JC-00-09 Cruise Report 27 July 2000

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Introduction

This report summarizes data collected by scientists from the National Marine Fisheries Service, Auke Bay Laboratory in Juneau, Alaska during a coordinated rope trawl and hydroacoustic survey of juvenile salmon in the northern region of the Alexander Archepeligo (Southeast Alaska) aboard the NOAA Ship *John N. Cobb* and the R/V *Quest*, 26 June-2 July, 2000.

Methods

Twenty stations along a primary migration corridor for juvenile salmon in Southeast Alaska were selected for sampling. Sample locations included: four stations along an offshore transect at Icy Point, four stations along a transect in Cross Sound, nine stations along a transect in Icy Strait, four stations along the upper Chatham transect, and four stations in the inshore waters (Figure 1; Table 1). A 20-min surface rope trawl haul, a CTD cast, and at least one vertical plankton sample with a conical net was taken at each station except ABM. Shallow bottom depths prevented trawling at ABM. All stations included a double oblique bongo sample except five duplicate stations in Icy Strait. Hydroacoustic data were collected by the R/V *Quest* along six transects across Icy Strait and at nine stations during rope trawl operations by the NOAA Ship *John N. Cobb*. All sampling occurred during daylight, between 0700 and 1500 hours (Table 2).

Oceanography

Oceanographic data were collected at each station before or immediately after the trawl haul. CTD data were collected with a Sea-Bird[1] SBE 19 Seacat profiler to 200 m or within 10 m of the bottom. Surface (2-m) temperature and salinity data also were collected at 1-minute intervals with a Sea-Bird SBE 21 thermosalinograph. A conical NORPAC net (50 cm, 243 micron mesh) was used for shallow (20-m) vertical sampling; and a conical WP-2 net (57 cm, 202 micron mesh) was used for deep (200-m or 20-m from bottom) vertical sampling. Both nets were used for deep vertical net sampling at the Icy Point and Auke Bay Monitor stations (Table 2). Double oblique bongo samples were also taken to a depth of 200 m or within 20 m of the bottom using a 60-cm diameter frame with 505 and 333 micron mesh nets.

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

A Bendix T1 bathykymograph was used to determine the maximum sampling depth. General Oceanics flow meters were placed inside the bongo net frame and Roshiga flow meters were placed in the deep conical net frames to determine filtered volumes. Ambient light intensities (W/m^2) were recorded at each station with a Li-Cor Model 189 radiometer. Water samples were taken at selected stations for later examination of chlorophyll and nutrients.

Fish sampling

Fish were sampled with a Nordic 264 rope trawl modified to fish the surface water directly astern of the ship. The trawl was 184 m long and had a mouth opening of 24 m × 30 m (depth × width). A pair of 3-m foam-filled Lite trawl doors, each weighing 544 kg (91 kg submerged), were used to spread the trawl open. The NOAA Ship *John N. Cobb* is a 29-m research vessel built in 1950 with a main engine of 325 horsepower and a cruising speed of 10 knots. Based on earlier gear trials, the actual fishing dimensions of the trawl was estimated to be 18 m vertical (head rope to foot rope) and 24 m horizontal (wingtip to wingtip), with a spread between the trawl doors ranging from 52 to 60 m. Mesh sizes of the trawl from the jib lines aft to the cod end were 162.6 cm, 81.3 cm, 40.6 cm, 20.3 cm, 12.7 cm, and 10.1 cm over the 129.6 m meshed portion of the rope trawl. A 6.1 m long, 0.8-cm knotless liner was sewn into the cod end. To keep the trawl headrope at the surface, a cluster of three meshed A-4 Polyform buoys were tethered to each wingtip of the headrope and two B-4 Polyform floats were attached to the center of the headrope. The trawl was fished with 137 m of 1.6-cm wire main warp attached to each door with three 55-m, two 1.0-cm, and one 1.3-cm wire bridles.

The trawl was fished for 20 min at 1.5 m/sec (3 knots), covering approximately 1.9 km (1.0 nautical mile) across a station. Over-water trawl speed was monitored from the vessel using an electromagnetic current meter (Marsh McBirney, Inc., Model 2000-21). Station coordinates were targeted as the midpoint of the trawl haul; however, current, swell, and wind conditions dictated the direction the trawl was set.

