

# Southeast Alaska Coastal Monitoring Project

JC-05-12 August 2005 Cruise Report

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Prepared by

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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 cruise JC-05-12, scheduled for 23-29 August, 2005, aboard the NOAA ship *John N. Cobb* in the marine waters of Southeast Alaska. This cruise was part of the Southeast Alaska Coastal Monitoring (SECM) project, and was the last 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 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 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. 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. Ultimately, the information from SECM will contribute to implementing the Ecosystem Approach to Management, EAM, for salmon and other managed 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 was successfully sampled for biological oceanographic information only in May, and no trawling was scheduled for this habitat. 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). Cruise reports of the May (JC-05-06), June (JC-05-08) and July (JC-05-10) cruises have previously been compiled.

General objectives of the August cruise were 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 northern region of Southeast Alaska; ; 2) collect physical and biological oceanographic data in these regions to evaluate responses of fishes and other marine organisms to climatic and environmental change; 3) conduct process studies focusing on bioenergetics and trophic interactions of juvenile salmon in these regions; and, 4) use any extra time available to collect squid samples by jigging at night offshore in the vicinity of Icy Point or nearshore in the vicinity of False Point Retreat.

## METHODS

Thirteen stations were scheduled for sampling during the August 2005 cruise (Table 1, Figure 1), including inshore, strait and coastal habitats. Standard sampling was scheduled at Auke Bay (ABM), along two transects with four stations each in Upper Chatham Strait and Icy Strait in the northern region of Southeast Alaska (NSE), and along a coastal transect off Icy Point. Standard sampling included oceanographic measurements at all stations and trawling at stations in Icy and Upper Chatham Strait only. Nocturnal jigging for squid was planned while drifting near False Point Retreat and Hawk Inlet as a piggyback sampling project.

### 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>.

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 transect, 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.

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

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 and temperature for validation of maximum deployment depth of each bongo tow. 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 24 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 juvenile salmon species was frozen in individually-labeled bags, for later laboratory analyses (see below). No subsamples were preserved in August. 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.

For the piggyback squid project, the general methodology was to jig with various gear from the vessel at night. Oceanographic measurements consisted only of a CTD cast to 200 m depth.

### 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) measurement of displacement volumes and gross taxonomic percent composition of all bongo net plankton samples; 7) zooplankton species

composition and abundance from all bongo net samples; 8) determination of chlorophyll and nutrient concentrations from surface and 20-m water samples; and, 9) analysis of temperature-salinity-fluorescence profiles.

## **RESULTS and DISCUSSION**

Nine of thirteen stations scheduled for sampling in the northern region of Southeast Alaska (NSE) were sampled in August, 2005 (Table 1), and two auxiliary areas were sampled with alternate gear. Inclement weather prohibited the sampling scheduled at Icy Point, however, which shortened the cruise by one day. Standard oceanographic sampling and surface trawling, as well as jigging, were conducted according to the following schedule:

- Day 1: Transit from Juneau subport to Auke Bay, sample ABM; transit to Chatham Strait;
- Day 2: Sample Upper Chatham Strait (4 stations);
- Day 3: Sample Icy Strait (4 stations); transit to Auke Bay to drop off 2 of scientific party;
- Day 4: Transit and sample near False Point Retreat (jig) for squid at night;
- Day 5: Sample near Hawk Inlet (jig) for squid at night; transit to Juneau subport;
- Day 6: Offload supplies.

Oceanographic samples collected from the 11 stations included 11 CTD casts, 11 Norpac tows, 4 bongo tows (8 net samples preserved), and 9 water samples (Table 2). Four trawl hauls were made at each of the two transects (Table 3).

Surface (3-m) temperatures ranged from 9.6 to 14.5°C and surface salinities ranged from 16.5 to 24.4 PSU in straits habitats (Table 2). The Auke Bay station had the warmest temperature (14.5°C) and lowest salinity (16.5 PSU). Temperatures varied across the two transects by as much as 3°C; the average temperature at Upper Chatham Strait was warmer than at Icy Strait (11.8°C vs. 11.1°C), but average salinities were identical (23.2 PSU). Thus, in August, average temperatures in straits of NSE were 1-2°C cooler and salinities were lower than in July, 2005 (see JC-05-10 July 2005 Cruise Report).

