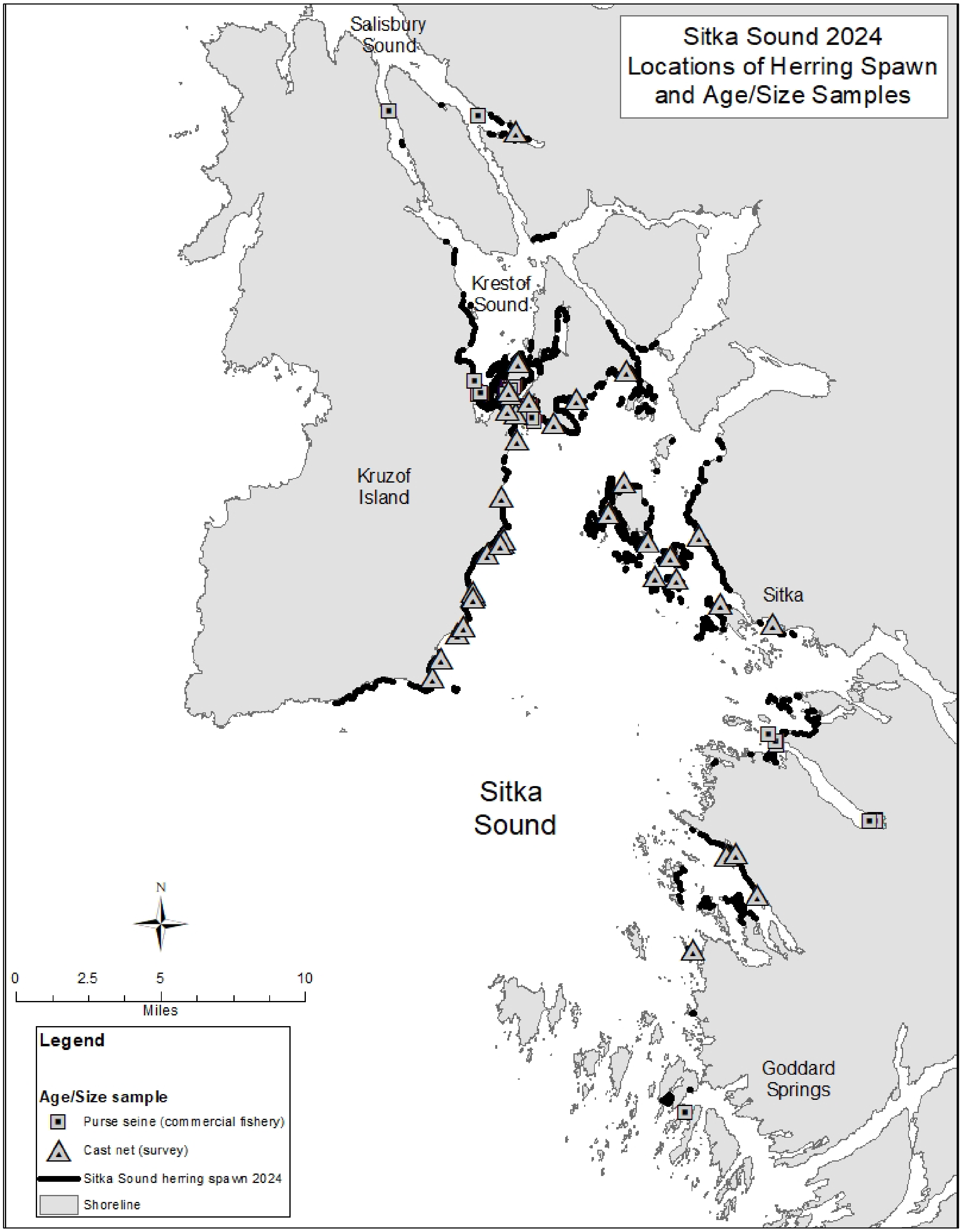

Figure 22.–Locations of herring spawn and samples collected for estimates of age and size for the Sitka Sound herring stock for the 2023–2024 season. Cumulative herring spawn denoted by thick black line along shoreline.

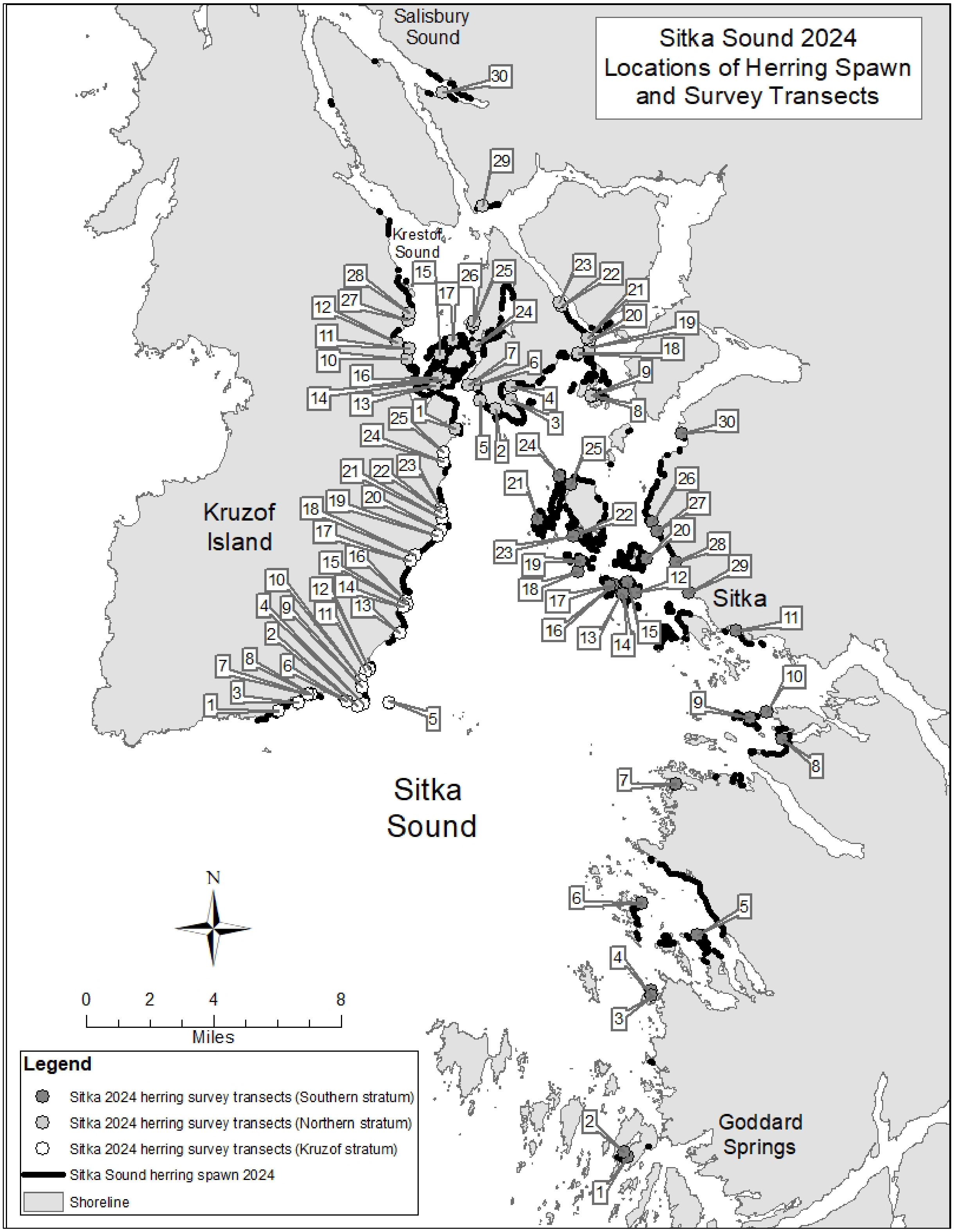

Figure 23.–Locations of herring spawn and egg deposition dive survey transects for the Sitka Sound herring stock for the 2023–2024 season. Cumulative herring spawn denoted by thick black line along shoreline.

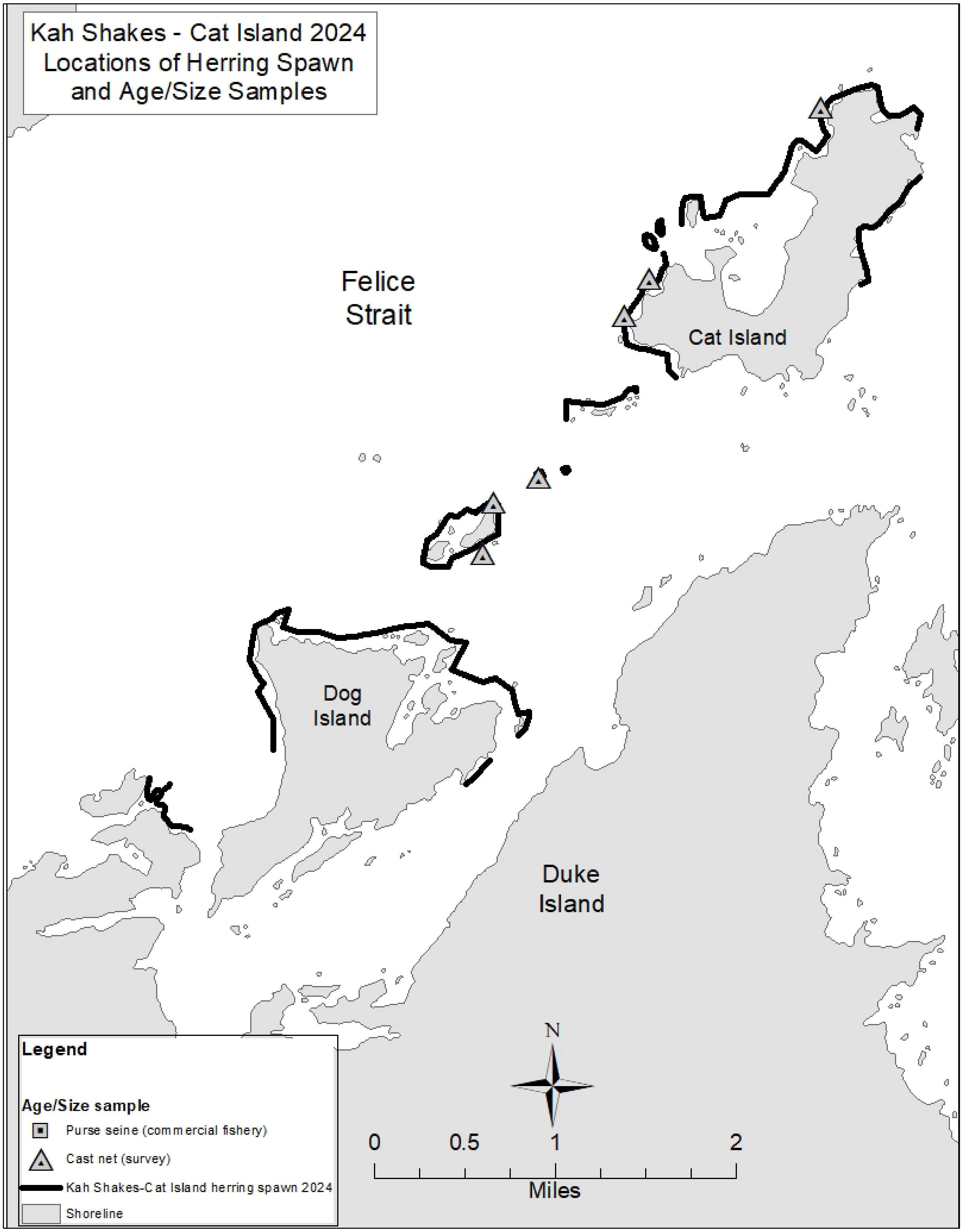

Figure 24.–Locations of herring spawn and samples collected for estimates of age and size for the Kah Shakes/Cat Island (Revilla Channel) herring stock for the 2023–2024 season. Cumulative herring spawn denoted by thick black line along shoreline.

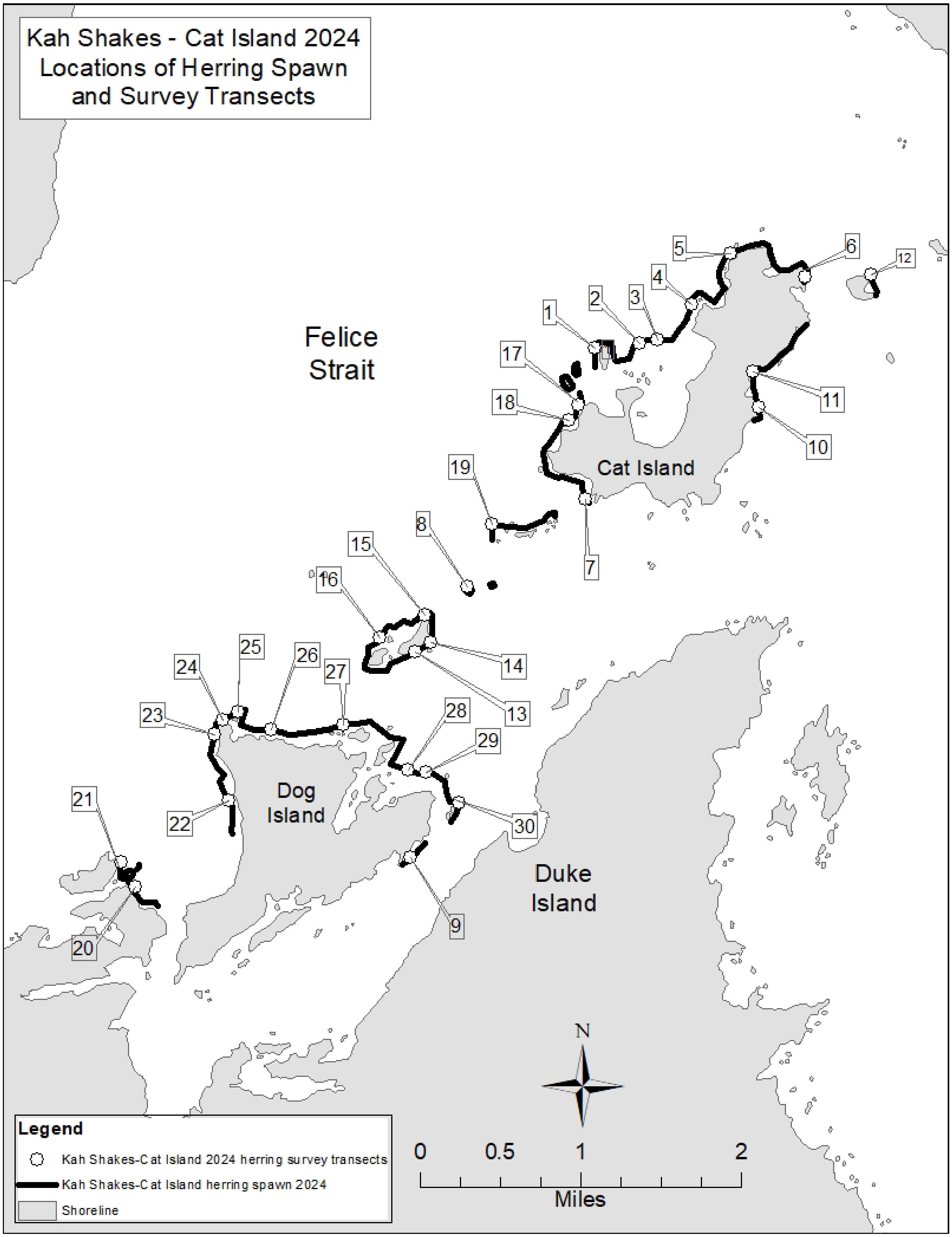

Figure 25.–Locations of herring spawn and egg deposition dive survey transects for the Kah Shakes/Cat Island (Revilla Channel) herring stock for the 2023–2024 season. Cumulative herring spawn denoted by thick black line along shoreline.

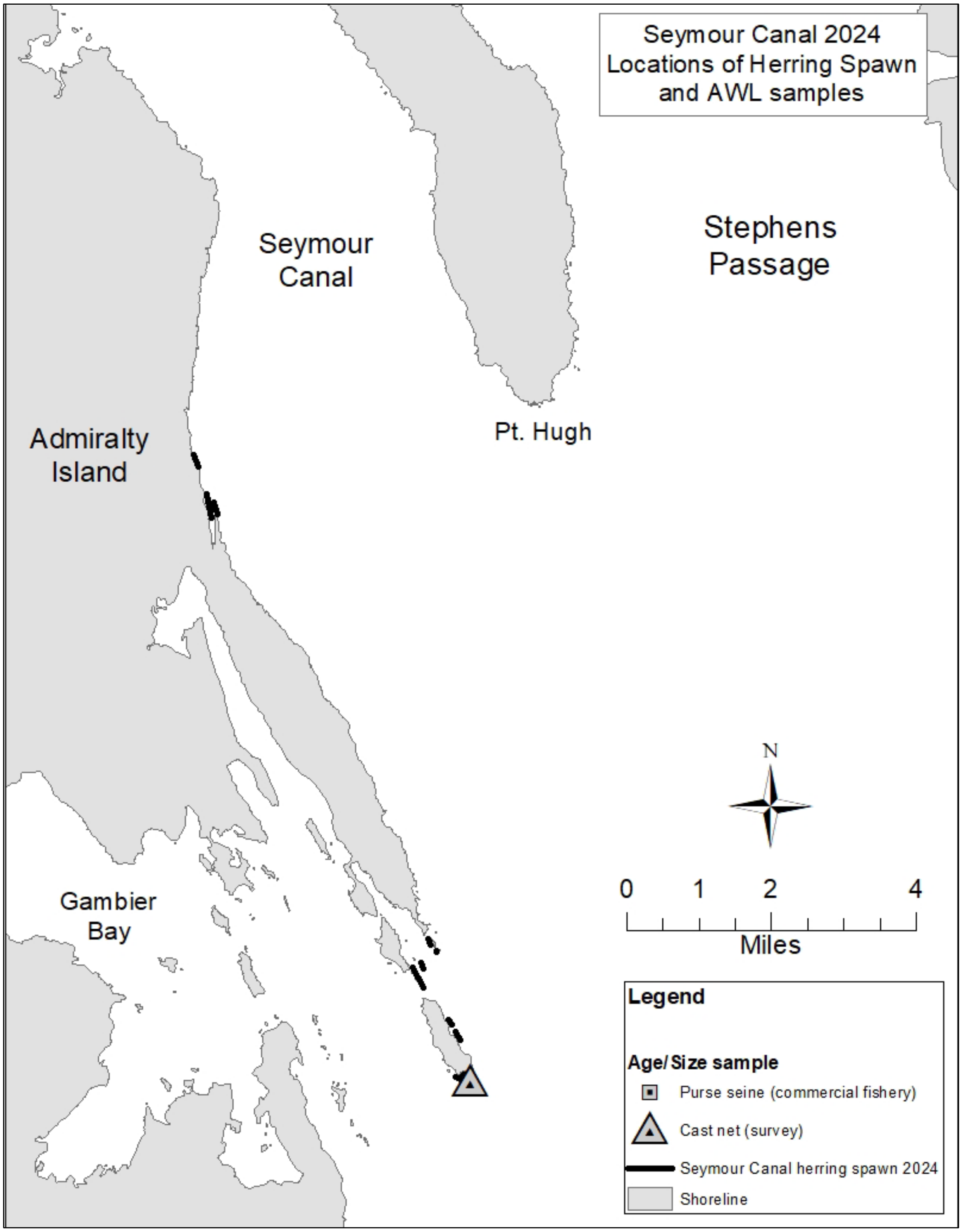

Figure 26.–Locations of herring spawn and samples collected for estimates of age and size for the Seymour Canal herring stock for the 2023–2024 season. Cumulative herring spawn denoted by thick black line along shoreline.

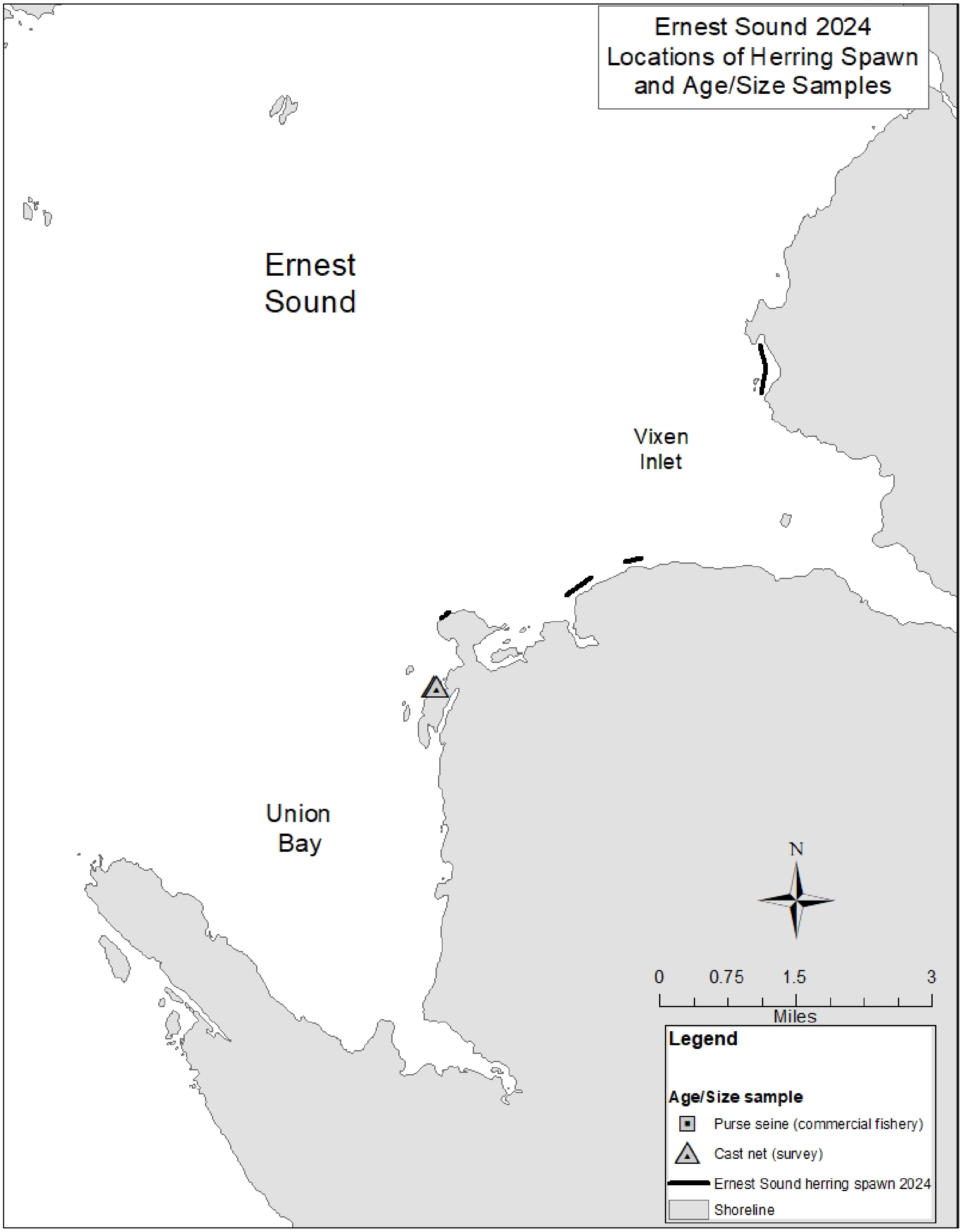

Figure 27.–Locations of herring spawn observed for the Ernest Sound herring stock for the 2023–2024 season. Cumulative herring spawn denoted by thick black line along shoreline. Although the line depicts observed active spawning, follow-up skiff surveys found herring eggs on substantially more shoreline, totaling around 4 nmi.

