

JC-00-18 Cruise Report
05 December 2000

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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 September - 01 October 2000. This cruise is the fifth 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 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-19¹ 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

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

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.

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 due to shallow depths. 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: settled volumes of zooplankton from the 20-m vertical hauls, and information derived from CWTs recovered 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 usually 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), 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 17 of the 20 core stations; most stations along the Cross Sound transect were not sampled due to strong tides, floating debris, and dicey weather conditions. However, repeated sampling was conducted at two stations in Icy Strait (ISC and ISD) to increase sample sizes of juvenile salmon. A total of 23 CTD casts, 25 vertical 20-m tows, 19 bongo tows, 5 deep vertical tows, and 23 rope trawl hauls were made during the cruise (Table 2). Seventeen water samples were also taken for later analysis of chlorophyll and nutrients.

Surface (2-m) temperatures and salinities during the cruise ranged 7.8-11.9 °C and 19.9-31.8 PSU (Table 3). Temperatures were highest at the stations along the coastal offshore transect (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 coastal stations (i.e., CSD, IPA, IPB, IPC, and IPD). Temperatures and salinities in September of 2000 were somewhat different than in the previous three years of study; in September of 2000, temperatures were warmer in inshore and coastal habitats and salinities were highest in Strait habitats than in the previous years of study.

Zooplankton biomass, as determined from the settled volumes from the 20-m vertical tows, ranged 0-11 ml at the stations, with the highest levels observed in the coastal stations (1.5-11 ml), intermediate amounts occurring at the inshore stations (0.5-4 ml) and the lowest amounts occurring at the strait stations (0-2 ml). Zooplankton biomass in 2000 was within the range of the prior three years of study.

A total of 627 fish and squid from 18 taxa were captured in the 23 rope trawl hauls, including all five species of Pacific salmon (Tables 3-5). About half of the catch component was juvenile salmon, comprised primarily of chinook salmon (*O. tshawytscha*) and pink salmon (*O. gorbuscha*). Of all species captured, the frequency of occurrence was highest for juvenile chinook salmon (Table 5).

Onboard stomach analysis was done on seven walleye pollock (*Theragra chalcogramma*), four chinook salmon, three spiny dogfish (*Squalus acanthias*), and one adult coho salmon (*O. kisutch*). Of the potential salmon predator stomachs examined, no remains of juvenile salmon were found.

Ten juvenile and immature salmon lacking adipose fins were examined for the presence of coded-wire tags (CWTs) (Table 6); nine contained CWTs: six chinook and three coho. One salmon was an adult (coho), one was an immature (chinook), and the remainder were juveniles. All but one of the CWT fish originated from southeastern Alaska. The non-Alaska fish was a juvenile chinook salmon that originated from the Columbia River Basin; from release to

recovery, this CWT fish migrated northward 1500 km at a rate >9 km/day. The apparent daily migration rates of the immature chinook salmon (0.6 km/d) and adult coho salmon (0.4 km/d) were lower than those of the juveniles (0.9-9.4 km/d).

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.

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 September - 01 October 2000.

Locality	Latitude Station	Longitude north	offshore west	Distance		m
				between km	Depth 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*, 25 September - 01 October 2000.

