

Berners Bay Area Herring Research, 2008

by

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Alaska Department of Fish and Game

Division of Commercial Fisheries



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Weights and measures (metric)		General		Measures (fisheries)	
centimeter	cm	Alaska Administrative Code	AAC	fork length	FL
deciliter	dL			mid-eye-to-fork	MEF
gram	g	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	mid-eye-to-tail-fork	METF
hectare	ha			standard length	SL
kilogram	kg			total length	TL
kilometer	km	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.		
liter	L	at	@	Mathematics, statistics	
meter	m			<i>all standard mathematical signs, symbols and abbreviations</i>	
milliliter	mL	compass directions:		alternate hypothesis	H _A
millimeter	mm	east	E	base of natural logarithm	<i>e</i>
		north	N	catch per unit effort	CPUE
Weights and measures (English)		south	S	coefficient of variation	CV
cubic feet per second	ft ³ /s	west	W	common test statistics	(F, t, χ^2 , etc.)
foot	ft	copyright	©	confidence interval	CI
gallon	gal	corporate suffixes:		correlation coefficient	
inch	in	Company	Co.	(multiple)	R
mile	mi	Corporation	Corp.	correlation coefficient	
nautical mile	nmi	Incorporated	Inc.	(simple)	r
ounce	oz	Limited	Ltd.	covariance	cov
pound	lb	District of Columbia	D.C.	degree (angular)	°
quart	qt	et alii (and others)	et al.	degrees of freedom	df
yard	yd	et cetera (and so forth)	etc.	expected value	<i>E</i>
		exempli gratia	e.g.	greater than	>
Time and temperature		(for example)		greater than or equal to	≥
day	d	Federal Information Code	FIC	harvest per unit effort	HPUE
degrees Celsius	°C	id est (that is)	i.e.	less than	<
degrees Fahrenheit	°F	latitude or longitude	lat. or long.	less than or equal to	≤
degrees kelvin	K	monetary symbols		logarithm (natural)	ln
hour	h	(U.S.)	\$, ¢	logarithm (base 10)	log
minute	min	months (tables and figures): first three letters	Jan, ..., Dec	logarithm (specify base)	log ₂ , etc.
second	s	registered trademark	®	minute (angular)	'
		trademark	™	not significant	NS
Physics and chemistry		United States (adjective)	U.S.	null hypothesis	H ₀
all atomic symbols		United States of America (noun)	USA	percent	%
alternating current	AC	U.S.C.	United States Code	probability	P
ampere	A	U.S. state	use two-letter abbreviations (e.g., AK, WA)	probability of a type I error (rejection of the null hypothesis when true)	α
calorie	cal			probability of a type II error (acceptance of the null hypothesis when false)	β
direct current	DC			second (angular)	"
hertz	Hz			standard deviation	SD
horsepower	hp			standard error	SE
hydrogen ion activity (negative log of)	pH			variance	
parts per million	ppm			population	Var
parts per thousand	ppt, ‰			sample	var
volts	V				
watts	W				

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ABSTRACT

Aerial and skiff surveys were used to document Pacific herring spawn locations in Lynn Canal during 2008. Spawn deposition dive surveys were used to estimate egg density and spawning biomass in the Berners Bay area of Lynn Canal. Results of these surveys indicate that the size of the Berners Bay area herring spawning population is about 499 tons, well below the 5,000-ton threshold necessary to allow a commercial fishery. As a result, Lynn Canal herring will not be opened to commercial harvest in 2009.

Key words: Lynn Canal, Berners Bay, herring, Southeast Alaska, stock assessment

INTRODUCTION

Prior to 1983 the Lynn Canal Pacific herring (*Clupea pallasii*) stock was one of the larger stocks in Southeast Alaska supporting several commercial fisheries including a sac roe fishery and bait pound fishery (Pritchett 2005). This stock declined through the 1970's and since 1982 has remained at low levels. The reason for the decline is not clear, however potential contributing factors may include: over fishing, habitat degradation or disturbance in Auke Bay, water pollution, geographic shifting of spawning aggregations, or population growth of major predators such as whales and sea lions. If the long-term decline was solely the result of over fishing, it is expected that this stock should have shown some signs of recovery during the 25-years since commercial exploitation has ceased. In other areas in Southeast Alaska, such as Hoonah Sound, herring stocks have grown from low levels to relatively high levels over a span of a few years. Historically the Lynn Canal herring spawning area has been generally defined as that area extending from Berners Bay south to Taku Harbor (Figure 1).

