

JC-99-06 Cruise Report
04 June 1999

Prepared by Joseph A. Orsi and Bruce L. Wing
Auke Bay Laboratory, 11305 Glacier Highway
Juneau, Alaska 99801-8626
TEL (907) 789-6034 and 789-6043 FAX (907) 789-6094
E-mail: joe.orsi@noaa.gov and bruce.wing@noaa.gov

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 20 to 25 May, 1999. This cruise is the first 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 were planned for all 24 stations, but because juvenile salmon were absent in May of the prior two years of sampling, limited trawl sampling was scheduled at only 12 stations in Icy Strait, off Icy Point, and off Cape Edward.

Oceanographic sampling:

The physical and biological environment was monitored at each station, and 2-m temperature and salinity readings were continuously logged on board the vessel. A SeaBird SBE-19¹

¹Reference 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. Logging of 2-m 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 with conical nets towed vertically and a bongo net towed obliquely. Vertical plankton tows were made from a depth of 20 m with a 50-cm frame and 243 micron mesh net at each station. 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 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 were sampled with a Nordic 264 rope trawl fished directly astern the NOAA ship *John N. Cobb* at the surface. 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 75 fathoms 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 were 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 (MS-222) 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 visually examined for a missing adipose fin, indicating the presence of and 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 was obtained from the http://www.psmfc.org/rmpc/cwt_reports.html.

RESULTS and DISCUSSION

Due to inclement weather towards the end of the cruise, sampling was accomplished at only 16 of the 24 stations scheduled. Weather also reduced the duration of the cruise from 7 to 6 days. Oceanographic data were taken at all 16 stations and trawling was conducted at 4 stations (Table 2). A total of 16 CTD casts, 16 bongo tows, 18 vertical 20-m tows, and 1 deep vertical tow were made during the cruise. Six water samples were taken at selected stations for later analysis of chlorophyll and nutrients.

Surface (2-m) temperatures and salinities during the cruise ranged 6.5-9.0°C and 25.0-31.9 (Table 3). Temperatures varied between stations, however salinities were lowest at the inshore stations (i.e., TKI, ABM, LFC, and FPR). Temperatures at the inshore and strait stations in 1999 were about a degree cooler than in 1997 and 1998, and temperatures in the coastal area (Cross Sound) was similar between the years 1999 and 1997 (no samples for 1998).

A total of four rope trawl hauls were made on the cruise, all along the Icy Strait transect (Table 3). A total of 77 fish representing six species were caught: 6 chinook salmon (*O. tshawytscha*), 1 Dolly Varden (*Salvelinus malma*), 62 walleye pollock (*Theragra chalcogramma*), 5 soft sculpin (*Gilbertidia sigalutes*), 2 bigmouth sculpin (*Hemipterus bolini*), and 1 Pacific herring (*Clupea pallasii*) (Table 4). Pollock and chinook had the highest frequency of occurrence and were the largest fish species encountered. No juvenile salmonids were captured; the chinook and the Dolly Varden were all immature in at least their second ocean year of life.

In addition to the fish catch, two Dall's porpoise (*Phocoenoides dalli*) were inadvertently captured in the trawl at the ISD station. Both porpoise were deceased upon retrieval of the net. The porpoise were not noticed until the net was retrieved back on deck. The animals were 166 and 171 cm in length (upper jaw to fluke notch) and 95 and 104 cm in girth. One porpoise had recent damage in the snout area and another had recent fin erosion. These injuries appeared to be caused by entanglement. This is the first marine mammal take with this trawl gear, which has been fished in southeastern Alaska in over 250 hauls from Dixon Entrance to Icy Point since 1996. At the time the porpoise were captured, water visibility was somewhat poor due to the spring plankton blooms. Soon after the porpoise take occurred, the National Marine Mammal Laboratory in Seattle was contacted by the Ship's officers, as was the Southwest Fisheries Science Center and the Director of the Auke Bay Laboratory. The most appropriate action

advised was to transport the porpoise back to the Auke Bay Laboratory so they could be frozen and utilized in other scientific studies. Therefore, we interrupted the cruise and immediately transported the porpoise back to the Auke Bay Lab for freezer storage. As with many of our transects, porpoise activity along the transect was noted at some stations as we conducted oceanographic sampling prior to trawling. Adult walleye pollock were caught in the trawl hauls across the four stations along this transect (2, 10, 41, 9), as were immature chinook salmon (2, 0, 1, 3). At the time the trawl was fishing, we were processing the catch from the prior haul and did not notice any porpoise activity. Our standard sampling procedure has been to process fish during trawl operations, often discarding some fish after biological samples have been collected. It is conceivable that the porpoise were lured toward the vessel by the fish discards. Conversely, they may have been attracted by the adult pollock in the area of the net, or may have been swimming around the gear and become entangled in the trawl. As far as future operations are concerned with this trawl gear, we feel the most appropriate action to minimize encounter rates of Dall's porpoise is: 1) stand off trawl operations if concentrations of Dall's porpoise are in the vicinity, and 2) avoid discarding any form of bycatch if the trawl is being deployed, fished, or retrieved. If these two methods prove unsuccessful, then more active deterrents such as seal bombs, or underwater recordings could be explored.

