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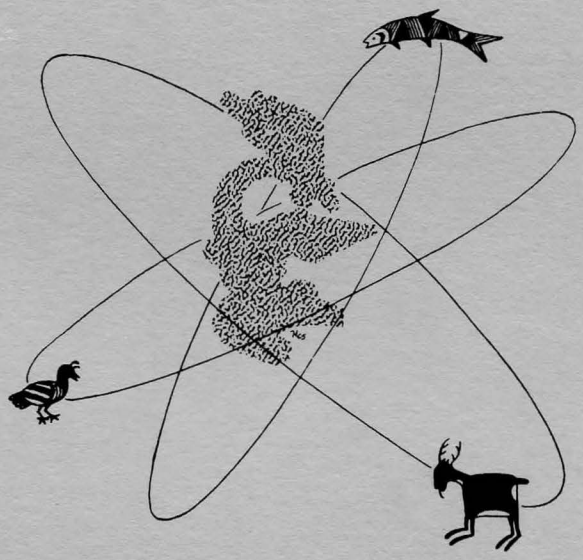

RESEARCH DIVISION

Oregon State Game Commission

DESCHUTES RIVER SUMMER STEELHEAD ECOLOGY

OREGON STATE GAME COMMISSION

Research Division

PROGRESS REPORT

DESCHUTES RIVER SUMMER STEELHEAD ECOLOGY

July 1, 1969 - December 1, 1970

Prepared by

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PROGRESS REPORT

Deschutes River summer steelhead ecology

I. Summary

Results of the first year of the Deschutes summer steelhead ecology and hatchery assessment studies are presented. In 1970 it was estimated that 12,723 anglers fished 56,671 hours to catch 2,708 steelhead. There were 190 adult steelhead captured with a 300' beach seine and electrofishing gear and tagged in 1970. Fourteen tag returns from anglers along with eight electrofishing recaptures of tagged fish indicated that summer steelhead might not move upstream rapidly. Downstream movement of steelhead smolts and fry was monitored on two tributaries. The peak movement of smolts occurred the first week in May. Little fry movement occurred in either stream.

Rearing programs were established at three Game Commission hatcheries to test the hypothesis that parr-smolt transformation is temperature or age dependent. The migration disposition of Deschutes steelhead reared in variable and constant temperature at the Corvallis laboratory was similar. All groups of summer steelhead reared at the laboratory displayed the usual vernal decrease in coefficient of condition in April and May followed by a marked increase in condition in June. Generally, sea-water survival stayed above 60 percent for all groups during the spring months.

II. Contents

This report covers the first year of a study of Deschutes summer steelhead ecology and factors limiting efficiency of hatchery production of summer steelhead smolts.

III. Background

Deschutes summer steelhead provide active angling recreation for several thousand fishing enthusiasts each year. The fish enter the Deschutes River from June through September and spawn the following spring. During that period they are subjected to several adverse environmental factors such as low flows, high temperature, disease, competition from undesirable species, dams, and long periods of exposure to anglers and predators. One or more of the factors has contributed to the decline of summer steelhead populations in the Deschutes River. Sound and successful management of steelhead and resident rainbow depends on a basic understanding of life history, ecological requirements, and their relationship to each other. The scope of the program is to gain an understanding of factors limiting efficiency of hatchery production of summer steelhead smolts and to gather the biological and ecological information needed to insure successful management of Deschutes summer steelhead and resident rainbow populations.

IV. Objectives

1. Determine the most efficient method of rearing Deschutes summer steelhead under hatchery conditions to attain maximal returns of hatchery-reared summer steelhead to the creel and augment the natural spawning population.

2. Determine migration characteristics, age structure, smolt characteristics and relative numbers of downstream migrant steelhead in the Deschutes River.

3. Determine migration characteristics, life history, relative size, and inter-relationship of adult summer steelhead and resident rainbow populations in the Deschutes River.

V. Procedures

Hatchery-rearing programs

A possible explanation for the low return of adult hatchery-reared summer steelhead is that the parr-smolt transformation is temperature or age dependent. In the past all juvenile steelhead released in the Deschutes River have been reared at hatcheries with water of constant temperature. Juvenile steelhead are presently being reared at constant and variable temperature hatcheries to test the hypothesis. The two groups will be marked differentially and released below the Pelton regulation reservoir. In addition, another group is being reared under variable water temperature for a two-year period to approximate the natural rearing cycle in the Deschutes River in order to test the age-dependency aspect. Experimental releases are planned for 1971-73.

Field investigations

A creel census program was established in order to estimate the catch of adult summer steelhead by sport anglers. The program extended from July 15, through October 31, 1970. The mainstem, downstream from Sherar's Bridge, was divided into three areas: (1) Webb's access road which extends from Buckhollow Creek 17 miles downstream on the east bank to Mack's Canyon (Figure 1), (2) Kloan (Freebridge) an area on the west bank of the river approximately seven miles above the mouth, and (3) boat and bank anglers at the mouth of the river. One weekend day and one weekday were sampled per week at each of the three areas. Weekends and weekdays were considered as separate strata. All sample days were selected from a table of random numbers. Each month was divided into two periods (1-15 and 16-31) for greater precision.

