

TRANSPORTATION STUDIES AT
PRIEST RAPIDS DAM, 1987

BY

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INTRODUCTION

In 1986, the National Marine Fisheries Service (NMFS) completed a 3-year marking program as part of the Grant County Public Utility District's (GPUD) study to determine the benefits of transporting spring chinook and sockeye salmon smolts collected at Priest Rapids Dam to a release site below Bonneville Dam. In 1987, as part of the study, the Mid-Columbia River Studies Committee granted permission to GPUD to contract with NMFS to mark additional juvenile sockeye salmon smolts at Priest Rapids Dam.

In 1987, the NMFS' principal objectives were as follows: 1) sort juvenile salmonids collected at Priest Rapids Dam, 2) mark juvenile sockeye salmon for the transport study, and 3) monitor the recovery of adults from juveniles tagged at Priest Rapids Dam during previous 3 years in various fisheries and at Columbia River trapping facilities. In addition, NMFS was to conduct a small pilot study to provide experience in transferring fish to seawater holding facilities, holding fish in seawater, and necropsying and recording data on mortalities. The ensuing larger study would be designed to determine if fish's stage of migration (degree of smoltification) at time of transportation influences their survival in seawater. Specifically, in 1987, NMFS was to sample two populations of fish, one at a hatchery (Leavenworth) and one already migrating (gatewells of Priest Rapids Dam) and transfer them to seawater holding facilities, hold them for about 120 days, and monitor mortalities and conduct postmortem examinations.

FISH SORTING AND MARKING OPERATIONS

Methods

The collection methods and equipment, handling methods and facilities, and fish transport apparatus used were described in detail by Dell et al. (1985) and Carlson et al. (1987). However, only one marking unit was used during this year's study.

In 1987, fish collection and marking operations began on 20 and 22 April, respectively. At the handling and marking facility at Priest Rapids Dam, fish were anesthetized with a 50 ppm concentration of MS-222, identified by species, and examined for previous marks. Brands were recorded for the Fish Passage Center (FPC). All previously marked fish, most chinook salmon, and all coho salmon and steelhead were passed via a freshwater line to a circular tank where they were held until nighttime for release into the Columbia River below the Dam. All smolt-sized (90-160mm FL) sockeye salmon were marked unless they exhibited obvious signs of injury or gross descaling. Sockeye salmon to be marked were passed via anesthetic water lines to the marking unit after receiving an adipose fin clip at the sorting station. The single marking unit was modified to mark control and transport groups simultaneously. Controls were marked nearly every day whereas the barge schedule at McNary Dam dictated that we mark on alternate days for truck transport and McNary barge transport groups.

In the marking unit, fish were freeze branded with a tool cooled by liquid nitrogen, tagged with a magnetic coded wire tag (CWT), and passed through a detection system to ensure the presence of a magnetized tag. Fish

markers were rotated periodically to provide equal treatment of transport and control groups. Following marking, the fish passed through a pipe via fresh water to either a holding tank for release into the river at night (control) or to a transport truck.

To obtain contribution data from various segments of the smolt outmigration, wire tag codes and brands were changed for the three treatment groups when marked group quotas of approximately 5,000 fish were met. Fish were periodically sampled from the marking lines and held for 5 or 6 days to determine post-marking delayed mortality, tag retention, and brand quality.

Results and Discussion

A total of 283,712 juvenile salmonids were counted in the NMFS sorting and marking complex at Priest Rapids Dam in 1987 (Table 1). Of these, 1,206 subyearling and 115,084 yearling chinook salmon, 5,549 sockeye salmon, 18,867 coho salmon, and 47,124 steelhead were sorted directly to a holding tank for subsequent release back to the river below the dam. An additional 18,043 yearling chinook salmon were freeze branded and 1,850 yearling chinook salmon and 1,930 sockeye salmon were PIT tagged for release below the dam as part of a separate study. Observed mortalities for the entire season were 13 subyearling and 32 yearling chinook salmon, 64 sockeye salmon, 3 coho salmon, and 7 steelhead.

During the transportation marking period (22 April to 4 June), 24,282 sockeye salmon were marked for transport by truck to below Bonneville Dam, 24,845 were marked for transport by truck to McNary Dam and subsequently barged to below Bonneville Dam, and 24,813 were marked for release as controls below Priest Rapids Dam (Table 2).

Table 1.--Summary of the disposition of fish handled at the Priest Rapids sorting and marking complex, 1987.

	Chinook "O'S"	Chinook "l's"	Sockeye	Steelhead	Coho
Number marked for control	0	0	24,813	0	0
Number marked for truck transport	0	0	24,282	0	0
Number marked for barge transport	0	0	24,845	0	0
Number rejected from sorting unit	1,206	115,084	5,549	47,124	18,867
Number branded for PIT tag control	0	18,043	0 ^{a/}	0	0
Number PIT tagged	0	1,850	1,930	0	0
Observed mortality	13	32	64	7	3
TOTALS	1,219	135,009	81,483	47,131	18,870
Percent species composition	0.4%	47.6%	28.7%	16.6%	6.7%
GRAND TOTAL	283,712				

^{a/} Three control groups used from the transport study.

Table 2.--Summary of brands and wire tag codes used to identify juvenile sockeye salmon that were collected and marked at Priest Rapids Dam and transported by truck to below Bonneville Dam, transported by truck to McNary Dam then transported by barge to below Bonneville Dam, or released as controls below Priest Rapids Dam, 1987.

Marking period	Brand Position, symbol & orientation ^{a/}	Wire code	Number marked
<u>Truck transport</u>			
27 Apr - 05 May	RA-K, 1	23-20-34	5,013
06 May - 17 May	RA-K, 2	23-20-37	4,743
18 May - 24 May	RA-K, 3	23-20-40	5,327
24 May - 26 May	RA-K, 4	23-20-43	5,207
27 May - 04 June	RA-S, 1	23-20-46	<u>3,992</u>
		TOTAL	24,282
<u>Barge transport</u>			
24 Apr - 07 May	RA-Y, 1	23-20-33	5,093
08 May - 21 May	RA-Y, 2	23-20-36	5,619 ^{b/}
21 May - 25 May	RA-Y, 3	23-20-39	5,216
25 May - 27 May	RA-Y, 4	23-20-42	5,238
27 May - 02 June	RA-H, 1	23-20-45	<u>3,679</u>
		TOTAL	24,845
<u>Control</u>			
22 Apr - 06 May	LA-W, 1	23-20-32	4,306
07 May - 14 May	LA-W, 2	23-20-35	5,420
15 May - 23 May	LA-W, 3	23-20-38	5,349
24 May - 25 May	LA-W, 4	23-20-41	5,050
27 May - 02 June	LA-Z, 1	23-20-44	<u>4,688</u>
		TOTAL	24,813

^{a/} Brand positions abbreviations are: RA = right anterior, LA = left anterior. Brand symbol is self explanatory. Brand orientation--refers to rotation of the brand around its centerpoint (e.g., 1 corresponds to the normal orientation, A; 2 to ; 3 to ; 4 to .

^{b/} Includes 380 sockeye marked for the barge on 15 May, mistakenly wire tagged 23-20-37.

A total of 495 sockeye salmon were held during the marking period to measure post-marking delayed mortality, tag loss, and brand quality (Table 3). Post-marking delayed mortality and tag loss averaged 1.0 and 3.6%, respectively. Overall, brand quality was good with 91.6% of the brands categorized as good, 6.7% categorized as fair, and 1.6% categorized as poor.

Table 3.--Post-marking delayed mortality, tag loss, and brand placement and condition after 5 or 6-day holding of marked juvenile sockeye salmon at Priest Rapids Dam, 1987.

Holding period	Number alive	Number dead	With lost tags	Brand	Brand condition		
					Good	Fair	Poor
07 May-12 May	51	0	0	LA-W,2	42	7	2
13 May-19 May	118	4	4	RA-Y,2	111	6	1
20 May-26 May	100	0	2	RA-K,3	90	8	2
27 May-02 June	101	1	7	LA-Z,1	92	7	2
27 May-02 June	<u>120</u>	<u>0</u>	<u>5</u>	RA-H,1	<u>114</u>	<u>5</u>	<u>1</u>
TOTALS	490	5	18		449	33	8

COLLECTION OF ADULTS FROM TRANSPORTATION TESTS IN 1984-86

During 1984-86, transport (test) and control lots of spring chinook and sockeye salmon were released below Bonneville (Corbett Landing) and Priest Rapids dams, respectively. In 1984, all smolts used in the study were dipped from gatewells at Priest Rapids Dam whereas in 1985-86 additional smolts were dipped from gatewells at Wanapum Dam. When final analyses are completed, the fish from Wanapum Dam will be either included with those from Priest Rapids Dam, analyzed separately, or dropped from analysis altogether, as appropriate.

During 1987, 3-ocean-age adults (both species) from 1984 tests returned to the Columbia River, thus completing returns for that year. Also, 2-ocean-age adults and jacks returned from tests in 1985 and 1986, respectively. Since we are slightly more than half-way through the adult recovery period, final analyses and conclusions cannot be drawn at this time. However, discussion is presented which may lead to an altered experimental design for future research.

Methods

Adult spring chinook and sockeye salmon returning in 1987 from transportation tests in 1984-86 were monitored from ocean fishing catches, Columbia River and tributary catches, tributary spawning grounds and hatcheries, and trapping facilities at Bonneville and Priest Rapids dams.

Trapping facilities were operated throughout the spring chinook and sockeye salmon migrations. At both dams, counts were made as adults passed through the CWT trap facilities. These counts were compared to total passage through the fish ladder(s) to establish a sample rate for each dam. At Priest Rapids Dam, we estimated 35% of the spring chinook salmon and 50% of the

sockeye salmon passed through the detector. At Bonneville Dam, the estimate was 25 and 35% for spring chinook and sockeye salmon, respectively. These estimates are useful to establish rates for total return of tagged fish to the designated trap location. In this report, all numbers of returns are observed unless otherwise stated.

Results and Discussion

During 1987, 398 spring chinook and, 1976 sockeye salmon were recovered from all monitoring sources. In addition, there were 165 adiposed clipped sockeye salmon that had illegible brands or no visible brand recovered at Bonneville Dam and 100 at Priest Rapids Dam.

Returns of Spring Chinook Salmon Marked in 1984-1986

Adults returning from the 1984 test year are complete. The returns are characterized by low numbers (compared to 1985 returns), and a negative transport benefit ratio (TBR) was observed at Priest Rapids Dam, though the TBR was slightly positive at Bonneville Dam (Table 4 and Appendix Tables 1 and 2). It is interesting to note that the recovery of 2-ocean-age adults was strongly negative (about 3.0:1); however, the return of 3-ocean-age adults was strongly positive (more than 2.0:1). Two strays from transported lots were recovered at Deschutes River (Oregon) hatcheries, indicating a loss of homing ability.

The preliminary data from 1985 tests (based on smolts dipped from gatewells at Priest Rapids Dam), indicate a much higher rate of return than the previous year. The TBR was strongly positive, at Bonneville Dam but only marginally so at Priest Rapids Dam. A positive TBR is indicated for combined returns to expected homing areas (hatcheries and spawning areas upstream from

Table 4.--Summary of spring chinook and sockeye salmon adults by recovery area that were marked and released in 1984-86 (data includes all recoveries through 31 December 1987).

Release year and site, and experimental group	Recovery Area (site)				Spawning	
	Bonneville	McNary ^{a/}	Priest R.	Fisheries	grounds	Hatchery
<u>Spring chinook salmon</u>						
1984 -						
test - Bonneville	19	10	8	15	1	7
control - Priest Rapids	15	26	22	22	4	32
1985 -						
test - Bonneville	64	4	43	24	8	22
control - Priest Rapids	27	4	35	25	10	17
test - Bonneville <u>b/</u>	23	0	11	4	4	3
control - Priest Rapids <u>b/</u>	11	0	10	3	2	13
1986 -						
test - Bonneville	0	n/a	0	0	0	0
control - Priest Rapids	0	n/a	1	0	0	0
test - Bonneville <u>b/</u>	1	n/a	0	0	0	0
control - Priest Rapids <u>b/</u>	0	n/a	0	0	0	1
<u>Sockeye salmon</u>						
1984-						
test - Bonneville	51	7	21	6	3	0
control - Priest Rapids	29	18	39	10	23	0
1985 -						
test - Bonneville	535	18	292	269	104	1
control - Priest Rapids	184	7	221	198	108	0
test - Bonneville <u>b/</u>	68	1	32	24	13	0
control - Priest Rapids <u>b/</u>	21	2	19	11	16	0
1986 -						
test - Bonneville	14	n/a	26	2	13	0
control - Priest Rapids	19	n/a	38	3	16	0
test - Bonneville <u>b/</u>	3	n/a	2	0	0	0
control - Priest Rapids <u>b/</u>	3	n/a	6	0	3	0

a/ Trapping operations ceased at McNary Dam in 1986.

b/ Smolts from these groups were collected at Wanapum Dam, transferred to Priest Rapids Dam, marked, and thereafter treated the same as those fish collected at Priest Rapids Dam.

Priest Rapids Dam (see Appendix Tables 3 to 10). Again, a stray transported adult was recovered from the Deschutes River. Observed strays coupled with a TBR at Priest Rapids Dam that was lower than was observed at Bonneville Dam, suggest a homing problem for transported spring chinook salmon in 1984-1985.

Percentage returns of adults from smolts dipped from gatewells at Wanapum Dam in 1985, and then treated as the fish collected at Priest Rapids Dam, were about one-half that of the fish dipped from Priest Rapids Dam gatewells (Appendix Tables 17 and 18). The TBR was essentially the same as observed for the fish dipped from gatewells at Priest Rapids Dam.

Only three jacks have been recovered from tests in 1986; one from the smolts dipped at Priest Rapids Dam and two from smolts dipped from gatewells at Wanapum Dam (Appendix Tables 19-22).

Returns of Sockeye Salmon Marked in 1984-1986

The results for sockeye salmon that were released in 1984 are similar to those for spring chinook salmon. The low numbers of returns indicated a positive TBR at Bonneville Dam which turned into a negative ratio based on observations at Priest Rapids (Table 4) (see also Appendix Tables 23 and 24). On the spawning grounds, the TBR was a negative 8:1. Recovery of sockeye salmon adults from tests in 1985, especially 2-ocean-age fish that returned in 1987, exceeded all expectations (Table 4). Preliminary returns to date include: 719 observed recoveries at Bonneville Dam, 513 observed recoveries at Priest Rapids Dam, and 431 recoveries from the treaty and non-treaty gill net fishery (data are based on smolts dipped from gatewells at Priest Rapids Dam, Appendix Tables 25 to 38). The estimated rate of return to Bonneville Dam was 3.3% for transported fish and 1.2% for controls. The rate

of return for transported fish is one of the highest determined for any species during transport experiments conducted by the NMFS (Ebel 1987) and approaches the pre-dam return rates observed for up-river steelhead and spring chinook salmon (Raymond 1988).

The dramatic results of the 1985 sockeye salmon tests should reduce concerns about the survival capabilities of sockeye salmon following transportation. There are, however, questions that need to be addressed before transportation can be used in its most effective manner to benefit the resource. A more detailed examination of observed return rates and TBRs for 1985 is warranted.

Since a replicated marking strategy was used during 1985 (marks were changed about every 7d), we can look at rate of return of transport and control groups by individual marks (Table 5). Based on observations at Bonneville Dam, the rate for transported fish increased as the downstream migration progressed whereas the reverse was true for the control fish. The same was generally true for observations at Priest Rapids Dam. The reasons for this phenomenon are unclear. However, one could speculate that early in the season, transported fish were forced to the ocean too early while at the same time control fish benefited from adequate flows and possibly low predation rates (water temperatures below 10°C). On the other hand, by late May or early June, predation may have taken a heavy toll on the control fish (Rieman et al. 1986), while this adversity had no action on the transported fish.

The rate of return of transported fish observed at Priest Rapids Dam was similar to that observed at Bonneville Dam in that as the season progressed in 1985, survival generally increased. However, the number of transported fish

Table 5.--The observed return and rate (%) for transport and control lots of sockeye salmon marked and released in 1985 that returned as adults in 1986-87 to Bonneville and Priest Rapids Dam.^{a/}

Release site	Tag code	No. released	Dates	No. and (%) returned to Bonneville Dam	No. and (%) returned to Priest Rapids Dam
Bonneville	23-17-16	10,232	20-28 Apr	55 (0.538)	31 (0.303)
	23-17-50	8,146	29 Apr-4 May	55 (0.675)	34 (0.303)
	23-17-52	8,171	5-12 May	69 (0.844)	43 (0.526)
	23-17-54	6,506	13-19 May	58 (0.891)	36 (0.553)
	23-17-26	10,259	20-26 May	144 (1.404)	82 (0.799)
	23-17-57	12,092	27 May-4 Jun	154 (1.275)	66 (0.546)
	Totals (Average)	55,406		535 (0.966)	292 (0.527)
Priest Rapids	23-17-17	9,614	20-28 Apr	56 (0.582)	52 (0.541)
	23-17-47	8,189	29 Apr-4 May	34 (0.415)	50 (0.611)
	23-17-49	8,171	5-12 May	22 (0.269)	20 (0.245)
	23-17-51	6,451	13-19 May	26 (0.403)	28 (0.434)
	23-17-19	10,403	20-26 May	24 (0.231)	47 (0.452)
	23-17-59	12,604	27 May-4 Jun	22 (0.175)	24 (0.190)
	Totals (Average)	55,432		184 (0.332)	221 (0.399)

^{a/} See also Appendix Tables 25 to 38.

was substantially less (292 vs 535) while the number of controls was greater (221 vs 184). Obviously, the result was a reduced TBR.

What accounts for the reduced TBR observed at Priest Rapids Dam? Our data suggest that the gill-net fishery--especially the non-treaty fishery--removed a disproportionate number of transported fish from the experimental population, and that more importantly, transported fish had a tendency toward impaired homing.

In many transport experiments we have seen a tendency for control adults to arrive at river observation points prior to the transported fish. The return of 2-ocean-age sockeye salmon in 1987 was no exception (Fig. 1 upper portion and Fig. 2). Note that at Week 29, the number of transported fish was starting to exceed the number of controls at Bonneville Dam, and by Week 30, this separation would have been dramatic if it were not for the fishery coinciding with Week 30. The removal of a disproportionate number of transported fish (Fig. 1 lower) appears to truncate the transport curve (Fig. 1 upper). Figure 2 shows the effect of removal of transported fish downstream from Bonneville Dam even more dramatically. At Priest Rapids Dam, the transported fish curve becomes bimodal, due in part to the run stretching out over a longer period compared to the more compressed run at Bonneville Dam.

A comparison of the TBRs in the treaty and non-treaty fisheries lends further support to our suggestion that the non-treaty fishery removed a disproportionate number of transported fish. During the non-treaty fishing, the TBR was about 1:1 during week 29, 2:1 during the week 30, and 1.6:1 overall (Fig. 1). These data demonstrate that the numbers of transport fish relative to controls were increasing in the non-treaty fishing area which was

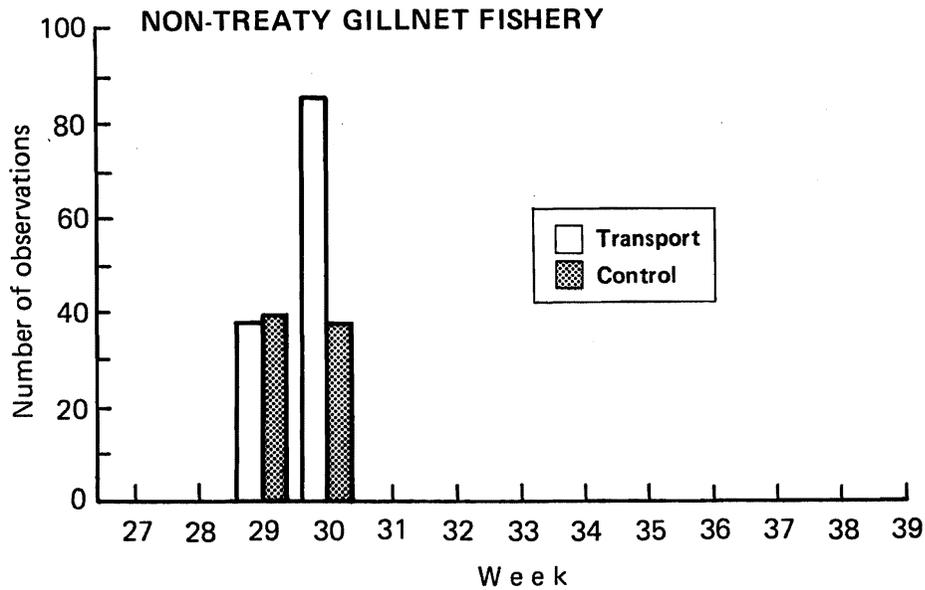
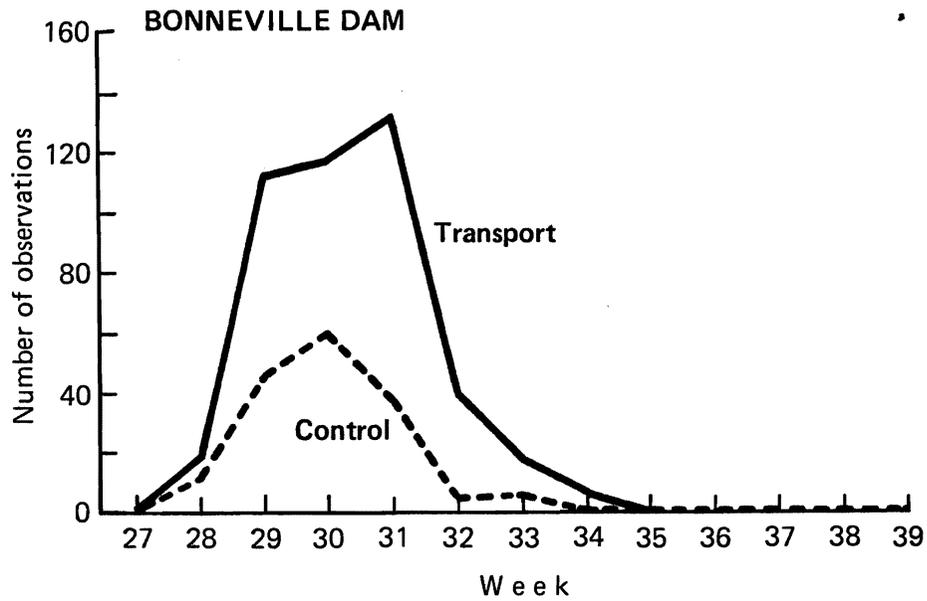


Figure 1.--The number of recoveries of sockeye salmon by week in 1987 at Bonneville Dam and from the non-treaty gill net fishery from transport and control groups marked at Priest Rapids Dam in 1985.