The two chinook salmon lacking an adipose fin each contained a previously implanted CWT, and both originated from the northern region of southeastern Alaska (Table 5). Both recovered CWT chinook were immature; one had been at sea for about a year and the other had been at sea for two years. Migration distances of the fish from their release localities were 130 and 170 km, and average daily migration rates were 0.5 and 0.2 km/d. Data from this May sampling documenting the occurrence of immature chinook in their second (age -.1) and third (age-.2) years at sea, and the corresponding origin information from the CWT fish, are consistent with results from the prior two years of study. In all three years, immature chinook have been present in the strait habitat in May, and all have originated from the northern region of southeastern Alaska.

Onboard stomach analysis was done on 37 fish: 30 walleye pollock, 6 immature chinook salmon, and 1 Dolly Varden. The walleye pollock fed primarily on euphausiids, the chinook fed primarily on forage fish, and the Dolly Varden fed primarily on crab megalops. No evidence of predation on juvenile salmon was observed.

ACKNOWLEDGMENTS

We would like to acknowledge the command and crew of the NOAA ship *John N. Cobb* (Bill Cobb, Mike Devany, Sam Hardy, Shannon King, Bill Lamoureux, Strydr Nutting, Dan Roby, and Del Sharp) for their superb cooperation and performance.

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*, 20-25 May 1999.

Locality	Station	Latitude	Longitude	Offshore distance	Inter-transect distance	
distance	Depth					
Auke Bay	ABM	58° 22.00' N	134° 40.00' W	1.5 km		60 m
Taku Inlet	TKI	58° 11.19' N	134° 11.71' W	2.2 km		175 m
False Point Retreat	FPR	58° 22.00' N	135° 00.00' W	1.8 km		680 m
Lower Favorite Channel	LFC	58° 20.98' N	134° 43.73' W	1.5 km		75 m
Upper Chatham Strait	UCA	58° 04.57' N	135° 00.08' W	3.2 km	3.2 km	400 m
	UCB	58° 06.22' N	135° 00.91' W	6.4 km	3.2 km	100 m
	UCC	58° 07.95' N	135° 01.69' W	6.4 km	3.2 km	100 m
	UCD	58° 09.64' N	135° 02.52' W	3.2 km	3.2 km	200 m
Icy Strait	ISA	58° 13.25' N	135° 31.76' W	3.2 km	3.2 km	128 m
	ISB	58° 14.22' N	135° 29.26' W	6.4 km	3.2 km	200 m
	ISC	58° 15.28' N	135° 26.65' W	6.4 km	3.2 km	200 m
	ISD	58° 16.38' N	135° 23.98' W	3.2 km	3.2 km	234 m
Cross Sound	CSA	58° 09.53' N	136° 26.96' W	3.2 km	3.2 km	300 m
	CSB	58° 10.91' N	136° 28.68' W	6.4 km	3.2 km	60 m
	CSC	58° 12.39' N	136° 30.46' W	6.4 km	3.2 km	200 m
	CSD	58° 13.84' N	136° 32.23' W	3.2 km	3.2 km	200 m
Icy Point	IPA	58° 20.12' N	137°07.16' W	6.9 km	16.8 km	160 m
	IPB	58° 12.71' N	137°16.96' W	23.4 km	16.8 km	130 m
	IPC	58° 05.28' N	137°26.75' W	40.2 km	16.8 km	150 m
	IPD	57° 53.50' N	137°42.60' W	65.0 km	24.8 km	1,300 m
Cape Edward	EDA	57° 39.00' N	136°23.20' W	8.0 km	8.0 km	90 m
	EDB	57° 36.00' N	136°34.40' W	20.0 km	12.0 km	185 m
	EDC	57° 32.50' N	136°46.60' W	33.0 km	13.0 km	1,270 m
	EDD	57° 28.75' N	136°56.60' W	47.0 km	13.0 km	1,800 m

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*, 20-25 May 1999.