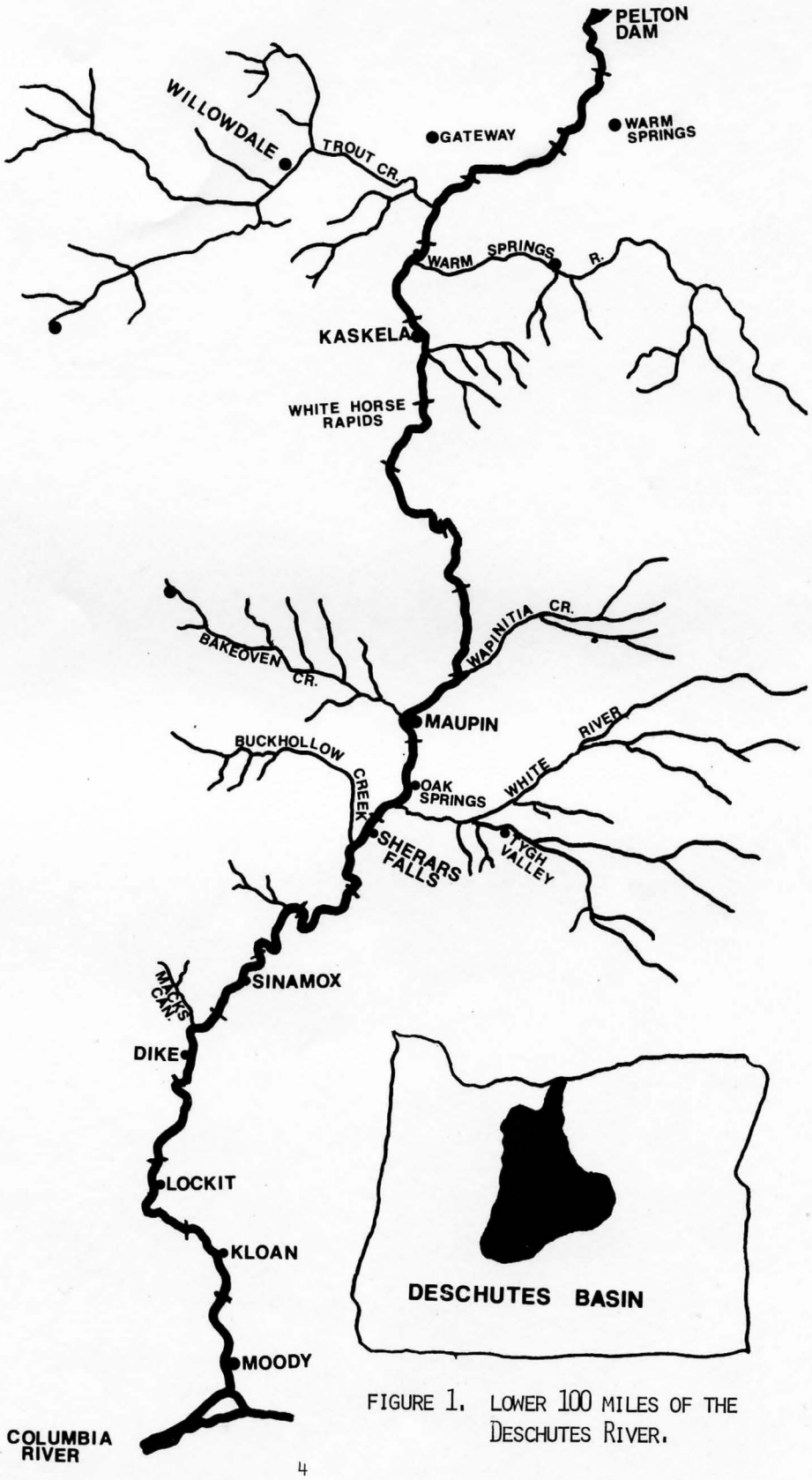

FIGURE 1. LOWER 100 MILES OF THE DESCHUTES RIVER.

The following symbols were used in the computations:

St = steelhead caught on any given day

H = total hours fished on any given day

A = total anglers interviewed on any given day

N = number of days in the sample period

K = number of days sampled in the sample period

%M = percentage of anglers missed on any given day.

On Webb's access road, the sample day began at 8 AM and continued until dark or until the last angler departed. The sampler remained at the Buckhollow area for the entire day interviewing each angler as he left the area. From the data collected each day at Webb's access road, the following items were computed:

(1) $\frac{N}{K} \Sigma$ St = $\hat{St}$, total estimated steelhead in any given stratum

(2) $\frac{N}{K} \Sigma \hat{H}$ = $\hat{H}$, total estimated hours fished in any given stratum

(3) $\frac{N}{K} \Sigma$ A = $\hat{A}$, total estimated anglers in any given stratum.

At the mouth of the river, the sample day began at 8 AM and continued until dark or until the last angler departed. The sampler interviewed all bank anglers as they finished fishing on both sides of the river and all boat anglers. A small percentage of bank anglers was missed on days with high angling pressure which was unavoidable when anglers left both sides of the river simultaneously. It was assumed that the anglers missed by the sampler caught steelhead at the same rate as the anglers interviewed. By expanding the anglers sampled by the percentage missed, a more accurate sample was obtained. Data collected on each sampling day during the month were used to compile the following items:

(1) $\frac{100A}{100-\%M}$ = Ac, corrected number of anglers for a given day

(2) $\frac{H}{A} \times Ac$ = Hc, corrected number of hours fished for a given day

(3) $\frac{St}{A} \times Ac$ = Stc, corrected number of steelhead caught on a given day

(4) $\frac{N}{K} \Sigma\ Ac$ = $\hat{A}$, total estimated anglers for any given stratum

(5) $\frac{N}{K} \Sigma\ Hc$ = $\hat{H}$, total estimated hours fished for any given stratum

(6) $\frac{N}{K} \Sigma\ St_c$ = $\hat{St}$, total estimated steelhead caught in any given stratum.

The sampling day at Kloan began at 1 PM and continued until dark or until the last angler was interviewed. A car counter was placed on the road leading to the Kloan area to measure total fishing pressure. From data collected on each sampling day, the following computations were made:

(1) Divide total number of anglers (A) for the days creeled by total cars (C) for the day creeled and multiply this by total numbers of cars counted by the mechanical car counter (Ct) to obtain the total number of anglers (A).

$\frac{A1}{C1} \times \frac{A2}{C2} \times Ct$ = $\hat{A}$, total estimated anglers in any given stratum.

(2) The same method of computations was used for hours fished and steelhead catch.

$\frac{H1}{C1} \times \frac{H2}{C2} \times (Ct)$ = $\hat{H}$, total estimated hours fished in any given stratum

$\frac{St1}{C1} \times \frac{St2}{C2} \times (Ct)$ = $\hat{St}$, total estimated steelhead in any given stratum.

Adult steelhead tagging program

The feasibility of capturing adult summer steelhead at the mouth of the Deschutes River was explored in September 1969. A 300-foot beach seine was used to capture 73 adult steelhead, each of which was marked with a spaghetti tag. During the summer months of 1970 the feasibility study was continued with a 300-foot beach seine and electrofishing gear at different locations on the river.

Juvenile steelhead downstream migrant trapping

In the spring of 1970 several trapping methods were employed in an attempt to capture downstream migrant steelhead. An inclined-plane trap was installed at a large diversion headgate on the lower Deschutes River. Three floating scoop traps and a 300-foot 1/2-inch mesh beach seine were used in other locations. Two small weirs were constructed on Bakeoven and Buckhollow creeks to monitor steelhead smolt and fry migration.

Laboratory studies

Five races of summer steelhead trout were reared from the fry stage through the normal migration period (June 1969 through June 11, 1970) at the Game Commission laboratory. One group of Deschutes summer steelhead was reared under a simulated natural seasonal water temperature cycle (6.9 to 18.6°C) while another group of Deschutes steelhead was reared under a constant water temperature (12°C). Skamania, Rogue, Umpqua, and Siletz summer steelhead were also reared under constant temperature for racial comparison.