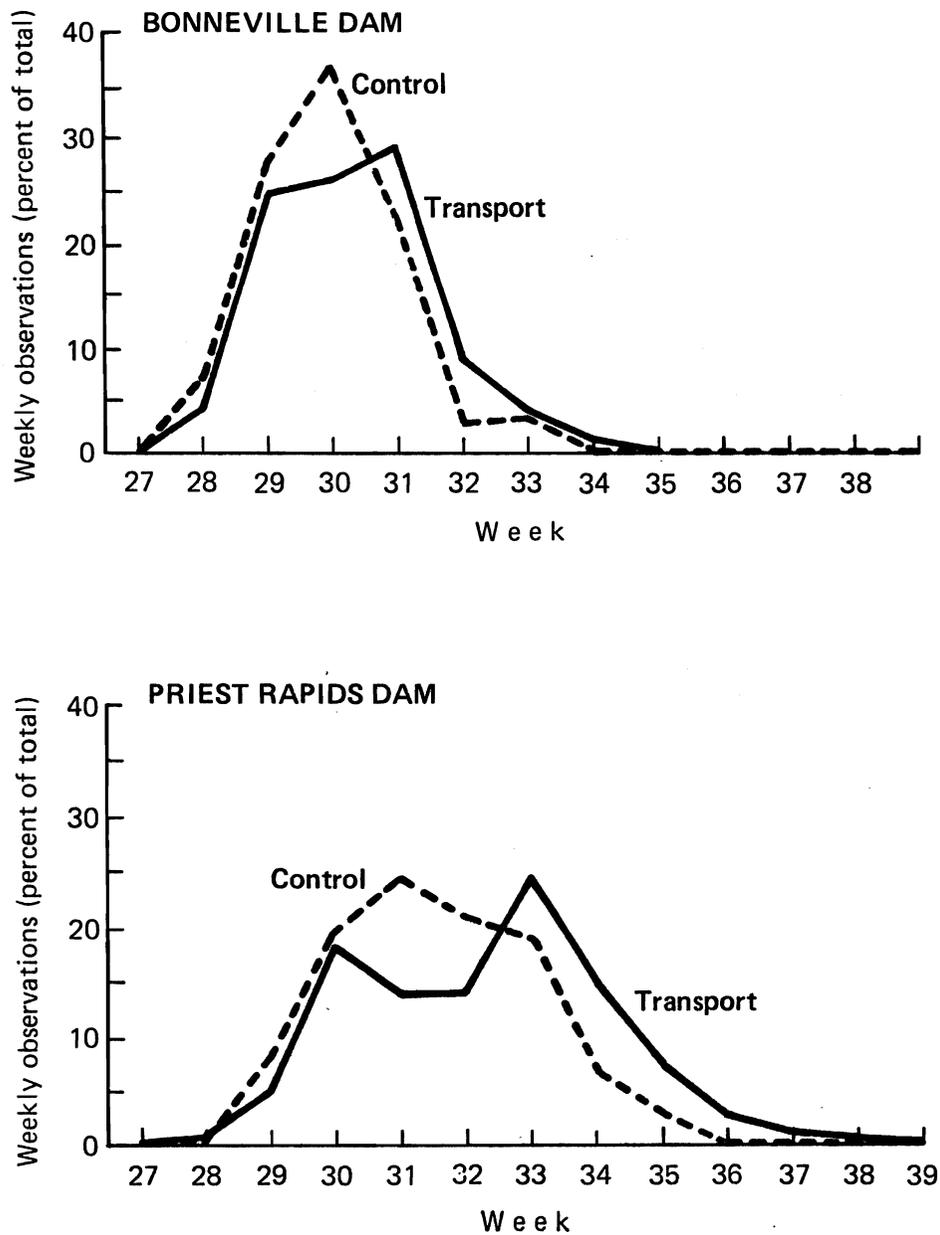


Figure 2.--The recovery of marked sockeye salmon in 1987 at Bonneville and Priest Rapids dams from transport and control groups marked at Priest Rapids Dam in 1985. Recovery is expressed as weekly percentage of season total for both groups.

confirmed by observations at Bonneville Dam (the TBR for week 30 was approximately 2:1). We, therefore, believe that the transported fish were already demonstrating a homing impairment that took place near Bonneville Dam, which resulted in unexpected low numbers of transported fish available to the treaty fishery upstream.

Another indication that homing of transported sockeye salmon was disturbed in the Bonneville Dam area was that one fish returned to Cascade Hatchery located near Bonneville Dam. This is the only case we know of that sockeye salmon from upriver sources has returned to a lower river hatchery. In any event, the transported fish failed to arrive in expected numbers at Priest Rapids Dam in 1986 and 1987, regardless of the precise area where the homing disruption occurred.

Sockeye salmon that were dipped from gatewells at Wanapum Dam and subsequently placed into test and control groups at Priest Rapids Dam in 1985, returned as adults in proportions similar to the chinook salmon. That is, the TBR corresponded to that of the Priest Rapids Dam fish and the rate of return was about one-half that observed for fish collected at Priest Rapids Dam (Appendix Tables 39 and 40).

One-ocean age fish returning from 1986 tests were few. Preliminary data indicated a negative TBR at Bonneville and Priest Rapids dams (Appendix Tables 41 and 42). Sockeye salmon adults that returned from smolts dipnetted at Wanapum Dam and then were marked at Priest Rapids Dam are shown in Appendix Tables 43 and 44.

The data from transport tests conducted so far at Priest Rapids Dam, suggest that survival of transported fish (spring chinook and sockeye salmon) is not a strong research consideration because in nearly all tests, the rate

of return of test fish exceeded that of controls at Bonneville Dam. However, the problem of impaired homing in spring chinook and sockeye salmon needs urgent attention. If the homing problems are resolved, then transportation of smolts from Priest Rapids Dam should benefit the resource substantially as previously shown for several species from the Snake River.

EFFECT OF TIME-IN-MIGRATION ON SEAWATER
SURVIVAL OF SPRING CHINOOK SALMON SMOLTS--A PILOT STUDY

Spring chinook salmon smolts marked and transported from Priest Rapids Dam to the Bonneville Dam tailrace in 1984 returned as adults at a substantially lower rate than the corresponding control group released in the Priest Rapids Dam tailrace. The TBR was strongly negative--about 3:1 in favor of controls. Previous transportation studies involving this species conducted in recent years on the Snake River have also produced low returns, but consistently positive TBRs (Park 1985).

A possible explanation of the different rates of return for fish from the Columbia and Snake rivers is the "time-in-migration theory." The low survival of transported mid-Columbia River spring chinook salmon may be caused by transportation delivering these fish to the seawater environment before they are physiologically prepared for the transition. On the other hand, the Snake River stocks, most of which migrate 200 miles or more in free-flowing rivers before being transported, may be better prepared physiologically to enter seawater and would not be adversely impacted by the quick transportation to the estuary.

To investigate this time-in-migration theory, a complex study was planned. Smolts sampled at various times at Leavenworth Hatchery and Priest Rapids Dam were to be exposed to several exercise or artificial migrational time periods in a river-like environment for 0 to 14 days and then transferred to and held in seawater for 120 days. However, time and logistical constraints dictated that only an abbreviated pilot time-in-migration study be conducted in 1987. In this abbreviated study, all migrational test groups were eliminated and only two groups of smolts--one sampled from Leavenworth

Hatchery and one sampled from the gatewells at Priest Rapids Dam--were transferred directly into seawater and held for approximately 120 days. The study was conducted primarily to provide an experience base for various efforts such as transferring fish to seawater holding facilities, holding fish in seawater, and necropsying and recording data on mortalities. Also, it was agreed that if fish sampled directly from Leavenworth Hatchery with no previous migrational experience exhibited little, if any, osmoregulatory difficulty, then further studies of this kind would probably not be necessary.

Methods

On 22 April, 1,100 spring chinook salmon juveniles were sampled from several different raceways at Leavenworth Hatchery, anesthetized in 40 ppm MS-222, counted, and divided equally into the two transport tanks on one of the GPUD's fish hauling trailers. The fish were subsequently transported to seawater quarantine facilities located at the NMFS marine experimental station at Manchester, Washington, on Puget Sound. Likewise, on 8 May an identical number of fish were sampled from several different gatewells at Priest Rapids Dam and similarly treated and transported to Manchester. At all times, transfers of fish were made utilizing water-to-water transfer techniques and equipment to minimize stress and physical trauma (Matthews et al. 1986).

Prior to transfer to seawater at Manchester, 100 fish from each group were subsampled from the transport vehicles. Each fish was measured to fork length and a scale sample removed. In addition, blood plasma, gill, and kidney samples were collected for preliminary T₄, Na⁺-K⁺ATPase (indicators of smoltifications), and bacterial kidney disease (BKD) analysis, respectively. The remaining 1,000 fish from each group were equally subdivided into 100 fish

replicates and distributed utilizing water-to-water techniques into 4-ft diameter fiberglass holding tanks at Manchester supplied with approximately 4 gpm each of pumped seawater at an average temperature of 12°C and 28 ppt salinity.

The study design called for holding test fish in the seawater quarantine system for approximately 120 days. All fish were fed to satiation daily with Oregon moist pellet (OMP) fish formula. Mortalities were removed from the tanks daily, measured to fork length, and examined critically for cause of death; a scale sample was also removed. During the necropsies, checks were made for BKD lesions and other abnormalities. The indirect fluorescent antibody technique (IFAT) (Novotny and Zaugg 1979) was used to determine the presence of BKD organism throughout the study. Mortalities were also examined for Vibrio anguillarum, the causative agent of vibriosis in seawater, by the presence of external lesions, plating techniques, and microscopy.

When the study was terminated in early September, all surviving fish were removed from the tanks, counted, and measured to fork length; a scale sample was also removed. At least 10 fish from each of the 20 holding tanks were necropsied and checked for BKD by the presence of obvious lesions and IFAT (if any tank did not contain 10 fish at the end of the study, then all of the fish in that tank were necropsied and checked for BKD).

A one-way analysis of variance (ANOVA) was used to statistically compare T4 and $\text{Na}^+ - \text{K}^+$ ATPase preliminary sample values between the Leavenworth Hatchery and Priest Rapids Dam test groups. Significance was established at ($P < 0.05$).

Results and Discussion

Mean values for the preliminary T4 and $\text{Na}^+-\text{K}^+\text{ATPase}$ samples for both test groups which were taken before the fish were transferred to seawater are shown in Table 6. The ANOVA indicated that the T4 levels for fish sampled at Leavenworth Hatchery were significantly higher ($P < 0.001$) than for those sampled at Priest Rapids Dam. Conversely, the $\text{Na}^+-\text{K}^+\text{ATPase}$ levels were significantly higher ($P < 0.001$) for fish sampled at Priest Rapids Dam than for those sampled at Leavenworth Hatchery. This relationship is considered normal for fish properly experiencing the smoltification process (Dickhoff 1987). The high values for T4 at Leavenworth Hatchery suggest that the fish were well into the initial stages of smoltification and were not released prematurely. Since the mean T4 values at Priest Rapids Dam were well below the mean values at Leavenworth Hatchery and the mean $\text{Na}^+-\text{K}^+\text{ATPase}$ values at the dam were well above the mean values at the hatchery, it was assumed that the downriver fish were well smolted.

The IFAT (Table 6) demonstrated BKD organisms in 21.0 and 17.0% of the preliminary samples of fish from Leavenworth Hatchery and Priest Rapids Dam, respectively. Since this technique is not sufficiently sensitive to detect a high percentage of low level infections (Sakai et al. 1987), these values should be considered as conservative and informational and not as absolute or exact incidence levels. It is noteworthy that the two fish in the Priest Rapids Dam sample that were the most heavily infected with BKD also exhibited the lowest $\text{Na}^+-\text{K}^+\text{ATPase}$ levels (Appendix Table 46.).

Test fish originating from Leavenworth Hatchery and Priest Rapids Dam were held in the seawater quarantine system for 131 and 115 days,

Table 6. Mean (\pm SD) $\text{Na}^+\text{-K}^+\text{ATPase}$ and T_4 values and the percentage of fish which were BKD positive by IFAT for Leavenworth Hatchery and Priest Rapids Dam spring chinook salmon sampled prior to holding in seawater.

	$\text{Na}^+\text{-K}^+\text{ATPase}$ (μ moles ATP hydrolyzed/mg protein/h)	T_4 (ng/ml)	BKD positive (%)
Leavenworth Hatchery	10.1 \pm 1.5	19.8 \pm 5.6	21.0
Priest Rapids Dam	29.3 \pm 6.5	8.5 \pm 2.6	17.0

respectively.^{1/} Table 7 presents the overall percent mortality and summarizes other post-death observations for both test groups. By the end of the study, mortality levels in both test groups were high, averaging 60.4% for the Leavenworth Hatchery test group and 73.1% for the Priest Rapids Dam test group. These percentages are likely conservative because they were derived from the original 1,000 fish in each test group and do not assume any mortality for those that escaped. Nearly all of the mortalities in both groups were associated with two agents, BKD and vibriosis. The IFAT demonstrated BKD organisms in 90.2 and 87.0% of the mortalities in the hatchery and dam test groups, respectively. About one-third of the hatchery mortalities and nearly two-thirds of the dam mortalities were infected with vibriosis concomittant with BKD. Vibriosis alone was found in 4.6 and 8.9% of the hatchery and dam mortalities, respectively. Surprisingly, only 2.5% of the hatchery group and 0.2% of the dam group succumbed to osmoregulatory failure, and all of these mortalities occurred within the first 3 weeks of holding.

The vibrio epizootic, which occurred primarily during the first 2 months of the study, confuses the interpretation of primary cause of death in this study. First of all, we believe that vibriosis actually caused the death of any mortality that was positive for this organism. However, since nearly all of the mortalities that died from vibriosis also contained BKD organisms and the pathogenesis of vibriosis and BKD are acute and chronic, respectively, many fish likely died of vibriosis before BKD had an opportunity to completely

^{1/} At the end of the study, we discovered that 17.9% of the hatchery test group and 20.8% of the dam test group were missing. We believe that most of these fish likely escaped through the standpipe drain systems in the tanks.

Table 7. The percentage mortality and a summary of the post-death observations for spring chinook salmon mortalities by sample site during seawater holding period of pilot time-in-migration study.

Sample site	No. held	Mortality (%)	Tank escape (%)	Mortalities with BKD (%)	Mortalities with vibriosis (%)	Mortalities with vibriosis only (%)	Mortalities with osmoregulatory failure (%)
Leavenworth Hatchery	1,000	60.4	17.9	90.2	37.6	4.6	2.5
Priest Rapids Dam	1,000	73.1	20.8	87.0	64.8	8.9	0.2

manifest itself. Results of the IFAT support this contention. The fish that died of vibriosis early were more heavily infected with BKD than those that died later suggesting that vibrio first selectively culled fish which were already weakened by advanced cases of BKD and then likely continued to cull other fish as they became progressively more weakened by BKD. Therefore, we believe that any mortality that was positive for both BKD and vibriosis would have eventually succumbed to BKD if vibrio had not been present.

At the end of the study, 55.3% of the hatchery test group and 75.4% of the dam test group tested positive for BKD by IFAT. This suggests that additional mortalities would have occurred if the study had continued.

Overall, the mortality and BKD incidence levels in both test groups were similar to those reported by Park et al. (1986) in a study in which spring chinook salmon smolts were sampled from the smolt collection system at Lower Granite Dam on the Snake River and subsequently held in a closed artificial seawater recirculation system for 140 days. The results of both studies strongly imply that BKD is likely the major underlying cause for very low return rates of hatchery spring chinook salmon originating from both river systems.

The results of this pilot study imply that insufficient smoltification is not the underlying cause for the very low return rate of spring chinook salmon transported from Priest Rapids Dam in 1984. The T4 and $\text{Na}^+ - \text{K}^+$ ATPase measurements indicated that the fish were experiencing a normal smoltification process. More importantly, the fish transferred directly to full-strength seawater from Leavenworth Hatchery without any prior migrational experience or supposed benefit of a gradual transition offered by a real or simulated

movement through an estuary appeared to suffer little osmoregulatory difficulty during this study.

SUMMARY AND RECOMMENDATIONS

1. During 1987, 73,940 sockeye salmon were marked for the ongoing transportation study. These included: 24,813 released as controls below Priest Rapids Dam, 24,282 released following truck transport to below Bonneville Dam, and 24,845 truck to McNary Dam and then released into the fish transport barge.
2. Preliminary data from returns of transported spring chinook and sockeye salmon suggest that transportation of smolts from Priest Rapids Dam to below Bonneville Dam in 1984-85 resulted in increased survival as more transported fish returned to Bonneville than did the corresponding controls. The highest estimated rate of return (survival) was shown for sockeye salmon transported in 1985 (3.29%). Returns from tests in 1984 (both species) are few and indicate a low survival for transported and control fish.
3. Preliminary data also indicate that TBRs are positive as measured at Bonneville Dam, but at Priest Rapids Dam, the ratios are negative or marginally positive. This strongly suggests homing impairment in some transported fish for both spring chinook and sockeye salmon.
4. Additional research is necessary to enhance the homing capabilities of transported Mid-Columbia River salmon.

5. We recommend that studies to evaluate time-in-migration vs seawater survival of spring chinook salmon smolts be discontinued.

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APPENDIX

Data Summaries

Appendix Table 1.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently released downstream from Priest Rapids Dam in 1984.

Master File Date : 30 December 1987
 RELEASE GROUPS INCLUDED: 8402A 8402B 8402C 8402D

1984 P.RAPIDS TRANS CONTROL BELOW P.RAPIDS
 SPRING CHINOOK

Brands Used: LAIU1 LAIR1 LAIM1 LAIU3
 Wire Codes Used: 231702 231704 231706 231660

RECOVERY AREA	1984	YEAR OF RETURN		1987	1988	NUMBER RELEASED: 38247	
		1985	1986			TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	0	13	2	0	15	0.039
MENARY TRAP	0	0	26	0	0	26	0.068
LOWER GRANITE TRAP	0	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	17	5	0	22	0.058
OCEAN FISHERIES							
ALASKA	0	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0	0.000
OREGON	0	0	1	0	0	1	0.003
CALIFORNIA	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	1	0	0	1	0.003
WENATCHEE R.	0	0	3	0	0	3	0.008
SNAKE R.	0	0	0	0	0	0	0.000
OTHER RIVERS	0	0	2	0	0	2	0.005
RIVER COMMERCIAL							
COMMERCIAL NET	0	0	0	2	0	2	0.005
COL. R. TEST FSHRY (ORE)	0	0	1	0	0	1	0.003
INDIAN FISHERY							
INDIAN FISHERY	0	0	0	5	0	5	0.013
FALL INDIAN NET	0	0	1	0	0	1	0.003
INDIAN CEREMONIAL	0	0	2	0	0	2	0.005
HATCHERIES							
WINTHROP H.	0	0	0	2	0	2	0.005
LEAVENWORTH H.	0	0	18	4	0	22	0.058
ENTIAT H.	0	0	3	5	0	8	0.021
STREAM SURVEY							
OTHER STREAMS	0	0	0	4	0	4	0.010
TOTALS	0	0	88	29	0	117	0.306
PERCENT OF RECOVERY	%	0.0	0.0	75.2	24.8	0.0	

Appendix Table 2.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently transported to Bonneville Dam (Corbett Landing) in 1984.

Master File Date : 30 December 1987

RELEASE GROUPS INCLUDED: 8401A 8401B 8401C 8401D

1984 P. RAPIDS TRANS TRUCK
SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RAIC1 RAID1 RAIF1 RAIC3
Wire Codes Used: 231703 231705 231707 231709

NUMBER RELEASED: 38673

RECOVERY AREA	1984	YEAR OF RETURN		1987	1988	TOTAL	% RETURN
		1985	1986				
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	1	4	14	0	19	0.049
MCNARY TRAP	0	0	10	0	0	10	0.026
LOWER GRANITE TRAP	0	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	1	7	0	8	0.021
OCEAN FISHERIES							
ALASKA	0	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0	0.000
OREGON	0	1	0	0	0	1	0.003
CALIFORNIA	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	1	1	0	2	0.005
SNAKE R.	0	0	0	0	0	0	0.000
OTHER RIVERS	0	0	0	1	0	1	0.003
RIVER COMMERCIAL							
COMMERCIAL NET	0	0	0	2	0	2	0.005
COL. R. TEST FSHRY (ORE)	0	0	1	0	0	1	0.003
INDIAN FISHERY							
INDIAN FISHERY	0	0	0	3	0	3	0.008
FALL INDIAN NET	0	0	1	0	0	1	0.003
INDIAN CEREMONIAL	0	0	4	0	0	4	0.010
HATCHERIES							
DESCHUTES R. HATCHERIES	0	0	2	0	0	2	0.005
WINTHROP H.	0	0	0	1	0	1	0.003
LEAVENWORTH H.	0	0	0	1	0	1	0.003
ENTIAT H.	0	0	0	3	0	3	0.008
STREAM SURVEY							
OTHER STREAMS	0	0	0	1	0	1	0.003
TOTALS	0	2	24	34	0	60	0.155
PERCENT OF RECOVERY	%	0.0	3.3	40.0	56.7	0.0	

Appendix Table 3.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently released downstream from Priest Rapids Dam in 1985.