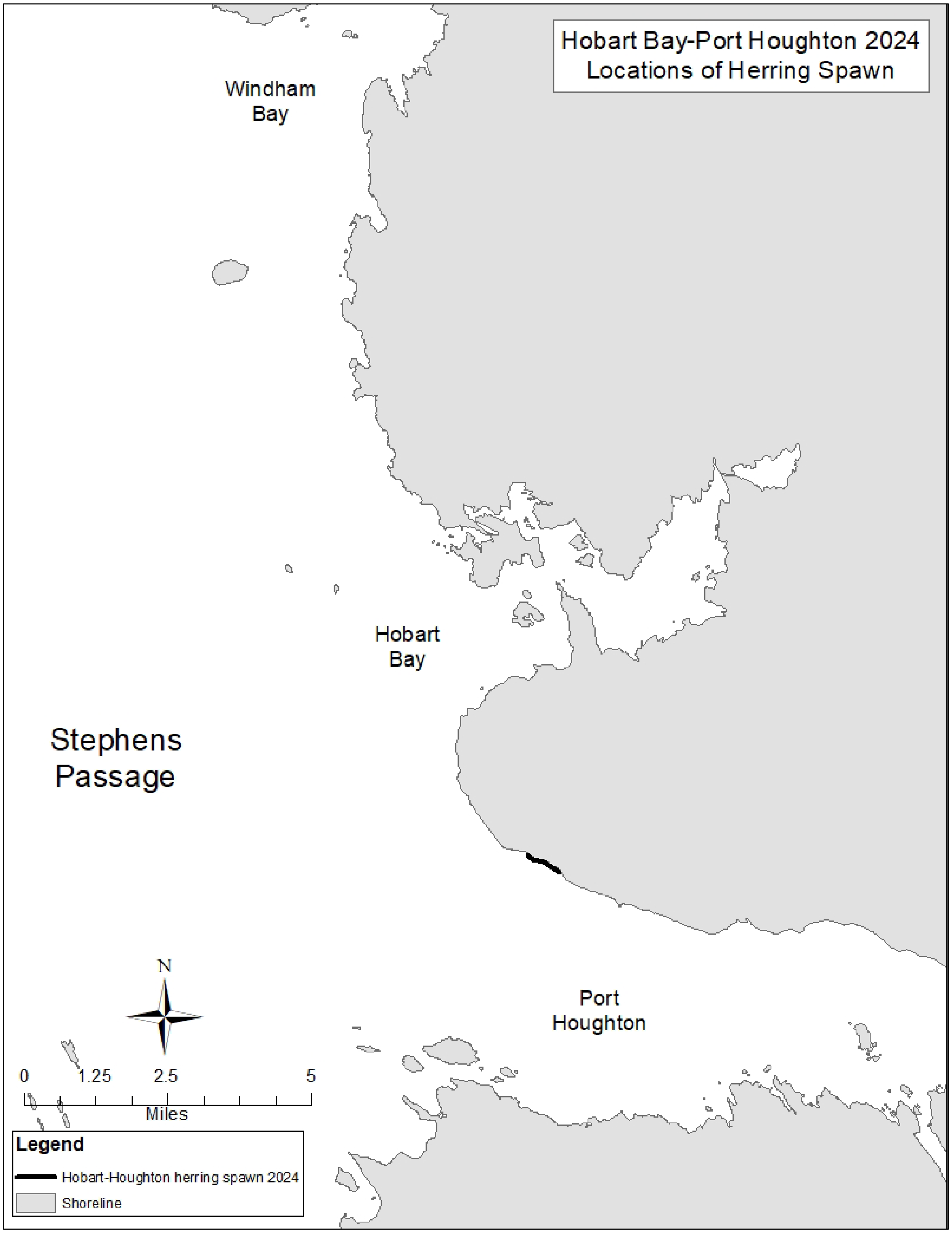

Figure 28.–Locations of herring spawn observed for the Hobart Bay/Port Houghton herring stock for the 2023–2024 season. Cumulative herring spawn denoted by thick black line along shoreline.

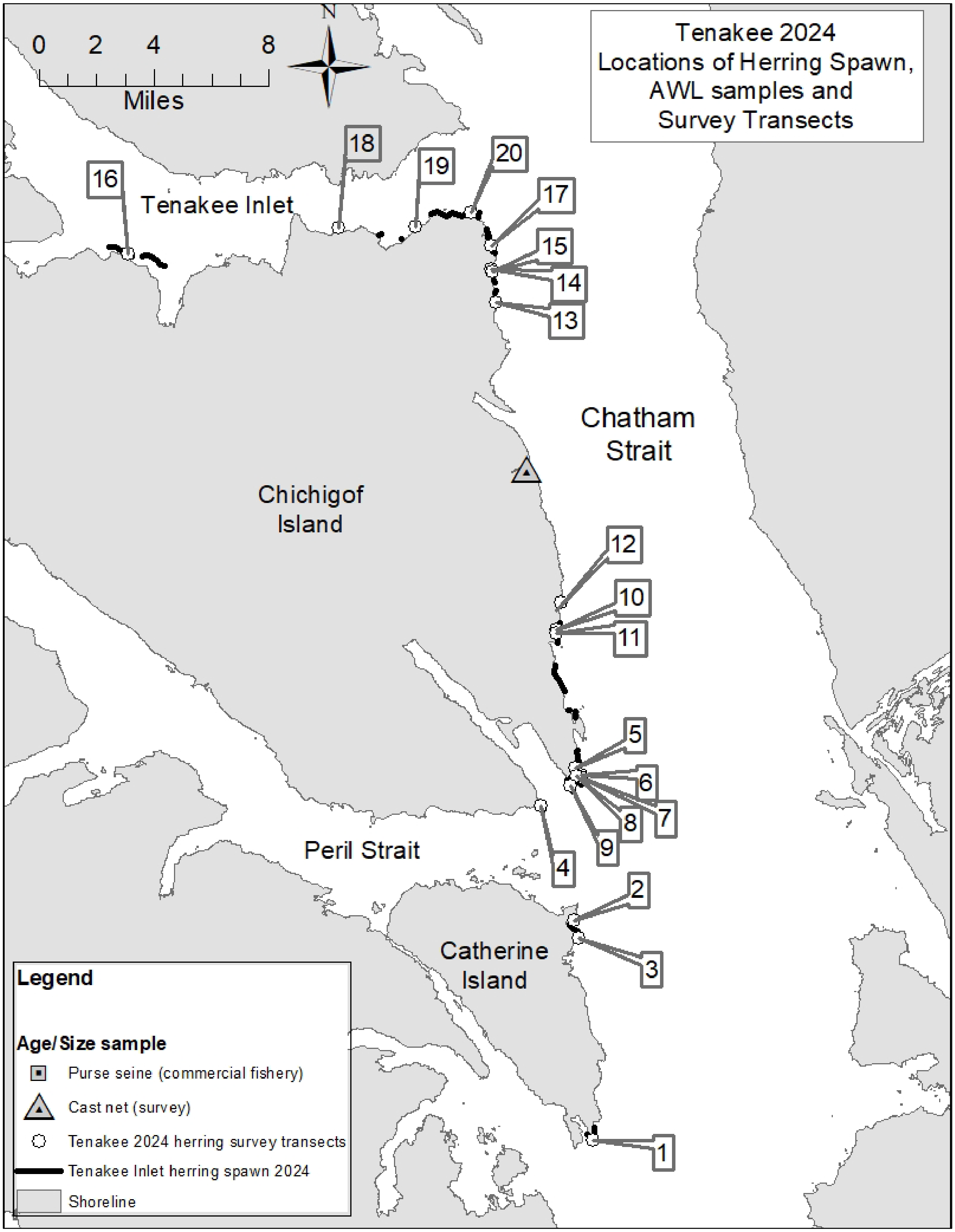

Figure 29.–Locations of herring spawn observed, samples collected for estimates of age and size, and egg deposition survey transects for the Tenakee Inlet herring stock for the 2023–2024 season. Cumulative herring spawn denoted by thick black line along shoreline.

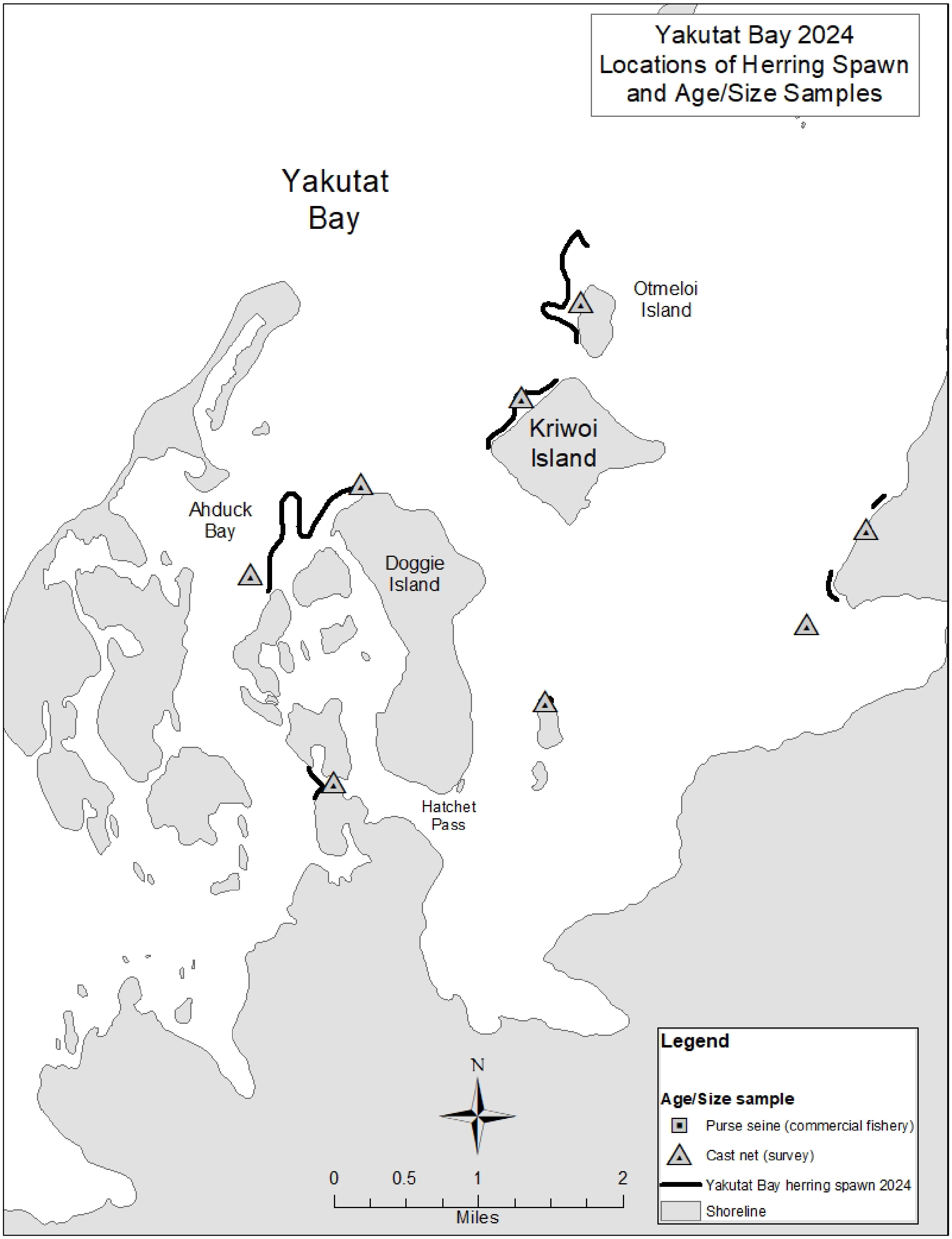

Figure 30.–Locations of herring observed for the Yakutat Bay herring stock for the 2023–2024 season. Cumulative herring spawn denoted by thick black line along shoreline.

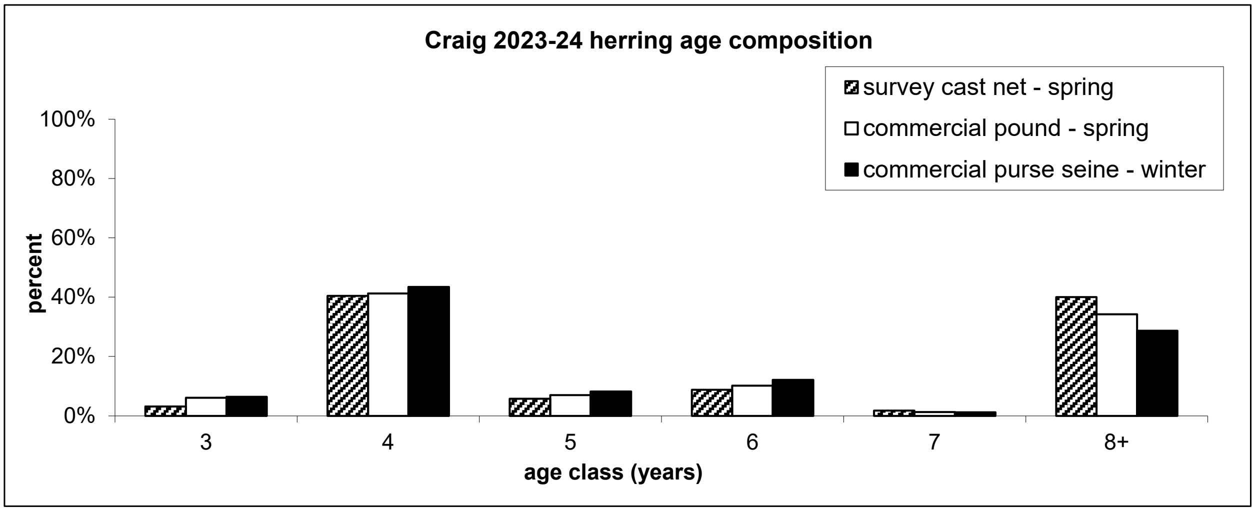

Figure 31.–Observed age composition for Craig herring stock in 2023–2024.

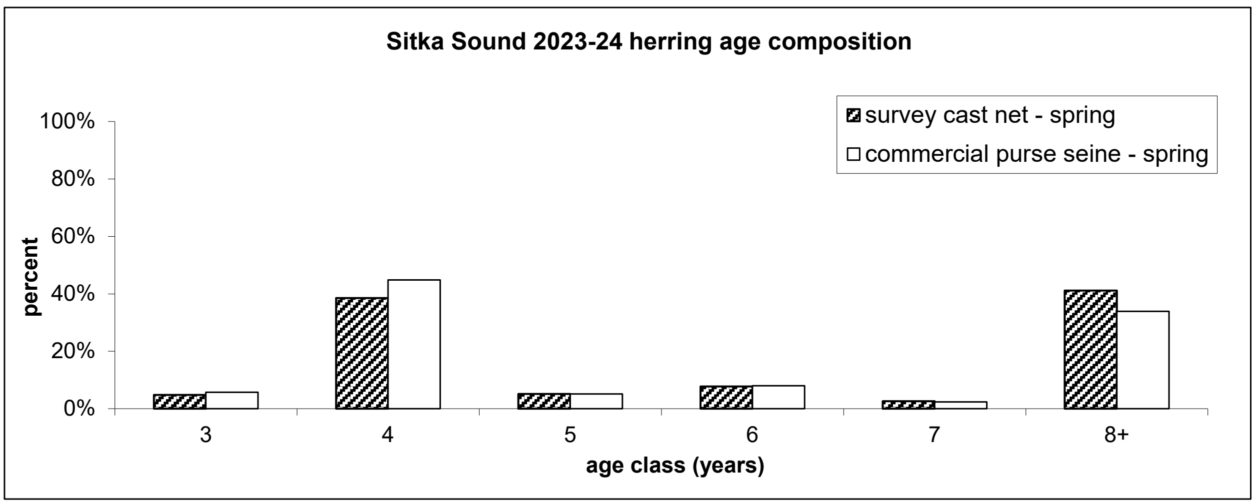

Figure 32.–Observed age composition for Sitka herring stock in 2023–2024.

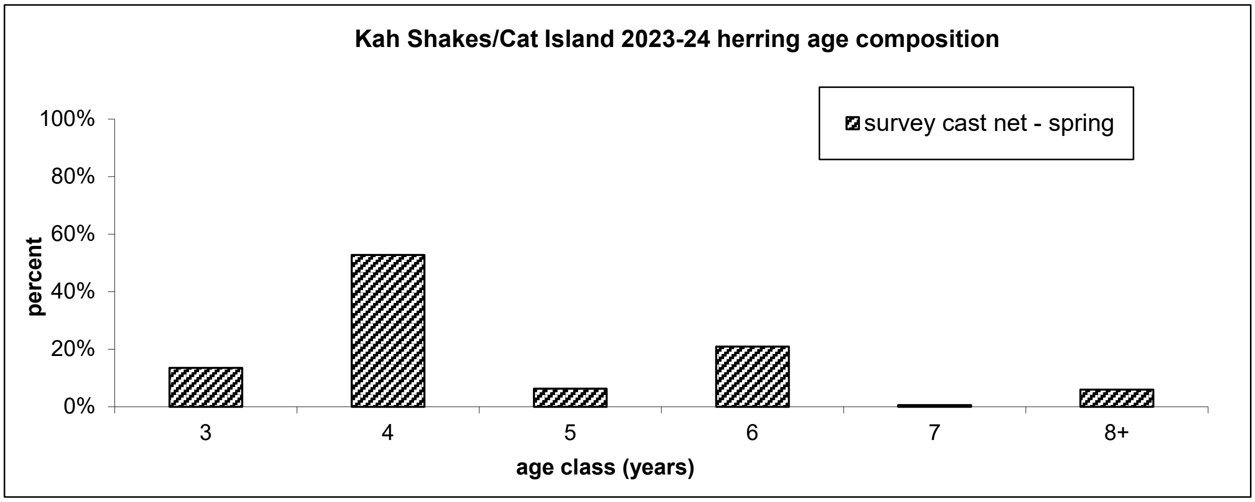

Figure 33.–Observed age composition for Kah Shakes/Cat Island (Revilla Channel) herring stock in 2023–2024.

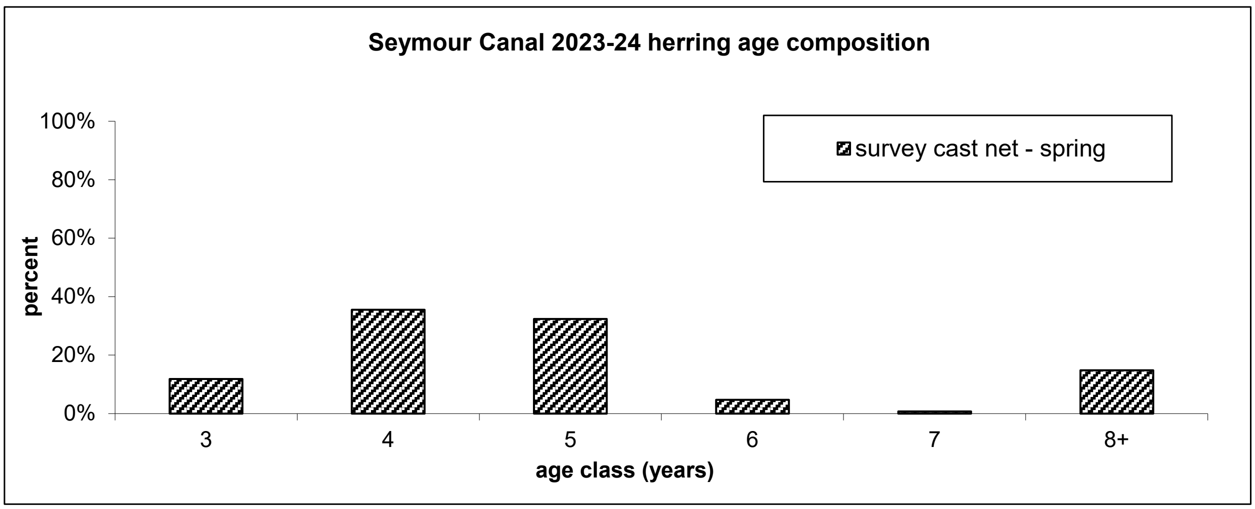

Figure 34.–Observed age composition for Seymour Canal herring stock in 2023–2024. Sample size was 405 herring, which is below the minimum of 511 needed to meet the age composition precision goal.

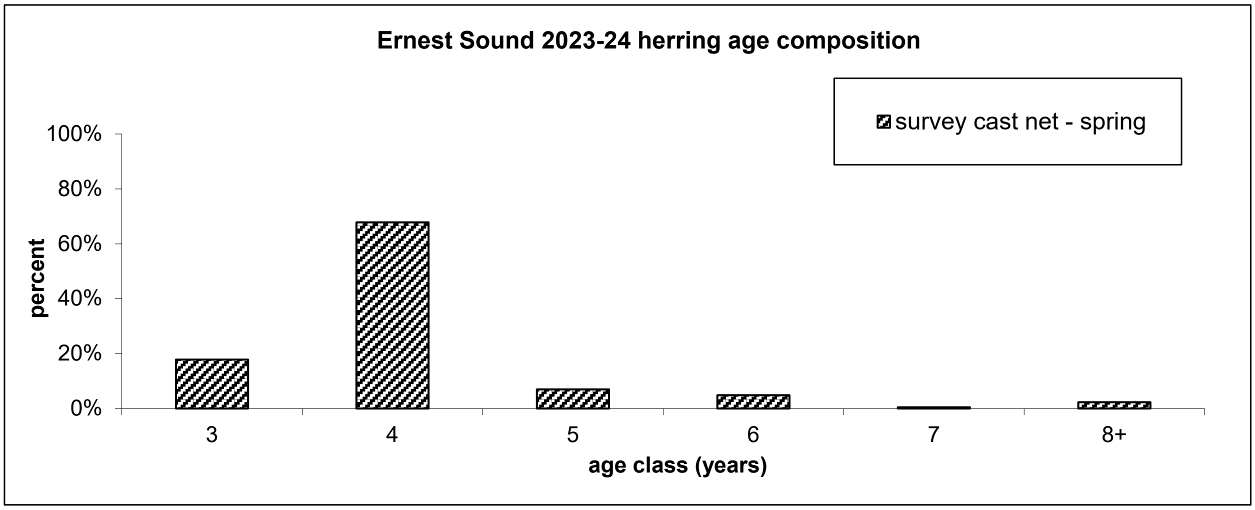

Figure 35.–Observed age composition for Ernest Sound herring spawning area in 2023–2024.

