Juvenile Salmonid Monitoring at Rock Island Dam Bypass Sampler

Annual Report

by

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Rock Island Dam Smolt Monitoring, 1985

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Wenatchee, WA

INTRODUCTION

The Northwest Power Planning Council developed a fish and wildlife program to protect, mitigate and enhance those resources as affected by construction and operation of the Columbia River hydroelectric facilities. Under this program, a Water Budget of allocated upstream storage was established to be used for instream flow augmentation to improve survival of downstream migrating salmon and steelhead trout. The Council's plan also calls for studies to monitor fish migration timing and survival, with the information then applied to the daily management and evaluation of the benefits resulting from the use of the Water Budget. The fishery agencies and tribes formed a Water Budget Center to direct the use of the Water Budget and to conduct or coordinate those studies related to Water Budget management and evaluation. The Water Budget Center developed a Smolt Monitoring Program, with several sites on the Columbia and Snake Rivers selected as smolt monitoring stations. Rock Island Dam, which is the first dam located below all the major salmon and steelhead producing tributaries of the mid-Columbia River, was selected as

a smolt monitoring station.

The 1985 Smolt Monitoring Program for the mid-Columbia was designed to index the daily number of outmigrating salmonids at Rock Island Dam and to report numbers of marked juveniles collected. Data from this program will allow a comparision and evaluation of year to year migration timing, travel time, and survival rates of different stocks of naturally produced and hatchery smoits.

Funding of the program as implemented by the Water Budget Center was provided for by Bonneville Power Administration, with P.U.D. No. 1 of Chelan County providing the trapping facility, personnel, and equipment to conduct the monitoring.

STUDY METHODS

Daily sampling objectives of the monitoring were: 1) total number of fish caught by species, 2) total number of branded fish caught by species, 3) daily average riverflow, and 4) daily average powerhouse flow through Rock Island #1 (old powerhouse) and Rock Island #2 (new powerhouse)(Fig. 1). The flow data was recorded so that an expanded index of fish passage through powerhouse X2 could be developed, based on the bypass collection count in relation to the proportion of total riverflow passing through powerhouse #2.

To provide travel time estimates between hatchery release points and Rock Island Dam, yearling chinook, subyearling chinook and steelhead in state and federal hatcheries were freeze branded by the Water Budget Center. The combination of timed releases of

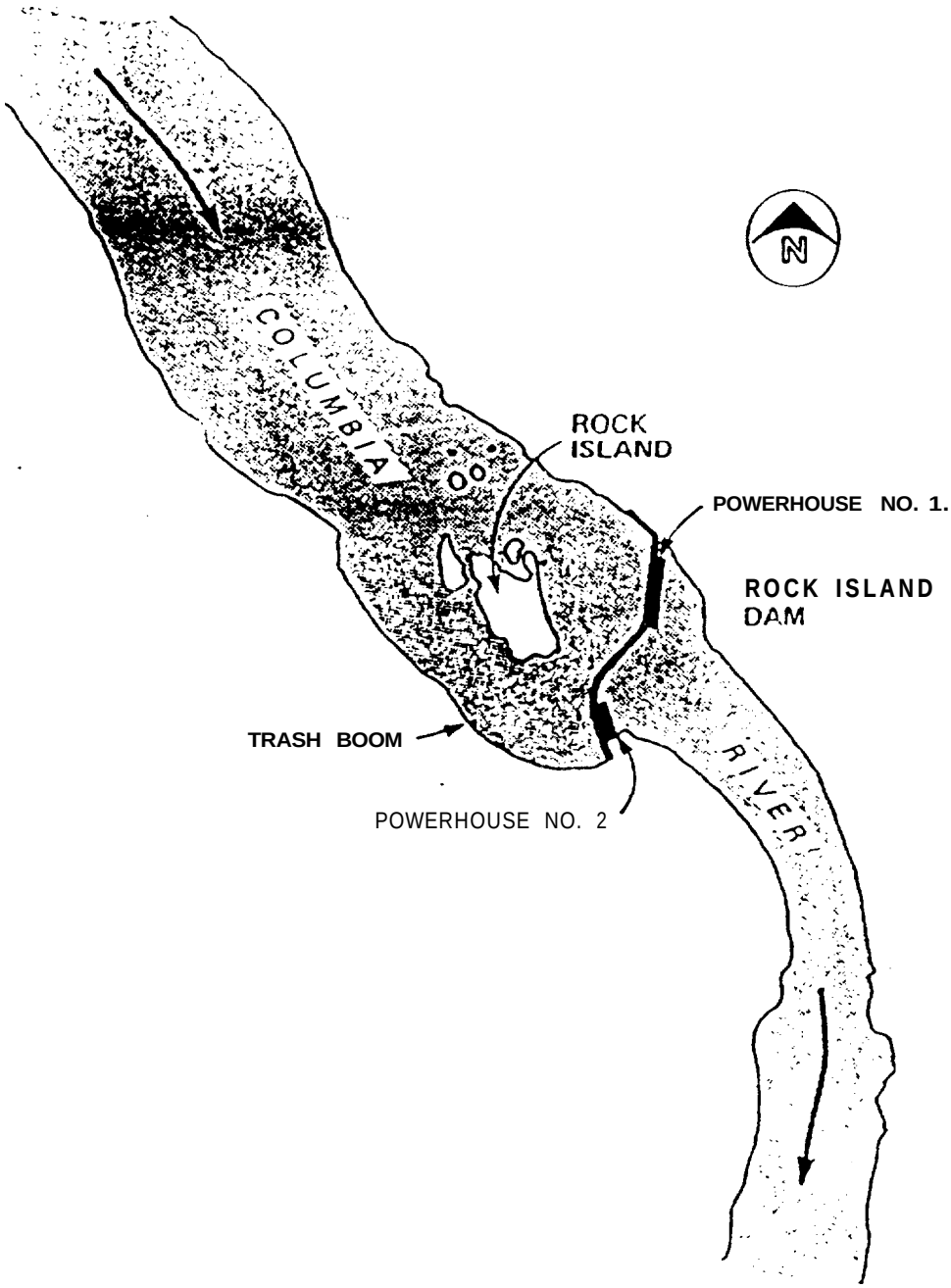

Fig. 1. Locations of powerhouse #l and powerhouse #2 of Rock Island hydroelectric project # 943-002.

marked smolts according to brand configuration (Table 1) and daily sampling of these branded smolts from the bypass trap provide travel time estimates between hatchery release points and Rock Island Dam.

Unmarked hatchery and native salmonids were also monitored to determine the peak arrival times for each species at Rock Island Dam.

Rock Island powerhouse **#2** operated under normal conditions during the sampling period of the monitoring program, which commenced April 1, 1985 and ended August 31, 1985. The gatewell orifice bypass trap at Rock Island Dam (Figs.2,3) collected fish from all of the 16 gate slots of the second -powerhouse, with no mechanical failures or unusual circumstances encountered which would affect the bypass trap sampling efficiency.

Personnel monitoring the bypass trap consisted of 1 permanent Fish and Wildlife Specialist employed by Chelan P.U.D. and 1 seasonal Biological Researcher.

Fish collected by the trap during the 24 hour sampling period (0900-0900) were held in the bypass flume (Fig. 4) before being delivered, via an elevator hopper, to an 8'x8'x3' portable fiberglass holding tank. The holding tank **was** supplied with a continous water supply from the right bank fishway with a 5 horsepower submersible pump.

Fish were examined for brands, clipped fins and identified by species in a sampling shed located next to the holding tank. Samples of 30-50 fish were anesthetized with a solution of MS 222, identified, and tabulated. The fish were then allowed to

Table 1. Summary of brand recovery rates for yearling chinook, sub-yearling chinook and steelhead, 1 April - 31 August, 1985.

CHINOOK YEARLING BRAND	RELEASE DATE	RELEASE SITE	NUMBER RELEASED	FIRST DATE RECOVERY	LAST DATE RECOVERY	NUMBER RECOVERED	50 % RECOVERY DATE
LA-7U-1st	4/13	LVWTH NFH	30,422	4/15	6/5	215	5/9
LA-7C-3rd	4/16	WNTHP NFH	36,704	4/22	6/2	130	5/14
LA-7F-1st	4/16	WNTHP NFH	12,568	4/25	5/31	47	5/13
LA-7T-1st	4/16	WNTHP NFH	5,890	4/24	5/27	19	5/16
LA-7C-1st	4/20	WNTHP NFH	35,186	4/25	6/1	179	5/17
LA-7K-1st	4/24	WNTHP NFH	34,959	4/29	6/3	193	5/17

CHINOOK SUBYRLING BRAND	RELEASE DATE	RELEASE SITE	NUMBER RELEASED	FIRST DATE RECOVERY	LAST DATE RECOVERY	NUMBER RECOVERED	50 % RECOVERY DATE
RA-T-3rd	5/10-18	WELLS WDF	22,515	5/16	7/2	40	6/19
LA-T-3rd	5/29-31	WELLS WDF	101,328	6/3	8/16	257	6/19

STEELHEAD BRAND	RELEASE DATE	RELEASE SITE	NUMBER RELEASED	FIRST DATE RECOVERY	LAST DATE RECOVERY	NUMBER RECOVERED	50 % RECOVERY DATE
RA-7U-1st	5/06	METHOW R	30,479	5/9	6/3	994	5/15
RA-7U-3rd	5/10	METHOW R	30,351	5/13	6/11	928	5/17
LA-7U-1st	5/14	METHOW R	30,378	5/17	6/12	685	5/21

