

JC-97-06 Cruise Report
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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 May 1997. This cruise was the first in a series of six monthly cruises scheduled to sample the inside and costal marine waters of this region.

Primary objectives for the cruises included: 1) sampling juvenile salmon (*Oncorhynchus* spp.) and ecologically related species with a rope trawl, 2) collecting associated physical and biological data with each trawl haul, and 3) examining the spatial and temporal occurrence of juvenile chum salmon (*O. keta*) and pink salmon (*O. gorbuscha*) and their diets and prey fields. One major focus of these cruises is to use otolith marked juvenile salmon to assess potential interactions between hatchery and wild stocks in the region.

Sampling was conducted at twenty stations throughout the inside and coastal offshore waters of the northern region of southeastern Alaska (Table 1). At each station, sampling involved: one 20-min trawl haul, one CTD cast, one double oblique bongo tow, one 20-m vertical plankton tow, and in coastal offshore waters only, one deep vertical plankton tow.

Trawl gear:

Fish were sampled with a Nordic¹ 264 rope trawl fished directly astern the NOAA ship *John N. Cobb* at the surface. The mouth opening of the trawl was 20 m deep and 35 m wide and it was spread apart 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 1.5 m/sec (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. To minimize the loss of fish behind the headrope, a small mesh panel of 10.2 cm mesh was sewn in along the jib lines on the top panel of the trawl between the head rope and the first 162.6 cm mesh.

Oceanographic sampling:

The physical and biological environment was monitored and sampled prior to each trawl. One

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

CTD cast was made with a Sea-Bird SBE 19 Seacat profiler to 200 m or within 10 m of the bottom. 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. The vertical plankton tows were made with a 50 cm frame and 353 micron mesh net. Flow meters were placed inside each bongo net and the deep conical net.

Results:

Twenty stations were sampled with 19 trawl hauls, 20 bongo tows, 20 CTD casts, and 24 vertical plankton hauls during the cruise (Table 1). Favorable weather conditions, particularly in the coastal ocean transects of Icy Point and Cross Sound, enabled sampling to be completed at all stations except trawling at the Auke Bay Monitor (ABM) station. Trawl sampling at the ABM station was not feasible because of shallow irregular bottom depths; therefore an additional station was sampled in nearby lower Favorite Channel.

Chinook salmon (*O. tshawytscha*) was the only species of Pacific salmon captured, and it had the highest frequency of occurrence of all the fish species sampled (Table 2). Sizes of the 18 chinook salmon sampled ranged 235-359 mm fork length (FL) and 154-650 g. The sizes and bright condition of the fish indicated they were primarily age -.1 (one-ocean) and immature. Two coded-wire tags (CWTs) were recovered from the chinook sampled. One CWT fish was released from Gastineau hatchery on 12 June 1996 at a size of 147 mm FL and 23.5 g and was recovered on 21 May 1997 in Upper Chatham Strait at a size of 310 mm FL and 410 g. The other CWT fish was released from Hidden Falls hatchery on 5 June 1996 at a size of 28.4 g and was recovered on 24 May 1997 in Icy Strait at a size of 326 mm FL and 505 g. Both CWTed fish were at sea for about a year and had migrated 70 to 135 km since release with average apparent migration rates of about 0.2-0.4 km/day.

A total of twelve fish species were sampled with the rope trawl (Table 2). The numbers of each fish species captured in order of decreasing abundance were: 237 Pacific herring (*Clupea harengus*), 77 walleye pollock (*Theragra chalcogramma*), 18 chinook salmon, 16 soft sculpin (*Gilbertidia sigalutes*), 10 capelin (*Mallotus villosus*), 6 Pacific sandfish (*Trichodon trichodon*), 5 starry flounder (*Platichthys stellatus*), 3 Pacific spiny lump sucker (*Eumicrotremus orbis*), 3 bigmouth sculpin (*Hemitripterus bolini*), 1 wolf-eel (*Anarrhichthys ocellatus*), 1 three-spined stickleback (*Gasterosteus aculeatus*), and 1 salmon shark (*Lamna ditropis*). In addition to the fish catch, 128 squid (Gonatidae) were sampled. Catches of fish or squid occurred in 15 of the 18 trawl hauls (Table 3).

