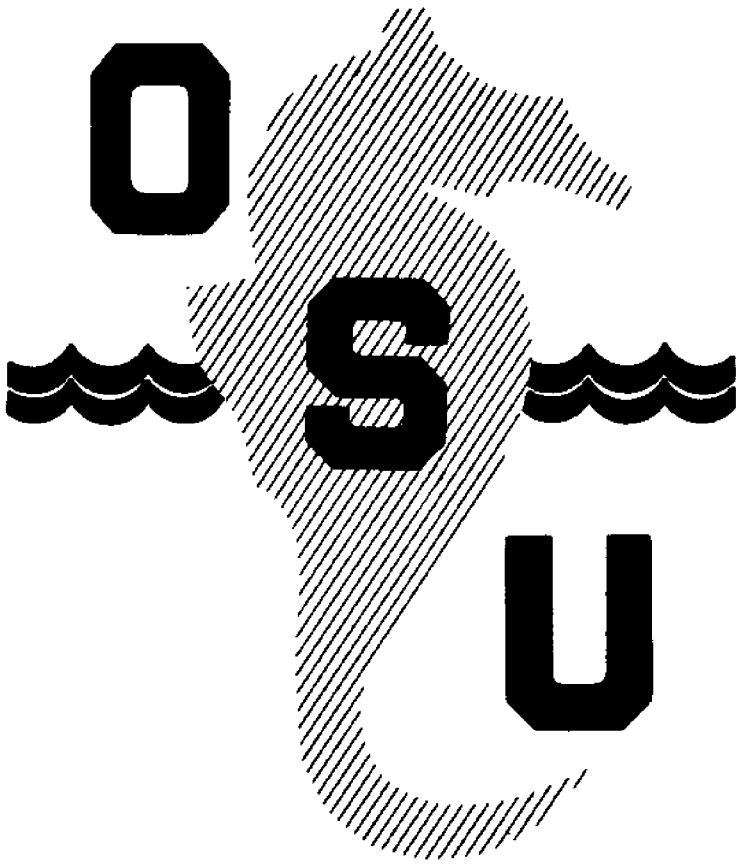
College of

OCEANOGRAPHY



THE UTILIZATION OF NETARTS BAY BY JUVENILE CHUM SALMON—1984

by

C. D. Wilson and W. G. Pearcy

Oregon State University
Sea Grant College Program
ORESU-T-85-002

Reference 85-4
February 1985
Field Report

OREGON STATE UNIVERSITY

THE UTILIZATION OF NETARTS BAY BY JUVENILE CHUM SALMON - 1984

by

C.D. Wilson and W.G. Pearcy

College of Oceanography
Oregon State University
Corvallis, Oregon 97331

FIELD REPORT

Field Report
Reference 85-4
February 1985

D.R. Caldwell
Acting Dean

Acknowledgments

This research was supported by Oregon Aqua-Foods Inc. and the Oregon State University Sea Grant College program. We would like to thank J. Lannan for use of OSU's Whiskey Creek hatchery facilities during our field season, F. Ratti for assistance in organizing supplies needed for field sampling, K. Krefft for determining fish lengths in the laboratory, F. Ratti, M. Bauwman, R. Brodeur, B. Burkle, R. Chitwood, A. Chung, M. Durffy, K. Krefft, P. Lamberson, E. Rexstad for their help in the field, and R. Schwartz of the Evironmental Protection Agency Laboratory for the generous use of a boat and outboard motor.

TABLE OF CONTENTS

INTRODUCTION

The School of Oceanography, Oregon State University, initiated a study during the spring of 1984 to investigate the utilization of Netarts Bay by juvenile chum salmon. Specific objectives the first year were to determine: 1) the relative numbers of hatchery and wild chum salmon, 2) the nursery areas utilized by hatchery and wild chum salmon, 3) the residence time of chum salmon, and 4) the size at which the fish emigrated from the bay. This report presents the methods and some preliminary results from the 1984 field season.

MATERIALS AND METHODS

Sampling Area

Netarts Bay is located approximately 96 km (60 mi) south of the mouth of the Columbia River and is considered the sixth largest estuary in Oregon with a surface area of 10.1 km (3.9 mi) at MHW (Kreag 1979). About 12% of the Bay is subtidal (Kreag 1979), with extensive eelgrass beds located in these areas as well as other lower intertidal areas. Sediments in the bay are composed of fine-to-medium sands and silts (Glanzman et al. 1971, Stout 1976). The east side of the lower bay has been extensively rip rapped. Of the 13 small streams that drain into Netarts Bay, Whiskey Creek is considered the largest, extending approximately 8.0 km (5.0 mi) in length (Stout 1976, Kreag 1979). Glanzman et al. (1971) estimated an average annual flow rate for Whiskey Creek of 28.3 liters/sec. (10 cfs). Whiskey Creek is the site of the Oregon State University experimental research hatchery for rearing chum salmon (Lannan 1975).

Gear - Whiskey Creek

A fyke net, 3.2 m long (Fig. 1), was used to sample outmigrating wild chum salmon fry in Whiskey Creek from 21 March to 3 May 1984. The net was situated approximately 35 m upstream from the highway

bridge across Whiskey Creek. Steel fence posts were placed approximately 1.25 m apart across the width of the creek immediately upstream from the fyke net. Each wing was secured to a fence post and, depending on the combination of posts selected, the net opening could be altered to sample various widths of the stream. The net extended across more than 95% of the width of the stream on 35 of the 42 days sampled, but only 1/3 to 1/2 of the stream was sampled during 7 days of high flow. When less than 100% of the stream was sampled, the catch was expanded proportionately to estimate the total catch for the entire stream.

Environmental Data - Whiskey Creek

Flow rates of Whiskey Creek were not measured directly although water depth was monitored to the nearest 1.0 cm to provide a relative index of water flow. Water temperature to the nearest 0.5 C and in the latter part of the study cloud cover was also recorded.

Sampling Procedure - Whiskey Creek

All species captured in the fyke net were identified, counted, and measured. Fork lengths of all species were determined to the nearest 1.0 mm. Occasionally, chum fry were subsampled for stomach content analysis and age determination. On 16 of the 42 sampling

days, the fyke net was fished from 1800-0800 hrs. On other days it was fished continuously over 24 hours. Continuous sampling at least two days every week enabled estimation of the number of fish emigrating during daylight hours (0900-1800 hrs), when sampling did not always occur. For example, an average of 2.4 fish outmigrated daily during 0900-1800 hrs from 11 April to 17 April based on 5 days of 0900-1800 hr sampling. On the remaining 2 days when sampling did not occur between 0900-1800 hrs, an average of 2.4 fish per day were estimated to have emigrated during this daytime period and were added to the numbers caught during 1800-9000 hrs to provide an estimate of the total numbers emigrating on those days.

Releases of Chum Salmon from the Whiskey Creek Hatchery

A total of approximately 860,300 juvenile chum salmon were released from the OSU Whiskey Creek hatchery into Netarts Bay on the evenings of 1 April and 16 April 1984. The first release group included between 25 to 40% of the total number of fish. These fish averaged 1.4 g and 52 mm (FL) on 1 April. No fish in this release group were fin clipped. The second release group included the remaining chum fry from Whiskey Creek, of which 24,000 were marked with a right ventral fin clip (RV). These fish averaged 1.9 g and 58 mm (FL) on 16 April. In addition, included in the second release group were 20,500 Whiskey Creek chum reared at the Oregon Aqua-Foods hatchery in Springfield, marked with a left ventral fin

clip (LV) and transported to the Whiskey Creek hatchery on 3 April at an average size of 0.75 g and 46 mm. Although smaller than the RV fish, the average size of the LV fish at release (16 April) was not determined. Five percent of the total numbers of fish released were fin clipped.

Gear - Netarts Bay

A 37-m long tapered floating beach seine, constructed by Eastside Net Shop (Seattle), was used to sample fishes in Netarts Bay. The physical dimensions of the net are presented in Fig. 1. The net was set in a semi-circle from the shoreline using a 5.1 m (16'8") Aluminum skiff (Mirrocraft) outfitted with a 20 hp outboard motor (Evinrude).

Environmental Data - Netarts Bay

Surface temperatures were measured to the nearest 0.5 C using a bucket thermometer and surface salinities were determined with a refractometer (American Optical, Model 10419) at the location of each successful beach seine set. Percent cloud cover, wind speed and direction were also recorded. Rough estimates of turbidity were made relative to the depth of water, e.g. if the bottom was visible beneath 2 m of water on station, visibility was recorded as equal to or exceeding 2 m. Stage of tide, and substrate type and

vegetation present were also recorded. Estimated maximum depth sampled and the distance the net was set from shore were noted during the latter half of the field season.

Sampling Procedure - Netarts Bay

Netarts Bay - A total of 11 high tide and 10 low tide stations, some marked with wooden stakes, were repeatedly sampled (Fig 2). Descriptions of the specific beach seine stations are given in Tables 1. Date, time of day, and performance of the gear were recorded. All stations were usually sampled at least once during a 1-2 day sampling period. All high tide stations could be sampled on tides 6.6 ft or higher (uncorrected tidal height as stated in the 1984 OSU Marine Science Center tide tables). Correction factors for times and elevations of slack low and high tides near the mouth of Netarts Bay are found in Stout (1976). Generally, a time lag of 40 and 80 minutes was found for high and low water, respectively, near the mouth. Sampling at high or low tide stations usually commenced at least 30 minutes before slack tide. Stations near the mouth were sampled first and stations farther up the estuary were usually sampled later as the slack high or low progressed up the bay. Slack high and low tides in the upper estuary were delayed by as much as 45 to 120 minutes, respectively, after slack high and low water at the mouth.

At each site all fish species captured were identified and counted. Large catches were subsampled. Fork lengths of the common species were determined to the nearest 1.0 mm. If substantial numbers of species other than chum salmon were captured, subsamples were preserved for stomach content and size frequency analysis. Potential fish predators of juvenile chum salmon including rainbow trout and cutthroat trout were occasionally captured and retained for stomach content analysis.

At the beginning of the study, all juvenile chum salmon, or a subsample of 50-100 individuals were anesthetized with MS222 (approx. 5 at a time), checked for fin clips, measured to the nearest 1.0 mm, and allowed to recover in a floating perforated container. This procedure was extremely time consuming and produced high percentages of moribund individuals. We subsequently abandoned the MS222 procedure and simply counted and checked unanesthetized fish for ventral fin clips. Fish that had been examined were then placed in a recovery bucket and released in groups of 100. A subsample of 5-50 chum was placed in 10% formalin or 95% ethanol for stomach content analysis and age determination, respectively. Fork lengths of all preserved fish were measured in the laboratory and converted to live fish lengths using the relationships determined from measurements of individual fresh and preserved fish (Appendices 1 and 2).

Data Analysis

For the purpose of data analysis the field season was divided into 21 sampling periods in which every beach seine station was usually sampled at least once. Toward the end of the field season some upper bay stations were not sampled during each period. The bay was arbitrarily divided into an upper bay (stations 1-4 and 12-14) and lower bay (stations 5-11 and 15-21)(Fig 2). Mean lengths and numbers of fish caught from different regions of the bay were compared using a t-test and Mann-Whitney test, respectively (Zar, 1974). Estimates of growth were compared using an F test for parallelism (Neter and Wasserman 1974).

RESULTS

Whiskey Creek

A total of 10,633 chum salmon fry were caught in the fyke net in Whiskey Creek and 11,910 fry were estimated to have outmigrated into Netarts Bay between 21 March and 3 May. This outmigration of wild chum salmon fry was approximately 1.4% of the total chum salmon releases from Whiskey Creek hatchery in 1984.

The number of chum fry migrating downstream generally decreased with time after 25 March, indicating that a portion of the outmigration occurred prior to our field sampling (Fig. 3a,Table 2). Figure 3a shows several peaks of outmigration between 22 March and 16 April. These peaks did not appear positively associated with the new moon as reported for other outmigrating salmonid fry (Mason 1975). In fact, the third largest catch of chum fry occurred under an unobscured full moon on 16 April (Table 2). Stream temperature ranged from 8.9 to 11.0 (mean 9.8; Table 2) and likewise showed little correlation with the strong pulses of outmigrating chum (Figs. 3a,3b). Stream flow, however, appeared associated with numbers of emigrating chum fry. Large numbers of chum fry were sampled on 3 of 4 occasions of high flow (water height >20 cm) (25 March; 7,12 April) (Table 2;Figs 3a,3c).

Except for two days, more than 95% of the chum outmigrants were captured between dusk and dawn (Table 3). Most fish were captured immediately after dusk, between 1800-2000 hrs before about 12 April and between 2000-2400 hrs after this date (Fig. 4;Table 3). Only an estimated 0.5% of the chum fry migrated during daylight between 0800-1800 hrs (Table 3).

The mean length of outmigrating chum salmon fry was 40.4 mm (s=1.4,n=3770)(Fig 5a). The mean length of juvenile chum salmon sampled during the first half of the downstream migration (21 March-8 April) was 40.4 mm (s=1.4,n=2946), the same as that of the latter half (10 April-2 May; s=2.0,n=824). However, the modal length was larger during the latter half of the outmigration (41 vs. 40 mm) when a greater proportion of small individuals were also caught (Fig 5b).

Three large chum salmon fingerlings (63-66 mm) were captured in the fyke net on 17-18 April. Because of their large size these fish were probably hatchery fish released downstream of the sampling site on 16 April. Therefore, it is conceivable that other chum fry may have entered the fyke net more than once.

Netarts Bay

A total of 435 beach seine sets were made in Netarts Bay from 16 March through 29 June 1984. Table 4 lists the date, time of day, gear performance, tide stage, water temperature, salinity, and turbidity for each beach seine set. The water temperature averaged 13.3 C and ranged from 6.1 C to 24.3 C. Figures 6a and 6b depict the large range in temperatures found at four upper and lower bay sites during the field season. The range appears larger for stations in the upper than lower bay, but no distinct seasonal trends are obvious. Mean salinity for all sites was 24 ppt and ranged from 4 to 33 ppt.

An estimated 21,700 juvenile chum salmon were caught from 16 March to 14 June. The number of chum salmon caught at each beach seine station are listed in Table 5. The average number of chum caught per beach seine set, all sites combined, ranged from 0 to 120 over the field season (Fig 7; Table 6). Large standard deviations of the number of fish per set (Table 6), as well as results from replicate sets (Table 7), indicate that chum salmon often occurred in schools or aggregations within the bay.

The first distinct increase in mean number of chum per set occurred on 2-3 April just subsequent to the first hatchery release

on 1 April (Fig 7, Table 6). The largest mean number of chum per set occurred during 17-18 April, immediately following the second hatchery release on 16 April (Fig 7, Table 6). Catches then declined to less than 50 fish per set between 23-27 April, rose to another peak on 10-11 May, and then declined to low numbers during late May and June (Fig 7, Table 6). The last six chum salmon were caught near the mouth of the bay at site 1 on 14 June (Table 5).

Large numbers of chum were captured in the bay on 2-3, 12-13, and 17-18 April (Fig 7, Table 6), immediately following three peaks of outmigration from Whiskey Creek on 2, 12, and 16 April (Table 2, Fig 3a). However, most chum salmon captured in the upper bay at this time were larger than the average size of outmigrating fry (40 mm). Furthermore, 5% or more of the fish caught after 7 April were marked (see Recapture of Marked Chum Salmon section), suggesting that large catches of chum salmon in the bay resulted from the hatchery releases on 1 April and 16 April.

Large catches of chum salmon occurred at both high and low tide stations from 16-17 March through 19-20 April (Table 8, Fig 8). After 23-24 April, however, the mean numbers of chum caught per set were consistently larger from low tide than high tide sites, with significant differences ($P<0.05$) on three occasions (Fig 8; Table 8). To determine if this difference was related to a

disproportionate number of sets in the upper or lower bay, catches at high and low tide sites were compared for both upper bay and the lower bay. No trend for larger catches of fish at high or low tide sites was apparent before 19-20 April and 23-24 April in the upper and lower bay, respectively (Tables 9, 10). After these dates, however, catches at low tide sites were consistently larger than at high tide sites in both upper and lower bay.

Peak catches of chum salmon were made in the upper bay sites before 26-27 April and in the lower bay sites after 26-27 April (Table 11, Fig 9). This indicates a down-bay movement of fish as a function of time. After 23-24 May an average of less than 1 fish per set was caught from the upper bay sites (Table 11). These trends were also apparent when only high or low tide stations were used to compare the catches in the upper and lower bay (Tables 9, 10).

Before 23-24 April, chum salmon caught in the upper bay were usually larger than those caught in the lower bay with significant differences ($P<0.05$) found on 6 of 9 occasions (Table 12). After 19-20 April, however, larger fish were caught in the lower rather than upper bay, with significant differences between mean lengths on 5 of 6 occasions (Table 12). This trend occurred for both high or low tide sites (Tables 13, 14).

On 12 of 16 occasions, significantly larger fish were caught in the upper bay from low tide than high tide stations (Table 15). On 8 of 16 comparisons in the lower bay, however, significantly larger fish were captured from high tide rather than low tide stations (Table 16).

Recapture of marked chum salmon

A total of 367 right-ventral (RV) fin-clipped and 464 left-ventral (LV) fin-clipped chum salmon were recaptured from 3 April through 31 May in beach seine hauls within Netarts Bay (Table 5). Thirty-six fish which had both ventral fins inadvertantly clipped were also recaptured (Table 5). The fact that fin-clipped fish appeared in our catches prior to the intended hatchery release date indicates some leakage of fish from the hatchery raceway. Percent occurrence of ventral fin-clipped fish in the catch was quite high after 8 April and averaged around 6.5% through 30-31 May (Fig 10; Table 17). This suggests that most fish sampled in the bay throughout the field season were of hatchery origin since about 5% of all the hatchery fish were fin-clipped.

Unexpectedly, greater numbers of the smaller (46 mm $\overline{FL}$ on 3 April) LV fish were recaptured than the larger (52 mm $\overline{FL}$ on 1 April) RV fish, even though greater numbers of RV fish were

released (Table 17, Fig 11). This may be explained by more rapid emigration of the larger RV fish from the estuary.

Growth was estimated from fork lengths of recaptured fin-clipped fish. The increase in plotted mean lengths after release for both LV and RV groups appears linear (Fig 12). No trend for decreased size is obvious due to emigration of large individuals from the bay. A straight line was fitted to individual length data by the method of least squares and resulted in the following relationships for RV and LV chum salmon (Fig 12):

RV fish: $L=0.41T+48.90$ ($R^2=0.60$)

LV fish: $L=0.48T+42.95$ ($R^2=0.71$)

where L represents the fork length in mm and T represents the number of days since 1 April that the fish were captured.

Estimated growth for LV chum salmon was 0.5 mm per day which was significantly greater ($P=0.004$) than the 0.4 mm per day determined for RV fish. The slightly faster growth rate exhibited by LV fish, which were smaller at time of release, may be the result of growth compensation.

Literature Cited

Glanzman, C.R., B. Glenne, and F. Burgess. 1971. Tidal hydraulics, flushing characteristics and water quality of Netarts Bay. Engineering Experiment Station, Oregon State University. Bull. No. 45. 33 pp.

Kreag, R.A. 1979. Natural resources of Netarts estuary. Oregon Dept. Fish. Wildlife, Estuary Inventory Report 2:1 45 pp.

Lannan, J.E. 1975. Netarts Bay chum salmon hatchery. Oregon State University, Sea Grant Pub. ORESU-H-75-001. 28 pp.

Mason, J.C. 1975. Seaward movement of juvenile fishes, including lunar periodicity in the movement of coho salmon (Oncorhynchus kisutch) fry. J. Fish. Res. Board Can. 32:2542-2547.

Neter,J. and W. Wasserman. 1974. Applied linear statistical models. Richard D. Irwin, Inc., Homewood, Illinois. 842 pp.

Stout, H. (editor). 1976. The natural resources and human utilization of Netarts Bay, Oregon. Oregon State Univ., Corvallis. 247 pp.

Zar, J.H. 1974. Biostatistical analysis. Prentice-Hall, Inc., Englewood Cliffs, New Jersey. 620 pp.