Master File Date : 30 December 1987

RELEASE GROUPS INCLUDED: 8503A 8503B 8503C 8503D 8503E 8503F

1985 P. RAPIDS TRANS CONTROL BELOW P. RAPIDS
SPRING CHINOOK

Brands Used: LAIL1 LAIN1 LAIS1 LAIL3 LAIN3 LAIS3
Wire Codes Used: 231753 231711 231713 231715 231755 231758

NUMBER RELEASED: 49700

RECOVERY AREA	1985	YEAR OF RETURN		1988	TOTAL	% RETURN
		1986	1987			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	2	25	0	27	0.054
MCMARY TRAP	0	4	0	0	4	0.008
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	2	33	0	35	0.070
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0.000
OREGON	3	0	1	0	4	0.008
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WEMATCHEE R.	0	2	5	0	7	0.014
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL						
COL. R. TEST FSHRY (DRE)	0	0	3	0	3	0.006
INDIAN FISHERY						
INDIAN FISHERY	0	0	10	0	10	0.020
SUMNER INDIAN NET	0	1	0	0	1	0.002
HATCHERIES						
WINTHROP H.	0	0	4	0	4	0.008
LEAVENWORTH H.	0	1	6	0	7	0.014
ENTIAT H.	0	0	6	0	6	0.012
STREAM SURVEY						
OTHER STREAMS	0	1	9	0	10	0.020
TOTALS	3	13	102	0	118	0.237
PERCENT OF RECOVERY	%	2.5	11.0	86.4	0.0	

Appendix Table 4.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently released downstream from Priest Rapids Dam in 1985.

Master File Date : 30 December 1987
RELEASE GROUPS INCLUDED: 8503A

1985 P.RAPIDS TRANS CONTROL BELOW P.RAPIDS
SPRING CHINOOK

Brands Used: LAIL1
Wire Codes Used: 231753

NUMBER RELEASED: 6603

RECOVERY AREA	1985	YEAR OF RETURN			TOTAL	% RETURN
		1986	1987	1988		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	5	0	5	0.076
MCNARY TRAP	0	1	0	0	1	0.015
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0	0.121
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0.000
OREGON	1	0	0	0	1	0.015
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL						
COL. R. TEST FSHRY (DRE)	0	0	2	0	2	0.030
INDIAN FISHERY						
INDIAN FISHERY	0	0	2	0	2	0.030
SUMNER INDIAN NET	0	1	0	0	1	0.015
HATCHERIES						
LEAVENWORTH H.	0	1	2	0	3	0.045
STREAM SURVEY						
OTHER STREAMS	0	0	1	0	1	0.015
TOTALS	1	3	20	0	24	0.363
PERCENT OF RECOVERY	%	4.2	12.5	83.3	0.0	

Appendix Table 5.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently released downstream from Priest Rapids Dam in 1985.

Master File Date : 30 December 1987
RELEASE GROUPS INCLUDED: 85038

1985 P.RAPIDS TRANS CONTROL BELOW P.RAPIDS
SPRING CHINOOK

Brands Used: LAINI
Wire Codes Used: 231711

NUMBER RELEASED: 8281

RECOVERY AREA	1985	YEAR OF RETURN			TOTAL	% RETURN
		1986	1987	1988		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	2	8	0	10	0.122
MCNARY TRAP	0	2	0	0	2	0.024
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	6	0	6	0.073
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	2	1	0	3	0.037
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY						
INDIAN FISHERY	0	0	3	0	3	0.037
HATCHERIES						
WINTHROP H.	0	0	1	0	1	0.012
ENTIAT H.	0	0	2	0	2	0.024
STREAM SURVEY						
OTHER STREAMS	0	0	2	0	2	0.024
TOTALS	0	6	23	0	29	0.354
PERCENT OF RECOVERY	%	0.0	28.7	79.3	0.0	

Appendix Table 6.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently released downstream from Priest Rapids Dam in 1985.

Master File Date : 30 December 1987
RELEASE GROUPS INCLUDED: 8503C

1985 P. RAPIDS TRANS CONTROL BELOW P. RAPIDS
SPRING CHINOOK

Brands Used: LAISI
Wire Codes Used: 231713

NUMBER RELEASED: 14431

RECOVERY AREA	YEAR OF RETURN				TOTAL	% RETURN
	1985	1986	1987	1988		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	6	0	6	0.042
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	7	0	7	0.049
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0.000
OREGON	2	0	1	0	3	0.021
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	1	0	1	0.007
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL						
COL. R. TEST FSHRY (DRE)	0	0	1	0	1	0.007
INDIAN FISHERY						
INDIAN FISHERY	0	0	1	0	1	0.007
HATCHERIES						
WINTHROP H.	0	0	2	0	2	0.014
LEAVENWORTH H.	0	0	1	0	1	0.007
ENTIAT H.	0	0	2	0	2	0.014
STREAM SURVEY						
OTHER STREAMS	0	0	1	0	1	0.007
TOTALS	2	0	23	0	25	0.173
PERCENT OF RECOVERY	2	0.0	92.0	0.0		

Appendix Table 7.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently released downstream from Priest Rapids Dam in 1985.

Master File Date : 30 December 1987
RELEASE GROUPS INCLUDED: 8503D

1985 P. RAPIDS TRANS CONTROL BELOW P. RAPIDS
SPRING CHINOOK

Brands Used: LAIL3
Wire Codes Used: 231715

NUMBER RELEASED: 18569

RECOVERY AREA	YEAR OF RETURN				TOTAL	% RETURN
	1985	1986	1987	1988		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	3	0	3	0.028
MCNARY TRAP	0	1	0	0	1	0.007
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	1	6	0	7	0.066
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	1	0	1	0.007
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY						
INDIAN FISHERY	0	0	4	0	4	0.038
HATCHERIES						
WINTHROP H.	0	0	1	0	1	0.007
ENTIAT H.	0	0	2	0	2	0.019
STREAM SURVEY						
OTHER STREAMS	0	0	1	0	1	0.007
TOTALS	0	2	18	0	20	0.189
PERCENT OF RECOVERY	%	0.0	18.0	0.0		

Appendix Table 8.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently released downstream from Priest Rapids Dam in 1985.

Master File Date : 30 December 1987
RELEASE GROUPS INCLUDED: 8503E

1985 P.RAPIDS TRANS CONTROL BELOW P.RAPIDS
SPRING CHINOOK

Brands Used: LAIN3
Wire Codes Used: 231755

NUMBER RELEASED: 6779

RECOVERY AREA	1985	YEAR OF RETURN			TOTAL	% RETURN
		1986	1987	1988		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	1	0	1	0.015
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	1	0	1	0.015
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	1	0	1	0.015
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
LEAVENWORTH H.	0	0	3	0	3	0.044
STREAM SURVEY						
OTHER STREAMS	0	0	1	0	1	0.015
TOTALS	0	0	7	0	7	0.103
PERCENT OF RECOVERY	%	0.0	0.0	100.0	0.0	

Appendix Table 9.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently released downstream from Priest Rapids Dam in 1985.

Master File Date : 30 December 1987
RELEASE GROUPS INCLUDED: 8583F

1985 P.RAPIDS TRANS CONTROL BELOW P.RAPIDS
SPRING CHINOOK

Brands Used: LAIS3
Wire Codes Used: 231758

NUMBER RELEASED: 3117

RECOVERY AREA	1985	YEAR OF RETURN			TOTAL	% RETURN
		1986	1987	1988		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	2	0	2	0.064
MCARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	1	5	0	6	0.192
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	1	0	1	0.032
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY						
OTHER STREAMS	0	1	3	0	4	0.128
TOTALS	0	2	11	0	13	0.417
PERCENT OF RECOVERY	2	0.0	15.4	84.6	0.0	

Appendix Table 10.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently transported to Bonneville Dam (Corbett Landing) in 1985.

Master File Date : 30 December 1987

RELEASE GROUPS INCLUDED: 8501A 8501B 8501C 8501D 8501E 8501F

1985 P. RAPIDS TRANS TRUCK

BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAIH1 RAIJ1 RAIK1 RAIH3 RAIJ3 RAIK3
Wire Codes Used: 231746 231710 231712 231714 231748 231756

NUMBER RELEASED: 58498

RECOVERY AREA	YEAR OF RETURN				TOTAL	% RETURN
	1985	1986	1987	1988		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	1	63	0	64	0.127
MCMARY TRAP	1	3	0	0	4	0.008
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	2	41	0	43	0.085
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0.000
OREGON	4	1	2	0	7	0.014
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	1	0	0	1	0.002
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	2	5	0	7	0.014
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL						
COL. R. TEST FSHRY (ORE)	0	1	2	0	3	0.006
INDIAN FISHERY						
INDIAN FISHERY	0	0	6	0	6	0.012
HATCHERIES						
DESCHUTES R. HATCHERIES	0	1	0	0	1	0.002
WINTHROP H.	0	0	3	0	3	0.006
LEAVENWORTH H.	0	0	5	0	5	0.010
ENTIAT H.	0	0	13	0	13	0.026
STREAM SURVEY						
OTHER STREAMS	0	0	8	0	8	0.016
TOTALS	5	12	149	0	166	0.329
PERCENT OF RECOVERY	%	3.8	7.2	89.8		0.0

Appendix Table 11.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently transported to Bonneville Dam (Corbett Landing) in 1985.

Master File Date : 30 December 1987
RELEASE GROUPS INCLUDED: 0301A

1985 P. RAPIDS TRANS TRUCK BELOW BONNEVILLE
SPRING CHINOOK

Brands Used: RAIN1
Wire Codes Used: 231746

NUMBER RELEASED: 7285

RECOVERY AREA	1985	YEAR OF RETURN		1988	TOTAL	% RETURN
		1986	1987			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	1	10	0	11	0.151
MCNARY TRAP	1	1	0	0	2	0.027
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	1	14	0	15	0.206
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	1	2	0	3	0.041
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL						
COL. R. TEST FISHRY (ORE)	0	0	1	0	1	0.014
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
LEAVENWORTH H.	0	0	1	0	1	0.014
STREAM SURVEY						
OTHER STREAMS	0	0	4	0	4	0.055
TOTALS	1	4	32	0	37	0.508
PERCENT OF RECOVERY	%	2.7	10.8	86.5	0.0	

Appendix Table 12.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently transported to Bonneville Dam (Corbett Landing) in 1985.

Master File Date : 30 December 1987
RELEASE GROUPS INCLUDED: 8501B

1985 P. RAPIDS TRANS TRUCK BELOW BONNEVILLE
SPRING CHINOOK

Brands Used: RAIJ1
Wire Codes Used: 231710

NUMBER RELEASED: 8388

RECOVERY AREA	1985	YEAR OF RETURN		1988	TOTAL	% RETURN
		1986	1987			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	13	0	13	0.155
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	6	0	6	0.072
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	2	0	2	0.024
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY						
INDIAN FISHERY	0	0	1	0	1	0.012
HATCHERIES						
LEAVENWORTH H.	0	0	2	0	2	0.024
ENTIAT H.	0	0	2	0	2	0.024
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	27	0	27	0.322
PERCENT OF RECOVERY	%	0.0	0.0	100.0	0.0	

Appendix Table 13.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently transported to Bonneville Dam (Corbett Landing) in 1985.

Master File Date : 30 December 1987
RELEASE GROUPS INCLUDED: 0581C

1985 P. RAPIDS TRANS TRUCK
SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RAIK1
Wire Codes Used: 231712

NUMBER RELEASED: 14384

RECOVERY AREA	YEAR OF RETURN				TOTAL	% RETURN
	1985	1986	1987	1988		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	15	0	15	0.104
MCMARY TRAP	0	1	0	0	1	0.007
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	1	8	0	9	0.063
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0.000
OREGON	0	1	1	0	2	0.014
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	1	0	0	1	0.007
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	1	0	0	1	0.007
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY						
INDIAN FISHERY	0	0	5	0	5	0.035
HATCHERIES						
DESMUTES R. HATCHERIES	0	1	0	0	1	0.007
ENTIAT H.	0	0	1	0	1	0.007
STREAM SURVEY						
OTHER STREAMS	0	0	1	0	1	0.007
TOTALS	0	6	31	0	37	0.257
PERCENT OF RECOVERY	%	0.0	16.2	83.8	0.0	

Appendix Table 14.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently transported to Bonneville Dam (Corbett Landing) in 1985.

Master File Date : 30 December 1987
RELEASE GROUPS INCLUDED: 89019

1985 P. RAPIDS TRANS TRUCK
SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RAIN3
Wire Codes Used: 231714

NUMBER RELEASED: 10688

RECOVERY AREA	1985	YEAR OF RETURN			TOTAL	% RETURN
		1986	1987	1988		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	14	0	14	0.131
MCARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	7	0	7	0.065
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0.000
OREGON	1	0	1	0	2	0.019
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	1	0	1	0.007
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL						
COL. R. TEST FSHRY (DRE)	0	0	1	0	1	0.007
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
WINTHROP H.	0	0	2	0	2	0.019
LEAVENWORTH H.	0	0	2	0	2	0.019
ENTIAT H.	0	0	8	0	8	0.075
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	1	0	36	0	37	0.346
PERCENT OF RECOVERY	%	2.7	0.0	97.3	0.0	

Appendix Table 15.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently transported to Bonneville Dam (Corbett Landing) in 1985.

Master File Date : 30 December 1987
RELEASE GROUPS INCLUDED: 0301E

1985 P. RAPIDS TRANS TRUCK
SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RA1J3
Wire Codes Used: 231748

NUMBER RELEASED: 6485

RECOVERY AREA	1985	YEAR OF RETURN			TOTAL	% RETURN
		1986	1987	1988		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.125
MCNERY TRAP	0	1	0	0	1	0.016
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	3	0	3	0.047
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0.000
OREGON	2	0	0	0	2	0.031
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
WINTHROP H.	0	0	1	0	1	0.016
ENTIAT H.	0	0	2	0	2	0.031
STREAM SURVEY						
OTHER STREAMS	0	0	2	0	2	0.031
TOTALS	2	1	16	0	19	0.297
PERCENT OF RECOVERY	%	10.5	5.3	84.2	0.0	

Appendix Table 16.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently transported to Bonneville Dam (Corbett Landing) in 1985.

Master File Date : 30 December 1987
RELEASE GROUPS INCLUDED: 0501F

1985 P. RAPIDS TRANS TRUCK
SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RAIK3
Wire Codes Used: 231736

NUMBER RELEASED: 3348

RECOVERY AREA	1985	YEAR OF RETURN			TOTAL	% RETURN
		1986	1987	1988		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	3	0	3	0.090
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	3	0	3	0.090
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0.000
OREGON	1	0	0	0	1	0.030
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL						
COL. R. TEST FSHRY (ORE)	0	1	0	0	1	0.030
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY						
OTHER STREAMS	0	0	1	0	1	0.030
TOTALS	1	1	7	0	9	0.269
PERCENT OF RECOVERY	2	11.1	11.1	77.8	0.0	

Appendix Table 17.--Adult recoveries from smolts dipped from gatewells at Wanapum Dam and subsequently released downstream from Priest Rapids Dam in 1985.

Master File Date : 30 December 1987

RELEASE GROUPS INCLUDED: 8507A 8507B 8507C 8507D 8507E

1985 WANAPUM TRANS CONTROL BELOW P. RAPIDS
SPRING CHINOOK

Brands Used: LA2C1 LA2J1 LA141 LA2C3 LA2J3
Wire Codes Used: 231725 231727 231741 231743 231745

NUMBER RELEASED: 25553

RECOVERY AREA	YEAR OF RETURN				TOTAL	% RETURN
	1985	1986	1987	1988		
RIVER SYSTEM TRAPS						
DORRVILLE TRAP	0	0	11	0	11	0.043
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	10	0	10	0.039
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY						
INDIAN FISHERY	0	0	2	0	2	0.006
FALL INDIAN NET	0	1	0	0	1	0.004
HATCHERIES						
WINTHROP H.	0	0	3	0	3	0.012
LEAVENWORTH H.	0	0	6	0	6	0.023
ENTIAT H.	0	0	4	0	4	0.016
STREAM SURVEY						
OTHER STREAMS	0	0	2	0	2	0.006
TOTALS	0	1	38	0	39	0.153
PERCENT OF RECOVERY	%	0.0	2.6	97.4	0.0	

Appendix Table 18.--Adult recoveries from smolts dipped from gatewells at Wanapum Dam and subsequently transported to Bonneville Dam (Corbett Landing) in 1985.

Master File Date : 30 December 1987

RELEASE GROUPS INCLUDED: 8505A 8505B 8505C 8505D 8505E

1985 WANAPUM TRANS TRUCK
SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RAIZ1 RAIY1 RAIY1 RAIY3 RAIY3
Wire Codes Used: 231728 231730 231740 231722 231744

NUMBER RELEASED: 26287

RECOVERY AREA	1985	YEAR OF RETURN		1988	TOTAL	% RETURN
		1986	1987			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	23	0	23	0.087
MCMARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	11	0	11	0.042
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0.000
OREGON	0	1	0	0	1	0.004
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY						
INDIAN FISHERY	0	0	2	0	2	0.008
FALL INDIAN NET	0	1	0	0	1	0.004
HATCHERIES						
ENTIAT H.	0	0	3	0	3	0.011
STREAM SURVEY						
OTHER STREAMS	0	0	4	0	4	0.015
TOTALS	0	2	43	0	45	0.171
PERCENT OF RECOVERY	%	0.0	4.4	95.6	0.0	

Appendix Table 19.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently released downstream from Priest Rapids Dam in 1986.

Master File Date : 30 December 1987
 RELEASE GROUPS INCLUDED: 8405A 8405B 8405C 8405D 8405E

1986 P. RAPIDS TRANS CONTROL BELOW P. RAPIDS
SPRING CHINOOK

Brands Used: LARH1 LARH2 LARH3 LARH4 LAR71
 Wire Codes Used: 231002 231003 231004 231005 231006

NUMBER RELEASED: 35595

RECOVERY AREA	1986	YEAR OF RETURN		TOTAL	% RETURN
		1987	1988		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	1	0	1	0.003
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	1	0	1	0.003
PERCENT OF RECOVERY	%	0.0	100.0	0.0	

Appendix Table 20.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently transported to Bonneville Dam (Corbett Landing) in 1986.

Master File Date : 30 December 1987

RELEASE GROUPS INCLUDED: 8603A 8603B 8603C 8603D 8603E

1986 P. RAPIDS TRANS TRUCK
SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RARF1 RARF2 RARF3 RARF4 RARY1
Wire Codes Used: 231760 231761 231762 231763 231801

NUMBER RELEASED: 34648

RECOVERY AREA	1986	YEAR OF RETURN		TOTAL	% RETURN
		1987	1988		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	0	0	0	0.000
PERCENT OF RECOVERY	%	0.0	0.0	0.0	

Appendix Table 21.--Adult recoveries from smolts dipped from gatewells at Wanapum Dam and subsequently released downstream from Priest Rapids Dam in 1986.

Master File Date : 30 December 1987

RELEASE GROUPS INCLUDED: 8689A 8689B 8689C 8689D 8689E

1986 WANAPUM TRANS CONTROL BELOW P. RAPIDS
SPRING CHINOOK

Brands Used: LARR1 LARR2 LARR3 LARR4 LAR73
Wire Codes Used: 231839 231840 231841 231842 231843

NUMBER RELEASED: 27283

RECOVERY AREA	1986	YEAR OF RETURN		TOTAL	% RETURN
		1987	1988		
RIVER SYSTEM TRAPS					
BOONEVILLE TRAP	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES					
LEAVENWORTH H.	0	1	0	1	0.004
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	1	0	1	0.004
PERCENT OF RECOVERY	%	0.0	100.0	0.0	

Appendix Table 22.--Adult recoveries from smolts dipped from gatewells at Wanapum Dam and subsequently transported to Bonneville Dam (Corbett Landing) in 1986.

Master File Date : 30 December 1987

RELEASE GROUPS INCLUDED: 8607A 8607B 8607C 8607D 8607E

1986 WANAPUM TRANS TRUCK
SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RARN1 RARN2 RARN3 RARN4 RARY3
Wire Codes Used: 231827 231828 231829 231830 231831

NUMBER RELEASED: 26876

RECOVERY AREA	1986	YEAR OF RETURN		TOTAL	% RETURN
		1987	1988		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	1	0	1	0.004
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	1	0	1	0.004
PERCENT OF RECOVERY	%	0.0	100.0	0.0	

Appendix Table 23.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently released downstream from Priest Rapids Dam in 1984.

