

# **Southeast Alaska Coastal Monitoring Project**

**JC-05-10 July 2005 Cruise Report**

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Scientists from the Marine Salmon Investigations Program at Auke Bay Laboratory (ABL), Alaska Fisheries Science Center, National Marine Fisheries Service, NOAA Fisheries, conducted a 13-day cruise aboard the NOAA ship *John N. Cobb* in the marine waters of Southeast Alaska, 20 July to 1 August, 2005. This cruise (JC-05-10) was part of the Southeast Alaska Coastal Monitoring (SECM) project, and was the third in a series of four cruises scheduled for 2005. 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. In addition to salmon information, SECM provides information on other pelagic fish species, zooplankton, and physical oceanography. An annual data report is summarized as a to the North Pacific Anadromous Fish Commission (NPAFC) document in the year following sample collection and processing. The information is further summarized in various publications and reports to improve understanding of trophic relationships among marine planktivores, to track long-term patterns and changes in the marine environment in response to climate change, to compare the Southeast Alaska marine ecosystems to others outside the region, to develop forecasting models for the commercial salmon harvest, and to provide input parameters for bioenergetic models. Ultimately, SECM will provide the information necessary to implement the Ecosystem Approach to Management, EAM, for salmon and other managed species. The information collected also provides 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.

Sampling in 2005 marks the ninth 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. In 2005, coastal habitat will be sampled for biological oceanographic information only in May and August, and no trawling is scheduled. This year, the SECM project began a new, three-year component funded by the Pacific Salmon Commission Northern Fund to compare strait habitats in the northern and southern regions of Southeast Alaska. The new objectives include sampling in June and July along historical transects in the northern region of Southeast Alaska (Icy Strait

and Upper Chatham Strait) and two new transects in the southern region of Southeast Alaska (Lower and Middle Clarence Strait). General objectives of this cruise are to: 1) collect and compare biological data on juvenile Pacific salmon and other pelagic fish species from surface rope trawl samples at stations in strait habitats in the two regions; 2) collect physical and biological oceanographic data in these regions to evaluate responses of fishes and other marine organisms to climatic and environmental change; and, 3) conduct process studies focusing on bioenergetics and trophic interactions of juvenile salmon in these regions.

## METHODS

Seventeen stations were scheduled for sampling during the July 2005 cruise (Table 1, Figures 1 and 2). Sampling was conducted at one station in Auke Bay (ABM) and along two transects with four stations each in Middle Clarence Strait and Lower Clarence Strait in the southern region of Southeast Alaska (SSE) and two transects with four stations each in Upper Chatham Strait and Icy Strait in the northern region (NSE). Oceanographic measurements were taken at all stations; trawling was conducted twice along transects at Upper Chatham and Middle Clarence Straits and three times at Icy and Lower Clarence Straits; no trawling was conducted at Auke Bay.

### Oceanographic sampling:

The oceanographic sampling included physical and biological monitoring at each station. To examine horizontal water structure, temperature and salinity readings were continuously logged at one-minute intervals from 3-m depth using a SeaBird SBE-21<sup>1</sup> thermosalinograph mounted on the vessel hull. 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, depending on bottom depth. Surface and 20-m water samples were taken once at each station for later determination of chlorophyll and nutrient content, using a bucket and a Niskin bottle. Ambient incident sunlight was measured with a Li-Cor Model LI-189 radiometer in Watts/m<sup>2</sup>. In conjunction with replicate trawls, CTD casts were deployed only to 50 m and no water samples were collected.

Zooplankton was sampled during all routine visits to each station, using conical nets hauled vertically and a bongo net system towed obliquely (Table 2). At each pass along a transect, vertical plankton hauls were retrieved from a depth of 20 m using a 50-cm frame, 243-micron mesh (Norpac) net. At Auke Bay station only, a WP2 net (202-micron mesh) sample was also hauled vertically from near bottom to the surface. At Auke Bay and at stations along the Icy Strait and Lower Clarence Strait transects, a 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, on one pass along these transects. General Oceanics flow meters were placed inside each of the bongo nets to determine the water volume sampled. A Vemco minilog data logger was used to record depth

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

and temperature for validation of maximum deployment depth of each bongo tow. Only the Norpac sample was collected during replicate trawling at Icy Strait and Middle Clarence Strait and at all passes along Upper Chatham and Middle Clarence Strait transects. All zooplankton samples were concentrated and preserved in 5% formalin-seawater solution for later laboratory analyses

### Trawl Sampling:

Sampling for fish was accomplished with 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 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, the fish caught were anaesthetized with tricaine methanesulfonate, identified, enumerated, measured, and stomachs sampled (if appropriate). The biomass of jellyfish retained by the net was estimated volumetrically and species were identified when possible. Fish were measured to the nearest mm fork length (FL) with a Limnoterra FMB IV electronic measuring board. A subsample of at least 50 specimens of each species was frozen in individually-labeled bags, for later laboratory analyses (see below). If available, a subsample of 60 unmeasured juvenile chum (*O. keta*) and 15 unmeasured juvenile pink (*O. gorbuscha*), salmon was also preserved in 10% formalin-seawater solution for later diet analyses; these fish were transferred to 50% isopropyl alcohol solution within a week of collection to maintain otoliths for stock identification. 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 species or major taxon and contribution estimated to the nearest 10% of total volume.

### Laboratory processing:

Data on settled volumes (SVs) of zooplankton in the 20-m vertical hauls and decoded CWTs of fish lacking adipose fins are included in this report. Laboratory processing in progress includes 1) measurement of weight and condition of juvenile salmon; 2) determination of energetic content from frozen samples of juvenile pink, chum (including separate stocks), and coho salmon; 3) examination for otolith thermal marks representing stocks of origin in frozen samples of juvenile chum, sockeye (*O. nerka*), coho, and chinook salmon; 4) scanning of all unclipped chinook and coho for possible presence of CWTs not indicated by lack of the adipose fin; 5) scale samples of each species of juvenile salmon; 6) determination of the stomach contents of

preserved juvenile pink and chum salmon (including separate stocks); 7) measurement of displacement volumes and gross taxonomic percent composition of all bongo net plankton samples; 8) zooplankton species composition and abundance from all bongo net samples; 9) determination of chlorophyll and nutrient concentrations from surface and 20-m water samples; and, 10) analysis of temperature-salinity-fluorescence profiles.