Date	Haul#	Station	CTD	Plankton net samples			Chlorophyll & nutrients	Rope trawl
				Norpac	Bongo	WP-2		
20 May	3001	TKI	1	1	1	0	1	0
20 May	3002	ABM	1	3	1	1	1	0
20 May	3003	LFC	1	1	1	0	0	0
20 May	3004	FPR	1	1	1	0	0	0
21 May	3005	ISA	1	1	1	0	1	1
21 May	3006	ISB	1	1	1	0	1	1
21 May	3007	ISC	1	1	1	0	0	1
21 May	3008	ISD	1	1	1	0	0	1
22 May	3009	UCD	1	1	1	0	1	0
22 May	3010	UCC	1	1	1	0	1	0
22 May	3011	UCB	1	1	1	0	0	0
22 May	3012	UCA	1	1	1	0	0	0
22 May	3013	CSD	1	1	1	0	1	0
22 May	3014	CSC	1	1	1	0	0	0
22 May	3015	CSB	1	1	1	0	0	0
22 May	3016	CSA	1	1	1	0	1	0
Total			16	18	16	1	8	4

Table 3.--Two meter temperatures and salinities, settled volumes of plankton from 20-m vertical Norpac hauls, and catches of fish with a rope trawl at stations sampled by the NOAA ship *John N. Cobb* in marine waters of the northern region of southeastern Alaska, 20-25 May 1999. Trawling only occurred at haul#s 3005-3008.

Date	Haul#	Station	<u>Two meter depth</u>		Settled plankton (ml)			Chinook salmon	Dolly Varden	Walleye pollock	Soft sculpin	Bigmouth sculpin	Pacific herring
			Temp. (°C)	Salinity ()	<u>20-m Norpac hauls</u>	Zoop-	Phyto-						
20 May	3001	TKI	6.9	25.0	~2	~48	50						
20 May	3002	ABM	9.0	27.1	~7	~48	55						
20 May	3003	LFC	9.0	27.2	~3	~107	110						
20 May	3004	FPR	6.7	30.5	~10	~80	90						
21 May	3005	ISA	6.5	31.0	6	14	20	2	0	2	0	0	0
21 May	3006	ISB	6.5	31.0	10	12	22	0	0	10	0	2	0
21 May	3007	ISC	7.3	30.8	22	18	40	1	1	41	4	0	1
21 May	3008	ISD	7.7	30.6	16	10	26	3	0	9	1	0	0
22 May	3009	UCD	7.1	30.8	10	10	20						
22 May	3010	UCC	7.1	30.8	13	10	23						
22 May	3011	UCB	6.3	31.1	5	20	25						
22 May	3012	UCA	6.5	30.3	11	10	21						
22 May	3013	CSD	6.8	31.9	3	3	6						
22 May	3014	CSC	7.0	31.9	6	54	60						
22 May	3015	CSB	6.9	31.9	7	29	36						
22 May	3016	CSA	7.9	31.6	7	31	38						
Total catch								6	1	62	5	2	1

Table 4.--Length, frequency of occurrence, and life history stage of measured fish captured with a rope trawl in the marine waters of the northern region of southeastern Alaska off the NOAA ship *John N. Cobb*, 20-25 May 1999.

history	Common name	Species	n	Fork length (mm)			Frequency of occurrence	Life ² stage
				min	max	x		
	Chinook salmon	<i>Oncorhynchus tshawytscha</i>	6	295	505	472.7	3	I
	Dolly Varden	<i>Salvelinus malma</i>	1	374	374	374.0	1	A
	Total salmonid		7					
	Walleye pollock	<i>Theragra chalcogramma</i>	62	384	570	472.7	4	A
	Soft sculpin	<i>Gilbertidia sigalutes</i>	5	42	56	51.8	2	I
	Bigmouth sculpin	<i>Hemipterus bolini</i>	2	36	44	40.0	1	J
	Pacific herring	<i>Clupea pallasii</i>	1	102	102	102.0	1	I
	Total non-salmonid		70					
	Total fish		77					

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 5.--Release and recovery information for coded-wire tagged salmon captured in the northern region of southeastern Alaska by rope trawl haul, NOAA ship *John N. Cobb*, 20-25 May 1999.

Species	Release information					Recovery information				Days release	Distance since (km)
	Coded-wire tag	Brood year	Agency ³	Locality	Date	Locality (station code)	Date	Size (mm) (g)			
Chinook	04:47/27	1996	ADFG	Taiya Inlet, AK	06/10/98	Icy Strait (ISD)	05/21/99	325	420.0	346	170
Chinook	04:47/11	1995	NSRA	Kasnyku Bay, AK	05/27/97	Icy Strait (ISD)	05/21/99	505	1575.0	724	130

³ ADFG = Alaska Department of Fish and Game
 NSRA = Northern Southeast Regional Aquaculture Association