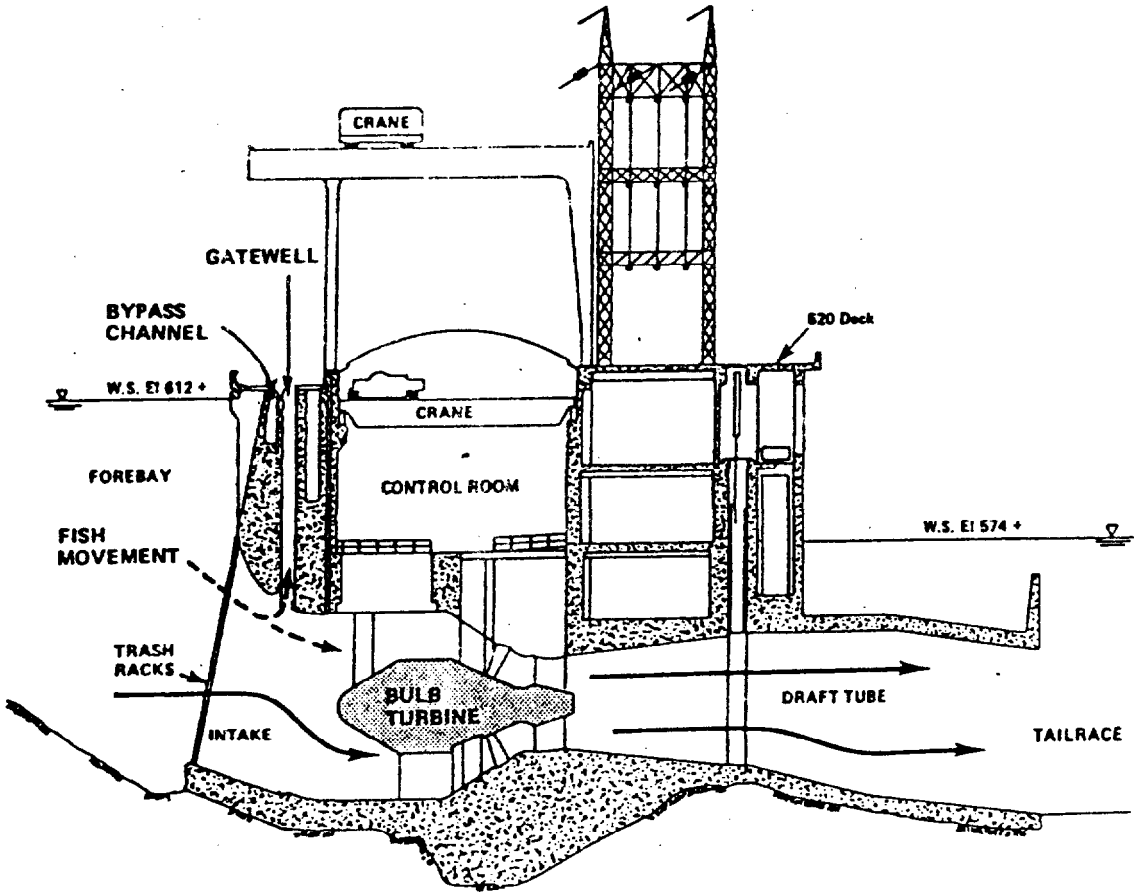

Fig. 2. Section through Rock Island Dam second powerhouse indicating fish movement into gatewell bypass system.

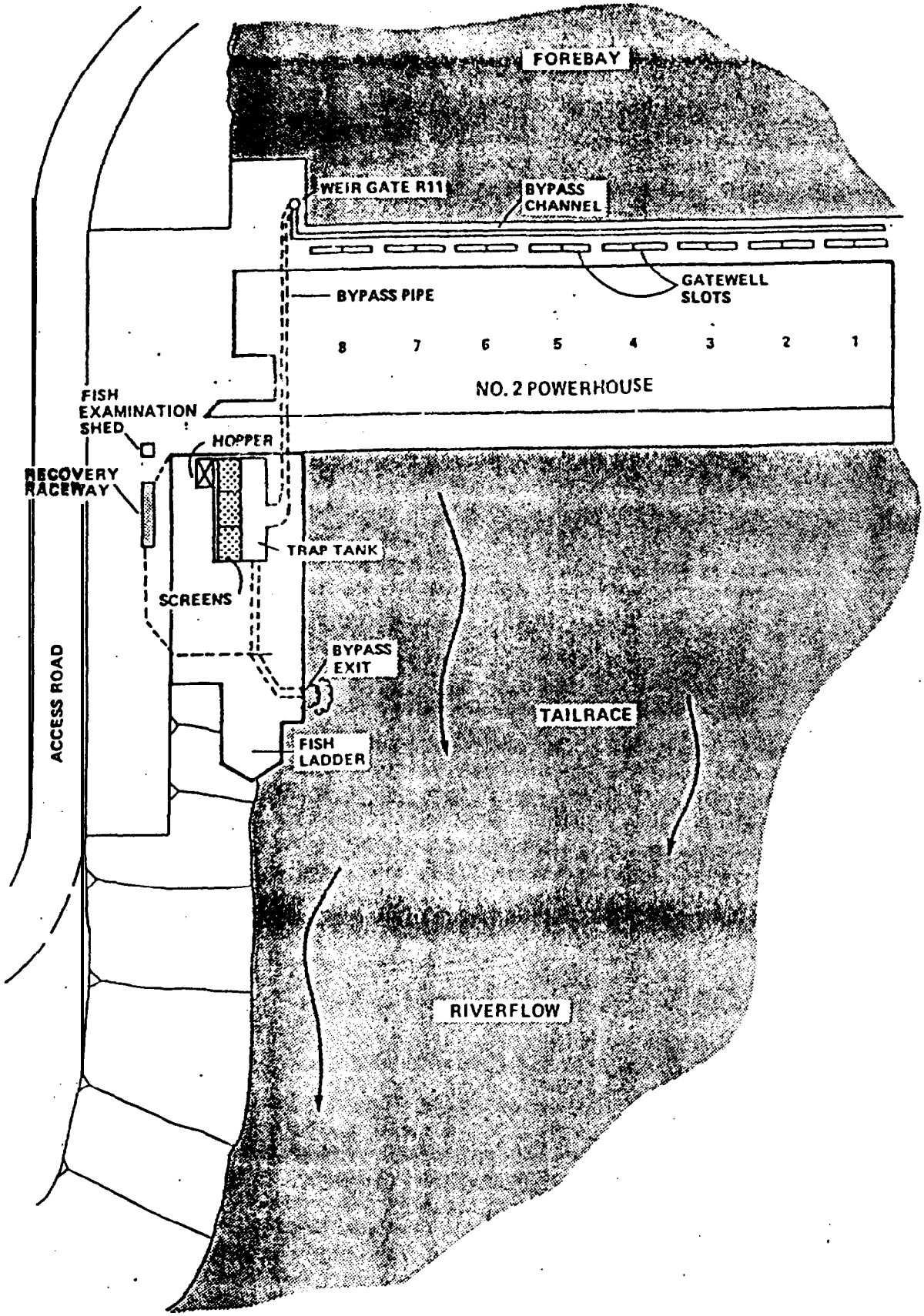

Fig. 3. Plan view of fingerling bypass and collection system at 'Rock Island Dam #2 powerhouse.

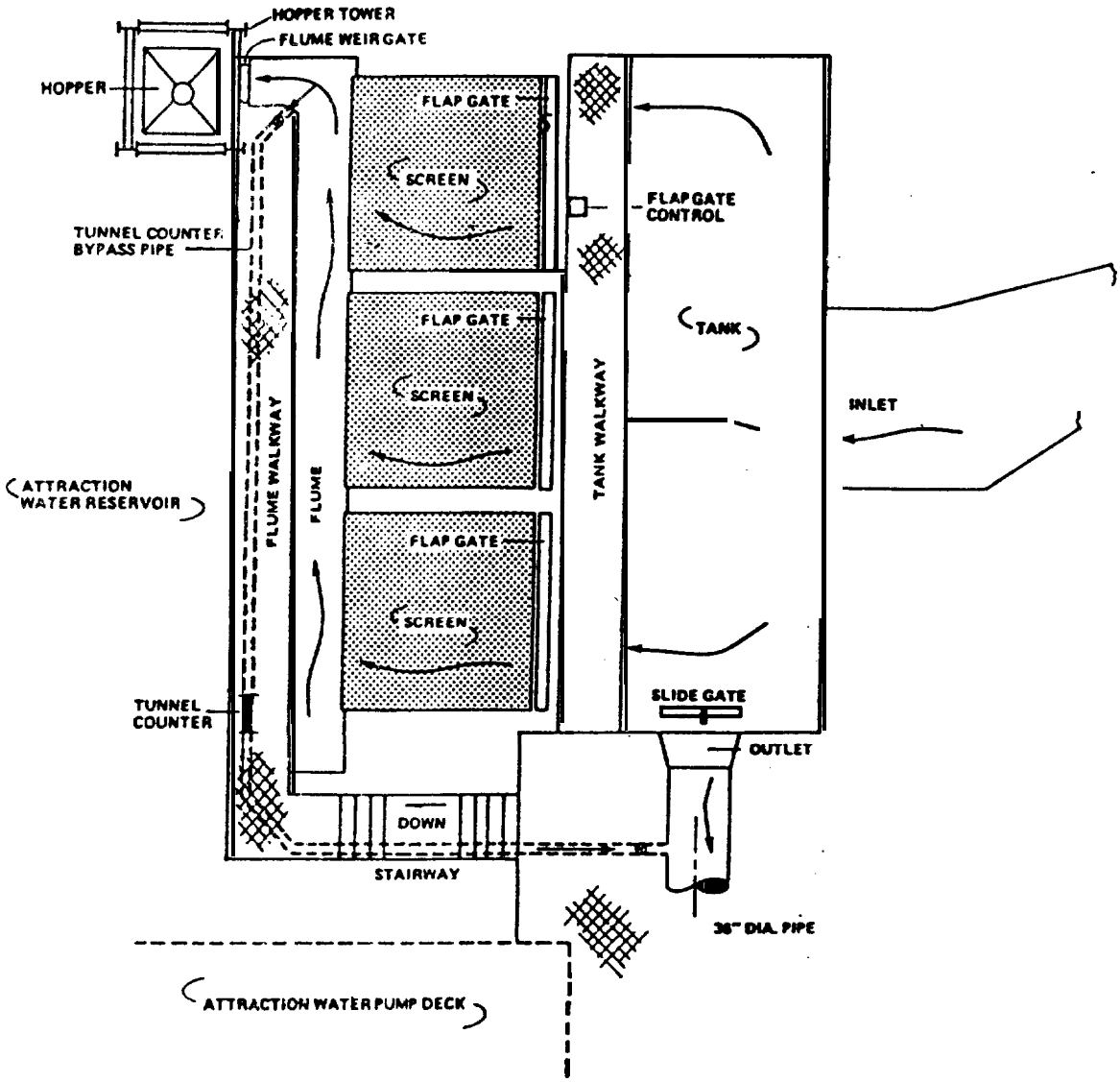

Fig. 4. Rock Island Dam fingerling collection trap.

recover in an isolated section of the holding tank. Field forms were used to record the data for latter transfer to the Water Budget Center {Figs. 5,6,7).

After the rxamined fish had fully recovered from the effects of the MS 222, they were released through a 4" PVC pipe from the recovery section of the tank (el. 620') to the tailrace (el. 574'). The release area of the tailrace was effectively protected from seagull predation with parallel lengths of 80 pound test monofilament fish line tied at approximately 6 foot intervals overhead of the pipe outlet.

All data pertinent to the smolt monitoring program were transferred from Chelan P.U.D. headquarters to the Water Budget Center daily via the Data Management System until mid June. From mid June to August 31 the weekend samples were transferred on the following Monday by 0900.

