SAMPLING JUVENILE CHINOOK SALMON (*ONCORHYNCHUS TSHAWYTSCHA*) AND COHO SALMON (0. KISUTCH) BY SMALL TROLLING GEAR IN THE NORTHERN AND CENTRAL REGIONS OF SOUTHEASTERN ALASKA, 1985

by

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May 1987

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ABSTRACT

Juvenile chinook salmon (Oncorhynchus tshawytscha) and coho salmon (O. kisutch), were sampled by small trolling gear in the marine waters of southeastern Alaska from January to December 1985 to determine their stock composition, age, size, distribution, and abundance. In 95 vessel days (799.5 hours) of fishing effort, 2,138 chinook salmon and 500 coho salmon were sampled by five vessels. Fishing effort occurred mostly in May and from September through October in the northern and central regions of southeastern Alaska; effort was monthly in Auke Bay, where seasonal abundance of chinook salmon peaked in August and coho salmon were caught only from July to September. In the northern and central regions, chinook salmon sampled in May were predominately age .2 (two marine winters old) and in the September-October period were age .1. No coho salmon were caught in May, and those caught in the September-October period were predominantly juveniles (age .0). Over 90% of the chinook salmon were 20-65 cm fork length (FL); nearly 95% of the coho salmon were 20-35 cm FL. -'Coded-wire tags (CWT's)-were recovered from 131 chinook 'salmon, and most (93) of these fish originated from southeastern Alaska, followed by British Columbia, Washington, and Oregon. Four age .0 coho salmon with CWT's originated from southeastern Alaska and Washington. Scale analysis revealed that chinook salmon sampled in inside (mainland) marine waters were primarily stream type (age 1.) and in outside (coastal) marine waters were predominantly ocean type (age 0.). Data on sizes and ages of fish caught and from CWT's recovered demonstrated that trolling with small hooks and lures effectively sampled juvenile chinook salmon and coho salmon in the marine environment.

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CONTENTS

INTRODUCTION 1

METHODS 2

Sampling Periods and Areas 2

Trolling Gear 2

Fishing Effort 4

Processing the Catch 6

Expanded Numbers 6

Age Analysis 7

RESULTS 7

DISCUSSION 32

ACKNOWLEDGMENTS 41

REFERENCES 43

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INTRODUCTION

Little information exists on the early marine biology of chinook salmon (Oncorhynchus tshawytscha) and coho salmon (O. kisutch) before their recruitment into commercial and sport fisheries in southeastern Alaska. Such information is unavailable due to a minimum fishery size limit (66 cm fork length (FL)) for chinook salmon (Kissner 1978) and due to the fishing techniques directed at older fish of both species. Chinook salmon are harvested as juveniles and adults after two to three marine winters (Kissner 1978), whereas coho salmon are harvested as adults after only one marine winter (Gray et al. 1981). Information exists on older chinook salmon and coho salmon harvested in the fisheries (Shaul et al. 1986; Van Alen et al. in press), counted in spawning ground escapements (Gray et al. 1981; Kissner 1982), and sampled through tagging research programs (Parker and Kirkness 1956; Kissner 1982; Shaul et al. 1986). However, research on the early marine biology of salmon in southeastern Alaskan waters (e.g., Godfrey 1965; Mason 1965; Major et al. 1978) has been restricted primarily to offshore distribution. In addition, sampling techniques (e.g., purse seines, gill nets, and longlines) for juvenile salmon have had relatively low catch rates of chinook salmon and coho salmon compared to those of pink salmon (O. gorbuscha), chum salmon (O. keta), and sockeye salmon (O. nerka) (Hartt 1975). As a result, a need exists for a sampling technique that provides data on the early marine biology of chinook salmon and coho salmon before their recruitment into the fisheries.

To obtain some of these data, juvenile chinook salmon and coho salmon were sampled by small hooks and lures in southeastern Alaska in

1985 to determine their stock composition, age, size, distribution, and abundance.

METHODS

Sampling Periods and Areas

Four chartered power trollers (Demijohn, Kiska, Northern Diver, and Puffin) and one laboratory vessel (Searcher) sampled juvenile chinook salmon and coho salmon for 95 days (799.5 hours) in southeastern Alaska. Locations yielding large salmon were fished minimally because sampling was directed at small salmon. Sampling occurred during three time periods: May, September through October, and year-round. The May sampling period was composed of two 15-day charters in the inside (mainland) to outside (coastal) waters of the northern and central regions of southeastern Alaska. Areas fished in the northern region were Cross Sound, Icy Strait, upper Chatham Strait, and lower Lynn Canal; areas fished in the central region were Sumner Strait, upper Clarence Strait, and Stikine Strait (Fig. 1). In the September-October period, these areas were sampled during two 15-day charters, and the outside waters of the northern region were sampled again during a 10-day charter. In the year-round period, Auke Bay and vicinity were sampled for 12 consecutive months (25 days total).

Trolling Gear

Each power troller fished two or usually four stainless steel wires (1.6-2.0 mm diameter)' with lead cannonball sinkers (9.1-22.7 kg) at 1-3 knots. Each wire line fished four to eight spreads spaced at about 3.7- to 7.3-m intervals throughout the line. A spread consisted of a snubber with a snap, a 3.7-m monofilament head leader (40.9 kg test), a

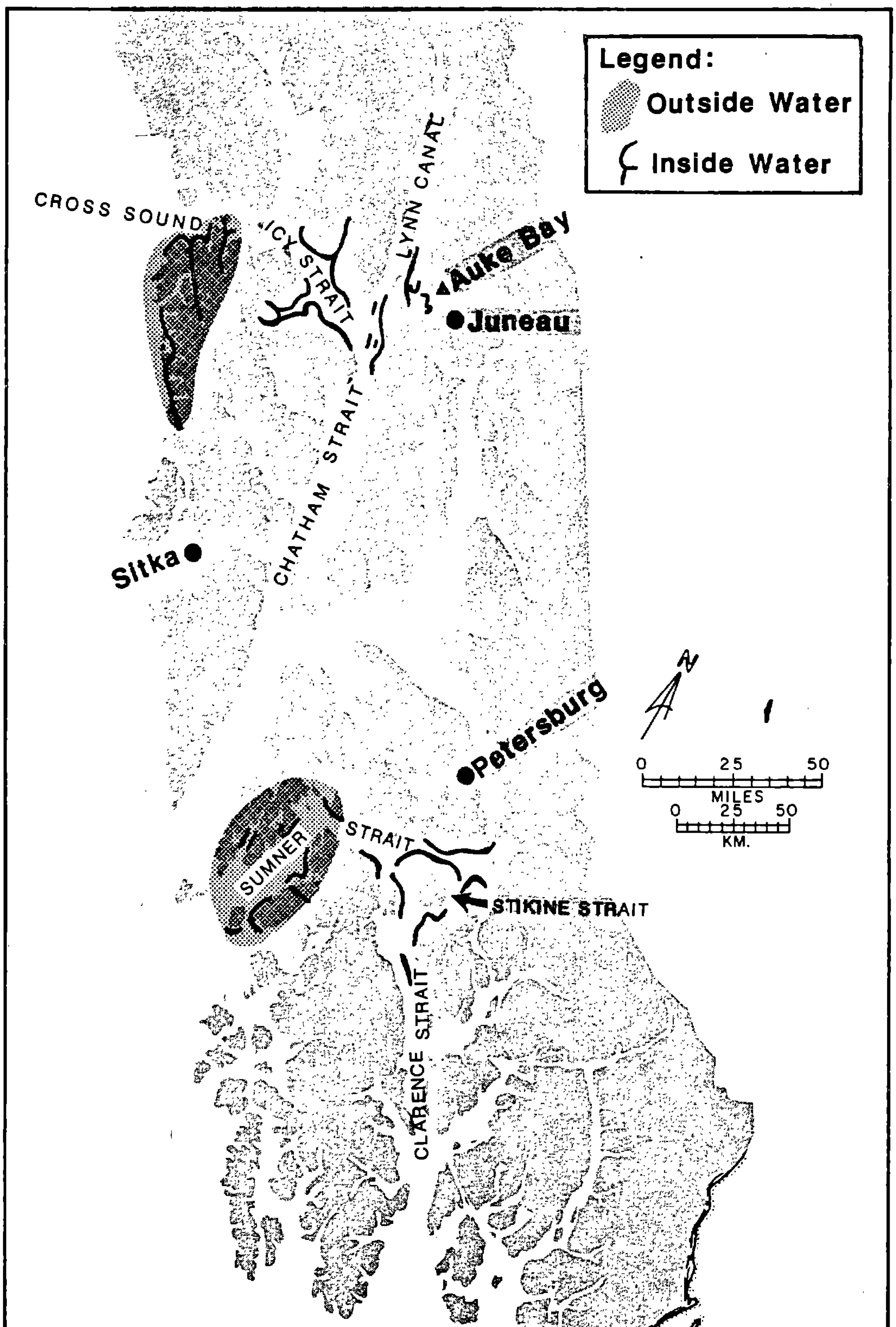


Figure 1. --Locations of trolling sites in the inside and outside waters of the northern and central regions of southeastern Alaska in January-December 1985.

28.0-cm flasher, a 0.9-m monofilament tail leader (25.0 kg test), and a terminal lure with a hook, The spreads were fished at depths of 3-70 m. For a more detailed description of trolling gear and methodology, see Browning (1980).

The lure types fished included hootchies, which were the most extensively used, and spoons, plugs, and bait herring. Flashers were placed in front of hootchies and bait herring, whereas spoons and plugs were usually fished independently. The lures and hooks were scaled-down facsimiles of commercial gear designed to select for smaller and younger salmon (Orsi in press). The size of a small hootchie, for example, was 6 cm (Fig. 2). The stainless steel hooks were single-barbed Mustad[1] (size 2/O) 9510x3S that had a gap (point to shank) of 1.6 cm and a throat (point to bend) of 2.0 cm. The exception to the exclusive use of these hook and lure sizes occurred in the northern region, where small and conventional commercial gear were fished simultaneously for 11 days in May and 12 days in the September-October period to compare the effectiveness of large versus small hooks and lures in catching small salmon (Orsi in press). All data collected in these periods are included in this report.

Fishing Effort

Total sampling time was determined from the time that all the trolling gear had begun fishing until it stopped. Catch rates are expressed as the number of salmon caught divided by the total sampling time at a location. Catches from Auke Bay and vicinity were averaged because in some months more than one vessel fished these areas. In