Master File Date : 30 December 1987
 RELEASE GROUPS INCLUDED: 8404A 8404B 8404C 8404D

1984 P. RAPIDS TRANS CONTROL BELOW P. RAPIDS
 SOCKEYE

Brands Used: LAIU1 LAIR1 LAIM1 LAIU3
 Wire Codes Used: 231654 231656 231658 231708

NUMBER RELEASED: 20674

RECOVERY AREA	1984	YEAR OF RETURN				TOTAL	% RETURN
		1985	1986	1987	1988		
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	2	25	2	0	29	0.140
MCNARY TRAP	0	0	18	0	0	18	0.087
LOWER GRANITE TRAP	0	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	35	4	0	39	0.189
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0.000
RIVER COMMERCIAL							
COMMERCIAL NET	0	0	0	1	0	1	0.005
INDIAN FISHERY							
SUMMER INDIAN NET	0	0	8	1	0	9	0.044
HATCHERIES	0	0	0	0	0	0	0.000
STREAM SURVEY							
OTHER STREAMS	0	0	20	3	0	23	0.111
TOTALS	0	2	106	11	0	119	0.576
PERCENT OF RECOVERY	2	0.0	1.7	89.1	9.2	0.0	

Appendix Table 24.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently transported to Bonneville Dam (Corbett Landing) in 1984.

Master File Date : 30 December 1987
 RELEASE GROUPS INCLUDED: 8483A 8483B 8483C 8483D

1984 P. RAPIDS TRANS TRUCK BELOW BONNEVILLE
 SOCKEYE

Brands Used: RAIC1 RAID1 RAIF1 RAIC3
 Wire Codes Used: 231653 231655 231657 231659

NUMBER RELEASED: 20731

RECOVERY AREA	1984	YEAR OF RETURN		1987	1988	TOTAL	% RETURN
		1985	1986				
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	3	46	2	0	51	0.246
MCNARY TRAP	0	0	7	0	0	7	0.034
LOWER GRANITE TRAP	0	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	20	1	0	21	0.101
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	1	0	1	0.005
SNAKE R.	0	0	0	0	0	0	0.000
RIVER COMMERCIAL							
COMMERCIAL NET	0	0	2	0	0	2	0.010
INDIAN FISHERY							
SUMNER INDIAN NET	0	0	2	1	0	3	0.014
HATCHERIES	0	0	0	0	0	0	0.000
STREAM SURVEY							
OTHER STREAMS	0	0	2	1	0	3	0.014
TOTALS	0	3	79	6	0	88	0.424
PERCENT OF RECOVERY	%	0.0	3.4	89.8	6.8	0.0	

Appendix Table 25.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently released downstream from Priest Rapids Dam in 1985.

Master File Date : 30 December 1987

RELEASE GROUPS INCLUDED: 8504A 8504B 8504C 8504D 8504E 8504F

**1985 P. RAPIDS TRANS CONTROL BELOW P. RAPIDS
SCKEYK**

Brands Used: LAIL1 LAIN1 LAIS1 LAIL3 LAIN3 LAIS3
Wire Codes Used: 231717 231747 231749 231751 231719 231759

NUMBER RELEASED: 55432

RECOVERY AREA	1985	YEAR OF RETURN		1988	TOTAL	% RETURN
		1986	1987			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	33	151	0	184	0.332
MCNARY TRAP	0	7	0	0	7	0.013
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	41	180	0	221	0.399
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	7	0	7	0.013
SNAKE R.	0	0	0	0	0	0.000
OTHER RIVERS	0	0	7	0	7	0.013
RIVER COMMERCIAL						
COMMERCIAL NET	0	0	77	0	77	0.139
COL. R. TEST FSHRY (ORE)	0	0	1	0	1	0.002
INDIAN FISHERY						
SUMNER INDIAN NET	0	0	106	0	106	0.191
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY						
OTHER STREAMS	0	13	95	0	108	0.195
OTHER	0	0	5	0	5	0.009
TOTALS	0	94	629	0	723	1.304
PERCENT OF RECOVERY	%	0.0	13.0	87.0	0.0	

Appendix Table 26.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently released downstream from Priest Rapids Dam in 1985.

Master File Date : 30 December 1987
RELEASE GROUPS INCLUDED: 8304A

1985 P. RAPIDS TRANS CONTROL BELOW P. RAPIDS
SOCKEYE

Brands Used: LAILI
Wire Codes Used: 231717

NUMBER RELEASED: 9614

RECOVERY AREA	1985	YEAR OF RETURN			TOTAL	% RETURN
		1986	1987	1988		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	9	47	0	56	0.582
MCNARY TRAP	0	2	0	0	2	0.021
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	7	45	0	52	0.541
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	2	0	2	0.021
SNAKE R.	0	0	0	0	0	0.000
OTHER RIVERS	0	0	1	0	1	0.010
RIVER COMMERCIAL						
COMMERCIAL NET	0	0	23	0	23	0.239
INDIAN FISHERY						
SUMNER INDIAN NET	0	0	36	0	36	0.374
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY						
OTHER STREAMS	0	5	25	0	30	0.312
OTHER	0	0	1	0	1	0.010
TOTALS	0	23	180	0	203	2.112
PERCENT OF RECOVERY	%	0.0	11.3	88.7	0.0	

Appendix Table 27.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently released downstream from Priest Rapids Dam in 1985.

Master File Date : 30 December 1987
RELEASE GROUPS INCLUDED: 85848

1985 P.RAPIDS TRANS CONTROL BELOW P.RAPIDS
SOCKEYE

Brands Used: LAINI
Wire Codes Used: 231747

NUMBER RELEASED: 8189

RECOVERY AREA	1985	YEAR OF RETURN			TOTAL	% RETURN
		1986	1987	1988		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	5	29	0	34	0.415
MCNARY TRAP	0	2	0	0	2	0.024
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	17	33	0	50	0.611
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	2	0	2	0.024
SNAKE R.	0	0	0	0	0	0.000
OTHER RIVERS	0	0	3	0	3	0.037
RIVER COMMERCIAL						
COMMERCIAL NET	0	0	11	0	11	0.134
INDIAN FISHERY						
SUMNER INDIAN NET	0	0	20	0	20	0.244
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY						
OTHER STREAMS	0	3	19	0	22	0.269
OTHER	0	0	4	0	4	0.049
TOTALS	0	27	121	0	148	1.887
PERCENT OF RECOVERY	%	0.0	18.2	81.8	0.0	

Appendix Table 28.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently released downstream from Priest Rapids Dam in 1985.

Master File Date : 30 December 1987
RELEASE GROUPS INCLUDED: 0304C

1985 P. RAPIDS TRANS CONTROL BELOW P. RAPIDS
SOCKEYE

Brands Used: LAISI
Wire Codes Used: 231749

NUMBER RELEASED: 8171

RECOVERY AREA	1985	YEAR OF RETURN		1988	TOTAL	% RETURN
		1986	1987			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	7	15	0	22	0.269
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	3	17	0	20	0.245
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0.000
OTHER RIVERS	0	0	2	0	2	0.024
RIVER COMMERCIAL						
COMMERCIAL NET	0	0	14	0	14	0.171
INDIAN FISHERY						
SUMMER INDIAN NET	0	0	14	0	14	0.171
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY						
OTHER STREAMS	0	1	18	0	19	0.233
TOTALS	0	11	88	0	91	1.114
PERCENT OF RECOVERY	%	0.0	12.1	87.9	0.0	

Appendix Table 29.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently released downstream from Priest Rapids Dam in 1985.

Master File Date : 30 December 1987
RELEASE GROUPS INCLUDED: 83049

1985 P. RAPIDS TRANS CONTROL BELOW P. RAPIDS
SOCKEYE

Brands Used: LAIL3
Wire Codes Used: 231751

NUMBER RELEASED: 6451

RECOVERY AREA	1985	YEAR OF RETURN		1988	TOTAL	% RETURN
		1986	1987			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	5	21	0	26	0.403
MCNARY TRAP	0	2	0	0	2	0.031
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	4	24	0	28	0.434
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WEMATCHEE R.	0	0	1	0	1	0.016
SNAKE R.	0	0	0	0	0	0.000
OTHER RIVERS	0	0	1	0	1	0.016
RIVER COMMERCIAL						
COMMERCIAL NET	0	0	4	0	4	0.062
INDIAN FISHERY						
SUMMER INDIAN NET	0	0	12	0	12	0.186
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY						
OTHER STREAMS	0	2	13	0	15	0.233
TOTALS	0	13	76	0	89	1.380
PERCENT OF RECOVERY	%	0.0	14.6	85.4	0.0	

Appendix Table 30.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently released downstream from Priest Rapids Dam in 1985.

Master File Date : 30 December 1987
RELEASE GROUPS INCLUDED: 8304E

1985 P. RAPIDS TRANS CONTROL BELOW P. RAPIDS
SOCKEYE

Brands Used: LAIN3
Wire Codes Used: 231719

NUMBER RELEASED: 10403

RECOVERY AREA	1985	YEAR OF RETURN			TOTAL	% RETURN
		1986	1987	1988		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	5	19	0	24	0.231
MCARY TRAP	0	1	0	0	1	0.010
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	6	41	0	47	0.452
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	1	0	1	0.010
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL						
COMMERCIAL NET	0	0	15	0	15	0.144
COL. R. TEST FSHRY (ORE)	0	0	1	0	1	0.010
INDIAN FISHERY						
SUMNER INDIAN NET	0	0	15	0	15	0.144
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY						
OTHER STREAMS	0	2	15	0	17	0.163
TOTALS	0	14	107	0	121	1.163
PERCENT OF RECOVERY	%	0.0	11.6	88.4	0.0	

Appendix Table 31.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently released downstream from Priest Rapids Dam in 1985.

Master File Date : 30 December 1987
 RELEASE GROUPS INCLUDED: 8504F

1985 P. RAPIDS TRANS CONTROL BELOW P. RAPIDS
 SOCKEYE

Brands Used: LAIS3
 Wire Codes Used: 231759

NUMBER RELEASED: 12604

RECOVERY AREA	1985	YEAR OF RETURN		1988	TOTAL	% RETURN
		1986	1987			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	2	20	0	22	0.175
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	4	20	0	24	0.190
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	1	0	1	0.008
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL						
COMMERCIAL NET	0	0	10	0	10	0.079
INDIAN FISHERY						
SUMNER INDIAN NET	0	0	9	0	9	0.071
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY						
OTHER STREAMS	0	0	5	0	5	0.040
TOTALS	0	6	65	0	71	0.563
PERCENT OF RECOVERY	%	0.0	8.5	91.5	0.0	

Appendix Table 32.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently transported to Bonneville Dam (Corbett Landing) in 1985.

Master File Date : 30 December 1987

RELEASE GROUPS INCLUDED: 8502A 8502B 8502C 8502D 8502E 8502F

**1985 P. RAPIDS TRANS TRUCK BELOW BONNEVILLE
SOCKEYE**

Brands Used: RAIN1 RAIJ1 RAIK1 RAIN3 RAIJ3 RAIK3
Wire Codes Used: 231716 231750 231752 231754 231726 231757

NUMBER RELEASED: 55406

RECOVERY AREA	1985	YEAR OF RETURN		1988	TOTAL	% RETURN
		1986	1987			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	100	435	0	535	0.966
MERRY TRAP	0	18	0	0	18	0.032
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	57	235	0	292	0.527
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	13	0	13	0.023
SNAKE R.	0	0	0	0	0	0.000
OTHER RIVERS	0	0	9	0	9	0.016
RIVER COMMERCIAL						
COMMERCIAL NET	0	0	122	0	122	0.220
INDIAN FISHERY						
SUMMER INDIAN NET	0	0	125	0	125	0.226
HATCHERIES						
CASCADE H.	0	0	1	0	1	0.002
STREAM SURVEY						
OTHER STREAMS	0	20	84	0	104	0.188
OTHER	0	0	1	0	1	0.002
TOTALS	0	195	1026	0	1221	2.204
PERCENT OF RECOVERY	%	0.0	16.0	84.0	0.0	

Appendix Table 33.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently transported to Bonneville Dam (Corbett Landing) in 1985.

Master File Date : 30 December 1987
RELEASE GROUPS INCLUDED: 8302A

1985 P. RAPIDS TRANS TRUCK BELOW BONNEVILLE
SOCKEYE

Brands Used: RAINI
Wire Codes Used: 231716

NUMBER RELEASED: 10232

RECOVERY AREA	1985	YEAR OF RETURN		1988	TOTAL	% RETURN
		1986	1987			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	10	45	0	55	0.538
MCNARY TRAP	0	1	0	0	1	0.010
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	4	27	0	31	0.303
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	1	0	1	0.010
SNAKE R.	0	0	0	0	0	0.000
OTHER RIVERS	0	0	2	0	2	0.020
RIVER COMMERCIAL						
COMMERCIAL NET	0	0	13	0	13	0.127
INDIAN FISHERY						
SUMNER INDIAN NET	0	0	23	0	23	0.225
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY						
OTHER STREAMS	0	4	9	0	13	0.127
TOTALS	0	19	120	0	139	1.358
PERCENT OF RECOVERY	%	0.0	13.7	86.3	0.0	

Appendix Table 34.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently transported to Bonneville Dam (Corbett Landing) in 1985.

Master File Date : 30 December 1987
RELEASE GROUPS INCLUDED: 8382B

1985 P. RAPIDS TRANS TRUCK BELOW BONNEVILLE
SOCKEYE

Brands Used: RA1J1
Wire Codes Used: 231750

NUMBER RELEASED: 8146

RECOVERY AREA	1985	YEAR OF RETURN		1988	TOTAL	% RETURN
		1986	1987			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	10	45	0	55	0.675
MCNARY TRAP	0	1	0	0	1	0.012
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	8	26	0	34	0.417
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WEMATCHEE R.	0	0	2	0	2	0.025
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL						
COMMERCIAL NET	0	0	15	0	15	0.184
INDIAN FISHERY						
SUMNER INDIAN NET	0	0	13	0	13	0.160
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY						
OTHER STREAMS	0	3	10	0	13	0.160
TOTALS	0	22	111	0	133	1.633
PERCENT OF RECOVERY	%	0.0	16.5	83.5	0.0	

Appendix Table 35.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently transported to Bonneville Dam (Corbett Landing) in 1985.

Master File Date : 30 December 1987
RELEASE GROUPS INCLUDED: 8382C

1985 P. RAPIDS TRANS TRUCK BELOW BONNEVILLE
SOCKEYE

Brands Used: RAIK1
Wire Codes Used: 231752

NUMBER RELEASED: 8171

RECOVERY AREA	1985	YEAR OF RETURN		1988	TOTAL	% RETURN
		1986	1987			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	8	61	0	69	0.844
MCNARY TRAP	0	4	0	0	4	0.049
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	6	37	0	43	0.526
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	4	0	4	0.049
SNAKE R.	0	0	0	0	0	0.000
OTHER RIVERS	0	0	4	0	4	0.049
RIVER COMMERCIAL						
COMMERCIAL NET	0	0	16	0	16	0.196
INDIAN FISHERY						
SUMNER INDIAN NET	0	0	19	0	19	0.233
HATCHERIES						
CASCADE H.	0	0	1	0	1	0.012
STREAM SURVEY						
OTHER STREAMS	0	2	12	0	14	0.171
TOTALS	0	20	154	0	174	2.129
PERCENT OF RECOVERY	%	0.0	11.5	88.5	0.0	

Appendix Table 36.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently transported to Bonneville Dam (Corbett Landing) in 1985.

Master File Date : 30 December 1987
RELEASE GROUPS INCLUDED: 05020

1985 P. RAPIDS TRANS TRUCK BELOW BONNEVILLE
SOCKEYE

Brands Used: RAINS
Wire Codes Used: 231754

NUMBER RELEASED: 6506

RECOVERY AREA	1985	YEAR OF RETURN			TOTAL	% RETURN
		1986	1987	1988		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	4	54	0	58	0.891
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	5	31	0	36	0.553
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	2	0	2	0.031
SNAKE R.	0	0	0	0	0	0.000
OTHER RIVERS	0	0	2	0	2	0.031
RIVER COMMERCIAL						
COMMERCIAL NET	0	0	25	0	25	0.384
INDIAN FISHERY						
SUMMER INDIAN NET	0	0	16	0	16	0.246
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY						
OTHER STREAMS	0	4	17	0	21	0.323
OTHER	0	0	1	0	1	0.015
TOTALS	0	13	148	0	161	2.475
PERCENT OF RECOVERY	2	0.0	8.1	91.9	0.0	

Appendix Table 37.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently transported to Bonneville Dam (Corbett Landing) in 1985.

Master File Date : 30 December 1987
RELEASE GROUPS INCLUDED: 0302E

1985 P. RAPIDS TRANS TRUCK BELOW BONNEVILLE
SOCKEYE

Brands Used: RA1J3
Wire Codes Used: 231726

NUMBER RELEASED: 10259

RECOVERY AREA	1985	YEAR OF RETURN			TOTAL	% RETURN
		1986	1987	1988		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	34	110	0	144	1.404
MCNARY TRAP	0	6	0	0	6	0.058
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	22	60	0	82	0.799
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	1	0	1	0.010
SNAKE R.	0	0	0	0	0	0.000
OTHER RIVERS	0	0	1	0	1	0.010
RIVER COMMERCIAL						
COMMERCIAL NET	0	0	27	0	27	0.263
INDIAN FISHERY						
SUMMER INDIAN NET	0	0	26	0	26	0.253
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY						
OTHER STREAMS	0	3	23	0	26	0.253
TOTALS	0	65	249	0	314	3.061
PERCENT OF RECOVERY	%	0.0	28.7	79.3	0.0	

Appendix Table 38.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently transported to Bonneville Dam (Corbett Landing) in 1985.

Master File Date : 30 December 1987
 RELEASE GROUPS INCLUDED: 8582F

1985 P. RAPIDS TRANS TRUCK BELOW BONNEVILLE
 SOCKEYE

Brands Used: RAIK3
 Wire Codes Used: 231757

NUMBER RELEASED: 12892

RECOVERY AREA	1985	YEAR OF RETURN		1988	TOTAL	% RETURN
		1986	1987			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	34	120	0	154	1.274
MCNARY TRAP	0	6	0	0	6	0.050
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	12	54	0	66	0.546
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	3	0	3	0.025
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL						
COMMERCIAL NET	0	0	26	0	26	0.215
INDIAN FISHERY						
SUMNER INDIAN NET	0	0	28	0	28	0.232
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY						
OTHER STREAMS	0	4	13	0	17	0.141
TOTALS	0	56	244	0	300	2.481
PERCENT OF RECOVERY	%	0.0	18.7	81.3	0.0	

Appendix Table 39.--Adult recoveries from smolts dipped from gatewells at Wanapum Dam and subsequently released downstream from Priest Rapids Dam in 1985.

Master File Date : 30 December 1987
 RELEASE GROUPS INCLUDED: 8500A 8500B 8500C 8500D 8500E

1985 WANAPUM TRANS CONTROL BELOW P. RAPIDS
 SOCKEYE

Brands Used: LA2C1 LA2J1 LA141 LA2C3 LA2J3
 Wire Codes Used: 231661 231663 231701 231721 231723

NUMBER RELEASED: 8599

RECOVERY AREA	1985	YEAR OF RETURN		1988	TOTAL	% RETURN
		1986	1987			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	9	12	0	21	0.244
MCNARY TRAP	0	2	0	0	2	0.023
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	4	15	0	19	0.221
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL						
COMMERCIAL NET	0	0	4	0	4	0.047
INDIAN FISHERY						
SUMNER INDIAN NET	0	0	7	0	7	0.081
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY						
OTHER STREAMS	0	0	16	0	16	0.186
OTHER	0	0	1	0	1	0.012
TOTALS	0	15	55	0	70	0.814
PERCENT OF RECOVERY	%	0.0	21.4	78.6	0.0	

Appendix Table 40.--Adult recoveries from smolts dipped from gatewells at Wanapum Dam and subsequently transported to Bonneville Dam (Corbett Landing) in 1985.

Master File Date : 30 December 1987

RELEASE GROUPS INCLUDED: 8506A 8506B 8506C 8506D 8506E

**1985 WANAPUM TRANS TRUCK BELOW BONNEVILLE
SOCKEYE**

Brands Used: RAIZ1 RAIY1 RAIY1 RAIZ3 RAIY3
Wire Codes Used: 231662 231718 231720 231742 231724

NUMBER RELEASED: 8602

RECOVERY AREA	1985	YEAR OF RETURN		1988	TOTAL	% RETURN
		1986	1987			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	25	43	0	68	0.791
MCNARY TRAP	0	1	0	0	1	0.012
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	24	0	32	0.372
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	1	0	1	0.012
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL						
COMMERCIAL NET	0	0	14	0	14	0.163
INDIAN FISHERY						
SUMMER INDIAN NET	0	0	9	0	9	0.105
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY						
OTHER STREAMS	0	1	12	0	13	0.151
OTHER	0	0	1	0	1	0.012
TOTALS	0	35	104	0	139	1.616
PERCENT OF RECOVERY	%	0.0	25.2	74.8	0.0	

Appendix Table 41.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently released downstream from Priest Rapids Dam in 1986.

Master File Date : 30 December 1987

RELEASE GROUPS INCLUDED: 0606A 0606B 0606C 0606D 0606E 0606F 0606G

1986 P. RAPIDS TRANS CONTROL BELOW P. RAPIDS
SCKEYK

Brands Used: LARH1 LARH2 LARH3 LAV 1 LAV 2 LAV 3 LAV 4
Wire Codes Used: 231737 231738 231739 231818 231819 231820 231901

NUMBER RELEASED: 50642

RECOVERY AREA	1986	YEAR OF RETURN		TOTAL	Z RETURN
		1987	1988		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	19	0	19	0.038
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	38	0	38	0.075
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT					
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	2	0	2	0.004
WENATCHEE R.	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY					
SUMNER INDIAN NET	0	1	0	1	0.002
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY					
OTHER STREAMS	0	16	0	16	0.032
TOTALS	0	76	0	76	0.150
PERCENT OF RECOVERY	Z	0.0	100.0	0.0	

Appendix Table 42.--Adult recoveries from smolts dipped from gatewells at Priest Rapids Dam and subsequently transported to Bonneville Dam (Corbett Landing) in 1986.

