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Berners Bay Area Herring Research, 2007

by

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and

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Alaska Department of Fish and Game **Division of 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)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

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

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ABSTRACT

Aerial and skiff surveys were used to document Pacific herring spawn locations in Lynn Canal during 2007. 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 1,461 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 2008.

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

INTRODUCTION

Prior to 1983 the Lynn Canal Pacific herring (*Clupea pallasi*) 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, and 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 20-year period 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 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 nmi, averaging approximately 11.6 nmi (Table 1). While significant spawning occurred in the vicinity of Auke Bay prior to 1981, there has been very limited spawning in Auke Bay in recent years. Recent spawning activity for the Lynn Canal herring stock is primarily centered between Bridget Cove and Berners Bay. From 1983 through 2006 the documented spawn has ranged from 2.0 to 8.8 nmi, averaging only 5.0 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. The consistent 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 conduced since 1970 to identify the dates and extent (miles of spawn along shoreline) of herring spawn. In 2004, 2005, and 2006 a dive survey based estimate of spawning biomass was completed by the department for the Berners Bay area (Pritchett et al. 2007) and was continued in 2007 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 2007 all aerial surveys were flown in a Cubcrafters Supercub aircraft on floats with a department contracted pilot. In 2007 there were 16 aerial surveys conducted for the Lynn Canal area between April 16 and May 23 (Appendix A).

As in 2004, 2005, and 2006 scuba surveys were used in 2007 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 25, 2007 and eight randomly selected transects were surveyed. Actual survey methods in 2007 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 7.4 nmi of spawn in the Berners Bay area in 2007 (Figure 2, Appendix A). For comparison, Table 1 also lists documented herring spawn for the Lynn Canal stock (i.e. greater Juneau area including the Berners Bay area, Figure 1), which includes additional areas where spawn may have been documented, such as Taku Harbor, Oliver Inlet, Auke Bay, or Tee Harbor.

Average survey transect length was 31 m with an average density of 287,712 eggs per square meter. Estimated 2007 spawning biomass was 1,461 tons. This estimate is at least twice that of estimates from the preceding three years. Nonetheless, 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.

REFERENCES CITED

Pritchett, M., S. Dressel, K. Monagle. 2007. Berners Bay Herring Research, 2005 and 2006 Research Report. Alaska Department of Fish and Game, Regional Report Series No. #R07-01, Douglas Alaska.

Pritchett. M. 2005. 2006 Report to the Alaska Board of Fisheries: Southeast Alaska-Yakutat herring fisheries. Alaska Department of Fish and Game, Fishery Management Report No. 05-67, Anchorage.

