

JC-99-15 Cruise Report
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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 20 to 26 August, 1999. 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 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-19¹ conductivity-temperature-depth (CTD) profiler was deployed at each station, as depth

¹Reference 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 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 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 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 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 20 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 Cape Edward transect. During poor weather conditions, two stations at the Icy Strait (ISC and ISD) were sampled again twice each with longer trawl durations to accumulate additional samples of juvenile samples. Consequently, oceanographic data were taken at 20 stations and trawling was conducted at 19 stations (Table 2). A total of 24 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 9.5-13.6°C and 14.4-31.4 (Table 3). Temperatures varied between stations, however salinities were lowest at the inshore stations (i.e., TKI, ABM, LFC, and FPR).

Zooplankton biomass, as determined from the settled volumes from the 20-m vertical tows, ranged 0.5-11.0 ml (Table 3). As in the previous two years of study, zooplankton biomass declined sharply from July to August. No consistent trends in zooplankton biomass were apparent between inshore, strait, or coastal habitats.

A total of 229 fish from 13 taxa were captured in the 24 rope trawl hauls, including all five species of Pacific salmon (Tables 3-5). The primary catch component was juvenile salmon, and the frequency of occurrence was highest for juvenile coho salmon (*O. kisutch*).

Onboard stomach analysis was done on 48 potential fish predators of juvenile salmon: 21 pink salmon (*O. gorbuscha*), 8 walleye pollock (*Gadus chalcogrammus*), 7 sablefish (*Anoplopoma fimbria*), 6 immature chinook salmon (*O. tshawytscha*), 4 coho salmon,

and 2 sockeye salmon (*O. nerka*). Although several fish had unidentifiable fish remains in their stomachs, the remains of juvenile salmon were not detected. One potential salmon predator, an adult female blue shark (*Prionace glauca*), was viable upon capture and therefore tagged and released on 25 August (156 cm-tip to tip, 140 cm-tip to fork, and 130 cm-tip to precaudal; NMFS orange anchor tag# SF98136).

Of the five juvenile coho salmon lacking adipose fins, two contained previously implanted CWTs (Table 6). All CWTed fish originated from the northern region of southeastern Alaska; one from an enhancement facility and one from a wild river system. From release to recovery the CWT fish migrated 100-165 km from their tagging localities and had spent 78-99 days at sea.

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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*, 20-26 August 1999.

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
Cape Edward	EDA	57° 39.00'	136°23.20'	8.0		90
	EDB	57° 36.00'	136°34.40'	20.0	12.0	185
	EDC	57° 32.50'	136°46.60'	33.0	13.0	1,270
	EDD	57° 28.75'	136°56.60'	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*, 20-26 August 1999.

Date	Haul#	Station	CTD	Plankton net samples			Chlorophyll & nutrients	Rope trawl
				Norpac	Bongo	WP-2		
20 August	3063	TKI	1	1	2	0	1	1
20 August	3064	LFC	1	1	2	0	1	1
20 August	3065	FPR	1	1	2	0	1	1
21 August	3066	UCC	1	1	2	0	0	1
21 August	3067	UCB	1	1	2	0	0	1
21 August	3068	UCA	1	1	2	0	1	1
21 August	3069	UCD	1	1	2	0	1	1
22 August	3070	ISB	1	1	2	0	0	1
22 August	3071	ISC	1	1	2	0	0	1
22 August	3072	ISD	1	1	2	0	1	1
22 August	3073	ISA	1	1	2	0	1	1
23 August	3074	CSD	1	1	2	0	1	1
23 August	3075	CSC	1	1	2	0	0	1
23 August	3076	CSB	1	1	2	0	0	1
23 August	3077	CSA	1	1	2	0	1	1
24 August	3078	ISC	1 ²	1	0 ²	0	0	1
24 August	3079	ISC	1 ²	1	0 ²	0	0	1
24 August	3080	ISD	1 ²	1	0 ²	0	0	1
24 August	3081	ISD	1 ²	1	0 ²	0	0	1
25 August	3082	IPA	1	1	2	1	0	1
25 August	3083	IPB	1	1	2	1	1	1
25 August	3084	IPC	1	1	2	1	1	1
25 August	3085	IPD	1	1	2	1	1	1
26 August	3086	ABM	1	3	2	1	1	0
Total			24	27	40	5	17	23

²CTD casts were only deployed to 50 m and no Bongo tows were made at these stations because they had previously been sampled on 22 August.

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, 20-26 August 1999.

