

Southeast Alaska Coastal Monitoring Project

JC-03-10 August Cruise Report

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Prepared by

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Scientists from the Marine Salmon Investigations Program at Auke Bay Laboratory, NOAA Fisheries, along with a collaborating JCFOS student planned a 4-day cruise aboard the NOAA ship *John N. Cobb* in the marine waters of the northern region of southeastern Alaska 08-11 August 2003. This cruise is the fifth in a series of six Southeast Alaska Coastal Monitoring (SECM) Project cruises scheduled for 2003.

The SECM project was initiated in 1997 to study the habitat and early marine ecology of juvenile Pacific salmon (*Oncorhynchus* spp) in inshore, strait, and coastal habitats along a primary seaward migration corridor. These habitats span 250 km from near Juneau, westward through Icy Strait to 64 km offshore in the Gulf of Alaska. Objectives for these cruises were to: 1) collect biological data on juvenile Pacific salmon and other pelagic fish species from surface rope trawl samples and 2) monitor physical and biological oceanographic indices seasonally at sampling stations in inside, strait, and offshore habitats of juvenile salmon.

Sampling in 2003 marks the seventh year of the SECM long-term study on how the intra- and inter-annual variability of physical and biological oceanographic indices relate to the distribution, abundance, growth, and survival of salmon and other fish populations at the same localities. The information collected will also provide insight into potential effects of climate change on stock-specific growth and recruitment of salmonids, interactions between hatchery and wild stocks of juvenile salmon, and the utilization of marine habitat by key fish species.

METHODS

Nine stations were scheduled for sampling during the 08-11 August 2003 cruise (Table 1, Figure 1). Stations were located in Auke Bay and along two transects with four stations each in Upper Chatham Strait and Icy Strait. Oceanographic measurements were planned for all stations and trawling was planned for all stations except Auke Bay Monitor. Rope trawl samples were replicated at all previously trawled stations with minimal accompanying oceanographic sampling.

Oceanographic sampling:

Temperature and salinity readings were continuously logged at one-minute intervals from a 2-m depth using a SeaBird SBE-21¹ thermosalinograph to provide data on horizontal water structure. A Seabird SBE-19 conductivity-temperature-depth (CTD) profiler was deployed at each station to 200 m or within 10 m of the bottom to examine vertical water structure. Surface water samples were taken at each station for later determination of chlorophyll and nutrient content.

Zooplankton was sampled at each station using conical nets hauled vertically and a bongo net system hauled obliquely. Vertical plankton hauls were taken from a depth of 20 m using a 50-cm frame and 243 micron mesh (NORPAC) net. At Auke Bay Monitor, and at stations along the Icy Strait transects, vertical hauls were taken from a depth of 200 m or within 20 m of the bottom using a 57-cm frame and 202 micron mesh (WP-2) net, and one double oblique bongo haul was taken from 200 m or within 20 m of the bottom using a 60-cm frame with 505 and 333 micron mesh nets. A Roshiga flow meter was placed inside the vertical net frames and a General Oceanics flow meter inside the bongo net frames to determine volume of water sampled. A Bendix/Marine Advisors Model T-1 Bathykymograph time depth recorder was used with the bongo nets to validate the maximum deployment depth of each haul. During replicate hauls, plankton was sampled with a NORPAC net only.

Trawl Sampling:

A Nordic 264 rope trawl fished, at the surface, directly astern the *John N. Cobb* was used to sample fish. The mouth opening of the trawl was approximately 20 m deep and 24 m wide, spread by a pair of 3 m Lite trawl doors. The trawl was fished fully open with 150 m of main warp out for a duration of 20 minutes at a speed of about 1.0-1.5 m/sec (2-3 knots). To fish the headrope of the trawl at the surface, a cluster of three meshed A-4 Polyform buoys was tethered to each wing tip of the headrope and one A-3 Polyform float was clipped onto the center of the headrope. Mesh sizes ranged from 162.6 cm in the throat of the trawl near the jib lines to 8.9 cm in the cod end. A 6.1 m long, 0.8 cm knotless liner was sewn into the codend. Along the jib lines on the top panel of the trawl, between the head rope and the first 162.6 cm mesh, a small mesh panel of 10.2 cm mesh was incorporated to minimize the loss of fish aft of the headrope.