Estimates of zooplankton and jellyfish biomass are also compared between transects in Table 2. Zooplankton biomass, as determined from SVs of the 20-m vertical tow samples, ranged from 4 to 23 ml in strait habitats. Mean SVs were 24.5 ml at ABM, 12.3 ml in Icy Strait and 3.9 ml in Upper Chatham Strait. Jellyfish biomass retained in the trawls ranged from 7 to 52 liters; mean jellyfish biomass was similar along the two transects, 22.7 liters in Icy Strait and 26.8 liters in Upper Chatham Strait. Zooplankton SVs and jellyfish biomass were similar to the mean amounts observed along these transects in July.

Juvenile salmon were caught at all eight strait stations in August, 2005. Totals of 309 and 346 juvenile salmon were collected from four rope trawl hauls each in Icy Strait and Upper Chatham Strait, respectively (Tables 3, 4, and 5). Five adult salmon were caught in Upper Chatham Strait only, including three pink, one chum, and one Chinook salmon (Tables 3, 4, and 6). Juvenile pink, chum, and coho salmon were present in every haul on the transects. Pinks were the most

abundant species, with 221 and 276 individuals captured in the two straits. Catches of pink salmon of this magnitude in August are unusual. This is the highest August CPUE for juvenile pink salmon in the nine-year history of SECM sampling, and is the only year in which CPUE for pinks was highest in August. Totals of 97 juvenile chum salmon, 44 juvenile coho, 15 juvenile sockeye, and 2 juvenile Chinook were also caught.

Four taxa of non-salmonid teleosts were captured in the trawls in August, totaling eleven individuals (Tables 4 and 5). Crested sculpin (*Blepias bilobus*) constituted the majority in both Icy and Upper Chatham Straits (n = 3 and 5, respectively). A prowlfish (*Zaprora silenus*), a Pacific spiny lumpsucker (*Eumicrotremus orbis*), and a wolf-eel (*Anarrhichthys ocellatus*) were also caught at one of the two transects.

Onboard stomach analysis was completed on five potential predators of juvenile salmon in August, including all adult salmon (see Tables 3 and 6). No juvenile salmon prey were found in any of their guts. The pink salmon, however, were piscivorous, with total prey weight composed of 88.5% lanternfish (Myctophidae) and 11.5% northern smoothtongue (*Leuroglossus stilbius schmidtii*); these food habits suggest nocturnal feeding on vertically-migrating fish species. Both the chum and the Chinook salmon had only amphipods in their guts.

Stock identification information was readily available for the single coho salmon caught in August that lacked the adipose fin and contained a CWT. This fish was caught on August 25 in Icy Strait (haul 9111, station ISB). Upon capture, it was 259 mm FL and weighed 199.3 g, compared to 15.3 g weight upon release on June 10 by DIPAC Sheep Creek facility near Juneau. In contrast to June and July cruises this year (see JC-05-08 June and JC-05-10 July Cruise Reports), in August, no clipped fish without tags were caught to indicate the presence of fish that originated in the Pacific Northwest, where adipose fin clipping of juveniles from hatcheries is mandatory for management purposes.

During the last two days of this cruise, nocturnal sampling for squid was attempted by three people using squid and herring jigs for approximately three hours, while the vessel was allowed to drift with the night light on. Catches (dipnetted) consisted of one herring (*Clupea pallasii*) and one young-of-the-year stickleback (*Gasterosteus aculeatus*) on 26 August, and no fish on 27 August; no squid were caught, but one individual was observed swimming away at the surface.