After each haul, the fish were anesthetized, identified, enumerated, measured, labeled, bagged, and frozen. Tricaine methanesulfonate (MS-222) was used to anesthetize the fish. After the catch was sorted, fish and squid were measured to the nearest mm fork length (FL) (squid: mantle length) with a Limnotera FMB IV electronic measuring board. All fish and squid were measured except the few large catches of pollock, squid, and herring, which were subsampled for lengths. All fish were frozen immediately after lengths were recorded. For large catches of juvenile salmon, blue-ice packs were used to minimize tissue decomposition and gastric activity in the stomachs. All salmon were examined for the presence of coded-wire tags (CWTs) through a visual scan of missing adipose fins. These fish were returned to the laboratory where the CWTs were extracted and read.

Diet analysis of potential juvenile salmon predators were examined onboard the vessel. Stomachs of these fish were removed and weighed. Stomach contents were removed, identified to the nearest convenient taxonomic level, and quantified to the nearest 10% of total volume.

Empty stomachs were weighed, and content weight was determined by subtracting the

weight of the empty stomach from the weight of the full stomach.

Hydroacoustic sampling

Hydroacoustic data were collected with a Biosonics DT4000 system with a 150 kHz narrow beam (six degree) transducer mounted in a fin and towed along the side of the vessel. The transducer was mounted in a side scanning configuration with a downward tilt of 4 degrees. Data were collected up to 50 meters from the transducer, at three pings per second, and with a noise threshold of -70 db. A sound absorbtion coefficient of .0036 was used, and the speed of sound in the water was estimated with water salinity of 28 Practical salinity units (PSU) and temperature of 12 E C.

All hydroacoustic data are presented in Sa units, mean backscattering area per unit of horizontal area, and is related to the mean volume backscattering strength, Sv, and the mean height of the integration surface (50 meters) by the following equation:

$$Sa(Sv, Meanheight) := \left(\left(10^{\frac{Sv}{10}}\right)\right) \cdot 4 \cdot \pi \cdot 1852^2 \cdot Meanheight$$

Results and Discussion

Surface (2-m) temperatures and salinities were higher over the continental shelf along the Icy Point transect than in inside waters. Salinities were highest in Cross Sound and along the Icy Point transect, and increased with distance offshore. The lowest salinities were found near the Taku River at station TKI (Table 2). Zooplankton settled volumes (SVs) were highest at the Icy Strait stations (up to 40 ml) and consisted primarily of small copepods and euphausiids. SVs were lowest at the Icy Point stations, most were 2 or 3 ml, however, IPD was had a SV of 10 ml, primarily due to large numbers of *Limacina*.

A total of 2,005 fish and squid were captured with the rope trawl, representing 24 different species (Tables 3 and 4). Salmon catches were predominately juvenile salmon (*n*=1544), however, several immature chinook (*n*=12) and mature salmon (*n*=7) were also captured. Juvenile chum salmon (*Oncorhynchus keta*) was consistently the most abundant fish species captured (*n*=917) and was significantly more abundant than the other species of juvenile salmon (sockeye salmon (*O. nerka*) (*n*=272), pink salmon (*O. gorbuscha*) (*n*=253), coho salmon (*O. kisutch*) (*n*=93), and chinook salmon (*O. tshawytscha*) (*n*=9)). Juvenile salmon were most abundant in Icy Strait, with peak catches occurring at ISB, and ISC; however this pattern was not consistent for all species of juvenile salmon. Juvenile chinook salmon were most abundant at the Lower Favorite Channel station (LFC), and significant catches of coho salmon were found at the False Point Retreat (FPR) and Upper Chatham stations (UCD and UCA).

Rope trawl catches of predominate non-salmonid species included: 177 walleye pollock (*Theragra chalcogramma*), 92 Pacific herring (*Clupea harengus*), 64 squid (Gonatidae), and 44 lingcod (*Ophiodon elongatus).* A large number of walleye pollock were captured at UCA. Several young-of-the-year pollock were also captured at the coastal stations (IPD, CSB, and

CSC). Young-of-the-year catches of Pacific herring were also predominately captured in the coastal stations (IPA, IPC, CSA, CSC, and CSD). Adult herring were only captured in inside waters at the Taku River station (TKI). Lingcod captured during the survey were young-of-the-year and were found exclusively at the coastal stations (IPA, IPB, IPC, IPD, CSB, and CSC).

Mean fork lengths of juvenile salmon varied by species. Coho salmon had the largest mean length (165 mm), followed by chinook (157 mm), sockeye (114 mm), chum (106 mm), and pink (95 mm) (Table 5). Juvenile coho salmon were the most uniformly distributed salmon. A total of 93 juvenile coho were captured in 12 of the 24 rope trawl hauls; whereas, 917 juvenile chum salmon were captured in 14 of the 24 rope trawl hauls.

