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Scientists from the Auke Bay Laboratory of the National Marine Fisheries Service, Alaska Fisheries Science Center, conducted a 6-d cruise aboard the NOAA ship *John N. Cobb* in the marine waters of the northern region of southeastern Alaska from 26 June to 01 July, 1999. This cruise is the second in a series of five monitoring cruises scheduled to sample the inside and coastal marine waters of the region monthly in 1999. Objectives for these monitoring cruises are to: 1) collect biological data on juvenile Pacific salmon (*Oncorhynchus* spp.) and other pelagic fish species from rope trawl samples, and 2) monitor physical and biological oceanographic indices seasonally at 24 stations.

Sampling in 1999 marks the third year of a 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. The information will also provide insight into potential effects of climate change on stock-specific growth and recruitment of salmonids and the utilization of marine habitat by key fish species.

### ***METHODS***

Twenty four stations were scheduled for sampling during this cruise, spanning from inside waters near Juneau to 60 km offshore in the Gulf of Alaska (Table 1). Oceanographic measurements and surface trawl sampling were planned for all 24 stations, as time and weather permitted.

#### Oceanographic sampling:

The physical and biological environment was monitored at each station, and 2-m depth temperature and salinity readings were continuously logged on board the vessel. A SeaBird SBE-19<sup>1</sup> conductivity-temperature-depth (CTD) profiler was deployed at each station, as depth

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

permitted, to 200 m or within 10 m of the bottom. Logging of 2-m depth temperatures and salinities was accomplished on board the vessel with a SeaBird SBE-21 thermosalinograph that recorded measurements every minute throughout the cruise.

Plankton was sampled at each station with conical and bongo nets. The conical nets were towed vertically and a bongo net was towed obliquely. At each station, vertical plankton tows were made from a depth of 20 m with a 50-cm frame and 243 micron mesh net. In Auke Bay and in coastal transects only, a 57-cm frame and a 202 micron mesh net was deployed to 200 m or within 20 m of the bottom. A Roshiga flow meter was used inside the 57-cm frame deep conical net to determine the amount of water volume sampled. Also at each station, one double oblique bongo tow was done to 200 m or within 20 m of the bottom using a 60-cm frame with 505 and 333 micron mesh nets. General Oceanics flow meters were placed inside each of the bongo nets to determine the amount of water volume sampled. A Bendix/Marine Advisors Model T-1 Bathykymograph time depth recorder was used with the bongo nets to validate the maximum deployment depth of each tow. Water samples were taken at selected stations for later determination of chlorophyll and nutrient content.

#### Trawl gear:

Fish sampling was conducted with a Nordic 264 rope trawl fished directly astern the NOAA ship *John N. Cobb* at the surface. Trawl sampling was planned for each station with the exception of Auke Bay Monitor, which was not attempted on account of shallow bottom depths in the vicinity. The mouth opening of the trawl was spread approximately 20 m deep and 26 m wide by a pair of 3.0 m Lite trawl doors. The trawl was fished fully open with 150 m of main warp out for a duration of 20 min at a speed of about 1.0-1.5 m/sec (2-3 knots). To fish the headrope of the trawl at the surface, a cluster of three meshed A-4 Polyform buoys was tethered to each wing tip of the headrope and one A-3 Polyform float was clipped onto the center of the headrope. Mesh sizes ranged from 162.6 cm in the throat of the trawl near the jib lines to 8.9 cm in the cod end. A 6.1 m long, 0.8 cm knotless liner was sewn into the codend. 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.

#### Fish Processing:

After each haul, the fish were anesthetized, identified, enumerated, measured, and stomach sampled (if appropriate). Tricaine methanesulfonate was used to anesthetize the fish. Fish were measured to the nearest mm fork length (FL) with a Limnotera FMB IV electronic measuring board. All captured salmon were electronically scanned or visually examined for a missing adipose fin, indicating the potential presence of an internal planted coded-wire tag (CWT). Stomachs from potential predators of juvenile salmon were excised, weighed, and classified by fullness. Stomach contents were removed and generally identified to the family level and quantified to the nearest 10% of total volume. The weight of the stomach contents was determined as the difference between the weight of the stomach and contents minus the weight of an empty stomach.

