

Southeast Alaska Coastal Monitoring (SECM) Project

JC-01-13 July Cruise Report

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Scientists from the Marine Salmon Investigations Program at Auke Bay Laboratory, National Marine Fisheries Service, Alaska Fisheries Science Center conducted a 7-day cruise aboard the NOAA ship *John N. Cobb* in the marine waters of the northern region of southeastern Alaska from 27 July to 2 August 2001. This cruise took place in the third of five sampling periods scheduled for 2001, and was part of the Southeast Alaska Coastal Monitoring (SECM) Project. The SECM project was initiated in 1997 to study the habitat use and early marine ecology of juvenile Pacific salmon (*Oncorhynchus* spp) in inshore, strait, and coastal habitats along a primary seaward migration corridor used by juvenile salmon. These habitats span the geographic area extending from near Juneau 250 km westward through Icy Strait to 64 km offshore in the Gulf of Alaska. Objectives for the monitoring cruises were to: 1) collect biological data on juvenile Pacific salmon (*Oncorhynchus* spp.) and other pelagic fish species from surface rope trawl samples; 2) monitor physical and biological oceanographic indices seasonally at sampling stations in inside, strait, and offshore habitats of juvenile salmon; and 3) conduct process studies focusing on bioenergetics of juvenile salmon. In addition to Auke Bay Laboratory scientists, Won Park, a collaborating doctoral student at University of Alaska Juneau Center for Fisheries and Ocean Science, assisted during the cruise.

Sampling in 2001 marks the fifth 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, and the utilization of marine habitat by key fish species.

METHODS

Thirteen stations were scheduled for sampling during the July 2001 cruise (Table 1, Figure 1). Stations were located in Auke Bay and along three transects with four stations each in Upper Chatham Strait, Icy Strait, and off Icy Point. Oceanographic measurements were taken at all stations and trawling occurred at all stations except Auke Bay. Rope trawl samples were replicated in strait habitats without taking additional oceanographic samples. Compared to prior

years, process studies on juvenile salmon diel feeding periodicity and gastric evacuation rates were added to the suite of SECM objectives for this cruise.

Oceanographic sampling:

The physical and biological environment was monitored at each station and throughout the cruise with two instruments. To examine horizontal water structure, temperature and salinity readings were continuously logged at one-minute intervals from 2-m depth using a SeaBird SBE-21¹ thermosalinograph. To examine vertical 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, dependent on depth. Surface water samples were taken at each of the 13 stations for later determination of chlorophyll and nutrient content.

Zooplankton was sampled at each station with conical nets towed vertically and a bongo net system towed obliquely. At each station, vertical plankton tows were made from a depth of 20 m with a 50-cm frame and 243 micron mesh (Norpac) net. At Auke Bay and Icy Point coastal transect, 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 57-cm frame deep conical 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 compare zooplankton from the zone inhabited by juvenile salmon caught in the trawl to that of the integrated water column. Only the Norpac and shallow bongo net samples were collected with the diel sample series, and only the Norpac sample was collected during replicate trawls. In addition, during most of the standard rope trawl hauls, neuston net samples (mouth opening 1 m², 505 µm mesh) were collected in 10 minute tows using the oceanographic winch along the port side of the vessel at 2-3 knots speed.

Trawl Sampling:

Twelve stations were sampled at least once during the July cruise 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

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

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, the fish caught were anaesthetized with tricaine methanesulfonate, identified, enumerated, measured, and stomachs sampled (if appropriate). Fish were measured to the nearest mm fork length (FL) with a Limnotera 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 a coded-wire tag (CWT). Stomachs from potential predators of juvenile salmon were excised, weighed, and classified by fullness. 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. Stomach contents were removed and prey were generally identified to the family level and estimated to the nearest 10% of total volume.

Process Studies:

Diel samples of juvenile pink (*O. gorbuscha*), chum (*O. keta*) and coho salmon were collected over a 24-hr period every three hours at a single station in Icy Strait (ISC) to examine their feeding periodicity. After measurement, these fish were fixed in 10% formalin-seawater solution for later stomach analysis. Shipboard gastric evacuation experiments using juvenile pink and chum salmon were also conducted in July by holding fish from single-haul catches in live tanks filled with sea water filtered through a 64 micron sieve at ambient temperatures of approximately 10-12 °C; lots of 8-10 individuals per species were then sacrificed every 2-3 hours up to 32 hours after capture to monitor the rate of passage of food from the gut. The fish were killed in anaesthetic and preserved in 10% formalin solution for later laboratory analysis of stomach fullness and contents. Information from the feeding periodicity and gastric evacuation studies will be combined with size information to develop bioenergetic models of juvenile salmon growth.