After each haul, captured fish were anaesthetized with tricaine methanesulfonate, identified, enumerated, measured, and stomachs sampled (if appropriate); measurements were made to the nearest mm fork length (FL) using a Limnoterra FMB IV electronic measuring board. The heads of all chinook (*O. tshawytscha*) and coho (*O. kisutch*) salmon lacking adipose fins were retained for the possible recovery of coded-wire tags (CWTs). Stomachs from potential predators of juvenile salmon were excised, weighed, and classified by fullness. Stomach contents were removed, identified to a practical level, and estimated to the nearest 10% of total volume. The

¹Reference to trade names does not imply endorsement by the NOAA Fisheries.

weight of the stomach contents was determined as the weight of the stomach and contents minus the weight of the empty stomach.

Laboratory processing:

Data on settled volumes (SVs, ml) of zooplankton in the 20-m vertical hauls and from decoded CWTs of fish lacking adipose fins are included in this report. Laboratory processing still in progress includes 1) measurement of weight and condition of juvenile salmon; 2) determination of energetic content from frozen samples of juvenile pink (*O. gorbuscha*), chum (*O. keta*), and coho salmon; 3) examination for otolith thermal marks in frozen samples of juvenile chum, sockeye, coho, and chinook salmon; 4) scale samples of each species of juvenile salmon; 5) measurement of plankton displacement volumes of all bongo net samples; and 6) microscopic analysis of zooplankton species composition and abundance estimation from all NORPAC and bongo net samples taken at the Icy Strait stations. These data will be reported in an annual North Pacific Anadromous Fish Commission document.

RESULTS and DISCUSSION

All nine stations were sampled (Table 1) according to the following schedule:

Day 1: Depart Juneau (R. Briscoe, M. Kubota, N. Muirhead, and J. Orsi) and sample Auke Bay (1 station) and Upper Chatham Strait transect (4 stations)

Day 2: Sample Icy Strait transect (4 stations)

Day 3: Do replicate sampling of Icy Strait transect (4 stations)

Day 4: Sample Icy Strait at night (1 station), and transit to Juneau NMFS Subport and offload supplies.

A total of 14 CTD casts, 16 NORPAC hauls, 24 bongo hauls, and 13 rope trawl hauls were made during the cruise (Table 2). Nine water samples were taken at all stations for later analysis of chlorophyll and nutrients.

Surface (2-m) temperatures and salinities ranged from 13.3 to 15.4 °C and 16.4 to 23.4 PSU (Table 3). Zooplankton biomass, as determined from the SVs of the NORPAC samples, ranged from 1 to 30 ml, with the highest SV found during the night sampling in Icy Strait (Table 3). The SVs of phytoplankton ranged 0-7 ml, and were generally lower than the zooplankton Svs.

A total of 988 fish and squid were collected from 13 rope trawls hauls with juvenile salmon comprising about 40% of the catch (Tables 3, 4, and 5). Of the 588 non-salmonid fish and squid

caught, the most abundant species was walleye pollock (*Theragra chalcogramma*), and the most frequently occurring species was crested sculpin (*Blepsias bilobus*) which occurred in 85% of the hauls.

Juvenile salmon were generally the most frequently occurring taxon, with chum, coho and pink salmon and occurring in 85, 77, and 77% of the hauls, respectively. The most abundant juvenile salmon species caught were pink and chum salmon, with total catches of 181 and 157 (Tables 3 and 5). Total catches of juvenile coho and sockeye salmon (*O. nerka*) were 35 and 14, whereas no juvenile chinook salmon were caught. A total of 13 immature/adult salmon were captured; 6 immature chinook salmon, 4 adult pink salmon, 2 adult coho salmon, and 1 adult chum salmon (Tables 3 and 5).

One immature chinook and one juvenile coho salmon lacking their adipose fin were caught and contained CWTs. Origins of these salmon were determined from the decoded CWTs (Table 6). The age 1.1 CWT chinook salmon was released at Kasnyku Bay, AK on 03 June 2002 and caught at Chatham Strait on 09 August 2003. The age 1.0 CWT coho salmon was released from the Berner's River on 18 May 2003 and caught in Icy Strait on 08 August 2003.

Stomach analysis was done on 67 potential predators of juvenile salmon: 53 walleye pollock, 6 immature chinook salmon, 4 adult pink salmon, 2 adult coho salmon, 1 adult chum salmon, and 1 Pacific hake (*Merluccius productus*). No juvenile salmon were identified in any of the predator stomachs. The walleye pollock were mainly planktivorous, consuming mostly copepods, euphausiids, and amphipods. All 6 immature chinook salmon were feeding on fish: capelin (*Mallotus villosus*), lanternfish, or unidentifiable species. Most of the adult salmon stomachs were empty although one of the coho salmon had preyed on pollock. The Pacific hake was feeding on fish and shrimp.