Master File Date : 30 December 1987

RELEASE GROUPS INCLUDED: 8604A 8604B 8604C 8604D 8604E 8604F 8604G

1986 P. RAPIDS TRANS TRUCK BELOW BONNEVILLE
SOCKEYE

Brands Used: RARF1 RARF2 RARF3 RAT 1 RAT 2 RAT 3 RAT 4
Wire Codes Used: 231731 231732 231733 231734 231735 231736 231862

NUMBER RELEASED: 49963

RECOVERY AREA	1986	YEAR OF RETURN		TOTAL	% RETURN
		1987	1988		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	14	0	14	0.028
MCARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	26	0	26	0.052
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL					
COMMERCIAL NET	0	2	0	2	0.004
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY					
OTHER STREAMS	0	13	0	13	0.026
TOTALS	0	55	0	55	0.110
PERCENT OF RECOVERY	%	0.0	100.0	0.0	

Appendix Table 43.--Adult recoveries from smolts dipped from gatewells at Wanapum Dam and subsequently released downstream from Priest Rapids Dam in 1986.

Master File Date : 30 December 1987

RELEASE GROUPS INCLUDED: 8610A 8610B 8610C 8610D 8610E 8610F

1986 WANAPUM TRANS CONTROL BELOW P. RAPIDS
SCKEYE

Brands Used: LARR1 LARR4 LARR3 LAL 1 LAL 2 LAL 3
Wire Codes Used: 231833 231834 231835 231836 231837 231838

NUMBER RELEASED: 14284

RECOVERY AREA	1986	YEAR OF RETURN		TOTAL	% RETURN
		1987	1988		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	3	0	3	0.021
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	6	0	6	0.042
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY					
OTHER STREAMS	0	3	0	3	0.021
TOTALS	0	12	0	12	0.084
PERCENT OF RECOVERY	%	0.0	100.0	0.0	

Appendix Table 44.--Adult recoveries from smolts dipped from gatewells at Wanapum Dam and subsequently transported to Bonneville Dam (Corbett Landing) in 1986.

Master File Date : 30 December 1987

RELEASE GROUPS INCLUDED: 8608A 8608B 8608C 8608D 8608E 8608F

1986 WANAPUM TRANS TRUCK BELOW BONNEVILLE
SOCKEYE

Brands Used: RARN1 RARN4 RARN3 RAU 1 RAU 2 RAU 3
Wire Codes Used: 231821 231822 231823 231824 231825 231826

NUMBER RELEASED: 14421

RECOVERY AREA	1986	YEAR OF RETURN		TOTAL	% RETURN
		1987	1988		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	3	0	3	0.021
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	2	0	2	0.014
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	5	0	5	0.035
PERCENT OF RECOVERY	%	0.0	100.0	0.0	

Appendix Table 45.--Fork lengths, T4, $\text{Na}^+\text{-K}^+\text{ATPase}$, BKD lesion, and BKD IFAT values for Leavenworth Hatchery spring chinook salmon sampled prior to holding during pilot time-in-migration seawater holding study, April 22, 1987.

Fork length (mm)	T4 (mg/ml)	$\text{Na}^+\text{-K}^+$ ($\mu\text{moles ATP hydrolyzed/}$ ATPase mg protein/h)	BKD <u>a/</u> lesions	BKD <u>b/</u> IFAT
130	20.0	12.2	0	0
155	23.2	10.8	0	-1
135	17.3	9.4	0	0
175	15.1	11.3	0	-1
135	23.1	10.4	0	0
149	17.2	9.9	0	0
133	32.0	14.1	0	-1
143	23.1	11.5	0	0
120	13.6	9.7	0	0
141	16.9	9.5	0	0
130	26.7	9.3	0	0
138	24.8	8.6	0	0
128	17.4	8.8	0	1
162	9.9	7.7	0	0
159	16.7	11.1	0	0
126	14.6	9.0	0	0
120	21.4	6.7	0	0
122	12.1	8.8	0	0
135	20.4	11.6	0	0
160	15.3	9.9	0	-1
150	21.3	10.7	0	0
126	21.5	10.7	0	0
140	16.0	11.3	0	0
126	7.3	8.1	0	0
120	22.8	9.7	0	-1
116	-	12.0	0	0
122	29.3	11.4	0	0
129	16.6	10.5	0	0
145	17.4	8.5	0	-1
129	19.2	10.2	0	0
149	10.0	8.6	0	0
135	17.2	10.2	0	0
130	24.1	10.7	0	0
148	21.8	10.3	0	0
145	20.8	11.4	0	0
132	19.7	-	0	0
132	22.1	-	0	0
137	18.2	-	0	0
132	20.8	-	0	0
129	31.7	-	0	0
148	27.3	-	0	0
163	10.8	-	0	0
124	18.0	-	0	0
140	23.6	-	0	2

Appendix Table 45.--Continued.

Fork length (mm)	T4 (mg/ml)	Na ⁺ -K ⁺ ATPase	(μ moles ATP hydrolyzed/ mg protein/h)	BKD a/ lesions	BKD b/ IFAT
122	18.6	-	-	0	-1
125	29.1	-	-	0	0
150	18.3	-	-	0	0
140	18.8	-	-	0	0
148	19.0	-	-	0	0
135	17.9	-	-	0	0
112	15.8	-	-	0	-1
130	20.3	-	-	0	0
113	-	-	-	0	0
140	29.8	-	-	0	0
132	15.7	-	-	0	0
140	18.6	-	-	0	0
145	34.6	-	-	0	0
120	12.6	-	-	0	0
128	18.0	-	-	0	0
142	-	-	-	0	0
155	-	-	-	0	1
137	-	-	-	0	0
140	-	-	-	0	0
145	-	-	-	0	0
132	-	-	-	0	0
145	-	-	-	0	0
138	-	-	-	0	0
160	-	-	-	0	0
129	-	-	-	0	0
129	-	-	-	0	0
132	-	-	-	0	0
137	-	-	-	0	0
116	-	-	-	0	0
135	-	-	-	0	0
128	-	-	-	0	-1
140	-	-	-	0	0
136	-	-	-	0	-1
142	-	-	-	0	0
118	-	-	-	0	0
126	-	-	-	0	0
131	-	-	-	0	0
120	-	-	-	0	0
171	-	-	-	2	-1
148	-	-	-	0	0
135	-	-	-	0	0
152	-	-	-	0	0
129	-	-	-	0	0
129	-	-	-	0	3
140	-	-	-	0	3
135	-	-	-	0	2
136	-	-	-	0	0
124	-	-	-	0	0
179	-	-	-	0	0

Appendix Table 45.--Continued.

Fork length (mm)	T4 (mg/ml)	Na ⁺ -K ⁺ (μ moles ATP hydrolyzed/ ATPase mg protein/h)	BKD <u>a/</u> lesions	BKD <u>b/</u> IFAT
150	-	-	0	0
128	-	-	0	0
135	-	-	0	2
115	-	-	0	2
150	-	-	0	2
155	-	-	0	2

a/ BKD lesion rankings

- 0 = No lesions observed
- 1 = Kidney appears swollen
- 2 = Possible lesions present (questionable)
- 3 = Visible lesions present

b/ BKD IFAT rankings same as other Tables

- 0 = No BKD organisms present in a minimum of 150 microscopic fields
- 1 = Less than 1 BKD organism per microscopic field
- 1 = 1-10 BKD organisms per microscopic field
- 2 = 10-100 BKD organisms per microscopic field
- 3 = 100+ BKD organisms per microscopic field
- * = No sample

Appendix Table 46.--Fork lengths, T4, Na⁺-K⁺ATPase, BKD lesions, and BKD IFAT values for Priest Rapids Dam spring chinook salmon sampled prior to holding during pilot time-in-migration seawater holding study, 8 May 1987.

Fork length (mm)	T4(ng/ml)	Na ⁺ -K ⁺ (μ moles ATP hydrolyzed/ATPase mg protein/h)	BKD a/lesions	BKD b/IFAT
142	12.9	28.6	0	0
165	11.8	22.6	0	0
145	6.9	26.2	0	0
148	11.1	20.1	0	0
173	6.4	11.5	0	2
128	13.4	30.6	0	0
136	8.6	32.1	0	0
125	7.5	35.8	0	0
178	5.1	34.8	0	0
155	6.0	27.0	0	0
132	6.6	28.9	0	1
125	7.6	32.7	0	0
137	9.1	32.4	0	0
149	13.4	40.6	0	-1
152	8.9	35.5	0	0
150	7.1	34.2	0	0
136	5.8	27.5	0	0
145	11.0	27.5	0	0
136	2.8	34.0	0	0
129	5.8	26.3	0	0
126	8.9	26.7	0	1
139	9.7	22.1	0	0
148	10.9	24.8	0	-1
170	12.3	20.4	0	0
152	8.9	28.5	0	0
150	5.4	29.0	0	0
121	6.5	33.1	0	0
139	12.0	34.1	0	0
144	9.6	34.5	0	0
129	8.7	35.8	0	0
121	6.1	41.1	0	0
128	4.2	35.0	0	0
130	4.9	31.8	0	0
134	7.1	15.1	3	3
120	8.7	26.1	0	0
152	8.1	-	0	0
141	10.9	-	-	0
123	7.3	-	0	0
141	8.0	-	0	0
139	8.3	-	0	0
141	5.0	-	0	-1
138	8.4	-	0	-1
139	8.7	-	0	0
139	9.9	-	0	0
141	7.1	-	0	0

Appendix Table 46.--Continued.

Fork length (mm)	T4 (mg/ml)	Na ⁺ -K ⁺ (μ moles ATP hydrolyzed/ ATPase mg protein/h)	BKD <u>a</u> / lesions	BKD <u>b</u> / IFAT
133	14.1	-	0	0
148	6.4	-	0	0
137	9.5	-	0	0
122	13.0	-	0	0
126	12.6	-	0	0
139	10.9	-	0	0
123	8.2	-	0	0
118	-	-	0	0
133	6.6	-	0	0
139	8.5	-	0	-1
138	7.0	-	0	0
126	6.1	-	0	0
153	8.4	-	0	-1
128	9.9	-	0	0
124	8.4	-	0	0
162	-	-	0	0
150	-	-	0	0
129	-	-	0	0
168	-	-	0	0
139	-	-	0	0
135	-	-	0	0
139	-	-	0	-1
162	-	-	0	0
143	-	-	0	0
146	-	-	0	0
129	-	-	0	0
169	-	-	0	0
126	-	-	0	0
132	-	-	0	0
133	-	-	0	0
129	-	-	0	0
125	-	-	0	-1
129	-	-	0	0
122	-	-	0	-1
129	-	-	0	0
131	-	-	0	0
139	-	-	0	0
151	-	-	0	0
146	-	-	0	0
130	-	-	0	0
139	-	-	0	0
132	-	-	0	0
136	-	-	0	0
128	-	-	0	0
156	-	-	0	0
134	-	-	0	-1
123	-	-	0	0
132	-	-	0	0

Appendix Table 46.--Continued.

Fork length (mm)	T4 (mg/ml)	Na ⁺ -K ⁺ (μmoles ATP hydrolyzed/ ATPase mg protein/h)	BKD <u>a/</u> lesions	BKD <u>b/</u> IFAT
138	-	-	0	0
142	-	-	0	0
136	-	-	0	0
132	-	-	0	0
128	-	-	0	0
126	-	-	0	0

a/ BKD lesion rankings

- 0 = No lesions observed
- 1 = Kidney appears swollen
- 2 = Possible lesions present (questionable)
- 3 = Visible lesions present

b/ BKD IFAT rankings

- 0 = No BKD organisms present in a minimum of 150 microscopic fields.
- 1 = less than 1 BKD organism per microscopic field.
- 1 = 1-10 BKD organisms per microscopic field.
- 2 = 10-100 BKD organisms per microscopic field.
- 3 = 100+ BKD organisms per microscopic field.

Appendix Table 47.--Fork lengths, BKD lesion and IFAT rankings, vibrio incidence, and osmoregulatory failure incidence by date, tank number, and test group of individual mortalities during pilot time-in-migration seawater holding study, 1987. All fish were spring chinook salmon juveniles.

Date	Mortality number	Test a/ group	Tank number	Fork length (mm)	BKD b/ lesions	BKD c/ IFAT	Vibriosis	Osmoregulatory failure
4/23	1	L	2	135	3	0	-	-
"	2	L	2	105	0	0	-	-
"	3	L	2	117	1	3	-	-
"	4	L	6	121	0	1	-	-
"	5	L	8	106	0	2	-	-
"	6	L	10	137	0	-1	-	-
"	7	L	1	108	0	-1	-	-
"	8	L	2	124	0	0	-	-
"	9	L	2	109	3	2	-	-
"	10	L	3	133	0	0	-	-
"	11	L	3	103	0	0	-	-
"	12	L	4	110	0	0	-	-
"	13	L	6	135	1	3	-	-
"	14	L	6	114	0	1	-	-
"	15	L	7	128	0	2	-	-
"	16	L	8	148	1	2	-	-
"	17	L	8	101	0	0	-	-
"	18	L	9	135	1	3	-	-
"	19	L	10	135	1	-1	-	-
"	20	L	10	113	0	-1	-	-
"	21	L	10	115	1	1	-	-
"	22	L	10	121	3	2	-	-
"	23	L	JUMPER	133	0	-1	-	-
"	24	L	7	138	0	-1	-	+
4/25	25	L	8	135	0	-1	-	+
"	26	L	9	120	0	0	-	+
"	27	L	10	140	0	0	-	+
"	28	L	10	138	0	0	-	-
4/26	29	L	6	110	0	0	-	+
"	30	L	6	110	0	0	-	+
"	31	L	7	130	0	0	-	-
"	32	L	7	125	0	1	-	-
"	33	L	7	115	0	1	-	-
"	34	L	9	130	0	0	-	+
"	35	L	9	143	0	0	-	-
"	36	L	9	118	0	0	-	+
4/27	37	L	3	132	1	3	-	-
"	38	L	5	113	0	0	-	+
"	39	L	6	111	0	1	-	-
"	40	L	7	114	0	0	-	+
"	41	L	7	123	0	0	-	-
"	42	L	8	131	1	1	-	-
"	43	L	9	124	0	-1	-	-
"	44	L	9	106	0	-1	-	+

Appendix Table 47.—Continued.

Date	Mortality number	Test a/ group	Tank number	Fork length (mm)	HKD b/ lesions	HKD c/ IFAT	Vibriosis	Osmoregulatory failure
4/27	45	L	9	101	2	-1	-	+
"	46	L	10	122	0	-1	-	-
"	47	L	10	135	2	1	-	-
4/27	48	L	10	109	0	-1	-	-
4/28	49	L	1	119	0	-1	-	-
"	50	L	5	124	3	2	-	-
"	51	L	7	128	0	-1	-	-
"	52	L	7	115	0	0	-	+
"	53	L	7	135	0	-1	-	+
"	54	L	9	163	0	-1	-	-
"	55	L	9	119	0	2	-	-
"	56	L	9	124	1	1	-	+
"	57	L	10	145	0	0	-	-
"	58	L	10	135	1	0	-	-
"	59	L	1	150	0	0	-	-
"	60	L	6	125	0	-1	-	+
"	61	L	7	150	0	0	-	+
"	62	L	7	129	1	-1	-	-
"	63	L	8	121	0	-1	-	-
"	64	L	9	126	1	0	-	-
"	65	L	2	125	0	0	-	+
"	66	L	8	135	0	0	-	-
4/30	67	L	2	148	0	0	-	+
"	68	L	4	130	0	0	-	-
"	69	L	5	110	0	0	-	-
"	70	L	7	110	0	-1	-	+
5/01	71	L	6	158	1	0	-	+
5/02	72	L	7	125	1	0	-	-
"	73	L	1	152	0	0	-	-
"	74	L	3	131	0	0	-	+
5/03	75	L	1	138	1	0	-	+
"	76	L	10	123	1	0	-	-
5/07	77	L	2	123	1	0	-	-
5/08	78	L	8	140	0	0	-	-
5/09	79	P	17	112	0	0	+	-
"	80	P	20	132	0	-1	-	-
"	81	P	13	124	0	0	-	+
"	82	P	12	116	1	0	-	-
"	83	P	12	109	0	0	-	-
5/10	84	P	12	138	0	-1	-	-
"	85	L	4	137	0	0	-	-
"	86	P	20	133	3	2	-	-
"	87	P	13	154	0	0	-	-
"	88	P	13	122	0	1	-	-
"	89	P	14	99	1	0	-	-
5/12	90	P	12	125	0	3	-	-
"	91	P	15	125	0	3	-	-
"	92	P	16	123	3	2	-	-
"	93	P	19	131	3	-1	-	-
"	94	L	10	145	2	3	-	-
5/13	95	P	17	119	1	-1	-	+
"	96	P	15	129	1	1	+	-

Appendix Table 47.—Continued.

Date	Mortality number	Test a/ group	Tank number	Fork length (mm)	EKD b/ lesions	EKD c/ IFAT	Vibriosis	Osmoregulatory failure
5/13	97	P	19	148	0	0	+	-
"	98	P	13	132	0	0	-	-
"	99	L	3	125	3	2	-	+
"	100	P	20	119	0	-1	-	-
"	101	L	4	136	0	-1	-	-
5/14	102	P	20	121	1	-1	+	-
"	103	L	1	160	0	1	-	+
"	104	P	18	115	0	-1	-	-
"	105	P	13	128	3	3	-	-
"	106	P	12	135	2	3	-	-
5/15	107	P	16	128	0	-1	-	+
"	108	P	16	124	0	0	+	-
"	109	P	17	111	0	-1	+	-
"	110	L	10	152	1	3	+	-
"	111	P	18	115	0	-1	+	-
5/16	112	P	16	135	0	0	-	-
"	113	P	17	120	0	0	-	-
"	114	P	17	132	0	-1	+	-
5/17	115	L	9	172	1	2	+	-
"	116	L	3	133	3	1	-	-
"	117	P	11	131	0	-1	-	-
"	118	P	11	134	0	-1	-	-
5/18	119	L	2	132	0	-1	+	-
"	120	L	9	115	0	3	+	-
"	121	P	12	133	0	-1	+	-
"	122	P	12	128	0	0	+	-
"	123	P	12	130	0	0	+	-
"	124	L	2	128	0	0	+	-
5/19	125	L	6	132	1	2	+	-
"	126	L	10	138	0	2	+	-
"	127	L	10	115	0	1	+	-
"	128	P	16	136	0	1	+	-
"	129	P	16	148	0	1	+	-
"	130	P	17	129	0	-1	+	-
"	131	P	17	121	0	2	+	-
"	132	P	17	149	0	-1	+	-
"	133	P	13	115	0	-1	+	-
"	134	P	14	118	0	-1	+	-
"	135	P	14	121	0	2	+	-
"	136	P	19	163	0	-1	+	-
5/20	137	L	2	133	0	-1	+	-
"	138	P	12	104	0	-1	+	-
"	139	P	11	143	0	-1	+	-
"	140	L	10	133	0	3	+	-
"	141	L	10	143	0	0	+	-
"	142	P	15	125	0	-1	+	-
"	143	P	15	133	0	2	+	-
"	144	P	20	126	0	2	+	-
"	145	P	17	145	0	-1	+	-
"	146	P	16	127	0	1	+	-
"	147	P	16	121	0	-1	+	-
"	148	P	16	126	0	0	+	-

Appendix Table 47.—Continued.

Date	Mortality number	Test a/ group	Tank number	Fork length (mm)	EKD b/ lesions	EKD c/ IFAT	Vibriosis	Osmoregulatory failure
5/20	149	P	16	131	0	1	+	-
"	150	P	16	121	0	1	+	-
"	151	P	16	136	0	1	+	-
5/21	152	P	16	150	0	-1	+	-
"	153	P	16	155	0	-1	+	-
"	154	P	16	141	0	-1	+	-
"	155	P	16	122	0	-1	+	-
5/21	157	P	16	121	0	-1	+	-
"	158	P	16	119	0	1	+	-
"	159	P	16	129	0	2	+	-
"	160	P	16	166	0	1	+	-
"	161	P	16	134	0	-1	+	-
"	162	P	16	127	0	0	+	-
"	163	P	16	129	0	0	+	-
"	164	P	16	141	0	0	+	-
"	165	P	12	126	0	-1	+	-
"	166	P	17	133	0	-1	+	-
"	167	P	17	136	0	-1	+	-
"	168	P	17	139	0	0	+	-
"	169	P	17	141	0	0	+	-
"	170	P	17	138	0	2	+	-
"	171	P	17	131	0	-1	+	-
"	172	P	17	166	0	1	+	-
"	173	P	13	120	0	-1	+	-
"	174	P	15	131	0	1	+	-
"	175	P	15	118	0	-1	+	-
5/22	176	P	20	144	0	2	+	-
"	177	P	20	155	0	-1	+	-
"	178	P	19	158	0	1	+	-
"	179	P	15	143	0	-1	+	-
"	180	P	17	137	0	2	+	-
"	181	P	17	141	0	2	+	-
"	182	P	17	142	0	0	+	-
"	183	P	17	138	0	0	+	-
"	184	P	17	156	0	-1	+	-
"	185	P	17	152	0	0	+	-
"	186	P	17	150	0	0	+	-
"	187	P	17	133	0	-1	+	-
"	188	P	18	146	0	0	+	-
"	189	P	16	143	0	0	+	-
"	190	P	16	156	0	1	+	-
"	191	P	16	132	0	0	+	-
"	192	P	16	130	0	-1	+	-
"	193	P	16	132	0	-1	+	-
"	194	P	16	146	0	1	+	-
"	195	P	16	151	0	1	+	-
"	196	P	16	128	0	-1	+	-
5/22	197	P	16	140	0	0	+	-
"	198	P	16	143	0	1	+	-
"	199	P	16	131	0	2	+	-
"	200	P	16	138	0	-1	+	-
5/23	201	L	8	118	1	-1	+	-

Appendix Table 47.—Continued.

