

# **Southeast Alaska Coastal Monitoring (SECM)**

**JC-01-05 Cruise Report**

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Prepared by

Alex C. Wertheimer, Molly V. Sturdevant, Joseph A. Orsi, and B. L. Wing  
Auke Bay Laboratory, 11305 Glacier Highway  
Juneau, Alaska 99801-8626  
TEL (907) 789-6034 FAX (907) 789-6094  
E-mail: [alex.wertheimer@noaa.gov](mailto:alex.wertheimer@noaa.gov)

## ***INTRODUCTION***

Scientists from the Auke Bay Laboratory of the National Marine Fisheries Service, Alaska Fisheries Science Center conducted a 7-d cruise aboard the NOAA ship *John N. Cobb* in the marine waters of the northern region of southeastern Alaska from 19 to 25 May, 2001. This cruise is the first in a series of five cruises scheduled to monitor the inside and coastal marine waters of the region monthly in spring, summer, and fall of 2001. Objectives for these monitoring cruises are to: 1) collect biological data on juvenile Pacific salmon (*Oncorhynchus* spp.) and other pelagic fish species from rope trawl samples, and 2) monitor physical and biological oceanographic indices seasonally at sampling stations in inside, straits, and coastal habitats of juvenile salmon.

Sampling in 2001 marks the fifth year of a long-term study of how the intra- and inter-annual variability of biophysical oceanographic indices relate to the distribution, abundance, growth, and survival of salmon and other fish populations at the same localities. The information will also provide insight into potential effects of climate change on stock-specific growth and recruitment of salmonids and the utilization of marine habitat by key fish species.

## ***METHODS***

Thirteen stations were scheduled for sampling during this cruise, spanning inside waters near Juneau along a 200 km westerly migration corridor within southeastern Alaska to 65 km offshore in the Gulf of Alaska (Table 1). Oceanographic measurements were taken at all stations. Rope trawl samples were limited during this cruise to the four Icy Strait stations. Juvenile pink and chum salmon were also sampled by beach seining at selected low gradient beaches with predominately cobble substrate to the north and south of the Icy Strait stations. These samples were collected to determine feeding periodicity and stomach evacuation rates of small (30-50 mm) juvenile salmon during the nearshore phase of their marine life history for use in bioenergetic modeling of food consumption.

### Oceanographic sampling:

Biophysical parameters were monitored at each station and throughout the cruise. To examine horizontal water structure, temperature and salinity readings from a 2-m depth were continuously

logged every minute throughout the cruise with a SeaBird SBE-21<sup>1</sup> thermosalinograph. To examine vertical water structure, a SeaBird SBE-19 conductivity-temperature-depth (CTD) profiler was deployed at each station, as depth permitted, to 200 m or within 10 m of the bottom. Surface water samples were taken at each of the 13 stations for later determination of chlorophyll and nutrient content.

Plankton was sampled at each station with conical and bongo nets. The conical nets were retrieved vertically and a bongo net was towed obliquely. At each station, vertical plankton hauls were made from a depth of 20 m with a 50-cm frame and 243 micron mesh (Norpac) net. In Auke Bay and in coastal transects only, a 57-cm frame and a 202 micron mesh (WP2) net was deployed to 200 m or within 20 m of the bottom. A Roshiga flow meter was used inside the WP-2 net to determine the amount of water volume sampled. Also at each station, one double oblique bongo tow was done to 200 m or within 20 m of the bottom using a 60-cm frame with 505 and 333 micron mesh nets. General Oceanics flow meters were placed inside each of the bongo nets to determine the amount of water volume 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 tow. At each of the Icy Strait stations, a second double oblique bongo tow was done to 20 meters (28 meter wire out at 45 degrees) to sample the upper water column with the same gear used for sampling the integrated water column.

