

Southeast Alaska Coastal Monitoring Project

JC-04-08 June Cruise Report

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Prepared by

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Scientists from the Marine Salmon Investigations Program at Auke Bay Laboratory, Alaska Fisheries Science Center, National Marine Fisheries Service, conducted a nine-day cruise aboard the NOAA ship *John N. Cobb* in the marine waters of the northern region of southeastern Alaska, 20-28 June 2004. This sampling continues the eighth year of the Southeast Alaska Coast Monitoring (SECM) project, which monitors oceanographic and biological conditions in the region, including Icy Strait, a primary seaward migration corridor used by juvenile Pacific salmon (*Oncorhynchus* spp.). SECM studies focus on the early marine ecology of juvenile salmon in inshore, strait, and coastal habitats; habitats in the study area span 250 km from near Juneau westward through Icy Strait to 65 km offshore in the Gulf of Alaska. General objectives for the SECM monitoring cruises are to: 1) collect biological data and stock-specific information on juvenile Pacific salmon and other pelagic fish species from surface rope trawl samples; 2) monitor physical and biological oceanographic indices seasonally at sampling stations in inshore, strait, and coastal habitats of juvenile salmon; and 3) conduct process studies focusing on bioenergetics of juvenile salmon. This cruise (JC-04-08) included the additional objective of collecting samples of juvenile salmon with a second, smaller mesh trawl, to compare size selection by gear type.

METHODS

Oceanographic sampling:

The biophysical environment was monitored at each station and throughout the cruise. 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 station for later determination of chlorophyll and nutrient content.

¹Reference to trade names does not imply endorsement by the NOAA Fisheries.

Zooplankton was sampled at each station with conical nets hauled vertically and a bongo net system towed obliquely. At each station, vertical plankton hauls were retrieved from a depth of 20 m using a 50-cm frame, 243- Φ mesh (NORPAC) net. At Icy Strait, Icy Point and Auke Bay stations, one deep vertical tow was made with a 57-cm, 202- Φ m mesh WP-2 net. A Rigosha flow meter was used inside the vertical net frames to determine the amount of water volume sampled. A “deep” double oblique bongo tow was done to 200 m depth or within 20 m of the bottom using a 60-cm frame with 505- and 333- μ mesh nets at all stations except the Upper Chatham Strait stations, and a “shallow” bongo tow was done to 20 m depth at Icy Strait stations. General Oceanic 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 Bathykymograph¹ time depth recorder, normally used with the bongo nets to validate the maximum deployment depth of each tow, failed to operate correctly. During replicate trawls, oceanographic samples were limited to the NORPAC zooplankton net and a shallow CTD (to 50 m depth).

Trawl Sampling:

Fish sampling was done with two research nets. The project standard gear, a Nordic 264 rope trawl, was fished directly astern the NOAA ship *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 m Lite trawl doors. The trawl was fished fully open with 150 m of main warp out for a duration of 20 min at a speed of about 1.0-1.5 m/sec (2-3 knots). To fish the headrope of the trawl at the surface, a cluster of three, meshed A-4 Polyform buoys was tethered to each wing tip of the headrope and one A-3 Polyform float was clipped onto the center of the headrope. Mesh sizes ranged from 162.6 cm in the throat of the trawl near the jib lines to 8.9 cm in the cod end. A 6.1 m long, 0.8 cm knotless liner was sewn into the codend. Along the jib lines on the top panel of the trawl, between the head rope and the first 162.6 cm mesh, a small mesh panel of 10.2 cm mesh was incorporated to minimize the loss of fish aft of the headrope.

Secondary fishing operations involved a two-boat trawl (townet) deployed and retrieved by the *John N. Cobb*, with assistance by the Auke Bay lab vessel *RV Quest*. This trawl has a mouth opening 3 m deep and 6 m wide and is held open vertically by a pair of steel spreader bars having bottom weights and top floats. The net was fished at a speed of 1.0 m/s (2 knots) for ten minutes with one towing bridle hooked to each vessel. The trawl is 14.9 m long and the mesh tapers in size from 7.62 cm to approximately 1.5 mm at the cod end.

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 Limnoterra FMB IV electronic measuring board or metric ruler. All salmon were examined for lack of the adipose fin, indicating the possible presence of a coded-wire tag (CWT) in the snout. 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 full stomach minus the weight of the empty stomach. After stomach contents were removed, prey were generally identified to the family level and estimated to the nearest 10% of total volume.