Approximately 50 fish from each group were released each month in Crooked Creek about 3.5 miles above a weir to monitor migration disposition. Monthly stocking began February 20 and continued through June 11. A combination of fin clips and cold brands was used to

identify individual fish as to group and month of release. From a total of 500 fish placed in each rearing tank, 40 to 50 fish were sampled semi-monthly for changes in length and weight. Sea-water tolerance tests were initiated in January on all groups to provide additional information on the relation between sea-water tolerance and parr-smolt transformation. Small groups of fish were exposed to seawater (30 o/oo) by immediate transition from freshwater for 20-day periods. Plasma samples were obtained from the survivors of the two groups of Deschutes steelhead and osmotic concentrations determined.

VI. Findings

Hatchery rearing programs

A group of 25,000 juvenile Deschutes summer steelhead reared for one year under variable water temperature was released below the Pelton regulation reservoir in early May. A control group of 40,000 steelhead reared under constant water temperature was released at the same time. Because of a late egg take, the group reared under variable temperatures was released at a size of 9 fish/lb, after hand grading, whereas the control group reached a size of 6 fish/lb. A sample of 200 fish from the variable-temperature group was released into Crooked Creek above the weir at the same time the major release was made in the Deschutes River. About 35 percent of the fish released into Crooked Creek migrated downstream. A large percentage were under 15 cm in length (Figure 2). All of the migrants captured at the Crooked Creek weir were $\geq$ 15 cm in length. If the same size dependent migration pattern is applicable for the major release into the Deschutes, a large number of fish will probably remain in the stream. The downstream movement of the control fish reared under constant water

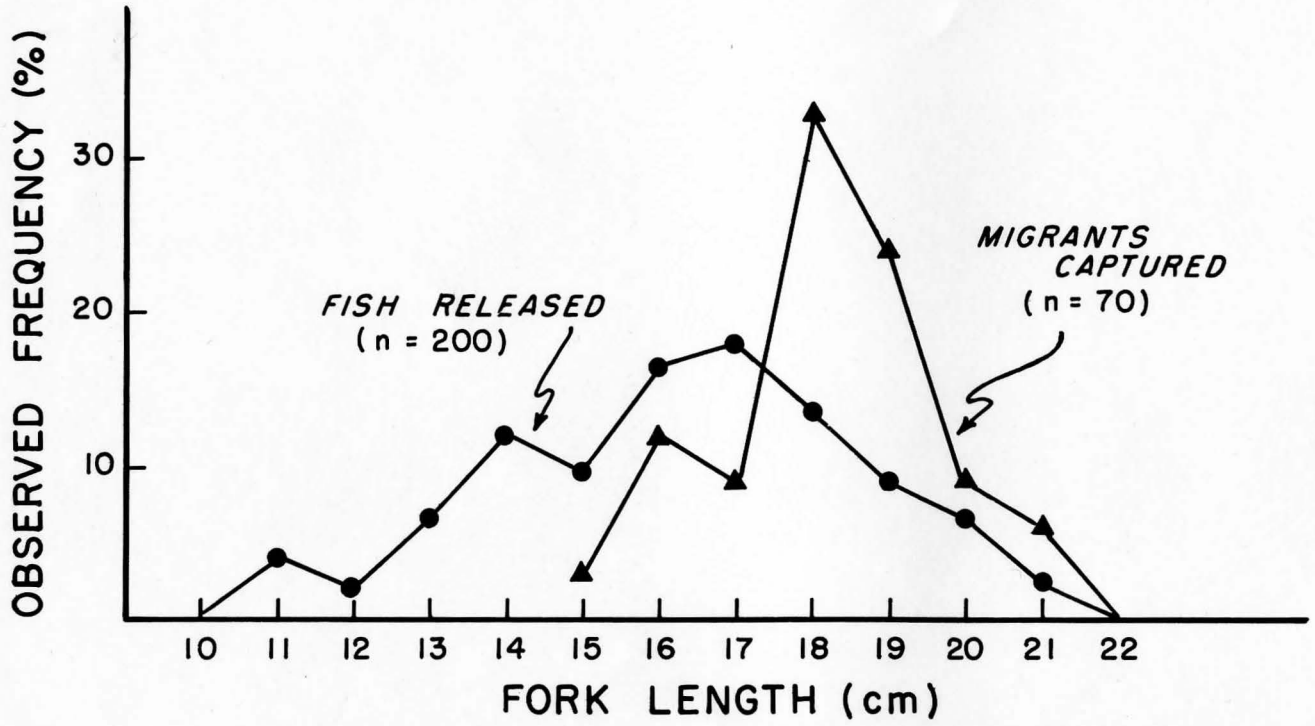

FIGURE 2. LENGTH-FREQUENCY DISTRIBUTION FOR DESCHUTES SUMMER STEELHEAD RELEASED FROM CEDAR CREEK HATCHERY AND FOR THE MIGRANTS CAPTURED AT CROOKED CREEK WEIR.

temperature was not monitored.

Two groups of 40,000 steelhead being reared under variable temperatures for one and two-year periods will be released in the spring of 1971. Both groups of fish should be comparable in size to control fish from Wizard Falls Hatchery.

Creel census

A total of 4,135 anglers with 874 steelhead were checked at the three sampling areas. It is estimated that during the 1970 angling season 12,723 anglers fished 56,671 hours to catch a total of 2,708 summer steelhead (Table 1). By comparison, 14,438 anglers fished 68,854 hours for 4,381 steelhead in the 1969 season. Poor angling success and adverse water conditions as well as a general decline in the number of steelhead moving up the Columbia River contributed to the decline in fishing pressure for the 1970 season.

A total of 98 marked steelhead was checked at the three sampling areas. Eighty-five were from the 1968 brood reared at Oak Springs and Wizard Falls hatcheries. The estimated catch of marked fish for the 1970 season was 275 (Table 2) of which an estimated 232 were from the 1969 release from Oak Springs and Wizard Falls hatcheries. Most miscellaneous marks checked were from releases into the Columbia River by the Washington Department of Game and Idaho Department of Fish and Game (Table 2). The estimated total catch of hatchery-reared summer steelhead as well as miscellaneous marked fish checked during the sampling season is summarized in Table 2.