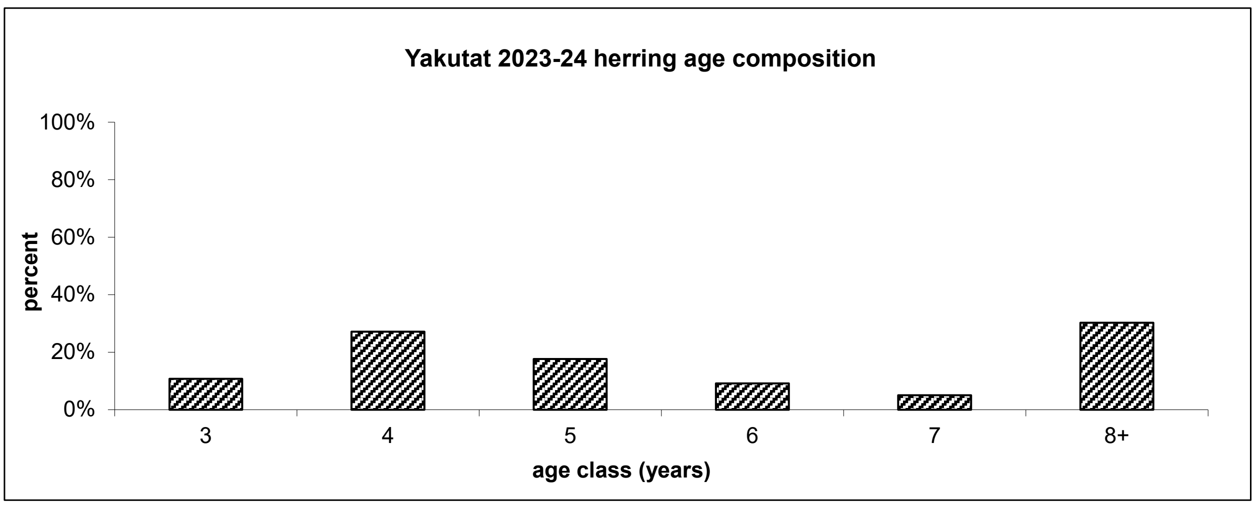

Figure 36.–Observed age composition for Yakutat Bay herring spawning area in 2023–2024.

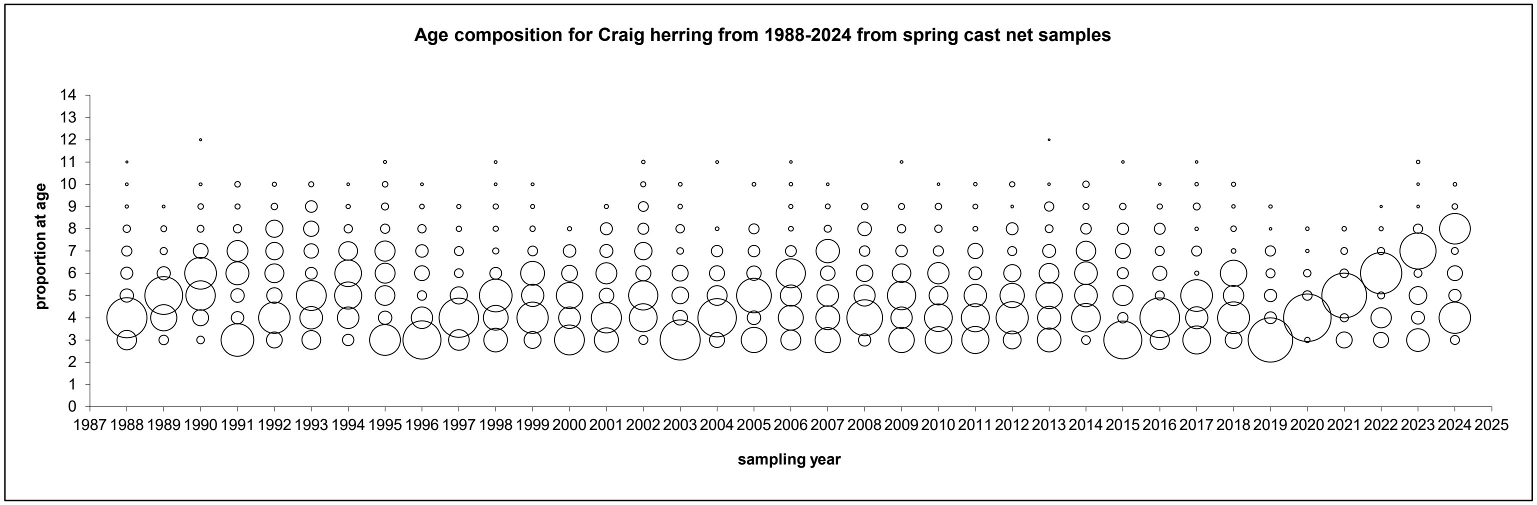

Figure 37.–Observed age compositions from sampling data for the Craig herring stock. Ages presented for 2000 may be biased slightly high due to misinterpretation of scale annuli. For reference, the largest circle represents 93% (2020).

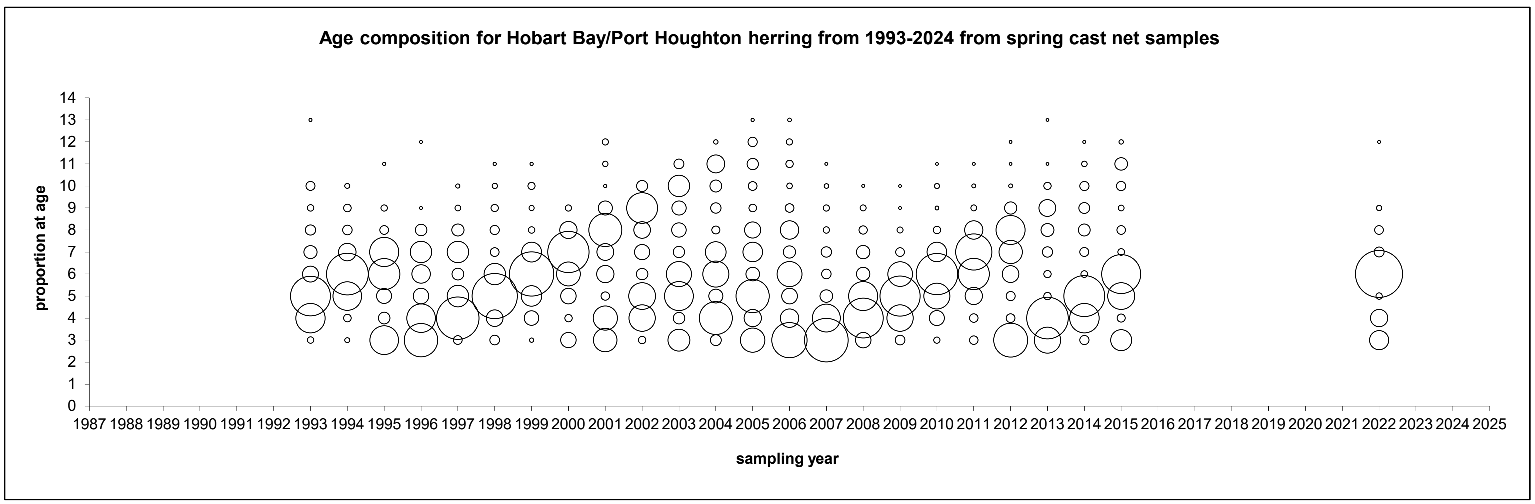

Figure 38.–Observed age compositions from sampling data for the Hobart Bay–Port Houghton herring stock. Ages presented for 2000 may be biased slightly high due to misinterpretation of scale annuli. For years with blanks, data were either not collected or is not available. For reference, the largest circle represents 72% (2022).

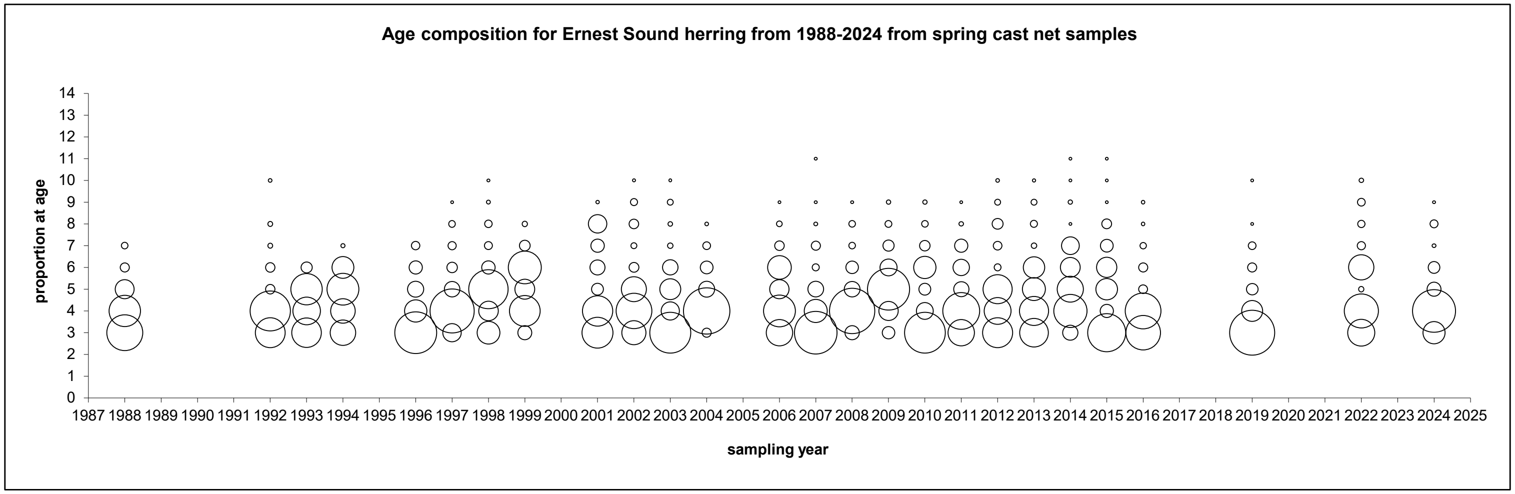

Figure 39.–Observed age compositions from sampling data for the Ernest Sound herring stock. For years with blanks, data were either not collected or are not available. For reference, the largest circle represents 80% (2004).

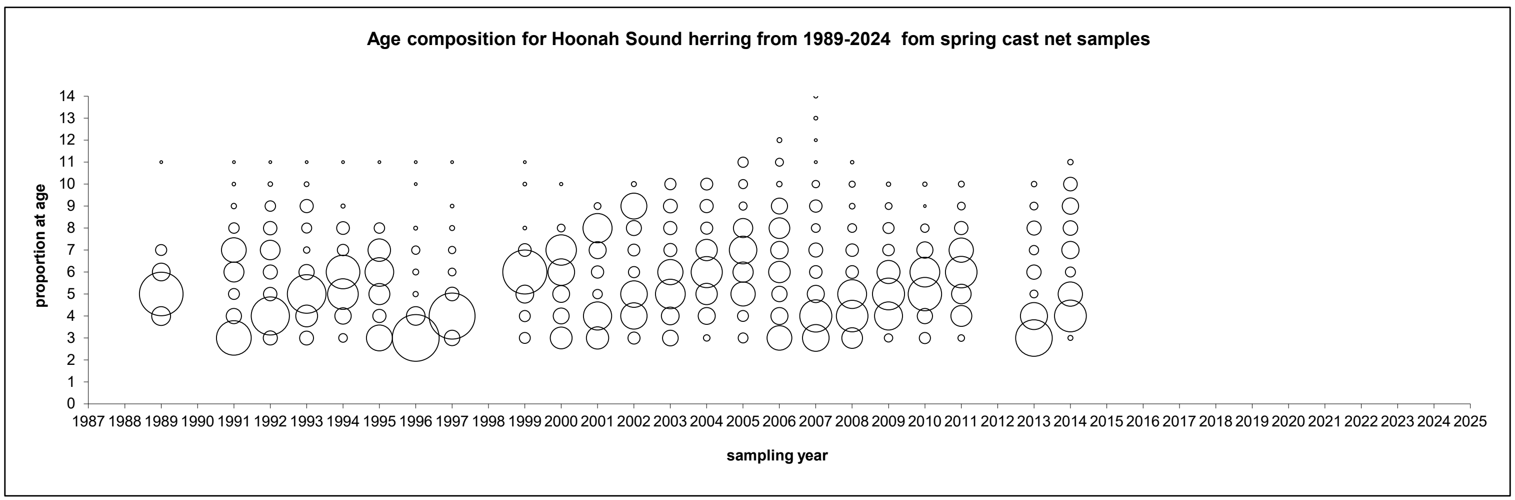

Figure 40.–Observed age compositions from sampling data for the Hoonah Sound herring stock. Ages presented for 2000 may be biased slightly high due to misinterpretation of scale annuli. For years with blanks, data were either not collected or are not available. For reference, the largest circle represents 82% (1996).

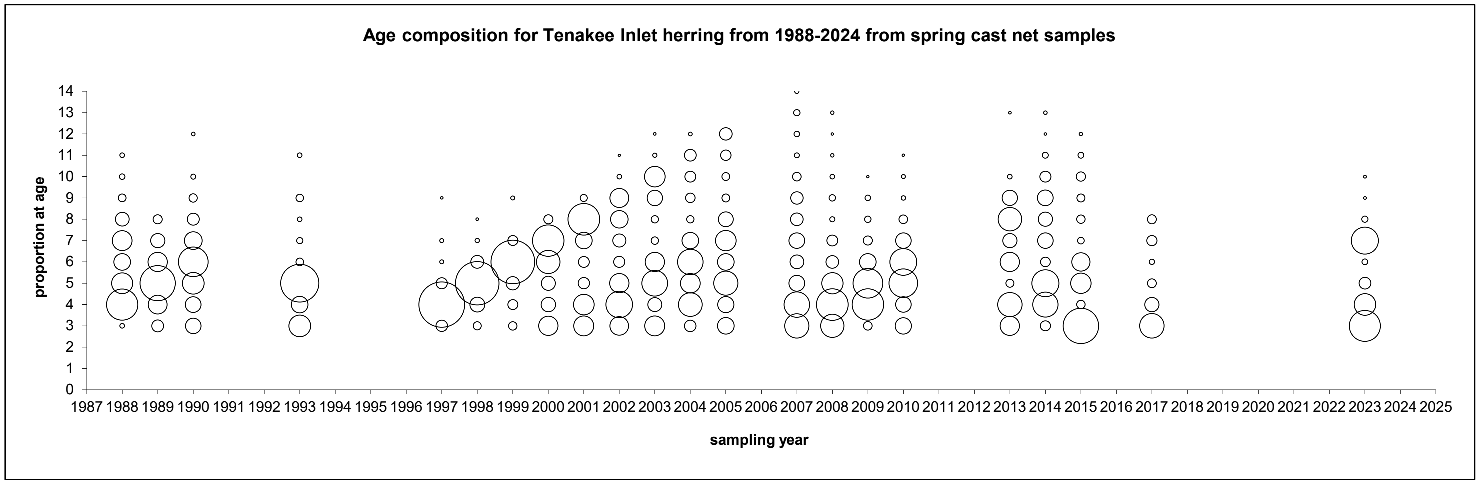

Figure 41.–Observed age compositions from sampling data for the Tenakee Inlet herring stock. Ages presented for 2000 may be biased slightly high due to misinterpretation of scale annuli. For years with blanks, data were either not collected or are not available. For reference, the largest circle represents 88% (1997).

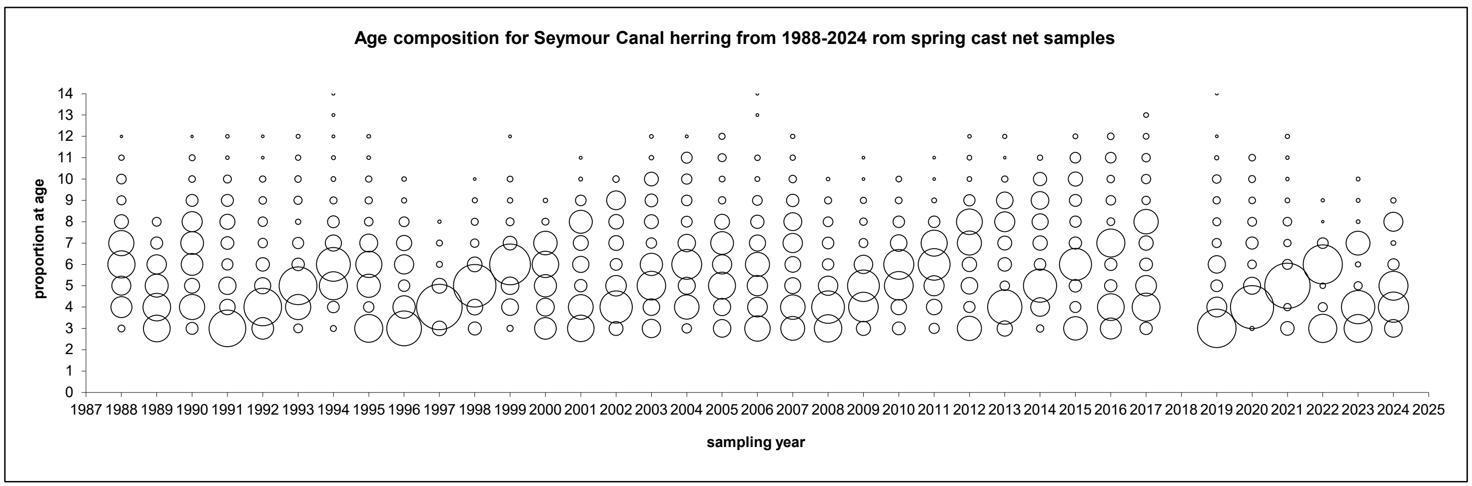

Figure 42.–Observed age compositions from sampling data for the Seymour Canal herring stock. Ages presented for 2000 may be biased slightly high due to misinterpretation of scale annuli. For years with blanks, data were either not collected or are not available. For reference, the largest circle represents 81% (2021 and 1997).

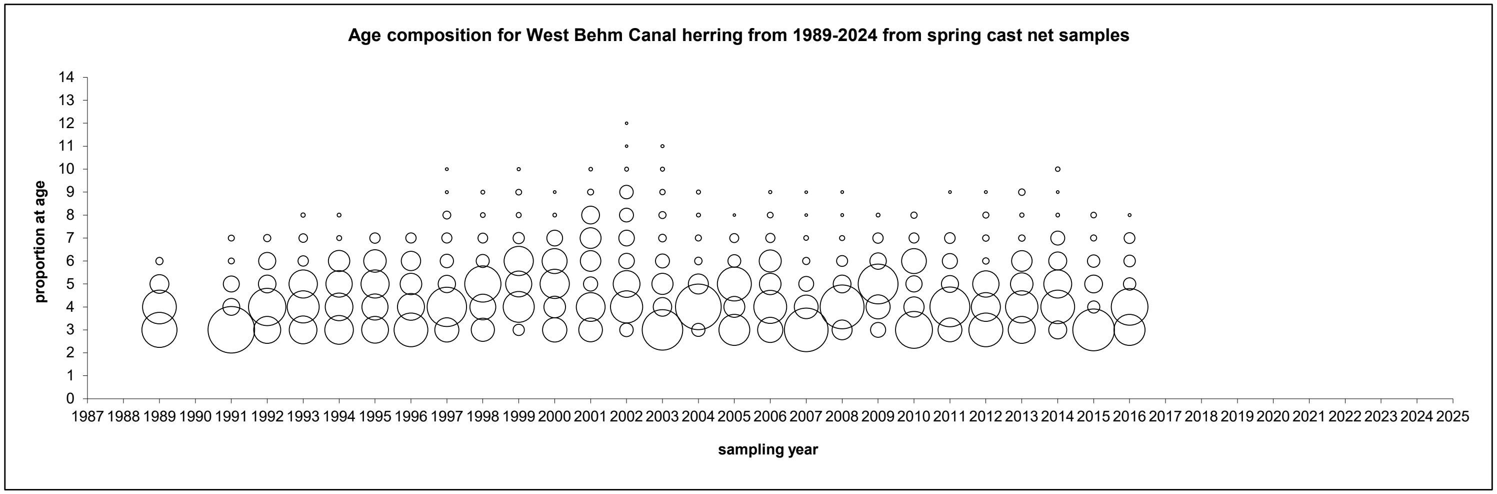

Figure 43.–Observed age compositions from sampling data for the West Behm Canal herring stock. Ages presented for 2000 may be biased slightly high due to misinterpretation of scale annuli. For years with blanks, data were either not collected or are not available. For reference, the largest circle represents 79% (1991).

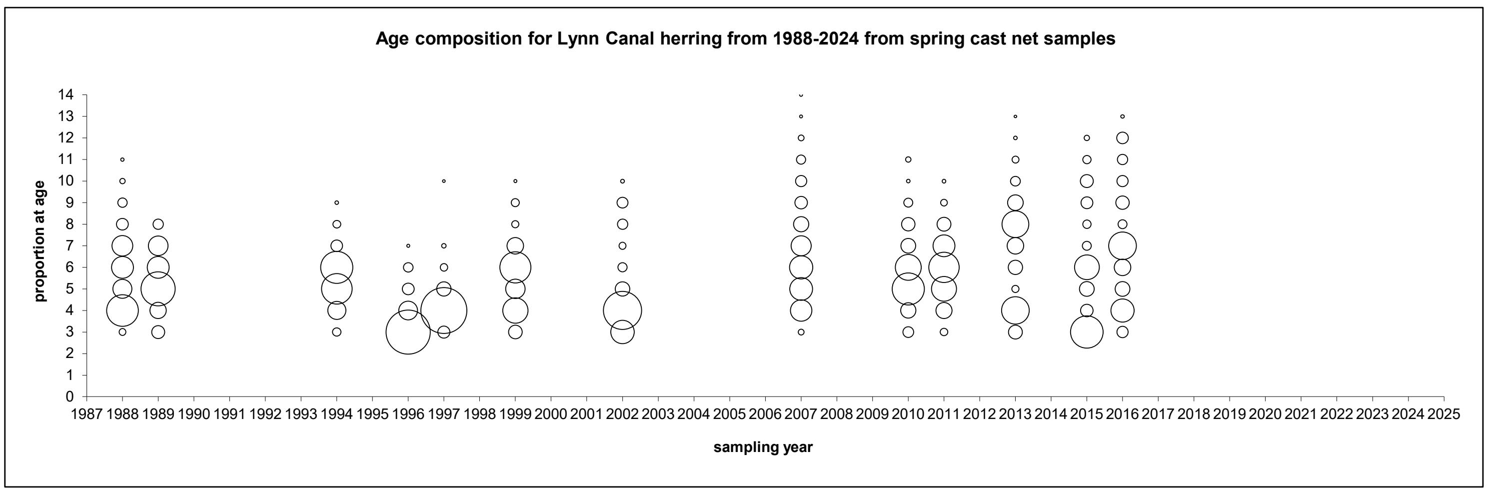

Figure 44.–Observed age compositions from sampling data for the Lynn Canal herring stock. For years with blanks, data were either not collected or are not available. For reference, the largest circle represents 84% (1997).