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

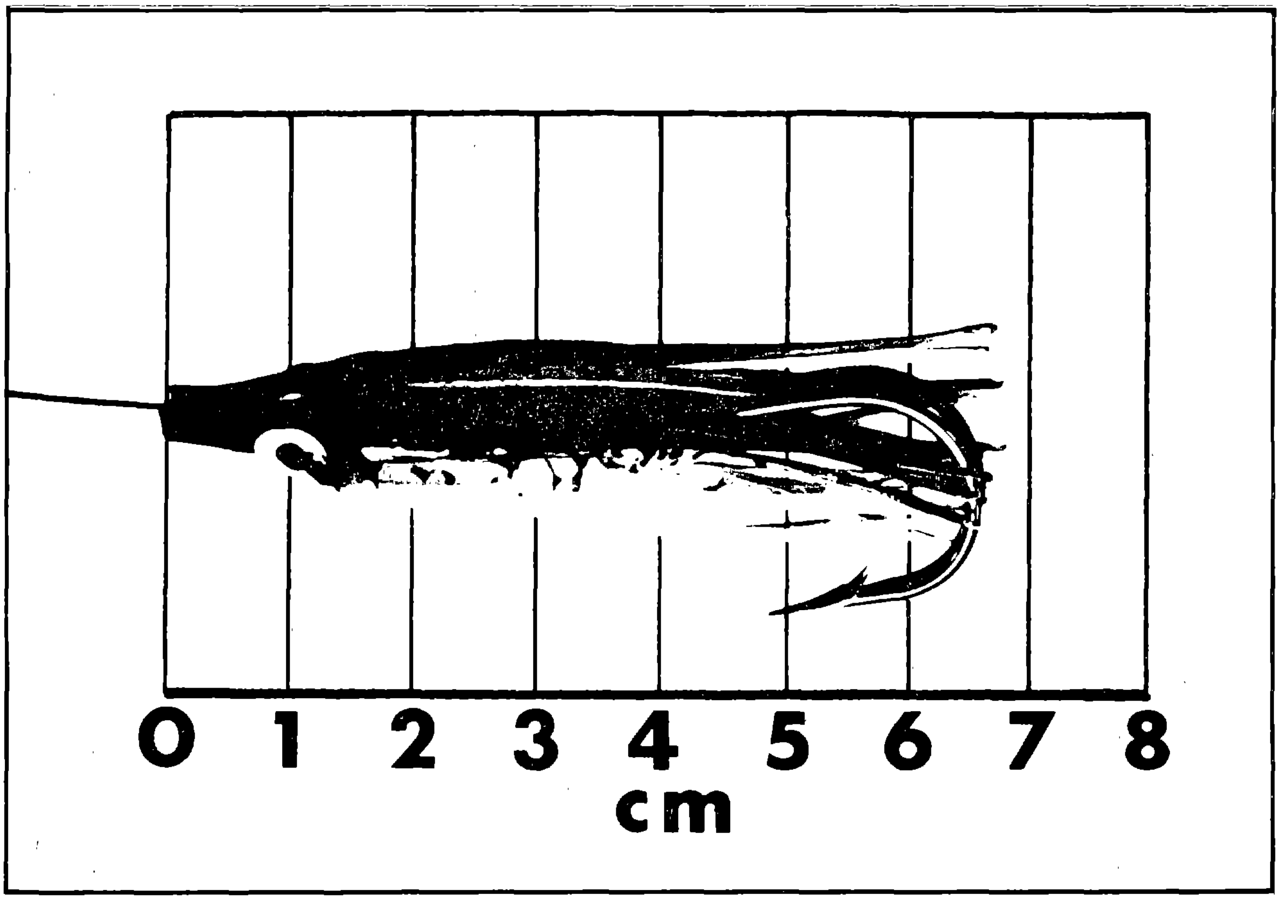


Figure 2. --Example of an undersized hook and hootchie lure.

addition, catch rates in Auke Bay and vicinity were expressed as fish caught per line per hour because the number of lines-fished per vessel was not constant. Fishing effort was directed primarily at juvenile chinook salmon; therefore, concentrations of juvenile coho salmon were sampled minimally.

Processing the Catch

After each salmon was hooked, one person led it to the stern of the boat, while the other person dipped it out of the water with an electric basket. Processing took place in the basket, thereby reducing average sampling time to less than 1 minute and eliminating the need for chemical anesthesia (Gunstrom and Bethers 1985; Orsi and Short in press). Each salmon was identified to species and measured for FL, and the date, location of capture, and lure depth were recorded. Additionally, scale samples for age analysis were taken from all chinook salmon. About 6 to 10 scales were removed from the preferred area (INPFC 1963) of each fish and mounted on a gummed scale card. Each viable salmon was tagged externally with a gray, 6.4-cm-long Floy anchor tag and then released. Upon return to the water, most fish recovered immediately and bolted away. All adipose fin-clipped chinook salmon of sublegal size (<66 cm FL) and all adipose fin-clipped juvenile (20-35 cm FL) coho salmon were sacrificed for coded-wire tags (CWT's). For each sacrificed fish, the weight, sex, and flesh color were recorded and its stomach preserved for diet analysis.

Expanded Numbers

Expanded numbers of CWT chinook salmon in this report were derived from Johnson (1985) or obtained through regional tag coordinators. Expanded numbers are included to establish the actual numbers of fish represented by CWT recoveries which, by themselves, do not account for the fact that some fish stocks are tagged in disproportionate numbers relative to a given number of fish. However, because CWT stocks lack equal geographical representation of all available chinook salmon stocks coast wide, these expanded numbers do not represent exact composition by origin.

Age Analysis

Chinook salmon ages were determined by analysis (Van Alen and Wood 1983) of 1,884 scales sampled in this study. Only scales with clear, distinct circuli and foci were analyzed. Marine ages of chinook salmon were determined and categorized by the nomenclature of Koo (1962) (i.e., the numeral following the decimal point denotes age in marine winters). Freshwater ages also were determined; fish were assigned as either age 0. (no freshwater winter) or age 1. (one freshwater winter) and designated as ocean type or stream type, respectively (Gilbert 1912; Healey 1983). To verify the accuracy of the age analysis, a comparison was made between the estimated and known ages of 114 chinook salmon with CWT's.

Marine age of coho salmon was determined by length distribution. In the September-October period, only two marine age classes of coho salmon were present, juveniles (.0) and adults (.1). The size difference (20-60 cm FL) of fish from these two age classes resulted in a bimodal length frequency distribution with virtually no overlap.

RESULTS

Trolling was accomplished each day, despite the frequently poor weather during spring and fall charters. Good site selection by vessel operators prior to weather fronts, and the ability of the trolling technique to sample in rough weather, enabled continuous sampling.

A total of 2,138 chinook salmon and 500 coho salmon were sampled in 799.5 hours of trolling effort (Table 1). Ninety-seven percent of the salmon were viable after processing, excluding those sacrificed for CWT's, and were externally tagged and released. Catches of chinook salmon and coho salmon were highest in the September-October period. The central inside waters of southeastern Alaska yielded the highest (7.09/hour) catch rates for chinook salmon, whereas the northern outside waters yielded the highest (2.40/hour) catch rates for coho salmon (Table 1). Sampling ranged from 5 to 55 hours per month in Auke Bay and vicinity, where chinook salmon were most abundant from August to October and coho salmon were caught only from July to September (Fig. 3). In all areas, catches of chinook salmon increased with lure depth to about 25-40 m, whereas catches of coho salmon were highest at about 3-11 m (Fig. 4).

Over 90% of the chinook salmon sampled were 20-65 cm FL (Figs. 5 and 6); nearly 95% of the coho salmon were 20-35 cm FL (Fig. 7). Length-weight relationships were similar between sublegal chinook salmon and juvenile coho salmon (Figs. 8 and 9).

Coded-wire tags were recovered from 131 chinook salmon (i.e., 599 fish if the numbers are expanded). The CWT's indicated that 93 (255) of these fish originated from southeastern Alaska, 22 (207) from British Columbia, 9 (95) from Washington, and 7 (42) from Oregon (Tables 2 and 3). Marine ages of these fish ranged from .0 to .3. Twenty-eight (77) were age .0 fish originating exclusively from southeastern Alaska. Seventy-four (339) were age .1 fish originating

Table 1.--Trolling locations, effort, and catch data from the vessels Puffin, Northern Diver, Kiska, Searcher, and Demijohn in the northern and central regions of southeastern Alaska, January-December 1985.

			Chinook salmon		Coho salmon	
Prea	Date	Hours fished	n	Mean catch per hour	n	Mean catch per hour
Puffin						
Auke Bay	1/24/85	7.25	2	0.28		
Auke Bay	1/25/85	8.00	1	0.13		
Auke Bay	2/19/85	9.00	0	0.00		
Auke Bay	2/20/85	9.00	0	0.00		
Auke Bay	3/22/85	11.75	0	0.00		
Auke Bay/Lower Lynn Canal	3/23/85	2.00	1	0.50		
Auke Bay	4/22/85	13.00	1	0.08		
Young Bay	4/23/85	11.50	1	0.09		
Lower Lynn Canal	4/24/85	12.50	0	0.00		
South Shelter	4/25/85	12.00	4	0.33		
Auke Bay	4/26/85	6.00	4	0.67		
Auke Bay	12/26/85	6.00	1	0.17		
	Total	108.00	15	0.14		
Northern Diver						
Excursion Inlet	5/06/85	6.00	6	1.00		
Excursion Inlet	5/07/85	10.25	0	0.00		
Idaho Inlet	5/08/85	6.75	9	1.33		
Entrance of Lisianski Inlet	5/08/85	3.25	0	0.00		
Entrance of Lisianski Inlet	5/09/85	11.75	13	1.11		
Lisianski Strait	5/10/85	8.25	1	0.12		
Head of Lisianski Inlet	5/11/85	7.00	2	0.29		
Lisianski Inlet (Sunnyside)	5/12/85	3.25	0	0.00		
Entrance of Lisianski Inlet	5/12/85	10.25	15	1.46		
Excursion Inlet (Homeshore)	5/13/85	5.25	1	0.19		
Port Frederick	5/14/85	11.50	4	0.35		
Point Sophia to Whiteshore Harbor	5/15/85	5.75	0	0.00		
Hawk Inlet	5/15/85	5.75	13	2.26		
Hawk Inlet	5/16/85	15.00	38	2.53		
Hawk Inlet	5/17/85	15.00	53	3.53		
Hawk Inlet	5/18/85	6.50	23	3.54		
Funter Bay	5/18/85	6.75	15	2.22		
Auke Bay	5/19/85	7.50	0	0.00		
Barlow Island to Shelter Island	5/20/85	10.25	11	1.07		
	Total	156.00	204	1.31		

Table 1.--Continued.

Area	Date	Hours fished	Chinook salmon n	Chinook salmon Mean catch per hour	Coho salmon n	Coho salmon Mean catch per hour
			Kiska			
Pt. Alexander to Blind Slough	5/09/85	9.25	5	0.54		
Steamer Pt. to Stikine Strait	5/10/85	7.50	1	0.13		
Snow Passage	5/10/85	4.50	0	0.00		
Snow Passage	5/11/85	3.50	0	0.00		
Pt. Colpoys to Sumner Strait	5/11/85	4.00	1	0.25		
Port Protection	5/11/85	1.00	1	1.00		
Port Protection	5/12/85	2.25	3	1.33		
Shakan Bay	5/12/85	2.25	0	0.00		
Bluff Island to Sumner Strait	5/13/85	6.50	7	1.08		
Shipley Bay	5/14/85	2.50	0	0.00		
Cape Pole South to Warren Channel	5/14/85	3.75	4	1.07		
Cape Pole South to Warren Channel	5/15/85	8.00	10	1.25		
Affleck Canal	5/16/85	14.00	55	3.93		
Affleck Canal	5/17/85	10.50	70	6.67		
Port Beauclerc	5/18/85	11.00	25	2.27		
Pt. Baker to Sumner Strait	5/19/85	2.00	7	3.50		
West Zarembo I. to Snow Passage	5/19/85	3.50	2	0.57		
North Zarembo I. to Snow Passage	5/20/85	5.25	2	0.38		
West Woronkofski I. to Stikine Strait	5/20/85	6.75	23	3.41		
West Woronkofski I. to Stikine Strait	5/21/85	11.25	82	7.29		
Pt. Alexander to Blind Slough	5/22/85	8.00	10	1.25		
	Total	127.25	308	2.42		
			Searcher			
Auke Bay	6/26/85	4.00	2	0.50	0	0.00
Auke Bay	6/27/85	7.00	9	1.29	0	0.00
Auke Bay	6/28/85	7.50	4	0.53	0	0.00
Auke Bay	7/29/85	8.00	4	0.50	0	0.00
Auke Bay/Shelter Island	7/30/85	6.00	10	1.67	4	0.67
Auke Bay	7/31/85	5.75	3	0.52	0	0.00
Auke Bay	8/23/85	5.75	21	3.65	0	0.00
Auke Bay	8/26/85	6.75	6	0.89	1	0.15
Auke Bay	8/27/85	6.75	9	1.33	0	0.00
Auke Bay	9/25/85	7.00	16	2.29	0	0.00
Auke Bay	10/22/85	5.75	6	1.04	0	0.00
Auke Bay	10/23/85	1.75	3	1.71	0	0.00
Auke Bay	11/20/85	5.00	1	0.20	0	0.00
	Total	77.00	94	1.22	5	0.06