RESULTS

The Rock Island trapping facility collected 126,849 juvenile salmon and steelhead during the 1985 smolt monitoring program. The daily collection samples for each species during the 1985 smolt monitoring at Rock Island Dam are presented in Tables l-5 and a monthly summary in Table 6 of Appendix A.

A total of 3,687 freeze brand marked chinook salmon and steelhead trout representing eleven distinct marks and releases, were collected and recorded during 1985. In addition, 23,417 adipose fin clipped chinook and steelhead were collected. Tables l-5 in Appendix B present the freeze brand marked and adipose

ROCK ISLAND

Page ____ of ____

WBC DAILY SMOLT MONITORING DATA

Recorder _____

Site Code _____

Batch # _____

Start Date/Time _____ _____ (MMDDYY HHMM)

Stop Date/Time _____ _____ (MMDDYY HHMM)

Sample Method Code _____

Sample Quality Code _____

Hours Sampled- _____

Sample Rate _____

Avg. River Flow _____

Avg. Powerhouse(l) _____ Avg. Poverhouse(2) _____

Avg. Spill _____

Summary Comment: _____

Detailed Comments: _____

	Chinook l's (Yearlings)	Chinook O's (Subyearlings)	Steelhead	Coho	Sockeye	Total
# Collected						
# Sampled						

Fig. 5. Water Budget Center daily smolt monitoring data sheet.

ROCK ISLAND BRAND RECOVERY

DATE _____ RECORDER _____

TIME _____ BATCH # _____

	AD CLIP	BRAND	LOCATION	POSITION	TALLY
CHINOOK 1					
CHINOOK 0					
STEELHEAD					

Fig. 6. Rock Island Dam brand recovery data sheet.

WBC SMOLT MONITORING DATA

Page ____ of ____

Recorder ____

Brand Recaptures

Site Code ____ Batch# ____

LINE #	SPECIES	BRAND POSITION	BRAND	BRAND ORIENTATION	CLIPPED FINS		
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
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25							
26							
27							
28							
29							
30							

LINE #	SPECIES	BRAND POSITION	BRAND	BRAND ORIENTATION	CLIPPED FINS		
31							
32							
33							
34							
35							
36							
37							
38							
39							
40							
41							
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Fig. 7. Water Budget Center smolt monitoring brand recovery data sheet.

clipped fish recovery by day for the months April-August, 1985 l Monthly summaries are contained in Table 6, Appendix B.

While the bypass trapping facility operated without mechanical failure during the smolt monitoring program, there were two instance5 of non-normal sampling procedures. On May 20 the release door of the flume that leads to the elevator hopper fell open, releasing all trapped fish into the hopper. Total mortality of the fish (due to the continual water from the bypass trap plunging into the hopper) was discovered the following morning. On May 21 the bypass flume became clogged with debris and overflowed, allowing the possible escape of some trapped saolts.

An examination of daily powerhouse #2 turbine flows in proportion to total river flow showed little variance in powerhouse operations over the period of peak salmonid outmigration. Monthly average powerhouse #2 flows for the period of April 1 through June 30 ranged from 83.5% to 84.8% of average total riverflow. By June 26, 90% of all outmigrating salmonids had passed Rock Island Dam (see Fig. 8). Rock Island Dam monthly powerhouse operations are summarized in Table 2.

The hydraulic data was supplied to the Water Budget Center, who used it to develop an expansion of Rock Island trap data. The expansion, derived by taking the actual trap collection count multiplied by the inverse proportion of water passing through powerhouse #2 during the sampling period ((collection count)* (river flaw/2nd powerhouse flow)). A comparision of actual trap collection count5 to the expanded index indicated virtually

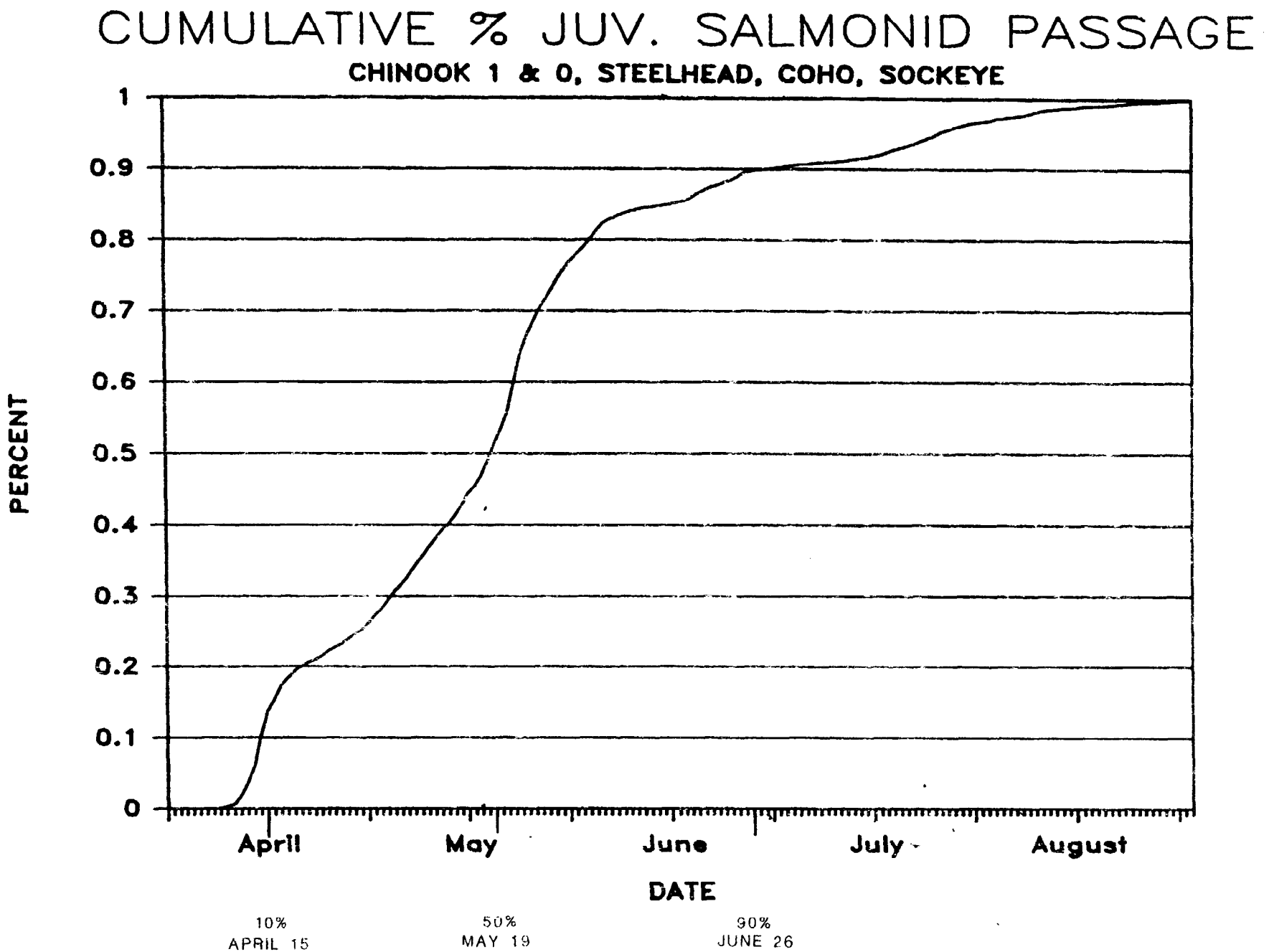

Fig. 8. Cumulative % total juvenile salmonid passage, Rock Island Dam, 1 April - 31 August, 1985.

Table 2. Rock Island Dam powerhouse operations expressed in kcfs and % streamflow, 1 April - 31 August, 1985.

MONTH	AVG TOTAL RIVER FLOW	AVERAGE PWRHSE #1 FLOW	AVERAGE PWRHSE #2 FLOW	AVERAGE SPILL	AVG % STRM FLW PWHS #1	AVG % STRM FLW PWHS #2
APRIL	92.5	6.7	77.3	7.5	7.8%	83.5%
MAY	132.1	11.2	112.0	7.5	8.5%	84.8%
JUNE	105.3	16.0	88.2	0.0	15.2%	83.8%
JULY	78.4	7.5	70.0	0.0	9.6%	89.3%
AUGUST	64.9	6.1	57.8	0.0	9.4%	89.1%

no difference between smolt timing estimates derived from actual and expanded counts. Differences in timing estimates observed between the two counts amounted to a one day difference! in the 10% passage dates for summer chinook and sockeye, and the 90% passage dates for steelhead. The 50% passage dates for sub-yearling chinook were two days apart. There were no observed differences in travel time estimates for marked groups of fish between actual and expanded count data. Since the expansion did not significantly affect timing estimates, actual count data were used for analysis.

Migration Timing

Yearling chinook were present the first day of the smolt monitoring program, April 1 and continued to be present every day until June 1. 2 . The last yearling chinook were collected on July 1st. The 10% and 90% passage dates for yearling chinook were April 16 and May 22 respectively. Peak passage of 1,712 yearling chinook occurred on April 16. As evidenced by brand recovery data (Table 1, App. B), this peak represents the Leavenworth Hatchery release of 2,050,000 yearling spring chinook. A second peak lasting approximately a week, May 5 to May 11 coincides with the 50% passage date of May 7 (see Figure 9).