The established spawning biomass threshold level for this stock is 5,000 tons. This means that before a herring fishery may be considered for the Lynn Canal spawning stock, a spawning biomass forecast must meet or exceed 5,000 tons. No commercial harvest has occurred in the Juneau area since the 1981-82 season.

Available records indicate that from 1953 to 1982 Lynn Canal herring primarily spawned from Auke Bay to Point Sherman including Berners Bay. The documented spawn for the Lynn Canal herring stock during this period ranged from 2.5 to 28.1 nautical miles, averaging approximately 11.6 nautical miles (Table 1). While significant spawning occurred in the vicinity of Auke Bay prior to 1981, there has been limited spawning in Auke Bay in recent years. Recent spawning activity for the Lynn Canal herring spawning stock is primarily centered between Bridget Cove and Berners Bay. From 1983 through 2007 the documented spawn has ranged from 2.0 to 8.8 nmi, averaging only 5.2 nmi. Since 1972 the Alaska Department of Fish and Game has recorded herring spawn between Echo Cove and the Berners Bay flats in most years, with few exceptions. Frequent herring spawn along this shoreline for the last 20 years suggests its importance as spawning habitat to this stock. Herring spawn timing has been documented as early as April 18 and as late as May 29.

The Alaska Department of Fish and Game conducts aerial and skiff surveys to monitor the Lynn Canal spawning stock. Aerial and skiff surveys have been conducted since 1970 to identify the dates and extent (miles of spawn along shoreline) of herring spawn. Beginning in 2004 and continuing through 2007 a dive survey based estimate of spawning biomass was completed by the department for the Berners Bay area (Pritchett et al. 2008) and was continued in 2008 as reported here. Since 2005, dive surveys and more frequent aerial surveys were initiated as a result of funding received by the department from Coeur Alaska as part of a mitigation process in

connection with plans to construct docking facilities at Cascade Point, within Berners Bay. Funding was intended to further understanding of herring use of habitat in the Berners Bay area and produce estimates of abundance.

MATERIALS AND METHODS

A series of aerial and skiff surveys are used to record spawning activities during the spring spawning period to document spawn timing and estimate the nautical miles of beach that received herring spawn. During the spring of 2008 all aerial surveys were flown in a Cubcrafters Supercub aircraft on floats with a department contracted pilot. In 2008 there were 12 aerial surveys conducted for the Lynn Canal area between April 21 and May 26 (Appendix A).

Scuba surveys were used in 2008 to estimate the total number of herring eggs deposited on the Berners Bay area spawning grounds. Egg estimates were converted to spawning population biomass using a fecundity relationship and weight-at-age data. The spawn deposition survey was conducted on May 21, 2008 and six randomly selected transects were surveyed (note that eight transects were plotted but time constraints limited the number of surveyed to six). Actual survey methods in 2008 were the same as those used in recent years (Pritchett et al. 2007). Dive surveys were conducted only on spawn in the Berners Bay area (i.e. not in areas such as Taku Harbor or Oliver Inlet) and therefore biomass estimates are only for the Berners Bay area in southern Lynn Canal.

RESULTS AND DISCUSSION

Aerial surveys documented a total of 3.3 nautical miles of spawn in the Berners Bay area in 2008 (Figure 2, Appendix A). For comparison, Table 1 also lists documented herring spawn for the Lynn Canal spawning stock (i.e. greater Juneau area which includes the Berners Bay area, Figure 1), which includes additional areas where spawn may have been documented historically such as Taku Harbor, Oliver Inlet, Auke Bay, or Tee Harbor. Other than the Berners Bay area, no other spawn was documented in the Juneau area in 2008.

Average survey transect length was 50 meters with an average density of 135,356 eggs per square meter. Estimated 2008 spawning biomass was 499 tons. The Lynn Canal spawning stock continues to be well below the 5,000 ton threshold and will likely remain closed to commercial harvest in the foreseeable future.

In the future as resources permit, the department intends to document herring spawning locations in the Juneau area with aerial and skiff surveys and to conduct dive assessment surveys in southern Lynn Canal and Berners Bay.