Laboratory processing:

Data on settled volumes (SVs) of zooplankton in the 20-m vertical hauls and from decoded CWTs of fish lacking adipose fins are included in this report. Laboratory processing in progress includes 1) measurement of length, weight, stomach fullness, and stomach contents of juvenile pink and chum salmon preserved in formalin for feeding periodicity and evacuation rates; 2) determination of energetic content from frozen samples of juvenile pink and chum salmon; 3) examination for otolith thermal marks in frozen samples of juvenile chum and sockeye salmon; 4) measurement of plankton displacement volumes of all Bongo net samples; 5) determination of decapod larval abundance from neuston net samples and from 333 µm Bongo net samples; and 6) zooplankton species composition and abundance from all Norpac hauls and from Bongo net samples taken in Icy Strait stations.

RESULTS and DISCUSSION

All thirteen stations scheduled for sampling in the northern region of southeastern Alaska were sampled (Table 1). Stations sampled in prior years at Cross Sound, Taku Inlet, Lower Favorite Channel and False Point Retreat were omitted to focus on key sampling locations and free up time for process studies. Standard oceanographic sampling and surface trawling were conducted according to the following schedule: day one, Auke Bay and Upper Chatham Strait transect; day 2, Icy Point transect (fortuitous weather); day 3, standard Icy Strait transect; day 4, early half of diel samples; day 5, late half of diel samples and Icy Strait replicates; day 6, replicate Upper Chatham Strait; day 7, transit to Juneau NMFS support dock.

Oceanographic sampling was accomplished at each station, despite interruptions from malfunctioning of the oceanographic winch. A total of 28 CTD casts, 30 Norpac tows, 50 bongo tows, and 5 WP2 tows were made during the cruise (Table 2). Water samples were also taken at 12 of the core stations for later analysis of chlorophyll and nutrients; a water sample from station UCB in Upper Chatham Strait was inadvertently omitted. In addition, 11 neuston samples of decapod zoeae were collected at UCD, UCC, the Icy Point and Icy Strait core stations, and during the 04:15 diel sample at ISC.

Surface (2-m) temperatures and salinities during the July cruise ranged from 10.2 to 14.1°C and from 18.9 to 32.0 PSU (Table 3). Salinity followed the typical spatial pattern, lowest in inshore stations (ABM) and increasing toward the Gulf of Alaska. Temperatures were highest offshore, while temperatures at the inshore and strait stations were lower and similar to each other. Compared to the June sampling period, average July temperatures were nearly 2 °C warmer offshore but were cooler inshore and similar in straits. Light levels were also generally lower during the July sampling period than in June (Table 3).

Zooplankton biomass, as determined from the SVs of the 20-m vertical tow samples, was generally lower in July than in June. SVs ranged from <1 to 16 ml at the stations (Table 3). No phytoplankton was visible, indicating low primary production at this time. Zooplankton SVs at the inshore station (ABM) were similar in June and July but the July SV was among the highest measurements for all locales in that month; by contrast, SVs at the strait and coastal locales were similar to each other, but were lower in July than in June.

A total of 7,695 fish was collected from 28 rope trawl hauls (Table 4). Juvenile salmon were the most frequently occurring group, while the non-salmonid total catch was greater. Juvenile pink, chum, sockeye (*O. nerka*) and coho salmon occurred in at least 75% of hauls, adult pink salmon occurred the next most frequently, and the non-salmonid, crested sculpin (*Blepsias bilobus*), occurred third most frequently. Among the juvenile salmon species, pink and chum salmon were most abundant, with total catches of 1,358 and 1,387 (Tables 4 and 5); catches of juvenile coho and sockeye salmon were an order of magnitude lower, while catches of juvenile chinook salmon were lowest. The 51 adult pink salmon and 15 immature chinook caught were the most abundant of large salmon (Tables 4 and 5). Juvenile salmon were caught at all strait stations and at the three coastal stations inside the shelf break, within 40 nm of shore. However, replicate hauls did not necessarily catch high numbers of juvenile salmon, particularly at stations in Upper Chatham Strait (Table 5).

More than 4,300 non-salmonids were caught in the trawl (Tables 4 and 6). By species, the largest catches were 3,308 walleye pollock (*Theragra chalcogramma*) and 918 eulachon (*Thaleichthys pacificus*) from the single diel trawl done at 21:50 on 31 July (haul 5060). Other notable catches were the 31 crested sculpin caught at most stations except offshore, and 12 spiny dogfish (*Squalus acanthias*), 12 pomfret (*Brama japonica*) and 29 squid (Gonatidae) caught only offshore (Table 6).

Six chinook and 19 coho salmon lacking adipose fins were examined for the presence of CWTs (Table 7). All but one of each species was CWT marked. All marked fish had been released within the region by Alaska hatcheries or the Alaska Department of Fish and Game. The five chinook were recovered in as little as 54 days and as many as 783 days after release. Most of the 18 coho were recovered between 43 and 67 days after release, although one was recovered 423 days post-release, as an adult.