Table 1.--Continued. 1

Area	Date	Hours fished	Chinook salmon n	Chinook salmon Mean catch per hour	Coho salmon n	Coho salmon Mean catch per hour
Demijohn						
Soapstone Point to Cross Sound	9/20/85	9.00	4	0.44	2	0.22
Column Point to Cross Sound	9/21/85	9.00	15	1.67	71	7.89
Stag Bay	9/21/85	1.00	1	1.00	0	0.00
Imperial Passage to Offshore Transect	9/22/85	1.00	0	0.00	47	47.00
Imperial Passage	9/22/85	6.00	9	1.50	7	1.17
North Ogden Passage	9/23/85	1.00	1	1.00	0	0.00
Slocum Arm (Khaz Head)	9/23/85	5.50	80	14.55	0	0.00
Slocum Arm (Khaz Head)	9/24/85	6.00	16	2.67	0	0.00
Slocum Arm (Khaz Head)	9/25/85	4.00	83	20.75	4	1.00
Portlock Harbor	9/25/85	3.25	12	3.69	0	0.00
Lisianski Strait (Pussy Cove)	9/26/85	5.50	9	1.64	29	5.27
Port Althorp	9/27/85	7.00	48	6.86	4	0.57
Idaho Inlet	9/28/85	3.00	4	1.33	3	1.00
Lisianski Inlet (Snake Ranch)	9/28/85	3.75	20	5.33	1	0.27
Head of Lisianski Inlet	9/29/85	5.00	2	0.40	0	0.00
	Total	70.00	304	4.34	168	2.40
Kiska						
Pt. Alexander to Blind Slough	9/21/85	5.50	2	0.36	1	0.18
West Woronkofski I. to Stikine Strait	9/21/85	1.00	8	8.00	1	1.00
West Woronkofski I. to Stikine Strait	9/22/85	11.75	126	10.72	20	1.70
West Woronkofski I. to Stikine Strait	9/23/85	11.25	114	10.13	31	2.76
Steamer Pt. to Clarence Strait	9/24/85	10.00	110	11.00	14	1.40
Steamer Bay to Clarence Strait	9/25/85	4.25	17	4.00	16	3.76
Kashevarof Passage	9/25/85	5.75	74	12.87	19	3.30
Port Beauclerc	9/26/85	3.50	5	1.43	0	0.00
Affleck Canal	9/27/85	4.25	1	0.24	0	0.00
Cape Pole to Warren Channel	9/27/85	2.00	0	0.00	0	0.00
South Warren I. to Iphigenia Bay	9/28/85	1.25	0	0.00	0	0.00
Shipley Bay	9/28/85	2.75	0	0.00	0	0.00
Shakan Bay	9/28/85	1.50	0	0.00	0	0.00
Pt. Alexander to Pt. Colpoys (Sumner Strait)	9/29/85	8.25	4	0.48	4	0.48
Snow Passage	9/29/85	1.25	4	3.20	1	0.80
Snow Passage	9/30/85	7.25	5	0.69	36	4.97

Table 1.--Continued.

Area	Date	Hours fished	Chinook salmon n	Chinook salmon Mean catch per hour	Coho salmon n	Coho salmon Mean catch per hour
			Kiska			
Pt. Harrington to Clarence Strait	10/01/85	8.00	119	14.88	19	2.38
Steamer Bay	10/02/85	8.25	49	5.94	33	4.00
West Woronkofski I. to Stikine Strait	10/03/85	10.75	56	5.21	20	1.86
Northeast Zarembo I. to Stikine Strait	10/04/85	9.50	72	7.58	30	3.16
Northeast Zarembo I. to Stikine Strait	10/05/85	3.25	94	28.92	7	2.15
	Total	121.25	860	7.09	252	2.08
			Northern Diver			
Auke Bay	9/24/85	9.25	18	1.95	1	0.11
Auke Bay	9/25/85	10.75	52	4.84	4	0.37
Funter Bay to Hawk Inlet	9/26/85	7.25	26	3.59	11	1.52
Hawk Inlet	9/27/85	11.50	44	3.83	7	0.61
Hawk Inlet	9/28/85	2.75	10	3.64	0	0.00
Homeshore to Excursion Inlet	9/28/85	6.50	11	1.69	8	1.23
Pleasant Island	9/29/85	2.50	5	2.00	4	1.60
Idaho Inlet	9/29/85	5.50	4	0.73	4	0.73
Idaho Inlet	9/30/85	3.50	10	2.86	0	0.00
Idaho Inlet	9/30/85	6.25	9	1.44	0	0.00
Idaho Inlet	10/01/85	2.75	5	1.82	0	0.00
South Inian Pass	10/01/85	8.00	7	0.88	23	2.88
Idaho Inlet	10/02/85	11.25	34	3.02	4	0.36
South Inian Pass	10/03/85	4.25	1	0.24	4	0.94
Port Frederick	10/03/85	2.50	6	2.40	0	0.00
Port Frederick	10/04/85	4.75	8	1.68	0	0.00
Hawk Inlet	10/04/85	2.50	8	3.20	3	1.20
Hawk Inlet	10/05/85	7.50	23	3.07	0	0.00
Funter Bay	10/05/85	2.00	3	1.50	0	0.00
Funter Bay	10/06/85	6.50	12	1.85	1	0.15
Auke Bay	10/07/85	11.25	32	2.84	1	0.09
Auke Bay	10/08/85	11.00	25	2.27	0	0.00
	Total	140.00	353	2.52	75	0.54

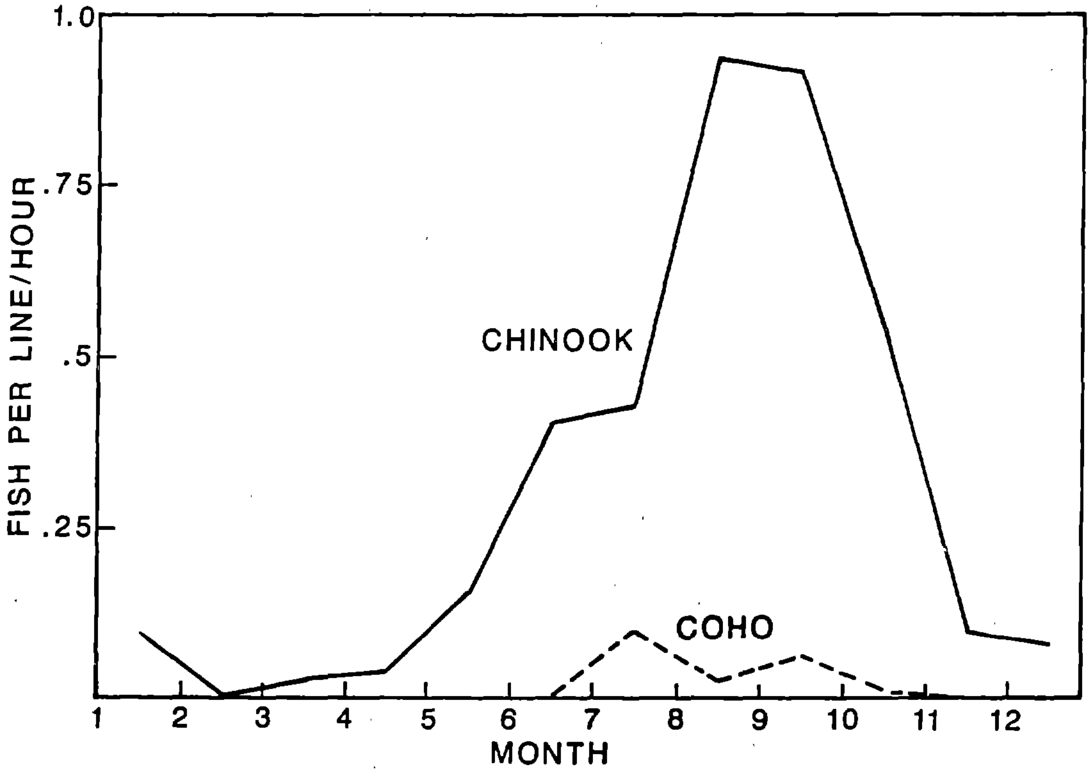


Figure 3.--Seasonality of chinook salmon (*Oncorhynchus tshawytscha*) and coho salmon (*O. kisutch*) in Auke Bay and vicinity in January-December 1985.

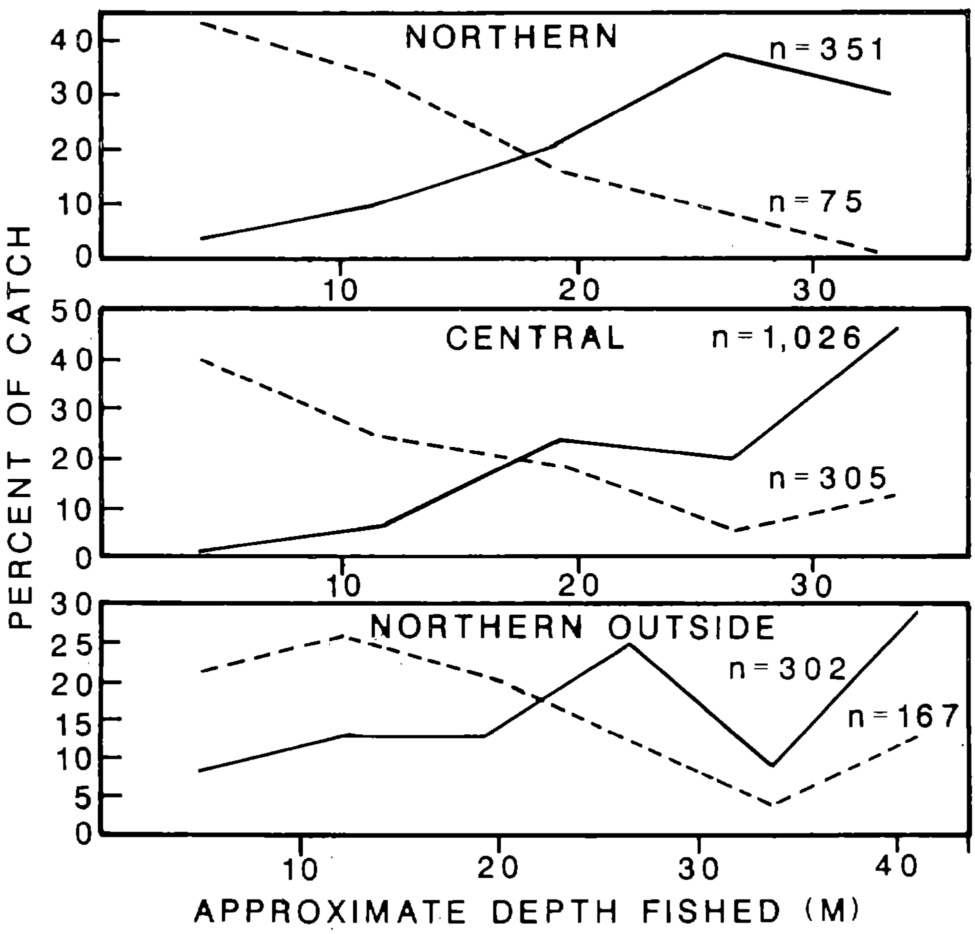


Figure 4.--Catch distributions of chinook salmon (Oncorhynchus tshawytscha) and coho salmon (O. kisutch) caught by troll gear during charters of the fishing vessels Northern Diver, Kiska, and Demijohn in the northern and central regions of southeastern Alaska in 1985. (-- = chinook salmon; --- = coho salmon)

