

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

**JC-01-16 August Cruise Report**

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### **INTRODUCTION**

Scientists from the Auke Bay Laboratory of the 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 26 August to 1 September 2001. This cruise was the fourth in a series of five scheduled for monitoring the inside and coastal marine waters of the region between late spring and early fall of 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, Doris Alcorn, a collaborating contract scientist, assisted during the cruise. Also, on 28 August, NOAA's Acting Under Secretary for Oceans and Atmosphere, Scott Gudes, and Becky Allee, Special Assistant to NOAA's Under Secretary, were transported to and from the ship by floatplane to observe vessel and scientific operations; they were assisted by Alex Wertheimer, a senior Fishery Research Biologist at Auke Bay Lab.

Sampling in 2001 marks the fifth year of a long-term study on how the intra- and interannual 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. It is also the first year in which process studies were planned for monthly cruises to generate additional details about the biology of juvenile salmon species. The information will 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 August cruise, in Auke Bay and along three transects with four stations each in Upper Chatham Strait, Icy Strait and off Icy Point (Fig. 1, Table 1). In this fifth year of sampling, the Cross Sound coastal transect and the single inshore stations at Taku Inlet, Lower Favorite Channel and False Point Retreat (TKI, LFC and FPR, respectively) that were sampled in past years were omitted to allow time to conduct shipboard process experiments needed for bioenergetic studies and to collect replicate samples in key strait habitats. Oceanographic measurements were planned for all stations and surface rope trawling was planned for all except Auke Bay (ABM), as time and weather permitted. However, inclement weather prevented sampling the Icy Point transect. Rope trawl samples were replicated in strait habitats without taking additional oceanographic samples. Process studies planned for this cruise included studies on juvenile salmon diel feeding periodicity and gastric evacuation rates.

### 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-21<sup>1</sup> 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; shipboard processing included filtration of 200 ml water with a Millipore system to separate phytoplankton cells from the liquid and then freezing the two components. Ambient light conditions were measured with a radiometer mounted on top of the vessel and were recorded to the nearest Watts per m<sup>2</sup> (W\*m<sup>-2</sup>) at each station before trawling.

Plankton 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. 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 57-cm frame deep conical net to determine the volume of water 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. During the two night-time trawls (hauls 5077 at 0400 and 5087 at 2200), neuston net samples

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

(mouth opening 1 m<sup>2</sup>, 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. These ancillary samples were preserved for Won Park, a University of Alaska, Juneau Center for Fisheries and Ocean Science doctoral student collaborating in SECM zooplankton studies (see cruise report JC-01-09).

#### Trawl gear:

Fish sampling was conducted with a Nordic 264 rope trawl fished directly astern the NOAA ship *John N. Cobb* at the surface. Trawling was planned for each station except Auke Bay Monitor, which was not attempted due to shallow depths. 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. A small mesh panel of 10.2 cm mesh was incorporated along the jib lines on the top panel of the trawl, between the head rope and the first 162.6 cm mesh, to minimize the loss of fish aft of the headrope.

Juvenile salmon and associated fishes were also sampled by rope trawl for two shipboard experiments, diel feeding periodicity and gastric evacuation rate of juvenile chum and pink salmon. The ISC station in Icy Strait was selected as the study site based on long-term catch data. For the diel feeding periodicity studies, trawling was conducted at seven, approximately 3-hour intervals over a two day period, August 28 and 30. Trawls were hauled back at approximately 0400, 0700, 1000, and 1300 on the first day and at 1300, 1600, 1900, and 2200 on the second day. The diel trawl hauls were fished for the 20 minute standard time. Processing of other catch, such as potential predators, was maintained as usual during diel samplings.