Onboard stomach analysis was done on 110 potential predators of juvenile salmon, including four immature/adult salmon species and three non-salmonid species (Table 8). The percent frequency of occurrence of principal prey categories and the rate of empty stomachs were reported for each species (Table 8). Some degree of piscivory was exhibited by all species examined: 13/15 chinook, 3/6 coho, 3/44 pink and 1/2 sockeye salmon, and 2/12 pomfret and 1/19 walleye pollock. However, juvenile salmon were preyed upon by only two species, spiny dogfish (3/12) and pomfret (1/12). Other fish prey included Pacific herring (*Clupea pallasii*), walleye pollock, osmerids, and unidentified fish larvae and remains. Among species that fed principally on invertebrates, pink salmon and pollock both consumed crab larvae, hyperiid amphipods and euphausiids, while pomfret principally consumed cephalopods, hyperiids and euphausiids. The rate of empty stomachs or non-feeding predators was $\leq 33\%$ per species (Table 8).

Preliminary tests were conducted in preparation for the anticipated process studies during standard sampling along the Icy Strait Transect. For diel feeding periodicity, we examined five juvenile pink and five juvenile chum stomachs from haul 5051 at ISC to estimate fullness. Both species' stomachs were full at that time (11:15), indicating active feeding. For evacuation studies, the survival of fish from haul 5051 was tested by placing them in the flow-through live tanks for two hours. Not more than 50% of the ten fish tested survived two hours. Therefore, fish handling procedures were modified to enhance survival, such as by emptying the fish from the net directly into a tote full of seawater and avoiding prop wash from the vessel.

Diel feeding periodicity studies were conducted on juvenile pink, chum and coho salmon. The diel sample series was collected by trawling at three-hour intervals at an Icy Strait station (ISC) over two days (Table 9). Feeding periodicity will be determined from 49 pink, 62 chum and 93 coho salmon stomach samples collected on July 30 at 04:15, 07:15, 10:15 and 13:15, and on July 31 at 13:15, 16:15, 19:10 and 22:30 (Table 9). Some of each of these species were collected in each period except the two night hauls, in which no pink or chum salmon were caught.

Evacuation experiments were conducted on juvenile pink and chum salmon (Table 10). These fish were in better condition when retrieved from the trawl in July compared to June because of their larger size and because of higher abundance of jellyfish (which "cushion" the fish in the cod

end of the trawl) at this time. Catches of juvenile coho were not large enough to allow evacuation studies to be done on them. Three trawl hauls were required to obtain catches large enough to supply stocks of pink and chum salmon from which to draw lots of fish for serial sacrifices. These T_0 hauls were collected at 07:00 (5054) and 08:20 (5999) on 30 July at station ISC and at 14:15 (5061) on 31 July at station ISD. A total of 105 pink and 159 chum salmon were preserved for evacuation studies. The mortality rate in experimental tanks was relatively low after handling procedures were modified to improve survival of the fish.

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 Mike Francisco and Stryder Nutting's knowledgeable assistance in enhancing survival of trawled fish to be used for evacuation studies.

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*, 27 July-2 August 2001. 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
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 marine waters of the northern region of southeastern Alaska off the NOAA ship *John N. Cobb*, 27 July-2 August 2001. Haul numbers of the diel sample series from July 30 -31 indicated in Table 7. Replicate trawl samples were taken on July 31 and August 1 in strait habitats.

Date	Station	Haul Number	CTD	Plankton net samples			Chlorophyll & nutrients	Rope trawl
				Norpac	Bongo ²	WP2		
27 Jul	ABM	5040	1	3	2	1	1	0
27 Jul	UCD	5041	1	1	2	0	1	1
27 Jul	UCC	5042	1	1	2	0	1	1
27 Jul	UCB	5043	1	1	2	0	--	1
28 Jul	IPD	5045	1	1	2	1	1	1
28 Jul	IPC	5046	1	1	2	1	1	1
28 Jul	IPB	5047	1	1	2	1	1	1
28 Jul	IPA	5048	1	1	2	1	1	1
29 Jul	ISA	5049	1	1	4	0	1	1
29 Jul	ISB	5050	1	1	4	0	1	1
29 Jul	ISC	5051	1	1	4	0	1	1
29 Jul	ISD	5052	1	1	4	0	1	1
29 Jul	UCA	5044	1	1	2	0	1	1
30 Jul ³	ISC	5053	1	1	2	0	0	1
30 Jul ³	ISC	5054	1	1	2	0	0	1
30 Jul	ISC	5999	0	0	0	0	0	1
30 Jul ³	ISC	5055	1	1	2	0	0	1
30 Jul ³	ISC	5056	1	1	2	0	0	1
31 Jul ³	ISC	5057	1	1	2	0	0	1
31 Jul ³	ISC	5058	1	1	2	0	0	1
31 Jul ³	ISC	5059	1	1	2	0	0	1
31 Jul ³	ISC	5060	1	1	2	0	0	1
31 Jul ⁴	ISD	5061	1	1	0	0	0	1
31 Jul ⁴	ISB	5062	1	1	0	0	0	1
1 Aug ⁴	ISA	5063	1	1	0	0	0	1
1 Aug ⁴	UCA	5064	1	1	0	0	0	1
1 Aug ⁴	UCB	5065	1	1	0	0	0	1
1 Aug ⁴	UCC	5066	1	1	0	0	0	1
1 Aug ⁴	UCD	5067	1	1	0	0	0	1
Total samples			28	30	50	5	12	28

²Bongo net system with two nets collecting simultaneously. ³Diel trawling was conducted July 30-31; no water samples were taken. ⁴Replicate trawl samples, limited oceanographic samples were collected.

