

JC-00-16 Cruise Report  
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Prepared by

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Scientists from the Auke Bay Laboratory of the National Marine Fisheries Service, Alaska Fisheries Science Center conducted a 7-d cruise aboard the NOAA ship *John N. Cobb* in the marine waters of the northern region of southeastern Alaska from 25 to 31 August, 2000. This cruise is the fourth in a series of five cruises scheduled to monitor the inside and coastal marine waters of the region monthly in spring, summer, and fall of 2000. 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 20 stations.

Sampling in 2000 marks the fourth 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 stations were scheduled for sampling during this cruise, spanning inside waters near Juneau along a 200 km westerly migration corridor within southeastern Alaska to 65 km offshore in the Gulf of Alaska (Table 1). Oceanographic measurements and surface trawl sampling were planned for all stations, as time and weather permitted.

#### Oceanographic sampling:

The physical and biological environment was monitored at each station and throughout the cruise. To examine horizontal water structure, temperature and salinity readings from a 2-m depth were continuously logged every minute throughout the cruise with a SeaBird SBE-21 thermosalinograph. To examine vertical water structure, a SeaBird SBE-19<sup>1</sup>

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

conductivity-temperature-depth (CTD) profiler was deployed at each station, as depth permitted, to 200 m or within 10 m of the bottom. Surface water samples were taken at selected stations for later determination of chlorophyll and nutrient content.

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 (Norpac) net. In Auke Bay and in coastal transects only, a 57-cm frame and a 202 micron mesh (WP2) 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. At the farthest offshore station (IPD) a second double oblique bongo tow was done to 325 meters to sample a dense layer identified on the John N. Cobb sonar at 300-400 m depth.

#### 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 depths in the vicinity. The mouth opening of the trawl was approximately 20 m deep and 26 m wide spread by a pair of 3.0 m Lite trawl doors. The trawl was fished fully open with 150 m of main warp out for 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 stomachs 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 the 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 salmon lacking the adipose fin. 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 regional mark coordinators, the [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 all of the 20 core stations. In addition, sampling of the Icy Strait transect was repeated on August 31 to increase sample sizes of juvenile salmon and to provide information on within period variability of catches. Therefore, oceanographic and trawl data were collected at 24 stations (Table 2). A total of 24 CTD casts, 26 vertical 20-m tows, 25 bongo tows, 5 deep vertical tows, and 23 rope trawl hauls were made during the cruise. Water samples were also taken at the 20 core stations for later analysis of chlorophyll and nutrients.

Surface (2-m) temperatures and salinities during the cruise ranged 7.9-13.2°C and 14.6-31.7 PSU (Table 3). Temperatures varied between stations and were warmest at the offshore stations (i.e., IPA, IPB, IPC, and IPD). Salinities were lowest at the inshore stations (i.e., TKI, ABM, LFC, and FPR) and highest at the Cross Sound and Icy Point transects.

Zooplankton biomass, as determined from the settled volumes from the 20-m vertical tows, ranged 0-20 ml at the stations (Table 3). The highest levels were observed in the inshore stations, averaging 13.8 ml at TKI, LFC, FPR, and ABM stations. In the straits habitat (UC and IS transects), zooplankton was somewhat lower, averaging 3.3-5.5 ml. Cross Sound (CS) transect was the lowest, averaging 1.5 ml across the transect. Zooplankton was generally higher at the offshore stations (IP transect) than either Cross Sound or the straits, averaging 8.8 ml.

A total of 486 fish from 15 taxa were captured in the 23 rope trawl hauls, including all five species of Pacific salmon (Tables 4-5). Juvenile salmon made up 84% of the catch; a total of 408 juvenile salmon were captured. Pink salmon and chum salmon were the most abundant species (Table 4), and had the highest frequency of occurrence (Table 6). Numbers of juvenile salmon caught on this cruise declined more than 90% from 4508 caught on the SECM cruise in July. Catch of all species of juvenile salmon declined by at least 50% from July to August except for juvenile chinook salmon, which increased slightly.