## RESULTS and DISCUSSION

All seventeen stations scheduled for sampling in the two regions of Southeast Alaska were sampled in July (Table 1). Standard oceanographic sampling and surface trawling were conducted according to the following schedule:

- Day 1: Transit from Juneau subport to southern Southeast Alaska (~200 nm);
- Day 2: Lower Clarence Strait (4 stations);
- Day 3: Middle Clarence Strait (4 stations);
- Day 4: Lower Clarence Strait (5 stations);
- Day 5: Lower Clarence Strait (8 stations);
- Day 6: Middle Clarence Strait (4 stations);
- Day 7: Transit north to Auke Bay, sample ABM (1 station), offload samples at ABL;
- Day 8: Upper Chatham Strait (4 stations);
- Day 9: Icy Strait (4 stations);
- Day 10: Icy Strait (5 stations);
- Day 11: Upper Chatham Strait (5 stations);
- Day 12: Icy Strait (5 stations), transit to Juneau subport;
- Day 13: Offload gear.

Oceanographic samples collected from the 17 stations included 48 CTD casts, 46 Norpac tows, 9 bongo tows (18 net samples preserved), and 34 water samples (Table 2). Fish were collected from 21 trawl hauls in SSE and 23 trawl hauls in NSE (Table 3).

Surface (3-m) temperatures ranged from 12.0 to 15.9°C and surface salinities ranged from 9.8 to 27.5 PSU in straits habitats (Table 2). Average temperatures were approximately 2°C warmer (~15°C vs. 13°C) and average salinity was higher (~24-26 PSU vs. 15-16 PSU) in the southern region compared to the northern region. Conditions in Auke Bay (ABM) were similar to those in the northern straits, 13.3°C and 16.5 PSU. Compared to June temperatures in 2005, July temperatures were warmer in SSE and cooler in NSE (see JC-05-08 June 2005 Cruise Report). This seasonal change in the strait habitats between regions reflects their proximities to major sources of freshwater, glacial melt and ocean moderation. Comparison of long-term average temperatures in straits in the northern region indicated that July 2005 was warmer than July of approximately half the years sampled since 1997 (1999-2002); only 2004 was warmer (data on file, ABL).

Data on zooplankton and jellyfish biomass are also compared between regions and transects in Table 2. Zooplankton biomass, as determined from SVs of the 20-m vertical tow samples, ranged from 1.8 to 34 ml in strait habitats. Average SVs were lower at transects in SSE (4-5 ml), than at

transects in NSE (~8-22 ml). Conversely, mean jellyfish biomass was much higher at transects in SSE (70-147 liters per trawl) than in NSE (22 liters per trawl). Jellyfish in SSE were principally the genera *Aurelia* and *Aequorea*, while *Cyanea* and *Chrysaora* were most prominent in NSE. Compared to June, average zooplankton SVs in July were lower in SSE and at least as high in NSE; similarly, estimated biomass of jellyfish in July declined by nearly half in SSE and increased in NSE (see JC-05-08 June 2005 Cruise Report).

Juvenile salmon were caught at all strait stations in July, in the majority of hauls conducted in both regions. Totals of 309 and 369 juvenile salmon were collected from the 21 and 23 rope trawl hauls each in SSE and NSE, respectively (Tables 3, 4, and 5). The adult and immature salmon caught included ten and 22 individuals in SSE and NSE, respectively, and were mainly pink salmon (Tables 3 and 4). Juvenile salmon were the most frequently occurring taxon, with pink, chum, and coho salmon each present in 46-78% of hauls per transect. Pink and chum were also the most abundant juvenile salmon, followed by coho salmon (Table 3). In SSE compared to NSE, 153 and 113 juvenile chum salmon, 86 and 119 juvenile pink salmon, and 49 and 106 juvenile coho salmon were caught. Juvenile sockeye salmon occurred in 44-57% of hauls, with total catches of 19 and 25; juvenile chinook salmon occurred in 8-29% of hauls with total catches of 2 individuals in SSE and 6 individuals in NSE (Table 5). Catches of juvenile salmon were lower than those in the previous month, for the third year in the history of the SECM project (see JC-05-08 June 2005 Cruise Report; data on file, ABL)

Seven taxa of non-salmonid teleosts were captured in the trawls, totaling 29 and 76 individuals in the SSE and NSE, respectively (Tables 4 and 5). The majority were pollock larvae (*Theragra chalcogramma*, n = 13), prowlfish (*Zaprora silenus*, n = 8) and spiny dogfish (*Squalus acanthias*, n = 8) in SSE and crested sculpin (*Blepsias bilobus*, n = 56) and prowlfish (n = 8) in NSE. Prowlfish occurred in 21-38% of hauls in each region, while crested sculpin occurred most frequently of all non-salmonids, in 78-79% of hauls only in the northern region.

Onboard stomach analysis was completed on 41 potential predators of juvenile salmon in July, including all maturing or adult salmon and all large non-salmonids except the salmon shark (Table 6). Guts of prowlfish and crested sculpin were not examined. No juvenile salmon prey were found in the guts of the seven species examined. The two species that were piscivorous, chinook (n = 3) and immature pollock (n = 2), had consumed sandlance (*Ammodytes hexapterus*, 88% prey weight) and lanternfish (Myctophidae, 95% prey weight), respectively. Pink salmon guts principally contained crab larvae (zoeae and megalopae, 60% prey weight overall), with pteropods and euphausiids as the next most prominent prey. Pink salmon were the only species with many specimens examined from both SSE (n = 8) and NSE (n = 15), and exhibited some regional differences in diet; pteropods were consumed only in NSE. The coho salmon (n = 1) had eaten euphausiids and the chum salmon (n = 3) had eaten mostly oikopleurans, while the one sockeye salmon gut was empty. The eight dogfish from SSE mainly preyed on squid (93% prey weight), although amphipods, euphausiids and fish were also present in the gut contents.

Stock identification information was readily available for salmon that lacked the adipose fin and contained CWTs. Of the seven salmon caught in July that lacked the adipose fin, all three chinook and two of the four coho contained CWTs (Table 8). All CWTs except one were from juveniles originating from localities within southeastern Alaska. The exception was a juvenile

chinook salmon from Blind Slough in the Lower Columbia River, recovered in Lower Clarence Strait. Also of note, three adipose-clipped juvenile salmon were caught in one haul at station UCD in the northern region. They included a chinook tagged at Port Armstrong on southern Baranof Island, a coho tagged in the Taku River, and a coho with no tag; the latter suggests an origin from the Pacific Northwest, where adipose fin clipping of juveniles from hatcheries is mandatory for management purposes. Many such clipped, but untagged coho were collected in the previous month (see JC-05-08 June 2005 Cruise Report), indicating that stocks originating from a broad region mix in the inside waters of both southern and northern Southeast Alaska.

Samples of juvenile pink and chum salmon were collected for comparative bioenergetics/process studies between the regions (Table 7). The numbers of juvenile chum salmon frozen for energy density measurements included 94 from SSE and 66 from NSE, compared to 59 and 46 juvenile chum salmon preserved from these regions for diet studies. The numbers of juvenile pink salmon included 63 and 80 frozen specimens vs. 23 and 37 preserved specimens from SSE and NSE, respectively. Laboratory analyses of these samples will ensue following identification of their stocks of origin from otolith thermal marks by contracted agencies.

