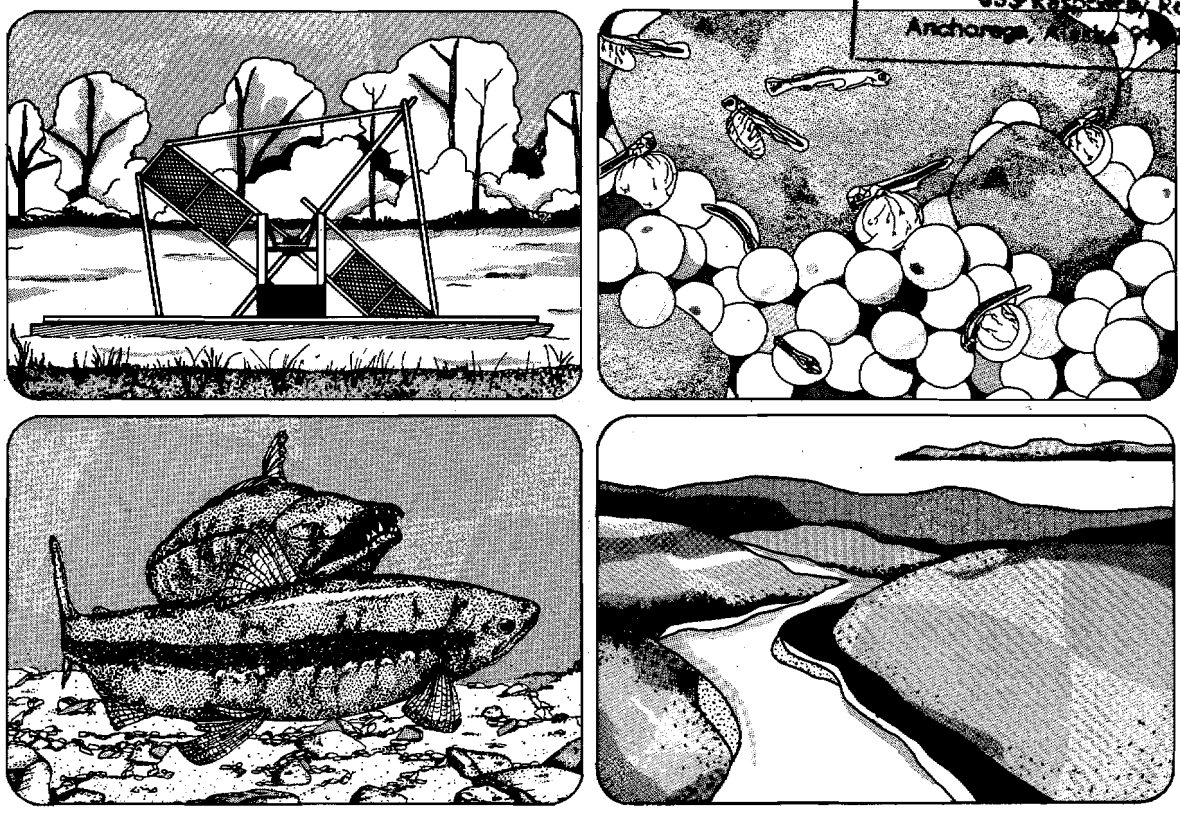

ALASKA DEPARTMENT OF FISH AND GAME
SUSITNA HYDRO AQUATIC STUDIES REPORT SERIES

ALASKA DEPARTMENT OF FISH AND GAME

SUSITNA RIVER AQUATIC STUDIES PROGRAM

Report No. 14

The Migration and Growth of Juvenile Salmon in the Susitna River, 1985.

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June 1986

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1.0 INTRODUCTION

Studies have been conducted since 1982 to describe the periods of freshwater residence, size, and timing of outmigration for juvenile salmon in the Susitna River and to provide population estimates for the reach of river between the Chulitna River confluence and Devil Canyon (middle reach). These data have been collected as part of the environmental assessment program to provide a basis of comparison between past, current, and future juvenile salmon populations in the Susitna River. Coupled with a long-term monitoring program, these data would be used to identify changes to these populations resulting from the proposed hydroelectric development. This report presents the results of the juvenile salmon outmigration studies conducted on the Susitna River between Cook Inlet and Devil Canyon during the 1985 open-water season. Five Pacific salmon species were studied: chinook (Oncorhynchus tshawytscha), coho (O. kisutch), sockeye (O. nerka), chum (O. keta), and pink (O. gorbuscha).

Investigations of the distribution, abundance, and migration of juvenile salmon during 1982 and 1983 were focussed primarily on the middle reach of the Susitna River (ADF&G 1983; Schmidt et al. 1984). These studies included the operation of stationary inclined plane outmigrant traps at Talkeetna Station, river mile (RM) 103.0 during 1982 and 1983 and a mark-recapture program for post-emergent chum and sockeye salmon fry using half-length coded wire tags in 1983 (Roth et al. 1984).

During the 1984 and 1985 open-water seasons, additional tasks were added to further describe juvenile salmon size, migration timing, and their response to changing habitat conditions. The study area was expanded to include the entire river between Cook Inlet and Devil Canyon. Outmigrant trapping was begun at Flathorn Station (RM 22.4) in the lower reach, and a cold brand mark-recapture program on juvenile chinook and coho salmon was initiated in the middle river reach.

The proposed objectives of the 1985 juvenile salmon program were:

- Monitor the timing, size, and relative abundance of all five species of juvenile salmon outmigrating from the middle reach of the Susitna River.
- Estimate the population of outmigrating chum and sockeye salmon fry and their survival from egg to outmigrant fry in this reach of river.
- Monitor the effects of changes in mainstem Susitna River dicharge and other environmental variables on juvenile salmon outmigration rates and timing.
- Monitor the timing, rate of movement, and population size of juvenile chinook and coho salmon outmigrating from Indian River.
- Estimate the overwintering survival of juvenile chinook salmon in the middle river reach.

- o Monitor the timing, size, and relative abundance of juvenile salmon outmigrating from the Susitna River into Cook Inlet past Flathorn Station.

- o Describe the horizontal distribution of juvenile salmon migrating past Flathorn Station to determine the paths of migration and the effects of various habitat variables on this movement.

- o Continue the collection of data on the relative timing, abundance, and size of migrating juvenile resident fish.

As the field season came to a close, it became apparent that reporting of all the data as proposed would not be possible for several reasons of which the loss of biometric support because of program funding reversals, was paramount. The loss of funding and the associated services of a biostatistician resulted in the modification of reporting objectives to a level of basic biological findings readily apparent from the data base. Subject areas contained in the proposed objectives that were not reported include the estimated population sizes of juvenile chinook and coho salmon in the middle river, survival estimates for age 1+ chinook and age 0+ sockeye and chum salmon, and the effects of habitat variables on juvenile salmon outmigration rates and timing. Similarly, funding cuts forced the cancellation of the Resident Fish report which was to present the information on the timing, abundance, and size of migrating juvenile resident fish.

Population estimates of juvenile chinook and coho salmon outmigrating from Indian River and from the middle river reach were not reported because the original program design was for an estimate of a closed population. Many of the assumptions for this type of model could not be met due to the extended period of time juvenile chinook and coho salmon spend in the study areas before outmigrating. When it became apparent that an open population model was necessary to estimate these populations, the program had already lost the funding required to support the biometric analysis.

The closed population estimate model originally proposed was found to be suitable for juvenile chum and sockeye salmon outmigrating from the middle river reach and estimates for these species are reported.

2.0 METHODS

2.1 Study Locations

Observations of the relative abundance, outmigration timing, and the size of juvenile salmon in the Susitna River were observed at study sites from Flathorn Station, at river mile (RM) 22.4, upstream to Portage Creek (RM 148.8) during the 1985 open-water season (Fig. 1). Outmigrant trapping was conducted at two sites in the mainstem river and mark-recapture programs were conducted at 22 tributary, slough and side channel sites in the middle river.

2.1.1 Stationary traps

Two stationary outmigrant traps were deployed on the mainstem Susitna River below the Yentna River confluence (RM 28.5) at Flathorn Station. One trap was fished off the west bank at RM 22.4 (Trap 1) and the other off the east bank at RM 24.6 (Trap 2) (Fig. 2). Trap 2 was relocated to RM 22.3 on August 30 due to the interference of an emerging gravel bar at the upstream sampling site.

Two stationary outmigrant traps were deployed on the mainstem Susitna River above the Chulitna River confluence at Talkeetna Station (RM 103) at the same locations used during 1983 and 1984. One trap was fished off the east bank (Trap 1) and the other off the west bank (Trap 2) of the river (Fig. 3).

2.1.2 Mobile trap

A mobile outmigrant trap was operated upstream of Flathorn Station at 12 established points along a transect between the east and west bank at RM 25.4 (Fig. 2).

2.1.3 Coded wire tagging

The coded wire tagging sites were selected from those locations above the Chulitna River confluence where high density chum and sockeye spawning was recorded (Barrett et al. 1985) and from ground surveys which established the availability of sufficient numbers of post-emergent chum and sockeye salmon fry for collection and tagging (Fig 3). High water conditions during the tagging period (May 22 through June 27) limited these sites during 1985 to Slough 8A (RM 125.3) and Slough 11 (RM 135.3).

2.1.4 Cold branding

The cold brand mark-recapture program was conducted at sites in Indian River (RM 138.6) and Portage Creek (RM 148.8) which were found to contain large concentrations of juvenile chinook and coho salmon (Fig. 3). Four sampling sites were established in Indian River [site 1 (TRM 0.0), site 2 (TRM 1.9), site 3 (TRM 2.3), and site 4 (TRM 11.9)] and two sites were established in Portage Creek (TRM 0.0 and TRM 5.1). Cold branding was also conducted at Side Channel 10A (RM 131.6) and Slough 15 (RM 138.3).

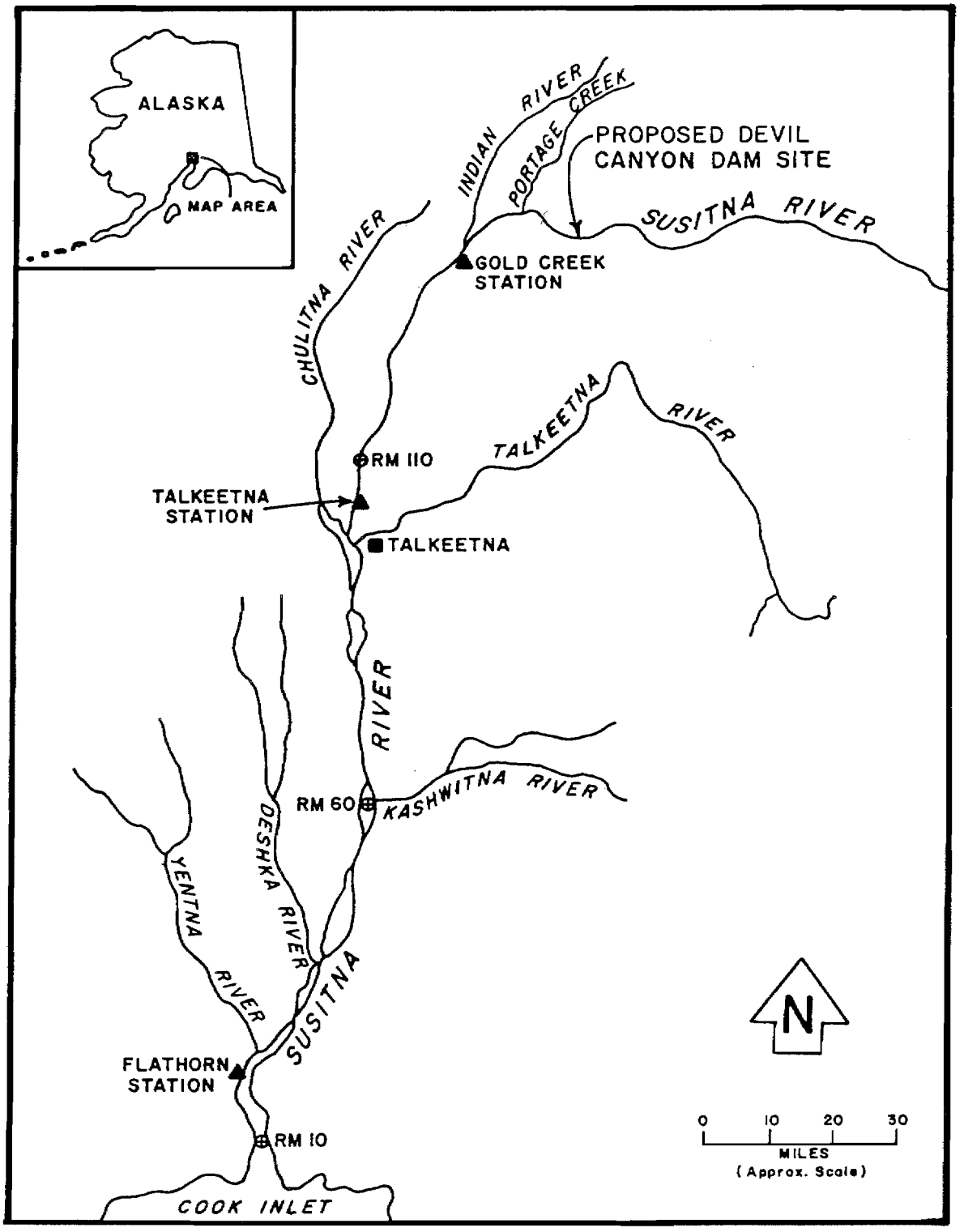

Figure 1. Map of the juvenile salmon study field stations in the Susitna River basin, 1985.

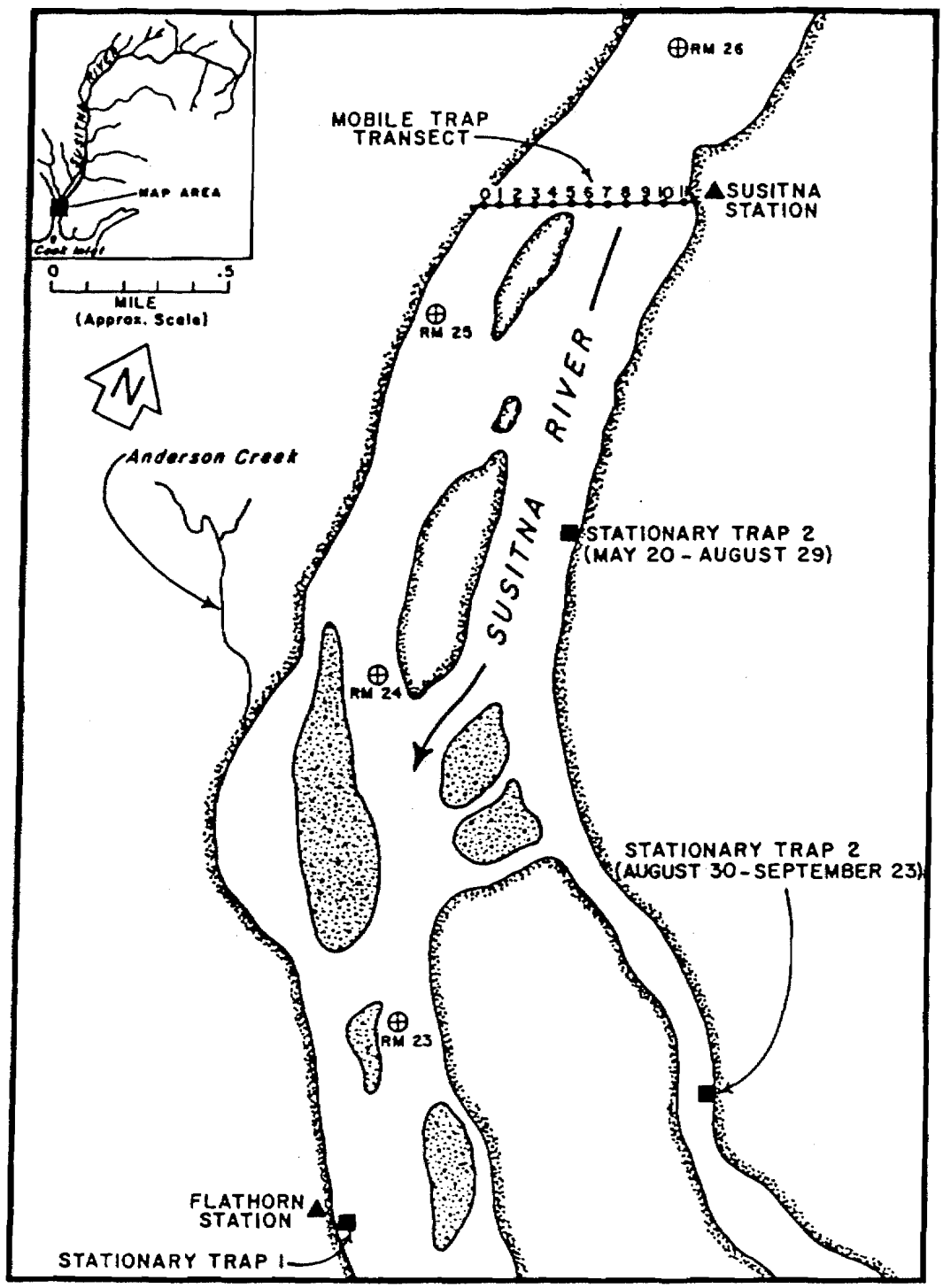

Figure 2. Map showing the locations of the Flathorn stationary outmigrant traps (RM 22.4) and the mobile outmigrant trap sampling points on the Susitna River, 1985.

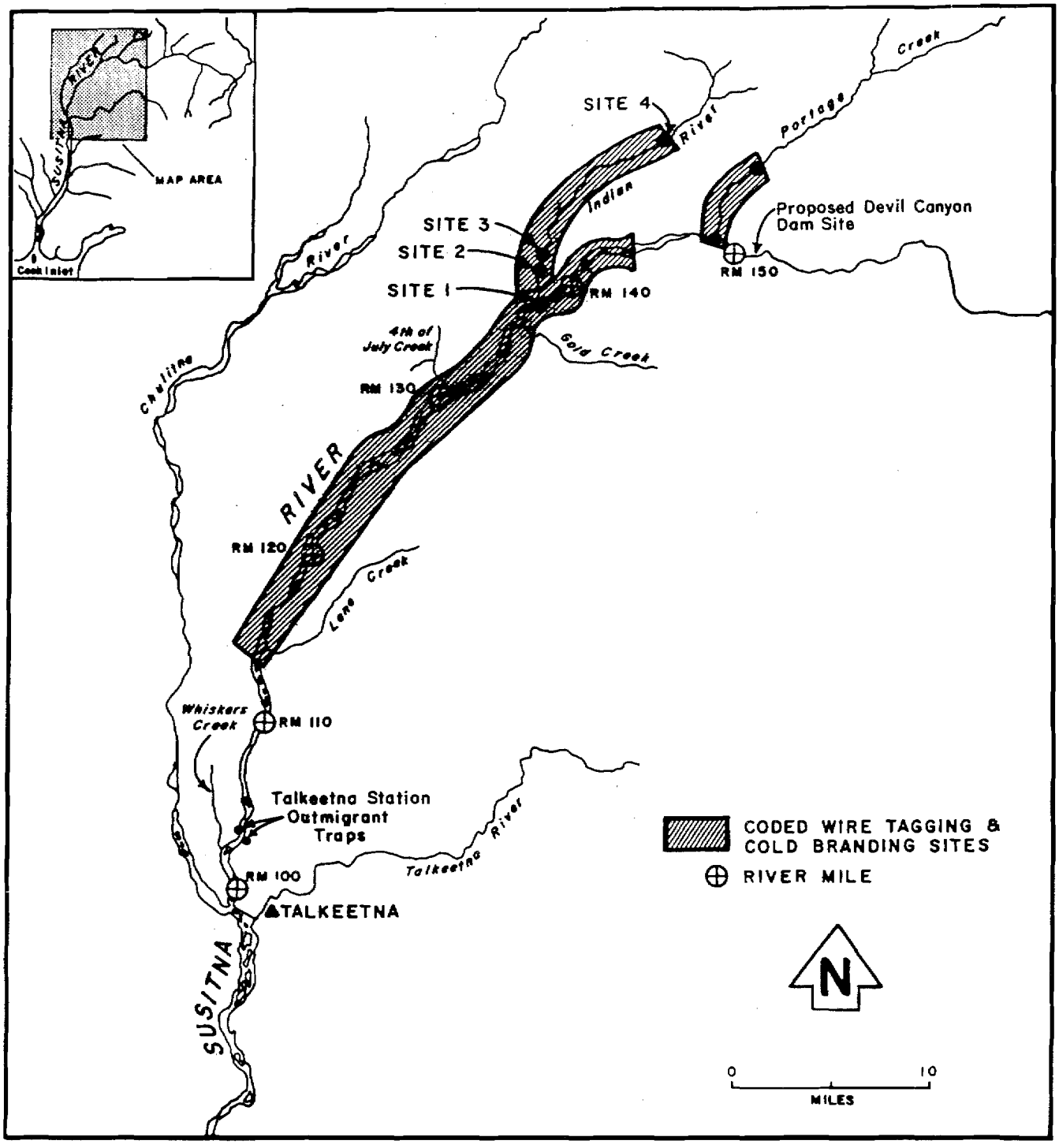

Figure 3. Map showing the reach where juvenile salmon mark-recapture sites were located (RM 112.3 to 144.8, and Indian River and Portage Creek) and the locations of the Talkeetna stationary outmigrant traps (RM 103.0), 1985.

Sampling to monitor the redistribution of branded fish from the marking sites was conducted at sites in the middle river which were observed to have rearing chinook and coho salmon juveniles (Fig. 3). The following 14 sites were sampled:

Sampling Site	River Mile
Slough 6A	112.3
Slough 8A	125.3
Slough 9A	133.6
Slough 10	133.8
Sidechannel 10A	133.9
Slough 14	135.9
Slough 15	137.2
Slough 16	137.7
Slough 17	138.9
Slough 19	139.7
Slough 20	140.1
Slough 21	142.0
Anna Creek Slough	143.2
Slough 22	144.3

2.2 Field Data Collection and Recording

2.2.1 Stationary traps

Descriptions and dimensions of the stationary outmigrant traps are provided in ADF&G (1983). The Susitna River discharge information for the middle river at Gold Creek Station (RM 136.8) and for the lower river at Susitna Station (RM 26.0) are presented in Appendix A.

2.2.1.1 Flathorn Station

The stationary outmigrant trap on the west bank of the Susitna River at Flathorn Station was operated from May 27 through September 23, 1985. The east bank trap was operated from May 28 through September 23, 1985. The traps were fished for 12 hours per day from approximately 0700 to 1900 hours. High debris levels precluded continuous 24 hour sampling at Flathorn Station. The traps were cleaned at one to three hour intervals throughout the fishing period to maintain optimum trap efficiency. Trap checks, including the sampling of collected fish and associated habitat parameters, were conducted from one to three times for each daily fishing period. To detect any obvious diurnal variations in fish movement past the sampling sites, the traps were operated on a continuous schedule from approximately 0700 hours of the first day to approximately 1900 hours of the following day once each week for eight weeks from June 29 through August 24.

All juvenile fish captured were anesthetized using MS-222 (Tricaine methanesulfonate). Field specimens were identified to species using the guidelines set forth by McConnell and Snyder (1972), Trautman (1973),

and Morrow (1980). Juvenile chinook and coho salmon were checked for cold brand marks and chum fry and sockeye juveniles were checked for adipose fin clips. Biological data were recorded for all fish collected at the traps. The fish were then held until recovery from the anesthetic was complete before being released downstream of the traps.

The biological data recorded included catch by species and age class for each trap check. In addition, total lengths were recorded to the nearest millimeter (mm) for a daily sample of up to 50 fish per species and age class captured in each trap. Three samples for each one millimeter length increment through the range of lengths collected were drawn monthly and weighed to the nearest 0.1 gram. Scale samples for chinook, coho, and sockeye salmon juveniles were collected during two week intervals from a sub-sample of three fish drawn from samples of fish grouped into five millimeter groupings for each species.

Water temperature (C^{o}) and turbidity (NTU) were recorded daily at each trap (Appendix A). The depth the traps were fished (feet), the water velocity (feet per second), and the mainstem river stage data (as determined from staff gages) were recorded during each trap check. The depth fished was recorded from the water surface to the bottom of the leading edge of the inclined plane. The trap fishing depth ranged from 1.0 to 3.3 feet. Velocity measurements were taken with a Marsh-McBirney velocity meter in front of the inclined plane at one-half of the depth fished. Biological and habitat data were entered onto field data forms and then into an Epson HX-20 microcomputer in the field. Computer entries were made for each trap check throughout the field season.

2.2.1.2 Talkeetna Station

The stationary outmigrant trap on the east bank of the Susitna River at Talkeetna Station was operated from May 27 through October 12, 1985. The west bank trap was operated from May 31 through October 12, 1985.

The traps were fished continuously through the open-water season. Data were collected similar to the procedures outlined for Flathorn Station (Section 2.2.1.1) except that as the Susitna River is a single channel at Talkeetna Station, water temperature and turbidity were measured only at the east bank trap (Appendix A), and weight and scales were obtained from samples drawn from the daily catch from both traps. Chum and sockeye salmon juveniles with a clipped adipose fin were passed through a detector to verify the presence or absence of a coded wire tag. All fish with coded wire tags recovered at the traps were preserved and the tags were later removed and decoded. Juvenile chinook and coho salmon collected at the traps were checked for a cold brand mark and all recovered marks were recorded.

2.2.2 Mobile trap

The mobile outmigrant trap was designed similarly to the stationary traps. The trap is 34 feet long and 11 feet wide with an inclined plane measuring 4.5 feet wide and 13 feet long. The trap is capable of

fishing to a maximum sampling depth of six feet. The trap is powered by two 50 horse power outboard engines equipped with 10.5 inch diameter by 13.0 inch pitch propellers.

The mobile trap was operated from June 6 through August 24 at Flathorn Station to sample the horizontal and vertical distribution of juvenile salmon. For five days each week during the sampling season, the mobile trap was fished for 15 to 20 minutes daily within each of the 12 horizontal strata along the transect line to establish horizontal distribution.

Positions of the mobile trap along the transect line were determined by sightings between fixed targets placed on the east and west banks of the river. Position at each transect sampling point was maintained by deploying an anchor from the bow of the trap. If substrate or velocity prevented the anchor system from maintaining trap position, the trap was held in place using the engines. Data recorded for the mobile trap at each sampling point included transect point number, depth fished (feet), velocity (feet per second), total time fished (minutes), species composition, and total length for each fish captured.

2.2.3 Coded wire tagging

Coded wire tagging of post-emergent chum and sockeye salmon fry was conducted from May 22 through June 27, 1985. The coded wire tagging equipment, implantation procedures, fish collection techniques, and data recording were similar to those outlined by Roth and Stratton (1985) except that 200 fish per tagging day (compared to 100 fish in 1984) were sampled in 1985 to determine the tag retention rates.

2.2.4 Cold branding

Mark-recapture studies were conducted from July 3 through October 12 to monitor distributional behavior of chinook and coho salmon in the middle river. Trapping at the mouth of Indian River was conducted daily while sites in Portage Creek and upper Indian River were sampled every four days. Baited minnow traps or beach seines were used to capture fish which were then transported to Gold Creek and held overnight, before being branded the following day. Fish were held for four days after branding to determine marking mortality before being released at the sites of capture.

The branding equipment and procedures were the same as those outlined by Roth and Stratton (1985). Juvenile chinook and coho salmon were branded with a distinctive mark to signify the collection site and period of their capture. Brands for Indian River mouth were changed every seven days. The brands at all other sampling sites were changed every eight days. Total length measurements were taken from a sub-sample of 50 fish drawn from the catch for each time period and capture location for all species. Data recorded were the same as that outlined by Roth and Stratton (1985). Brand symbols, release dates, and the number of fish branded by species and collection site during the cold-branding program are presented in Appendix B.

Minnow trap sampling was conducted at the 14 mainstem side channel and slough sites three to five times during the season. The number of fish captured, the number of marked fish recaptured, and the brand symbols of these marked fish were recorded.

Chum and sockeye salmon fry were experimentally cold branded to test the feasibility of this technique as a more cost-effective marking procedure than the use of coded wire tags. The results of this experiment are presented in Appendix C.

2.3 Data Analysis

2.3.1 Juvenile salmon catch per unit effort

The stationary trap data for both Flathorn and Talkeetna stations are for both bank traps combined because of the similarity in the beginning and end points of the outmigration (timing) recorded for both traps at each site. The catch data recorded for juvenile salmon at the stationary outmigrant traps are presented as the average catch per hour for each calander day of sampling effort. Tables of the raw catch data and figures of the catch per unit effort (CPUE) data for each trap at Flathorn Station are presented by species and age class in Appendix D.

The catch at Talkeetna and Flathorn stations were expanded to 24-hour fishing periods by dividing the number of hours fished on a given day into 24 and then multiplying this ratio by the catch for each species and age class. This calculation was done so that each day's effort was weighted equally for presentation as cumulative catch. The CPUE plotted for each species and age class of juvenile salmon collected at the stationary traps at both sites were calculated using the von Hann linear filter (Dixon et al. 1981) as presented in Roth and Stratton (1985). The cumulative catch totals were adjusted for days not fished by tabulating the mean of the total catches recorded for the three days preceding and the three days following an unsampled day.

The mobile trap catch data were adjusted for the days not fished by tabulating the mean of the total catches recorded for the day preceding and the day following an unsampled day. These catch rates were then smoothed for graphic presentation using the linear filter. Due to the large differences between velocities at each sampling stratum, the horizontal distribution data collected at Flathorn Station are presented as the catch per unit volume rather than catch per unit time.

A linear regression of the natural logarithm of weight versus the natural logarithm of length for each of the salmon species was calculated (Le Cren 1951). The regression equations were used to provide estimates of the total biomass passing the Talkeetna and Flathorn station outmigrant traps by two week sampling period through the season (Appendix E).

2.3.2 Population estimates

Population estimates for chum and sockeye salmon fry were calculated using the methods outlined in Roth and Stratton (1985) except that in addition to the Schaefer (1951) method, population estimates were also generated using the Peterson estimate outlined by Chapman (1951). The Petersen estimate was included because the Schaefer method does not provide a calculation of confidence intervals for the population estimates.

3.0 RESULTS AND DISCUSSION

In this report, fry are defined as age 0+ fish while the term juvenile is used to describe the group of all age classes of salmon prior to their entry into the ocean.

Observations of the catch per unit effort (CPUE), size, distribution, and abundance of juvenile salmon are presented by species and age class. The CPUE information is presented for Talkeetna and Flathorn stations to allow comparisons of the timing of outmigration past these two sites. However, as the middle river spawning escapements represent less than 10% (estimated from the data presented by Thompson et al. 1986) of the total escapement into the Susitna River drainage, peak juvenile salmon catches recorded at Flathorn Station should not be considered a primary result of fish outmigrating from the middle reach. Rather, the Flathorn Station catches are made up of fish produced throughout the drainage.

3.1 Chinook Salmon

3.1.1 Catch per unit effort

3.1.1.1 Age 0+

A total of 3,905 age 0+ chinook salmon were collected during surveys of Portage Creek (RM 148.8) from July 9 through September 25, 1985. Sixty-one percent of the fish were collected by seining in the upstream site (TRM 5.1). Trapping at the mouth (TRM 0.0) and at the upstream site accounted for the remaining 39%. Trap catches ranged from a high of 15.3 fry per trap on August 9 to 2.2 fry per trap on August 21 (Table 1). Peak catches were also recorded during the initiation of sampling in early July and again in mid-September.

Surveys of Indian River sites (RM 138.6; TRM 0.0 to 11.9) collected 32,260 age 0+ chinook salmon from July 3 through October 10, 1985. Eighty-one percent of the season trapping effort in this tributary was conducted at the mouth (site 1) and accounted for 62% of the fish collected in Indian River.

Chinook fry catches at Indian River mouth were highest during early July with the peak mean catch of 32 fry per trap recorded on July 9 (Fig. 4 upper). By the end of July, Indian River discharges were rising to the point that the associated high water velocities appeared to reduce the habitat quality at the sampling sites. These high flows also resulted in decreased trap efficiency. Catches declined in the first two weeks of August and peak flood discharges which prevented sampling were observed in Indian River from August 14 through 17. Sampling was resumed at the mouth site on August 17 and a second peak in catch rates (16 fish per trap) was recorded the following day. The higher catches were possibly due to increased trap efficiency with lower flows and the collection of fry which had been displaced from areas upstream during the high flow period. Declining catches at the mouth of Indian River after the August peak may have been a result of a reduction in the

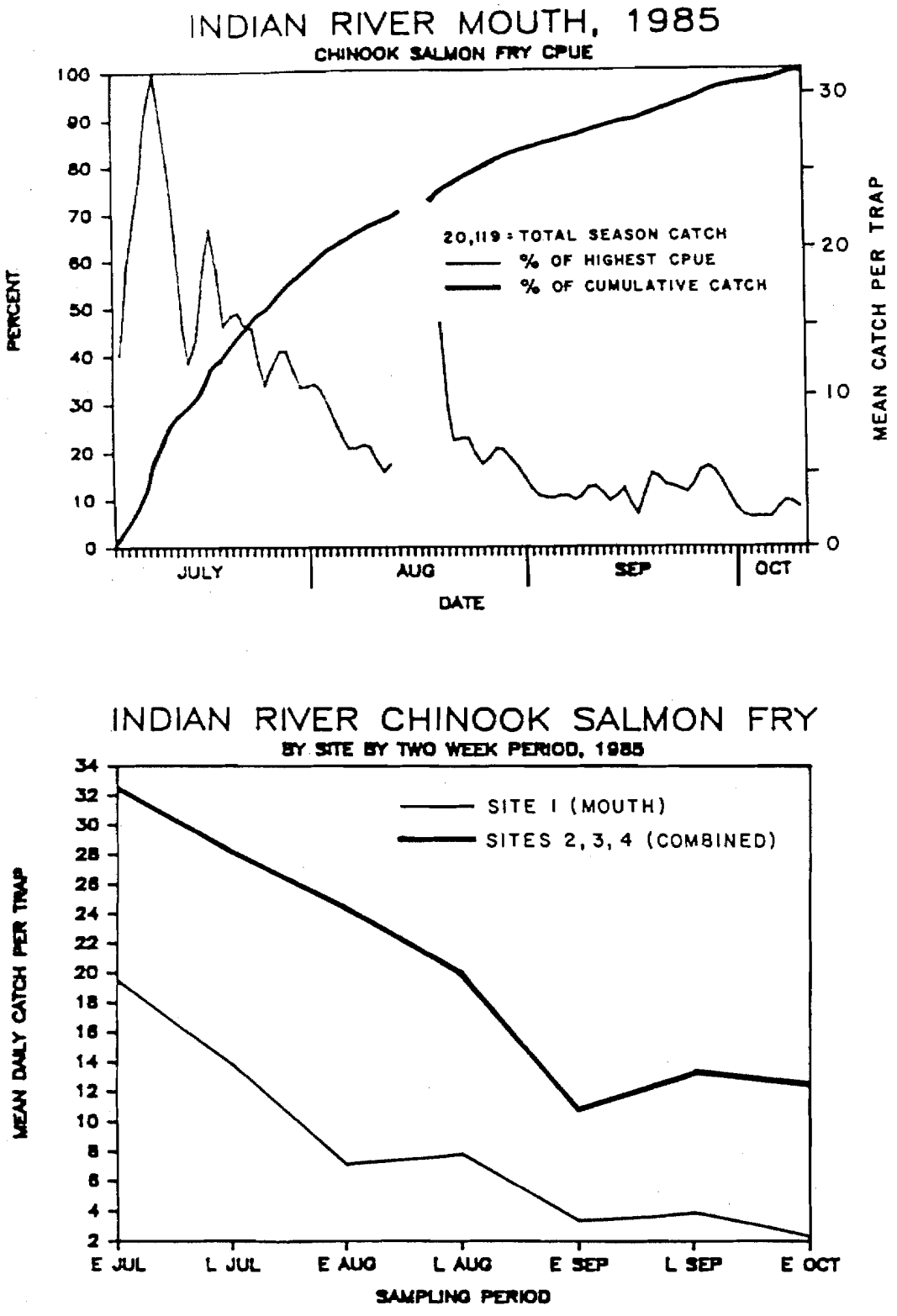

Figure 4. Chinook salmon (age 0+) daily catch per unit effort and cumulative catch recorded at the mouth of Indian River (upper figure) and the catch per trap by site by two week period at the four sampling sites in Indian River (lower figure), 1985.

number of downstream migrating fry to replace those fish which were captured and removed from the sampling site. Also, decreasing discharges may have caused a reduction in the amount of available rearing habitat.

Table 1. Chinook salmon (age 0+) catch per trap by sampling date for Portage Creek, 1985.

Sampling Date	Number Caught	Number of Traps	Catch Per Trap	Sampling Date	Number Caught	Number of Traps	Catch Per Trap
12-Jul	276	25	11.0	29-Aug	122	20	6.1
19-Jul	81	20	4.1	03-Sep	85	20	4.3
20-Jul	59	20	3.0	07-Sep	155	20	7.8
09-Aug	153	10	15.3	11-Sep	129	10	12.9
17-Aug	48	5	9.6	17-Sep	132	20	6.6
21-Aug	44	20	2.2	25-Sep	96	20	4.8
25-Aug	130	20	6.5				

Chinook fry were more abundant in the three upstream sites as the average CPUE for the three upper sites combined was higher than at the mouth (Fig. 4 lower). Nineteen percent of the effort was concentrated in the three upstream sites which accounted for 38% of the total chinook fry caught in Indian River. Chinook fry catches at sites 3 and 4, the two uppermost sampling sites in Indian River, were highest in early July while the peak catch per trap day in the next lower site (site 2) occurred in early August (Table 2). Similar to the observations for chinook fry catches at the mouth of Indian River (site 1), an increase in catches was recorded at all upper Indian River sites following the high discharge period in mid-August. The increase in catches may have been a result of increased trap efficiency (lower flows) and the addition of fry from upstream areas.

Table 2. Chinook salmon (age 0+) catch per trap by site and sampling date for the three upstream sites in Indian River, 1985.

	SITE 2			SITE 3			SITE 4		
Sampling Date	Number Caught	Number of Traps	Catch Per Trap	Number Caught	Number of Traps	Catch Per Trap	Number Caught	Number of Traps	Catch Per Trap
06-Jul	175	10	17.5	549	10	54.9	198	10	19.8
10-Jul	98	9	10.9	773	10	77.3	282	9	31.3
14-Jul	195	10	19.5	365	10	36.5	232	10	23.2
18-Jul	313	10	31.3	527	10	52.7	109	10	10.9
24-Jul	203	10	20.3	511	10	51.1	176	10	17.6
28-Jul	319	10	31.9	227	10	22.7	158	10	15.8
01-Aug	272	10	27.2	366	10	36.6	128	10	12.8
05-Aug	418	10	41.8	250	10	25.0	115	10	11.5
09-Aug	318	10	31.8	165	10	16.5	162	10	16.2
17-Aug	147	10	14.7	133	10	13.3	107	10	10.7
21-Aug	298	9	33.1	186	10	18.6	151	10	15.1
25-Aug	400	10	40.0	280	10	28.0	66	10	6.6
29-Aug	303	10	30.3	245	10	24.5	61	10	6.1
03-Sep	241	10	24.1	65	10	6.5	42	10	4.2
07-Sep	187	10	18.7	40	10	4.0	42	10	4.2
11-Sep	274	10	27.4	62	10	6.2	32	10	3.2
17-Sep	178	10	17.8	92	10	9.2	67	10	6.7
25-Sep	248	10	24.8	169	10	16.9	45	10	4.5
01-Oct	252	10	25.2	95	10	9.5	29	10	2.9

Fourteen slough and sidechannel sites (page 10) between Portage Creek and Talkeetna Station (RM 103.0) were each sampled with minnow traps three to five times between late July and early October to determine the extent of redistribution of chinook fry in the middle river (Table 3). No spawning of chinook salmon has been recorded at any of these sloughs and sidechannels (Barrett et al. 1985). High catches of fry at these sites indicates that they provide important rearing habitat for fry which have outmigrated from their natal tributaries. Trap catches and recaptures of branded fish were highest at sites that were in close proximity to the two marking sites, Indian River and Portage Creek. The highest CPUE at the 14 sampling sites was recorded at Slough 22 on August 29 (47.2 fish per trap).

The timing of age 0+ chinook salmon outmigration was similar at both Talkeetna and Flathorn stations during 1985 (Fig. 5). Ninety percent of the total season catch was recorded during July and August at both stations.

A total of 16,570 chinook salmon fry were collected in the Talkeetna stationary outmigrant traps during 1985. Peak catches were recorded from early July through late August with the highest catch of 24.7 chinook fry per hour recorded on July 6 (Fig. 5 upper). Outmigration began on July 1 with 50% of the season's catch recorded by July 18. A smaller peak in catches was recorded in the traps on August 18. This peak corresponds with the high catches recorded for chinook fry at the mouth of Indian River during this same period (Fig. 4 upper) and may have been due to migrating fry which were displaced from Indian River during the high flows. Ninety-five percent of the catches at Talkeetna Station were recorded by late August although chinook fry were captured through the remainder of the sampling season at this site.

The stationary traps at Flathorn Station collected 5,338 chinook fry with peak catches recorded from late June through late August (Fig. 5 lower). The chinook fry catches at this site peaked at 6.2 fish per hour on July 6 with 50% of the captures recorded by July 22. Similar to Talkeetna Station, 95% of the season's catch of chinook fry at Flathorn Station was recorded by late August indicating similar outmigration timing for chinook fry in both reaches during the 1985 open-water period.

Catches of the 466 chinook salmon fry collected in the mobile outmigrant trap during the horizontal distribution studies peaked in mid-July and again in mid-August (Fig. 6 upper). Fifty percent of the catches were recorded by July 29. As recorded by the stationary traps at this site, chinook fry outmigration had begun by the end of June and, as shown by the slope of the cumulative catch, was comparatively steady through mid-August. Chinook fry were captured primarily at the two bank transects (Fig. 6 lower). Thirty-two percent of the 466 chinook fry captured in the mobile trap were collected at the two bank transects which represented only 17% of the horizontal sampling effort indicating a tendency for chinook fry to migrate near the banks of the river.

Table 3. Chinook salmon (age 0+) catch per trap and the number of branded fish recaptured by site and date for the 14 selected sites in the middle reach of the Susitna River, 1985.

Sampling Site	Date	Total Catch	Catch Per Trap	# of Fish Recaptured	Percent Recapture
Slough 6A (RM 112.3)	8/6	393	39.3	8	2.0
	8/17	103	10.3	0	0.0
	9/3	11	1.1	0	0.0
	9/22	15	1.5	0	0.0
Slough 8A (RM 125.3)	8/24	65	6.5	0	0.0
	9/6	18	1.8	0	0.0
	9/26	118	11.8	1	0.8
Slough 9A (RM 133.6)	8/23	22	2.2	1	4.5
	9/11	48	4.8	3	6.3
	9/26	56	5.6	3	5.4
Slough 10 (RM 133.8)	8/7	46	4.6	1	2.2
	8/25	61	6.1	1	1.6
	9/6	234	23.4	1	0.4
	9/27	176	17.6	3	1.7
Sidechannel 10A (RM 133.9)	8/24	37	3.7	0	0.0
	9/6	208	20.8	2	1.0
	10/4	248	9.9	3	1.2
Slough 14 (RM 135.9)	8/23	128	12.8	2	1.6
	9/11	83	8.3	2	2.4
	9/27	49	4.9	1	2.0
Slough 15 (RM 137.2)	8/20	368	36.8	11	3.0
	9/2	344	34.4	10	2.9
	9/19	352	35.2	10	2.8
	9/28	696	27.8	11	1.6
Slough 16 (RM 137.7)	7/29	84	8.4	2	2.4
	8/12	291	29.1	6	2.1
	8/29	51	5.1	5	9.8
	9/14	186	18.6	5	2.7
	10/1	252	25.2	8	3.2
Slough 17 (RM 138.9)	8/18	78	7.8	1	1.3
	9/2	80	8.0	0	0.0
	9/19	60	6.0	0	0.0
Slough 19 (RM 139.7)	8/12	9	0.9	0	0.0
	9/2	25	2.5	0	0.0
	9/19	36	3.6	0	0.0
Slough 20 (RM 140.1)	7/31	14	1.4	0	0.0
	9/5	30	3.0	0	0.0
	9/21	21	2.1	0	0.0
Slough 21 (RM 142.0)	7/29	1	0.1	0	0.0
	8/18	41	4.1	0	0.0
	9/5	39	3.9	0	0.0
	9/21	118	11.8	0	0.0
Anna Creek Slough (RM 143.2)	7/29	75	7.5	0	0.0
	8/18	115	11.5	0	0.0
	9/5	207	20.7	0	0.0
	9/21	305	30.5	0	0.0
Slough 22 (RM 144.3)	7/29	13	1.3	0	0.0
	8/12	368	36.8	0	0.0
	8/29	472	47.2	2	0.4
	9/14	374	37.4	0	0.0
	10/9	247	24.7	0	0.0

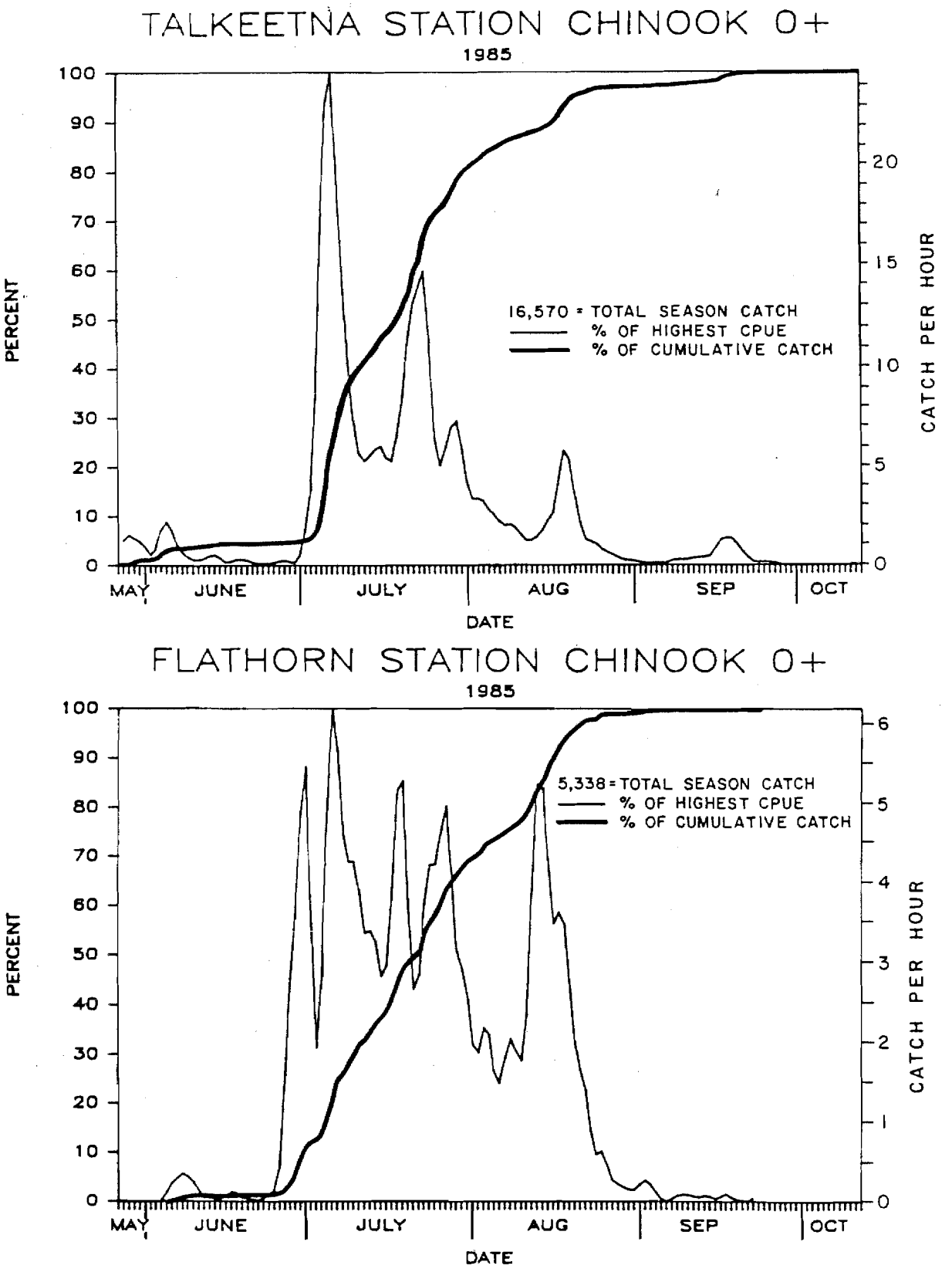

Figure 5. Chinook salmon (age 0+) daily catch per unit effort and cumulative catch recorded at the Talkeetna (upper figure) and Flathorn (lower figure) stationary outmigrant traps, 1985.