The first sub-yearling chinook were collected on April 10 with daily occurance starting May 16 and contining until the last day of the smolt monitoring program, August 31. Peak passage of 721 sub-yearling chinook occurred on June 19. The 10% and 90% passage dates were June 9 and August 8 respectively, while the

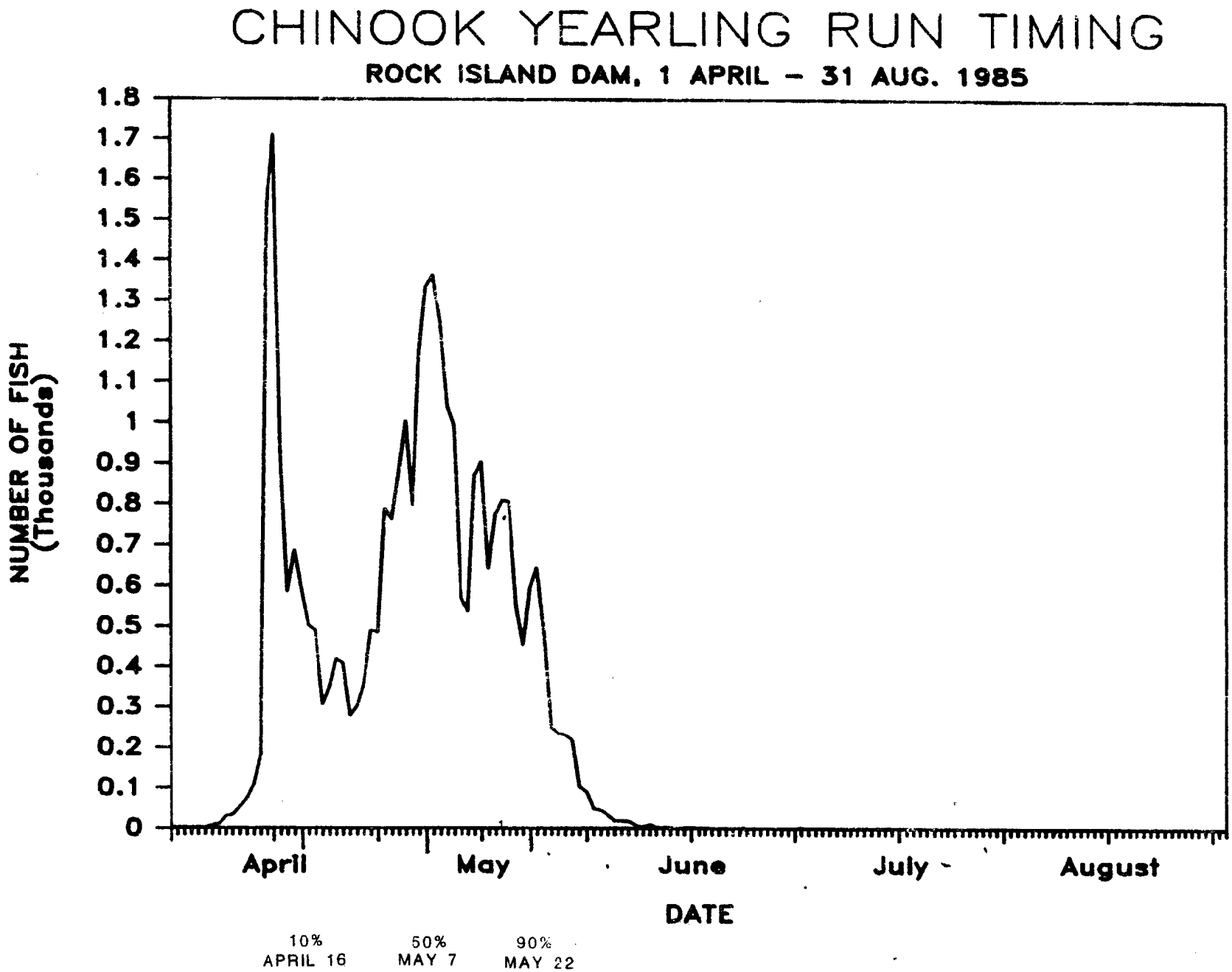

Fig. 9. Chinook yearling run timing, Rock Island Dam, 1 April - 31 August, 1985.

50% passage date for slihyearling chinook was July 10 (see Figure 10).

Daily collection of steelhead smolts began on April 4 and continued until July 2, after which steelhead were intermittently collected in low numbers {<l0) until August 31. Peak passage of 3,642 steelhead occurred on May 23, one day after the 50% passage date. The 10% and 30% passage dates were May 11 and June 2 respectively (see Figure 11).

Sockeye smolts were present at Rock Island Dam on the first day of the monitoring program, April 1, and were collected daily until July 2. The last sockeye smo1t was trapped on August 25. Peak passage occurred on April 15, with 3,933 sockeye srolts trapped. The 10% and 90% passage dates were April 13 and May 29 respectively, while 50% of the outmigrating sockeye smolts had passed Rock Island Dam on April 18 (see Figure 12).

Daily collection of coho smolts began on May 21 and continued until June 24. Sporadic samples of coho were collected after June 24, with the last coho collected on August 11. Peak passage of 1,182 coho smolts occurred on May 24, one day after the 10% passage date. The 50% and 90% passage dates were May 28 and June 5 respectively (see Figure 13). The bimodal coho passage timing for 1985 is not typical of previous years. The coho originate from the Turtle Rock rearing facility, 22 miles upstream from Rock Island Dam. In previous years, the total coho production has been released in one group during the first week in May. However, in 1985 there were two releases at the rearing station, 95,000 on May 1 and 58,000 on May 31. The majority of

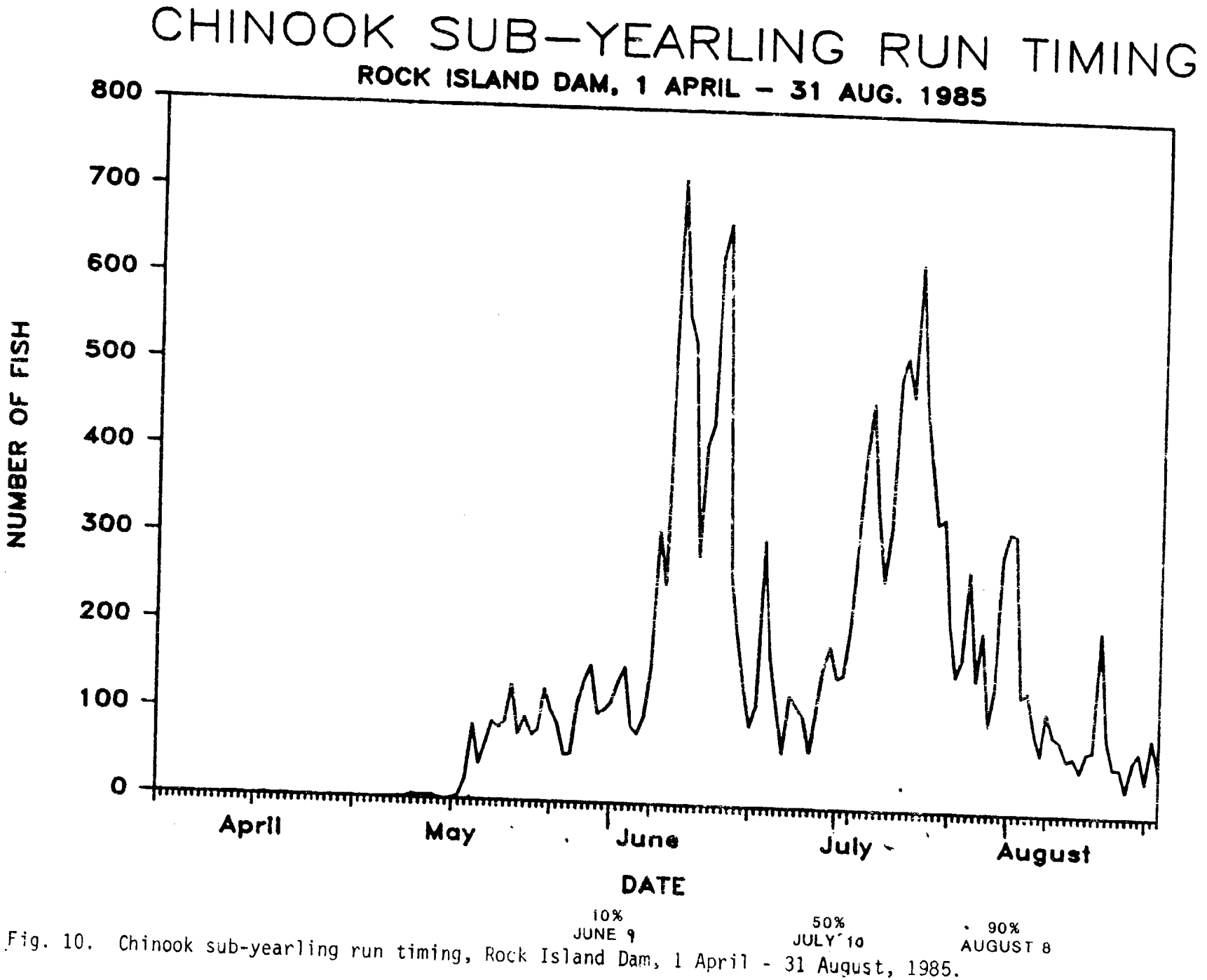

Fig. 10. Chinook sub-yearling run timing, Rock Island Dam, 1 April - 31 August, 1985.

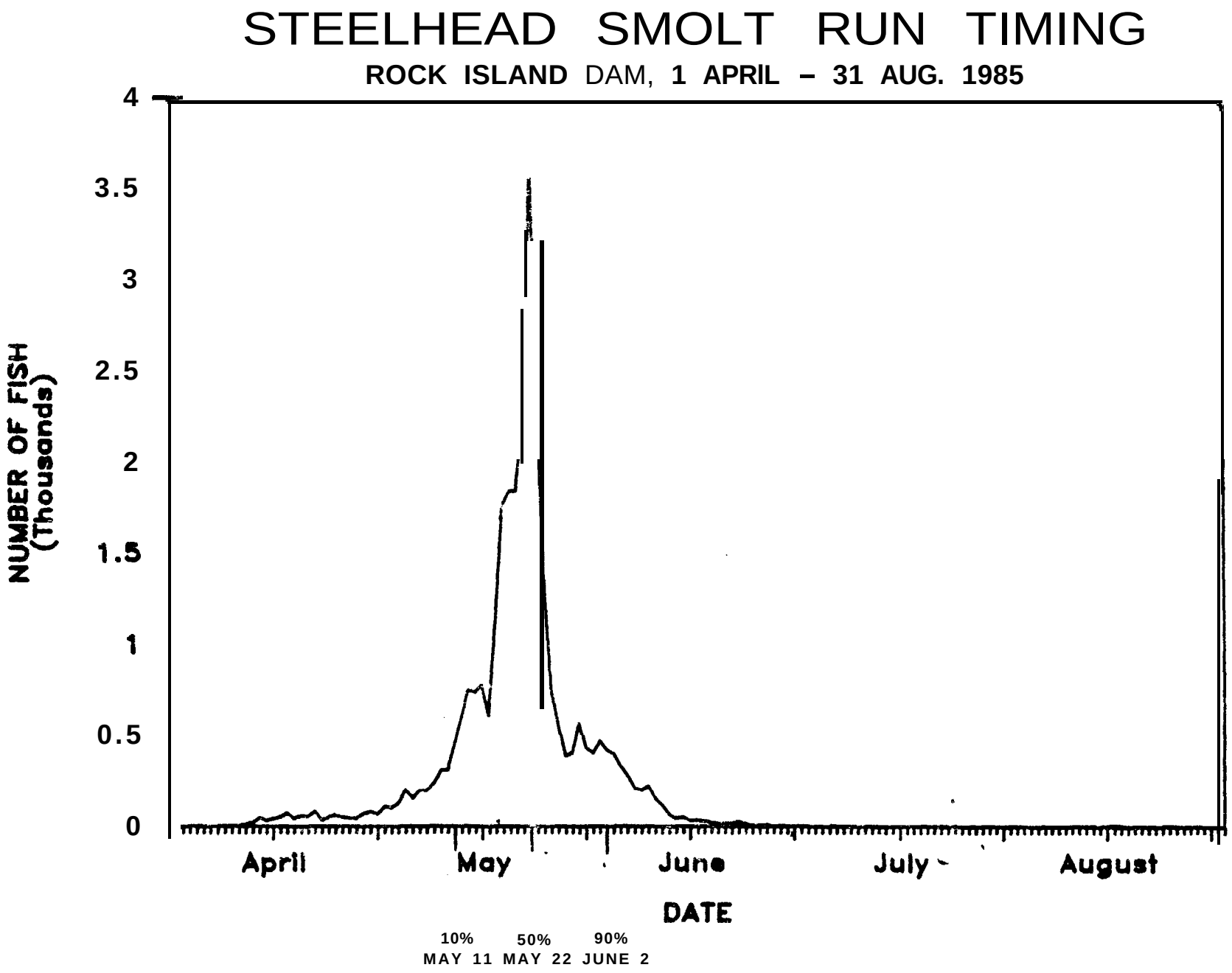

Fig. 11. Steelhead smolt run timing, Rock Island Dam, 1 April - 31 August, 1985.