#### **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 scheduled for oceanographic and biological sampling in the marine waters of the northern and southern regions of Southeast Alaska using the NOAA ship *John N. Cobb*, 20 July to 1 August, 2005. Distance between stations within transect is indicated in the “offshore distance” column.

Locality	Station	Latitude	Longitude	Offshore distance (km)	Bottom depth (m)
<b>Northern region</b>					
Auke Bay Monitor	ABM	58°22.00'N	134°40.00'W	1.5	60
Upper Chatham Strait	UCA	58°04.57'N	135°00.08'W	3.2	400
Upper Chatham Strait	UCB	58°06.22'N	135°00.91'W	6.4	100
Upper Chatham Strait	UCC	58°07.95'N	135°04.00'W	6.4	100
Upper Chatham Strait	UCD	58°09.64'N	135°02.52'W	3.2	200
Icy Strait	ISA	58°13.25'N	135°31.76'W	3.2	128
Icy Strait	ISB	58°14.22'N	135°29.26'W	6.4	200
Icy Strait	ISC	58°15.28'N	135°26.65'W	6.4	200
Icy Strait	ISD	58°16.38'N	135°23.98'W	3.2	234
<b>Southern region</b>					
Middle Clarence Strait	MCA	55°23.51'N	131°55.49'W	3.2	346
Middle Clarence Strait	MCB	55°24.26'N	131°58.23'W	6.4	439
Middle Clarence Strait	MCC	55°25.06'N	132°01.19'W	6.4	412
Middle Clarence Strait	MCD	55°25.79'N	132°03.93'W	3.2	461
Lower Clarence Strait	LCA	55°07.37'N	131°48.09'W	3.2	413
Lower Clarence Strait	LCB	55°07.32'N	131°51.09'W	6.4	459
Lower Clarence Strait	LCC	55°07.14'N	131°53.79'W	6.4	466
Lower Clarence Strait	LCD	55°06.93'N	131°56.79'W	3.2	315

Table 2.—Oceanographic data and biological samples collected at stations sampled in the marine waters of the southern and northern regions of southeastern Alaska using the NOAA ship *John N. Cobb*, during cruise JC-05-10 on 20 July to 1 August, 2005. Water samples for nutrient and chlorophyll analyses include surface and 20-m samples. Bongo samples include paired 333- and 505- $\mu$ m mesh nets. Mean temperature, salinity, incident light level, Secchi depth, 20-m Norpac volume, and jellyfish volume is indicated per transect, with depth of CTDs and the number of water and plankton samples collected. MD = missing data, NT = no trawling; asterisk denotes a replicate haul.

Station	Date	Haul number	Time	Temp. (°C)	Salinity (PSU)	Light (W/m <sup>2</sup> )	CTD (m)	Secchi (m)	Water samples	Bongo samples	Norpac samples	SV Norpac Zoop. (ml)	Jellyfish (liters)
<b>Southern region</b>													
<b>Lower Clarence Strait (LC)</b>													
LCA	21 July	9056	7:15	14.4	27.0	49	197	4	2	1	1	19.5	188
LCB	21 July	9057	9:40	14.9	27.0	155	200	3.5	2	1	1	4.5	173
LCC	21 July	9058	12:15	14.9	26.9	1050	200	5	2	1	1	3.0	150
LCD	21 July	9059	14:20	15.7	26.8	930	200	5	2	1	1	3.5	158
LCD	23 July	9067	7:55	15.1	26.3	167	50	5	0	0	1	4.0	233
LCC	23 July	9066	9:25	14.8	25.5	117	50	4	0	0	1	4.0	113
LCB	23 July	9065	11:00	14.9	25.8	137	50	5	0	0	1	3.5	98
LCA	23 July	9064	13:30	15.0	27.0	582	50	4	0	0	1	6.0	MD
LCC*	23 July	9068	15:20	15.2	27.5	530	50	4	0	0	1	4.5	65
LCD	24 July	9069	8:20	15.2	25.2	502	50	5	0	0	1	3.0	248
LCC	24 July	9070	9:55	15.3	25.2	652	50	4	0	0	1	5.0	120
LCB	24 July	9071	11:45	15.5	25.4	818	50	5	0	0	1	2.5	98
LCA	24 July	9072	13:00	15.9	25.3	838	50	4	0	0	1	1.8	120
LCD	24 July	9073	15:14	14.7	26.3	760	200	5	0	0	0	--	NT
LCC	24 July	9074	15:30	14.8	26.1	705	200	4.5	0	0	0	--	NT
LCB	24 July	9075	16:05	15.1	25.8	675	200	4	0	0	0	--	NT
LCA	24 July	9076	16:25	14.5	26.3	350	200	3.5	0	0	0	--	NT
<b>Subtotals, LC</b>				15.2	26.1	564	17	4	8	4	13	5.0	147



Station	Date	Haul number	Time	Temp. (°C)	Salinity (PSU)	Light (W/m <sup>2</sup> )	CTD (m)	Secchi (m)	Water samples	Bongo samples	Norpac samples	SV Norpac Zoop. (ml)	Jellyfish (liters)
<b>Middle Clarence Strait (MC)</b>													
MCD	22 July	9060	8:25	15.2	24.5	503	50	4	2	0	1	5.0	45
MCC	22 July	9061	10:00	15.0	24.8	639	50	4	2	0	1	4.0	90
MCB	22 July	9062	12:00	15.6	23.8	816	50	4.5	2	0	1	8.0	75
MCA	22 July	9063	13:40	15.3	25.7	785	50	4	2	0	1	6.0	83
MCA	25 July	9077	7:25	15.8	23.6	82	50	4	0	0	1	2.5	60
MCB	25 July	9078	9:00	15.7	23.5	248	50	4	0	0	1	3.0	60
MCC	25 July	9079	10:10	15.7	23.4	72	50	4.5	0	0	1	1.3	75
MCD	25 July	9080	12:05	15.6	24.5	258	50	4.5	0	0	1	3.0	75
<b>Subtotals, MC</b>				15.5	24.2	425	8	4.2	8	0	8	4	70
<b>Northern region</b>													
<b>Inshore</b>													
ABM	26 July	9081	12:45	13.3	16.5	108	45	4	2	1	3	11.8	NT
<b>Icy Strait (IS)</b>													
ISA	28 July	9086	7:25	12.5	14.0	180	90	4	2	1	1	34.0	5
ISB	28 July	9087	8:55	13.1	13.0	58	174	3	2	1	1	17.5	22
ISC	28 July	9088	12:30	13.4	16.3	259	200	3.5	2	1	1	14.0	30
ISD	28 July	9089	14:30	13.1	16.7	252	200	3.5	2	1	1	30.0	17
ISD	29 July	9090	7:45	13.1	16.7	37	50	4	0	0	1	19.0	9
ISC	29 July	9091	9:05	13.2	15.1	100	50	4	0	0	1	20.0	8
ISB	29 July	9092	11:00	13.2	15.6	374	50	4.5	0	0	1	20.0	15
ISA	29 July	9093	12:45	12.7	15.8	548	50	3	0	0	1	30.0	15
ISD*	29 July	9094	15:20	13.0	17.6	267	50	3.5	0	0	1	23.5	35
ISA	31 July	9100	7:35	12.4	18.8	88	90	4	0	0	1	21.0	15
ISB	31 July	9101	9:00	12.9	18.3	110	175	3	0	0	1	16.0	15
ISC	31 July	9102	10:25	13.4	17.5	204	200	4	0	0	1	19.0	38
ISD	31 July	9103	12:00	13.5	16.6	319	200	4.5	0	0	1	19.0	48
ISD*	31 July	9104	13:25	13.6	16.4	638	--	--	0	0	0	--	41
<b>Subtotals, IS</b>				13.1	16.3	245	13	3.7	8	4	13	21.8	22.4