### Laboratory processing:

Data from biological samples readily processed in the laboratory are included in this cruise report. These data include: 1) settled volumes of zooplankton from the 20-m vertical hauls, and 2) CWTs from the heads of adipose fin-clipped salmon. Each sample of plankton was settled for a 24 hr period in an IMHOF 1000 ml cone to determine the volume of zooplankton at each station. Volumes of settled zooplankton and phytoplankton were recorded to the nearest ml, when possible. CWTs were removed from heads of salmon lacking the adipose fin and decoded to determine the release data of the fish. CWT codes were verified by an independent tag reader. Release data for the CWT codes were obtained from the Pacific States Marine Fisheries Commission ([http://www.psmfc.org/rmpc/cwt\\_reports.html](http://www.psmfc.org/rmpc/cwt_reports.html)), the Alaska Department of Fish and Game (<http://tagotoweb.adfg.state.ak.us>), or the National Marine Fisheries Service, Auke Bay Laboratory.

## ***RESULTS and DISCUSSION***

Sampling was accomplished at 23 of the 24 stations scheduled. To maximize sampling opportunities along coastal stations, repetitive excursions to the outer coast were necessary. Despite these excursions, inclement weather still precluded sampling at the furthest offshore station along the Icy Point transect (IPD). Consequently, oceanographic data were taken at 23 stations and trawling was conducted at 22 stations (Table 2). A total of 23 CTD casts, 23 bongo tows, 25 vertical 20-m tows, and 4 deep vertical tows were made during the cruise. Seventeen water samples were taken at selected stations for later analysis of chlorophyll and nutrients.

Surface (2-m) temperatures and salinities during the cruise ranged 7.5-13.6EC and 14.4-32.0 ★ (Table 3). Temperatures varied between stations, however salinities were lowest at the inshore stations (i.e., TKI, ABM, LFC, and FPR). Temperatures at the strait and coastal stations in 1999 were about a degree cooler than the previous two years of study (1997 and 1998), however, temperatures in the inshore stations were somewhat warmer in 1999.

Zooplankton biomass, as determined from the settled volumes from the 20-m vertical tows, was highest in the inshore stations (20-40 ml), lowest at the coastal stations in Cross Sound (4-7 ml), and intermediate in the remaining strait and coastal stations (10-25 ml) (Table 3). Zooplankton biomass was somewhat higher in 1999 than the previous two years in coastal and inshore habitats, and somewhat lower in strait habitats.

A total of 1,266 fish and squid from 22 taxa were captured in the 22 rope trawl hauls, including all five species of Pacific salmon (Tables 3-5). The primary catch component was juvenile salmon, particularly in the strait and inshore habitats. The frequency of occurrence was highest for chum salmon (*O. keta*), coho salmon (*O. kisutch*), sockeye salmon (*O. nerka*), and walleye pollock (*Theragra chalcogramma*), whereas Pacific herring (*Clupea pallasii*) were second most abundant species but only occurred at the three inshore stations (Table 5).

Onboard stomach analysis was done on 73 potential fish predators of juvenile salmon: 21 immature chinook salmon (*O. tshawytscha*), 15 walleye pollock, 14 pink salmon (*O. gorbuscha*),

10 spiny dogfish (*Squalus acanthias*), 5 sablefish (*Anoplopoma fimbria*), 2 Dolly Varden (*Salvelinus malma*), 2 sockeye salmon, 2 starry flounder (*Platichthys stellatus*), 1 coho salmon, and 1 Pacific sandfish (*Trichodon trichodon*). Although, several fish had unidentifiable fish remains in their stomachs, the remains of juvenile salmon were only found in the stomachs of two sablefish and one spiny dogfish. Other major prey items included; Pacific sandlance (*Ammodytes hexapterus*), Pacific herring, crab megalops, euphausiids, pterapods, walleye pollock, and unidentified fish larvae.