Table 1. Summary of steelhead catch, fishing pressure, and number of anglers for 1970 season on the lower Deschutes River

Date	Weekdays			Weekends			Totals		
	Anglers	Catch	Hours	Anglers	Catch	Hours	Anglers	Catch	Hours
Mouth-Bank Anglers									
7/16-7/31/70	407.2	54.0	1364.8	313.6	27.6	1239.4	720.8	82.0	2604.2
8/1-8/15/70	698.0	37.0	3222.5	565.8	161.3	2789.3	1263.8	198.3	6011.8
8/16-8/31/70	954.3	82.0	3852.2	520.3	123.3	2664.2	1474.6	205.3	6516.4
9/1-9/15/70	532.4	100.6	1886.0	504.6	77.2	2249.6	1037.0	177.8	4135.6
9/16-9/30/70	432.7	83.2	1591.3	289.0	47.6	1263.6	721.7	130.8	2854.9
10/1-10/15/70	137.5	11.0	404.3	96.6	18.8	358.0	234.1	29.8	762.3
10/16-10/31/70	99.0	33.0	286.0	57.7	7.0	145.0	156.7	40.0	431.0
Area Total							5608.7	864.0	23316.2
Mouth-Boat Anglers									
7/16-7/31/70	28.0	4.0	162.0	56.0	28.0	180.0	84.0	32.0	342.0
8/1-8/15/70	110.0	75.0	822.5	137.5	60.0	1102.5	247.5	135.0	1925.0
8/16-8/31/70	214.5	132.0	1410.7	168.3	70.0	1083.3	382.8	202.0	2494.0
9/1-9/15/70	71.5	5.5	236.5	122.0	24.0	601.0	193.5	29.5	837.5
9/16-9/30/70	62.3	18.3	242.0	50.0	32.0	348.0	112.3	50.3	590.0
10/1-10/15/70	0	0	0	82.0	22.0	480.0	82.0	22.0	480.0
10/16-10/31/70	0	0	0	6.7	0	10.0	6.7	0	10.0
Area Total							1108.8	470.8	6678.5
Kloan									
7/16-7/31/70							264.3	78.0	1315.7
8/1-8/15/70							351.3	176.4	2217.1
8/16-8/31/70							514.2	221.0	3496.0
9/1-9/15/70							290.4	57.1	1520.8
9/16-9/30/70							188.4	44.2	1079.2
10/1-10/15/70							24.0	20.0	124.0
Area Total							1632.6	596.7	9752.8
Webb's Access Road									
7/16-7/31/70	168.0	32.0	464.0	166.0	30.0	739.0	334.0	62.0	1203.0
8/1-8/15/70	500.0	70.0	1695.0	590.0	97.5	2441.3	1090.0	167.5	4136.3
8/16-8/31/70	423.5	121.0	1430.0	611.7	93.3	2751.7	1035.2	214.3	4181.7
9/1-9/15/70	335.5	27.5	1053.3	384.0	42.0	1394.0	719.5	69.5	2447.3
9/16-9/30/70	374.0	117.3	1719.7	410.0	64.0	1621.0	784.0	181.3	3340.7
10/1-10/15/70	132.0	22.0	442.7	200.0	22.0	595.0	232.0	44.0	1037.7
10/16-10/31/70	55.0	11.0	220.0	123.3	26.7	357.5	178.3	37.7	577.5
Area Total							4373.0	776.3	16924.2
Sum of Area Totals							12,723.1	2707.8	56671.7
*95% confidence limits								±551.7*	

Table 2. Catch of hatchery-reared summer steelhead on lower Deschutes River for 1970 season

Mark	Number creeled	Brood year	Origin	Estimated catch	Number released
AdLV	29	1968	Wizard Falls Hatchery	73	50,665
AdRV	30	1968	Oak Springs Hatchery	81	84,104
ANRP	26	1968	Wizard Falls Hatchery	78	34,058
ANLV	1	1967	Wizard Falls Hatchery	5	87,083
RV	1	Miscellaneous marks creeled (WDG)		5	
LV	1	" " "	(IDFG)	2	
DRV	1	" " "	(?)	2	
LVRV	1	" " "	(OSGC)	2	
DAd	1	" " "	(WDG)	2	
Ad	3	" " "	(WDG)	6	
D	3	" " "	(WDG)	17	
DRm	1	" " "	(?)	2	
		Estimated catch hatchery steelhead		275	

Adult steelhead tagging program

In September 1969, 147 hauls were made with a 300-foot beach seine to capture and tag 73 adult summer steelhead at the mouth of the Deschutes River. Twenty-six have been returned by anglers. Of them, seven were from the lower one mile of the Deschutes, two were from approximately 12 miles above the mouth, and 17 were returned by anglers fishing the Snake River and its tributaries. Tag returns from the Snake River system indicate that there is a considerable amount of straying of upper Columbia River steelhead into the mouth of the Deschutes River. It is hypothesized that the steelhead move into the lower river because of its cooler water.

In the summer of 1970, new seining locations further upstream were examined where there would be less chance of capturing fish destined for other rivers. A site was located about three miles above the mouth at Moody. In July and August, 270 seine hauls were made to capture and tag 30 adult steelhead. Again, five of them were counted over John Day Dam on the Columbia River a few days after tagging.

Because of the effort expended to catch each fish with a beach seine and the limited number of seining sites available in the Deschutes River, seining activity was terminated at the end of August and other fish capturing techniques were explored. A 16-foot drift boat equipped with a 1000-watt generator and a D.C. converter was used successfully in capturing 160 adult steelhead in September in the Kloan area about seven miles above the mouth. To date we have 14 tag returns from Kloan anglers. This information along with eight electrofishing recaptures of tagged fish in the area indicates that steelhead do not move upstream rapidly. After the first freshet on September 16, success with electrofishing gear decreased rapidly indicating that most of the fish left the area.

Of the 160 steelhead captured with electrofishing gear, 32 were marked, returning from 1969 releases from Oak Springs and Wizard Falls hatcheries. Only two tagged steelhead have been observed of 245 adults trapped at the Pelton trap through December 1970.

Juvenile steelhead downstream migrant trapping

An inclined plane trap was installed at a large diversion headgate on the lower Deschutes River to monitor the downstream migration of juvenile steelhead. A total of 25 juvenile steelhead and 96 chinook were captured. Electrofishing activity in the diversion revealed that a large number of smolts were in the area but they were not attracted to the trapping facility. Future plans include renovating the facility to provide more attraction water for the migrants. Three scoop traps used on the main river were largely unsuccessful in capturing steelhead migrants. The strong swimming ability of steelhead apparently enables them to avoid the scoop-type traps and the inclined plane area.

Low-head weirs were installed on Bakeoven and Buckhollow creeks,

tributaries entering the Deschutes at Maupin and Sherar's Bridge, respectively. Downstream movement of smolts in Bakeoven Creek is summarized in Figure 3. The length-frequency and age of a random sample of steelhead migrants from Bakeoven Creek is summarized in Figure 4. The weir on Buckhollow Creek was installed later to monitor the movement of steelhead fry. A total of 1,166 was trapped at Bakeoven Creek and 263 at Buckhollow Creek. It is believed that most of the fry remained in the stream in pool areas during the summer.

