JC-99-18 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 26 September to 02 October, 1999. This cruise was the fifth in a series of five cruises scheduled to monitor the inside and coastal marine waters of the region monthly in 1999. 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 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-19[1] conductivity-temperature-depth (CTD) profiler was deployed at each station, as depth

[1]Reference 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 volume of water 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 volume of water 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 due to 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 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 biomass 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. Inclement weather precluded sampling at the Cape Edward transect. Oceanographic data were taken at 20 stations and trawling was conducted at 19 stations (Table 2). A total of 20 CTD casts, 22 bongo tows, 22 vertical 20-m tows, and 5 deep WP-2 vertical tows were made during the cruise. Fourteen water samples were taken at selected stations for later analysis of chlorophyll and nutrients.

Surface (2-m) temperatures and salinities during the cruise ranged 7.3-10.6° and 16.4-31.5 (Table 3). Temperatures varied between stations, however salinities were lowest at the inshore stations (i.e., TKI, ABM, LFC, and FPR), intermediate at the strait stations (ISA-ISD, UCA-UCD), and highest at the coastal stations (IPA-IPD, CSA-CSD).

Zooplankton biomass, as determined from the settled volumes from the 20-m vertical tows, ranged 0.5-10.0 ml (Table 3). As in the previous two years of study, zooplankton biomass was at a minima in October. Zooplankton biomass was highest along the offshore transect (IPA-IPD).

A total of 2,715 fish from 18 taxa were captured in the 19 rope trawl hauls, including all five species of Pacific salmon (Tables 3-5). Although, the primary catch component was capelin (*Mallotus villosus*) and herring (*Clupea pallasi*), the frequency of occurrence was highest for juvenile pink salmon (*O. gorbuscha*) and coho salmon (*O. kisutch*).

Onboard stomach analysis was done on 29 potential fish predators of juvenile salmon: 13 Pacific sandfish (*Trichodon trichodon*), 8 adult walleye pollock (, 6 adult coho salmon, 1 immature chinook salmon (*O. tshawytscha*), and 1 adult starry flounder (*Platichthys stellatus*). Predation on juvenile salmon was only observed with coho salmon, where one of the six fish had eaten juvenile salmon (one 174 mm chum salmon).

Of the two juvenile chinook and one juvenile coho salmon lacking adipose fins, the two chinook contained CWTs (Table 6). Both 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 15-95 km from their tagging localities and had spent 110-149 days at sea.

## *ACKNOWLEDGMENTS*

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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, 26 September - 01 October 1999.

| Locality | Latitude Station | Longitude north | offshore west | Distance between km | Depth km | 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 |
| 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, 26 Sept - 01 Oct 1999.

| Date | Haul# | Station | CTD | Plankton net samples | | | Chlorophyll & nutrients | Rope trawl |
|---|---|---|---|---|---|---|---|---|
| | | | | Norpac | Bongo | WP-2 | | |
| 26 September | 3087 | TKI | 1 | 1 | 2 | 0 | 1 | 1 |
| 26 September | 3088 | ABM | 1 | 3 | 2 | 1 | 1 | 0 |
| 26 September | 3089 | LFC | 1 | 1 | 2 | 0 | 1 | 1 |
| 26 September | 3090 | FPR | 1 | 1 | 4[2] | 0 | 1 | 1 |
| 27 September | 3091 | ISA | 1 | 1 | 2 | 0 | 1 | 1 |
| 27 September | 3092 | ISB | 1 | 1 | 2 | 0 | 0 | 1 |
| 27 September | 3093 | ISC | 1 | 1 | 2 | 0 | 0 | 1 |
| 27 September | 3094 | ISD | 1 | 1 | 2 | 0 | 1 | 1 |
| 28 September | 3095 | IPA | 1 | 1 | 2 | 1 | 1 | 1 |
| 28 September | 3096 | IPB | 1 | 1 | 2 | 1 | 1 | 1 |
| 30 September | 3097 | IPC | 1 | 1 | 2 | 1 | 1 | 1 |
| 30 September | 3098 | IPD | 1 | 1 | 4[2] | 1 | 1 | 1 |
| 29 September | 3099 | CSA | 1 | 1 | 2 | 0 | 1 | 1 |
| 29 September | 3100 | CSB | 1 | 1 | 2 | 0 | 0 | 1 |
| 28 September | 3101 | CSC | 1 | 1 | 2 | 0 | 0 | 1 |
| 28 September | 3102 | CSD | 1 | 1 | 2 | 0 | 1 | 1 |
| 01 October | 3103 | UCA | 1 | 1 | 2 | 0 | 1 | 1 |
| 01 October | 3104 | UCB | 1 | 1 | 2 | 0 | 0 | 1 |
| 01 October | 3105 | UCC | 1 | 1 | 2 | 0 | 0 | 1 |
| 01 October | 3106 | UCD | 1 | 1 | 2 | 0 | 1 | 1 |
| Total | | | 20 | 22 | 44 | 5 | 14 | 19 |

[2]One additional bongo tow was made at these two stations to collect plankton samples that were frozen and used for hydrocarbon analysis.