Laboratory processing:

Laboratory processing in progress includes 1) settled volumes (SVs) of zooplankton in the 20-m NORPAC vertical hauls; 2) displacement volumes (DVs) of zooplankton in bongo net

samples; 3) measurement of weight and condition of juvenile salmon; 4) determination of energetic content from frozen samples of juvenile pink, chum, and coho salmon; 5) examination for otolith thermal marks in frozen samples of juvenile chum, sockeye, coho, and chinook salmon; 6) scale samples of each species of juvenile salmon 7) zooplankton species composition and abundance from all NORPAC and bongo net samples taken in Icy Strait stations; and 8) detailed stomach analysis of juvenile chum salmon (for the Southeast Sustainable Salmon Fund, SSSF, companion project).

RESULTS and DISCUSSION

Sixteen stations were sampled on cruise JC-04-08 (Table 1, Figure 1). Oceanographic measurements were taken at all stations; rope trawl samples were taken at all stations except ABM, IPC and IPD, with replicate samples taken at IPA, IPB, and the four Icy Strait stations. Townetting was conducted at ISC and ISD on the last two nights of the cruise using the RV *Quest*, and one nocturnal surface trawl haul was conducted at station ISC. Sampling was conducted at the 3-station transect in Taku Inlet, including the historically-sampled TKI, to complement the nearshore sampling done for a companion SSSF project. Standard oceanographic sampling and surface trawling were conducted according to the following schedule (see also Table 1):

- Day 1: ABM zooplankton and oceanographic samples, transit to Icy Point;
- Day 2: Icy Point zooplankton and oceanographic samples, 4 surface trawls;
- Day 3: Icy Strait zooplankton and oceanographic samples, 4 surface trawls;
- Day 4: Chatham Strait zooplankton and oceanographic samples, 4 surface trawls;
- Day 5: Taku Inlet zooplankton and oceanographic samples, 3 surface trawls;
- Day 6: Icy Strait replicate sampling, 4 surface trawls;
- Day 7: Icy Strait two-boat trawl samples (7);
- Day 8: Icy Strait two-boat trawl samples (6), nocturnal zooplankton and surface trawl samples (1);
- Day 9: Return to port mid-day.

Oceanographic data collected during the cruise included 23 CTD casts, 16 water samples, and 78 zooplankton samples (Table 2). Shallow and deep bongo samples were collected once during the day at each station in Icy Strait and in Taku Inlet, and once nocturnally at Icy Strait station ISC. NORPAC 20-m vertical hauls were taken each time a station was sampled, including during replicate trawling operations, but not during townet operations. WP-2 net samples were collected only at the Auke Bay, Icy Point and Icy Strait stations. All plankton samples were preserved in 5% formalin-seawater solution for later laboratory analyses.

Surface (2-m) temperatures recorded by the vessel thermosalinograph ranged from 9.2°C to 15.6°C and salinities ranged from 9.5 to 31.6 PSU (Table 2). Salinity and temperature observations at the Taku Inlet stations were noticeably lower than at stations in other localities and habitats, and secchi disk readings were much lower, reflecting the high silt load of turbid freshwater from the glacial Taku River. Conversely, Icy Point stations reflected more oceanic conditions than waters in strait habitats, with cooler temperatures, higher salinities, and greater water clarity (secchi depths). Light levels were generally above 600 Watts/m² during the entire cruise, reflecting the extraordinarily sunny weather with air temperatures above 80°F; smoke haze transported into Southeast Alaska from forest fires in the interior of Alaska and Canada occluded ambient light readings.

Plankton total settled volumes ranged from 1.5 ml to 100 ml, with the highest volumes at stations in Upper Chatham Strait and the lowest at Icy Point (Table 3). Phytoplankton was virtually absent in the June samples; instead, mucosal/gelatinous “slub” from larvaceans constituted the non-zooplankton portion of the total settled volumes. The percentage of zooplankton in these samples ranged from 28-100%.

Nearly 12,300 fish were captured in 19 surface trawls and 13 two-boat trawl hauls in June (Table 4). Juvenile salmon catches totaled more than 5,900 fish, with approximately 87% caught in surface trawls and 13% in townet hauls. Juvenile salmon CPUE in strait habitat in June 2004 (mean of 392 fish per haul) was the second highest observed in all eight years of SECM research, including the annual peak catches that typically occur in July. The only higher CPUE occurred in June of 1998, when 6,382 juvenile salmon were caught for a CPUE of 772 fish per haul; the maximum July CPUE over the years was 349 fish per haul (3,495 total fish), in the year 2000.

Of the juvenile salmon captured, chum were the most abundant salmon species (3,396), followed by pink (2,226), sockeye (197), coho (75), and chinook (7). Most of these fish were caught in strait habitat. The highest catches occurred during replicate fishing with the surface trawl on June 25, when 656 chum and 650 pinks were caught at ISB, followed by 860 chum and 905 pink at ISC. Samples of juvenile chum salmon from Icy Strait (n=120) and Chatham Strait (n=60) were preserved in 10% formalin-seawater solution for the SSSF companion project examining trophic interactions of hatchery and wild chums from Taku Inlet.

