

Southeast Alaska Coastal Monitoring Project

JC-03-08 July Cruise Report

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Prepared by

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Scientists from the Marine Salmon Investigations Program at Auke Bay Laboratory, Alaska Fisheries Science Center, National Marine Fisheries Service, NOAA Fisheries conducted a 8-day cruise aboard the NOAA ship *John N. Cobb* in the marine waters of the northern region of southeastern Alaska, 22-29 July 2003. This cruise was the fourth 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

Thirteen stations were scheduled for sampling on cruise JC-03-08 (Table 1, Figure 1). Stations were located in Auke Bay, along two transects with four stations each in Upper Chatham Strait

and Icy Strait, and along one transect with four stations in the Gulf of Alaska. Oceanographic measurements were planned for all stations and trawling was planned for all stations except Auke Bay Monitor.

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 the adipose fin were

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

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 and prey were generally identified to the family level and estimated to the nearest 10% of total volume. The 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 the adipose fin 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. The additional information will be reported in an annual North Pacific Anadromous Fish Commission document.

RESULTS and DISCUSSION

Sampling was conducted according to the following schedule at the thirteen stations:

Day 1: Depart NMFS Subport, Juneau and transit to vicinity of Icy Point.

Day 2: Daylight oceanographic sampling (4 stations) and rope trawling (two inshore stations only) at the Icy Point transect .

Day 3: Daylight rope trawling with oceanographic sampling at the Icy Strait transect (4 stations).

Day 4: Daylight rope trawling at Upper Chatham Strait transect (4 stations) with partial oceanographic sampling.

Day 5: Daylight rope trawling (replicate) at Icy Strait transect (4 stations) and partial oceanographic sampling.

Day 6: Daylight rope trawling (replicate) at Upper Chatham Strait transect (4 stations) and partial oceanographic sampling.

Day 7: Anchor near Icy Strait station ISC due to main engine problems on the vessel.

____ Day 8: Nocturnal rope trawling at one Icy Strait station (ISC) and oceanographic sampling at Auke Bay Monitor. Return to NMFS Subport, Juneau.

Oceanographic sampling was accomplished at all stations. A total of 22 CTD casts, 9 water samples, 24 Norpac tows, and 19 bongo tows (two net samples each tow) were made during the cruise (Table 2). Surface (2-m) temperatures and salinities ranged from 12.3 to 15.8 °C and from 15.5 to 31.7 PSU (Table 3). Settled volumes of zooplankton from the 20-m vertical NORPAC hauls ranged from 2-100 ml. Extensive phytoplankton blooms were apparent along the Icy Strait transect as evidenced by phytoplankton volumes averaging about 70 ml per station on 24 and 26 July.

A total of 21 rope trawl hauls were made at the stations scheduled for trawling (Table 2). A total of 2,924 fish and squid were captured, represented by 12 species (Tables 3-5). Juvenile salmon comprised over 78% of the catch. However, the largest single catch was made during the one night trawl haul in Icy Strait where over 500 fish and squid were captured, consisting of mainly age 1+ walleye pollock (*Theragra chalcogramma*). Of all the fish captured, juvenile salmon occurred most frequently (76-95%) in all of the trawl hauls.

Two juvenile coho salmon lacking the adipose fin were retained for later CWT detection. No CWTs were detected from these fish.

Stomachs were examined from 68 potential predators of juvenile salmon. These fish were represented by four species: walleye pollock (34), spiny dogfish (*Squalus acanthias*) (22), adult pink salmon (11), and Pacific herring (*Clupea pallasii*) (1). Of all the fish stomachs examined, only one from a spiny dogfish contained identifiable juvenile salmon as prey.

ACKNOWLEDGMENTS

We acknowledge and compliment the command and crew of the NOAA ship *John N. Cobb* for their cooperation and performance during the cruise.

Table 1.—Localities and coordinates of stations sampling in marine waters of the northern region of southeastern Alaska using the NOAA ship *John N. Cobb*, 22-29 July, 2003.

Habitat	Station	Latitude North	Longitude West	Distance		Depth m	
				offshore km	between km		
Inshore		Auke Bay station					
	ABM	58° 22.00'	134° 40.00'	1.5	—	60	
Strait		Upper Chatham Strait transect					
	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 transect					
	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	
	Coastal		Icy Point transect				
		IPA	58° 20.12'	137°07.16'	6.9	—	160
		IPB	58° 12.71'	137°16.96'	23.4	16.8	130
		IPC	58° 05.28'	137°26.75'	40.2	16.8	150
IPD		57° 53.50'	137°42.60'	65.0	24.8	1,300	

Table 2.—Types of data collected at different habitat types sampled monthly in marine waters of the northern region of southeastern Alaska, 22-29 July 2003.