Table 3.- Temperature and salinity at 2-m depth and plankton settled volumes from 20-m vertical Norpac hauls at stations sampled in marine waters of northern southeastern Alaska, 27 July-2 August 2001. Dashes indicate no sample taken.

Date	Station	Haul#.	Time	Temp. (°C)	Salinity (PSU)	Light (W*m ⁻²)	Plankton settled volume (ml)		
							Zooplankton	Phytoplankton	Total Plankton
27 Jul	ABM	5040	1024	12.7	18.9	85.0	11	0	11
27 Jul	ABM	5040	1024	12.7	18.9	85.0	10	0	10
27 Jul	ABM	5040	1024	12.7	18.9	85.0	10	0	10
27 Jul	UCD	5041	1345	11.9	25.4	119.0	5.5	0	5.5
27 Jul	UCC	5042	1554	12.5	23.3	34.0	3.5	0	3.5
27 Jul	UCB	5043	2000	12.6	25.7	8.0	4.5	0	4.5
28 Jul	IPD	5045	0715	14.1	32.0	30.0	8	0	8
28 Jul	IPC	5046	1120	13.8	32.0	0.0	7	0	7
28 Jul	IPB	5047	1330	13.3	31.7	147.0	7	0	7
28 Jul	IPA	5048	1600	13.6	31.7	222.0	13	0	13
29 Jul	ISA	5049	0720	10.2	29.2	15.0	7	0	7
29 Jul	ISB	5050	1006	11.0	29.0	43.0	2.8	0	2.8
29 Jul	ISC	5051	1115	12.1	25.8	80.0	5.5	0	5.5
29 Jul	ISD	5052	1400	12.8	22.6	266.0	11	0	11
29 Jul	UCA	5044	1700	12.1	26.2	179.0	1.5	0	1.5
30 Jul	ISC	5053	0410	12.3	24.8	0.1	7.5	0	7.5
30 Jul	ISC	5054	0700	12.5	24.2	66.0	6.5	0	6.5
30 Jul	ISC	5999 ²	0820	12.6	23.6	66.0	--	--	--
30 Jul	ISC	5055	1000	12.6	23.9	0.0	4.5	0	4.5
30 Jul	ISC	5056	1300	12.5	24.6	175.0	5	0	5
31 Jul	ISC	5057	1230	12.9	23.2	97.0	5	0	5
31 Jul	ISC	5058	1551	12.8	23.6	55.7	9	0	9
31 Jul	ISC	5059	1915	12.7	24.0	16.0	9	0	9
31 Jul	ISC	5060	2150	12.7	24.1	0.2	16	0	16
31 Jul	ISD	5061	1415	12.8	23.8	56.0	10	0	10
31 Jul	ISB	5062	1800	12.4	24.9	18.0	13	0	13
01 Aug	ISA	5063	0817	11.5	27.4	92.0	3.5	0	3.5
01 Aug	UCA	5064	1115	12.8	25.1	76.0	0.7	0	0.7
01 Aug	UCB	5065	1315	13.2	25.1	180.0	0.9	0	0.9
01 Aug	UCC	5066	1445	12.6	23.2	317.0	4	0	4
01 Aug	UCD	5067	1630	13.1	20.1	560.0	7.5	0	7.5

²Extra haul to collect additional fish for evacuation studies. No oceanographic samples collected.

Table 4.- Number, length, frequency of occurrence³, and life history stage of fish species captured in 28 rope trawl hauls in marine waters of the northern region of southeastern Alaska, 27 July-2 August 2001. Frequency of occurrence = number of hauls with species present; percent hauls with species in parentheses.