Frequency of occurrence of juvenile salmon was high in strait habitat. Among rope trawl hauls in Icy Strait, juvenile pink and chum salmon were captured in 8:9 and 9:9 total hauls, while juvenile sockeye and coho were caught in 7:9 haul. In Chatham Strait, all juvenile species except chinook salmon were caught in all four of the trawl hauls. Very few juvenile salmon or other fish were caught at the Icy Point coastal habitat stations, and only one salmon, a juvenile chinook, was caught at a Taku Inlet inshore habitat station (TKI; Table 5). Among two-boat (towntnet) hauls, all species of juvenile salmon except chinook were represented from station ISC; towntnet fishing effort was focused there because only one juvenile chum salmon was caught in one of the three towntnet hauls at ISD. Several hundred juvenile pink and chum salmon from towntnet hauls at ISC were transferred to a live tank for feeding trial experiments at ABL.

Catches of immature and adult salmon catches totaled 26 fish, all but one caught in the surface trawls. The majority were chinook salmon caught in Icy Strait (Tables 4 and 7).

The adipose fins of two immature chinook and two juvenile coho salmon captured in Icy Strait on June 22 were lacking, indicating the possible presence of a coded-wire tag (CWT) in the snout. These fish included two chinook from the 2001 brood year captured at station ISA; one was released at Little Port Walter by NMFS 400 days prior to capture and one was released at Fish Creek by DIPAC hatchery 376 days prior to capture. Only one of the two coho salmon snouts actually contained a CWT. This fish was a wild coho from the 2002 brood year released in Taku River by Fish and Game 38 days prior to its capture at station ISC.

Twenty non-salmonid fish taxa were captured in the rope trawl and towntnet hauls (Table 4). Juvenile osmerids (capelin and eulachon), herring and juvenile Walleye pollock were common and/or abundant in Taku Inlet. In Icy Strait, juvenile Walleye pollock were common throughout the day and in both gear types; they were most abundant in the nocturnal trawl, with a

total catch of 450. Thus, daytime catches of juvenile salmon sometimes co-occurred with relatively small catches of juvenile pollock, but the nocturnal trawl caught few juvenile salmon when large numbers of Walleye pollock were caught. No other non-salmonid species was common in townet catches except young-of-the-year pollock and herring, which were not quantitatively sampled because of their small size (@ 20-30 mm) and were therefore not enumerated or systematically measured.

On-board stomach analysis was completed on 72 potential fish predators, including 13 chinook, ten chum, and one sockeye salmon, and 47 juvenile pollock. Predation on juvenile salmon was evident only among the older salmon. The stomach of an immature chinook from station UCB in Upper Chatham Strait (313 mm FL, 350 g) contained an 80 mm pink salmon juvenile. These preliminary results will be further summarized in the 2005 annual report compiling all catch and laboratory processing information from 2004 cruises.

ACKNOWLEDGMENTS

We acknowledge and compliment the command and crew of the NOAA ship *John N. Cobb* for their cooperation, hard work, and safety consciousness during the cruise. We also appreciated the uncompensated volunteer work of S.M. Baxter.

Table 1.—Localities and coordinates of stations scheduled for oceanographic and/or fish sampling in the marine waters of the northern region of southeastern Alaska using the NOAA ship *John N. Cobb*, 20-28 June 2004. Inter-transect distance refers to adjacent stations in a transect locality.

Habitat	Station	Latitude North	Longitude West	Distance		Depth m
				Offshore km	Between km	
Inshore						
		Auke Bay Monitor				
	ABM	58° 22.00'	134° 40.00'	1.5	—	60
		Taku Inlet transect				
	TKG	58° 15.88'	134° 05.74'	1.4	6.0	71
	TKH	58° 12.62'	134° 06.55'	1.4	6.0	105
	TKI	58° 11.19'	134° 11.71'	2.2	6.0	175
Strait						
		Upper Chatham Strait transect				
	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 transect				
	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
Coastal						
		Icy Point transect				
	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	58° 53.50'	137° 42.60'	65.0	24.8	1,300

Table 2.—Oceanographic and biological samples collected in the marine waters of the northern region of southeastern Alaska using the NOAA ship *John N. Cobb*, 20-28 June 2004. Abbreviations: R = surface rope trawl, TN = two-boat trawl (townet).