Of the nine juvenile coho salmon and one juvenile chinook salmon lacking adipose fins, all but one of the coho contained previously implanted CWTs (Table 6). All CWTed fish were juveniles that had originated from the northern region of southeastern Alaska; five from enhancement facilities and four from wild river systems. From release to recovery the CWT fish migrated 25-150 km from their tagging localities and had spent 19-44 days at sea. Compared to the eight juvenile coho salmon (1.6-5.0 km/d), the one chinook salmon had the slowest daily migration rate (1.3 km/d). Data documenting the initial occurrence of CWT coho and chinook juveniles in the study area in June, is consistent with results from the prior two years of study.

#### **ACKNOWLEDGMENTS**

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Table 1.--Localities and coordinates of stations scheduled for sampling in the marine waters of the northern region of southeastern Alaska off the NOAA ship *John N. Cobb*, 26 June-01 July 1999.

Locality	Latitude Station	Longitude north	offshore west	Distance		m
				between	Depth	
				km	km	
Auke Bay	ABM	58E 22.00'	134E 40.00'	1.5	●	60
Taku Inlet	TKI	58E 11.19'	134E 11.71'	2.2	17.0	175
Lower Favorite Channel	LFC	58E 20.98'	134E 43.73'	1.5	17.0	75
False Point Retreat	FPR	58E 22.00'	135E 00.00'	1.8	34.0	680
Upper Chatham Strait	UCA	58E 04.57'	135E 00.08'	3.2	●	400
	UCB	58E 06.22'	135E 00.91'	6.4	3.2	100
	UCC	58E 07.95'	135E 01.69'	6.4	3.2	100
	UCD	58E 09.64'	135E 02.52'	3.2	3.2	200
Icy Strait	ISA	58E 13.25'	135E 31.76'	3.2	●	128
	ISB	58E 14.22'	135E 29.26'	6.4	3.2	200
	ISC	58E 15.28'	135E 26.65'	6.4	3.2	200
	ISD	58E 16.38'	135E 23.98'	3.2	3.2	234
Cross Sound	CSA	58E 09.53'	136E 26.96'	3.2	●	300
	CSB	58E 10.91'	136E 28.68'	6.4	3.2	60
	CSC	58E 12.39'	136E 30.46'	6.4	3.2	200
	CSD	58E 13.84'	136E 32.23'	3.2	3.2	200
Icy Point	IPA	58E 20.12'	137E07.16'	6.9	●	160
	IPB	58E 12.71'	137E16.96'	23.4	16.8	130
	IPC	58E 05.28'	137E26.75'	40.2	16.8	150
	IPD	57E 53.50'	137E42.60'	65.0	24.8	1,300
Cape Edward	EDA	57E 39.00'	136E23.20'	8.0	●	90
	EDB	57E 36.00'	136E34.40'	20.0	12.0	185
	EDC	57E 32.50'	136E46.60'	33.0	13.0	1,270
	EDD	57E 28.75'	136E56.60'	47.0	13.0	1,800

Table 2.--Oceanographic and biological samples collected in the marine waters of the northern region of southeastern Alaska off the NOAA ship *John N. Cobb*, 26 June-01 July 1999.

Date	Haul#	Station	CTD	Plankton net samples			Chlorophyll & nutrients	Rope trawl
				Norpac	Bongo	WP-2		
26 June	3017	TKI	1	1	2	0	1	1
26 June	3018	FPR	1	1	2	0	1	1
27 June	3019	IPA	1	1	2	1	1	1
27 June	3020	IPB	1	1	2	1	1	1
27 June	3021	IPC	1	1	2	1	1	1
28 June	3022	CSA	1	1	2	0	1	1
28 June	3023	CSB	1	1	2	0	0	1
28 June	3024	CSC	1	1	2	0	0	1
28 June	3025	CSD	1	1	2	0	1	129 June
	3026	ISA	1	1	2	0	1	1
29 June	3027	ISB	1	1	2	0	0	1
29 June	3028	ISC	1	1	2	0	0	1
29 June	3029	ISD	1	1	2	0	1	1
30 June	3030	EDA	1	1	2	0	1	1
30 June	3031	EDB	1	1	2	0	1	1
30 June	3032	EDC	1	1	2	0	1	1
30 June	3033	EDD	1	1	2	0	1	1
01 July	3034	UCA	1	1	2	0	1	1
01 July	3035	UCB	1	1	2	0	0	1
01 July	3036	UCC	1	1	2	0	0	1
01 July	3037	UCD	1	1	2	0	1	1
01 July	3038	LFC	1	1	2	0	1	1
01 July	3039	ABM	1	3	2	1	1	0
<b>Total</b>			23	25	46	4	17	22