Laboratory studies

The first release of summer steelhead reared at the laboratory was made February 20. Little movement occurred in any of the first groups until approximately 60 days after release or around April 1 (Table 3). The migration disposition of Deschutes steelhead reared in variable and constant water temperature was similar for all releases. A graphical comparison of movement patterns for the two groups of Deschutes fish is presented in Figure 5. The data suggest that constant temperature did not influence migration of juvenile Deschutes summer steelhead. April seems to be the optimum time for releasing Deschutes fish.

Early releases of steelhead from the Siletz, Umpqua, Rogue and Skamania stocks remained in the stream for a long period of time before migrating downstream (Table 2). The different races of summer steelhead appear to be similar in migration time. A graphical comparison of the movement patterns is presented in Figures 6 and 7.

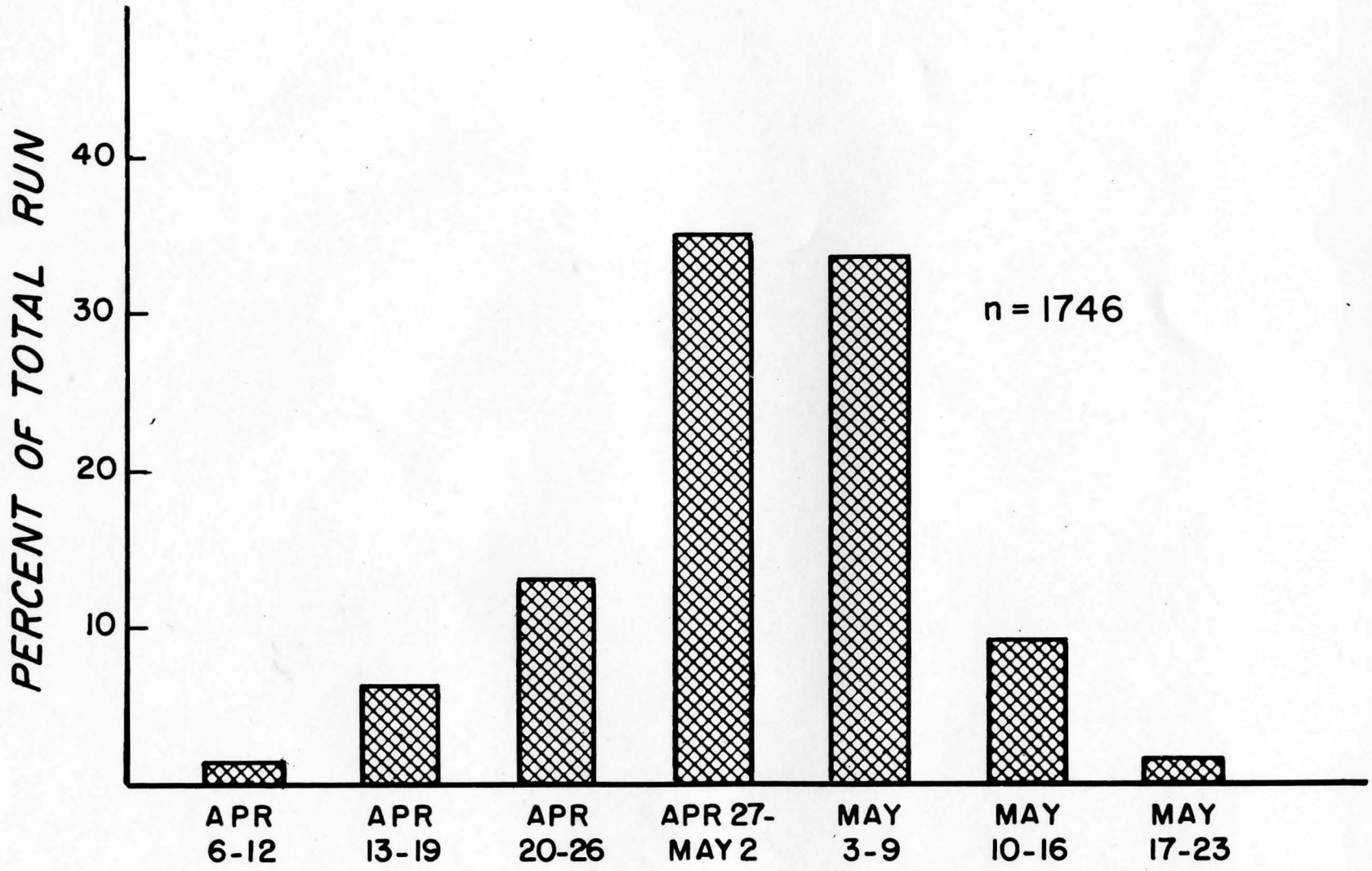

FIGURE 3. DOWNSTREAM MOVEMENT OF JUVENILE STEELHEAD IN BAKEOVEN CREEK.

FIGURE 4. LENGTH-FREQUENCY AND AGE OF A SAMPLE OF JUVENILE STEELHEAD MIGRATING DOWNSTREAM IN BAKEOVEN CREEK.

Table 3. The ratio of the number of juvenile summer steelhead recovered migrating downstream to those stocked (percent) for different release dates

	15 days[a]	30 days	45 days	60 days	75 days	90 days	Total
			February 20				
Deschutes (NT)[b]	0/48(0)	0/48(0)	0/48(0)	7/48(15)	11/48(23)	5/48(10)	23/48(48)
Deschutes (CT)[c]	0/50(0)	0/50(0)	0/50(0)	4/50(8)	17/50(34)	11/50(22)	32/50(64)
Skamania	0/49(0)	0/49(0)	0/49(0)	3/49(6)	13/49(26)	19/49(39)	35/49(71)
Rogue	0/50(0)	0/50(0)	1/50(2)	11/50(22)	16/50(32)	6/50(12)	34/50(68)
Umpqua	0/50(0)	0/50(0)	0/50(0)	8/50(26)	13/50(26)	12/50(24)	33/50(66)
Siletz	0/50(0)	1/50(2)	1/50(2)	17/50(34)	16/50(32)	2/50(4)	37/50(74)
			March 20				
Deschutes (NT)	1/25(4)	0/25(0)	16/25(64)	2/25(8)	0/25(0)		19/25(76)
Deschutes (CT)	0/25(0)	2/25(8)	10/25(40)	8/25(32)	0/25(0)		20/25(80)
Skamania	0/25(0)	0/25(0)	7/25(28)	7/25(28)	1/25(4)		15/25(60)
Rogue	0/25(0)	3/25(12)	7/25(28)	5/25(20)	1/25(4)		16/25(64)
Umpqua	0/25(0)	5/25(20)	9/25(36)	4/25(16)	0/25(0)		18/25(72)
Siletz	0/25(0)	13/25(52)	7/25(28)	0/25(0)	0/25(0)		20/25(80)
			April 17				
Deschutes (NT)	23/50(46)	17/50(34)	0/50(0)				40/50(80)
Deschutes (CT)	25/49(51)	14/49(29)	5/49(10)				44/49(90)
Skamania	12/50(24)	16/50(32)	5/50(10)				33/50(66)
Rogue	8/50(16)	23/50(46)	2/50(4)				33/50(66)
Umpqua	12/50(24)	21/50(42)	1/50(2)				34/50(68)
Siletz	22/50(44)	9/50(18)	1/50(2)				32/50(64)
			May 7				
Deschutes (NT)	47/75(63)	1/75(1)					48/75(64)
Deschutes (CT)	68/100(68)	5/100(5)					73/100(73)
Skamania	63/100(63)	6/100(6)					69/100(69)
Rogue	30/75(40)	8/75(11)					38/75(51)
Umpqua	37/100(37)	6/100(6)					43/100(43)
Siletz	25/50(50)	2/50(4)					27/50(54)
			June 11				
Deschutes (NT)	13/49(27)	0/49(0)					13/49(27)
Deschutes (CT)	10/39(26)	0/39(0)					10/39(26)
Skamania	18/50(36)	0/50(0)					18/50(36)
Rogue	5/50(10)	3/50(6)					8/50(16)
Umpqua	2/37(5)	0/37(0)					2/37(5)
Siletz	4/25(16)	0/25(0)					4/25(16)