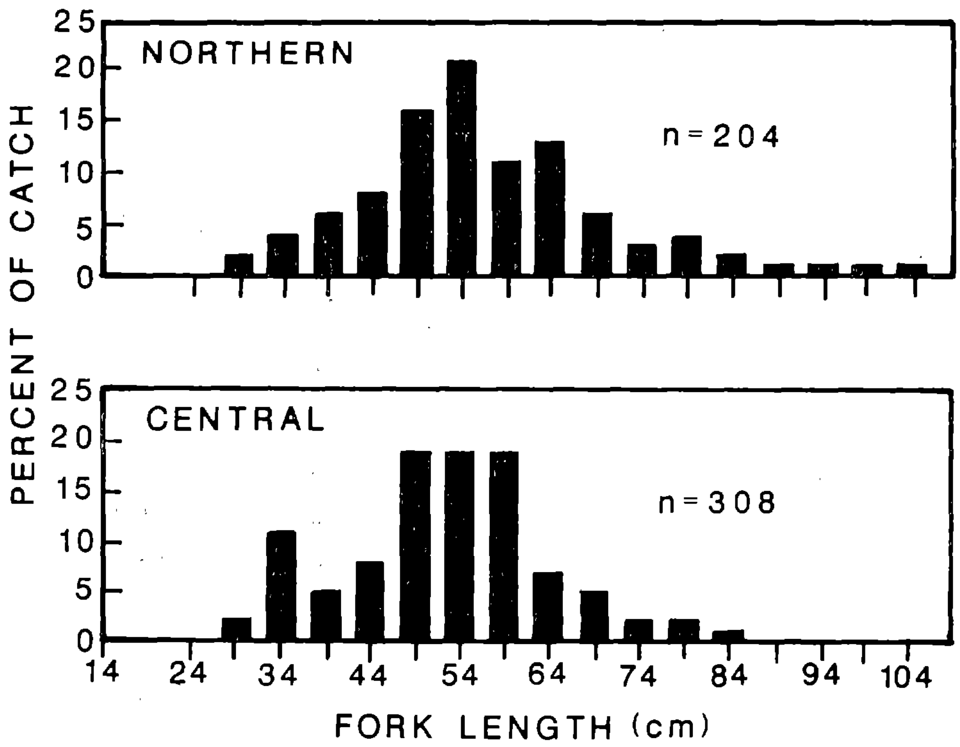


Figure 5. --Length frequency distributions of chinook salmon (<u>Oncorhynchus tshawytscha</u>) caught during charters of the fishing vessels <u>Northern Diver</u> and <u>Kiska</u> in the northern and central regions of southern Alaska from 6 to 22 May 1985.

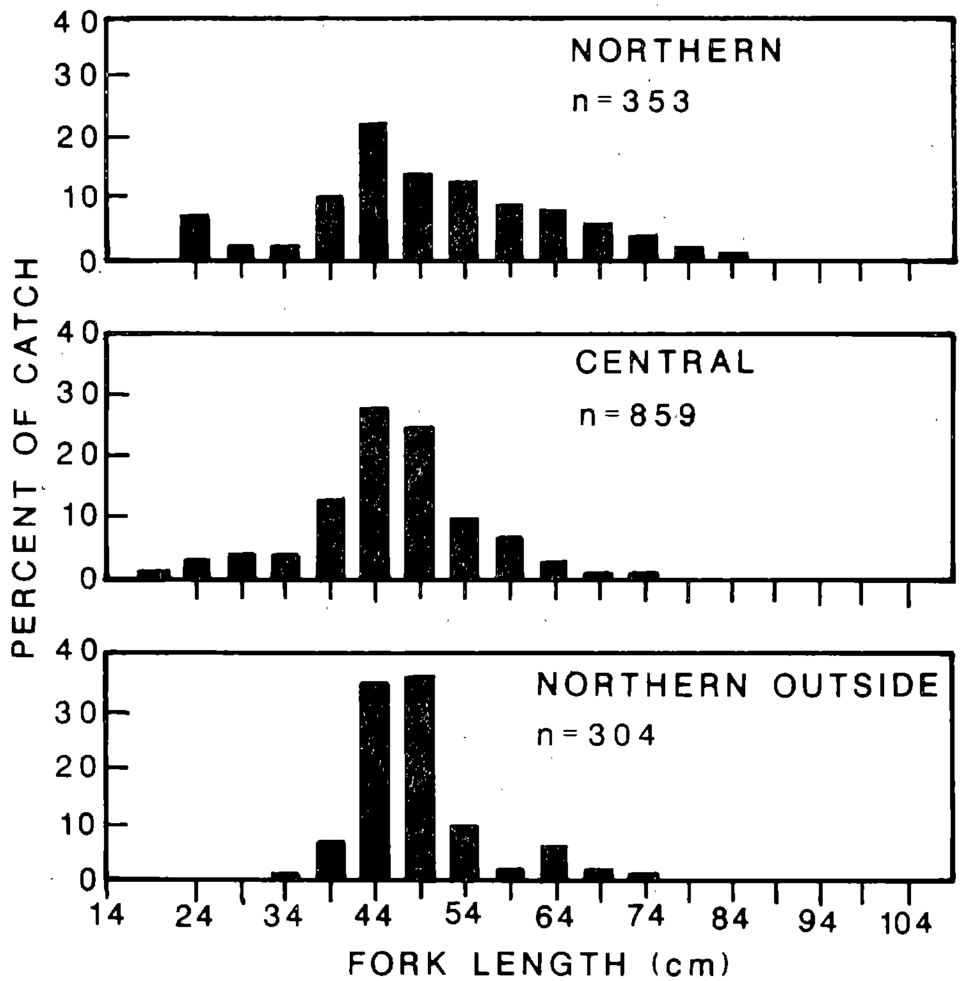


Figure 6. --Length frequency distributions of chinook salmon (*Oncorhynchus tshawytscha*) caught during charters of the fishing vessels *Northern Diver*, Kiska, and *Demijohn* in the northern and central regions of southeastern Alaska from 20 September to 8 October 1985.

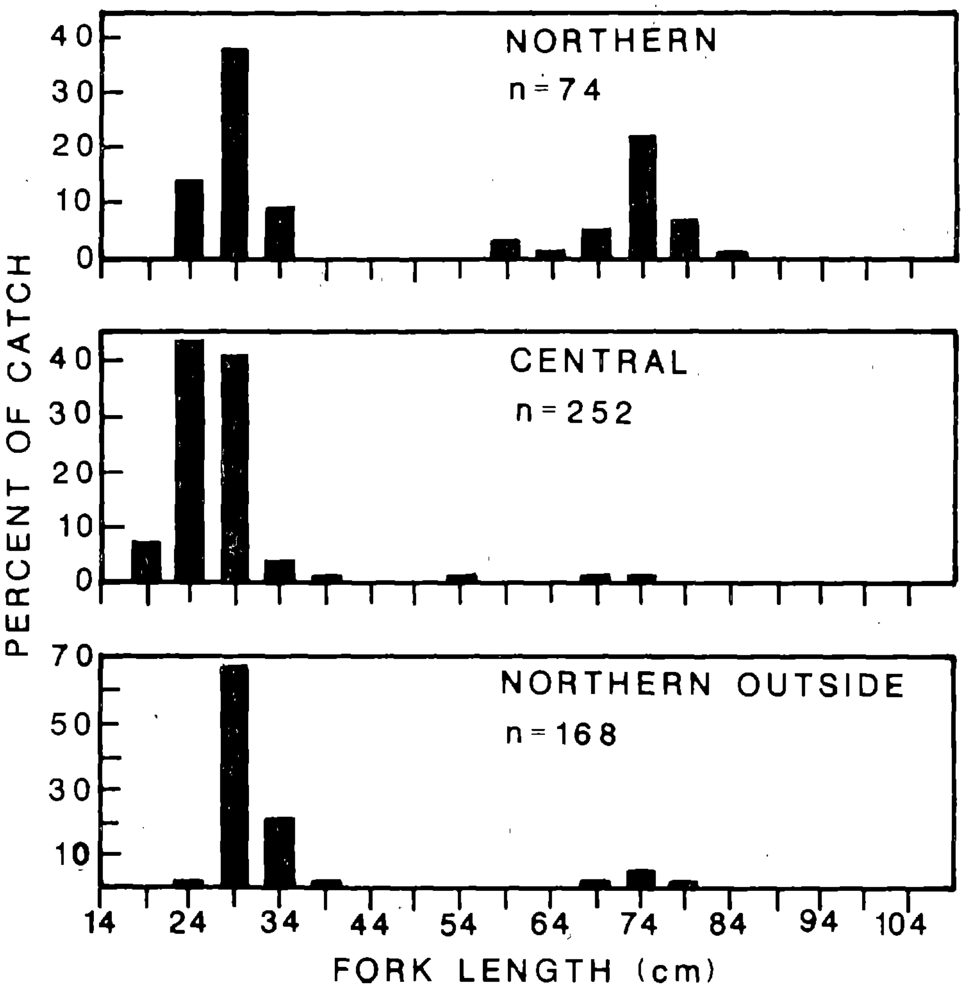
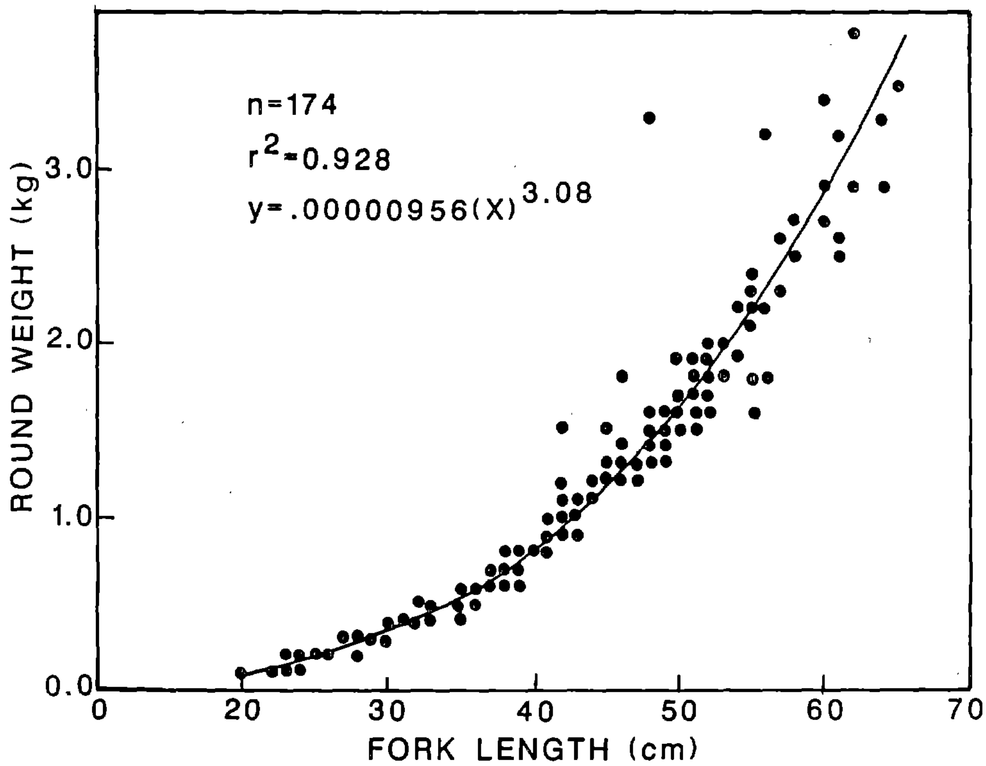


Figure 7. --Length frequency distributions of coho salmon (*Oncorhynchus kisutch*) caught during charters of the fishing vessels Demijohn, Kiska, and Northern Diver in the northern and central regions of southeastern Alaska from 20 September to 8 October 1985.



Figu.re 8.--Length-weight relationship of sublegal (<66 cm fork length) chinook salmon (Oncorhynchus tshawytscha) caught in the northern and central regions of southeastern Alaska in 1985.