## 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 region of Southeast Alaska using the NOAA ship *John N. Cobb*, 23 to 28 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>Inshore</b>					
Auke Bay Monitor	ABM	58°22.00'N	134°40.00'W	1.5	60
<b>Coastal</b>					
Icy Point	IPA	58° 20.12'N	137° 07.16'W	6.9	—
Icy Point	IPB	58° 12.71'N	137° 16.96'W	23.4	16.8
Icy Point	IPC	58° 05.28'N	137° 26.75'W	40.2	16.8
Icy Point	IPD	57° 53.50'N	137° 42.60'W	65.0	24.8
<b>Strait</b>					
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
False Point Retreat	FPR	58°22.5 'N	134°58.5 'W	--	--
Hawk Inlet	HKI	58°10.0 'N	134°47.0 'W	--	--

Table 2.—Oceanographic data and biological samples collected at stations sampled in the marine waters of northern southeastern Alaska using the NOAA ship *John N. Cobb*, during cruise JC-05-12 on 23 to 28 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. ND = no data.

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>Northern region</b>													
<b>Inshore</b>													
ABM	23 Aug	9105	14:30	14.5	16.5	170	50	3	1	1	3	24.5	ND
FPR	26 Aug	9114	23:30	14.0	20.0	0	200	3	0	0	0	ND	ND
HI	27 Aug	9115	23:30	12.4	23.7	0	200	4	0	0	0	ND	ND
<b>Icy Strait (IS)</b>													
ISA	25 Aug	9110	8:20	9.6	22.8	30	100	3	1	1	1	10.0	10.0
ISB	25 Aug	9111	10:20	9.9	22.0	118	170	3	1	1	1	23.0	15.2
ISC	25 Aug	9112	13:00	12.3	23.7	101	189	5	1	1	1	4.0	35.0
ISD	25 Aug	9113	15:15	12.5	24.4	73	180	2	1	1	1	12.0	30.5
<b>Subtotals, IS</b>				11.1	23.2	80.5	--	3.3	4	4	4	12.3	22.7
<b>Upper Chatham Strait (UC)</b>													
UCA	24 Aug	9106	7:45	10.3	23.8	8	50	4	0	0	1	3.0	7.0
UCB	24 Aug	9107	9:20	11.1	22.9	20	50	4	0	0	1	2.0	17.5
UCC	24 Aug	9108	11:47	12.6	22.2	28	50	5	0	0	1	5.5	52.0
UCD	24 Aug	9109	15:40	13.0	23.7	56	50	3	0	0	1	5.0	30.7
<b>Subtotals, UC</b>				11.8	23.2	28.1	--	4.0	5	0	4	3.9	26.8

Table 3.—Rope trawl catches of salmon at stations sampled in the marine waters of the northern region of southeastern Alaska, using the NOAA ship *John N. Cobb* during JC-05-12 on 23 to 28 August, 2005.

Station	Date	Haul number	Chum	Pink	Sockeye	Coho	Chinook	Subtotal, juvenile salmon	Chum (adult)	Chinook (adult)	Pink (adult)	Subtotal, adult salmon,
<b>Icy Strait (IS)</b>												
ISA	25 Aug	9110	7	34	1	6	0	48	0	0	0	0
ISB	25 Aug	9111	20	101	0	12	0	133	0	0	0	0
ISC	25 Aug	9112	24	78	4	6	1	113	0	0	0	0
ISD	25 Aug	9113	5	8	0	1	1	15	0	0	0	0
	<b>Subtotals, IS</b>		<b>56</b>	<b>221</b>	<b>5</b>	<b>25</b>	<b>2</b>	<b>309</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Upper Chatham Strait (UC)</b>												
UCA	24 Aug	9106	0	1	0	7	0	8	0	1	0	1
UCB	24 Aug	9107	15	176	9	6	0	206	0	0	0	0
UCC	24 Aug	9108	20	79	1	2	0	102	1	0	0	1
UCD	24 Aug	9109	6	20	0	4	0	30	0	0	3	3
	<b>Subtotals, UC</b>		<b>41</b>	<b>276</b>	<b>10</b>	<b>19</b>	<b>0</b>	<b>346</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>5</b>
	<b>Grand total</b>		<b>98</b>	<b>498</b>	<b>15</b>	<b>43</b>	<b>2</b>	<b>656</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>5</b>



Table 4.—Juvenile, immature, and adult salmon, and non-salmonid catches, from eight rope trawl hauls using the NOAA ship *John N. Cobb* in the marine waters of the northern region of southeastern Alaska, during JC-05-12 on 23 to 28 August, 2005.