Onboard stomach analysis was done on 63 potential predators of juvenile salmon, namely: immature chinook salmon (18), adult walleye pollock (32), adult starry flounder (5), immature and adult Pacific sandfish (6), and adult Pacific herring (2). The principal prey items of the chinook salmon were juvenile fish, including: sand lance (100-130 mm), eelpouts, sculpins, and small unidentified larval fish (10 mm). Juvenile squid and decapod zoea were also noted in the salmon stomach dissections. Walleye pollock diets consisted predominately of larvaceans (oikopleura), euphausiid species, and hyperiid amphipods, while small larval fish and occasional invertebrates including polychaetes, chaetognaths, and decapod zoea were also observed. The starry flounder examined had relatively empty stomachs except for one fish that contained

mainly euphausiids. Large numbers of parasitic nematodes were also visible in all the starry flounder stomachs. Pacific herring stomach contents consisted mainly of gastropods (*Limacina*); parasitic worms were again present in substantial numbers. Five of the six Pacific sandfish stomachs examined contained very digested juvenile fish species, thought to be salmonids (40-55 mm), and one stomach content primarily contained unknown crustacean larvae, although this particular fish was a gravid female with a copious amount of eggs.

Stomach fullness varied among species. Walleye pollock and Pacific sandfish stomachs were consistently full to distended, whereas chinook salmon stomach fullness ranged from a trace of food to 25% full, starry flounders were typically empty, and Pacific herring were 25-50% full.

Oceanographic features, such as the 2-m temperature and salinity readings, differed somewhat between localities. In general, warmer temperatures and lower salinities were found at the inside stations, whereas colder, more saline conditions were found at the coastal stations (Table 3).

Cursory examination of plankton samples indicated a wide diversity of zooplankton (e.g., amphipods, euphausiids, copepods, isopods, etc.) and ichthyoplankton (e.g., walleye pollock, myctophids, eelpouts, etc.). Plankton abundance also differed between habitats. The coastal and offshore samples contained limited amounts of phytoplankton, whereas the inside stations had dense concentrations that at times partially clogged the bongo nets.

Discussion:

Results from this cruise are complementary to a cruise conducted thirteen years ago in the same general inside waters of the northern region of southeastern Alaska using a purse seine fished off the NOAA ship *John N. Cobb* on 7-12 May 1984 (Cruise report JC-84-01). On this cruise, chinook salmon were also the only salmon species encountered and Pacific herring and walleye pollock were the most abundant fish species. In 21 purse seine sets, 14 chinook (260-767 mm) were sampled, similar to the 18 chinook (235-359) sampled in 19 trawl hauls during this cruise. The only notable differences in catch composition between cruises were the 51 Dolly Varden and larger chinook caught with the purse seine, which can probably be attributed to the more nearshore fishing localities of the purse seine sets.

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Special thanks to Auke Bay Laboratory personnel Mary Auburn, Audra Brase, and Lee Hulbert who participated on the entire cruise. Their invaluable assistance onboard the vessel enabled the reporting of prey items from stomach samples of potential salmon predators and the identification of numerous planktonic taxa. Dr. Bruce Wing is also to be recognized for participating on the first two stations of the cruise to instruct us on the proper procedure for the double oblique Bongo tow. Finally, I would like to acknowledge the command and crew of the NOAA ship *John N. Cobb* for their superb cooperation and hospitality for the duration of the cruise.

Table 1.--Localities and coordinates of stations sampled in the marine waters of the northern region of southeastern Alaska off the NOAA ship *John N. Cobb*, 20-25 May 1997.