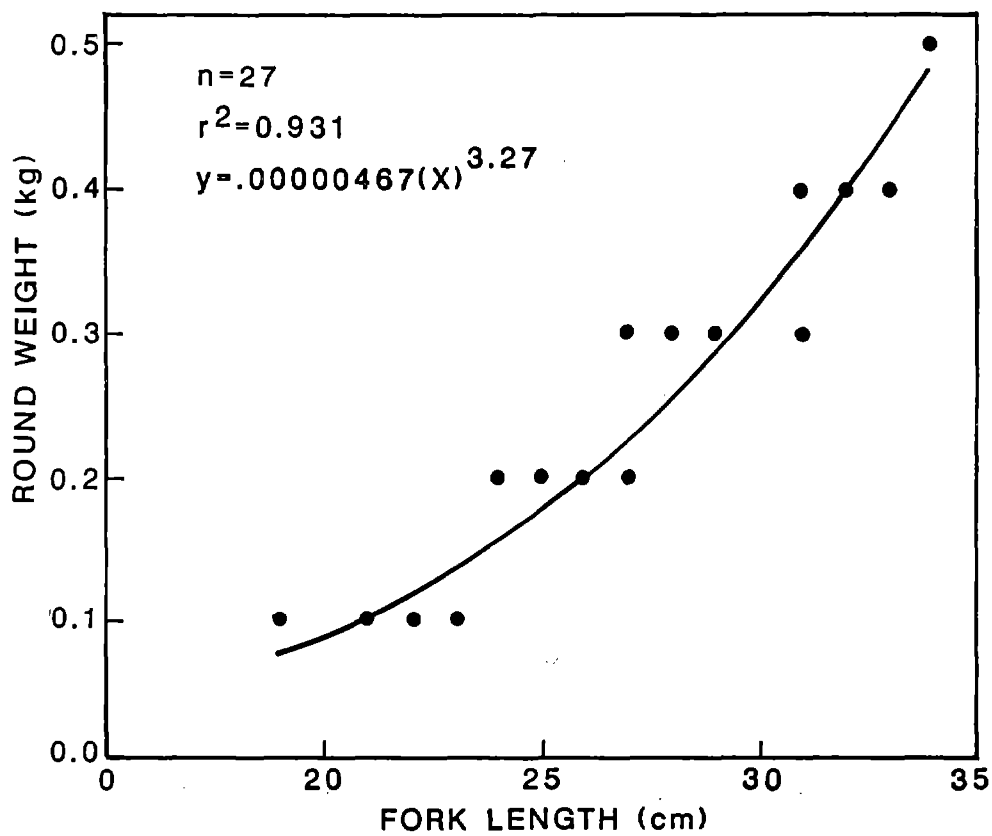


Figure 9. --Length-weight relationship of juvenile coho salmon (Oncorhynchus kisutch) caught in the northern and central regions of southeastern Alaska in 1985.

Table 2.--Actual and expanded (in parentheses) numbers, origins, and ages of coded-wire tagged chinook salmon (Oncorhynchus tshawytscha) (<66 cm fork length; 28 in total length) collected in January-December 1985. Expanded numbers are from Johnson (1985).

	Number of tagged salmon by age								
	Age .0		Age .1		Age .2		Age .3		
Origin	0.0	1.0	0.1	1.1	0.2	1.2	0.3	1.3	Total
Southeastern Alaska	-	28(77)	-	54(160)	-	11(18)	-	-	93(255)
British Columbia	-	-	8 (64)	-	13(142)	-	1(1)	-	22(207)
Washington	-	-	5 (73)	-	4 (22)	-	-	-	9 (95)
Oregon	-	-	7 (42)	-	-	-	-	-	7 (42)
Total	-	28(77)	20(179)	54(160)	17(164)	11(18)	1(1)	-	131(599)

Table 3.--Release and recovery data from coded-wire tagged chinook salmon (Oncorhynchus tshawytscha) (<66 cm fork length) captured in the northern and central regions of southeastern Alaska in January-December 1985.

Brood year	Tag code	Tag agency[a/]	Release data: Location	Release data: Stock	Release data: Date	Release data: Weight (g)	Recovery data: Vessel[b/]	Recovery data: Location	Recovery data: Date	Recovery data: Fork length (cm)	Recovery data: Weight (kg)	Sex	Days since release	Age[c/]
82	02:25/19	CDFO	QUINSAM R	QUINSAM R	5/15/83	11.5	KI	W WORONKOFSKI	5/21/85	49.0	1.6	M	706	0.2
82	02:25/41	CDFO	ROBERT-SON CR	ROBERTSON CR	6/01/83	7.0	KI	AFFLECK CANAL	5/17/85	48.0	1.5	F	716	0.2
82	02:25/57	CDFO	PUNT-LEDGE R	PUNTLEDGE R	6/15/83	11.3	KI	AFFLECK CANAL	5/16/85	52.0	1.6	F	701	0.2
82	02:25/59	CDFO	ATNARKO R	ATNARKO R	6/15/83	3.1	ND	LISIANSKI INL	5/12/85	48.0	1.4	F	697	0.2
83	02:26/32	CDFO	QUINSAM R	QUINSAM R	6/15/83	14.0	DJ	IMPERIAL PASS	9/25/85	46.0	1.4	-	467	0.1
83	02:26/32	CDFO	QUINSAM R	QUINSAM R	6/15/84	14.0	KI	NE ZAREMBO I	10/05/85	43.0	1.1	M	477	0.1
83	02:26/32	CDFO	QUINSAM R	QUINSAM R	6/15/84	14.0	DJ	SLOCUM ARM	9/25/85	49.0	1.4	-	467	0.1
83	02:26/32	CDFO	QUINSAM R	QUINSAM R	6/15/84	14.0	KI	N CLARENCE ST	9/25/85	44.0	1.1	F	467	0.1
83	02:26/35	CDFO	PUNT-LEDGE R	PUNTLEDGE R	6/15/84	8.7	OR	IDAHO INLET	10/02/85	47.0	1.3	M	474	0.1
83	02:27/45	CDFO	KITIMAT R	KITIMAT R	6/15/84	6.3	DJ	SLOCUM ARM	9/25/85	48.0	1.5	M	467	0.1
83	02:27/48	CDFO	BIG QUALICUM	BIG QUALICUM	6/15/84	9.0	DJ	SLOCUM ARM	9/23/85	45.0	1.5	M	465	0.1
83	02:28/61	CDFO	MARBLE R	MARBLE R	7/01/84	5.6	DJ	PORT ALTHORP	9/27/85	46.0	1.8	F	453	0.1
81	03:17/62	NMFS	LPW	UNUK R	5/15/83	16.0	ND	HAWK INLET	5/16/85	52.0	1.9	F	732	1.2
81	03:17/62	NMFS	LPW	UNUK R	5/15/83	16.0	SE	AUKE BAY	7/31/85	60.0	3.4	F	808	1.2
81	03:17/62	NMFS	LPW	UNUK R	5/15/83	16.0	ND	HAWK INLET	5/16/85	62.0	3.8	M	732	1.2
82	03:18/08	NMFS	LPW	UNUK R	5/15/84	31.1	DJ	PORT ALTHORP	9/27/85	48.0	1.5	F	500	1.1
82	03:18/08	NMFS	LPW	UNUK R	5/15/84	31.2	ND	HAWK INLET	5/17/85	44.0	1.1	M	367	1.1
82	03:18/09	NMFS	LPW	UNUK R	5/15/84	29.9	ND	HAWK INLET	5/18/85	37.0	0.7	-	368	1.1
82	03:18/09	NMFS	LPW	UNUK R	5/15/84	29.9	ND	EXCURSION INL	5/06/85	37.0	0.6	F	356	1.1
82	03:18/10	NMFS	LPW	UNUK R	5/15/84	34.7	SE	AUKE BAY	6/27/85	43.0	0.9	M	408	1.1
82	03:18/10	NMFS	LPW	UNUK R	5/15/84	34.7	ND	HAWK INLET	10/05/85	52.0	1.8	F	508	1.1

Table 3.--Continued.

Brood year	Tag code	Tag agency [a]	Release data: Location	Release data: Stock	Release data: Date	Release data: Weight (g)	Recovery data: Vessel [b]	Recovery data: Location	Recovery data: Date	Recovery data: Fork length (cm)	Recovery data: Weight (kg)	Sex	Days since release	Age [c]
82	03:18/11	NMFS	LPW	UNUK R	5/15/84	36.0	ND	HAWK INLET	5/16/85	42.0	0.9	M	366	1.1
82	03:18/11	NMFS	LPW	UNUK R	5/15/84	36.0	ND	PORT FREDERICK	10/04/85	50.0	1.9	F	507	1.1
82	03:18/11	NMFS	LPW	UNUK R	5/15/84	36.0	ND	HAWK INLET	5/15/85	38.0	0.8	F	365	1.1
82	03:18/13	NMFS	LPW	UNUK R	5/15/84	35.2	ND	IDAHO INLET	10/02/85	52.0	1.9	M	505	1.1
82	03:18/13	NMFS	LPW	UNUK R	5/15/84	35.2	ND	HAWK INLET	5/18/85	40.0	0.8	F	368	1.1
82	03:18/14	NMFS	LPW	UNUK R	5/15/84	43.7	OR	L LYNN CANAL	2/26/85	38.0	0.2	F	287	1.1
82	03:18/15	NMFS	LPW	UNUK R	5/15/84	20.2	ND	HAWK INLET	10/05/85	48.0	1.3	M	508	1.1
82	03:18/15	NMFS	LPW	UNUK R	5/15/84	20.2	ND	HAWK INLET	5/16/85	39.0	0.7	M	366	1.1
82	03:18/16	NMFS	LPW	UNUK R	5/15/84	20.2	ND	HAWK INLET	5/17/85	36.0	0.6	M	367	1.1
82	03:18/18	NMFS	LPW	UNUK R	5/15/84	20.2	DJ	SLOCUM ARM	9/25/85	58.0	2.5	M	498	1.1
83	03:18/28	NMFS	LPW	UNUK R	5/19/85	18.0	SE	AUKE BAY	9/24/85	26.0	0.2	M	128	1.0
83	03:18/29	NMFS	LPW	UNUK R	5/19/85	66.8	ND	EXCURSION INL	9/28/85	31.0	0.4	M	132	1.0
83	03:18/29	NMFS	LPW	UNUK R	5/19/85	59.9	ND	AUKE BAY	9/24/85	30.0	0.3	-	132	1.0
83	03:18/33	NMFS	LPW	UNUK R	5/15/85	30.4	OR	SEYMOUR CANAL	10/25/85	29.0	-	F	163	1.0
83	03:18/39	NMFS	LPW	UNUK R	5/19/85	28.2	ND	AUKE BAY	10/08/85	27.0	0.3	F	142	1.0
83	03:18/44	NMFS	LPW	UNUK R	5/19/85	17.1	ND	HAWK INLET	10/05/85	29.0	0.3	F	139	1.0
83	03:18/50	NMFS	LPW	UNUK R	5/19/85	28.2	ND	HAWK INLET	10/05/85	29.0	0.3	M	139	1.0
83	03:18/51	NMFS	LPW	UNUK R	5/19/85	28.2	ND	FUNTER BAY	9/27/85	28.0	0.3	F	131	1.0
81	03:63/03	NMFS	LPW	UNUK R	5/15/83	14.7	ND	EXCURSION INL	5/06/85	61.0	2.6	F	722	1.2
82	03:63/08	NMFS	LPW	CHICKAMIN R	5/15/84	17.2	SE	AUKE BAY	9/24/85	45.0	1.2	F	497	1.1
82	03:63/08	NMFS	LPW	CHICKAMIN R	5/15/84	17.2	OR	IDAHO INLET	10/02/85	49.0	1.6	F	505	1.1
83	04:03/21	SSRA	NEETS BAY	UNUK R	5/31/85	28.0	KI	W WORONKOFSKI	9/22/85	33.0	0.4	M	114	1.0
83	04:03/21	SSRA	NEETS BAY	UNUK R	5/31/85	28.0	KI	W WORONKOFSKI	9/22/85	32.0	0.4	M	114	1.0
83	04:03/21	SSRA	NEETS BAY	UNUK R	5/31/85	28.0	KI	STEAMER PT	10/02/85	28.0	0.2	M	124	1.0
83	04:03/21	SSRA	NEETS BAY	UNUK R	5/31/85	28.0	KI	NE ZAREMBO I	10/04/85	32.0	0.5	M	126	1.0
83	04:03/21	SSRA	NEETS BAY	UNUK R	5/31/85	28.0	KI	W WORONKOFSKI	9/23/85	30.0	0.4	M	115	1.0

Table 3.--Continued.