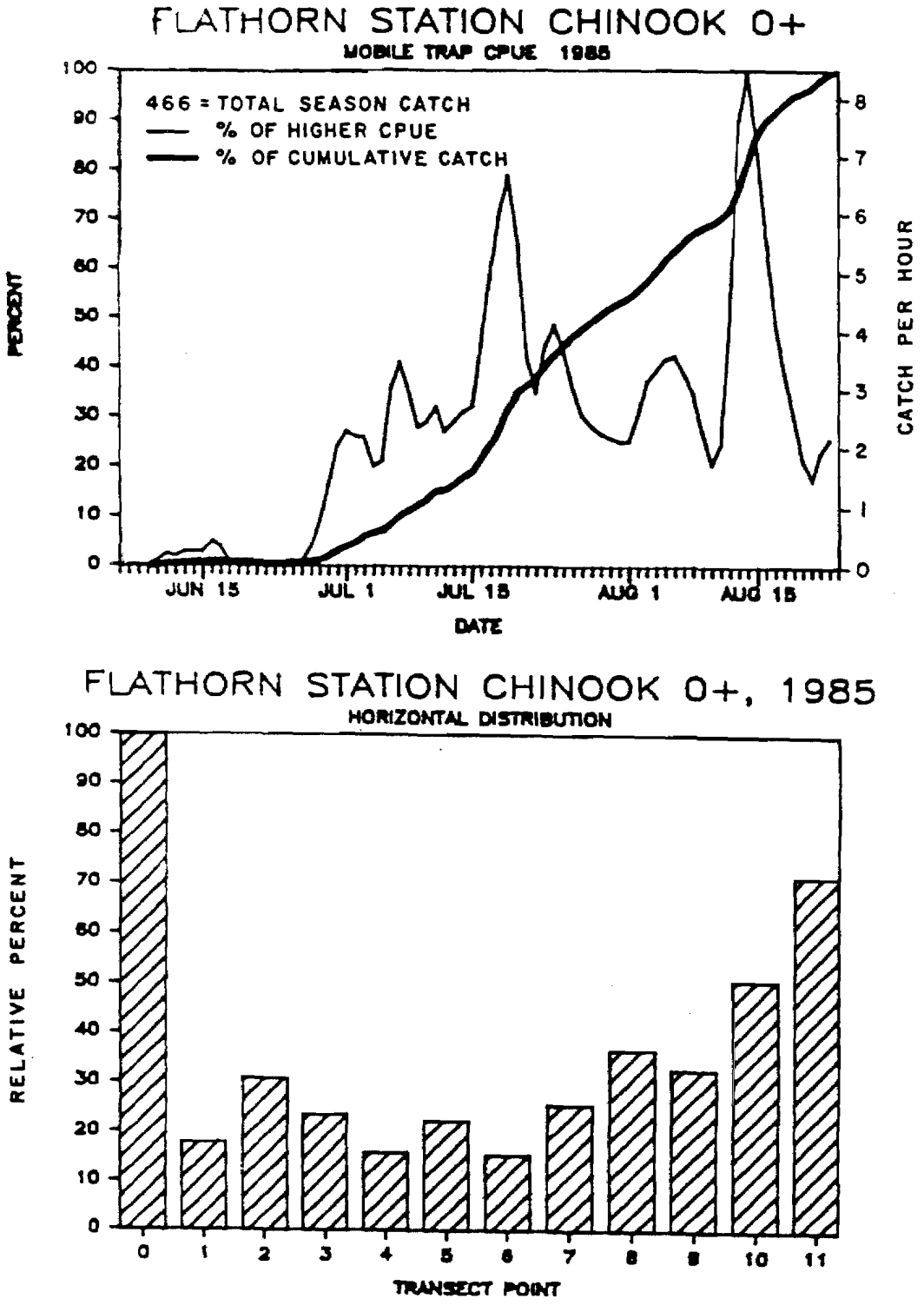

Figure 6. Chinook salmon (age 0+) daily catch per unit effort and cumulative catch (upper figure) and the catch as a percent of the highest catch per unit volume by transect point (lower figure) recorded at the Flathorn Station mobile outmigrant trap, 1985.

3.1.1.2 Age 1+

A total of 51 age 1+ chinook salmon juveniles were captured during the cold-branding program. All of the captures were recorded in Indian River, primarily during July and August. Stratton (1986) found chinook salmon juveniles overwintering in Indian River in the spring of 1985, but most of these age 1+ fish had apparently outmigrated from this tributary before the cold-branding program began in July.

Peak catches of age 1+ chinook salmon captured at the Talkeetna Station outmigrant traps were recorded in late May and early July (Fig. 7 upper). Fifty percent of the 2,494 age 1+ chinook caught at this site were collected by July 3. The highest catch for this age class was 7.0 fish per hour on July 4. The outmigration of age 1+ chinook salmon from the middle river during the open-water period was essentially complete by mid-July although a few fish were captured in the traps through late August.

As was observed at Talkeetna Station, the outmigration of age 1+ chinook salmon past Flathorn Station was already in progress when the traps were deployed in late May (Fig 7 lower). The highest catch of the season was 7.3 fish per hour recorded on June 27 (the date when 50% of the 3,241 age 1+ chinook were caught) and 95% of the total season's catch of this age class was recorded by late July.

Catches of age 1+ chinook salmon captured in the Flathorn Station mobile trap peaked at 12.8 fish per hour on June 28 and 50% of the 428 age 1+ chinook catch was recorded by July 1 (Fig. 8 upper). Similar to the age 0+ chinook salmon, the highest catches of age 1+ chinook in the mobile trap were recorded at the two bank transect sites (Fig 8 lower).

Catches of age 1+ chinook salmon in the outmigrant traps indicate that the migration of this age class in both reaches of the Susitna River had begun by the time sampling was initiated following break-up. Stratton (1986) observed that the outmigration of age 1+ chinook salmon during the spring of 1985 had begun prior to break-up in the middle river. The outmigration from the Susitna River was essentially completed for this age class by late July.

3.1.2 Size

3.1.2.1 Age 0+

Mean total lengths for chinook salmon fry increased through the season at individual sites (Table 4). During each sampling period, mean total lengths were progressively larger for sites further downstream. Chinook fry with the shortest mean length during each period were collected in Portage Creek (RM 148.8) while the longest mean lengths were observed for chinook fry collected at Flathorn Station (RM 22.4).

Chinook fry collected in the stationary outmigrant traps during early June averaged 40 mm at both Talkeetna and Flathorn stations but by early

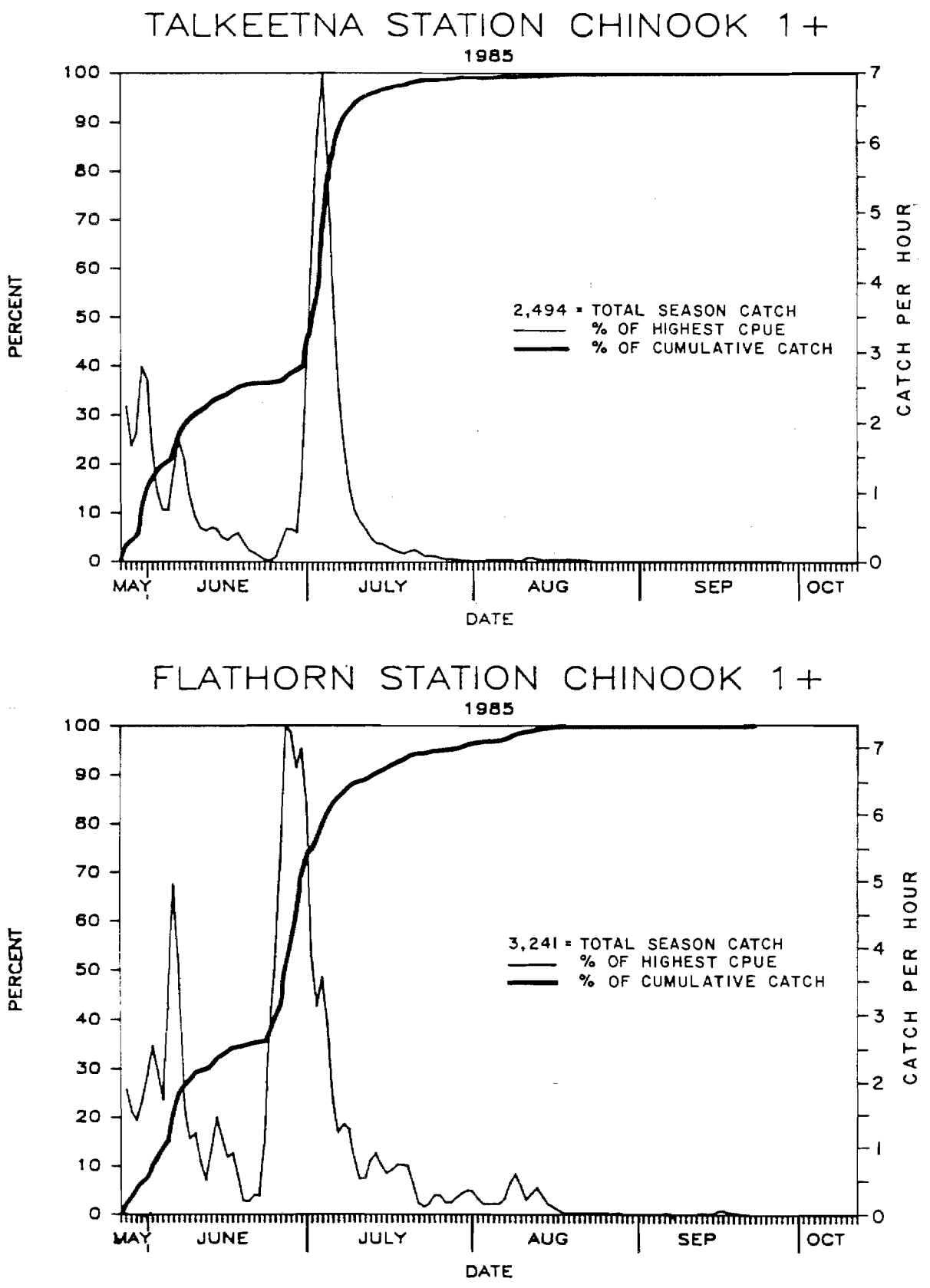

Figure 7. Chinook salmon (age 1+) daily catch per unit effort and cumulative catch recorded at the Talkeetna (upper figure) and Flathorn (lower figure) stationary outmigrant traps, 1985.

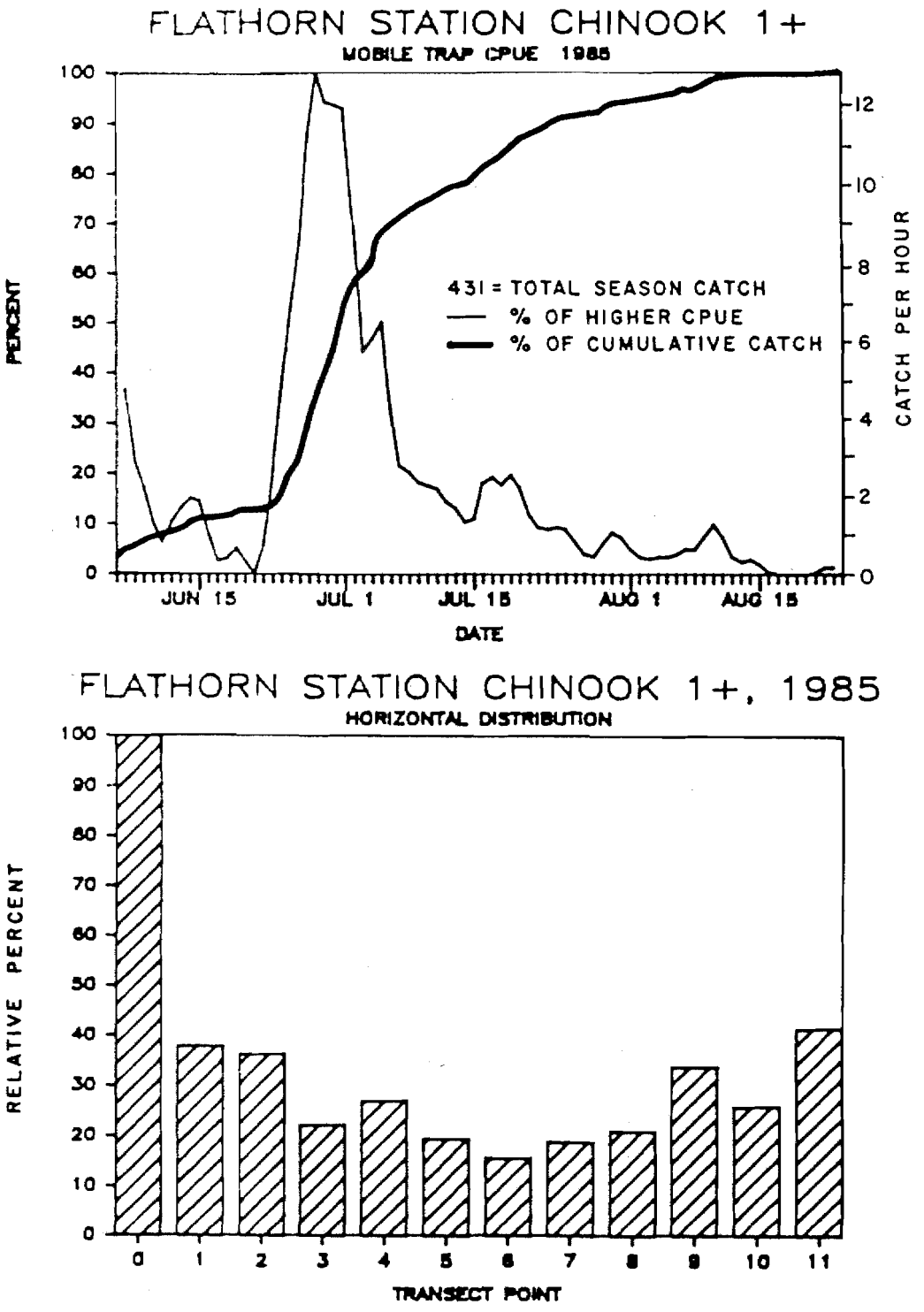

Figure 8. Chinook salmon (age 1+) daily catch per unit effort and cumulative catch (upper figure) and the catch as a percent of the highest catch per unit volume by transect point (lower figure) recorded at the Flathorn Station mobile outmigrant trap, 1985.

Table 4. Chinook salmon (age 0+) mean total length, range of lengths, and associated confidence intervals by site and sampling period in the Susitna River, 1985.

Sampling Period	Portage Creek				Indian River Mouth				Talkeetna Station				Flathorn Station				Flathorn Mobile Trap			
	n	Mean Length	Range of lengths	95 % C.I.	n	Mean Length	Range of lengths	95 % C.I.	n	Mean Length	Range of lengths	95 % C.I.	n	Mean Length	Range of lengths	95 % C.I.	n	Mean Length	Range of lengths	95 % C.I.
May 27 to June 15	a	-	-	-	a	-	-	-	470	39.6	34-47	0.2	68	40.0	32-46	0.8	3	42.7	42-43	1.4
June 16-30	a	-	-	-	a	-	-	-	113	43.2	32-62	1.0	241	50.4	33-68	0.6	8	48.5	42-56	4.4
July 1-15	101	40.3	36-51	0.8	57	43.9	38-64	1.7	645	50.1	33-71	0.6	960	58.7	34-75	0.5	77	59.5	40-73	2.2
July 16-31	150	43.0	34-52	0.5	54	48.0	39-62	1.3	943	53.3	35-80	0.6	1427	63.8	38-82	0.4	172	67.6	43-79	1.0
August 1-15	51	47.4	41-64	1.1	50	51.2	41-63	1.3	855	55.9	37-88	0.7	982	71.5	41-89	0.5	160	75.0	56-89	1.0
August 16-31	150	49.7	40-61	0.7	50	56.1	44-67	1.4	627	57.3	39-85	0.7	568	71.7	42-95	0.7	53	74.5	47-89	2.1
September 1-15	100	50.9	40-68	1.1	101	61.6	47-78	1.0	158	60.7	45-84	1.2	23	75.6	48-88	6.3	a	-	-	-
September 16 to October 12	50	52.4	38-61	1.4	50	65.7	53-78	1.8	237	63.7	43-92	1.1	10	76.3	65-85	7.5	a	-	-	-

a Not sampled

C.I. = 95% confidence intervals plus or minus the mean length

July during the peak period of outmigration for both sites, lower river chinook fry averaged 9 mm longer than fry collected in the middle river. This trend of longer lengths continued and by the end of the sampling season, lower river chinook fry averaged 76 mm which was 12 mm longer than fry collected in the middle river at Talkeetna Station.

The differences in mean length between sites and between reaches may be due to several factors including differences in water temperatures, emergence timing, habitat conditions, and genetics. Roth and Stratton (1985) observed that chinook fry collected in the Deshka River (RM 40.6) in 1984 averaged 10 to 15 mm longer than fry collected in Indian River during the same periods. The incubation and rearing conditions in these two tributaries differ in that Indian River is a fast-flowing river with cool water temperatures and limited rearing areas, while the Deshka River is slower flowing with seasonably warmer water temperatures and abundant rearing habitat. Size differences observed between sites in Table 3 is most probably explained by a combination of factors acting on a number of mixed stocks which had hatched and reared under varying habitat conditions.

3.1.2.2 Age 1+

The mean total length of age 1+ chinook salmon, similar to age 0+ fish, was larger in the lower river than in the middle river during the open-water period. Age 1+ chinook salmon averaged approximately 81 mm during their outmigration past Talkeetna Station while age 1+ chinook collected at Flathorn Station averaged 87 mm during this same period.

3.1.3 Mark-and-recapture

A total of 3,771 juvenile chinook salmon were cold branded and released in Portage Creek from July 9 through September 25, 1985. The difference between the number caught and the number branded is a result of mortality occurring during the collection and branding procedures. Chinook fry mortality during this cold branding operation in Portage Creek was 3.4%.

A total of 30,567 chinook salmon fry were cold branded and released in Indian River from July 3 through October 10, 1985. Chinook salmon fry mortality from cold branding was 4.4% in Indian River.

Cold branding conducted at Sidechannel 10A and Slough 15 contributed an additional 653 and 1,448 branded chinook salmon fry, respectively, to the marked fish pool for the middle river mark-recapture program.

3.1.3.1 Spatial and temporal distribution

A portion of the chinook salmon fry which were branded and released in the middle river in 1985 remained at the capture sites for a period of time before migrating suggesting that many of the chinook fry collected at the branding sites in the middle river were actively rearing at these sites.

Ninety-two fry branded in Portage Creek were recaptured in this tributary from 1 to 34 days (mean; 10 days) after their release. Of the chinook fry branded and released at the mouth of Indian River, 132 were later recaptured at the release site. Residence time for these recaptures was from 1 to 76 days (mean; 9 days) after release. At the three upstream sites in Indian River, 341 chinook fry which were branded at these sites were recaptured at the release sites from 1 to 61 days (mean; 18 days) after release.

In addition to the chinook salmon which were branded and recovered in 1985, 38 age 1+ chinook salmon which were recaptured at Talkeetna Station in 1985 (1.5% of the age 1+ chinook salmon captured at this site) had been branded during the 1984 summer program or the 1984-85 winter program. The majority (60%) of these fish were branded and released during the 1984 summer cold-branding program in Indian River (Table 5).

Juvenile chinook salmon with cold brands were recaptured at numerous sites in the middle reach of the Susitna River during 1985. However, no branded chinook salmon were captured at Flathorn Station. Also, no recaptures of branded chinook fry were made at sampling sites located upstream from the sites where they were released.

Of the chinook salmon fry branded and released in Portage Creek, five were recaptured at the mouth of Indian River. In addition, six chinook fry branded in Portage Creek were recaptured at the selected slough sites and two were recovered at Talkeetna Station.

Fifty-five of the chinook fry branded at the three upper Indian River sites were recaptured at the mouth of Indian River from 1 to 55 days (mean; 18 days) after their release at the upstream sites. In addition, 23 chinook salmon fry branded at the three upper sites in Indian River were subsequently recaptured in this tributary at sites downstream from the areas of release. These recaptures were made from 4 to 38 days (mean; 25 days) after release.

Chinook salmon fry branded at the four Indian River sites were also recaptured during sampling of other middle river sites. Trapping at the 14 selected sites in the middle river captured 97 branded chinook salmon fry which had been previously released in Indian River. These recaptures were recorded from 1 to 73 days (mean; 23 days) after release. Seventy percent of the recaptures were made at sloughs 15 and 16, the two nearest sites downstream from Indian River. In addition, the Talkeetna Station traps recovered 53 branded chinook salmon fry which had been released at the mouth of Indian River from 1 to 61 days (mean; 29 days) earlier and nine recaptures of chinook fry which had been released in the three upper Indian River sites from 1 to 37 days (mean; 17 days) earlier.

The information collected in 1985 suggests that the distribution of chinook fry, after emergence, is subject to flow conditions and to the amount of rearing habitat available. The natal tributaries provide the

Table 5. Release and recapture data for the chinook and coho salmon juveniles cold-branded in the middle river between August 10, 1984 and April 15, 1985 which were recaptured at the Talkeetna Station outmigrant traps in 1985.

Talkeetna Trap 1985 Recapture Data				Branding Release Data		Talkeetna Trap 1985 Recapture Data				Branding Release Data	
#	Date	Species	Length	Date	Location	#	Date	Species	Length	Date	Location
1	5/28	Chinook	65	8-29-84	Slough 19	21	6/10	Chinook	95	4-16-85	Slough 9A
2	5/31	Chinook	81	11/15/84	Slough 22	22	6/13	Chinook	62	1-8-85	Slough 22
3	5/31	Chinook	86	9-25-84	Indian R.	23	6/13	Chinook	62	2-20-85	Slough 22
4	5/31	Chinook	77	9/24/84	Indian R.	24	6/13	Chinook	67	2-20-85	Slough 22
5	5/31	Chinook	77	9-13-84	Slough 22	25	6/13	Chinook	72	9-11-84	Indian R.
6	6/1	Chinook	74	12/15/84	Slough 9A	26	6/20	Chinook	86	9-11-84	Indian R.
7	6/1	Chinook	73	9-11-84	Indian R.	27	7/3	Chinook	75	8-27-84	Indian R.
8	6/1	Chinook	70	9/11/84	Indian R.	28	7/3	Chinook	70	9-11-84	Indian R.
9	6/1	Chinook	65	10/11/84	Slough 20	29	7/3	Chinook	70	8-27-84	Indian R.
10	6/1	Chinook	80	12-18-84	Indian R.	30	7/4	Chinook	85	8-11-84	Indian R.
11	6/2	Chinook	78	10/9/84	Indian R.	31	7/4	Chinook	90	8-11-84	Indian R.
12	6/2	Chinook	91	10-9-84	Indian R.	32	7/4	Chinook	93	8-10-84	Indian R.
13	6/2	Chinook	73	10/10/84	Indian R.	33	7/5	Chinook	83	1-24-85	Slough 22
14	6/4	Chinook	84	12-16-84	Slough 22	34	7/5	Chinook	82	3-14-85	Indian R.
15	6/6	Chinook	80	9/13/84	Slough 22	35	7/6	Chinook	82	1-24-85	Slough 22
16	6/7	Chinook	66	9/13/84	Slough 22	36	7/7	Chinook	74	12-16-84	Slough 22
17	6/7	Chinook	88	10/10-84	Indian R.	37	7/9	Coho	73	10-26-84	Indian R.
18	6/8	Chinook	76	9/11/84	Indian R.	38	7/13	Coho	77	3-14-85	Indian R.
19	6/8	Chinook	79	8-10-84	Indian R.	39	7/14	Chinook	80	4-15-85	Slough 22
20	6/8	Chinook	82	9/11/84	Indian R.	40	7/15	Chinook	79	9-11-84	Indian R.

necessary habitat for some of the chinook fry but the remainder are forced to outmigrate during the summer. Their redistribution appears to include a bank oriented downstream migration which allows the fry to locate additional rearing areas. Many of these fry in the middle river find suitable habitats in the sloughs and sidechannels of this reach while the remainder continue into the lower river.

The recovery of branded chinook salmon juveniles at the various sampling sites in the middle river coupled with the outmigrant trap data at Talkeetna and Flathorn stations suggest the presence of the three life history groups discussed in Roth and Stratton (1985). The collection of branded chinook in Portage Creek and Indian River during the open-water period and the recapture of branded chinook in Indian River through the previous winter (Stratton 1986) suggest that a portion of the juvenile chinook salmon in the middle river remain in their natal sites until their outmigration to the ocean as age 1+ fish. A second group of chinook salmon juveniles is comprised of fish which spend a portion of their first summer in their natal tributaries and then redistribute downstream. Some of these fish find suitable rearing and overwintering habitat in sloughs and sidechannels in the middle river while the remainder continue downstream to sites in the lower river. These fish then enter the ocean the following year as age 1+ fish. The third group of juvenile chinook salmon, as suggested by the catches at Flathorn Station, are made up of fish which rear for a time in the Susitna River but then enter the ocean during their first summer as age 0+ fish. Scales collected from adults at Flathorn Station indicates that juveniles which migrate to the ocean as age 0+ fish probably represent a small percentage of the total population, have very low survival rates, or a combination of these factors. Thompson et al. (1986) reported that of the 1,976 adult chinook salmon scale samples analyzed from Flathorn Station in 1985, only 5% indicated the fish had outmigrated to the ocean as age 0+ fish.

3.2 Coho Salmon

3.2.1 Catch per unit effort

3.2.1.1 Age 0+

Only 201 age 0+ coho salmon were collected in Portage Creek in 1985, with catches never exceeding two fry per trap day (Table 6). Suchanek et al. (1984) found that coho salmon fry prefer habitat areas having relatively deep water, slow velocities, and cover consisting of debris, vegetation, and undercut banks. Portage Creek has very few areas with these types of habitat so that one could conclude that few coho fry remain in this tributary to rear through the season.

Indian River supported the largest percentage (32.4%) of spawning coho salmon in the middle river in 1984 (Barrett et al. 1985) and has a greater number of areas having habitat preferred by rearing coho salmon. This resulted in relatively higher catches of coho fry in Indian River than in Portage Creek. A total of 3,098 age 0+ coho salmon were collected from all four sites in Indian River during the cold-branding program.

Table 6. Coho salmon (age 0+) catch per trap by sampling date for Portage Creek, 1985.

Sampling Date	Number Caught	Number of Traps	Catch Per Trap	Sampling Date	Number Caught	Number of Traps	Catch Per Trap
12-Jul	0	25	0.0	29-Aug	7	20	0.4
19-Jul	0	20	0.0	03-Sep	4	20	0.2
20-Jul	1	20	0.1	07-Sep	25	20	1.3
09-Aug	4	10	0.4	11-Sep	12	10	1.2
17-Aug	12	5	2.4	17-Sep	6	20	0.3
21-Aug	25	20	1.3	25-Sep	10	20	0.5
25-Aug	11	20	0.6				

While the daily trapping effort at the mouth of Indian River (site 1) accounted for 81% of the total effort in this tributary, only 40% of the total catch was recorded at this site. Coho fry catches at the mouth, like those for chinook fry, were highest during July with the peak mean catch of 2.6 coho fry per trap day recorded on July 18 (Fig. 9 upper).

Coho salmon fry were more abundant in the three upstream sites in Indian River as shown by the much higher catches through the season at the upstream sites than at the mouth (Fig. 9 lower). Sites 2, 3, and 4 accounted for only 19% of the effort in Indian River, but 60% of the catches were recorded at these sites (Table 7).

Table 7. Coho salmon (age 0+) catch per trap by site and sampling date for the three upstream sites in Indian River, 1985.

	SITE 2			SITE 3			SITE 4		
Sampling Date	Number Caught	Number of Traps	Catch Per Trap	Number Caught	Number of Traps	Catch Per Trap	Number Caught	Number of Traps	Catch Per Trap
06-Jul	15	10	1.5	0	10	0.0	3	10	0.3
10-Jul	12	9	1.3	3	10	0.3	66	9	7.3
14-Jul	22	10	2.2	10	10	1.0	66	10	6.6
18-Jul	11	10	1.1	13	10	1.3	67	10	6.7
24-Jul	13	10	1.3	24	10	2.4	50	10	5.0
28-Jul	17	10	1.7	11	10	1.1	34	10	3.4
01-Aug	35	10	3.5	27	10	2.7	31	10	3.1
05-Aug	40	10	4.0	20	10	2.0	53	10	5.3
09-Aug	29	10	2.9	25	10	2.5	98	10	9.8
17-Aug	47	10	4.7	17	10	1.7	48	10	4.8
21-Aug	32	9	3.6	24	10	2.4	85	10	8.5
25-Aug	45	10	4.5	42	10	4.2	83	10	8.3
29-Aug	55	10	5.5	22	10	2.2	39	10	3.9
03-Sep	50	10	5.0	18	10	1.8	31	10	3.1
07-Sep	55	10	5.5	2	10	0.2	42	10	4.2
11-Sep	16	10	1.6	19	10	1.9	27	10	2.7
17-Sep	37	10	3.7	23	10	2.3	32	10	3.2
25-Sep	66	10	6.6	19	10	1.9	18	10	1.8
01-Oct	42	10	4.2	16	10	1.6	4	10	0.4

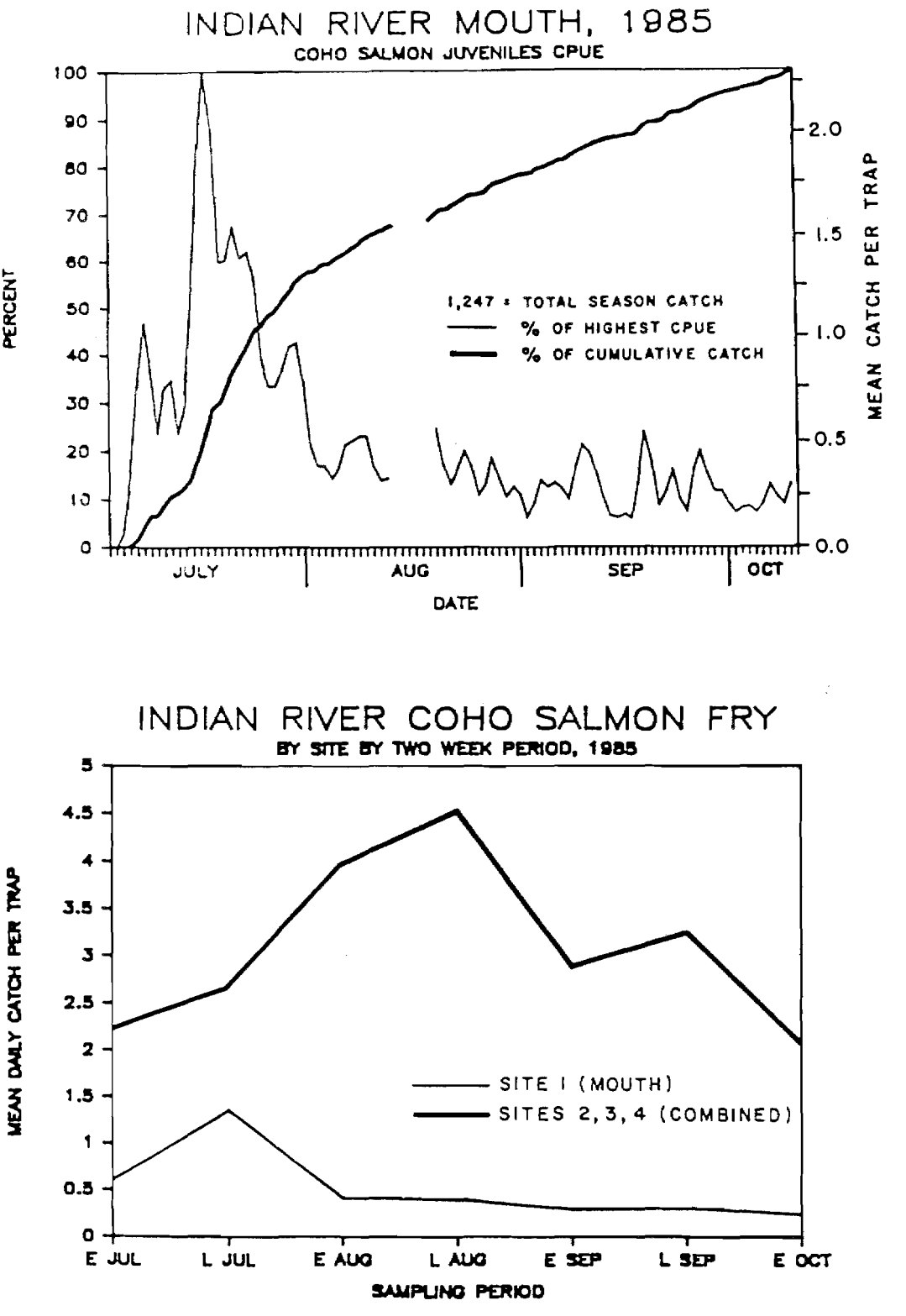

Figure 9. Coho salmon juveniles daily catch per unit effort and cumulative catch recorded at the mouth of Indian River (upper figure) and the catch per trap by site by two week period at the four sampling sites in Indian River (lower figure), 1985.

The catch data for coho salmon fry trapped in the 14 selected sites between Portage Creek and Talkeetna Station are presented in Table 8. Coho fry catches increased at eight of the 14 sites through the season indicating the movement of fry from their natal areas into these sites to rear. The highest catch per unit effort recorded at the selected sites was 13.8 fish per trap day in sloughs 14 and 15 on September 11 and September 19, respectively. Sloughs 14 and 15 provide the water depths and cover types preferred by rearing coho salmon and are located on the same side of the Susitna River as Indian River. These two sites are located at 1.4 and 2.6 miles downstream from Indian River and are among the first suitable rearing sites encountered by fish which have migrated out of this tributary.

A total season catch of 1,579 coho salmon fry was recorded at the Talkeetna stationary outmigrant traps with 50% of the catch recorded by August 15. Daily catches fluctuated dramatically for coho fry through the season but never exceeded 0.9 fry per hour (Fig. 10 upper). As shown by the slope of the cumulative catch, the outmigration of coho salmon fry past Talkeetna Station was relatively consistant indicating the continual downstream redistribution of coho fry in the middle river during the open-water period.

Observations of coho salmon fry in the middle river indicates that fry are widely distributed within the reach but are not very abundant. The middle river supports a relatively small population of spawning adult coho (1200 estimated in 1984 by Barrett et al. 1985) in comparison to the lower river, and the fry actively search out suitable rearing areas during the open-water period.

A cumulative catch of 1,756 coho salmon fry was recorded for the stationary traps at Flathorn Station. High catches were recorded during early July and mid-August with the peak mean catch of 6.1 fry per hour recorded on August 15 (Fig 10 lower). The slope of the cumulative catch at Flathorn Station was less consistant than that recorded at Talkeetna Station. Although 50% of the season catch was recorded on August 15 at both sites, 72% of the catch at Flathorn Station was recorded during the July and August outmigration peaks which accounted for only 20% of the season's effort. This indicates that the age 0+ coho salmon passing Flathorn Station are subject to outmigration pulses that may be driven by changes in discharge or other factors that influence this outmigration. Discharge was found to have influenced the outmigration of coho fry in the middle river during 1983 (Roth et al. 1984).

The highest catches of the 71 coho salmon fry collected in the mobile trap at Flathorn Station were recorded at the two bank transect sites (Fig. 11 lower). The higher catches of age 0+ coho salmon along the bank sites relative to the offshore transects suggests a tendency for near-shore migration for coho fry as they continue to search out suitable rearing habitats. Fifty percent of the captures of coho fry in

Table 8. Coho salmon (age 0+) catch per trap and the number of branded fish recaptured by site and date for the 14 selected sites in the middle reach of the Susitna River, 1985.

Sampling Site	Date	Total Catch	Catch Per Trap	# of Fish Recaptured	Percent Recapture
Slough 6A (RM 112.3)	8/6	35	3.5	0	0.0
	8/17	45	4.5	0	0.0
	9/3	24	2.4	0	0.0
	9/22	19	1.9	1	5.3
Slough 8A (RM 125.3)	8/24	19	1.9	0	0.0
	9/6	40	4.0	2	5.0
	9/26	110	11.0	3	2.7
Slough 9A (RM 133.6)	8/23	1	0.1	0	0.0
	9/11	0	0.0	0	0.0
	9/26	0	0.0	0	0.0
Slough 10 (RM 133.8)	8/7	0	0.0	0	0.0
	8/25	4	0.4	0	0.0
	9/6	28	2.8	3	10.7
	9/27	33	3.3	5	15.2
Sidechannel 10A (RM 133.9)	8/24	0	0.0	0	0.0
	9/6	0	0.0	0	0.0
	10/4	9	0.4	1	11.1
Slough 14 (RM 135.9)	8/23	96	9.6	1	1.0
	9/11	138	13.8	1	0.7
	9/27	45	4.5	2	4.4
Slough 15 (RM 137.2)	8/20	49	4.9	0	0.0
	9/2	72	7.2	2	2.8
	9/19	138	13.8	3	2.2
	9/28	209	8.4	4	1.9
Slough 16 (RM 137.7)	7/29	0	0.0	0	0.0
	8/12	11	1.1	0	0.0
	8/29	8	0.8	0	0.0
	9/14	20	2.0	0	0.0
	10/1	51	5.1	3	5.9
Slough 17 (RM 138.9)	8/18	34	3.4	0	0.0
	9/2	37	3.7	0	0.0
	9/19	96	9.6	0	0.0
Slough 19 (RM 139.7)	8/12	0	0.0	0	0.0
	9/2	1	0.1	1	100.0
	9/19	16	1.6	0	0.0
Slough 20 (RM 140.1)	7/31	0	0.0	0	0.0
	9/5	3	0.3	0	0.0
	9/21	0	0.0	0	0.0
Slough 21 (RM 142.0)	7/29	0	0.0	0	0.0
	8/18	5	0.5	0	0.0
	9/5	25	2.5	0	0.0
	9/21	9	0.9	0	0.0
Anna Creek Slough (RM 143.2)	7/29	0	0.0	0	0.0
	8/18	6	0.6	0	0.0
	9/5	37	3.7	0	0.0
	9/21	40	4.0	0	0.0
Slough 22 (RM 144.3)	7/29	0	0.0	0	0.0
	8/12	1	0.1	0	0.0
	8/29	3	0.3	0	0.0
	9/14	3	0.3	0	0.0
	10/9	3	0.3	0	0.0

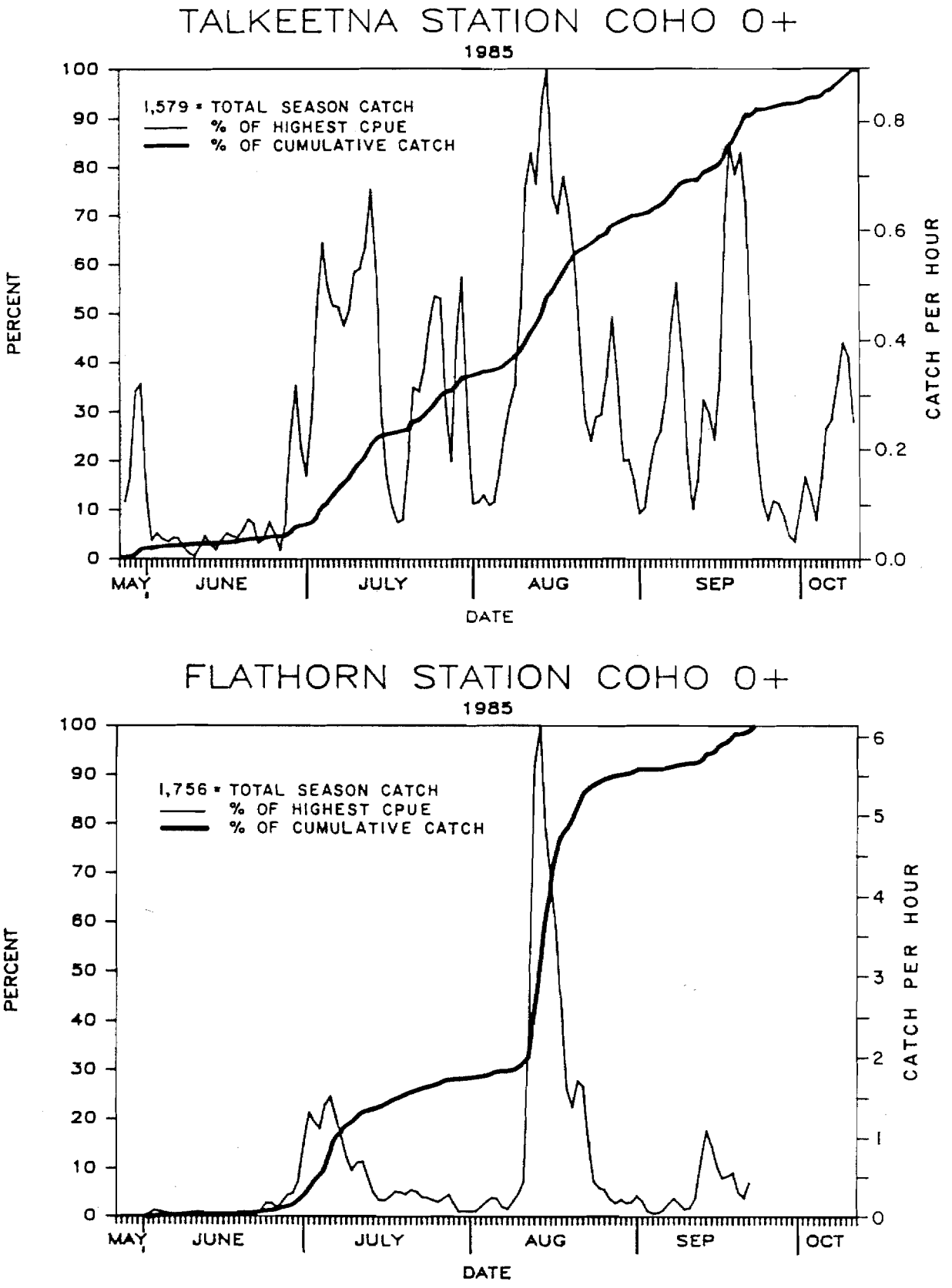

Figure 10. Coho salmon (age 0+) daily catch per unit effort and cumulative catch recorded at the Talkeetna (top graph) and Flathorn (bottom graph) stationary outmigrant traps, 1985.

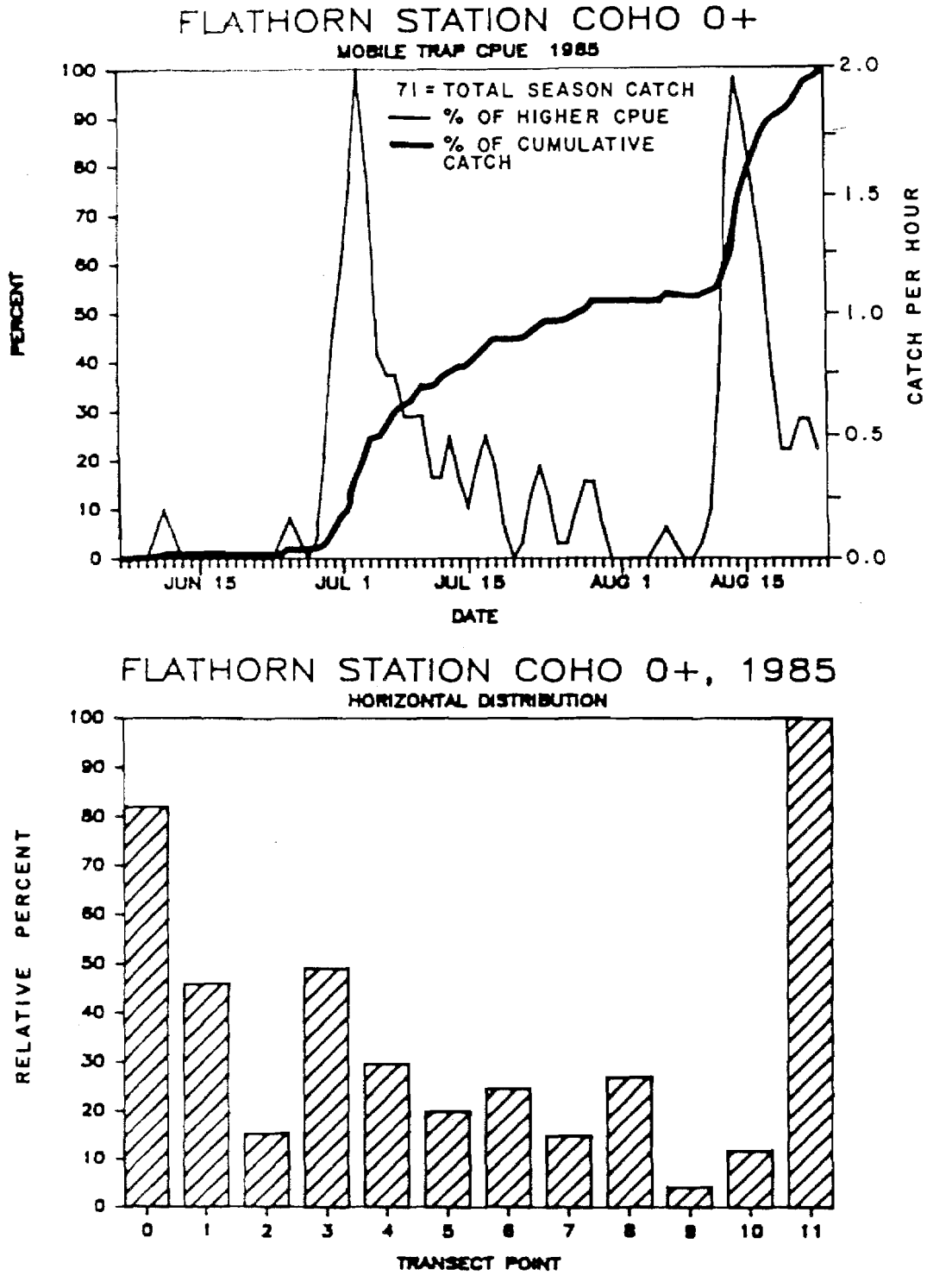

Figure 11. Coho salmon (age 0+) daily catch per unit effort and cumulative catch (upper figure) and the catch as a percent of the highest catch per unit volume by transect point (lower figure) recorded at the Flathorn Station mobile outmigrant trap, 1985.

the mobile trap were recorded by July 28. Similar to the pattern observed past the stationary traps at this site, the peak catches were recorded in early July and again in mid-August (Fig. 11 upper).