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Station	Date	Haul number	Time	Temp. (°C)	Salinity (PSU)	Light (W/m <sup>2</sup> )	CTD (m)	Secchi (m)	Water samples	Bongo samples	Norpac samples	SV Norpac Zoop. (ml)	Jellyfish (liters)
<b>Upper Chatham Strait (UC)</b>													
UCD	27 July	9082	10:00	13.2	9.8	195	50	3	0	0	1	8.5	30
UCC	27 July	9083	12:00	13.0	10.4	100	50	4	0	0	1	8.0	15
UCB	27 July	9084	14:00	12.8	10.9	207	50	6	0	0	1	7.5	15
UCA	27 July	9085	15:45	12.0	11.6	134	50	5	0	0	1	6.5	15
UCD	30 July	9095	8:05	13.8	15.5	136	50	3.5	2	0	1	7.5	15
UCC	30 July	9096	9:30	13.6	17.1	339	50	4	2	0	1	8.5	15
UCB	30 July	9097	11:30	13.2	20.7	299	50	4	2	0	1	8.0	5
UCA	30 July	9098	13:20	12.7	20.6	642	50	4	2	0	1	9.5	6
UCD*	30 July	9099	15:05	12.9	16.7	334	50	4	0	0	1	9.0	22
<b>Subtotals, UC</b>				13.0	14.8	265	9	4.2	8	0	9	8.1	15.3

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Table 3.—Rope trawl catches of salmon at stations sampled in the marine waters of the southern and northern regions of southeastern Alaska, using the NOAA ship *John N. Cobb* during cruise JC-05-10, 20 July to 1 August, 2005. Asterisk denotes a replicate haul.

Station	Date	Haul number	Chum	Pink	Sockeye	Coho	Chinook	Subtotal, juvenile salmon	Chum (Adult)	Pink (Adult)	Sockeye (Adult)	Coho (Adult)	Chinook (Imm.)	Chinook (Adult)	Subtotal, imm/adult salmon
<b>Southern region</b>															
<b>Lower Clarence Strait (LC)</b>															
LCA	21 July	9056	74	67	0	5	0	146	0	0	0	0	0	0	0
LCB	21 July	9057	2	1	1	4	1	9	0	0	0	0	0	0	0
LCC	21 July	9058	4	0	2	0	0	6	0	2	0	0	0	0	2
LCD	21 July	9059	2	0	1	7	0	10	1	1	0	0	0	0	2
LCD	23 July	9067	0	0	0	3	0	3	0	0	0	0	0	0	0
LCC	23 July	9066	3	1	0	4	0	8	0	2	0	0	0	0	2
LCB	23 July	9065	10	2	4	0	0	16	0	0	0	0	0	0	0
LCA	23 July	9064	5	1	1	0	0	7	0	0	0	0	0	0	0
LCC*	23 July	9068	6	0	0	0	0	6	0	0	0	0	0	0	0
LCD	24 July	9069	0	0	0	0	0	0	0	0	0	0	0	0	0
LCC	24 July	9070	0	0	0	0	0	0	0	0	0	0	0	0	0
LCB	24 July	9071	2	0	0	2	0	4	0	0	0	0	0	0	0
LCA	24 July	9072	2	1	1	0	0	4	0	0	0	0	0	0	0
<b>Subtotals, LC</b>			110	73	10	25	1	219	1	5	0	0	0	0	6

Station	Date	Haul number	Chum	Pink	Sockeye	Coho	Chinook	Subtotal, juvenile salmon	Chum (Adult)	Pink (Adult)	Sockeye (Adult)	Coho (Adult)	Chinook (Imm.)	Chinook (Adult)	Subtotal, imm/adult salmon
<b>Middle Clarence Strait (MC)</b>															
MCD	22 July	9060	2	0	0	5	0	7	0	1	0	0	0	0	1
MCC	22 July	9061	8	2	4	10	0	24	0	2	0	0	0	0	2
MCB	22 July	9062	0	0	0	0	0	0	0	0	0	0	0	0	0
MCA	22 July	9063	19	3	4	1	0	27	0	0	0	0	0	0	0
MCA	25 July	9077	11	7	1	0	0	19	0	0	0	0	0	1	1
MCB	25 July	9078	0	0	0	6	1	7	0	0	0	0	0	0	0
MCC	25 July	9079	3	1	0	2	0	6	0	0	0	0	0	0	0
MCD	25 July	9080	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Subtotals, MC</b>			<b>43</b>	<b>13</b>	<b>9</b>	<b>24</b>	<b>1</b>	<b>90</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>4</b>
<b>Grand total, SSE</b>			<b>153</b>	<b>86</b>	<b>19</b>	<b>49</b>	<b>2</b>	<b>309</b>	<b>1</b>	<b>8</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>10</b>
<b>Northern region</b>															
<b>Icy Strait (IS)</b>															
ISA	28 July	9086	0	2	0	0	0	2	0	0	0	0	0	0	0
ISB	28 July	9087	0	0	0	0	0	0	0	0	0	0	0	0	0
ISC	28 July	9088	4	14	0	2	0	20	0	0	0	0	0	0	0
ISD	28 July	9089	14	1	1	2	1	19	0	0	0	0	0	0	0
ISD	29 July	9090	16	8	3	3	1	31	0	0	0	0	0	0	0
ISC	29 July	9091	10	4	1	2	0	17	1	1	1	0	0	0	3
ISB	29 July	9092	6	2	1	0	0	9	1	4	0	0	0	0	5
ISA	29 July	9093	2	16	1	6	1	26	0	0	0	0	1	0	1
ISD*	29 July	9094	0	0	1	3	0	4	0	0	0	0	0	0	0
ISA	31 July	9100	1	0	1	0	2	4	0	0	0	1	0	0	1
ISB	31 July	9101	0	1	0	3	0	4	0	0	0	0	0	0	0
ISC	31 July	9102	0	1	0	2	0	3	0	0	0	0	0	0	0
ISD	31 July	9103	4	7	0	6	0	17	0	0	0	0	1	0	1
ISD*	31 July	9104	1	5	1	5	0	12	0	0	0	0	0	0	0
<b>Subtotals, IS</b>			<b>58</b>	<b>61</b>	<b>10</b>	<b>34</b>	<b>5</b>	<b>168</b>	<b>2</b>	<b>5</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>11</b>