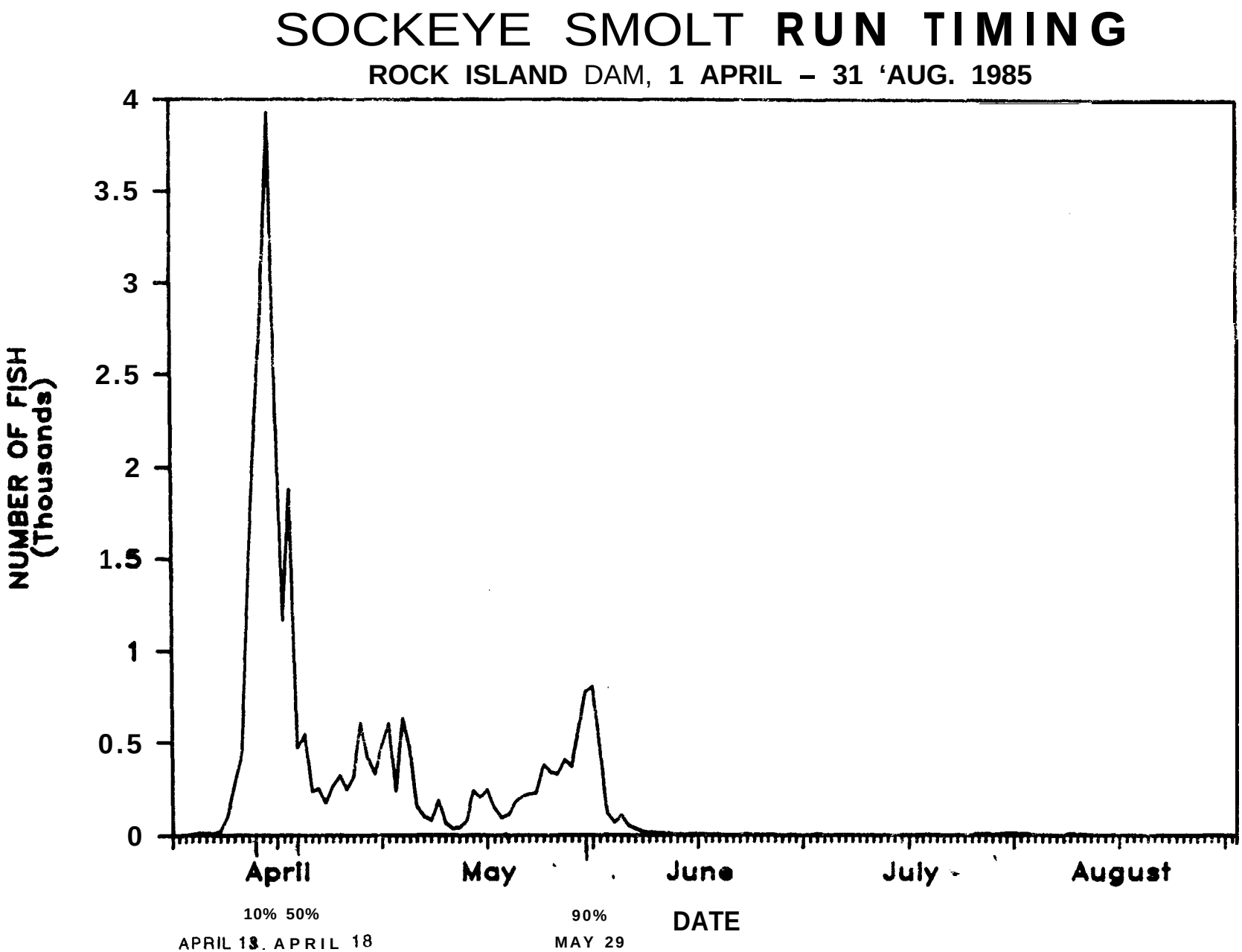

Fig. 12. Sockeye smolt run timing, Rock Island Dam, 1 April - 31 August, 1985.

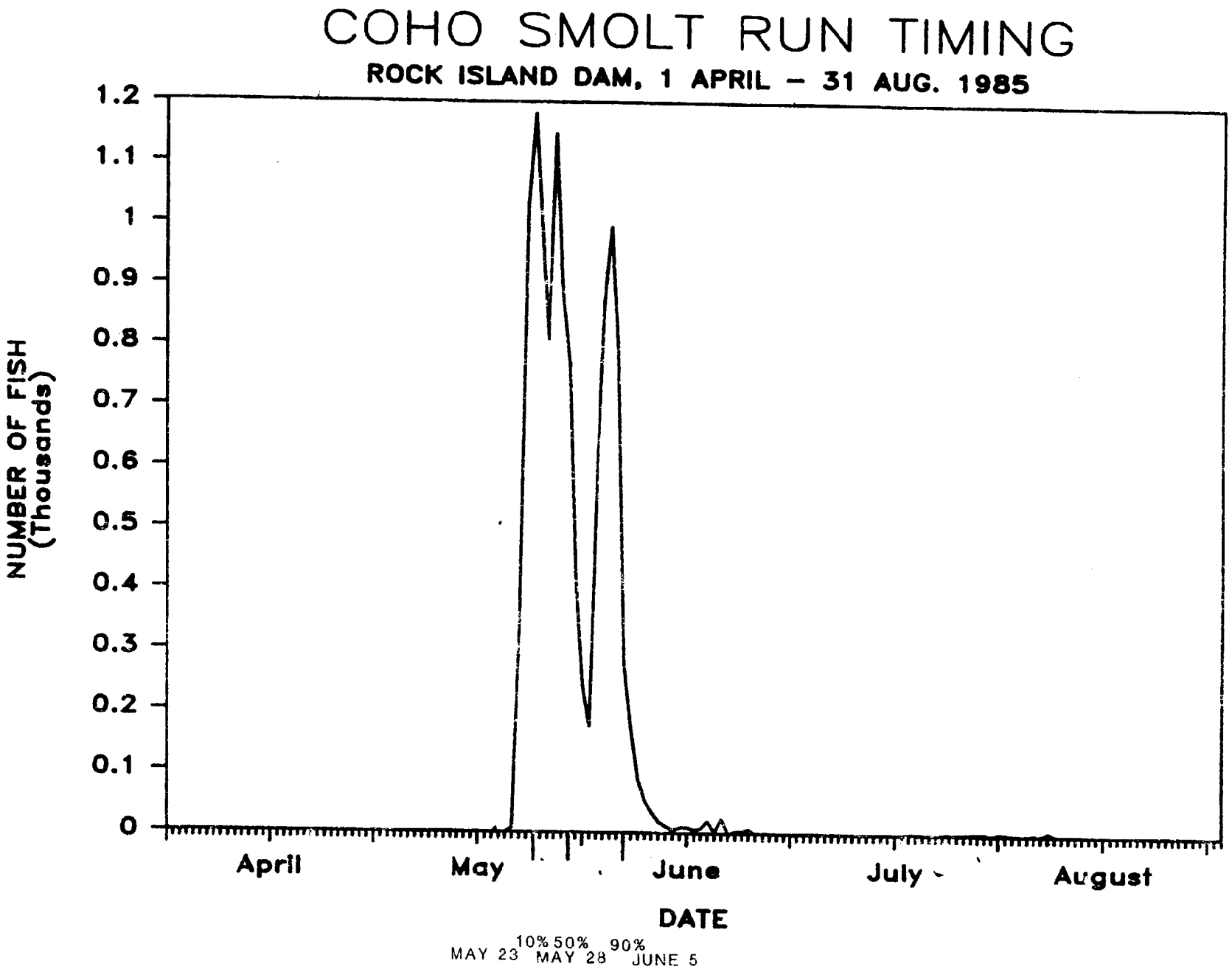

Fig. 13. Coho smolt run timing, Rock Island Dam, 1 April - 31 August, 1985.

the Turtle Rock coho production was transported to the Yakima River system.

The early peak passage count of 5,503 on April 15 is largely influenced by the combination of high collection counts of yearling chinook (1,538) and sockeye (3,933). The May 23 peak count of 5,582 is the combination of steelhead (3,642) and coho (1,027) to make up 83.6% of the sample. Total juveniie salmonid run timing is represented in Figure 14.

To assess the effect of sub-yearling chinook on the 10%, 50%, and 90% dates for total cumulative juvenile salmonid passage, a conparision of the data was done between a population with all juvenile salmonids included against a population excluding sub-yearling chinook. The duration of the total juvenile salmonid paasage (10% date to 90% date) was 73 days, April 15 to June 26 with a 50% passage date on May 19. Excluding sub-yearling from this same format results in a spring migrant run duration of 47 days, April 14 to May 30, with a 50% passage date on May 14 (see Fig. 15).