Date	Haul#	Station	Temp. (°C)	Salinity (o/oo)	Settled plankton (ml)			Juvenile					Immature			Adult			
					Zoop-	Phyto-	Total	Coho	Pink	Chum	Chin	Sock	Chin	Sock	Chin	Sock	Pink	Coho	Sock
20 August	3063	TKI	10.7	14.4	10	30	40					△							
20 August	3064	LFC	13.0	20.1	10	10	20					◊	◊						
20 August	3065	FPR	13.6	15.7	4	0	4	◊△				◊					1		
21 August	3066	UCC	13.4	18.8	2	0	2												
21 August	3067	UCB	12.9	23.8	1	0	1	◊									◊	◊	◊
21 August	3068	UCA	12.7	24.7	1	0	1										◊		
21 August	3069	UCD	13.3	18.6	2	0	2												
22 August	3070	ISB	12.9	21.4	4	0	4												
22 August	3071	ISC	13.4	17.9	7	0	7	◊◊	◊				◊		◊		◊		
22 August	3072	ISD	13.4	18.3	8	0	8	◊	◊	◊									
22 August	3073	ISA	11.0	26.8	9	0	9												
23 August	3074	CSD	9.5	29.2	3	0	3	◊	◊◊	◊◊									◊
23 August	3075	CSC	9.9	30.1	5	0	5		△								◊		
23 August	3076	CSB	9.8	29.8	5	0	5	◊											◊
23 August	3077	CSA	10.4	29.0	3	0	3												
24 August	3078	ISC	11.9	◊◊◊◊	11	0	11	◊	◊	◊			◊						◊
24 August	3079	ISC	12.5	◊◊◊◊	10	0	10	◊	◊	◊				◊					
24 August	3080	ISD	12.8	◊◊◊◊	△	△	△										◊	◊	
24 August	3081	ISD	12.8	◊◊◊◊	◊	△	◊	◊	◊	◊				◊			◊		
25 August	3082	IPA	10.5	29.5	10	0	10	◊	◊										
25 August	3083	IPB	13.0	◊◊◊◊	11	0	11	◊						◊					
25 August	3084	IPC	12.1	◊◊◊◊	1	0	1	◊				◊							
25 August	3085	IPD	13.0	31.4	0.5	0	0.5			◊									
26 August	3086	ABM	11.3	16.5	◊◊	◊◊	◊△	na	na	na	na	na	na	na	na	na	na	na	na
		Total catch	—					49	46	21	11	3	1	6	21	4	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, 20-26 August 1999.

Date	Haul#	Station	Capelin	Prowfish	Crested sculpin	Walleye pollock	Sablefish	Pacific herring	Pacific spiny lumpsucker	Pacific sandlance	Blue shark
20 August	3063	TKI	⊙		⊙			⊙			
20 August	3064	LFC					⊙		⊙		
20 August	3065	FPR					⊙				
21 August	3066	UCC	⊙		⊙						
21 August	3067	UCB			⊙	⊙	⊙				
21 August	3068	UCA		⊙	⊙	△	⊙				
21 August	3069	UCD									
22 August	3070	ISB									
22 August	3071	ISC		—	⊙						
22 August	3072	ISD		⊙	⊙						
22 August	3073	ISA									
23 August	3074	CSD	⊙⊙				⊙	⊙		⊙	
23 August	3075	CSC									
23 August	3076	CSB		⊙							
23 August	3077	CSA		⊙			—				
24 August	3078	ISC		⊙				⊙			
24 August	3079	ISC		⊙							
24 August	3080	ISD		⊙	⊙						
24 August	3081	ISD		⊙	⊙			⊙			
25 August	3082	IPA									
25 August	3083	IPB									⊙
25 August	3084	IPC		⊙							
25 August	3085	IPD									
26 August	3086	ABM	na	na	na	na	na	na	na	na	na
Total catch			19	12	10	8	7	6	1	1	1

Table 5.--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*, 20-26 August 1999.

history Common name	Species	n	Fork length (mm)			Frequency of occurrence	Life ³ stage
			min	max	x		
Coho salmon	<i>Oncorhynchus keta</i>	49	180	309	224.7	12	J
Pink salmon	<i>O. gorbuscha</i>	46	107	179	134.4	8	J
Chum salmon	<i>Oncorhynchus keta</i>	21	113	164	138.9	6	J
Chinook salmon	<i>O. tshawytscha</i>	11	152	270	190.1	4	J
Sockeye salmon	<i>O. nerka</i>	3	99	144	122.3	3	J
Chinook salmon	<i>O. tshawytscha</i>	6	366	459	417.2	3	I
Sockeye salmon	<i>O. nerka</i>	1	347	347	347.0	1	I
Pink salmon	<i>O. gorbuscha</i>	21	427	533	483.8	8	A
Coho salmon	<i>O. kisutch</i>	4	574	683	647.5	4	A
Sockeye salmon	<i>O. nerka</i>	2	585	668	626.5	2	A
Salmonid total		164					
Capelin	<i>Mallotus villosus</i>	19	34	53	45.4	3	J
Prowfish	<i>Theragra chalcogramma</i>	12	69	201	120.0	9	I-A
Crested sculpin	<i>Blepsias bilobus</i>	10	101	157	129.2	8	I-A
Walleye pollock	<i>Gadus chalcogrammus</i>	8	8	504	564	532.8	2
A Sablefish	<i>Anoplopoma fischeroni</i>						
△ Pacific herring	<i>Clupea pallasii</i>	6	131	211	158.8	4	I-A
P. Spiny lump sucker	<i>Eumicrotremus orbis</i>	1	69	69	69.0	1	I
Pacific sand lance	<i>Ammodytes hexapterus</i>	1	81	81	81.0	1	J
Blue shark	<i>Prionace glauca</i>	1	1397	1397	1397.0	1	A
Non-salmonid total		65					
Total		229					

³J = 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*, 20-26 August 1999.

Species	Release information					Recovery information				Days release	Distance since (km)
	Coded-wire tag	Brood code	Agency ⁴	Locality	Date	Locality (station code)	Date	Size (mm)	Size (g)		
Coho	04:45/31	1997	ADFG	Berner's R., AK (wild)	05-06/99	Icy Strait (ISC)	08/23/99	239	163.1	99	100
Coho	50:31/01	1997	DIPC	Gastineau Channel, AK	06/07/99	Icy Strait (ISC)	08/24/99	211	109.0	△△	165
Coho	No Tag					Icy Point (IPA)	08/25/99	262	240.0		
Coho	No Tag					Icy Point (IPB)	08/25/99	291	285.0		
Coho	No Tag					Icy Point (IPC)	08/25/99	309	320.0		

⁴ ADFG = Alaska Department of Fish and Game
DIPC = Douglas Island Pink and Chum Corporation