Mean sizes of juvenile salmon were: pink salmon, 159 mm; chum salmon, 179 mm; sockeye salmon, 172 mm; coho salmon, 245 mm; and chinook salmon, 214 mm (Table 6). The largest increase in average lengths of juvenile salmon since the July sampling cruise was 49 mm for chum salmon. Average lengths increased by 44 mm for coho salmon, 39 mm for pink salmon,

29 mm for sockeye salmon, and 22 mm for chinook salmon.

Onboard stomach analysis was done on 26 potential predators of juvenile salmon: 7 walleye pollock (*Theragra chalcogramma*), 3 adult pink salmon, 5 adult chum salmon, 7 adult coho salmon, and 4 immature chinook salmon. Fish remains were identified in four of the coho, one of the chum, and 2 of the chinook salmon. Of these, juvenile salmon remains were definitely identified in one of the coho salmon.

Five juvenile salmon lacking adipose fins were examined for the presence of previously implanted coded-wire tags (CWTs) (Table 7). Three of the five salmon contained CWTs: two chinook and one coho. One of the chinook tags was lost during processing. The two CWT fish with decoded tags originated from the northern region of southeastern Alaska. The chinook salmon was a juvenile, released 94 days earlier. It was recovered 130 km from its release site, an average migration rate of 1.4 km/d. The coho salmon was an adult, presumably returning from the Gulf of Alaska through Icy Strait. It was recovered 444 days after release, 90 km from its release site.

#### **ACKNOWLEDGMENTS**

We would like to acknowledge the command and crew of the NOAA ship *John N. Cobb* for their superb cooperation and performance during the cruise. Flexibility in the sampling schedule to account for weather and unanticipated biological conditions (e.g., deep scattering layer on the sonar at IPD) allowed us to meet and exceed our scientific objectives.

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*, 25-31 August 2000.

Locality	Latitude Station	Longitude north	offshore west	Distance between		Depth m
				km	km	
Auke Bay	ABM	58° 22.00'	134° 40.00'	1.5		60
Taku Inlet	TKI	58° 11.19'	134° 11.71'	2.2	17.0	175
Lower Favorite Channel	LFC	58° 20.98'	134° 43.73'	1.5	17.0	75
False Point Retreat	FPR	58° 22.00'	135° 00.00'	1.8	34.0	680
Upper Chatham Strait	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	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
Cross Sound	CSA	58° 09.53'	136° 26.96'	3.2		300
	CSB	58° 10.91'	136° 28.68'	6.4	3.2	60
	CSC	58° 12.39'	136° 30.46'	6.4	3.2	200
	CSD	58° 13.84'	136° 32.23'	3.2	3.2	200
Icy Point	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	57° 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 off the NOAA ship *John N. Cobb*, 19-25 July 2000.

Date	Haul#	Station	CTD	Plankton net samples			Chlorophyll & nutrients	Rope trawl
				Norpac	Bongo	WP-2		
25 August	4066	TKI	1	1	2	0	1	1
25 August	4067	LFC	1	1	2	0	1	1
31 August	4068	ABM	1	3	2	1	1	0
25 August	4069	FPR	1	1	2	0	1	1
26 August	4070	ISA	1	1	2	0	1	1
26 August	4071	ISB	1	1	2	0	1	1
26 August	4072	ISC	1	1	2	0	1	1
26 August	4073	ISD	1	1	2	0	1	1
27 August	4074	CSA	1	1	2	0	1	1
27 August	4075	CSB	1	1	2	0	1	1
27 August	4076	CSC	1	1	2	0	1	1
27 August	4077	CSD	1	1	2	0	1	1
28 August	4078	IPA	1	1	2	1	1	1
28 August	4079	IPB	1	1	2	1	1	1
28 August	4080	IPC	1	1	2	1	1	1
28 August	4081	IPD	1	1	4	1	1	1
29 August	4082	UCA	1	1	2	0	1	1
29 August	4083	UCB	1	1	2	0	1	1
29 August	4084	UCC	1	1	2	0	1	129
August	4085	UCD	1	1	2	0	1	1
30 August	4086	ISA	1	1	0	0	0	1
30 August	4087	ISB	1	1	0	0	0	1
30 August	4088	ISC	1	1	0	0	0	1
30 August	4089	ISD	1	1	0	0	0	1
Total			24	24	42	5	20	23

Table 3.--Two meter depth temperatures and salinities and settled volumes of plankton from 20-m vertical Norpac hauls taken from the NOAA ship *John N. Cobb* in marine waters of the northern region of southeastern Alaska, 25-31 August 2000.