Station	Date	Haul number	Subtotal, juvenile salmon	Subtotal, adult salmon	Crested sculpin	Prowfish	Spiny lump sucker	Wolf-eel	Subtotal, non-salmonids	Total fish
<b>Icy Strait (IS)</b>										
ISA	25 Aug	9110	48	0	1	0	1	0	2	50
ISB	25 Aug	9111	133	0	0	0	0	0	0	133
ISC	25 Aug	9112	113	0	2	0	0	0	2	115
ISD	25 Aug	9113	15	0	0	0	0	0	0	15
<b>Subtotals, IS</b>			<b>309</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>313</b>
<b>Upper Chatham Strait (UC)</b>										
UCA	24 Aug	9106	8	1	1	0	0	0	1	10
UCB	24 Aug	9107	206	0	2	0	0	1	3	209
UCC	24 Aug	9108	102	1	1	1	0	0	2	105
UCD	24 Aug	9109	30	3	1	0	0	0	1	34
<b>Subtotals, UC</b>			<b>346</b>	<b>5</b>	<b>5</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>7</b>	<b>358</b>
<b>Grand total</b>			<b>656</b>	<b>5</b>	<b>8</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>11</b>	<b>672</b>

Table 5.—Frequency of occurrence (FO) and %FO of fish caught in eight rope trawl hauls using the *John N. Cobb* in the marine waters of northern region of southeastern Alaska, 23 to 28 August, 2005. The number of hauls per transect is in parentheses.

Species	Icy Strait (4)		Upper Chatham Strait (4)	
	FO	%FO	FO	%FO
<b>Juvenile salmon</b>				
Pink	4	100	4	100
Chum	4	100	3	75
Sockeye	2	50	2	50
Coho	4	100	4	100
Chinook	1	25	0	0
<b>Immature and adult salmon</b>				
Pink (Adult)	0	0	1	25
Chum (Adult)	0	0	1	25
Chinook (Adult)	0	0	1	25
<b>Non-salmonids</b>				
Crested sculpin	2	50	4	100
Prowfish	0	0	1	25
Pacific spiny lumpsucker	1	25	0	0
Wolf-eel	0	0	1	25

Table 6.—Fork length (minimum, maximum, mean and standard deviation, SD, of fork length) and life history stage of fish measured from eight rope trawl hauls using the NOAA ship *John N. Cobb* in the marine waters of the northern region of southeastern Alaska, 23 to 28 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>Icy Strait (IS)</b>							
Pink	<i>Oncorhynchus gorbuscha</i>	221	J	126	211	168	15
Chum	<i>O. keta</i>	55	J	142	225	190	20
Sockeye	<i>O. nerka</i>	5	J	172	182	178	4
Coho	<i>O. kisutch</i>	26	J	157	292	238	26
Chinook	<i>O. tshawytscha</i>	1	J	255	255	255	--
Crested sculpin	<i>Blepsias bilobus</i>	3	J	115	137	123	12
Pacific sp. lumpsucker	<i>Eumicrotremus orbis</i>	1	J	90	90	90	--
<b>Upper Chatham Strait (UC)</b>							
Pink	<i>O. gorbuscha</i>	276	J	123	215	173	16
Chum	<i>O. keta</i>	40	J	149	219	192	17
Sockeye	<i>O. nerka</i>	10	J	169	197	182	8
Coho	<i>O. kisutch</i>	19	J	141	271	236	30
Pink	<i>O. gorbuscha</i>	3	A	470	480	477	6
Chum	<i>O. keta</i>	1	A	630	630	630	--
Chinook	<i>O. tshawytscha</i>	1	A	530	530	530	--
Crested sculpin	<i>Blepsias bilobus</i>	5	J	119	142	127	9
Prowfish	<i>Zaprora silenus</i>	1	J	112	112	112	--
Wolf-eel	<i>Anarrichthys ocellatus</i>	1	J	427	427	427	--