#### Trawl sampling:

Fish sampling at the Icy Strait stations was conducted with a Nordic 264 rope trawl fished directly astern the *John N. Cobb* at the surface. The mouth opening of the trawl was approximately 20 m deep and 26 m wide spread by a pair of 3.0 m Lite trawl doors. The trawl was fished fully open with 150 m of main warp out for a duration of 20 min 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, fish caught were anesthetized, identified, enumerated, measured, and stomachs sampled (if appropriate). Tricaine methanesulfonate was used to anesthetize the fish. Fish were measured to the nearest mm fork length (FL) with a Limnotera FMB IV electronic measuring board. Stomachs from potential predators of juvenile salmon were excised, weighed, and classified by fullness. Stomach contents were removed and generally identified to the family level and quantified to the nearest 10% of total volume. The weight of the stomach contents was determined as the difference between the weight of the stomach and contents minus the weight of the empty stomach.

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<sup>1</sup>Reference to trade names does not imply endorsement by the National Marine Fisheries Service.

### Beach seining:

Beach seine sets were made from a 4.9 m skiff at beaches to the north (Crist Point) and south (Home Shore) of the Icy Strait stations. A 37-m beach seine was set in a roundhaul pattern. Pink and chum salmon captured were sorted by species and enumerated. Fish collected for feeding periodicity were preserved immediately in formalin. Fish collected for energetic content and otolith analysis were frozen. Fish collected for the evacuation experiment were placed in transfer buckets and brought back alive to the *John N. Cobb*. Fishes other than pink and chum salmon were released alive.

### Evacuation experiments:

Pink and chum salmon were held in 20 l buckets in water filtered through a 64 micron sieve. The buckets were placed in a water bath of flow through seawater to maintain temperatures at 7-9° C. Samples of 8-10 fish of each species were removed at nine time intervals ranging from 1-32 hour after capture. The samples were killed in anaesthetic and preserved in 10% formalin solution for later laboratory analysis of stomach fullness and contents.

### Laboratory processing:

Data from settled volumes of zooplankton from the 20-m vertical hauls are included in this report. Subsequent laboratory processing will include: 1) measurement of length, weight, stomach fullness, and stomach contents of pink and chum salmon fry preserved in formalin for feeding periodicity and evacuation rates; 2) determination of energetic content from frozen samples of pink and chum salmon juveniles; 3) examination for otolith thermal marks in frozen samples of juvenile chum salmon; 4) displacement volume of zooplankton from all bongo net samples; and 5) determination of zooplankton species composition and numerical abundance in zooplankton samples from ABM, Icy Strait, and Icy Point stations.

## ***RESULTS and DISCUSSION***

Oceanographic sampling was accomplished at all of the 13 core stations. A total of 13 CTD casts, 13 vertical 20-m tows, 34 bongo tows, and 5 deep vertical tows were made during the cruise (Table 2). Water samples were also taken at the 13 core stations for later analysis of chlorophyll and nutrients. Stations at Auke Bay, Chatham Strait, and Icy Strait were sampled on May 19 and 20. Because of inclement weather, sampling at the Icy Point station was delayed until May 24. Instead of proceeding to the Icy Point area after completing the Icy Strait stations on May 20, the *Cobb* returned to Auke Bay and picked up the beach seine equipment and skiff and changed scientific crew. The vessel then returned to Icy Strait to support beach seine operations on May 21-23.

Surface (2-m) temperatures and salinities at the core stations ranged from 7.0-7.9°C and from 28.8-32.2 PSU, respectively (Table 3). Salinity followed the typical pattern observed in past years, lowest in inside stations and increasing into the Gulf of Alaska. Also typical of past years,

the salinity gradient is not strongly developed in May relative to the salinity gradient observed later in the season. As a result, temperatures at 2-m were similar among stations, with no inshore-offshore gradient apparent.

Zooplankton settled volumes from the 20-m vertical tows ranged from 6-42 ml at the stations (Table 3). The most inshore station (ABM) had the lowest level, averaging 11.7 ml. The Upper Chatham transect had the highest average across stations at 29.0 ml. Icy Strait and Icy Point transects were similar, averaging 18.0 and 17.5 ml respectively. At Icy Point, the two nearshore stations averaged 6.5 ml, markedly lower than the 28.5 ml average for the two offshore stations.