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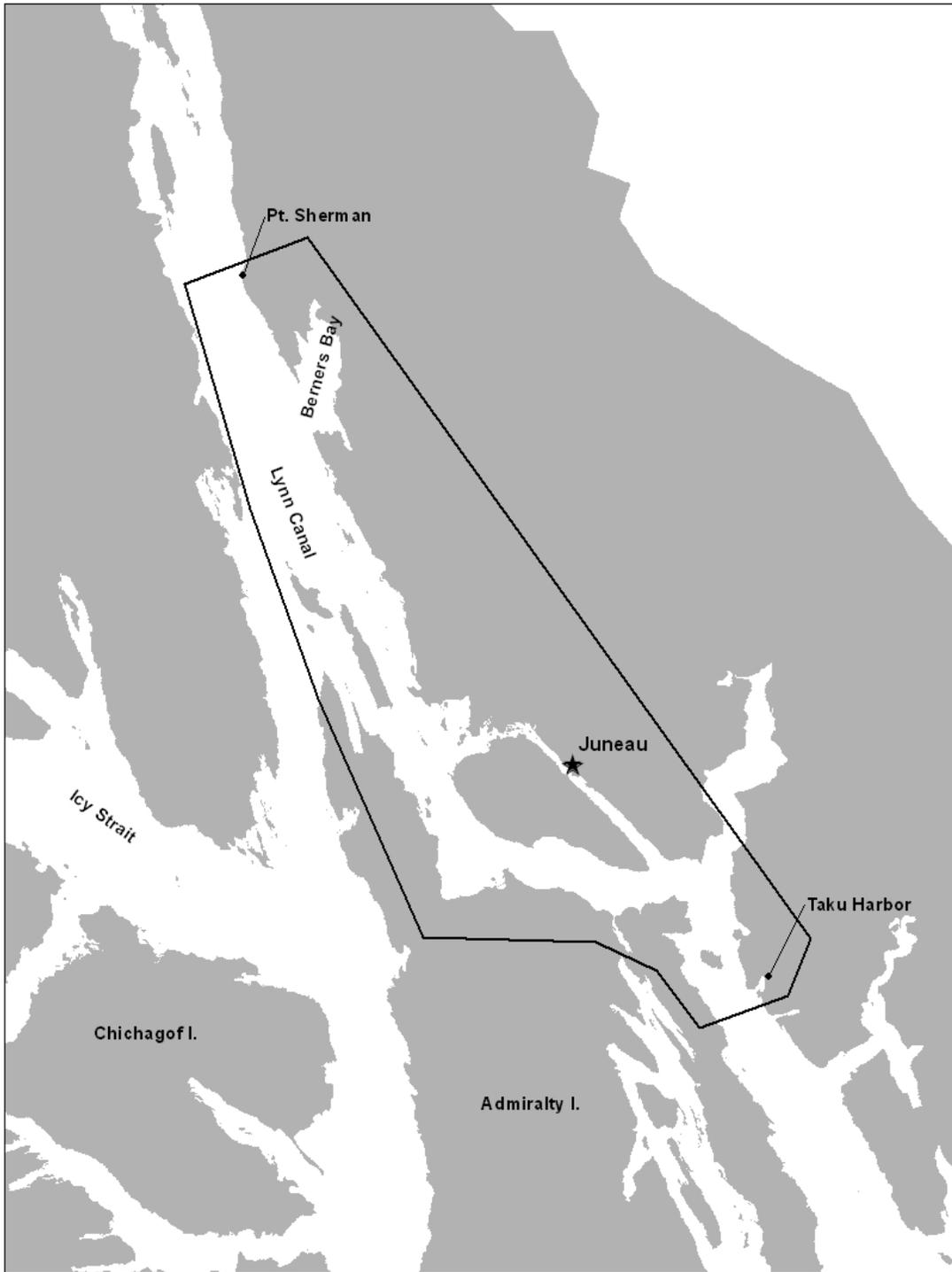


Figure 1.—Historic Lynn Canal herring spawning area.