Stomachs from 63 fish were examined onboard the NOAA Ship *John N. Cobb*, including: 39 adult walleye pollock, 12 immature chinook, five adult chum salmon, two spiny dogfish, two adult starry flounder, one adult coho salmon, one adult pink salmon, one adult black rockfish. A juvenile pink salmon was found in one of the walleye pollock stomachs, and an immature sockeye salmon was found in one of the spiny dogfish stomachs. Neither predation event was thought to be the result of net feeding due to the digested state of the salmon.

Hydroacoustic surveys were conducted along several transects near the Icy Strait stations (ISA–ISD) and are shown in Figures 2 and 3. Time periods where sea states introduced surface noise were removed and data without surface noise are shown. Criteria used to identify surface noise included, high backscatter levels (Sa values over 200), and absence of structure or pattern in the acoustic echos. A constant echo was present throughout the acoustic beam in situations where surface noise was present. Catch data were not available at the time of the acoustic survey; however, rope trawl samples collected in the survey area one and two days after the hydroacoustic survey indicated that surface targets were almost exclusively juvenile salmon near the Icy Strait stations (ISA-ISD).

Hydroacoustic data also were collected during rope trawl operations at the Icy Strait stations (ISA-ISD) and Upper Chatham stations (UCA-UCD) (Table 6). Surface noise due to wave action and boat motion were a problem at the ISC and ISD stations; therefore these data are not included. We found that sea states larger than 1.5 feet were sufficient to add significant surface noise to the data. Mean acoustic backcattering levels at the Icy Strait stations where surface noise was not a problem (ISA and ISB) agreed well with juvenile salmon catch levels. However, mean acoustic backscattering levels at Upper Chatham did not agree well with juvenile salmon catch levels, largely due to the presence of adult walleye pollock. Juvenile salmon catches and acoustic backscattering levels show similar trends with the absence of UCA (the station with large numbers of walleye pollock), however, there is still a fair amount of error in the relationship (Figure 4).

Acoustic signatures of juvenile salmon and walleye pollock appeared to differ, but more research is needed to acoustically distinguish juvenile salmon from other fish species and life-history stages of salmon. Future research should also include deployment of the hydroacoustic system from the NOAA Ship *John N. Cobb* to minimize sampling error in comparisons between rope trawl catches and acoustic backscattering levels.

Acknowledgments

We would like to commend the command and crew of the NOAA ship *John N. Cobb* for their cooperation and performance throughout the cruise. We would also like to thank John Thedinga for the loan of the hydroacoustic system and Bill Ostrand for his assistance with the hydroacoustic data collection and callibration.

Table 1.-- Localities and coordinates of stations sampled during a coordinated rope trawl and hydroacoustic survey for juvenile salmon by the NOAA Ship *John N. Cobb* and the R/V *Quest* in the northern region of Southeast Alaska, 26 June–2 July, 2000.

Locality	Station	Latitude	Longitude	Distance from shore (km)	Bottom depth (m)
		Inshore			
Taku Inlet	TKI	58E11.19NN	134E11.71NW	2.2	175
Auke Bay Monitor	ABM	58E22.00NN	134E40.00NW	1.5	60
Lower Favorite Channel	LFC	58E20.98NN	134E43.73NW	1.5	75
False Point Retreat	FPR	58E22.00NN	135E00.00NW	1.8	680
		Strait			
Upper Chatham Strait	UCA	58E04.57NN	135E00.08NW	3.2	400
Upper Chatham Strait	UCB	58E06.22NN	135E00.91NW	6.4	100
Upper Chatham Strait	UCC	58E07.95NN	135E04.00NW	6.4	100
Upper Chatham Strait	UCD	58E09.64NN	135E02.52NW	3.2	200
Icy Strait	ISA	58E13.25NN	135E31.76NW	3.2	128
Icy Strait	ISB	58E14.22NN	135E29.26NW	6.4	200
Icy Strait	ISC	58E15.28NN	135E26.65NW	6.4	200
Icy Strait	ISD	58E16.38NN	135E23.98NW	3.2	234
		Coastal			
Cross Sound	CSA	58E09.53NN	136E26.96NW	3.2	300
Cross Sound	CSB	58E10.91NN	136E28.68NW	6.4	60
Cross Sound	CSC	58E12.39NN	136E30.46NW	6.4	200
Cross Sound	CSD	58E13.84NN	136E32.23NW	3.2	200
Icy Point	IPA	58E20.12NN	137E07.16NW	6.9	160
Icy Point	IPB	58E12.71NN	137E16.96NW	23.4	130
Icy Point	IPC	58E05.28NN	137E26.75NW	40.2	150
Icy Point	IPD	57E53.50NN	137E42.60NW	65.0	1300

Table 2.-- Light levels, surface (2 m) temperature and salinity, and zooplankton settled volumes (SV) from 20 m vertical plankton hauls collected during a coordinated rope trawl and hydraoacoustic survey for juvenile salmon by the NOAA Ship *John N. Cobb* and the R/V *Quest* in the northern region of Southeast Alaska, 26 June–2 July, 2000.