Table 1. Description of high tide beach seine stations.

STATION	LOCATION	DESCRIPTION/COMMENTS	APPROX. WATER DEPTH (m)
1 One High.	West shore near mouth of bay. Across from marina and public boat ramp. Near sign that reads,"overnight camping prohibited."	Firm sand substrate. No vegetation.	0.6-1.2
2 Two High.	East side of bay. Immediately north of marina riprap.	Firm sand substrate. Red and green drift algae (e.g. Ulva spp., Gigartina spp.) in May-June.	0.6-1.2
3 Three High.	Immediately south of Lee Hanson's oyster larvae rearing facility. A small grass-covered clay-soil outcropping and a very small creek identifies the site.	Soft mud substrate. No vegetation. Seine set off north side of outcropping and pulled onto riprap.	1.8 or greater
4 Four High.	North side of Yager Creek culvert. Near public road sign that reads, "bay store grocery and hardware."	Soft mud substrate. No vegetation. Seine set against south side of grass-covered clay-soil outcropping immediately north of Yager Creek.	1.5 or less
5 Unnamed Creek.	North side of Unnamed Creek culvert by grass-covered clay-soiled outcropping. Steve Rosso's oyster stakes are immediately south of this site.	Soft mud substrate. No vegetation. Seine set against south side of outcropping, inside of "old" fence stakes on mud flat and retrieved onto riprap.	1.2 or less
6 Willow Bush High.	Site on bluff 100-150 yds south of S. Rosso's oyster facility.	Firm sand substrate. No vegetation. Site identified by large willow bush.	0.9 or less
7 Mud Paradise.	Site on beach below the house of the owner of Wee Willies Restaurant.	Very soft mud/silt substrate. No vegetation except when high tides submerge grassy shore.	0.6 or less
8 Whiskey Creek.	Beach immediately south of Whiskey Creek mouth.	Very soft mud/silt substrate. no vegetation except when high tides submerge grassy shore.	0.5 or less
9 South 1.	First creek south of Whiskey Creek. Immediately south of first bluff south of Whiskey Creek.	Soft mud substrate. Several patches of Enteromorpha spp. or other similar ulvoid. High tides submerge grassy shore.	1.2 or less
10 Picnic Point.	Between southernmost bluff of bay with houses (including boathouse with indian carving) and Crown-Zellerbach roadside park.	Soft mud/silt substrate. No vegetation except on high tides when Salicornia virginica and Triglochin maritumum in upper regions of site are submerged.	0.8 or less
11 West-South 1	West side of bay immediately south of bluff identified by large sand bank without vegetation.	Firm sand substrate. No vegetation except when high tides submerge grassy shore.	0.6 or less

Table 1. (cont.) Description of low tide beach seine stations.

STATION	LOCATION	DESCRIPTION/COMMENTS	APPROX. WATER DEPTH (m)
12 One Low.	West shore near mouth of bay. Across from marina and public boat ramp. Near sign that reads,"overnight camping prohibited."	Firm sand substrate. Several patches of eelgrass (Zostera marina). Basin with steeply sloped sides. Depth exceeds depth sampled by gear.	1.5 or greater
13 Two Low.	East side of bay. Immediately north of marina riprap.	Firm sand substrate. Drift algae and patches of Sargassum muticum in May-June. Sand cusps which are difficult to seine over; net often fills with sand.	0.9-1.5
14 Three Low.	Immediately south of Lee Hanson's oyster larva rearing facility. A small grass-covered clay-soil outcropping and a very small creek identifies the site.	Soft mud substrate. Extensive eelgrass beds. On tides less than 0 ft this site may be devoid of water. Sample on an ebbing or flooding tide (when sufficient water covers eelgrass).	0.6
15 Willow Bush Low.	Site on bluff 100-150 yds south of S. Rosso's oyster facility.	Firm sand substrate. No vegetation. Site identified by large willow bush.	1.2 or greater
16 Lagoon.	Shallow "lagoon-like" basin west of Wee Willies restaurant.	Firm sand substrate. No vegetation. Seine in narrow channel linking "lagoon" to larger tidal channel; retrieve on southwest bank. Seine on flooding tide. On low tides (0 ft) this site is devoid of water.	0.6
17 Opposite Lagoon.	Directly across tidal channel from lagoon channel.	Firm sand substrate. Eelgrass bed.	0.6-1.2
18 Thirteen Low.	Due west from Wee Willies Restaurant; midway between Two Stake Point and Lagoon sites.	Firm sand substrate. No vegetation.	0.9-1.2
19 Two Stake Point.	Two hundred yds north of Snag point site immediately before main channel divides. East side of main channel.	Firm sand substrate with many dead bivalve shells. No vegetation.	0.9-1.2
20 Snag Point.	Immediately south of confluence of Whiskey Creek and main tidal channel. East side of main channel.	Firm sand substrate. Seine at southern edge of eelgrass bed.	1.2 or greater
21 South-33.	Southernmost low tide station. East side of main tidal channel between Whiskey Creek site and South One site.	Firm sand substrate. No vegetation.	0.6-0.9

Table 2. Fyke net catches of chum salmon fry (expressed as percent of total catch), water temperature, and water level in Whiskey Creek.

Moon phase	Date	Chum Caught (% of total)	Water Temp (C)	Water Level (CM)
	21 mar 84	7.08	10.0	-
	22 mar 84	10.92	10.5	-
	23 mar 84	5.95	10.0	-
Lst Qtr	24 mar 84	4.59	9.9	7.6[a]
	25 mar 84	14.69	9.9	24.1[a]
	26 mar 84	5.61	10.1	24.1[a]
	27 mar 84	3.68	10.1	19.0
	28 mar 84	2.47	9.2	16.7
	29 mar 84	2.95	8.9	13.7
	30 mar 84	3.09	9.8	11.9
	31 mar 84	2.57	9.8	9.6
New	1 apr 84	3.46	9.4	8.3
	2 apr 84	4.10	9.9	5.5
	3 apr 84	1.27	9.3	5.0
	4 apr 84	2.36	9.1	3.0
	5 apr 84	1.86	9.6	2.5
	6 apr 84	1.18	-	4.3
	7 apr 84	3.19	-	24.3
	8 apr 84	0.65	-	15.2
Fst Qtr	9 apr 84	--	-	-
	10 apr 84	0.18	9.1	14.4
	11 apr 84	0.13	9.0	26.4
	12 apr 84	3.84	9.0	20.8
	13 apr 84	0.65	9.3	15.4
	14 apr 84	0.78	10.7	11.9
Full	15 apr 84	2.94	10.3	9.6
	16 apr 84	4.16	10.1	7.6
	17 apr 84	1.04	9.8	7.3
	18 apr 84	1.19	11.0	6.6
	19 apr 84	0.68	9.8	10.4
	20 apr 84	0.52	10.5	8.1
	21 apr 84	0.59	9.9	8.6
	22 apr 84	0.38	10.3	8.3
Lst Qtr	23 apr 84	0.22	9.9	7.8
	24 apr 84	0.12	9.1	6.0
	25 apr 84	0.01	9.2	5.0
	26 apr 84	0.01	9.7	4.0
	27 apr 84	0.03	10.6	3.0
	28 apr 84	0.04	9.9	4.0
	29 apr 84	0.00	9.8	8.8
	30 apr 84	0.00	10.0	15.7
New	1 may 84	0.01	9.8	31.7
	2 may 84	0.00	9.6	23.6

[a]Estimated value

Table 3. Diel periodicity of downstream migrating chum salmon fry from Whiskey Creek (expressed as percent of total).

Date	Total Number	Percent of Daily Total 1800-2000 hrs	2000-2400 hrs	2400-0800 hrs	0800-1800 hrs
21 mar 84	843.0[a]	65.4[b]	20.9	13.0	0.7
22 mar 84	1300.0	35.2	43.4	20.9	0.5
23 mar 84	709.0	46.5	44.9	8.5	0.1
24 apr 84	546.1	27.7	38.6[b]	32.6	1.1[b]
25 apr 84	1750.0[a]	29.9[d]	69.0[bd]	0.9	0.2
26 mar 84	668.3[a]	80.4[b]	13.3	5.7	0.6
27 mar 84	438.3[a]	37.9	33.3	27.8	1.0
28 mar 84	290.0[a]	58.3	26.5	15.2	0.0
29 mar 84	451.0[a]	28.8	49.0[b]	22.2[b]	0.0
30 mar 84	368.0[a]	59.8[b]	13.9[b]	26.4[b]	0.0
31 mar 84	306.0[a]	55.9	37.9	6.2	0.0
1 apr 84	412.0	56.8	21.4	21.8	0.0
2 apr 84	488.0	64.8	24.2	11.1	0.0
3 apr 84	151.0	28.5	57.0	14.6	0.0[b]
4 apr 84	281.5[a]	33.7	35.2[b]	30.2	0.9
5 apr 84	221.0[a]	33.0	53.8	11.8	1.4
6 apr 84	145.5	33.3	31.2	34.8	0.7
7 apr 84	380.5	78.8	16.8	3.7[b]	0.7
8 apr 84	78.0[ac]	55.1	44.9	-	-
9 apr 84	-	-	-	-	-
10 apr 84	21.5[a]	51.2	23.3	14.0	11.6
11 apr 84	15.0[ac]	73.3	26.7	-	-
12 apr 84	457.0[a]	25.2	48.8	25.4	0.7
13 apr 84	77.0	15.6	40.3	44.1[b]	0.0
14 apr 84	93.0[a]	22.6	33.3[bd]	51.6[b]	4.3
15 apr 84	354.0[a]	46.0	45.7[a]	8.0[b]	0.3
16 apr 84	495.0[a]	12.5	83.0[a]	3.6	0.8
17 apr 84	126.0[a]	16.9	26.4	4.8	0.0
18 apr 84	142.0[a]	31.7	68.3	0.0[a]	0.0
19 apr 84	81.0[a]	34.6	64.2	1.2[a]	0.0
20 apr 84	62.0	0.0	85.5[b]	14.5	0.0
21 apr 84	70.0	8.6	84.3	7.1	0.0
22 apr 84	45.0	33.3	28.9	37.8	0.0
23 apr 84	26.0	7.7	65.4		26.9
24 apr 84	21.0	38.1	61.9	0.0	0.0
25 apr 84	1.0	0.0	100.0	0.0	0.0
26 apr 84	1.0	0.0	0.0	100.0	0.0
27 apr 84	3.0	0.0	100.0	0.0	0.0
28 apr 84	5.0	0.0	100.0	0.0	0.0
29 apr 84	0.0	0.0	0.0	0.0	0.0
30 apr 84	0.0	0.0	0.0	0.0	0.0
1 may 84	1.0[a]	0.0	100.0	0.0	0.0
2 may 84	0.0[a]	0.0	0.0	0.0	-
	11,910	42.7	41.7	15.2	0.5

[a] Estimated numbers; net fished less than 24 continuous hours.

[b] Time ± 1 hour.

[c] Total calculated between 1800-2400 hours.

[d] Less than actual value.

[e] Value low; tide or gear problems.

Table 4. Netarts Bay environmental data. Perf: gear performance where 1=excellent, 2=good, 3=poor (not quantitative); turbidity of 1='average' turbidity, 2='high' turbidity.

Haul	Station	Date	Time	Perf	Tide	Temp (C)	Salinity (ppt)	Turbidity
1	one high	16 Mar 84	900	1	h	11.0	--	-
2	two high	16 Mar 84	940	1	hf	11.0	--	-
3	three high	16 Mar 84	1015	2	hf	11.5	--	1
4	four high	16 Mar 84	1020	3	hf	11.0	30	1
5	willow bush high	16 Mar 84	1045	2	hf	11.5	29	1
9	mud paradise	16 Mar 84	1215	1	hs	11.0	24	1
10	Whiskey Creek	16 Mar 84	1235	1	hs	11.5	27	1
11	Whiskey Creek	16 Mar 84	1300	1	hs	11.0	22	-
12	snag point	17 Mar 84	750	2	ls	10.0	27	-
13	two stake point	17 Mar 84	810	1	ls	10.0	27	-
14	lagoon	17 Mar 84	840	2	lf	10.0	27	1
15	willow bush low	17 Mar 84	920	1	lf	10.0	26	-
16	willow bush high	17 Mar 84	940	3	hf	10.5	20	-
17	willow bush high	17 Mar 84	1000	1	hf	10.5	24	1
19	Unnamed Creek	17 Mar 84	1055	2	hf	11.0	21	1
20	four high	17 Mar 84	1130	2	hf	11.0	30	-
22	three low	22 Mar 84	1100	1	ls	12.0	25	-
23	lagoon	22 Mar 84	1200	3	le	12.5	30	-
24	opposite lagoon	22 Mar 84	1240	1	ls	12.5	29	-
25	willow bush low	22 Mar 84	1300	1	lf	13.5	27	-
26	thirteen low	22 Mar 84	1345	1	lf	14.0	27	-
27	willow bush high	22 Mar 84	1740	1	hf	14.5	24	-
28	Unnamed Creek	22 Mar 84	1835	2	hs	13.5	26	-
29	Whiskey Creek	23 Mar 84	800	1	he	10.0	8	-
30	Whiskey Creek	23 Mar 84	840	1	he	10.0	10	-
31	snag point	23 Mar 84	1320	2	le	13.5	27	-
32	south-33	23 Mar 84	1350	1	le	14.0	26	-
33	south-33	23 Mar 84	1420	2	ls	14.0	25	-
34	thirteen low	23 Mar 84	1445	1	lf	13.0	21	-
35	willow bush low	23 Mar 84	1530	1	lf	13.5	15	-
40	one low	31 Mar 84	800	1	ls	10.5	28	1
41	three low	31 Mar 84	830	2	lf	11.0	25	-
42	willow bush low	31 Mar 84	900	1	lf	10.0	26	-
43	thirteen low	31 Mar 84	935	1	lf	12.5	26	-
44	south 1	31 Mar 84	1216	2	hs	12.0	10	-
45	picnic point	31 Mar 84	1250	1	hf	13.0	23	-
46	Unnamed Creek	31 Mar 84	1316	1	hs	13.0	27	-
47	willow bush high	31 Mar 84	1345	2	he	13.0	28	-
48	mud paradise	31 Mar 84	1430	1	he	13.0	27	2
49	Whiskey Creek	31 Mar 84	1505	1	he	11.5	--	2
50	south-33	1 Apr 84	830	1	l-	11.0	23	-
51	snag point	1 Apr 84	850	1	ls	11.0	22	-
52	two stake point	1 Apr 84	905	1	lf	11.0	22	-
53	lagoon	1 Apr 84	930	1	lf	12.0	23	-
54	lagoon	1 Apr 84	945	1	lf	12.0	23	-
55	opposite lagoon	1 Apr 84	1005	2	lf	12.0	25	-
56	willow bush low	1 Apr 84	1030	2	lf	12.0	26	-
57	willow bush low	1 Apr 84	1045	2	lf	12.0	26	-
58	two high	1 Apr 84	1335	1	hs	13.0	28	-

Table 4. (cont.)

Haul	Station	Date	Time	Perf	Tide	Temp (C)	Salinity (ppt)	Turbidity
59	two high	1 Apr 84	1345	1	hs	13.0	28	-
60	Unnamed Creek	1 Apr 84	1445	2	he	13.5	28	1
61	willow bush high	1 Apr 84	1517	1	he	14.0	26	1
62	willow bush high	1 Apr 84	1540	1	he	14.0	26	1
63	south-33	2 Apr 84	900	1	ls	11.5	25	-
64	snag point	2 Apr 84	920	1	l-	11.5	25	1
65	snag point	2 Apr 84	955	1	lf	11.5	25	-
66	two stake point	2 Apr 84	1010	1	l-	11.5	25	1
67	thirteen low	2 Apr 84	1030	1	lf	13.0	26	1
68	lagoon	2 Apr 84	1045	1	lf	11.5	27	1
69	willow bush low	2 Apr 84	1110	1	lf	12.0	26	1
70	picnic point	2 Apr 84	1350	1	hf	17.5	15	1
71	south 1	2 Apr 84	1415	1	hf	14.0	14	1
72	Whiskey Creek	2 Apr 84	1440	2	hs	15.0	24	1
73	mud paradise	2 Apr 84	1505	1	hs	14.0	26	1
74	willow bush high	2 Apr 84	1535	1	he	15.0	29	1
75	Unnamed Creek	2 Apr 84	1550	1	he	14.5	24	1
76	four high	2 Apr 84	1600	3	h-	--	--	-
77	four high	2 Apr 84	1630	1	h-	--	--	-
78	south-33	2 Apr 84	840	1	le	11.0	26	-
79	snag point	3 Apr 84	900	1	le	11.0	25	-
80	thirteen low	3 Apr 84	915	1	le	11.0	26	-
81	opposite lagoon	3 Apr 84	945	1	ls	11.0	25	-
82	two low	3 Apr 84	1005	1	lf	11.0	27	1
83	one low	3 Apr 84	1025	1	lf	11.0	27	-
84	three low	3 Apr 84	1045	1	lf	11.0	25	-
85	willow bush low	3 Apr 84	1110	1	l-	11.5	25	-
86	lagoon	3 Apr 84	1126	1	lf	11.5	27	-
87	two stake point	3 Apr 84	1145	1	lf	11.5	27	-
88	picnic point	3 Apr 84	1430	1	he	17.5	12	-
89	south 1	3 Apr 84	1500	1	he	13.0	18	-
90	Whiskey Creek	3 Apr 84	1540	1	he	14.5	12	1
91	mud paradise	3 Apr 84	1600	1	he	15.0	24	1
92	willow bush high	3 Apr 84	1625	1	he	15.5	26	-
93	one low	4 Apr 84	830	2	le	10.0	27	1
93	one low	4 Apr 84	845	1	le	10.0	27	1
93	one low	4 Apr 84	900	1	le	10.0	27	1
93	one low	4 Apr 84	915	1	le	10.0	27	1
94	two low	4 Apr 84	930	2	ls	11.0	30	1
94	two low	4 Apr 84	945	1	ls	11.0	30	1
94	two low	4 Apr 84	1000	1	ls	11.0	30	1
95	willow bush low	4 Apr 84	1020	2	lf	13.0	28	1
95	willow bush low	4 Apr 84	1035	2	lf	13.0	28	1
96	two stake point	4 Apr 84	1100	1	lf	13.0	27	-
97	snag point	4 Apr 84	1130	1	lf	13.0	27	1
98	south-33	4 Apr 84	1200	1	lf	--	--	-
99	one low	5 Apr 84	940	3	le	10.0	30	1
100	one low	5 Apr 84	950	1	le	10.0	30	1
101	two low	5 Apr 84	1005	1	ls	11.0	29	1

Table 4. (cont.)