Date	Mortality number	Test <u>a/</u> group	Tank number	Fork length (mm)	HKD <u>b/</u> lesions	HKD <u>c/</u> IFAT	Vibriosis	Osmoregulatory failure
5/23	202	P	12	140	0	2	+	-
"	203	P	12	129	3	2	+	-
"	204	P	12	150	0	2	+	-
"	205	P	12	117	0	2	+	-
"	206	P	14	131	3	2	+	-
"	207	P	11	115	0	3	+	-
"	208	P	11	118	0	-1	+	-
"	209	P	11	120	0	1	+	-
5/23	210	L	4	133	3	3	+	-
"	211	L	2	160	0	2	+	-
"	212	L	2	131	0	1	+	-
"	213	P	17	141	0	1	+	-
"	214	P	17	145	0	-1	+	-
"	215	P	17	112	0	1	+	-
"	216	P	17	155	0	1	+	-
"	217	P	17	142	0	-1	+	-
"	218	P	17	176	0	-1	+	-
"	219	P	17	132	0	-1	+	-
"	220	P	16	140	0	-1	+	-
"	221	P	16	143	0	0	+	-
"	222	P	16	145	0	1	+	-
"	223	P	18	151	0	1	+	-
"	224	P	18	147	0	-1	+	-
"	225	P	18	150	0	-1	+	-
"	226	P	18	138	0	-1	+	-
"	227	P	18	142	0	-1	+	-
"	228	P	18	136	0	0	+	-
"	229	P	18	141	0	1	+	-
"	230	P	18	147	0	-1	+	-
"	231	P	18	142	0	0	+	-
"	232	P	18	151	0	0	+	-
5/24	233	P	15	127	0	-1	+	-
"	234	P	15	122	0	2	+	-
"	235	P	15	131	0	1	+	-
"	236	P	15	125	0	-1	+	-
"	237	P	15	133	0	0	+	-
"	238	P	18	163	0	0	+	-
"	239	P	18	157	0	-1	+	-
"	240	P	18	152	0	0	+	-
"	241	P	18	161	0	-1	+	-
"	242	L	2	144	0	-1	+	-
"	243	L	2	136	0	-1	+	-
"	244	L	2	142	0	1	+	-
"	245	L	2	138	0	0	+	-
"	246	P	17	142	0	0	+	-
"	247	P	17	128	0	-1	+	-
"	248	P	17	136	0	-1	+	-
"	249	P	17	127	0	0	+	-
"	250	P	17	128	0	1	+	-
"	251	P	11	152	0	-1	+	-
"	252	P	11	121	2	-1	+	-
"	253	P	11	136	0	2	+	-

Appendix Table 47.—Continued.

Date	Mortality number	Test <u>a/</u> group	Tank number	Fork length (mm)	HKD <u>b/</u> lesions	HKD <u>c/</u> IFAT	Vibriosis	Osmoregulatory failure
5/25	254	P	19	132	0	2	+	-
"	255	P	20	148	0	2	+	-
"	256	P	20	119	0	1	+	-
"	257	P	20	130	0	3	+	-
"	258	P	20	125	0	2	+	-
"	259	P	20	120	0	2	+	-
"	260	P	20	135	0	3	+	-
"	261	P	20	128	0	2	+	-
"	262	P	20	132	0	3	+	-
"	263	P	20	119	0	3	+	-
"	264	P	20	147	0	2	+	-
"	265	P	20	149	0	2	+	-
"	266	P	20	158	0	3	+	-
"	267	P	20	125	3	3	+	-
"	268	P	20	133		-1	+	-
"	269	P	20	130		-1	+	-
"	270	P	20	115		3	+	-
"	271	P	20	107		1	+	-
"	272	P	20	145		3	+	-
"	273	P	15	130		2	+	-
"	274	P	15	136		3	+	-
5/25	275	P	15	122	0	2	+	-
"	276	P	15	116	0	2	+	-
"	277	P	15	-	0	3	+	-
"	278	P	15	120	0	2	+	-
"	279	P	15	138	0	2	+	-
"	280	P	15	128	0	1	+	-
"	281	P	15	117	0	3	+	-
"	282	P	15	100	0	3	+	-
"	283	P	15	-	0	3	+	-
"	284	P	15	116	0	2	+	-
"	285	P	15	128	0	2	+	-
"	286	P	15	121	0	2	+	-
"	287	P	15	115	0	0	+	-
"	288	P	15	109	0	0	+	-
"	289	L	4	125	0	2	+	-
"	290	L	4	129	0	3	+	-
"	291	L	4	128	0	-1	+	-
"	292	L	4	130	0	2	+	-
"	293	L	4	131	0	-1	+	-
"	294	P	19	146	0	1	+	-
"	295	P	19	130	0	-1	+	-
"	296	P	19	120	0	2	+	-
"	297	P	19	116	0	-1	+	-
"	298	P	19	112	0	-1	+	-
"	299	P	19	129	0	-1	+	-
"	300	P	19	123	0	3	+	-
"	301	P	19	130	0	2	+	-
"	302	P	19	128	0	2	+	-
"	303	P	19	130	0	3	+	-
"	304	P	19	126	0	3	+	-
"	305	P	19	125	0	1	+	-

Appendix Table 47.—Continued.

Date	Mortality number	Test <u>a/</u> group	Tank number	Fork length (mm)	BKD <u>b/</u> lesions	BKD <u>c/</u> IFAT	Vibriosis	Osmoregulatory failure
5/25	306	L	6	122	0	2	+	-
"	307	L	6	124	0	3	+	-
"	308	L	6	122	0	3	+	-
"	309	L	10	127	0	-1	+	-
"	310	L	10	129	3	3	+	-
"	311	P	12	147	0	2	+	-
"	312	P	12	132	0	-1	+	-
"	313	P	12	124	0	3	+	-
"	314	P	12	123	0	3	+	-
"	315	P	12	129	0	2	+	-
"	316	P	12	125	0	2	+	-
"	317	P	12	132	0	3	+	-
"	318	P	12	131	0	2	+	-
"	319	P	12	-	0	-1	+	-
"	320	L	3	129	0	3	+	-
"	321	P	16	126	0	3	+	-
"	322	P	16	132	0	3	+	-
"	323	P	17	127	0	3	+	-
"	324	P	17	127	0	3	+	-
"	325	L	2	140	0	2	+	-
"	326	L	2	137	0	2	+	-
"	327	L	2	139	0	1	+	-
"	328	L	2	135	0	-1	+	-
"	329	P	14	129	0	2	+	-
"	330	P	14	133	0	-1	+	-
"	331	P	14	136	0	3	+	-
"	332	P	14	136	0	3	+	-
"	333	P	14	139	0	-1	+	-
"	334	P	13	142	0	-1	+	-
"	335	P	13	138	0	1	+	-
"	336	P	18	136	0	-1	+	-
"	337	P	18	141	0	-1	+	-
"	338	P	18	138	0	-1	+	-
"	339	P	18	138	0	1	+	-
"	340	P	11	137	0	-1	+	-
"	341	P	11	142	0	-1	+	-
"	342	P	11	146	0	-1	+	-
"	343	P	11	130	0	-1	+	-
5/26	344	L	9	142	0	-1	+	-
"	345	L	9	138	0	3	+	-
"	346	P	17	136	0	-1	+	-
"	347	P	17	126	0	-1	+	-
"	348	P	17	148	0	-1	+	-
"	349	P	11	173	0	0	+	-
"	350	P	11	116	0	1	+	-
"	351	P	11	149	0	-1	+	-
"	352	P	11	145	0	1	+	-
"	353	P	11	125	0	-1	+	-
"	354	P	11	120	0	-1	+	-
"	355	L	4	133	0	-1	+	-
"	357	P	20	150	0	2	+	-

Appendix Table 47.—Continued.

Date	Mortality number	Test a/ group	Tank number	Fork length (mm)	BKD b/ lesions	BKD c/ IFAT	Vibriosis	Osmoregulatory failure
5/26	358	P	20	140	0	1	+	-
"	359	P	20	120	0	-1	+	-
"	360	P	20	160	0	-1	+	-
"	361	P	20	180	0	-1	+	-
"	362	P	20	142	0	1	+	-
"	363	P	20	148	0	2	+	-
"	364	P	20	127	0	-1	+	-
"	365	P	20	150	0	2	+	-
"	366	P	20	130	0	3	+	-
"	367	P	20	138	0	3	+	-
"	368	P	20	135	0	-1	+	-
"	369	P	20	135	0	-1	+	-
"	370	P	20	138	0	-1	+	-
"	371	P	19	145	0	3	+	-
"	372	P	19	124	0	3	+	-
"	373	P	19	115	0	-1	+	-
"	374	P	19	105	0	-1	+	-
"	375	P	19	145	0	-1	+	-
"	376	P	19	120	0	2	+	-
"	377	P	19	120	0	2	+	-
"	379	P	12	167	0	1	+	-
"	380	L	2	148	0	1	+	-
"	381	L	2	145	0	1	+	-
"	382	L	2	130	0	1	+	-
"	383	L	2	109	0	3	+	-
"	384	L	6	130	0	3	+	-
"	385	L	6	119	0	1	+	-
"	386	L	6	140	0	1	+	-
"	387	P	15	155	0	-1	+	-
"	388	P	15	123	0	-1	+	-
"	389	P	15	140	0	-1	+	-
"	390	P	15	127	0	1	+	-
"	391	P	15	132	0	1	+	-
"	392	P	15	123	0	-1	+	-
"	393	P	15	119	0	1	+	-
"	394	P	15	120	0	2	+	-
"	395	P	18	119	0	2	+	-
"	396	L	18	133	0	3	+	-
"	397	P	18	121	0	2	+	-
"	398	L	10	151	0	3	+	-
"	399	L	9	152	0	3	+	-
"	400	L	4	143	0	1	+	-
"	401	L	4	129	0	1	+	-
"	402	L	6	152	0	1	+	-
"	403	L	6	128	0	2	+	-
"	404	L	6	139	0	2	+	-
"	405	P	18	144	0	1	+	-
"	406	P	11	134	0	2	+	-
"	407	P	11	132	0	2	+	-
"	408	P	11	125	0	3	+	-
"	409	P	11	136	0	3	+	-
"	410	P	11	142	0	3	+	-

Appendix Table 47.—Continued.

Date	Mortality number	Test a/ group	Tank number	Fork length (mm)	BKD b/ lesions	BKD c/ IFAT	Vibriosis	Osmoregulatory failure
5/26	411	P	11	128	0	3	+	-
"	412	P	16	159	0	1	+	-
"	413	P	15	124	0	2	+	-
"	414	P	17	123	0	3	+	-
"	415	P	17	127	0	2	+	-
"	416	P	14	133	0	2	+	-
"	417	P	14	130	0	3	+	-
"	418	P	13	123	0	2	+	-
"	419	P	13	124	0	2	+	-
"	420	P	13	125	0	2	+	-
"	421	P	13	138	0	-1	+	-
"	422	P	13	144	0	1	+	-
"	423	P	13	121	0	-1	+	-
"	424	P	13	133	3	3	+	-
"	425	P	12	130	0	-1	+	-
5/27	426	P	12	120	0	-1	+	-
"	427	P	12	130	0	1	+	-
"	428	P	12	140	0	1	+	-
"	429	P	12	135	0	1	+	-
"	430	P	20	131	0	-1	+	-
"	431	P	20	150	0	-1	+	-
"	432	P	20	133	0	-1	+	-
"	433	P	20	132	0	-1	+	-
"	434	P	20	130	0	-1	+	-
"	435	P	19	142	0	-1	+	-
"	436	P	19	118	1	3	+	-
"	437	P	19	160	0	1	+	-
"	438	P	19	141	0	0	+	-
"	439	P	19	160	0	-1	+	-
"	440	P	19	146	0	1	+	-
"	441	P	19	139	0	-1	+	-
"	442	P	19	123	0	-1	+	-
"	443	P	19	139	0	2	+	-
"	444	P	19	120	0	-1	+	-
"	445	P	19	130	0	-1	+	-
"	446	P	19	126	0	-1	+	-
"	447	P	19	147	0	1	+	-
"	448	P	19	129	0	-1	+	-
5/28	449	P	12	188	0	-1	+	-
"	450	P	12	171	0	-1	+	-
"	451	P	18	99	0	0	+	-
"	452	P	18	140	0	-1	+	-
"	453	P	18	160	0	0	+	-
"	454	P	18	131	0	-1	+	-
"	455	P	18	120	0	0	+	-
"	456	P	18	185	0	0	+	-
"	457	P	18	131	0	-1	+	-
"	458	P	15	140	0	-1	+	-
"	459	P	15	146	0	0	+	-
"	460	P	15	138	0	-1	+	-
"	461	P	13	141	0	-1	+	-
"	462	P	13	160	0	1	+	-

Appendix Table 47.—Continued.

Date	Mortality number	Test a/ group	Tank number	Fork length (mm)	BKD b/ lesions	BKD c/ IFAT	Vibriosis	Osmoregulatory failure
5/28	463	P	13	126	0	2	+	-
"	464	P	19	141	0	1	+	-
"	465	P	19	123	0	-1	+	-
"	466	P	19	133	0	-1	+	-
5/29	467	P	20	123	0	-1	+	-
"	468	P	20	136	0	1	+	-
"	469	P	17	156	0	-1	+	-
"	470	P	17	160	0	-1	+	-
"	471	P	17	158	0	-1	+	-
"	472	P	19	145	0	-1	+	-
"	473	P	19	143	0	-1	+	-
"	474	P	18	136	0	-1	+	-
"	475	P	18	158	0	-1	+	-
"	476	P	18	126	0	-1	+	-
"	477	P	18	142	0	-1	+	-
"	478	P	18	122	0	-1	+	-
"	479	L	4	130	0	-1	+	-
"	480	L	4	128	0	-1	+	-
"	481	L	2	150	0	-1	+	-
"	482	L	2	118	0	-1	+	-
"	483	L	2	135	0	0	+	-
"	484	L	2	160	0	-1	+	-
5/30	485	P	12	121	0	-1	+	-
"	486	P	12	150	0	-1	+	-
"	487	P	14	133	0	-1	+	-
"	488	P	14	129	0	-1	+	-
"	489	P	14	138	0	-1	+	-
"	490	P	14	128	0	-1	+	-
"	491	P	14	131	0	2	+	-
"	492	P	13	132	0	-1	+	-
"	493	P	13	129	0	-1	+	-
"	494	P	18	146	0	-1	+	-
"	495	P	18	151	0	-1	+	-
"	496	P	19	121	0	-1	+	-
"	497	P	19	149	0	1	+	-
"	498	P	20	126	0	-1	+	-
"	499	L	6	171	0	-1	+	-
"	500	P	15	148	0	-1	+	-
"	501	P	15	140	0	-1	+	-
"	502	P	15	131	0	-1	+	-
"	503	L	10	143	0	-1	+	-
"	504	L	10	141	0	-1	+	-
5/31	505	L	9	151	0	1	+	-
"	506	L	3	156	0	1	+	-
"	507	L	3	141	0	-1	+	-
"	508	L	3	128	0	-1	+	-
"	509	L	3	158	0	-1	+	-
"	510	L	3	135	0	-1	+	-
"	511	P	17	136	0	-1	+	-
"	512	P	19	119	0	-1	+	-
"	513	P	19	149	0	-1	+	-
"	514	P	19	125	0	-1	+	-

Appendix Table 47.—Continued.

Date	Mortality number	Test <u>a/</u> group	Tank number	Fork length (mm)	BKD <u>b/</u> lesions	BKD <u>c/</u> IFAT	Vibriosis	Osmoregulatory failure
5/31	515	P	13	133	0	2	+	-
"	516	P	13	123	0	-1	+	-
"	517	L	6	143	0	-1	+	-
"	518	L	6	149	0	-1	+	-
"	519	L	6	146	0	-1	+	-
"	520	L	6	126	0	-1	+	-
"	521	P	18	136	0	-1	+	-
"	522	P	18	141	0	-1	+	-
"	523	P	18	148	0	-1	+	-
"	524	P	18	136	0	-1	+	-
"	525	P	18	138	0	-1	+	-
"	526	P	12	141	0	-1	+	-
"	527	P	12	122	0	-1	+	-
"	528	P	12	133	0	-1	+	-
"	529	P	12	149	0	-1	+	-
"	530	P	12	155	0	-1	+	-
"	531	L	5	149	0	3	+	-
"	532	L	5	144	0	2	+	-
"	533	P	15	134	0	-1	+	-
"	534	L	4	142	0	-1	+	-
6/01	535	P	20	133	0	-1	+	-
"	536	L	10	143	0	-1	+	-
"	537	P	14	146	0	-1	+	-
"	538	P	14	148	0	-1	+	-
"	539	P	14	135	0	-1	+	-
"	540	P	18	134	0	1	+	-
"	541	P	18	135	0	-1	+	-
"	542	P	20	140	0	-1	+	-
"	543	P	20	163	0	-1	+	-
"	544	P	19	143	0	-1	+	-
"	545	P	19	128	0	-1	+	-
"	546	L	1	130	0	-1	+	-
"	547	L	3	136	0	2	+	-
"	548	L	3	168	0	-1	+	-
"	549	L	3	112	0	-1	+	-
"	550	L	3	131	0	-1	+	-
"	551	L	3	132	0	-1	+	-
"	552	L	6	138	0	-1	+	-
"	553	L	6	131	0	-1	+	-
6/03	554	L	1	122	0	-1	+	-
"	555	L	1	148	0	2	+	-
"	556	L	1	116	0	-1	+	-
"	557	L	1	121	0	-1	+	-
"	558	L	1	118	0	2	+	-
"	559	L	1	135	0	3	+	-
"	560	L	3	146	0	-1	+	-
"	561	L	3	165	0	-1	+	-
"	562	L	3	138	0	3	+	-
"	563	L	3	138	0	-1	+	-
"	564	L	3	142	0	-1	+	-
"	565	L	4	139	0	-1	+	-
"	566	L	4	140	0	1	+	-

Appendix Table 47.—Continued.

Date	Mortality number	Test <u>a</u> / group	Tank number	Fork length (mm)	BKD <u>b</u> / lesions	BKD <u>c</u> / IFAT	Vibriosis	Osmoregulatory failure
6/03	567	L	4	136	0	1	+	-
"	568	L	5	142	0	2	+	-
"	569	L	5	139	0	-1	+	-
"	570	L	5	138	0	1	+	-
"	571	L	5	139	0	3	+	-
"	572	L	5	143	0	-1	+	-
"	573	L	5	150	0	-1	+	-
"	574	L	8	138	0	-1	+	-
"	575	L	9	140	0	-1	+	-
"	576	P	11	138	0	-1	+	-
"	577	P	11	127	0	-1	+	-
"	578	P	11	142	0	3	+	-
"	579	P	11	145	0	3	+	-
"	580	P	12	138	0	-1	+	-
"	581	P	12	136	0	-1	+	-
"	582	P	13	165	0	-1	+	-
"	583	P	13	140	0	-1	+	-
"	584	P	13	139	0	3	+	-
"	585	P	13	142	0	-1	+	-
"	586	P	14	139	0	-1	+	-
"	587	P	14	136	0	-1	+	-
"	588	P	14	141	0	-1	+	-
"	589	P	14	140	0	-1	+	-
"	590	P	18	110	0	1	+	-
"	591	P	19	125	0	-1	+	-
6/04	592	P	14	130	0	-1	+	-
"	593	L	5	146	1	-1	+	-
"	594	L	5	133	0	-1	+	-
"	595	L	5	123	0	-1	+	-
"	596	P	15	119	0	1	+	-
"	597	P	13	153	0	-1	+	-
"	598	P	20	146	0	-1	+	-
"	599	L	3	133	0	-1	+	-
"	600	L	3	143	0	-1	+	-
6/05	601	P	16	131	0	-1	+	-
"	602	P	16	128	0	-1	+	-
"	603	P	16	125	0	-1	+	-
"	604	P	15	148	0	-1	+	-
"	605	P	20	155	0	-1	+	-
"	606	P	20	123	0	-1	+	-
"	607	P	20	171	0	-1	+	-
"	608	L	1	131	0	1	+	-
"	609	L	1	154	0	-1	+	-
"	610	L	7	126	0	-1	+	-
"	611	L	7	130	0	-1	+	-
"	612	L	3	131	0	-1	+	-
"	613	L	3	144	0	1	+	-
"	614	P	12	135	0	-1	+	-
"	615	L	4	149	0	-1	+	-
"	616	L	8	126	0	-1	+	-
"	617	L	8	127	0	-1	+	-
"	618	L	8	143	0	*	+	-

Appendix Table 47.—Continued.

