JC-00-12 Cruise Report
11 August 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 19 to 25 July, 2000. In addition to Auke Bay Laboratory scientists, Laurie A. Weitkamp, a scientist from the Northwest Fisheries Science Center accompanied us on the cruise. This cruise is the third 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[1] 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.

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

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

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), 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 18 of the 20 core stations; two stations were not sampled on account of limited time due to vessel personnel constraints. However, repeated sampling was conducted at two stations in Icy Strait (ISC and ISD) to increase sample sizes of juvenile salmon. Therefore, oceanographic and trawl data were collected at 20 stations (Table 2). A total of 20 CTD casts, 22 vertical 20-m tows, 20 bongo tows, 5 deep vertical tows, and 19 rope trawl hauls were made during the cruise. Twenty water samples were additionally taken for later analysis of chlorophyll and nutrients.

Surface (2-m) temperatures and salinities during the cruise ranged 7.3-14.1°C and 14.6-31.6 PSU (Table 3). Temperatures varied between stations and were warmest at the two furthest offshore stations (i.e., IPC and IPD). Salinities were lowest at the inshore stations (i.e., TKI, ABM, LFC, and FPR) and highest in the offshore coastal stations (i.e., IPA, IPB, IPC, and IPD). . Temperatures and salinities in 2000 were generally within the ranges found within in the previous three years of study.

Zooplankton biomass, as determined from the settled volumes from the 20-m vertical tows, ranged 1-30 ml at the stations, with the highest levels observed in the inshore stations (11-30 ml), with variable amounts occurring at the coastal (1-8 ml) and strait (2-12 ml) stations. Zooplankton biomass was relatively lower in strait and coastal habitats in comparison to the previous three years of study.

A total of 4,758 fish from 17 taxa were captured in the 19 rope trawl hauls, including all five species of Pacific salmon (Tables 3-5). The primary catch component was juvenile salmon, particularly chum salmon (*O. keta*) and pink salmon (*O. gorbuscha*). The frequency of occurrence was highest for chum salmon, pink salmon, sockeye salmon (*O. nerka*), and coho salmon (*O. kisutch*) (Table 5).

Onboard stomach analysis was done on 60 spiny dogfish (*Squalus acanthias*), 26 walleye

pollock (*Theragra chalcogramma*), 10 pink salmon, 4 immature chinook salmon (*O. tshawytscha*), 4 Pacific sandfish (*Trichodon trichodon*), and 3 chum salmon. Of the potential salmon predators examined, no remains of juvenile salmon were identifiable, however, one spiny dogfish was found to contain remains of an immature sockeye salmon.

Seven juvenile salmon lacking adipose fins were examined for the presence of previously implanted coded-wire tags (CWTs) (Table 6). Five of the seven salmon contained CWTs: one chinook and four coho. All CWT fish originated from the northern region of southeastern Alaska. From release to recovery, the CWT fish migrated 15-130 km from their tagging localities and had spent 37-50 days at sea. The chinook salmon had a relatively slower daily migration rate (0.4 km/d) than did the four juvenile coho salmon (2.6, 2.1, 2.4, and 2.1 km/d). Data documenting the occurrence of CWT coho and chinook juveniles in the study area in July, is consistent with results from the prior three years of study.

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*, 19-25 July 2000.

Locality	Station	Latitude north	Longitude west	Distance between offshore km	Depth km	Depth m
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		
19 July	4046	TKI	1	1	2	0	1	1
19 July	4047	LFC	1	1	2	0	1	1
19 July	4048	ABM	1	3	2	1	1	0
20 July	4049	ISA	1	1	2	0	1	1
20 July	4050	ISB	1	1	2	0	1	1
20 July	4051	ISC	1	1	2	0	1	1
20 July	4052	ISD	1	1	2	0	1	1
21 July	4054	UCD	1	1	2	0	1	1
21 July	4055	UCC	1	1	2	0	1	1
21 July	4056	UCB	1	1	2	0	1	1
21 July	4057	UCA	1	1	2	0	1	1
22 July	4058	ISD	1	1	2	0	1	1
22 July	4059	ISC	1	1	2	0	1	1
22 July	4053	FPR	1	1	2	0	1	1
23 July	4060	CSD	1	1	2	0	1	1
23 July	4061	CSC	1	1	2	0	1	1
24 July	4062	IPA	1	1	2	1	1	1
24 July	4063	IPB	1	1	2	1	1	1
24 July	4064	IPC	1	1	2	1	1	1
24 July	4065	IPD	1	1	2	1	1	1
Total			20	22	40	5	20	19

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, 19-25 July 2000.