Date	Station	Haul Number	Time	Temperature (°C)	Salinity (PSU)	Light level (W/m ²)	CTD depth (m)	Secchi depth (m)	Plankton samples			
									Bongo (333 and 505 µ)	NORPAC (243 µ)	WP-2 (202 µ)	Fishing gear
20 June	ABM	8018	10:55	14.5	20.8	745	45	1.5	2	3	1	R
21 June	IPA	8019	7:45	12.8	31.3	500	140	3.0	2	1	1	R
21 June	IPB	8020	11:45	12.9	31.6	850	110	5.5	2	1	1	R
21 June	IPC	8021	16:00	13.3	31.6	848	120	6.0	2	1	1	--
21 June	IPD	8022	18:05	13.0	31.6	450	200	6.5	2	1	1	--
21 June	ISA	8025	7:00	14.5	23.2	45	88	4.0	4	1	1	R
22 June	ISB	8026	10:15	14.7	22.3	667	176	2.0	4	1	1	R
22 June	ISC	8027	13:30	14.7	24.0	830	200	4.0	4	1	1	R
22 June	ISD	8028	16:00	15.6	24.8	742	200	4.0	4	1	1	R
22 June	UCA	8029	7:30	15.0	20.7	120	200	2.5	0	1	0	R
23 June	UCB	8030	9:45	13.7	23.9	622	132	3.5	0	1	0	R
23 June	UCC	8031	11:40	13.5	24.5	702	150	3.0	0	1	0	R
23 June	UCD	8032	13:45	15.0	21.0	823	132	3.0	0	1	0	R
24 June	TKI	8033	15:00	12.2	15.6	800	158	0.5	4	1	0	R
24 June	TKH	8034	12:25	9.2	16.2	880	180	0.2	4	1	0	R
24 June	TKG	8035	9:20	10.1	9.5	650	112	0.5	4	1	0	R
25 June	ISA	8036	8:00	13.6	26.8	355	89	4.5	0	1	0	R
25 June	ISB	8037	9:20	13.2	27.0	588	182	4.0	0	1	0	R
25 June	ISC	8038	13:00	13.3	27.3	830	200	3.0	0	1	0	R
25 June	ISD	8039	16:00	12.4	28.1	575	200	3.0	4	1	0	R
28 June	ISC	8051	1:00	11.3	28.5	0	200	0.0	4	0	0	R
Subtotals for surface trawl									46	22	9	19

Table 2, continued.

Date	Station	Haul Number	Time	Temperature (°C)	Salinity (PSU)	Light level (Wt/m ²)	CTD depth (m)	Secchi depth (m)	Plankton samples			Fishing gear
									Bongo (333 and 505 µ)	NORPAC (243 µ)	WP-2 (202 µ)	
26 June	ISC	8040	21:30	12.1	28.2	153	50	2.0	0	1	0	TN
26 June	ISC	8041	22:10	--	--	--	--	--	--	--	--	TN
26 June	ISC	8042	22:40	--	--	--	--	--	--	--	--	TN
26 June	ISD	8043	23:45	--	--	--	--	--	--	--	--	TN
27 June	ISD	8044	0:05	--	--	--	--	--	--	--	--	TN
27 June	ISD	8045	0:30	--	--	--	--	--	--	--	--	TN
27 June	ISC	8046	1:15	--	--	--	--	--	--	--	--	TN
27 June	ISC	8047	21:15	--	--	--	--	--	--	--	--	TN
27 June	ISC	8048	22:15	--	--	--	--	--	--	--	--	TN
27 June	ISC	8049	22:30	--	--	--	--	--	--	--	--	TN
27 June	ISC	8050	22:55	--	--	--	--	--	--	--	--	TN
27 June	ISC	8052	23:30	--	--	--	--	--	--	--	--	TN
27 June	ISC	8053	23:55	--	--	--	--	--	--	--	--	TN
Subtotals for townet hauls									0	1	0	13

Table 3.—Zooplankton settled volumes (SV, nearest 0.5 ml) from 20-m vertical NORPAC net tows collected in the marine waters of the northern region of southeastern Alaska using the NOAA ship *John N. Cobb*, 20-28 June 2004.

Station	Haul Number	Settled volume (SV)			Zooplankton (%)
		Total plankton	Zooplankton	Phytoplankton ^a	
ABM	8018	30	8.5	0	28
ABM	8018	35	10	0	29
ABM	8018	45	12.5	0	28
IPA	8019	3	0.5	0	17
IPB	8020	1.5	0.5	0	33
IPC	8021	3	0.5	0	17
IPD	8022	10	10	0	100
ISA	8025	14.5	6.5	0	45
ISB	8026	50	35	0	70
ISC	8027	30	18	0	60
ISD	8028	30	16	0	53
UCA	8029	50	27	0	54
UCB	8030	35	13	0	37
UCC	8031	60	38	0	63
UCD	8032	45	13	0	29
TKG	8035	15	11	0	73
TKH	8034	14	14	0	100
TKI	8033*	100	--	--	--
ISA	8036	23	12	0	52
ISB	8037	20	10	0	50
ISC	8038	20	16	0	80
ISD	8039	21	11	0	52
ISC	8040	11	10	0	91

^asample of mixed zooplankton and slub, no phytoplankton

Table 4.—Rope trawl and two-boat trawl (towed) salmon catches at stations sampled in the marine waters of the northern region of southeastern Alaska using the NOAA ship *John N. Cobb* and Auke Bay Lab's *R/V Quest*, 20-28 June 2004. Dashes indicate no trawling was conducted at the station. Abbreviations: J = juvenile, I = immature, A = adult.