The gastric evacuation experiment was planned to be conducted simultaneously with the diel feeding periodicity, with an early morning (0400 or 0700) diel trawling sample to serve as the 0-hour fullness sample at the beginning of stomach evacuation. Initiation of these process studies required approximately 200 specimens each of juvenile pink and chum salmon. Following the successful methods used during the previous SECM cruise in July (JC-13-01), two live tanks approximately 2.5 m<sup>3</sup> in volume were filled with flow-through seawater. The water was drawn from 2 m depth to maintain ambient temperatures and filtered through 63 µm mesh to eliminate potential prey. We anticipated holding live juvenile salmon “stock” from the catch to sacrifice subsamples of 10-15 specimens at hourly intervals (i.e., T<sub>0</sub>, T<sub>1</sub>, T<sub>4</sub>...T<sub>32</sub>) to monitor the rate of passage of food from the gut.

#### Fish Processing:

After each haul, the fish were anaesthetized with tricaine methanesulfonate, identified, enumerated, measured, and the stomachs sampled (if appropriate). Fish were measured to the nearest mm fork length (FL) with a Limnotera FMB IV electronic measuring board. For very large

catches, only a subsample was measured. All captured salmon were visually examined for the absence of an adipose fin, indicating the potential presence of an internal planted coded-wire tag (CWT). 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.

#### Laboratory processing:

Each 20-m vertical plankton haul sample was settled for a 24 hr period in an Imhof 1000 ml cone to determine the volume of zooplankton at each station. Volumes of settled zooplankton and phytoplankton were recorded to the nearest ml, when possible. CWTs were removed from heads of salmon lacking the adipose fin and decoded to determine the lot, location, and date the fish were released. CWT codes were verified by an independent tag reader. Release data for the CWT codes were obtained from regional mark coordinators, the Pacific States Marine Fisheries Commission ([http://www.psmfc.org/rmpc/cwt\\_reports.html](http://www.psmfc.org/rmpc/cwt_reports.html)), the Alaska Department of Fish and Game (<http://tagotoweb.adfg.state.ak.us>), or the National Marine Fisheries Service, Auke Bay Laboratory. Stomachs of diel samples of juvenile salmon were excised after preserved fish were measured and weighed; stomachs were transferred to 50% isopropyl alcohol for storage until the contents could be examined under the microscope..

## **RESULTS and DISCUSSION**

Sampling was accomplished at nine of thirteen core stations in August (Table 2). Icy Point was not sampled due to inclement weather and time constraints. A diel series of samples was collected at ISC in seven time periods over two days. Replicate trawl samples were taken in the straits on two other days to improve abundance estimation and increase sample sizes of juvenile salmon. Oceanographic sampling and surface trawling were conducted according to the following schedule: day one, standard Auke Bay and Upper Chatham Strait transect; day 2, standard Icy Strait transect; day 3, first half of diel samples and rendezvous with floatplane to transfer NOAA visitors; day 4, Icy Strait replicates; day 5, second half of diel samples; day 6, replicate Upper Chatham Strait; day 7, transit to Juneau NMFS support dock. Therefore, oceanographic and trawl data were collected on 25 occasions during August, for totals of 24 rope trawl hauls, 25 CTD casts, 27 20-m Norpac tows, 36 bongo tows, 1 deep vertical tows (WP2), and 9 water samples (Table 2).

#### Physical oceanography:

August oceanographic data indicated late summer habitat conditions, with temperatures beginning to drop, salinities lower, and light levels similar to those observed in July. Surface (2-m) temperatures and salinities during the cruise ranged from 10.7-12.8°C (mean 12.3°C) and 21.1-28.6 Practical Salinity Units (PSU, mean 24.4 PSU; Table 3). Thus temperatures and salinities were similar throughout the inside waters. In general, temperatures varied by < 1°C between stations on a transect and between transects. The single exception occurred during

replicate sampling in Icy Strait, when the morning temperatures were the lowest observed for the cruise. Salinities varied among stations on a transect by as much as 5.9 PSU (Upper Chatham Strait) in one day. Average light conditions during the August cruise were low, 125 W\*m<sup>-2</sup>. Diel oceanographic sampling at ISC in Icy Strait also revealed little temperature or salinity variation over a 24-hr period, although ambient light conditions varied from 0-355 W\*m<sup>-2</sup> (Table 3).