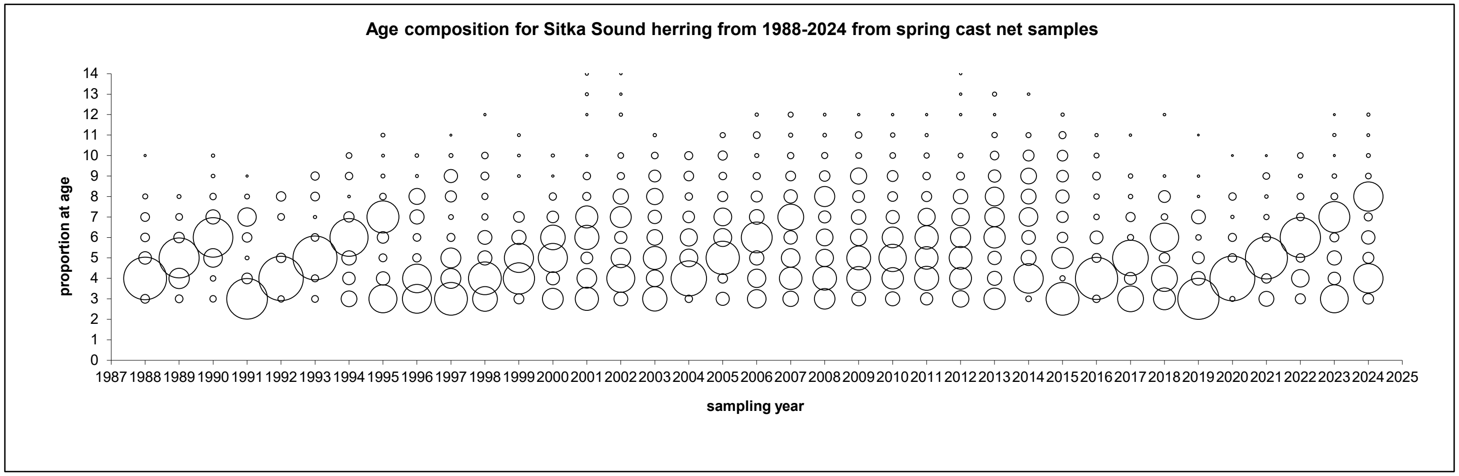

Figure 45.–Observed age compositions from sampling data for the Sitka Sound herring stock. Ages presented for 2000 may be biased slightly high due to misinterpretation of scale annuli. For reference, the largest circle represents 91% (2020).

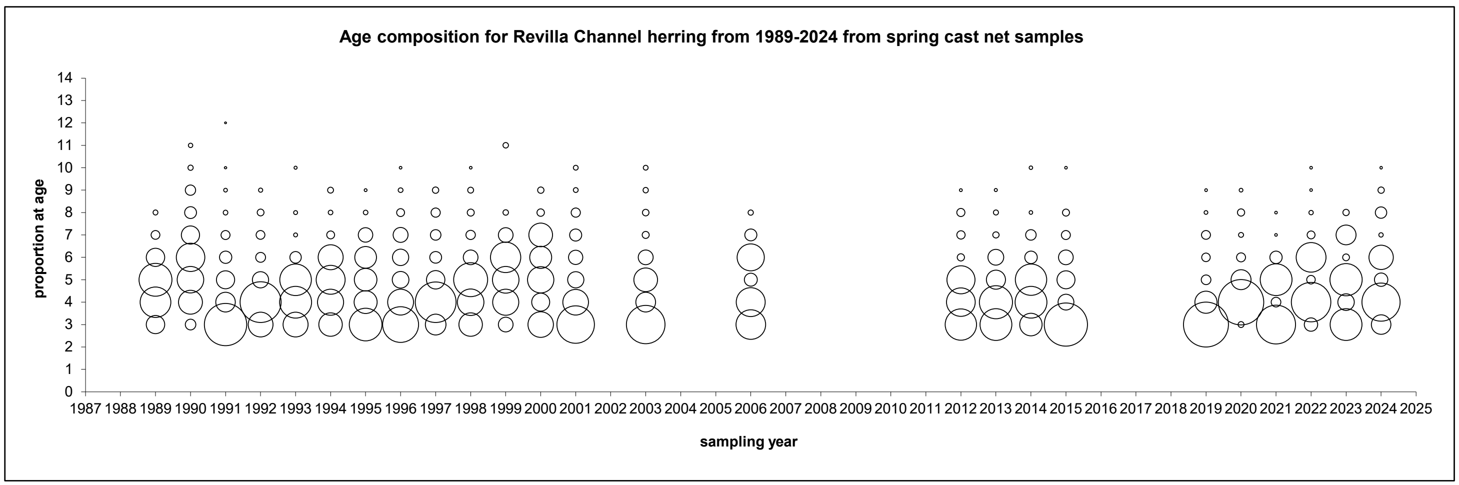

Figure 46.–Observed age compositions from sampling data for the Kah Shakes/Cat Island (Revilla Channel) herring stock. Ages presented for 2000 may be biased slightly high due to misinterpretation of scale annuli. For years with blanks, data were either not collected or are not available. For reference, the largest circle represents 75% (2020).

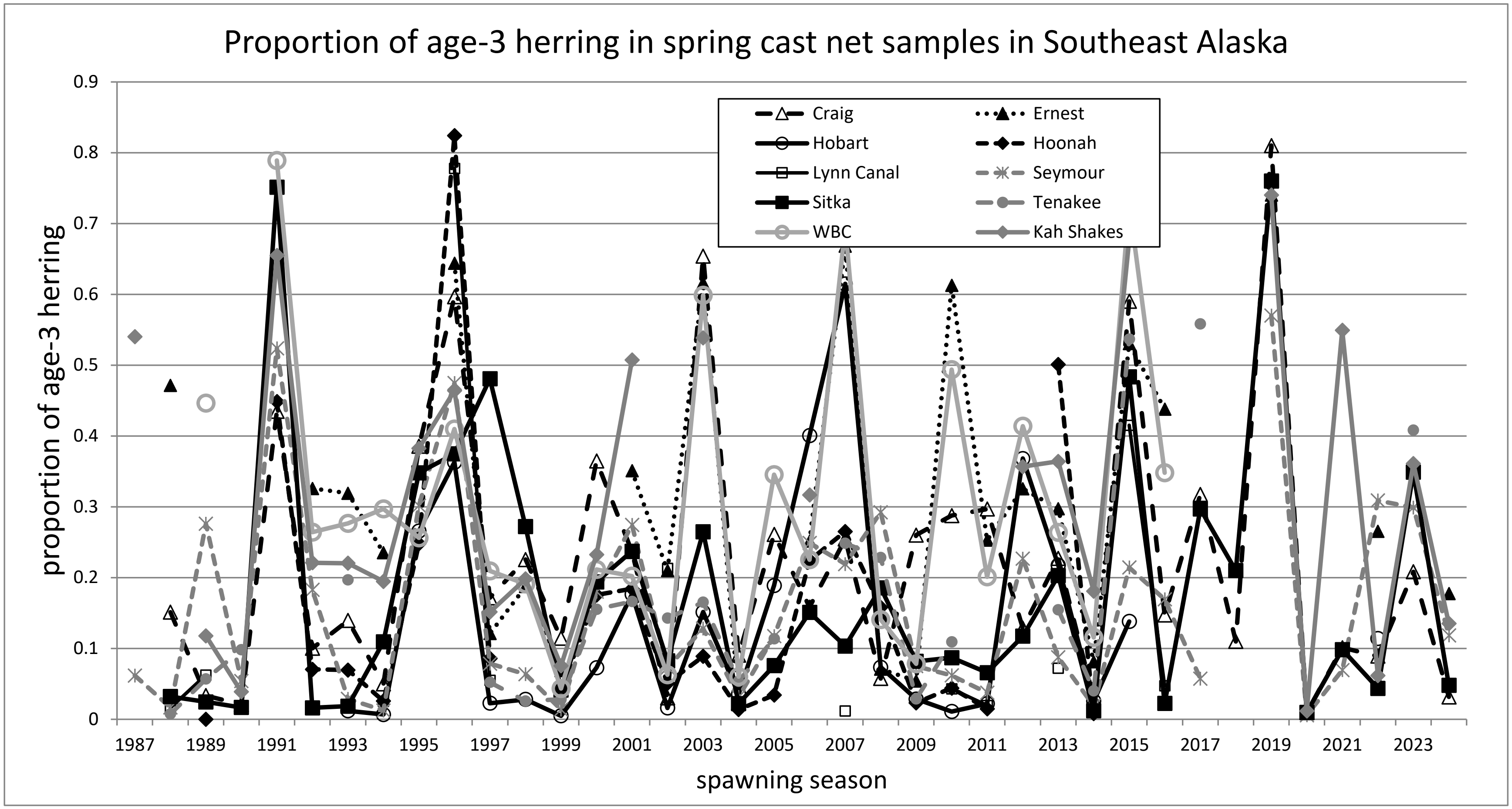

Figure 47.–Proportions of observed age-3 herring in spring cast nest samples of spawning populations for stocks in Southeast Alaska.

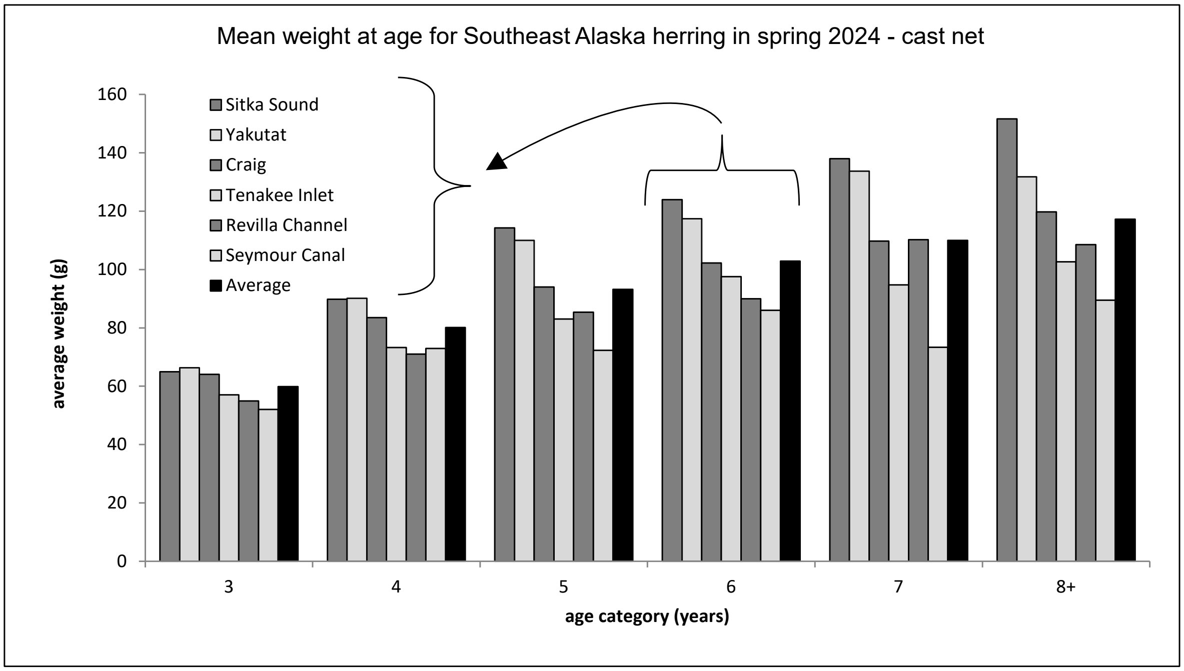

Figure 48.–Mean observed weight-at-age for Southeast Alaska herring stocks surveyed in spring 2024, sorted by age-6.

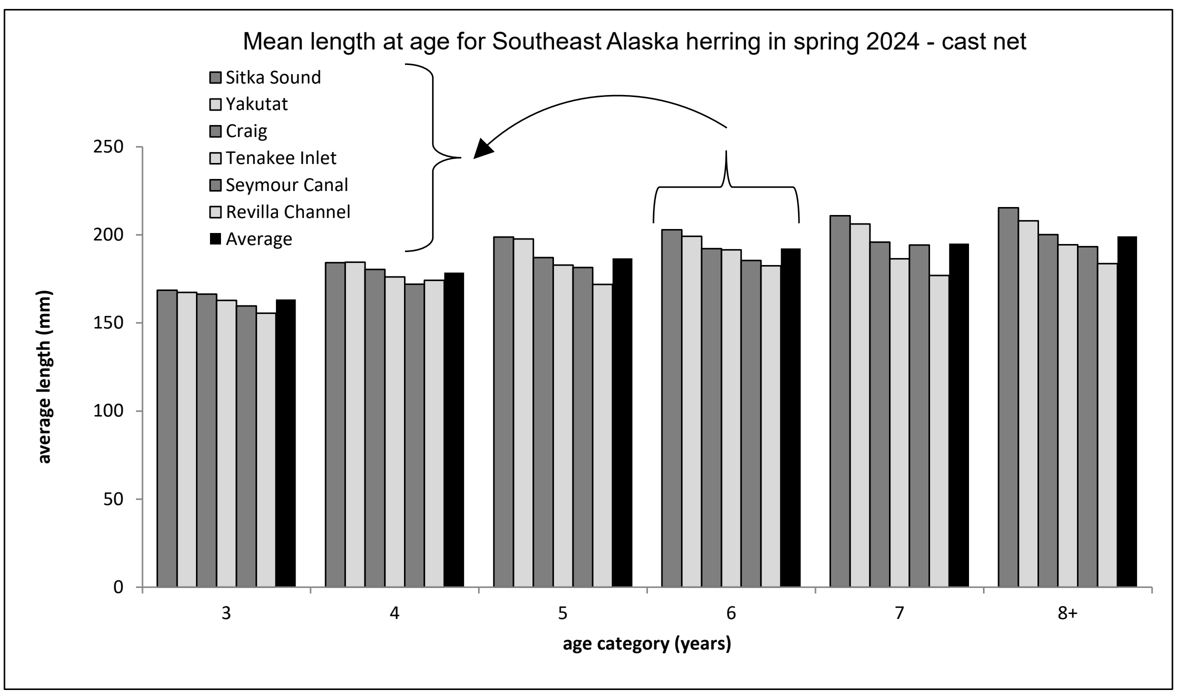

Figure 49.–Mean observed length-at-age for Southeast Alaska herring stocks surveyed in spring 2024, sorted by age-6.

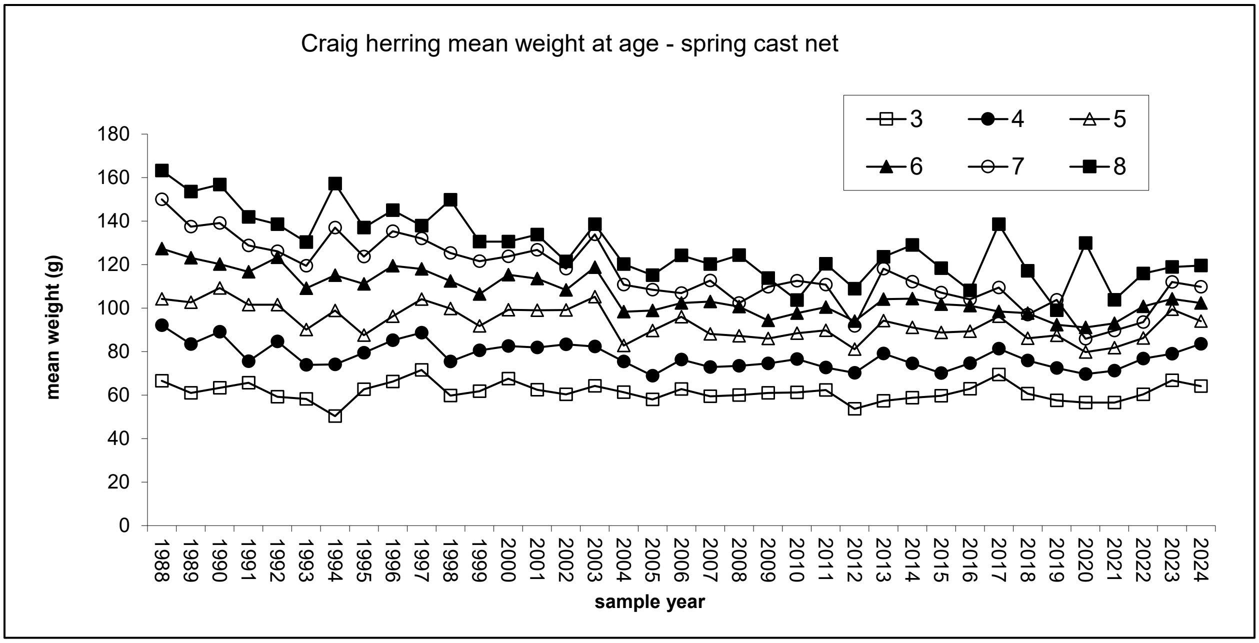

Figure 50.–Mean observed weight-at-age of the Craig herring spawning population. Weights presented for 2000 may be biased slightly high due to misinterpretation of scale annuli.

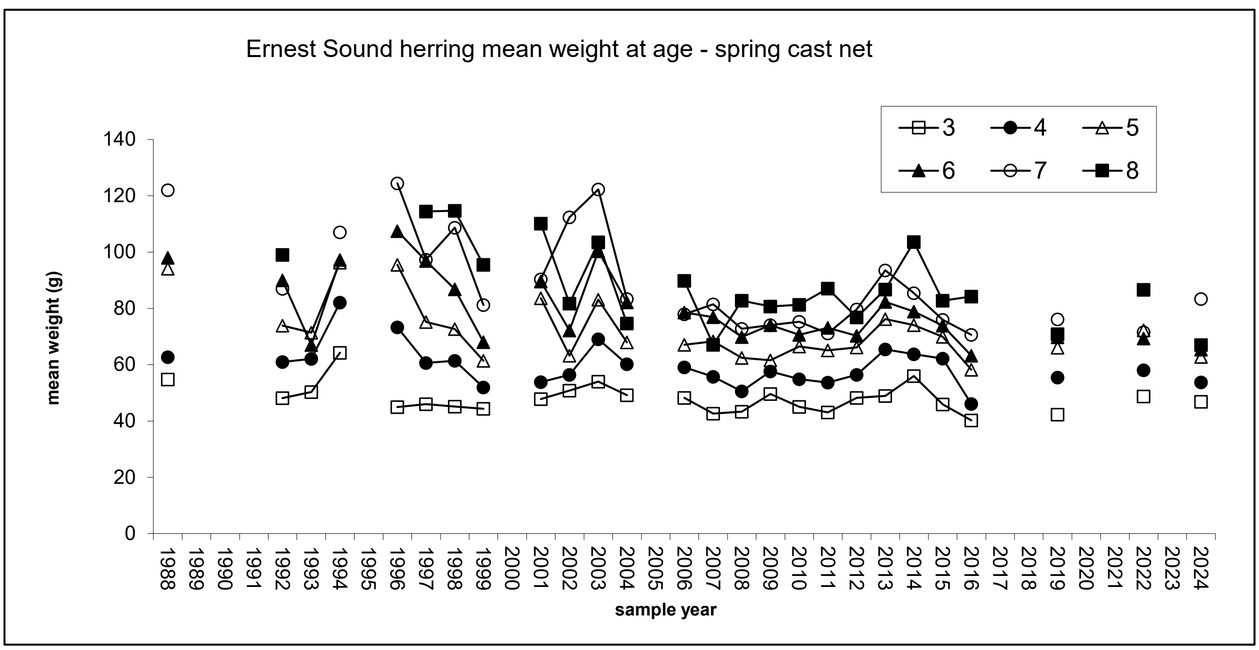

Figure 51.–Mean observed weight-at-age of the Ernest Sound herring spawning population. Weights presented for 2000 may be biased slightly high due to misinterpretation of scale annuli. For years with blanks, data were either not collected or are not available.

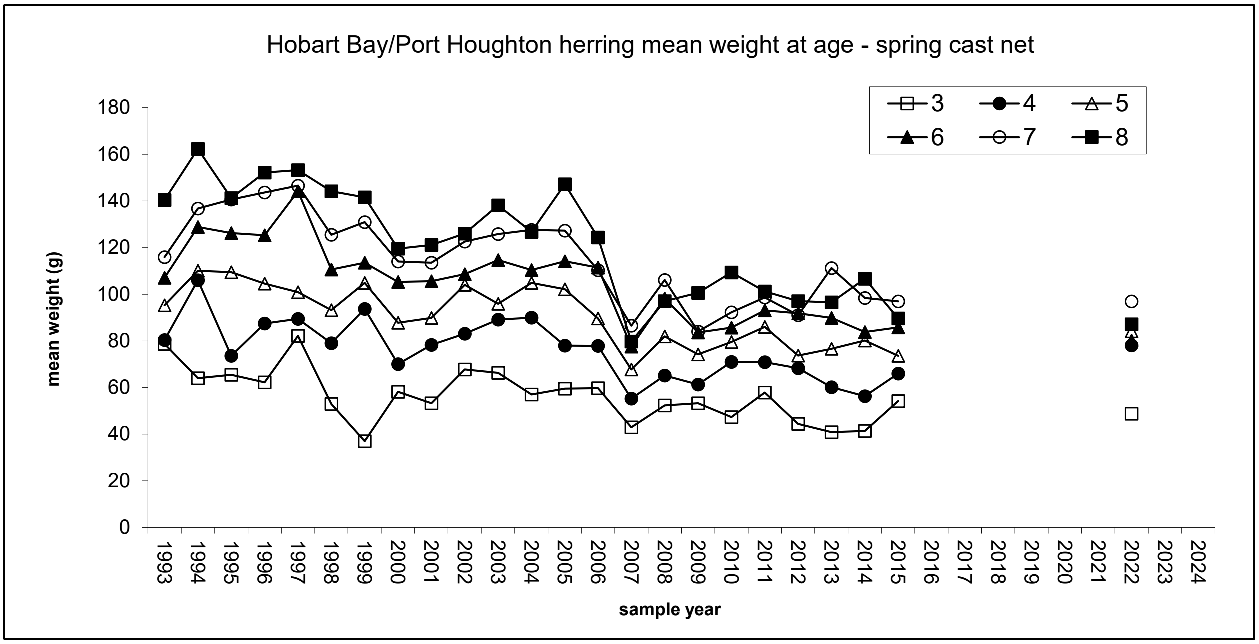

Figure 52.–Mean observed weight-at-age for the Hobart Bay-Port Houghton herring spawning population. For years with blanks, data were either not collected or are not available.