Common name	Species name	Number caught (n)	Freq. of occurrence	Fork length (mm)			Life history stage
				Min.	Max.	Mean	
Juvenile salmon							
Pink	<i>Oncorhynchus gorbuscha</i>	1,387	21 (75)		163	120.6	J
Chum	<i>O. keta</i>	1,358	22 (79)		171	122.5	J
Sockeye	<i>O. nerka</i>	165	21 (75)	82	192	126.2	J
Coho	<i>O. kisutch</i>	367	25 (89)	133	258	189.8	J
Chinook	<i>O. tshawytscha</i>	24	10 (18)	153	241	215.5	J
Subtotal		3,301					
Immature/adult salmon							
Pink	<i>O. gorbuscha</i>	51	17 (61)	375	585	494.9	A
Sockeye	<i>O. nerka</i>	2	1 (7)	314	607	460.5	I, A
Coho	<i>O. kisutch</i>	6	5 (18)	528	725	638.0	A
Chinook	<i>O. tshawytscha</i>	15	8 (29)	333	695	408.8	I
Subtotal		74					
Non-salmonids							
Crested sculpin	<i>Blepsias bilobus</i>	31	15 (54)	56	125	94.8	J
Eulachon	<i>Thaleichthys pacificus</i>	918	1 (4)	117	163	139.3	J
Pacific herring	<i>Clupea pallasii</i>	5	5 (18)	125	242	154.0	J
Pomfret	<i>Brama japonica</i>	12	1 (4)	324	367	344.3	A
Prowfish	<i>Zaprora silenus</i>	1	1 (4)	111	111	111.0	J
Walleye pollock	<i>Theragra chalcogramma</i>	3,308	12 (43)	163	547	258.5	J
Rockfish	<i>Sebastes</i> sp.	3	2 (7)	36	40	38.0	A
Squid	Gonatidae	29	2 (7)	15	118	43.7	J
Spiny dogfish	<i>Squalus acanthias</i>	12	2 (7)	489	734	629.2	A
Wolf-eel	<i>Anarrhichthys ocellatus</i>	1	1 (4)	274	274	274.0	J
Subtotal		4,320					
Total fish measured		7,695					

³J = juvenile or post larvae in first year at sea (i.e., age -.0), I = immature age -.1 or older, and A = mature (-ing) adult.

Table 5.-Numbers of salmon caught with a rope trawl at stations sampled from the NOAA ship *John N. Cobb* in marine waters of the northern region of southeastern Alaska, 27 July-2 August 2001.

Date	Station	Haul#	Juvenile salmon					Immature	Adult salmon			
			Chum	Pink	Coho	Chinook	Sockeye	Chinook	Chum	Pink	Coho	Sockeye
27 Jul	ABM	5040	--	--	--	--	--	--	--	--	--	--
27 Jul	UCD	5041 ⁴	121	136	78	4	26	2	0	0	0	0
27 Jul	UCC	5042 ¹	154	215	12	0	6	1	0	1	0	0
27 Jul	UCB	5043	252	244	4	0	4	0	0	1	0	0
28 Jul	IPD	5045	0	0	0	0	0	0	0	0	0	0
28 Jul	IPC	5046	15	14	0	0	0	0	0	1	0	0
28 Jul	IPB	5047	51	21	3	0	6	0	0	1	0	0
28 Jul	IPA	5048	22	48	3	0	2	0	0	1	0	0
29 Jul	ISA	5049 ⁴	73	24	15	0	7	0	0	2	1	0
29 Jul	ISB	5050 ⁴	15	14	17	0	2	1	0	2	0	0
29 Jul	ISC	5051	80	36	12	0	5	0	0	13	0	0
29 Jul	ISD	5052 ⁴	6	10	16	0	5	1	0	4	2	0
29 Jul	UCA	50441	3	0	1	7	0	0	0	0	0	0
30 Jul	ISC	5053 ⁴	0	0	12	2	0	3	0	0	0	0
30 Jul	ISC	5054 ⁴	42	5	29	2	2	0	0	0	0	0
30 Jul	ISC	5999	182	209	25	0	16	0	0	1	0	0
30 Jul	ISC	5055	61	75	15	0	1	0	0	0	0	0
30 Jul	ISC	5056 ⁴	9	8	47	0	1	0	0	1	0	0
31 Jul	ISC	5057	4	5	16	1	2	0	0	4	0	0
31 Jul	ISC	5058	124	118	7	0	33	0	0	0	0	0
31 Jul	ISC	5059 ⁴	19	4	20	4	8	1	0	0	1	0
31 Jul	ISC	5060	0	0	3	1	0	5	0	11	0	1
31 Jul	ISD	5061	45	63	5	1	4	0	0	1	0	0
31 Jul	ISB	5062	72	110	8	0	30	0	0	0	0	0
01 Aug	ISA	5063	0	0	0	0	0	0	0	0	0	0
01 Aug	UCA	5064	1	5	4	0	0	0	0	2	1	0
01 Aug	UCB	5065 ⁴	0	0	5	1	1	0	0	3	1	0
01 Aug	UCC	5066 ⁴	0	0	6	1	2	1	0	2	0	0
01 Aug	UCD	5067	7	23	4	0	2	0	0	0	0	0
Total			1,358	1,387	367	24	165	15	0	51	6	1

⁴coded-wire tag present (see Table 7)

Table 6.- Catches of fish other than salmon at stations sampled with a rope trawl from the NOAA ship *John N. Cobb* in marine waters of the northern region of southeastern Alaska, 27 July-2 August 2001.