#### Plankton:

Zooplankton biomass, as determined from the settled volumes of the 20-m vertical tows, ranged from 2-20 ml (Table 3). Mean values per locality were highest inshore, for Auke Bay (19 ml), and lowest for Upper Chatham Strait (3 ml). Virtually no phytoplankton was present in the August samples. Although zooplankton volumes were generally low, temporal differences in the upper 20 m water column were evident from diel sampling at ISC. Daily zooplankton volumes peaked at 2200.

#### Fish catches:

Eight stations were sampled at least once during the August cruise with the Nordic trawl fished directly astern of the *John N. Cobb* at the surface. Totals of 531 juvenile salmon, 23 immature/adult salmon, and 13,210 non-salmonid fish were captured in the 25 rope trawl hauls (Tables 4 and 5). The primary component of the catch in terms of frequency of occurrence was juvenile salmon. Juvenile chum (*O. keta*) and pink (*O. gorbuscha*) salmon were present in  $\geq 75\%$  of hauls, juvenile coho salmon in 56% of hauls, and juvenile sockeye and chinook salmon in  $\leq 40\%$  of hauls (Table 6). The most abundant salmon were juvenile pink salmon, with 338 caught; the second most abundant were juvenile chum salmon, with 128 caught. However, catches of these species were an order of magnitude lower than in the previous month of July (see JC-13-01 Cruise Report). The catches of juvenile sockeye (*O. nerka*), coho (*O. kisutch*), and chinook (*O. tshawytscha*) salmon were lower than for juvenile pink and chum salmon (n = 18, 32, and 15, respectively, Table 5). The mean FLs of juvenile pink, chum and sockeye salmon were similar, about 150 mm. Juvenile coho and chinook salmon were larger, with mean FLs of 227 and 246 mm (Table 5). Among the four species of maturing salmon captured, immature chinook were caught in the greatest numbers (10); no immature/adult sockeye were caught. Maturing salmon were captured in < 10% of all hauls.

Non-salmonids were generally not abundant in daytime surface trawls (Tables 5 and 6). Crested sculpin (*Blepius bilobus*) were caught most frequently, in 84% of hauls, but only 57 were caught overall. An unusually large catch of 17 crested sculpin was captured in a single haul August 31 at station UCA. The next most frequently caught species was prowlfish (*Zaprora silenus*), present in 28% of hauls, with a total of seven individuals caught. Two forage species were caught infrequently, but were very abundant in the two night time hauls made on August 28 (0400) and August 30 (2200). Numbers of juvenile eulachon (*Thaleichthys pacificus*) and walleye pollock (*Theragra chalcogramma*) were estimated in the thousands (Tables 5 and 6).

One juvenile coho salmon (*O. kisutch*) containing a CWT was recovered in Icy Strait at 0815, Haul 5081, at ISA. It was released (code 04:03/90) by DIPAC hatchery in Gastineau Channel near Juneau on June 14 and recovered August 29, 2.5 months post-release.

### Fish diets:

Stomach analysis was performed on board the vessel on 47 potential predators of juvenile salmon. No empty stomachs were observed for the ten chinook, two chum, or eight coho salmon, but 2/3 of the pink salmon had empty stomachs; only one of the 24 walleye pollock stomachs was empty (Table 7). Some degree of piscivory was exhibited by all species except the pink salmon, but juvenile salmon were preyed upon by only one adult coho salmon. Overall, 63-100% of salmon predators had consumed fish prey, including Pacific herring (*Clupea pallasii*), lanternfish (Myctophidae), walleye pollock and unidentified larvae and fish remains. The most common invertebrate prey were euphausiids and amphipods, with pteropods, crab zoeae and miscellaneous “other” occurring less commonly (Table 7).

### Diel feeding periodicity samples:

Diel trawling was conducted at seven, three-hour time intervals at ISC on August 28 and 30 (Table 8). The morning collections were generally limited; no juvenile salmon were caught in the first interval at 0400. In subsequent intervals, totals of 171 juvenile pink and 50 juvenile chum salmon were collected, as well as smaller numbers of juvenile sockeye and coho salmon. Feeding periodicity will be determined from analysis of their stomach contents, including time of day of peak stomach fullness and diel differences in prey consumed. The August diel samples will be compared to those collected in May, June and July for an analysis of ontogenetic changes in feeding periodicity and changes in prey composition. These samples provide information on feeding interactions between the species from single hauls at different times of day.