Date	Station	Haul Number	Juvenile Salmon							Immature and Adult Salmon						
			Chum	Pink	Coho	Chinook	Sockeye	Subtotal	Chinook (I)	Chum (A)	Pink (A)	Sockeye (A)	Subtotal			
21 June	IPA	8019	0	0	0	0	0	0	0	0	0	0	0	0	0	
21 June	IPB	8020	4	0	0	0	3	7	0	0	1	0	0	0	1	
21 June	IPA	8023	1	1	0	0	0	2	0	0	0	0	0	0	0	
21 June	IPB	8024	0	0	0	0	0	0	0	0	0	1	0	0	1	
21 June	IPC	--														
21 June	IPD	--														
22 June	ISA	8025	115	4	2	0	0	121	0	5	1	0	0	0	6	
22 June	ISB	8026	48	33	6	0	4	91	1	1	0	0	0	0	1	
22 June	ISC	8027	27	20	4	0	3	54	0	0	0	0	0	0	0	
22 June	ISD	8028	155	12	3	0	8	178	0	1	1	0	0	0	1	
23 June	UCA	8029	208	138	6	0	11	363	0	0	0	0	0	0	0	
23 June	UCB	8030	77	19	6	0	8	110	1	0	0	0	0	0	1	
23 June	UCC	8031	159	45	21	0	13	238	0	0	0	0	0	0	0	
23 June	UCD	8032	105	9	6	0	9	129	0	0	0	0	0	0	0	
24 June	TKI	8033	0	0	0	6	0	6	0	0	0	0	0	0	0	
24 June	TKH	8034	0	0	0	0	0	0	0	0	0	0	0	0	0	
24 June	TKG	8035	0	0	0	0	0	0	0	0	0	0	0	0	0	
25 June	ISA	8036	41	28	3	0	1	75	2	0	0	0	1	1	1	
25 June	ISB	8037	656	650	12	0	45	1,370	7	1	0	0	0	0	8	
25 June	ISC	8038	860	905	2	0	36	1,803	0	0	0	0	0	0	0	
25 June	ISD	8039	365	176	0	1	35	577	0	1	1	0	0	0	1	
28 June	ISC	8051	3	0	0	0	0	3	0	0	5	0	0	0	5	
Subtotal			2,824	2,040	71	7	176	5,128	16	10	1	1	1	1	25	

Surface trawl catches

Table 4 —continued.

Date	Station	Haul Number	Juvenile Salmon							Immature and Adult Salmon					
			Chum	Pink	Coho	Chinook	Sockeye	Subtotal	Chinook (I)	Chum (A)	Pink (A)	Sockeye (A)	Subtotal		
			Towernet catches												
26 June	ISC	8040	90	30	0	0	4	124	0	0	0	0	0	0	
26 June	ISC	8041	70	36	1	0	4	111	0	0	0	0	0	0	
26 June	ISC	8042	184	44	0	0	3	231	0	0	1	0	0	1	
26 June	ISD	8043	1	0	0	0	0	1	0	0	0	0	0	0	
27 June	ISD	8044	0	0	0	0	0	0	0	0	0	0	0	0	
27 June	ISD	8045	0	0	0	0	0	0	0	0	0	0	0	0	
27 June	ISC	8046	90	35	0	0	0	125	0	0	0	0	0	0	
27 June	ISC	8047	35	14	0	0	3	52	0	0	0	0	0	0	
27 June	ISC	8048	10	8	2	0	1	21	0	0	0	0	0	0	
27 June	ISC	8049	5	1	0	0	0	6	0	0	0	0	0	0	
27 June	ISC	8050	39	13	0	0	2	54	0	0	0	0	0	0	
27 June	ISC	8052	19	1	0	0	1	21	0	0	0	0	0	0	
27 June	ISC	8053	29	4	1	0	3	37	0	0	0	0	0	0	
Subtotal			572	186	4	0	21	783	0	0	1	0	0	1	
Grand total			3,396	2,226	75	10	197	5911	13	10	2	1	1	26	

Table 5.—Rope trawl and two-boat trawl (towed) catches of non-salmonids at stations sampled in the marine waters of the northern region of southeastern Alaska using the NOAA ship *John N. Cobb* and Auke Bay Lab's *R/V Quest*, 20-28 June 2004. Fish scientific names are presented in Table 6.