The only species of fish captured in the four rope trawl hauls were adult walleye pollock (Table 4). Consistent with past sampling with the rope trawl in May in the epipelagic habitat, no juvenile salmon were captured with this gear. Onboard stomach analysis was done on 12 walleye pollock. Euphausiids had the highest frequency of occurrence (70%) and comprised the highest volume (80%) of the stomach contents. No evidence of predation on juvenile or larval fishes was observed in the pollock sampled.

Juvenile salmon were captured in nearshore habitats by beach seining. Thirty beach seine sets were made, capturing approximately 700 juvenile pink and chum salmon. Chum salmon were more abundant on the Crist Point (southern) side of Icy Strait, whereas pink salmon were more abundant on the Homeshore (north) side. Other species caught in the beach seine included coho and chinook salmon smolts, Dolly Varden and cutthroat trout, sandlance, yellowfin sole, tubesnout, staghorn sculpin, buffalo sculpin, great sculpin, and silverspot sculpin. These species were released alive without sampling. Salmonid smolts were abundant on the Crist Point side, while few were caught on the Homeshore side. A total of 161 chum salmon and 251 pink salmon were retained for diel feeding and gastric evacuation studies. An additional 100 pink salmon and 100 chum salmon juveniles were frozen for size, otolith, and energetic content analyses. Pink salmon juveniles caught in the beach seine ranged from 30-40 mm in length. Chum salmon juveniles ranged from 35-50 mm in length, except for three fish 90-95 mm caught in association with several hundred salmonid smolts (primarily coho and Dolly Varden). These three fish were also retained for otolith analysis to determine if they were of hatchery origin.

#### ***ACKNOWLEDGMENTS***

We acknowledge and compliment the command and crew of the NOAA ship *John N. Cobb* for their cooperation and performance during the cruise. Flexibility in the sampling schedule to account for weather allowed us to meet our scientific objectives. We especially appreciated Rickie Edward's enthusiastic help wrestling the beach seine.

Table 1.--Localities and coordinates of stations scheduled for oceanographic sampling in the marine waters of the northern region of southeastern Alaska off the NOAA ship *John N. Cobb*, 19-25 May 2001.

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
Icy Point	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.--Oceanographic and biological samples collected in the marine waters of the northern region of southeastern Alaska off the NOAA ship *John N. Cobb*, 19-25 May 2001.

Date	Haul#	Station	CTD	Plankton net samples			Chlorophyll & nutrients	Rope trawl
				Norpac	Bongo	WP-2		
19 May	5001	ABM	1	1	2	1	1	0
19 May	5005	UCA	1	1	2	0	1	0
19 May	5004	UCB	1	1	2	0	1	0
19 May	5003	UCC	1	1	2	0	1	0
19 May	5002	UCD	1	1	2	0	1	0
20 May	5006	ISA	1	1	4	0	1	1
20 May	5007	ISB	1	1	4	0	1	1
20 May	5008	ISC	1	1	4	0	1	1
20 May	5009	ISD	1	1	4	0	1	1
24 May	5010	IPA	1	1	2	1	1	0
24 May	5011	IPB	1	1	2	1	1	0
24 May	5012	IPC	1	1	2	1	1	0
24 May	5013	IPD	1	1	2	1	1	0
Total			13	13	34	5	13	4

Table 3.--Two meter depth temperatures and salinities and settled volumes of plankton from 20-m vertical Norpac hauls taken from the NOAA ship *John N. Cobb* in marine waters of the northern region of southeastern Alaska, 19-25 May, 2001.