Catches of juvenile chum salmon were too small to provide sufficient samples for the gastric evacuation study. No catch exceeded 26 individuals (Table 4). Catches of juvenile pink salmon were marginally adequate to initiate evacuation studies from late-day hauls, with 87 individuals caught at 1900 and 63 individuals at 2200; however, the decision was made to forego doing the experiment for several reasons: 1) pink salmon were the second priority species; 2) evening light conditions were low; and 3) extremely large hauls of forage fish were anticipated for late night catches, presenting time constraints.

## **ACKNOWLEDGMENTS**

We would like to acknowledge the command and crew of the NOAA ship *John N. Cobb* for their superb cooperation and performance during the cruise. We appreciate the opportunity to host NOAA management personnel from Washington, D. C.

Table 1.- Localities and coordinates of stations scheduled for sampling in the marine waters of the northern region of southeastern Alaska using the NOAA ship *John N. Cobb*, 26 August-1 September 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 marine waters of the northern region of southeastern Alaska off the NOAA ship *John N. Cobb*, 26 August-1 September 2001. Dashes indicate sample not collected.

Date	Station	Haul#	Plankton net samples				Chlorophyll & nutrients	Rope trawl
			CTD	Norpac	Bongo	WP2		
26 Aug	5068	ABM	1	3	2	1	1	--
26 Aug	5069	UCD	1	1	2	0	1	1
26 Aug	5070	UCC	1	1	2	0	1	1
26 Aug	5071	UCB	1	1	2	0	1	1
26 Aug	5072	UCA	1	1	2	0	1	1
27 Aug	5073	ISA	1	1	2	0	1	1
27 Aug	5074	ISB	1	1	2	0	1	1
27 Aug	5075	ISC	1	1	2	0	1	1
27 Aug	5076	ISD	1	1	2	0	1	1
28 Aug <sup>2</sup>	5077	ISC	1	1	2	0	0	1
28 Aug	5078	ISC	1	1	2	0	0	1
28 Aug	5079	ISC	1	1	4	0	0	1
28 Aug	5080	ISC	1	1	2	0	0	1
29 Aug <sup>3</sup>	5081	ISA	1	1	0	0	0	1
29 Aug	5082	ISB	1	1	0	0	0	1
29 Aug	5083	ISD	1	1	0	0	0	1
30 Aug <sup>2</sup>	5084	ISC	1	1	2	0	0	1
30 Aug	5085	ISC	1	1	2	0	0	1
30 Aug	5086	ISC	1	1	2	0	0	1
30 Aug	5087	ISC	1	1	2	0	0	1
31 Aug <sup>3</sup>	5088	UCA	1	1	0	0	0	1
31 Aug	5089	UCB	1	1	0	0	0	1
31 Aug	5090	UCC	1	1	0	0	0	1
31 Aug	5091	UCD	1	1	0	0	0	1
31 Aug	5092	ISD	1	1	0	0	0	1
Total			25	27	36	1	9	24

<sup>2</sup>Diel trawling was conducted August 28 and 30; no water samples were taken.

<sup>3</sup>Replicate trawl samples August 29 and 31, limited oceanographic samples were collected.

Table 3.- Temperatures and salinities at 2-m depth, ambient light conditions, and settled volumes of plankton in 20-m vertical Norpac hauls at stations sampled from the NOAA ship *John N. Cobb* in marine waters of northern southeastern Alaska, 26 August-1 September 2001. ABM SVs are average of three samples.