Date	Haul	Station	Temp (C)	Salinity (PSU)	Settled Volume (ml)		
					Zoop.	Phyto.	
08/25/2000	4066	TKI	8.90	13.00	9	2	11
08/25/2000	4067	LFC	10.40	15.80	15	15	30
08/25/2000	4069	FPR	11.90	11.50	10	10	20
08/26/2000	4070	ISA	11.50	27.10	3	0	3
08/26/2000	4071	ISB	11.60	26.70	4	0	4
08/26/2000	4072	ISC	11.80	21.10	11	0	11
08/26/2000	4073	ISD	12.00	21.20	4	0	4
08/27/2000	4074	CSA	10.90	30.70	1	0	1
08/27/2000	4075	CSB	7.90	31.70	3	0	3
08/27/2000	4076	CSC	8.20	31.00	1	0	1
08/27/2000	4077	CSD	7.90	27.50	1	0	1
08/28/2000	4078	IPA	12.50	31.40	4	0	4
08/28/2000	4079	IPB	13.20	31.50	10	0	10
08/28/2000	4080	IPC	13.00	31.50	15	0	15
08/28/2000	4081	IPD	12.50	31.50	6	0	6
08/29/2000	4082	UCA	11.60	24.00	1	0	1
08/29/2000	4083	UCB	11.60	22.70	0	0	0
08/29/2000	4084	UCC	11.30	23.00	9	2	11
08/29/2000	4085	UCD	11.60	20.50	5	0	5
08/30/2000	4068	ABM	11.30	17.90	21	0	21
08/30/2000	4086	ISA	8.90	29.60	1	0	1
08/30/2000	4087	ISB	10.60	25.90	3	0	3
08/30/2000	4088	ISC	11.50	22.50	4	0	4
08/30/2000	4089	ISD	11.60	22.00	5	0	5

Table 4.—Catches of juvenile, immature, and adult 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, 25-31 August 2000.

Date	Haul	Statio	Juveniles				Immatures and Adults				
			Chum	Pink	Sock	Coho	Pink	Chum	Coho		
08/25/2000	4066	TKI	0	0	0	0	4	0	0	0	2
08/25/2000	4067	LFC	0	0	0	0	3	0	0	0	0
08/25/2000	4069	FPR	0	2	0	0	0	0	0	0	0
08/26/2000	4070	ISA	2	7	1	0	1	0	0	0	2
08/26/2000	4071	ISB	15	18	3	2	1	0	1	1	0
08/26/2000	4072	ISC	7	10	0	0	2	0	0	0	0
08/26/2000	4073	ISD	2	1	0	0	0	0	0	0	0
08/27/2000	4074	CSA	0	0	0	1	0	1	0	1	0
08/27/2000	4075	CSB	0	1	0	0	0	0	1	2	0
08/27/2000	4076	CSC	0	0	0	0	0	0	0	0	0
08/27/2000	4077	CSD	0	1	0	0	0	0	1	0	0
08/28/2000	4078	IPA	4	14	0	6	0	0	0	0	0
08/28/2000	4079	IPB	0	1	0	0	0	0	0	0	0
08/28/2000	4080	IPC	0	0	0	3	0	0	0	0	0
08/28/2000	4081	IPD	0	0	0	2	0	0	0	0	0
08/29/2000	4082	UCA	2	4	0	0	1	0	0	0	0
08/29/2000	4083	UCB	0	1	1	0	0	0	0	0	0
08/29/2000	4084	UCC	15	34	16	6	0	0	1	0	0
08/29/2000	4085	UCD	1	9	0	5	3	0	0	0	0
08/30/2000	4068	ABM	NA	NA	NA	NA	NA	NA	NA	NA	NA
08/30/2000	4086	ISA	2	1	0	2	1	0	0	0	0
08/30/2000	4087	ISB	2	3	0	0	1	2	0	2	0
08/30/2000	4088	ISC	24	82	55	0	2	0	0	0	0
08/30/2000	4089	ISD	3	13	0	4	2	0	1	1	0
	TOTAL		79	202	75	31	21	3	5	7	4



Table 5.--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, 25-30 August, 2000.