Haul	Station	Date	Time	Perf	Tide	Temp (C)	Salinity (ppt)	Turbidity
102	two low	5 Apr 84	1017	1	ls	11.0	29	1
103	three low	5 Apr 84	1045	2	lf	12.0	26	-
104	willow bush low	5 Apr 84	1105	1	lf	13.0	25	-
105	opposite lagoon	5 Apr 84	1115	1	lf	12.0	26	-
106	thirteen low	5 Apr 84	1135	1	lf	14.0	26	-
107	lagoon	5 Apr 84	1150	1	lf	14.0	24	-
108	two stake point	5 Apr 84	1210	1	lf	14.5	25	1
109	snag point	5 Apr 84	1230	1	lf	15.0	26	-
110	south-33	5 Apr 84	1250	1	lf	14.5	25	-
111	picnic point	5 Apr 84	1620	1	hf	19.0	11	2
112	south 1	5 Apr 84	1645	1	hf	13.5	5	2
888	mud paradise	5 Apr 84	1730	1	he	17.0	26	1
113	two high	8 Apr 84	620	2	he	8.9	24	-
114	three high	8 Apr 84	650	2	he	6.4	24	1
115	Unnamed Creek	8 Apr 84	720	1	he	6.1	15	-
117	mud paradise	8 Apr 84	800	1	he	8.9	24	-
118	Whiskey Creek	8 Apr 84	815	2	he	6.7	5	-
119	south-33	8 Apr 84	1150	1	le	10.0	24	1
120	snag point	8 Apr 84	1205	1	le	11.7	25	-
121	two low	8 Apr 84	1230	3	ls	10.0	28	-
121	two low	8 Apr 84	1250	1	ls	10.0	28	-
121	two low	8 Apr 84	1300	1	ls	10.0	28	-
122	one low	8 Apr 84	1320	1	ls	--	--	-
123	three low	8 Apr 84	1340	1	lf	13.3	8	-
124	willow bush low	8 Apr 84	1400	1	lf	12.2	--	1
125	lagoon	8 Apr 84	1430	1	lf	12.8	24	1
126	opposite lagoon	8 Apr 84	1445	1	lf	11.7	25	1
127	two stake point	8 Apr 84	1500	1	lf	12.2	24	1
128	thirteen low	8 Apr 84	1510	1	lf	13.9	24	1
128	thirteen low	8 Apr 84	1520	1	lf	13.9	24	1
128	thirteen low	8 Apr 84	1530	1	lf	13.9	24	1
129	picnic point	12 Apr 84	830	1	hf	10.5	11	2
130	south 1	12 Apr 84	855	1	hf	10.2	11	2
131	Whiskey Creek	12 Apr 84	925	1	hs	9.0	10	2
132	mud paradise	12 Apr 84	945	1	he	9.0	11	2
133	willow bush high	12 Apr 84	1010	1	he	9.0	11	-
134	four high	12 Apr 84	1030	2	he	10.2	24	-
134	four high	12 Apr 84	1105	1	he	10.2	24	2
135	three high	12 Apr 84	1045	1	he	11.0	25	1
136	Unnamed Creek	12 Apr 84	1140	1	he	10.2	16	2
137	one low	12 Apr 84	1655	1	le	10.0	26	1
138	two low	12 Apr 84	1720	1	ls	10.5	23	1
139	two low	12 Apr 84	1735	1	ls	10.5	23	1
140	three low	12 Apr 84	1800	1	ls	--	--	-
141	willow bush low	12 Apr 84	1820	1	ls	9.0	20	1
142	thirteen low	13 Apr 84	1720	1	le	11.2	25	1
143	opposite lagoon	13 Apr 84	1745	3	le	11.0	22	1
143	opposite lagoon	13 Apr 84	1800	1	le	11.0	22	1
144	south-33	13 Apr 84	1830	1	ls	11.0	22	1

Table 4. (cont.)

Haul	Station	Date	Time	Perf	Tide	Temp (C)	Salinity (ppt)	Turbidity
145	snag point	13 Apr 84	1850	1	le	11.0	22	1
146	south-33	14 Apr 84	645	3	le	10.0	20	1
147	snag point	14 Apr 84	730	1	ls	10.0	22	1
148	two stake point	14 Apr 84	745	1	ls	10.0	22	1
149	three low	14 Apr 84	810	1	lf	11.0	22	1
150	lagoon	14 Apr 84	840	1	lf	10.4	25	1
151	picnic point	14 Apr 84	1145	1	hf	15.0	22	1
152	south 1	14 Apr 84	1230	1	hs	16.0	20	1
153	two high	14 Apr 84	1255	1	hs	13.5	27	1
154	one high	14 Apr 84	1310	1	hs	14.5	27	1
155	three high	14 Apr 84	1330	1	he	12.5	26	1
156	four high	14 Apr 84	1345	2	he	13.5	21	1
157	Unnamed Creek	14 Apr 84	1410	1	he	16.0	27	-
158	two low	15 Apr 84	730	1	ls	12.0	25	-
159	one low	15 Apr 84	800	1	ls	11.0	26	1
160	willow bush low	15 Apr 84	820	1	lf	12.0	24	1
161	opposite lagoon	15 Apr 84	840	1	lf	12.0	24	2
162	lagoon	15 Apr 84	900	1	lf	12.0	25	2
163	thirteen low	15 Apr 84	920	2	lf	12.0	23	2
163	thirteen low	15 Apr 84	935	2	lf	12.0	23	2
164	Whiskey Creek	15 Apr 84	1215	1	hf	13.5	22	2
165	mud paradise	15 Apr 84	1230	1	h-	13.0	26	2
166	Unnamed Creek	15 Apr 84	1245	2	hs	13.0	26	2
167	willow bush high	15 Apr 84	1300	1	hs	13.0	26	2
168	picnic point	15 Apr 84	1330	1	hs	15.0	17	2
168	picnic point	15 Apr 84	1340	1	hs	15.0	17	2
169	west-south 1	15 Apr 84	1410	1	hs	13.5	26	2
170	south 1	15 Apr 84	1445	1	he	13.0	21	2
171	one low	16 Apr 84	745	1	le	11.0	26	1
172	two low	16 Apr 84	810	1	le	11.0	25	1
173	three low	16 Apr 84	830	2	le	11.0	20	1
174	willow bush low	16 Apr 84	855	1	le	11.5	24	1
175	opposite lagoon	16 Apr 84	905	1	le	13.0	26	1
176	thirteen low	16 Apr 84	930	2	lf	12.0	26	1
177	two stake point	16 Apr 84	950	1	lf	12.0	25	1
178	snag point	16 Apr 84	1000	1	lf	15.0	24	1
179	south-33	16 Apr 84	1030	1	lf	13.0	25	1
180	Whiskey Creek	16 Apr 84	1310	2	hf	14.5	6	2
181	west-south 1	16 Apr 84	1325	1	hs	17.5	25	1
181	west-south 1	16 Apr 84	1335	1	hs	17.5	25	1
182	two high	16 Apr 84	1400	1	hs	13.0	28	1
182	two high	16 Apr 84	1415	1	hs	13.0	28	1
183	one high	16 Apr 84	1425	1	hs	13.5	29	1
184	three high	16 Apr 84	1445	1	he	13.0	24	1
185	Unnamed Creek	16 Apr 84	1500	1	he	14.5	25	1
186	willow bush high	16 Apr 84	1520	1	he	15.5	28	2
187	mud paradise	16 Apr 84	1550	1	he	14.0	25	1
188	one low	17 Apr 84	825	1	le	10.5	27	1
189	two low	17 Apr 84	900	1	le	11.5	28	1

Table 4. (cont.)

Haul	Station	Date	Time	Perf	Tide	Temp (C)	Salinity (ppt)	Turbidity
189	two low	17 Apr 84	915	1	le	11.5	28	1
190	willow bush low	17 Apr 84	935	1	le	12.2	24	1
191	opposite lagoon	17 Apr 84	950	1	le	13.0	27	1
192	thirteen low	17 Apr 84	1005	1	lf	13.0	28	1
192	thirteen low	17 Apr 84	1015	1	lf	13.0	28	1
193	west-south 1	17 Apr 84	1425	1	he	17.5	28	-
194	picnic point	17 Apr 84	1445	1	hs	21.0	18	2
195	south 1	17 Apr 84	1505	1	he	14.5	21	2
196	Whiskey Creek	17 Apr 84	1530	1	he	15.5	18	2
197	opposite lagoon	17 Apr 84	--	1	lf	14.0	29	-
198	two stake point	17 Apr 84	1000	3	le	14.0	26	-
198	two stake point	17 Apr 84	1015	2	le	14.0	26	-
199	snag point	17 Apr 84	940	-	le	13.0	28	-
200	south-33	17 Apr 84	815	2	le	13.0	26	-
200	south-33	17 Apr 84	830	2	le	13.0	26	-
201	mud paradise	17 Apr 84	1550	1	he	14.5	24	2
202	willow bush high	17 Apr 84	1615	1	he	15.5	25	2
203	Unnamed Creek	17 Apr 84	1630	1	he	15.0	22	2
204	willow bush high	18 Apr 84	1430	2	hf	11.0	26	2
205	two high	18 Apr 84	1530	1	hs	13.0	29	1
206	one high	18 Apr 84	1600	1	he	14.5	29	1
206	one high	18 Apr 84	1620	1	he	14.5	29	1
207	two high	18 Apr 84	1630	1	he	12.0	29	1
208	three high	18 Apr 84	1730	1	he	12.5	27	1
209	four high	18 Apr 84	1800	2	he	13.0	20	2
210	one low	19 Apr 84	1000	1	le	11.5	27	1
211	two low	19 Apr 84	1025	2	le	12.0	27	1
211	two low	19 Apr 84	1035	1	le	12.0	27	1
212	willow bush low	19 Apr 84	1100	1	le	12.0	25	1
213	opposite lagoon	19 Apr 84	1130	1	ls	12.0	25	1
214	lagoon	19 Apr 84	1145	1	lf	12.5	25	1
215	thirteen low	19 Apr 84	1215	1	lf	13.0	25	1
216	two stake point	19 Apr 84	1240	1	lf	13.0	26	1
217	south-33	19 Apr 84	1300	1	lf	13.5	25	1
218	Whiskey Creek	19 Apr 84	1520	2	hf	15.0	24	1
219	west-south 1	19 Apr 84	1550	1	hf	15.0	24	1
220	picnic point	19 Apr 84	1650	1	hs	16.0	19	2
221	south 1	19 Apr 84	1700	1	he	12.0	10	1
222	one low	20 Apr 84	1030	1	le	13.0	29	1
223	two low	20 Apr 84	1050	1	ls	13.0	31	1
224	three low	20 Apr 84	1120	2	ls	14.5	24	1
225	willow bush low	20 Apr 84	1200	1	le	14.0	26	1
226	two stake point	20 Apr 84	1230	1	l-	15.0	25	1
227	snag point	20 Apr 84	1300	1	lf	17.0	27	1
228	south-33	20 Apr 84	1330	1	lf	15.5	26	1
229	two high	20 Apr 84	1730	1	hs	13.5	29	1
229	two high	20 Apr 84	1830	1	hs	13.5	28	1
230	one high	20 Apr 84	1800	1	hs	13.0	28	1
230	one high	20 Apr 84	1810	1	hs	13.0	28	1

Table 4. (cont.)

Haul	Station	Date	Time	Perf	Tide	Temp (C)	Salinity (ppt)	Turbidity
231	west-south 1	23 Apr 84	615	1	hs	9.5	25	1
232	picnic point	23 Apr 84	650	1	he	10.0	15	2
233	south 1	23 Apr 84	715	1	he	10.0	15	2
234	Whiskey Creek	23 Apr 84	730	1	he	10.0	16	2
235	south-33	23 Apr 84	1230	1	le	16.0	25	1
236	snag point	23 Apr 84	1215	1	le	15.0	25	1
237	two low	23 Apr 84	1340	1	ls	12.0	30	1
238	one low	23 Apr 84	1400	1	ls	14.0	30	1
239	willow bush low	23 Apr 84	1430	1	lf	15.0	25	1
240	opposite lagoon	23 Apr 84	1450	1	lf	15.0	25	1
241	thirteen low	23 Apr 84	1530	1	lf	16.0	25	1
242	two stake point	23 Apr 84	1600	1	lf	16.0	25	2
243	willow bush high	24 Apr 84	745	1	hs	9.5	25	-
244	three high	24 Apr 84	815	2	hs	10.5	28	1
245	two high	24 Apr 84	845	1	hs	10.0	26	1
245	two high	24 Apr 84	900	1	hs	10.0	26	1
246	one high	24 Apr 84	920	1	hs	12.0	30	1
246	one high	24 Apr 84	945	1	hs	12.0	30	1
247	three low	24 Apr 84	1350	2	le	13.5	26	2
248	one low	24 Apr 84	1420	1	le	13.0	30	1
249	two low	24 Apr 84	1445	1	ls	12.0	28	1
250	willow bush low	24 Apr 84	1510	1	ls	13.0	24	1
251	opposite lagoon	24 Apr 84	1530	2	ls	13.0	25	1
252	thirteen low	24 Apr 84	1550	1	lf	12.0	24	1
252	thirteen low	24 Apr 84	1600	1	lf	12.0	24	1
253	two stake point	24 Apr 84	1645	1	lf	13.0	24	2
254	snag point	24 Apr 84	1655	1	lf	12.8	24	2
255	south-33	24 Apr 84	1710	1	lf	12.0	22	2
256	west-south 1	26 Apr 84	1030	2	hf	13.0	26	1
257	picnic point	26 Apr 84	1120	1	he	14.0	25	1
258	three low	26 Apr 84	1515	1	le	13.5	28	1
259	one low	26 Apr 84	1545	1	le	13.5	31	-
260	two low	26 Apr 84	1600	1	l-	13.0	29	1
260	two low	26 Apr 84	1610	2	l-	13.0	29	1
261	willow bush low	26 Apr 84	1640	2	le	15.5	24	2
262	opposite lagoon	26 Apr 84	1730	1	ls	15.0	25	1
263	thirteen low	26 Apr 84	1750	1	lf	15.0	25	1
264	two stake point	26 Apr 84	1820	2	lf	14.0	22	1
265	willow bush high	27 Apr 84	1130	1	hf	17.0	30	1
266	two high	27 Apr 84	1200	1	hs	11.5	32	1
267	one high	27 Apr 84	1235	1	he	12.5	32	1
268	three high	27 Apr 84	1300	1	he	13.5	31	1
269	snag point	27 Apr 84	1710	1	le	17.5	28	1
269	snag point	27 Apr 84	1815	1	ls	17.5	25	1
270	south-33	27 Apr 84	1740	1	ls	17.0	25	1
270	south-33	27 Apr 84	1800	1	ls	17.0	25	1
271	willow bush low	27 Apr 84	1840	1	lf	16.5	24	1
272	three low	2 May 84	805	1	le	10.5	15	2
273	one low	2 May 84	820	1	le	10.5	26	1

Table 4. (cont.)

Haul	Station	Date	Time	Perf	Tide	Temp (C)	Salinity (ppt)	Turbidity
274	two low	2 May 84	930	1	lf	11.0	24	1
275	willow bush low	2 May 84	1005	1	l-	11.5	18	2
276	opposite lagoon	2 May 84	1030	1	ls	11.8	22	1
277	thirteen low	2 May 84	1050	1	lf	13.5	21	2
278	two stake point	2 May 84	1100	1	lf	12.0	20	2
279	snag point	2 May 84	1125	1	lf	13.0	21	2
280	south-33	2 May 84	1145	1	lf	12.5	22	2
281	west-south 1	2 May 84	1430	1	hf	16.5	23	2
282	picnic point	2 May 84	1510	1	hf	16.0	4	2
282	picnic point	2 May 84	1530	1	hf	16.0	4	2
283	south 1	2 May 84	1545	1	hs	13.2	15	2
284	Whiskey Creek	2 May 84	1600	1	h-	14.0	17	2
285	mud paradise	2 May 84	1630	1	h-	13.0	25	2
286	willow bush high	2 May 84	1645	1	he	13.2	22	1
287	Unnamed Creek	2 May 84	1705	1	he	13.0	18	2
288	four high	2 May 84	1730	1	he	12.0	15	2
289	one low	3 May 84	1005	1	le	11.5	30	1
290	south-33	3 May 84	1135	1	ls	15.0	22	1
291	snag point	3 May 84	1145	1	ls	14.8	22	1
292	willow bush low	3 May 84	1215	1	lf	14.2	20	1
293	lagoon	3 May 84	1235	1	lf	14.0	23	1
294	three high	3 May 84	1505	1	hf	13.5	30	1
295	one high	3 May 84	1540	1	hf	13.5	32	1
296	two high	3 May 84	1600	2	hf	14.9	30	1
297	two high	10 May 84	935	1	hs	12.0	27	1
298	one high	10 May 84	1005	1	hs	12.0	27	-
299	three high	10 May 84	1035	1	hs	12.5	28	1
300	four high	10 May 84	1050	1	he	12.8	--	1
301	willow bush high	10 May 84	1130	1	he	--	27	1
302	Unnamed Creek	10 May 84	1150	1	he	13.0	24	1
303	three low	10 May 84	1515	1	le	13.7	26	1
304	two low	10 May 84	1620	1	ls	13.5	28	1
305	one low	10 May 84	1645	1	ls	13.5	28	1
306	willow bush low	10 May 84	1800	1	lf	14.5	25	1
307	opposite lagoon	10 May 84	1820	1	lf	14.5	24	1
308	lagoon	10 May 84	1840	1	lf	14.5	24	1
309	thirteen low	10 May 84	1900	1	lf	14.5	24	1
310	west-south 1	11 May 84	1030	1	hf	13.3	18	2
310	west-south 1	11 May 84	1045	1	hf	13.3	18	2
311	picnic point	11 May 84	1130	1	hs	13.0	12	2
311	picnic point	11 May 84	1145	1	hs	13.0	12	2
312	south 1	11 May 84	1207	2	he	13.0	16	1
313	Whiskey Creek	11 May 84	1230	1	he	13.0	12	1
314	mud paradise	11 May 84	1250	1	he	14.0	18	1
315	south-33	11 May 84	1600	1	le	14.0	24	1
316	snag point	11 May 84	1630	1	le	14.0	24	1
317	two stake point	11 May 84	1650	1	le	14.0	24	1
318	one low	16 May 84	820	1	ls	12.5	28	1
319	two low	16 May 84	945	1	ls	13.5	27	1

Table 4. (cont.)

Haul	Station	Date	Time	Perf	Tide	Temp (C)	Salinity (ppt)	Turbidity
320	willow bush low	16 May 84	1015	1	ls	14.0	26	1
321	opposite lagoon	16 May 84	1040	1	ls	14.5	25	1
322	thirteen low	16 May 84	1110	1	lf	15.4	26	1
323	two stake point	16 May 84	1145	1	lf	15.8	28	1
324	snag point	16 May 84	1200	1	lf	15.8	26	1
325	south-33	16 May 84	1215	1	lf	17.5	26	1
326	one high	16 May 84	1510	1	hf	16.2	32	1
327	two high	16 May 84	1535	1	hf	15.5	29	1
328	west-south 1	16 May 84	1600	1	hf	24.3	25	-
329	picnic point	16 May 84	1625	1	hf	20.4	24	2
330	south 1	16 May 84	1645	1	he	18.4	12	-
331	three high	16 May 84	1715	1	he	14.7	28	1
332	one low	17 May 84	1100	1	ls	14.7	30	1
332	one low	17 May 84	1200	1	lf	16.0	30	1
333	two low	17 May 84	1235	1	lf	17.0	30	1
334	lagoon	17 May 84	1300	1	lf	17.2	28	1
335	Whiskey Creek	17 May 84	1630	1	hs	21.5	20	1
336	mud paradise	17 May 84	1700	1	he	22.3	27	1
337	willow bush high	17 May 84	1720	2	he	19.8	28	1
338	Unnamed Creek	17 May 84	1740	1	he	22.0	26	1
339	four high	17 May 84	1800	1	he	17.5	23	1
340	two high	17 May 84	1830	1	he	15.8	30	1
341	west-south 1	23 May 84	745	1	hs	12.2	22	1
342	picnic point	23 May 84	815	1	hs	10.8	17	2
343	south 1	23 May 84	830	1	he	12.0	27	1
344	Whiskey Creek	23 May 84	850	1	he	12.0	19	1
345	three low	23 May 84	1305	1	le	16.5	19	1
346	one low	23 May 84	1330	1	le	17.5	26	1
346	one low	23 May 84	1340	1	le	17.5	26	1
347	two low	23 May 84	1440	1	lf	15.5	29	1
348	willow bush low	23 May 84	1500	1	le	17.0	20	1
349	opposite lagoon	23 May 84	1515	1	ls	17.0	25	1
350	lagoon	23 May 84	1530	1	le	19.0	24	1
351	thirteen low	23 May 84	1550	1	ls	17.8	22	1
352	two stake point	23 May 84	1605	1	ls	17.5	19	-
353	snag point	23 May 84	1620	1	l-	17.5	22	1
354	south-33	23 May 84	1630	1	lf	18.0	22	1
354	south-33	23 May 84	1645	1	lf	18.0	22	1
356	two high	24 May 84	815	1	hf	13.0	25	1
357	one high	24 May 84	830	1	hf	13.0	24	1
358	mud paradise	24 May 84	905	1	hf	14.5	24	1
359	willow bush high	24 May 84	930	2	hs	15.0	25	1
360	Unnamed Creek	24 May 84	945	1	he	14.0	20	1
361	four high	24 May 84	1015	1	hs	13.0	26	-
362	three high	24 May 84	1030	1	hs	14.0	21	-
363	one low	31 May 84	810	1	le	11.8	29	1
363	one low	31 May 84	830	1	le	11.8	29	1
364	two low	31 May 84	845	1	le	13.5	28	1
365	willow bush low	31 May 84	915	1	le	14.5	26	1

Table 4. (cont.)