Date	Station	Haul #	Time	Temperature (°C)	Salinity (PSU)	Light (W*m <sup>-2</sup> )	Plankton settled volume (ml)		
							Zooplankton	Phytoplankton	Total
26 Aug	ABM	5068	10:30	12.4	22.2	342	19	0	19
26 Aug	UCD	5069	14:00	12.5	21.1	328	5	0	5
26 Aug	UCC	5070	15:30	12.4	25.6	246	4	0	4
26 Aug	UCB	5071	17:00	11.8	27.0	30	2	0	2
26 Aug	UCA	5072	19:05	12.2	26.4	14	2	0	2
27 Aug	ISA	5073	07:30	12.7	22.3	15	4	0	4
27 Aug	ISB	5074	09:00	12.4	24.5	13	5	0	5
27 Aug	ISC	5075	10:30	12.8	21.5	83	8	0	8
27 Aug	ISD	5076	13:00	12.6	23.3	108	8	0	8
28 Aug	ISC	5077	04:00	12.6	23.7	0	3	0	3
28 Aug	ISC	5078	07:00	12.5	23.8	6	3	0	3
28 Aug	ISC	5079	10:00	12.6	23.6	213	5	0	5
28 Aug	ISC	5080	12:30	12.7	23.7	142	4	0	4
29 Aug	ISA	5081	08:15	10.7	28.2	5	4	0	4
29 Aug	ISB	5082	09:30	10.8	27.8	38	4	0	4
29 Aug	ISD	5083	11:10	12.5	24.3	109	4	0	4
30 Aug	ISC	5084	13:00	12.3	24.5	355	6	0	6
30 Aug	ISC	5085	16:00	12.8	23.9	6	3	0	3
30 Aug	ISC	5086	19:00	12.6	24.7	4	6	0	6
30 Aug	ISC	5087	22:00	12.5	24.8	0	8	0	8
31 Aug	UCA	5088	10:30	12.4	28.6	203	11	0	11
31 Aug	UCB	5089	12:00	11.8	27.9	106	2	0	2
31 Aug	UCC	5090	13:30	12.0	24.4	142	2	0	2
31 Aug	UCD	5091	14:45	12.2	22.4	40	4	0	4
31 Aug	ISD	5092	08:30	12.5	24.1	143	6	0	6

Table 4.—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, 26 August-1 September 2001.

Date	Station	Haul#	Juvenile salmon					Immature and adult salmon						
			Chum	Pink	Coho	Chinook	Sockeye	Total	Chinook	Chum	Pink	Coho	Sockeye	Total
26 Aug	UCD	5069	0	3	0	3	0	6	0	0	0	0	0	0
26 Aug	UCC	5070	2	42	2	2	2	50	0	0	0	0	0	0
26 Aug	UCB	5071	1	1	4	0	0	6	0	0	1	1	0	2
26 Aug	UCA	5072	0	1	0	0	0	1	2	0	1	1	0	4
27 Aug	ISA	5073	1	2	3	0	0	6	0	0	0	0	0	0
27 Aug	ISB	5074	17	17	1	0	0	35	0	0	0	0	0	0
27 Aug	ISC	5075	4	9	1	2	1	17	0	0	0	0	0	0
27 Aug	ISD	5076	23	23	1	0	2	49	1	0	0	0	0	1
28 Aug	ISC	5077	0	0	0	0	0	0	2	0	1	0	0	3
28 Aug	ISC	5078	1	2	0	0	0	3	0	0	0	0	0	0
28 Aug	ISC	5079	2	0	0	0	0	2	0	0	0	0	0	0
28 Aug	ISC	5080	14	1	1	1	0	17	0	0	0	1	0	1
29 Aug	ISA	5081 <sup>4</sup>	1	2	4	0	0	7	0	0	0	0	0	0
29 Aug	ISB	5082	0	2	1	1	0	4	0	0	0	0	0	0
29 Aug	ISD	5083	13	24	1	2	1	41	0	0	0	0	0	0
30 Aug	ISC	5084	0	4	0	0	0	4	0	0	0	0	0	0
30 Aug	ISC	5085	4	14	0	1	1	20	0	0	0	1	0	1
30 Aug	ISC	5086	26	87	2	2	5	122	0	0	0	0	0	0
30 Aug	ISC	5087	3	63	1	0	3	70	2	2	0	0	0	4
31 Aug	UCA	5088	1	1	8	0	0	10	1	0	0	3	0	4
31 Aug	UCB	5089	2	0	0	1	1	4	2	0	0	1	0	3
31 Aug	UCC	5090	4	11	0	0	1	16	0	0	0	0	0	0
31 Aug	UCD	5091	3	5	0	0	1	9	0	0	0	0	0	0
31 Aug	ISD	5092	6	24	2	0	0	32	0	0	0	0	0	0
Total Catch			128	338	32	15	18	531	10	2	3	8	0	23

<sup>4</sup>coded-wire tag present

Table 5.- 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, 26 August-1 September 2001.