Date	Haul Number	Station	Walleye Pollock	Pacific Herring	Crested Sculpin	Pacific Rockfish	Pacific Prowfish	Pacific Sandfish	Spiny Lumpsucker	Capelin	Sablefish	Wolf Eel
08/25/2000	4066	TKI	1	43					1			
08/25/2000	4067	LFC	1		1				1	1		
08/25/2000	4069	FPR			2							
08/26/2000	4070	ISA		1					1			
08/26/2000	4071	ISB		1	1							
08/26/2000	4072	ISC	1		3							
08/26/2000	4073	ISD			11							
08/27/2000	4074	CSA	2	5	1		1					1
08/27/2000	4075	CSB					1					1
08/27/2000	4077	CSC						2				
08/27/2000	4079	CSD				1					1	
08/28/2000	4082	IPA	1		3							
08/28/2000	4083	IPB			2		2					
08/28/2000	4084	IPC	1		2							
08/28/2000	4085	IPD					2					
08/29/2000	4086	UCA	1									
08/29/2000	4089	UCC			1				1			
08/29/2000	4088	UCB		1								1
<b>TOTAL</b>			7	8	27	1	6	2	3	1	1	3

Table 6.—Number measured, length data, and frequency of occurrence of fish captured in rope trawl hauls in the marine waters of the northern region of southeastern Alaska off the NOAA ship *John N. Cobb*, 25-31 August 2000.

Species	Number		Fork Length		Frequency of Occurrence
	Measure	(mm)			
Pink Salmon	202	105	212	159.43	17
Chum Salmon	79	128	208	178.68	12
Sockeye Salmon (juveniles)	75	128	212	172.03	5
Coho Salmon	31	173	322	245.29	9
Chinook Salmon (juveniles)	21	138	265	213.86	11
Chinook Salmon	4	340	631	445.75	2
Pink Salmon (adult)	3	481	539	503.67	2
Chum Salmon (adult)	5	665	760	711.20	5
Coho Salmon (adult)	7	626	730	669.00	5
Pacific herring	51	73	217	144.76	5
capelin	1	30	30	30.00	1
crested sculpin	27	98	163	131.67	10
prowfish	6	99	133	114.67	4
spiny lump sucker	4	41	65	55.75	4
sablefish	1	169	169	169.00	1
Pacific sandfish	2	83	85	84.00	1
walleye pollock	8	63	533	415.63	7
Sebastes sp.	1	61	61	61.00	1
wolf-eel	3	60	445	312.67	3

Table 7.--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*, 25-31 August 2000. NSRA = Northern Southeast Regional Aquaculture Association; DIPC = Douglas Island Pink and Chum Incorporated.

Species	Release information						Recovery information				Days release	Distance since (km)
	Coded-wire tag	Brood code	Agency <sup>2</sup>	Locality	Date	Size (mm) (g)	Locality (station code)	Date	Size (mm) (g)			
Chinook	Lost Tag	__	__	__	__	__Taku Inlet (TKI)	08/25/00	186	75.1	__	__	
Chinook	No Tag					Taku Inlet (TKI)	08/25/00	172	51.9			
Chinook	04:46/63	1998	NSRA	Kasnyku Bay, AK	05/24/00	__ 37.3	Icy Strait (ISC)	08/26/00	258	244.3	94	130
Coho	50:04/61	1997	DIPC	Gastineau Channel, AK	06/09/99	16.7	Cross Sound (CSB)	08/27/00	643	3500.0	444	90
Coho	No Tag	__	__	__	__	__	Icy Point (IPA)	08/28/00	292	286.8	__	__