Haul	Station	Date	Time	Perf	Tide	Temp (C)	Salinity (ppt)	Turbidity
366	thirteen low	31 May 84	940	1	le	15.5	26	1
367	opposite lagoon	31 May 84	1010	1	le	16.0	26	1
368	two stake point	31 May 84	1105	1	lf	17.0	25	1
369	snag point	31 May 84	1125	1	lf	17.5	24	1
370	south-33	31 May 84	1145	1	ls	17.5	24	1
371	lagoon	31 May 84	1200	1	lf	16.5	26	1
372	one high	31 May 84	1400	1	hf	16.5	33	1
372	one high	31 May 84	1420	1	hf	16.5	33	1
373	two high	31 May 84	1445	1	hf	15.0	32	1
374	four high	31 May 84	1500	1	hf	18.5	22	1
375	willow bush high	31 May 84	1530	1	hf	20.0	25	-
376	mud paradise	31 May 84	1545	1	hf	20.5	26	1
377	three high	31 May 84	1630	1	hs	14.5	31	1
378	one low	6 Jun 84	1310	1	le	14.0	27	1
378	one low	6 Jun 84	1320	1	le	14.0	27	1
378	one low	6 Jun 84	1345	1	le	14.0	27	1
379	two low	6 Jun 84	1400	1	lf	13.5	27	1
380	willow bush low	6 Jun 84	1420	1	le	14.5	18	1
381	opposite lagoon	6 Jun 84	1437	1	lf	14.0	25	-
382	thirteen low	6 Jun 84	1500	1	lf	15.0	22	1
383	two stake point	6 Jun 84	1520	1	ls	14.5	22	1
384	south-33	6 Jun 84	1610	1	lf	15.0	23	1
385	lagoon	6 Jun 84	1630	2	lf	14.0	22	1
386	one high	6 Jun 84	1700	1	hf	13.5	25	1
386	one high	6 Jun 84	1730	1	hf	13.5	25	1
387	picnic point	6 Jun 84	1930	1	hf	14.0	15	2
388	west-south 1	6 Jun 84	1950	1	hf	14.5	21	1
389	two high	6 Jun 84	2020	1	hf	13.0	25	1
390	one low	14 Jun 84	930	1	ls	13.0	32	1
390	one low	14 Jun 84	1010	1	ls	13.0	32	1
390	one low	14 Jun 84	1020	1	ls	13.0	32	1
391	two low	14 Jun 84	1040	1	lf	15.5	32	1
392	one high	14 Jun 84	1345	1	hf	13.5	32	1
392	one high	14 Jun 84	1400	1	hf	13.5	32	1
393	two high	14 Jun 84	1430	2	hf	14.5	32	1
394	one low	29 Jun 84	815	1	le	15.0	27	1
394	one low	29 Jun 84	830	1	le	15.0	27	1
394	one low	29 Jun 84	845	1	le	15.0	27	1
395	two low	29 Jun 84	1000	1	lf	16.0	26	1
396	one high	29 Jun 84	1255	1	hf	16.0	28	1
396	one high	29 Jun 84	1305	1	hf	16.0	28	1
396	one high	29 Jun 84	1320	1	hf	16.0	28	1
397	two high	29 Jun 84	1340	1	hf	16.1	29	1

Table 5. Number of chum salmon caught at each beach seine station. Total: number of fish subsampled from catch; Adj-Total: subsample expanded to represent total fish caught; L-Clip: left ventral fin-clipped fish; R-Clip: right ventral fin-clipped fish; B-Clip: both ventral fin-clipped fish.

Haul	Station	Date	Total	L-Clip	R-Clip	B-Clip	Adj-Total
1	one high	16 Mar 84	0	0	0	0	0
2	two high	16 Mar 84	0	0	0	0	0
3	three high	16 Mar 84	0	0	0	0	0
4	four high	16 Mar 84	0	0	0	0	0
5	willow bush high	16 Mar 84	1	0	0	0	1
9	mud paradise	16 Mar 84	0	0	0	0	0
10	Whiskey Creek	16 Mar 84	0	0	0	0	0
11	Whiskey Creek	16 Mar 84	2	0	0	0	2
12	snag point	17 Mar 84	0	0	0	0	0
13	two stake point	17 Mar 84	0	0	0	0	0
14	lagoon	17 Mar 84	0	0	0	0	0
15	willow bush low	17 Mar 84	2	0	0	0	2
16	willow bush high	17 Mar 84	4	0	0	0	4
17	willow bush high	17 Mar 84	10	0	0	0	10
19	Unnamed Creek	17 Mar 84	11	0	0	0	11
20	four high	17 Mar 84	0	0	0	0	0
22	three low	22 Mar 84	1	0	0	0	1
23	lagoon	22 Mar 84	0	0	0	0	0
24	opposite lagoon	22 Mar 84	0	0	0	0	0
25	willow bush low	22 Mar 84	59	0	0	0	59
26	thirteen low	22 Mar 84	4	0	0	0	4
27	willow bush high	22 Mar 84	40	0	0	0	40
28	Unnamed Creek	22 Mar 84	32	0	0	0	32
29	Whiskey Creek	23 Mar 84	9	0	0	0	9
30	Whiskey Creek	23 Mar 84	15	0	0	0	15
31	snag point	23 Mar 84	0	0	0	0	0
32	south-33	23 Mar 84	35	0	0	0	35
33	south-33	23 Mar 84	0	0	0	0	0
34	thirteen low	23 Mar 84	0	0	0	0	0
35	willow bush low	23 Mar 84	11	0	0	0	11
40	one low	31 Mar 84	2	0	0	0	2
41	three low	31 Mar 84	26	0	0	0	26
42	willow bush low	31 Mar 84	11	0	0	0	11
43	thirteen low	31 Mar 84	0	0	0	0	0
44	south 1	31 Mar 84	5	0	0	0	5
45	picnic point	31 Mar 84	5	0	0	0	5
46	Unnamed Creek	31 Mar 84	130	0	0	0	130
47	willow bush high	31 Mar 84	0	0	0	0	0
48	mud paradise	31 Mar 84	0	0	0	0	0
49	Whiskey Creek	31 Mar 84	1	0	0	0	1
50	south-33	1 Apr 84	20	0	0	0	20
51	snag point	1 Apr 84	0	0	0	0	0
52	two stake point	1 Apr 84	0	0	0	0	0
53	lagoon	1 Apr 84	52	0	0	0	52
54	lagoon	1 Apr 84	25	0	0	0	25
55	opposite lagoon	1 Apr 84	0	0	0	0	0
56	willow bush low	1 Apr 84	22	0	0	0	22
57	willow bush low	1 Apr 84	16	0	0	0	16
58	two high	1 Apr 84	7	0	0	0	7
59	two high	1 Apr 84	16	0	0	0	16

Table 5. (cont.)

Haul	Station	Date	Total	L-Clip	R-Clip	B-Clip	Adj-Total
60	Unnamed Creek	1 Apr 84	178	0	0	0	178
61	willow bush high	1 Apr 84	25	0	0	0	25
62	willow bush high	1 Apr 84	0	0	0	0	0
63	south-33	2 Apr 84	71	0	0	0	71
64	snag point	2 Apr 84	579	0	0	0	579
65	snag point	2 Apr 84	107	0	0	0	107
66	two stake point	2 Apr 84	0	0	0	0	0
67	thirteen low	2 Apr 84	9	0	0	0	9
68	lagoon	2 Apr 84	1	0	0	0	1
69	willow bush low	2 Apr 84	40	0	0	0	40
70	picnic point	2 Apr 84	6	0	0	0	6
71	south 1	2 Apr 84	5	0	0	0	5
72	Whiskey Creek	2 Apr 84	13	0	0	0	13
73	mud paradise	2 Apr 84	97	0	0	0	97
74	willow bush high	2 Apr 84	21	0	0	0	21
75	Unnamed Creek	2 Apr 84	52	0	0	0	52
76	four high	2 Apr 84	75	0	0	0	75
77	four high	2 Apr 84	12	0	0	0	12
78	south-33	2 Apr 84	9	0	0	0	9
79	snag point	3 Apr 84	223	0	0	0	223
80	thirteen low	3 Apr 84	0	0	0	0	0
81	opposite lagoon	3 Apr 84	8	1	0	0	9
82	two low	3 Apr 84	7	0	0	0	7
83	one low	3 Apr 84	0	0	0	0	0
84	three low	3 Apr 84	1	0	0	0	1
85	willow bush low	3 Apr 84	104	0	0	0	104
86	lagoon	3 Apr 84	27	0	0	0	27
87	two stake point	3 Apr 84	29	0	0	0	29
88	picnic point	3 Apr 84	36	0	0	0	36
89	south 1	3 Apr 84	77	0	0	0	77
90	Whiskey Creek	3 Apr 84	103	0	0	0	103
91	mud paradise	3 Apr 84	43	0	0	0	43
92	willow bush high	3 Apr 84	54	0	0	0	54
93	one low	4 Apr 84	1	0	0	0	1
93	one low	4 Apr 84	0	0	0	0	0
93	one low	4 Apr 84	0	0	0	0	0
93	one low	4 Apr 84	0	0	0	0	0
94	two low	4 Apr 84	0	0	0	0	0
94	two low	4 Apr 84	0	0	0	0	0
94	two low	4 Apr 84	0	0	0	0	0
95	willow bush low	4 Apr 84	1	0	0	0	1
95	willow bush low	4 Apr 84	48	0	0	0	48
96	two stake point	4 Apr 84	0	0	0	0	0
97	snag point	4 Apr 84	30	0	0	0	30
98	south-33	4 Apr 84	61	0	0	0	61
99	one low	5 Apr 84	0	0	0	0	0
100	one low	5 Apr 84	0	0	0	0	0
101	two low	5 Apr 84	23	0	0	0	23
102	two low	5 Apr 84	122	0	2	0	124
103	three low	5 Apr 84	0	0	0	0	0

Table 5. (cont.)

Haul	Station	Date	Total	L-Clip	R-Clip	B-Clip	Adj-Total
104	willow bush low	5 Apr 84	67	0	0	0	67
105	opposite lagoon	5 Apr 84	5	0	0	0	5
106	thirteen low	5 Apr 84	1	0	0	0	1
107	lagoon	5 Apr 84	15	0	0	0	15
108	two stake point	5 Apr 84	76	0	0	0	76
109	snag point	5 Apr 84	223	0	0	0	223
110	south-33	5 Apr 84	58	0	0	0	58
111	picnic point	5 Apr 84	2	0	0	0	2
112	south 1	5 Apr 84	63	0	0	1	64
888	mud paradise	5 Apr 84	17	0	0	0	17
113	two high	8 Apr 84	2	0	0	0	2
114	three high	8 Apr 84	14	0	0	0	14
115	Unnamed Creek	8 Apr 84	39	0	0	0	39
117	mud paradise	8 Apr 84	29	5	2	1	37
118	Whiskey Creek	8 Apr 84	19	2	1	0	22
119	south-33	8 Apr 84	0	0	0	0	0
120	snag point	8 Apr 84	128	0	2	0	130
121	two low	8 Apr 84	6	0	0	0	6
121	two low	8 Apr 84	0	0	0	0	0
121	two low	8 Apr 84	0	0	0	0	0
122	one low	8 Apr 84	0	0	0	0	0
123	three low	8 Apr 84	1	0	0	0	1
124	willow bush low	8 Apr 84	4	0	0	0	4
125	lagoon	8 Apr 84	84	5	3	0	92
126	opposite lagoon	8 Apr 84	1	0	0	0	1
127	two stake point	8 Apr 84	28	0	0	0	28
128	thirteen low	8 Apr 84	0	0	0	0	0
128	thirteen low	8 Apr 84	0	0	0	0	0
128	thirteen low	8 Apr 84	0	0	1	0	1
129	picnic point	12 Apr 84	11	0	0	0	11
130	south 1	12 Apr 84	10	1	2	0	13
131	Whiskey Creek	12 Apr 84	3	0	1	0	4
132	mud paradise	12 Apr 84	7	1	0	0	8
133	willow bush high	12 Apr 84	71	8	1	0	80
134	four high	12 Apr 84	0	0	0	0	0
134	four high	12 Apr 84	1	0	0	0	1
135	three high	12 Apr 84	6	0	0	0	6
136	Unnamed Creek	12 Apr 84	0	0	0	0	0
137	one low	12 Apr 84	7	0	0	0	7
138	two low	12 Apr 84	0	0	0	0	0
139	two low	12 Apr 84	4	0	0	0	4
140	three low	12 Apr 84	8	0	1	0	9
141	willow bush low	12 Apr 84	11	1	2	0	14
142	thirteen low	13 Apr 84	8	0	1	0	9
143	opposite lagoon	13 Apr 84	1	0	0	0	1
143	opposite lagoon	13 Apr 84	0	0	0	0	0
144	south-33	13 Apr 84	160	4	4	0	1370
145	snag point	13 Apr 84	48	1	0	0	49
146	south-33	14 Apr 84	20	4	8	1	25
147	snag point	14 Apr 84	126	5	5	0	318

Table 5. (cont.)

Haul	Station	Date	Total	L-Clip	R-Clip	B-Clip	Adj-Total
148	two stake point	14 Apr 84	49	1	1	0	106
149	three low	14 Apr 84	128	3	0	1	132
150	lagoon	14 Apr 84	1	0	0	0	1
151	picnic point	14 Apr 84	42	2	2	0	46
152	south 1	14 Apr 84	7	0	1	0	8
153	two high	14 Apr 84	7	1	0	0	8
154	one high	14 Apr 84	73	0	1	0	74
155	three high	14 Apr 84	41	1	0	1	43
156	four high	14 Apr 84	0	0	0	0	0
157	Unnamed Creek	14 Apr 84	27	1	1	0	203
158	two low	15 Apr 84	25	0	0	0	25
159	one low	15 Apr 84	9	0	1	0	10
160	willow bush low	15 Apr 84	1	0	0	0	1
161	opposite lagoon	15 Apr 84	79	2	1	0	270
162	lagoon	15 Apr 84	89	1	3	0	247
163	thirteen low	15 Apr 84	63	1	3	0	67
163	thirteen low	15 Apr 84	6	0	0	0	6
164	Whiskey Creek	15 Apr 84	6	0	0	0	6
165	mud paradise	15 Apr 84	36	3	0	0	39
166	Unnamed Creek	15 Apr 84	0	0	0	0	0
167	willow bush high	15 Apr 84	4	0	0	0	4
168	picnic point	15 Apr 84	56	0	1	0	57
168	picnic point	15 Apr 84	47	2	2	0	51
169	west-south 1	15 Apr 84	95	2	0	0	97
170	south 1	15 Apr 84	64	13	1	0	78
171	one low	16 Apr 84	20	0	1	1	22
172	two low	16 Apr 84	0	0	0	0	0
173	three low	16 Apr 84	0	0	0	0	0
174	willow bush low	16 Apr 84	35	2	3	0	40
175	opposite lagoon	16 Apr 84	0	0	0	0	0
176	thirteen low	16 Apr 84	1	0	0	0	1
177	two stake point	16 Apr 84	125	1	2	0	128
178	snag point	16 Apr 84	116	5	5	0	423
179	south-33	16 Apr 84	106	1	2	1	192
180	Whiskey Creek	16 Apr 84	8	0	0	0	8
181	west-south 1	16 Apr 84	31	0	0	0	31
181	west-south 1	16 Apr 84	56	0	1	1	58
182	two high	16 Apr 84	22	1	0	0	23
182	two high	16 Apr 84	117	1	0	0	118
183	one high	16 Apr 84	90	1	2	0	192
184	three high	16 Apr 84	50	0	1	0	125
185	Unnamed Creek	16 Apr 84	50	0	0	1	203
186	willow bush high	16 Apr 84	55	2	1	0	58
187	mud paradise	16 Apr 84	75	11	1	1	89
188	one low	17 Apr 84	0	0	0	0	0
189	two low	17 Apr 84	3	0	0	0	3
189	two low	17 Apr 84	0	0	0	0	0
190	willow bush low	17 Apr 84	1	0	0	0	1
191	opposite lagoon	17 Apr 84	0	0	0	0	0
192	thirteen low	17 Apr 84	128	2	3	0	133

Table 5. (cont.)

Haul	Station	Date	Total	L-Clip	R-Clip	B-Clip	Adj-Total
192	thirteen low	17 Apr 84	29	1	1	0	31
193	west-south 1	17 Apr 84	64	1	2	0	128
194	picnic point	17 Apr 84	3	0	0	0	3
195	south 1	17 Apr 84	53	1	1	0	78
196	Whiskey Creek	17 Apr 84	99	4	1	2	227
197	opposite lagoon	17 Apr 84	1	0	0	0	1
198	two stake point	17 Apr 84	0	0	0	0	0
198	two stake point	17 Apr 84	0	0	0	0	0
199	snag point	17 Apr 84	61	1	1	0	63
200	south-33	17 Apr 84	83	3	3	2	91
200	south-33	17 Apr 84	35	1	3	0	39
201	mud paradise	17 Apr 84	18	0	0	0	18
202	willow bush high	17 Apr 84	276	7	5	1	1734
203	Unnamed Creek	17 Apr 84	43	1	5	1	76
204	willow bush high	18 Apr 84	41	6	6	0	283
205	two high	18 Apr 84	40	0	1	0	41
206	one high	18 Apr 84	12	0	0	0	12
206	one high	18 Apr 84	0	0	0	0	0
207	two high	18 Apr 84	233	10	1	1	245
208	three high	18 Apr 84	7	1	0	0	8
209	four high	18 Apr 84	54	1	1	0	56
210	one low	19 Apr 84	0	0	0	0	0
211	two low	19 Apr 84	17	1	0	0	18
211	two low	19 Apr 84	8	0	0	0	8
212	willow bush low	19 Apr 84	225	10	12	2	249
213	opposite lagoon	19 Apr 84	16	3	0	0	19
214	lagoon	19 Apr 84	131	7	4	0	142
215	thirteen low	19 Apr 84	5	0	0	0	5
216	two stake point	19 Apr 84	259	3	8	0	270
217	south-33	19 Apr 84	105	1	7	0	113
218	Whiskey Creek	19 Apr 84	66	2	4	0	72
219	west-south 1	19 Apr 84	400	15	15	0	430
220	picnic point	19 Apr 84	84	3	2	0	89
221	south 1	19 Apr 84	539	13	22	3	577
222	one low	20 Apr 84	0	0	0	0	0
223	two low	20 Apr 84	21	2	1	0	24
224	three low	20 Apr 84	4	0	0	0	4
225	willow bush low	20 Apr 84	218	10	12	0	240
226	two stake point	20 Apr 84	22	0	0	0	22
227	snag point	20 Apr 84	296	12	10	1	319
228	south-33	20 Apr 84	65	2	4	0	71
229	two high	20 Apr 84	35	0	1	0	36
229	two high	20 Apr 84	43	0	0	0	43
230	one high	20 Apr 84	1	0	0	0	1
230	one high	20 Apr 84	3	0	0	0	3
231	west-south 1	23 Apr 84	27	0	2	0	29
232	picnic point	23 Apr 84	5	0	0	0	5
233	south 1	23 Apr 84	22	0	0	0	22
234	Whiskey Creek	23 Apr 84	0	0	0	0	0
235	south-33	23 Apr 84	206	12	5	1	224

Table 5. (cont.)