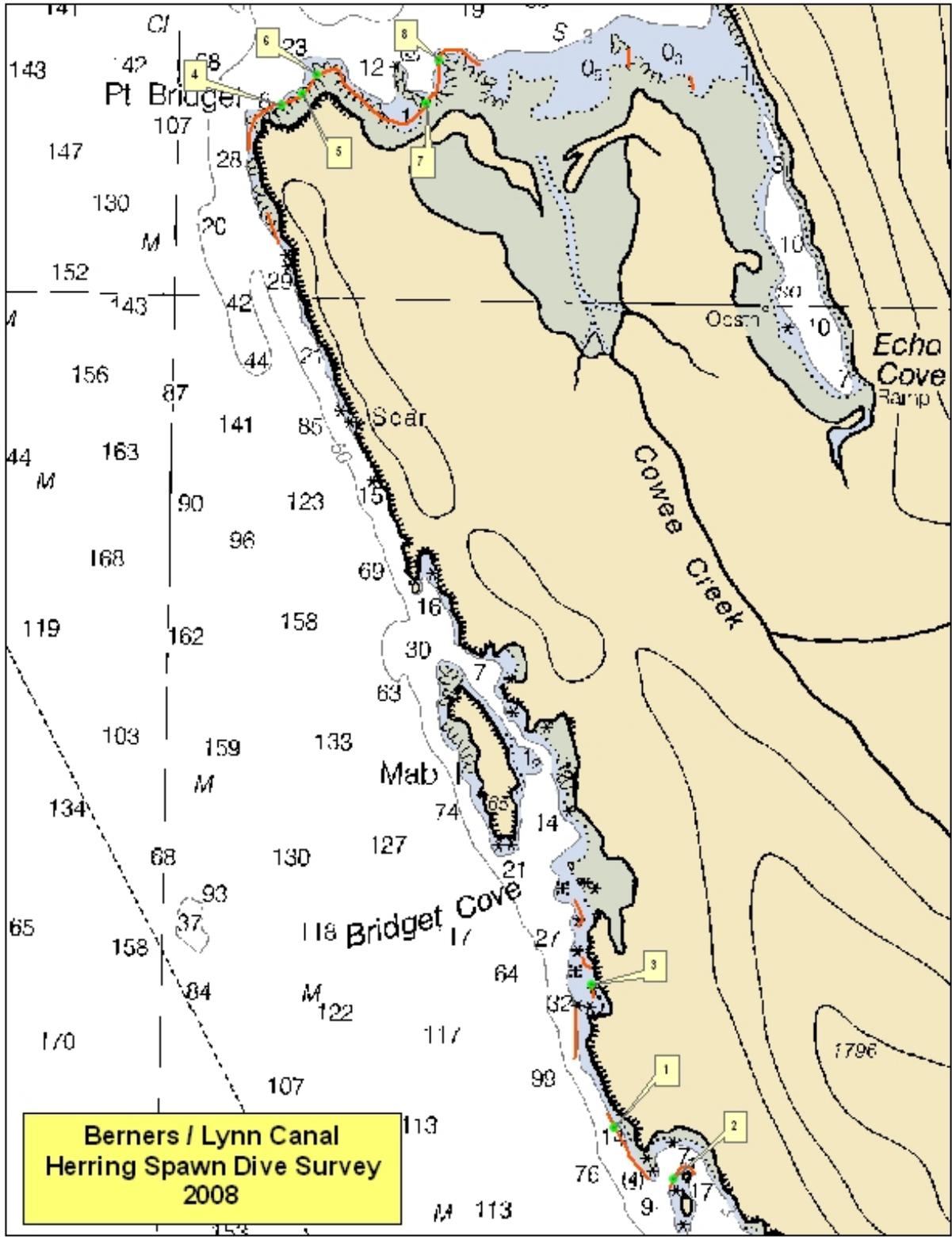


Figure 2.—Berners Bay and Lynn Canal 2008 herring spawn shoreline (broad, dark line parallel to shore) and transect locations (numbers 1–8).

Table 1.—Historic Lynn Canal commercial harvest, spawn dates, and nautical miles of spawn.