Date	Haul #	Station	Crested sculpin	Eulachon	Pacific herring	Pomfret	Prow- fish	<i>Sebastes</i> sp.	Spiny dogfish	Squid	Walleye pollock	Wolf- eel	Total non-salmonids
27 Jul	5041	UCD	4	0	0	0	0	0	0	0	2	0	6
27 Jul	5042	UCB	1	0	0	0	0	0	0	0	0	0	1
27 Jul	5043	UCB	1	0	1	0	0	0	0	0	1	0	3
28 Jul	5045	IPD	0	0	0	12	0	2	0	22	0	0	36
28 Jul	5046	IPC	0	0	0	0	0	1	0	0	0	1	2
28 Jul	5047	IPB	0	0	0	0	0	0	8	0	0	0	8
28 Jul	5048	IPA	0	0	0	0	0	0	4	0	0	0	4
29 Jul	5049	ISA	0	0	1	0	0	0	0	0	0	0	1
29 Jul	5050	ISB	0	0	0	0	0	0	0	0	0	0	0
29 Jul	5051	ISC	2	0	0	0	0	0	0	0	0	0	2
29 Jul	5052	ISD	4	0	0	0	0	0	0	0	1	0	5
29 Jul	5044	UCA	0	0	0	0	0	0	0	0	1	0	1
30 Jul	5053	ISC	1	0	0	0	0	0	0	0	0	0	1
30 Jul	5054	ISC	1	0	1	0	0	0	0	0	1	0	3
30 Jul	5999	ISC	1	0	0	0	0	0	0	0	0	0	1
30 Jul	5055	ISC	0	0	1	0	0	0	0	0	1	0	2
30 Jul	5056	ISC	2	0	0	0	1	0	0	0	0	0	3
31 Jul	5057	ISC	2	0	0	0	0	0	0	0	0	0	2
31 Jul	5058	ISC	3	0	0	0	0	0	0	0	0	0	3
31 Jul	5059	ISC	2	0	0	0	0	0	0	0	0	0	2
31 Jul	5060	ISC	0	918	1	0	0	0	0	7	3,289	0	4,215
31 Jul	5061	ISD	0	0	0	0	0	0	0	0	1	0	1
31 Jul	5062	ISB	1	0	0	0	0	0	0	0	2	0	3
01 Aug	5064	UCA	3	0	0	0	0	0	0	0	0	0	3
01 Aug	5065	UCB	0	0	0	0	0	0	0	0	3	0	3
01 Aug	5066	UCC	3	0	0	0	0	0	0	0	4	0	7
01 Aug	5067	UCD	0	0	0	0	0	0	0	0	2	0	2
Total non-salmonids	31		31	918	5	12	1	3	12	29	3,308	1	4,320

Table 7.- Release and recovery information for coho and chinook salmon recovered in marine waters of northern southeastern Alaska in July 2001 lacking adipose fins and examined for presence of coded-wire tags. U. Chatham = Upper Chatham.

Recovery information						Release information					
Haul Number	Fish Number	Locality	Station	Date	Size (g)	Locality	Tag Code	Agency	Date	Size (g)	days out
<u>Chinook salmon</u>											
5041	26 ⁵	U. Chatham	UCD	7/27/2001	134.8	--	No Tag	--	--	--	--
5044	3	U. Chatham	UCA	7/29/2001	155.2	Hidden Falls	04:48/19	NSRAA	6/5/2001	40.5	54
5044	5	U. Chatham	UCA	7/29/2001	198.9	Hidden Falls	04:48/19	NSRAA	6/5/2001	40.5	54
5050	49	Icy Strait	ISB	7/29/2001	2600.0	Gastineau Ch 111-40	50:04/57	DIPAC	6/7/1999	25.3	783
5053	17	Icy Strait	ISC	7/30/2001	1300.0	Kasnyku Bay 112-11	04:38/63	NSRAA	5/24/2000	37.1	432
5059	59	Icy Strait	ISC	7/31/2001	166.3	Port Armstrong	04:28/18	AKI	--	--	--
<u>Coho salmon</u>											
5041	27	U. Chatham	UCD	7/27/2001	55.8	Auke Creek	04:01/68	ADFG	6/1/2001	13.0	56
5041	28	U. Chatham	UCD	7/27/2001	44.8	Sheep Creek	04:03/92	DIPAC	6/14/2001	15.9	43
5041	29	U. Chatham	UCD	7/27/2001	78.9	Gastineau Ch 111-40	04:03/91	DIPAC	6/14/2001	21.8	43
5041	30	U. Chatham	UCD	7/27/2001	50.3	Berners River	04:40/21	ADFG	5/30/2001	--	58
5041	31	U. Chatham	UCD	7/27/2001	55.5	Gastineau Ch 111-40	04:03/90	DIPAC	6/14/2001	22.4	43
5041	32	U. Chatham	UCD	7/27/2001	72.7	Gastineau Ch 111-40	04:03/90	DIPAC	6/14/2001	22.4	43
5041	33	U. Chatham	UCD	7/27/2001	59.8	Gastineau Ch 111-40	04:03/91	DIPAC	6/14/2001	21.8	43
5041	34	U. Chatham	UCD	7/27/2001	50.7	Gastineau Ch 111-40	04:03/91	DIPAC	6/14/2001	21.8	43
5042	1	U. Chatham	UCC	7/27/2001	61.3	Berners River	04:40/21	ADFG	5/30/2001	--	58
5049	6	Icy Strait	ISA	7/29/2001	86.5	Chilkat R 115-32	04:03/98	ADFG	5/23/2001	6.2	67
5052	8	Icy Strait	ISD	7/27/2001	30.6	Sheep Creek	04:03/92	DIPAC	6/14/2001	15.9	43
5052	12	Icy Strait	ISD	7/27/2001	43.0	Berners River	04:40/21	ADFG	5/30/2001	--	58
5054	17	Icy Strait	ISC	7/30/2001	51.5	Kasnyku Bay 112-11	04:19/05	NSRAA	6/2/2000	20.5	423
5056	1	Icy Strait	ISC	7/30/2001	76.9	Gastineau Ch 111-40	04:03/90	DIPAC	6/14/2001	22.4	46
5056	2	Icy Strait	ISC	7/30/2001	63.7	Gastineau Ch 111-40	04:03:91	DIPAC	6/14/2001	21.8	46
5059	5	Icy Strait	ISC	7/31/2001	70.6	Gastineau Ch 111-40	04:03/89	DIPAC	6/14/2001	20.9	47
5059	60	Icy Strait	ISC	7/31/2001	3450.0	Gastineau Ch 111-40	50:31/20	DIPAC	6/12/2001	21.4	49
5065	11 ⁵	U. Chatham	UCB	8/1/2001	--	--	No Tag	--	--	--	--
5066	1	U. Chatham	UCC	8/1/2001	84.6	Gastineau Ch 111-40	04:03/91	DIPAC	6/14/2001	21.8	48