a. Days elapsed since release.
b. Simulated natural temperature cycle.
c. Constant temperature.

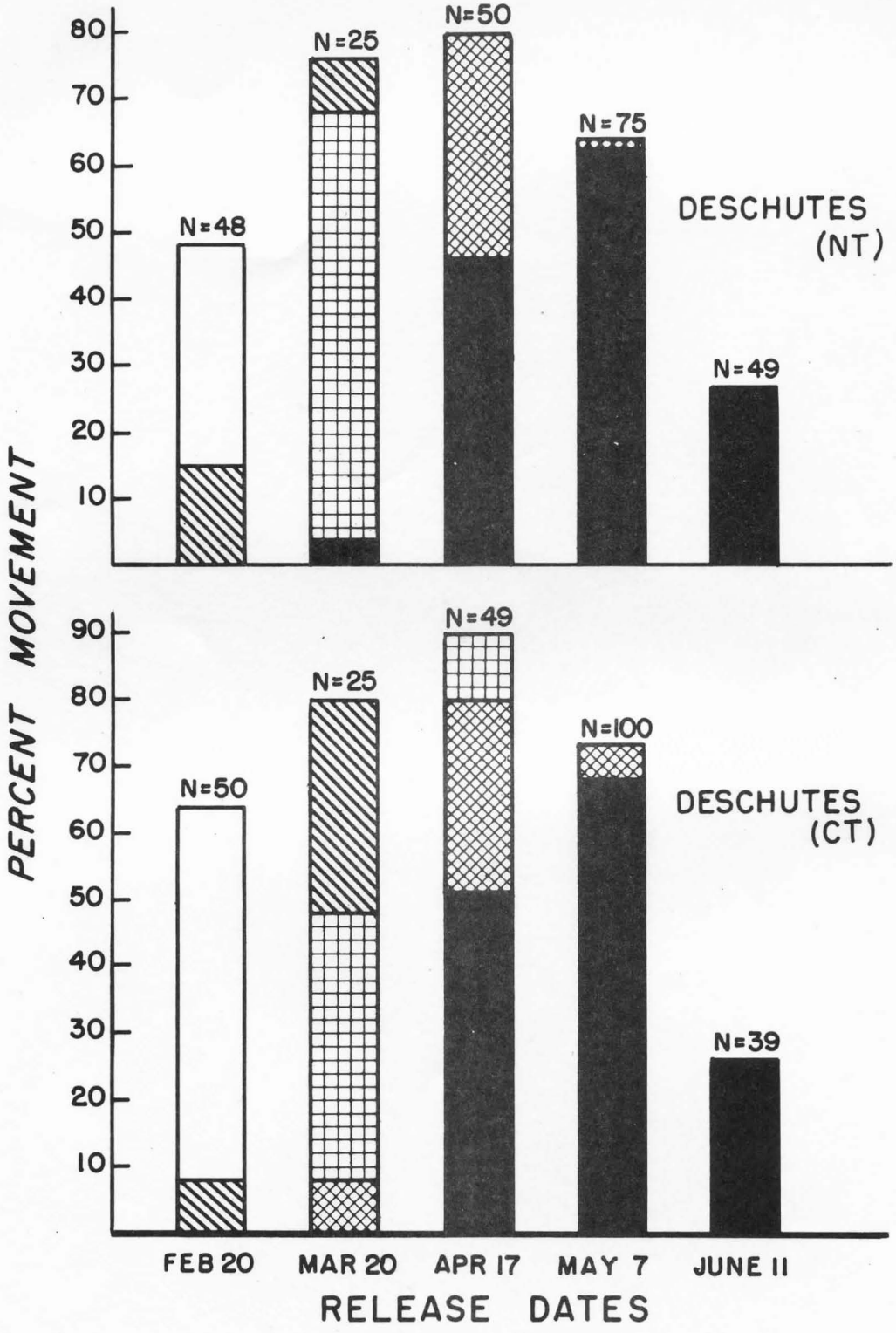

FIGURE 5. PATTERN AND MAGNITUDE OF DOWNSTREAM MIGRATION OF JUVENILE DESCHUTES SUMMER STEELHEAD REARED UNDER CONSTANT (CT) AND VARIABLE (NT) WATER TEMPERATURES WHEN RELEASED INTO CROOKED CREEK IN 1970. N = NUMBER OF FISH RELEASED.