Season	Total quota (tons)	Total Harvest (tons)	Pound harvest (tons)	Seine harvest (tons)	Gillnet harvest (tons)	Date of first spawn	Major spawning dates	Nautical miles of spawn - Juneau Area	Nautical miles of spawn - Berners Bay Area
1952-53								8.2	
1953-54								9.4	
1954-55								12.2	
1955-56								10.0	
1956-57								28.1	
1957-58								24.1	
1958-59								10.8	
1959-60		156	156			5/1	5/1-5/15	12.9	
1960-61		22	22						
1961-62		354	354						
1962-63		101	101						
1963-64		195	195						
1964-65		200	200						
1965-66		109	109						
1966-67		100	100						
1967-68		475	475						
1968-69		600	0	600					
1969-70	750	240	240				5/2-5/4	11.5	
1970-71	750	654	654						
1971-72	950	524	431	93		5/2	5/6	8.5	
1972-73	950	350	49	301			4/25	10.6	
1973-74	620	396	73	319	4		4/27	13.2	
1974-75	620	644	88	556	2		5/5	10.9	
1975-76	870	631	74	433	124		4/27	15.9	
1976-77	995	926	0	709	217		5/3	9.7	
1977-78	820	966	0	603	363		4/24	8.0	
1978-79	120	7	11	0			4/18	5.7	
1979-80	720	976	0	976			5/8	9.8	
1980-81	845	777	2	775			4/30	9.2	
1981-82	400	551	0	551				2.5	

— continued —

Table 1.—continued (page 2 of 2)

Season	Total quota (tons)	Total Harvest (tons)	Pound harvest (tons)	Seine harvest (tons)	Gillnet harvest (tons)	Date of first spawn	Major spawning dates Nauauai mmes of spawn – Juneau Area	Nauauai mmes of spawn – Berners Bay Area Berners Bay Area (tons)
1982–83							5/1	6.0
1983–84							4/24	2.6
1984–85							4/29	5.1
1985–86							5/2	5.0
1986–87							5/4	2.5
1987–88							4/30–5/3	7.3
1988–89							4/24	5.8 4.3
1989–90							4/26	3.3 3.3
1990–91							4/30–5/4	5.6 1.7
1991–92							4/27	7.5 4.2
1992–93							5/4–5/6	5.1 3.5
1993–94							4/27–5/8	6.2 4.5
1994–95							5/10–5/24	2.1 1.0
1995–96						4/29	5/5	8.5 3.7
1996–97						5/1	5/5	5.6 3.0
1997–98						5/13		2.0 0.6
1998–99								5.5 4.7
1999–00						5/4	5/10–5/10	5.6 3.6
2000–01						5/5	5/5–5/6	6.9 3.8
2001–02						5/29	5/29	4.0 3.0
2002–03						4/30	4/30 – 5/2	3.0 2.2
2003–04						5/4	5/4 – 5/9	8.8 5.1 719
2004–05						5/10	5/11–5/12	2.8 1.4 318
2005–06						5/12	5/13 – /14	4.5 3.9 712
2006–07						5/11	5/11–5/16	8.2 7.4 1,461
2007–08						5/2	5/2–5/4	3.3 3.3 499
Average	724	433	145	493	142	5/6	5/3	7.9 3.4 742

APPENDIX

Appendix A.—Lynn Canal and Berners Bay Area 2008 Herring Survey Flight Log.

Total miles of spawn: 3.3

Spawning dates: 5/2–5/4

Peak spawn: 5/2

- April 21: Very quiet. Predators scattered from Pt. Louisa to Pt. Bridgett.
- April 25: No change from last survey. No activity in Berners Bay.
- April 29: Slight increase in numbers of predators observed, particularly in Berners Bay, but most of the sea lions are still hauled out at Benjamin Island.
- May 2: 2.6 nm of active spawn near Pt. Bridget, Slate Cove, and Sunshine Cove. Herring schools on the beach near Cascade Pt, in Bridget Cove and in the vicinity of Yankee Cove. One whale and 350 sea lions; most of them off the flats at the head of Berners Bay.
- May 3: 0.6 nm of light spawn at Pt. Bridget and 0.3 nm at south Bridgett Cove. No herring schools seen today. Yesterdays spawn has dissipated and few predators observed in the Bay during this survey.
- May 4: 0.25 nm of spawn in Bridget Cove. Schools of herring on the beach in Bridget Cove. 200+ sea lions in large rafts offshore in Berners Bay.
- May 5: No herring and no spawn; sea lions a bit more scattered today with some rafting inside Berners Bay and some smaller groups active from Yankee Cove to the Berners/Lace tideflat.
- May 7: No herring, no spawn, and very few predators.
- May 21: Herring spawn deposition dive survey conducted; six of eight transects completed.
- May 23: Good schools lining the beach in Tee Harbor, schools on the beach near the Shrine. Nothing north of Eagle River, no sealions hauled out at Benjamin Is (a few around in the water).
- May 24: Large school in N Tee Harbor, not lining the beach however.
- May 25: Schools in Tee Harbor.
- May 26: School much diminished in size.