Table 3.--Two meter depth temperatures and salinities, settled volumes of plankton from 20-m vertical Norpac hauls, and catches of salmon at stations sampled in marine waters of the northern region of southeastern Alaska, 26 September - 01 October 1999.

| | | | Temp. | Sal. | Settled plankton (ml) | | Juvenile Immature | | | | | Adult | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Haul# | Station | (°C) | (o/oo) | Zoop- | Phyto- | Pink | Chum | Sock | Coho | Chin | Chin | Coho |
| 26 September | 3087 | TKI | 7.3 | 16.4 | 1.0 | 0.0 | 2 | | | | 1 | | 1 |
| 26 September | 3088 | ABM | 8.3 | 17.9 | 2.5 | 0.0 | | | | | | | |
| 26 September | 3089 | LFC | 7.2 | 18.3 | 1.0 | 0.0 | | | | | 15 | | 1 |
| 26 September | 3090 | FPR | 9.4 | 24.1 | 1.0 | 0.0 | 7 | 2 | 10 | | | | |
| 27 September | 3091 | ISA | 8.3 | 29.4 | 1.0 | 0.0 | 1 | | | 1 | | | 1 |
| 27 September | 3092 | ISB | 8.3 | 29.3 | 1.0 | 0.0 | 1 | | | 1 | | | |
| 27 September | 3093 | ISC | 8.7 | 28.1 | 1.0 | 0.0 | 7 | 6 | | 2 | 1 | | |
| 27 September | 3094 | ISD | 9.2 | 25.4 | 1.0 | 0.0 | | | 2 | 1 | 2 | | |
| 28 September | 3095 | IPA | 10.6 | 31.0 | 3.0 | 0.0 | | | | | | | 1 |
| 28 September | 3096 | IPB | 10.2 | 30.5 | 3.0 | 0.0 | | | | | | | |
| 30 September | 3097 | IPC | 10.3 | 30.4 | 10.0 | 0.0 | 1 | 1 | | | | | |
| 30 September | 3098 | IPD | 10.3 | 31.2 | 4.0 | 0.0 | | | | | | | |
| 29 September | 3099 | CSA | 8.5 | 31.3 | 2.0 | 0.0 | | | | 1 | | | 2 |
| 29 September | 3100 | CSB | 8.6 | 31.5 | 1.0 | 0.0 | 1 | 1 | | 5 | | | |
| 28 September | 3101 | CSC | 7.8 | 30.9 | 1.0 | 0.0 | 85 | 12 | 4 | | 1 | | |
| 28 September | 3102 | CSD | 7.8 | 31.1 | 0.5 | 0.0 | 135 | 19 | 17 | | | | 1 |
| 01 October | 3103 | UCA | 9.0 | 25.0 | 0.5 | 0.0 | | | | 3 | 3 | ⊙ | |
| 01 October | 3104 | UCB | 9.0 | 26.1 | 0.5 | 0.0 | | | | 2 | | | |
| 01 October | 3105 | UCC | 8.9 | 23.5 | 0.5 | 0.0 | | | | 1 | | | |
| 01 October | 3106 | UCD | 8.9 | 24.0 | 1.0 | 0.0 | 1 | | | 1 | 1 | | |
| | Total catch | | | | | | 241 | 41 | 33 | 18 | 24 | 1 | 7 |

Table 4.--Catches of fish other than salmon at stations sampled in marine waters of the northern region of southeastern Alaska, 26 September - 01 October 1999.

| Date | Haul# | Station | Capelin | Pacific herring | Soft sculpin | Pacific sandfish | Walleye pollock | Pacific spiny lumpsucker | Prowfish | Crested sculpin | Sablefish | Squid | Other[3] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 26 September | 3087 | TKI | ⊙ | ⊙⊡⊙ | | ⊙⊙ | ⊙ | | | | | | ⊙ |
| 26 September | 3088 | ABM | na | na | na | na | na | na | na | na | na | na | na |
| 26 September | 3089 | LFC | | | | ⊙ | ⊙ | | ⊙ | ⊙ | | | |
| 26 September | 3090 | FPR | | | | | ⊙ | | ⊙ | ⊙ | | | |
| 27 September | 3091 | ISA | △⊙△ | | ⊡⊙ | | ⊙ | ⊙ | | | | | |
| 27 September | 3092 | ISB | ⊡△△ | | ⊙⊙ | | ⊙ | | | | | | ⊙ |
| 27 September | 3093 | ISC | | | | | ⊙ | ⊙ | | | | | |
| 27 September | 3094 | ISD | | | ⊙ | | | | | | | | |
| 28 September | 3095 | IPA | | | | | | | | | | | |
| 28 September | 3096 | IPB | ⊙ | | | | | | | | | 1 | |
| 30 September | 3097 | IPC | | | | | | | | | | ⊙ | |
| 30 September | 3098 | IPD | | | | | | | | | | | |
| 29 September | 3099 | CSA | ⊙△⊙ | | | | | | | | | | 29 |
| September | 3100 | CSB | ⊙⊙⊙ | | | | | | | | | | |
| 28 September | 3101 | CSC | ⊙△△ | ⊙ | | | ⊙ | | | | | | |
| 28 September | 3102 | CSD | ⊙⊙ | ⊙ | | | | | | | ⊙ | | ⊙ |
| 01 October | 3103 | UCA | | ⊙ | ⊙ | | | | | | | | |
| 01 October | 3104 | UCB | ⊙△ | | ⊙ | | | | | | | | |
| 01 October | 3105 | UCC | | | | | | | | | | | |
| 01 October | 3106 | UCD | | | ⊙ | | | | ⊙ | | | | |
| | Total catch | | 1,820 | 398 | 90 | 13 | 10 | 4 | 3 | 2 | 1 | 5 | 4 |