Haul	Station	Date	Total	L-Clip	R-Clip	B-Clip	Adj-Total
236	snag point	23 Apr 84	109	2	1	0	112
237	two low	23 Apr 84	12	1	0	0	13
238	one low	23 Apr 84	52	2	0	0	54
239	willow bush low	23 Apr 84	85	2	1	0	88
240	opposite lagoon	23 Apr 84	0	0	0	0	0
241	thirteen low	23 Apr 84	189	3	6	0	198
242	two stake point	23 Apr 84	53	1	1	0	55
243	willow bush high	24 Apr 84	7	3	0	0	10
244	three high	24 Apr 84	1	0	0	0	1
245	two high	24 Apr 84	12	1	1	0	14
245	two high	24 Apr 84	77	0	0	1	78
246	one high	24 Apr 84	42	1	1	0	44
246	one high	24 Apr 84	0	0	0	0	0
247	three low	24 Apr 84	33	1	1	1	36
248	one low	24 Apr 84	0	0	0	0	0
249	two low	24 Apr 84	13	0	0	0	13
250	willow bush low	24 Apr 84	0	0	0	0	0
251	opposite lagoon	24 Apr 84	0	0	0	0	0
252	thirteen low	24 Apr 84	112	1	5	1	119
252	thirteen low	24 Apr 84	121	6	3	0	130
253	two stake point	24 Apr 84	1	0	0	0	1
254	snag point	24 Apr 84	0	0	0	0	0
255	south-33	24 Apr 84	3	0	0	0	3
256	west-south 1	26 Apr 84	19	2	0	0	21
257	picnic point	26 Apr 84	0	0	0	0	0
258	three low	26 Apr 84	33	1	1	0	35
259	one low	26 Apr 84	0	0	0	0	0
260	two low	26 Apr 84	78	4	3	0	85
260	two low	26 Apr 84	34	1	1	0	36
261	willow bush low	26 Apr 84	57	8	4	0	69
262	opposite lagoon	26 Apr 84	18	1	1	0	20
263	thirteen low	26 Apr 84	75	2	5	0	82
264	two stake point	26 Apr 84	124	11	10	0	145
265	willow bush high	27 Apr 84	4	1	0	0	5
266	two high	27 Apr 84	72	3	0	0	75
267	one high	27 Apr 84	3	0	0	0	3
268	three high	27 Apr 84	16	3	0	0	19
269	snag point	27 Apr 84	24	0	1	0	25
269	snag point	27 Apr 84	59	5	2	1	67
270	south-33	27 Apr 84	0	0	0	0	0
270	south-33	27 Apr 84	21	3	3	0	27
271	willow bush low	27 Apr 84	3	0	0	0	3
272	three low	2 May 84	14	0	0	0	14
273	one low	2 May 84	446	13	9	1	469
274	two low	2 May 84	28	0	0	1	29
275	willow bush low	2 May 84	5	0	0	0	5
276	opposite lagoon	2 May 84	15	0	1	0	16
277	thirteen low	2 May 84	25	5	3	0	33
278	two stake point	2 May 84	2	1	0	0	3
279	snag point	2 May 84	52	5	2	0	59

Table 5. (cont.)

Haul	Station	Date	Total	L-Clip	R-Clip	B-Clip	Adj-Total
280	south-33	2 May 84	60	5	2	0	67
281	west-south 1	2 May 84	3	0	0	0	3
282	picnic point	2 May 84	0	0	0	0	0
282	picnic point	2 May 84	1	0	0	0	1
283	south 1	2 May 84	1	1	0	0	2
284	Whiskey Creek	2 May 84	0	0	0	0	0
285	mud paradise	2 May 84	3	1	0	0	4
286	willow bush high	2 May 84	14	0	0	0	14
287	Unnamed Creek	2 May 84	1	0	0	0	1
288	four high	2 May 84	19	0	0	0	19
289	one low	3 May 84	612	34	19	0	665
290	south-33	3 May 84	32	1	0	0	33
291	snag point	3 May 84	8	2	0	0	10
292	willow bush low	3 May 84	6	0	0	0	6
293	lagoon	3 May 84	51	2	1	1	55
294	three high	3 May 84	1	0	0	0	1
295	one high	3 May 84	220	9	5	1	235
296	two high	3 May 84	4	0	0	0	4
297	two high	10 May 84	2	1	0	0	3
298	one high	10 May 84	230	5	2	1	238
299	three high	10 May 84	12	0	1	1	14
300	four high	10 May 84	0	0	0	0	0
301	willow bush high	10 May 84	3	0	0	0	3
302	Unnamed Creek	10 May 84	0	0	0	0	0
303	three low	10 May 84	0	0	0	0	0
304	two low	10 May 84	16	0	0	0	16
305	one low	10 May 84	631	31	32	1	1390
306	willow bush low	10 May 84	21	3	0	0	24
307	opposite lagoon	10 May 84	5	0	0	0	5
308	lagoon	10 May 84	37	1	1	0	39
309	thirteen low	10 May 84	46	4	1	0	51
310	west-south 1	11 May 84	6	0	0	0	6
310	west-south 1	11 May 84	3	0	0	0	3
311	picnic point	11 May 84	9	0	0	1	10
311	picnic point	11 May 84	6	0	0	0	6
312	south 1	11 May 84	0	0	0	0	0
313	Whiskey Creek	11 May 84	2	0	0	0	2
314	mud paradise	11 May 84	0	0	0	0	0
315	south-33	11 May 84	2	0	0	0	2
316	snag point	11 May 84	9	0	0	0	9
317	two stake point	11 May 84	3	1	0	0	4
318	one low	16 May 84	448	16	6	0	470
319	two low	16 May 84	29	1	1	0	31
320	willow bush low	16 May 84	7	0	0	0	7
321	opposite lagoon	16 May 84	8	0	0	0	8
322	thirteen low	16 May 84	1	0	0	0	1
323	two stake point	16 May 84	2	0	0	0	2
324	snag point	16 May 84	3	0	0	0	3
325	south-33	16 May 84	2	0	0	0	2
326	one high	16 May 84	49	4	3	0	56

Table 5. (cont.)

Haul	Station	Date	Total	L-Clip	R-Clip	B-Clip	Adj-Total
327	two high	16 May 84	8	0	1	0	9
328	west-south 1	16 May 84	0	0	0	0	0
329	picnic point	16 May 84	1	0	0	0	1
330	south 1	16 May 84	0	0	0	0	0
331	three high	16 May 84	0	0	0	0	0
332	one low	17 May 84	8	0	2	0	10
332	one low	17 May 84	215	8	8	0	231
333	two low	17 May 84	0	0	0	0	0
334	lagoon	17 May 84	13	1	1	0	15
335	Whiskey Creek	17 May 84	0	0	0	0	0
336	mud paradise	17 May 84	0	0	0	0	0
337	willow bush high	17 May 84	0	0	0	0	0
338	Unnamed Creek	17 May 84	0	0	0	0	0
339	four high	17 May 84	0	0	0	0	0
340	two high	17 May 84	54	1	0	0	55
341	west-south 1	23 May 84	0	0	0	0	0
342	picnic point	23 May 84	0	0	0	0	0
343	south 1	23 May 84	0	0	0	0	0
344	Whiskey Creek	23 May 84	0	0	0	0	0
345	three low	23 May 84	0	0	0	0	0
346	one low	23 May 84	67	2	1	0	70
346	one low	23 May 84	19	3	2	0	24
347	two low	23 May 84	6	0	1	0	7
348	willow bush low	23 May 84	1	0	0	0	1
349	opposite lagoon	23 May 84	0	0	0	0	0
350	lagoon	23 May 84	1	0	0	0	1
351	thirteen low	23 May 84	0	0	0	0	0
352	two stake point	23 May 84	2	0	0	0	2
353	snag point	23 May 84	0	0	0	0	0
354	south-33	23 May 84	0	0	0	0	0
354	south-33	23 May 84	0	0	0	0	0
356	two high	24 May 84	0	0	0	0	0
357	one high	24 May 84	47	1	2	0	50
358	mud paradise	24 May 84	0	0	0	0	0
359	willow bush high	24 May 84	0	0	0	0	0
360	Unnamed Creek	24 May 84	0	0	0	0	0
361	four high	24 May 84	0	0	0	0	0
362	three high	24 May 84	0	0	0	0	0
363	one low	31 May 84	0	0	0	0	0
363	one low	31 May 84	0	0	0	0	0
364	two low	31 May 84	40	1	1	0	42
365	willow bush low	31 May 84	0	0	0	0	0
366	thirteen low	31 May 84	0	0	0	0	0
367	opposite lagoon	31 May 84	0	0	0	0	0
368	two stake point	31 May 84	0	0	0	0	0
369	snag point	31 May 84	0	0	0	0	0
370	south-33	31 May 84	0	0	0	0	0
371	lagoon	31 May 84	0	0	0	0	0
372	one high	31 May 84	1	0	0	0	1
372	one high	31 May 84	11	0	0	0	11

Table 5. (cont.)

Haul	Station	Date	Total	L-Clip	R-Clip	B-Clip	Adj-Total
373	two high	31 May 84	0	0	0	0	0
374	four high	31 May 84	0	0	0	0	0
375	willow bush high	31 May 84	0	0	0	0	0
376	mud paradise	31 May 84	0	0	0	0	0
377	three high	31 May 84	0	0	0	0	0
378	one low	6 Jun 84	36	0	0	0	36
378	one low	6 Jun 84	1	0	0	0	1
378	one low	6 Jun 84	16	0	0	0	16
379	two low	6 Jun 84	0	0	0	0	0
380	willow bush low	6 Jun 84	0	0	0	0	0
381	opposite lagoon	6 Jun 84	0	0	0	0	0
382	thirteen low	6 Jun 84	0	0	0	0	0
383	two stake point	6 Jun 84	0	0	0	0	0
384	south-33	6 Jun 84	0	0	0	0	0
385	lagoon	6 Jun 84	0	0	0	0	0
386	one high	6 Jun 84	4	0	0	0	4
386	one high	6 Jun 84	3	0	0	0	3
387	picnic point	6 Jun 84	0	0	0	0	0
388	west-south 1	6 Jun 84	0	0	0	0	0
389	two high	6 Jun 84	0	0	0	0	0
390	one low	14 Jun 84	0	0	0	0	0
390	one low	14 Jun 84	0	0	0	0	0
390	one low	14 Jun 84	0	0	0	0	0
391	two low	14 Jun 84	0	0	0	0	0
392	one high	14 Jun 84	2	0	0	0	2
392	one high	14 Jun 84	1	0	0	0	1
393	two high	14 Jun 84	0	0	0	0	0
394	one low	29 Jun 84	0	0	0	0	0
394	one low	29 Jun 84	0	0	0	0	0
394	one low	29 Jun 84	0	0	0	0	0
395	two low	29 Jun 84	0	0	0	0	0
396	one high	29 Jun 84	0	0	0	0	0
396	one high	29 Jun 84	0	0	0	0	0
396	one high	29 Jun 84	0	0	0	0	0
397	two high	29 Jun 84	0	0	0	0	0

Table 6. Mean number of chum salmon per beach seine set, all stations combined.

Date	Mean num	Num hauls	Std dev
16-17 mar 84	1.88	16	3.56
22-23 mar 84	14.71	14	19.10
31 mar-1 apr	23.52	23	43.75
2-3 apr 84	60.33	30	109.50
4-5 apr 84	30.22	27	50.45
8 apr 84	19.84	19	35.20
12-13 apr 84	83.47	19	312.17
14-15 apr 84	71.19	27	89.11
16 apr 84	85.65	20	105.47
17-18 apr 84	120.85	27	332.13
19-20 apr 84	114.79	24	154.91
23-24 apr 84	44.61	28	61.54
26-27 apr 84	37.74	19	39.38
2-3 may 84	67.23	26	156.86
10-11 may 84	79.35	23	289.94
16-17 may 84	39.09	23	105.91
23-24 may 84	6.74	23	17.82
30-31 may 84	3.18	17	10.35
6 jun 84	4.00	15	9.78
14 jun 84	0.43	7	0.79
29 jun 84	0.00	8	0.00

Table 7. Number of chum salmon taken from replicate beach seine hauls. Adj-Total: estimated number of chum salmon from beach seine catch.

Haul	Station	Date	Time	Adj-Total
53	lagoon	1 Apr 84	930	52
54	lagoon	1 Apr 84	945	25
56	willow bush low	1 Apr 84	1030	22
57	willow bush low	1 Apr 84	1045	16
58	two high	1 Apr 84	1335	7
59	two high	1 Apr 84	1345	16
61	willow bush high	1 Apr 84	1517	25
62	willow bush high	1 Apr 84	1540	0
64	snag point	2 Apr 84	920	579
65	snag point	2 Apr 84	955	107
76	four high	2 Apr 84	1600	75
77	four high	2 Apr 84	1630	12
93	one low	4 Apr 84	830	1
93	one low	4 Apr 84	845	0
93	one low	4 Apr 84	900	0
93	one low	4 Apr 84	915	0
94	two low	4 Apr 84	930	0
94	two low	4 Apr 84	945	0
94	two low	4 Apr 84	1000	0
95	willow bush low	4 Apr 84	1020	1
95	willow bush low	4 Apr 84	1035	48
99	one low	5 Apr 84	940	0
100	one low	5 Apr 84	950	0
101	two low	5 Apr 84	1005	23
102	two low	5 Apr 84	1017	124
121	two low	8 Apr 84	1230	6
121	two low	8 Apr 84	1250	0
121	two low	8 Apr 84	1300	0
128	thirteen low	8 Apr 84	1510	0
128	thirteen low	8 Apr 84	1520	0
128	thirteen low	8 Apr 84	1530	1
134	four high	12 Apr 84	1030	0
134	four high	12 Apr 84	1105	1
138	two low	12 Apr 84	1720	0
139	two low	12 Apr 84	1735	4

Table 7. (cont.)

Haul	Station	Date	Time	Adj-Total
143	opposite lagoon	13 Apr 84	1745	1
143	opposite lagoon	13 Apr 84	1800	0
163	thirteen low	15 Apr 84	920	67
163	thirteen low	15 Apr 84	935	6
168	picnic point	15 Apr 84	1330	57
168	picnic point	15 Apr 84	1340	51
181	west-south 1	16 Apr 84	1325	31
181	west-south 1	16 Apr 84	1335	58
182	two high	16 Apr 84	1400	23
182	two high	16 Apr 84	1415	118
189	two low	17 Apr 84	900	3
189	two low	17 Apr 84	915	0
192	thirteen low	17 Apr 84	1005	133
192	thirteen low	17 Apr 84	1015	31
198	two stake point	17 Apr 84	1000	0
198	two stake point	17 Apr 84	1015	0
200	south-33	17 Apr 84	815	91
200	south-33	17 Apr 84	830	39
206	one high	18 Apr 84	1600	12
206	one high	18 Apr 84	1620	0
211	two low	19 Apr 84	1025	18
211	two low	19 Apr 84	1035	8
229	two high	20 Apr 84	1730	36
229	two high	20 Apr 84	1830	43
230	one high	20 Apr 84	1800	1
230	one high	20 Apr 84	1810	3
245	two high	24 Apr 84	845	14
245	two high	24 Apr 84	900	78
246	one high	24 Apr 84	920	44
246	one high	24 Apr 84	945	0
252	thirteen low	24 Apr 84	1550	119
252	thirteen low	24 Apr 84	1600	130
260	two low	26 Apr 84	1600	85
260	two low	26 Apr 84	1610	36

Table 7. (cont.)

Haul	Station	Date	Time	Adj-Total
269	snag point	27 Apr 84	1710	25
269	snag point	27 Apr 84	1815	67
270	south-33	27 Apr 84	1740	0
270	south-33	27 Apr 84	1800	27
282	picnic point	2 May 84	1510	0
282	picnic point	2 May 84	1530	1
310	west-south 1	11 May 84	1030	6
310	west-south 1	11 May 84	1045	3
311	picnic point	11 May 84	1130	10
311	picnic point	11 May 84	1145	6
332	one low	17 May 84	1100	10
332	one low	17 May 84	1200	231
346	one low	23 May 84	1330	70
346	one low	23 May 84	1340	24
354	south-33	23 May 84	1630	0
354	south-33	23 May 84	1645	0
363	one low	31 May 84	810	0
363	one low	31 May 84	830	0
372	one high	31 May 84	1400	1
372	one high	31 May 84	1420	11
378	one low	6 Jun 84	1310	36
378	one low	6 Jun 84	1320	1
378	one low	6 Jun 84	1345	16
386	one high	6 Jun 84	1700	4
386	one high	6 Jun 84	1730	3
390	one low	14 Jun 84	930	0
390	one low	14 Jun 84	1010	0
390	one low	14 Jun 84	1020	0
392	one high	14 Jun 84	1345	2
392	one high	14 Jun 84	1400	1
394	one low	29 Jun 84	815	0
394	one low	29 Jun 84	830	0
394	one low	29 Jun 84	845	0
396	one high	29 Jun 84	1255	0

Table 7. (cont.)

Haul	Station	Date	Time	Adj-Total
396	one high	29 Jun 84	1305	0
396	one high	29 Jun 84	1320	0

Table 8. Mean number of chum salmon per beach seine set for high and low tide stations. Asterisks indicate significance at P<0.05.

	High Tide Sites			Low Tide Sites		
Date	Mean num/ set	Num hauls	Std dev	Mean num/ set	Num hauls	Std dev
16-17 mar 84	2.33	12	4.01	0.50	4	1.00
22-23 mar 84	24.00	4	14.45	11.00	10	20.09
31 mar-1 apr	33.36	11	61.09	14.50	12	15.80
2-3 apr 84	45.69	13	34.17	71.53	17	143.34
4-5 apr 84	27.67	3	32.35	30.54	24	52.77
8 apr 84	22.84*	5	15.61	18.79	14	40.44
12-13 apr 84	13.67	9	25.31	146.30	10	430.21
14-15 apr 84	47.60	15	53.26	100.67	12	115.98
16 apr 84	90.50	10	68.25	80.80	10	137.02
17-18 apr 84	207.21*	14	449.69	27.85	13	43.16
19-20 apr 84	156.38	8	219.89	94.00	16	113.35
23-24 apr 84	20.30	10	24.82	58.11	18	71.76
26-27 apr 84	20.50	6	28.07	45.69	13	42.20
2-3 may 84	23.67	12	66.82	104.57*	14	200.72
10-11 may 84	21.92	13	65.06	154.00*	10	434.62
16-17 may 84	10.08	12	21.37	70.73*	11	148.54
23-24 may 84	4.55	11	15.08	8.75	12	20.48
30-31 may 84	1.71	7	4.11	4.20	10	13.28
6 jun 84	1.40	5	1.95	5.30	10	11.89
14 jun 84	1.00	3	1.00	0.00	4	0.00
29 jun 84	0.00	4	0.00	0.00	4	0.00

Table 9. Mean number of chum salmon per beach seine set for high and low tide stations in upper bay.

Date	High Tide Sites			Low Tide Sites		
	Mean num/ set	Num hauls	Std dev	Mean num/ set	Num hauls	Std dev
16-17 mar 84	4.00	7	4.65	0.50	4	1.00
22-23 mar 84	24.00	4	14.45	12.11	9	20.98
31 mar-1 apr	38.22	9	67.17	14.60	10	16.53
2-3 apr 84	46.09	11	34.66	86.29	14	154.78
4-5 apr 84	29.00	3	30.81	48.75	12	61.80
8 apr 84	32.67	3	9.29	28.44	9	48.59
12-13 apr 84	19.33	6	30.09	240.50	6	553.63
14-15 apr 84	53.55	11	58.96	115.67	9	127.97
16 apr 84	74.50	6	68.68	112.29	7	155.74
17-18 apr 84	317.38	8	580.54	35.90	10	46.59
19-20 apr 84	292.00	4	251.58	145.00	10	116.84
23-24 apr 84	13.20	5	12.03	71.54	13	80.23
26-27 apr 84	8.67	3	10.97	48.67	9	46.70
2-3 may 84	3.13	8	4.16	28.70	10	24.41
10-11 may 84	3.33	9	3.43	19.14	7	19.40
16-17 may 84	0.14	7	0.38	6.00	6	5.22
23-24 may 84	0.00	7	0.00	0.50	8	0.76
30-31 may 84	0.00	2	0.00	0.00	7	0.00
6 jun 84	0.00	2	0.00	0.00	6	0.00
14 jun 84	--	-	--	--	-	--
29 jun 84	--	-	--	--	-	--

Table 10. Mean number of chum salmon per beach seine set for high and low tide stations in lower bay.