Station	Date	Haul number	Chum	Pink	Sockeye	Coho	Chinook	Subtotal, juvenile salmon	Chum (Adult)	Pink (Adult)	Sockeye (Adult)	Coho (Adult)	Chinook (Imm.)	Chinook (Adult)	Subtotal, imm/adult salmon
<b>Upper Chatham Strait (UC)</b>															
UCD	27 July	9082	10	9	4	16	1	40	0	3	0	0	0	0	3
UCC	27 July	9083	30	35	6	13	0	84	0	0	0	0	0	0	0
UCB	27 July	9084	3	3	1	0	0	7	0	0	0	0	0	0	0
UCA	27 July	9085	0	0	0	5	0	5	0	4	0	0	0	0	4
UCD	30 July	9095	11	10	4	5	0	30	0	2	0	0	0	0	2
UCC	30 July	9096	1	1	0	11	0	13	0	0	0	0	0	0	0
UCB	30 July	9097	0	0	0	13	0	13	0	0	0	0	0	0	0
UCA	30 July	9098	0	0	0	0	0	0	0	0	0	0	0	0	0
UCD*	30 July	9099	0	0	0	9	0	9	0	1	0	0	1	0	2
	<b>Subtotals, UC</b>		<b>55</b>	<b>58</b>	<b>15</b>	<b>72</b>	<b>1</b>	<b>201</b>	<b>0</b>	<b>10</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>11</b>
	<b>Grand total, NSE</b>		<b>113</b>	<b>119</b>	<b>25</b>	<b>106</b>	<b>6</b>	<b>369</b>	<b>2</b>	<b>15</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>0</b>	<b>22</b>

Table 4.—Juvenile, immature, and adult salmon, and non-salmonid catches, from 44 rope trawl hauls using the NOAA ship *John N. Cobb* in the marine waters of the southern and northern regions of southeastern Alaska, 20 July to 1 August, 2005. Asterisk denotes a replicate haul.

Station	Date	Haul number	Subtotal, juvenile salmon	Subtotal, imm./ad. salmon	Crested sculpin	Prowfish	Salmon shark	Spiny lump sucker	Spiny dogfish	Walleye pollock	Walleye pollock larvae	Wolf-eel	Subtotal, non-salmonids	Total Fish
<b>Southern region</b>														
<b>Lower Clarence Strait (LC)</b>														
LCA	21 July	9056	146	0	0	2	0	0	0	0	4	0	6	152
LCB	21 July	9057	9	0	0	0	0	0	0	0	0	0	0	9
LCC	21 July	9058	6	2	0	0	0	0	1	0	3	0	4	12
LCD	21 July	9059	10	2	0	0	0	0	0	0	3	0	3	15
LCD	23 July	9067	3	0	0	1	0	0	0	0	1	0	2	5
LCC	23 July	9066	8	2	0	0	0	0	3	0	1	0	4	14
LCB	23 July	9065	16	0	0	0	0	0	0	0	0	0	0	16
LCA	23 July	9064	7	0	0	1	0	0	2	0	0	0	3	10
LCC*	23 July	9068	6	0	0	0	0	0	0	0	1	0	1	7
LCD	24 July	9069	0	0	0	0	0	0	0	0	0	0	0	0
LCC	24 July	9070	0	0	0	0	0	0	2	0	0	0	2	2
LCB	24 July	9071	4	0	0	0	0	0	0	0	0	0	0	4
LCA	24 July	9072	4	0	0	0	0	0	0	0	0	0	0	4
<b>Subtotals, LC</b>			219	6	0	4	0	0	8	0	13	0	25	250
<b>Middle Clarence Strait (MC)</b>														
MCD	22 July	9060	7	1	0	0	0	0	0	0	0	0	0	8
MCC	22 July	9061	24	2	0	0	0	0	0	0	0	0	0	26
MCB	22 July	9062	0	0	0	1	0	0	0	0	0	0	1	1
MCA	22 July	9063	27	0	0	2	0	0	0	0	0	0	2	29
MCA	25 July	9077	19	1	0	1	0	0	0	0	0	0	1	21
MCB	25 July	9078	7	0	0	0	0	0	0	0	0	0	0	7
MCC	25 July	9079	6	0	0	0	0	0	0	0	0	0	0	6
MCD	25 July	9080	0	0	0	0	0	0	0	0	0	0	0	0
<b>Subtotals, MC</b>			90	4	0	4	0	0	0	0	0	0	4	98
<b>Grand total SSE</b>			<b>309</b>	<b>10</b>	<b>0</b>	<b>8</b>	<b>0</b>	<b>0</b>	<b>8</b>	<b>0</b>	<b>13</b>	<b>0</b>	<b>29</b>	<b>348</b>

Station	Date	Haul number	Subtotal, juvenile salmon	Subtotal, imm./ad. salmon	Crested sculpin	Prowfish	Salmon shark	Spiny lumpsucker	Spiny dogfish	Walleye pollock	Walleye pollock larvae	Wolf-eel	Subtotal, non-salmonids	Total Fish
<b>Northern region</b>														
<b>Icy Strait (IS)</b>														
ISA	28 July	9086	2	0	0	0	0	0	0	0	0	0	0	2
ISB	28 July	9087	0	0	0	1	0	0	0	0	0	0	1	1
ISC	28 July	9088	20	0	3	0	0	0	0	0	0	0	3	23
ISD	28 July	9089	19	0	2	0	0	0	0	0	0	0	2	21
ISD	29 July	9090	31	0	1	0	0	0	0	0	0	0	1	32
ISC	29 July	9091	17	3	1	0	0	0	0	0	0	0	1	21
ISB	29 July	9092	9	5	5	0	0	0	0	1	0	0	6	20
ISA	29 July	9093	26	1	2	0	1	1	0	0	0	1	5	32
ISD*	29 July	9094	4	0	3	0	0	0	0	0	0	1	4	8
ISA	31 July	9100	4	1	0	1	0	0	0	1	0	0	2	7
ISB	31 July	9101	4	0	2	0	0	0	0	0	0	0	2	6
ISC	31 July	9102	3	0	3	2	0	0	0	0	0	0	5	8
ISD	31 July	9103	17	1	11	0	0	0	0	0	0	0	11	29
ISD*	31 July	9104	12	0	1	0	0	0	0	0	0	0	1	13
<b>Subtotals, IS</b>			168	11	34	4	1	1	0	2	0	2	44	223
<b>Upper Chatham Strait (UC)</b>														
UCD	27 July	9082	40	3	9	2	0	0	0	0	1	0	12	55
UCC	27 July	9083	84	0	3	0	0	0	0	0	0	2	5	89
UCB	27 July	9084	7	0	1	0	0	0	0	0	1	0	2	9
UCA	27 July	9085	5	4	6	0	0	0	0	0	0	0	6	15
UCD	30 July	9095	30	2	0	0	0	0	0	0	0	0	0	32
UCC	30 July	9096	13	0	0	0	0	0	0	0	0	0	0	13
UCB	30 July	9097	13	0	1	1	0	0	0	0	1	0	3	16
UCA	30 July	9098	0	0	1	0	0	0	0	0	1	0	2	2
UCD*	30 July	9099	9	2	1	1	0	0	0	0	0	0	2	13
<b>Subtotals, UC</b>			201	11	22	4	0	0	0	0	4	2	32	244
<b>Grand total NSE</b>			<b>369</b>	<b>22</b>	<b>56</b>	<b>8</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>4</b>	<b>4</b>	<b>76</b>	<b>467</b>