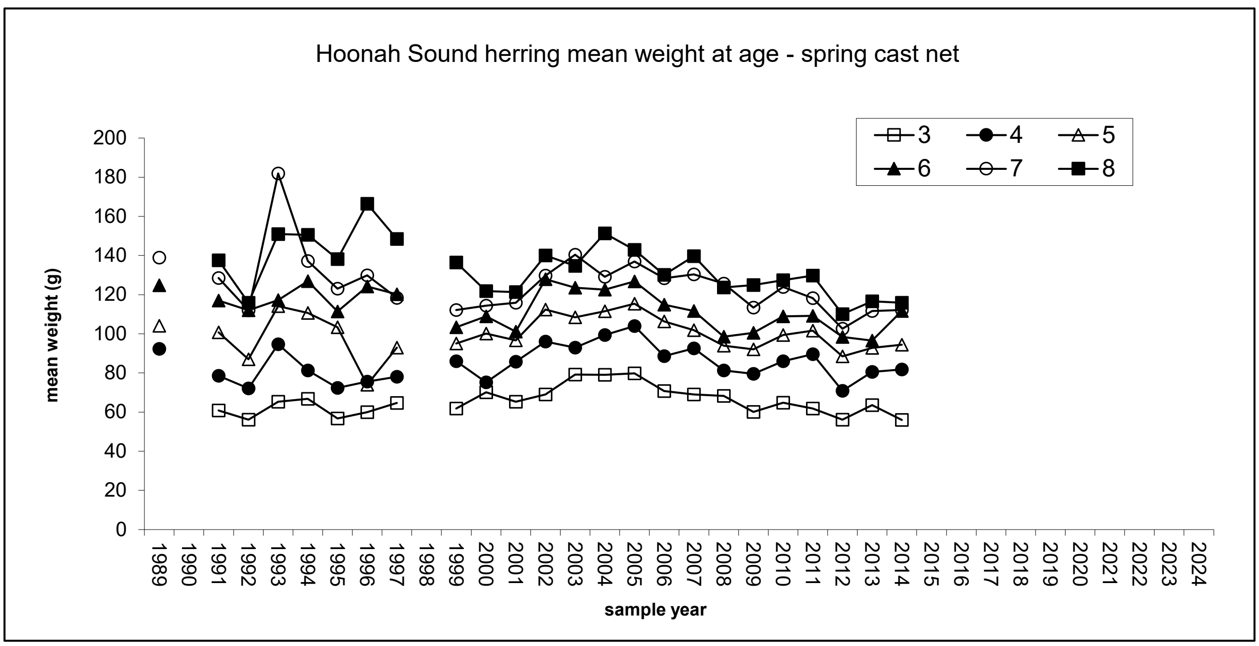

Figure 53.–Mean observed weight-at-age for the Hoonah Sound herring spawning population. Weights presented for 2000 may be biased slightly high due to misinterpretation of scale annuli. For years with blanks, data were either not collected or are not available.

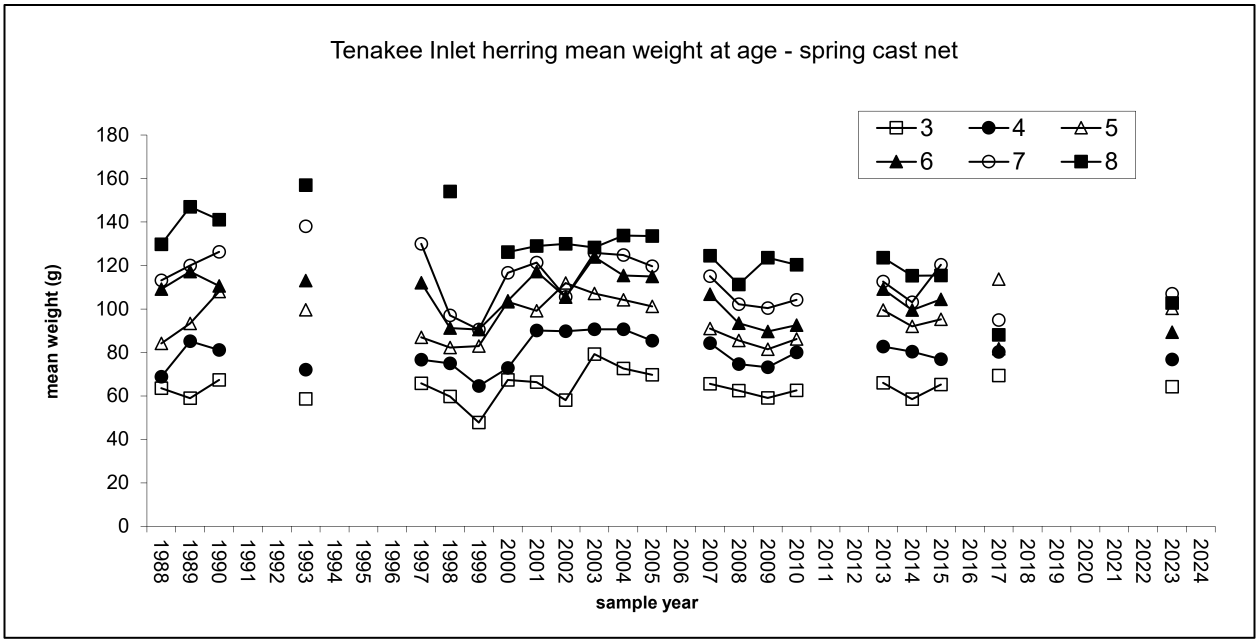

Figure 54.–Mean observed weight-at-age for the Tenakee Inlet herring stock. Weights presented for 2000 may be biased slightly high due to misinterpretation of scale annuli. For years with blanks, data were either not collected or are not available.

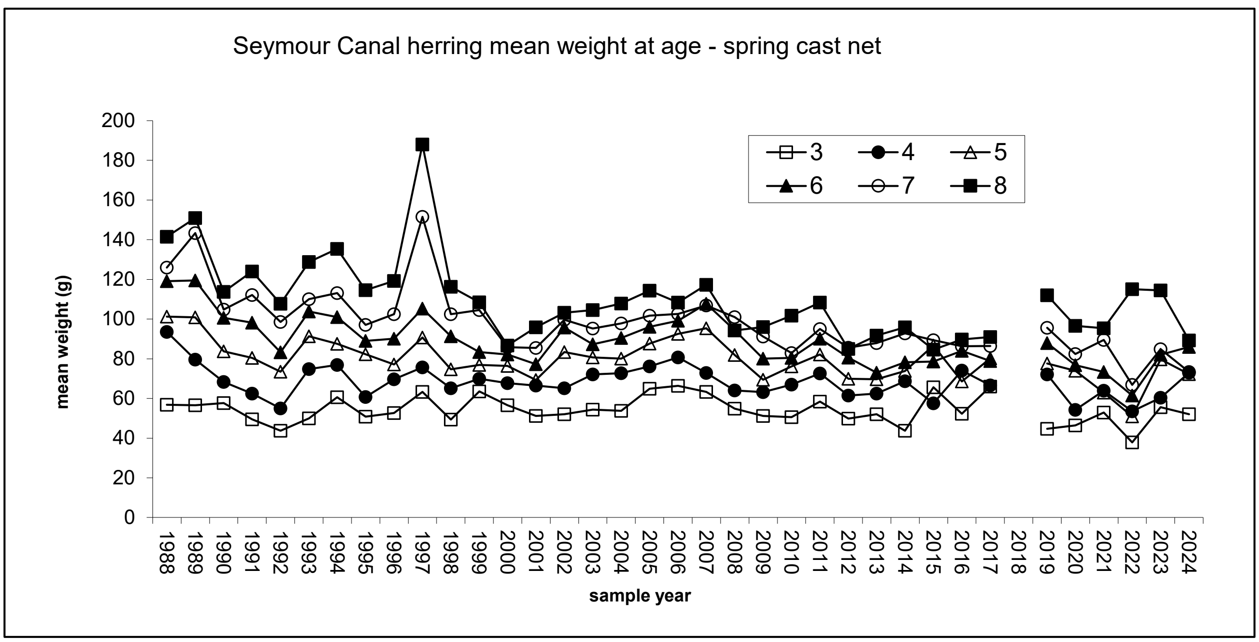

Figure 55.–Mean observed weight-at-age for the Seymour Canal herring stock. Weights presented for 2000 may be biased slightly high due to misinterpretation of scale annuli. For years with blanks, data were either not collected or are not available.

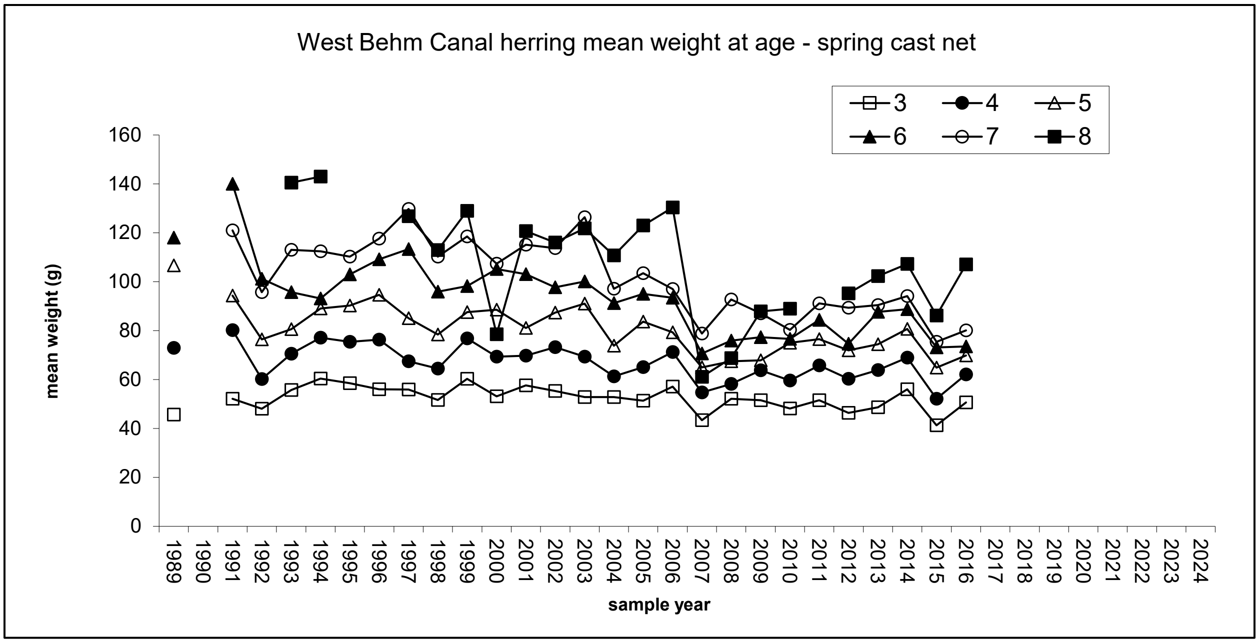

Figure 56.–Mean observed weight-at-age for the West Behm Canal herring spawning population. Weights presented for 2000 may be biased slightly high due to misinterpretation of scale annuli. 2015 weights are probably biased low due to required additional sample handling that resulted in loss of weight. For years with blanks, data were either not collected or are not available.

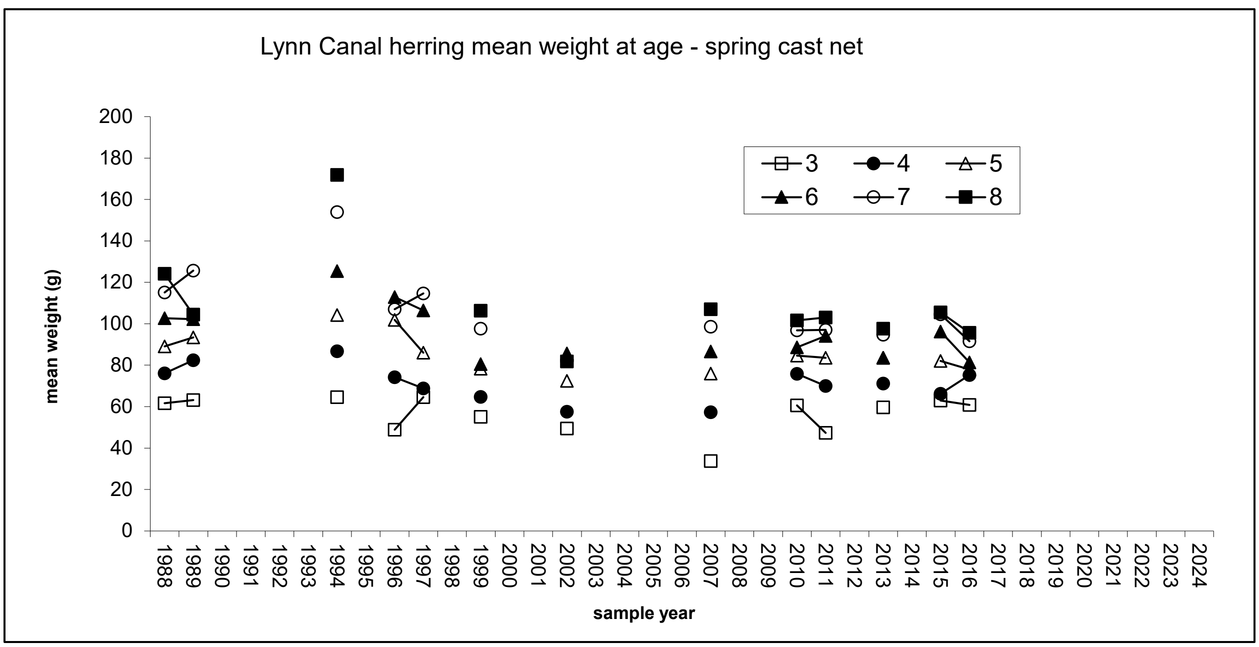

Figure 57.–Mean observed weight-at-age for the Lynn Canal herring spawning population. For years with blanks, data were either not collected or are not available.

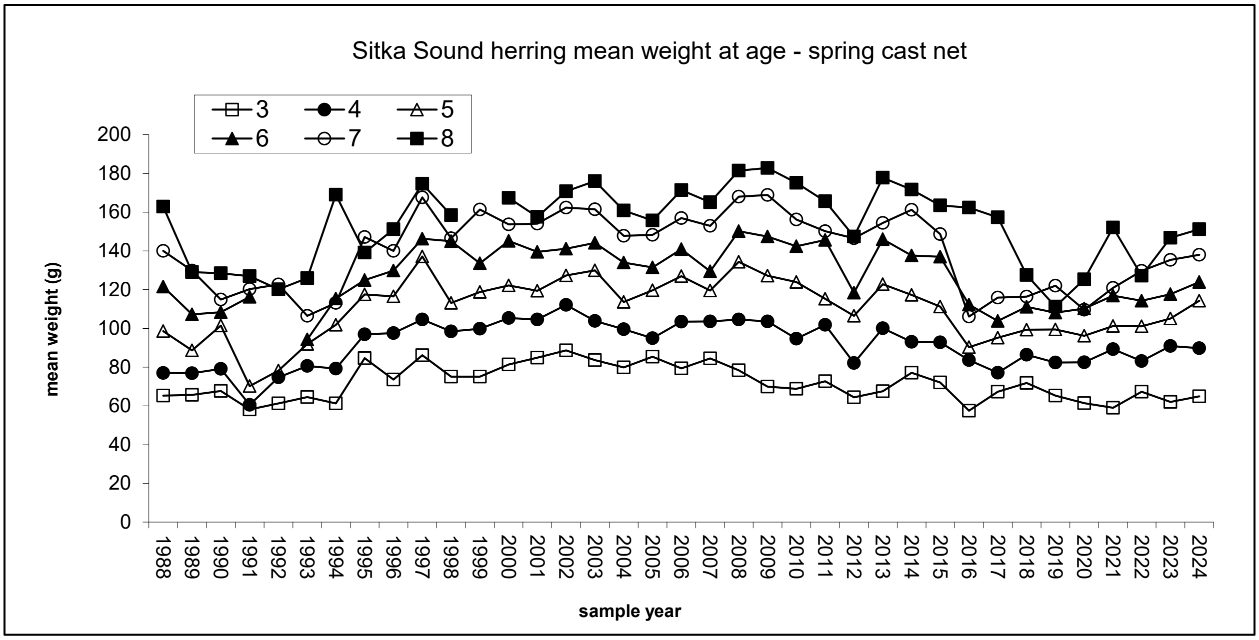

Figure 58.–Mean observed weight-at-age for the Sitka Sound herring spawning population. Weights presented for 2000 may be biased slightly high due to misinterpretation of scale annuli.

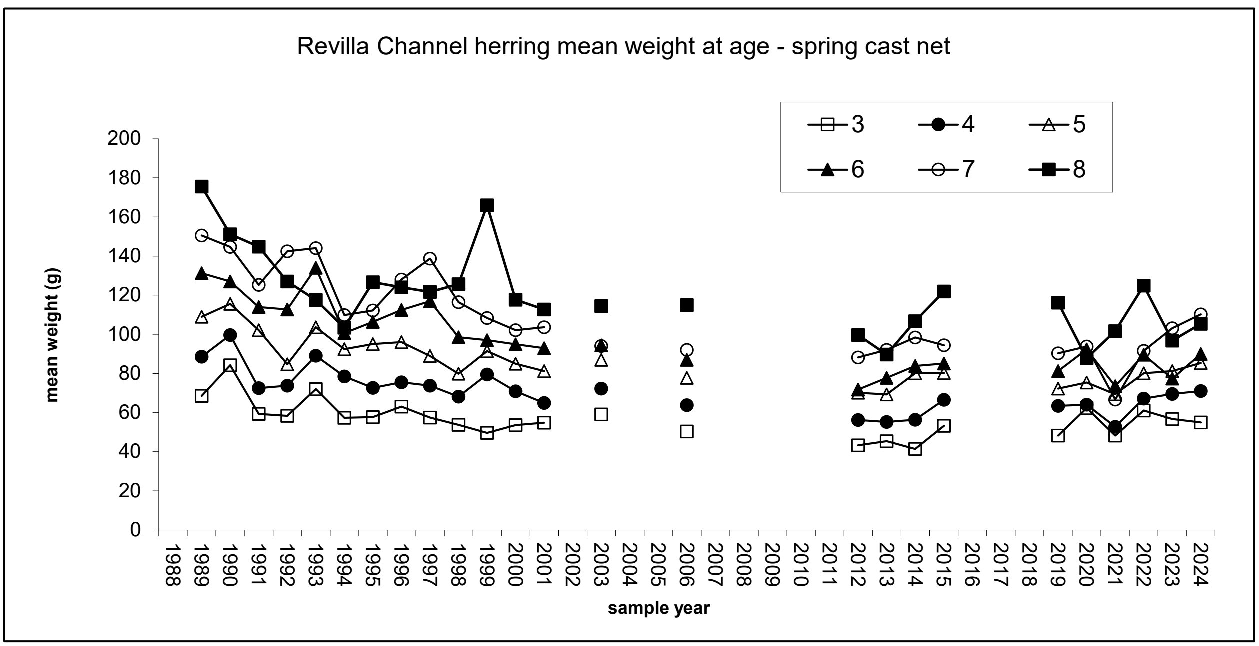

Figure 59.–Mean observed weight-at-age for the Revilla Channel herring spawning population. Weights presented for 2000 may be biased slightly high due to misinterpretation of scale annuli. For years with blanks, data were either not collected or are not available.

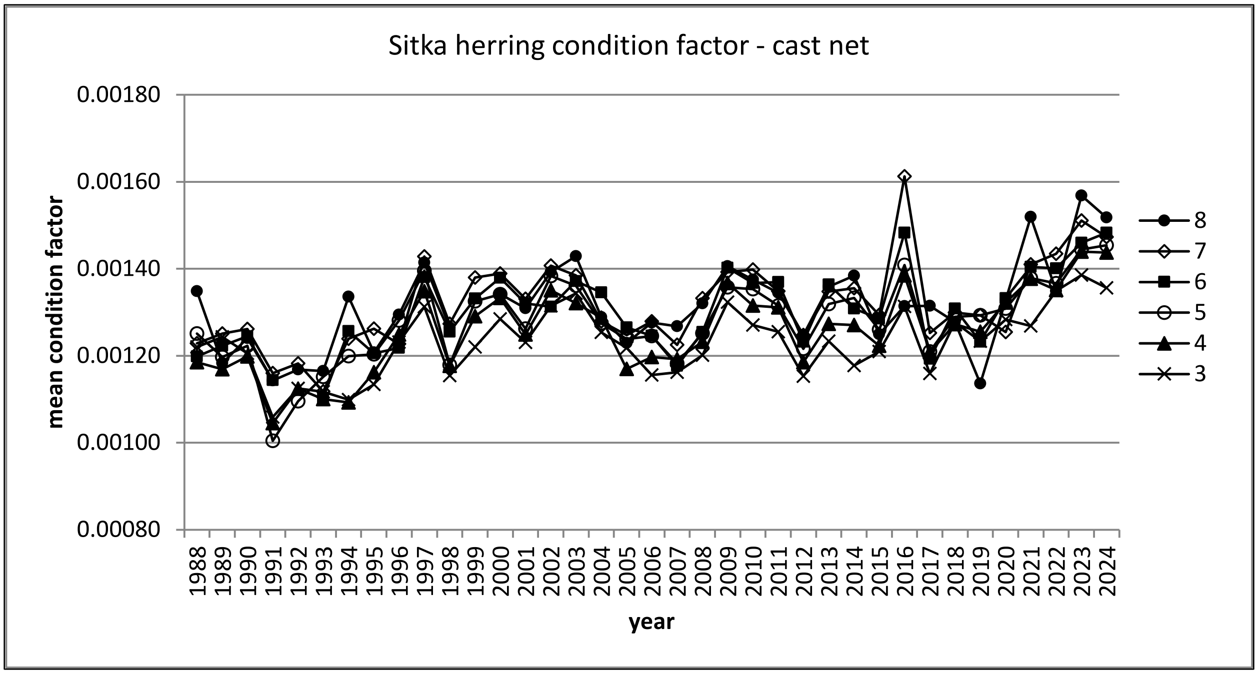

Figure 60.–Mean condition factors of age-3 through age-8 herring for the Sitka Sound spawning population, based on spring cast net samples taken during active spawning. 2016 values may be biased high due to length measurements that were probably underestimated.