Table 3.--Two meter depth temperatures and salinities, settled volumes of plankton from 20-m vertical Norpac hauls, and catches of salmon with a rope trawl at stations sampled by the NOAA ship *John N. Cobb* in marine waters of the northern region of southeastern Alaska, 26 June-01 July 1999.

Date	Haul#	Station	Temp. (EC)	Salinity (o/oo)	Settled plankton (ml)			Juvenile salmon					Immature Chinook	Adult salmon		
					Zoop-	Phyto-	Total	Chum	Coho	Sockeye	Pink	Chinook		Pink	Sock	Coho
26 June	3017	TKI	11.1	14.4	20	4	24	1	11	14	●	2	2	●	●	●
26 June	3018	FPR	11.5	25.4	30	10	40	4	14	2	●	●	●	●	●	●
27 June	3019	IPA	10.6	31.5	10	2	12	●	●	●	●	●	●	3	1	●
27 June	3020	IPB	11.5	31.8	15	5	20	●	●	●	●	●	●	●	●	●
27 June	3021	IPC	11.0	32.0	10	25	35	●	●	●	●	●	●	●	●	●
28 June	3022	CSA	8.8	30.8	6	0	6	●	●	●	●	●	●	●	●	1
28 June	3023	CSB	7.8	31.8	7	0	7	●	●	●	●	●	●	3	●	●
28 June	3024	CSC	7.5	32.0	4	0	4	●	●	●	●	●	●	2	●	●
28 June	3025	CSD	7.5	31.0	5	0	5	●	1	1	●	●	●	1	●	●
29 June	3026	ISA	8.4	30.2	10	0	10	●	●	●	●	●	●	●	●	●
29 June	3027	ISB	10.3	29.1	18	2	20	16	2	42	●	●	1	●	●	●
29 June	3028	ISC	11.1	27.3	15	5	20	95	1	36	8	2	2	●	1	●
29 June	3029	ISD	11.5	26.7	20	20	40	7	69	3	3	●	4	1	●	●
30 June	3030	EDA	10.9	31.5	23	0	23	25	●	●	●	●	●	●	●	●
30 June	3031	EDB	10.9	31.5	23	0	23	●	●	2	●	●	●	2	●	●
30 June	3032	EDC	10.1	31.4	25	10	35	●	●	●	●	●	●	●	●	●
30 June	3033	EDD	10.9	31.9	20	5	25	●	●	●	●	●	●	●	●	●
01 July	3034	UCA	10.9	29.1	20	0	20	12	3	●	●	●	4	2	●	●
01 July	3035	UCB	10.2	29.6	15	5	20	69	13	1	3	●	6	●	●	●
01 July	3036	UCC	11.2	28.9	20	7	27	17	15	3	5	●	●	●	●	●
01 July	3037	UCD	11.4	26.9	15	20	35	257	60	7	13	●	4	●	●	●
01 July	3038	LFC	12.7	17.5	40	15	55	3	5	●	●	●	●	●	●	●
01 July	3039	ABM	13.6	17.4	~30	~50	80	na	na	na	na	na	na	na	na	na
Total catch			●	●	●	●	●	506	194	111	32	4	23	14	2	1

Table 4.--Catches of fish other than salmon with a rope trawl at stations sampled by the NOAA ship *John N. Cobb* in marine waters of the northern region of southeastern Alaska, 26 June-01 July 1999. One squid was captured at each of the following stations: 3020, 3030, 3031, and 3033. One silverspotted sculpin was also caught in haul# 3037.