ACKNOWLEDGMENTS

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Table 1.--Localities and coordinates of stations scheduled for oceanographic or fish sampling in the marine waters of the northern region of southeastern Alaska off the NOAA ship *John N. Cobb*, 08-11 August 2003. Distance between refers to adjacent stations in a transect locality.

Locality	Station	Latitude North	Longitude West	Distance		Depth m
				offshore km	between km	
Auke Bay	ABM	58° 22.00'	134° 40.00'	1.5	—	60
Upper Chatham Strait	UCA	58° 04.57'	135° 00.08'	3.2	—	400
	UCB	58° 06.22'	135° 00.91'	6.4	3.2	100
	UCC	58° 07.95'	135° 01.69'	6.4	3.2	100
	UCD	58° 09.64'	135° 02.52'	3.2	3.2	200
Icy Strait	ISA	58° 13.25'	135° 31.76'	3.2	—	128
	ISB	58° 14.22'	135° 29.26'	6.4	3.2	200
	ISC	58° 15.28'	135° 26.65'	6.4	3.2	200
	ISD	58° 16.38'	135° 23.98'	3.2	3.2	234

Table 2.—Number of oceanographic and biological samples collected in the marine waters of the northern region of southeastern Alaska using the NOAA ship *John N. Cobb*, 08-11 August 2003.

Date	Time	Haul#	Station	CTD	Plankton net samples			Chlorophyll & nutrients	Rope trawl
					NORPAC	Bongo _{deep}	Bongo _{20m}		
08 August	1030	7087	ABM	1	3	4	0	1	0
08 August	1400	7088	UCD	1	1	0	0	1	1
08 August	1530	7089	UCC	1	1	2	0	1	1
08 August	1709	7090	UCB	1	1	0	0	1	1
08 August	1855	7091	UCA	1	1	0	0	1	1
09 August	0902	7092	ISA	1	1	2	2	1	1
09 August	1020	7093	ISB	1	1	2	2	1	1
09 August	1500	7094	ISC	1	1	2	2	1	1
09 August	1720	7095	ISD	1	1	0	0	1	1
10 August	0730	7096	ISD	1	1	2	2	0	1
10 August	0945	7097	ISC	1	1	2	0	0	1
10 August	1206	7098	ISB	1	1	0	0	0	1
10 August	1430	7099	ISA	1	1	0	0	0	1
11 August	0120	7100	ISC	1	1	0	0	0	1
Total				14	16	16	8	9	13

Table 3.—Two meter depth temperatures and salinities, 20-m vertical NORPAC plankton settled volumes (SVs), and number of salmon caught in rope trawl hauls from the NOAA ship *John N. Cobb* at stations in marine waters of the northern region of southeastern Alaska, 08-11 August 2003. Asterisks denote average values of three replicate hauls.

Date	Haul#	Station	Temp. (°C)	Salinity (PSU)	Plankton SVs (ml)			Juvenile salmon				Immature	Adult		
					Zoop-	Phyto-	Total	Pink	Chum	Sockeye	Coho	Chinook	Pink	Coho	Chum
08 August	7087	ABM	13.4	20.2	6.5*	4.0*	10.5*	—	—	—	—	—	—	—	—
08 August	7088	UCD	14.0	19.6	2.0	3.0	5.0	1	2	0	3	0	0	0	0
08 August	7089	UCC	14.7	16.5	4.0	0.5	4.5	12	9	3	4	1	0	0	0
08 August	7090	UCB	14.2	20.1	8.0	1.0	9.0	27	19	1	3	1	1	0	0
08 August	7091	UCA	14.0	16.4	5.0	2.0	7.0	4	7	0	12	0	0	0	0
09 August	7092	ISA	14.0	21.3	9.0	0.0	9.0	17	32	0	2	1	0	1	0
09 August	7093	ISB	14.1	21.8	1.0	7.0	8.0	73	42	3	4	2	0	0	0
09 August	7094	ISC	15.4	16.8	11.0	1.0	12.0	8	11	2	1	0	0	0	0
09 August	7095	ISD	14.9	18.4	9.0	1.0	10.0	20	10	1	0	0	0	0	0
10 August	7096	ISD	13.9	17.9	1.0	7.0	8.0	0	4	0	3	0	0	0	0
10 August	7097	ISC	14.2	19.4	9.0	1.0	10.0	0	0	0	1	0	2	1	1
10 August	7098	ISB	13.3	21.8	12.0	0.0	12.0	0	0	0	0	0	0	0	0
10 August	7099	ISA	13.7	23.4	14.0	1.0	15.0	17	19	4	2	0	1	0	0
11 August	7100	ISC	14.3	18.9	30.0	5.0	35.0	2	2	0	0	1	0	0	0
Total Catch			—	—	—	—	—	181	157	14	35	6	4	2	1

Table 4.—Number of non-salmonids caught in rope trawl hauls from the NOAA ship *John N. Cobb* at stations in marine waters of the northern region of southeastern Alaska, 08-11 August 2003. Walleye pollock juveniles are in parentheses.