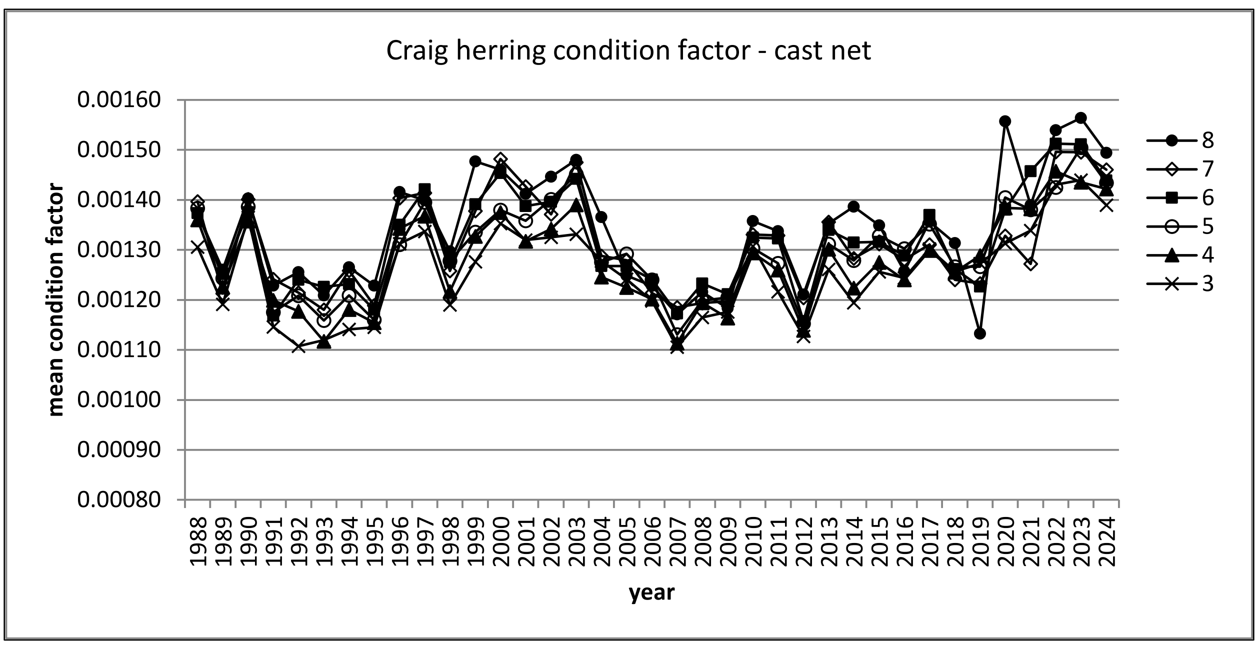

Figure 61.–Mean condition factors of age-3 through age-8 herring for the Craig spawning population, based on spring cast net samples taken during active spawning.

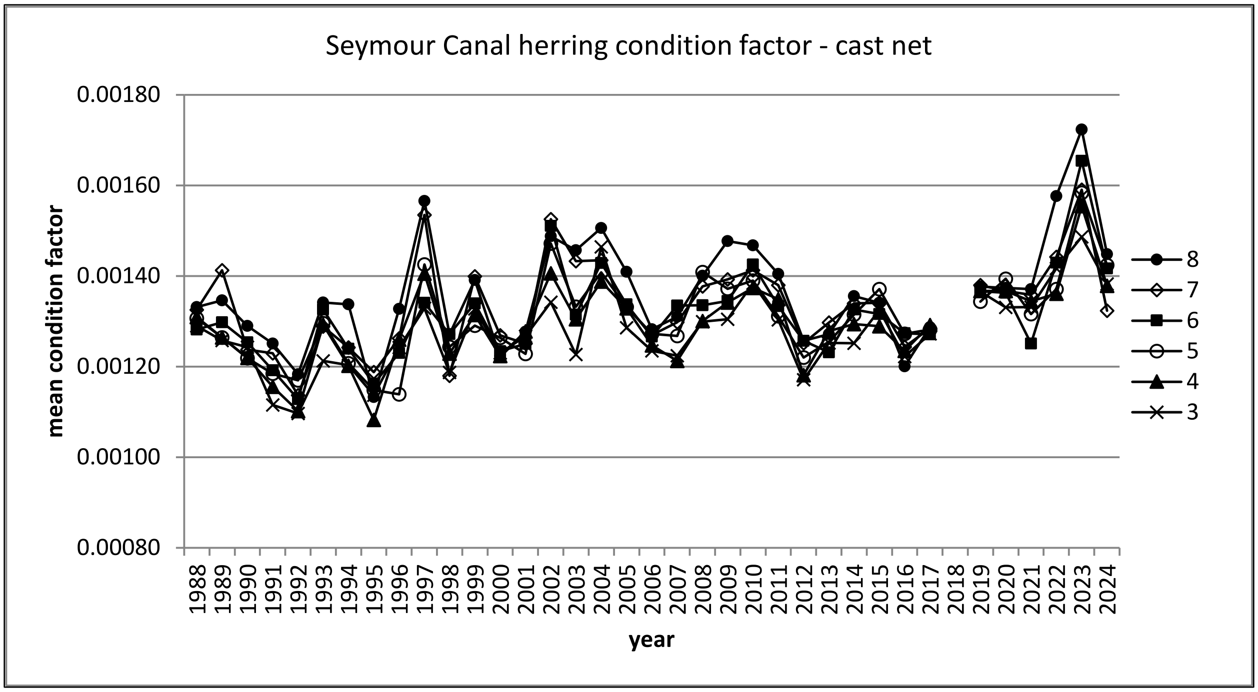

Figure 62.–Mean condition factors of age-3 through age-8 herring for the Seymour Canal spawning population, based on spring cast net samples taken during active spawning.

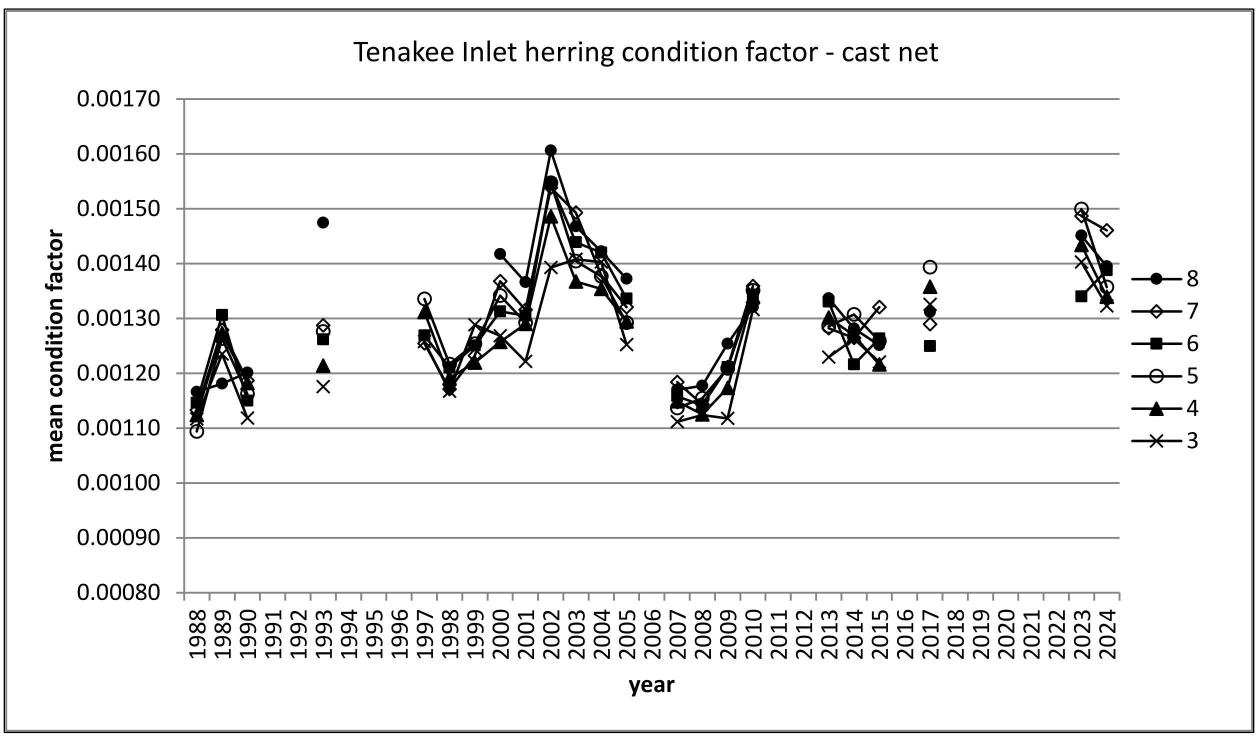

Figure 63.–Mean condition factors of age-3 through age-8 herring for the Tenakee Inlet spawning population, based on spring cast net samples taken during active spawning.

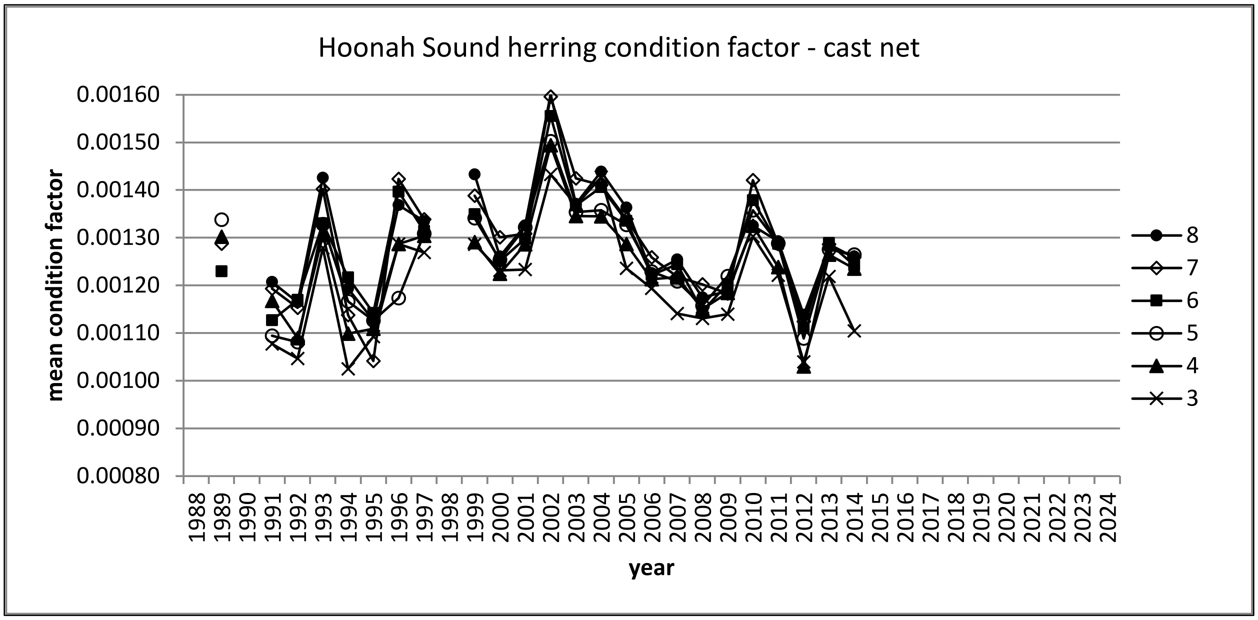

Figure 64.–Mean condition factors of age-3 through age-8 herring for the Hoonah Sound spawning population, based on spring cast net samples taken during active spawning.

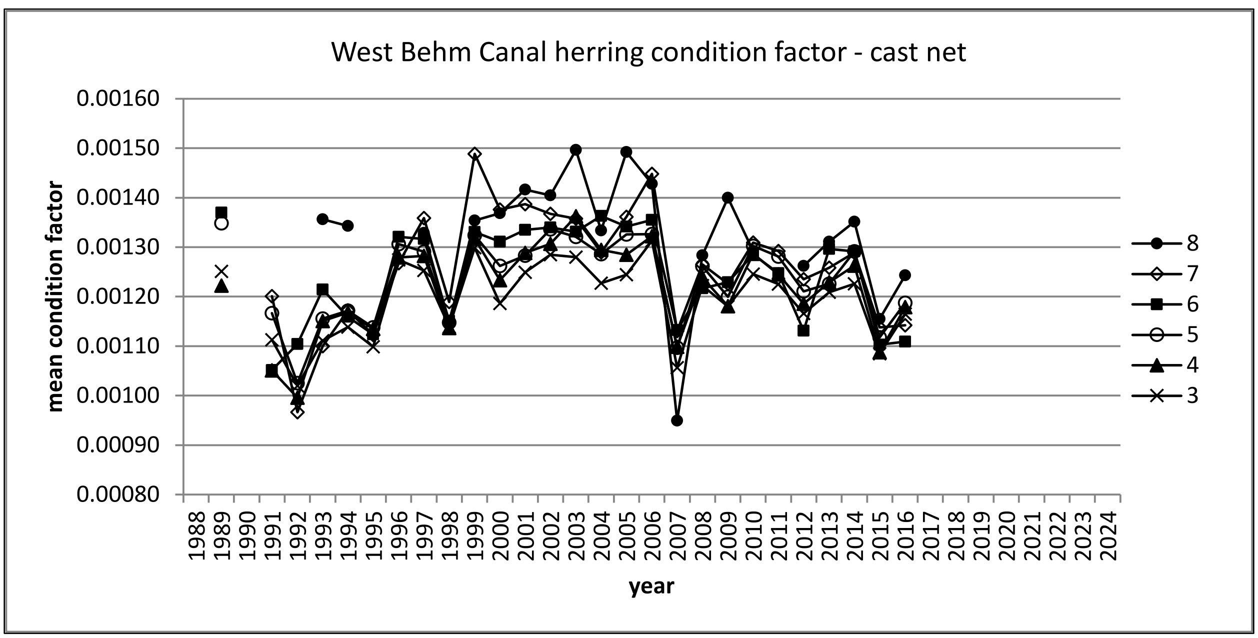

Figure 65.–Mean condition factors of age-3 through age-8 herring for the West Behm Canal spawning population, based on spring cast net samples taken during active spawning. 2015 condition factors are probably biased low due to required additional sample handling that resulted in loss of weight.

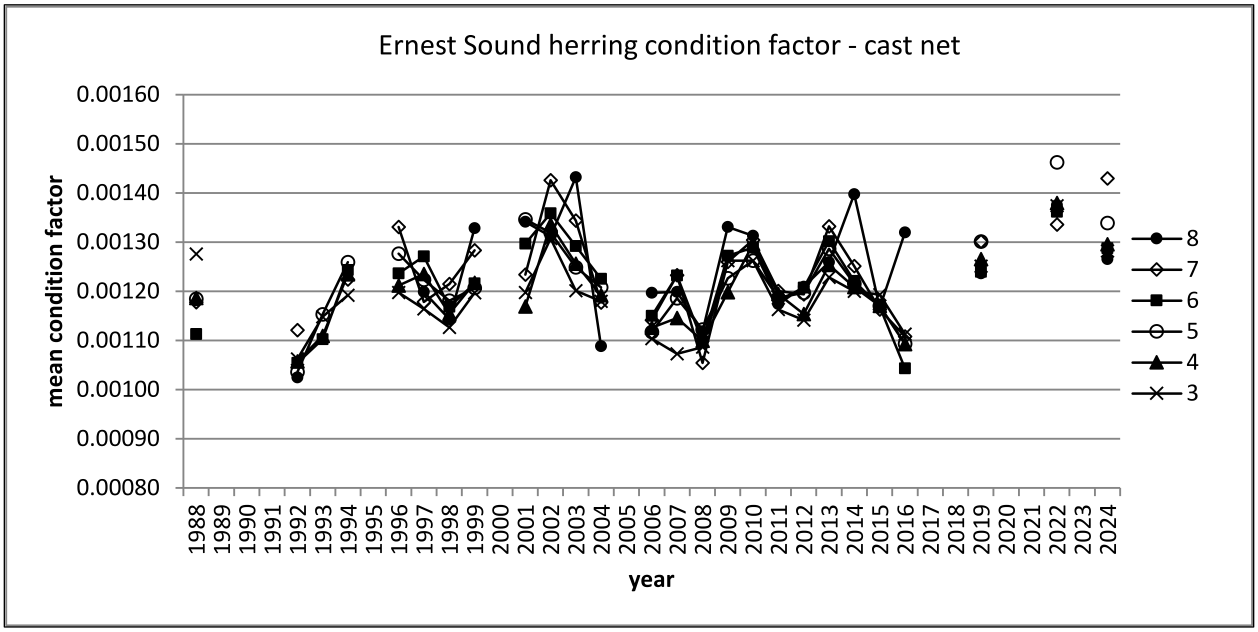

Figure 66.–Mean condition factors of age-3 through age-8 herring for the Ernest Sound spawning population, based on spring cast net samples taken during active spawning.

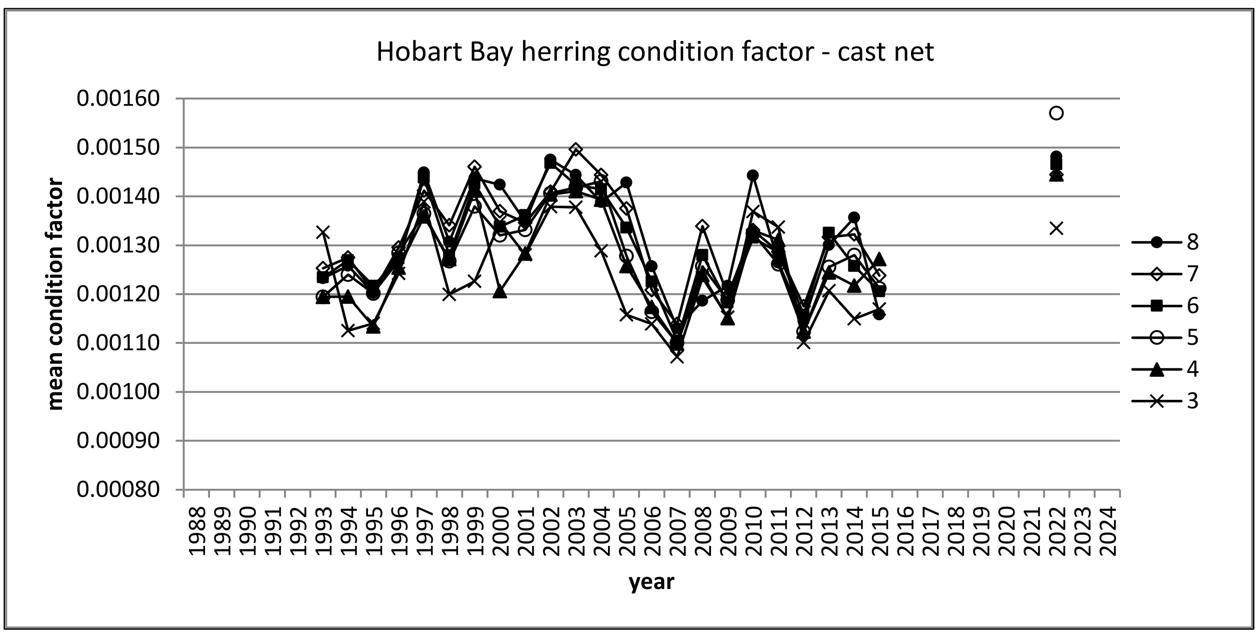

Figure 67.–Mean condition factors of age-3 through age-8 herring for the Hobart Bay spawning population, based on spring cast net samples taken during active spawning.

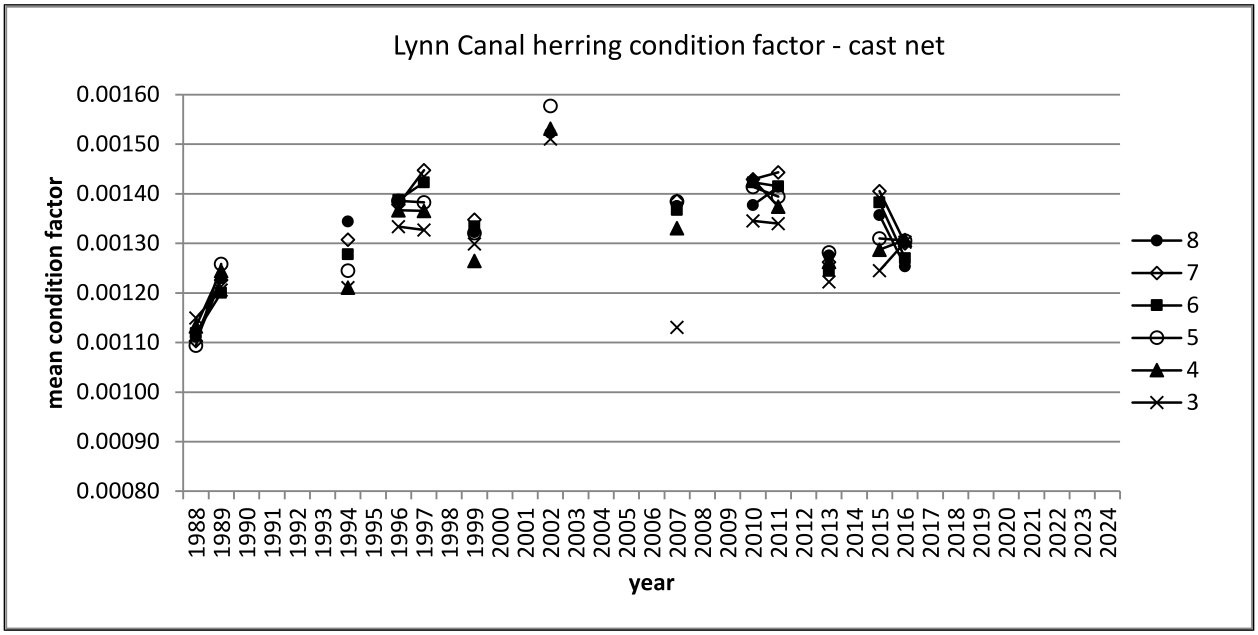

Figure 68.–Mean condition factors of age-3 through age-8 herring for the Lynn Canal spawning population, based on spring cast net samples taken during active spawning.

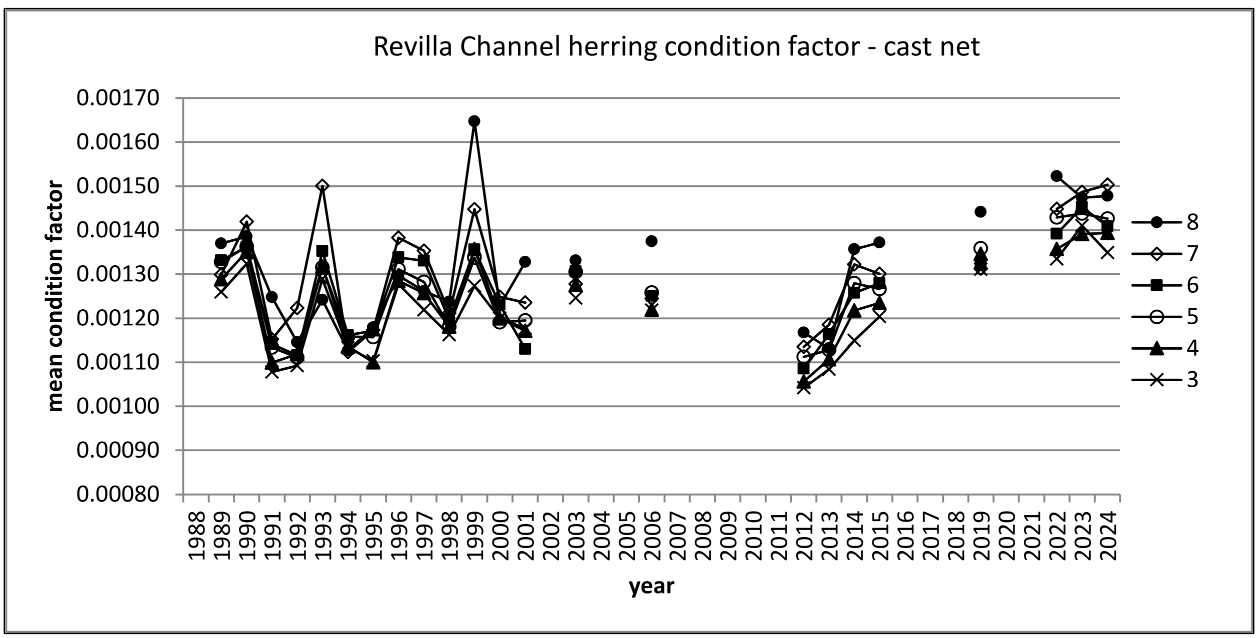

Figure 69.–Mean condition factors of age-3 through age-8 herring for the Revilla Channel spawning population, based on spring cast net samples taken during active spawning.