			Temp.	Salinity	Settled plankton (ml)			Juvenile salmon					Immature		Adult	
Date	Haul#	Station	(°C)	(PSU)	Zoop-	Phyto-	Total	Chum	Pink	Sockeye	Coho		Chinook	Chinook		
	Chum	Pink	Chum													
19 July	4046	TKI	10.4	14.6	15.0	8.0	23.0	0	0	0	0	5	0	0	1	0
19 July	4047	LFC	12.8	17.0	~20.0	~45.0	65.0	0	0	2	2	2	0	0	0	0
19 July	4048	ABM	13.0	17.1	~30.0	~30.0	60.0	na	na	na	na	na	na	na	na	na
20 July	4049	ISA	11.6	27.9	12.0	3.0	15.0	28	3	2	9	0	1	0	0	0
20 July	4050	ISB	11.5	28.2	8.0	52.0	60.0	95	70	11	5	1	2	0	0	0
20 July	4051	ISC	12.7	27.4	8.0	0.0	8.0	461	217	37	15	1	2	0	2	0
20 July	4052	ISD	13.0	26.9	9.0	0.0	9.0	52	42	5	17	0	0	0	0	0
21 July	4054	UCD	12.0	27.4	2.5	0.0	2.5	51	26	1	2	1	0	0	0	0
21 July	4055	UCC	12.5	28.1	2.0	0.0	2.0	103	34	4	5	0	0	0	0	0
21 July	4056	UCB	10.8	28.9	2.5	0.0	2.5	59	8	2	4	1	0	0	3	021
July	4057	UCA	12.8	27.0	3.5	0.0	3.5	120	18	0	3	1	0	0	0	1
22 July	4058	ISD	12.7	25.8	5.0	0.0	5.0	1,144	592	34	26	1	0	0	2	0
22 July	4059	ISC	12.5	26.5	6.0	0.0	6.0	91	61	19	12	1	1	0	1	1
22 July	4053	FPR	13.3	15.3	11.0	10.0	21.0	15	11	5	3	0	1	0	0	0
23 July	4060	CSD	7.3	26.0	2.0	0.0	2.0	283	270	8	0	0	0	0	0	0
23 July	4061	CSC	8.7	30.3	5.0	0.0	5.0	4	4	0	1	0	0	0	0	0
24 July	4062	IPA	13.1	31.4	7.0	0.0	7.0	63	60	2	2	1	0	0	1	0
24 July	4063	IPB	12.9	31.3	4.5	0.0	4.5	89	41	10	2	1	0	0	0	0
24 July	4064	IPC	13.4	31.1	8.0	0.0	8.0	50	62	7	1	0	0	0	0	0
24 July	4065	IPD	14.1	31.6	1.0	0.0	1.0	2	0	5	0	0	0	1	1	0
	Total catch		—	—	—	—	—	2,710	1,519	154	109	16	7	1	11	2

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, 19-25 July 2000.

Date	Haul#	Station	Spiny dogfish	Walleye pollock	Pacific herring	Crested sculpin	Black rockfish	Prowfish	Pacific sandfish	Pacific spiny lumpsucker	Smooth lumpsucker	Silver-spotted sculpin	Capelin	Pomfret
19 July	4046	TKI	0	9	15	6	0	1	0	0	0	0	1	0
19 July	4047	LFC	0	2	1	4	0	1	4	1	0	0	0	0
19 July	4048	ABM	na	na	na	na	na	na	na	na	na	na	na	na
20 July	4049	ISA	0	1	0	0	0	0	0	0	1	0	0	0
20 July	4050	ISB	0	4	0	0	0	0	0	0	0	0	0	0
20 July	4051	ISC	0	1	0	1	0	0	0	0	0	0	0	0
20 July	4052	ISD	0	0	0	2	0	0	0	0	0	0	0	0
21 July	4054	UCD	0	0	0	2	0	0	0	0	0	0	0	0
21 July	4055	UCC	0	2	0	2	0	0	0	0	0	0	0	0
21 July	4056	UCB	0	3	0	0	0	0	0	0	0	0	0	0
21 July	4057	UCA	0	6	0	0	0	0	0	0	0	0	0	0
22 July	4058	ISD	0	0	0	1	0	0	0	0	0	0	0	0
22 July	4059	ISC	0	0	0	1	0	0	0	0	0	0	0	0
22 July	4053	FPR	0	0	0	2	0	0	0	0	0	0	0	0
23 July	4060	CSD	0	0	4	0	0	0	0	0	0	0	0	0
23 July	4061	CSC	0	0	2	0	0	0	0	1	0	1	0	0
24 July	4062	IPA	89	0	0	0	0	1	0	0	0	0	0	0
24 July	4063	IPB	21	0	0	0	0	0	0	0	0	0	0	0
24 July	4064	IPC	3	0	0	0	0	1	0	0	0	0	0	0
24 July	4065	IPD	0	6	0	0	21	1	0	0	0	0	0	1
	Total catch		113	34	22	21	21	5	4	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*, 19-25 July 2000.