⁵No tag present

Table 8.-Percent frequency of occurrence of prey categories in stomachs of predators examined in July 2001 in marine waters of the northern region of southeastern Alaska. The number of stomachs examined is shown in parentheses for each species.

Prey category	Pacific salmon (immature/adult)				Non-salmonids		
	Chinook (15)	Coho (6)	Pink (44)	Sockeye (2)	Pomfret (12)	Spiny dogfish (12)	Walleye pollock (19)
	<u>Invertebrate prey</u>						
Amphipods, Hyperiid	0.0	16.7	31.1	50.0	58.3	0.0	39.1
Cephalopods	26.7	0.0	0.0	0.0	83.3	8.3	4.3
Copepods	6.7	0.0	4.4	0.0	0.0	0.0	4.3
Euphausiids	13.3	0.0	31.1	0.0	50.0	25.0	52.2
Jellies	0.0	0.0	0.0	0.0	0.0	8.3	4.3
Other	0.0	0.0	6.7	0.0	16.7	16.7	13.0
Pteropods	0.0	0.0	0.0	0.0	8.3	0.0	0.0
Crab zoeae	13.3	16.7	64.4	50.0	16.7	0.0	30.4
Crab megalops	0.0	0.0	4.4	0.0	25.0	0.0	4.3
	<u>Fish prey</u>						
Juvenile salmon	0.0	0.0	0.0	0.0	8.3	25.0	0.0
Herring	6.7	16.7	0.0	0.0	0.0	0.0	0.0
Osmeridae	0.0	0.0	2.2	0.0	0.0	0.0	0.0
Unidentified larvae	46.7	0.0	4.4	50.0	0.0	0.0	4.3
Walleye Pollock	6.7	33.3	0.0	0.0	0.0	0.0	0.0
Unknown remains	40.0	33.3	0.0	0.0	8.3	41.7	0.0
Empty stomachs	6.7	33.3	20.0	0.0	0.0	16.7	21.7

Table 9.- Samples of juvenile pink, chum and coho salmon collected in Icy Strait (ISC) by rope trawl at diel intervals of three hours for the feeding periodicity study in July 2001. Fish lengths were measured fresh as part of routine catches, then preserved in formalin.

Diel period	Date	Time	Haul #	Number of juvenile salmon		
				Pink	Chum	Coho
D1	Jul 30	4:15	5053	0	0	12
D2	Jul 30	7:15	5054	5	10	12
D3	Jul 30	10:15	5055	15	15	15
D4-1	Jul 30	13:15	5056	8	9	15
D4-2	Jul 31	13:15	5057	5	4	15
D5	Jul 31	16:15	5058	12	12	12
D6	Jul 31	19:10	5059	4	12	9
D7	Jul 31	22:30	5060	0	0	3
Total				49	62	93

Table 10.– Samples of juvenile pink and chum salmon used in evacuation rate studies conducted aboard the NOAA ship *John N. Cobb* in July 2001. Fish were held for specific time intervals (T_n , in hours) in filtered seawater, then killed and preserved in formalin. T_0 refers to the time fish were positively identified from trawls recently brought aboard, the start time when stomachs were assumed to be full, and the source of subsequently sacrificed lots of fish identified as T_n . Hauls identified as T_0 may also be part of the diel series (see Table 7).