APPENDIX A: KEY TO VEGETATIVE SUBSTRATE TYPES USED FOR HERRING SPAWN DEPOSITION SURVEY

Appendix A1.–Key to vegetative substrate types used for herring spawn deposition survey.

Code	Expanded code	Species included	Latin names
AGM	Agarum	Sieve kelp	*Agarum clathratum*
ALA	Alaria	Ribbon kelps	*Alaria marginata*, *A. nana*, *A. fistulosa*
ELG	Eel grass	Eel grass, surfgrasses	*Zostera marina*, *Phyllospadix serrulatus*, *P. scouleri*
FIL	Filamentous algae	Sea hair	*Enteromorpha intestinalis*
FIR	Fir kelp	Black pine, Oregon pine (red algae)	*Neorhodomela larix*, *N. oregona*
FUC	Fucus	Rockweed	*Fucus gardneri*
HIR	Hair kelp	Witch's hair, stringy acid kelp	*Desmarestia aculeata*, *D. viridis*
LAM	Laminaria	split kelp, sugar kelp, suction-cup kelp	*Laminaria bongardiana*, *L. yezoensis* (when isolated and identifiable), *Saccharina latissima* (formerly *L. saccharina)*
LBK	Large/leafy brown kelps	Five-ribbed kelp, three-ribbed kelp, split kelp, sugar kelp, sea spatula, sieve kelp, ribbon kelp	*Costaria costata*, *Cymathere triplicata*, *Laminaria* spp., *Pleurophycus gardneri*, *Agarum*, *Alaria* spp.
MAC	Macrocystis	Small perennial kelp	*Macrocystis* spp.
NER	Nereocystis	Bull kelp	*Nereocystis leutkeana*
RED	Red algae	All red leafy algae (red ribbons, red blades, red sea cabbage, Turkish washcloth)	*Palmaria mollis*, *P. hecatensis*, *P. callophylloides*, *Dilsea californica*, *Neodilsea borealis*, *Mastocarpus papillatus*, *Turnerella mertensiana*
ULV	Ulva	Sea lettuce	*Ulva fenestrata*, *Ulvaria obscura*
COR	Coralline algae	Coral seaweeds (red algae)	*Bossiella*, *Corallina*, *Serraticardia*

APPENDIX B: KEY TO BOTTOM TYPES USED FOR HERRING SPAWN DEPOSITION SURVEY

Appendix B1.–Key to bottom types used for herring spawn deposition survey.

Code	Expanded code	Definition
RCK	Bedrock	Various rocky substrates >1 m in diameter
BLD	Boulder	Substrate between 25 cm and 1 m
CBL	Cobble	Substrate between 6 cm and 25 cm
GVL	Gravel	Substrate between 0.4 cm and 6 cm
SND	Sand	Clearly separate grains of <0.4 cm
MUD	Mud	Soft, paste-like material
SIL	Silt	Fine organic dusting (very rarely used)
BAR	Barnacle	Area primarily covered with barnacles
SHL	Shell	Area primarily covered with whole or crushed shells
MUS	Mussels	Area primarily covered with mussels
WDY	Woody debris	Any submerged bark, logs, branches or root systems

APPENDIX C: SPAWN SURVEYS BY DATE

Appendix C1.–Aerial and skiff herring spawn surveys by date, in Craig, West Behm Canal, Revilla Channel, and other areas (Ketchikan Management Area), Southeast Alaska in 2024.

Craig

Date	Activity
March 19, 2024	Limited predator activity.
March 21, 2024	1.1 nmi of spawn on Fish Egg Island.
March 22, 2024	3.6 nmi of spawn on Fish Egg and Ballena Islands.
March 23, 2024	9.0 nmi of spawn on the POW shoreline, Ballena, and Fish Egg Islands.
March 24, 2024	12.1 nmi of spawn on POW, Ballena, Balandra, Fish Egg, and San Juan Bautista Islands.
March 25, 2024	10.1 nmi of spawn on POW, Coronados, Fish Egg, and San Juan Bautista Islands.
March 26, 2024	8.7 nmi of spawn on POW, Coronados, and Fish Egg Islands.
March 27, 2024	1.2 nmi of spawn on Albertos and San Juan Bautista Islands, and Port Baigal.
March 28, 2024	0.1 nmi of spawn on Alberto Islands.
April 4, 2024	0.8 nmi of spawn on Wadleigh and Alberto Islands

West Behm Canal

Date	Activity
March 23, 2024	Approximately 0.2 nmi spawn on Indian Point. Cleveland Peninsula shoreline from Mike Point north to Point Francis
March 24, 2024	Wadding and Raymond Cove extending north towards Point Francis. Light spawn near Indian Point. Whipple Creek.
March 26, 2024	Light spawn in Wadding and Raymond Cove
March 30, 2024	Whitney mapped 2.0 nmi of spawn at Indian Point during her weekend in her personal boat. Completely outside of department time and funding.
April 15, 2024	Approximately 0.5 nmi spawn south of Smugglers Cove, found with Planet post season
April 17, 2024	Approximately 0.75 nmi of spawn along Cleveland Peninsula south of Smugglers Cove and near Camaano (mapped by PSG AMB)
May 20, 2024	Spot spawn at Point Higgins

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Revilla Channel (State waters)

Date	Activity
March 16, 2024	Spot spawn on the northwest side of Double Island. Approximately 0.2 nmi documented by AIR.
March 17, 2024	Approx. 1.0 nmi of spawn on Cat and Double Islands. Appoximately 0.3 nmi documentd by AIR.
March 18, 2024	3.5 nmi of spawn on Cat, Dog, Double, and Village Islands.
March 19, 2024	5.8 nmi of spawn on Cat, Dog, Double, and Village Islands.
March 20, 2024	5.2 nmi of spawn on Cat, Dog, Fripo, and Village Islands.
March 21, 2024	2.7 nmi of spawn on Cat, Dog, Duke, and Fripo Islands.
March 22, 2024	1.5 nmi of spawn on Dog Island.
March 23, 2024	0.3 nmi of spawn on Duke Island.

Revilla Channel (Annette Island Reserve waters)

Date	Activity
2024	No spawn observed on Annette Island in 2024

Kasaan Bay

Date	Activity
April 16, 2024	1.4 nmi reported from public with photo from floatplane

East Behm Canal

Date	Activity
March 20, 2024	~0.8 nmi at Dew Pt. just south of Fitzgibbon cove and Fish Pt inside mouth of Chickamin River.

Appendix C2.–Aerial and skiff herring spawn surveys by date, in Sitka Sound and Hoonah Sound (Sitka Management Area), Southeast Alaska in 2024.

March 15: Dupuis, Walloch, Smith. 0945–1018. Flight was with Doug in a Cessna 185. Aerial surveys have begun for the 2024 Sitka Sound herring season. The survey flight conducted on March 15 covered Sitka Sound from Eastern Channel to Hayward Strait. Survey conditions were poor with low clouds, rain, 30-knot winds, and fog obscuring visibility. No herring schools or spawn were observed today; herring predators were observed throughout the surveyed area. Humpback whales were observed north of Bieli Rocks and in Eastern Bay. Small concentrations of sea lions were observed near Inner Point, Eastern Bay, and east of the Siginaka Islands. Predator numbers and locations are typical for this time of year.

March 16: Dupuis, Walloch, Smith. 0830–0940. Flight was with a Cessna 185. See March 18 for flight summary

March 17: Dupuis, Walloch, Smith. 0900–1000. Flight was with a Cessna 185. See March 18 for flight summary.

March 18: Dupuis, Walloch, Smith. 0850–0930. Flight was with a Cessna 185. It was decided that the Sitka Sound herring sac roe fishery will be put on 2-hour notice effective 8:00 a.m., Wednesday, March 20, 2024. This means that a fishery could be expected with 2 hours' notice after the effective time.

A 2-hour notice fishery meeting will be conducted via Zoom and is scheduled for Tuesday, March 19, from 5:30 p.m. until 7:00 p.m. The R/V *Kestrel* is scheduled to arrive in Sitka the morning of March 20 and will immediately conduct a vessel survey.

Aerial surveys were conducted daily from March 16 to 18. These survey flights covered Sitka Sound from Crawfish Inlet to Hayward Strait and Cape Edgecumbe. Herring were observed only on March 16 near Low Island; no herring spawn has been observed to date. Herring predators were observed throughout the surveyed area. Humpback whales were observed between St. Lazaria Island and Hayward Strait, with the largest concentrations located near Inner Point. Sea lion numbers increased during this time period and were concentrated on points and rock piles between Fred's Creek and Brent's Beach. Predator numbers and locations are typical for this time of year.

Department and industry vessels surveyed along the Kruzof Island shoreline from Fred's Creek to Mountain Point today and observed several very large schools of herring in shallower waters.

March 19: Smith. 0815–0925. Flight was with a Cessna 185. Today's aerial survey covered Sitka Sound from Crawfish Inlet to Hayward Strait and St. Lazaria Island. No herring schools or spawn were observed today. Herring predators were seen throughout the surveyed area; however, predator activity was focused along the Kruzof Island shoreline from Shoals Point to Hayward Strait. The largest concentrations of humpback whales were located near Fred's Creek and Inner Point. Sea lions were concentrated on points and rock piles between Fred's Creek and Brent's Beach. Predator numbers have been steadily increasing since aerial surveys began.

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Two successful test sets were conducted today; the results are as follows:

Time	Area	Tons	% Mature	% Immature	Avg weight	% Female
11:33	Inner Point	100	1.3 %	6.3 %	81 g	40.9 %
13:25	Mountain Point	100	9.6 %	2.2 %	158 g	47.9 %

March 20: Dupuis. 0800–0845. Today's aerial survey covered Sitka Sound from Cape Burunof to Krestof Sound and St. Lazaria Island. No herring schools or spawn were observed today. Herring predators were seen throughout the surveyed area; however, predator activity was focused along the Kruzof Island shoreline from Shoals Point to St. Lazaria Island. The largest concentrations of humpback whales were located near St. Lazaria Island. Sea lions were concentrated on points and rock piles between Sitka Point and the Magoun Islands. In general, predator locations shifted significantly westward along the Kruzof Island shoreline relative to the previous aerial survey.

Department and industry vessels surveyed along the Kruzof Island shoreline from Sitka Point to Krestof Sound. Scattered smaller schools of herring were observed between Hayward Strait and Shoals Point and very large schools of herring were seen between Shoals Point and Sitka Point.

Two test sets were attempted today in the vicinity of Shoals Point but were unsuccessful.

March 21: Walloch. 0800–0900. Today's aerial survey covered Sitka Sound from Cape Burunof to Krestof Sound and St. Lazaria Island. No herring schools or spawn were observed today. Herring predators were seen throughout the surveyed area; however, predator activity was focused along the Kruzof Island shoreline from Inner Point to Hayward Strait. The largest concentrations of humpback whales were located near Mountain Point. Sea lions were concentrated on points and rock piles between Sitka Point and the Magoun Islands. In general, predator locations shifted significantly eastward along the Kruzof Island shoreline relative to the previous aerial survey.

Department and industry vessels surveyed along the Kruzof Island shoreline from Sitka Point to Krestof Sound. Scattered smaller schools of herring were observed between Sitka Point and Fred's Creek and very large schools of herring were seen between Fred's Creek and Hayward Strait.

Two successful test sets were conducted today; the results are as follows:

Time	Area	Tons	% Mature Roe	% Immature Roe	Avg weight	% Female
10:18	Hayward Strait	200	1.9 %	8.6 %	90 g	–
10:40	Mountain Point	100	6.6 %	3.9 %	143 g	–

March 22: Walloch. 1000–1100. Today's aerial survey covered Sitka Sound from Cape Burunof to Salisbury Sound and Cape Edgecumbe. No herring schools or spawn were observed today. Herring predators were seen throughout the surveyed area; however, predator activity was focused along the Kruzof Island shoreline from Inner Point to Hayward Strait. The largest concentrations of humpback whales were located in Hayward Strait. Sea lions were concentrated on points and rock piles between Sitka Point and the Magoun Islands. In general, predator locations were similar to the previous aerial survey.

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Department and industry vessels surveyed Sitka Sound from Harbor Point to Hayward Strait and along the Kruzof Island shoreline from Sitka Point to Krestof Sound. Scattered smaller schools of herring were observed between Harbor Point and Old Sitka Rocks and very large schools of herring were seen Inner Point and Hayward Strait.

Three successful test sets were conducted today; the results are as follows:

Time	Area	Tons	% Mature Roe	% Immature Roe	Avg weight	% Female
10:03	Hayward Strait	150	10.7 %	3.0 %	137 g	53 %
10:57	Inner Point	150	6.9 %	2.9 %	133 g	39 %
12:44	Hayward Strait	200	11.3 %	1.8 %	149 g	–

An opening of the Sitka Sound herring sac roe fishery occurred today from 4:00 p.m. until 5:00 p.m., as stated in field announcement on VHF channel 10. The open area for this fishery included the waters of Hayward south of 57°09.39′ N lat, north of 57°08.00′ N lat, and west of 135°30.76′ W long (Figure 1). The emergency order corresponding with today's opening is EO 1H0224. Harvest estimates from today's fishery will be included on the next fishery update.

March 23: Walloch. 0800–9000. Today's aerial survey covered Sitka Sound from Redoubt Bay to Krestof Sound and Cape Edgecumbe. Herring schools were visible from the air in the vicinity of Olga Strait. Approximately 0.25 nautical miles of herring spawn was observed on the eastern side of Kasiana Island. Herring predators were seen throughout the surveyed area; however, predator activity was focused along the Kruzof Island shoreline from St. Lazaria to Hayward Strait. The largest concentrations of humpback whales were located near St. Lazaria Island and Inner Point. Sea lions were concentrated on points and rock piles between Sitka Point and the Magoun Islands. Additionally, several whales were observed south of Long Island.

Department and industry vessels surveyed Sitka Sound from Harbor Point to Hayward Strait, along the Kruzof Island shoreline from Inner Point to Krestof Sound, and from Aleutkina Bay to Samsing Cove. Numerous schools of herring were observed between Harbor Point and Dog Point, through the Siginaka Islands, and from Eastern Bay to Promisla Bay. Very large schools of herring were seen from Inner Point and Hayward Strait and south of Long Island. The estimated harvest from the fishery that occurred on March 22 was approximately 340 tons of herring.

March 24: Walloch. 0800–0915. Today's aerial survey covered Sitka Sound from Cape Burunof to Salisbury Sound and Cape Edgecumbe. Herring schools were visible from the air in the vicinity of St. John Baptist Bay. Approximately 3.2 nautical miles (nmi; Figure 1) of herring spawn was observed on Kasiana Island, Halibut Point, Neva Strait, Degroff Bay, and Fred's Creek. Herring predators were seen throughout the surveyed area; however, predator activity was focused along the Kruzof Island shoreline from St. Lazaria to Hayward Strait. The largest concentrations of humpback whales were located near St. Lazaria Island and in Hayward Strait. Sea lions were concentrated on points and rock piles between Sitka Point and the Magoun Islands.

Department and industry vessels surveyed Sitka Sound from Harbor Point to Cape Burunof and from Hayward Strait to Krestof Sound. Very large schools of herring were observed between Cape Burunof and Long Island and from Kamenoi Point to Brady Island.

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One successful test set was conducted today; the results are as follows:

Time	Area	Tons	% Mature Roe	% Immature Roe	Avg weight	% Female
9:12	Rob Point	200	10.1 %	1.6 %	130 g	50.4 %

An opening of the Sitka Sound herring sac roe fishery occurred today from 12:30 p.m. until 5:00 p.m., as stated in field announcement on VHF channel 10. The initial open area for this fishery included the waters of Hayward Strait and Krestof Sound south of 57°11.24′ N lat, north of 57°08.00′ N lat, and west of 135°30.76′ W long (Figure 2). The emergency order corresponding with today's opening is EO 1H0324. No harvest estimates from today's fishery are available at this time but will be included on the next fishery update.

March 25: Walloch. 0800–0900. Today's aerial survey covered Sitka Sound from Cape Burunof to Salisbury Sound and Cape Edgecumbe. Herring schools were visible from the air in the vicinity of the Magoun Islands, Crescent Bay, and Leesoffkaia Bay. Approximately 3.4 nautical miles (nmi) of herring spawn was observed on Kasiana Island, Halibut Point, Apple Island, Crow Island, Gagarin Island, and Fred's Creek (Figure 1). Herring predators were seen widely distributed throughout the surveyed area; however, predator activity was focused along the Kruzof Island shoreline from St. Lazaria to Hayward Strait. The largest concentrations of humpback whales were located near St. Lazaria Island and in Hayward Strait. Sea lions were concentrated on points and rock piles between Sitka Point and the Magoun Islands and in St. John Baptist Bay.

Department and industry vessels surveyed Sitka Sound from Harbor Point to Krestof Sound, from Promisla Bay to the Siginaka Islands, and from Crescent Bay to Samsing Cove. Very large schools of herring were observed between Cape Burunof and Long Island, in Samsing Cove, and from Kamenoi Point to Brady Island.

No test sets were conducted today.

An opening of the Sitka Sound herring sac roe fishery occurred today from 11:30 a.m. until 6:00 p.m., as stated in field announcement on VHF channel 10. The initial open area for this fishery included the waters of Hayward Strait and Krestof Sound south of 57°11.24′ N lat and north of 57°09.16′ N lat (Figure 2). The emergency order corresponding with today's opening is EO 1H0424. No harvest estimates from today's fishery are available at this time but will be included in the next fishery update. Approximately 1,910 tons of herring were harvested in the fishery that occurred on March 24.

March 26: Walloch. 0800–0915. Today's aerial survey covered Sitka Sound from Dorothy Narrows to Krestof Sound and St. Lazaria Island. Herring schools were visible from the air in the vicinity of the Magoun Islands, Crescent Bay, and Leesoffskaia Bay. Approximately 8.6 nautical miles (nmi) of herring spawn was observed on Kasiana Island, Halibut Point, Apple Island, Crow Island, Gagarin Island, and Fred's Creek (Figure 1). Herring predators were widely distributed throughout the surveyed area; however, predator activity was focused along the Kruzof Island shoreline from St. Lazaria to Hayward Strait. The largest concentrations of humpback whales were located near St. Lazaria Island and near Inner Point. Sea lions were concentrated on points and rock piles between Fred's Creek and the Magoun Islands.

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Department and industry vessels surveyed Sitka Sound from Harbor Point to Krestof Sound, in Promisla Bay, and from Crescent Bay to Samsing Cove. Numerous large schools of herring were observed along the Sitka road system from Harbor Point to Magic Island, in Deep Inlet, and in northern Hayward Strait and southern Krestof Sound.

One successful test set was conducted today; the results are as follows:

Time	Area	Tons	% Mature Roe	% Immature Roe	Avg weight	% Female
9:22	Deep Inlet	300	11.7 %	0.3 %	144 g	50.5 %

An opening of the Sitka Sound herring sac roe fishery occurred today from 1:00 p.m. until 6:00 p.m., as stated in field announcement on VHF channel 10. The two open areas for this fishery included areas north and south of Sitka. South of Sitka included the area of Deep Inlet, Samsing Cove, Aleutkina Bay and contiguous waters south of 57°00.81′ N lat and east of 135°21.93′ N lat (Figure 2). The area north of Sitka included the waters of Hayward Strait and Krestof Sound south of 57°11.24′ N lat and north of 57°08.94′ N lat (Figure 3). The emergency order corresponding with today's opening is EO 1H0524. No harvest estimates from today's fishery are available at this time but will be included in the next fishery update. Approximately 1,780 tons of herring were harvested in the fishery that occurred on March 25. Since March 22, an estimated 4,030 tons of herring have been harvested.

March 27: Walloch. 0800–0930. Today's aerial survey covered Sitka Sound from Deep Inlet to Salisbury Sound and St. Lazaria Island. Herring schools were visible from the air in the vicinity of the Magoun Islands, Krestof Sound, Salisbury Sound, Eastern Bay, Crescent Bay, and Leesoffskaia Bay. Approximately 10.3 nautical miles (nmi) of herring spawn was observed along the Sitka road system from Halibut Point to Harbor Point and on Kasiana, Apple, Crow, Gagarin, and Middle Islands, and near Fred's Creek (Figure 1). Herring predators were widely distributed throughout the surveyed area. No significant concentration of predators was noted today.

Department and industry vessels surveyed Sitka Sound from Harbor Point to Shoals Point and from Crescent Bay to Samsing Cove. Numerous large schools of herring were observed along the Sitka road system from Harbor Point to Halibut Point, in Deep Inlet, and in northern Hayward Strait and southern Krestof Sound. Very large schools of herring were observed in shallow water along the Kruzof Island shoreline from Point Brown to Shoals Point.

No test sets were conducted today.

An opening of the Sitka Sound herring sac roe fishery occurred today from 11:00 a.m. until 6:00 p.m., as stated in field announcement on VHF channel 10. The two open areas for this fishery included areas north and south of Sitka. South of Sitka included the area of Deep Inlet, Samsing Cove, Aleutkina Bay and contiguous waters south of 57°00.81′ N lat and east of 135°21.93′ N lat (Figure 2). The area north of Sitka included the waters of Hayward Strait and Krestof Sound south of 57°11.24′ N lat and north of 57°08.94′ N lat (Figure 3). The emergency order corresponding with today's opening is EO 1H0624. No harvest estimates from today's fishery are available at this time but will be included in the next fishery update. Approximately 1,580 tons of herring were harvested in the fishery that occurred on March 25. Since March 22, an estimated 5,610 tons of herring have been harvested.

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March 28: Walloch. 0800–0930. Today's aerial survey covered Sitka Sound from Dorothy Narrows to Krestof Sound and Shoals Point. Herring schools were visible from the air in the vicinity of the Magoun Islands, Krestof Sound, Samsing Cove and Leesoffskaia Bay. Approximately 23.3 nautical miles (nmi) of herring spawn was observed along the Sitka road system from Watson Point to Halibut Point, along the causeway, and on Japonski, Battery, Kasiana, Apple, Crow, Gagarin, Chaichei, Neva, and Middle Islands, from Shoals Point to Inner Point, and in Redoubt Bay (Figure 1). Herring predators were widely distributed throughout the surveyed area. No significant concentration of predators was noted today.

Department and industry vessels surveyed Sitka Sound from Harbor Point to Shoals Point and from Crescent Bay to Samsing Cove. Numerous large schools of herring were observed along the Sitka road system from Watson Point to Halibut Point, in Deep Inlet, and in from Kamenoi Point to Point Brown. Numerous scattered schools of herring were observed from Eastern Bay to Promisla Bay and in Redoubt Bay.