3.2.1.2 Age 1+ and 2+

No age 1+ coho salmon were captured during surveys of Portage Creek and no age 2+ coho were collected during the marking programs in 1985. Age 1+ coho salmon were collected sporadically during the tagging program in May and June with the highest concentrations observed in Slough 11 and Indian River. One hundred eight age 1+ coho salmon were captured in Indian River between July 3 and October 7, indicating that a portion of the coho remain in this tributary to rear and overwinter. Stratton (1986) also collected small numbers of overwintering coho salmon juveniles in 1985.

Six hundred twenty-five age 1+ and 2+ coho salmon were caught at the Talkeetna Station traps. The peak catch of 0.4 fish per hour was recorded on May 31 and 50% of the season catch was recorded by July 16 (Fig. 12 upper). As was observed for the age 0+ coho collected at this station, the slope of the cumulative outmigration of age 1+ and 2+ coho salmon juveniles did not fluctuate appreciably through the sampling season indicating an ongoing downstream redistribution of these age classes. Age 2+ coho salmon made up 14% of the total season catch of age 1+ and 2+ coho salmon at Talkeetna Station. Most of the outmigration of this age class was recorded during June. Age 1+ coho made up the remaining 86% of the catches at this site and the outmigration of this age class continued through the open-water period.

A total of 607 age 1+ and 2+ coho salmon were captured in the stationary traps at Flathorn Station. Peak catches and 50% of the total season catch were recorded during the last week of June (Fig. 12 lower). Scale samples indicated that this peak was comprised primarily of age 2+ coho salmon. A second smaller peak comprised of age 1+ coho was observed in mid-August.

The mobile trap at Flathorn Station collected 312 age 1+ and 2+ coho salmon with the peak catch rate of 1.3 fish per hour recorded on June 26, by which time 50% of the season's catch in this trap was recorded (Fig. 13 upper). Age 2+ coho salmon made up 75% of this total catch in the mobile trap during 1985. The highest catches of age 1+ and 2+ coho salmon were recorded at the west bank transect site (Fig. 13 lower).

In summary, the outmigrant trap data shows that during the open-water period, age 2+ coho salmon migrate to the ocean primarily during May and June while the remaining juvenile coho undergo a downstream redistribution through the season. Much of the migration of age 0+ and 1+ coho is probably due to the limited areas in the middle river that provide habitat which is suitable for coho rearing so that coho may be continually seeking areas with adequate food supplies.

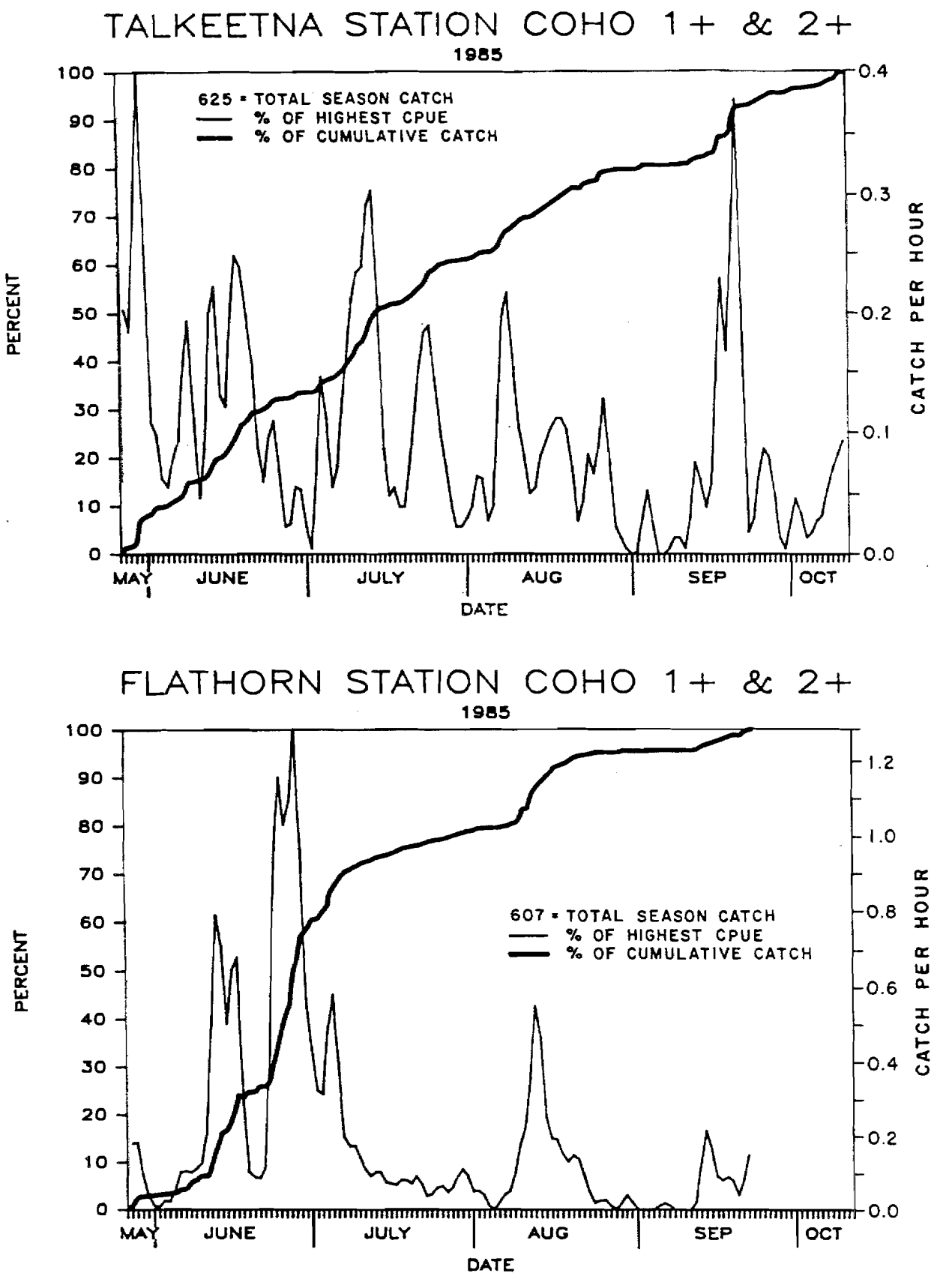

Figure 12. Coho salmon (age 1+ and 2+) daily catch per unit effort and cumulative catch recorded at the Talkeetna (upper figure) and Flathorn (lower figure) stationary outmigrant traps, 1985.

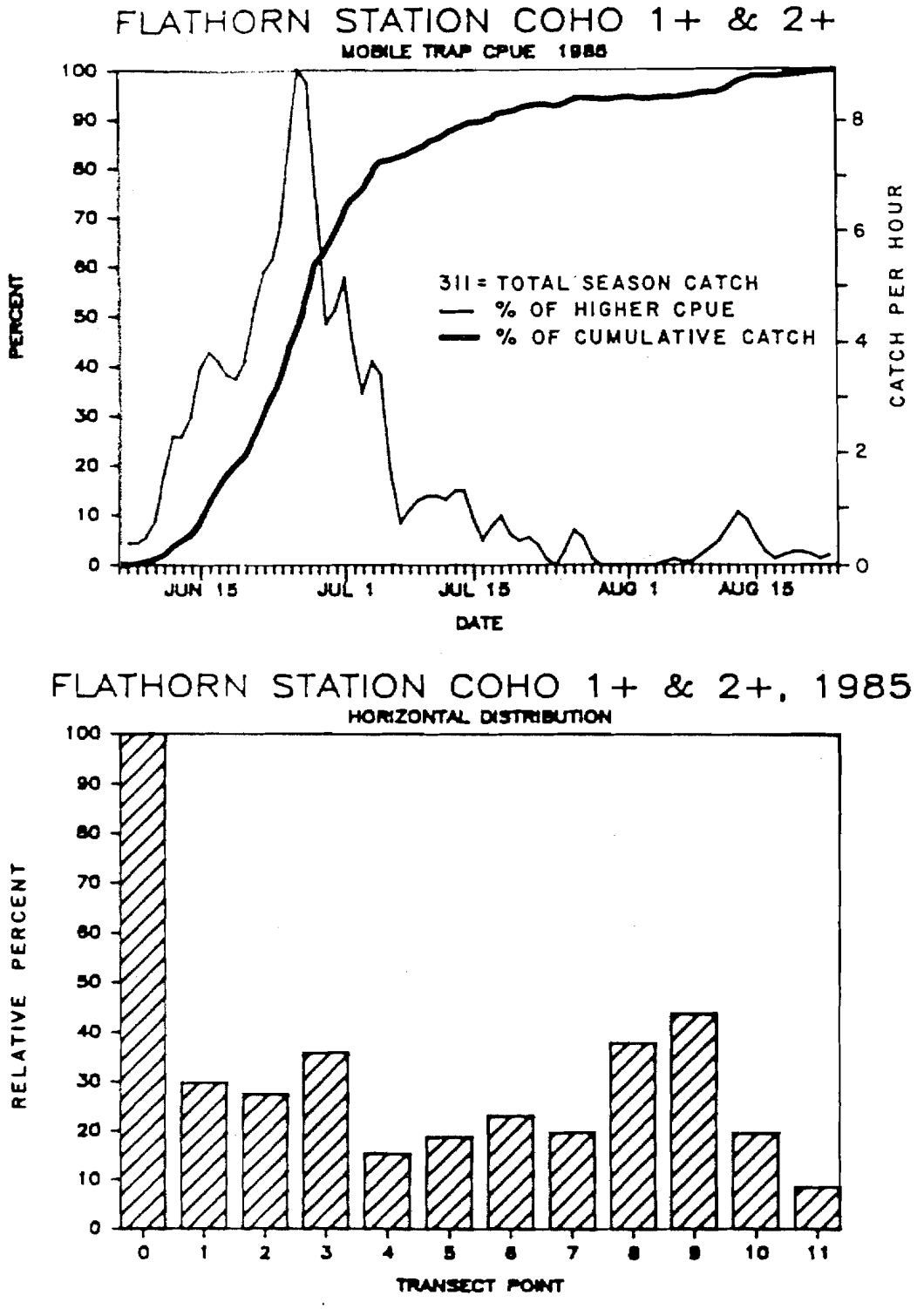

Figure 13. Coho salmon (age 1+ and 2+) daily catch per unit effort and cumulative catch (upper figure) and the catch as a percent of the highest catch per unit volume by transect point (lower figure) recorded at the Flathorn Station mobile outmigrant trap, 1985.

3.2.2 Size

3.2.2.1 Age 0+

As was observed for chinook salmon fry in the Susitna River, the mean length of coho fry progressively increased downstream for each sampling period (Table 9). By late September, coho fry in the lower reach of the Susitna River averaged 10 mm longer than the fry collected in Indian River. This difference may be due to the genetically mixed stocks present in the catches in the lower river and the variable growth rates of these stocks.

3.2.2.2 Age 1+ and 2+

Age 1+ coho were also generally longer at Flathorn Station than at Talkeetna Station during the season (Table 10). Age 2+ coho salmon collected at all sites combined in the Susitna River during 1985 averaged 132 mm (range; 109 to 174 mm).

3.2.3 Mark-and-recapture

In 1985, the cold-branding program accounted for 179 branded coho salmon juveniles released in Portage Creek, and a total of 2,986 coho salmon released in Indian River. Juvenile coho salmon mortality resulting from the branding program was 4.1%. Cold-branding studies conducted at Slough 15 and Sidechannel 10A contributed an additional 12 and 619 marked coho salmon, respectively, to the population of coho salmon branded and released in the middle river.

3.2.3.1 Spatial and temporal distribution

A portion of the juvenile coho salmon branded in the middle river apparently reared for a time at the collection sites. Eight of the 179 (4.5%) coho salmon juveniles branded in Portage Creek were recaptured at the marking sites from 1 to 20 days (mean; 9 days) after release. Of the 1,794 coho salmon branded in the three upper Indian River sites, 169 (9.4%) were later recaptured at the release sites. These recaptures were recorded from 4 to 61 days (mean; 17 days) after release. No coho salmon juveniles which had been branded at the mouth of Indian River were recovered at this site during subsequent sampling.

In addition to the coho salmon which were branded and recaptured in 1985, two age 1+ coho salmon which had been branded as fry during the 1984-85 winter program were recaptured at Talkeetna Station in 1985 (Table 5).

As was observed for chinook salmon, no branded coho salmon were captured at Flathorn Station or at sampling sites located upstream from their release sites.

Five of the juvenile coho salmon branded in Portage Creek were recaptured during surveys of the 14 selected sites in the middle river.

Table 9. Coho salmon (age 0+) mean total length, range of lengths, and associated confidence intervals by site and sampling period in the Susitna River, 1985.

Sampling Period	Indian River Mouth				Talkeetna Station				Flathorn Station				Flathorn Mobile Trap			
	n	Mean Length	Range of lengths	95 % C.I.	n	Mean Length	Range of lengths	95 % C.I.	n	Mean Length	Range of lengths	95 % C.I.	n	Mean Length	Range of lengths	95 % C.I.
May 27 to June 15	a	-	-	-	40	36.1	33-40	0.5	13	36.4	33-40	1.3	2	40.5	39-42	19.0
June 16-30	a	-	-	-	62	36.8	31-46	0.9	49	39.8	31-54	1.6	2	37.5	36-39	19.0
July 1-15	51	34.7	30-47	0.7	274	37.9	30-56	0.6	311	41.2	30-68	1.0	26	39.0	28-69	4.4
July 16-31	49	37.6	33-47	0.8	179	42.5	32-60	1.0	101	47.4	30-76	2.4	11	52.3	34-79	10.5
August 1-15	50	43.6	36-58	1.3	235	47.0	28-64	0.8	383	57.8	32-79	0.9	23	61.2	35-84	5.6
August 16-31	50	46.8	36-60	1.2	233	52.4	35-76	1.1	537	56.6	41-79	0.7	16	62.3	43-82	6.7
September 1-15	50	51.4	36-62	1.5	175	57.5	42-85	1.5	60	62.8	50-77	1.8	a	-	-	-
September 16 to October 12	38	53.2	38-72	2.5	301	60.9	35-87	1.0	94	63.6	37-82	1.9	a	-	-	-

a Not sampled

C.I. = 95% confidence intervals plus or minus the mean length

Table 10. Coho salmon (age 1+) mean total length, range of lengths, and associated confidence intervals by site and sampling period in the Susitna River, 1985.

Sampling Period	Talkeetna Station				Flathorn Station				Flathorn Mobile Trap			
	n	Mean Length	Range of lengths	95 % C.I.	n	Mean Length	Range of lengths	95 % C.I.	n	Mean Length	Range of lengths	95 % C.I.
May 27 to June 15	74	76.1	51-108	3.4	55	90.6	60-113	4.3	7	89.0	65-112	16.5
June 16-30	50	78.7	54-114	5.5	140	97.0	66-116	1.9	34	102.4	86-107	2.6
July 1-15	109	78.2	58-110	2.0	66	91.4	66-118	3.9	18	102.1	74-118	7.7
July 16-31	65	79.2	61-120	3.0	28	89.6	80-113	3.0	8	105.6	84-125	12.8
August 1-15	68	80.7	64-124	2.6	65	93.7	80-132	3.1	9	100.1	86-129	12.0
August 16-31	54	89.8	71-120	3.4	35	93.9	82-119	3.2	2	94.5	92-97	31.8
September 1-15	21	102.2	88-128	5.0	8	107.5	85-132	13.6	a	-	-	-
September 16 to October 12	101	116.8	89-150	3.5	18	97.7	83-145	9.0	a	-	-	-

a Not sampled

C.I. = 95% confidence intervals plus or minus the mean length

No other coho salmon branded in Portage Creek were recaptured. Of the juvenile coho salmon branded at the mouth of Indian River, three were recovered at Talkeetna Station from 1 to 9 days (mean; 5 days) after release. Four of the coho salmon branded in the three upper Indian River sites were recaptured at the mouth (site 1) from 9 to 20 days (mean; 14 days) after release, and three were recaptured at Talkeetna Station from 16 to 56 days (mean; 35 days) after release.

Trapping at the 14 selected sites in the middle reach recovered 24 branded coho salmon which had been released at the sites in Indian River. Also, one of the coho salmon branded in Slough 15 was recaptured at Talkeetna Station three days later.

The recapture of branded coho salmon juveniles at the 14 selected sites confirms that many of the coho salmon in the middle river are continually redistributing downstream during the open-water period. The collection of branded coho at Talkeetna Station shows that the redistribution of middle river coho is not limited to this reach, as some of these fish enter the lower river to suitable rearing and overwintering habitats.

3.3 Sockeye Salmon

3.3.1 Catch per unit effort

3.3.1.1 Age 0+

The Talkeetna Station outmigrant traps accounted for a cumulative catch of 5,068 age 0+ sockeye salmon in 1985. Peak catches were observed with the initial deployment of the traps in late May with the highest catch rate of 12.8 fry per hour recorded on May 28 (Fig. 14 upper). These high catches were probably a result of the high flows occuring during break-up in the middle river in 1985. The highest season discharge in this reach was 39,700 cfs recorded on May 28 (Appendix Figure A.1). At this discharge level, all of the sloughs which support sockeye salmon spawning in the middle river, except Slough 11, were overtopped with mainstem water which flushed post-emergent sockeye fry from their natal sites. As shown by the high catches at Talkeetna Station, many of these fry were flushed out of the middle river. Fifty percent of the total catch of sockeye fry at Talkeetna Station was obtained by July 1. Catches decreased after late July although sockeye fry were captured through the remainder of the sampling season.

At Flathorn Station, a total of 5,053 sockeye salmon fry were captured in the two stationary traps. As observed at Talkeetna Station, the outmigration of sockeye fry was already in progress when the traps were deployed in late May. Peak catches were recorded during July, 50% of the total catch for both traps was recorded by July 15, and the highest daily catch (4.8 fish per hour) occurred on July 18 (Fig. 14 lower).

The outmigration timing recorded for the mobile trap was similar to the patterns observed for the stationary traps at this site. Fifty percent

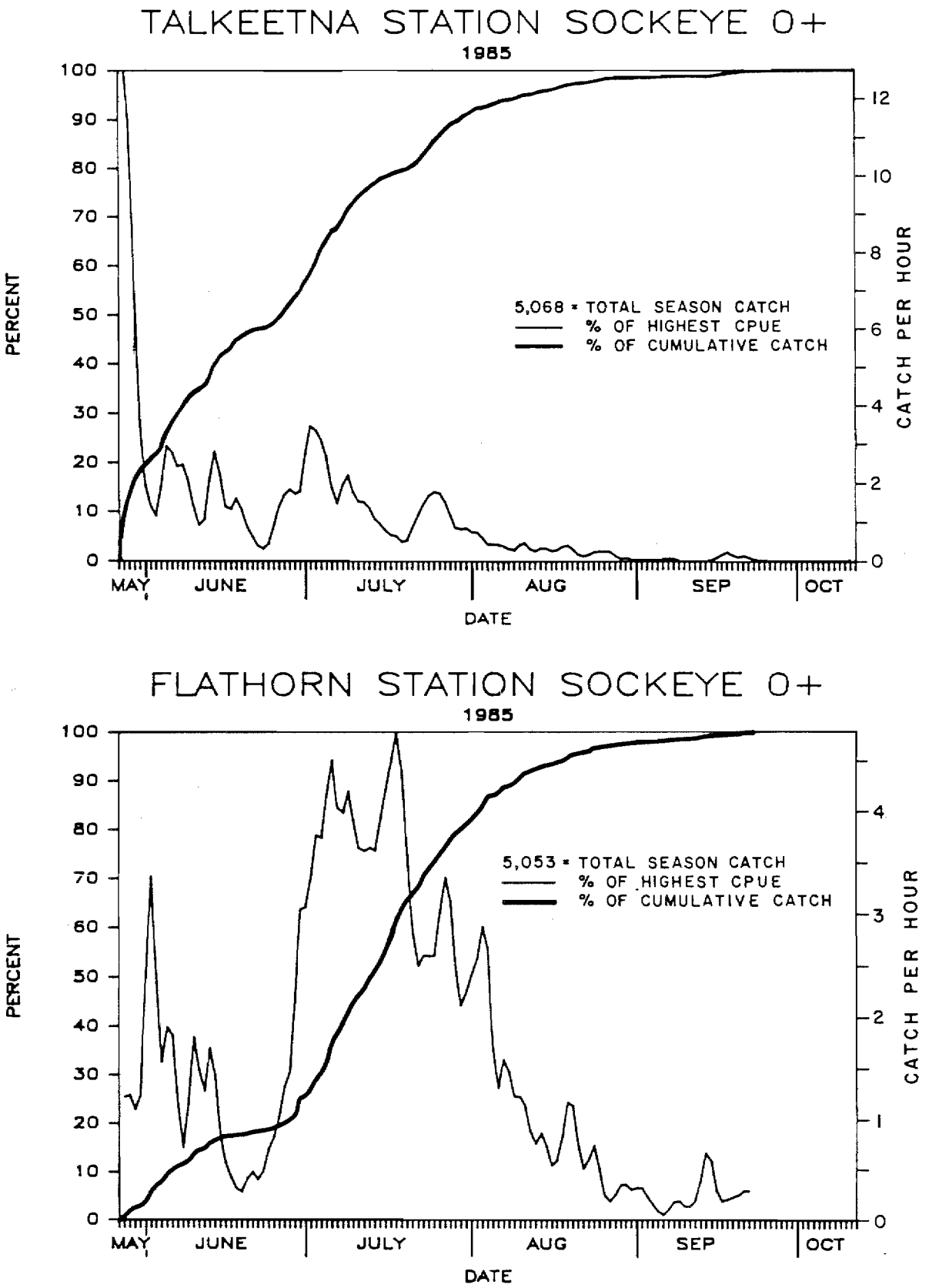

Figure 14. Sockeye salmon (age 0+) daily catch per unit effort and cumulative catch recorded at the Talkeetna (top graph) and Flathorn (bottom graph) stationary outmigrant traps, 1985.

of the total catch in the mobile trap was recorded by July 18 and the highest daily catch of 11.4 fry per hour occurred the following day (Fig. 15 upper).

The Flathorn mobile trap captured 828 age 0+ sockeye salmon during 1985, with the highest catches recorded at the bank transect sites (Fig. 15 lower) suggesting a tendency for near-shore migration for age 0+ sockeye. This is similar to the horizontal distribution recorded for sockeye fry in 1984 (Roth and Stratton 1985) and could be a response to the horizontal velocity gradient of the river at this site. Generally, velocities across the transect were lowest near the shore while higher velocities were recorded at the center channel sites. Another possibility is that the migration of sockeye fry near the shore was a behavior exhibited by age 0+ sockeye. McCart (1967) noted that sockeye fry moving downstream in the Babine River in British Columbia migrated primarily next to the stream margins.

Catches of sockeye fry in the mobile trap were highest at the west bank transect site (Fig. 15 lower). The influence of the Yentna River (a primary sockeye producer in the Susitna drainage coupled with the apparent tendency for near-shore migration of sockeye fry may be the primary reasons for the highest relative catches occurring at the west bank site.

3.3.1.2 Age 1+

The outmigration of age 1+ sockeye salmon during the open-water period occurred primarily during May and June and was virtually complete by the end of July. Catches of the 154 age 1+ sockeye salmon captured at Talkeetna Station were recorded from late May through late July (Fig. 16 upper). The highest catch rate of 0.5 fish per hour was recorded on May 31 and corresponds with the high mainstem discharges recorded in the middle river. The overtopping of the sloughs during these flows probably displaced many of the age 1+ sockeye from these sites, similar to the observations for age 0+ sockeye. Fifty percent of the total catch at Talkeetna Station was recorded by June 4 and 95% of the outmigration from the middle river was recorded by July 5.

Catches of the 1,174 age 1+ sockeye collected at Flathorn were also recorded from late May through late July (Fig. 16 lower). The peak catches were observed during June (50% by June 17) and the highest catch of 3.5 fish per hour was recorded on June 24. Ninety-five percent of the outmigration past this site was recorded by June 30.

Fifty percent of the 592 age 1+ sockeye salmon collected in the mobile trap were recorded by June 15 with 95% of the total catch recorded by early July (Fig. 17 upper). Most of these fish were collected at the west bank transect site (Fig. 17 lower). Similar to age 0+ sockeye, the high catches at this site are probably due to its close proximity to the confluence of the Yentna River.

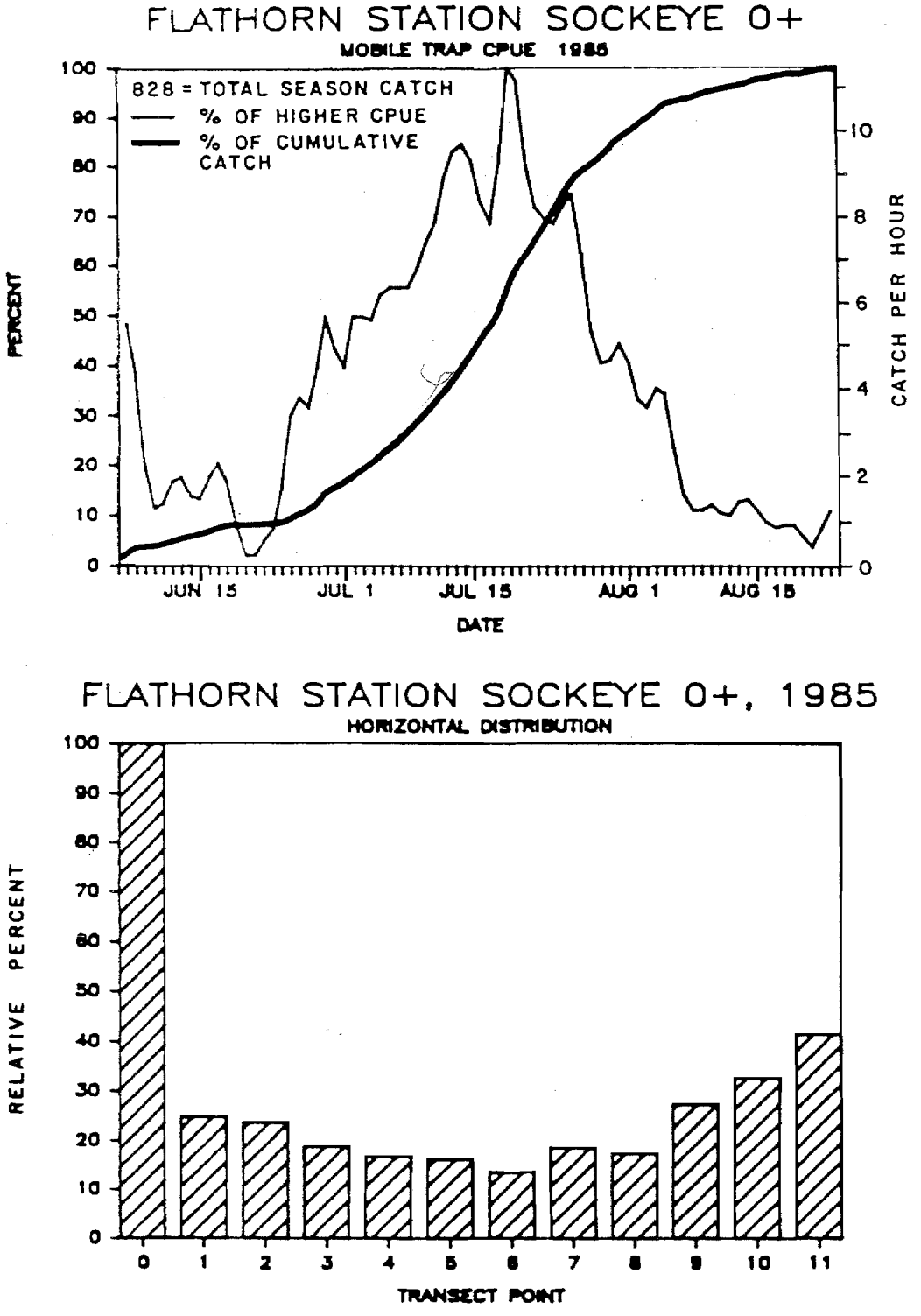

Figure 15. Sockeye salmon (age 0+) daily catch per unit effort and cumulative catch (upper figure) and the catch as a percent of the highest catch per unit volume by transect point (lower figure) recorded at the Flathorn Station mobile outmigrant trap, 1985.

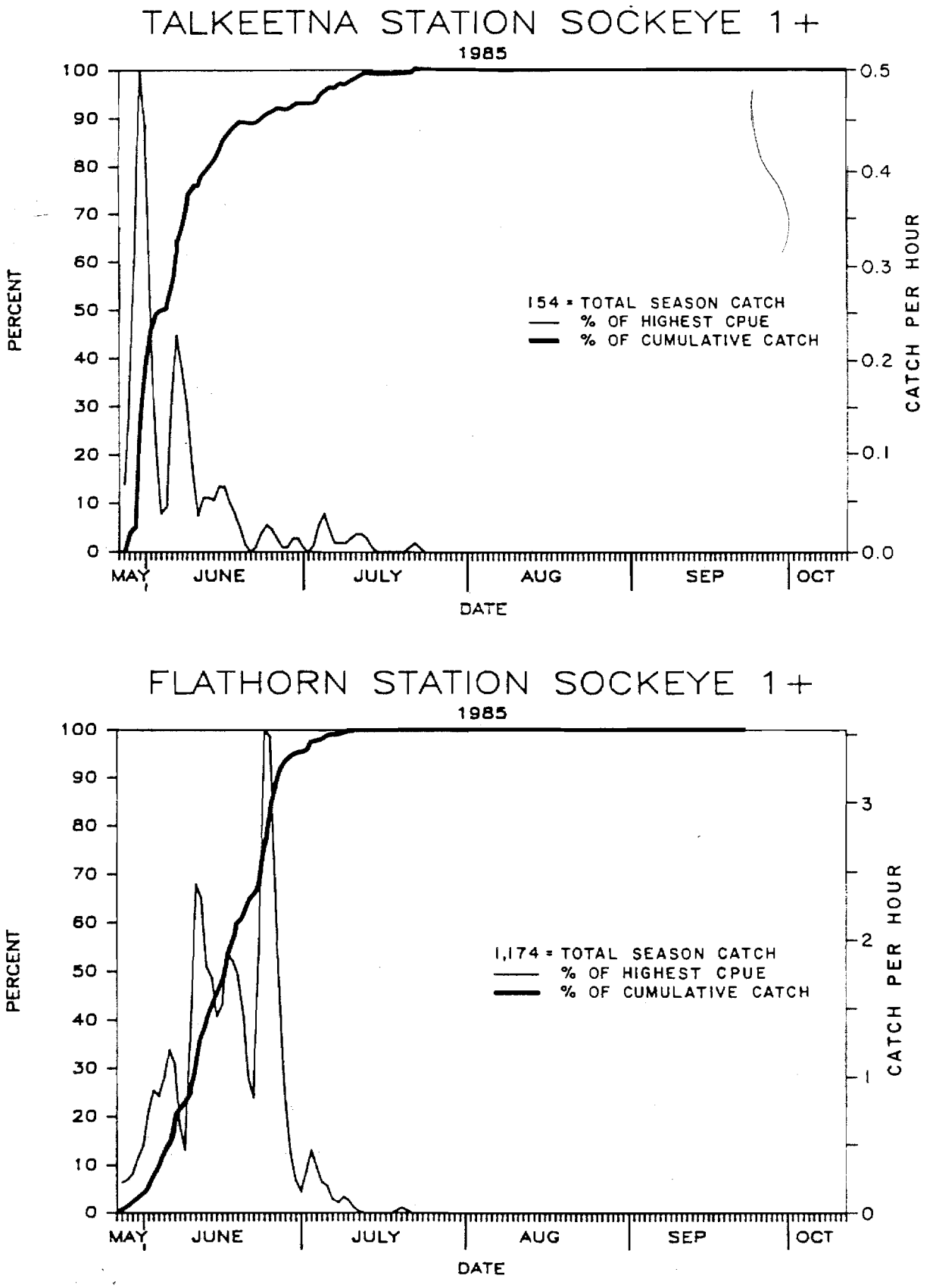

Figure 16. Sockeye salmon (age 1+) daily catch per unit effort and cumulative catch recorded at the Talkeetna (top graph) and Flathorn (bottom graph) stationary outmigrant traps, 1985.

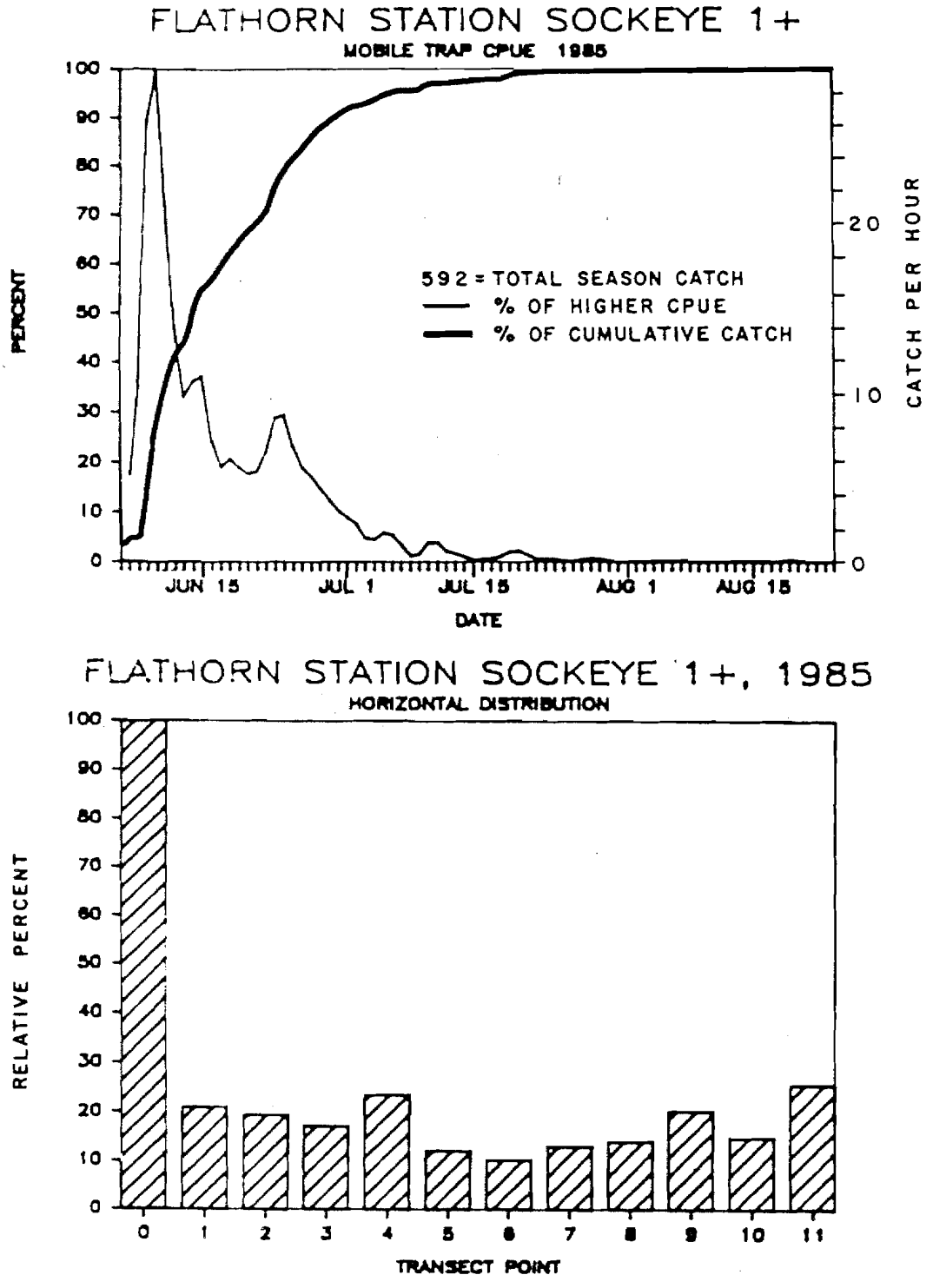

Figure 17. Sockeye salmon (age 1+) daily catch per unit effort and cumulative catch (upper figure) and the catch as a percent of the highest catch per unit volume by transect point (lower figure) recorded at the Flathorn Station mobile outmigrant trap, 1985.

3.3.2 Size

3.3.2.1 Age 0+

Mean total lengths of sockeye salmon fry collected at Talkeetna Station during June and July averaged smaller than sockeye fry collected at Flathorn Station during the same periods (Table 11). Sockeye fry collected in the mobile trap were consistantly larger than fry collected in the stationary traps after early June. By late July, mean total lengths of sockeye fry collected in the stationary traps in both reaches were the same length (50 mm).

3.3.2.2 Age 1+

Age 1+ sockeye salmon collected at Talkeetna Station averaged 69 mm total length during their outmigration from the middle river in 1985 while age 1+ sockeye caught at Flathorn Station averaged 80 mm. The difference in the mean lengths between these two reaches may be due to better rearing and overwintering conditions in the lower river relative to the middle river. Sockeye fry in the middle reach rear primarily in sloughs while many sockeye rearing areas in the lower river are associated with lake systems. These lakes probably provide additional growth potential for sockeye prior to outmigration. Marcuson (1985) reported mean lengths for age 1+ sockeye in Larson Lake in the Talkeetna River drainage that were approximately 10 mm longer than observed for age 1+ sockeye in the middle reach of the Susitna River.

3.3.3 Mark-and-recapture

A total of 11,436 sockeye salmon fry (mean; 34 mm) were coded wire tagged and released at sloughs 8A and 11 between June 2 and June 26, 1985. Tag retention rates through release were 96.9% and tagging mortality was 1.7%.

A total of 189 tagged sockeye fry (1.7% of the total tagged sockeye fry released) were recovered from the 5,068 sockeye fry captured and examined for tags at Talkeetna Station. Recoveries of coded wire tagged sockeye fry were made from 0 to 96 days (mean; 19 days) following their release at the tagging sites. Tag retention recorded at the outmigrant traps (96.4%) was similar to the tag retention at release indicating that no significant tag loss was occurring during the summer. No coded wire tagged fish were collected at Flathorn Station in 1985.

Six sockeye salmon which were tagged and released during 1984 were recovered from the 154 age 1+ sockeye captured at Talkeetna Station in 1985. Also, six sockeye salmon marked and released during 1984 were recovered during sampling at Trapper Creek Sidechannel (RM 91.5) in May, 1985.

Roth and Stratton (1985) postulated that middle river sockeye juveniles could be grouped into three catagories. The first group were those fish which spent their entire freshwater period in the middle river,

Table 11. Sockeye salmon (age 0+) mean total length, range of lengths, and associated confidence intervals by site and sampling period in the Susitna River, 1985.

Sampling Period	Talkeetna Station				Flathorn Station				Flathorn Mobile Trap			
	n	Mean Length	Range of lengths	95 % C.I.	n	Mean Length	Range of lengths	95 % C.I.	n	Mean Length	Range of lengths	95 % C.I.
May 27 to June 15	562	32.9	29-50	0.2	606	37.4	27-57	0.3	51	36.5	29-42	1.0
June 16-30	365	35.5	28-60	0.4	325	37.6	27-64	0.8	79	42.2	27-65	2.3
July 1-15	570	42.0	30-77	0.6	911	45.4	26-70	0.7	232	49.2	27-72	1.4
July 16-31	636	49.8	31-80	0.7	1225	49.4	25-82	0.5	335	56.5	30-80	1.1
August 1-15	301	50.6	32-85	1.0	588	51.1	30-90	0.8	90	59.7	34-84	2.5
August 16-31	157	54.6	35-81	1.3	234	52.8	29-86	1.2	20	60.0	43-74	4.7
September 1-15	23	59.3	35-89	5.8	62	52.2	38-68	2.3	a	-	-	-
September 16 to October 12	58	64.0	47-83	2.6	46	58.7	35-79	2.7	a	-	-	-

a Not sampled

C.I. = 95% confidence intervals plus or minus the mean length

overwintered in this reach, and then migrated to the ocean as age 1+ fish. These fish were represented in the 1985 catches by the age 1+ sockeye collected at Talkeetna Station, six of which had been coded wire tagged in this reach the previous summer. The second group of sockeye salmon juveniles are those fish which rear for a portion of their first summer in the middle river and then migrate to areas in the lower river to overwinter before entering the ocean as age 1+ fish the following spring. The six coded wire tagged age 1+ sockeye recaptured at Trapper Creek Sidechannel were fish from this life history type. The third group of juvenile sockeye salmon are made up of fish which spend a portion of their first summer rearing in the middle river and then begin a downstream migration, eventually entering the ocean as age 0+ fish.

However, the percentages of the total middle river outmigration represented by type two and three life histories is not known. In addition to the tagged fish captured at Trapper Creek Sidechannel, coded wire tagged sockeye fry have also been recovered at Goose Creek Sidechannel (RM 73.1) indicating that many of the sockeye migrating out of the middle river as fry are successful in finding suitable rearing habitats in the lower river. Scales collected from adults returning to the middle river to spawn indicates that sockeye salmon juveniles which migrate to the ocean as age 0+ fish (group 3) probably have very low survival rates (Barrett et al. 1984).

3.3.4 Population estimates

Using the method by Schaefer (1951), the population of age 0+ sockeye salmon above Talkeetna Station during 1985 was estimated to be 309,000 fry. A similar estimate, 305,000 (95% C.I. = 265,000 to 352,000) was calculated for the middle river using the revised Petersen estimate provided by Chapman (1951). The similarity in the population estimates obtained from both methods suggests that the recovery of marked and unmarked sockeye fry at Talkeetna Station was random so that sockeye salmon fry population estimates in the middle river may not need to be stratified.

3.4 Chum Salmon

3.4.1 Catch per unit effort

Chum salmon fry were captured incidentally during the cold branding program. A total of 489 chum salmon fry were collected in 648 trap days (mean; 0.8 fry per trap per day) between July 11 and August 9 in Indian River, and 918 chum fry were collected by beach seine in Portage Creek.

The peak catch rate at Talkeetna Station of 30 chum fry per hour occurred May 27, the first day of sampling (Fig. 18 upper). This is similar to the high catches recorded for age 0+ sockeye and is probably a result of the season high mainstem discharges during break-up which flushed the post-emergent chum fry from their natal sloughs and side

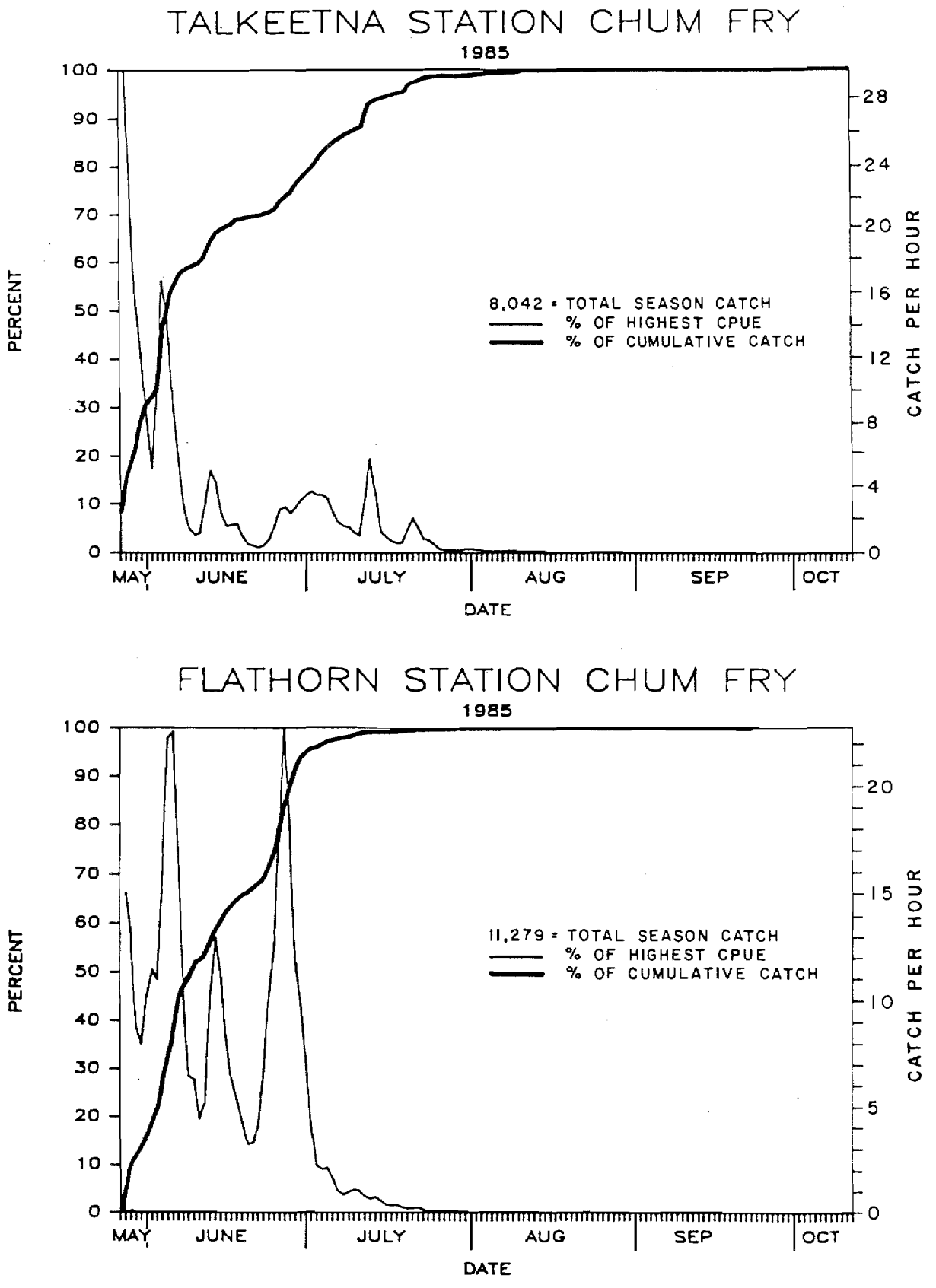

Figure 18. Chum salmon fry daily catch per unit effort and cumulative catch recorded at the Talkeetna (top graph) and Flathorn (bottom graph) stationary outmigrant traps, 1985.

channels. The migratory behavior of chum fry may also have influenced this peak as Roth et al. (1984) showed that chum fry outmigration in the middle river was strongly correlated (r = 0.89) with discharge. Fifty percent of the 8,042 chum salmon fry recovered at Talkeetna Station during 1985 were captured by June 5, ten days after sampling began. The outmigration of chum fry from the middle river was essentially complete (95%) by mid-July.