Date	Mortality number	Test <u>a</u> / group	Tank number	Fork length (mm)	BKD b/ lesions	BKD <u>c</u> / IFAT	Vibriosis	Osmoregulatory failure
6/05	619	L	10	121	0	*	+	-
"	620	L	10	132	0	*	+	-
"	621	L	10	145	0	*	+	-
"	622	L	10	141	0	*	+	-
"	623	L	5	122	0	*	+	-
"	624	L	5	124	0	*	+	-
"	625	L	5	138	0	*	+	-
"	626	L	5	132	0	-1	+	-
"	627	L	5	141	0	-1	+	-
"	628	L	5	134	0	-1	+	-
"	629	L	9	153	0	-1	+	-
"	630	L	9	133	0	-1	+	-
"	631	L	3	142	0	-1	+	-
6/07	632	L	5	136	0	-1	+	-
"	633	L	5	152	0	-1	+	-
"	634	L	5	148	0	-1	+	-
"	635	L	8	132	0	-1	+	-
"	636	L	8	121	0	-1	+	-
"	637	L	8	130	0	-1	+	-
"	638	L	2	125	0	-1	+	-
6/08	639	L	5	144	0	-1	+	-
"	640	L	5	136	0	-1	+	-
"	641	L	5	122	0	-1	+	-
"	642	L	5	129	0	-1	+	-
"	643	L	5	130	0	-1	+	-
"	644	L	5	132	0	-1	+	-
"	645	L	5	140	0	-1	+	-
"	646	L	8	149	0	-1	+	-
"	647	L	8	138	0	-1	+	-
"	648	L	8	136	0	-1	+	-
"	649	L	8	142	0	-1	+	-
"	650	L	8	151	0	-1	+	-
"	651	L	8	149	0	-1	+	-
"	652	L	8	152	0	-1	+	-
"	653	L	3	141	0	-1	+	-
"	654	P	20	136	0	-1	+	-
"	655	P	20	140	0	-1	+	-
6/09	656	L	8	120	0	-1	+	-
"	657	L	8	146	0	-1	+	-
"	658	L	8	140	1	-1	+	-
"	659	L	8	149	0	-1	+	-
"	660	L	8	140	0	-1	+	-
"	661	L	8	133	0	-1	+	-
"	662	L	1	149	0	-1	+	-
"	663	L	1	139	2	-1	+	-
6/10	664	L	1	111	0	-1	+	-
"	665	L	1	149	0	-1	+	-
"	666	L	1	150	0	-1	+	-
"	667	L	3	124	0	0	+	-
"	668	L	5	152	0	-1	+	-
"	669	L	7	173	0	0	+	-
"	670	L	7	131	0	0	+	-

Appendix Table 47.—Continued.

Date	Mortality number	Test a/ group	Tank number	Fork length (mm)	EKD b/ lesions	EKD c/ IFAT	Vibriosis	Osmoregulatory failure
6/10	671	L	7	126	0	-1	+	-
"	672	L	9	134	0	-1	+	-
"	673	L	9	150	0	-1	+	-
"	674	L	9	136	0	0	+	-
"	675	L	5	137	0	-1	+	-
"	676	L	5	142	0	-1	+	-
"	677	L	5	151	0	-1	+	-
"	678	L	5	139	0	0	+	-
6/11	679	L	8	125	0	0	+	-
"	680	L	8	127	0	-1	+	-
"	681	L	10	132	0	-1	+	-
"	682	L	1	169	0	-1	+	-
"	683	L	1	130	0	-1	+	-
"	684	P	13	164	0	-1	+	-
"	685	P	13	132	0	-1	+	-
"	686	P	11	172	0	-1	+	-
"	687	L	6	130	0	-1	+	-
6/13	688	P	12	118	0	-1	+	-
"	689	P	12	135	0	-1	+	-
"	690	P	20	142	0	-1	+	-
"	691	L	8	161	0	-1	+	-
"	692	L	8	120	0	-1	+	-
"	693	P	13	135	0	-1	+	-
6/14	694	P	12	141	0	-1	+	-
"	695	L	8	125	0	-1	+	-
6/15	696	P	20	132	0	-1	+	-
"	697	P	14	147	0	-1	+	-
"	698	L	6	139	0	-1	+	-
"	699	L	3	132	0	0	+	-
"	700	L	9	131	0	0	+	-
6/17	701	L	3	122	0	-1	+	-
"	702	P	20	142	0	-1	+	-
"	703	P	20	143	0	-1	+	-
"	704	L	2	136	0	-1	+	-
"	705	L	2	140	0	3	+	-
"	706	P	19	131	0	-1	+	-
"	707	P	17	133	0	-1	+	-
"	708	P	16	151	0	-1	+	-
6/18	709	L	5	134	0	-1	+	-
"	710	P	18	136	0	-1	+	-
"	711	L	7	126	0	-1	+	-
"	712	L	7	146	0	-1	+	-
6/20	713	P	14	153	1	-1	+	-
"	714	P	17	148	0	1	+	-
"	715	P	20	128	0	2	+	-
"	716	P	20	130	0	-1	+	-
"	717	P	18	120	0	0	+	-
"	718	P	18	141	0	0	+	-
6/21	719	P	18	143	0	0	+	-
"	720	L	5	138	0	3	-	-
"	721	P	14	142	0	-1	+	-
6/22	722	P	13	145	0	-1	+	-

Appendix Table 47.—Continued.

Date	Mortality number	Test a/ group	Tank number	Fork length (mm)	BKD b/ lesions	BKD c/ IFAT	Vibriosis	Osmoregulatory failure
6/22	723	L	2	143	0	-1	+	-
"	724	P	18	151	0	0	+	-
"	725	P	18	112	0	0	+	-
"	726	P	18	136	0	-1	+	-
"	727	P	19	131	0	-1	+	-
"	728	P	19	128	0	0	+	-
"	729	P	16	136	0	0	+	-
"	730	L	2	122	0	0	+	-
6/25	731	P	19	153	0	0	+	-
"	732	P	18	173	0	-1	+	-
"	733	P	20	162	0	0	+	-
"	734	P	17	133	0	0	+	-
6/26	735	L	6	151	0	-1	+	-
"	736	P	19	144	0	-1	+	-
"	737	L	2	123	0	0	+	-
"	738	L	2	154	0	-1	+	-
6/27	739	P	14	138	0	0	+	-
"	740	P	15	123	0	-1	+	-
"	741	L	6	141	0	0	+	-
"	742	L	5	134	0	-1	+	-
"	743	L	5	127	3	3	-	-
"	744	P	13	134	0	2	+	-
"	745	P	13	141	0	2	+	-
"	746	L	7	137	0	-1	+	-
"	747	P	20	131	0	-1	+	-
6/28	748	P	17	142	0	1	+	-
"	749	P	17	127	0	2	+	-
"	750	P	11	132	0	-1	+	-
"	751	P	11	147	0	1	+	-
"	752	P	12	125	3	1	-	-
"	753	P	16	162	0	0	+	-
6/29	754	P	13	136	0	0	+	-
"	755	L	7	142	0	0	+	-
"	756	P	20	140	2	-1	+	-
"	757	P	18	123	0	0	+	-
"	758	P	17	143	0	0	+	-
"	759	P	17	141	0	0	+	-
"	760	L	8	144	0	-1	+	-
"	761	L	8	153	0	0	+	-
"	762	L	2	138	0	0	+	-
"	763	L	3	129	0	2	+	-
"	764	P	19	177	3	3	-	-
"	765	L	7	116	0	1	+	-
"	766	P	18	136	0	-1	+	-
7/02	767	L	5	124	0	1	+	-
"	768	L	5	141	0	-1	+	-
"	769	P	11	156	0	2	+	-
"	770	L	6	134	0	-1	+	-
"	771	P	18	146	0	-1	+	-
"	772	P	19	87	0	2	+	-
"	773	P	19	121	0	2	+	-
"	774	P	19	136	0	-1	+	-

Appendix Table 47.—Continued.

Date	Mortality number	Test a/ group	Tank number	Fork length (mm)	HKD b/ lesions	HKD c/ IFAT	Vibriosis	Osmoregulatory failure
7/02	775	L	8	142	0	-1	+	-
"	776	P	12	131	0	-1	+	-
7/03	777	P	16	132	0	-1	+	-
"	778	P	15	125	3	-1	-	-
"	779	L	3	137	0	0	+	-
"	780	L	3	135	0	-1	+	-
"	781	P	19	133	0	-1	+	-
7/04	782	P	12	141	0	0	+	-
"	783	L	7	133	0	0	+	-
"	784	L	7	145	0	-1	+	-
"	785	L	7	147	0	0	+	-
"	786	L	7	150	0	0	+	-
"	787	L	7	127	0	0	+	-
"	788	L	7	130	0	0	+	-
"	789	L	7	111	0	1	+	-
"	790	P	17	148	0	-1	+	-
"	791	P	17	133	0	0	+	-
"	792	P	17	121	0	0	+	-
7/05	793	L	6	131	0	0	+	-
"	794	L	8	146	0	0	+	-
"	795	L	3	147	0	-1	+	-
"	796	P	11	154	0	0	+	-
"	797	P	11	143	0	0	+	-
"	798	P	11	138	0	-1	+	-
7/06	799	L	7	136	0	0	+	-
"	800	L	7	123	0	0	+	-
"	801	P	15	99	3	2	-	-
"	802	P	14	147	1	3	-	-
"	803	P	14	133	2	3	-	-
"	804	P	11	152	0	-1	-	-
7/07	805	P	20	160	4	3	-	-
"	806	P	20	139	0	0	+	-
"	807	P	19	120	1	3	-	-
"	808	P	18	159	0	3	-	-
"	809	P	18	122	2	1	-	-
"	810	P	18	152	1	0	-	-
"	811	P	14	123	2	3	-	-
"	812	P	14	136	0	0	+	-
"	813	P	11	133	0	0	+	-
"	814	P	11	125	0	0	+	-
"	815	P	11	158	0	0	+	-
"	816	P	12	109	1	-1	+	-
"	817	L	2	128	0	2	-	-
"	818	L	7	118	0	0	+	-
7/09	819	P	11	131	0	0	+	-
"	820	L	1	140	3	3	-	-
"	821	P	18	134	0	0	+	-
"	822	P	18	103	0	3	-	-
"	823	P	19	144	0	0	+	-
"	824	P	19	121	0	0	+	-
"	825	P	17	134	0	2	-	-
"	826	P	17	142	2	3	-	-

Appendix Table 47.—Continued.

Date	Mortality number	Test a/ group	Tank number	Fork length (mm)	HKD b/ lesions	HKD c/ IFAT	Vibriosis	Osmoregulatory failure
7/09	827	L	8	140	0	3	-	-
"	828	P	12	152	3	3	-	-
"	829	L	9	113	0	2	-	-
7/10	830	P	11	141	0	1	-	-
"	831	P	11	144	0	-1	-	-
"	832	P	19	150	0	0	-	-
7/11	833	L	5	131	3	2	-	-
"	834	L	6	125	0	2	-	-
"	835	P	11	122	0	-1	-	-
"	836	P	11	126	0	-1	-	-
"	837	P	11	140	0	0	-	-
"	838	P	12	141	0	-1	-	-
"	839	P	12	131	0	-1	-	-
"	840	P	13	124	0	-1	-	-
"	841	L	2	130	3	1	-	-
"	842	L	2	128	1	-1	-	-
7/12	843	P	17	126	3	-1	-	-
"	844	P	17	130	2	3	-	-
"	845	L	5	142	3	3	-	-
"	846	P	11	130	0	-1	-	-
"	847	L	6	140	0	2	-	-
"	848	L	6	152	0	-1	-	-
"	849	L	6	140	0	1	-	-
"	850	L	6	123	0	-1	-	-
"	851	L	9	158	3	1	-	-
"	852	P	20	163	0	-1	-	-
"	853	P	20	144	0	-1	-	-
"	854	P	19	152	2	1	-	-
"	855	P	19	128	0	-1	-	-
7/13	856	L	6	123	0	-1	-	-
"	857	L	1	120	0	-1	-	-
"	858	L	1	143	0	0	-	-
"	859	L	9	160	1	3	-	-
"	860	L	7	171	0	-1	-	-
"	861	L	7	116	0	1	-	-
"	862	L	7	120	0	0	-	-
"	863	P	13	166	0	1	-	-
"	864	P	13	127	0	2	-	-
"	865	P	13	151	0	2	-	-
"	866	P	11	138	3	3	-	-
"	867	P	11	140	0	1	-	-
"	868	P	11	138	0	-1	-	-
7/14	869	L	2	146	3	3	-	-
"	870	L	3	138	2	2	-	-
"	871	L	3	142	0	3	-	-
"	872	L	4	148	1	3	-	-
"	873	L	4	142	0	3	-	-
"	874	L	5	138	3	3	-	-
"	875	L	7	164	2	1	-	-
"	876	L	7	146	2	1	-	-
"	877	L	8	140	1	1	-	-
"	878	L	9	137	0	-1	-	-

Appendix Table 47.— Continued.

Date	Mortality number	Test a/ group	Tank number	Fork length (mm)	HKD b/ lesions	HKD c/ IFAT	Vibriosis	Osmoregulatory failure
7/14	879	P	11	135	1	-1	-	-
"	880	P	11	128	2	2	-	-
"	881	P	13	175	1	3	-	-
"	882	P	13	176	0	0	-	-
"	883	P	13	125	2	-1	-	-
"	884	P	13	136	2	1	-	-
"	885	P	15	143	2	2	-	-
"	886	P	15	152	1	3	-	-
"	887	P	15	139	0	3	-	-
"	888	P	17	126	2	3	-	-
"	889	P	17	126	3	3	-	-
"	890	P	13	-	-	3	-	-
7/15	891	L	7	134	1	-1	-	-
"	892	L	9	150	3	3	-	-
"	893	L	10	158	3	3	-	-
"	894	P	11	143	0	-1	-	-
"	895	P	15	109	1	2	-	-
"	896	P	16	142	3	2	-	-
"	897	P	19	130	3	2	-	-
"	898	P	19	133	3	3	-	-
"	899	P	20	-	3	1	-	-
7/16	900	P	15	142	1	1	-	-
"	901	L	5	152	3	3	-	-
"	902	P	19	165	3	3	-	-
"	903	P	19	140	0	-1	-	-
"	904	L	4	111	3	-1	-	-
"	905	P	14	150	1	2	-	-
"	906	L	9	128	0	-1	-	-
7/17	907	P	18	151	0	1	-	-
"	908	L	7	166	2	3	-	-
"	909	L	7	132	1	2	-	-
"	910	L	7	129	0	1	-	-
"	911	L	7	140	1	1	-	-
"	912	P	16	151	0	3	-	-
"	913	P	11	133	0	-1	-	-
"	914	P	14	168	3	1	-	-
"	915	P	14	112	4	3	-	-
"	916	L	6	113	3	3	-	-
"	917	P	15	118	1	1	-	-
"	918	P	17	160	1	1	-	-
"	919	L	1	133	3	2	-	-
"	920	L	3	144	3	2	-	-
"	921	L	3	127	1	-1	-	-
"	922	P	12	153	0	-1	-	-
"	923	P	12	142	4	3	-	-
"	924	P	11	141	2	3	-	-
"	925	P	11	130	0	-1	-	-
"	926	P	13	123	0	0	-	-
"	927	L	7	147	0	2	-	-
"	928	L	7	117	2	3	-	-
"	929	L	7	123	0	1	-	-
"	930	L	7	137	0	1	-	-

Appendix Table 47.—Continued.

Date	Mortality number	Test a/ group	Tank number	Fork length (mm)	BKD b/ lesions	BKD c/ IFAT	Vibriosis	Osmoregulatory failure
7/17	931	P	15	126	3	3	-	-
7/19	932	L	7	146	1	1	-	-
"	933	L	7	121	0	1	-	-
"	934	L	6	110	0	-1	-	-
"	935	L	6	133	1	1	-	-
"	936	L	5	157	3	2	-	-
"	937	P	13	139	0	-1	-	-
"	938	L	3	141	2	1	-	-
"	939	P	12	138	0	-1	-	-
"	940	P	19	137	0	2	-	-
"	941	P	19	128	0	-1	-	-
7/20	942	P	17	184	3	1	-	-
"	943	L	5	121	0	2	-	-
"	944	P	16	140	1	1	-	-
"	945	P	16	135	3	3	-	-
"	946	L	8	114	0	0	-	-
"	947	L	8	126	1	*	-	-
"	948	L	9	140	0	*	-	-
"	949	L	9	142	0	1	-	-
"	950	L	4	129	0	-1	-	-
7/21	951	L	4	133	1	1	-	-
"	952	L	4	130	3	3	-	-
"	953	L	4	126	1	1	-	-
"	954	L	4	128	0	0	-	-
"	955	L	6	124	1	1	-	-
"	956	L	6	126	2	3	-	-
"	957	L	7	129	0	2	-	-
"	958	L	7	144	3	3	-	-
"	959	L	10	137	0	3	-	-
"	960	L	10	115	0	2	-	-
"	961	L	10	125	0	0	-	-
"	962	L	10	108	0	2	-	-
"	963	P	12	105	2	3	-	-
"	964	P	12	143	3	3	-	-
"	965	P	11	149	1	2	-	-
"	966	P	15	127	2	3	-	-
"	967	P	17	138	1	2	-	-
"	968	P	18	116	2	3	-	-
"	969	P	19	148	1	1	-	-
"	970	L	7	134	0	-1	-	-
"	971	L	4	125	1	2	-	-
"	972	L	3	133	1	3	-	-
"	973	L	3	136	1	1	-	-
"	974	L	1	137	0	-1	-	-
"	975	L	1	127	2	2	-	-
"	976	L	2	137	1	-1	-	-
7/22	977	P	13	160	1	2	-	-
"	978	P	16	166	1	1	+	-
7/23	979	L	1	132	0	-1	-	-
"	980	P	12	148	0	-1	-	-
"	981	L	4	137	1	1	-	-
"	982	L	4	126	1	1	+	-

Appendix Table 47.—Continued.

Date	Mortality number	Test <u>a</u> / group	Tank number	Fork length (mm)	BKD <u>b</u> / lesions	BKD <u>c</u> / IFAT	Vibriosis	Osmoregulatory failure
7/23	983	L	2	149	0	-1	-	-
"	984	P	15	173	0	-1	-	-
"	985	P	15	131	1	1	-	-
"	986	P	16	167	2	1	-	-
"	987	P	16	130	1	1	-	-
"	988	L	6	148	0	-1	-	-
"	989	L	6	137	0	-1	-	-
"	990	L	8	136	0	0	-	-
"	991	L	7	123	0	-1	-	-
"	992	L	7	133	0	-1	-	-
"	993	L	7	118	0	-1	-	-
"	994	L	7	121	0	-1	-	-
"	995	L	5	152	3	3	-	-
"	996	L	5	147	1	1	-	-
"	997	P	17	136	3	2	-	-
"	998	L	10	143	0	-1	-	-
"	999	L	9	157	2	1	-	-
7/24	1000	P	11	143	3	1	-	-
"	1001	P	11	131	3	3	-	-
"	1002	L	7	144	1	3	-	-
"	1003	P	19	131	0	0	-	-
"	1004	P	20	137	0	*	-	-
"	1005	P	17	143	0	-1	-	-
"	1006	P	17	131	2	2	-	-
"	1007	P	15	133	3	2	-	-
"	1008	P	15	130	1	3	-	-
"	1009	L	9	126	3	*	-	-
7/25	1010	L	2	154	0	-1	-	-
"	1011	L	2	145	3	3	-	-
"	1012	P	11	150	1	2	-	-
"	1013	P	11	148	3	3	-	-
"	1014	L	3	154	0	2	-	-
"	1015	L	4	128	1	2	-	-
"	1016	L	4	131	1	2	-	-
"	1017	L	5	140	3	2	-	-
"	1018	L	6	141	3	3	-	-
"	1019	P	19	120	1	2	-	-
"	1020	L	9	156	0	3	-	-
7/26	1021	P	12	137	3	3	-	-
"	1022	P	11	142	1	1	-	-
"	1023	L	6	130	2	1	-	-
"	1024	P	14	133	0	-1	-	-
"	1025	L	3	136	0	-1	-	-
"	1026	P	15	128	2	2	-	-
"	1027	P	16	178	3	3	-	-
7/27	1028	L	5	151	3	3	-	-
"	1029	L	5	132	3	3	-	-
"	1030	L	7	163	2	1	-	-
"	1031	L	7	136	3	1	-	-
"	1032	L	7	146	3	2	-	-
"	1033	L	8	141	3	2	-	-
"	1034	P	11	136	3	2	-	-

Appendix Table 47.—Continued.

Date	Mortality number	Test <u>a/</u> group	Tank number	Fork length (mm)	BKD <u>b/</u> lesions	BKD <u>c/</u> IFAT	Vibriosis	Osmoregulatory failure
7/27	1035	P	13	158	3	3	-	-
"	1036	P	14	110	3	3	-	-
"	1037	P	16	139	3	1	-	-
7/28	1038	L	1	158	3	3	-	-
"	1039	L	1	154	3	3	-	-
"	1040	L	4	115	2	2	-	-
"	1041	L	4	129	3	3	-	-
"	1042	L	5	113	3	3	-	-
"	1043	P	17	155	1	1	-	-
"	1044	P	18	138	3	2	-	-
"	1045	P	19	150	3	3	-	-
"	1046	L	1	141	3	3	-	-
"	1047	L	4	132	3	3	-	-
"	1048	L	6	124	2	3	-	-
"	1049	L	7	139	3	3	-	-
"	1050	P	14	159	3	3	-	-
7/30	1051	P	15	168	2	3	-	-
"	1052	P	15	150	3	3	-	-
"	1053	P	15	147	1	3	-	-
"	1054	P	16	154	3	3	-	-
"	1055	P	16	138	3	3	-	-
"	1056	L	5	193	1	2	-	-
"	1057	P	19	147	1	3	-	-
"	1058	P	19	156	0	-1	-	-
7/31	1059	L	5	172	2	2	-	-
"	1060	L	9	162	3	3	-	-
"	1061	P	17	159	3	3	-	-
"	1062	L	1	140	0	-1	-	-
"	1063	L	1	152	1	-1	-	-
"	1064	L	5	128	0	-1	-	-
8/01	1065	L	3	133	0	-1	-	-
"	1066	P	13	128	0	1	-	-
"	1067	P	13	144	1	1	-	-
"	1068	P	11	131	1	-1	-	-
"	1069	L	10	135	0	-1	-	-
"	1070	P	19	141	0	-1	-	-
"	1071	P	16	145	1	-1	-	-
"	1072	L	5	138	0	1	-	-
"	1073	L	8	142	1	1	-	-
8/02	1074	L	5	141	3	2	-	-
"	1075	L	5	138	2	3	-	-
"	1076	L	4	143	3	3	-	-
"	1077	L	4	138	2	3	-	-
"	1078	L	4	141	3	3	-	-
"	1079	L	4	152	3	3	-	-
"	1080	L	4	133	0	2	-	-
"	1081	L	4	128	1	2	-	-
"	1082	L	3	140	1	3	-	-
"	1083	L	3	146	2	3	-	-
"	1084	P	15	138	0	-1	-	-
"	1085	L	7	151	1	3	-	-
"	1086	P	7	167	2	2	-	-

Appendix Table 47.—Continued.