Date	Haul#	Station	Pacific	Walleye	Soft	Spiny	Dolly			Pacific	Wolf-	Starry	Prow-	Bigmouth		Smooth	
			herring	pollock	sculpin	dogfish	Sablefish	Varden	Capelin	Lingcod	sandfish	eel	flounder	fish	Poacher	sculpin	lumpsucker
26 June	3017	TKI	202	1	9	●	●	●	2	●	2	●	2	●	●	1	●
26 June	3018	FPR	2	1	●	●	●	●	●	●	●	●	●	●	●	●	●
27 June	3019	IPA	●	●	●	1	●	●	●	●	●	●	●	●	●	●	●
27 June	3020	IPB	●	●	●	9	●	●	●	2	●	●	●	1	●	●	●
27 June	3021	IPC	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
28 June	3022	CSA	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
28 June	3023	CSB	●	1	●	●	●	●	●	●	●	●	●	●	●	●	●
28 June	3024	CSC	●	3	●	●	●	●	●	●	●	●	●	●	●	●	●
28 June	3025	CSD	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
29 June	3026	ISA	●	●	●	●	●	●	●	●	●	●	●	●	●	●	1
29 June	3027	ISB	●	●	1	●	●	●	●	●	●	●	●	●	●	●	●
29 June	3028	ISC	●	1	●	●	4	1	●	●	●	●	●	●	●	●	●
29 June	3029	ISD	●	●	●	●	●	1	●	●	●	●	●	●	●	●	●
30 June	3030	EDA	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
30 June	3031	EDB	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
30 June	3032	EDC	●	●	●	●	●	●	●	●	●	1	●	●	●	●	●
30 June	3033	EDD	●	1	●	●	●	●	●	●	●	1	●	●	●	●	●
01 July	3034	UCA	●	2	●	●	●	●	●	●	●	●	●	●	●	●	●
01 July	3035	UCB	●	3	●	●	●	●	●	●	●	●	●	●	●	●	●
01 July	3036	UCC	●	1	●	●	1	●	●	●	●	●	●	●	1	●	●
01 July	3037	UCD	●	1	●	●	●	●	●	●	●	●	●	●	●	●	●
01 July	3038	LFC	113	●	1	●	●	●	●	●	●	●	●	●	●	●	●
01 July	3039	ABM	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
Total catch			317	15	11	10	5	2	2	2	2	2	2	1	1	1	1

Table 5.--Length, frequency of occurrence, and life history stage of measured fish and squid captured with a rope trawl in the marine waters of the northern region of southeastern Alaska off the NOAA ship *John N. Cobb*, 26 June-01 July 1999.

Common name	Species	n	Fork length (mm)			Frequency of occurrence	Life <sup>2</sup> history stage
			min	max	$\bar{x}$		
Chum salmon	<i>Oncorhynchus keta</i>	506	77	133	103.7	11	J
Coho salmon	<i>O. kisutch</i>	194	83	207	153.8	11	J
Sockeye salmon	<i>O. nerka</i>	111	89	167	123.0	10	J
Pink salmon	<i>O. gorbuscha</i>	32	76	134	97.2	6	J
Chinook salmon	<i>O. tshawytscha</i>	4	90	183	138.8	2	J
Chinook salmon	<i>O. tshawytscha</i>	23	232	603	381.3	7	I
Pink salmon	<i>O. gorbuscha</i>	14	426	555	478.2	7	A
Sockeye salmon	<i>O. nerka</i>	2	595	699	647.0	2	A
Coho salmon	<i>O. kisutch</i>	1	514	514	514.0	1	A
Dolly Varden	<i>Salvelinus malma</i>	2	242	297	269.5	2	A
Salmonid total		889	●	●	●	●	●
Pacific herring <sup>3</sup>	<i>Clupea pallasii</i>	317	99	232	129.6	3	I-A
Walleye pollock	<i>Theragra chalcogramma</i>	15	29	557	4451.4	10	J-A
Soft sculpin	<i>Gilbertidia sigalutes</i>	11	31	57	48.8	3	I
Spiny dogfish	<i>Squalus acanthias</i>	10	572	991	815.6	2	A
Sablefish	<i>Anoplopoma fimbria</i>	5	285	326	309.2	1	I
Capelin	<i>Mallotus villosus</i>	2	59	68	63.5	1	J
Starry flounder	<i>Platichthys stellatus</i>	2	320	353	336.6	1	A
Lingcod	<i>Ophiodon elongatus</i>	2	47	51	49.0	1	J
Pacific sandfish	<i>Trichodon trichodon</i>	2	157	162	159.5	1	I
Wolf-eel	<i>Anarrhichthys ocellatus</i>	2	398	465	431.5	2	I
Pacific sandlance	<i>Ammodytes hexapterus</i>	1	64	64	64.0	1	J
Prowfish	<i>Zaprora silenus</i>	1	65	65	65.0	1	J
Silverspotted sculpin	<i>Blepsias cirrhosus</i>	1	43	43	43.0	1	J
Smooth lumpsucker	<i>Aptocyclus ventricosus</i>	1	145	145	145.0	1	A
Bigmouth sculpin	<i>Hemipterus bolini</i>	1	55	55	55.0	1	J
Squid	Gonatidae	4	34	69	51.5	4	J
Non-salmonid total		377	●	●	●	●	●
Total fish and squid		1,266	●	●	●	●	●