The timing of chum salmon outmigration past Flathorn Station was similar to the timing recorded past Talkeetna Station (Fig. 18). Outmigration was underway when the traps were deployed in late May and the peak catch of 22.8 fry per hour was recorded on June 27 (Fig. 18 lower). Fifty percent of the 11,279 chum salmon fry collected in the stationary traps at Flathorn Station were captured by June 13 and 95% of the chum fry were collected by July 2.

The peak catch of the 2,012 chum fry captured in the mobile trap was 63.9 fry per hour recorded on June 30, four days after 50% of the total season catch was reached (Fig. 19 upper). The timing patterns were similar for both the stationary and mobile traps with peak catches occurring in early and late June. High chum salmon fry catches were recorded at all of the transect sites (Fig. 19 lower) indicating a relatively uniform horizontal distribution of chum fry across the channel at this site during their outmigration.

3.4.2 Size

Outmigrating chum salmon fry in both the middle and lower reaches of the Susitna River averaged approximately 42 mm in 1985. The upper range of lengths observed for chum fry (67 mm) shows that rearing and growth was occurring for some of the chum fry before they outmigrated.

3.4.3 Mark-and-recapture

A total of 13,341 coded wire tagged chum fry averaging 40mm total length were released at sites in the middle river in 1985. Tag retention through release was 93.2% and tagging mortality was 0.7%. In addition, 897 cold-branded chum fry were released in Portage Creek. Seventy-eight of these marked fish were recaptured at this site up to three weeks after release, again showing that some chum salmon rearing was occurring.

Thirty-seven coded wire tagged chum salmon fry (0.3% of the total tagged chum released) were recovered at Talkeetna Station during 1985. Recoveries were made from 0 to 15 days (mean; 4 days) following their release at the tagging sites. Tag retention past Talkeetna Station for coded wire tagged chum fry was 94.6% indicating that chum fry were retaining their tags during outmigration. Also, four of the cold branded chum fry released in Portage Creek (0.4% of the total branded chum released) were recaptured at Talkeetna Station. No marked chum salmon fry were collected at Flathorn Station in 1985.

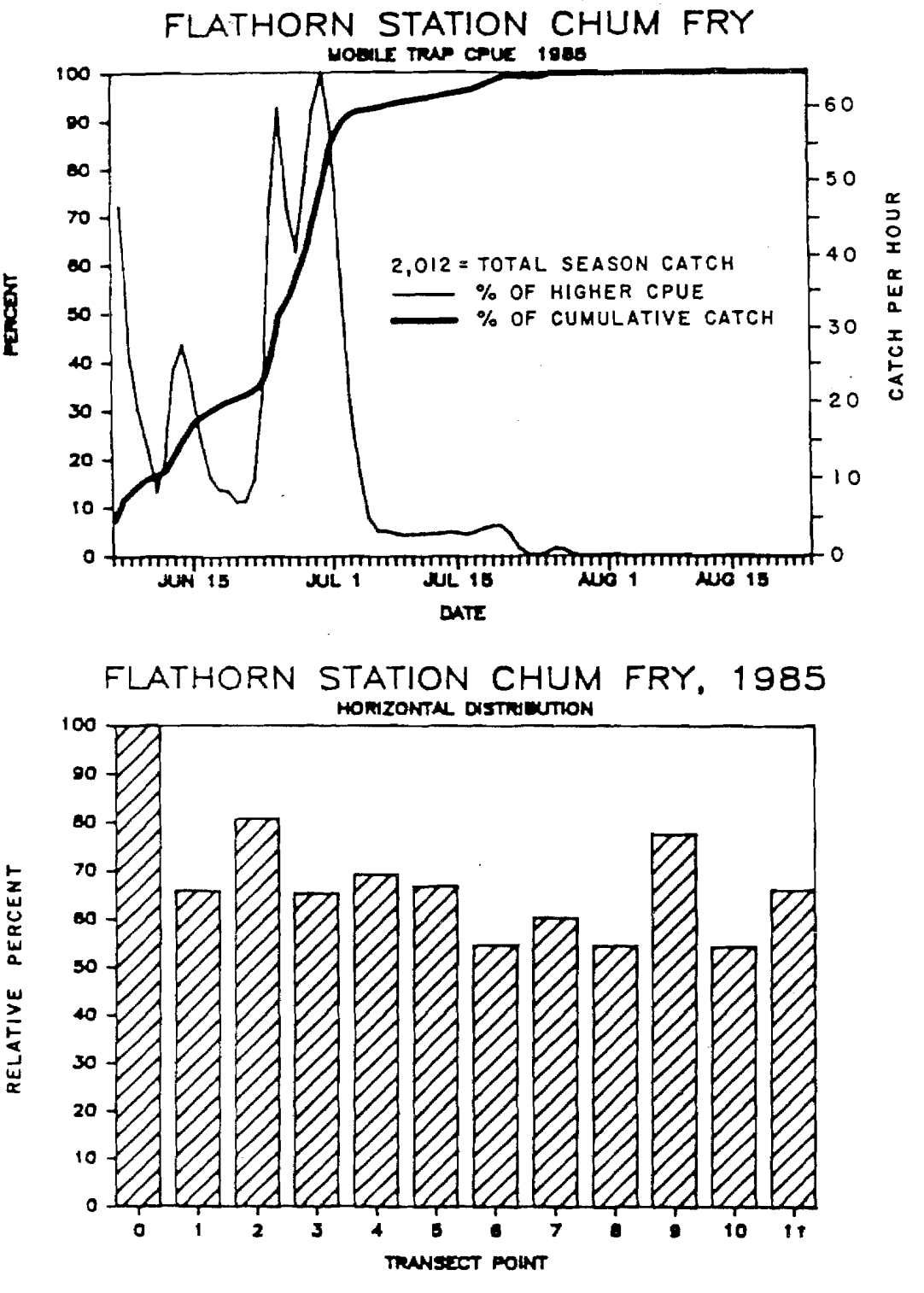

Figure 19. Chum salmon fry daily catch per unit effort and cumulative catch (upper figure) and the catch as a percent of the highest catch per unit volume by transect point (lower figure) recorded at the Flathorn Station mobile outmigrant trap, 1985.

3.4.4 Population estimates

A population of 3,155,000 chum salmon fry was estimated above Talkeetna Station in 1985 using the method outlined by Schaefer (1951). In comparison, 2,737,000 (95% C.I. = 2,031,000 to 3,782,000) chum fry were estimated using the revised Petersen estimate presented by Chapman (1951). As the Schaefer estimate lies within the 95% confidence intervals for the Petersen estimate, stratification may not be needed for middle river chum fry population estimates.

3.5 Pink Salmon

The stationary outmigrant traps at Talkeetna Station collected 214 pink salmon fry during 1985. Fifty percent of the oumigration was recorded by June 24 and 95% was recorded by July 14 (Fig. 20 upper). Daily catches did not exceed 1.0 fish per hour and the the last catch was recorded on July 25. The low catches of were probably due to the outmigration of pink fry from the middle river prior to break-up. Also, those fish which were in the middle river following break-up may have migrated in the center of the river, beyond the sampling area of the stationary bank traps.

The total catch of pink fry at the Flathorn stationary traps was 4,351 fish. Fifty percent of the season's catch was recorded on June 20 and the highest daily catch (12.2 fry per hour) was recorded on June 24 (Fig. 20 lower). The last pink salmon fry observed at Flathorn Station was collected on July 24.

The mobile trap at Flathorn Station collected 1,974 pink salmon fry with 50% of the captures recorded by June 17 (Fig. 21 upper). The peak daily catch of 51.2 fish per hour occurred on June 11, and the last catch was recorded on August 3. The highest catches of pink salmon fry were recorded in the center-channel transect sites (Fig. 21 lower). Pink fry were the only species of juvenile salmon to display this horizontal distribution pattern. They may possibly have been outmigrating in association with the higher velocities in the center-channel transects.

3.5.2 Size

Pink salmon in the Susitna River outmigrate shortly after emerging as shown by the mean length of 37 mm during outmigration. A few larger pink fry (to 48 mm) were collected indicating that a small percentage of fry were feeding and growing before outmigrating.

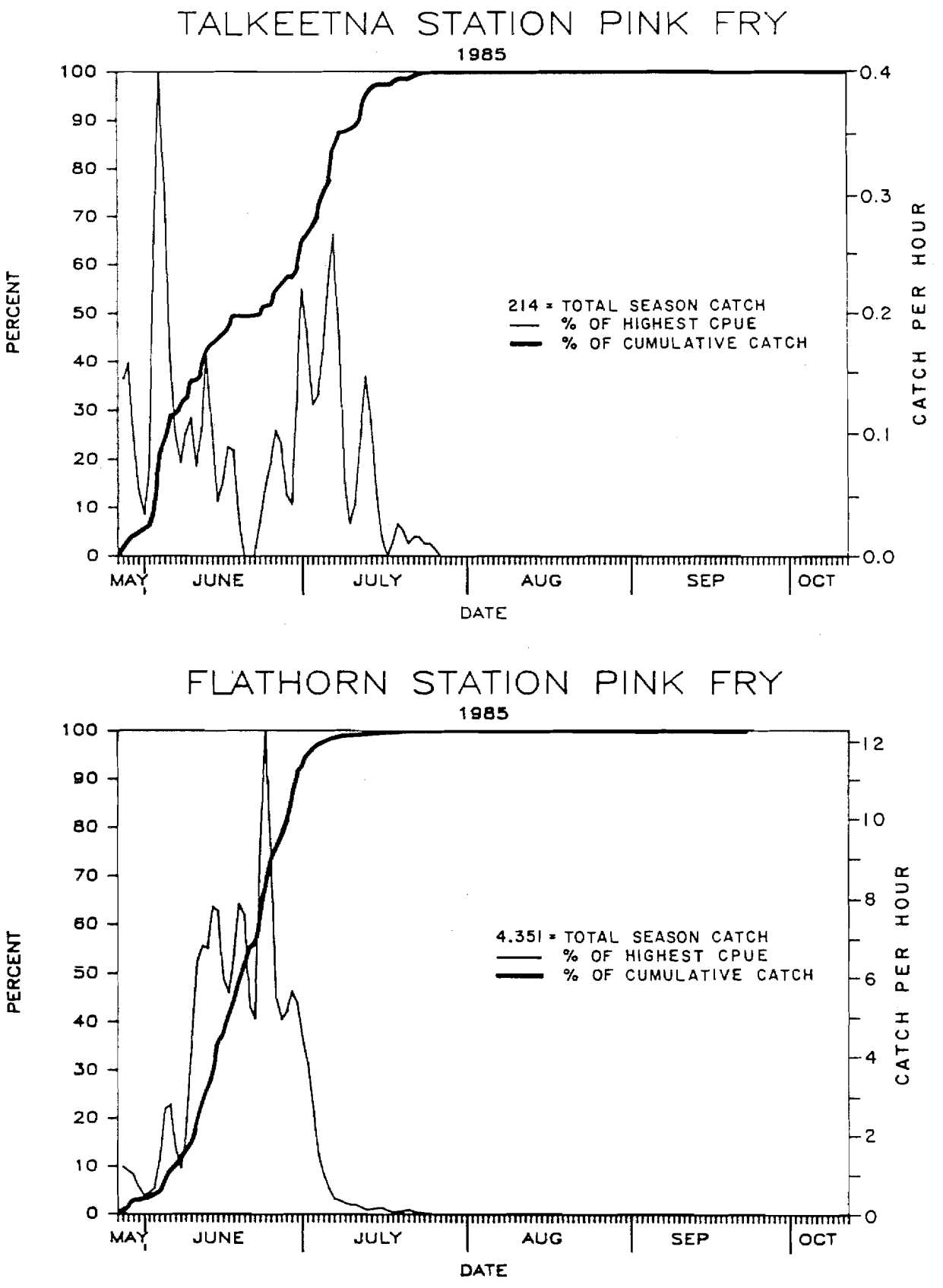

Figure 20. Pink salmon fry daily catch per unit effort and cumulative catch recorded at the Talkeetna (top graph) and Flathorn (bottom graph) stationary outmigrant traps, 1985.

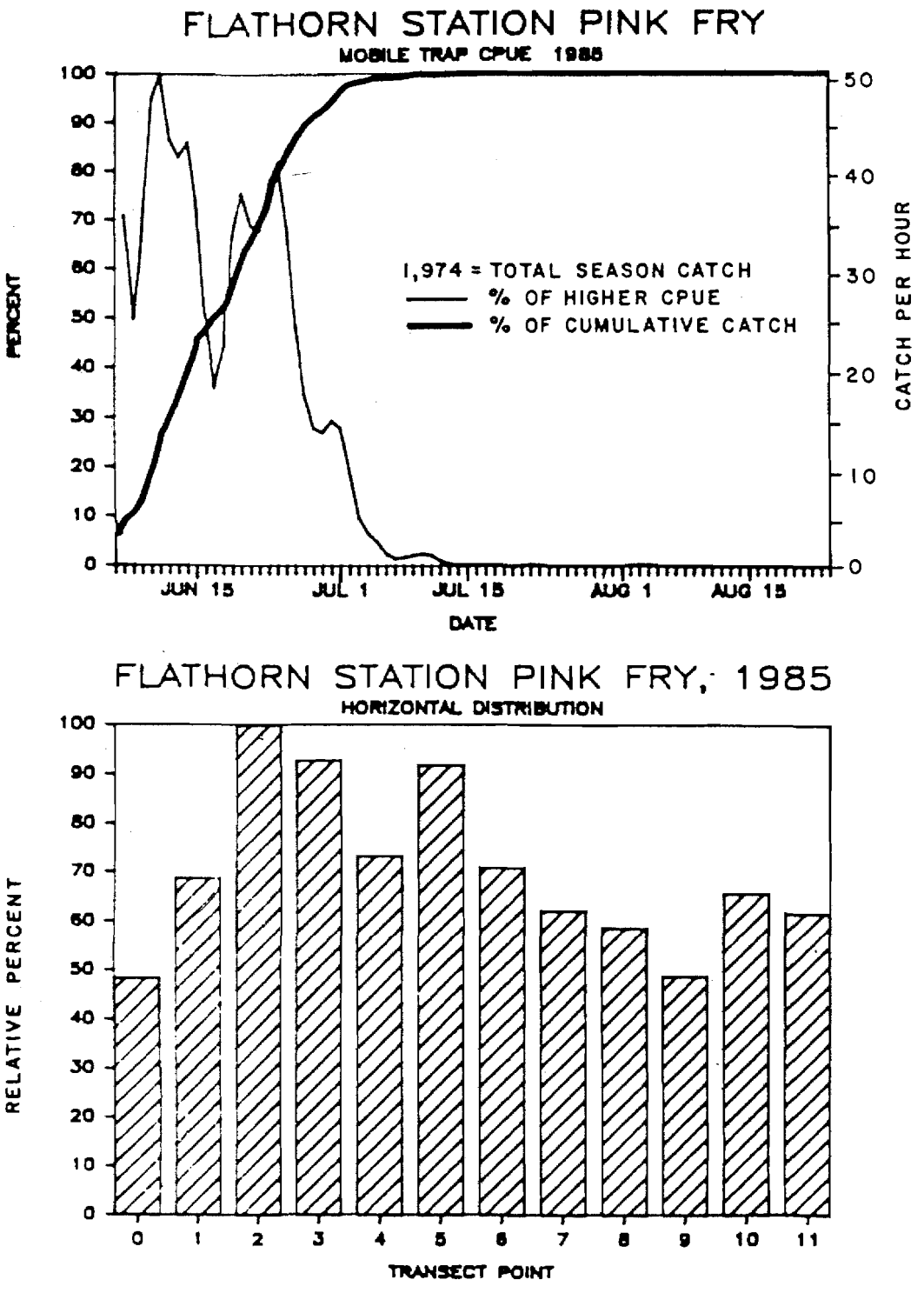

Figure 21. Pink salmon fry daily catch per unit effort and cumulative catch (upper figure) and the catch as a percent of the highest catch per unit volume by transect point (lower figure) recorded at the Flathorn Station mobile outmigrant trap, 1985.

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5.0 ACKNOWLEDGEMENTS

Funding for this study was provided by the State of Alaska, Alaska Power Authority.

We would like to express our appreciation for the logistical services provided by Air Logistics and the Alaska Railroad.

We would also like to extend our thanks to the local residents and property owners around Talkeetna including Bill Bleakley and Harold and Nancy Larson.

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7.0 APPENDICES

Appendix A - Discharge, Temperature, and Turbidity for Talkeetna and Flathorn Stations, 1985.

Appendix B - Brand Symbols, Release Dates, and the Number of Fish Branded by Species and Collection Site in the Middle Reach of the Susitna River During the Cold-Branding Program, 1984-1985.

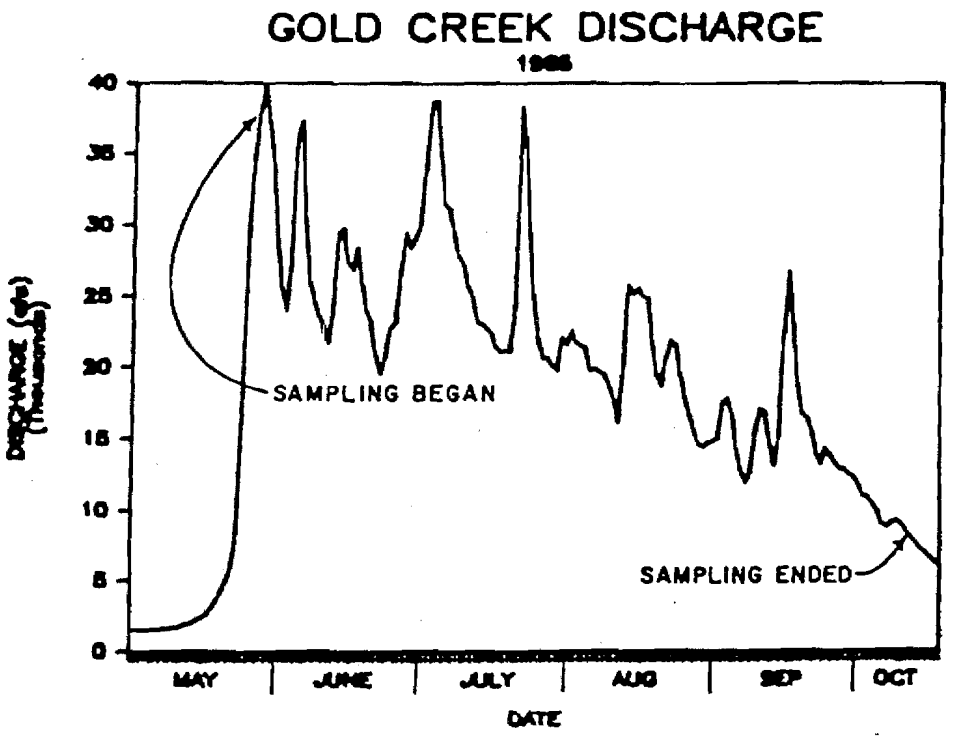
Appendix C - Chum and Sockeye Salmon Cold-Branding Experiment.

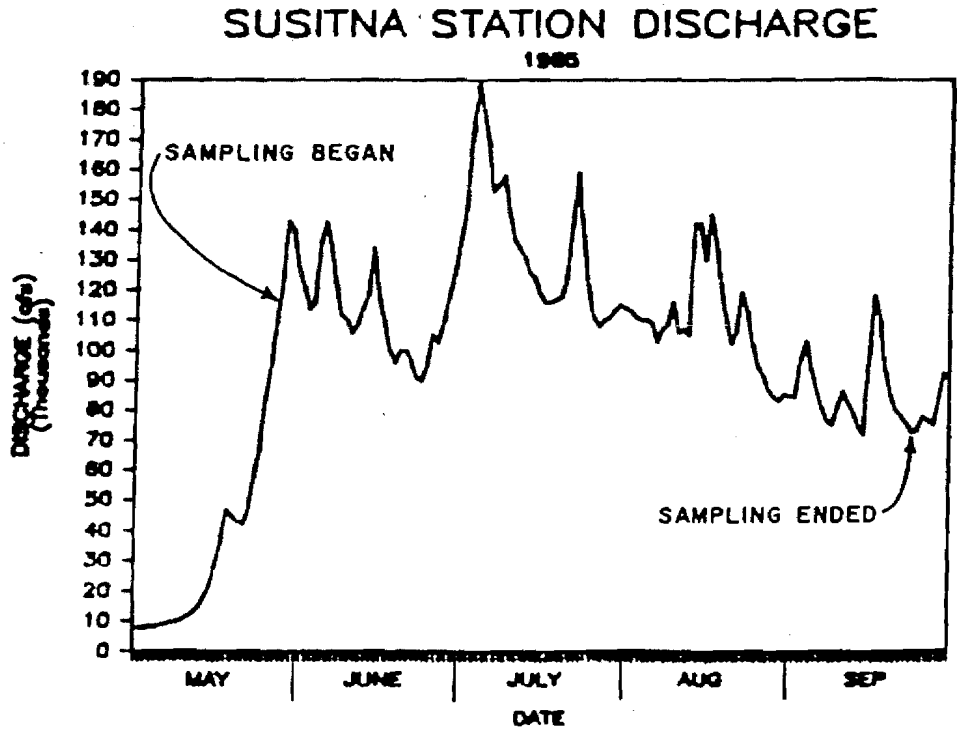
Appendix D - Flathorn Station Juvenile Salmon Catch Data, 1985.

Appendix E - Length and Weight Relationship Data for Juvenile Salmon, 1985.

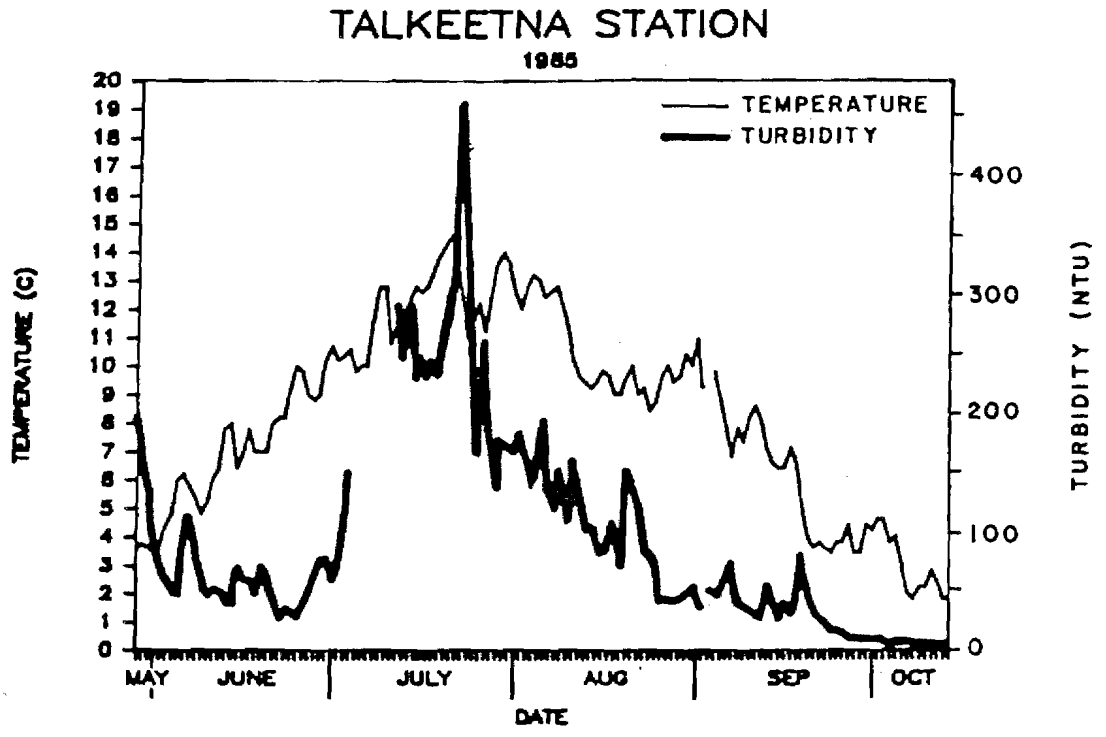
APPENDIX A

Discharge, Temperature, and Turbidity for Talkeetna and Flathorn Stations, 1985

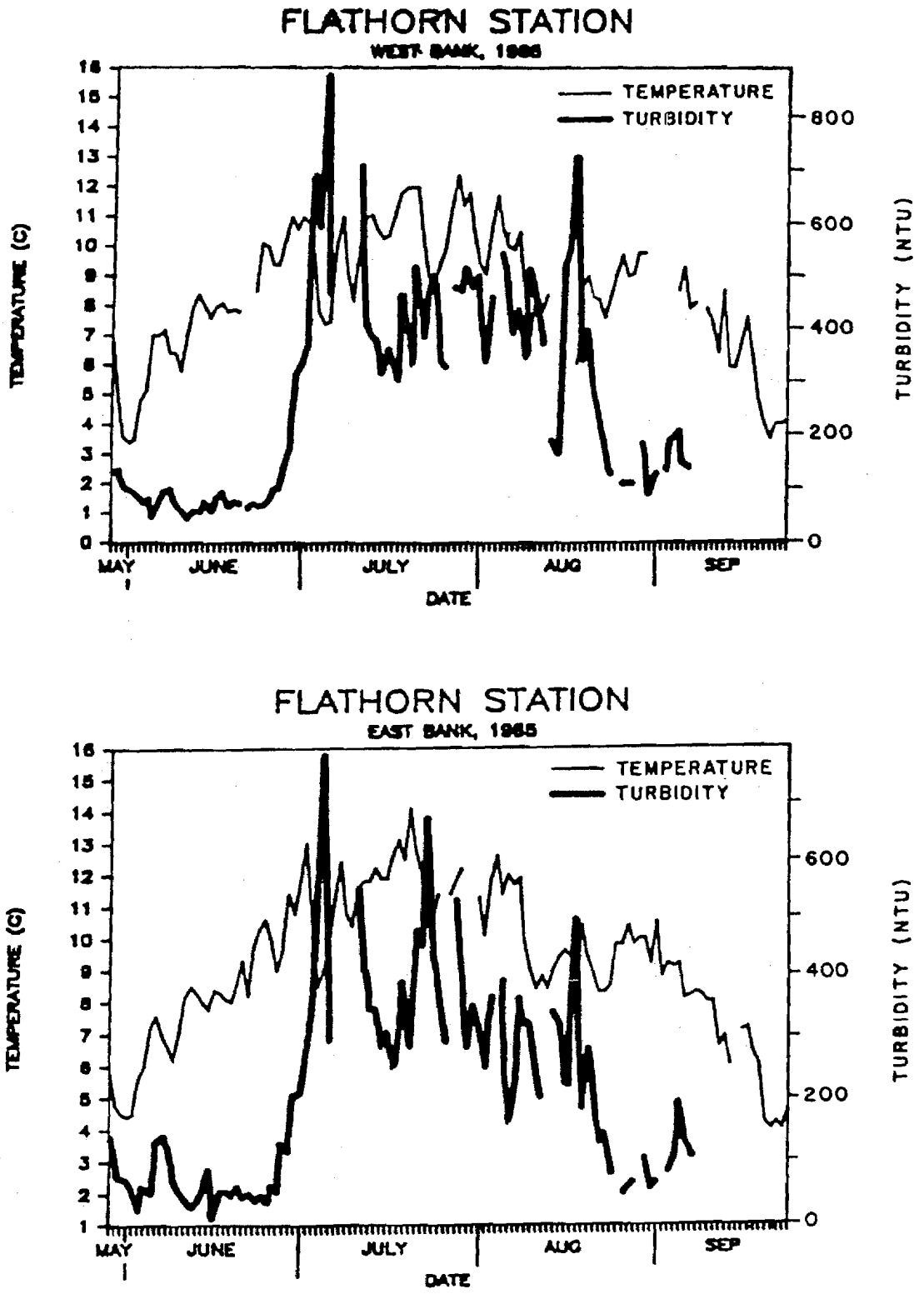




Appendix Figure A.1. Mainstem discharge in the Susitna River measured at the USGS gaging stations at Gold Creek Station (upper figure) and Susitna Station (lower figure), 1985.



Appendix Figure A.2. Talkeetna Station water temperature and turbidity, 1985.



Appendix Figure A.3. Flathorn Station water temperature and turbidity recorded for the west (upper figure) and east (lower figure) bank outmigrant traps, 1985.

Appendix Table A.1. Talkeetna Station water temperature and turbidity, 1985.

DATE	WATER TEMP. (C)	TURBIDITY (NTU)	DATE	WATER TEMP. (C)	TURBIDITY (NTU)	DATE	WATER TEMP. (C)	TURBIDITY (NTU)
850527	3.6	210	850712	12.2	304	850827	9.6	44
850528	3.8	160	850713	12.8	240	850828	10.4	48
850529	3.6	136	850714	12.6	256	850829	10.0	52
850530	3.4	94	850715	12.8	240	850830	10.9	56
850531	3.6	76	850716	13.2	252	850831	9.2	37
850601	4.4	59	850717	13.8	240	850901	---	--
850602	4.8	49	850718	14.2	264	850902	9.8	52
850603	6.0	49	850719	14.6	288	850903	8.8	48
850604	6.2	90	850720	14.8	320	850904	7.8	64
850605	5.8	120	850721	12.6	480	850905	6.8	76
850606	5.4	90	850722	11.0	328	850906	7.8	52
850607	4.8	57	850723	11.6	232	850907	7.3	40
850608	5.2	48	850724	12.2	172	850908	8.2	34
850609	6.0	53	850725	11.2	272	850909	8.6	28
850610	6.4	52	850726	12.4	200	850910	8.0	26
850611	7.8	42	850727	13.6	144	850911	7.1	56
850612	8.0	40	850728	14.0	184	850912	6.6	46
850613	6.4	72	850729	13.6	180	850913	6.4	26
850614	7.0	62	850730	12.6	176	850914	6.4	39
850615	7.8	61	850731	12.0	192	850915	7.1	30
850616	7.0	50	850801	12.8	164	850916	6.6	68
850617	7.0	72	850802	13.2	144	850917	5.2	84
850618	7.0	54	850803	13.0	164	850918	4.0	50
850619	8.0	39	850804	12.4	200	850919	3.6	37
850620	8.2	30	850805	12.6	141	850920	3.8	26
850621	8.2	36	850806	12.8	124	850921	3.6	23
850622	9.2	32	850807	12.2	160	850922	3.4	16
850623	10.0	28	850808	11.4	112	850923	3.8	16
850624	9.8	37	850809	10.2	168	850924	3.8	13
850625	9.0	52	850810	9.6	150	850925	4.4	10
850626	8.8	66	850811	9.4	128	850926	3.4	10
850627	9.0	79	850812	9.2	104	850927	3.4	10
850628	10.2	82	850813	9.4	108	850928	4.4	9
850629	10.7	64	850814	9.8	86	850929	4.2	8
850630	10.2	74	850815	9.6	88	850930	4.6	8
850701	10.4	112	850816	9.0	112	851001	4.6	8
850702	10.6	158	850817	9.0	74	851002	3.8	4
850703	9.8	---	850818	9.6	156	851003	4.0	6
850704	10.0	---	850819	10.0	148	851004	3.0	6
850705	10.0	---	850820	9.0	120	851005	2.0	8
850706	11.6	---	850821	9.2	86	851006	1.8	6
850707	12.8	---	850822	8.4	80	851007	2.2	6
850708	12.8	---	850823	8.7	72	851008	2.2	5
850709	10.8	---	850824	9.6	43	851009	2.8	5
850710	11.4	304	850825	10.0	46	851010	2.4	4
850711	11.8	256	850826	9.4	44	851011	1.8	5
						851012	1.8	5

Appendix Table A.2. Flathorn Station water temperature and turbidity recorded for the west (trap 1) and east (trap 2) bank outmigrant traps, 1985.

DATE	TRAP 1 WATER TEMP. (C)	TRAP 1 TURBIDITY (NTU)	TRAP 2 WATER TEMP. (C)	TRAP 2 TURBIDITY (NTU)
850527	---	---	---	---
850528	6.8	132	5.8	194
850529	5.0	138	4.8	124
850530	3.6	104	4.5	122
850531	3.4	100.	4.4	116
850601	3.5	88	4.5	104
850602	4.8	80	5.6	73
850603	5.2	84	6.0	110
850604	7.0	52	7.2	102
850605	7.0	80	7.6	184
850606	7.2	96	7.0	192
850607	6.4	104	6.6	172
850608	6.4	76	6.2	120
850609	5.8	60	7.0	104
850610	7.0	46	8.2	92
850611	8.0	56	8.5	78
850612	8.4	56	8.3	88
850613	8.0	76	8.0	112
850614	7.6	60	7.8	140
850615	8.0	85	8.4	61
850616	8.1	96	8.3	104
850617	7.8	68	8.1	104
850618	7.9	76	8.0	96
850619	7.8	78	8.6	112
850620	---	--	9.3	96
850621	---	66	8.2	98
850622	8.5	74	9.8	90
850623	10.1	68	10.3	96
850624	10.0	76	10.6	86
850625	9.4	98	10.0	110
850626	9.4	101	9.0	104
850627	10.2	142	9.6	176
850628	11.0	184	11.4	164
850629	10.6	320	10.8	252
850630	11.0	336	11.8	256
850701	10.8	380	13.0	304
850702	9.8	688	10.6	376
850703	7.8	592	8.5	496
850704	7.4	878	9.0	788
850705	7.5	464	9.8	336
850706	10.0	---	11.2	---
850707	11.0	630	12.4	640
850708	9.1	---	10.8	---
850709	8.2	---	10.4	---
850710	10.0	704	11.6	576
850711	11.0	405	11.8	445
850712	11.1	384	11.8	392
850713	10.6	376	12.2	388
850714	10.3	316	11.9	328
850715	10.4	364	11.9	356
850716	11.0	320	12.6	296
850717	11.8	303	13.1	332
850718	12.0	468	12.5	432
850719	12.0	332	14.1	328
850720	12.0	520	12.8	512
850721	10.4	384	12.0	488
850722	9.0	480	10.4	688
850723	8.8	504	10.6	488
850724	9.4	344	11.4	392
850725	10.0	328	----	336
850726	11.4	---	11.4	---
850727	12.4	480	11.8	560
850728	11.4	472	12.2	424
850729	11.8	512	----	336
850730	10.4	480	----	392
850731	9.4	504	11.3	344
850801	9.1	340	10.1	296
850802	10.6	464	11.8	408
850803	11.7	---	12.6	---
850804	10.6	544	11.4	432
850805	10.0	432	12.0	208
850806	9.9	392	11.7	256
850807	10.5	432	11.9	408
850808	8.0	344	9.8	368
850809	7.0	512	9.0	366
850810	8.6	448	8.4	296
850811	7.8	368	8.8	248
850812	8.4	---	8.4	---
850813	---	192	9.0	384
850814	9.0	164	9.4	360
850815	---	512	9.6	272
850816	---	560	9.4	268
850817	6.0	720	8.8	528
850818	8.6	340	10.4	236
850819	9.0	400	9.4	324
850820	8.3	288	8.9	224
850821	8.2	232	8.3	176
850822	7.6	168	8.3	192
850823	8.3	128	8.5	128
850824	9.0	---	9.8	---
850825	9.7	113	9.8	101
850826	9.0	112	10.4	109
850827	9.1	112	9.8	120
850828	9.8	---	10.0	---
850829	9.8	186	10.0	154
850830	---	92	9.2	106
850831	8.8	132	10.5	120
850901	---	---	8.8	---
850902	9.2	132	9.2	132
850903	---	196	9.1	158
850904	8.5	208	9.2	240
850905	9.3	148	8.1	182
850906	7.9	140	8.2	156
850907	8.1	---	8.3	---
850908	---	---	8.2	---
850909	7.9	---	8.0	---
850910	7.4	---	8.0	---
850911	6.4	---	6.6	---
850912	8.5	---	6.9	---
850913	5.9	---	6.0	---
850914	5.9	---	---	---
850915	6.7	---	7.1	---
850916	7.6	---	7.2	---
850917	6.3	---	6.4	---
850918	4.8	---	6.0	---
850919	4.0	---	4.2	---
850920	3.5	---	4.0	---
850921	4.0	---	4.2	---
850922	4.0	---	4.0	---
850923	4.1	---	4.6	---

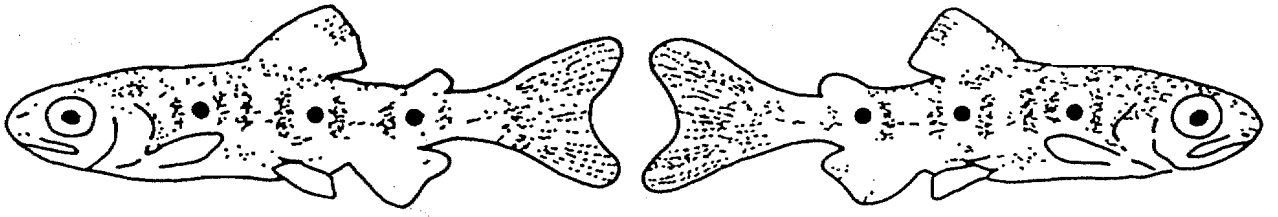
APPENDIX B

Brand Symbols, Release Dates, and the Number of Fish Branded by Species and Collection Site in the Middle Reach of the Susitna River During the Cold-Branding Program, 1984-1985

Cold branding of juvenile salmon has been conducted in the middle reach of the Susitna River since 1984. This appendix is provided so that other investigators who may encounter any of these branded fish can determine the location and dates of their release. The information presented covers the 1984 summer cold branding study (July to October), the 1985 summer branding study (July to October), and the 1985 winter study (November and December) (Appendix Tables B.1, B.2, and B.3).

These data coupled with the branding and release information presented in Stratton (1986) provide all of the brand symbols and locations as well as the release sites and dates for juvenile salmon branded in the Susitna River during the Susitna Aquatic Studies program. Branding symbol and location on the fish presented in the tables are described in Appendix Figure B.1.

Six Branding Locations (•)



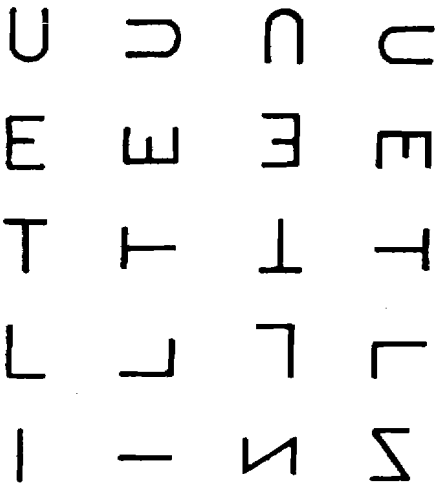
Left Side

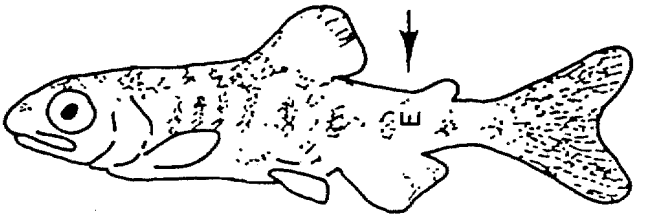
Right Side

BRANDING LOCATION CODES

FL - FRONT LEFT
ML - MIDDLE LEFT
BL - BACK LEFT
BR - BACK RIGHT
MR - MIDDLE RIGHT
FR - FRONT RIGHT

Sample Cold Brands





The brand on this fish would be recorded on the field data form as "BLω", where the BL is the branding location and ω is the brand used.

Appendix Figure B.1. Branding locations, branding location codes, and sample brands used for cold branding juvenile salmon, 1985.

Appendix Table B.1. Brand symbol, release dates, and the number of fish branded by species and collection site in the middle reach of the Susitna River during the summer cold-branding program, 1985.

RELEASE SITE - INDIAN RIVER MOUTH (SITE 1)

BRAND SYMBOL	RELEASE DATES	# OF FISH BRANDED BY SPECIES CHINOOK	COHO	CHUM
MR○	7/9-20	5,845	154	0
MR○	7/21	2,435	253	0
ML○	7/26-31	1,766	161	59
ML○	8/1-10	2,043	127	39
MR○	8/13-19	993	76	0
ML○	8/19-25	1,103	46	0
MR○	8/28-9/2	1,121	59	0
ML○	9/2-8	875	48	0
BL○	9/12-18	747	81	0
BR○	9/18-24	576	43	0
FR○	9/27-10/4	805	60	0
FL○	10/8-12	503	40	0
BL○	10/12	412	44	0

RELEASE SITE - INDIAN RIVER SITE 2

BRAND SYMBOL	RELEASE DATES	# OF FISH BRANDED BY SPECIES CHINOOK	COHO	CHUM
MR+	7/9-14	268	27	0
MRH	7/18-21	491	33	0
ML⋈	7/28-8/1	192	15	1
FR+	8/5-9	654	70	0
BR+	8/17-21	445	76	0
BR⋈	8/25-29	684	75	0
BRH	9/3-7	527	101	1
FR⋈	9/11-17	467	70	0
MR□	9/25	177	37	0
FR□	10/1	246	66	0
FR◇	10/7	235	41	0

RELEASE SITE - INDIAN RIVER SITE 3

BRAND SYMBOL	RELEASE DATES	# OF FISH BRANDED BY SPECIES CHINOOK	COHO	CHUM
ML+	7/9-14	1,301	3	0
MLH	7/18-21	849	23	0
FRX	7/28-8/1	540	28	40
FLX	8/5-9	570	46	0
BRX	8/17-21	278	42	0
BL⋈	8/25-29	460	65	0
BLH	9/3-7	281	40	0
FLH	9/11-17	67	21	0
ML□	9/25	90	23	0
FL□	10/1	168	19	0
ML◇	10/7	95	16	0

Appendix Table B.1. Continued.

RELEASE SITE - INDIAN RIVER SITE 4

BRAND SYMBOL	RELEASE DATES	# OF FISH BRANDED BY SPECIES CHINOOK	COHO	CHUM
MR X	7/9-14	475	69	0
MR H	7/18-21	337	132	0
ML X	7/28-8/1	306	77	0
FL +	8/5-9	234	84	0
BL X	8/17-21	255	145	0
FL H	8/25-29	216	166	0
FR H	9/3-7	100	70	0
BL +	9/11-17	59	67	0
BL □	9/25	64	31	0
BR □	10/1	45	18	0
MR ◇	10/7	29	4	0

RELEASE SITE - PORTAGE CREEK

BRAND SYMBOL	RELEASE DATES	# OF FISH BRANDED BY SPECIES CHINOOK	COHO	CHUM
MR V	7/17-21	1,332	39	406
MR Λ	7/28-8/1	1,174	33	397
ML V	8/5	210	12	86
ML Λ	8/17	151	4	0
MR >	8/21-25	90	37	0
MR <	8/29-9/3	244	18	0
ML >	9/7-11	232	29	0
ML <	9/17-25	243	18	0
BR V	10/1	95	10	0

OTHER RELEASE SITES

BRAND SYMBOL	RELEASE SITE	RELEASE DATES	SPECIES	# OF FISH RELEASED
MR ⊂	SLOUGH 15	9/27-10/2	CHINOOK	628
MR ∪	SLOUGH 15	9/27-10/2	CHINOOK	348
MR ⊃	SLOUGH 15	9/27-10/2	CHINOOK	146
MR ∪	SLOUGH 15	9/27-10/2	CHINOOK	181
MR ⊂	SLOUGH 15	9/27-10/2	COHO	203
MR ∪	SLOUGH 15	9/27-10/2	COHO	151
MR ⊃	SLOUGH 15	9/27-10/2	COHO	74
MR ∪	SLOUGH 15	9/27-10/2	COHO	90
MR ⊢	SLOUGH 11	7/7	SOCKEYE	127
MR ⊂	SLOUGH 11	7/7	CHUM	138
MR ∃	SLOUGH 10A	10/3-8	CHINOOK	245
MR ∈	SLOUGH 10A	10/3-8	CHINOOK	164
MR ∃	SLOUGH 10A	10/3-8	CHINOOK	50
MR E	SLOUGH 10A	10/3-8	CHINOOK	86
MR ∃	SLOUGH 10A	10/3-8	COHO	8
MR ∃	SLOUGH 10A	10/3-8	COHO	1
MR E	SLOUGH 10A	10/3-8	COHO	1

Appendix Table B.2. Brand symbol, release dates, and the number of fish branded by species and collection site in the middle reach of the Susitna River during the winter cold-branding program, 1985.

BRAND SYMBOL	RELEASE SITE	RELEASE DATE	# OF FISH RELEASED CHINOOK	COHO
FL E	SLOUGH 22	11/6	30	0
ML E	SLOUGH 22	11/6	157	0
BL E	SLOUGH 22	11/6	115	2
BL ∃	SLOUGH 22	11/20	119	0
FR ∃	SLOUGH 22	11/20	258	14
FR ∃	SLOUGH 22	12/6	140	0
BR ∃	SLOUGH 22	12/6	77	2
BR ∈	SLOUGH 22	12/19	141	0
FL ∈	SLOUGH 22	12/19	166	2
FR J	SLOUGH 20	12/20	238	0
BR ∩	INDIAN RIVER	11/6	115	97
FL ∩	INDIAN RIVER	11/6	41	26
FR ∧	INDIAN RIVER	11/7	50	10
BL V	INDIAN RIVER	11/20	219	20
FR V	INDIAN RIVER	11/20	10	3
FL V	INDIAN RIVER	11/20	34	88
BR >	INDIAN RIVER	12/6	20	0
BL >	INDIAN RIVER	12/6	7	3
FR >	INDIAN RIVER	12/6	13	28
FL <	INDIAN RIVER	12/19	44	9
BR <	INDIAN RIVER	12/19	0	2
BL <	INDIAN RIVER	12/19	13	26
FL ⊂	SLOUGH 9A	11/6	5	0
ML ⊂	SLOUGH 9A	11/6	30	0
BL ⊂	SLOUGH 9A	11/6	22	0
FR ⊂	SLOUGH 9A	11/6	15	1
BR ⊂	SLOUGH 9A	11/6	78	1
ML ⊃	SLOUGH 9A	11/20	5	0
BL ⊃	SLOUGH 9A	11/20	166	4
FR ⊃	SLOUGH 9A	11/20	201	2
BR ⊃	SLOUGH 9A	11/20	114	0
FL ⊃	SLOUGH 9A	11/20	131	0
BL U	SLOUGH 9A	12/12	2	0
FR U	SLOUGH 9A	12/12	10	0
BR U	SLOUGH 9A	12/12	84	1
FL U	SLOUGH 9A	12/12	43	1
ML U	SLOUGH 9A	12/12	8	0
FR L	WASTOID SLOUGH	11/6	35	1
FL J	WASTOID SLOUGH	11/6	1	5
FL И	SLOUGH 6A	11/7	16	61
ML И	SLOUGH 6A	11/21	7	14
MR И	SLOUGH 6A	11/21	4	38
BR И	SLOUGH 6A	12/12	2	6
BL И	SLOUGH 6A	12/12	1	14
MR ⊥	HIDDEN SLOUGH	11/20	53	56
FL T	HIDDEN SLOUGH	11/21	72	10
BR T	HIDDEN SLOUGH	12/4	56	12
BL ⊥	HIDDEN SLOUGH	12/4	47	21
FR C	TRAPPER CREEK SIDECHANNEL	11/7	8	10
FL ⊐	TRAPPER CREEK SIDECHANNEL	11/7	51	109
MR C	TRAPPER CREEK SIDECHANNEL	11/21	49	51
ML ⊐	TRAPPER CREEK SIDECHANNEL	11/21	37	21
BR C	TRAPPER CREEK SIDECHANNEL	12/4	3	2
BL ⊐	TRAPPER CREEK SIDECHANNEL	12/4	33	28

Appendix Table B.3. Brand symbol, release dates, and the number of fish branded by species and collection site in the middle reach of the Susitna River during the summer cold-branding program, 1984.