Date	Station	Haul #	Crested sculpin	Pacific Eulachon	Prow- Herring	Pro- fish	Squid	Walleye pollock	Wolf- eel	Capelin	Smooth lump- sucker	Soft sculpin	Spiny lump- sucker	White- spotted greenling	Total # Fish
26 Aug	UCD	5069	1	0	0	0	0	2	0	0	0	0	0	0	3
26 Aug	UCC	5070	1	0	0	0	0	0	0	0	0	0	0	0	1
Jan 26	UCB	5071	0	0	0	0	0	0	0	0	0	0	0	0	0
26 Aug	UCA	5072	3	0	0	0	0	0	0	0	0	0	0	0	3
27 Aug	ISA	5073	2	0	0	1	0	0	0	0	0	1	0	0	4
27 Aug	ISB	5074	6	0	0	0	0	0	0	0	0	0	0	0	6
27 Aug	ISC	5075	1	0	0	1	0	0	0	0	0	0	0	0	2
27 Aug	ISD	5076	2	0	0	0	0	0	0	0	0	2	0	0	4
28 Aug	ISC	5077	1	2,090	0	0	6	1,792	0	0	0	0	0	0	3,889
28 Aug	ISC	5078	3	0	0	0	0	1	1	0	0	0	0	0	5
28 Aug	ISC	5080	4	0	0	1	0	0	0	0	0	0	0	0	5
28 Aug	ISC	5079	2	0	0	1	0	0	0	0	0	1	0	0	4
29 Aug	ISA	5081	1	0	0	0	0	0	0	0	0	0	1	0	2
29 Aug	ISB	5082	1	0	0	0	0	0	0	0	0	1	0	0	2
29 Aug	ISD	5083	2	0	0	0	0	0	0	0	0	0	0	0	2
30 Aug	ISC	5084	2	0	0	0	0	0	0	0	0	0	0	0	2
30 Aug	ISC	5085	1	0	0	0	0	0	0	0	0	0	0	1	2
30 Aug	ISC	5086	0	0	0	1	0	0	0	0	0	0	0	0	1
30 Aug	ISC	5087	0	1,290	5	0	0	7,945	0	1	1	1	0	0	9,242
31 Aug	UCA	5088	17	0	0	1	0	2	0	0	0	0	0	0	20
31 Aug	UCB	5089	2	0	0	0	0	0	0	0	0	0	0	0	2
31 Aug	UCC	5090	2	0	0	0	0	0	1	0	0	0	0	0	3
31 Aug	UCD	5091	2	0	0	0	0	2	0	0	0	0	0	0	4
31 Aug	ISD	5092	1	0	0	1	0	0	0	0	0	0	0	0	2
Total per species			57	3,380	5	7	6	9,744	2	9,242	1	5	1	1	13,210

Table 6.- Length, frequency of occurrence, and life history stage<sup>5</sup> of fish captured with 25 rope trawl hauls in marine waters of the northern region of southeastern Alaska using the NOAA ship *John N. Cobb*, 26 August-1 September 2001. Dashes indicate no measurements taken. Frequency of occurrence = number of hauls with species present; percent hauls with species in parentheses. Abbreviations: Min. = minimum, Max. = maximum.