Date	Haul	Station	Temp (°C)	Salinity (PSU)	Settled Volume (ml)		
					Zoop.	Phyto.	Total
05/19/2001	5001	ABM	7.9	28.8	12	7	19
05/19/2001	5002	UCD	7.0	30.7	23	0	23
05/19/2001	5003	UCC	7.8	30.7	23	0	23
05/19/2001	5004	UCB	7.4	30.8	42	0	42
05/19/2001	5005	UCA	7.1	30.0	28	0	28
05/20/2001	5006	ISA	7.2	31.2	16	18	34
05/20/2001	5007	ISB	7.2	31.3	15	30	45
05/20/2001	5008	ISC	7.0	31.1	18	0	18
05/20/2001	5009	ISD	7.1	31.0	23	0	23
05/24/2001	5010	IPA	7.1	31.9	6	0	6
05/24/2001	5011	IPB	7.4	31.9	7	0	7
05/24/2001	5012	IPC	7.8	32.1	31	0	31
05/24/2001	5013	IPD	7.6	32.2	23	0	23

Table 4.—Number measured, length data, and frequency of occurrence of fish captured in four rope trawl hauls in the marine waters of the northern region of southeastern Alaska off the NOAA ship *John N. Cobb*, 19-25 May, 2001.

Species	Number Caught	Number Measured	Fork Length (mm)			Frequency of Occurrence
			Min	Max	Mean	
Walleye pollock	56	56	38	537	481.8	4/4



Table 5. Samples of juvenile pink and chum salmon preserved in formalin for diel feeding periodicity study, 22-23 May 2001.

Diel Period	Date	Time	Haul #	# Pinks	# Chum	Comment
D1	05/22	0650	05/22-01	12	12	
D2	05/22	1045	05/22-03	5	19	Pinks combined with 5/22-04
D2	05/22	1115	05/22-04	8	--	Pinks combined with 5/22-03
D2	05/23	1020	05/23-23	12	--	Replicate
D3	05/22	1400	05/22-05	4	23	Pinks combined with 5/22-06
D3	05/22	1410	05/22-06	8	--	Pinks combined with 5/22-05
D4	05/22	1800	05/22-10	9	10	Combined with 5/22-11,12
D4	05/22	1810	05/22-11	2	2	Combined with 5/22-10,12
D4	05/22	1820	05/22-12	2	4	Combined with 5/22-10,12
D5	05/22	2110	05/22-16	2	2	Pinks combined with 5/22-17,18 Chums combined with 5/22-17
D5	05/22	2120	05/22-17	7	14	Pinks combined with 5/22-16,18 Chums combined with 5/22-16
D5	05/22	2130	05/22-18	5	--	Pinks combined with 5/22-16,17

Table 6. Samples of juvenile pink and chum salmon held for specific time intervals in filtered seawater and then killed and preserved in formalin for evacuation rate analysis.

Time Period	Day:Hour Sampled	Hours Held	Number Preserved	Tank Temperature	T <sub>0</sub> Haul Number
<u>Chum Salmon</u>					
T1	5/22:0850	1	15	7.3	5/22-02
T2	5/22:0950	2	15	8.3	5/22-02
T4	5/22:1150	4	15	7.3	5/22-02
T6	5/22:1350	6	15	8.0	5/22-02
T8	5/22:1545	8	21	7.8	5/22-02
T11	5/22:1740	11	14	7.8	5/22-01
T14	5/22:2040	14	14	7.2	5/22-01
T24	5/23:0650	24	10	7.7	5/22-01
T32	5/22:1450	32	9	7.3	5/22-01
<u>Pink Salmon</u>					
T1	5/22:2230	1	13	7.3	5/22-16,17,18
T1	5/23:1120	1	15	8.0	5/23-23
T2	5/22:2330	2	9	8.3	5/22-16,17,18
T2	5/23:1220	2	15	7.4	5/23-23
T3	5/22:1710	3	10	7.8	5/22-05,06
T4	5/23:1420	4	15	---	5/23-23
T6	5/23:2010	6	9	---	5/22-05,06
T6	5/22:2040	6.5	9	7.8	5/22-05,06
T8	5/23:0530	8	10	7.9	5/22-16,17,18
T8	5/23:1820	8	15	7.4	5/23-23
T11	5/22:1740	11	10	7.8	5/22-01
T16	5/22:2240	16	8	7.2	5/22-01
T24	5/23:0650	24	9	7.7	5/22-01
T24	5/24:1020	24	15	---	5/23-23
T32	5/24:1820	32	15	9.3	5/23-23