BRAND SYMBOL	RELEASE SITE	RELEASE DATE	# OF FISH RELEASED CHINOOK	COHO
MR⊓	PORTAGE CREEK	6/29	6	0
MRE	PORTAGE CREEK	7/1-2	12	0
MR⌋	PORTAGE CREEK	7/3,8/24	169	0
MRω	SLOUGH 22	9/11-13	2,734	0
MRE	SLOUGH 21	9/24-26	229	2
ML∃	SLOUGH 20	10/11	158	1
MR⌐	SLOUGH 19	8/29	703	22
ML⌋	SLOUGH 17	8/29	323	21
MR–	SLOUGH 16	7/16	158	0
ML–	SLOUGH 16	7/17	69	0
MR\	SLOUGH 16	7/18	138	0
ML/	SLOUGH 16	7/19	73	0
MR⊃	INDIAN RIVER	7/14-20	1,983	360
ML⊃	INDIAN RIVER	7/29	778	7
MR⊂	INDIAN RIVER	8/2	1,103	10
ML⊂	INDIAN RIVER	8/9-13	4,957	54
MR∪	INDIAN RIVER	8/9-12	1,813	100
MR∩	INDIAN RIVER	8/24	3,399	120
ML∪	INDIAN RIVER	8/26-9/12	2,715	180
ML∩	INDIAN RIVER	9/8-13	3,122	127
ML≤	INDIAN RIVER	9/23-25	1,583	183
MR≤	INDIAN RIVER	9/23-27	1,734	23
FL⊃	INDIAN RIVER	10/8-10	1,335	159
FR⊂	INDIAN RIVER	10/9-11	688	57
MRN	SLOUGH 14	9/10	182	53
MRT	UPPER SLOUGH 11 SIDECHANNEL	7/29	130	0
MLT	UPPER SLOUGH 11 SIDECHANNEL	7/30	194	0
MR⊥	UPPER SLOUGH 11 SIDECHANNEL	7/31	179	0
ML⊥	UPPER SLOUGH 11 SIDECHANNEL	8/1	173	0
MR∃	SIDECHANNEL 10A	7/16	231	0
MLE	SIDECHANNEL 10A	7/17	119	0
MR∃	SIDECHANNEL 10A	7/18	186	0
MLω	SLOUGH 10	9/26	195	0
MR⊣	MOOSE SLOUGH	8/8	238	0
ML⊢	MOOSE SLOUGH	8/9	480	0
MR⊢	MOOSE SLOUGH	8/10	212	0
ML⊣	MOOSE SLOUGH	8/11	137	0

APPENDIX C

Chum and Sockeye Salmon Cold-Branding Experiment

One-half length coded wire tags have been used since 1983 to mark post-emergent chum and sockeye salmon fry in the middle reach of the Susitna River between the Chulitna River confluence and Devil Canyon (Roth et al. 1984; Roth and Stratton 1985). The marked fish were recaptured at Talkeetna Station (RM 103.0) to provide population and survival estimates for outmigrating chum and sockeye salmon fry. Although this technique has proven effective in providing a long term discernable mark for small salmon fry, the high costs associated with coded wire tagging program may prevent its use by other marking studies. A marking experiment was conducted in 1985 to test cold branding as a more cost-effective alternative for marking post-emergent chum and sockeye salmon.

The pilot study was conducted from June 22 to July 7. Samples of chum and sockeye salmon fry collected from Slough 11 (RM 135.3) were used to test the effectiveness of cold branding. To determine which length of time that the fish were held against the branding apparatus provided the best mark, three different branding times were tested. Sub-samples of 50 fish of each species were branded for 1, 2, or 3 seconds and then monitored for two weeks to determine the mortality and mark visibility and clarity for each branding time. The total length of the chum and sockeye salmon fry averaged 38 and 30 mm, respectively.

A branding time of one second provided the best brand clarity and lowest mortality for both sockeye and chum salmon fry (Appendix Table C.1). As branding time was increased, so also were mortality and distortion of the mark. Another result of the longer branding times was a permanent bending of the body at the point where the brand was applied. This was not observed in the one-second branding time group. The amount of time required for the brand to darken and become easily visible was five to seven days for all groups.

Appendix Table C.1. Mortality and brand clarity over a two week period for chum and sockeye salmon fry cold branded for three branding durations, 1985.

Branding Duration (seconds)	Mortality		Brand Clarity	
	Chum	Sockeye	Chum	Sockeye
0	0	0	----	----
1	0	1	Excellent	Excellent
2	1	5	Slight Distortion	Slight Distortion
3	11	17	Highly Distorted	Highly Distorted

Cold branding can provide an alternative technique for marking small chum and sockeye salmon fry when a long-term mark is required and may be a more cost-effective technique than coded wire tagging. The cost savings are realized in that the cold-branding equipment is less expensive to obtain and requires less maintenance. Also, two people can brand at the same time on a single branding machine while only one person at a time can operate the coded wire tagger. However, the second person is still required for coded wire tagging to clip the adipose fin of the fish to be tagged to provide a visual indicator to the presence or absence of a coded wire tag. Cold brands are visible on the fish and require no additional marks. With the same number of people involved in both tagging techniques, it may be possible to mark twice as many fish during the same time period using cold branding.

During recovery efforts, coded wire tagged fish must be passed through a tag detector to verify the presence of a tag. The fish must then be sacrificed to determine the tag release information from the code on the wire tag. With a cold-branded fish, the mark is easily observed visually and does not require sacrificing the fish.

The five to seven day period required for the mark to become visible on a fish after cold branding may limit the usefulness of this technique in some marking programs. However, if retaining the fish is not possible and if recapture of these fish may occur before the mark becomes visible, the addition of a second mark could be useful. Dye immersion staining with Bismark Brown dye has been found effective in providing short-term marks for chum and sockeye salmon fry (Roth et al. 1984). Dye marking of cold-branded fish prior to release would allow the visual identification of a marked fish prior to the cold brand becoming readily visible.

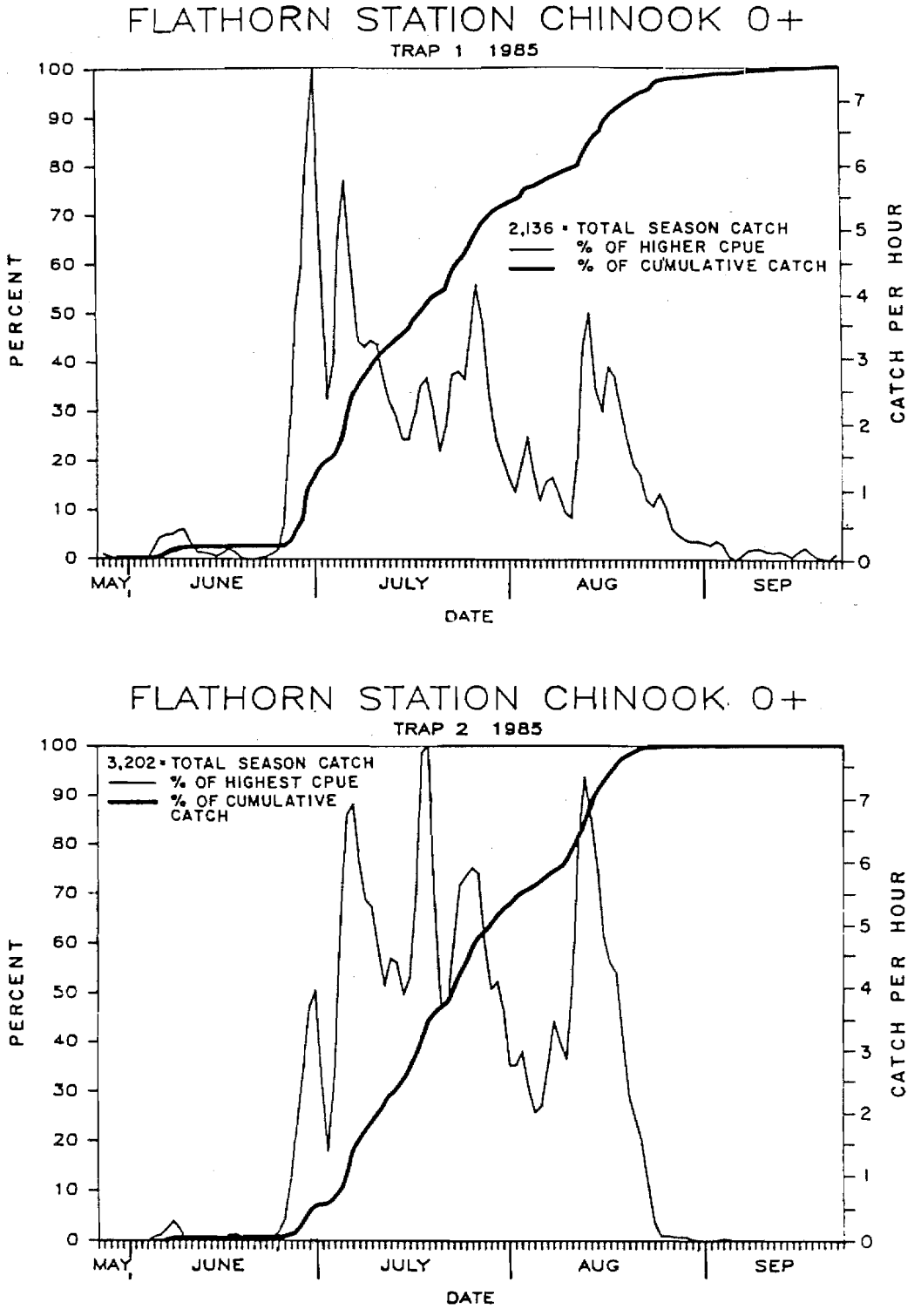
It is presently not known how long the cold-brand mark will stay visible on chum and sockeye salmon fry. Branded chum fry were collected up to three weeks after branding and the marks were still clearly visible. Also, chinook and coho salmon juveniles with distinct brands have been collected in the Susitna River over one year after they were released. Although the short brand duration worked well for small fish in this experiment, futher studies should be conducted before applying these techniques in other programs.

APPENDIX D

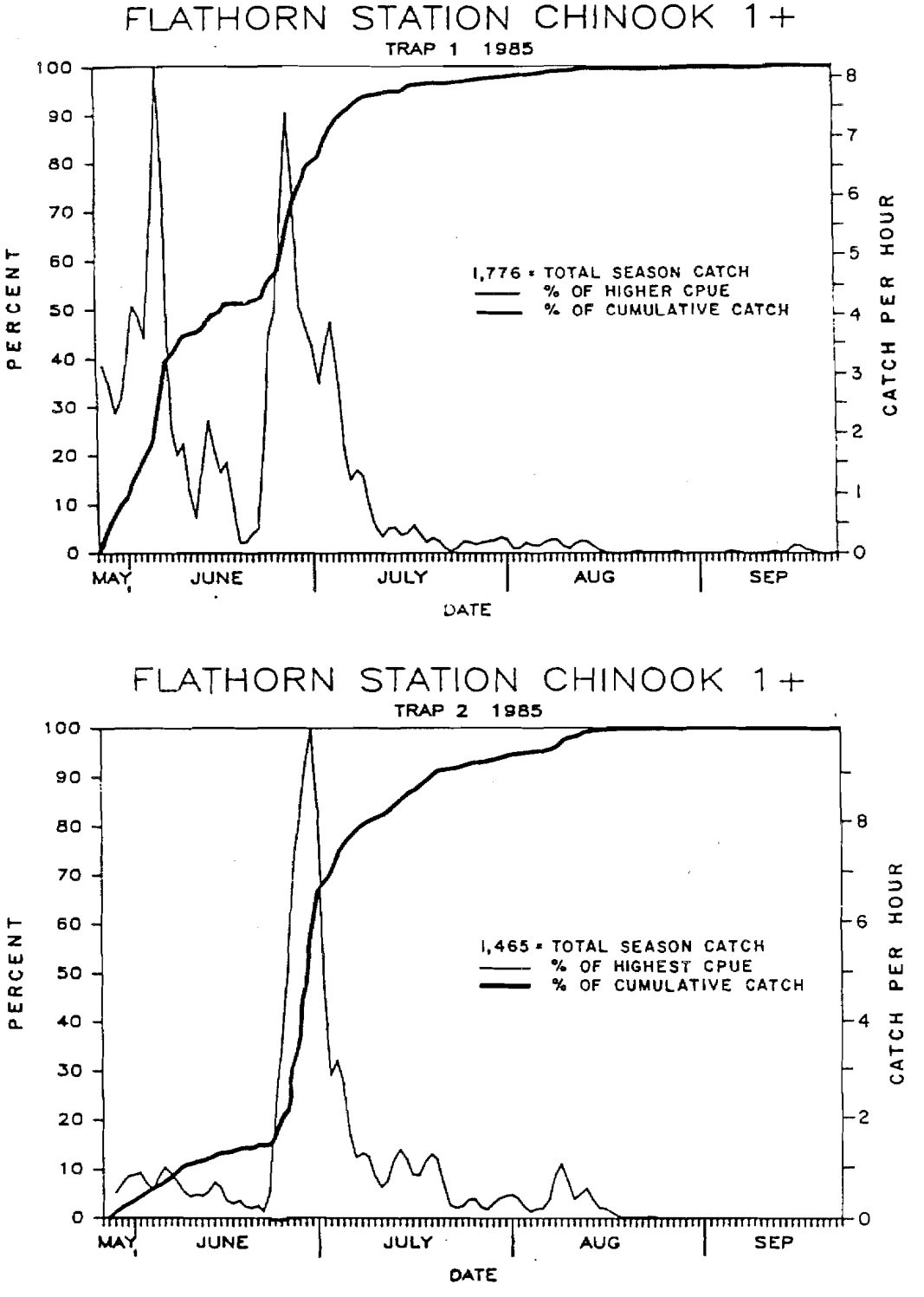
Flathorn Station Juvenile Salmon Catch Data, 1985

The catch data for both banks of the Susitna river at Flathorn Station were combined when an overlay of the individual catch curves for each bank trap indicated there was a close similarity between the beginning and end points of the juvenile salmon outmigration and the slopes of the cumulative catch. However, Flathorn Station is only four miles downstream from the confluence of the Susitna and Yentna rivers. This proximity may be reflected by statistically different within-season peaks in timing, and in age class and species composition. In the case of age 1+ chinook for example, an outmigration peak was detected by the west bank trap on June 6 while a corresponding peak was not detected by the east bank trap (Appendix Fig. E.2). This peak in the catch data may indicate that a pulse of age 1+ chinook outmigrated from the Yentna River and was subsequently detected by the west bank trap. If this interpretation of the data is valid, the bank migration of chinook salmon juveniles produced in the Yentna River may occur as far downstream as Flathorn Station. Turbity and temperature data were recorded at each of the Flathorn traps to evaluate their relationship to the catch (Appendix A).

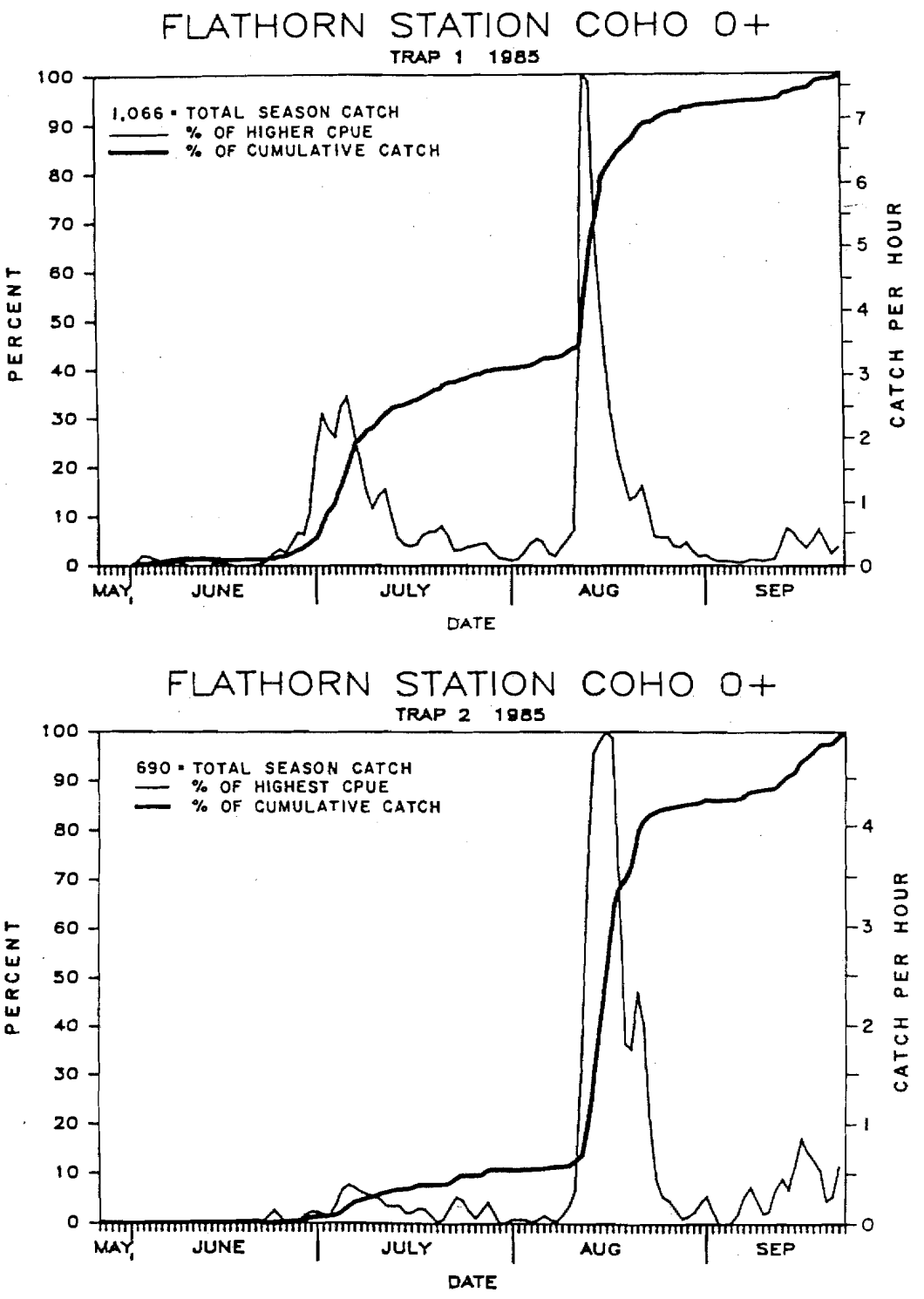
Roth et al. (1984) statistically implied that CPUE's were different between the two bank traps at Talkeetna Station in 1983. Although differences between banks may exist at both Talkeetna and Flathorn stations, the factors affecting the CPUE's at each station are probably different. Unlike Flathorn Station, the Susitna River at Talkeetna Station does not have a major tributary in close upstream proximity and therefore is not considered to have an immediate, discernable cause for a major dissimilarity in the behavior of juvenile salmon between banks.



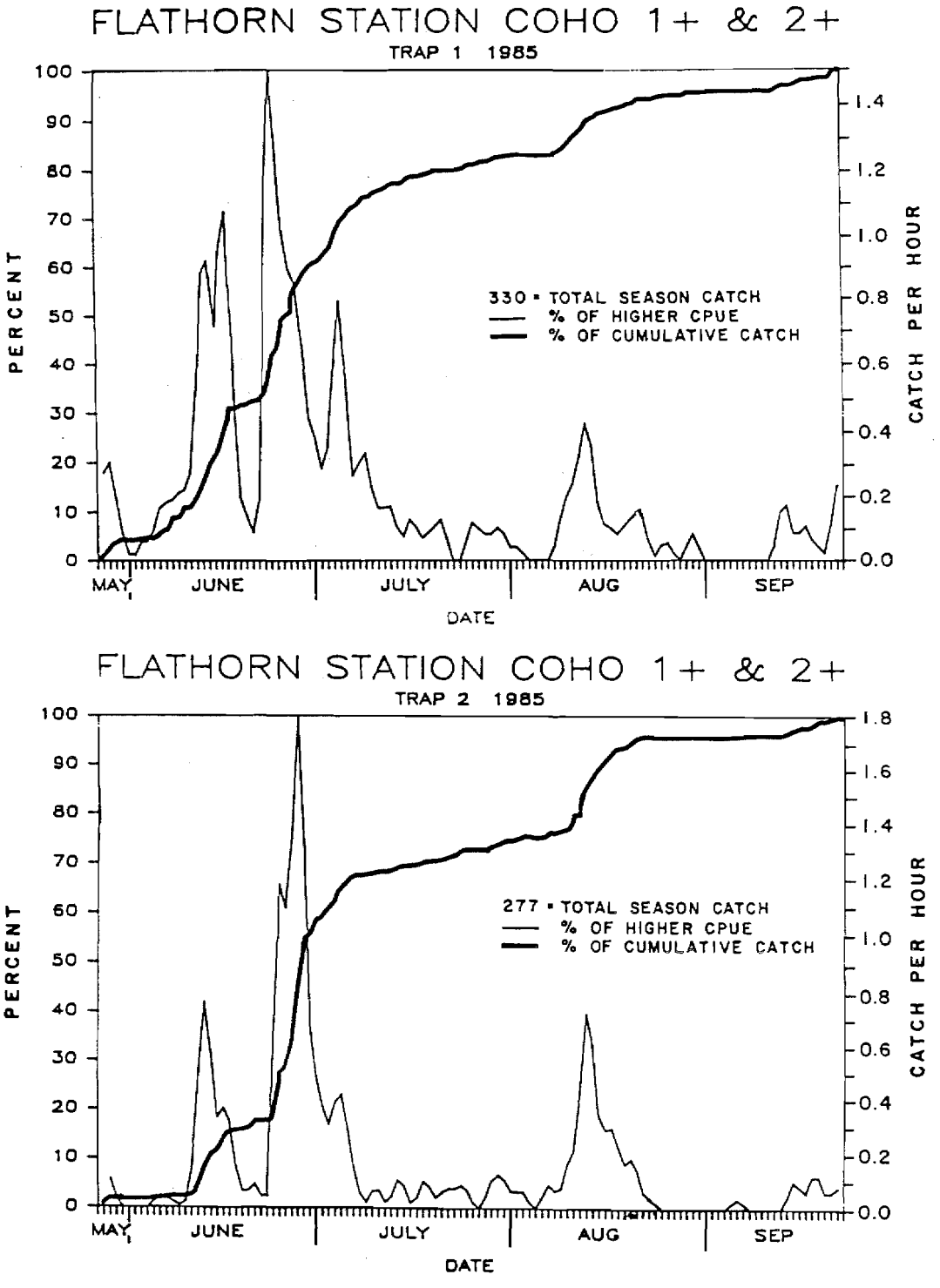
Appendix Figure D.1. Flathorn Station chinook salmon (age 0+) daily and cumulative catch recorded for the west bank (upper figure) and east bank (lower figure) stationary outmigrant traps, 1985.



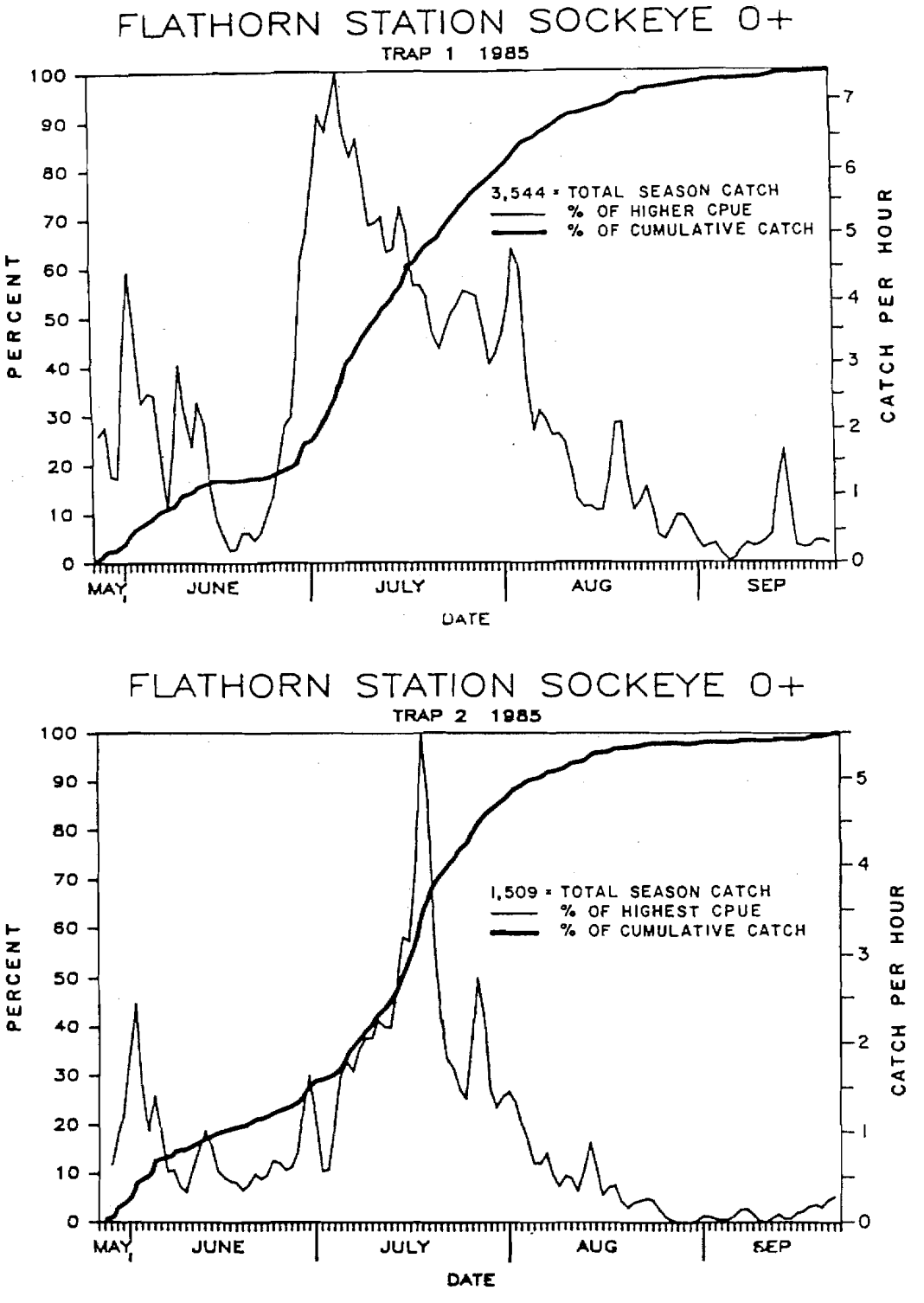
Appendix Figure D.2. Flathorn Station chinook salmon (age 1+) daily and cumulative catch recorded for the west bank (upper figure) and east bank (lower figure) stationary outmigrant traps, 1985.



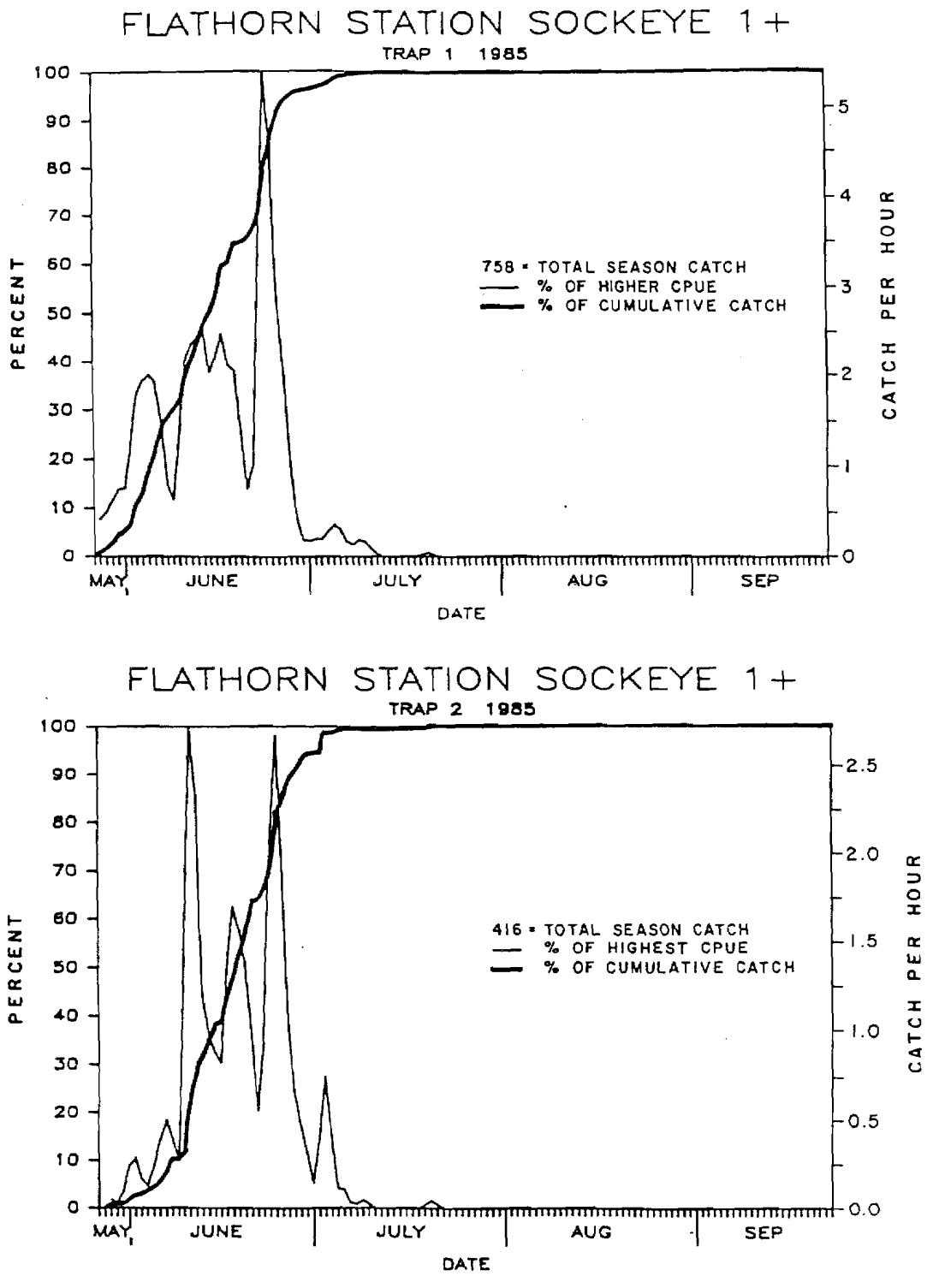
Appendix Figure D.3. Flathorn Station coho salmon (age 0+) daily and cumulative catch recorded for the west bank (upper figure) and east bank (lower figure) stationary outmigrant traps, 1985.



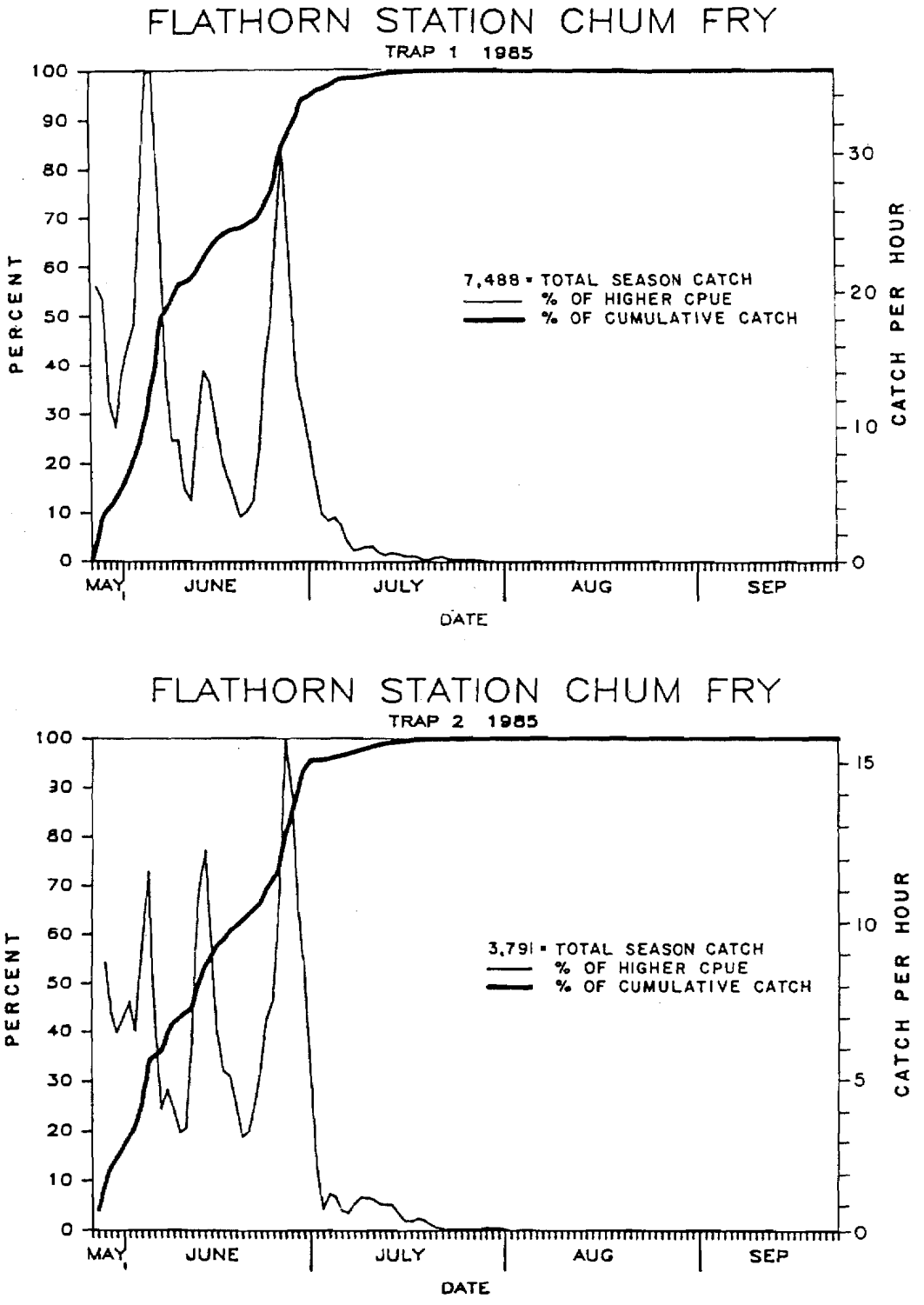
Appendix Figure D.4. Flathorn Station coho salmon (age 1+ and 2+) daily and cumulative catch recorded for the west bank (upper figure) and east bank (lower figure) stationary outmigrant traps, 1985.



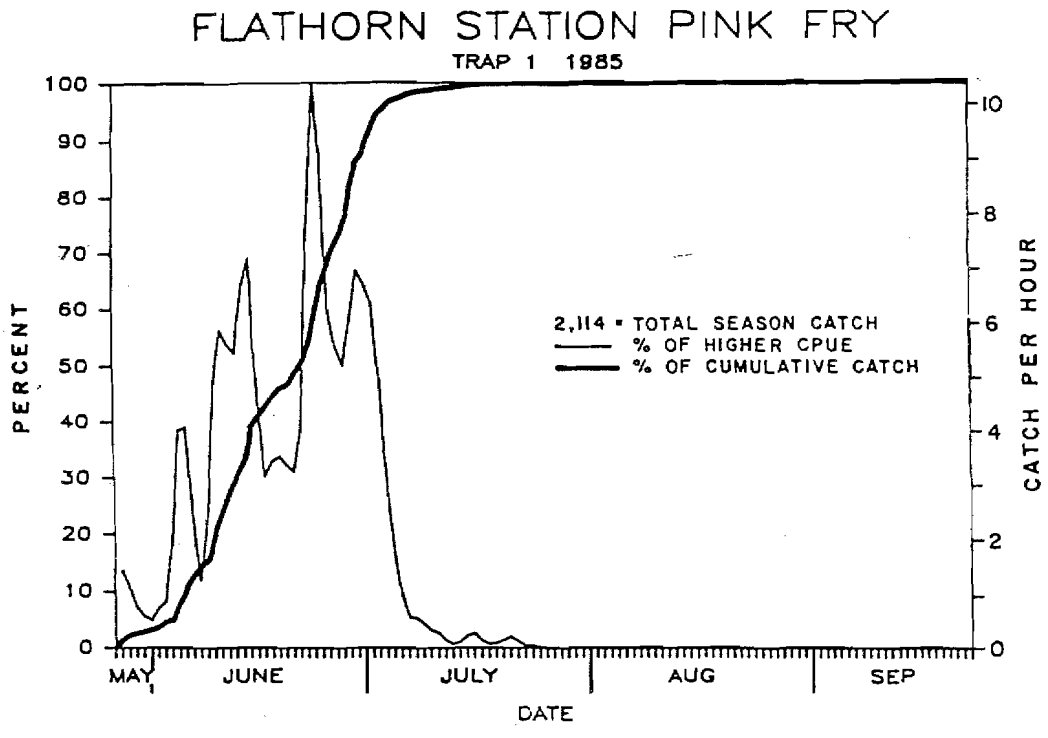
Appendix Figure D.5. Flathorn Station sockeye salmon (age 0+) daily and cumulative catch recorded for the west bank (upper figure) and east bank (lower figure) stationary outmigrant traps, 1985.

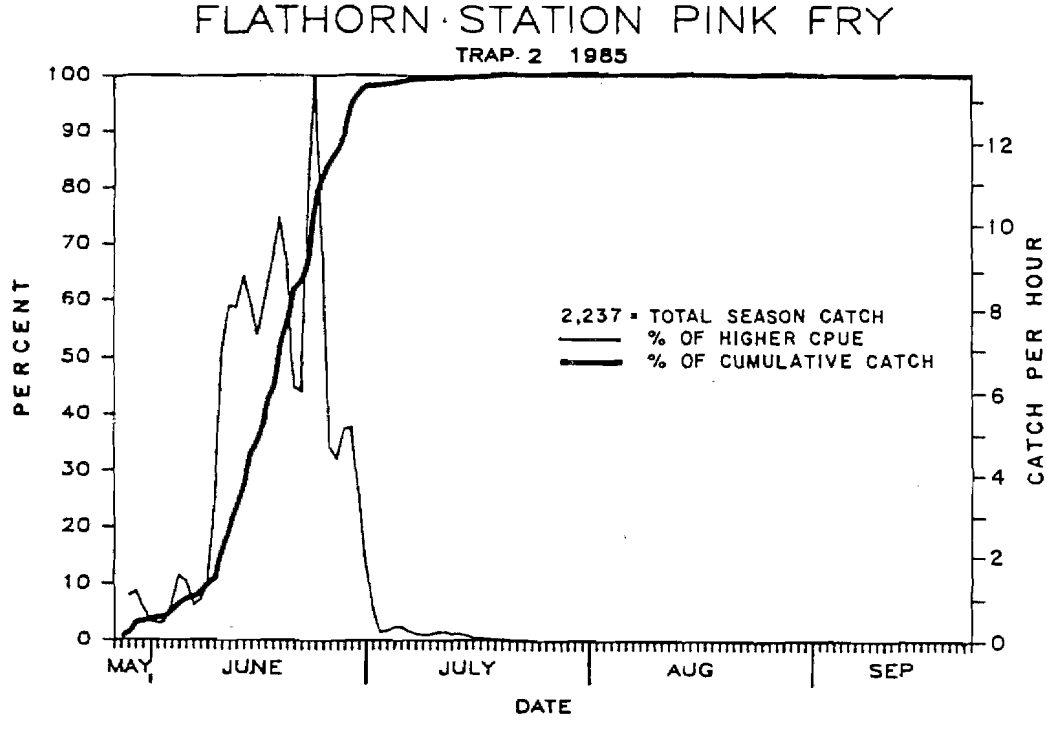


Appendix Figure D.6. Flathorn Station sockeye salmon (age 1+) daily and cumulative catch recorded for the west bank (upper figure) and east bank (lower figure) stationary outmigrant traps, 1985.



Appendix Figure D.7. Flathorn Station chum salmon fry daily and cumulative catch recorded for the west bank (upper figure) and east bank (lower figure) stationary outmigrant traps, 1985.





Appendix Figure D.8. Flathorn Station pink salmon fry daily and cumulative catch recorded for the west bank (upper figure) and east bank (lower figure) stationary outmigrant traps, 1985.

Appendix Table D.1. Flathorn Station chinook salmon (age 0+) daily and cumulative catch recorded for the west bank (trap 1) and east bank (trap 2) stationary outmigrant traps, 1985.

	TRAP 1					TRAP 2				
Date	Hours Fished	Daily Catch	Cumulative Catch	Daily CPUE	Percent Cumulative	Hours Fished	Daily Catch	Cumulative Catch	Daily CPUE	Percent Cumulative
850527	7.83	0	0	0.00	0	0	-	-	----	----
850528	13.50	2	2	0.15	0.09	12.75	0	0	0.00	0.00
850529	15.75	0	2	0.00	0.09	23.17	0	0	0.00	0.00
850530	15.42	0	2	0.00	0.09	22.75	0	0	0.00	0.00
850531	12.17	0	2	0.00	0.09	12.08	0	0	0.00	0.00
850601	13.42	0	2	0.00	0.09	12.83	0	0	0.00	0.00
850602	11.50	0	2	0.00	0.09	11.83	0	0	0.00	0.00
850603	14.33	0	2	0.00	0.09	14.58	0	0	0.00	0.00
850604	11.83	0	2	0.00	0.09	24.08	0	0	0.00	0.00
850605	14.17	0	2	0.00	0.09	18.58	1	1	0.05	0.03
850606	13.50	7	9	0.52	0.42	11.75	2	3	0.17	0.09
850607	24.33	6	15	0.25	0.70	13.50	0	3	0.00	0.09
850608	24.42	11	26	0.45	1.22	24.00	14	17	0.58	0.53
850609	23.58	8	34	0.34	1.59	23.00	2	19	0.09	0.59
850610	14.75	9	43	0.61	2.01	11.25	0	19	0.00	0.59
850611	14.58	3	46	0.21	2.15	12.33	0	19	0.00	0.59
850612	12.25	0	46	0.00	2.15	11.83	0	19	0.00	0.59
850613	11.33	2	48	0.18	2.24	11.50	0	19	0.00	0.59
850614	10.25	0	48	0.00	2.24	10.83	0	19	0.00	0.59
850615	12.25	1	49	0.08	2.29	12.67	0	19	0.00	0.59
850616	13.17	0	49	0.00	2.29	12.42	1	20	0.08	0.62
850617	11.92	3	52	0.25	2.43	11.25	1	21	0.09	0.66
850618	12.25	1	53	0.08	2.48	11.75	2	23	0.17	0.72
850619	7.92	0	53	0.00	2.48	13.08	0	23	0.00	0.72
850620	3.00	0	53	0.00	2.48	12.50	1	24	0.08	0.75
850621	11.50	0	53	0.00	2.48	22.58	0	24	0.00	0.75
850622	12.17	0	53	0.00	2.48	7.75	0	24	0.00	0.75
850623	12.33	1	54	0.08	2.52	11.83	0	24	0.00	0.75
850624	9.50	0	54	0.00	2.52	11.92	1	25	0.08	0.78
850625	12.67	3	57	0.24	2.66	12.17	2	27	0.16	0.84
850626	12.50	1	58	0.08	2.71	11.83	2	29	0.17	0.91
850627	12.25	21	79	1.71	3.69	13.17	11	40	0.84	1.25
850628	12.33	59	138	4.78	6.45	11.83	23	63	1.94	1.97
850629	15.92	58	196	3.64	9.16	17.92	51	114	2.85	3.56
850630	20.42	114	310	5.58	14.49	17.33	55	169	3.17	5.28
850701	5.92	61	371	10.31	17.34	9.58	53	222	5.53	6.93
850702	11.58	41	412	3.54	19.26	8.17	13	235	1.59	7.34
850703	11.75	22	434	1.87	20.29	11.67	10	245	0.86	7.65
850704	12.08	29	463	2.40	21.65	11.33	26	271	2.29	8.46
850705	11.83	63	526	5.32	24.59	12.83	68	339	5.30	10.59
850706	16.00	104	630	6.50	29.45	16.43	116	455	7.06	14.21
850707	19.75	91	721	4.61	33.71	18.58	139	594	7.48	18.55
850708	12.00	28	749	2.33	35.02	12.42	69	663	5.56	20.71
850709	12.17	48	797	3.95	37.26	11.42	60	723	5.26	22.58
850710	12.25	32	829	2.61	38.76	12.00	65	788	5.42	24.61
850711	12.25	50	879	4.08	41.09	11.75	58	846	4.94	26.42
850712	11.83	26	905	2.20	42.31	11.83	37	883	3.13	27.58
850713	11.92	30	935	2.52	43.71	12.00	59	942	4.92	29.42
850714	12.00	27	962	2.25	44.97	11.75	57	999	4.85	31.20
850715	11.92	20	982	1.68	45.91	12.08	35	1034	2.90	32.29
850716	15.00	25	1007	1.67	47.08	14.75	72	1106	4.88	34.54
850717	21.00	47	1054	2.24	49.28	20.58	81	1187	3.94	37.07
850718	12.42	33	1087	2.66	50.82	12.33	112	1299	9.08	40.57
850719	12.00	36	1123	3.00	52.50	12.33	109	1408	8.84	43.97
850720	12.00	28	1151	2.33	53.81	11.83	54	1462	4.56	45.66
850721	11.92	16	1167	1.34	54.56	11.83	41	1503	3.46	46.94
850722	11.92	19	1186	1.59	55.45	11.92	41	1544	3.44	48.22
850723	18.00	63	1249	3.50	58.39	16.83	78	1622	4.63	50.66
850724	18.17	47	1296	2.59	60.59	19.08	114	1736	5.97	54.22
850725	12.58	34	1330	2.70	62.18	12.42	73	1809	5.88	56.50

Appendix Table D.1. Continued.