Marked Fish Recoveries

The Water Budget Center released freeze brand marked hatchery chinook and steelhead at different times during the season to evaluate travel time and survival as related to Columbia River flow rates. The first brand recovery. at Rock Island Dam was on April 15, consisting of the yearling spring chinook from Leavenworth National Fish Hatchery that were released on April 13. The 50% recovery date at Rock Island for

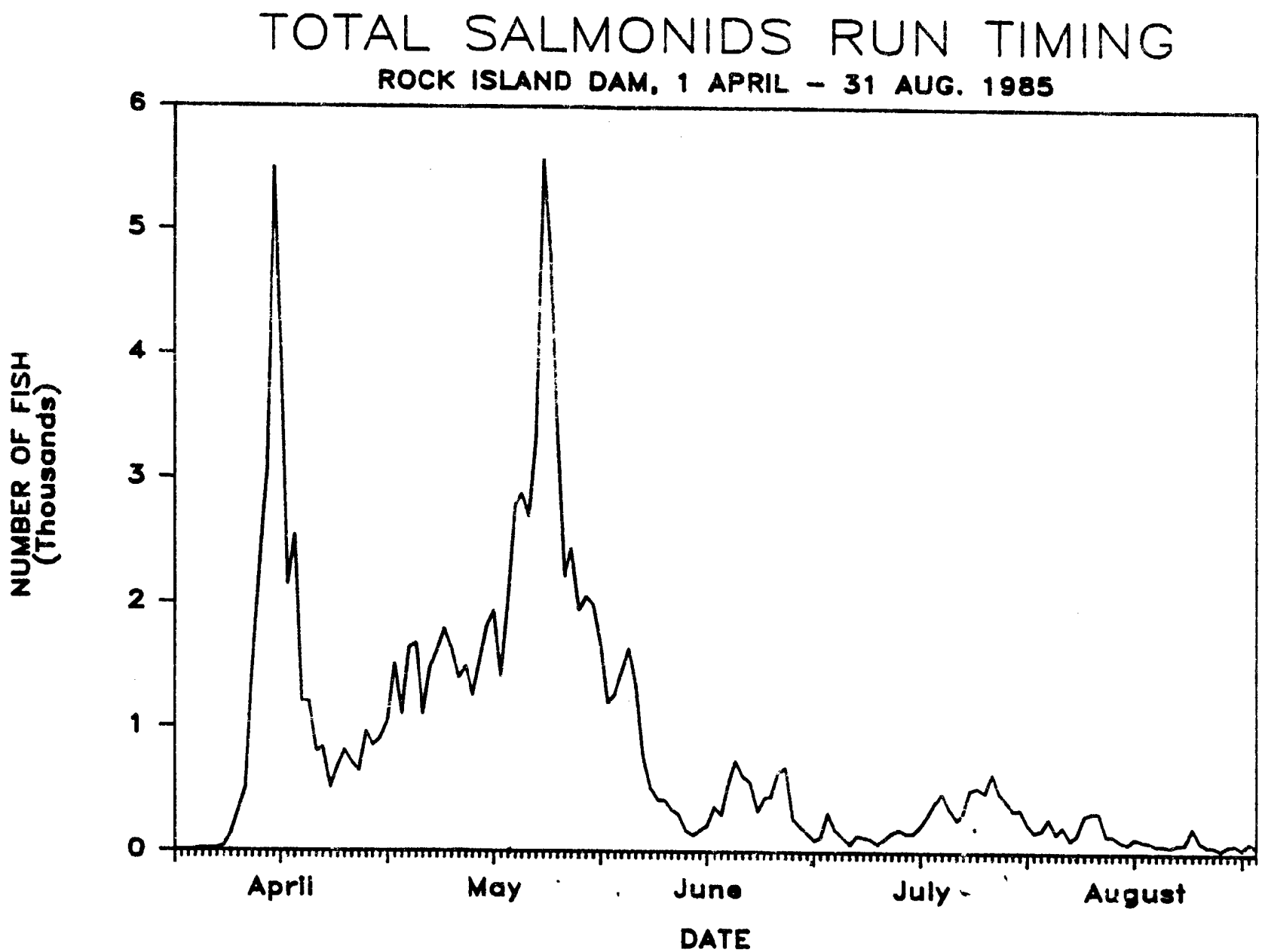

Fig. 14. Total juvenile salmonid run timing, Rock Island Dam, 1 April - 31 August, 1985.

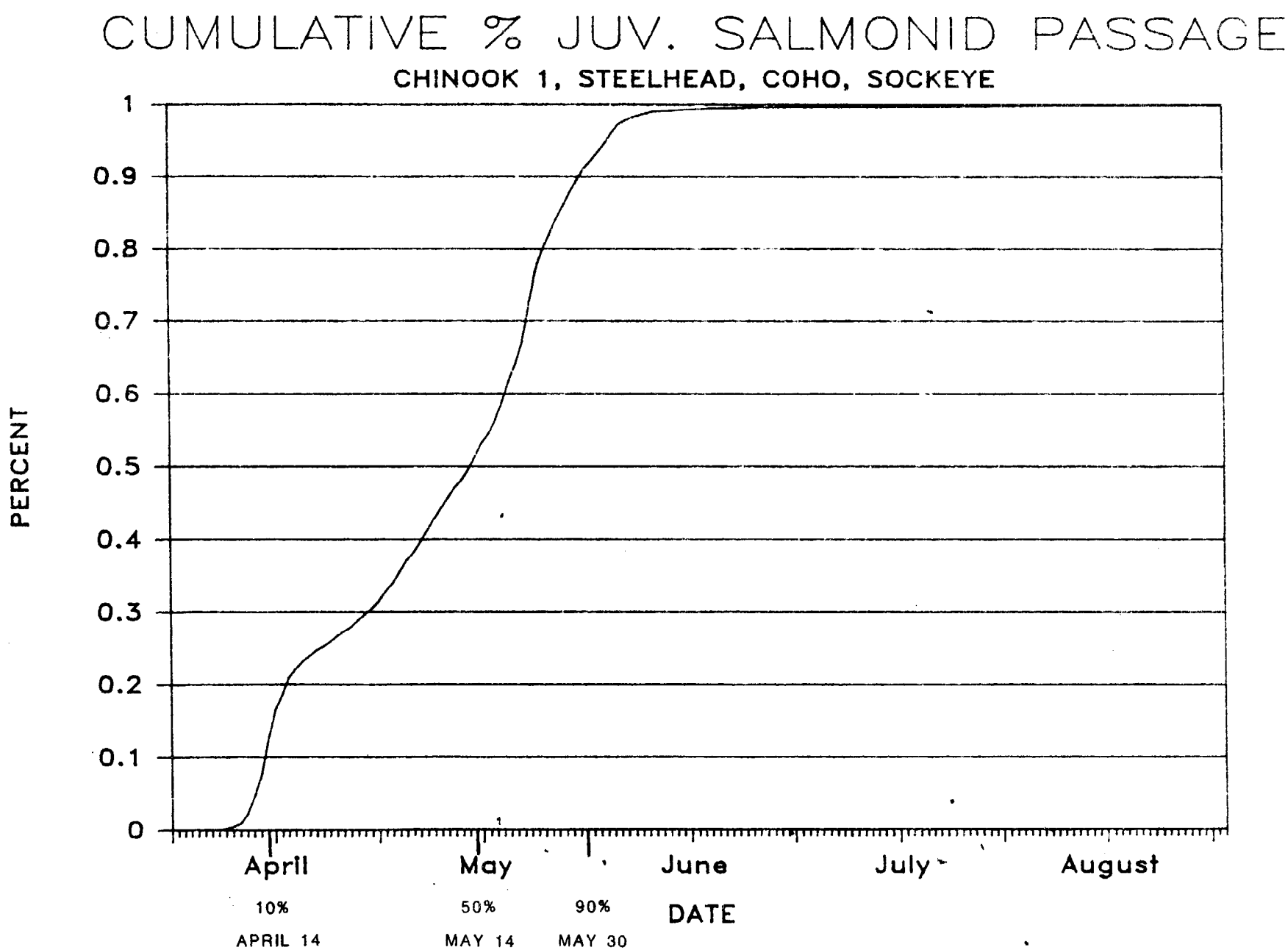

Fig. 15. Cumulative % juvenile salmonid passage excluding sub-yearling chinook, Rock Island Dam, 1 April - 31 August, 1985.

the Leavenworth branded yearling spring chinook was May 9, resulting in a median travel time of 26 days. Final recovery of the Leavenworth branded chinook occurred on June 5. These fish enter the Columbia River only 15 miles above Rock Island Dam, thus Columbia River flows have minimal influence on travel time to Rock Island for this group.

Winthrop National Fish Hatchery released three groups of yearling chinook on April 16. The brand configuration and number of fish released were as follows: LA-7C-3rd (36,704); LA-7F-1st (12,568); and LA-7T-1st (5,890). The first date of brand recovery differed by three days for the individual groups, with LA-7C-3rd the first brand recovered on April 22, followed by LA-7T-1st on April 24 and then LA-7F-1st on April 25. The median travel time (50% recovery date\ for the three groups released on April 16 varied by 3 days, 27 days for LA-7F-lst, 28 days for LA-7C-3rd, and 30 days for IA-7T-1st. Final dates of brand recovery of the yearling chinook released from Winthrop NFH on April 16 was directly related to the number of fish released. The largest of the three brand groups released (LA-?C-3rd) had the longest period of time over which brands were recovered, lasting until June 2, followed by the next largest group (LA-7F-1st) last recovered on May 31, and then the smallest group released (LA-7T-1st) last recovered on May 27. Two final groups of spring chinook were released from Winthrop on April 20 and 24, with brand configuration and number of fish released being LA-7C-1st (35,186) and LA-7K-1st (34,959) respectively. Median travel time (50% brand recovery May 17) for the April 20 release (LA-7C-1st)

was 27 days. Median travel time for the April 24 release (LA-7K-lst) was 23 days, with 50% recovered on May 17. The last date of brand recovery for the April 20 and 24 releases was June 1 and 3 respectively.

Sub-yearling summer chinook were released from Wells WDF hatchery with two different brand configurations, RA-T-3rd and LA-T-3rd. An early release of 22,515 (RA-t-3) occurred from May 10-18. A second release of 101,328 (LA-T-3) took place from May 29-31, which corresponds to normal release timing of Wells summer chinook. The first branded sub-yearling chinook recovered at Rock Island Dam occurred on May 16, 6 days after the release. The second group of branded sub-yearling chinook took 5 days for the first fish to reach Rock Island Dam after their release. Median travel time for the first brand configuratiuon release (5/10-18) was 40 days, with a 50% passage date on June 19. Median travel time for the second brand configuration release (5/29-31) was 21 days, June 19 being the 50% passage date.

Steelhead smolts from Wells WDG hatchery were released 4 days apart in the Methow river as three seperate brand configurations, with 30,479 (RA-7U-1st) released on May 6, 30,351 (RA-7U-3rd) released on May 10, and the final release of 30,378 (LA-7U-1st) on May 14. The first date of recovery for each of the brand groups was also spread over 4 day intervals, with RA-7U-1st the first brand recovered on May 9 followed by RA-7U-3rd on May 13 and finally LA-7U-1st on May 17. Median travel time for the first brand group released was 9 days, with 50% passage by May 15. The second and third brand groups released had median

travel times of 7 days each, with 50% passing by May 17 and May 21 respectively. Table 1 summarizes brand recovery rates for the smolt monitoring program at Rock lsland Dam.