Date	Time	Haul#	Station	Data collection type					
				Rope trawl	CTD cast	NORPAC Bongo	WP-2 vertical	Chlorophyll & nutrients	
23 July	0755	7063	IPA	1	1	4	1	1	1
23 July	1005	7064	IPA	1	0	0	0	0	0
23 July	1210	7065	IPB	1	1	2	1	1	1
23 July	1430	7066	IPB	1	0	0	0	0	0
23 July	1600	7067	IPC	0	1	2	1	1	1
23 July	1827	7068	IPD	0	1	2	1	1	1
24 July	1015	7069	ISA	1	1	4	1	1	1
24 July	1220	7070	ISB	1	1	4	1	1	1
24 July	1450	7071	ISC	1	1	6	1	1	1
24 July	1805	7072	ISD	1	1	4	1	1	1
25 July	0745	7073	UCA	1	1	0	1	0	0
25 July	0915	7074	UCB	1	1	0	1	0	0
25 July	1145	7075	UCC	1	1	4	1	0	0
25 July	1305	7076	UCD	1	1	0	1	0	0
26 July	0720	7077	ISA	1	1	0	1	0	0
26 July	0950	7078	ISB	1	1	0	1	0	0
26 July	1025	7079	ISC	1	1	0	1	0	0
26 July	1220	7080	ISD	1	1	0	1	0	0
27 July	0800	7081	UCD	1	1	0	1	0	0
27 July	0920	7082	UCC	1	1	0	1	0	0
27 July	1120	7083	UCB	1	1	0	1	0	0
27 July	1345	7084	UCA	1	1	0	1	0	0
29 July	0130	7085	ISC	1	1	2	1	0	0
29 July	0655	7086	ABM	0	1	4	3	1	1
Total				21	22	38	24	9	9

Table 3.—Two meter depth temperatures and salinities, settled volumes of plankton from 20-m vertical Norpac hauls, and catches of salmon with a rope trawl at stations sampled from the NOAA ship *John N. Cobb* in marine waters of the northern region of southeastern Alaska, 22-29 July 2003. All hauls except 7086 were made during daylight hours.

Date	Haul#	Station	Temp.	Salinity	Settled plankton (ml)			Juvenile salmon					Adult salmon
			(°C)	(PSU)	Zoop-	Phyto-	Total	Pink	Chum	Sockeye	Coho	Chinook	Pink
23 July	7063	IPA	13.2	31.1	2.0	8.0	10.0	0	1	0	1	0	0
23 July	7064	IPA	13.8	31.7	—	—	—	0	3	0	1	0	1
23 July	7065	IPB	14.9	31.7	2.0	5.0	7.0	128	80	9	1	0	0
23 July	7066	IPB	14.9	31.7	—	—	—	322	147	35	1	0	0
23 July	7067	IPC	14.7	31.6	6.0	0.0	6.0	—	—	—	—	—	—
23 July	7068	IPD	15.8	31.0	2.0	8.0	10.0	—	—	—	—	—	—
24 July	7069	ISA	13.6	25.7	100.0	220.0	320.0	18	27	0	22	0	1
24 July	7070	ISB	13.6	25.6	40.0	60.0	100.0	0	3	0	1	0	3
24 July	7071	ISC	14.0	25.0	26.0	60.0	86.0	23	88	3	2	0	0
24 July	7072	ISD	13.7	25.4	35.0	10.0	45.0	73	28	3	5	0	0
25 July	7073	UCA	13.9	20.8	5.0	1.0	6.0	129	59	8	0	0	1
25 July	7074	UCB	13.2	22.0	6.0	1.0	7.0	50	9	9	3	0	0
25 July	7075	UCC	13.0	23.3	2.0	5.0	7.0	57	41	2	0	0	0
25 July	7076	UCD	13.3	22.5	2.0	10.0	12.0	92	76	2	7	0	1
26 July	7077	ISA	13.4	25.7	20.0	170.0	190.0	10	16	1	4	0	0
26 July	7078	ISB	13.0	26.6	10.0	80.0	90.0	2	22	0	2	0	0
26 July	7079	ISC	12.8	26.6	10.0	62.0	72.0	9	16	1	2	0	3
26 July	7080	ISD	12.9	25.6	5.0	25.0	30.0	39	13	3	2	0	0
27 July	7081	UCD	13.0	23.0	6.0	6.0	12.0	0	0	2	9	0	0
27 July	7082	UCC	13.3	22.0	4.0	1.0	5.0	203	92	37	5	0	0
27 July	7083	UCB	12.7	25.2	4.0	1.0	5.0	124	51	19	2	0	0
27 July	7084	UCA	13.0	22.8	4.0	0.0	4.0	5	12	2	4	0	1
29 July	7085	ISC	12.3	27.9	28.0	10.0	38.0	6	5	1	4		1
29 July	7086	ABM	13.1	15.5	8.0	15.0	23.0	—	—	—	—	—	—
Total catch			—	—	—	—	—	1,290	789	137	78	0	12