Date	TRAP 1 Hours Fished	TRAP 1 Daily Catch	TRAP 1 Cumulative Catch	TRAP 1 Daily CPUE	TRAP 1 Percent Cumulative	TRAP 2 Hours Fished	TRAP 2 Daily Catch	TRAP 2 Cumulative Catch	TRAP 2 Daily CPUE	TRAP 2 Percent Cumulative
850726	12.83	37	1367	2.88	63.91	13.58	72	1881	5.30	58.74
850727	11.92	61	1428	5.12	66.76	11.92	84	1965	7.05	61.37
850728	12.17	43	1471	3.53	68.77	11.92	45	2010	3.78	62.77
850729	12.33	27	1498	2.19	70.03	11.92	48	2058	4.03	64.27
850730	12.33	22	1520	1.78	71.06	12.17	49	2107	4.03	65.80
850731	11.92	18	1538	1.51	71.90	11.50	49	2156	4.26	67.33
850801	11.92	15	1553	1.26	72.60	12.00	24	2180	2.00	68.08
850802	12.08	11	1564	0.91	73.12	12.08	33	2213	2.73	69.11
850803	12.00	12	1576	1.00	73.68	12.25	44	2257	3.59	70.49
850804	12.33	34	1610	2.76	75.27	12.00	24	2281	2.00	71.24
850805	12.42	11	1621	0.89	75.78	12.00	23	2304	1.92	71.96
850806	12.92	8	1629	0.62	76.16	12.58	28	2332	2.23	72.83
850807	11.83	17	1646	1.44	76.95	11.92	25	2357	2.10	73.61
850808	12.17	15	1661	1.23	77.65	5.75	26	2383	4.52	74.42
850809	11.92	13	1674	1.09	78.26	11.67	32	2415	2.74	75.42
850810	17.33	11	1685	0.63	78.78	16.33	41	2456	2.51	76.70
850811	19.00	9	1694	0.47	79.20	21.00	77	2533	3.67	79.11
850812	12.75	12	1706	0.94	79.76	12.08	79	2612	6.54	81.57
850813	12.08	46	1752	3.81	81.91	12.08	104	2716	8.61	84.82
850814	11.83	52	1804	4.39	84.34	12.08	67	2783	5.54	86.91
850815	15.83	37	1841	2.34	86.07	16.00	112	2895	7.00	90.41
850816	20.25	26	1867	1.28	87.28	19.50	76	2971	3.90	92.79
850817	11.83	48	1915	4.06	89.53	11.92	52	3023	4.36	94.41
850818	11.83	27	1942	2.28	90.79	11.83	58	3081	4.90	96.22
850819	12.67	31	1973	2.45	92.24	12.17	33	3114	2.71	97.25
850820	12.08	21	1994	1.74	93.22	12.00	27	3141	2.25	98.09
850821	12.83	15	2009	1.17	93.92	12.50	22	3163	1.76	98.78
850822	12.42	20	2029	1.61	94.86	12.17	22	3185	1.81	99.47
850823	12.33	9	2038	0.73	95.28	12.50	10	3195	0.80	99.78
850824	15.25	8	2046	0.52	95.65	12.25	2	3197	0.16	99.84
850825	20.42	29	2075	1.42	97.01	12.50	0	3197	0.00	99.84
850826	12.33	8	2083	0.65	97.38	12.50	2	3199	0.16	99.91
850827	12.50	5	2088	0.40	97.62	12.00	0	3199	0.00	99.91
850828	12.08	5	2093	0.41	97.85	12.25	1	3200	0.08	99.94
850829	12.33	3	2096	0.24	97.99	13.75	1	3201	0.07	99.97
850830	12.50	4	2100	0.32	98.18	12.17	0	3201	0.00	99.97
850831	15.83	3	2103	0.19	98.32	12.33	0	3201	0.00	99.97
850901	9.75	4	2107	0.41	98.50	9.83	0	3201	0.00	99.97
850902	0	-	2107	----	98.50	12.17	0	3201	0.00	99.97
850903	8.75	4	2111	0.46	98.83	12.67	0	3201	0.00	99.97
850904	13.83	3	2114	0.22	99.02	13.67	1	3202	0.07	100.00
850905	12.08	0	2114	0.00	99.02	12.08	0	3202	0.00	100.00
850906	13.00	0	2114	0.00	99.02	13.58	0	3202	0.00	100.00
850907	12.33	0	2114	0.00	99.02	12.25	0	3202	0.00	100.00
850908	12.58	3	2117	0.24	99.11	11.33	0	3202	0.00	100.00
850909	12.00	1	2118	0.08	99.16	12.17	0	3202	0.00	100.00
850910	12.25	3	2121	0.24	99.30	12.50	0	3202	0.00	100.00
850911	12.67	1	2122	0.08	99.35	12.67	0	3202	0.00	100.00
850912	12.00	1	2123	0.08	99.39	12.00	0	3202	0.00	100.00
850913	12.00	2	2125	0.17	99.49	11.67	0	3202	0.00	100.00
850914	11.83	1	2126	0.08	99.53	0	-	3202	----	100.00
850915	3.50	0	2126	0.00	99.53	12.67	0	3202	0.00	100.00
850916	12.00	1	2127	0.08	99.58	12.00	0	3202	0.00	100.00
850917	12.08	4	2131	0.33	99.77	12.08	0	3202	0.00	100.00
850918	12.42	0	2131	0.00	99.77	12.67	0	3202	0.00	100.00
850919	12.33	1	2132	0.08	99.81	12.33	0	3202	0.00	100.00
850920	12.00	0	2132	0.00	99.81	11.08	0	3202	0.00	100.00
850921	12.42	0	2132	0.00	99.81	12.25	0	3202	0.00	100.00
850922	12.33	0	2132	0.00	99.81	12.00	0	3202	0.00	100.00
850923	12.08	4	2136	0.33	100.00	12.17	0	3202	0.00	100.00

Appendix Table D.2. Flathorn Station chinook salmon (age 1+) daily and cumulative catch recorded for the west bank (trap 1) and east bank (trap 2) stationary outmigrant traps, 1985.

	TRAP 1					TRAP 2				
Date	Hours Fished	Daily Catch	Cumulative Catch	Daily CPUE	Percent Cumulative	Hours Fished	Daily Catch	Cumulative Catch	Daily CPUE	Percent Cumulative
850527	7.83	10	10	1.28	0.56	0	-	-	----	----
850528	13.50	61	71	4.52	4.00	12.75	4	4	0.31	0.27
850529	15.75	37	108	2.35	6.08	23.17	14	18	0.60	1.23
850530	15.42	30	138	1.95	7.77	22.75	12	30	0.53	2.05
850531	12.17	38	176	3.12	9.91	12.08	14	44	1.16	3.00
850601	13.42	29	205	2.16	11.54	12.83	7	51	0.55	3.48
850602	11.50	66	271	5.74	15.26	11.83	15	66	1.27	4.51
850603	14.33	43	314	3.00	17.68	14.58	9	75	0.62	5.12
850604	11.83	49	363	4.14	20.44	24.08	9	84	0.37	5.73
850605	14.17	45	408	3.18	22.97	18.58	17	101	0.91	6.89
850606	13.50	167	575	12.37	32.38	11.75	14	115	1.19	7.85
850607	24.33	119	694	4.89	39.08	13.50	11	126	0.81	8.60
850608	24.42	31	725	1.27	40.82	24.00	18	144	0.75	9.83
850609	23.58	29	754	1.23	42.45	23.00	14	158	0.61	10.78
850610	14.75	42	796	2.85	44.82	11.25	2	160	0.18	10.92
850611	14.58	6	802	0.41	45.16	12.33	9	169	0.73	11.54
850612	12.25	6	808	0.49	45.50	11.83	3	172	0.25	11.74
850613	11.33	11	819	0.97	46.11	11.50	6	178	0.52	12.15
850614	10.25	33	852	3.22	47.97	10.83	9	187	0.83	12.76
850615	12.25	18	870	1.47	48.99	12.67	9	196	0.71	13.38
850616	13.17	9	879	0.68	49.49	12.42	3	199	0.24	13.58
850617	11.92	31	910	2.60	51.24	11.25	2	201	0.18	13.72
850618	12.25	3	913	0.24	51.41	11.75	6	207	0.51	14.13
850619	7.92	2	915	0.25	51.52	13.08	2	209	0.15	14.27
850620	3.00	0	915	0.00	51.52	12.50	1	210	0.08	14.33
850621	11.50	6	921	0.52	51.86	22.58	10	220	0.44	15.02
850622	12.17	4	925	0.33	52.08	7.75	0	220	0.00	15.02
850623	12.33	6	931	0.49	52.42	11.83	0	220	0.00	15.02
850624	9.50	55	986	5.79	55.52	11.92	23	243	1.93	16.59
850625	12.67	34	1020	2.68	57.43	12.17	55	298	4.52	20.34
850626	12.50	64	1084	5.12	61.04	11.83	29	327	2.45	22.32
850627	12.25	115	1199	9.39	67.51	13.17	132	459	10.03	31.33
850628	12.33	71	1270	5.76	71.51	11.83	72	531	6.08	36.25
850629	15.92	58	1328	3.64	74.77	17.92	186	717	10.38	48.94
850630	20.42	72	1400	3.53	78.83	17.33	168	885	9.69	60.41
850701	5.92	27	1427	4.56	80.35	9.58	95	980	9.91	66.89
850702	11.58	16	1443	1.38	81.25	8.17	28	1008	3.43	68.81
850703	11.75	48	1491	4.09	83.95	11.67	24	1032	2.06	70.44
850704	12.08	51	1542	4.22	86.82	11.33	45	1077	3.97	73.52
850705	11.83	36	1578	3.04	88.85	12.83	35	1112	2.73	75.90
850706	16.00	27	1605	1.69	90.37	16.43	25	1137	1.52	77.61
850707	19.75	14	1619	0.71	91.16	18.58	19	1156	1.02	78.91
850708	12.00	22	1641	1.83	92.40	12.42	17	1173	1.37	80.07
850709	12.17	15	1656	1.23	93.24	11.42	17	1190	1.49	81.23
850710	12.25	11	1667	0.90	93.86	12.00	8	1198	0.67	81.77
850711	12.25	4	1671	0.33	94.09	11.75	7	1205	0.60	82.25
850712	11.83	2	1673	0.17	94.20	11.83	8	1213	0.68	82.80
850713	11.92	6	1679	0.50	94.54	12.00	14	1227	1.17	83.75
850714	12.00	6	1685	0.50	94.88	11.75	20	1247	1.70	85.12
850715	11.92	3	1688	0.25	95.05	12.08	12	1259	0.99	85.94
850716	15.00	3	1691	0.20	95.21	14.75	16	1275	1.08	87.03
850717	21.00	15	1706	0.71	96.06	20.58	8	1283	0.39	87.58
850718	12.42	3	1709	0.24	96.23	12.33	20	1303	1.62	88.94
850719	12.00	1	1710	0.08	96.28	12.33	12	1315	0.97	89.76
850720	12.00	4	1714	0.33	96.51	11.83	19	1334	1.61	91.06
850721	11.92	3	1717	0.25	96.68	11.83	7	1341	0.59	91.54
850722	11.92	0	1717	0.00	96.68	11.92	1	1342	0.08	91.60
850723	18.00	1	1718	0.06	96.73	16.83	5	1347	0.30	91.95
850724	18.17	0	1718	0.00	96.73	19.08	2	1349	0.10	92.08
850725	12.58	4	1722	0.32	96.96	12.42	6	1355	0.48	92.49

Appendix Table D.2. Continued.

	TRAP 1					TRAP 2				
Date	Hours Fished	Daily Catch	Cumulative Catch	Daily CPUE	Percent Cumulative	Hours Fished	Daily Catch	Cumulative Catch	Daily CPUE	Percent Cumulative
850726	12.83	2	1724	0.16	97.07	13.58	6	1361	0.44	92.90
850727	11.92	1	1725	0.08	97.13	11.92	2	1363	0.17	93.04
850728	12.17	3	1728	0.25	97.30	11.92	1	1364	0.08	93.11
850729	12.33	2	1730	0.16	97.41	11.92	4	1368	0.34	93.38
850730	12.33	3	1733	0.24	97.58	12.17	5	1373	0.41	93.72
850731	11.92	3	1736	0.25	97.75	11.50	5	1378	0.43	94.06
850801	11.92	4	1740	0.34	97.97	12.00	6	1384	0.50	94.47
850802	12.08	0	1740	0.00	97.97	12.08	5	1389	0.41	94.81
850803	12.00	0	1740	0.00	97.97	12.25	3	1392	0.24	95.02
850804	12.33	4	1744	0.32	98.20	12.00	0	1392	0.00	95.02
850805	12.42	1	1745	0.08	98.25	12.00	3	1395	0.25	95.22
850806	12.92	1	1746	0.08	98.31	12.58	3	1398	0.24	95.43
850807	11.83	3	1749	0.25	98.48	11.92	1	1399	0.08	95.49
850808	12.17	2	1751	0.16	98.59	5.75	6	1405	1.04	95.90
850809	11.92	4	1755	0.34	98.82	11.67	15	1420	1.29	96.93
850810	17.33	1	1756	0.06	98.87	16.33	12	1432	0.73	97.75
850811	19.00	0	1756	0.00	98.87	21.00	4	1436	0.19	98.02
850812	12.75	3	1759	0.24	99.04	12.08	5	1441	0.41	98.36
850813	12.08	2	1761	0.17	99.16	12.08	11	1452	0.91	99.11
850814	11.83	3	1764	0.25	99.32	12.08	2	1454	0.17	99.25
850815	15.83	1	1765	0.06	99.38	16.00	4	1458	0.25	99.52
850816	20.25	1	1766	0.05	99.44	19.50	3	1461	0.15	99.73
850817	11.83	0	1766	0.00	99.44	11.92	2	1463	0.17	99.86
850818	11.83	0	1766	0.00	99.44	11.83	0	1463	0.00	99.86
850819	12.67	0	1766	0.00	99.44	12.17	0	1463	0.00	99.86
850820	12.08	0	1766	0.00	99.44	12.00	1	1464	0.08	99.93
850821	12.83	0	1766	0.00	99.44	12.50	0	1464	0.00	99.93
850822	12.42	1	1767	0.08	99.49	12.17	0	1464	0.00	99.93
850823	12.33	0	1767	0.00	99.49	12.50	1	1465	0.08	100.00
850824	15.25	0	1767	0.00	99.49	12.25	0	1465	0.00	100.00
850825	20.42	1	1768	0.05	99.55	12.50	0	1465	0.00	100.00
850826	12.33	0	1768	0.00	99.55	12.50	0	1465	0.00	100.00
850827	12.50	0	1768	0.00	99.55	12.00	0	1465	0.00	100.00
850828	12.08	1	1769	0.08	99.61	12.25	0	1465	0.00	100.00
850829	12.33	0	1769	0.00	99.61	13.75	0	1465	0.00	100.00
850830	12.50	0	1769	0.00	99.61	12.17	0	1465	0.00	100.00
850831	15.83	0	1769	0.00	99.61	12.33	0	1465	0.00	100.00
850901	9.75	0	1769	0.00	99.61	9.83	0	1465	0.00	100.00
850902	0	-	1769	----	99.61	12.17	0	1465	0.00	100.00
850903	8.75	0	1769	0.00	99.61	12.67	0	1465	0.00	100.00
850904	13.83	0	1769	0.00	99.61	13.67	0	1465	0.00	100.00
850905	12.08	0	1769	0.00	99.61	12.08	0	1465	0.00	100.00
850906	13.00	1	1770	0.08	99.66	13.58	0	1465	0.00	100.00
850907	12.33	0	1770	0.00	99.66	12.25	0	1465	0.00	100.00
850908	12.58	0	1770	0.00	99.66	11.33	0	1465	0.00	100.00
850909	12.00	0	1770	0.00	99.66	12.17	0	1465	0.00	100.00
850910	12.25	0	1770	0.00	99.66	12.50	0	1465	0.00	100.00
850911	12.67	0	1770	0.00	99.66	12.67	0	1465	0.00	100.00
850912	12.00	0	1770	0.00	99.66	12.00	0	1465	0.00	100.00
850913	12.00	1	1771	0.08	99.72	11.67	0	1465	0.00	100.00
850914	11.83	0	1771	0.00	99.72	0	-	1465	----	100.00
850915	3.50	0	1771	0.00	99.72	12.67	0	1465	0.00	100.00
850916	12.00	2	1773	0.17	99.83	12.00	0	1465	0.00	100.00
850917	12.08	2	1775	0.17	99.94	12.08	0	1465	0.00	100.00
850918	12.42	0	1775	0.00	99.94	12.67	0	1465	0.00	100.00
850919	12.33	1	1776	0.08	100.00	12.33	0	1465	0.00	100.00
850920	12.00	0	1776	0.00	100.00	11.08	0	1465	0.00	100.00
850921	12.42	0	1776	0.00	100.00	12.25	0	1465	0.00	100.00
850922	12.33	0	1776	0.00	100.00	12.00	0	1465	0.00	100.00
850923	12.08	0	1776	0.00	100.00	12.17	0	1465	0.00	100.00

Appendix Table D.3. Flathorn Station coho salmon (age 0+) daily and cumulative catch recorded for the west bank (trap 1) and east bank (trap 2) stationary outmigrant traps, 1985.

	TRAP 1					TRAP 2				
Date	Hours Fished	Daily Catch	Cumulative Catch	Daily CPUE	Percent Cumulative	Hours Fished	Daily Catch	Cumulative Catch	Daily CPUE	Percent Cumulative
850527	7.83	0	0	0.00	0.00	0	-	-	----	----
850528	13.50	0	0	0.00	0.00	12.75	0	0	0.00	0.00
850529	15.75	0	0	0.00	0.00	23.17	0	0	0.00	0.00
850530	15.42	0	0	0.00	0.00	22.75	0	0	0.00	0.00
850531	12.17	0	0	0.00	0.00	12.08	0	0	0.00	0.00
850601	13.42	0	0	0.00	0.00	12.83	0	0	0.00	0.00
850602	11.50	0	0	0.00	0.00	11.83	0	0	0.00	0.00
850603	14.33	4	4	0.28	0.38	14.58	0	0	0.00	0.00
850604	11.83	1	5	0.08	0.47	24.08	0	0	0.00	0.00
850605	14.17	2	7	0.14	0.66	18.58	0	0	0.00	0.00
850606	13.50	1	8	0.07	0.75	11.75	0	0	0.00	0.00
850607	24.33	0	8	0.00	0.75	13.50	0	0	0.00	0.00
850608	24.42	2	10	0.08	0.94	24.00	0	0	0.00	0.00
850609	23.58	2	12	0.08	1.13	23.00	0	0	0.00	0.00
850610	14.75	0	12	0.00	1.13	11.25	0	0	0.00	0.00
850611	14.58	0	12	0.00	1.13	12.33	0	0	0.00	0.00
850612	12.25	0	12	0.00	1.13	11.83	0	0	0.00	0.00
850613	11.33	0	12	0.00	1.13	11.50	0	0	0.00	0.00
850614	10.25	0	12	0.00	1.13	10.83	0	0	0.00	0.00
850615	12.25	1	13	0.08	1.22	12.67	0	0	0.00	0.00
850616	13.17	1	14	0.08	1.31	12.42	0	0	0.00	0.00
850617	11.92	0	14	0.00	1.31	11.25	0	0	0.00	0.00
850618	12.25	0	14	0.00	1.31	11.75	0	0	0.00	0.00
850619	7.92	0	14	0.00	1.31	13.08	0	0	0.00	0.00
850620	3.00	0	14	0.00	1.31	12.50	0	0	0.00	0.00
850621	11.50	0	14	0.00	1.31	22.58	1	1	0.04	0.14
850622	12.17	1	15	0.08	1.41	7.75	0	1	0.00	0.14
850623	12.33	0	15	0.00	1.41	11.83	0	1	0.00	0.14
850624	9.50	2	17	0.21	1.59	11.92	3	4	0.25	0.58
850625	12.67	5	22	0.39	2.06	12.17	0	4	0.00	0.58
850626	12.50	1	23	0.08	2.16	11.83	0	4	0.00	0.58
850627	12.25	4	27	0.33	2.53	13.17	0	4	0.00	0.58
850628	12.33	9	36	0.73	3.38	11.83	0	4	0.00	0.58
850629	15.92	5	41	0.31	3.85	17.92	2	6	0.11	0.87
850630	20.42	13	54	0.64	5.07	17.33	2	8	0.12	1.16
850701	5.92	11	65	1.86	6.10	9.58	1	9	0.10	1.30
850702	11.58	32	97	2.76	9.10	8.17	1	10	0.12	1.45
850703	11.75	25	122	2.13	11.44	11.67	0	10	0.00	1.45
850704	12.08	19	141	1.57	13.23	11.33	2	12	0.18	1.74
850705	11.83	33	174	2.79	16.32	12.83	5	17	0.39	2.46
850706	16.00	46	220	2.88	20.64	16.43	6	23	0.37	3.33
850707	19.75	41	261	2.08	24.48	18.58	7	30	0.38	4.35
850708	12.00	20	281	1.67	26.36	12.42	3	33	0.24	4.78
850709	12.17	16	297	1.32	27.86	11.42	4	37	0.35	5.36
850710	12.25	6	303	0.49	28.42	12.00	2	39	0.17	5.65
850711	12.25	16	319	1.31	29.92	11.75	4	43	0.34	6.23
850712	11.83	16	335	1.35	31.43	11.83	1	44	0.08	6.38
850713	11.92	10	345	0.84	32.36	12.00	2	46	0.17	6.67
850714	12.00	3	348	0.25	32.65	11.75	3	49	0.26	7.10
850715	11.92	5	353	0.42	33.11	12.08	0	49	0.00	7.10
850716	15.00	3	356	0.20	33.40	14.75	2	51	0.14	7.39
850717	21.00	8	364	0.38	34.15	20.58	3	54	0.15	7.83
850718	12.42	5	369	0.40	34.62	12.33	2	56	0.16	8.12
850719	12.00	9	378	0.75	35.46	12.33	1	57	0.08	8.26
850720	12.00	3	381	0.25	35.74	11.83	0	57	0.00	8.26
850721	11.92	11	392	0.92	36.77	11.83	0	57	0.00	8.26
850722	11.92	5	397	0.42	37.24	11.92	2	59	0.17	8.55
850723	18.00	2	399	0.11	37.43	16.83	5	64	0.30	9.28
850724	18.17	6	405	0.33	37.99	19.08	5	69	0.26	10.00
850725	12.58	3	408	0.24	38.27	12.42	1	70	0.08	10.14

Appendix Table D.3. Continued.

Date	TRAP 1 Hours Fished	TRAP 1 Daily Catch	TRAP 1 Cumulative Catch	TRAP 1 Daily CPUE	TRAP 1 Percent Cumulative	TRAP 2 Hours Fished	TRAP 2 Daily Catch	TRAP 2 Cumulative Catch	TRAP 2 Daily CPUE	TRAP 2 Percent Cumulative
850726	12.83	5	413	0.39	38.74	13.58	1	71	0.07	10.29
850727	11.92	3	416	0.25	39.02	11.92	0	71	0.00	10.29
850728	12.17	6	422	0.49	39.59	11.92	5	76	0.42	11.01
850729	12.33	2	424	0.16	39.77	11.92	0	76	0.00	11.01
850730	12.33	1	425	0.08	39.87	12.17	0	76	0.00	11.01
850731	11.92	2	427	0.17	40.06	11.50	0	76	0.00	11.01
850801	11.92	0	427	0.00	40.06	12.00	1	77	0.08	11.16
850802	12.08	2	429	0.17	40.24	12.08	0	77	0.00	11.16
850803	12.00	1	430	0.08	40.34	12.25	1	78	0.08	11.30
850804	12.33	6	436	0.49	40.90	12.00	0	78	0.00	11.30
850805	12.42	4	440	0.32	41.28	12.00	0	78	0.00	11.30
850806	12.92	7	447	0.54	41.93	12.58	2	80	0.16	11.59
850807	11.83	1	448	0.08	42.03	11.92	0	80	0.00	11.59
850808	12.17	1	449	0.08	42.12	5.75	0	80	0.00	11.59
850809	11.92	4	453	0.34	42.50	11.67	1	81	0.09	11.74
850810	17.33	7	460	0.40	43.15	16.33	2	83	0.12	12.03
850811	19.00	10	470	0.53	44.09	21.00	7	90	0.33	13.04
850812	12.75	10	480	0.78	45.03	12.08	6	96	0.50	13.91
850813	12.08	136	616	11.26	57.79	12.08	56	152	4.63	22.03
850814	11.83	88	704	7.44	66.04	12.08	52	204	4.30	29.57
850815	15.83	65	769	4.11	72.14	16.00	85	289	5.31	41.88
850816	20.25	79	848	3.90	79.55	19.50	80	369	4.10	53.48
850817	11.83	21	869	1.77	81.52	11.92	70	439	5.87	63.62
850818	11.83	25	894	2.11	83.86	11.83	39	478	3.30	69.28
850819	12.67	15	909	1.18	85.27	12.17	14	492	1.15	71.30
850820	12.08	13	922	1.08	86.49	12.00	18	510	1.50	73.91
850821	12.83	10	932	0.78	87.43	12.50	34	544	2.72	78.84
850822	12.42	22	954	1.77	89.49	12.17	27	571	2.22	82.75
850823	12.33	9	963	0.73	90.34	12.50	10	581	0.80	84.20
850824	15.25	5	968	0.33	90.81	12.25	4	585	0.33	84.78
850825	20.42	9	977	0.44	91.65	12.50	3	588	0.24	85.22
850826	12.33	7	984	0.57	92.31	12.50	3	591	0.24	85.65
850827	12.50	3	987	0.24	92.59	12.00	2	593	0.17	85.94
850828	12.08	2	989	0.17	92.78	12.25	0	593	0.00	85.94
850829	12.33	7	996	0.57	93.43	13.75	1	594	0.07	86.09
850830	12.50	2	998	0.16	93.62	12.17	2	596	0.16	86.38
850831	15.83	1	999	0.06	93.71	12.33	1	597	0.08	86.52
850901	9.75	3	1002	0.31	94.00	9.83	5	602	0.51	87.25
850902	0	-	1002	----	94.00	12.17	0	602	0.00	87.25
850903	8.75	1	1003	0.11	94.09	12.67	0	602	0.00	87.25
850904	13.83	1	1004	0.07	94.18	13.67	0	602	0.00	87.25
850905	12.08	1	1005	0.08	94.28	12.08	0	602	0.00	87.25
850906	13.00	1	1006	0.08	94.37	13.58	1	603	0.07	87.39
850907	12.33	0	1006	0.00	94.37	12.25	3	606	0.24	87.83
850908	12.58	2	1008	0.16	94.56	11.33	6	612	0.53	88.70
850909	12.00	1	1009	0.08	94.65	12.17	2	614	0.16	88.99
850910	12.25	1	1010	0.08	94.75	12.50	1	615	0.08	89.13
850911	12.67	1	1011	0.08	94.84	12.67	1	616	0.08	89.28
850912	12.00	2	1013	0.17	95.03	12.00	3	619	0.25	89.71
850913	12.00	1	1014	0.08	95.12	11.67	9	628	0.77	91.01
850914	11.83	12	1026	1.01	96.25	0	-	628	----	91.01
850915	3.50	1	1027	0.29	96.34	12.67	7	635	0.55	92.03
850916	12.00	6	1033	0.50	96.90	12.00	14	649	1.17	94.06
850917	12.08	3	1036	0.25	97.19	12.08	6	655	0.50	94.93
850918	12.42	2	1038	0.16	97.37	12.67	8	663	0.63	96.09
850919	12.33	13	1051	1.05	98.59	12.33	9	672	0.73	97.39
850920	12.00	1	1052	0.08	98.69	11.08	0	672	0.00	97.39
850921	12.42	4	1056	0.32	99.06	12.25	2	674	0.16	97.68
850922	12.33	1	1057	0.08	99.16	12.00	9	683	0.75	98.99
850923	12.08	9	1066	0.74	100.00	12.17	7	690	0.58	100.00

Appendix Table D.4. Flathorn Station coho salmon (age 1+ and 2+) daily and cumulative catch recorded for the west bank (trap 1) and east bank (trap 2) stationary outmigrant traps, 1985.

	TRAP 1					TRAP 2				
Date	Hours Fished	Daily Catch	Cumulative Catch	Daily CPUE	Percent Cumulative	Hours Fished	Daily Catch	Cumulative Catch	Daily CPUE	Percent Cumulative
850527	7.83	0	0	0.00	0.00	0	-	-	----	----
850528	13.50	5	5	0.37	1.52	12.75	2	2	0.16	0.73
850529	15.75	5	10	0.32	3.03	23.17	3	5	0.13	1.82
850530	15.42	3	13	0.19	3.94	22.75	0	5	0.00	1.82
850531	12.17	1	14	0.08	4.24	12.08	0	5	0.00	1.82
850601	13.42	0	14	0.00	4.24	12.83	0	5	0.00	1.82
850602	11.50	0	14	0.00	4.24	11.83	0	5	0.00	1.82
850603	14.33	1	15	0.07	4.55	14.58	0	5	0.00	1.82
850604	11.83	1	16	0.08	4.85	24.08	0	5	0.00	1.82
850605	14.17	0	16	0.00	4.85	18.58	0	5	0.00	1.82
850606	13.50	4	20	0.30	6.06	11.75	1	6	0.09	2.19
850607	24.33	1	21	0.04	6.36	13.50	0	6	0.00	2.19
850608	24.42	8	29	0.33	8.79	24.00	1	7	0.04	2.55
850609	23.58	1	30	0.04	9.09	23.00	0	7	0.00	2.55
850610	14.75	6	36	0.41	10.91	11.25	0	7	0.00	2.55
850611	14.58	0	36	0.00	10.91	12.33	1	8	0.08	2.92
850612	12.25	8	44	0.65	13.33	11.83	5	13	0.42	4.74
850613	11.33	9	53	0.79	16.06	11.50	12	25	1.04	9.12
850614	10.25	13	66	1.27	20.00	10.83	6	31	0.55	11.31
850615	12.25	4	70	0.33	21.21	12.67	2	33	0.16	12.04
850616	13.17	12	82	0.91	24.85	12.42	6	39	0.48	14.23
850617	11.92	20	102	1.68	30.91	11.25	4	43	0.36	15.69
850618	12.25	0	102	0.00	30.91	11.75	1	44	0.09	16.06
850619	7.92	3	105	0.38	31.82	13.08	1	45	0.08	16.42
850620	3.00	0	105	0.00	31.82	12.50	0	45	0.00	16.42
850621	11.50	2	107	0.17	32.42	22.58	4	49	0.18	17.88
850622	12.17	0	107	0.00	32.42	7.75	0	49	0.00	17.88
850623	12.33	7	114	0.57	34.55	11.83	0	49	0.00	17.88
850624	9.50	23	137	2.42	41.52	11.92	2	51	0.17	18.61
850625	12.67	7	144	0.55	43.64	12.17	25	76	2.05	27.74
850626	12.50	20	164	1.60	49.70	11.83	6	82	0.51	29.93
850627	12.25	4	168	0.33	50.91	13.17	18	100	1.37	36.50
850628	12.33	16	184	1.30	55.76	11.83	26	126	2.20	45.99
850629	15.92	7	191	0.44	57.88	17.92	27	153	1.51	55.84
850630	20.42	8	199	0.39	60.30	17.33	3	156	0.17	56.93
850701	5.92	3	202	0.51	61.21	9.58	8	164	0.83	59.85
850702	11.58	1	203	0.09	61.52	8.17	1	165	0.12	60.22
850703	11.75	5	208	0.43	63.03	11.67	5	170	0.43	62.04
850704	12.08	5	213	0.41	64.55	11.33	3	173	0.26	63.14
850705	11.83	14	227	1.18	68.79	12.83	8	181	0.62	66.06
850706	16.00	6	233	0.38	70.61	16.43	3	184	0.18	67.15
850707	19.75	4	237	0.20	71.82	18.58	4	188	0.22	68.61
850708	12.00	3	240	0.25	72.73	12.42	0	188	0.00	68.61
850709	12.17	6	246	0.49	74.55	11.42	0	188	0.00	68.61
850710	12.25	1	247	0.08	74.85	12.00	1	189	0.08	68.98
850711	12.25	3	250	0.24	75.76	11.75	1	190	0.09	69.34
850712	11.83	1	251	0.08	76.06	11.83	0	190	0.00	69.34
850713	11.92	3	254	0.25	76.97	12.00	0	190	0.00	69.34
850714	12.00	1	255	0.08	77.27	11.75	2	192	0.17	70.07
850715	11.92	0	255	0.00	77.27	12.08	1	193	0.08	70.44
850716	15.00	3	258	0.20	78.18	14.75	0	193	0.00	70.44
850717	21.00	2	260	0.10	78.79	20.58	0	193	0.00	70.44
850718	12.42	0	260	0.00	78.79	12.33	2	195	0.16	71.17
850719	12.00	2	262	0.17	79.39	12.33	1	196	0.08	71.53
850720	12.00	0	262	0.00	79.39	11.83	0	196	0.00	71.53
850721	11.92	3	265	0.25	80.30	11.83	1	197	0.08	71.90
850722	11.92	0	265	0.00	80.30	11.92	1	198	0.08	72.26
850723	18.00	0	265	0.00	80.30	16.83	1	199	0.06	72.63
850724	18.17	0	265	0.00	80.30	19.08	2	201	0.10	73.36
850725	12.58	0	265	0.00	80.30	12.42	1	202	0.08	73.72

Appendix Table D.4. Continued.

Date	TRAP 1 Hours Fished	TRAP 1 Daily Catch	TRAP 1 Cumulative Catch	TRAP 1 Daily CPUE	TRAP 1 Percent Cumulative	TRAP 2 Hours Fished	TRAP 2 Daily Catch	TRAP 2 Cumulative Catch	TRAP 2 Daily CPUE	TRAP 2 Percent Cumulative
850726	12.83	3	268	0.23	81.21	13.58	0	202	0.00	73.72
850727	11.92	0	268	0.00	81.21	11.92	0	202	0.00	73.72
850728	12.17	2	270	0.16	81.82	11.92	0	202	0.00	73.72
850729	12.33	0	270	0.00	81.82	11.92	2	204	0.17	74.45
850730	12.33	2	272	0.16	82.42	12.17	1	205	0.08	74.82
850731	11.92	1	273	0.08	82.73	11.50	2	207	0.17	75.55
850801	11.92	0	273	0.00	82.73	12.00	0	207	0.00	75.55
850802	12.08	1	274	0.08	83.03	12.08	1	208	0.08	75.91
850803	12.00	0	274	0.00	83.03	12.25	1	209	0.08	76.28
850804	12.33	0	274	0.00	83.03	12.00	0	209	0.00	76.28
850805	12.42	0	274	0.00	83.03	12.00	0	209	0.00	76.28
850806	12.92	0	274	0.00	83.03	12.58	0	209	0.00	76.28
850807	11.83	0	274	0.00	83.03	11.92	2	211	0.17	77.01
850808	12.17	0	274	0.00	83.03	5.75	0	211	0.00	77.01
850809	11.92	2	276	0.17	83.64	11.67	1	212	0.09	77.37
850810	17.33	3	279	0.17	84.55	16.33	2	214	0.12	78.10
850811	19.00	5	284	0.26	86.06	21.00	7	221	0.33	80.66
850812	12.75	3	287	0.24	86.97	12.08	1	222	0.08	81.02
850813	12.08	6	293	0.50	88.79	12.08	14	236	1.16	86.13
850814	11.83	5	298	0.42	90.30	12.08	6	242	0.50	88.32
850815	15.83	1	299	0.06	90.61	16.00	5	247	0.31	90.15
850816	20.25	3	302	0.15	91.52	19.50	5	252	0.26	91.97
850817	11.83	1	303	0.08	91.82	11.92	4	256	0.34	93.43
850818	11.83	1	304	0.08	92.12	11.83	3	259	0.25	94.53
850819	12.67	1	305	0.08	92.42	12.17	1	260	0.08	94.89
850820	12.08	2	307	0.17	93.03	12.00	3	263	0.25	95.99
850821	12.83	1	308	0.08	93.33	12.50	2	265	0.16	96.72
850822	12.42	3	311	0.24	94.24	12.17	0	265	0.00	96.72
850823	12.33	0	311	0.00	94.24	12.50	1	266	0.08	97.08
850824	15.25	0	311	0.00	94.24	12.25	0	266	0.00	97.08
850825	20.42	1	312	0.05	94.55	12.50	0	266	0.00	97.08
850826	12.33	1	313	0.08	94.85	12.50	0	266	0.00	97.08
850827	12.50	0	313	0.00	94.85	12.00	0	266	0.00	97.08
850828	12.08	0	313	0.00	94.85	12.25	0	266	0.00	97.08
850829	12.33	0	313	0.00	94.85	13.75	0	266	0.00	97.08
850830	12.50	2	315	0.16	95.45	12.17	0	266	0.00	97.08
850831	15.83	0	315	0.00	95.45	12.33	0	266	0.00	97.08
850901	9.75	0	315	0.00	95.45	9.83	0	266	0.00	97.08
850902	0	-	315	----	95.45	12.17	0	266	0.00	97.08
850903	8.75	0	315	0.00	95.45	12.67	0	266	0.00	97.08
850904	13.83	0	315	0.00	95.45	13.67	0	266	0.00	97.08
850905	12.08	0	315	0.00	95.45	12.08	0	266	0.00	97.08
850906	13.00	0	315	0.00	95.45	13.58	1	267	0.07	97.45
850907	12.33	0	315	0.00	95.45	12.25	0	267	0.00	97.45
850908	12.58	0	315	0.00	95.45	11.33	0	267	0.00	97.45
850909	12.00	0	315	0.00	95.45	12.17	0	267	0.00	97.45
850910	12.25	0	315	0.00	95.45	12.50	0	267	0.00	97.45
850911	12.67	0	315	0.00	95.45	12.67	0	267	0.00	97.45
850912	12.00	0	315	0.00	95.45	12.00	0	267	0.00	97.45
850913	12.00	2	317	0.17	96.06	11.67	0	267	0.00	97.45
850914	11.83	3	320	0.25	96.97	0	-	267	----	97.45
850915	3.50	0	320	0.00	96.97	12.67	2	269	0.16	98.18
850916	12.00	1	321	0.08	97.27	12.00	1	270	0.08	98.54
850917	12.08	2	323	0.17	97.88	12.08	0	270	0.00	98.54
850918	12.42	0	323	0.00	97.88	12.67	2	272	0.16	99.27
850919	12.33	1	324	0.08	98.18	12.33	2	274	0.16	100.00
850920	12.00	0	324	0.00	98.18	11.08	0	274	0.00	100.00
850921	12.42	0	324	0.00	98.18	12.25	1	275	0.08	100.36
850922	12.33	5	329	0.41	99.70	12.00	1	276	0.08	100.73
850923	12.08	1	330	0.08	100.00	12.17	1	277	0.08	101.09

Appendix Table D.5. Flathorn Station sockeye salmon (age 0+) daily and cumulative catch recorded for the west bank (trap 1) and east bank (trap 2) stationary outmigrant traps, 1985.

	TRAP 1					TRAP 2				
Date	Hours Fished	Daily Catch	Cumulative Catch	Daily CPUE	Percent Cumulative	Hours Fished	Daily Catch	Cumulative Catch	Daily CPUE	Percent Cumulative
850527	7.83	7	7	0.89	0.20	0	-	-	----	----
850528	13.50	28	35	2.07	0.99	12.75	9	9	0.71	0.60
850529	15.75	40	75	2.54	2.12	23.17	6	15	0.26	0.99
850530	15.42	15	90	0.97	2.54	22.75	31	46	1.36	3.05
850531	12.17	8	98	0.66	2.77	12.08	12	58	0.99	3.84
850601	13.42	37	135	2.76	3.81	12.83	18	76	1.40	5.04
850602	11.50	66	201	5.74	5.67	11.83	44	120	3.72	7.95
850603	14.33	44	245	3.07	6.91	14.58	14	134	0.96	8.88
850604	11.83	23	268	1.94	7.56	24.08	12	146	0.50	9.68
850605	14.17	36	304	2.54	8.58	18.58	40	186	2.15	12.33
850606	13.50	41	345	3.04	9.73	11.75	10	196	0.85	12.99
850607	24.33	32	377	1.32	10.64	13.50	4	200	0.30	13.25
850608	24.42	12	389	0.49	10.98	24.00	20	220	0.83	14.58
850609	23.58	20	409	0.85	11.54	23.00	9	229	0.39	15.18
850610	14.75	70	479	4.75	13.52	11.25	0	229	0.00	15.18
850611	14.58	21	500	1.44	14.11	12.33	12	241	0.97	15.97
850612	12.25	14	514	1.14	14.50	11.83	5	246	0.42	16.30
850613	11.33	36	550	3.18	15.52	11.50	17	263	1.48	17.43
850614	10.25	21	571	2.05	16.11	10.83	8	271	0.74	17.96
850615	12.25	11	582	0.90	16.42	12.67	6	277	0.47	18.36
850616	13.17	8	590	0.61	16.65	12.42	8	285	0.64	18.89
850617	11.92	5	595	0.42	16.79	11.25	3	288	0.27	19.09
850618	12.25	2	597	0.16	16.85	11.75	8	296	0.68	19.62
850619	7.92	0	597	0.00	16.85	13.08	2	298	0.15	19.75
850620	3.00	2	599	0.67	16.90	12.50	6	304	0.48	20.15
850621	11.50	5	604	0.43	17.04	22.58	13	317	0.58	21.01
850622	12.17	3	607	0.25	17.13	7.75	4	321	0.52	21.27
850623	12.33	5	612	0.41	17.27	11.83	4	325	0.34	21.54
850624	9.50	7	619	0.74	17.47	11.92	11	336	0.92	22.27
850625	12.67	12	631	0.95	17.80	12.17	7	343	0.58	22.73
850626	12.50	16	647	1.28	18.26	11.83	7	350	0.59	23.19
850627	12.25	30	677	2.45	19.10	13.17	8	358	0.61	23.72
850628	12.33	25	702	2.03	19.81	11.83	8	366	0.68	24.25
850629	15.92	35	737	2.20	20.80	17.92	21	387	1.17	25.65
850630	20.42	121	858	5.93	24.21	17.33	35	422	2.02	27.97
850701	5.92	23	881	3.89	24.86	9.58	13	435	1.36	28.83
850702	11.58	69	950	5.96	26.81	8.17	1	436	0.12	28.89
850703	11.75	87	1037	7.40	29.26	11.67	8	444	0.69	29.42
850704	12.08	71	1108	5.88	31.26	11.33	10	454	0.88	30.09
850705	11.83	76	1184	6.42	33.41	12.83	24	478	1.87	31.68
850706	16.00	136	1320	8.50	37.25	16.43	32	510	1.95	33.80
850707	19.75	114	1434	5.77	40.46	18.58	26	536	1.40	35.52
850708	12.00	66	1500	5.50	42.33	12.42	25	561	2.01	37.18
850709	12.17	89	1589	7.31	44.84	11.42	27	588	2.36	38.97
850710	12.25	62	1651	5.06	46.59	12.00	18	606	1.50	40.16
850711	12.25	67	1718	5.47	48.48	11.75	34	640	2.89	42.41
850712	11.83	48	1766	4.06	49.83	11.83	21	661	1.78	43.80
850713	11.92	79	1845	6.63	52.06	12.00	28	689	2.33	45.66
850714	12.00	39	1884	3.25	53.16	11.75	27	716	2.30	47.45
850715	11.92	64	1948	5.37	54.97	12.08	44	760	3.64	50.36
850716	15.00	71	2019	4.73	56.97	14.75	47	807	3.19	53.48
850717	21.00	133	2152	6.33	60.72	20.58	53	860	2.58	56.99
850718	12.42	29	2181	2.33	61.54	12.33	97	957	7.87	63.42
850719	12.00	66	2247	5.50	63.40	12.33	45	1002	3.65	66.40
850720	12.00	38	2285	3.17	64.48	11.83	44	1046	3.72	69.32
850721	11.92	48	2333	4.03	65.83	11.83	21	1067	1.78	70.71
850722	11.92	28	2361	2.35	66.62	11.92	23	1090	1.93	72.23
850723	18.00	71	2432	3.94	68.62	16.83	28	1118	1.66	74.09
850724	18.17	66	2498	3.63	70.49	19.08	31	1149	1.62	76.14
850725	12.58	46	2544	3.66	71.78	12.42	13	1162	1.05	77.00

Appendix Table D.5. Continued.

Date	TRAP 1 Hours Fished	TRAP 1 Daily Catch	TRAP 1 Cumulative Catch	TRAP 1 Daily CPUE	TRAP 1 Percent Cumulative	TRAP 2 Hours Fished	TRAP 2 Daily Catch	TRAP 2 Cumulative Catch	TRAP 2 Daily CPUE	TRAP 2 Percent Cumulative
850726	12.83	57	2601	4.44	73.39	13.58	25	1187	1.84	78.66
850727	11.92	43	2644	3.61	74.60	11.92	42	1229	3.52	81.44
850728	12.17	53	2697	4.35	76.10	11.92	25	1254	2.10	83.10
850729	12.33	43	2740	3.49	77.31	11.92	17	1271	1.43	84.23
850730	12.33	32	2772	2.60	78.22	12.17	12	1283	0.99	85.02
850731	11.92	37	2809	3.10	79.26	11.50	20	1303	1.74	86.35
850801	11.92	43	2852	3.61	80.47	12.00	14	1317	1.17	87.28
850802	12.08	40	2892	3.31	81.60	12.08	21	1338	1.74	88.67
850803	12.00	61	2953	5.08	83.32	12.25	9	1347	0.73	89.26
850804	12.33	64	3017	5.19	85.13	12.00	15	1362	1.25	90.26
850805	12.42	27	3044	2.17	85.89	12.00	5	1367	0.42	90.59
850806	12.92	18	3062	1.39	86.40	12.58	7	1374	0.56	91.05
850807	11.83	34	3096	2.87	87.36	11.92	13	1387	1.09	91.92
850808	12.17	23	3119	1.89	88.01	5.75	2	1389	0.35	92.05
850809	11.92	22	3141	1.85	88.63	11.67	4	1393	0.34	92.31
850810	17.33	35	3176	2.02	89.62	16.33	9	1402	0.55	92.91
850811	19.00	33	3209	1.74	90.55	21.00	13	1415	0.62	93.77
850812	12.75	21	3230	1.65	91.14	12.08	2	1417	0.17	93.90
850813	12.08	7	3237	0.58	91.34	12.08	5	1422	0.41	94.23
850814	11.83	11	3248	0.93	91.65	12.08	16	1438	1.32	95.29
850815	15.83	14	3262	0.88	92.04	16.00	8	1446	0.50	95.83
850816	20.25	14	3276	0.69	92.44	19.50	3	1449	0.15	96.02
850817	11.83	10	3286	0.85	92.72	11.92	5	1454	0.42	96.36
850818	11.83	9	3295	0.76	92.97	11.83	7	1461	0.59	96.82
850819	12.67	32	3327	2.53	93.88	12.17	1	1462	0.08	96.89
850820	12.08	30	3357	2.48	94.72	12.00	2	1464	0.17	97.02
850821	12.83	11	3368	0.86	95.03	12.50	3	1467	0.24	97.22
850822	12.42	11	3379	0.89	95.34	12.17	3	1470	0.25	97.42
850823	12.33	6	3385	0.49	95.51	12.50	3	1473	0.24	97.61
850824	15.25	27	3412	1.77	96.28	12.25	4	1477	0.33	97.88
850825	20.42	10	3422	0.49	96.56	12.50	1	1478	0.08	97.95
850826	12.33	6	3428	0.49	96.73	12.50	1	1479	0.08	98.01
850827	12.50	2	3430	0.16	96.78	12.00	0	1479	0.00	98.01
850828	12.08	7	3437	0.58	96.98	12.25	0	1479	0.00	98.01
850829	12.33	9	3446	0.73	97.23	13.75	0	1479	0.00	98.01
850830	12.50	10	3456	0.80	97.52	12.17	0	1479	0.00	98.01
850831	15.83	7	3463	0.44	97.71	12.33	0	1479	0.00	98.01
850901	9.75	5	3468	0.51	97.86	9.83	1	1480	0.10	98.08
850902	0	-	3468	----	97.86	12.17	1	1481	0.08	98.14
850903	8.75	3	3471	0.34	97.94	12.67	0	1481	0.00	98.14
850904	13.83	5	3476	0.36	98.08	13.67	1	1482	0.07	98.21
850905	12.08	1	3477	0.08	98.11	12.08	0	1482	0.00	98.21
850906	13.00	0	3477	0.00	98.11	13.58	1	1483	0.07	98.28
850907	12.33	0	3477	0.00	98.11	12.25	2	1485	0.16	98.41
850908	12.58	3	3480	0.24	98.19	11.33	2	1487	0.18	98.54
850909	12.00	4	3484	0.33	98.31	12.17	1	1488	0.08	98.61
850910	12.25	3	3487	0.24	98.39	12.50	0	1488	0.00	98.61
850911	12.67	2	3489	0.16	98.45	12.67	0	1488	0.00	98.61
850912	12.00	6	3495	0.50	98.62	12.00	0	1488	0.00	98.61
850913	12.00	2	3497	0.17	98.67	11.67	2	1490	0.17	98.74
850914	11.83	10	3507	0.85	98.96	0	-	1490	----	98.74
850915	3.50	10	3517	2.86	99.24	12.67	0	1490	0.00	98.74
850916	12.00	2	3519	0.17	99.29	12.00	2	1492	0.17	98.87
850917	12.08	4	3523	0.33	99.41	12.08	1	1493	0.08	98.94
850918	12.42	2	3525	0.16	99.46	12.67	2	1495	0.16	99.07
850919	12.33	3	3528	0.24	99.55	12.33	4	1499	0.32	99.34
850920	12.00	4	3532	0.33	99.66	11.08	0	1499	0.00	99.34
850921	12.42	5	3537	0.40	99.80	12.25	4	1503	0.33	99.60
850922	12.33	2	3539	0.16	99.86	12.00	4	1507	0.33	99.87
850923	12.08	5	3544	0.41	100.00	12.17	2	1509	0.16	100.00

Appendix Table D.6. Flathorn Station sockeye salmon (age 1+) daily and cumulative catch recorded for the west bank (trap 1) and east bank (trap 2) stationary outmigrant traps, 1985.