Common name	Species name	Number measured	Fork length (mm)			Frequency of occurrence	Life history stage
			Min.	Max.	Mean		
Pink	<i>Oncorhynchus gorbuscha</i>	338	96	205	154.9	21 (84)	J
Chum	<i>O. keta</i>	128	93	197	144.6	19 (76)	J
Sockeye	<i>O. nerka</i>	18	95	205	147.3	10 (40)	J
Coho	<i>O. kisutch</i>	32	192	298	227.0	14 (56)	J
Chinook	<i>O. tshawytscha</i>	15	207	302	245.6	9 (36)	J
<b>Total juvenile salmon measured</b>		<b>531</b>					
Chinook	<i>O. tshawytscha</i>	10	380	590	448.3	6 (24)	I
Pink	<i>O. gorbuscha</i>	3	421	550	487.0	3 (12)	A
Coho	<i>O. kisutch</i>	8	482	701	635.1	6 (24)	A
Chum	<i>O. keta</i>	2	672	721	696.5	1 (4)	A
<b>Total maturing salmon measured</b>		<b>23</b>					
Capelin	<i>Mallotus villosus</i>	1	--	--	--	1 (4)	J
Pacific herring	<i>Clupea pallasii</i>	5	142	218	185.6	1 (4)	I
Eulachon	<i>Thaleichthys pacificus</i>	103	103	188	144.3	2 (8)	I
Crested sculpin	<i>Blepsias bilobus</i>	57	85	175	138.1	21 (84)	J
Soft sculpin	<i>Psychrolutes sigalutes</i>	5	15	27	21.0	4 (16)	J, A
Prowfish	<i>Zaprora silenus</i>	7	89	165	133.0	7 (28)	J
Walleye pollock	<i>Theragra chalcogramma</i>	140	177	548	269.2	6 (24)	J, A
Wolf-eel	<i>Anarrhichthys ocellatus</i>	2	340	387	363.5	2 (8)	A
Squid	Gonatidae	6	36	145	92.0	1 (4)	J
Smooth lumpsucker	<i>Aptocyclus ventricosus</i>	1	213	213	213	1 (4)	J
Spiny lumpsucker	<i>Eumicrotremus orbis</i>	1	72	72	72	1 (4)	J
White-spotted greenling	<i>Hexagrammos stelleri</i>	1	333	333	333	1	A
<b>Total non-salmonids measured</b>		<b>327</b>					
<b>Total fish measured</b>		<b>881</b>					

<sup>5</sup>J = 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 7.- Percent frequency of occurrence of invertebrate and fish prey categories, and percent empty stomachs, of predators examined in August 2001 from 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 (10)	Chum (2)	Coho (8)	Pink (3)	Walleye pollock (24)
	<u>Fish prey</u>				
Overall piscivores	70	100	63	0	29
Juvenile salmon	0	0	13	0	0
Eulachon	0	0	0	0	8
Pacific herring	0	0	25	0	0
Lanternfish	0	50	0	0	0
Unident. larvae	30	0	0	0	0
Unknown remains	30	50	63	0	21
Walleye pollock	10	0	0	0	0
	<u>Invertebrate prey</u>				
Amphipods, Hyperiid	30	0	25	33	25
Euphausiids	40	100	38	33	67
Pteropods	0	0	0	0	8
Crab zoeae	20	0	13	0	4
Other	10	50	0	0	8
Empty stomachs	0	0	0	67	4

Table 8.—Numbers of juvenile salmon frozen for diel feeding periodicity study in Icy Strait, 28 and 30 August 2001. No salmon were caught in diel period D1.

Diel Time Period	Haul#	Time of Catch	Date	Hour of Feeding	Juvenile salmon species				
					Pink	Chum	Coho	Sockeye	Chinook
D1	5077	0415	28 Aug	0	0	0	0	0	0
D2	5078	0715	28 Aug	3	2	1	0	0	0
D3	5079	1015	28 Aug	6	0	2	0	0	0
D4-1	5080	1315	28 Aug	9	1	14	1	0	1
D4-2	5084	1315	30 Aug	9	4	0	0	0	0
D5	5085	1615	30 Aug	12	14	4	0	1	1
D6	5086	1910	30 Aug	15	87	26	2	5	2
D7	5087	2230	30 Aug	18	63	3	1	3	0
Total					171	50	4	9	4