Date	Haul#	Station	CTD	Plankton net samples			Chlorophyll & nutrients	Rope trawl
				Norpac	Bongo	WP-2		
25 Sept.	4090	TKI	1	1	2	0	1	1
25 Sept.	4091	LFC	1	1	2	0	1	1
25 Sept.	4092	ABM	1	3	2	1	1	0
26 Sept.	4093	IPA	1	1	2	1	1	1
26 Sept.	4094	IPB	1	1	2	1	1	1
26 Sept.	4095	IPC	1	1	2	1	1	1
26 Sept.	4096	IPD	1	1	2	1	1	1
27 Sept.	4097	ISA	1	1	2	0	1	1
27 Sept.	4098	ISB	1	1	2	0	1	1
27 Sept.	4099	ISC	1	1	2	0	1	127
Sept.	4100	ISD	1	1	2	0	1	1
28 Sept.	4101	FPR	1	1	2	0	1	1
28 Sept.	4102	UCD	1	1	2	0	1	1
28 Sept.	4103	UCC	1	1	2	0	1	1
28 Sept.	4104	UCB	1	1	2	0	1	1
28 Sept.	4105	UCA	1	1	2	0	1	1
29 Sept.	4106	CSD	1	1	2	0	1	0
29 Sept.	4113	ISD	1	1	0	0	0	1
29 Sept.	4112	ISC	1	1	0	0	0	1
29 Sept.	4111	ISB	1	1	0	0	0	1
29 Sept.	4110	ISA	1	1	0	0	0	1
30 Sept.	4114	ISA	1	1	2	0	0	1
30 Sept.	4115	ISA	0	0	0	0	0	1
30 Sept.	4117	ISB	1	1	2	0	0	1
30 Sept.	4116	ISB	0	0	0	0	0	1
Total			23	25	38	5	17	23

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, 25 September - 01 October 2000.

Date	Haul#	Station	Temp. (°C)	Salinity (PSU)	Settled plankton (ml)			Juvenile salmon					Immature	Adult
					Zoop-	Phyto-	Total	Pink	Chinook	Chum	Sockeye	Coho	Chinook	Coho
25 Sept.	4090	TKI	8.3	19.9	4.0	1.0	5.0	0	5	0	0	0	0	0
25 Sept.	4091	LFC	9.3	22.2	3.0	4.0	7.0	0	2	0	0	0	0	0
25 Sept.	4092	ABM	9.2	22.3	3.0	1.5	4.5	—	—	—	—	—	—	—
26 Sept.	4093	IPA	11.5	30.9	11.0	0.0	11.0	0	1	0	0	1	0	0
26 Sept.	4094	IPB	11.6	30.9	3.5	0.0	3.5	0	0	0	0	2	0	0
26 Sept.	4095	IPC	11.6	31.1	2.5	0.0	2.5	0	0	0	0	0	0	0
26 Sept.	4096	IPD	11.9	31.8	2.0	0.0	2.0	0	0	0	0	0	0	0
27 Sept.	4097	ISA	8.6	28.8	1.0	0.0	1.0	2	5	0	1	9	0	0
27 Sept.	4098	ISB	8.9	28.3	0.5	0.0	0.5	94	13	12	12	3	0	1
27 Sept.	4099	ISC	9.3	27.0	2.0	0.0	2.0	5	6	1	0	0	0	0
27 Sept.	4100	ISD	9.4	27.0	1.5	0.0	1.5	4	1	0	4	0	0	0
28 Sept.	4101	FPR	9.8	26.3	0.5	0.0	0.5	0	0	0	0	0	0	0
28 Sept.	4102	UCD	9.5	27.6	0.5	0.0	0.5	0	1	0	0	0	0	0
28 Sept.	4103	UCC	9.2	28.1	0.5	0.0	0.5	8	0	0	1	0	0	0
28 Sept.	4104	UCB	8.6	29.5	0.0	0.0	0.0	0	0	0	0	0	0	0
28 Sept.	4105	UCA	8.5	29.8	0.0	0.0	0.0	0	0	0	0	0	0	0
29 Sept.	4106	CSD	8.0	31.5	2.0	0.0	2.0	0	0	0	0	0	0	0
29 Sept.	4113	ISD	9.2	26.5	1.5	0.0	1.5	4	4	0	0	0	0	0
29 Sept.	4112	ISC	9.3	26.4	1.5	0.0	1.5	11	4	0	2	1	0	0
29 Sept.	4111	ISB	8.3	29.4	0.0	0.0	0.0	3	21	6	1	0	0	0
29 Sept.	4110	ISA	8.0	29.8	1.0	0.0	1.0	5	11	2	1	0	0	0
30 Sept.	4114	ISA	7.8	29.9	1.0	0.0	1.0	0	3	2	0	1	1	0
30 Sept.	4115	ISA	7.9	29.8	—	—	—	0	5	0	0	0	1	0
30 Sept.	4117	ISB	8.3	29.3	1.0	0.0	1.0	1	9	0	0	0	1	0
30 Sept.	4116	ISB	8.4	28.6	—	—	—	12	15	3	0	5	0	0
Total catch			—	—	—	—	—	149	106	26	22	22	3	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, 25 September - 01 October 2000.