Table 4.—Catches in numbers of fish other than salmon with a rope trawl at stations sampled from the NOAA ship *John N. Cobb* in marine waters of the northern region of southeastern Alaska, 22-29 July 2003. All hauls except 7086 were made during daylight hours.

Date	Haul#	Station	Squid	Crested sculpin	Walleye pollock	Juvenile pollock	Smooth lumpsucker	Wolf- eel	Spiny dogfish	Prowfish	Pacific herring	Fish larvae
23 July	7063	IPA	0	0	0	0	0	0	4	0	0	0
23 July	7064	IPA	0	0	0	0	0	0	17	0	0	0
23 July	7065	IPB	10	0	0	0	0	0	1	0	0	1
23 July	7066	IPB	10	0	0	0	0	0	0	0	0	1
23 July	7067	IPC	0	0	0	0	0	0	0	0	0	0
23 July	7068	IPD	0	0	0	0	0	0	0	0	0	0
24 July	7069	ISA	0	5	0	0	0	0	0	0	0	0
24 July	7070	ISB	0	3	45	1	0	0	0	2	0	0
24 July	7071	ISC	0	1	1	0	0	0	0	1	0	0
24 July	7072	ISD	0	2	0	1	0	0	0	3	0	0
25 July	7073	UCA	0	2	0	0	0	0	0	4	0	0
25 July	7074	UCB	0	1	0	0	0	1	0	2	0	0
25 July	7075	UCC	0	1	0	0	0	0	0	0	0	0
25 July	7076	UCD	0	3	0	0	1	0	0	0	0	0
26 July	7077	ISA	0	10	2	0	0	0	0	0	0	0
26 July	7078	ISB	0	0	56	0	0	0	0	0	0	0
26 July	7079	ISC	0	0	1	0	0	0	0	1	0	0
26 July	7080	ISD	0	3	0	0	0	0	0	2	0	0
27 July	7081	UCD	0	1	0	0	0	0	0	5	0	0
27 July	7082	UCC	0	4	0	0	0	0	0	2	0	0
27 July	7083	UCB	0	1	0	0	0	0	0	1	1	0
27 July	7084	UCA	0	1	0	0	0	0	0	1	0	0
29 July	7085	ISC	27	2	368	4	0	0	0	1	0	0
29 July	7086	ABM	—	—	—	—	—	—	—	—	—	—
Total catch			47	40	473	6	1	1	22	25	1	2

Table 5.—Length, frequency of occurrence, and life history stage of fish captured in 21 rope trawl hauls in marine waters of the northern region of southeastern Alaska using the NOAA ship *John N. Cobb*, 22-29 July 2003.

Common name	Species	n ³	Fork length (mm)			Frequency of occurrence	Life ² history stage
			min	max	\bar{x}		
Pink salmon	<i>O. gorbuscha</i>	1,290	85	166	121.8	81%	J
Chum salmon	<i>Oncorhynchus keta</i>	789	81	203	125.8	95%	J
Sockeye salmon	<i>O. nerka</i>	137	98	200	128.4	76%	J
Coho salmon	<i>O. kisutch</i>	78	152	266	202.6	90%	J
Pink salmon	<i>O. gorbuscha</i>	12	433	595	513.9	38%	A
Total salmonids captured and measured ³		2,306	—	—	—	—	—
Squid	Gonatidae	47	17	127	63.1	14%	I
Crested sculpin	<i>Blepsias bilobus</i>	40	56	121	95.2	71%	I-A
Walleye pollock	<i>Theragra chalcogramma</i>	6	38	67	52.5	29%	J
		473	260	440	332.5	14%	I
Smooth lumpsucker	<i>Aptocyclus ventricosus</i>	1	170	170	170.0	5%	A
Wolf- Eel	<i>Anarrhichthys ocellatus</i>	1	440	440	440.0	5%	A
Prowfish	<i>Zaprora silenus</i>	25	59	133	95.3	57%	A
Spiny dogfish	<i>Squalus acanthias</i>	22	535	930	715.4	14%	A
Pacific herring	<i>Clupea pallasii</i>	1	227	227	227.0	5%	A
Unknown fish		2	35	35	35.0	10%	J
Total non-salmonids captured and measured ³		618	—	—	—	—	—
Total fish and squid captured and measured ³		2,924	—	—	—	—	—

²J = 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

³Some species were subsampled for length; actual numbers of the following species were measured: 1,045 pink salmon, 732 chum salmon, 92 walleye pollock, and 1 unknown fish.