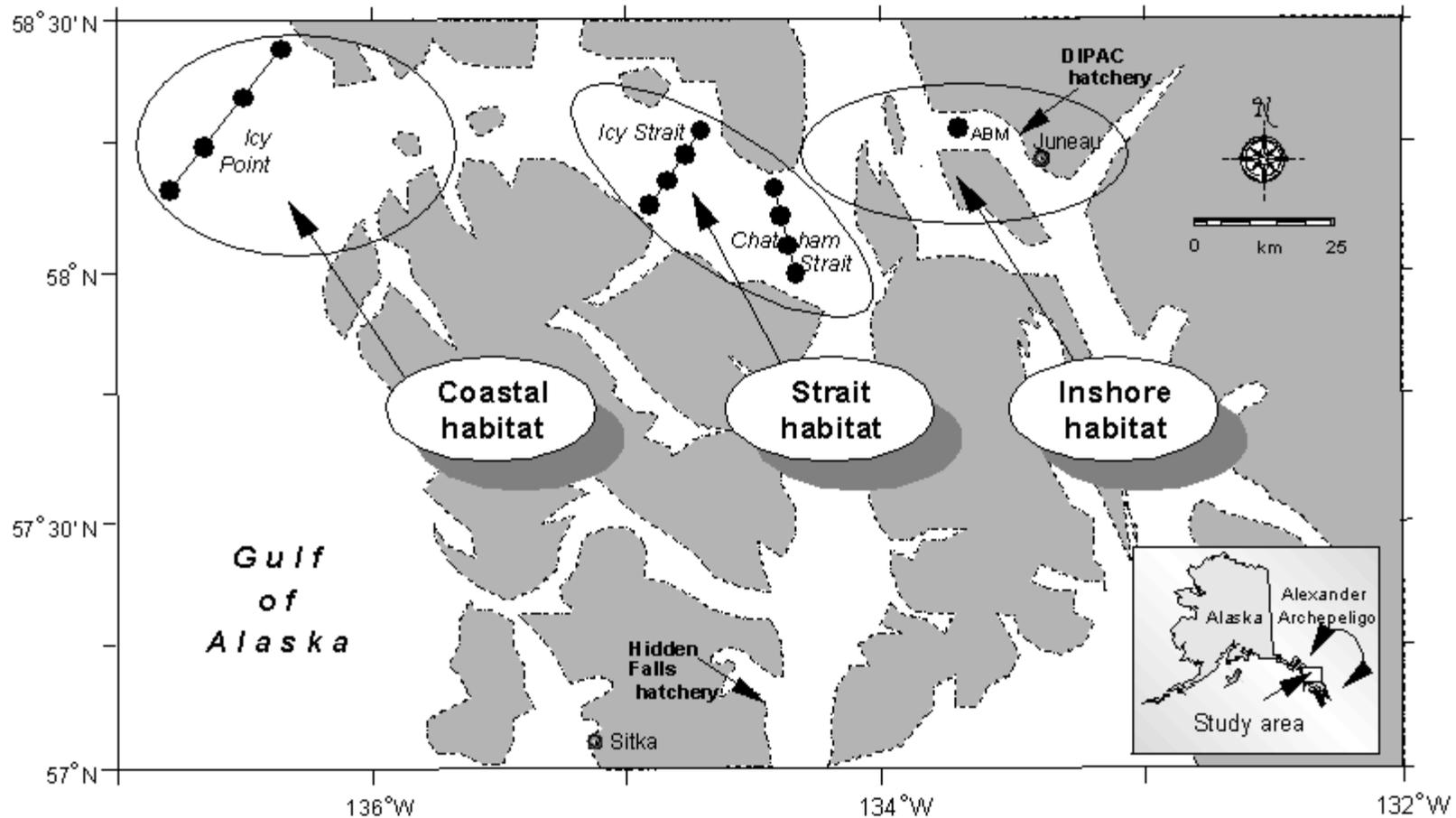


Figure 1.—Stations sampled monthly in three habitats (large arrows) of the marine waters of the northern region of southeastern Alaska, May–October 1997-2001. Small arrows indicate principal enhancement facilities, DIPAC (Douglas Island Pink and Chum) and Hidden Falls hatchery.