[3]Five additional species of fish were captured, one individual each, at the following haul#s: silver-spotted sculpin haul# 3102, eulachon haul# 3087, starry flounder haul# 3087, and three-spined stickleback haul# 3092.

Table 5.--Length, frequency of occurrence, and life history stage of measured fish captured in the marine waters of the northern region of southeastern Alaska, 26 September - 01 October 1999.

| Common name | Species | n | Fork length (mm) min | max | x̄ | Frequency of occurrence | Life history stage[4] |
|---|---|---|---|---|---|---|---|
| Pink salmon | *Oncorhynchus gorbuscha* | 241 | 121 | 229 | 168.1 | 10 | J |
| Chum salmon | *O. keta* | 41 | 139 | 213 | 164.4 | 6 | J |
| Sockeye salmon | *O. nerka* | 33 | 135 | 209 | 162.9 | 4 | J |
| Coho salmon | *O. kisutch* | 18 | 181 | 316 | 278.7 | 10 | J |
| " | " | " " | 7 | 570 | 780 | 656.7 | 6 | A |
| Chinook salmon | *O. tshawytscha* | 24 | 163 | 273 | 214.3 | 7 | J |
| " | " | " " | 1 | 413 | 413 | 413.0 | 1 | I |
| Salmonid total | | 365 | | | | | |
| Capelin[5] | [illegible] | 1,820 | 41 | 111 | 58.9 | 9 | J |
| Pacific herring[4] | *Clupea pallasi* | 398 | 62 | 204 | 99.1 | 4 | I-A |
| Soft sculpin[4] | *Psychrolutes sigalutes* | 90 | 16 | 36 | 24.3 | 6 | J-A |
| Pacific sandfish | *Trichodon trichodon* | 13 | 111 | 227 | 166.8 | 2 | J-A |
| Walleye pollock | [illegible] | 10 | 338 | 585 | 478.3 | 7 | A |
| P. Spiny lumpsucker | *Eumicrotremus orbis* | 4 | 61 | 94 | 78.5 | 2 | J-A |
| Prowfish | [illegible] | 3 | 161 | 177 | 169.3 | 3 | I-A |
| Crested sculpin | *Blepsias bilobus* | 2 | 175 | 179 | 177.0 | 2 | I-A |
| Sablefish | [illegible] | | | | | | |
| Silver-spotted sculpin | *Blepsias cirrhosus* | 1 | 97 | 97 | 97.0 | 1 | J |
| Eulachon | *Thaleichthys pacificus* | 1 | 78 | 78 | 78.0 | 1 | J |
| Starry flounder | *Platichthys stellatus* | 1 | 324 | 324 | 324.0 | 1 | A |
| Three-sp. stickleback | *Gasterosteus aculeatus* | 1 | 79 | 79 | 79.0 | 1 | A |
| Squid | Gonatidae | 5 | 19 | 30 | 25.0 | 2 | J |
| Non-salmonid total | | 2,350 | | | | | |

[4]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.

[5]Subsamples of lengths were taken for these species as follows: 195 capelin, 107 Pacific herring, and 35 soft sculpin.

| | |
|---|---|
| Total | 2,715 |

Table 6.--Release and recovery information for coded-wire tagged salmon captured in the northern region of southeastern Alaska, 26 September - 01 October 1999.

| | | Release information | | | | | | Recovery information | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coded-wire tag code | Brood year | Agency[6] | Locality | Date | Size (mm) | Size (g) | Locality (station code) | Date | Size (mm) | Size (g) | Days traveled since release | Distance (km) |
| Chinook | 04:01/41 | 1997 | ADFG | Taku River, AK (wild) | 04-06/99 | ◬⬠ | 3.8 | L. Favorite Ch. (LFC) | 09/26/99 | 203 | 106.9 | 149 | 95 |
| Chinook | 50:04/58 | 1997 | DIPC | Gastineau Channel, AK | 06/07/99 | | 24.3 | L. Favorite Ch. (LFC) | 09/26/99 | 201 | 99.9 | ⬠⬠◬ | 15 |
| Coho | No Tag | | | | | | | Cross Sound (CSB) | | 09/29/99 | 299 | 329.9 | |

[6] ADFG = Alaska Department of Fish and Game
DIPC = Douglas Island Pink and Chum Corporation