Brood year	Tag code	Tag agency[a]	Release data: Location	Stock	Date	Weight (g)	Recovery data: Vessel[b]	Location	Date	Fork length (cm)	Weight (kg)	Sex	Days since release	Age[c]
83	04:03/21	SSRA	NEETS BAY	UNUK R	5/31/85	28.0	KI	W WORONKOFSKI	9/22/85	33.0	0.5	M	114	1.0
83	04:03/21	SSRA	NEETS BAY	UNUK R	5/31/85	28.0	KI	STEAMER PT	9/24/85	29.0	0.3	F	116	1.0
83	04:03/21	SSRA	NEETS BAY	UNUK R	5/31/85	28.0	KI	W WORONKOFSKI	9/22/85	30.0	0.4	F	114	1.0
83	04:03/21	SSRA	NEETS BAY	UNUK R	5/31/85	28.0	KI	W WORONKOFSKI	9/23/85	32.0	0.4	M	115	1.0
83	04:03/21	SSRA	NEETS BAY	UNUK R	5/31/85	28.0	KI	W WORONKOFSKI	9/22/85	33.0	0.5	M	114	1.0
82	04:20/61	ADFG	UNUK R	WILD	4/15/84		KI	NE ZAREMBO I	10/04/85	48.0	1.5	M	537	1.1
82	04:21/58	ADFG	UNUK R	WILD	4/15/84		DJ	LISIANSKI INL	9/26/85	56.0	3.2	F	529	1.1
81	04:22/17	ADFG	KASNYKU BAY	ANDREW CR	5/15/83	12.4	ND	HAWK INLET	5/17/85	53.0	1.8	F	733	1.2
81	04:22/22	ADFG	KETCHIKAN CR	CRYSTAL CR	5/15/83	17.9	ND	HAWK INLET	5/16/85	65.0	3.5	F	732	1.2
81	04:22/28	ADFG	SPEEL ARM	SITUK/KS/ ANDREW CR	5/15/83	10.3	OR	L LYNN CANAL	12/31/85	61.0	-	F	961	1.2
81	04:22/28	ADFG	SPEEL ARM	SITUK/KS/ ANDREW CR	5/15/83	2.7	SE	AUKE BAY	8/26/85	55.0	2.1	M	834	1.2
81	04:22/29	ADFG	CRYSTAL CR	CRYSTAL CR	5/15/83	15.2	ND	HAWK INLET	5/16/85	52.0	1.7	F	732	1.2
81	04:22/29	ADFG	CRYSTAL CR	CRYSTAL CR	5/15/83	15.2	KI	BLIND SLOUGH	5/09/85	61.0	2.5	M	725	1.2
83	04:22/46	NSRA	BEAR COVE	ANDREW CR	5/20/85	56.0	DJ	SLOCUM ARM	9/23/85	33.0	0.4	-	126	1.0
83	04:22/46	NSRA	BEAR COVE	ANDREW CR	5/20/85	56.0	DJ	PORTLOCK HBR	9/25/85	30.0	0.4	-	128	1.0
83	04:22/46	NSRA	BEAR COVE	ANDREW CR	5/20/85	56.0	ND	IDAHO INLET	10/01/85	30.0	0.4	M	134	1.0
83	04:22/48	NSRA	BEAR COVE	ANDREW CR	5/20/85	56.0	ND	IDAHO INLET	10/02/85	32.0	0.5	F	135	1.0
82	04:22/55	SSRA	NEETS BAY	CRIPPLE CR/ LPW	6/15/84	47.8	KI	NE ZAREMBO I	10/05/85	55.0	2.3	F	477	1.1
82	04:22/55	SSRA	NEETS BAY	CRIPPLE CR/ LPW	6/15/84	47.8	KI	N CLARENCE ST	9/25/85	55.0	2.2	F	467	1.1
82	04:22/55	SSRA	NEETS BAY	CRIPPLE CR/ LPW	6/15/84	47.8	KI	NE ZAREMBO I	10/05/85	58.0	2.7	F	477	1.1
82	04:23/35	ADFG	KASNYKU BAY	ANDREW CR	5/15/84	22.7	ND	HAWK INLET	10/05/85	49.0	1.4	M	508	1.1
82	04:23/50	ADFG	SPEEL ARM	ANDREW CR	6/10/84	16.7	PU	AUKE BAY AK	1/24/85	27.0	0.2	F	228	1.1
82	04:23/50	ADFG	SPEEL ARM	ANDREW CR	6/10/84	16.7	SE	AUKE BAY AK	8/23/85	36.0	0.6	F	439	1.1
82	04:23/50	ADFG	SPEEL ARM	ANDREW CR	6/15/84	16.7	OR	SEYMOUR CANAL	10/22/85	36.0	-	F	494	1.1

Table 3.--Continued.

Brood year	Tag code	Tag agency[a/]	Release data: Location	Stock	Date	Weight (g)	Recovery data: Vessel[b/]	Location	Date	Fork length (cm)	Weight (kg)	Sex	Days since release	Age[c/]
82	04:23/53	ADFG	OHMER CR	CRYSTAL CR	5/15/84	17.7	KI	W WORONKOFSKI	9/22/85	48.0	1.4	M	495	1.1
82	04:23/53	ADFG	OHMER CR	CRYSTAL CR	5/15/84	17.7	KI	W WORONKOFSKI	9/22/85	45.0	1.3	F	495	1.1
82	04:23/53	ADFG	OHMER CR	CRYSTAL CR	5/15/84	17.7	KI	W WORONKOFSKI	5/21/85	32.0	0.4	M	371	1.1
82	04:23/53	ADFG	OHMER CR	CRYSTAL CR	5/15/84	17.7	KI	W WORONKOFSKI	9/23/85	43.0	1.0	F	496	1.1
82	04:23/53	ADFG	OHMER CR	CRYSTAL CR	5/15/84	17.7	ND	HAWK INLET	10/05/85	47.0	1.3	F	508	1.1
82	04:23/53	ADFG	OHMER CR	CRYSTAL CR	5/15/84	17.7	KI	W WORONKOFSKI	10/03/85	42.0	1.0	F	506	1.1
82	04:23/53	ADFG	OHMER CR	CRYSTAL CR	5/15/84	17.7	KI	BLIND SLOUGH	5/22/85	35.0	0.6	M	372	1.1
82	04:23/53	ADFG	OHMER CR	CRYSTAL CR	5/15/84	17.7	KI	NE ZAREMBO I	10/05/85	51.0	1.8	M	508	1.1
82	04:23/53	ADFG	OHMER CR	CRYSTAL CR	5/15/84	17.7	KI	W WORONKOFSKI	5/21/85	32.0	0.4	M	371	1.1
82	04:23/54	ADFG	CRYSTAL CR	CRYSTAL CR	5/15/84	20.4	KI	W WORONKOFSKI	9/22/85	47.0	1.2	F	495	1.1
82	04:23/54	ADFG	CRYSTAL CR	CRYSTAL CR	5/15/84	20.4	KI	BLIND SLOUGH	5/22/85	31.0	0.4	M	372	1.1
82	04:23/54	ADFG	CRYSTAL CR	CRYSTAL CR	5/15/84	20.4	ND	IDAHO INLET	10/02/85	49.0	1.6	M	505	1.1
82	04:23/54	ADFG	CRYSTAL CR	CRYSTAL CR	5/15/84	20.4	KI	PT BARRIE	5/19/85	37.0	0.6	M	369	1.1
82	04:23/54	ADFG	CRYSTAL CR	CRYSTAL CR	5/15/84	20.4	KI	STEAMER PT	9/24/85	52.0	1.7	F	497	1.1
82	04:23/54	ADFG	CRYSTAL CR	CRYSTAL CR	5/15/84	20.4	KI	STEAMER PT	9/24/85	49.0	1.6	M	497	1.1
82	04:23/54	ADFG	CRYSTAL CR	CRYSTAL CR	5/15/84	20.4	KI	SNOW PASSAGE	9/30/85	48.0	1.4	M	503	1.1
82	04:23/54	ADFG	CRYSTAL CR	CRYSTAL CR	5/15/84	20.4	DJ	LISIANSKI INL	9/28/85	52.0	1.9	M	501	1.1
82	04:23/54	ADFG	CRYSTAL CR	CRYSTAL CR	5/15/84	20.4	KI	NE ZAREMBO I	10/04/85	43.0	1.0	M	507	1.1
82	04:23/55	ADFG	CRYSTAL CR	ANDREW CR	5/15/84	23.0	KI	W WORONKOFSKI	9/21/85	48.0	-	M	494	1.1
82	04:23/55	ADFG	CRYSTAL CR	ANDREW CR	5/15/84	23.0	KI	NE ZAREMBO I	10/04/85	46.0	1.4	F	507	1.1
82	04:23/55	ADFG	CRYSTAL CR	ANDREW CR	5/15/84	23.0	DJ	SLOCUM ARM	9/23/85	39.0	0.8	M	496	1.1
82	04:23/56	ADFG	CRYSTAL CR	ANDREW CR	5/15/84	20.4	KI	W WORONKOFSKI	9/23/85	44.0	1.2	F	496	1.1
82	04:23/63	ADFG	SPEEL ARM	KING SALMON R	6/15/84	14.9	ND	AUKE BAY	10/07/85	36.0	0.5	F	479	1.1
82	04:23/63	ADFG	SPEEL ARM	KING SALMON R	6/15/84	14.9	ND	AUKE BAY	9/25/85	42.0	1.2	M	467	1.1
82	04:23/63	ADFG	SPEEL ARM	KING SALMON R	6/15/84	14.9	ND	HAWK INLET	9/27/85	36.0	0.5	F	469	1.1

Table 3.--Continued.

Brood year	Tag code	Tag agency[a/]	Release data: Location	Release data: Stock	Release data: Date	Release data: Weight (g)	Recovery data: Vessel[b/]	Recovery data: Location	Recovery data: Date	Recovery data: Fork length (cm)	Recovery data: Weight (kg)	Sex	Days since release	Age[c/]
83	04:24/08	ADFG	HIDDEN FALLS	ANDREW CR	5/21/85	18.0	ND	AUKE BAY	9/25/85	22.0	0.1	M	127	1.0
83	04:24/08	ADFG	HIDDEN FALLS	ANDREW CR	5/21/85	18.0	SE	AUKE BAY	9/24/85	24.0	0.2	M	126	1.0
82	04:24/30	SSRA	NEETS BAY	CRIPPLE CR/ LPW	6/15/84	47.8	KI	STEAMER PT	9/25/85	53.0	2.0	F	467	1.1
82	04:24/30	SSRA	NEETS BAY	CRIPPLE CR/ LPW	6/15/84	47.8	KI	NE ZAREMBO I	10/04/85	52.0	2.0	F	476	1.1
82	04:24/31	SSRA	NEETS BAY	CRIPPLE CR/ LPW	6/15/84	47.8	KI	NE ZAREMBO I	10/04/85	57.0	2.6	M	476	1.1
82	04:24/31	SSRA	NEETS BAY	CRIPPLE CR/ LPW	6/15/84	47.8	KI	P HARRINGTON	10/01/85	51.0	1.8	F	473	1.1
82	04:24/31	SSRA	NEETS BAY	CRIPPLE CR/ LPW	6/15/84	47.8	OR	ISLAS BAY	7/17/85	53.0	-	F	397	1.1
82	04:24/31	SSRA	NEETS BAY	CRIPPLE CR/ LPW	6/15/84	47.8	KI	W WORONKOFSKI	9/22/85	55.0	2.4	F	464	1.1
83	04:25/03	SSRA	WHITMAN LK	UNUK R	5/31/85	23.8	KI	STEAMER PT	10/02/85	30.0	0.3	M	124	1.0
83	04:25/11	ADFG	CRYSTAL CR	ANDREW- CRYSTAL	5/13/85	22.9	KI	W WORONKOFSKI	9/23/85	23.0	0.2	M	133	1.0
83	04:25/12	ADFG	CRYSTAL CR	ANDREW- CRYSTAL	5/13/85	22.9	KI	NE ZAREMBO I	10/04/85	26.0	0.2	M	144	1.0
83	04:25/13	ADFG	CRYSTAL CR	ANDREW- CRYSTAL	5/13/85	22.9	KI	W WORONKOFSKI	9/22/85	27.0	0.3	F	132	1.0
83	07:29/17	ODFW	ELK R	ELK R	10/15/84	46.3	OR	YAKOBI ROCK	7/24/85	39.0	-	M	733	0.1
83	07:31/24	ODFW	UMATILLA R	UPRIVER BRIGHT	6/15/84	5.3	OR	YAKOBI ISLAND	8/12/85	41.0	-	M	423	0.1
83	07:31/24	ODFW	UMATILLA R	UPRIVER BRIGHT	6/15/84	5.3	DJ	OGDEN PASSAGE	9/23/85	50.0	1.5	F	465	0.1
83	07:31/25	ODFW	TANNER CR	UPRIVER BRIGHT	6/15/84	5.7	DJ	SLOCUM ARM	9/23/85	42.0	1.5	F	465	0.1
83	07:31/25	ODFW	TANNER CR	UPRIVER BRIGHT	6/15/84	5.7	OR	SURGE BAY	7/26/85	38.0	-	M	406	0.1

Table 3. --Continued.