					(2 m depth)		Zooplankton
				Light	Temp.	Salin.	SV
Date	Time	Haul	Station	(wt/m^2)	(EC)	(PSU)	(ml)
6/26/00	08:11	4021	TKI	600.00	10.70	18.30	15
6/26/00	12:16	4022	LFC	888.00	13.90	19.10	35
6/26/00	15:00	4023	FPR	220.00	13.10	21.90	20
6/27/00	7:15	4024	IPA	132.00	12.90	29.30	2
6/27/00	9:33	4025	IPB	225.00	13.20	31.00	2
6/27/00	11:43	4026	IPC	240.00	13.00	31.40	3
6/27/00	14:45	4027	IPD	220.00	12.90	31.80	10
6/28/00	6:59	4028	CSA	63.00	11.60	31.40	5
6/28/00	8:26	4029	CSB	42.00	7.90	31.70	6
6/28/00	9:46	4030	CSC	96.00	8.10	31.50	6
6/28/00	11:49	4031	CSD	75.00	8.00	31.60	4
6/29/00	7:44	4032	ISA	105.00	12.60	25.80	40
6/29/00	9:05	4033	ISB	14.60	12.40	25.80	40
6/29/00	11:59	4034	ISC	216.00	12.50	25.70	40
6/29/00	12:59	4035	ISD	212.00	12.50	25.80	15
6/29/00	14:56	4036	ISB	150.00	12.00	26.60	--
6/30/00	7:00	4037	UCD	63.00	12.50	24.50	15
6/30/00	8:39	4038	UCC	295.00	12.70	24.00	18
6/30/00	10:16	4039	UCB	201.00	13.20	23.00	22
6/30/00	12:11	4040	UCA	65.00	13.40	22.50	20
7/1/00	6:57	4041	ISA	45.00	11.20	26.90	12
7/1/00	8:18	4042	ISB	99.00	12.30	25.20	--
7/1/00	9:33	4043	ISC	198.00	12.60	25.10	--
7/1/00	10:54	4044	ISD	225.00	11.70	26.70	--
7/1/00	17:10	4045	ABM	--	13.60	17.60	24

Table 3.-- Numbers of salmon captured by rope trawl during a coordinated rope trawl and hydroacoustic survey for juvenile salmon by the NOAA Ship *John N. Cobb* and the R/V *Quest* in the northern region of Southeast Alaska, 26 June–2 July, 2000.

			Juvenile					Immature	Mature		
Date	Haul	Station	Pink	Chum	Sockeye	Coho	Chinook	Chinook	Pink	Chum	Coho
6/26/2000	4021	TKI	--	--	--	--	--	--	--	--	--
6/26/2000	4022	LFC	--	--	1		7	--	--	--	--
6/26/2000	4023	FPR	--	--	--	17	--	--	1	2	--
6/27/2000	4024	IPA	1	1	--	1	1	--	--	--	--
6/27/2000	4025	IPB	--	2	4	3	--	--	--	1	--
6/27/2000	4026	IPC	--	--	--	--	--	--	--	--	--
6/27/2000	4027	IPD	--	--	--	--	--	--	--	--	--
6/28/2000	4028	CSA	--	--	--	--	--	--	--	--	--
6/28/2000	4029	CSB	--	8	3		--	--	--	--	--
6/28/2000	4030	CSC	1	--	--	--	--	--	--	--	--
6/28/2000	4031	CSD	--	--	--	--	--	--	--	1	--
6/29/2000	4032	ISA	--	17	6	3	--	1	--	--	--
6/29/2000	4033	ISB	139	300	125		--	1	--	1	--
6/29/2000	4034	ISC	--	2	1	11	--	1	--	--	--
6/29/2000	4035	ISD	1	10	1		--	--	--	--	--
6/29/2000	4036	ISB	7	171	36		--	--	--	--	--
6/30/2000	4037	UCD	23	74	23	20	--	2	--	--	--
6/30/2000	4038	UCC	--	--	--	--	--	--	--	--	--
6/30/2000	4039	UCB	16	67	12	7	1	3	--	--	--
6/30/2000	4040	UCA	--	3	--	10	--	2	--	--	--
7/01/2000	4041	ISA	--	2	2	5	--	--	--	--	--
7/01/2000	4042	ISB	--	--	--	6	--	--	--	--	--
7/01/2000	4043	ISC	26	247	40	8	--	1	--	--	1
7/01/2000	4044	ISD	39	13	18	2	--	1	--	--	--
70/1/2000	4045	ABM									
	Total		253	917	272	93	9	12	1	5	1