	High Tide Sites			Low Tide Sites		
Date	Mean num/ set	Num hauls	Std dev	Mean num/ set	Num hauls	Std dev
16-17 mar 84	0.00	5	0.00	--	-	--
22-23 mar 84	--	-	--	1.00	1	0.00
31 mar-1 apr	11.50	2	6.36	14.00	2	16.97
2-3 apr 84	43.50	2	44.55	2.67	3	3.79
4-5 apr 84	--	-	--	12.33	12	35.78
8 apr 84	8.00	2	8.49	1.40	5	2.61
12-13 apr 84	2.33	3	3.21	5.00	4	3.92
14-15 apr 84	31.25	4	34.07	55.67	3	66.53
16 apr 84	114.50	4	69.52	7.33	3	12.70
17-18 apr 84	60.33	6	92.96	1.00	3	1.73
19-20 apr 84	20.75	4	21.85	9.00	6	9.94
23-24 apr 84	27.40	5	33.40	23.20	5	21.56
26-27 apr 84	32.33	3	37.81	39.00	4	34.94
2-3 may 84	64.75	4	113.77	294.25	4	325.01
10-11 may 84	63.75	4	116.32	468.67	3	797.94
16-17 may 84	24.00	5	29.99	148.40	5	203.23
23-24 may 84	12.50	4	25.00	25.25	4	31.49
30-31 may 84	2.40	5	4.83	14.00	3	24.25
6 jun 84	2.33	3	2.08	13.25	4	16.84
14 jun 84	1.00	3	1.00	0.00	4	0.00
29 jun 84	0.00	4	0.00	0.00	4	0.00

Table 11. Mean number of chum salmon per beach seine set caught in the upper and lower bay. Asterisks indicate significance at P<0.05 (*) or P<0.01 (**).

	Upper Bay Sites			Lower Bay Sites		
Date	Mean num/ set	Num hauls	Std dev	Mean num/ set	Num hauls	Std dev
16-17 mar 84	2.73	11	4.05	0.00	5	0.00
22-23 mar 84	15.77	13	19.45	1.00	1	0.00
31 mar-1 apr	25.79	19	47.85	12.75	4	10.56
2-3 apr 84	68.60	25	117.87	19.00	5	31.68
4-5 apr 84	44.53*	15	56.81	12.33	12	35.78
8 apr 84	29.50	12	41.67	3.29	7	5.19
12-13 apr 84	129.92*	12	391.25	3.86	7	3.63
14-15 apr 84	81.50	20	98.64	41.71	7	47.18
16 apr 84	94.85	13	120.32	68.57	7	75.84
17-18 apr 84	161.00	18	400.79	40.56	9	79.26
19-20 apr 84	187.00*	14	169.72	13.70	10	15.84
23-24 apr 84	55.33	18	72.80	25.30	10	26.60
26-27 apr 84	38.67	12	43.99	36.14	7	33.16
2-3 may 84	17.33	18	22.25	178.13*	8	256.64
10-11 may 84	10.25	16	14.92	237.29	7	515.60
16-17 may 84	2.85	13	4.54	86.20*	10	151.75
23-24 may 84	0.27	15	0.59	18.88**	8	27.19
30-31 may 84	0.00	9	0.00	6.75	8	14.74
6 jun 84	0.00	8	0.00	8.57*	7	13.31
14 jun 84	--	-	--	0.43	7	0.79
29 jun 84	--	-	--	0.00	8	0.00

Table 12. Mean fork lengths (mm) for upper and lower bay beach seine stations. Asterisks indicate significance at P<0.05 (*) or P<0.01 (**).

	Upper Bay Sites			Lower Bay Sites		
Date	Mean length	Std dev	Num	Mean length	Std dev	Num
16-17 mar 84	40.23	3.04	30	--	--	-
22-23 mar 84	43.02	3.78	129	--	--	-
31 mar-1 apr	45.94	4.61	408	44.92	5.31	51
2-3 apr 84	47.47**	4.91	835	45.02	4.68	95
4-5 apr 84	49.07**	4.96	488	45.23	5.14	149
8 apr 84	50.15	5.23	368	50.38	5.44	24
12-13 apr 84	54.47**	5.50	357	46.89	6.42	27
14-15 apr 84	52.54	5.58	881	52.43	6.26	303
16 apr 84	53.85**	5.24	705	51.89	6.55	306
17-18 apr 84	56.40**	4.57	993	52.59	6.89	200
19-20 apr 84	56.96**	4.85	839	52.62	6.78	125
23-24 apr 84	58.76	4.79	540	60.51**	5.77	253
26-27 apr 84	57.88	4.79	301	59.17**	7.38	216
2-3 may 84	57.64	5.91	328	59.47**	7.02	514
10-11 may 84	59.98	6.07	164	62.53**	7.26	314
16-17 may 84	61.76	5.34	150	61.97*	8.31	252
23-24 may 84	59.75	7.14	4	69.36	5.93	151
30-31 may 84	--	--	-	71.33	3.98	54
6 jun 84	--	--	-	70.13	5.94	60
14 jun 84	--	--	-	76.00	2.65	3
29 jun 84	--	--	-	--	--	-

Table 13. Mean fork lengths (mm) for upper and lower bay beach seine stations at high tide. Asterisks indicate significance at P<0.05 (*) or P<0.01 (**).

	Upper Bay Sites			Lower Bay Sites		
Date	Mean length	Std dev	Num	Mean length	Std dev	Num
16-17 mar 84	40.00	2.98	28	--	--	-
22-23 mar 84	41.04	2.17	50	--	--	-
31 mar-1 apr	46.14**	4.69	264	42.48	2.68	23
2-3 apr 84	47.85**	4.30	411	45.41	4.65	87
4-5 apr 84	46.71	4.78	83	--	--	-
8 apr 84	47.24	4.62	99	50.31**	4.91	16
12-13 apr 84	50.94	5.36	116	47.71	5.12	7
14-15 apr 84	50.07	5.25	418	53.35**	7.34	125
16 apr 84	52.45	5.64	293	52.37	6.38	284
17-18 apr 84	56.46**	4.55	650	52.54	6.83	197
19-20 apr 84	56.37**	5.40	387	51.76	7.41	71
23-24 apr 84	53.09	5.74	66	61.20**	6.17	137
26-27 apr 84	55.27	4.64	26	57.25	8.09	65
2-3 may 84	53.40	7.84	42	62.31**	6.32	108
10-11 may 84	54.70	5.53	30	62.34**	7.43	119
16-17 may 84	62.39	5.33	112	64.78**	8.39	120
23-24 may 84	--	--	-	73.02	4.47	50
30-31 may 84	--	--	-	73.67	4.68	12
6 jun 84	--	--	-	67.86	7.13	7
14 jun 84	--	--	-	76.00	2.65	3
29 jun 84	--	--	-	--	--	-

Table 14. Mean fork lengths (mm) for upper and lower bay beach seine stations at low tide. Asterisks indicate significance at P<0.05 (*) or P<0.01 (**).

	Upper Bay Sites			Lower Bay Sites		
Date	Mean length	Std dev	Num	Mean length	Std dev	Num
16-17 mar 84	43.50	2.12	2	--	--	-
22-23 mar 84	44.27	4.05	79	--	--	-
31 mar-1 apr	45.58	4.44	144	46.93	6.09	28
2-3 apr 84	47.88**	5.42	424	40.75	2.31	8
4-5 apr 84	49.55**	4.87	405	45.23	5.14	149
8 apr 84	51.22	5.04	269	50.50	6.74	8
12-13 apr 84	56.17**	4.69	241	46.60	6.92	20
14-15 apr 84	54.78**	4.89	463	51.79	5.30	178
16 apr 84	54.84**	4.69	412	45.64	5.46	22
17-18 apr 84	56.30	4.61	343	55.33	5.69	3
19-20 apr 84	57.46**	4.26	452	53.76	5.71	54
23-24 apr 84	59.55	4.06	474	59.70	5.16	116
26-27 apr 84	58.13	4.73	275	60.00**	6.91	151
2-3 may 84	58.26	5.31	286	58.71	7.01	406
10-11 may 84	61.16	5.54	134	62.64**	7.17	195
16-17 may 84	59.89	4.97	38	59.42	7.38	132
23-24 may 84	59.75	7.14	4	67.55**	5.74	101
30-31 may 84	--	--	-	70.67	3.55	42
6 jun 84	--	--	-	70.43	5.78	53
14 jun 84	--	--	-	--	--	-
29 jun 84	--	--	-	--	--	-

Table 15. Mean fork lengths (mm) for high and low tide beach seine stations in upper bay. Asterisks indicate significance at P<0.05 (*) or P<0.05 (**).

	High Tide Sites			Low Tide Sites		
Date	Mean length	Std dev	Num	Mean length	Std dev	Num
16-17 mar 84	40.00	2.98	28	43.50	2.12	2
22-23 mar 84	41.04	2.17	50	44.27**	4.05	79
31 mar-1 apr	46.14	4.69	264	45.58	4.44	144
2-3 apr 84	47.05	4.30	411	47.88**	5.42	424
4-5 apr 84	46.71	4.78	83	49.55**	4.87	405
8 apr 84	47.24	4.62	99	51.22**	5.04	269
12-13 apr 84	50.94	5.36	116	56.17**	4.69	241
14-15 apr 84	50.07	5.25	418	54.78**	4.89	463
16 apr 84	52.45	5.64	293	54.84**	4.69	412
17-18 apr 84	56.46	4.55	650	56.30	4.61	343
19-20 apr 84	56.37	5.40	387	57.46**	4.26	452
23-24 apr 84	53.09	5.74	66	59.55**	4.06	474
26-27 apr 84	55.27	4.64	26	58.13**	4.73	275
2-3 may 84	53.40	7.84	42	58.26**	5.31	286
10-11 may 84	54.70	5.53	30	61.16**	5.54	134
16-17 may 84	62.39**	5.33	112	59.89	4.97	38
23-24 may 84	--	--	-	59.75	7.14	4
30-31 may 84	--	--	-	--	--	-
6 jun 84	--	--	-	--	--	-
14 jun 84	--	--	-	--	--	-
29 jun 84	--	--	-	--	--	-

Table 16. Mean fork lengths (mm) for high and low tide beach seine stations in lower bay. Asterisks indicate significance at P<0.05 (*) or P<0.01 (**).

	High Tide Sites			Low Tide Sites		
Date	Mean length	Std dev	Num	Mean length	Std dev	Num
16-17 mar 84	--	--	-	--	--	-
22-23 mar 84	--	--	-	--	--	-
31 mar-1 apr	42.48	2.68	23	46.93**	6.09	28
2-3 apr 84	45.41**	4.65	87	40.75	2.31	8
4-5 apr 84	--	--	-	45.23	5.14	149
8 apr 84	50.31	4.91	16	50.50	6.74	8
12-13 apr 84	47.71	5.12	7	46.60	6.92	20
14-15 apr 84	53.35*	7.34	125	51.79	5.30	177
16 apr 84	52.37**	6.38	284	45.64	5.46	22
17-18 apr 84	52.54	6.83	197	55.33	5.69	3
19-20 apr 84	51.76	7.41	71	53.76	5.71	54
23-24 apr 84	61.20*	6.17	137	59.70	5.16	116
26-27 apr 84	57.25	8.09	65	60.00**	6.91	151
2-3 may 84	62.31**	6.32	108	58.71	7.01	406
10-11 may 84	62.34	7.43	119	62.64	7.17	195
16-17 may 84	64.78**	8.39	120	59.42	7.38	132
23-24 may 84	73.02**	4.47	50	67.55	5.74	101
30-31 may 84	73.67**	4.68	12	70.67	3.55	42
6 jun 84	67.86	7.13	7	70.43	5.78	53
14 jun 84	76.00	2.65	3	--	--	-
29 jun 84	--	--	-	--	--	-

Table 17. Percent occurrence of recaptured marked juvenile chum salmon. L-Clip: left ventral fin-clipped fish. R-Clip: right ventral fin-clipped fish. B-Clip: both ventral fin-clipped fish.

Date	Total Num	L-Clip (% of total)	R-Clip (% of total)	B-Clip (% of total)	Total-Clip (% of total)
16-17 mar 84	30	--	--	--	--
22-23 mar 84	206	--	--	--	--
31 mar-1 apr	541	--	--	--	--
2-3 apr 84	1809	0.06	--	--	0.06
4-5 apr 84	813	--	0.25	0.12	0.37
8 apr 84	355	3.27	2.47	0.28	5.84
12-13 apr 84	356	4.30	3.26	--	7.29
14-15 apr 84	1101	3.67	2.05	0.27	5.82
16 apr 84	959	2.54	1.94	0.52	4.86
17-18 apr 84	1284	3.02	2.58	0.54	5.93
19-20 apr 84	2563	3.17	3.83	0.23	6.97
23-24 apr 84	1182	2.96	2.23	0.34	5.36
26-27 apr 84	648	6.57	4.62	0.16	10.74
2-3 may 84	1623	4.64	2.52	0.25	7.15
10-11 may 84	1043	4.22	3.43	4.38	7.70
16-17 may 84	846	3.53	2.53	--	5.90
23-24 may 84	143	4.03	4.03	--	7.74
30-31 may 84	52	1.89	1.89	--	3.70
6 jun 84	60	--	--	--	--
14 jun 84	3	--	--	--	--
29 jun 84	0	--	--	--	--

Table 18. Mean fork lengths (mm) of recaptured marked juvenile chum salmon. Right-Clip: right ventral fin-clipped fish. Left-Clip: left ventral fin-clipped fish.

	Right-Clip			Left-Clip		
Date	Mean length	Std dev	Num	Mean length	Std dev	Num
3 apr 84	--	--	-	59.00	--	1
5 apr 84	51.00	2.83	2	--	--	-
8 apr 84	49.67	3.94	12	45.46	2.26	13
12 apr 84	53.57	2.76	7	47.45	3.11	11
13 apr 84	55.20	3.03	5	50.60	1.52	5
14 apr 84	53.73	2.41	11	47.63	4.09	19
15 apr 84	53.58	3.03	12	50.21	2.30	24
16 apr 84	55.21	4.13	19	48.22	3.56	27
17 apr 84	56.05	3.40	22	51.04	2.20	26
18 apr 84	54.33	3.57	9	49.50	3.35	18
19 apr 84	56.54	2.74	28	52.52	1.74	27
20 apr 84	56.33	5.05	6	54.22	2.64	9
23 apr 84	59.20	2.11	15	54.24	3.56	21
24 apr 84	58.00	4.00	12	55.00	4.92	13
26 apr 84	61.80	3.47	15	56.23	4.14	22
27 apr 84	58.17	6.34	6	54.79	4.12	14
2 may 84	60.55	3.30	20	57.40	3.28	42
3 may 84	60.54	2.79	13	59.09	2.87	32
10 may 84	65.49	4.05	37	61.47	3.43	47
11 may 84	--	--	-	57.00	0.00	1
16 may 84	64.91	6.83	11	62.95	4.02	21
17 may 84	64.67	3.88	6	64.29	3.82	7
23 may 84	70.75	9.54	4	70.24	1.64	5
24 may 84	73.00	2.83	2	70.00	--	1
31 may 84	76.00	--	1	73.00	--	1

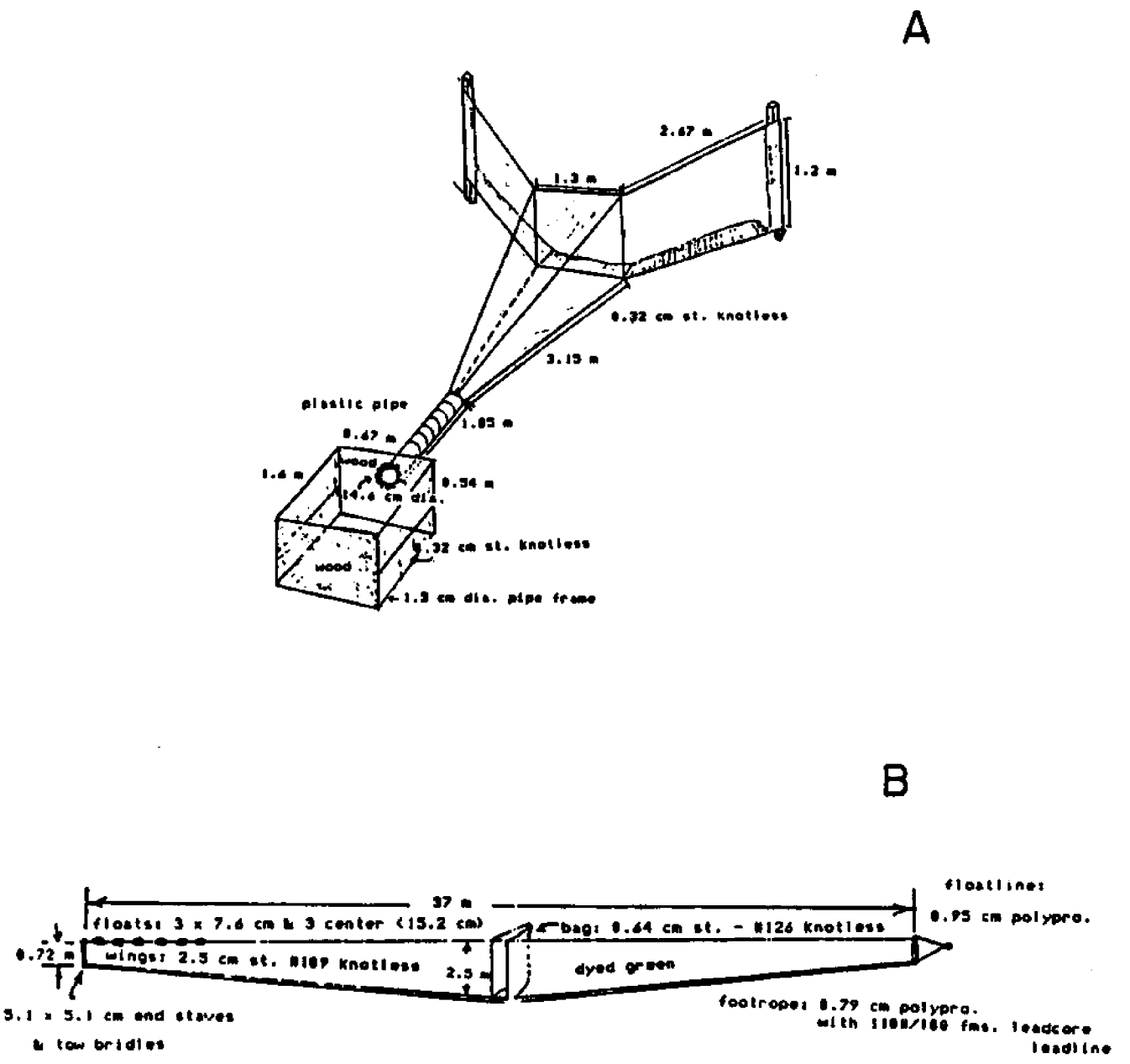


Figure 1. Physical dimensions of the fyke net (A) and beach seine (B).