Table 5.—Frequency of occurrence (FO) and %FO of fish caught in 44 rope trawl hauls using the *John N. Cobb* in the marine waters of the southern and northern regions of southeastern Alaska, 20 July to 1 August, 2005. The number of hauls per transect is shown in parentheses.

Species	Southern region				Northern region			
	Lower Clarence Strait (13)		Middle Clarence Strait (8)		Icy Strait (14)		Upper Chatham Strait (9)	
	FO	%FO	FO	%FO	FO	%FO	FO	%FO
<b>Juvenile salmon</b>								
Chum	10	76.9	5	62.5	9	64.3	5	55.6
Pink	6	46.2	4	50.0	11	78.6	5	55.6
Sockeye	6	46.2	3	37.5	8	57.1	4	44.4
Coho	6	46.2	5	62.5	10	71.4	7	77.8
Chinook	1	7.7	1	12.5	4	28.6	1	11.1
<b>Immature and adult salmon</b>								
Chum (Adult)	1	7.7	0	0.0	2	14.3	0	0.0
Pink (Adult)	3	23.1	2	25.0	2	14.3	4	44.4
Sockeye (Adult)	0	0.0	0	0.0	1	7.1	0	0.0
Coho (Adult)	0	0.0	0	0.0	1	7.1	0	0.0
Chinook (Imm.)	0	0.0	0	0.0	2	14.3	1	11.1
Chinook (Adult)	0	0.0	1	12.5	0	0.0	0	0.0
<b>Non-salmonids</b>								
		0.0						
Crested sculpin	0	0.0	0	0.0	11	78.6	7	77.8
Prowfish	3	23.1	3	37.5	3	21.4	3	33.3
Salmon shark	0	0.0	0	0.0	1	7.1	0	0.0
Spiny lumpsucker	0	0.0	0	0.0	1	7.1	0	0.0
Spiny dogfish	4	30.8	0	0.0	0	0.0	0	0.0
Walleye pollock juv.	0	0.0	0	0.0	2	14.3	0	0.0
Walleye pollock larvae	6	46.2	0	0.0	0	0.0	4	44.4
Wolf-eel	0	0.0	0	0.0	2	14.3	1	11.1



Table 6.—Length (minimum, maximum, mean and standard deviation, SD, of fork length) and life history stage of fish measured from 44 rope trawl hauls using the NOAA ship *John N. Cobb* in the marine waters of the southern and northern regions of southeastern Alaska, 20 July to 1 August, 2005. Life history stage abbreviations are: L = larval fish, J = juvenile in first year at sea, I = immature, and A = mature adult.

Common name	Genus and species or Family	Number measured	Life history stage	Min length (mm)	Max length (mm)	Mean length (mm)	SD length (mm)
<b>Southern region</b>							
<b>Lower Clarence Strait</b>							
Pink	<i>Oncorhynchus gorbuscha</i>	58	J	101	152	12	10
Chum	<i>O. keta</i>	65	J	103	189	13	13
Sockeye	<i>O. nerka</i>	10	J	125	161	139	10
Coho	<i>O. kisutch</i>	25	J	164	242	207	20
Chinook	<i>O. tshawytscha</i>	1	J	252	252	252	
Pink	<i>O. gorbuscha</i>	5	A	473	555	503	32
Chum	<i>O. keta</i>	1	I	702	702	702	
Walleye pollock	<i>Theragra chalcogramma</i>	13	I	50	65	58	4
Prowfish	<i>Zaprora silenus</i>	4	J	53	106	80	22
Spiny dogfish	<i>Squalus acanthias</i>	8	A	490	745	609	77
<b>Middle Clarence Strait</b>							
Pink	<i>O. gorbuscha</i>	13	J	105	133	119	10
Chum	<i>O. keta</i>	43	J	91	168	122	13
Sockeye	<i>O. nerka</i>	9	J	119	152	133	12
Coho	<i>O. kisutch</i>	24	J	177	233	197	13
Chinook	<i>O. tshawytscha</i>	1	J	187	187	187	
Pink	<i>O. gorbuscha</i>	3	A	465	545	493	45
Chinook	<i>O. tshawytscha</i>	1	A	635	635	635	
Prowfish	<i>Z. silenus</i>	4	J	66	106	88	19
<b>Northern region</b>							
<b>Icy Strait</b>							
Pink	<i>O. gorbuscha</i>	59	J	104	196	134	17
Chum	<i>O. keta</i>	57	J	99	173	126	16
Sockeye	<i>O. nerka</i>	10	J	93	165	119	27
Coho	<i>O. kisutch</i>	34	J	162	243	205	18
Chinook	<i>O. tshawytscha</i>	5	J	205	271	244	27
Pink	<i>O. gorbuscha</i>	5	A	450	552	501	40
Chum	<i>O. keta</i>	2	A	580	592	586	9
Sockeye	<i>O. nerka</i>	1	A	647	647	647	
Coho	<i>O. kisutch</i>	1	A	608	608	608	
Chinook	<i>O. tshawytscha</i>	1	I	305	305	305	
Chinook	<i>O. tshawytscha</i>	1	A	655	655	655	
Walleye pollock	<i>T. chalcogramma</i>	2	I	295	318	307	16