Table 4. -- Numbers of non-salmonid fish and squid captured by rope trawl during a coordinated rope trawl and hydroacoustic survey for juvenile salmon by the NOAA Ship *John N. Cobb* and the R/V *Quest* in the northern region of Southeast Alaska, 26 June–2 July, 2000.

Haul	Station	Walleye pollock	Pacific herring	Squid	Lingcod	Pacific sand-lance	Pacific cod	Prow-fish	Sebastes	Soft sculpin	Crested sculpin	AT flounder	Spiny dogfish	Starry flounder	Eula-chon	Capelin	Silver spotted	Black rock-	Wolf	Pacific green-sculpin
																				fish
																				eel
																				ling
4021	TKI	--	8	--	--	--	--	--	--	--	--	--	--		--	1	--	--	--	--
4022	LFC	--	--	--	--	--	--	1	--	--	--	--	--	2	--	--	--	--	--	--
4023	FPR	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4024	IPA	8	50	1	4	--	6	3	--	1	--	--	1	--	--	--	--	--	--	--
4025	IPB 1	--	--	1	24	9	2	1	--	--	--	--	1	--	--	--	--	--	--	--
4026	IPC	--	4	4	9	5	2	1	--	--	--	--	--	--	--	--	--	--	--	--
4027	IPD	10	--	59	1	--	2	--	6	--	--	4	--	--	--	--	--	--	--	1
4028	CSA	--	1	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--
4029	CSB	5	–	--	4	--	--	--	--	--	--	--	--	--	2	--	--	--	--	--
4030	CSC	11	25	--	2	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4031	CSD	--	3	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--
4032	ISA	--	--	--	--	--	--	--	--	1	1	--	--	--	--	--	1	--	--	--
4033	ISB	1	--	--	--	--	--	--	--	2	--	--	--	--	--	--	--	--	--	--
4034	ISC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4035	ISD	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--
4036	ISB	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

4037	UCD --	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--
4038	UCC --	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4039	UCB --	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4040	UCA --	127	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--
4041	ISA --	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4042	ISB --	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4043	ISC --	5	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--
4044	ISD --	2	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--
4045	ABM Total 1	177	92	64	44	15	13	7	6	5	4	4	2	2	2	1	1	1	1

captured by rope trawl during a coordinated rope trawl and hydroacoustic survey for juvenile salmon by the NOAA Ship *John N. Cobb* and the R/V *Quest* in the northern region of Southeast Alaska, 26 June–2 July, 2000.

Common name	Species	*n*	Fork length (mm) min	max		Frequency of occurrence	Life[1] history stage
Pink salmon	*Oncorhynchus gorbuscha*	250	76	125	95.24	9	J
Chum salmon	*O. keta*	814	79	135	106.23	14	J
Sockeye salmon	*O. nerka*	272	83	158	114.19	13	J
Coho salmon	*O. kisutch*	93	117	226	164.46	12	J
Chinook salmon	*O. tshawytscha*	9	131	249	156.56	3	J
Pink salmon	*O. gorbuscha*	1	507	507	507.00	1	M
Chum salmon	*O. keta*	5	559	742	690.40	4	M
Coho salmon	*O. kisutch*	1	602	602	602.00	1	M
Chinook salmon	*O. tshawytscha*	12	264	550	355.25	8	I
Walleye pollock	*Theragra chalcogramma*	75	26	554	259.04	13	L,A
Pacific herring	*Clupea harengus*	68	26	190	51.72	7	L,A
Lingcod	*Ophiodon elongatus*	44	53	83	69.16	6	J
Squid	Gonatidae	30	26	58	41.20	3	J,A
Pacific sandlance	*Ammodytes hexapterus*	15	55	76	64.67	3	A
Pacific cod	*Gadus macrocephalus*	13	31	58	47.31	5	L,J
Prowfish	*Zaprora silenus*	7	51	103	68.29	5	J,A
Rockfish	*Sebastes* spp.	6	17	26	21.00	1	L,J
Soft sculpin	*Gilbertidia sigalutes*	5	24	47	39.80	4	J,A
Crested sculpin	*Blepsias bilobus*	4	27	59	45.75	4	J,A
Arrowtooth flounder	*Atheresthes stomias*	4	31	43	38.75	1	L
Spiny dogfish	*Squalus acanthias*	2	779	977	878.00	2	A
Starry flounder	*Platichthys stellatus*	2	322	340	331.00	1	A
Eulachon	*Thaleichthys pacificus*	2	125	125	125.00	1	A
Capelin	*Mallotus villosus*	1	89	89	89.00	1	A
Silver-sp sculpin	*Blepsias cirrhosus*	1	155	155	155.00	1	A
Black rockfish	*Sebastes melanops*	1	458	458	458.00	1	A
Wolf-eel	*Anarrhichthys ocellatus*	1	1000	1000	1000.00	1	A
Pacific greenling	*Hexagrammos* spp.	1	58	58	58.00	1	J