Brood year	Tag code	Tag agency[a/]	Release data: Location	Stock	Date	Weight (g)	Recovery data: Vessel[b/]	Location	Date	Fork length (cm)	Weight (kg)	Sex	Days since release	Age[c/]
83	07:31/25	ODFW	TANNER CR	UPRIVER BRIGHT	6/15/84	5.7	KI	PT HARRINGTON	10/01/85	42.0	1.0	M	473	0.1
82	08:20/50	CDFR	QUINSAM R	QUINSAM R	5/15/83	6.1	OR	GRAVES HARBOR	4/09/85	53.0	-	F	695	0.2
82	08:20/52	CDFR	QUINSAM R	QUINSAM R	5/15/83	7.3	KI	PORT BEAUCLERC	5/18/85	60.0	2.9	M	734	0.2
82	08:20/57	CDFR	QUINSAM R	QUINSAM R	5/15/83	7.4	KI	AFFLECK CANAL	5/17/85	56.0	1.8	F	733	0.2
82	08:20/58	CDFR	QUINSAM R	QUINSAM R	5/15/83	9.3	KI	AFFLECK CANAL	5/16/85	54.0	1.9	M	732	0.2
82	08:20/61	CDFR	QUINSAM R	QUINSAM R	5/15/83	10.7	KI	PT BARRIE	5/19/85	54.0	2.2	M	735	0.2
82	08:21/02	CDFR	QUINSAM R	QUINSAM R	6/15/83	10.9	SE	AUKE BAY	6/23/85	52.0	1.9	F	739	0.2
82	08:21/05	CDFR	QUINSAM R	QUINSAM R	6/15/83	12.7	ND	HAWK INLET	5/16/85	47.0	1.3	M	701	0.2
82	08:21/07	CDFR	QUINSAM R	QUINSAM R	6/15/83	14.7	KI	PORT BEAUCLERC	5/18/85	48.0	1.5	M	703	0.2
82	08:21/08	CDFR	QUINSAM R	QUINSAM R	6/15/83	14.5	OR	FREDERICK SD	3/18/85	64.0	-	F	642	0.2
82	08:21/09	CDFR	QUINSAM R	QUINSAM R	6/15/83	14.0	ND	HAWK INLET	9/27/85	57.0	2.3	M	835	0.2
81	08:21/29	CDFR	QUINSAM R	QUINSAM R	5/15/82	5.2	ND	SHELTER IS	5/20/85	64.0	3.2	M	1,101	0.3
82	08:21/48	CDFR	QUINSAM R	QUINSAM R	7/15/83	18.7	KI	AFFLECK CANAL	5/16/85	53.0	2.0	F	671	0.2
83	08:22/53	CDFR	CAPILANO R	BIG QUALICUM	6/15/84	5.5	ND	IDAHO INLET	9/30/85	47.0	1.2	F	472	0.1
83	21:16/21	QDNR	SALMON R	QUINAULT R	7/15/84	10.6	DJ	PORT ALTHORP	9/27/85	51.0	1.6	F	439	0.1
83	47:16/25	MIC	TAMGAS CR	LPW-KTCH	5/15/85	28.3	KI	W WORONKOFSKI	10/03/85	30.0	0.4	M	141	1.0
83	60:36/51	OAF	YAQUINA BAY	OAF-YAQUINA	10/15/84	116.4	DJ	SLOCUM ARM	9/25/85	52.0	1.8	F	345	0.1
83	60:36/56	OAF	YAQUINA BAY	OAF-YAQUINA	9/15/84	53.4	KI	N CLARENCE ST	9/25/85	48.0	1.4	M	375	0.1
83	60:37/11	OAF	YAQUINA BAY	OAF-YAQUINA	8/15/84	65.8	KI	STEAMER PT	9/24/85	49.0	1.4	M	405	0.1
83	62:17/60	ANAD	COOS BAY	ANADROMOUS	10/15/84	59.0	DJ	SLOCUM ARM	9/25/85	50.0	1.7	-	345	0.1
82	63:26/11	WDF	COLUMBIA R	PRIEST RAPIDS	5/15/83	5.4	KI	W WORONKOFSKI	5/21/85	50.0	1.6	M	737	0.2
82	63:26/11	WDF	COLUMBIA R	PRIEST RAPIDS	5/15/83	5.4	KI	AFFLECK CANAL	5/17/85	51.0	1.7	F	733	0.2
82	63:26/12	WDF	COLUMBIA R	PRIEST RAPIDS	6/15/83	7.2	ND	IDAHO INLET	10/01/85	62.0	2.9	F	839	0.2
82	63:26/12	WDF	COLUMBIA R	PRIEST RAPIDS	6/15/83	7.2	KI	AFFLECK CANAL	5/16/85	55.0	1.8	M	701	0.2
82	63:28/44	WDF	COLUMBIA R	BRTS-BON-NEVILLE	5/15/84	31.5	KI	W WORONKOFSKI	9/22/85	44.0	1.1	F	495	0.1

Table 3.--Continued.

			Release data				Recovery data							
Brood year	Tag code	Tag agency[a/]	Location	Stock	Date	Weight (g)	Vessel[b/]	Location	Date	Fork length (cm)	Weight (kg)	Sex	Days since release	Age[c/]
83	63:28/48	WDF	COLUMBIA R	BRTS-BON-NEVILLE	6/15/84	6.0	DJ	SLOCUM ARM	9/25/85	46.0	1.2	-	467	0.1
83	63:28/48	WDF	COLUMBIA R	BRTS-BON-NEVILLE	6/15/84	6.0	DJ	SLOCUM ARM	9/25/85	49.0	1.6	-	467	0.1
83	63:31/16	WDF	WASHOUGAL R	WASHOUGAL R	6/15/84	6.2	DJ	SOAPSTONE	9/26/85	44.0	1.1	F	468	0.1
81	B4:09/07	SSRA	NEETS BAY	CRIPPLE CR	5/15/83	29.5	ND	HAWK INLET	5/17/85	64.0	2.9	F	733	1.2
81	B4:09/07	SSRA	NEETS BAY	CRIPPLE CR	5/15/83	29.5	ND	HAWK INLET	5/17/85	56.0	2.2	M	733	1.2

[a/] Tagging agencies:

ADFC = Alaska Department of Fish and Game
ANAD = Anadromous Inc., Oregon
CDFO = Canadian Department of Fisheries and Oceans-Operations
CDFR = Canadian Department of Fisheries and Oceans-Research
MIC = Metlakatla Indian Community
NMFS = National Marine Fisheries Service
NSRA = Northern Southeast Regional Aquaculture Association
OAF = Oregon Aquafoods, Inc.
ODFW = Oregon Department of Fish and Wildlife
QDNR = Quinault Department of National Resources
SSRA = Southern Southeast Regional Aquaculture Association
WDF = Washington Department of Fisheries

[b/] Vessels engaged in fisheries research:

DJ = Demijohn
KI = Kiska
ND = Northern Diver
OR = Other voluntary commercial troll recoveries
PU = Puffin
SE = Searcher

[c/] Ageing by European method.

from southeastern Alaska, British Columbia, Washington, and Oregon (Table 2). Twenty-eight (182) were age .2 fish originating from southeastern Alaska, British Columbia, and Washington (Table 2). Only one age .3 chinook salmon of sublegal size was caught; it originated from British Columbia. Eleven additional CWT chinook salmon of sublegal size were turned in by commercial trollers (Table 3). All CWT chinook salmon that were stream type (age 1.) originated from southeastern Alaska, whereas those that were ocean type (0.) originated from British Columbia, Washington, and Oregon (Table 2). Coded-wire tags also were recovered from four age .0 coho salmon, two originating from southeastern Alaska and two from Washington (Table 4).

Scale analysis of chinook salmon revealed that the predominant marine age class was .2 in May and .1 in the September-October period (Table 5). Scale analysis also indicated that more ocean-type chinook salmon were sampled in the outside waters and more stream-type chinook salmon were sampled in the inside waters (Table 6). For all scale samples combined, ocean-type chinook salmon constituted 54% of the catch (Table 5).

Accuracy of ageing by scale pattern analysis was 83%; i.e., 95 of 114 CWT chinook salmon were aged correctly. A matrix of their known ages and respective designations is provided:

Age	Known age					
designation	1.0	1.1	1.2	0.1	0.2	0.3
1.0	25	5				
1.1		35		1		
1.2			14		4	
0.1		9		13		
0.2					7	
0.3						1

Table 4.--Release and recovery data from coded-wire tagged juvenile coho salmon (*Oncorhynchus kisutch*) captured in the northern and central regions of southeastern Alaska in January-December 1985.

			Release data				Recovery data							
Brood year	Tag code	Tag agency[a/]	Location	Stock	Date	Weight (g)	Vessel[b/]	Location	Date	Length (cm FL)	Weight (kg)	Sex	Days since release	Age[c/]
83	04:03/17	ADFG	SNETTISHAM	SNET-SPEEL	6/17/85	11.7	ND	S. INIAN PASS	10/01/85	29.0	0.3	M	106	1.0
83	04:25/06	SSRA	WHITMAN LAKE	WHITMAN LAKE	5/29/85	22.3	OR	SURGE BAY	9/09/85	32.0	-	-	103	1.0
83	63:32/53	WDF	ELOCKMAN	ELOCKMAN	5/01/85	25.2	KI	STEAMER PT	9/25/85	33.0	0.4	F	147	1.0
83	63:32/56	WDF	SOLEDUCK	SOLEDUCK	5/04/85	23.9	DJ	HERBERT GRAVES	9/22/85	32.0	0.4	-	141	1.0
83	84:09/10	NSRA	L ROSTISLAF	SASHIN CREEK	5/15/85	1.0	DJ	PORTLOCK HBR	9/22/85	27.0	0.2	-	130	1.0

[a/] Tagging agencies:
ADFC = Alaska Department of Fish and Came
NSRA = Northern Southeast Regional Aquaculture Association
SSRA = Southern Southeast Regional Aquaculture Association
WDF = Washington Department of Fisheries

[b/] Vessels engaged in fisheries research:
DJ = *Demijohn*
KI = *Kiska*
ND = *Northern Diver*
OR = Other voluntary commercial troll recoveries

[c/] Ageing by European method.

Table 5.--Age apportionment based on scale analysis of chinook salmon (*Oncorhynchus tshawytscha*) caught in the northern and central regions of southeastern Alaska in January-December 1985. Number of ageable scales equals 1,884.

Area	Sampling date	n	Age C. (%) 0.0	0.1	0.2	0.3	0.4	Total	Age 1. (%) 1.0	1.1	1.2	1.3	1.4	Total
Auke Bay and vicinity[a/]	Jan-Apr and Dec	11	-	-	-	10	-	10	18	27	18	27	-	90
Auke Bay and vicinity[b/]	Jun-Nov	92	-	5	10	-	-	15	11	44	27	3	-	85
Northern region[c/]	May	189	-	-	25	11	2	38	-	14	37	9	2[d/]	62
Central region[e/]	May	276	-	-	37	8	1	46	-	24	26	4	-	54
Northern region[c]	Sep-Oct	309	-	21	14	1	-	36	10	38	14	2	-	64
Central region[e/]	Sep-Oct	753	-	56	7	-	-	63	16	19	2	-	-	37
Northern region outside waters[f/]	Sep	254	-	71	8	-	-	79	6	14	1	-	-	21
							Percent	54					Percent	46

[a/]Data from Puffin.
[b/]Data from *Searcher*.
[c/]Data from *Northern* Diver.
[d/]Includes one age 1.5 chinook salmon.
[e/] Data from *Kiska*.
[f/]Data from *Demijohn*.