Date	Mortality number	Test a/ group	Tank number	Fork length (mm)	HKD b/ lesions	HKD c/ IFAT	Vibriosis	Osmoregulatory failure
8/02	1087	P	17	148	0	2	-	-
"	1088	P	13	137	0	2	-	-
"	1089	P	13	130	0	1	-	-
"	1090	P	13	151	1	2	-	-
"	1091	P	18	132	0	-1	-	-
"	1092	P	16	125	0	-1	-	-
8/03	1093	L	5	141	3	3	-	-
"	1094	L	5	145	2	3	-	-
"	1095	L	9	-	-	0	-	-
"	1096	L	6	153	3	3	-	-
"	1097	L	6	148	3	3	-	-
"	1098	L	6	151	3	3	-	-
"	1099	L	6	132	0	-1	-	-
"	1100	L	6	143	0	-1	-	-
"	1101	P	13	153	0	3	-	-
"	1102	P	13	156	1	3	-	-
"	1103	P	13	121	0	3	-	-
"	1104	P	17	203	0	1	-	-
"	1105	L	3	152	3	3	-	-
"	1106	L	3	121	3	3	-	-
"	1107	L	3	146	3	3	-	-
"	1108	L	3	138	3	3	-	-
"	1109	L	3	135	3	1	-	-
"	1110	L	5	128	3	2	-	-
"	1111	P	11	133	0	2	-	-
"	1112	P	11	-	-	3	-	-
"	1113	P	11	138	0	1	-	-
"	1114	P	11	121	0	-1	-	-
"	1115	P	11	130	0	-1	-	-
"	1116	L	4	125	0	2	-	-
"	1117	L	4	133	0	-1	-	-
"	1118	L	4	145	0	0	-	-
"	1119	L	4	145	0	-1	-	-
"	1120	P	16	152	0	-1	-	-
8/04	1121	P	11	-	0	-1	-	-
"	1122	L	1	159	1	2	-	-
"	1123	L	3	129	3	2	-	-
"	1124	L	5	115	3	3	-	-
"	1125	L	6	129	3	3	-	-
"	1126	L	7	119	3	3	-	-
"	1127	L	10	110	3	3	-	-
"	1128	P	11	129	2	2	-	-
"	1129	P	11	127	0	3	-	-
"	1130	P	12	135	2	1	-	-
"	1131	P	14	-	-	*	-	-
"	1132	P	15	128	3	3	-	-
"	1133	P	16	-	-	*	-	-
"	1134	P	16	143	3	1	-	-
"	1135	P	18	136	3	1	-	-
"	1136	P	20	158	3	3	-	-
8/05	1137	L	1	140	2	3	-	-
"	1138	L	4	145	3	3	-	-

Appendix Table 47.—Continued.

Date	Mortality number	Test a/ group	Tank number	Fork length (mm)	BKD b/ lesions	BKD c/ IFAT	Vibriosis	Osmoregulatory failure
8/05	1139	L	4	145	0	3	-	-
"	1140	L	9	135	3	3	-	-
"	1141	L	9	145	3	3	-	-
"	1142	P	11	138	0	-1	-	-
"	1143	P	12	145	3	3	-	-
"	1144	P	12	133	0	0	-	-
"	1145	P	13	158	1	0	-	-
"	1146	P	13	142	0	0	-	-
"	1147	P	15	158	3	1	-	-
"	1148	P	15	-	0	0	-	-
8/06	1149	L	6	129	3	3	-	-
"	1150	L	6	148	0	1	-	-
"	1151	L	4	158	1	3	-	-
"	1152	L	10	119	2	2	-	-
"	1153	L	10	129	1	0	-	-
"	1154	L	3	153	3	3	-	-
8/07	1155	P	15	139	3	3	-	-
"	1156	P	12	143	0	3	-	-
"	1157	P	12	140	0	2	-	-
"	1158	L	5	122	2	3	-	-
8/09	1159	P	17	137	0	0	-	-
"	1160	P	18	131	2	1	-	-
"	1161	L	7	142	3	3	-	-
"	1162	L	5	154	3	3	-	-
"	1163	P	13	130	3	1	-	-
8/10	1164	L	9	142	3	3	-	-
"	1165	L	9	137	3	3	-	-
"	1166	L	8	136	1	2	-	-
"	1167	L	1	134	1	3	-	-
"	1168	L	1	-	-	*	-	-
"	1169	P	12	141	0	1	-	-
"	1170	P	12	137	0	0	-	-
"	1171	P	12	138	1	0	-	-
8/12	1172	P	17	133	0	0	-	-
"	1173	P	17	128	0	0	-	-
"	1174	P	18	135	0	0	-	-
"	1175	P	18	141	0	0	-	-
"	1176	L	4	143	2	3	-	-
"	1177	L	4	152	1	3	-	-
"	1178	L	4	122	0	0	-	-
"	1179	L	3	137	3	2	-	-
"	1180	L	3	135	3	3	-	-
"	1181	L	3	142	2	3	-	-
"	1182	L	3	128	3	3	-	-
"	1183	P	12	144	3	3	-	-
"	1184	P	12	145	3	2	-	-
"	1185	P	12	138	1	3	-	-
"	1186	P	12	123	1	3	-	-
"	1187	P	12	146	3	3	-	-
"	1188	P	12	151	2	2	-	-
"	1189	L	1	153	1	3	-	-
"	1190	P	13	118	1	2	-	-

Appendix Table 47.— Continued.

Date	Mortality number	Test a/ group	Tank number	Fork length (mm)	BKD b/ lesions	BKD c/ IFAT	Vibriosis	Osmoregulatory failure
8/12	1191	P	13	120	1	2	-	-
8/13	1192	L	6	148	2	3	-	-
"	1193	L	6	150	2	3	-	-
"	1194	L	10	-	-	2	-	-
"	1195	L	4	154	0	1	-	-
"	1196	L	4	126	0	2	-	-
"	1197	L	4	134	1	2	-	-
"	1198	L	1	151	2	3	-	-
"	1199	L	1	122	0	-1	-	-
"	1200	P	16	149	0	1	-	-
"	1201	P	16	145	1	1	-	-
"	1202	P	15	136	0	1	-	-
8/14	1203	P	15	145	0	-1	-	-
"	1204	P	15	133	0	-1	-	-
"	1205	L	7	142	3	3	-	-
"	1206	L	7	140	3	3	-	-
"	1207	L	7	154	3	3	-	-
"	1208	L	3	127	3	3	-	-
"	1209	L	3	160	3	3	-	-
"	1210	L	3	150	1	3	-	-
"	1211	P	13	139	0	1	-	-
"	1212	P	12	132	2	2	-	-
"	1213	P	12	128	3	3	-	-
"	1214	P	12	141	2	2	-	-
"	1215	L	7	133	2	1	-	-
"	1216	L	3	128	3	3	-	-
"	1217	L	3	128	3	3	-	-
"	1218	L	8	147	0	-1	-	-
8/15	1219	L	4	145	3	2	-	-
"	1220	L	1	130	3	1	-	-
"	1221	L	7	127	3	3	-	-
"	1222	P	15	132	2	2	-	-
8/16	1223	L	3	142	2	3	-	-
"	1224	L	3	137	2	2	-	-
"	1225	L	1	157	0	2	-	-
"	1226	L	4	128	1	2	-	-
"	1227	L	4	137	0	3	-	-
"	1228	L	4	143	0	1	-	-
8/17	1229	L	1	151	3	2	-	-
"	1230	L	3	163	2	2	-	-
"	1231	L	7	172	3	1	-	-
8/18	1232	L	7	122	0	-1	-	-
"	1233	L	7	136	1	2	-	-
"	1234	P	17	141	0	0	-	-
"	1235	P	19	156	0	1	-	-
"	1236	L	4	147	0	-1	-	-
"	1237	L	4	-	-	*	-	-
"	1238	L	4	126	0	-1	-	-
"	1239	L	4	138	0	1	-	-
"	1240	L	4	135	0	-1	-	-
"	1241	L	4	133	0	-1	-	-
"	1242	L	4	-	-	*	-	-

Appendix Table 47.—Continued.

Date	Mortality number	Test a/ group	Tank number	Fork length (mm)	BKD b/ lesions	BKD c/ IFAT	Vibriosis	Osmoregulatory failure
8/18	1243	L	4	149	0	1	-	-
"	1244	P	11	128	0	-1	-	-
"	1245	P	11	137	0	0	-	-
"	1246	L	9	164	1	-1	-	-
"	1247	P	12	171	0	-1	-	-
"	1248	P	12	153	0	2	-	-
"	1249	L	5	141	0	1	-	-
"	1250	L	3	138	0	-1	-	-
8/19	1251	P	13	167	3	3	-	-
"	1252	P	13	158	3	3	-	-
"	1253	L	3	-	-	*	-	-
"	1254	L	2	146	0	0	-	-
"	1255	L	2	163	0	-1	-	-
"	1256	L	2	128	1	0	-	-
"	1257	L	2	167	0	0	-	-
"	1258	L	5	158	0	-1	-	-
"	1259	L	5	131	0	0	-	-
"	1260	L	5	-	-	0	-	-
"	1261	L	5	-	-	0	-	-
"	1262	L	9	141	0	2	-	-
"	1263	P	18	136	1	2	-	-
"	1264	P	18	127	2	2	-	-
"	1265	P	18	151	0	2	-	-
"	1266	L	10	168	0	-1	-	-
8/20	1267	L	10	145	0	0	-	-
"	1268	L	10	137	0	0	-	-
"	1269	L	10	162	0	0	-	-
"	1270	L	10	151	0	0	-	-
"	1271	P	16	173	3	2	-	-
"	1272	P	16	165	3	2	-	-
"	1273	P	16	168	3	3	-	-
"	1274	P	11	151	3	1	-	-
"	1275	P	11	142	3	2	-	-
"	1276	P	11	163	3	2	-	-
"	1277	P	11	154	3	2	-	-
8/23	1279	P	19	153	0	0	-	-
"	1280	L	10	148	3	1	-	-
"	1281	L	10	161	3	-1	-	-
"	1282	L	3	151	3	1	-	-
"	1283	L	3	154	3	1	-	-
"	1284	L	6	144	3	1	-	-
"	1285	L	6	127	3	1	-	-
"	1286	L	6	138	3	1	-	-
"	1287	L	6	151	3	1	-	-
8/24	1288	P	13	160	0	-1	-	-
"	1289	P	13	145	0	-1	-	-
"	1290	P	18	156	3	1	-	-
"	1291	P	18	163	3	-1	-	-
"	1292	P	18	157	3	-1	-	-
"	1293	P	18	148	3	2	-	-
"	1294	P	18	145	3	2	-	-
"	1295	L	4	145	3	2	-	-

Appendix Table 47.—Continued.

Date	Mortality number	Test a/ group	Tank number	Fork length (mm)	BKD b/ lesions	BKD c/ IFAT	Vibriosis	Osmoregulatory failure
8/24	1296	P	12	127	0	3	-	-
"	1297	P	12	133	1	2	-	-
"	1298	L	2	120	0	2	-	-
"	1299	L	2	156	0	2	-	-
"	1300	L	7	148	0	3	-	-
"	1301	L	7	166	0	3	-	-
"	1302	L	7	153	2	3	-	-
"	1303	L	1	155	0	-1	-	-
8/26	1304	L	2	120	-	2	-	-
"	1305	L	3	135	0	1	-	-
"	1306	L	4	135	0	1	-	-
"	1307	L	4	-	-	0	-	-
"	1308	L	4	130	0	0	-	-
"	1309	L	4	135	0	-1	-	-
"	1310	L	7	160	0	-1	-	-
"	1311	L	9	-	-	*	-	-
"	1312	L	10	125	0	-1	-	-
"	1313	P	12	120	-	-1	-	-
"	1314	P	11	140	1	0	-	-
"	1315	P	11	158	2	1	-	-
"	1316	P	13	148	0	-1	-	-
"	1317	P	14	-	-	*	-	-
"	1318	P	15	150	3	1	-	-
"	1319	P	16	134	3	-1	-	-
"	1320	P	18	165	1	1	-	-
"	1321	P	19	148	3	3	-	-
"	1322	P	20	148	3	3	-	-
8/27	1323	L	5	153	3	3	-	-
"	1324	L	5	167	3	3	-	-
"	1325	L	4	147	3	3	-	-
8/28	1326	L	1	138	3	3	-	-
"	1327	L	1	140	3	3	-	-
"	1328	L	1	142	3	2	-	-
"	1329	L	1	161	3	2	-	-
"	1330	P	12	133	0	-1	-	-
8/30	1331	P	14	137	0	0	-	-
"	1332	L	5	158	1	1	-	-
"	1333	L	7	160	0	-1	-	-
"	1334	L	7	127	0	0	-	-
"	1335	P	18	-	-	0	-	-
"	1336	P	18	131	0	0	-	-
"	1337	L	4	152	0	-1	-	-
8/31	1338	P	16	138	2	-1	-	-
"	1339	L	10	142	3	2	-	-
"	1340	L	10	137	3	2	-	-
"	1341	L	9	-	-	*	-	-
"	1342	L	7	161	3	-1	-	-
"	1343	L	7	158	3	-1	-	-
"	1344	L	7	152	3	2	-	-
"	1345	L	7	167	3	-1	-	-
"	1346	P	15	148	0	-1	-	-
"	1347	P	15	151	0	-1	-	-

Appendix Table 47.—Continued.

Date	Mortality number	Test <u>a/</u> group	Tank number	Fork length (mm)	BKD <u>b/</u> lesions	BKD <u>c/</u> IFAT	Vibriosis	Osmoregulatory failure
8/31	1348	L	3	167	0	0	-	-
"	1349	L	3	153	0	0	-	-
"	1350	L	3	155	0	-1	-	-
"	1351	L	3	142	0	0	-	-
"	1352	L	3	-	-	*	-	-
"	1353	L	3	158	0	-1	-	-
"	1354	L	3	155	0	0	-	-
"	1355	P	11	137	0	0	-	-
"	1356	L	1	-	-	0	-	-
"	1357	L	1	179	0	-1	-	-

a/ L = Leavenworth Hatchery test group; P = Priest Rapids Dam test group.

b/ BKD lesion rankings

- 0 = No lesions observed
- 1 = Kidney appears swollen
- 2 = Possible lesions present (questionable)
- 3 = Visible lesions present

c/ BKD IFAT rankings

- 0 = No BKD organisms present in a minimum of 150 microscopic fields
- 1 = less than 1 BKD organism per microscopic field
- 2 = 10- 100 BKD organisms per microscopic field
- 3 = 100+ BKD organisms per microscopic field
- * = No Sample

Appendix Table 48.-- Fork lengths, BKD lesions rankings, and BKD IFAT rankings by tank number for the Leavenworth Hatchery test group when the pilot time-in-migration seawater holding study was terminated on 3 September, 1987. All fish were spring chinook salmon juveniles.

Tank number	Fork length (mm)	BKD lesions ^{a/}	BKD IFAT ^{b/}
1	149	0	0
"	146	0	-1
"	135	0	0
"	143	2	-1
"	156	2	1
"	150	2	-1
"	158	1	1
"	120	1	-1
"	148	0	0
"	167	-	-
"	152	-	-
"	172	-	-
"	144	-	-
"	136	-	-
"	151	-	-
"	141	-	-
"	131	-	-
"	163	-	-
"	168	-	-
"	147	-	-
"	150	-	-
"	164	-	-
"	130	-	-
"	133	-	-
"	156	-	-
"	167	-	-
"	138	-	-
"	147	-	-
"	129	-	-
"	151	-	-
2	140	3	1
"	158	0	0
"	160	3	1
"	159	0	0
"	145	3	3
"	130	3	2
"	154	0	0
"	148	0	0
"	130	0	0
"	158	3	1
"	143	2	-1

Appendix Table 48.--Continued.

Tank number	Fork length (mm)	BKD lesions ^{a/}	BKD IFAT ^{b/}
"	164	-	-
"	153	-	-
"	161	-	-
"	152	-	-
"	159	-	-
"	160	-	-
"	143	-	-
"	126	-	-
"	144	-	-
3	143	-	-
"	178	2	-1
"	141	0	0
"	132	3	-1
"	149	3	1
"	154	1	0
"	138	1	0
"	139	3	-1
"	156	0	0
"	135	0	0
"	173	-	-
"	182	-	-
"	151	-	-
"	158	-	-
"	162	-	-
"	178	-	-
"	153	-	-
"	148	-	-
"	143	-	-
"	152	-	-
"	150	-	-
"	154	-	-
"	148	-	-
4	125	3	2
"	130	0	0
"	140	0	0
"	128	3	-1
"	127	2	0
"	136	0	-1
"	151	0	0
"	148	1	0
"	134	0	0
"	135	0	0
"	166	-	-
"	147	-	-
"	173	-	-

Appendix Table 48.--Continued.

Tank number	Fork length (mm)	BKD lesions ^{a/}	BKD IFAT ^{b/}
"	160	-	-
"	148	-	-
"	151	-	-
"	131	-	-
"	133	-	-
"	141	-	-
"	161	-	-
5	166	0	0
"	170	3	3
"	132	2	1
"	134	2	-1
"	133	0	0
"	144	3	-1
"	150	2	1
"	138	1	0
"	191	-	-
"	137	-	-
"	154	-	-
"	156	-	-
"	168	-	-
"	160	-	-
"	151	-	-
5	142	-	-
"	139	-	-
"	134	-	-
"	147	-	-
"	133	-	-
6	166	3	1
"	124	2	0
"	176	2	0
"	158	1	-1
"	144	0	0
"	150	2	0
"	134	3	2
"	147	3	1
"	144	3	2
"	146	2	0
"	149	-	-
"	143	-	-
"	150	-	-
"	133	-	-
"	151	-	-
"	142	-	-
"	156	-	-
"	130	-	-

Appendix Table 48.--Continued.

Tank number	Fork length (mm)	BKD lesions ^{a/}	BKD IFAT ^{b/}
"	128	-	-
"	133	-	-
"	127	-	-
7	144	3	2
"	150	1	-1
"	160	3	1
"	159	3	3
"	161	2	-1
"	148	2	-1
"	136	1	0
"	131	3	3
"	142	2	1
8	178	1	0
"	201	3	1
"	137	3	1
"	150	0	-1
"	128	1	-1
9	158	1	0
"	140	2	-1
"	180	0	0
"	147	0	0
"	158	3	3
"	153	0	-1
"	124	2	-1
"	137	0	0
"	138	0	-1
"	133	1	0
"	161	-	-
"	178	-	-
"	164	-	-
"	152	-	-
"	140	-	-
"	160	-	-
"	153	-	-
"	161	-	-
"	163	-	-
"	144	-	-
"	158	-	-
"	155	-	-
"	168	-	-
"	152	-	-
"	163	-	-
"	129	-	-
"	146	-	-
"	148	-	-

Appendix Table 48.--Continued.

Tank number	Fork length (mm)	BKD lesions ^{a/}	BKD IFAT ^{b/}
9	138	-	-
10	150	1	0
"	160	0	-1
"	136	1	-1
"	147	2	-1
"	143	1	0
"	138	0	0
"	146	1	0
"	157	2	-1
"	144	0	-1
"	154	3	2
11	166	1	0
"	163	3	2
"	130	3	2
"	139	3	1
"	150	2	-1
"	138	0	-1
12	149	1	0
"	181	2	-1
"	175	0	-1
"	138	2	1
"	137	2	-1
"	160	0	0
"	178	3	2
"	128	3	3
"	157	0	0
13	178	2	1
"	167	3	2
"	158	0	0
"	139	0	-1
"	143	1	0
"	138	1	-1
"	139	0	-1
"	186	2	-1
14	138	3	2
"	158	1	0
"	170	1	-1
"	168	3	3
"	144	1	-1
"	164	3	2
"	140	3	1
"	137	2	2
"	122	0	0
15	179	3	3
"	159	0	0

Appendix Table 48.--Continued.

Tank number	Fork length (mm)	BKD lesions ^{a/}	BKD IFAT ^{b/}
15	155	3	1
"	142	3	2
"	150	1	-1
"	136	1	1
"	152	3	2
"	142	2	-1
"	156	2	-1
16	183	0	0
"	152	1	0
"	146	1	2
"	158	1	-1
17	168	1	-1
"	200	0	-1
"	160	0	0
"	160	0	0
"	134	3	3
18	174	0	0
"	143	2	1
"	202	2	1
"	135	1	1
19	161	3	3
"	158	2	-1
"	172	0	0
"	141	3	3
"	132	2	3
20	135	0	0
"	182	0	-1

a/ BKD lesion rankings

- 0 = No lesions observed
- 1 = Kidney appears swollen
- 2 = Possible lesions present (questionable)
- 3 = Visible lesions present

b/ BKD IFAT rankings same as other Tables

- 0 = No BKD organisms present in a minimum of 150 microscopic fields
- 1 = Less than 1 BKD organism per microscopic field
- 1 = 1-10 BKD organisms per microscopic field
- 2 = 10-100 BKD organisms per microscopic field
- 3 = 100+ BKD organisms per microscopic field
- * = No sample