coordinated rope trawl and hydroacoustic survey for juvenile salmon by the NOAA Ship *John N. Cobb* and the R/V *Quest* in the northern region of Southeast Alaska, 26 June–2 July, 2000.

Date	Haul	Station	Mean acoustic backscatter (Sa)	Total juvenile salmon catch	Adult walleye pollock catch
6/29/2000	4032	ISA	15.36	26	0
6/29/2000	4033	ISB	69.74	564	0
6/29/2000	4034	ISC	–.–*	14	0
6/29/2000	4035	ISD	–.–*	12	0
6/29/2000	4036	ISB	20.85	214	0
6/30/2000	4037	UCD	44.52	140	0
6/30/2000	4038	UCC	3.62	0	1
6/30/2000	4039	UCB	5.35	103	0
6/30/2000	4040	UCA	178.34	13	127

* - Wave action and boat motion introduced significant surface noise in acoustic backscatter.

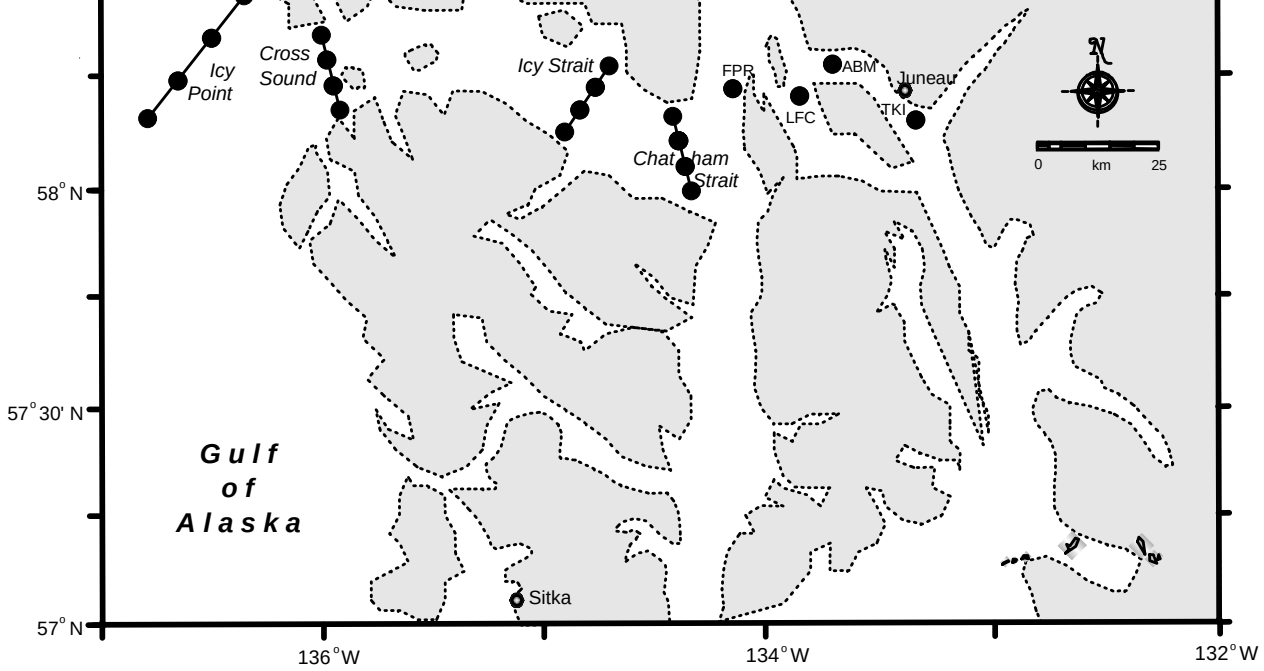

Figure 1. -- Localities and coordinates of stations sampled during a coordinated rope trawl and hydroacoustic survey for juvenile salmon by the NOAA Ship *John N. Cobb* and