Time interval	Day	Time	Hours held	Number of juvenile salmon		T_0 Haul Number
				Pink	Chum	
T_0	30 July	0755	0	5	10	5054
T_0	30 July	0900	0	12	12	5999
T_0	31 July	1515	0	13	8	5061
T_1	30 July	0855	1	0	9	5054
T_1	30 July	1000	1	0	6	5999
T_1	31 July	1615	1	11	8	5061
T_2	30 July	0955	2	0	8	5054
T_2	30 July	1130	2	0	6	5999
T_2	31 July	1715	2	8	12	5061
T_4	30 July	1155	4	0	6	5054
T_4	30 July	1300	4	0	12	5999
T_4	31 July	1915	4	15	1	5061
T_7	30 July	1400	7	4	4	5999
T_7	31 July	2215	7	8	0	5061
T_8	30 July	1555	8	0	6	5054
T_8	30 July	1700	8	7	8	5999
T_8	31 July	2305	8	4	8	5061
T_{12}	30 July	2100	12	7	9	5999
T_{16}	31 July	0100	16	8	8	5999
T_{20}	31 July	0500	20	2	10	5999
T_{24}	30 July	0800	24	0	3	5054
T_{24}	31 July	1515	24	0	5	5061
Total				105	159	

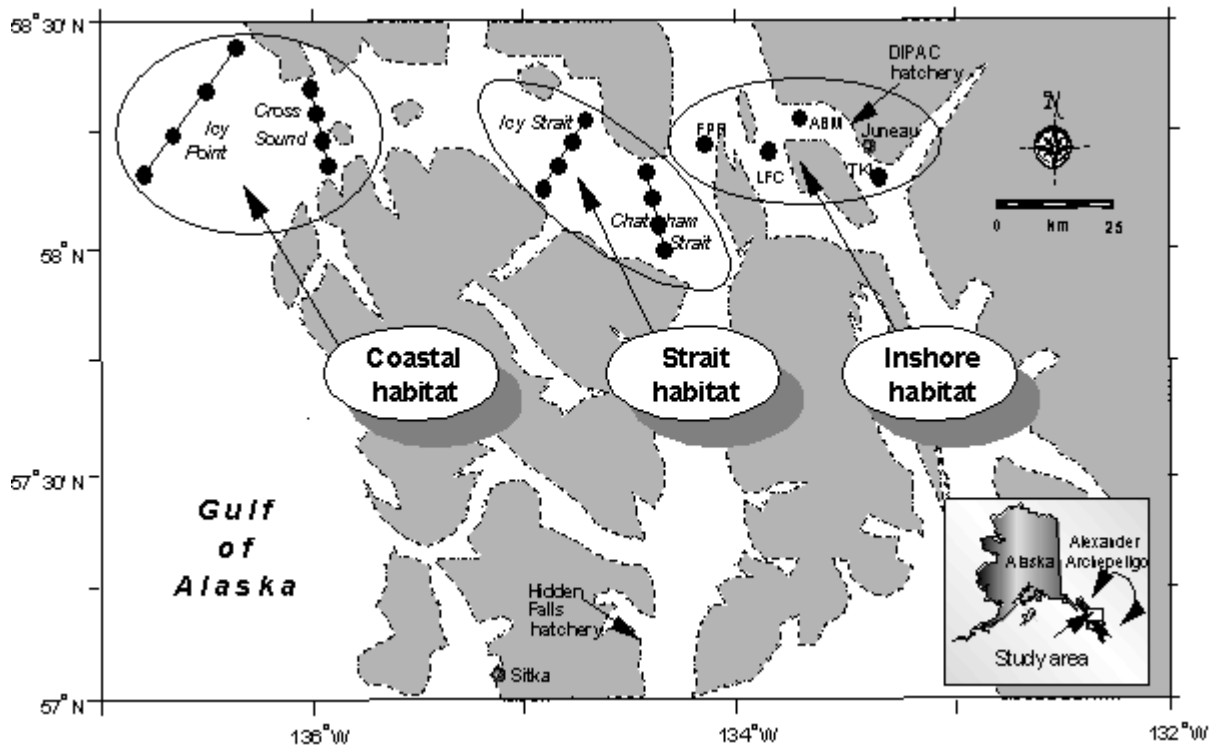


Figure 1.- Stations sampled monthly in marine waters of the northern region of southeastern Alaska, May–September 1997–2001. Small arrows indicate two major enhancement facilities: DIPAC (Douglas Island Pink and Chum) hatchery and Hidden Falls hatchery. Note that only ABM in the inshore habitat was sampled in 2001.