The Rock Island Dam smolt monitoring station fulfilled the objectives of the 1985 Water Budget smolt monitoring program, by *'monitoring smolt movement and travel time" in an "efficient and consistent operation" (1985 Water budget Measures Program, Water Budget Center, December 5,1985). The smolt monitoring station operated effectively and consistently throughout the 1985 season. The 126,849 fish collected represents a small proportion of the run passing the project, which is desirable from the standpoint of minimizing handling of smolts, yet the sample size is adequate for run timing estimates. The trapping facility requires minimal labor to maintain in operation and appears to consistently sample tbe fish population passing Rock Island Dam. An indication of the consistency is evidenced by the recoveries of marked fish, first in the consistent estimates of median passage for the three groups of chinook released from Winthrop on April 16, and secondly from the proportion of marked groups recovered. The three Winthrop marked groups released on April 16 theoretically should have had siniliar survival rates to Rock Island Dam, and with consistent sampling should have been recovered in equal proportions. The recovery proportions for these groups at Rock Island are .35%, .37%, and .32%, which do not differ significantly on the basis of statistical tests.

APPENDIX A

Table 1.. Daily Samples From Rock Island Smolt Monitoring Program, April, 1985.

STOP DATE/TIME	CHINOOK YEARLING	CHINOOK SUB-YEAR.	STLHD.	COHO	SOCKEYE	TOTAL SALMONIDS
03-30-85/09:00	0	0	0	0	0	0
03-31-85/09:00	3	0	0	cl	0	0
04-01-85/09:00	4	0	0	3	1	5
04-02-85/09:00	2	0	0	0	1	3
04-03-85/09:00	2	0	0	0	2	4
04-04-85/09:00	1	0	1	0	7	9
04-05-85/09:00	3	0	2	0	15	20
04-06-85/09:00	2	0	4	0	12	18
04-07-85/09:00	9	0	1	0	8	18
04-08-85/09:00	12	0	1	0	27	40
04-09-85/09:00	31	0	2	0	106	139
04-10-85/09:00	35	1	5	0	278	319
04-11-85/09:00	5 5	0	4	a	447	506
04-12-85/09:00	75	0	14	0	1398	1487
04-13-85/09:00	110	1	22	0	2190	2323
04-14-85/09:00	184	2	49	0	2837	3072
04-15-85/09:00	1538	0	32	0	3933	5503
04-16-85/09:00	1712	0	46	0	2326	4084
04-17-85/09:00	928	1	51	0	1169	2149
04-18-85/09:00	588	2	74	0	1881	2545
04-19-85/09:00	689	0	43	0	473	1205
04-20-85/09:00	587	1	61	0	551	1200
04-21-85/09:00	504	1	55	0	240	800
04-22-85/09:00	489	1	86	0	259	835
04-23-85/09:00	306	0	32	0	172	510
04-24-85/09:00	350	0	53	0	273	676
04-25-85/09:00	421	1	65	0	325	812
04-26-85/09:00	410	0	50	0	250	710
04-27-85/09:00	279	0	44	0	321	644
04-28-85/09:00	305	1	45	0	612	963
04-29-85/09:00	359	0	72	0	420	851
04-30-85/09:00	493	0	84	0	333	910.
Monthly Totals	10483	12	998	0	20867	32360

Table 2. Daily Sarples From Rock Island Smolt Monitoring Program, Hay, 1985.

STOP DATE/TIME	CHINOOK YEARLING	CHINOOK SUB-YEAR.	STLHD.	COHO	SOCKEYE	TOTAL SALMONIDS
05-01-85/09:00	486	1	68	0	488	1043
05-02-85/09:00	731	0	111	0	610	1512
05-03-85/09:00	764	1	101	0	241	1107
05-04-85/09:00	878	0	132	0	639	1649
05-05-85/09:00	1005	0	203	0	470	1678
05-06-85/09:00	799	0	153	0	153	1105
05-07-85/09:00	1176	1	199	0	100	1476
05-08-85/09:00	1336	2	197	0	80	1615
05-09-85/09:00	1365	1	240	0	190	1796
05-10-85/09:00	1249	5	309	0	68	1631
05-11-85/09:00	1042	3	312	0	37	1394
05-12-85/09:00	993	4	455	1	44	1497
05-13-85/09:00	568	4	601	0	84	1257
05-14-85/09:00	539	1	750	0	247	1537
05-15-85/09:00	874	0	736	0	207	1817
05-16-85/09:00	906	2	780	0	253	1941
05-17-85/09:00	643	5	608	0	149	1405
05-18-85/09:00	779	24	1135	0	94	2032
05-19-85/09:00	812	87	1778	0	116	2793
05-20-85/09:00	808	42	1849	0	184	2883
05-21-85/09:00	553	66	1855	9	216	2699
05-22-85/09:00	455	91	2225	345	229	3345
05-23-85/09:00	596	84	3642	1027	233	5582
05-24-85/09:00	646	92	2506	1182	384	4810
05-25-85/09:00	484	135	1381	988	341	3329
05-26-85/09:00	249	77	754	809	333	2222
05-27-85/09:00	236	97	560	1149	409	2451
05-28-85/09:00	232	77	387	882	374	1952
05-29-85/09:00	219	84	406	770	580	2059
05-30-85/09:00	103	130	568	409	779	1989
05-31-85/09:00	90	104	429	240	812	1675
Monthly Totals	21676	1220	25430	7811	9144	65281

Table 3. Daily Samples Froa Rock Island Smolt Monitoring Program, June, 1985.

STOP DATE/TIME	CHINOOK YEARLING	CHINOOK SUB-YEAR.	STLHD.	COHO	SOCKEYE	TOTAL SALMONIDS
06-01-85/09:00	49	89	403	174	483	1198
06-02-85/09:00	46	55	473	584	114	1274
06-03-85/09:00	33	57	420	874	69	1453
06-04-85/09:00	18	115	400	996	110	1639
06-05-85/09:00	19	141	333	792	51	1336
06-06-85/09:00	18	158	282	278	37	773
06-07-85/09:00	7	103	211	167	21	509
06-08-85/09:00	5	108	201	87	13	414
06-09-85/09:00	10	117	225	52	11	415
06-10-85/09:00	3	140	149	34	11	337
06-11-85/09:00	3	157	113	18	8	299
06-12-85/09:00	4	88	63	11	2	168
06-13-85/09:00	0	81	40	5	4	130
06-14-85/09:00	3	101	52	10	8	174
06-15-85/09:00	4	159	32	10	7	212
06-16-85/09:00	1	315	36	5	7	364
06-17-85/09:00	3	252	30	9	4	298
06-18-85/09:00	1	505	20	21	6	553
06-19-85/09:00	1	721	13	1	3	739
06-20-85/09:00	2	563	17	25	3	610
06-21-85/09:00	2	532	19	1	6	560
06-22-85/09:00	3	286	28	4	6	327
06-23-85/09:00	1	413	14	5	5	438
06-24-85/09:00	0	437	6	8	2	453
06-25-85/09:00	1	631	11	0	8	651
06-26-85/09:00	0	670	8	2	3	683
06-27-85/09:00	0	265	1	1	0	267
06-28-85/09:00	0	197	5	1	1	204
06-29-85/09:00	0	141	4	0	3	148
06-30-85/09:00	0	93	2	0	1	96
Monthly Totals	237	7690	3611	4175	1009	16722

Table 4. Daily Samples From Rock Island Smolt Monitoring Program, July, 1985.

STOP DATE/TIME	CHINOOK YEARLING	CHINOOK SUB-YEAR.	STLHD.	COHO	SOCKEYE	TOTAL SALMONIDS
07-01-85/09:00	3	117	1	0	2	123
07-02-85/09:00	0	307	2	1	8	318
07-03-85/09:00	0	175	0	2	a	177
07-04-85/09:00	0	119	1	0	3	123
07-05-85/09:00	0	64	0	0	1	65
07-06-85/09:00	0	130	4	0	5	139
07-07-85/09:00	0	117	1	0	2	120
07-08-85/09:00	0	105	1	0	2	108
07-09-85/09:00	0	66	0	0	2	68
07-10-85/09:00	0	113	0	0	3	116
07-11-85/09:00	0	162	0	0	1	163
07-12-85/09:00	a	188	0	0	1	189
07-13-85/09:00	0	151	0	0	0	151
07-14-85/09:00	a	155	0	0	1	156
07-15-85/09:00	0	212	1	0	2	215
07-16-85/09:00	0	306	0	a	4	310
07-17-85/09:00	0	401	2	3	4	410
07-18-85/09:00	0	468	2	2	7	479
07-19-85/09:00	0	343	3	1	4	351
07-20-85/09:00	0	263	0	0	1	264
07-21-85/09:00	0	324	4	0	2	330
07-22-85/09:00	0	496	4	2	7	509
07-23-85/09:00	0	522	a	3	4	529
07-24-85/09:00	0	476	2	2	4	484
07-25-85/09:00	0	630	a	2	9	641
07-26-85/09:00	a	465	3	5	10	483
07-27-85/09:00	a	397	1	3	11	412
07-28-85/09:00	0	331	0	3	6	340
07-29-85/09:00	0	337	0	0	14	351
07-30-85/09:00	0	217	0	4	12	233
07-31-85/09:00	0	157	0	2	4	165
Monthly Totals	3	8314	32	35	138	8522

Table 5. Daily Samples From Rock Island Smolt Monitoring Program, August, 1985.