Date	Station	Haul Number	Arrowtooth flounder	Black rockfish	Osmeridae	Capelin	Eulachon	Northern smoothtongue	Crested sculpin	Pacific herring	Lingcod	Hexagrammidae	Myctophidae	Pacific sandfish	Pacific sandlance	<i>Sebastes</i> sp.	Smooth lumpsucker	Spiny dogfish	Squid	Starry flounder	Walleye pollock	Wolf-eel	Total non-salmonids
21 Jun	IPA	8019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
21 Jun	IPB	8020	0	1	0	0	0	0	0	0	0	132	0	0	0	0	0	0	0	0	0	0	136
21 Jun	IPA	8023	0	0	0	0	0	0	0	0	0	0	0	0	6	1	0	0	1	0	0	0	8
21 Jun	IPB	8024	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	3
22 Jun	ISA	8025	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	2
22 Jun	ISB	8026	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	296	1	298
22 Jun	ISC	8027	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	5
22 Jun	ISD	8028	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23 Jun	UCA	8029	0	0	0	0	0	0	2	0	0	0	0	0	3	0	0	0	0	0	0	0	5
23 Jun	UCB	8030	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23 Jun	UCC	8031	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2
23 Jun	UCD	8032	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	50	0	51
24 Jun	TKI	8033	0	0	6	0	0	0	0	30	0	0	0	2	0	0	0	0	0	0	0	0	38
24 Jun	TKH	8034	0	0	52	9	21	0	0	50	0	0	46	2	0	0	0	0	12	0	137	0	329
24 Jun	TKG	8035	0	0	3948	0	0	0	0	74	0	0	4	59	0	0	1	0	0	0	279	0	4365
25 Jun	ISA	8036	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	3
25 Jun	ISB	8037	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	365	0	365
25 Jun	ISC	8038	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	118	0	118
25 Jun	ISD	8039	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	114	0	114
28 Jun	ISC	8051	1	0	0	0	3	10	0	1	0	0	0	0	0	0	6	0	43	0	450	0	514
Subtotal			1	1	4007	9	24	10	2	156	2	132	50	68	13	1	8	4	57	1	1816	1	6363

Surface trawl catches

Table 5, continued.

Date	Station	Haul Number	Arrowtooth flounder	Black rockfish	Osmeridae	Capelin	Eulachon	Northern smoothtongue	Crested sculpin	Pacific herring	Lingcod	Hexagrammidae	Myctophidae	Pacific sandfish	Pacific sandlance	<i>Sebastes</i> sp.	Smooth lumpsucker	Spiny dogfish	Squid	Starry flounder	Walleye pollock	Wolf-eel	Total non-salmonids
26 Jun	ISC	8040	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 Jun	ISC	8041	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
26 Jun	ISC	8042	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 Jun	ISD	8043	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
27 Jun	ISD	8044	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	6
27 Jun	ISD	8045	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4
27 Jun	ISC	8046	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27 Jun	ISC	8047	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27 Jun	ISC	8048	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27 Jun	ISC	8049	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	27	0	28
27 Jun	ISC	8050	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	30
27 Jun	ISC	8052	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49	0	49
27 Jun	ISC	8053	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	85	0	85
	Subtotal		0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	85	0	204
	Grand total		1	1	4007	9	24	10	3	157	2	132	50	68	13	1	8	4	57	1	202	1	6567

Townet catches

Table 6.—Frequency of occurrence of fish species caught in 21 surface trawl and 13 townet hauls in four localities in the marine waters of the northern region of south-eastern Alaska using the NOAA ship *John N. Cobb*, 20-28 July 2004. No townetting was conducted in Auke Bay, Icy Point, Upper Chatham Strait or Taku Inlet. Dashes indicate no data.