	TRAP 1					TRAP 2				
Date	Hours Fished	Daily Catch	Cumulative Catch	Daily CPUE	Percent Cumulative	Hours Fished	Daily Catch	Cumulative Catch	Daily CPUE	Percent Cumulative
850527	7.83	0	0	0.00	0.00	0	-	-	----	----
850528	13.50	8	8	0.59	1.06	12.75	1	1	0.08	0.24
850529	15.75	7	15	0.44	1.98	23.17	1	2	0.04	0.48
850530	15.42	8	23	0.52	3.03	22.75	1	3	0.04	0.72
850531	12.17	12	35	0.99	4.62	12.08	0	3	0.00	0.72
850601	13.42	6	41	0.45	5.41	12.83	4	7	0.31	1.68
850602	11.50	13	54	1.13	7.12	11.83	4	11	0.34	2.64
850603	14.33	31	85	2.16	11.21	14.58	2	13	0.14	3.13
850604	11.83	19	104	1.61	13.72	24.08	1	14	0.04	3.37
850605	14.17	33	137	2.33	18.07	18.58	5	19	0.27	4.57
850606	13.50	23	160	1.70	21.11	11.75	4	23	0.34	5.53
850607	24.33	47	207	1.93	27.31	13.50	8	31	0.59	7.45
850608	24.42	8	215	0.33	28.36	24.00	11	42	0.46	10.10
850609	23.58	13	228	0.55	30.08	23.00	1	43	0.04	10.34
850610	14.75	16	244	1.08	32.19	11.25	6	49	0.53	11.78
850611	14.58	37	281	2.54	37.07	12.33	50	99	4.05	23.80
850612	12.25	29	310	2.37	40.90	11.83	25	124	2.11	29.81
850613	11.33	23	333	2.03	43.93	11.50	10	134	0.87	32.21
850614	10.25	33	366	3.22	48.28	10.83	10	144	0.92	34.62
850615	12.25	19	385	1.55	50.79	12.67	14	158	1.11	37.98
850616	13.17	23	408	1.75	53.83	12.42	4	162	0.32	38.94
850617	11.92	44	452	3.69	59.63	11.25	17	179	1.51	43.03
850618	12.25	8	460	0.65	60.69	11.75	22	201	1.87	48.32
850619	7.92	27	487	3.41	64.25	13.08	19	220	1.45	52.88
850620	3.00	2	489	0.67	64.51	12.50	18	238	1.44	57.21
850621	11.50	8	497	0.70	65.57	22.58	26	264	1.15	63.46
850622	12.17	11	508	0.90	67.02	7.75	1	265	0.13	63.70
850623	12.33	19	527	1.54	69.53	11.83	9	274	0.76	65.87
850624	9.50	79	606	8.32	79.95	11.92	23	297	1.93	71.39
850625	12.67	41	647	3.24	85.36	12.17	43	340	3.53	81.73
850626	12.50	39	686	3.12	90.50	11.83	18	358	1.52	86.06
850627	12.25	25	711	2.04	93.80	13.17	13	371	0.99	89.18
850628	12.33	10	721	0.81	95.12	11.83	7	378	0.59	90.87
850629	15.92	6	727	0.38	95.91	17.92	8	386	0.45	92.79
850630	20.42	2	729	0.10	96.17	17.33	6	392	0.35	94.23
850701	5.92	1	730	0.17	96.31	9.58	1	393	0.10	94.47
850702	11.58	3	733	0.26	96.70	8.17	0	393	0.00	94.47
850703	11.75	1	734	0.09	96.83	11.67	17	410	1.46	98.56
850704	12.08	4	738	0.33	97.36	11.33	0	410	0.00	98.56
850705	11.83	4	742	0.34	97.89	12.83	2	412	0.16	99.04
850706	16.00	6	748	0.38	98.68	16.43	2	414	0.12	99.52
850707	19.75	2	750	0.10	98.94	18.58	0	414	0.00	99.52
850708	12.00	1	751	0.08	99.08	12.42	0	414	0.00	99.52
850709	12.17	3	754	0.25	99.47	11.42	1	415	0.09	99.76
850710	12.25	2	756	0.16	99.74	12.00	0	415	0.00	99.76
850711	12.25	1	757	0.08	99.87	11.75	0	415	0.00	99.76
850712	11.83	0	757	0.00	99.87	11.83	0	415	0.00	99.76
850713	11.92	0	757	0.00	99.87	12.00	0	415	0.00	99.76
850714	12.00	0	757	0.00	99.87	11.75	0	415	0.00	99.76
850715	11.92	0	757	0.00	99.87	12.08	0	415	0.00	99.76
850716	15.00	0	757	0.00	99.87	14.75	0	415	0.00	99.76
850717	21.00	0	757	0.00	99.87	20.58	0	415	0.00	99.76
850718	12.42	0	757	0.00	99.87	12.33	0	415	0.00	99.76
850719	12.00	0	757	0.00	99.87	12.33	0	415	0.00	99.76
850720	12.00	1	758	0.08	100.00	11.83	1	416	0.08	100.00
850721	11.92	0	758	0.00	100.00	11.83	0	416	0.00	100.00
850722	11.92	0	758	0.00	100.00	11.92	0	416	0.00	100.00
850723	18.00	0	758	0.00	100.00	16.83	0	416	0.00	100.00
850724	18.17	0	758	0.00	100.00	19.08	0	416	0.00	100.00
850725	12.58	0	758	0.00	100.00	12.42	0	416	0.00	100.00

Appendix Table D.6. Continued.

Date	TRAP 1 Hours Fished	TRAP 1 Daily Catch	TRAP 1 Cumulative Catch	TRAP 1 Daily CPUE	TRAP 1 Percent Cumulative	TRAP 2 Hours Fished	TRAP 2 Daily Catch	TRAP 2 Cumulative Catch	TRAP 2 Daily CPUE	TRAP 2 Percent Cumulative
850726	12.83	0	758	0.00	100.00	13.58	0	416	0.00	100.00
850727	11.92	0	758	0.00	100.00	11.92	0	416	0.00	100.00
850728	12.17	0	758	0.00	100.00	11.92	0	416	0.00	100.00
850729	12.33	0	758	0.00	100.00	11.92	0	416	0.00	100.00
850730	12.33	0	758	0.00	100.00	12.17	0	416	0.00	100.00
850731	11.92	0	758	0.00	100.00	11.50	0	416	0.00	100.00
850801	11.92	0	758	0.00	100.00	12.00	0	416	0.00	100.00
850802	12.08	0	758	0.00	100.00	12.08	0	416	0.00	100.00
850803	12.00	0	758	0.00	100.00	12.25	0	416	0.00	100.00
850804	12.33	0	758	0.00	100.00	12.00	0	416	0.00	100.00
850805	12.42	0	758	0.00	100.00	12.00	0	416	0.00	100.00
850806	12.92	0	758	0.00	100.00	12.58	0	416	0.00	100.00
850807	11.83	0	758	0.00	100.00	11.92	0	416	0.00	100.00
850808	12.17	0	758	0.00	100.00	5.75	0	416	0.00	100.00
850809	11.92	0	758	0.00	100.00	11.67	0	416	0.00	100.00
850810	17.33	0	758	0.00	100.00	16.33	0	416	0.00	100.00
850811	19.00	0	758	0.00	100.00	21.00	0	416	0.00	100.00
850812	12.75	0	758	0.00	100.00	12.08	0	416	0.00	100.00
850813	12.08	0	758	0.00	100.00	12.08	0	416	0.00	100.00
850814	11.83	0	758	0.00	100.00	12.08	0	416	0.00	100.00
850815	15.83	0	758	0.00	100.00	16.00	0	416	0.00	100.00
850816	20.25	0	758	0.00	100.00	19.50	0	416	0.00	100.00
850817	11.83	0	758	0.00	100.00	11.92	0	416	0.00	100.00
850818	11.83	0	758	0.00	100.00	11.83	0	416	0.00	100.00
850819	12.67	0	758	0.00	100.00	12.17	0	416	0.00	100.00
850820	12.08	0	758	0.00	100.00	12.00	0	416	0.00	100.00
850821	12.83	0	758	0.00	100.00	12.50	0	416	0.00	100.00
850822	12.42	0	758	0.00	100.00	12.17	0	416	0.00	100.00
850823	12.33	0	758	0.00	100.00	12.50	0	416	0.00	100.00
850824	15.25	0	758	0.00	100.00	12.25	0	416	0.00	100.00
850825	20.42	0	758	0.00	100.00	12.50	0	416	0.00	100.00
850826	12.33	0	758	0.00	100.00	12.50	0	416	0.00	100.00
850827	12.50	0	758	0.00	100.00	12.00	0	416	0.00	100.00
850828	12.08	0	758	0.00	100.00	12.25	0	416	0.00	100.00
850829	12.33	0	758	0.00	100.00	13.75	0	416	0.00	100.00
850830	12.50	0	758	0.00	100.00	12.17	0	416	0.00	100.00
850831	15.83	0	758	0.00	100.00	12.33	0	416	0.00	100.00
850901	9.75	0	758	0.00	100.00	9.83	0	416	0.00	100.00
850902	0	-	758	----	100.00	12.17	0	416	0.00	100.00
850903	8.75	0	758	0.00	100.00	12.67	0	416	0.00	100.00
850904	13.83	0	758	0.00	100.00	13.67	0	416	0.00	100.00
850905	12.08	0	758	0.00	100.00	12.08	0	416	0.00	100.00
850906	13.00	0	758	0.00	100.00	13.58	0	416	0.00	100.00
850907	12.33	0	758	0.00	100.00	12.25	0	416	0.00	100.00
850908	12.58	0	758	0.00	100.00	11.33	0	416	0.00	100.00
850909	12.00	0	758	0.00	100.00	12.17	0	416	0.00	100.00
850910	12.25	0	758	0.00	100.00	12.50	0	416	0.00	100.00
850911	12.67	0	758	0.00	100.00	12.67	0	416	0.00	100.00
850912	12.00	0	758	0.00	100.00	12.00	0	416	0.00	100.00
850913	12.00	0	758	0.00	100.00	11.67	0	416	0.00	100.00
850914	11.83	0	758	0.00	100.00	0	-	416	----	100.00
850915	3.50	0	758	0.00	100.00	12.67	0	416	0.00	100.00
850916	12.00	0	758	0.00	100.00	12.00	0	416	0.00	100.00
850917	12.08	0	758	0.00	100.00	12.08	0	416	0.00	100.00
850918	12.42	0	758	0.00	100.00	12.67	0	416	0.00	100.00
850919	12.33	0	758	0.00	100.00	12.33	0	416	0.00	100.00
850920	12.00	0	758	0.00	100.00	11.08	0	416	0.00	100.00
850921	12.42	0	758	0.00	100.00	12.25	0	416	0.00	100.00
850922	12.33	0	758	0.00	100.00	12.00	0	416	0.00	100.00
850923	12.08	0	758	0.00	100.00	12.17	0	416	0.00	100.00

Appendix Table D.7. Flathorn Station chum salmon fry daily and cumulative catch recorded for the west bank (trap 1) and east bank (trap 2) stationary outmigrant traps, 1985.

	TRAP 1					TRAP 2				
Date	Hours Fished	Daily Catch	Cumulative Catch	Daily CPUE	Percent Cumulative	Hours Fished	Daily Catch	Cumulative Catch	Daily CPUE	Percent Cumulative
850527	7.83	90	90	11.49	1.20	0	---	---	-----	----
850528	13.50	313	403	23.19	5.38	12.75	150	150	11.77	3.96
850529	15.75	351	754	22.29	10.07	23.17	176	326	7.60	8.60
850530	15.42	129	883	8.37	11.79	22.75	163	489	7.17	12.90
850531	12.17	88	971	7.23	12.97	12.08	70	559	5.79	14.75
850601	13.42	216	1187	16.10	15.85	12.83	81	640	6.31	16.88
850602	11.50	180	1367	15.65	18.26	11.83	103	743	8.71	19.60
850603	14.33	221	1588	15.42	21.21	14.58	77	820	5.28	21.63
850604	11.83	268	1856	22.65	24.79	24.08	145	965	6.02	25.46
850605	14.17	594	2450	41.93	32.72	18.58	333	1298	17.92	34.24
850606	13.50	487	2937	36.07	39.22	11.75	47	1345	4.00	35.48
850607	24.33	711	3648	29.22	48.72	13.50	37	1382	2.74	36.45
850608	24.42	229	3877	9.38	51.78	24.00	143	1525	5.96	40.23
850609	23.58	146	4023	6.19	53.73	23.00	72	1597	3.13	42.13
850610	14.75	199	4222	13.49	56.38	11.25	36	1633	3.20	43.08
850611	14.58	33	4255	2.26	56.82	12.33	36	1669	2.92	44.03
850612	12.25	40	4295	3.27	57.36	11.83	47	1716	3.97	45.27
850613	11.33	105	4400	9.27	58.76	11.50	149	1865	12.96	49.20
850614	10.25	174	4574	16.98	61.08	10.83	147	2012	13.57	53.07
850615	12.25	153	4727	12.49	63.13	12.67	107	2119	8.45	55.90
850616	13.17	138	4865	10.48	64.97	12.42	79	2198	6.36	57.98
850617	11.92	85	4950	7.13	66.11	11.25	44	2242	3.91	59.14
850618	12.25	67	5017	5.47	67.00	11.75	71	2313	6.04	61.01
850619	7.92	49	5066	6.19	67.65	13.08	47	2360	3.59	62.25
850620	3.00	3	5069	1.00	67.69	12.50	37	2397	2.96	63.23
850621	11.50	59	5128	5.13	68.48	22.58	53	2450	2.35	64.63
850622	12.17	45	5173	3.70	69.08	7.75	38	2488	4.90	65.63
850623	12.33	67	5240	5.43	69.98	11.83	45	2533	3.80	66.82
850624	9.50	174	5414	18.32	72.30	11.92	93	2626	7.80	69.27
850625	12.67	206	5620	16.27	75.05	12.17	90	2716	7.40	71.64
850626	12.50	252	5872	20.16	78.42	11.83	80	2796	6.76	73.75
850627	12.25	490	6362	40.00	84.96	13.17	291	3087	22.10	81.43
850628	12.33	248	6610	20.11	88.27	11.83	141	3228	11.92	85.15
850629	15.92	162	6772	10.18	90.44	17.92	183	3411	10.21	89.98
850630	20.42	282	7054	13.81	94.20	17.33	148	3559	8.54	93.88
850701	5.92	40	7094	6.76	94.74	9.58	61	3620	6.37	95.49
850702	11.58	90	7184	7.77	95.94	8.17	6	3626	0.73	95.65
850703	11.75	13	7197	1.11	96.11	11.67	1	3627	0.09	95.67
850704	12.08	51	7248	4.22	96.79	11.33	20	3647	1.76	96.20
850705	11.83	30	7278	2.54	97.20	12.83	12	3659	0.94	96.52
850706	16.00	59	7337	3.69	97.98	16.43	9	3668	0.55	96.76
850707	19.75	19	7356	0.96	98.24	18.58	7	3675	0.38	96.94
850708	12.00	7	7363	0.58	98.33	12.42	11	3686	0.89	97.23
850709	12.17	15	7378	1.23	98.53	11.42	14	3700	1.23	97.60
850710	12.25	10	7388	0.82	98.66	12.00	10	3710	0.83	97.86
850711	12.25	20	7408	1.63	98.93	11.75	14	3724	1.19	98.23
850712	11.83	5	7413	0.42	99.00	11.83	8	3732	0.68	98.44
850713	11.92	4	7417	0.34	99.05	12.00	9	3741	0.75	98.68
850714	12.00	11	7428	0.92	99.20	11.75	12	3753	1.02	99.00
850715	11.92	5	7433	0.42	99.27	12.08	5	3758	0.41	99.13
850716	15.00	8	7441	0.53	99.37	14.75	5	3763	0.34	99.26
850717	21.00	7	7448	0.33	99.47	20.58	2	3765	0.10	99.31
850718	12.42	6	7454	0.48	99.55	12.33	7	3772	0.57	99.50
850719	12.00	1	7455	0.08	99.56	12.33	3	3775	0.24	99.58
850720	12.00	2	7457	0.17	99.59	11.83	3	3778	0.25	99.66
850721	11.92	3	7460	0.25	99.63	11.83	1	3779	0.08	99.68
850722	11.92	7	7467	0.59	99.72	11.92	1	3780	0.08	99.71
850723	18.00	3	7470	0.17	99.76	16.83	1	3781	0.06	99.74
850724	18.17	1	7471	0.06	99.77	19.08	1	3782	0.05	99.76
850725	12.58	4	7475	0.32	99.83	12.42	0	3782	0.00	99.76

Appendix Table D.7. Continued.

Date	TRAP 1 Hours Fished	TRAP 1 Daily Catch	TRAP 1 Cumulative Catch	TRAP 1 Daily CPUE	TRAP 1 Percent Cumulative	TRAP 2 Hours Fished	TRAP 2 Daily Catch	TRAP 2 Cumulative Catch	TRAP 2 Daily CPUE	TRAP 2 Percent Cumulative
850726	12.83	0	7475	0.00	99.83	13.58	2	3784	0.15	99.82
850727	11.92	4	7479	0.34	99.88	11.92	0	3784	0.00	99.82
850728	12.17	1	7480	0.08	99.89	11.92	1	3785	0.08	99.84
850729	12.33	1	7481	0.08	99.91	11.92	2	3787	0.17	99.89
850730	12.33	0	7481	0.00	99.91	12.17	0	3787	0.00	99.89
850731	11.92	0	7481	0.00	99.91	11.50	2	3789	0.17	99.95
850801	11.92	1	7482	0.08	99.92	12.00	0	3789	0.00	99.95
850802	12.08	0	7482	0.00	99.92	12.08	0	3789	0.00	99.95
850803	12.00	0	7482	0.00	99.92	12.25	0	3789	0.00	99.95
850804	12.33	1	7483	0.08	99.93	12.00	1	3790	0.08	99.97
850805	12.42	1	7484	0.08	99.95	12.00	0	3790	0.00	99.97
850806	12.92	0	7484	0.00	99.95	12.58	0	3790	0.00	99.97
850807	11.83	0	7484	0.00	99.95	11.92	0	3790	0.00	99.97
850808	12.17	0	7484	0.00	99.95	5.75	0	3790	0.00	99.97
850809	11.92	0	7484	0.00	99.95	11.67	0	3790	0.00	99.97
850810	17.33	1	7485	0.06	99.96	16.33	0	3790	0.00	99.97
850811	19.00	1	7486	0.05	99.97	21.00	0	3790	0.00	99.97
850812	12.75	0	7486	0.00	99.97	12.08	0	3790	0.00	99.97
850813	12.08	0	7486	0.00	99.97	12.08	0	3790	0.00	99.97
850814	11.83	0	7486	0.00	99.97	12.08	0	3790	0.00	99.97
850815	15.83	0	7486	0.00	99.97	16.00	0	3790	0.00	99.97
850816	20.25	0	7486	0.00	99.97	19.50	1	3791	0.05	100.00
850817	11.83	0	7486	0.00	99.97	11.92	0	3791	0.00	100.00
850818	11.83	0	7486	0.00	99.97	11.83	0	3791	0.00	100.00
850819	12.67	0	7486	0.00	99.97	12.17	0	3791	0.00	100.00
850820	12.08	0	7486	0.00	99.97	12.00	0	3791	0.00	100.00
850821	12.83	0	7486	0.00	99.97	12.50	0	3791	0.00	100.00
850822	12.42	0	7486	0.00	99.97	12.17	0	3791	0.00	100.00
850823	12.33	1	7487	0.08	99.99	12.50	0	3791	0.00	100.00
850824	15.25	0	7487	0.00	99.99	12.25	0	3791	0.00	100.00
850825	20.42	0	7487	0.00	99.99	12.50	0	3791	0.00	100.00
850826	12.33	0	7487	0.00	99.99	12.50	0	3791	0.00	100.00
850827	12.50	0	7487	0.00	99.99	12.00	0	3791	0.00	100.00
850828	12.08	0	7487	0.00	99.99	12.25	0	3791	0.00	100.00
850829	12.33	0	7487	0.00	99.99	13.75	0	3791	0.00	100.00
850830	12.50	0	7487	0.00	99.99	12.17	0	3791	0.00	100.00
850831	15.83	0	7487	0.00	99.99	12.33	0	3791	0.00	100.00
850901	9.75	0	7487	0.00	99.99	9.83	0	3791	0.00	100.00
850902	0	-	7487	----	99.99	12.17	0	3791	0.00	100.00
850903	8.75	0	7487	0.00	99.99	12.67	0	3791	0.00	100.00
850904	13.83	0	7487	0.00	99.99	13.67	0	3791	0.00	100.00
850905	12.08	0	7487	0.00	99.99	12.08	0	3791	0.00	100.00
850906	13.00	0	7487	0.00	99.99	13.58	0	3791	0.00	100.00
850907	12.33	0	7487	0.00	99.99	12.25	0	3791	0.00	100.00
850908	12.58	0	7487	0.00	99.99	11.33	0	3791	0.00	100.00
850909	12.00	0	7487	0.00	99.99	12.17	0	3791	0.00	100.00
850910	12.25	0	7487	0.00	99.99	12.50	0	3791	0.00	100.00
850911	12.67	0	7487	0.00	99.99	12.67	0	3791	0.00	100.00
850912	12.00	0	7487	0.00	99.99	12.00	0	3791	0.00	100.00
850913	12.00	0	7487	0.00	99.99	11.67	0	3791	0.00	100.00
850914	11.83	0	7487	0.00	99.99	0	-	3791	----	100.00
850915	3.50	1	7488	0.29	100.00	12.67	0	3791	0.00	100.00
850916	12.00	0	7488	0.00	100.00	12.00	0	3791	0.00	100.00
850917	12.08	0	7488	0.00	100.00	12.08	0	3791	0.00	100.00
850918	12.42	0	7488	0.00	100.00	12.67	0	3791	0.00	100.00
850919	12.33	0	7488	0.00	100.00	12.33	0	3791	0.00	100.00
850920	12.00	0	7488	0.00	100.00	11.08	0	3791	0.00	100.00
850921	12.42	0	7488	0.00	100.00	12.25	0	3791	0.00	100.00
850922	12.33	0	7488	0.00	100.00	12.00	0	3791	0.00	100.00
850923	12.08	0	7488	0.00	100.00	12.17	0	3791	0.00	100.00

Appendix Table D.8. Flathorn Station pink salmon fry daily and cumulative catch recorded for the west bank (trap 1) and east bank (trap 2) stationary outmigrant traps, 1985.

Date	TRAP 1 Hours Fished	Daily Catch	Cumulative Catch	Daily CPUE	Percent Cumulative	TRAP 2 Hours Fished	Daily Catch	Cumulative Catch	Daily CPUE	Percent Cumulative
850527	7.83	7	7	0.89	0.33	0	-	-	----	----
850528	13.50	27	34	2.00	1.61	12.75	16	16	1.26	0.72
850529	15.75	13	47	0.83	2.22	23.17	13	29	0.56	1.30
850530	15.42	12	59	0.78	2.79	22.75	43	72	1.89	3.22
850531	12.17	7	66	0.58	3.12	12.08	4	76	0.33	3.40
850601	13.42	5	71	0.37	3.36	12.83	7	83	0.55	3.71
850602	11.50	8	79	0.70	3.74	11.83	4	87	0.34	3.89
850603	14.33	17	96	1.19	4.54	14.58	5	92	0.34	4.11
850604	11.83	4	100	0.34	4.73	24.08	18	110	0.75	4.92
850605	14.17	79	179	5.58	8.47	18.58	33	143	1.78	6.39
850606	13.50	61	240	4.52	11.35	11.75	22	165	1.87	7.38
850607	24.33	39	279	1.60	13.20	13.50	2	167	0.15	7.47
850608	24.42	25	304	1.02	14.38	24.00	29	196	1.21	8.76
850609	23.58	31	335	1.31	15.85	23.00	32	228	1.39	10.19
850610	14.75	93	428	6.31	20.25	11.25	16	244	1.42	10.91
850611	14.58	82	510	5.62	24.12	12.33	115	359	9.33	16.05
850612	12.25	72	582	5.88	27.53	11.83	88	447	7.44	19.98
850613	11.33	57	639	5.03	30.23	11.50	89	536	7.74	23.96
850614	10.25	60	699	5.85	33.07	10.83	96	632	8.86	28.25
850615	12.25	124	823	10.12	38.93	12.67	118	750	9.32	33.53
850616	13.17	36	859	2.73	40.63	12.42	57	807	4.59	36.08
850617	11.92	38	897	3.19	42.43	11.25	119	926	10.58	41.39
850618	12.25	42	939	3.43	44.42	11.75	83	1009	7.06	45.11
850619	7.92	29	968	3.66	45.79	13.08	154	1163	11.77	51.99
850620	3.00	10	978	3.33	46.26	12.50	123	1286	9.84	57.49
850621	11.50	36	1014	3.13	47.97	22.58	107	1393	4.74	62.27
850622	12.17	40	1054	3.29	49.86	7.75	38	1431	4.90	63.97
850623	12.33	77	1131	6.24	53.50	11.83	110	1541	9.30	68.89
850624	9.50	126	1257	13.26	59.46	11.92	233	1774	19.55	79.30
850625	12.67	113	1370	8.92	64.81	12.17	70	1844	5.75	82.43
850626	12.50	60	1430	4.80	67.64	11.83	53	1897	4.48	84.80
850627	12.25	81	1511	6.61	71.48	13.17	51	1948	3.87	87.08
850628	12.33	52	1563	4.22	73.94	11.83	61	2009	5.16	89.81
850629	15.92	92	1655	5.78	78.29	17.92	110	2119	6.14	94.73
850630	20.42	169	1824	8.28	86.28	17.33	52	2171	3.00	97.05
850701	5.92	33	1857	5.58	87.84	9.58	24	2195	2.50	98.12
850702	11.58	87	1944	7.51	91.96	8.17	1	2196	0.12	98.17
850703	11.75	58	2002	4.94	94.70	11.67	4	2200	0.34	98.35
850704	12.08	26	2028	2.15	95.93	11.33	1	2201	0.09	98.39
850705	11.83	23	2051	1.94	97.02	12.83	6	2207	0.47	98.66
850706	16.00	14	2065	0.88	97.68	16.43	5	2212	0.30	98.88
850707	19.75	6	2071	0.30	97.97	18.58	5	2217	0.27	99.11
850708	12.00	9	2080	0.75	98.39	12.42	1	2218	0.08	99.15
850709	12.17	4	2084	0.33	98.58	11.42	2	2220	0.18	99.24
850710	12.25	4	2088	0.33	98.77	12.00	1	2221	0.08	99.28
850711	12.25	4	2092	0.33	98.96	11.75	3	2224	0.26	99.42
850712	11.83	1	2093	0.08	99.01	11.83	3	2227	0.25	99.55
850713	11.92	1	2094	0.08	99.05	12.00	1	2228	0.08	99.60
850714	12.00	1	2095	0.08	99.10	11.75	3	2231	0.26	99.73
850715	11.92	2	2097	0.17	99.20	12.08	1	2232	0.08	99.78
850716	15.00	7	2104	0.47	99.53	14.75	1	2233	0.07	99.82
850717	21.00	0	2104	0.00	99.53	20.58	1	2234	0.05	99.87
850718	12.42	1	2105	0.08	99.57	12.33	1	2235	0.08	99.91
850719	12.00	2	2107	0.17	99.67	12.33	0	2235	0.00	99.91
850720	12.00	0	2107	0.00	99.67	11.83	1	2236	0.08	99.96
850721	11.92	5	2112	0.42	99.91	11.83	0	2236	0.00	99.96
850722	11.92	0	2112	0.00	99.91	11.92	0	2236	0.00	99.96
850723	18.00	1	2113	0.06	99.95	16.83	1	2237	0.06	100.00
850724	18.17	1	2114	0.06	100.00	19.08	0	2237	0.00	100.00
850725	12.58	0	2114	0.00	100.00	12.42	0	2237	0.00	100.00

Appendix Table D.8. Continued.

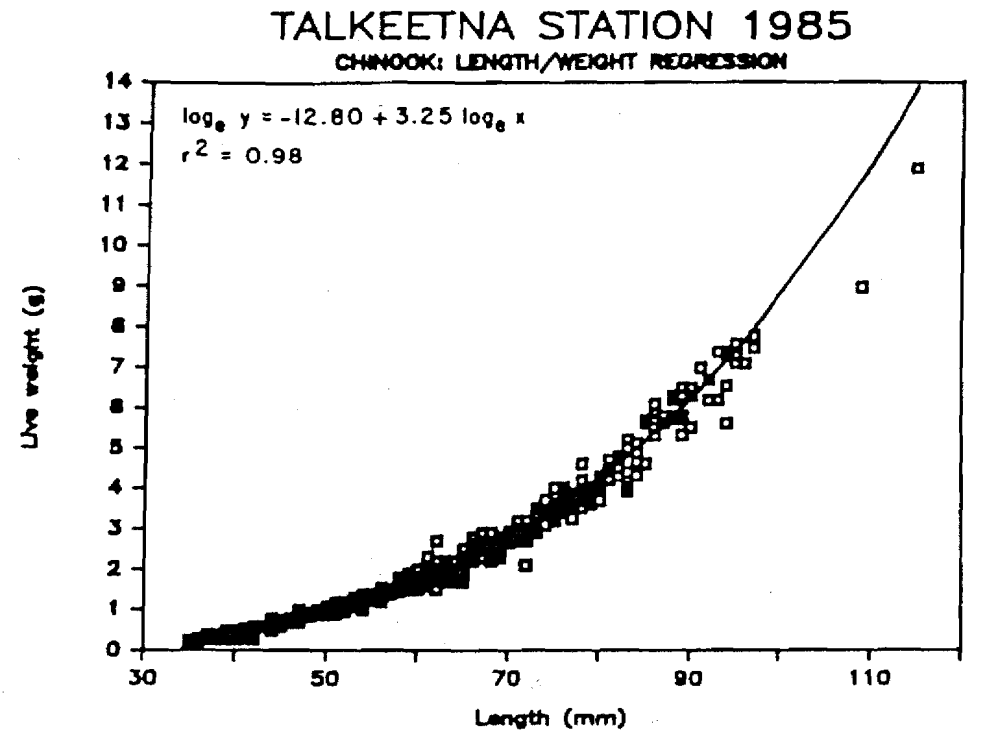
	TRAP 1					TRAP 2				
Date	Hours Fished	Daily Catch	Cumulative Catch	Daily CPUE	Percent Cumulative	Hours Fished	Daily Catch	Cumulative Catch	Daily CPUE	Percent Cumulative
850726	12.83	0	2114	0.00	100.00	13.58	0	2237	0.00	100.00
850727	11.92	0	2114	0.00	100.00	11.92	0	2237	0.00	100.00
850728	12.17	0	2114	0.00	100.00	11.92	0	2237	0.00	100.00
850729	12.33	0	2114	0.00	100.00	11.92	0	2237	0.00	100.00
850730	12.33	0	2114	0.00	100.00	12.17	0	2237	0.00	100.00
850731	11.92	0	2114	0.00	100.00	11.50	0	2237	0.00	100.00
850801	11.92	0	2114	0.00	100.00	12.00	0	2237	0.00	100.00
850802	12.08	0	2114	0.00	100.00	12.08	0	2237	0.00	100.00
850803	12.00	0	2114	0.00	100.00	12.25	0	2237	0.00	100.00
850804	12.33	0	2114	0.00	100.00	12.00	0	2237	0.00	100.00
850805	12.42	0	2114	0.00	100.00	12.00	0	2237	0.00	100.00
850806	12.92	0	2114	0.00	100.00	12.58	0	2237	0.00	100.00
850807	11.83	0	2114	0.00	100.00	11.92	0	2237	0.00	100.00
850808	12.17	0	2114	0.00	100.00	5.75	0	2237	0.00	100.00
850809	11.92	0	2114	0.00	100.00	11.67	0	2237	0.00	100.00
850810	17.33	0	2114	0.00	100.00	16.33	0	2237	0.00	100.00
850811	19.00	0	2114	0.00	100.00	21.00	0	2237	0.00	100.00
850812	12.75	0	2114	0.00	100.00	12.08	0	2237	0.00	100.00
850813	12.08	0	2114	0.00	100.00	12.08	0	2237	0.00	100.00
850814	11.83	0	2114	0.00	100.00	12.08	0	2237	0.00	100.00
850815	15.83	0	2114	0.00	100.00	16.00	0	2237	0.00	100.00
850816	20.25	0	2114	0.00	100.00	19.50	0	2237	0.00	100.00
850817	11.83	0	2114	0.00	100.00	11.92	0	2237	0.00	100.00
850818	11.83	0	2114	0.00	100.00	11.83	0	2237	0.00	100.00
850819	12.67	0	2114	0.00	100.00	12.17	0	2237	0.00	100.00
850820	12.08	0	2114	0.00	100.00	12.00	0	2237	0.00	100.00
850821	12.83	0	2114	0.00	100.00	12.50	0	2237	0.00	100.00
850822	12.42	0	2114	0.00	100.00	12.17	0	2237	0.00	100.00
850823	12.33	0	2114	0.00	100.00	12.50	0	2237	0.00	100.00
850824	15.25	0	2114	0.00	100.00	12.25	0	2237	0.00	100.00
850825	20.42	0	2114	0.00	100.00	12.50	0	2237	0.00	100.00
850826	12.33	0	2114	0.00	100.00	12.50	0	2237	0.00	100.00
850827	12.50	0	2114	0.00	100.00	12.00	0	2237	0.00	100.00
850828	12.08	0	2114	0.00	100.00	12.25	0	2237	0.00	100.00
850829	12.33	0	2114	0.00	100.00	13.75	0	2237	0.00	100.00
850830	12.50	0	2114	0.00	100.00	12.17	0	2237	0.00	100.00
850831	15.83	0	2114	0.00	100.00	12.33	0	2237	0.00	100.00
850901	9.75	0	2114	0.00	100.00	9.83	0	2237	0.00	100.00
850902	0	-	2114	----	100.00	12.17	0	2237	0.00	100.00
850903	8.75	0	2114	0.00	100.00	12.67	0	2237	0.00	100.00
850904	13.83	0	2114	0.00	100.00	13.67	0	2237	0.00	100.00
850905	12.08	0	2114	0.00	100.00	12.08	0	2237	0.00	100.00
850906	13.00	0	2114	0.00	100.00	13.58	0	2237	0.00	100.00
850907	12.33	0	2114	0.00	100.00	12.25	0	2237	0.00	100.00
850908	12.58	0	2114	0.00	100.00	11.33	0	2237	0.00	100.00
850909	12.00	0	2114	0.00	100.00	12.17	0	2237	0.00	100.00
850910	12.25	0	2114	0.00	100.00	12.50	0	2237	0.00	100.00
850911	12.67	0	2114	0.00	100.00	12.67	0	2237	0.00	100.00
850912	12.00	0	2114	0.00	100.00	12.00	0	2237	0.00	100.00
850913	12.00	0	2114	0.00	100.00	11.67	0	2237	0.00	100.00
850914	11.83	0	2114	0.00	100.00	0	-	2237	----	100.00
850915	3.50	0	2114	0.00	100.00	12.67	0	2237	0.00	100.00
850916	12.00	0	2114	0.00	100.00	12.00	0	2237	0.00	100.00
850917	12.08	0	2114	0.00	100.00	12.08	0	2237	0.00	100.00
850918	12.42	0	2114	0.00	100.00	12.67	0	2237	0.00	100.00
850919	12.33	0	2114	0.00	100.00	12.33	0	2237	0.00	100.00
850920	12.00	0	2114	0.00	100.00	11.08	0	2237	0.00	100.00
850921	12.42	0	2114	0.00	100.00	12.25	0	2237	0.00	100.00
850922	12.33	0	2114	0.00	100.00	12.00	0	2237	0.00	100.00
850923	12.08	0	2114	0.00	100.00	12.17	0	2237	0.00	100.00

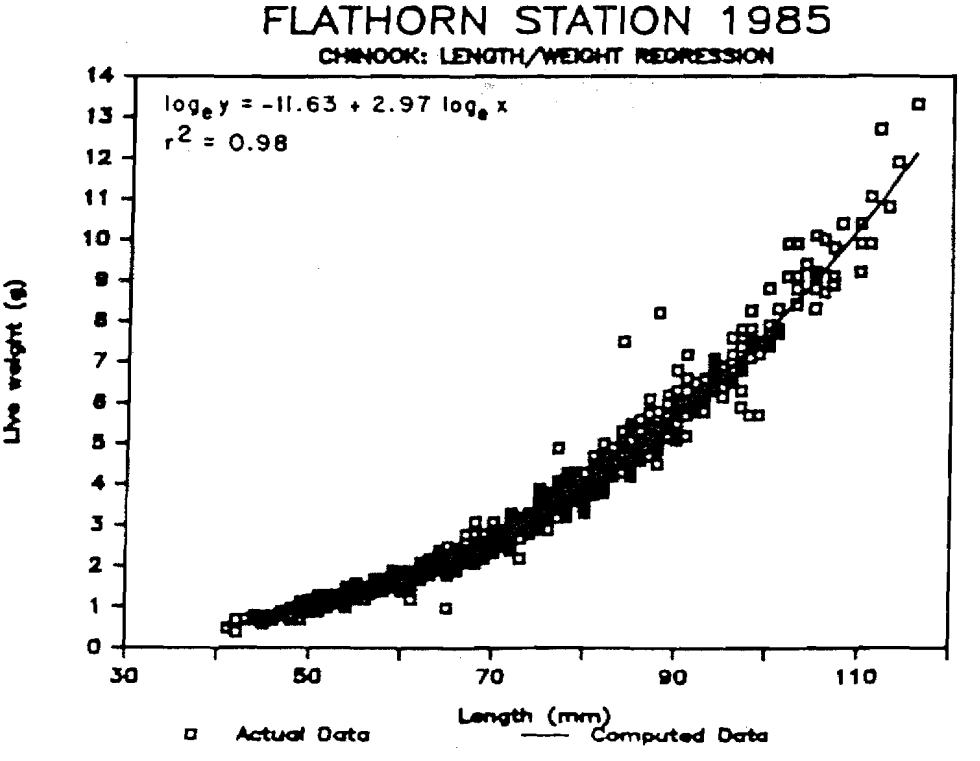
APPENDIX E

Length and Weight Relationship Data for Juvenile Salmon, 1985

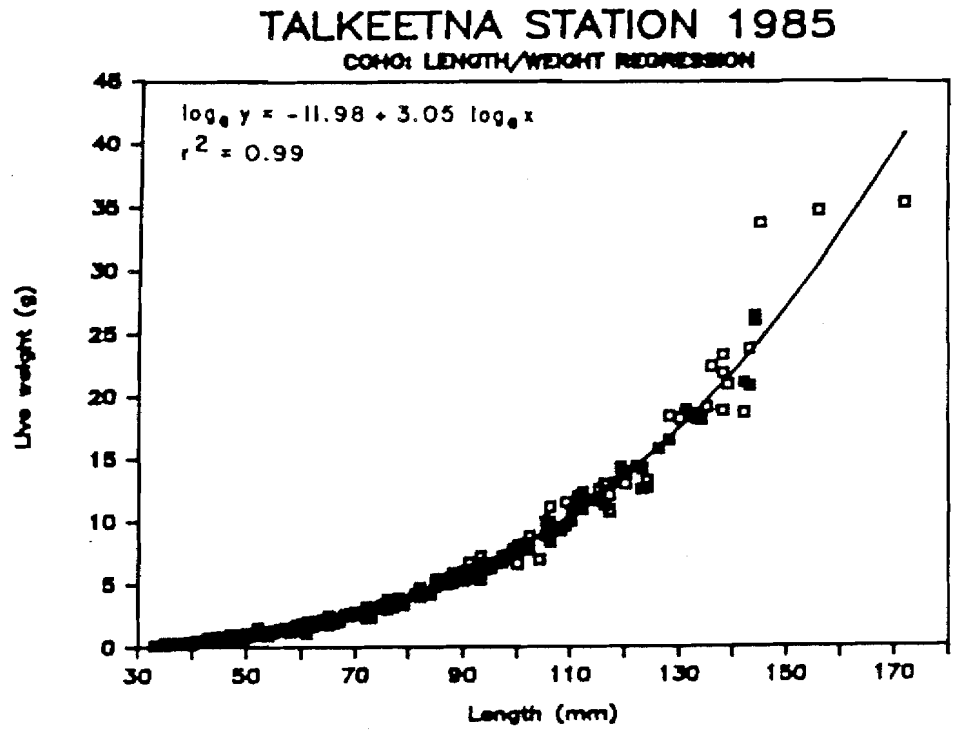
Length and weight relationship data was collected from samples of all five species of juvenile salmon collected in the stationary outmigrant traps at Talkeetna and Flathorn stations. A regression was done on the natural logarithm of weight versus the natural logarithm of length for each species and each collection site (Appendix Fig. E1 - E7). The regression equations for Talkeetna and Flathorn stations were used to provide estimates of the cumulative biomass passing these sites for each species and age class by two week sampling period through the season (Appendix Fig. E8 - E15).

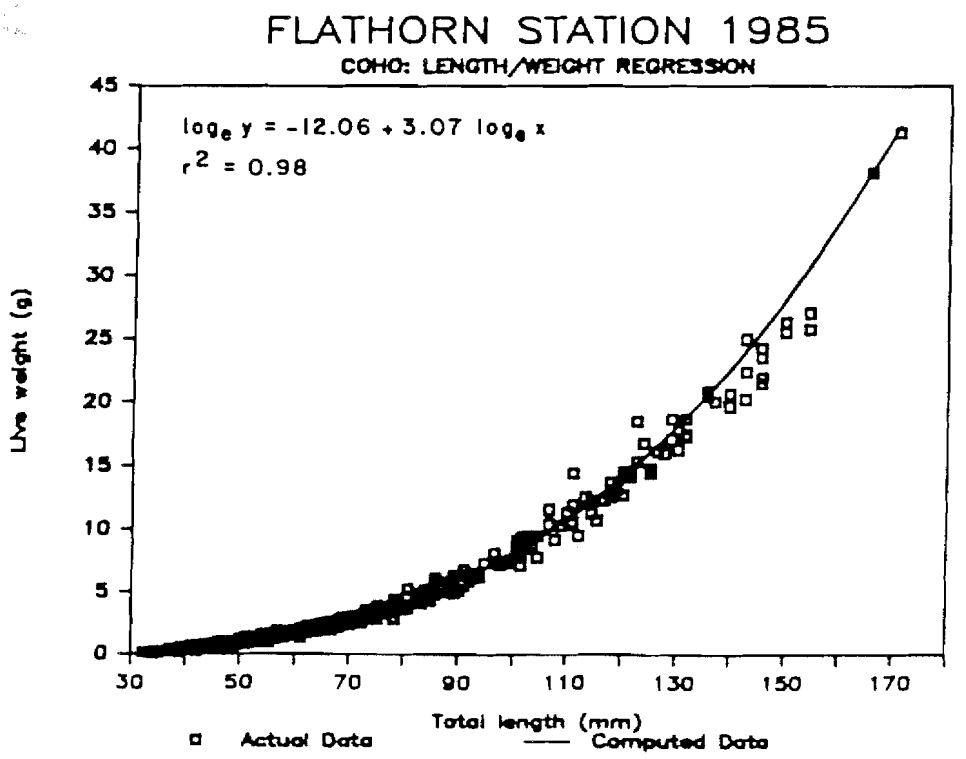
The difference between the cumulative biomass movement and the movement of total numbers of fish (cumulative catch) results from fish growth occurring during the open-water season. The cumulative biomass curve is probably a better indicator of the value of rearing habitat in each reach of river. If suitable habitat is available, fish are able to spend a greater time rearing and obtaining additional growth. The value is realized in the increased probability that these larger fish will survive to return as adults. Management decisions for these fish should consider the timing of total biomass movement in the river rather than formulating actions only from the catch data.