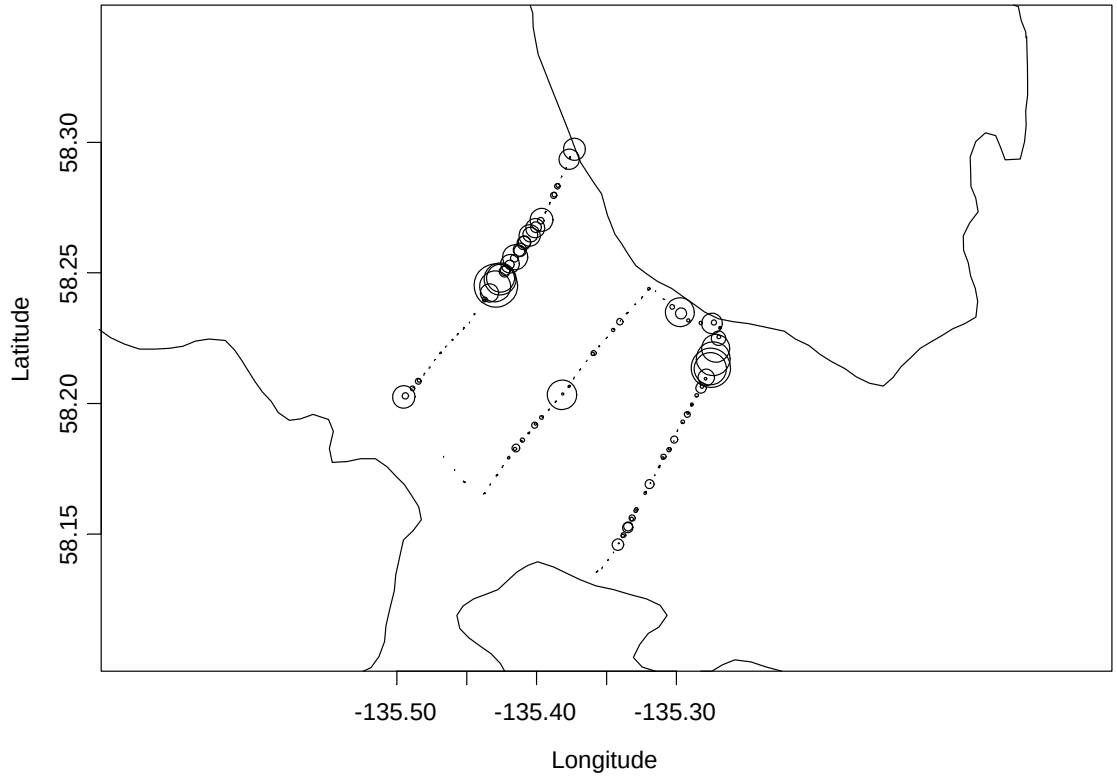

Figure 2. -- Near-surface (0-20 m) acoustic backscatter levels in Icy Strait during a coordinated rope trawl and hydroacoustic survey for juvenile salmon by the NOAA Ship *John N. Cobb* and the R/V *Quest* in the northern portion of Southeast Alaska, 26 June–3