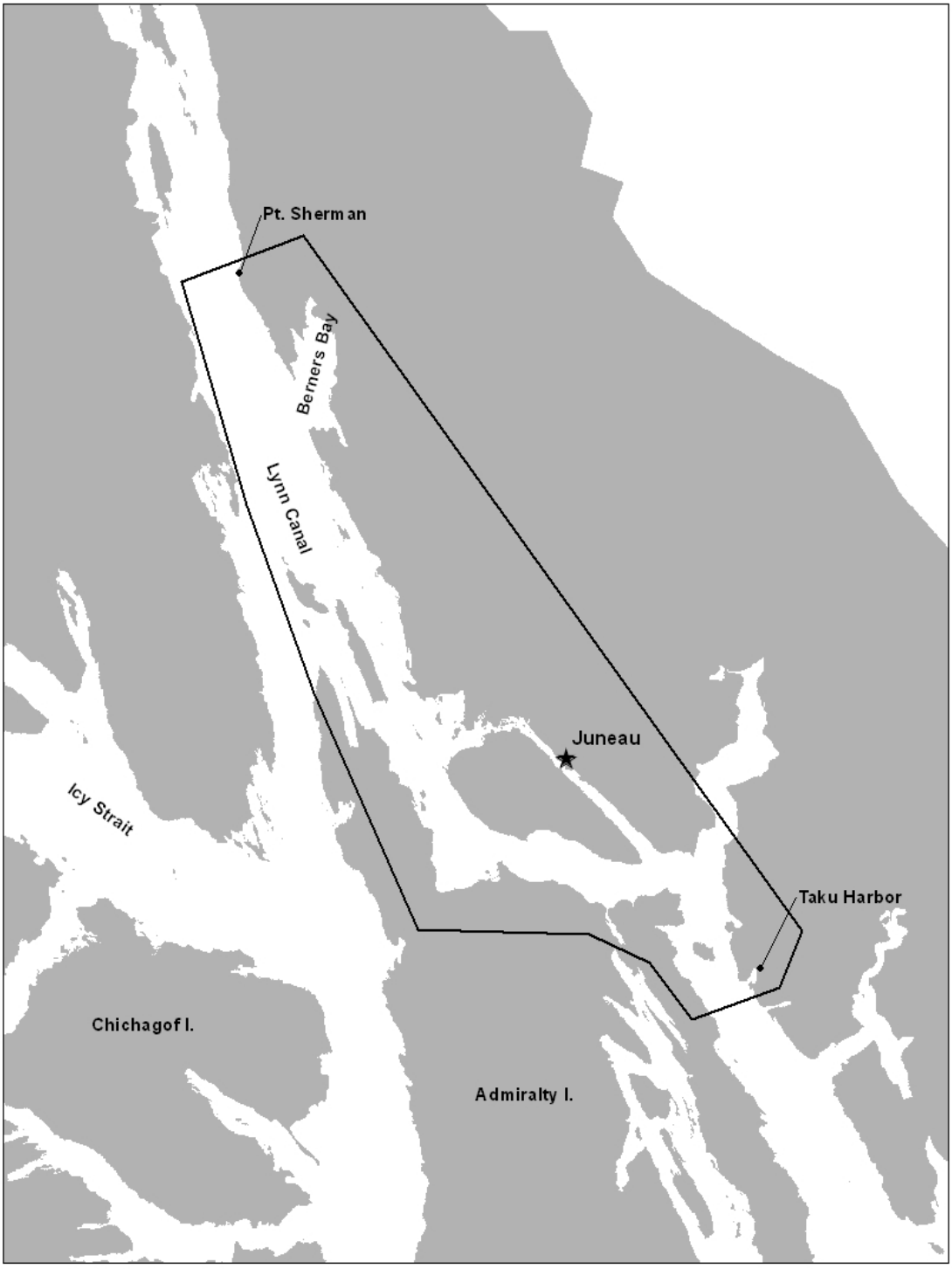

Figure 1.–Historic Lynn Canal herring spawning area.