Species	Icy	Icy	Upper	Taku
	Point	Strait	Chatham	Inlet
	Surface trawl			
Number of hauls	4	9	4	3
Juv. chinook salmon (<i>O. tshawytscha</i>)	0	1	0	1
Juv. chum salmon (<i>O. keta</i>)	2	9	4	0
Juv. coho salmon (<i>O. kisutch</i>)	0	7	4	0
Juv. pink salmon (<i>O. gorbuscha</i>)	1	8	4	0
Juv. sockeye salmon (<i>O. nerka</i>)	1	7	4	0
Imm. chinook salmon (<i>O. tshawytscha</i>)	0	4	1	0
Adult chum salmon (<i>O. keta</i>)	1	5	0	0
Adult pink salmon (<i>O. gorbuscha</i>)	1	0	0	0
Adult sockeye salmon (<i>O. nerka</i>)	0	1	0	0
Arrowtooth flounder (<i>Atheresthes stomias</i>)	0	1	0	0
Black rockfish (<i>Sebastes melanops</i>)	1	0	0	0
Capelin (<i>Mallotus villosus</i>)	0	0	1	1
Eulachon (<i>Thaleichthys pacificus</i>)	0	1	0	1
Osmeridae (smelts)	0	0	0	3
Crested sculpin (<i>Blepsias bilobus</i>)	0	0	1	0
Lingcod (<i>Ophiodon elongates</i>)	1	0	0	0
Hexagrammidae (greenling)	1	0	0	0
Myctophidae (lanternfish)	0	0	0	2
Pacific Sandfish (<i>Trichodon trichodon</i>)	0	2	1	3
Pacific sandlance (<i>Ammodytes hexapterus</i>)	2	0	0	0
<i>Sebastes</i> sp. (rockfish larvae)	1	0	0	0
Smooth lump sucker (<i>Aptocyclus ventricosus</i>)	0	1	1	1
Northern smoothtongue (<i>Leuroglossus stilbius schmidti</i>)	0	1	0	0
Spiny dogfish (<i>Squalus acanthias</i>)	2	0	0	0
Squid (<i>Beryteuthis magister</i> , <i>Gonatus</i> sp.)	1	2	0	1
Starry flounder (<i>Platichthys stellatus</i>)	0	1	0	0
Walleye pollock (<i>Theragra chalcogramma</i>)	0	7	2	2
Wolf-eel (<i>Anarrhichthys ocellatus</i>)	0	1	0	0
	Townet			
Number of hauls	0	13	0	0
Juv. chum salmon (<i>O. keta</i>)	--	11	--	--
Juv. coho salmon (<i>O. kisutch</i>)	--	3	--	--
Juv. pink salmon (<i>O. gorbuscha</i>)	--	10	--	--
Juv. sockeye salmon (<i>O. nerka</i>)	--	8	--	--
Adult pink salmon (<i>O. gorbuscha</i>)	--	1	--	--
Crested sculpin (<i>Blepsias bilobus</i>)	--	1	--	--
Walleye pollock (<i>Theragra chalcogramma</i>)	--	7	--	--

Table 7.—Frequency of occurrence in hauls (FO), percent frequency of occurrence (%FO), length, size and life history stage (J = juvenile, I = immature, A = adult) of fish (see scientific names in Table 6) captured in 21 rope trawl hauls and 13 townet hauls in the marine waters of the northern region of southeastern Alaska using the NOAA ship *John N. Cobb*, 20-28 June 2004. SD = standard deviation.

Species	Life history stage	Frequency of occurrence	Percent frequency of occurrence	Number measured	Fork length (minimum)	Fork length (maximum)	Fork length (mean)	Fork length (SD)
Surface trawl								
Chinook	J	2	9.5	7	147	175	158.9	10.9
Chum	J	15	71.4	1675	71	138	103.4	10.0
Coho	J	11	52.4	71	121	237	169.8	25.3
Pink	J	13	61.9	946	69	136	97.9	10.4
Sockeye	J	12	57.1	177	71	189	110.9	17.4
Chinook	I	5	23.8	16	233	580	361.8	95.1
Chum	A	6	28.6	10	575	750	689.5	48.8
Pink	A	1	4.8	1	425	425	425.0	--
Sockeye	A	1	4.8	1	638	638	638.0	--
Arrowtooth flounder	A	1	4.8	1	580	580	580.0	--
Black rockfish	A	1	4.8	1	510	510	510.0	--
Capelin	J	2	9.5	9	57	80	72.3	7.6
Eulachon	J	2	9.5	24	82	203	125.0	29.8
Smoothtongue	J	1	4.8	9	86	125	106.4	13.0
Crested sculpin	J	1	4.8	2	37	55	46.0	12.7
Herring (Pacific)	J, A	5	23.8	102	161	240	195.2	14.8
Lingcod	J	1	4.8	2	68	72	70.0	2.8
Myctophidae	A	2	9.5	50	35	101	68.3	12.6
Hexagrammidae	J	1	4.8	49	51	90	67.2	6.4
Pacific Sandfish	J, A	6	28.6	68	56	225	140.4	27.2
Sebastes sp.	J	1	4.8	1	20	20	20.0	--
Smooth lumpsucker	A	3	14.3	4	110	220	175	46.6
Spiny dogfish	A	2	9.5	4	505	712	647.5	96.7
Squid	J, A	4	19.0	57	35	253	89.3	39.0
Starry flounder	A	1	4.8	1	335	335	335.0	--
Walleye pollock	J	11	52.4	179	279	432	349.9	25.7
Wolf-eel	A	1	4.8	1	1300	1300	1300.0	--
Townet								
Chum	J	11	84.6	427	78	135	112.4	9.7
Coho	J	3	23.1	4	109	197	138.5	40.3
Pink	J	10	76.9	131	72	136	105.7	13.2
Sockeye	J	8	61.5	20	91	136	110.2	12.9
Pink	A	1	7.7	1	520	520	520.0	--
Crested sculpin	J	1	7.7	1	67	67	67.0	--
Pacific herring	J	1	7.7	1	116	116	116.0	--
Walleye pollock	J	7	53.8	1	350	350	350.0	--