Locality	Station	Latitude	Longitude	Offshore	Inter-	transect
distance	Depth				distance	
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 ²	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° 56.37' N	135°38.31' W	60.0 km	16.8 km	200 m

²Added this station because Auke Bay could not be trawled

Table 2.--Abundance, length, frequency of occurrence, and life history stage of fish and squid 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 1997.

history Common name	Species	n	Fork length (mm)			x	Frequency Life ³ of occurrence stage	
			min	max				
Chinook salmon	<i>Oncorhynchus tshawytscha</i>	18	259	359		284.4	9	I
Soft sculpin	<i>Gilbertidia sigalutes</i>	16	40	55		48.3	8	J, A
Walleye pollock	<i>Theragra chalcogramma</i>	77	255	565		465.2	5	I, A
Squid ⁴	Gonatidae	128	22	44		35.7	4	J
Capelin	<i>Mallotus villosus</i>	10	30	91		72.4	4	L, A
Pacific herring	<i>Clupea harengus</i>	237	134	211		175.5	3	A
Bigmouth sculpin	<i>Hemitripterus bolini</i>	3	38	47		43.7	3	J
Pacific spiny lumpsucker	<i>Eumicrotremus orbis</i>	3	39	58		49.3	2	J
Pacific sandfish	<i>Trichodon trichodon</i>	6	121	218		149.7	1	I, A
Starry flounder	<i>Platichthys stellatus</i>	5	309	347		334.6	1	A
Three-spined stickleback	<i>Gasterosteus aculeatus</i>	1	-	-		79.0	1	A
Wolf-eel	<i>Anarrhichthys ocellatus</i>	1	-	-		1040.0	1	A
Salmon shark	<i>Lamna ditropis</i>	1	-	-		1900.0	1	A

³Life history stage: L=larvae, 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=adult near age of sexual maturity.

⁴Mantle lengths

Table 3.--Temperatures and salinities at stations sampled in the northern region of southeastern Alaska and catches of fish and squid by rope trawl haul, NOAA ship *John N. Cobb*, 20-25 May 1997.

Date	Haul#	Station	Two meter depth		Chinook salmon	Pacific herring	Walleye pollock	Soft sculpin	Capelin	Pacific sandfish	Starry flounder	PSL	Bigmouth sculpin	Three-spined stickleback	Wolf-eel	Salmon shark	Squid
			temp (°C)	salinity (o/oo)													
20 May	1001	TKU	10.0	17.9	-	-	-	2	1	-	5	1	1	-	-	-	-
20 May	1002	ABM ⁵	8.7	26.7	-	-	-	-	-	-	-	-	-	-	-	-	-
20 May	1003	FPR	7.9	29.5	-	-	-	-	-	-	-	-	-	-	-	-	-
21 May	1004	UCD	7.9	28.8	4	-	-	3	-	-	-	-	-	-	-	-	-
21 May	1005	UCC	7.8	28.7	-	1	-	1	-	-	-	-	-	-	-	-	-
21 May	1006	UCB	8.7	28.0	-	-	3	1	-	-	-	-	-	-	-	-	-
21 May	1007	UCA	9.4	28.6	2	-	56	1	-	-	-	-	-	-	-	-	-
22 May	1008	IPA	8.2	30.8	-	-	-	-	-	-	-	-	-	-	-	-	-
22 May	1009	IPB	8.7	31.2	3	1	-	-	-	-	-	-	-	-	-	-	8
22 May	1010	IPC	9.1	31.3	1	-	-	-	-	-	-	-	-	-	-	-	22
22 May	1011	IPD	9.4	31.3	-	-	-	-	-	-	-	-	-	-	-	-	96
23 May	1012	CSA	6.9	31.4	-	-	-	-	6	-	-	-	-	-	-	-	2
23 May	1013	CSB	6.6	31.4	-	-	-	-	-	-	-	-	-	1	-	-	-
23 May	1014	CSC	6.6	31.7	-	1	-	-	-	-	-	-	-	-	-	-	-
23 May	1015	CSD	6.5	31.8	-	-	-	-	-	-	-	-	-	-	1	-	-
24 May	1016	ISA	8.1	30.8	1	-	2	1	-	-	-	-	-	-	-	-	-
24 May	1017	ISB	8.5	29.9	4	-	10	4	2	-	-	-	1	-	-	-	-
24 May	1018	ISC	8.6	29.9	1	-	6	-	1	-	-	-	1	-	-	1	-
24 May	1019	ISD	9.0	29.4	-	-	-	-	-	-	-	-	-	-	-	-	-
25 May	1020	LFC	11.2	25.4	1	235	-	1	-	6	-	2	-	-	-	-	-
Total catch					18	237	77	16	10	6	5	3	3	1	1	1	128

⁵Not sampled with rope trawl due to shallow irregular bottom depths.