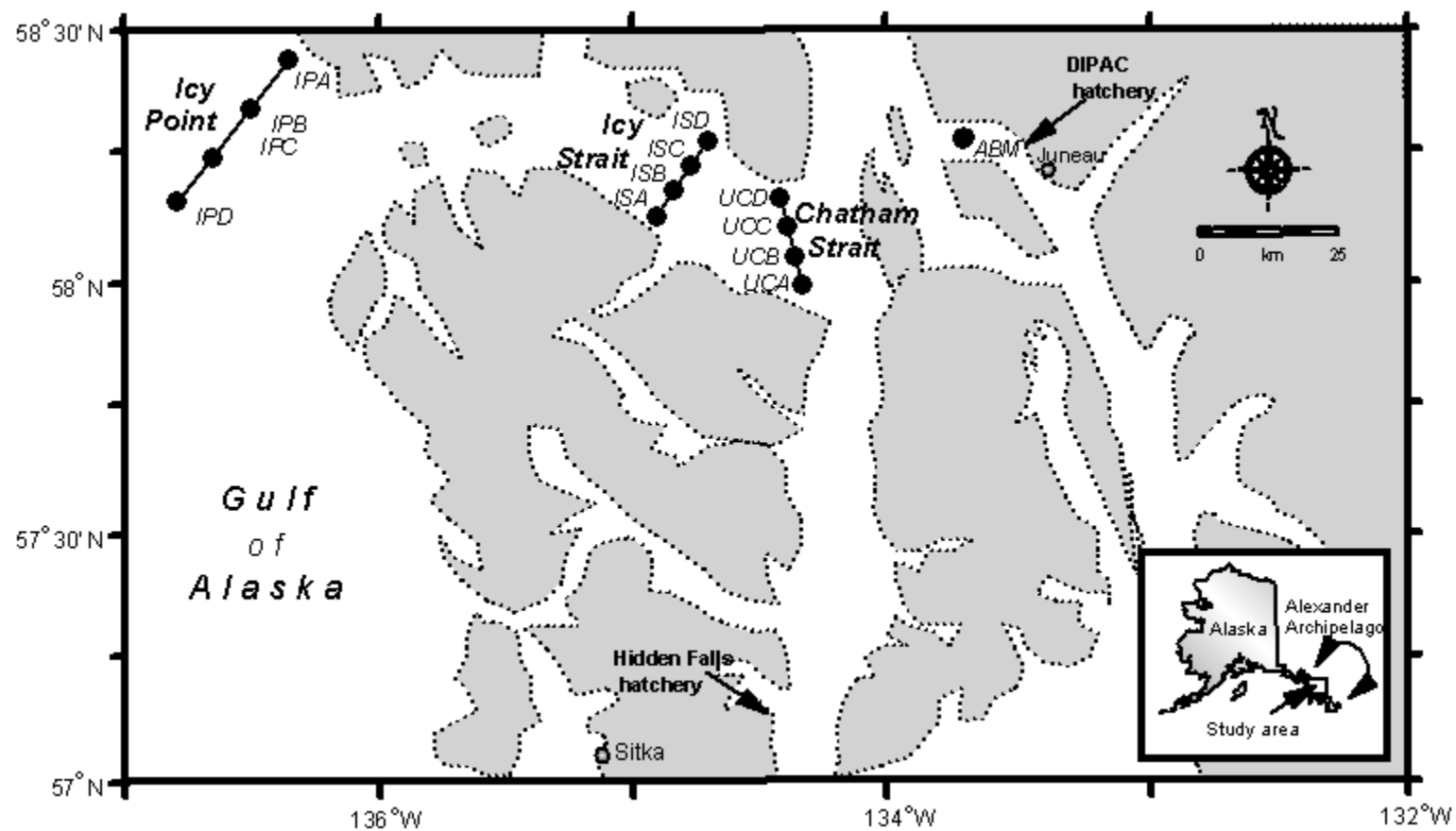


Figure 1.—Locations of stations sampled in marine waters of the northern region of southeastern Alaska, 22-29 July 2003.