Common name	Genus and species or Family	Number measured	Life history stage	Min length (mm)	Max length (mm)	Mean length (mm)	SD length (mm)
Prowfish	<i>Z. silenus</i>	4	J	85	113	102	13
Crested sculpin	<i>Blepsias bilobus</i>	33	J	94	149	114	14
Sp. lumpsucker	<i>Eumicrotremus orbis</i>	1	J	49	49	49	
Wolf-eel	<i>Anarrhichthys ocellatus</i>	2	J	375	450	413	53
Salmon shark	<i>Lamna ditropis</i>	1	A	1960	1960	1960	
<b>Upper Chatham Strait</b>							
Pink	<i>O. gorbuscha</i>	58	J	104	182	125	13
Chum	<i>O. keta</i>	55	J	95	163	127	16
Sockeye	<i>O. nerka</i>	15	J	76	156	108	23
Coho	<i>O. kisutch</i>	72	J	153	258	211	23
Chinook	<i>O. tshawytscha</i>	1	J	296	296	296	
Pink	<i>O. gorbuscha</i>	10	A	505	620	535	39
Chinook	<i>O. tshawytscha</i>	1	I	408	408	408	
Walleye Pollock	<i>T. chalcogramma</i>	3	I	43	50	46	4
Prowfish	<i>Z. silenus</i>	4	J	79	111	95	13
Crested sculpin	<i>B. bilobus</i>	22	J	88	130	112	13
Wolf-eel	<i>A. ocellatus</i>	2	J	417	420	419	2

Table 7.— Numbers of juvenile salmon frozen for calorimetry or preserved for diet studies, collected in the marine waters of two regions of southeastern Alaska, 20 July to 1 August, 2005.

Station	Date	Haul number	Frozen samples		Preserved samples	
			Juv. chum	Juv. pink	Juv. chum	Juv. pink
<b>Southern region</b>						
<b>Lower Clarence Strait</b>						
LCA	21 July	9056	29	52	45	15
LCB	21 July	9057	2	1	0	0
LCC	21 July	9058	4	0	0	0
LCD	21 July	9059	2	0	0	0
LCA	23 July	9064	5	1	0	0
LCB	23 July	9065	10	2	0	0
LCC	23 July	9066	3	1	0	0
LCC	23 July	9068	6	0	0	0
LCA	24 July	9072	2	1	0	0
LCB	24 July	9071	2	0	0	0
	<b>Subtotal, LC</b>		65	58	45	15
<b>Middle Clarence Strait</b>						
MCA	22 July	9063	19	3	0	0
MCC	22 July	9061	8	2	0	0
MCD	22 July	9060	2	0	0	0
MCA	25 July	9077	0	0	11	7
MCC	25 July	9079	0	0	3	1
	<b>Subtotal, MC</b>		29	5	14	8
<b>Northern region</b>						
<b>Icy Strait</b>						
ISA	28 July	9086	0	2	0	0
ISC	28 July	9088	4	14	0	0
ISD	28 July	9089	13	1	0	0
ISA	29 July	9093	2	15	0	0
ISB	29 July	9092	6	1	0	0
ISC	29 July	9091	10	4	0	0
ISD	29 July	9090	16	8	0	0
ISA	31 July	9100	1	0	0	0
ISB	31 July	9101	0	1	0	0
ISC	31 July	9102	0	1	0	0
ISD	31 July	9103	0	0	4	7
ISD	31 July	9104	0	0	1	5
	<b>Subtotal, IS</b>		52	47	5	12
<b>Upper Clarence Strait</b>						
UCB	27 July	9084	3	3	0	0
UCC	27 July	9083	0	20	30	15
UCD	27 July	9082	10	9	0	0
UCC	30 July	9096	1	1	0	0
UCD	30 July	9095	0	0	11	10
	<b>Subtotal, UC</b>		14	33	41	25
<b>Total</b>			160	143	105	60

Table 8.—Release and recovery information for salmon that were caught in rope trawl hauls using the NOAA ship *John N. Cobb* in two regions of southeastern Alaska, 20 July to 1 August 2005, and that lacked the adipose fin, indicating presence of a coded-wire tag. Numbers of fish is in parentheses. Agency acronym definitions are: ADFG = Alaska Department of Fish and Game, ARMK = Armstrong Keta Hatchery, DIPAC = Douglas Island Pink and Chum Corporation, NSRAA = Northern Southeast Regional Aquaculture Association, SSRAA = Southern Southeast Regional Aquaculture Association, ODFW = Oregon Department of Fish and Wildlife, WDFW = Washington Department of Fish and Wildlife, and QUIN = Quinault Indian Nation. ND = no data.

Haul num.	Fish number	Tag code	Agency	Release information				Recovery information					
				Brood year	Release date	Release locality	Release size (g)	Recov. date	Recov. station	Recov. size (g)	Recov. size (mm)	Days out	
<b>Southern region</b>													
<b>Chinook (1)</b>													
9057	1	09:39/32	ODFW	2003	4/4/05	Blind Slough, L. Columbia R.	13.2	7/21/05	LCB	183.7	252	108	
<b>Coho (1)</b>													
9066	1	No tag						7/23/05	LCC	139.2	225		
<b>Northern region</b>													
<b>Chinook (2)</b>													
9100	1	03:22/69	NMFS	2003	5/19/05	Little Port Walter	24.0	7/31/05	ISA	17.0	231	73	
9082	1	04:09/53	ARMK	2003	5/21/05	Port Armstrong 109-10	52.8	7/27/05	UCD	352.3	296	67	
<b>Coho (3)</b>													
9082	2	04:10/11	ADFG	2003	5/15/05	Canyon Island, Taku River	10.7	7/27/05	UCD	118.5	210	73	
9082	3	No tag						7/27/05	UCD	105.1	206		
9104	8	04:11/33	ADFG	2003	4/26/05	Chilkat River (W) 115-32		7/31/05	ISD	104.8	208	96	