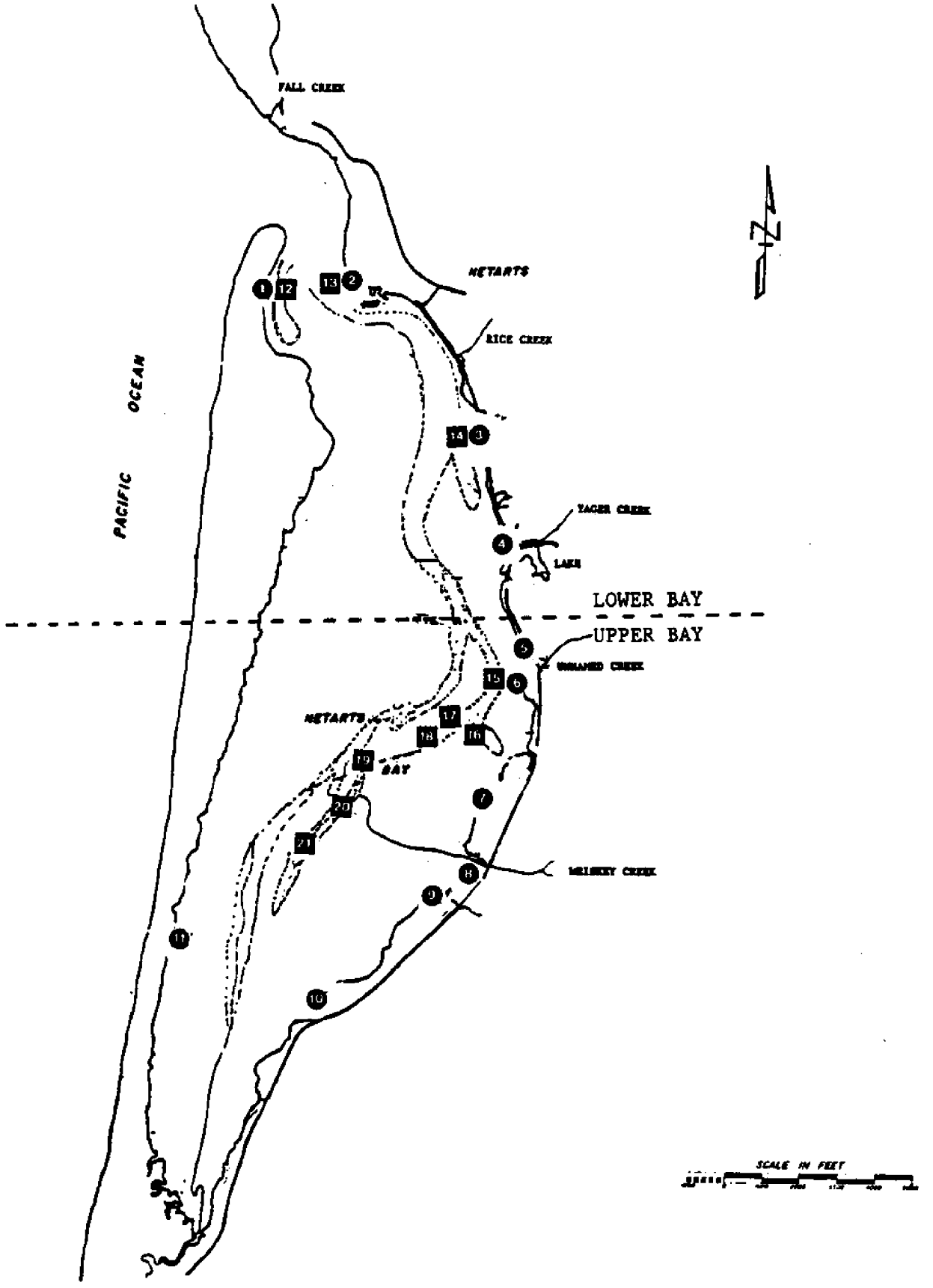


Figure 2. Location of high tide (circles) and low tide (squares) beach seine stations.

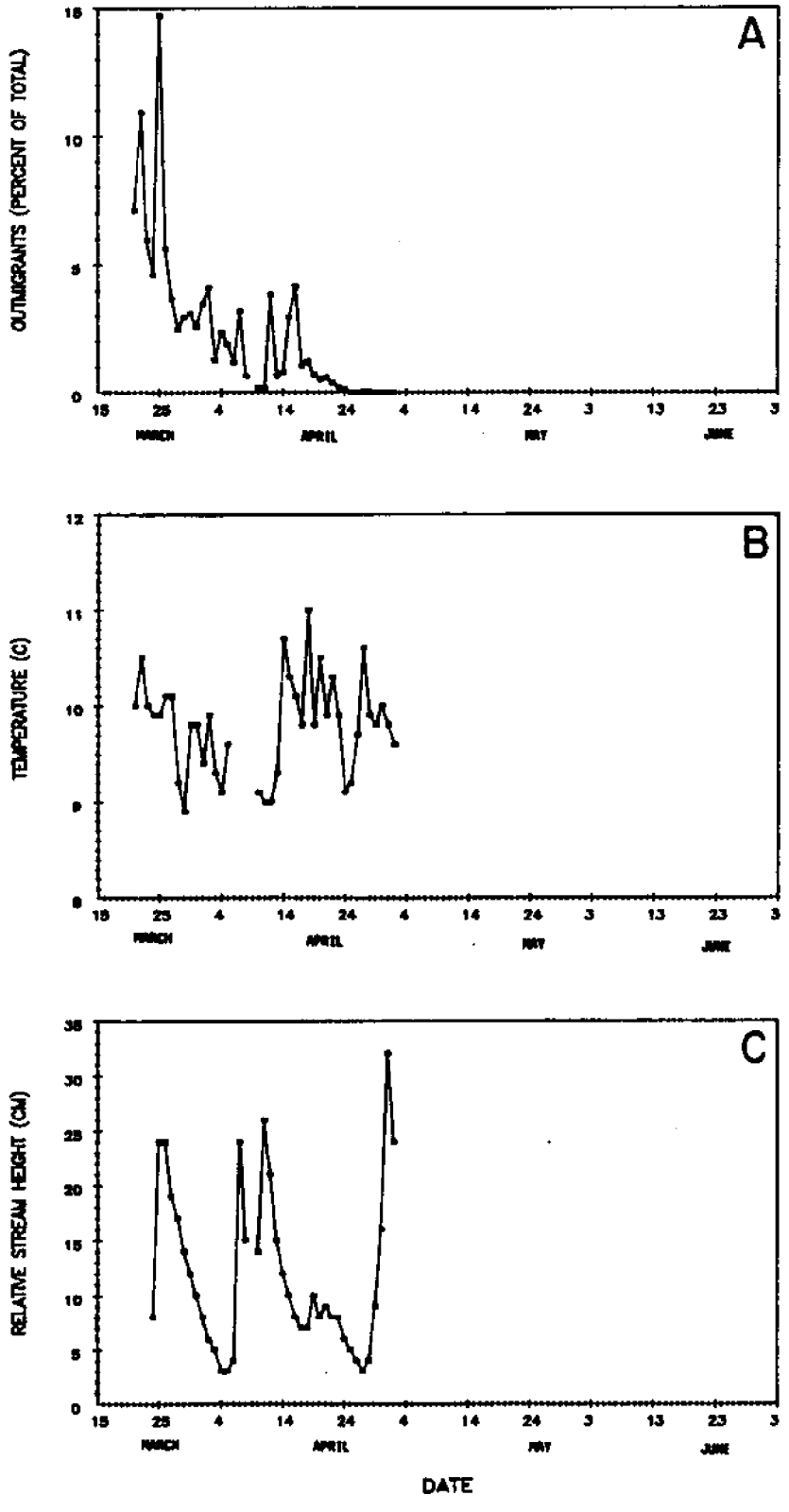


Figure 3. Fyke net catches of chum salmon fry in Whiskey Creek (A), water temperature (B) and water level (C).

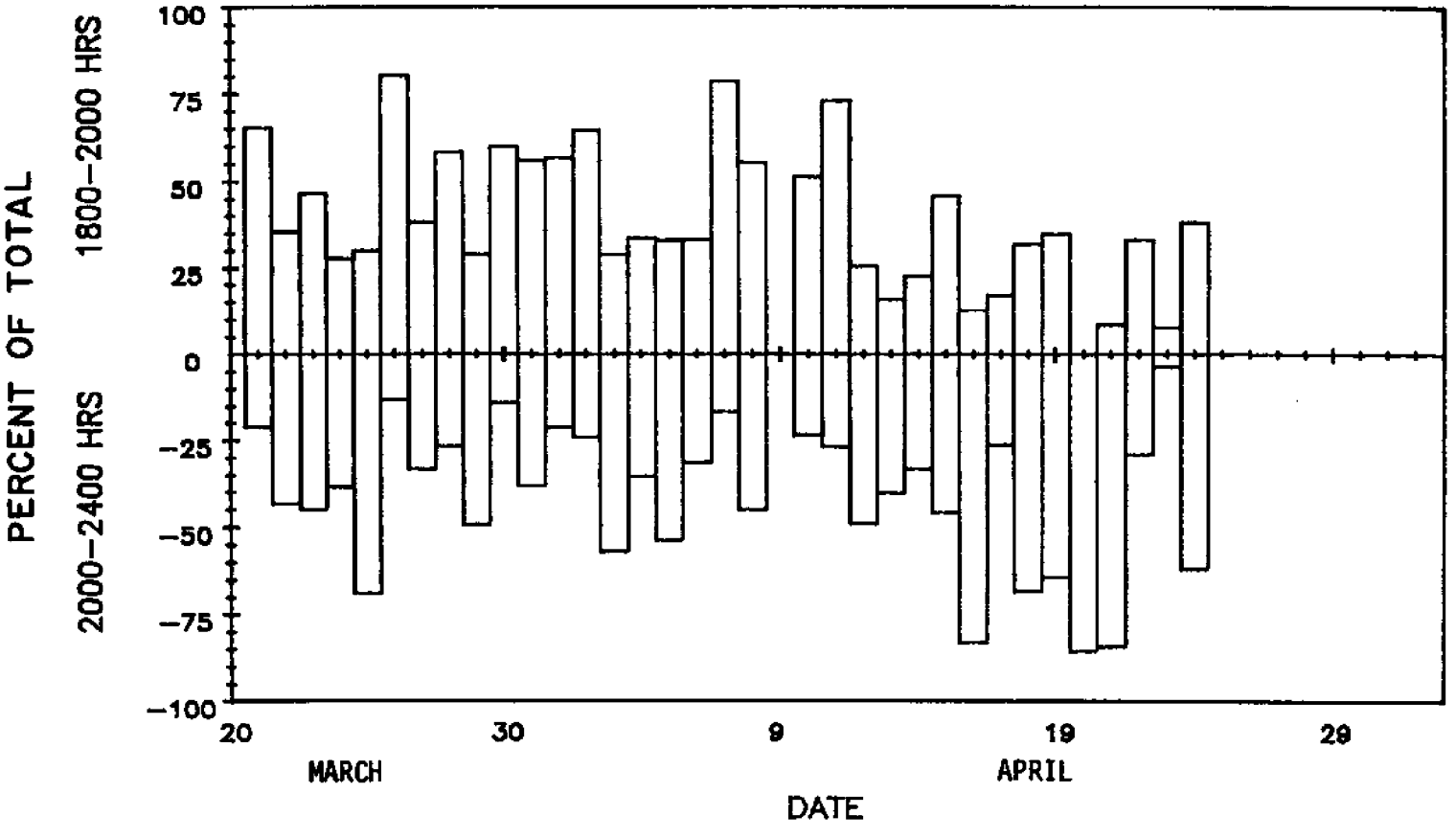


Figure 4. Percent of the daily total of downstream migrating chum salmon fry caught between 1800-2000 and 2000-2400 hours in Whiskey Creek. Catches of less than 20 fish not shown.

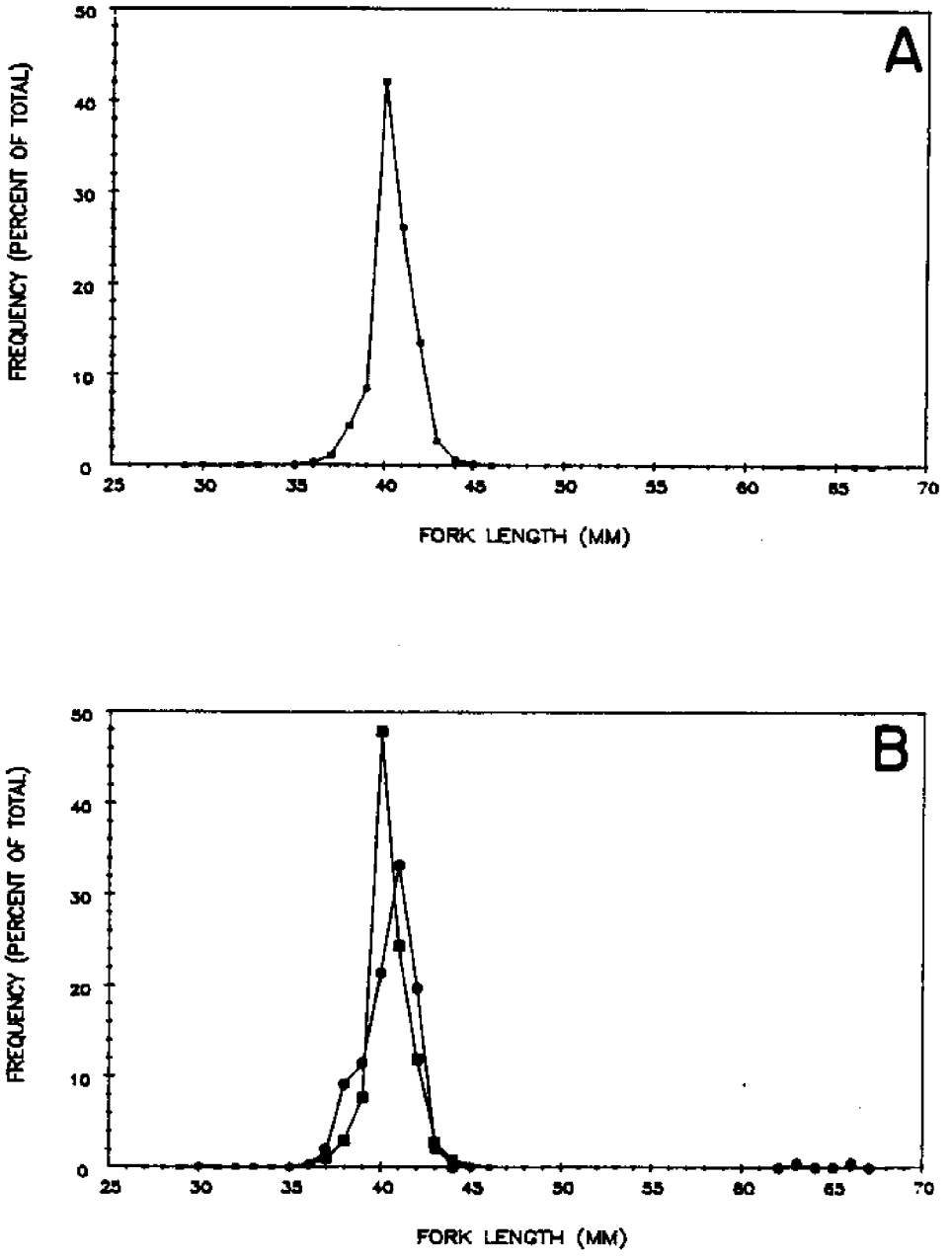


Figure 5. Length frequencies of outmigrating chum salmon fry from Whiskey Creek during 21 March-2 May (A); and 21 March-8 April (squares) and 10 April-2 May (circles) (B).

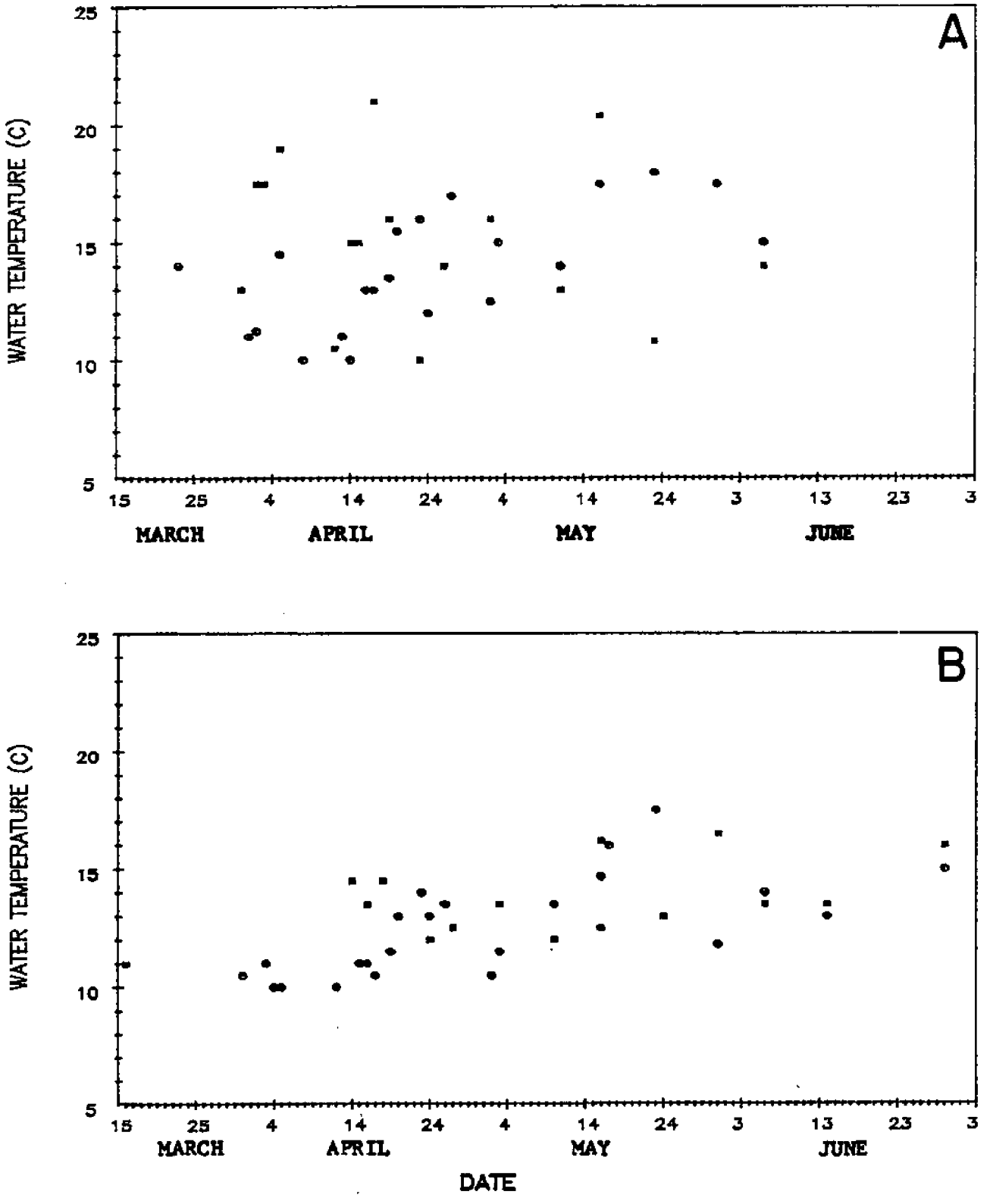


Figure 6. Water temperature from two upper bay beach seine stations, Picnic Point (squares) and South-33 (circles) (A); and two lower bay stations, One High (squares) and One Low (circles) (B).