1-15 DAYS ■ 16-30 DAYS ▨ 31-45 DAYS ▦ 46-60 DAYS ▨ 60 DAYS □

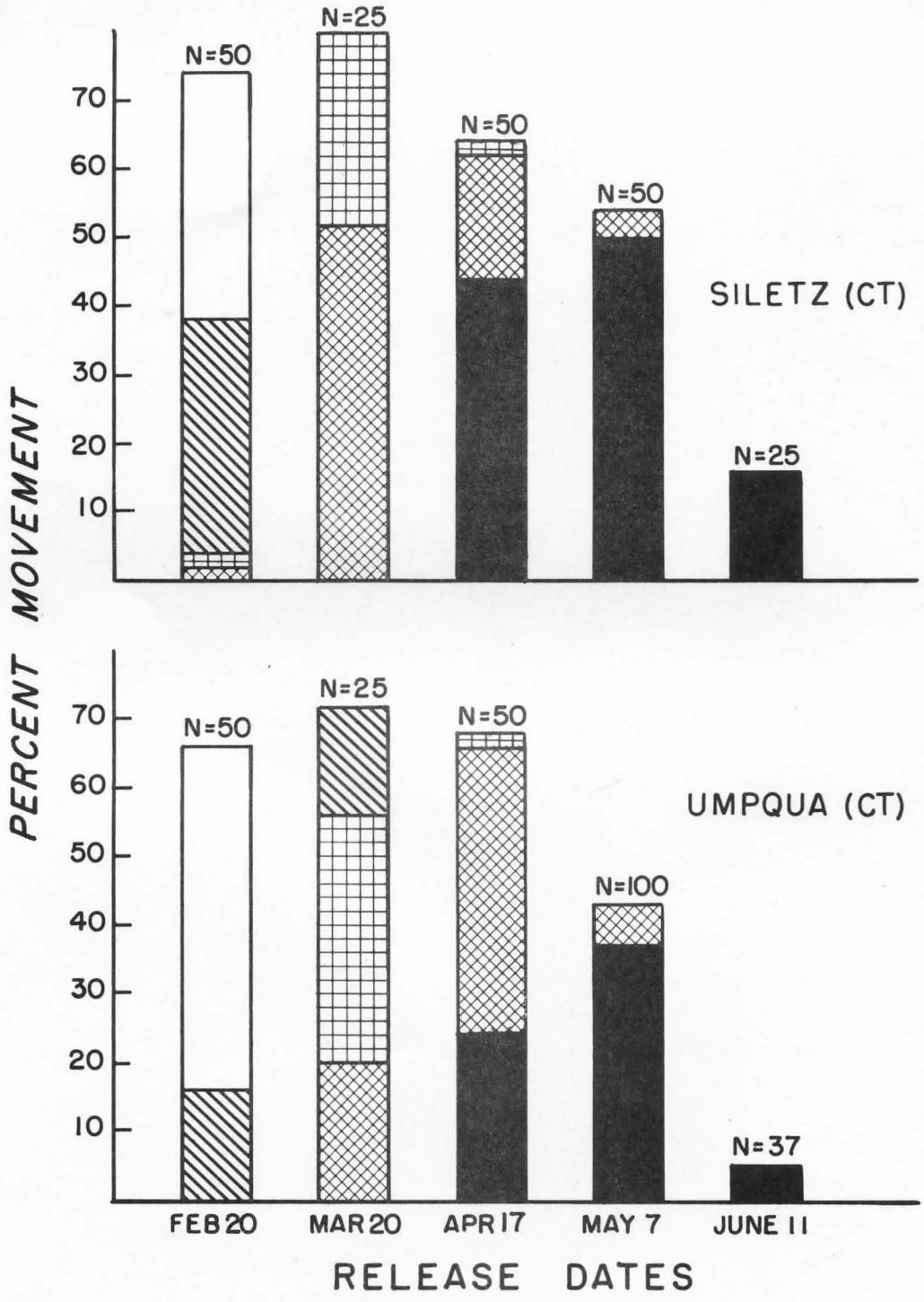

FIGURE 6. PATTERN AND MAGNITUDE OF DOWNSTREAM MIGRATION OF UMPQUA AND SILETZ JUVENILE STEELHEAD REARED UNDER CONSTANT TEMPERATURE (CT) WHEN RELEASED INTO CROOKED CREEK IN 1970. N = NUMBER OF FISH RELEASED.