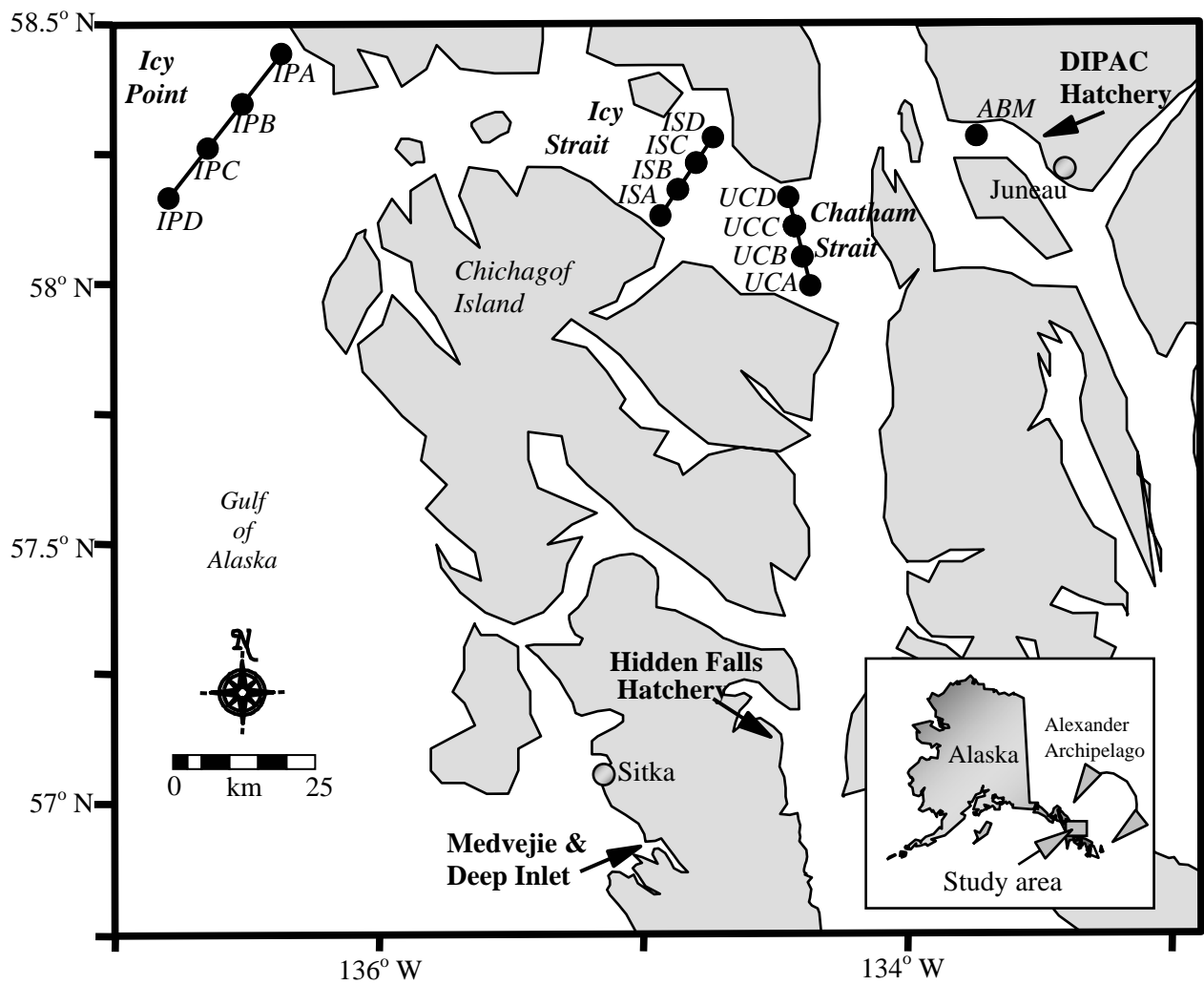


Figure 1.—Icy Strait and Upper Chatham Strait stations sampled from 23 to 28 August in the marine waters of the northern region of southeastern Alaska, 2005.