Table 6.--Chinook salmon (*Oncorhynchus tshawytscha*) age distribution (i.e., ocean type (age 0.) and stream type (age 1.)) based on scale analysis of fish sampled in the inside and outside waters of the northern and central regions of southeastern Alaska in January-December 1985. Number of ageable scales equals 1,884.

	Inside waters (%)			Outside waters (%)		
Period	n	0.	1.	n	0.	1.
			Auke Bay and vicinity			
Year round[a]	103	15	85	-	-	-
			Northern			
May[b]	155	30	70	34	76	24
September-October[c]	245	29	71	318	75	25
			Central			
May[d]	113	32	68	163	56	44
September-October	748	64	36	5	60	40

[a]Data from *Searcher* and *Puffin*.
[b]Data from *Northern Diver*.
[c]Data from *Northern Diver* and *Demijohn*.
[d]Data from *Kiska*.

DISCUSSION

Previous tagging studies (see Mason 1965) have documented that chinook salmon yearling and fingerling migrants move northward upon entering marine waters. The recent advent of CWT's (Jefferts et al. 1963), coupled with their widespread acceptance and coast-wide use (Johnson 1985), has provided precise information on early marine migration and timing of a multitude of specific salmon stocks. The CWT recoveries in our study indicate that stocks of juvenile chinook salmon from southeastern Alaska, British Columbia, Washington, and Oregon use the marine waters of southeastern Alaska as a nursery area. The marine distribution patterns of these stocks in southeastern Alaska are represented by their distinctly different origins and are related to their freshwater and marine ages and temporal occurrence.

The marine ages of most chinook salmon recovered with CWT's were .0, .1, and .2, but the recoveries were not fully representative of age .2 fish. Age .2 stream-type fish, which were substantially larger than age .2 ocean-type fish, were biased toward smaller fish because all CWT fish larger than the legal size limit (66 cm FL) were released. Additionally, fish approaching legal size or larger usually bent or straightened hooks on the small gear, whereas the considerably smaller (age .0 and .1) chinook salmon did not. Therefore, recoveries probably were representative of age .0 and .1 fish but not of age .2 fish.

Stream- and ocean-type chinook salmon with CWT's were represented by distinctly different origins. Chinook salmon stocks from Alaska were exclusively stream type; those from British Columbia, Washington, and Oregon were exclusively ocean type. The absence of stream-type chinook salmon of non-Alaskan origin indicated that these fish were not prevalent in the marine waters of southeastern Alaska, a factor consistent with the hypothesis by Healey (1983), who suggested that they move directly offshore during their first summer at sea and reside primarily in offshore waters. The absence of ocean-type fish of Alaskan origin was not surprising; rarely have ocean-type chinook salmon been produced naturally in Alaskan streams (Van Alen et al. in press). However, their absence in the sampling contradicts the recent increase in Alaskan hatchery production of ocean-type chinook salmon smolts and the traditional stream-type smolts. The absence of ocean-type fish may indicate either low marine survival as a result of this culture method in Alaska or differences in their marine distribution patterns. Collections of additional CWT data from juvenile chinook salmon, or natal stream recoveries of tagged salmon from our study, should further define distribution patterns and migrations of specific stocks.

The marine distribution patterns of the chinook salmon reflected

Ocean-type chinook salmon, constituting 54% of the catch, were primarily located in the outside waters of southeastern Alaska (Table 6). This finding is similar to the scale pattern analysis by Van Alen et al. (in press), who determined that 55.7%, 74.9%, 60.7%, and 50.8% of the commercial catches in southeastern Alaska in 1982, 1983, 1984, and 1985, respectively, were ocean-type chinook salmon. In our sampling, the ocean-type component was most prevalent in the northern outside waters in May and in the September-October period (Table 6). This paralleled the distribution of legal-sized, older (primarily ages 0.3 and 0.4) fish southeastern Alaska (Van Alen et al. in press) and during past research (Parker and Kirkness 1956).

The temporal occurrence of stream- and ocean-type chinook salmon in the study areas was related to marine age classes. Age .0 fish were recovered only in fall and were exclusively stream-type and of Alaskan origin. Al though no ocean-type age .0 fish were sampled, they may have occurred south of the study areas. The age .1 fish sampled in May also were exclusively stream type and of Alaskan origin. The absence of age .1 ocean-type fish in May indicated that southern stocks of these fish either had not migrated northward to the study areas or were distributed offshore. Again, age .1 ocean-type fish may have occurred earlier in the year in regions south of the study areas. In September, however, the age .1 ocean-type fish were well established and, in fact, constituted 71% of the catch in the northern outside region (Table 5). Therefore, ocean-type chinook salmon of non-Alaskan origin did not occur in the study areas until fall during their second year at sea (i.e., when they were age .1), whereas the stream-type fish of Alaskan origin first occurred in fall during their first year at sea (i.e., when they were age .0).

The seasonal abundance of marine age classes of juvenile chinook salmon in our study permitted us to develop a hypothesis to explain the observed distribution patterns. Age .0 stream-type chinook salmon of southeastern Alaska origin enter the marine environment in May and June and reside in nearshore and protected inside waters for about 5 months. In late fall, age .0 stream-type fish from some stocks, or portions thereof, migrated seaward to coastal waters or perhaps to more oceanic offshore waters. In spring, the seasonal migration of stream-type chinook salmon into southeastern Alaska includes older, maturing fish returning to natal spawning streams and younger (age .1 and .2) immature fish. Some age .1 stream-type fish (age .0 fish from the previous year)

in the inside waters of northern and central southeastern Alaska, but they are less abundant than the age .2 fish (Table 5). By September, however, age .1 chinook salmon are the predominant age class, indicating the reappearance of age .1 stream-type fish and the influx of age .1 ocean-type fish into the study areas. This hypothesis was supported by the year-round sampling in Auke Bay as well as the seasonal sampling in the northern and central regions. The influx of immature chinook salmon from Alaskan and non-Alaskan stocks documents the importance of the marine waters of southeastern Alaska as a primary nursery area for both groups of stocks..

If our assumption that catch rates are indicative of abundance is correct, then chinook salmon abundance declined in Auke Bay in November and December. One alternate explanation for reduced catch rates is that the fish were still present but exhibited reduced activity due to lower temperatures in winter. This explanation is unlikely because temperatures in November and December are similar to those in May and June at 20-30 m depths (Bruce et al. 1977) at which chinook salmon are most commonly caught. However, many fish are still active in winter, as indicated by the winter troll and sport fisheries exclusively harvesting chinook salmon in southeastern Alaska. Another alternate explanation

light intensity needed by fish to feed (Blaxter 1980). During winter months in higher latitudes, light intensity that allows salmon to effectively forage is greatly reduced, thereby reducing trolling gear efficiency. The more likely explanation for the reduced catch rates is declining abundance due to some fish emigrating from Auke Bay.

Our CWT recoveries demonstrate that juvenile coho salmon of non-Alaskan origin also use southeastern Alaska as a nursery area. Two of the four coho salmon recovered with CWT's in 1985 were age .0 and originated from Washington hatcheries (Table 4). This result complemented the intensive tagging study by Hartt and Dell (1986), who have documented the occurrence of southern stocks of juvenile coho salmon off the coast of southeastern Alaska. Previous CWT recoveries of age .0 coho salmon from southern stocks have occurred in southeastern Alaska. Seven age .0 coho salmon (Mortensen[2]) were caught by gill net in lower Chatham Strait in August 1983; of these, one had a CWT and originated from British Columbia (Table 7). Seven age .0 coho salmon with CWT's also were recovered by a commercial troller in 1982. One of these fish originated from Oregon, and one originated from British Columbia (Table 7). Although the CWT recoveries indicate that age .0 coho salmon use the marine waters of southeastern Alaska, recoveries are

non-Alaskan juvenile coho salmon migrating through the region.

Trolling with small hooks and lures is a cost-effective method of obtaining marine life-history data on juvenile chinook salmon and coho

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[2]D. G. Mortensen, unpubl. data, Auke Bay Laboratory, P.O. Box 210155, Auke Bay, AK 99821.

Table 7.--Release and recovery data from coded-wire tagged juvenile coho salmon (*Oncorhynchus kisutch*) of non-Alaskan origin obtained from various sources in 1982-83.

			Release data				Recovery data				Days
Brood year	Tag code	Tag agency[a]	Location	Stock	Date	Weight (g)	Location	Date	Length (cm FL)	Weight (kg)	since release
80	02:22/41[b]	CDFO	Robertson Cr	Robertson Cr	4/15/82	22.6	Graves Harbor	9/30/82	34.0	-	141
81	02:24/08[c]	CDFO	B Qualicum BC	Big Qualicum	5/16/83	20.9	Chatham Strait	8/14/83	25.5	0.2	90
80	07:26/49[b]	ODFW	Big Creek	-	4/15/82	28.7	Yakobi Island	8/09/82	32.5	-	116

[a] Tagging agencies:
CDFO = Canadian Department of Fisheries and Oceans-Operations
ODFW = Oregon Department of Fish and Wildlife

[b] Caught during commercial trolling.

[c] Caught during gill-net research.

salmon in southeastern Alaska. For example, a power troller chartered in 1985 required only one scientist on board yet sampled 25.0 juvenile chinook salmon and 12.7 juvenile coho salmon daily at a cost of $406 per day. In contrast, a drum seiner chartered in 1984 required a three-person scientific crew yet sampled only 0.3 juvenile chinook salmon and 7.9 juvenile coho salmon daily (J. Landingham, Auke Bay Laboratory, personal communication, September 1986) at a cost of $3,333 per day. Sampling with trolling gear also enables the depth of capture to be estimated, a characteristic lacking in many other sampling techniques (Hartt 1975). For example, small mesh gill nets (Jaenicke et al. 1984 ; Mortensen footnote 2) require a large vessel to fish sufficient amounts of gear and do not effectively sample juvenile chinook salmon, which tend to be distributed deeper than juvenile coho salmon. Additionally, juvenile salmon caught by the scaled-down trolling gear generally are in good condition and suitable for tagging because each fish is retrieved individually and can be processed rapidly.

Increased trolling effort for juvenile chinook salmon and coho salmon, spawning ground recoveries of fish tagged during our study, and scale analysis will provide a more complete evaluation of stock composition, marine distribution, and temporal occurrence of these fish. Annual replications of seasonal sampling also are necessary to determine age class composition over time because the overall results can be misinterpreted if a particularly strong or weak year class exists. Our data primarily describe the northern inside region (Auke Bay) so further data collections in other regions are necessary to fully describe seasonal movement of juvenile chinook salmon in the marine waters of southeastern Alaska. All of this information is the key to understanding the complete marine biology of wild and hatchery juvenile chinook salmon and coho salmon in southeastern Alaska.

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ACKNOWLEDGMENTS

We are grateful to the operators of the fishing vessels Demijohn (Paul Corbin and Chris Carol), Kiska (Scott and Julie Hursey), Northern Diver (Robert and Jean Earl), and Puffin (Louis Barr) for their extra effort and assistance throughout the charters. We thank the commercial trollers Louis Barr and Edward Burgeron for contributing the additional coded-wire tag information in this report, and Eileen Sturrock for the scale pattern analysis. We are grateful to the Auke Bay Laboratory scientists who planned or participated in this study: William Heard, Herbert Jaenicke, Joyce Landingham, and Jerry Taylor. In addition, we appreciate the cooperative help of Mike Bethers, Doug Mecum, and Gary Sanders of the Alaska Department of Fish and Game.

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