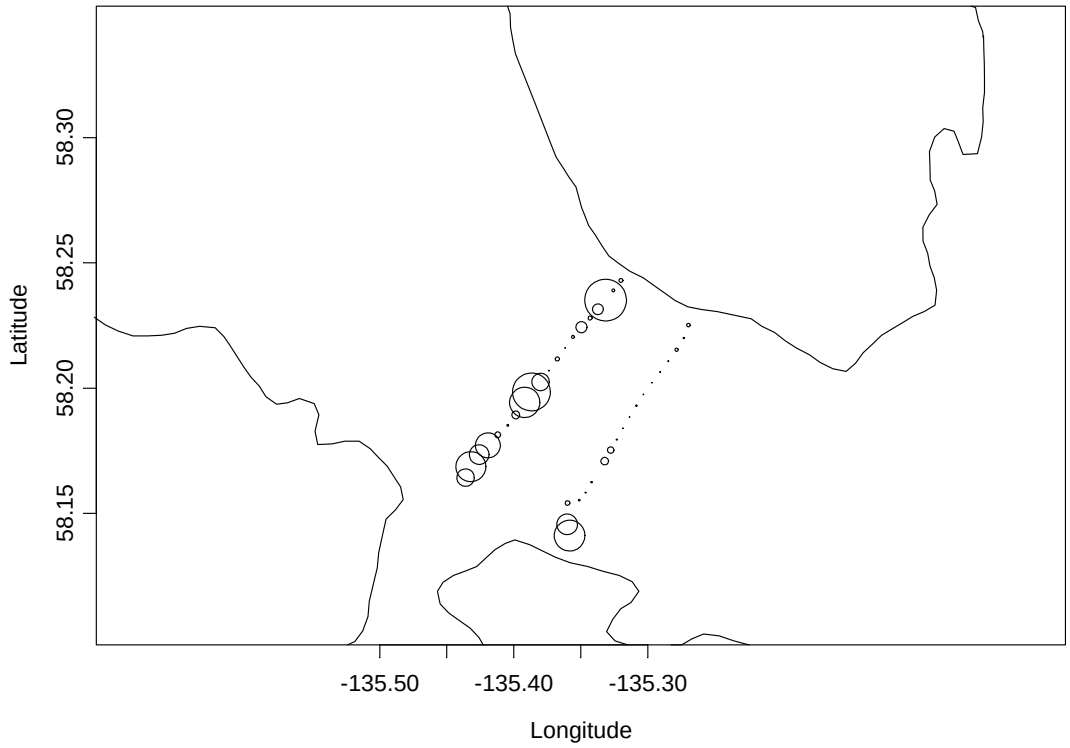

Figure 3. -- Near-surface (0-20 m) acoustic backscatter levels in Icy Strait during a coordinated rope trawl and hydroacoustic survey for juvenile salmon by the NOAA Ship *John N.*

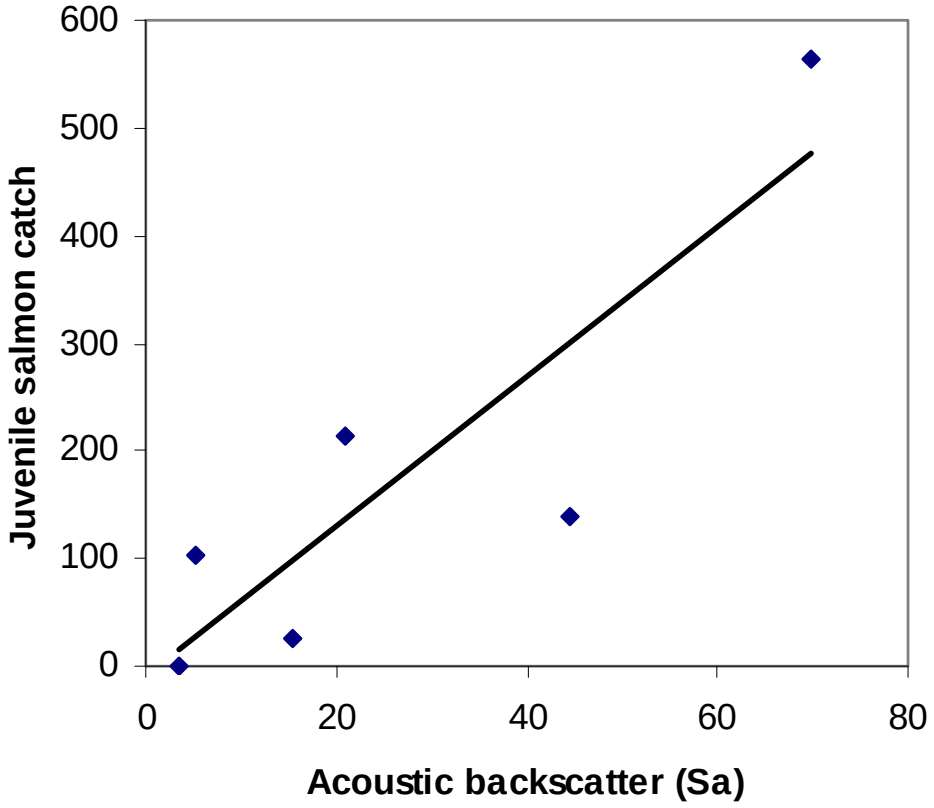

Figure 3. -- Near-surface (0-20 m) acoustic backscatter levels and associated juvenile salmon catch collected during a coordinated rope trawl and hydroacoustic survey for juvenile salmon by the NOAA Ship *John N. Cobb* and the R/V *Quest* in the northern region of Southeast Alaska, 26 June–2 July, 2000.