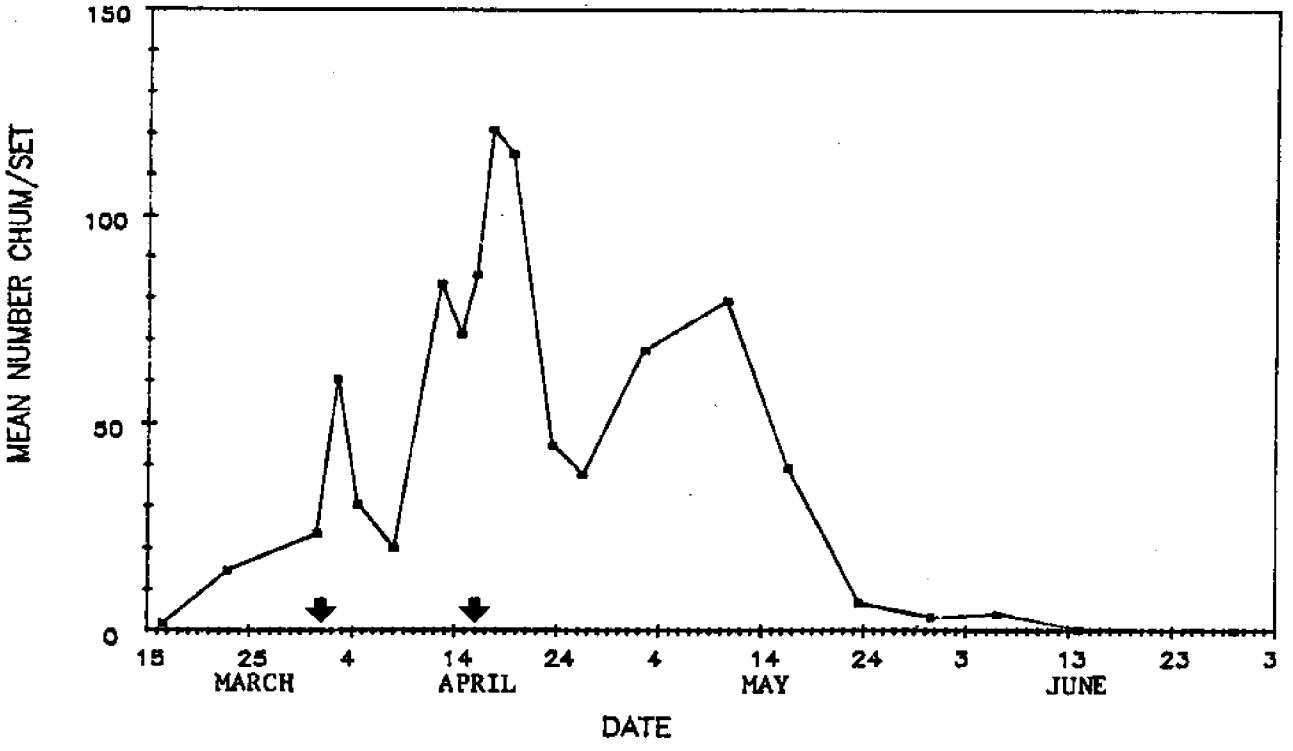


Figure 7. Mean number of chum salmon per beach seine set all stations pooled. Arrows indicate date of first and second hatchery releases.

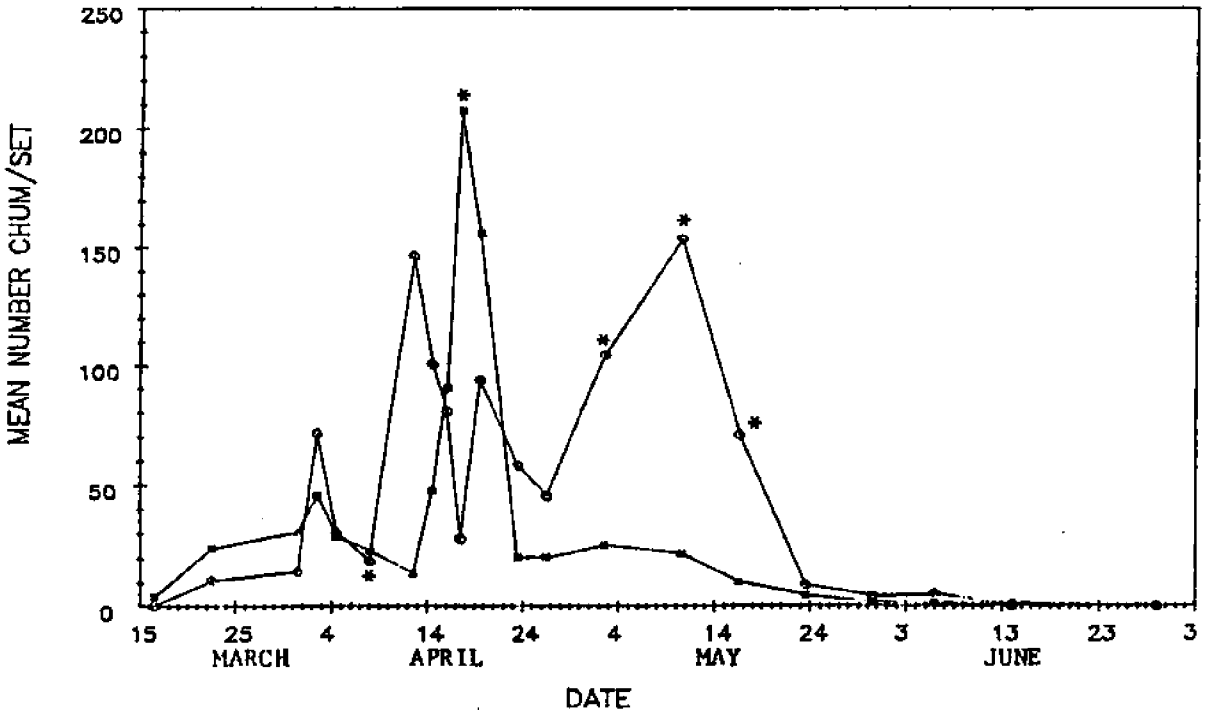


Figure 8. Mean number of chum salmon per beach seine set for all high tide stations (squares) and low tide stations (circles). Asterisks indicate significance at P<0.05.

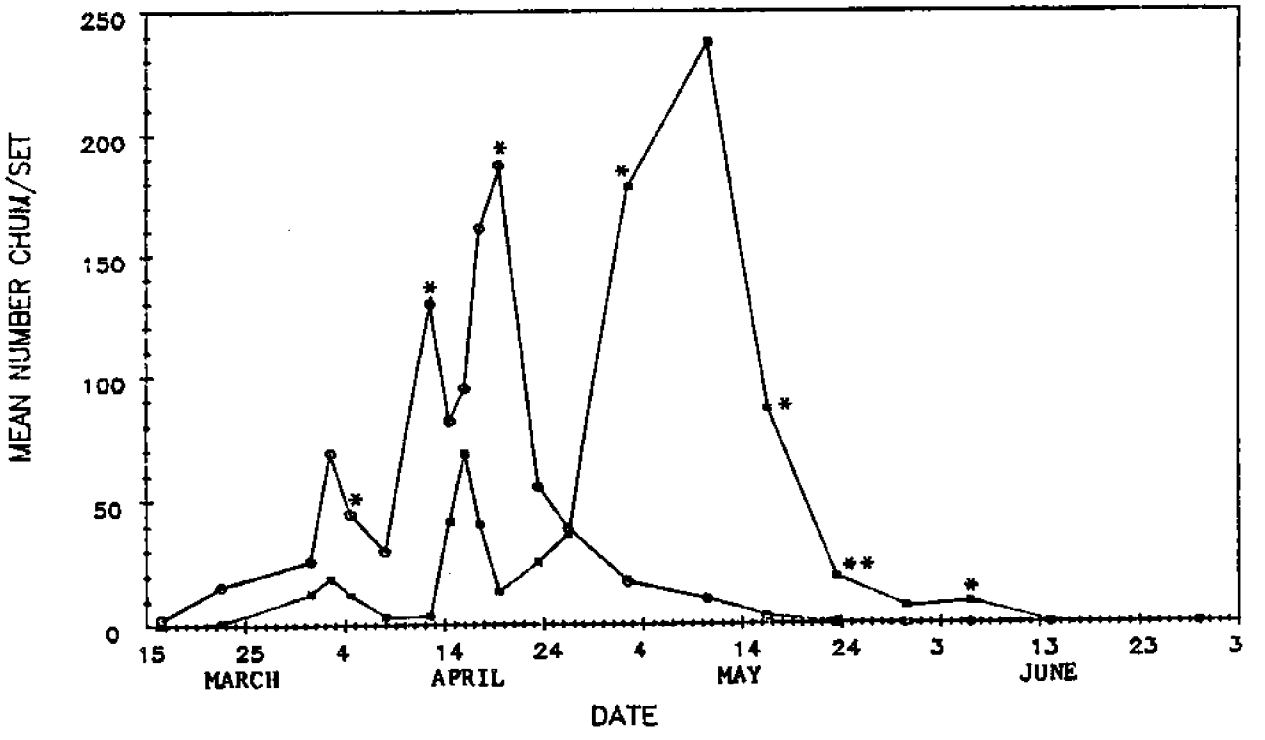


Figure 9. Mean number of chum salmon per beach seine set for all lower bay stations (squares) and upper bay stations (circles). Asterisks indicate significance at P<0.05 (*) and P<0.01 (**).

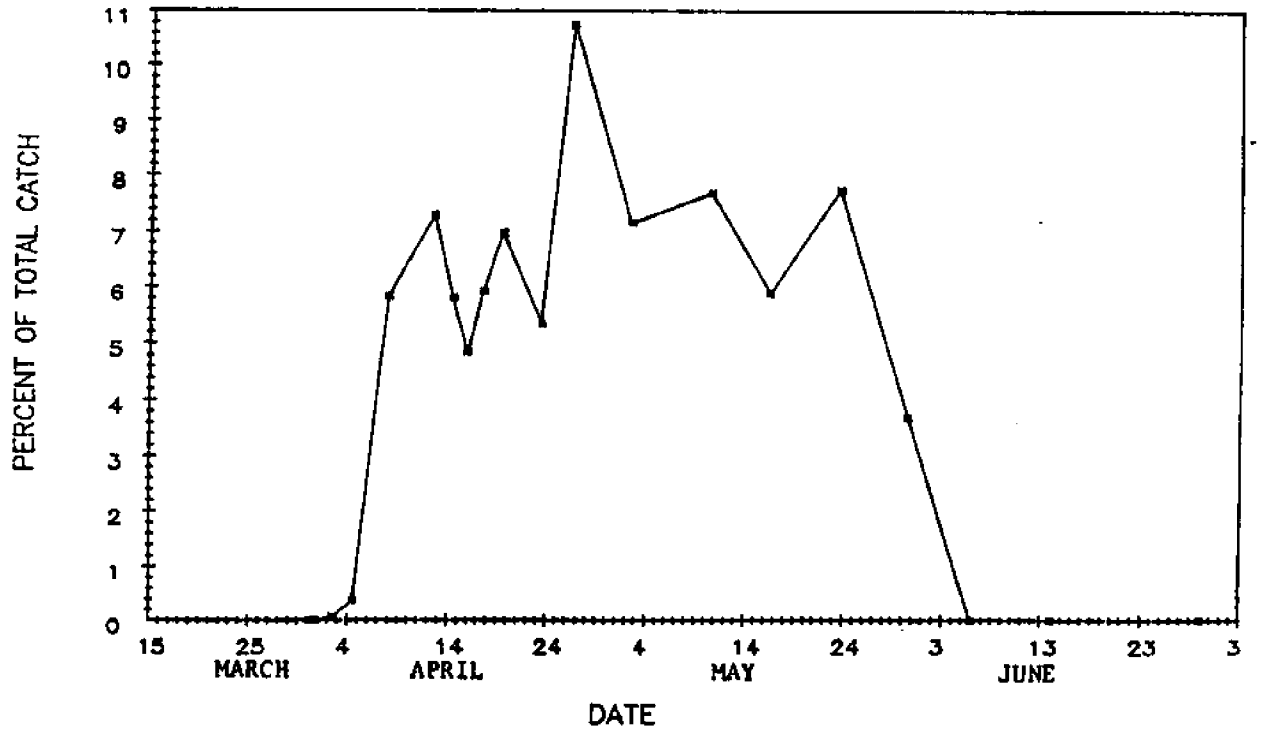


Figure 10. Percent occurrence of recaptured tagged chum salmon for all beach seine sets.

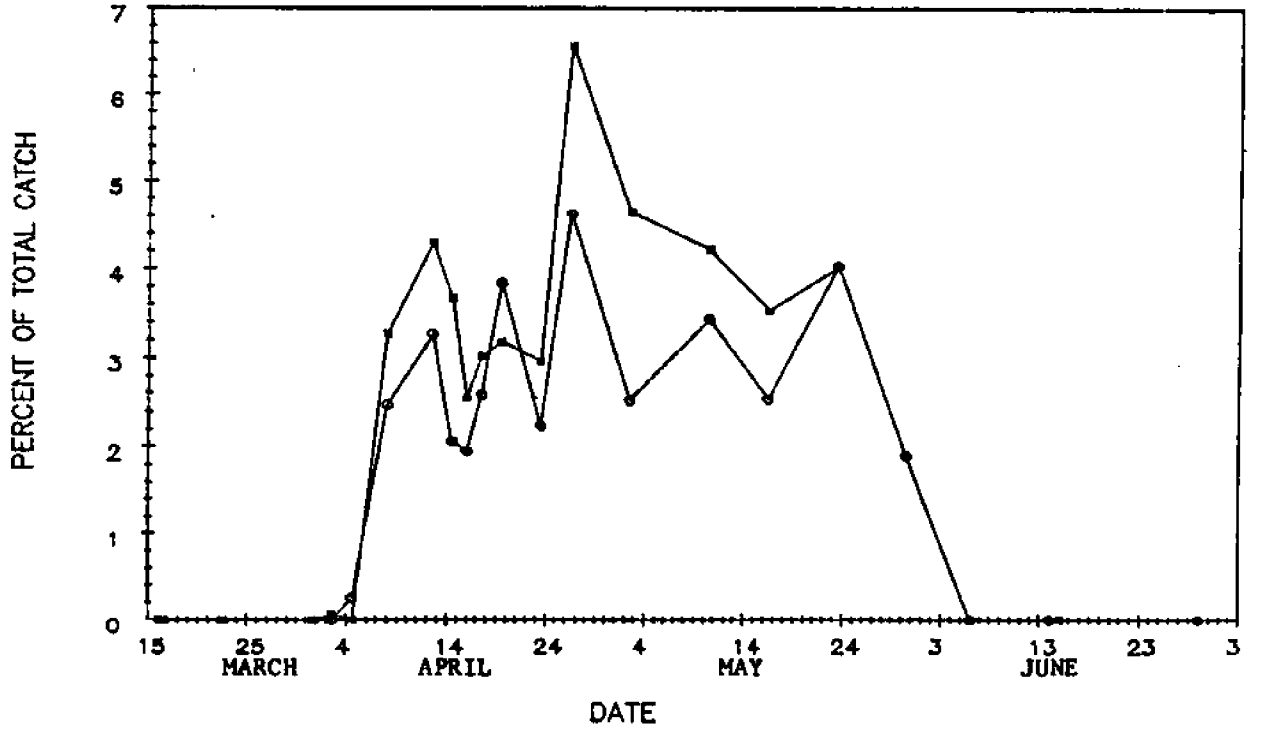


Figure 11. Percent occurrence of recaptured left ventral fin-clipped fish (squares) and right ventral fin-clipped fish (circles) for all beach seine sets.

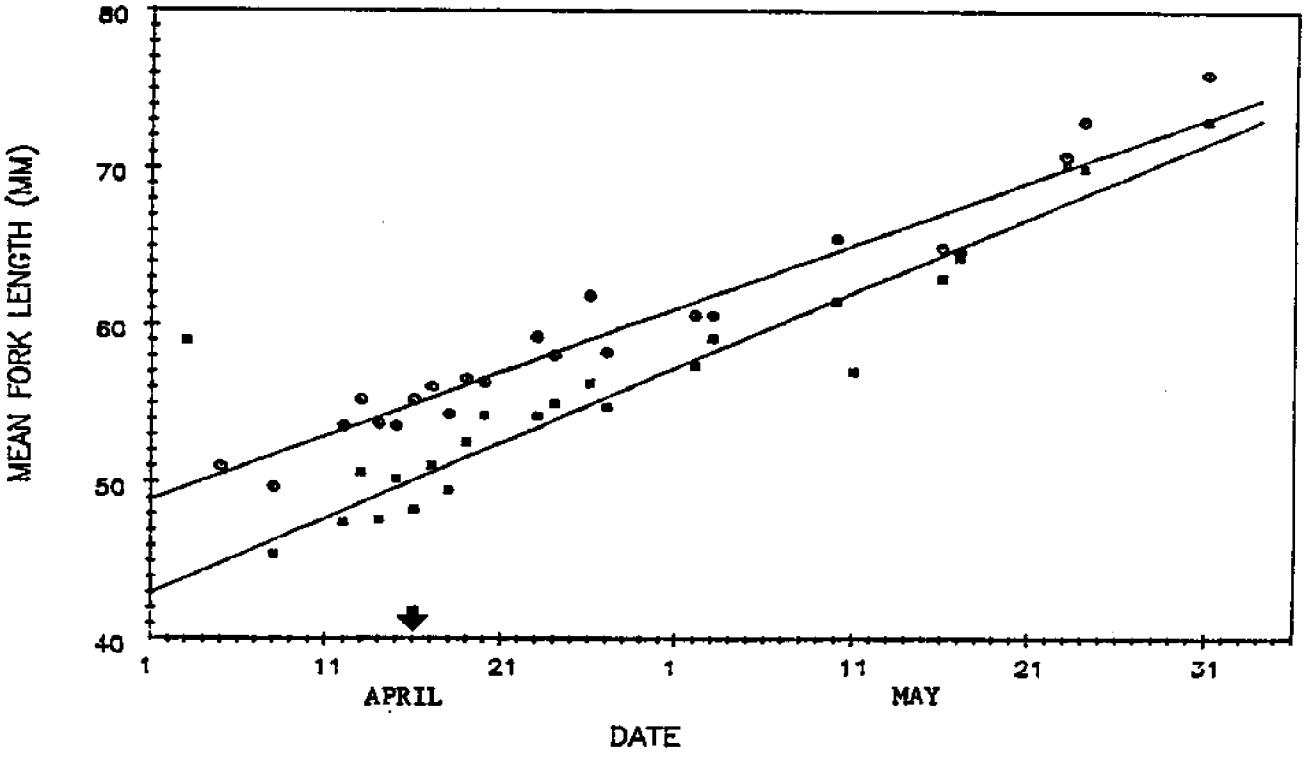


Figure 12. Fitted growth lines and mean fork lengths (mm) for recaptured left ventral fin-clipped fish (squares) and right ventral fin-clipped fish (circles) from all beach seine sets. Arrow indicates intended hatchery release date of fin-clipped fish (see text for explanation).

Appendix 1. Fork lengths (mm) and relationship between juvenile chum salmon measured live and after preservation in 10% formalin and 40% isopropanol.

Live length (mm)	Preserved length (mm)
36	--
37	36,36,36
38	36,37,36,36,36,37,37,38
39	37,38,38,38
40	38,40,38,38,39
41	40,39,39,39,39
42	--
43	--
44	--
45	--
46	--
47	45,45
48	47,46,47,46
49	47,47,48
50	--
51	49
52	51,49,50,50,51
53	--
54	--
55	53,53,53,52,53
56	55,54,54,55,55,54
57	55,55,55,54,55
58	55,55,55,56,56,55
59	57,56,57,57,57
60	57,58,57,58,57
61	59,58,59,59
62	--
63	--
64	--
65	63,63

N = 78

1.040·(pres. length) - 0.084 = live length

R^2 = 0.995

Appendix 2. Fork lengths (mm) and relationship between juvenile chum salmon measured live and after preservation in 95% ethanol.

Live length (mm)	Preserved length (mm)
33	--
34	33,33,33
35	34
36	34,34,35,34,35
37	35,35,34,35,35
38	37,36,37,37,37,37
39	37,37,37
40	39,38,38
41	40,38,39
42	40
43	--
44	--
45	--
46	--
47	--
48	--
49	--
50	--
51	--
52	51,51
53	--
54	54
55	53,54,53,53
56	55,55,54,55,55,55,55
57	55,56,56,56,55,56,56,56,56,55
58	57,57,57,57,57,57,57
59	58,58,58,58
60	59,59,58,59,59,58,59,59,58,59
61	60,60,61,60,59,60
62	60,60,61,61,61,60,60,61
63	60,62,62,62,62
64	63,62,63
65	63,64,63,63
66	65,65,65,
67	65,65,65
69	69

N = 108

0.986·(pres. length) + 2.126 = live length

R^2 = 0.997