Common name	Species	n	Fork length (mm) min	max	x	Frequency of occurrence	Life history stage[2]
Chum salmon	*Oncorhynchus keta*	1,622[3]	85	179	130.1	17	J
Pink salmon	*O. gorbuscha*	1,177[3]	65	184	121.3	16	J
Sockeye salmon	*O. nerka*	154	99	193	143.3	16	J
Coho salmon	*O. kisutch*	109	138	264	200.9	16	J
Chinook salmon	*O. tshawytscha*	16	131	225	191.5	11	J
Chinook salmon	*O. tshawytscha*	7	255	579	382.6	5	I
Chum salmon	*O. keta*	1	585	585	585.0	1	I
Pink salmon	*O. gorbuscha*	11	445	566	482.9	7	A
Chum salmon	*O. keta*	2	634	669	651.5	2	A
Total salmonids measured		3,099					
Spiny dogfish	*Squalus acanthias*	59[3]	462	880	601.1	3	A
Walleye pollock	*Theragra chalcogramma*	34	40	578	362.4	9	J-A
Pacific herring	*Clupea pallasi*	22	43	202	139.2	4	J-A
Crested sculpin	*Blepsias bilobus*	21	54	119	84.0	9	I-A
Black rockfish	*Sebastes melanops*	21	40	51	45.7	1	J
Prowfish	*Zaprora silenus*	5	56	165	83.8	5	J-A
Pacific sandfish	*Trichodon trichodon*	4	173	199	179.5	1	I
P. Spiny lumpsucker	*Eumicrotremus orbis*	2	51	72	61.5	2	I
Smooth lumpsucker	*Aptocyclus ventricosus*	1	217	217	217.0	1	A
Silver-spotted sculpin	*Blepsias cirrhosus*	1	44	44	44.0	1	J
Capelin	*Mallotus villosus*	1	39	39	39.0	1	J
Pomfret	*Brama japonica*	1	399	399	399.0	1	A
Total non-salmonids measured		172					
Total fish measured		3,271					

[2]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.

[3]The samples of fish measured for these species are a portion of the total number captured. The total number captured for each of these species is given in Tables 3 and 4.

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*, 19-25 July 2000.

		Release information					Recovery information				Days	Distance
	Coded-wire	Brood				Size			Size			since
Species	tag code	year	Agency[4]	Locality	Date	(mm) (g)	Locality (station code)	Date	(mm)	(g)	release	(km)
Chinook	04:01/60	1998	DIPC	Gastineau Channel, AK	06/12/00	23.0	L. Favorite Ch. (LFC)	07/19/00	136	26.4	37	15
Chinook	No Tag						Icy Point (IPB)	07/24/00	210	108.1		
Coho	04:49/05	1998	NSRA	Kasnyku Bay, AK	06/02/00	20.6	Icy Strait (ISD)	07/22/00	210	99.3	50	130
Coho	50:31/05	1998	DIPC	Sheep Creek, AK	06/07/00	14.9	Icy Strait (ISC)	07/22/00	189	73.6	45	95
Coho	50:31/16	1998	DIPC	Gastineau Channel, AK	06/12/00	— 20.9	Icy Strait (ISA)	07/20/00	175	53.8	38	90
Coho	50:31/07	1998	DIPC	Sheep Creek, AK	06/07/00	14.9	Icy Strait (ISC)	07/22/00	182	67.1	45	95
Coho	No Tag						Icy Point (IPA)	07/24/00	255	193.6		

[4] DIPC = Douglas Island Pink and Chum Corporation
NSRA = Northern Southeast Regional Aquaculture Association