STOP DATE/TIME	CHINOOK YEARLING	CHINOOK SUB-YEAR.	STLHD.	COHO	SOCKEYE	TOTAL SALHONIDS
08-01-85/09:00	0	177	0	1	10	188
08-02-85/09:00	0	278	0	3	2	280
08-03-85/09:00	0	153	0	1	0	154
08-04-85/09:00	0	208	0	3	2	213
08-05-85/09:00	0	102	2	0	1	105
08-06-85/09:00	0	146	1	7	1	155
08-07-85/09;00	0	297	0	1	8	306
08-08-85/09:00	0	323	1	0	6	330
08-09-85/09:00	0	320	2	1	4	327
08-10-85/09:00	0	134	3	1	0	138
08-11-85/09:00	0	142	1	1	1	145
08-12-85/09:00	0	95	2	0	0	97
08-13-85/09:00	0	69	3	a	1	73
08-14-85/09:00	0	119	3	0	2	124
08-15-85/09:00	0	91	9	0	0	100
08-16-85/09:00	0	85	5	a	0	90
08-17-85/09:00	a	64	1	0	0	65
08-18-85/09:00	0	68	4	0	0	72
08-19-85/09:00	0	51	3	0	0	54
08-20-85/09:00	0	74	1	0	1	76
08-21-85/09:00	0	76	4	0	0	80
08-22-85/09:00	0	213	1	0	0	214
08-23-85/09:00	0	89	4	0	1	94
08-24-85/09:00	0	56	1	0	2	59
08-25-85/09:00	0	57	0	0	1	58
08-26-85/09:00	0	30	1	0	0	31
08-27-85/09:00	0	65	1	0	1	67
08-28-85/09:00	0	76	3	0	0	79
08-29-85/09:00	0	41	1	0	0	42
08-30-85/09:00	0	92	1	0	0	93
08-31-85/09:00	0	55	0	0	0	55
Monthly Totals	0	3846	58	16	44	3964

Table 6. Monthly summary Rock Island Smolt Honitoring, April-August, 1985.

MONTH	CHINOOK YEARLING	CHINOOK SUB-YEAR.	STLHD.	COHO	SOCKEYE	TOTAL SALMONIDS
April	10483	12	998	0	20867	32360
May	21676	1220	25430	7811	9144	65281
June	237	7690	3611	4175	1009	16722
July	3	8314	32	35	138	8522
August	0	3846	58	16	44	3964
Yearly Totals	32399	21082	30129	12037	31202	126849

APPENDIX B

Table 1. Daily summary of marked chinook and steelhead sampled from Rock Island bypass trap, April, 1985.

	CHINOOK BRANDS									STEELHEAD BRANDS			
DATE	7U/1	7C/1	7C/3	7F/1	7K/1	7T/1	RA/T/3	LA/T/3	AD CLIP	RA/7U/1	RA/7U/3	LA/7U/1	AD CLIP
4-12-85													1
4-13-85													5
4-14-85													3
4-15-85	11												5
4-16-85	8												3
4-17-85	5												9
4-18-85	3												21
4-19-85	2												10
4-20-85	5												19
4-21-85	1												21
4-22-85	2		1										41
4-23-85	1		0										10
4-24-85	1		4			1							12
4-25-85	1	1	3	1		0							33
4-26-85	6	0	4	3		1							18
4-27-85	1	1	2	0		0							26
4-28-85	0	4	2	0		0			1				24
4-29-85	2	3	2	0	1	0			0				41
4-30-85	1	2	2	1	0	1			1				51
Monthly totals	50	11	20	5	1	3	0	0	2	0	0	0	353

Table 2. Daily summary of marked chinook and steelhead sampled from Rock Island bypass trap, May, 1985.

	CHINOOK BRANDS										STEELHEAD BRANDS			
DATE	7U/1	7C/1	7C/3	7F/1	7K/1	7T/1	RA/T/3	LA/T/3	AD CLIP	:	RA/7U/1	RA/7U/3	LA/7U/1	AD CLIP
5-01-85	3	2	1	0	4	0				:				32
5-02-85	3	0	2	2	2	0			161	:				58
5-03-85	4	1	4	0	1	0			99	:				61
5-04-85	3	2	2	1	0	0			68	:				50
5-05-85	9	2	3	1	4	1			51	:				86
5-06-85	2	2	4	2	1	0			29	:				76
5-07-85	9	3	2	4	2	1			32	:				101
5-08-85	10	9	5	3	5	1			18	:				97
5-09-85	17	9	5	0	2	0			6	:	23			142
5-10-85	11	5	4	0	4	0			4	:	84			214
5-11-85	13	4	5	2	9	1			2	:	68			123
5-12-85	11	10	4	3	5	0			8	:	75			361
5-13-85	7	3	2	2	11	0			5	:	76	24		504
5-14-85	4	6	4	1	6	0			2	:	81	106		658
5-15-85	4	7	7	2	7	2			2	:	91	133		563
5-16-85	9	13	8	3	31	1	1		9	:	87	136		634
5-17-85	5	9	8	2	11	2	0		2	:	90	117	9	505
5-18-85	7	4	6	2	8	0	1		0	:	95	77	40	860
5-19-85	7	7	4	2	12	1	0		0	:	93	72	148	1204
5-20-85	5	5	1	0	9	0	0		0	:	40	49	130	1236
5-21-85	0	6	6	0	8	1	0		1	:	29	71	111	1411
5-22-85	1	8	3	3	9	1	0		2	:	12	38	58	1998
5-23-85	2	12	7	2	3	2	0		0	:	20	41	80	3015
5-24-85	2	4	2	0	5	0	0		4	:	3	20	36	2019
5-25-85	9	8	3	0	1	0	0		0	:	10	20	24	1073
5-26-85	0	2	1	2	11	0	0		0	:	2	5	16	520
5-27-85	0	3	3	0	2	2	0		0	:	6	2	9	412
5-28-85	4	7	2	1	5		0		1	:	1	2	2	264
5-29-85	1	3	0	0	5		1		4	:	2	4	7	291
5-30-85	1	5	1	0	1		0		1	:	0	3	1	417
5-31-85	0	3	0	2	4		2		1	:	2	2	3	308
Monthly totals	163	164	109	42	188	16	5	0	512	:	990	922	674	19293

Table 3. Daily summary of marked chinook and steelhead sampled from Rock Island bypass trap, June, 1985.

	CHINOOK BRANDS									STEELHEAD BRANDS			
DATE	7U/1	7C/1	7C/3	7F/1	7K/1	7T/1	RA/T/3	LA/T/3	AD CLIP	RA/7U/1	RA/7U/3	LA/7U/1	AD CLIP
6-01-85	1	4	0		3		1	0	0	2	1	3	329
6-02-85	0		1		0		1	0	1	0	0	3	411
6-03-85	0				1		0	2	3	2	1	0	346
6-04-85	0						0	10	0		0	0	304
6-05-85	1						2	25	0		0	1	228
6-06-85							1	11	1		1	0	225
6-07-85							2	12	0		0	2	158
6-08-85							1	11	0		0	0	138
6-09-85							0	10	0		1	1	148
6-10-85							0	8	0		0	0	116
6-11-85							0	8	0		2	0	81
6-12-85							1	2	0			1	48
6-13-85							0	0	0				27
6-14-85							1	4	0				37
6-15-85							2	4	0				14
6-16-85							0	5	8				10
6-17-85							0	5	2				14
6-18-85							2	3	5				11
6-19-85							4	19	42				5
6-20-85							2	8	17				9
6-21-85							2	16	20				7
6-22-85							2	5	9				8
6-23-85							2	8	13				3
6-24-85							2	12	24				2
6-25-85							2	18	54				4
6-26-85							3	20	112				3
6-27-85							1	11	25				0
6-28-85							0	3	3				0
6-29-85							0	0	5				2
6-30-85							0	0	1				1
Monthly totals	2	4	1	0	4	0	34	240	345	4	6	11	2689

Table 4. Daily summary of marked chinook and steelhead sampled from Rock Island bypass trap, July, 1985.

	CHINOOK BRANDS										STEELHEAD BRANDS			
DATE	7U/1	7C/1	7C/3	7F/1	7K/1	7T/1	RA/T/3	LA/T/3	AD CLIP	:	RA/7U/1	RA/7U/3	LA/7U/1	AD CLIP
7-01-85							0	1	2	:				1
7-02-85							1	3	27	:				0
7-03-85								4	22	:				0
7-04-85								0	5	:				1
7-05-85								0	0	:				0
7-06-85								0	0	:				0
7-07-85								0	2	:				0
7-08-85								0	0	:				0
7-09-85								0	3	:				0
7-10-85								0	1	:				0
7-11-85								0	1	:				0
7-12-85								0	1	:				0
7-13-85								0	0	:				0
7-14-85								0	0	:				0
7-15-85								0	2	:				1
7-16-85								1	3	:				0
7-17-85								0	3	:				2
7-18-85								0	5	:				2
7-19-85								0	6	:				3
7-20-85								0	3	:				0
7-21-85								0	3	:				3
7-22-85								0	0	:				0
7-23-85								4	7	:				0
7-24-85								0	6	:				0
7-25-85								0	7	:				0
7-26-85								1	7	:				0
7-27-85								0	2	:				1
7-28-85								1	2	:				0
7-29-85								0	3	:				0
7-30-85								0	4	:				0
7-31-85								0	0	:				0
Monthly totals	0	0	0	0	0	0	1	15	127	:	0	0	0	14

Table 5. Daily summary of marked chinook and steelhead sampled from Rock Island bypass trap, August, 1985.

	CHINOOK BRANDS									STEELHEAD BRANDS			
DATE	7U/1	7C/1	7C/3	7T/1	7Z/1	7T/1	RA/T/3	LA/T/3	AD CLIP	RA/7U/1	RA/7U/3	LA/7U/1	AD CLIP
8-01-85								0	3				0
8-02-85								0	1				0
8-03-85								0	4				0
8-04-85								0	1				0
8-05-85								0	0				0
8-06-85								0	1				0
8-07-85								0	4				0
8-08-85								0	10				0
8-09-85								0	5				0
8-10-85								0	2				0
8-11-85								0	1				0
8-12-85								0	2				0
8-13-85								1	1				1
8-14-85								0	3				0
8-15-85								0	7				0
8-16-85								1	2				0
8-17-85									1				0
8-18-85									3				0
8-19-85									1				0
8-20-85									5				0
8-21-85									3				0
8-22-85									7				0
8-23-85									3				0
8-24-85									1				1
8-25-85									2				0
8-26-85									0				1
8-27-85									0				0
8-28-85									1				0
8-29-85									1				0
8-30-85									2				1
8-31-85									1				0
									0				
Monthly totals	0	0	0	0	0	0	0	2	78	0	0	0	4

Table 6. Monthly summary of marked chinook and steelhead sampled from Rock Island bypass trap, 1 April - 31 August, 1985.

	CHINOOK BRANDS									STEELHEAD BRANDS			
Month	7U/1	7C/1	7C/3	7F/1	7K/3	7T/1	RA/T/3	LA/T/3	AD CLIP	RA/7U/1	RA/7U/3	LA/7U/1	AD CLIP
April	50	11	20	5	1	3	0	0	2	0	0	0	353
May	163	164	109	42	188	16	5	0	512	990	922	674	19293
June	2	4	1	0	4	0	34	240	345	4	6	11	2689
July	0	0	0	0	0	0	1	15	127	0	0	0	14
August	0	0	0	0	0	0	0	2	78	0	0	0	4
Yearly Total	215	179	130	47	193	19	40	257	1064	994	928	685	22353