Date	Haul#	Station	Walleye pollock	Crested sculpin	Squid	Lanternfish	Prowfish	Pacific herring	Pacific hake	Wolf-eel	Salmon shark	Pacific sandfish
08 August	7087	ABM	—	—	—	—	—	—	—	—	—	—
08 August	7088	UCD	0	1	0	0	0	0	0	0	0	0
08 August	7089	UCC	0	5	0	0	2	0	0	0	0	0
08 August	7090	UCB	0	4	0	0	0	0	0	0	0	0
08 August	7091	UCA	0	0	0	0	0	0	0	0	0	0
09 August	7092	ISA	22	2	0	0	0	0	0	1	0	0
09 August	7093	ISB	0	6	0	0	1	0	1	0	0	1
09 August	7094	ISC	2	0	0	0	4	0	0	0	0	0
09 August	7095	ISD	0	1	0	0	1	1	0	0	0	0
10 August	7096	ISD	0	4	0	0	0	0	0	0	0	0
10 August	7097	ISC	0 (1)	1	0	0	1	0	0	0	0	0
10 August	7098	ISB	18	1	0	0	1	0	0	0	0	0
10 August	7099	ISA	425	10	0	0	0	0	0	0	1	0
11 August	7100	ISC	11 (6)	1	33	19	0	0	0	0	0	0
Total			478 (7)	36	33	19	10	1	1	1	1	1

Table 5.—Length, percent frequency of occurrence (FO), and life history stage of fish caught in 13 rope trawl hauls from the NOAA ship *John N. Cobb* in the marine waters of the northern region of southeastern Alaska, 08-11 August 2003.

Common name	Species	n	Fork length (mm)			%FO	Life ³ history stage
			min	max	x		
Pink salmon	<i>Oncorhynchus gorbuscha</i>	181	95	177	133.4	77	J
Chum salmon	<i>O. keta</i>	157	89	186	138.0	85	J
Sockeye salmon	<i>O. nerka</i>	14	122	197	139.1	46	J
Coho salmon	<i>O. kisutch</i>	35	171	264	215.4	77	J
Chinook salmon	<i>O. tshawytscha</i>	6	370	545	465.0	23	I
Pink salmon	<i>O. gorbuscha</i>	4	450	510	486.5	31	A
Coho salmon	<i>O. kisutch</i>	2	667	770	718.5	16	A
Chum salmon	<i>O. keta</i>	1	542	542	542.0	8	A
Total salmonids measured		400	—	—	—	—	—
Walleye pollock	<i>Theragra chalcogramma</i>	103	269	376	325.9	38	A
		7	51	60	55.0	15	J
Crested sculpin	<i>Blepsias bilobus</i>	36	81	146	114.5	85	I-A
Squid	Gonatidae	33	36	131	102.1	8	J-A
Lanternfish	Myctophidae	19	31	71	57.3	8	A
Prowfish	<i>Zaprora silenus</i>	10	62	142	114.5	46	I
Pacific herring	<i>Clupea pallasii</i>	1	144	144	144.0	8	I
Pacific hake	<i>Merluccius productus</i>	1	415	415	415.0	8	A
Wolf-eel	<i>Anarrhichthys ocellatus</i>	1	470	470	470.0	8	J
Salmon shark	<i>Lamna ditropis</i>	1	2100	2100	2100.0	8	A
Pacific sandfish	<i>Trichodon trichodon</i>	1	101	101	101.0	8	I
Total non-salmonids measured		213	—	—	—	—	—
Total fish and squid measured		613	—	—	—	—	—