<sup>2</sup>J = juvenile or post larvae in first year at sea (i.e., age -.0), I = immature age -.1 or older in pre-spawn condition, and A = mature adult or near age of maturity.

<sup>3</sup>A subsample of 145 herring was measured.

Table 6.--Release and recovery information for coded-wire tagged salmon captured in the northern region of southeastern Alaska by rope trawl, NOAA ship *John N. Cobb*, 26 June-01 July 1999.

Species	Release information						Recovery information					Days since release	Distance traveled (km)
	Coded-wire tag code	Brood year	Agency <sup>4</sup>	Locality	Date	Size (mm) (g)	Locality (station code)	Date	Size (mm) (g)				
Chin	50:04/59	1997	DIPC	Gastineau Hatch., AK	06/07/99	● 25.3	Taku Inlet (TKI)	06/26/99	125	22.0	19	25	
Coho	50:04/62	1997	DIPC	Gastineau Hatch., AK	06/07/99	● 16.7	False Pt. Retreat (FPR)	06/26/99	127	20.0	19	45	
Coho	50:04/50	1997	DIPC	Sheep Creek, AK	06/08/99	● 15.8	False Pt. Retreat (FPR)	06/26/99	130	21.3	18	50	
Coho	50:31/03	1997	NSRA	Kasnyku Bay, AK	06/07/99	● 17.1	False Pt. Retreat (FPR)	06/26/99	137	25.2	19	30	
Coho	03:02/73	1997	NMFS	Auke Creek, AK (wild)	05-06/99	● ●	Icy Strait (ISD)	06/29/99	159	50.1	~44	75	
Coho	04:45/31	1997	ADFG	Berners R., AK (wild)	06/2-8/99	● ●	Chatham Strait (UCD)	07/01/99	164	48.7	~26	70	
Coho	04:45/31	1997	ADFG	Berners R., AK (wild)	06/2-8/99	● ●	Chatham Strait (UCD)	07/01/99	159	43.9	~26	70	
Coho	04:01/28	1997	ADFG	Chilkat R., AK (wild)	5/24-6/6/99	● ●	Chatham Strait (UCD)	07/01/99	203	90.1	~30	150	
Coho	04:49/14	1997	NSRA	Kasnyku Bay, AK	06/07/99	● 22.0	Chatham Strait (UCD)	07/01/99	167	54.1	24	105	
Coho	No Tag	●	●	●	●	● ● ●	Taku Inlet (TKI)	06/26/99	159	17.0	●	●	

<sup>4</sup> ADFG = Alaska Department of Fish and Game  
DIPC = Douglas Island Pink and Chum Corporation  
NMFS = National Marine Fisheries Service  
NSRA = Northern Southeast Regional Aquaculture Association