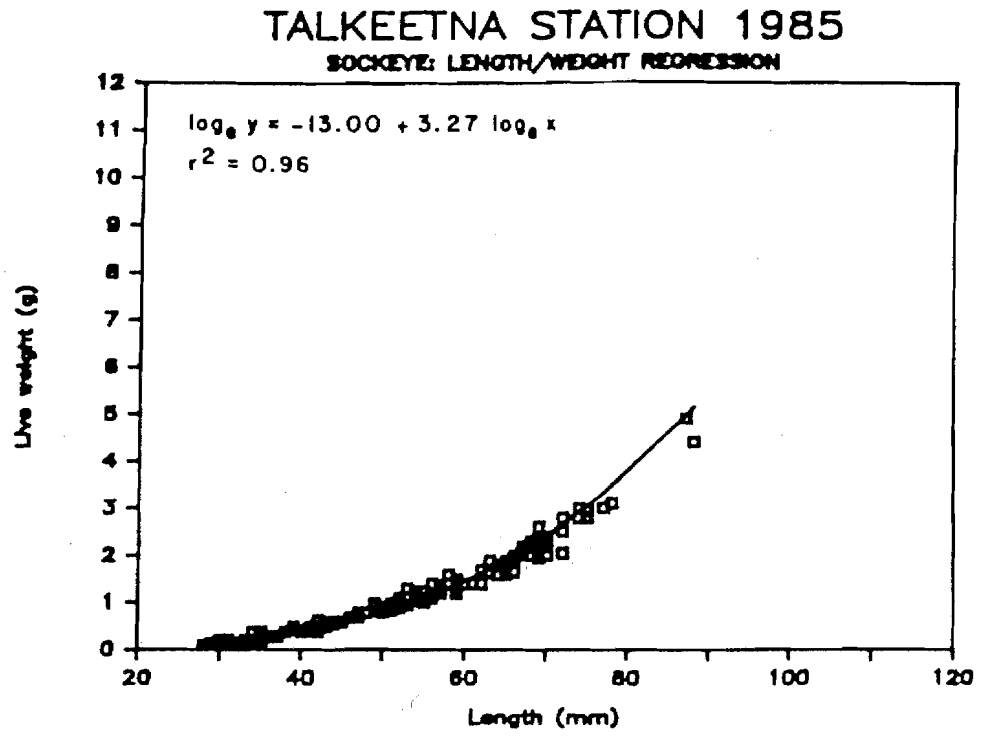


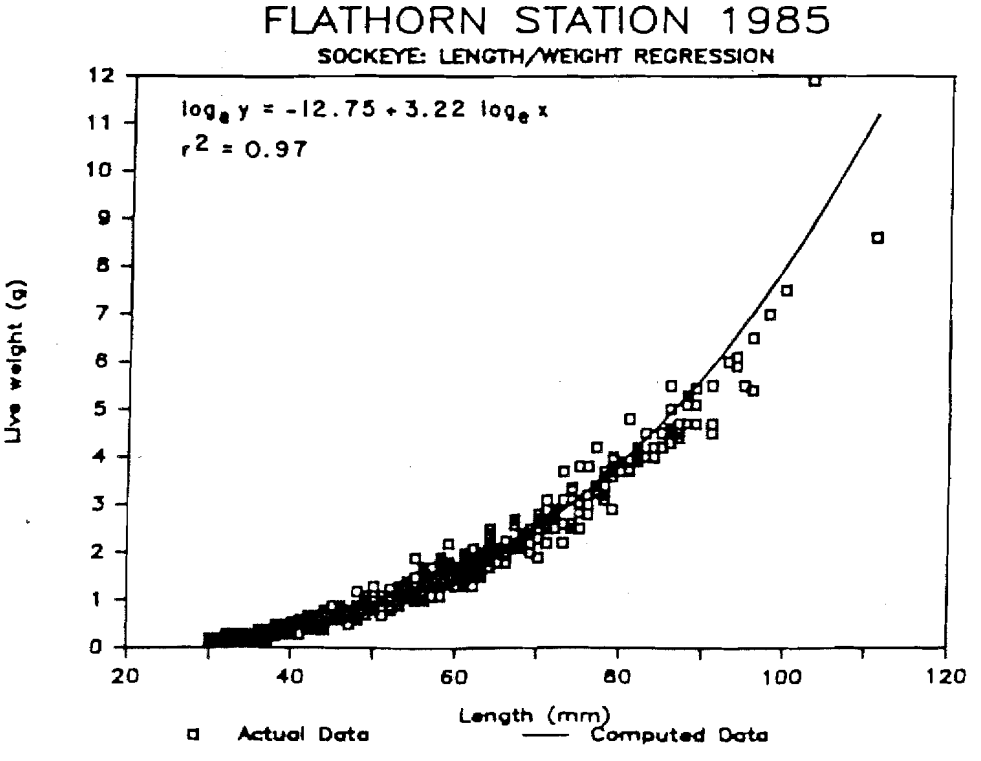
Appendix Figure E.1. Weight/length relationship for juvenile chinook salmon collected at the Talkeetna (upper figure) and Flathorn (lower figure) stationary outmigrant traps, 1985.



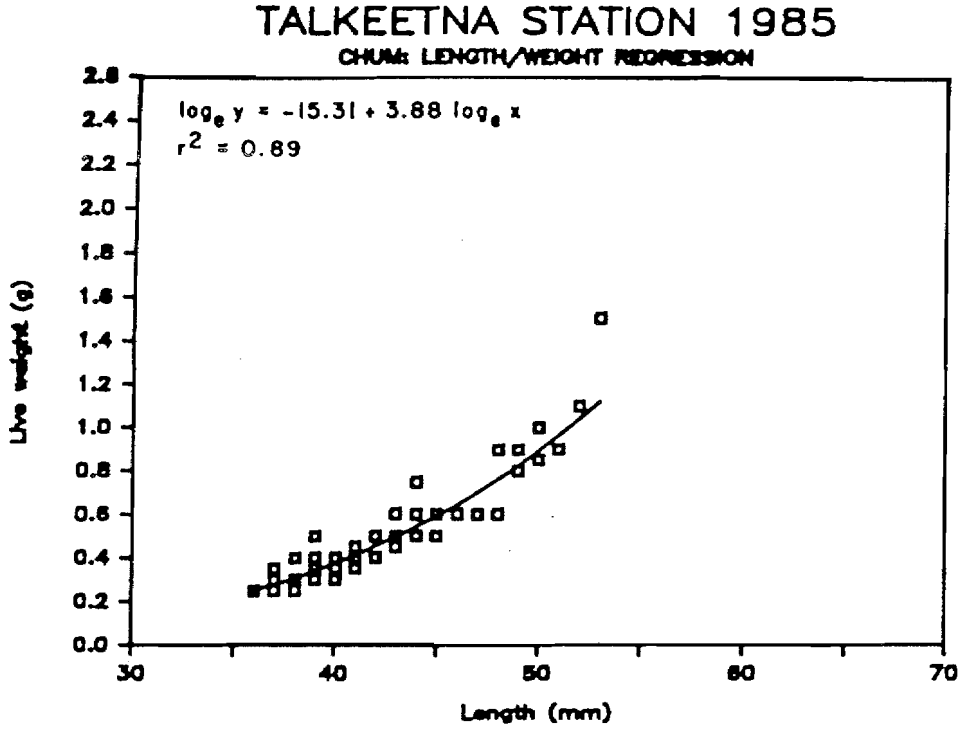


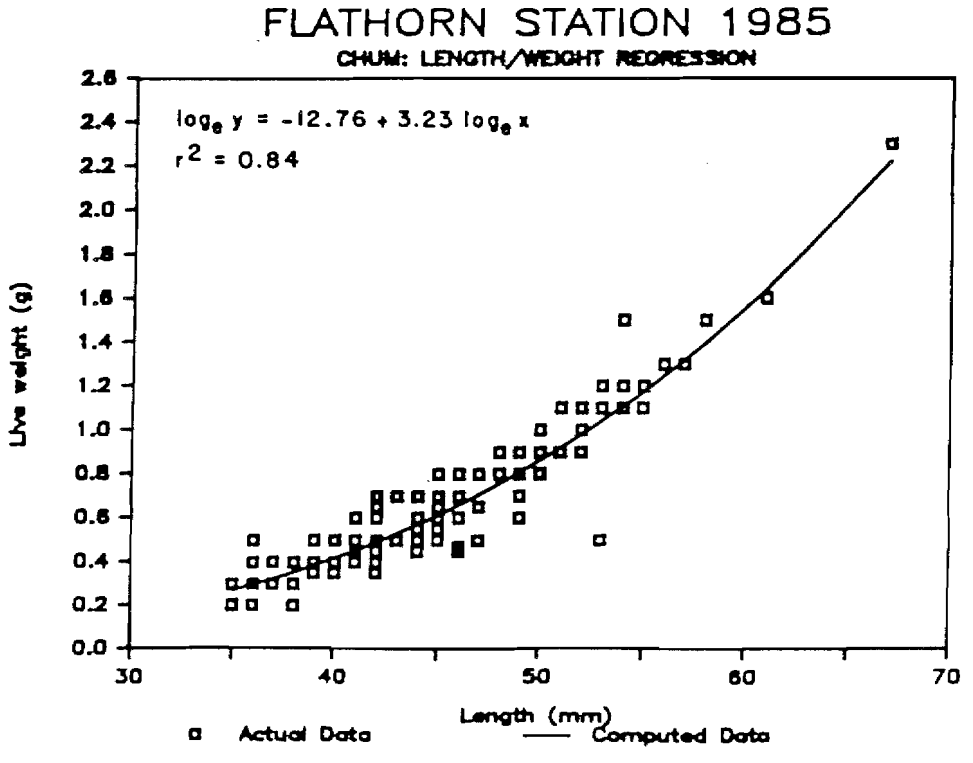
Appendix Figure E.2. Weight/length relationship for juvenile coho salmon collected at the Talkeetna (upper figure) and Flathorn (lower figure) stationary outmigrant traps, 1985.



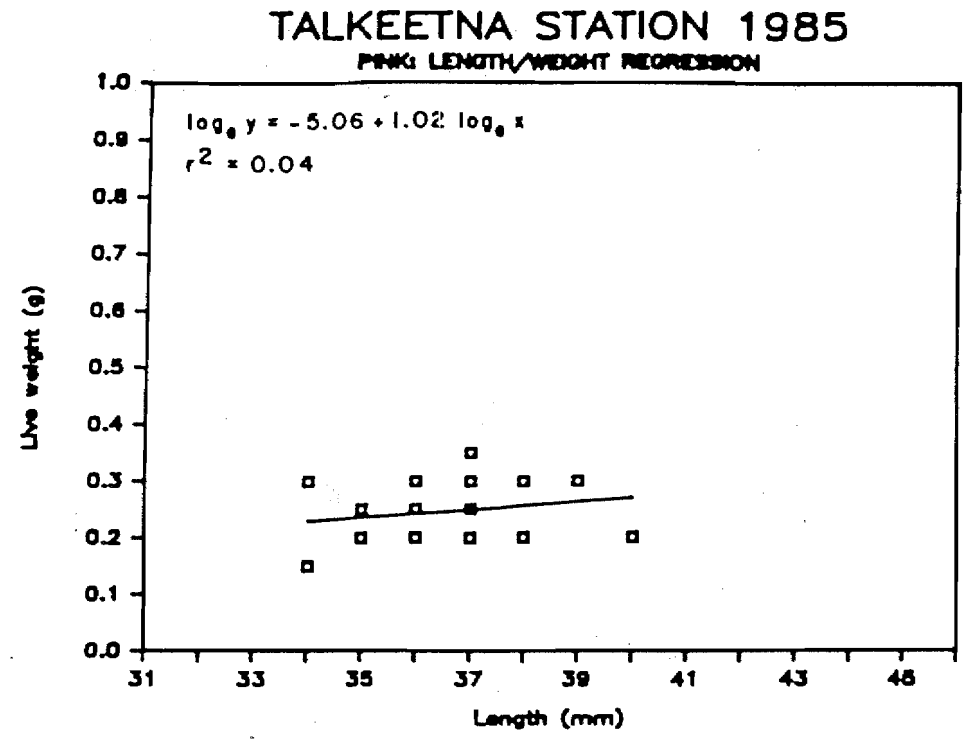


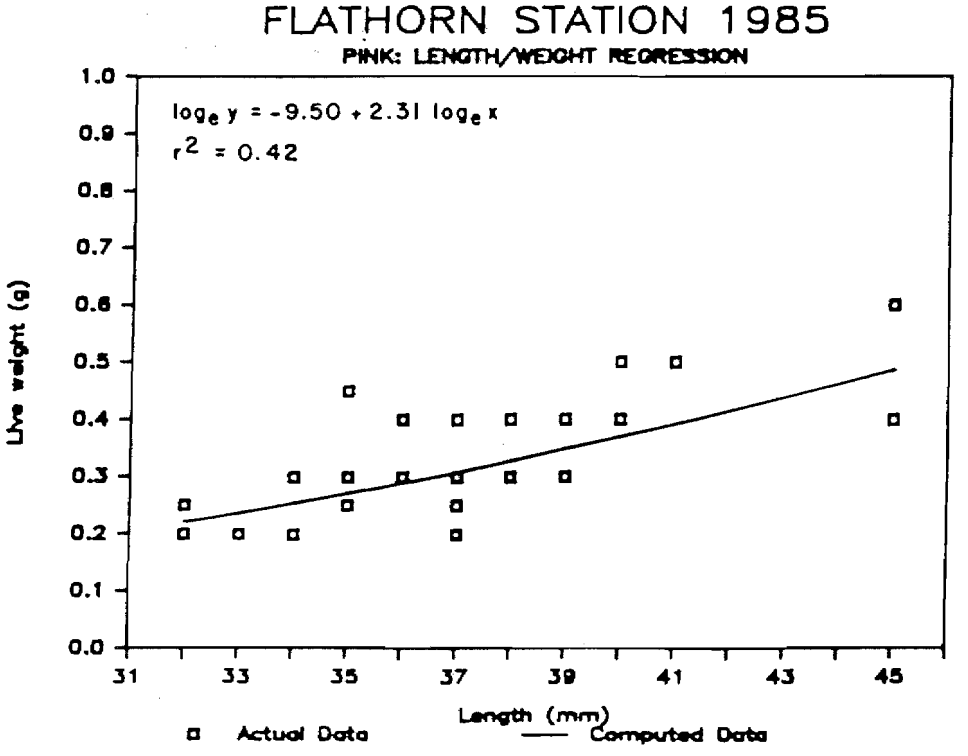
Appendix Figure E.3. Weight/length relationship for juvenile sockeye salmon collected at the Talkeetna (upper figure) and Flathorn (lower figure) stationary outmigrant traps, 1985.



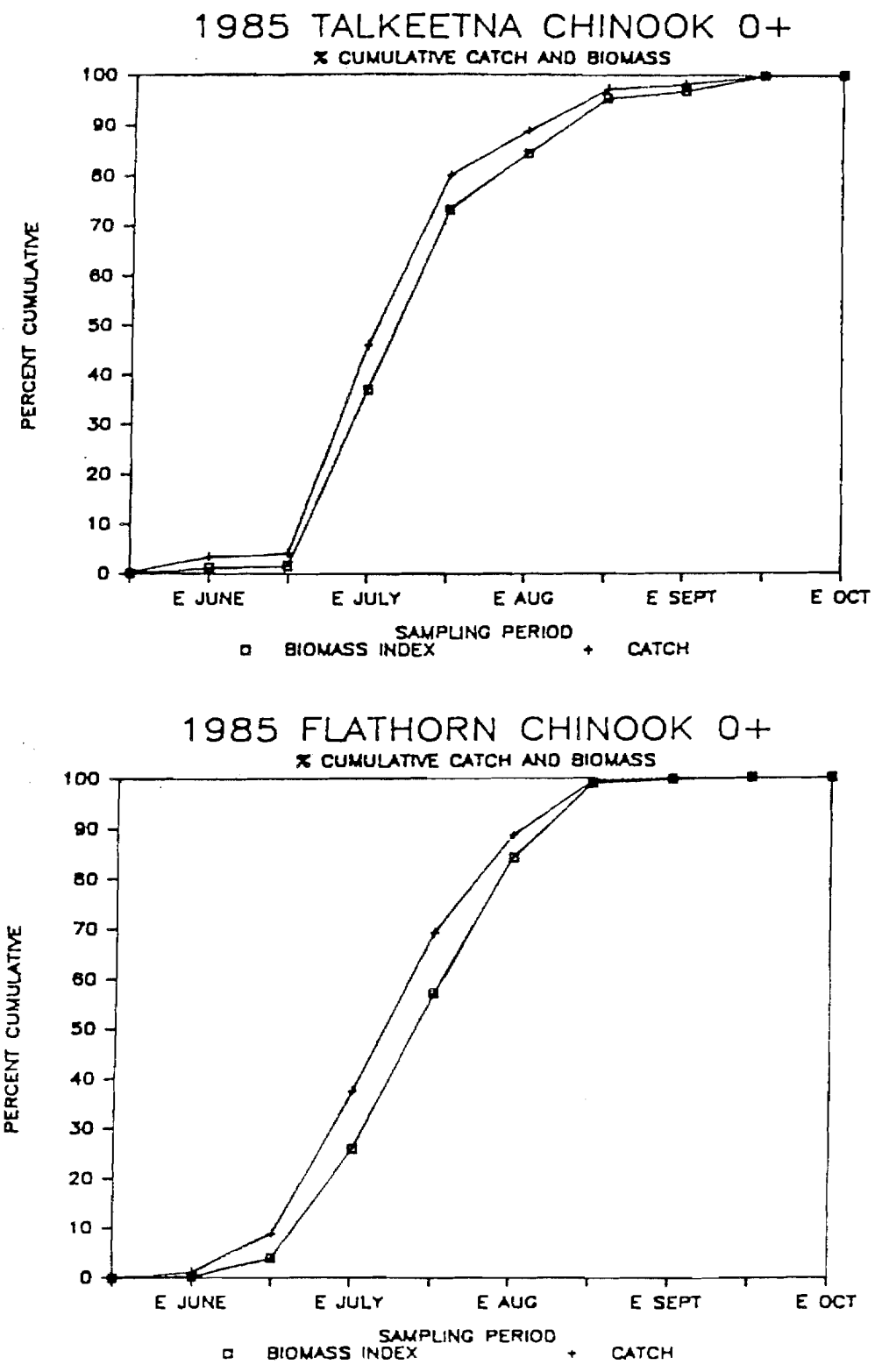


Appendix Figure E.4. Weight/length relationship for juvenile chum salmon collected at the Talkeetna (upper figure) and Flathorn (lower figure) stationary outmigrant traps, 1985.

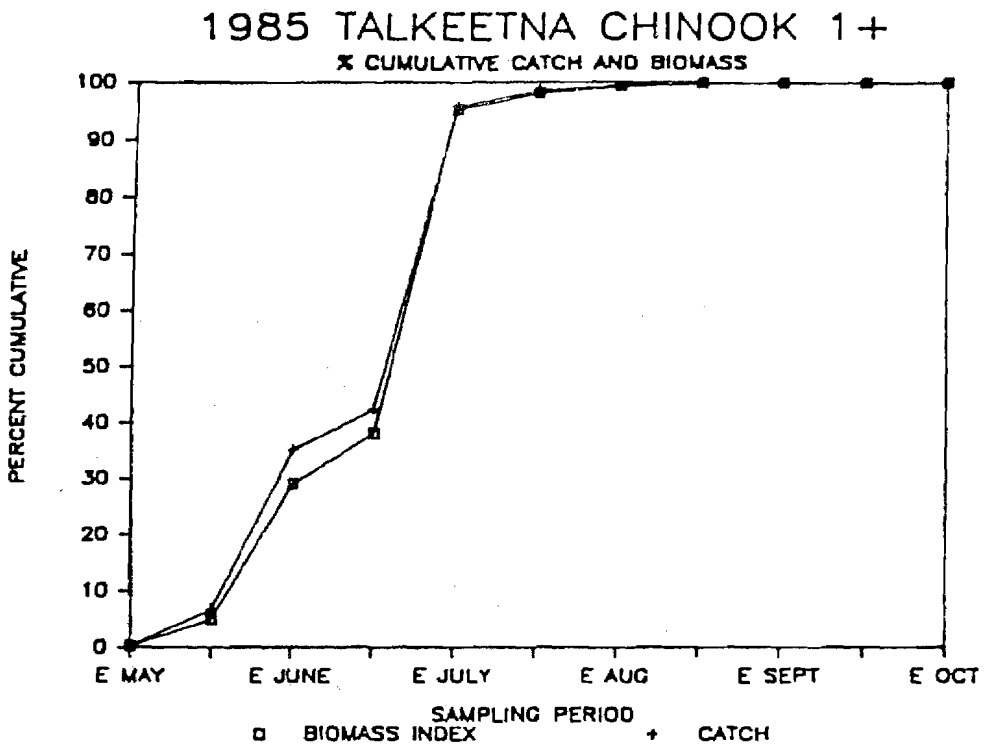


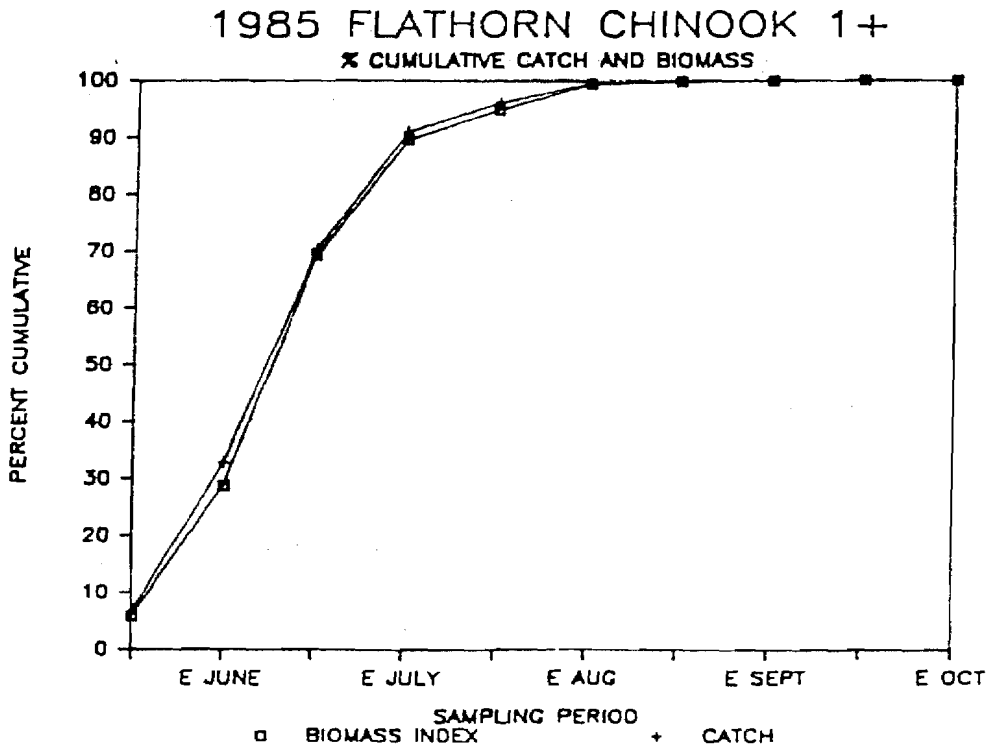


Appendix Figure E.5. Weight/length relationship for juvenile pink salmon collected at the Talkeetna (upper figure) and Flathorn (lower figure) stationary outmigrant traps, 1985.

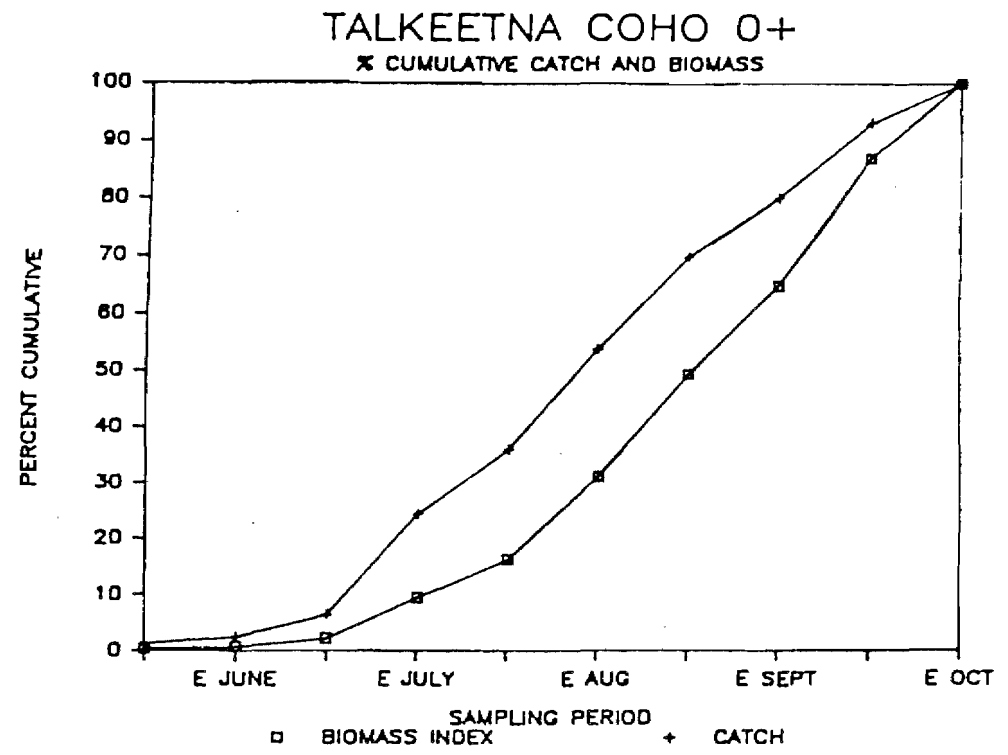


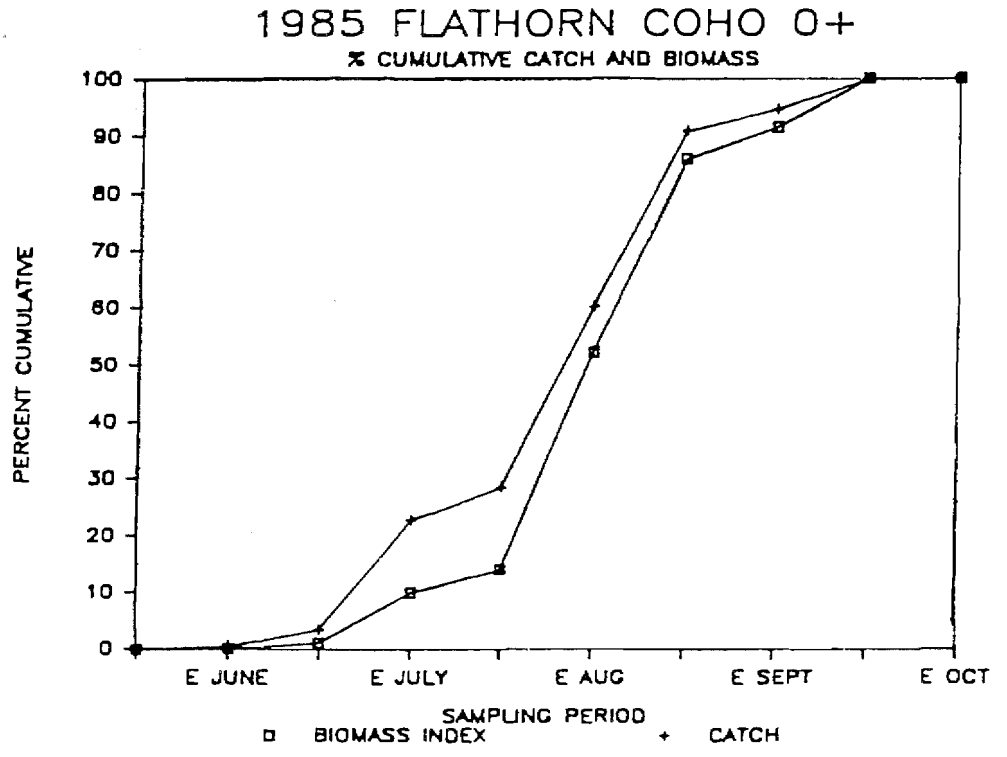
Appendix Figure E.6. Chinook salmon (age 0+) cumulative catch and biomass recorded at Talkeetna (upper figure) and Flathorn (lower figure) stations, 1985.



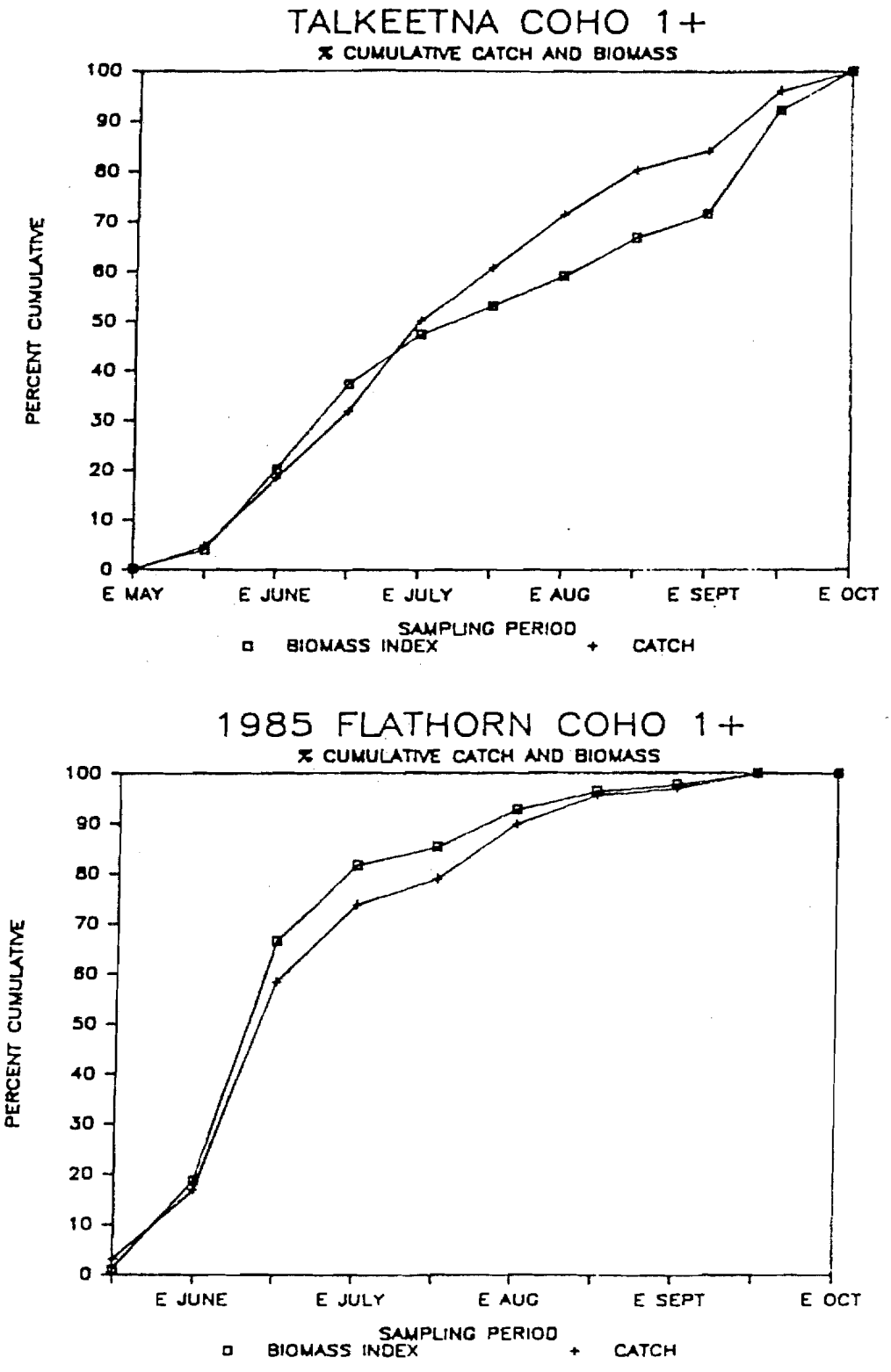


Appendix Figure E.7. Chinook salmon (age 1+) cumulative catch and biomass recorded at Talkeetna (upper figure) and Flathorn (lower figure) stations, 1985.

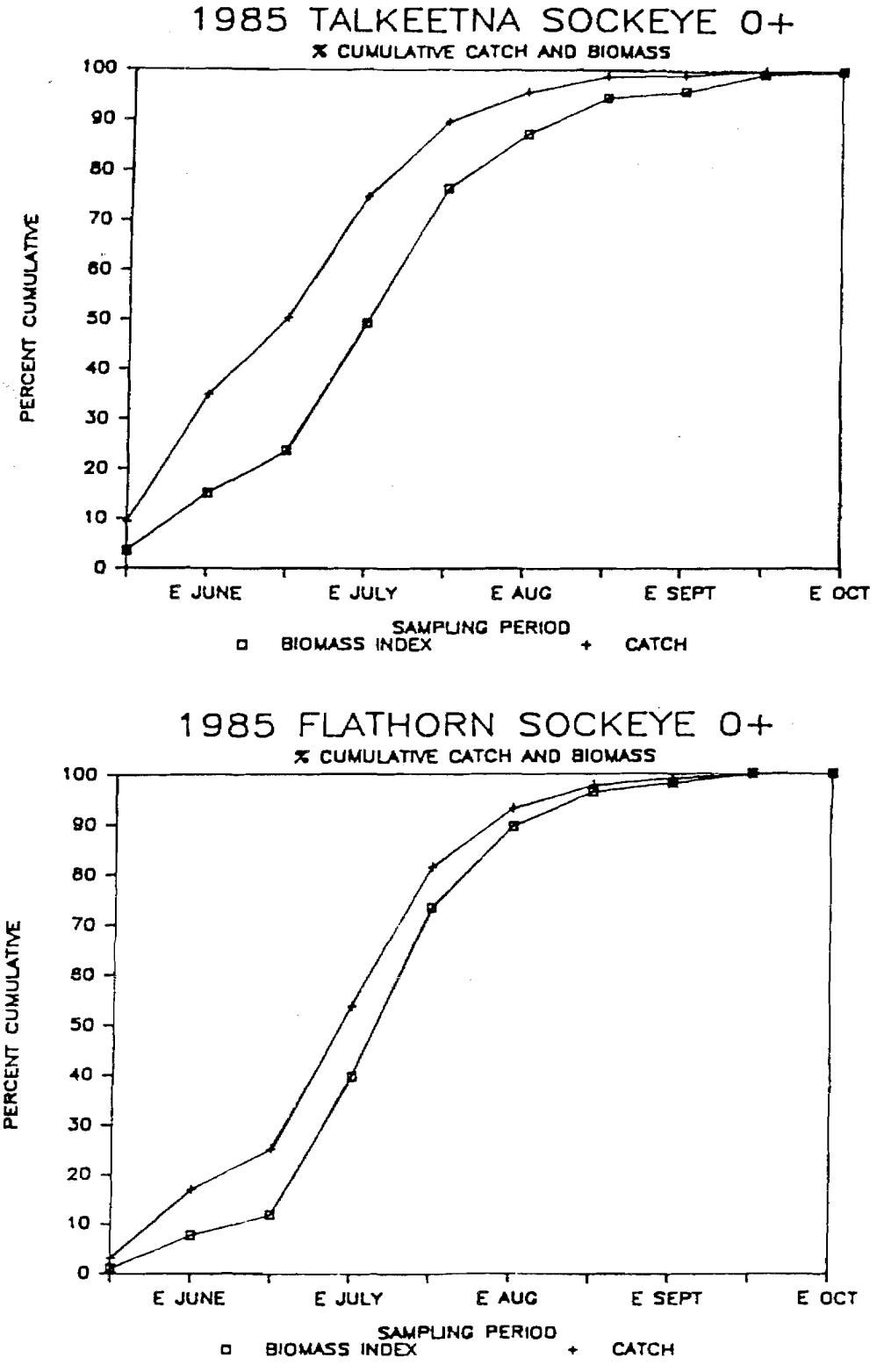




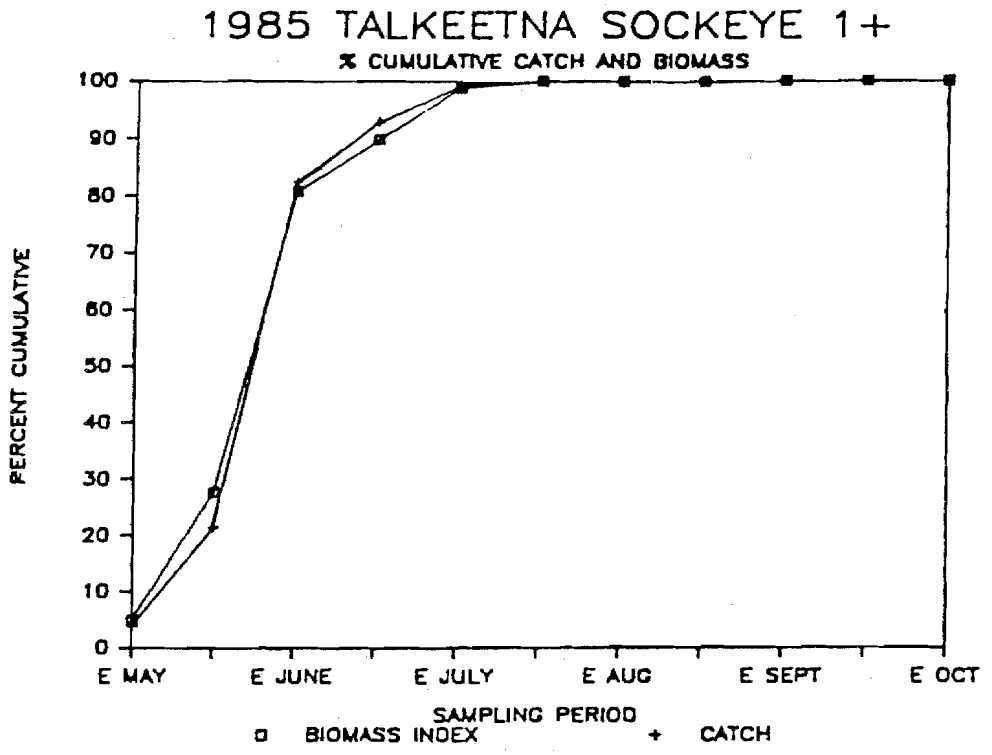
Appendix Figure E.8. Coho salmon (age 0+) cumulative catch and biomass recorded at Talkeetna (upper figure) and Flathorn (lower figure) stations, 1985.

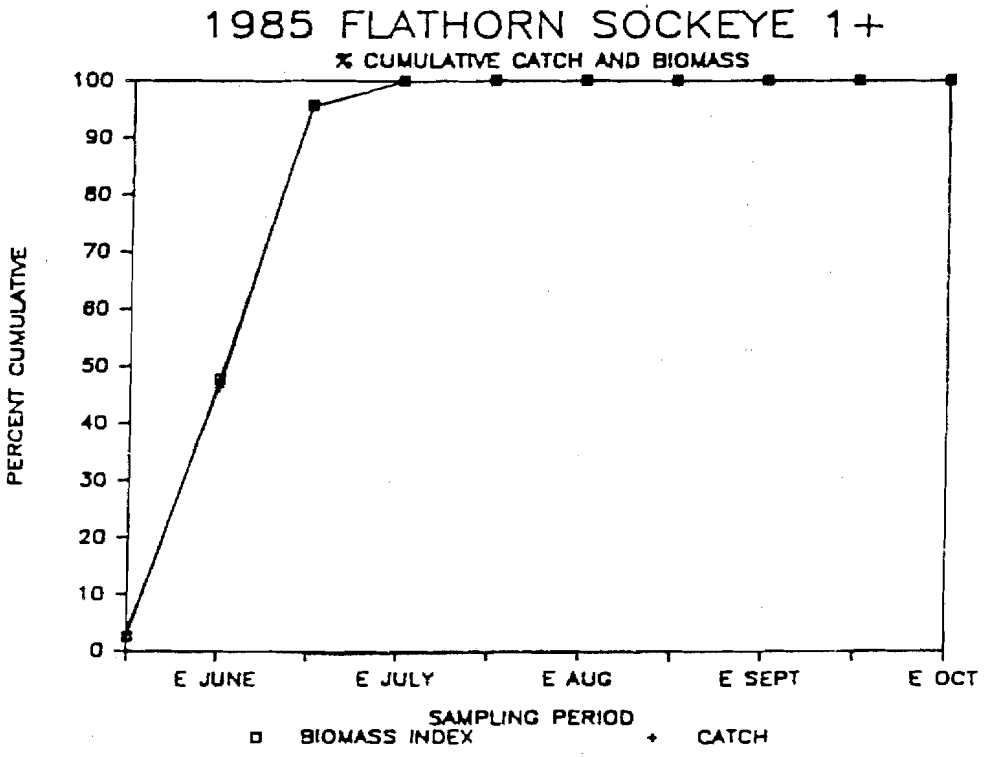


Appendix Figure E.9. Coho salmon (age 1+ and 2+) cumulative catch and biomass recorded at Talkeetna (upper figure) and Flathorn (lower figure) stations, 1985.

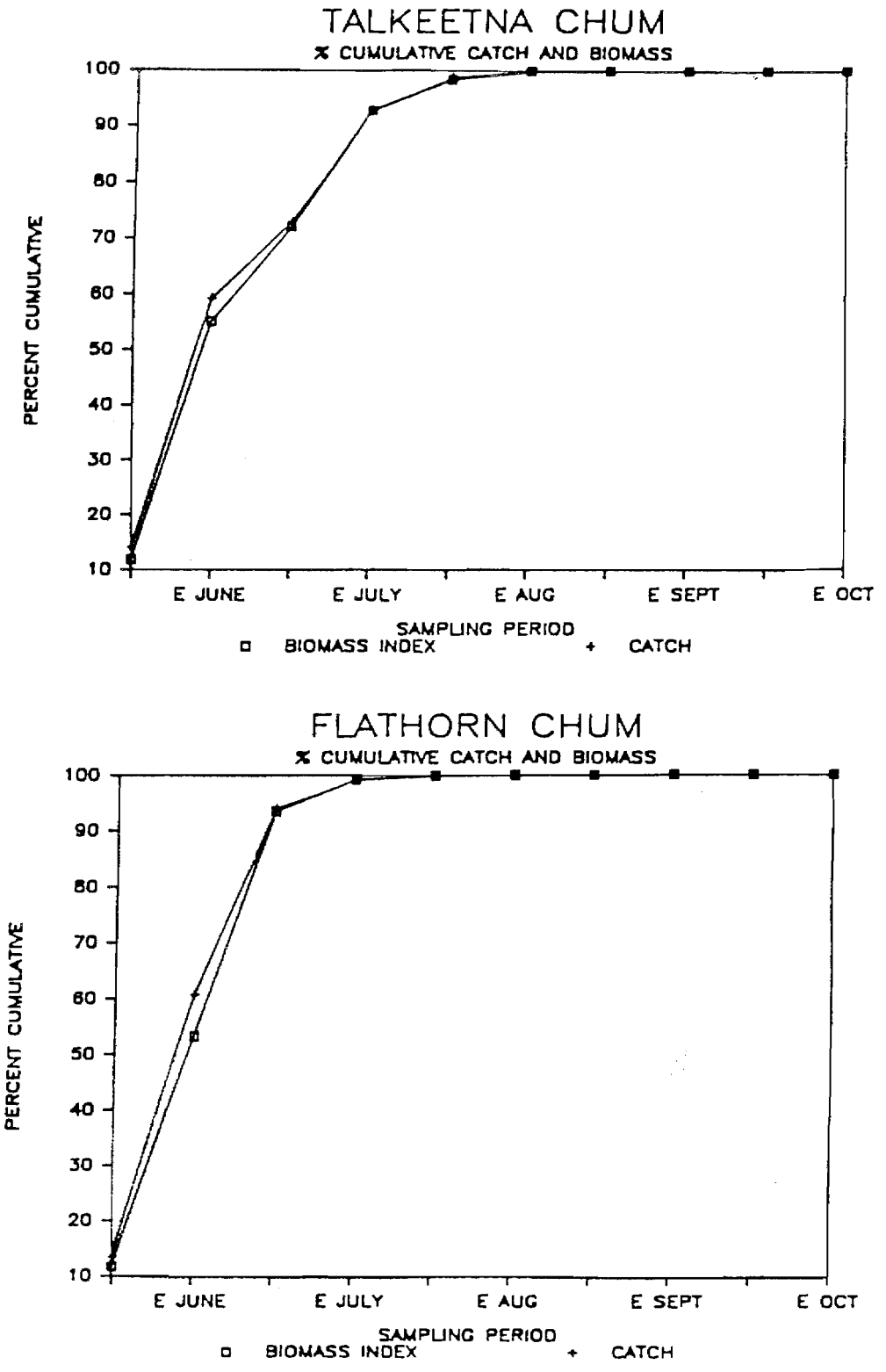


Appendix Figure E.10. Sockeye salmon (age 0+) cumulative catch and biomass recorded at Talkeetna (upper figure) and Flathorn (lower figure) stations, 1985.

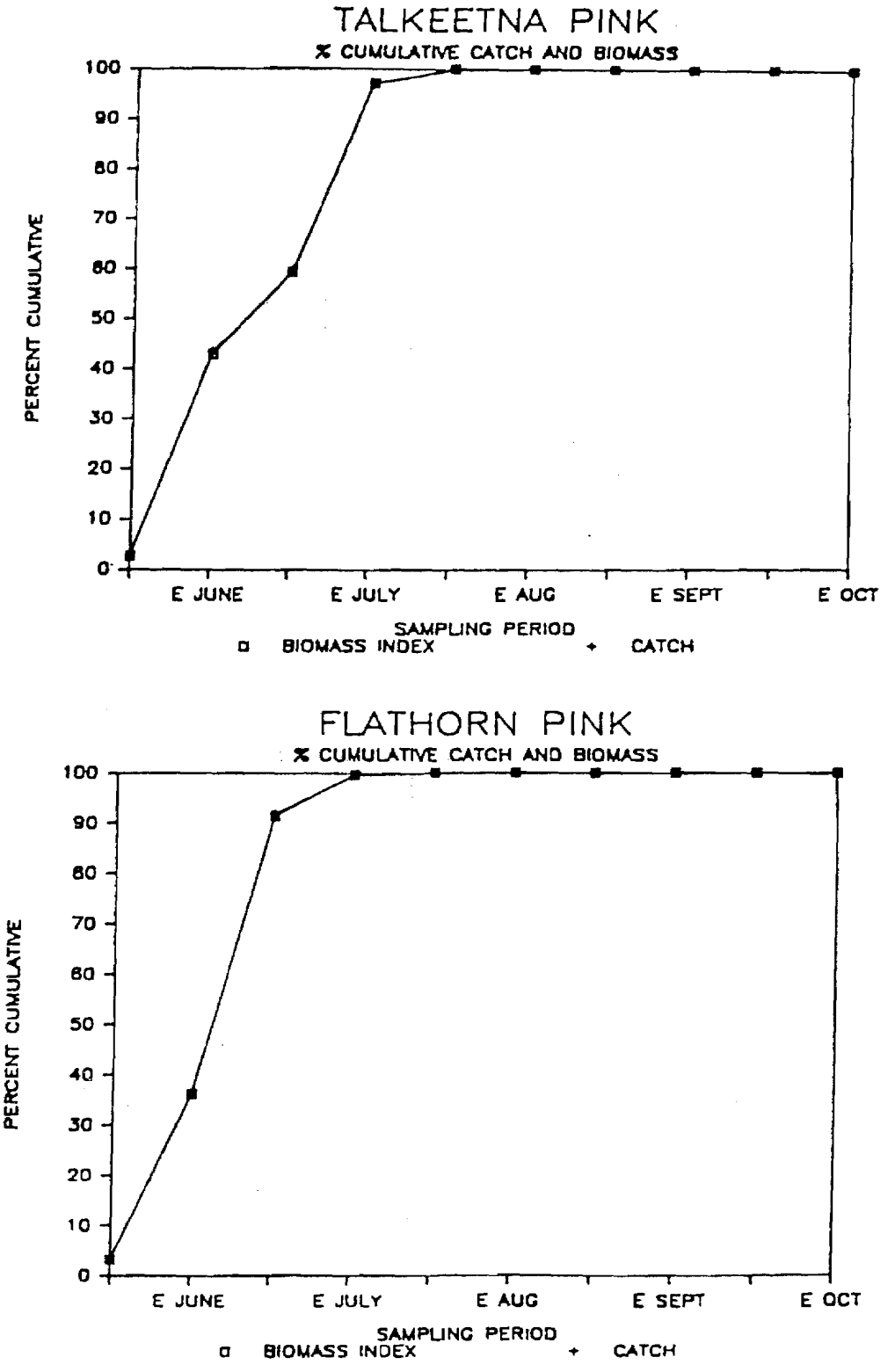




Appendix Figure E.11. Sockeye salmon (age 1+) cumulative catch and biomass recorded at Talkeetna (upper figure) and Flathorn (lower figure) stations, 1985.



Appendix Figure E.12. Chum salmon fry cumulative catch and biomass recorded at Talkeetna (upper figure) and Flathorn (lower figure) stations, 1985.



Appendix Figure E.13. Pink salmon fry cumulative catch and biomass recorded at Talkeetna (upper figure) and Flathorn (lower figure) stations, 1985.