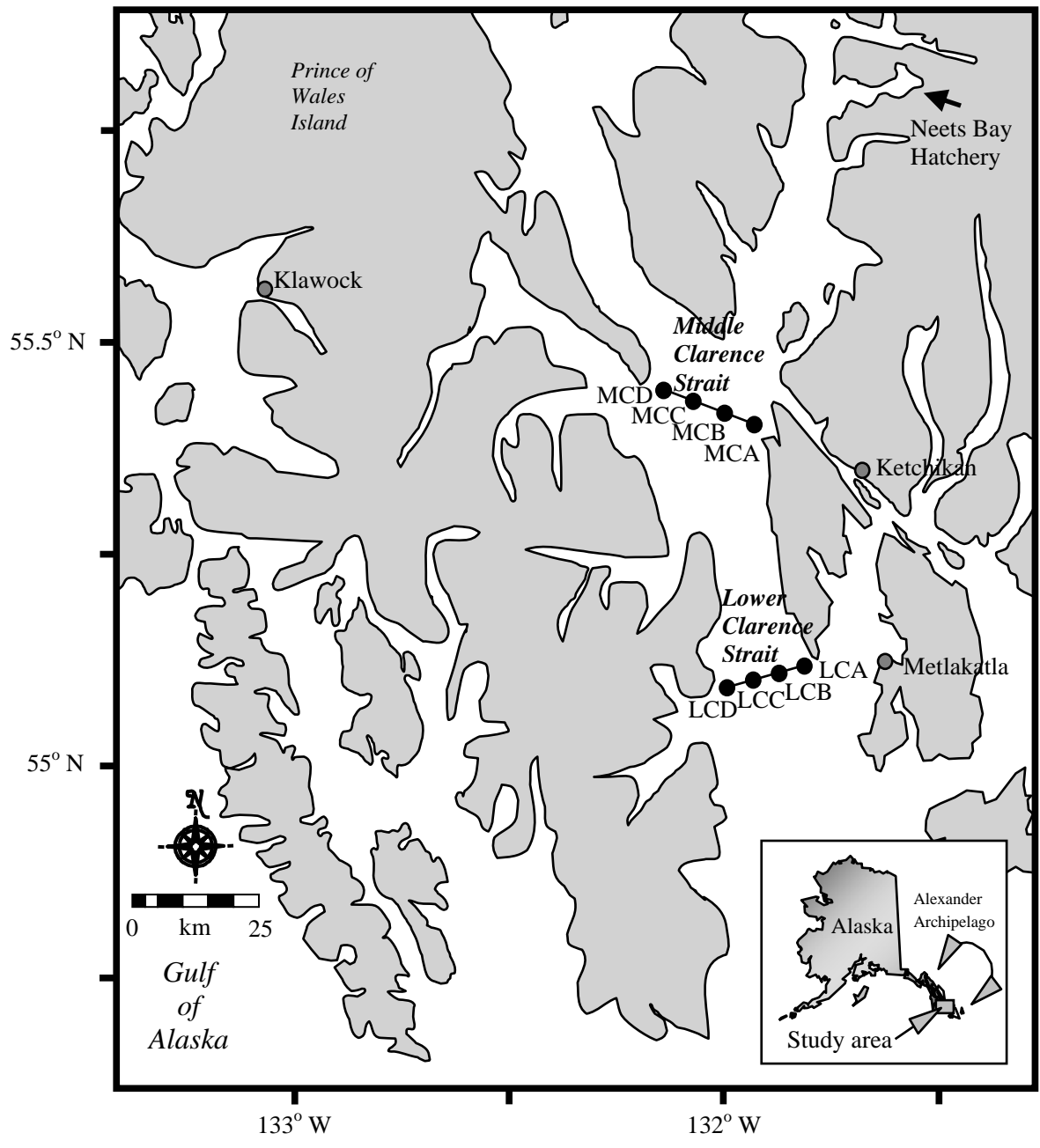


Figure 1. — Lower and Middle Clarence Strait stations sampled July 20 to August 3 in marine waters of the southern region of southeastern Alaska, 2005.

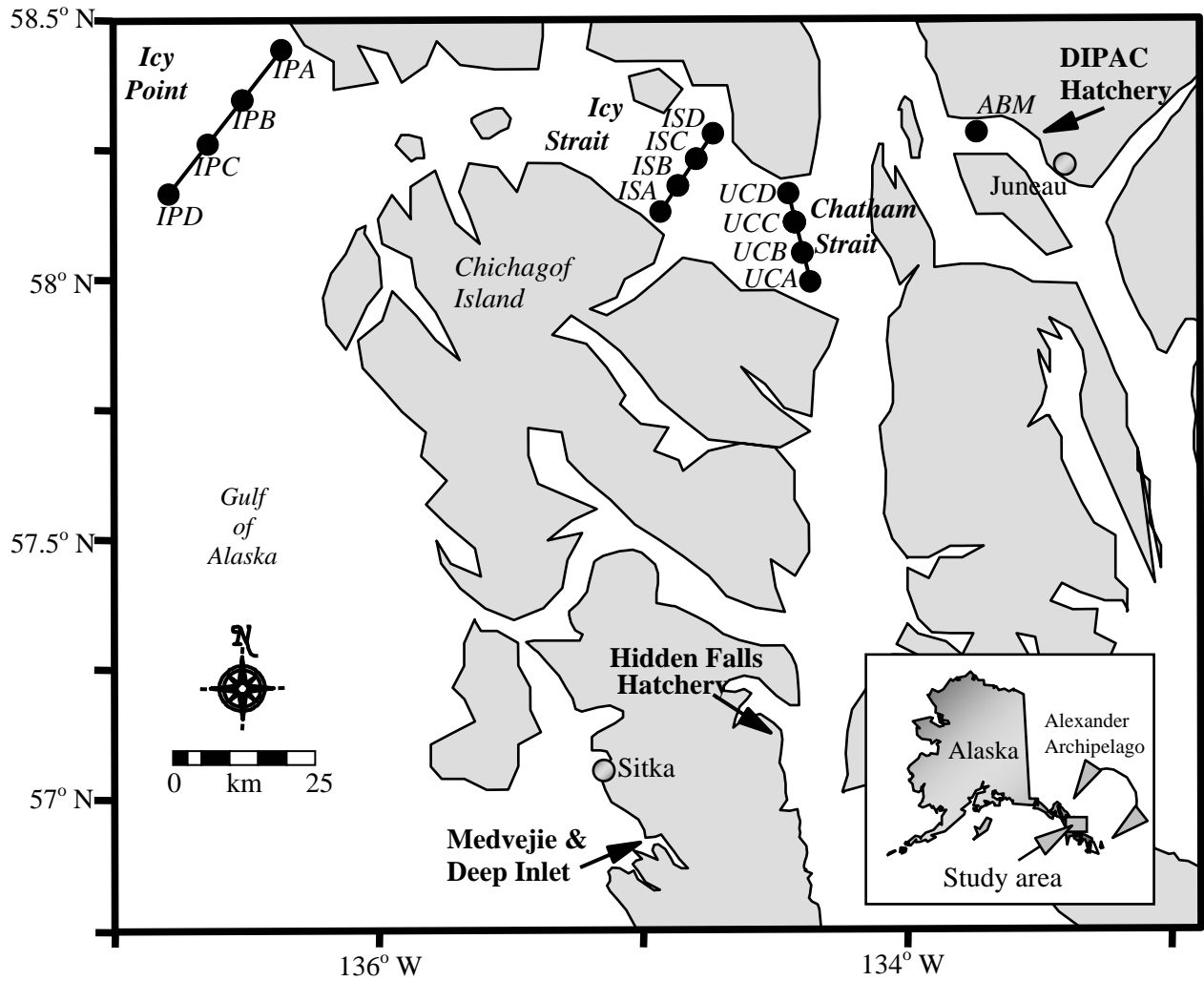


Figure 2.—Icy Strait and Upper Chatham Strait stations sampled from July 20 to August 1 in the marine waters of the northern region of southeastern Alaska, 2005.