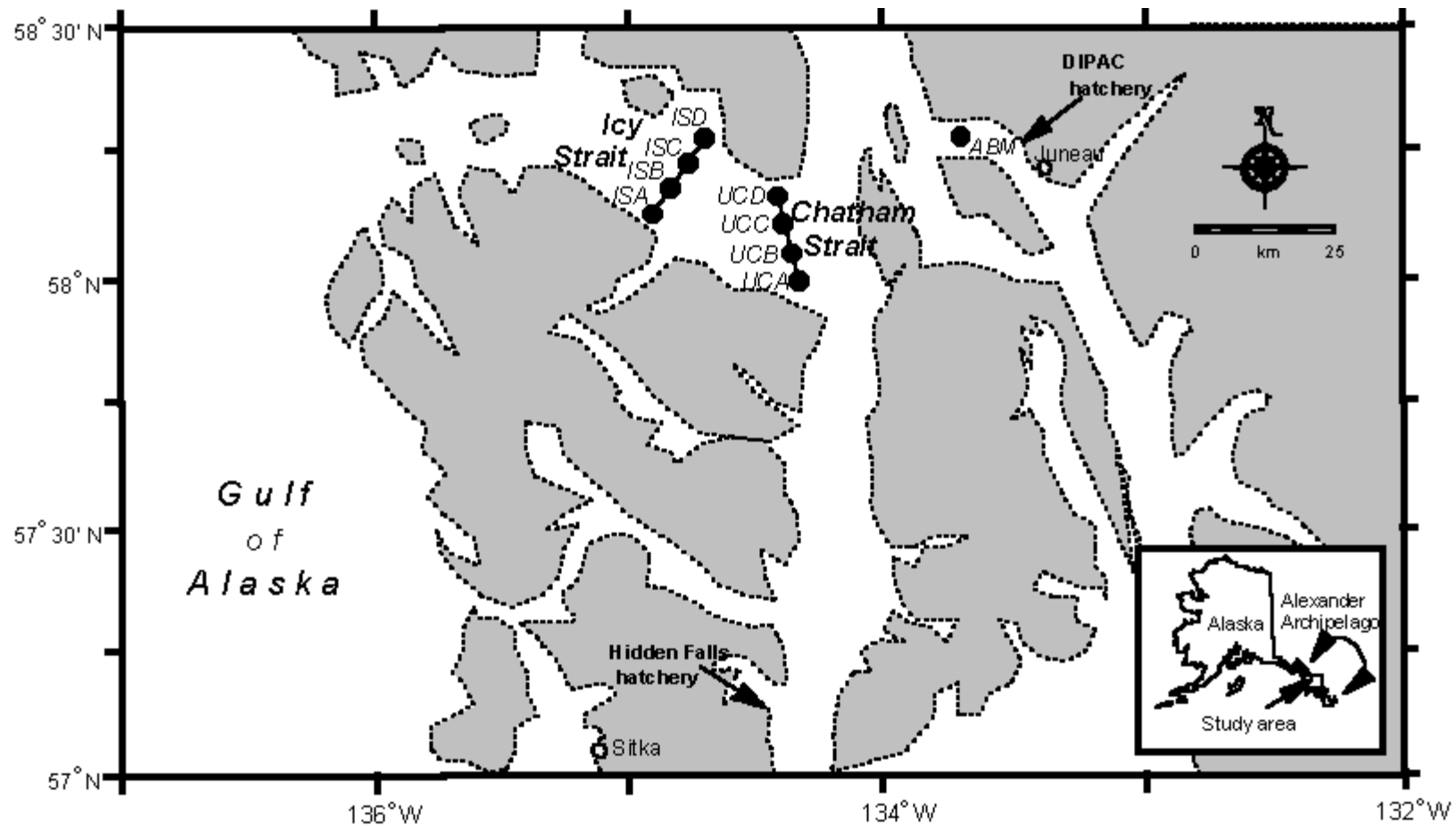
³L=larval fish, J=juvenile or post larvae in first year at sea (i.e. age-.0), I=immature age-.1 or older in pre-spawn condition, and A=mature adult or near age of maturity.

Table 6.—Release and recovery information for salmon lacking the adipose fin or coded-wire tagged caught in rope trawl hauls from the NOAA ship *John N. Cobb* in the northern region of southeastern Alaska, 08-11 August 2003.

Species	Coded-wire tag code	Release information				Recovery information				Days since release	Marine distance traveled				
		Brood year	Agency ⁴	Locality	Date	Size		Locality (station code)	Date		Size		km	km/d	
						mm	g				mm	g	Age ⁵		
Chinook	04:48/28	2000	NSRA	Kasnyku Bay, AK	6/03/02	—	43.0	Chatham St. (UCA) Haul#7093 Fish#162	8/09/03	480	1650.0	1.1	432	100	0.2
Coho	04:05/57	2001	ADFG	Berners R. (Wild), AK	5/18/03	105	—	Icy Strait (ISC) Haul#7091 Fish#12	8/08/03	213	103.5	1.0	83	105	1.3

⁴ADFG=Alaska Department of Fish and Game and NSRA=Northern Southeast Regional Aquiculture.

⁵European age notation, with the numeral before the decimal denoting the number of freshwater winters and the numeral following the decimal denoting marine winters.



Figure

1.—Nine stations sampled in the marine waters of the northern region of southeastern Alaska off the NOAA ship *John N. Cobb*, 08-11 August 2003.