Date	Haul#	Station	Soft sculpin	Pacific herring	Squid	Crested sculpin	Walleye pollock	Capelin	Rex sole	Spiny dogfish	Prowfish	Wolf-eel	Salmon shark	Smooth lump sucker	Pacific spiny lump sucker
25 Sept.	4090	TKI	0	1	0	0	1	0	0	0	1	0	0	0	0
25 Sept.	4091	LFC	0	0	0	1	1	0	0	0	0	0	0	0	0
25 Sept.	4092	ABM	—	—	—	—	—	—						—	—
															—
															—
26 Sept.	4093	IPA	0	0	0	0	0	0	1	3	0	0	0	0	0
26 Sept.	4094	IPB	0	1	0	0	0	0	0	0	0	0	0	0	0
26 Sept.	4095	IPC	0	0	20	0	0	0	0	0	0	0	0	0	0
26 Sept.	4096	IPD	0	0	3	0	0	0	3	0	0	0	0	0	0
27 Sept.	4097	ISA	0	0	0	0	0	0	0	0	0	0	1	0	0
27 Sept.	4098	ISB	0	0	0	1	0	0	0	0	0	0	0	0	0
27 Sept.	4099	ISC	41	0	0	0	0	0	0	0	0	0	0	0	0
27 Sept.	4100	ISD	3	0	0	0	1	0	0	0	0	0	0	0	0
28 Sept.	4101	FPR	0	0	0	4	1	0	0	0	1	0	0	0	0
28 Sept.	4102	UCD	0	0	0	1	0	0	0	0	0	0	0	0	0
28 Sept.	4103	UCC	1	0	0	1	0	0	0	0	0	0	0	0	0
28 Sept.	4104	UCB	0	0	0	2	2	0	0	0	0	0	0	0	0
28 Sept.	4105	UCA	0	0	0	6	0	0	0	0	0	0	0	0	0
29 Sept.	4106	CSD	0	0	0	0	0	0	0	0	0	0	0	0	0
29 Sept.	4113	ISD	3	0	0	1	0	0	0	0	0	0	0	0	0
29 Sept.	4112	ISC	6	0	0	0	0	0	0	0	0	0	0	0	0
29 Sept.	4111	ISB	9	0	0	0	0	0	0	0	0	0	0	0	0
29 Sept.	4110	ISA	12	0	0	0	1	0	0	0	0	1	0	0	0
30 Sept.	4114	ISA	19	46	0	0	2	1	0	0	0	0	0	0	0
30 Sept.	4115	ISA	26	5	0	0	1	3	0	0	0	0	0	1	0
30 Sept.	4117	ISB	14	0	0	0	0	0	0	0	0	0	0	0	1
30 Sept.	4116	ISB	42	0	0	2	0	0	0	0	0	0	0	0	0
Total catch			176	53	23	19	10	4	4	3	2	1	1	1	1

Table 5.--Length, frequency of occurrence, and life history stage of fish captured with 19 rope trawl hauls in the marine waters of the northern region of southeastern Alaska off the NOAA ship *John N. Cobb*, 25 September - 01 October 2000.