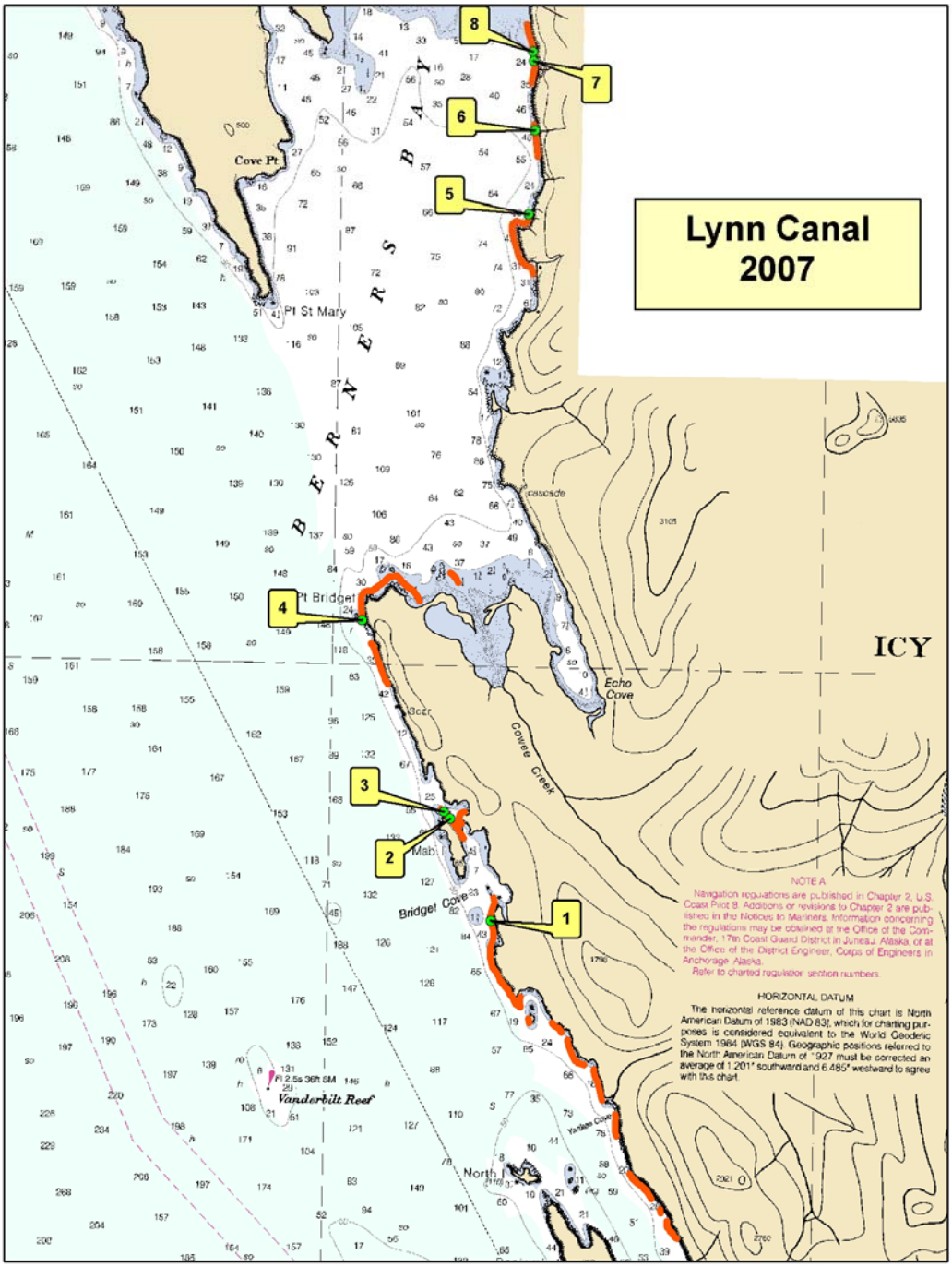

Figure 2.–Berners Bay area 2007 herring spawn shoreline (broad, dark line parallel to shore) and transect locations (numbers 1–8).

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

Season	Total quota (tons)	Total Harvest (tons)	Pound catch (tons)	Seine catch (tons)	Gillnet catch (tons)	Date of first spawn	Major spawning dates	Nautical miles of spawn - Juneau Area	Nautical miles of spawn - Berners Bay Area	Spawning biomass - Berners Bay Area (tons)
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 catch (tons)	Seine catch (tons)	Gillnet catch (tons)	Date of first spawn	Major spawning dates	Nautical miles of spawn - Juneau Area	Nautical miles of spawn - Berners Bay Area	Spawning biomass - 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

APPENDIX

Appendix A..–Lynn Canal and Berners Bay Area 2007 Herring Survey Flight Log.

Total miles of spawn:	7.4 nmi
Spawning dates:	5/11-5/22
Peak spawning:	5/11-5/16

4/16 1st aerial survey. 20 sea lion, 60 harbor seal at mouth of Berners. No herring activity.
4/20 40 sea lions in Berners Bay, 40 harbor seal at mouth of Berners. No herring activity.
4/25 62 sea lions, one whale. No herring activity.
4/30 1 whale 4 sea lions. No herring activity
5/4 328 sea lions 6 whale in Berners Bay, none S of Pt Bridget
5/7 18 sealions
5/11 50 sealions, 6 whales, many schools, 1 nmi active spawn.
5/12 27 sealions, 3 whales, 16 schools of herring, 0.5 nmi active spawn
5/13 45 sealions, 1 whale. 1 nmi spawn
5/14 9 sealions, 1 whale, several small schools, ¾ mile active spawn
5/15 10 sealions and 2 whales, ≈3 nmi active spawn
5/16 0.5 nmi intense spawn, 15 sealions
5/17 spot spawn, 0 whales, sealions at Benjamin Is
5/18 2 spot spawns, no herring or predators
5/22 ¾ nmi spawn, many schools observed
5/23 few predators, no new spawn