No test sets were conducted today.

An opening of the Sitka Sound herring sac roe fishery occurred today from 11:00 a.m. until 6:00 p.m., as stated in field announcement on VHF channel 10. The 2 open areas for this fishery included areas north and south of Sitka. The area north of Sitka included the waters of Hayward Strait and Krestof Sound south of 57°11.24′ N lat, north of 57°08.00′ N lat, and west of 135°30.76′ W long (Figure 2). South of Sitka included the area of Deep Inlet, Samsing Cove, Aleutkina Bay and contiguous waters south of 57°00.81′ N lat and east of 135°21.93′ W long (Figure 3). The emergency order corresponding with today's opening is EO 1H0724. No harvest estimates from today's fishery are available at this time but will be included in the next fishery update. Approximately 1,015 tons of herring were harvested in the fishery that occurred on March 27. Since March 22, an estimated 6,625 tons of herring have been harvested.

March 29: Walloch. 0800–0945. Today's aerial survey covered Sitka Sound from Dorothy Narrows to Salisbury Sound and St. Lazaria Island. Herring schools were visible from the air in the vicinity of Leesoffskaia Bay. Approximately 26.2 nautical miles (nmi) of herring spawn was observed scattered along the Sitka road system from Watson Point to Halibut Point, along the causeway, and on Japonski, Battery, Kasiana, Apple, Crow, Gagarin, Chaichei, Neva, Siginaka, and Middle Islands, along the Kruzof Island shoreline from lava Island to Mountain Point, in Hayward Strait, Kresta Point, and in Redoubt Bay (Figure 1). Herring predators were widely distributed throughout the surveyed area. No significant concentration of predators was noted today.

Department and industry vessels surveyed Sitka Sound from Deep Inlet to Samsing Cove, from Cape Burunof to Dorothy Narrows, from Eastern Bay to Krestof Sound, and in Salisbury Sound. Scattered schools of herring were located throughout the surveyed area and larger schools of herring were found from Deep Inlet to Samsing Cove and from Hayward Strait to Krestof Sound. Many the schools of herring were located in very shallow water along the surveyed shorelines.

No test sets were conducted today.

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An opening of the Sitka Sound herring sac roe fishery occurred today from 11:00 a.m. until 6:00 p.m., as stated in field announcement on VHF channel 10. The 2 open areas for this fishery included areas north and south of Sitka. The area north of Sitka included the waters of Hayward Strait and Krestof Sound south of 57°11.24′ N lat, north of 57°08.00′ N lat, and west of 135°30.76′ W long. South of Sitka included the area of Deep Inlet, Samsing Cove, Aleutkina Bay and contiguous waters south of 57°00.81′ N lat and east of 135°21.93′ W long. The emergency order corresponding with today's opening is EO 1H0724. No harvest estimates from today's fishery are available at this time but will be included in the next fishery update. Approximately 1,970 tons of herring were harvested in the fishery that occurred on March 28. Since March 22, an estimated 8,595 tons of herring have been harvested.

March 30: Walloch. 0800–0945. Today's aerial survey covered Sitka Sound from Dorothy Narrows to Krestof Sound and St. Lazaria Island. No herring schools were visible from the air today. Approximately 15.1 nautical miles (nmi) of herring spawn was observed scattered in Starrigavan Bay, along the causeway, and on Japonski, Chaichei, Siginaka, Magoun, Error, and Middle Islands, in Sandy Cove, along the Kruzof Island shoreline from Lava Island to Mountain Point, in Hayward Strait, Kresta Point, Promisla Bay, and in Redoubt Bay (Figure 1). Since March 23, a cumulative total of 45 nmi of herring spawn has been recorded in Sitka Sound. Few herring predators were seen today.

Department and industry vessels surveyed Sitka Sound from Indian River to Samsing Cove, from Eastern Bay to Krestof Sound, and from Starrigavan Bay to Olga Strait. Scattered schools of herring were located throughout the surveyed area. Many of the schools of herring were located in very shallow water along the surveyed shorelines.

No test sets were conducted today.

Two openings of the Sitka Sound herring sac roe fishery occurred today as stated in field announcements on VHF channel 10. The two open areas for this fishery included the area around Deep Inlet and from Indian River to Silver Bay (Figure 2). The area of Deep Inlet, Samsing Cove, Aleutkina Bay and contiguous waters south of 57°00.81′ N lat and east of 135°21.93′ W long was opened from 9:00 a.m. to 6:00 p.m. The area from Indian River to Silver Bay south of 57°02.88′ N lat, north of 57°01.57′ N lat, west of 135°11.89′ W long and east of 135°20.20′ W long was opened from 10:00 a.m. to 12:10 a.m. The emergency orders corresponding with today's opening are EO 1H1024 and EO 1H1124. No harvest estimates from today's fishery are available at this time but will be included in the next fishery update. Approximately 1,310 tons of herring were harvested in the fishery that occurred on March 29. Since March 22, an estimated 9,905 tons of herring have been harvested.

March 31: Walloch. 0800-0945. Today's aerial survey covered Sitka Sound from Dorothy Narrows to Salisbury Sound and St. Lazaria Island. No herring schools were visible from the air today. Approximately 7.6 nautical miles (nmi) of herring spawn was observed along the causeway, in Crescent Bay, Hayward Strait, Promisla Bay, Magoun Islands, Aleutkina Bay, and in Redoubt Bay (Figure 1).

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Since March 23, a cumulative total of 48.8 nmi of herring spawn has been recorded in Sitka Sound. Approximately 637 tons of herring were harvested in the fishery that occurred on March 30. Since March 22, an estimated 10,542 tons of herring have been harvested.

The Sitka Sound herring sac roe fishery is open from 8:00 a.m. until 6:00 p.m. daily, in the waters of Salisbury Sound, St. John Baptist Bay, and Sukoi Inlet north of 57°16.40′ N lat, south of the latitude of Point Kakul at 57°21.75′ N lat, and east of 135°45.90′ W long, in the waters of Deep Inlet, Aleutkina Bay, and contiguous waters south of 57°00.81′ N lat and east of 135°21.93′ W long, and in the waters within 3 nmi from the Baranof Island shoreline south of the latitude of Povorotni Point at 56°57.13′ N lat and north of 56°41.75′ N lat (near Aspid Cape), except for the waters of Whale and Necker Bays until closed by field or advisory announcement. Fishing boundaries and open times may be modified by subsequent announcement.

April 01: Dupuis flight 0800–0915. Today's aerial survey covered Sitka Sound from Dorothy Narrows to Salisbury Sound and Fred's Creek. No herring schools were visible from the air today. Approximately 10.1 nautical miles (nmi) of herring spawn was observed in Hayward Strait, Magoun Islands, Promisla Bay, Eastern Bay, Aleutkina Bay, Herring Bay, and in Redoubt Bay (Figure 1). Since March 23, a cumulative total of 55.4 nmi of herring spawn has been recorded in Sitka Sound.

Approximately 1,105 tons of herring were harvested in the fishery that occurred on March 31. Since March 22, an estimated 11,647 tons of herring have been harvested.

April 02: Walloch flight 0800–1000. Today's aerial survey covered Sitka Sound from Dorothy Narrows to Salisbury Sound and Hayward Strait. No herring schools were visible from the air today. Approximately 21.7 nautical miles (nmi) of herring spawn was observed in Hayward Strait, Magoun Islands, Krestof Sound, Sukoi Inlet, St. John Baptist Bay, Olga Strait, Promisla Bay, Eastern Bay, Aleutkina Bay, Herring Bay, Redoubt Bay, and near Frosty Reef (Figure 1). Since March 23, a cumulative total of 71.4 nmi of herring spawn has been recorded in Sitka Sound.

Approximately 530 tons of herring were harvested in the fishery that occurred on April 1. Since March 22, an estimated 12,177 tons of herring have been harvested.

April 03: Dupuis flight 0815–1000. Today's aerial survey covered Sitka Sound from Crawfish Inlet to Salisbury Sound and Shoals Point. No herring schools were visible from the air today. Approximately 3.5 nautical miles (nmi) of herring spawn was observed in the Magoun Islands, St. John Baptist Bay, Eastern Bay, Sandy Cove, Redoubt Bay, and near Frosty Reef (Figure 1). Since March 23, a cumulative total of 72.0 nmi of herring spawn has been recorded in Sitka Sound.

Approximately 815 tons of herring were harvested in the fishery that occurred on April 2. Since March 22, an estimated 12,992 tons of herring have been harvested.

April 04: Dupuis flight 0800–930. Today's aerial survey covered Sitka Sound from Crawfish Inlet to Salisbury Sound and Hayward Strait. No herring schools were visible from the air today. Approximately 1.0 nautical mile (nmi) of herring spawn was observed in St. John Baptist Bay, Redoubt Bay, and near Dorothy Narrows.

Approximately 350 tons of herring were harvested in the fishery that occurred on April 3. Since March 22, an estimated 13,342 tons of herring have been harvested.

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The Sitka Sound herring sac roe fishery is open from 8:00 a.m. until 6:00 p.m. daily, in the waters of Salisbury Sound, St. John Baptist Bay, and Sukoi Inlet north of 57°16.40′ N lat, south of the latitude of Point Kakul at 57°21.75′ N lat, and east of 135°45.90′ W long, in the waters of Deep Inlet, Aleutkina Bay, and contiguous waters south of 57°00.81′ N lat and east of 135°21.93′ W long, and in the waters within 3 nmi from the Baranof Island shoreline south of the latitude of Povorotni Point at 56°57.13′ N lat and north of 56°41.75′ N lat (near Aspid Cape), except for the waters of Whale and Necker Bays until closed by field or advisory announcement. Fishing boundaries and open times may be modified by subsequent announcement.

April 05: Dupuis flight 0800–0930. Today's aerial survey covered Sitka Sound from West Crawfish Inlet to Salisbury Sound and Hayward Strait. No herring schools were visible from the air today. Approximately 1.4 nautical miles (nmi) of herring spawn was observed in St. John Baptist Bay, Redoubt Bay, and in Hayward Strait.

The Sitka Sound herring sac roe fishery will close for the season at 6:00 p.m. on Friday, April 5, 2024. Preliminary hails from processors from March 22 through April 5 put the total harvest at approximately 13,300 tons of herring. Final harvest estimates will be announced in the season summary advisory announcement.

April 06: Dupuis flight 0800-0930. Today's aerial survey covered Sitka Sound from West Crawfish Inlet to Salisbury Sound and Hayward Strait. No herring schools were visible from the air today. Approximately 1.4 nautical miles (nmi) of herring spawn was observed in Hayward Strait, DeGroff Bay, and St. John Baptist Bay.

April 07: Walloch flight 0800-0900. Today's aerial survey covered Sitka Sound from Windy Passage to Salisbury Sound and Hayward Strait. No herring schools were visible from the air today. Approximately 1.4 nautical miles (nmi) of herring spawn was observed in Promisla Bay, Hayward Strait, and DeGroff Bay.

April 08: Smith flight 0800–9000. Aerial surveys conducted from March 6 through March 8 covered Sitka Sound from West Crawfish Inlet to Salisbury Sound and Hayward Strait. During these flights, small amounts of herring spawn were observed in St. John Baptist Bay, De Groff Bay, Promisla Bay, Eastern Bay, and in Hayward Strait.

A vessel survey conducted in the area from Middle Island to Battery Island today found an additional 4.4 nautical miles (nmi) of herring spawn that was not recorded during the aerial surveys this season. The total cumulative herring spawn observed to date (including today's vessel observed spawn) in Sitka Sound is approximately 78.8 nmi (Figure 1). Another vessel survey is planned for April 9.

April 09: Smith flight 0800–0930. Today's aerial survey covered Sitka Sound from West Crawfish Inlet to Salisbury Sound. There were no herring schools observed from the air. Sea Lions were observed from the air near the Magoun Islands and De Groff Bay. Approximately 0.5 nautical miles (nmi) of herring spawn was observed in Promisla Bay.

A vessel survey conducted in the area from the Siginaka Islands to the Magoun Islands today found an additional 5.6 nautical miles (nmi) of herring spawn that was not recorded during the aerial surveys this season.

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April 10: Smith flight 0800–0900. Today's aerial survey covered Sitka Sound from West Crawfish Inlet to Salisbury Sound. There were no herring schools observed from the air. Sea Lions were observed in Krestof Sound, Magoun Islands, and De Groff Bay. Approximately 0.8 nautical miles (nmi) of herring spawn was observed by Leesoffskaia Bay and De Groff Bay. The GPS tracks of the flight were not recorded for this survey.

April 11: Smith flight 0930–1100. Today's aerial survey covered Sitka Sound from Crawfish Inlet to Salisbury Sound. There were no herring schools observed from the air. Sea Lions were observed in Promisla Bay, De Groff Bay, and Neva Strait. There was also a humpback observed by Promisla Bay. Approximately 0.05 nautical miles (nmi) of herring spawn was observed in Starrigavan Bay.

April 12: Smith flight 0800–0900. Today's aerial survey covered Sitka Sound from West Crawfish Inlet to Middle Island. Poor visibility didn't allow the survey to continue north up to Krestof Sound and Salisbury Sound. There were no herring schools or spawn observed from the air. Today was the third day of spawn deposition dive surveys.

April 13: Smith flight 0800–0915. Today's aerial survey covered Sitka Sound from Crawfish Inlet to St. John Baptist Bay and Hayward Strait. There were no herring schools or spawn observed from the air. The highest concentration of whales was observed by Hayward Strait with approximately 5 Gray Whales and 9 Humpback Whales. Today was the final day of spawn deposition surveys.

April 14: Dupuis flight 1000–1115. Today's aerial survey covered Sitka Sound from Aspid Cape to Salisbury Sound. There were no herring schools or spawn observed from the air. There were no notable concentrations of marine mammals observed.

April 15: Walloch flight 0800–0900. Today's aerial survey covered Sitka Sound form Aspid Cape to St. John Baptist Bay. There were no herring schools or spawn observed from the air. There were Gray Whales observed from Inner Point to Hayward Strait (approximately 22 Gray Whales).

April 16: Dupuis flight 0800–0930. Today's aerial survey covered northern Sitka Sound from the airport to Salisbury Sound, Hoonah Sound, Khaz Bay, and Slocum Arm. No herring or herring spawn were observed in Sitka Sound, Salisbury Sound, or Hoonah Sound. However, Spawn was observed in Piehls Pass and Khaz Bay.

April 17: Dupuis flight 0800–0900. Today's aerial survey covered Sitka Sound from Aspid Cape to Hayward Strait. No herring or herring spawn was observed today. Approximately 130 gray whales were observed from Shoals Point to Hayward Strait and near the Apple Islands. This was the final aerial survey for the 2024 season.

Appendix C3.–Aerial and skiff herring spawn surveys by date, at Bradfield Canal, Ernest Sound, Ship Island, Zimovia Strait and Eastern Passage, Bear Creek, Hobart Bay, and other areas within Petersburg-Wrangell Management Area in Southeast Alaska, 2024.

Bradfield Canal

Not surveyed in 2024.

Vixen Inlet/ Union Bay/Emerald Bay

Total miles of spawn: ~4.0
Spawning dates: 4/9-4/11
Peak spawning: 4/11

4/4 No herring spawn or schools observed, 20 sea lions.
4/5 No herring spawn or schools observed, 1 sea lion, very few birds.
4/8 Small herring schools observed in Vixen, 60 sea lions, very few birds.
4/9 Drift @ Vixen Pt. likely occurred the day prior (4/8) and 1.0 nmi active @ Union Pt. 50 sea lions.
4/10 Drift @ Union.Pt. and Vixen Inlet, likely occurred the day prior (4/9) 120 sea lions, few birds.
4/11 1.2 nmi active @ Union Pt and Viven Inlet, 500 scoters. 4.0 nmi eggs from skiff survey.
4/13 No herring spawn or schools observed, 40 sea lions, 6,000 scoters, 5,000 gulls.
4/15 No herring spawn or schools observed, 20 sea lions, 5,000 scoters.
4/17 No herring spawn or schools observed, very few birds.

Onslow/Stone/Brownson Island/Canoe Pass

Total miles of spawn: none

4/5 No herring spawn or schools observed, zero sea lions, very few birds
4/8 No herring spawn or schools observed, zero sea lions, very few birds
4/9 No herring spawn or schools observed, zero sea lions, very few birds
4/10 No herring spawn or schools observed, zero sea lions, very few birds.
4/11 No herring spawn or schools observed, zero sea lions, very few birds.

Ship Island

Not surveyed in 2024

Zimovia St. and Eastern Passage

4/4 No herring spawn or schools observed, 2 sea lions.
4/5 No herring spawn or schools observed, 5 sea lions.
4/8 No herring spawn or schools observed, zero sea lions, few birds.
4/9 No herring spawn or schools observed, zero sea lions. 1,000 scoters @ Pats.
4/10 Small area of drift @ Pats with 2,000 scoters.
4/11 No herring spawn or schools observed, zero sea lions.

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Bear Creek

Not surveyed in 2024

Farragut Bay

Not surveyed in 2024

Hobart Bay

Total miles of spawn: Unknown
Spawning dates: Unknown
Peak spawning: Unknown

4/20 No herring or herring spawn observed.

Port Houghton

Total miles of spawn: ~0.5 nmi
Spawning dates: 4/20
Peak spawning: unknown

4/29 ~0.5 nmi of herring spawn on the north shore with approximately one dozen sea lions in the vicinity.

Sunset Cove/Windham Bay

Not surveyed in 2024

Gambier Bay/Pybus Bay

Not surveyed by Petersburg Management Area in 2024

Port Camden

Not surveyed in 2024

Tebenkof Bay

Not surveyed in 2024

Appendix C4.–Aerial and skiff herring spawn surveys by date in Juneau Management Area, in Southeast Alaska, 2024.

Seymour Canal

Number of times surveyed: 9

Total miles of spawn: 1.5 nmi

Spawning dates: 4/23 – 4/25

Peak spawn: 4/24

4/16: No staging herring or herring spawn; 1 school inside Dorn Island; 21SL, 4W in Point Gambier area; excellent vis.
4/19: Several schools north of Point Gambier; 5SL, 3W; excellent vis.
4/20: 2 schools on outside of Glass Peninsula and 1 school north of Point Gambier; 0.5 nmi active spawn in Port Houghton; 15SL, 1W; excellent vis.
4/23: **0.5 nmi active spawn** on Gambier Island; 33SL, 2W; good vis.
4/24: **0.7 nmi active spawn** on Gambier Island and Big Bend; 97SL, 1W; good vis.
4/25: **0.2 nmi active spawn** on Gambier Island and Big Bend; 54SL, 1W; good vis.
4/26: No herring or herring spawn; 48SL, 1W; excellent vis.
4/29: No herring or herring spawn; 36SL, 1W; good vis.
5/2: No staging herring or herring spawn; small schools observed north of Swimming Pool and along Big Bend; 26SL, 5W; good vis.

Tenakee Inlet (Tenakee Inlet and south along Chatham Strait shoreline to Point Moses in Peril Strait and Catherine Island shoreline)

Number of times surveyed: 8

Total miles of spawn:10.6 nmi

Spawning dates: 4/16 – 4/21

Peak spawn: 4/17, 4/20

4/16: **0.1 nmi active spawn** south of South Passage Pt; 2 schools in Basket Bay area; 50SL (only 5SL in Tenakee), 2W off White Rock; excellent vis.
4/17: **7.8 nmi active spawn** from inside South Passage Pt to Point Lull; 1 school in Trap Bay area; 106SL, 5W; excellent vis.
4/18: **0.2 nmi active spawn** in Little Basket Bay; several schools off Point Hayes and Catherine Island shoreline; 76SL, 3W; good vis.
4/19: **0.3 nmi active spawn** in small segments from Trap Bay to Point Hayes; 61SL (plus 150+ hauled out by Point Lull), 3W; excellent vis.
4/20: **2.5 nmi of active spawn** from west of Kadashan flats to Point Hayes; schools near South Passage Pt, Don’s Creek, Point Hayes, and Catherine Island shoreline; 168SL, 4W; excellent vis.
4/21: **0.2 nmi of active spawn** at Point Craven; several schools on beach west of Craven; 149SL, 3W; good vis.
4/23: No herring or spawn; 93SL, 1W; good vis.
5/2: No herring or spawn; 46SL, 1W; good vis.

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Lynn Canal (not actively surveyed)

Number of times surveyed out of Juneau: 0

Total miles of spawn:

Spawning dates: 4/15 – ?

Peak spawn:

4/15: Alaska Seaplanes pilot forwarded pics of active spawn at Seduction Pt, appeared to be >1 nmi; NZ flew out of Haines on 4/16 and potentially got cast net samples from Mud Bay

Oliver Inlet/Stink Creek

Number of times surveyed: 10

Total miles of spawn: 0.6 nmi

Spawning dates: 4/17 – 4/18

Peak Spawn: 4/17 – 4/18

4/16: No herring or herring spawn; no predators; good vis.
4/17: **~0.5nmi of active spawn** documented by satellite imagery; no aerial survey
4/18: Word from local boaters of active spawn in similar area; no aerial survey
4/19: Several schools near entrance of Olivers Inlet (spawn-outs?); no predators; excellent vis.
4/20: Schools at entrance to Olivers and near Stink Creek; thousands of scoters; good vis.
4/21: No herring or herring spawn; thousands of scoters; good vis.
4/23: No herring or herring spawn; good vis.
4/24: No herring or herring spawn; good vis.
4/25: No herring or herring spawn; good vis.
4/26: No herring or herring spawn; 1W; excellent vis.
4/29: No herring or herring spawn; good vis.
5/2: No herring or herring spawn; good vis.

Port Frederick (not consistently surveyed in 2024)

Number of times surveyed: 1

Total miles of spawn observed: none

Spawning dates:

5/2: No herring or herring spawn; 8SL; 2W; good vis.

Taku Harbor

Number of times surveyed: 0

Appendix C5.–Aerial and skiff herring spawn surveys by date, in the Yakutat Management Area, in Southeast Alaska, 2024.

Yakutat Bay

Boat surveys were conducted during six days between April 4 to 15, 2024 in the areas of Doggie Island, Khantaak Island, Kriwoi Island, and Knight Island. Cumulative spawn mileage totaled 3.9 nmi.

Appendix C6.–Aerial and skiff herring spawn surveys by date, in the Haines Management Area, in Southeast Alaska, 2024.

Yakutat Bay

On April 15 Seaplanes pilot documented approximately 1 nmi of spawn (estimated from photos) surrounding the Chilkat State Park peninsula. The pilot also observed small spot spawn in Johns Cove and Twin Coves in Chilkat inlet that same timeframe.

On April 17 a boat survey was conducted and the major spawn around Seduction Point was gone, but there was spot spawn observed ½ mile up the east side of the peninsula; also saw good spawning in Mud Bay on both sides of the bay, and just south of that area for a total of ~.75nmi of spawn.

Anecdotal observations from locals were that on April 9, there was spawn in Lutak Inlet on each side of the outlet of Chilkoot River, but no amount of spawn was reported.