history Common name	Species	n	Fork length (mm)			Frequency of occurrence	Life ² stage
			min	max	x		
Pink salmon	<i>Oncorhynchus gorbuscha</i>	149	137	260	198.4	11	J
Chinook salmon	<i>O. tshawytscha</i>	106	175	391	263.5	16	J
Chum salmon	<i>O. keta</i>	26	188	257	217.6	6	J
Sockeye salmon	<i>O. nerka</i>	22	144	227	195.7	7	J
Coho salmon	<i>O. kisutch</i>	22	249	344	284.5	7	J
Chinook salmon	<i>O. tshawytscha</i>	3	415	592	482.0	3	I
Coho salmon	<i>O. kisutch</i>	1	688	688	688.0	1	A
Total salmonids measured		329					
Soft sculpin	<i>Psychrolutes sigalutes</i>	176	17	45	28.2	11	J
Pacific herring	<i>Clupea pallasii</i>	53	125	258	150.9	4	J-A
Squid	Gonatidae	23	25	51	34.8	2	J
Crested sculpin	<i>Blepsias bilobus</i>	19	127	184	154.3	9	I-A
Walleye pollock	<i>Theragra chalcogramma</i>	10	45	691	384.8	8	J-A
Capelin	<i>Mallotus villosus</i>	4	41	59	51.5	2	J
Rex sole	<i>Glyptocephalus zachirus</i>	4	74	85	78.0	2	J
Spiny dogfish	<i>Squalus acanthias</i>	3	537	589	564.0	1	A
Prowfish	<i>Zaprora silenus</i>	2	158	176	167.0	2	I
Wolf-eel	<i>Anarrhichthys ocellatus</i>	1	435	435	435.0	1	I
Salmon shark	<i>Lamna ditropis</i>	1	1800	1800	1800.0	1	A
Smooth lump sucker	<i>Aptocyclus ventricosus</i>	1	210	210	210.0	1	A
P. Spiny lump sucker	<i>Eumicrotremus orbis</i>	1	43	43	43.0	1	I
Total non-salmonids measured		298					
Total fish and squid measured		627					

²J = 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.

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*, 25 September - 01 October 2000.

Species	Release information				Recovery information							Marine distance traveled			
	Coded-wire tag code	Brood year	Agency ³	Locality	Date	Size		Locality (station code)	Date	Size		Age ⁴	Days since release	km	km/d
						mm	g			mm	g				
Chinook	03:01/54	1998	NMFS	Little Port Walter, AK	05/18/00	16.1		Icy Strait (ISB)	09/30/00	258	236.5	1.0	135	225	1.7
Chinook	03:62/42	1998	NMFS	Little Port Walter, AK	05/18/00	21.1		Icy Strait (ISA)	09/30/00	251	205.0	1.0	135	225	1.7
Chinook	04:01/49	1997	ADFG	Crystal Lake, AK	05/27/99	127	27.5	Icy Strait (ISB)	09/30/00	439	1150.0	1.1	491	280	0.6
Chinook	04:46/63	1998	NSRA	Kasnyku Bay, AK	05/24/00	37.1		Icy Strait (ISA)	09/27/00	278	318.8	1.0	126	130	1.0
Chinook	04:49/06	1998	NSRA	Bear Cove, AK	05/24/00	92.5		Icy Strait (ISB)	09/27/00	286	302.5	1.0	125	235	1.9
Chinook	05:32/16	1998	FWS	Clear Cr./Salmon R., ID	04/06/00	22.7		Icy Point (IPA)	09/26/00	310	415.9	1.0	174	1635	9.4
Coho	04:01/23	1997	ADFG	Chikatan R., AK (Wild)	06/02/99			Icy Strait (ISB)	09/27/00	6880	4300.0	1.1	485	180	0.4
Coho	50:31/05	1998	DIPC	Sheep Creek, AK	06/07/00	—	14.9	Icy Strait (ISA)	09/30/00	261	228.2	1.0	115	100	0.9
Coho	50:31/08	1998	DIPC	Sheep Creek, AK	06/07/00		14.9	Icy Strait (ISB)	09/30/00	293	325.1	1.0	115	95	0.9
Coho	No Tag							Icy Point (IPB)	09/26/00	333	459.5				

³ ADFG=Alaska Department of Fish and Game, DIPC=Douglas Island Pink and Chum Corporation, FWS=Fish and Wildlife Service, NMFS=National Marine Fisheries Service, and NSRA=Northern Southeast Regional Aquaculture Association.

⁴European age notation, with the numeral before the decimal denoting the number of freshwater winters and the numeral following the decimal denoting marine winters.