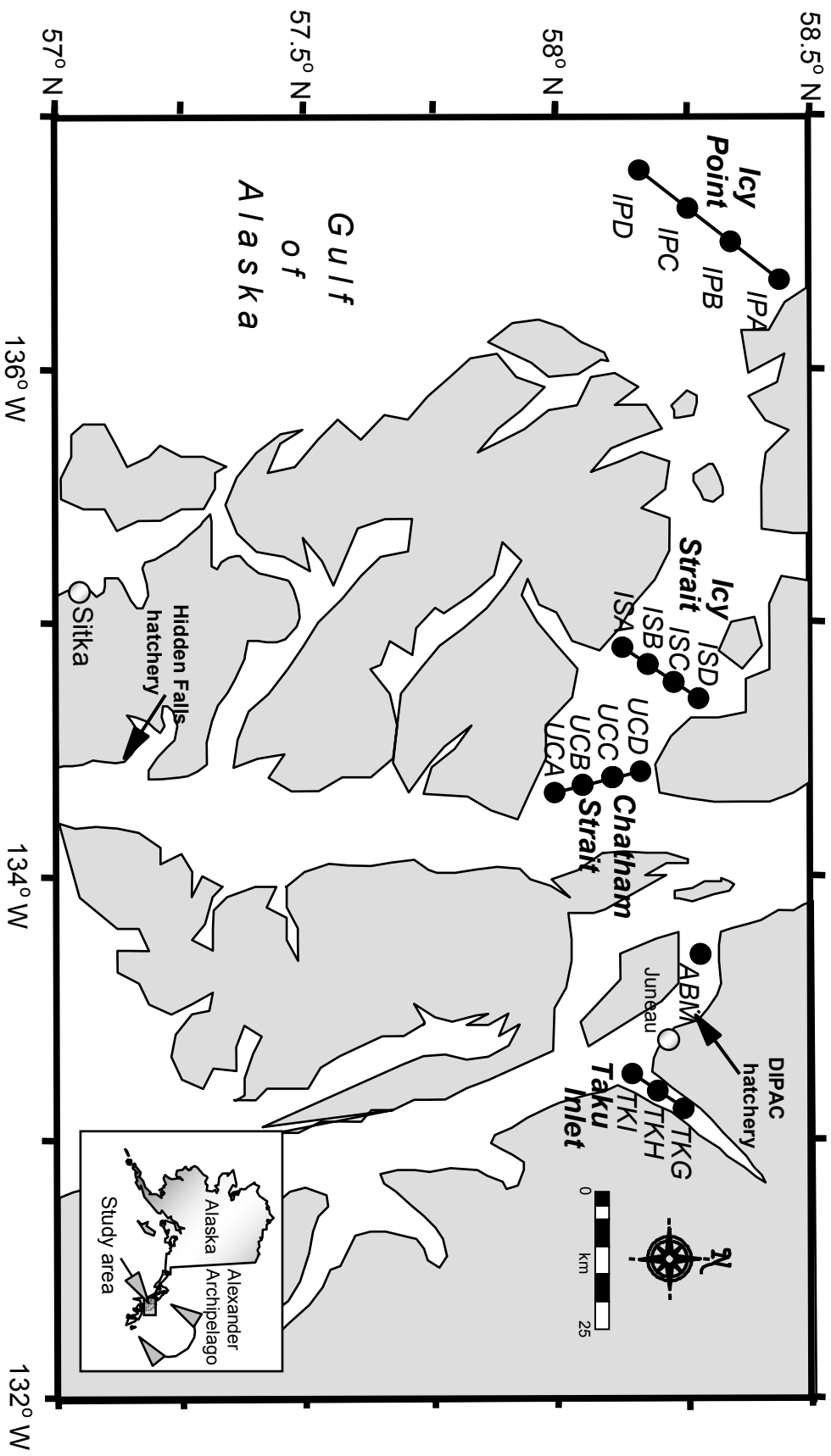


Figure 1.—Locations of Icy Strait stations sampled from the NOAA ship *John N. Cobb* and RV *Quest*, 20-28 June 2004.