1-15 DAYS ■ 16-30 DAYS ▨ 31-45 DAYS ▦ 46-60 DAYS ▧ 60 DAYS □

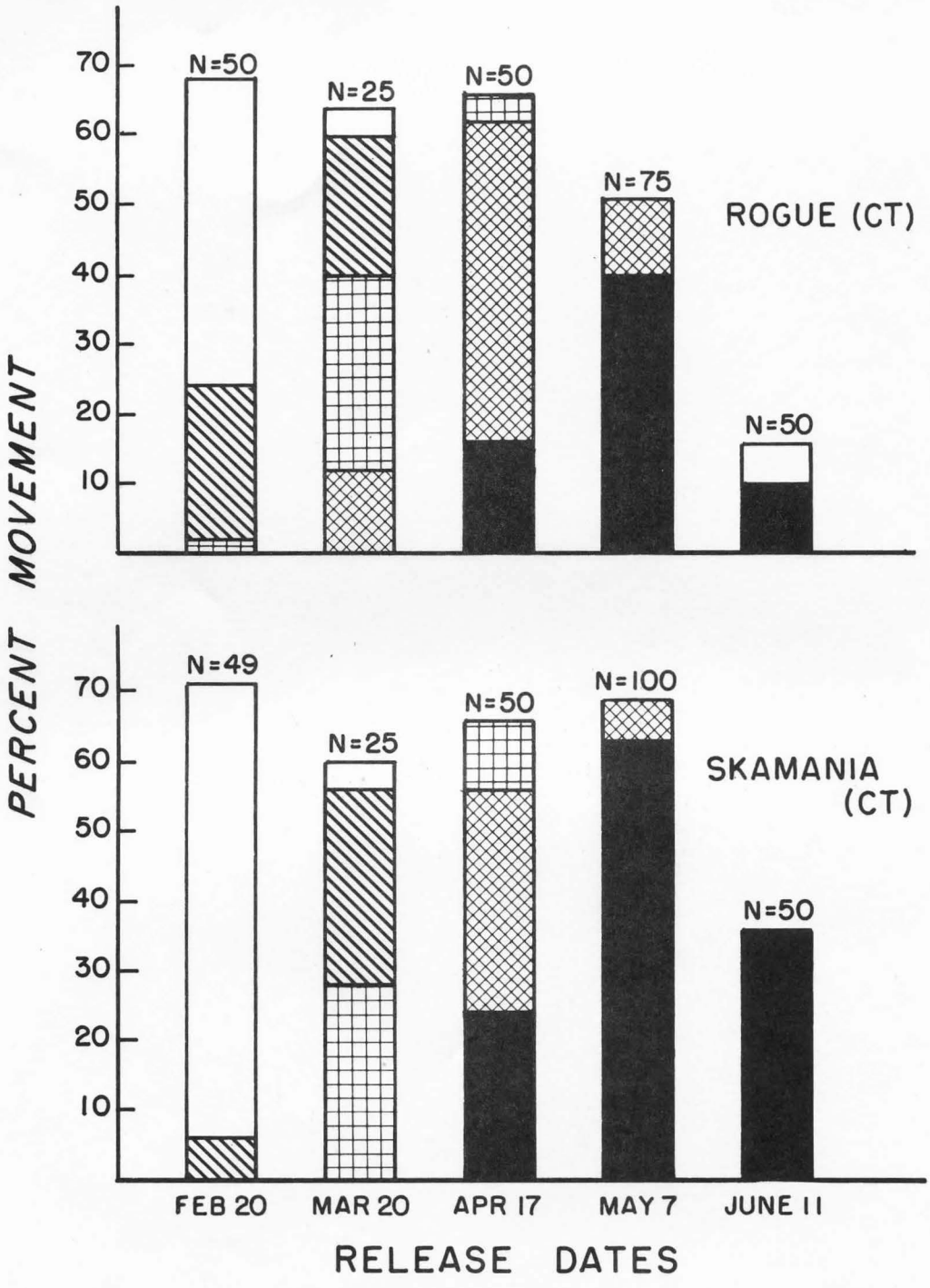

FIGURE 7. PATTERN AND MAGNITUDE OF DOWNSTREAM MIGRATION OF SKAMANIA AND ROGUE JUVENILE SUMMER STEELHEAD REARED UNDER CONSTANT WATER TEMPERATURE (CT) WHEN RELEASED INTO CROOKED CREEK IN 1970. N = NUMBER OF FISH RELEASED.

1-15 DAYS ■ 16-30 DAYS ▨ 31-45 DAYS ▦ 46-60 DAYS ▨ 60 DAYS □

Coefficient of condition

All groups of summer steelhead reared at the laboratory displayed the vernal decrease in coefficient of condition followed by a marked increase in condition. This pattern is typical of winter steelhead which undergo parr-smolt transformation and then revert to a non-migratory form. Graphical examination (Figure 8 and 9) showed the vernal nadir to occur in May except for the Siletz and Deschutes (VT) where it occurred earlier. The greatest change in coefficient of condition for Siletz steelhead coincides nicely with peak migration which occurred in March. The coefficient of condition for Deschutes steelhead reared in a variable temperature regime dropped more drastically than for any of the groups reared under constant temperature.

Sea-water adaptation

Results of sea-water tolerance tests were variable over the test period (January through June). Generally, survival was above 60 percent for all groups during the spring (Figure 10 and Table 4) but Siletz fish displayed marked loss of tolerance in May and June. The osmotic concentration of plasma for Deschutes fish reared in CT or NT temperature regimes was similar (Table 5) but concentrations were higher in both groups of Deschutes steelhead relative to Alsea winter steelhead.

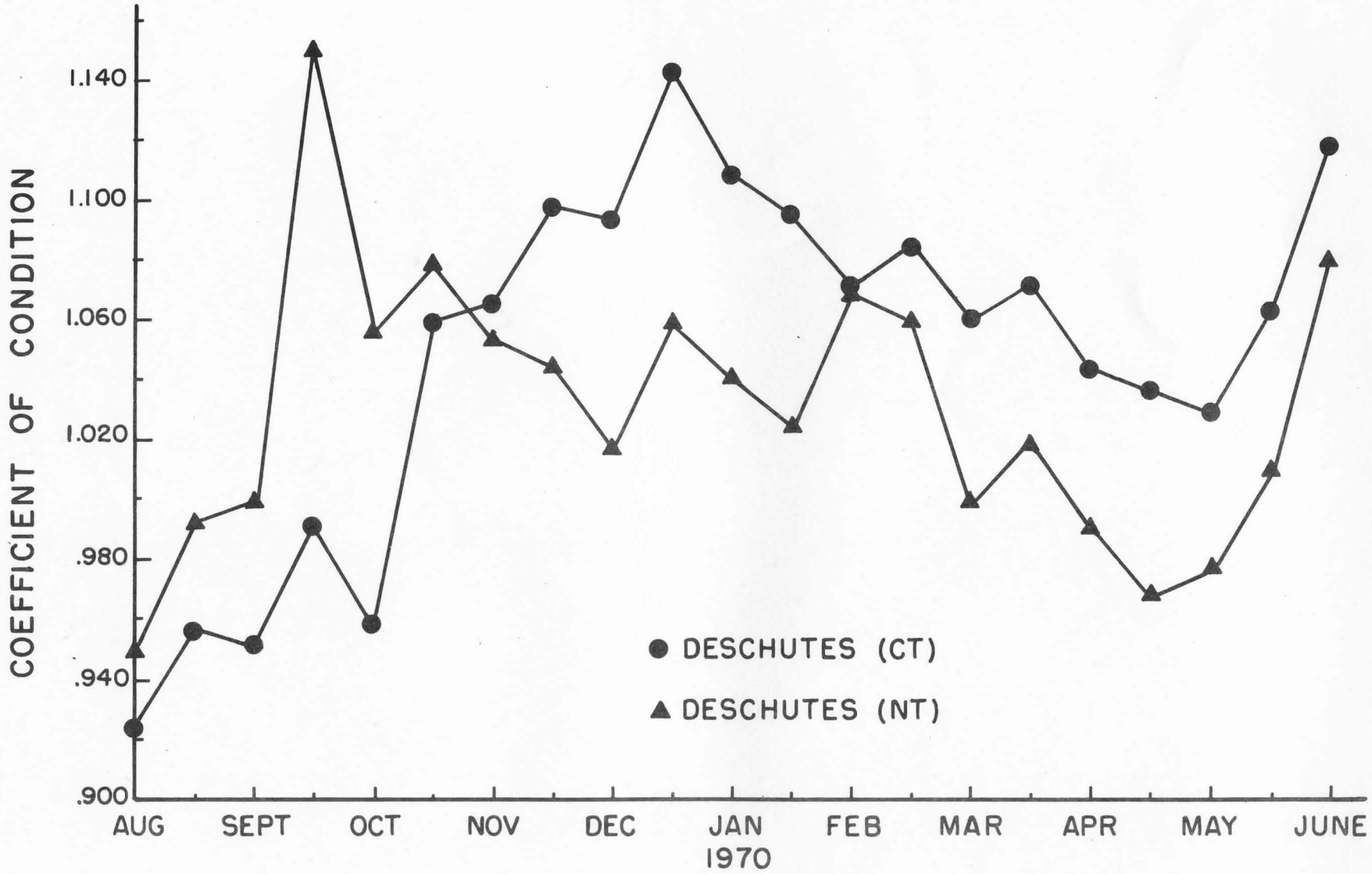

FIGURE 8. SEASONAL CHANGES IN MEAN COEFFICIENT OF CONDITION FOR JUVENILE DESCHUTES SUMMER STEELHEAD REARED UNDER CONSTANT (CT) AND NORMAL (NT) VARIABLE WATER TEMPERATURE.

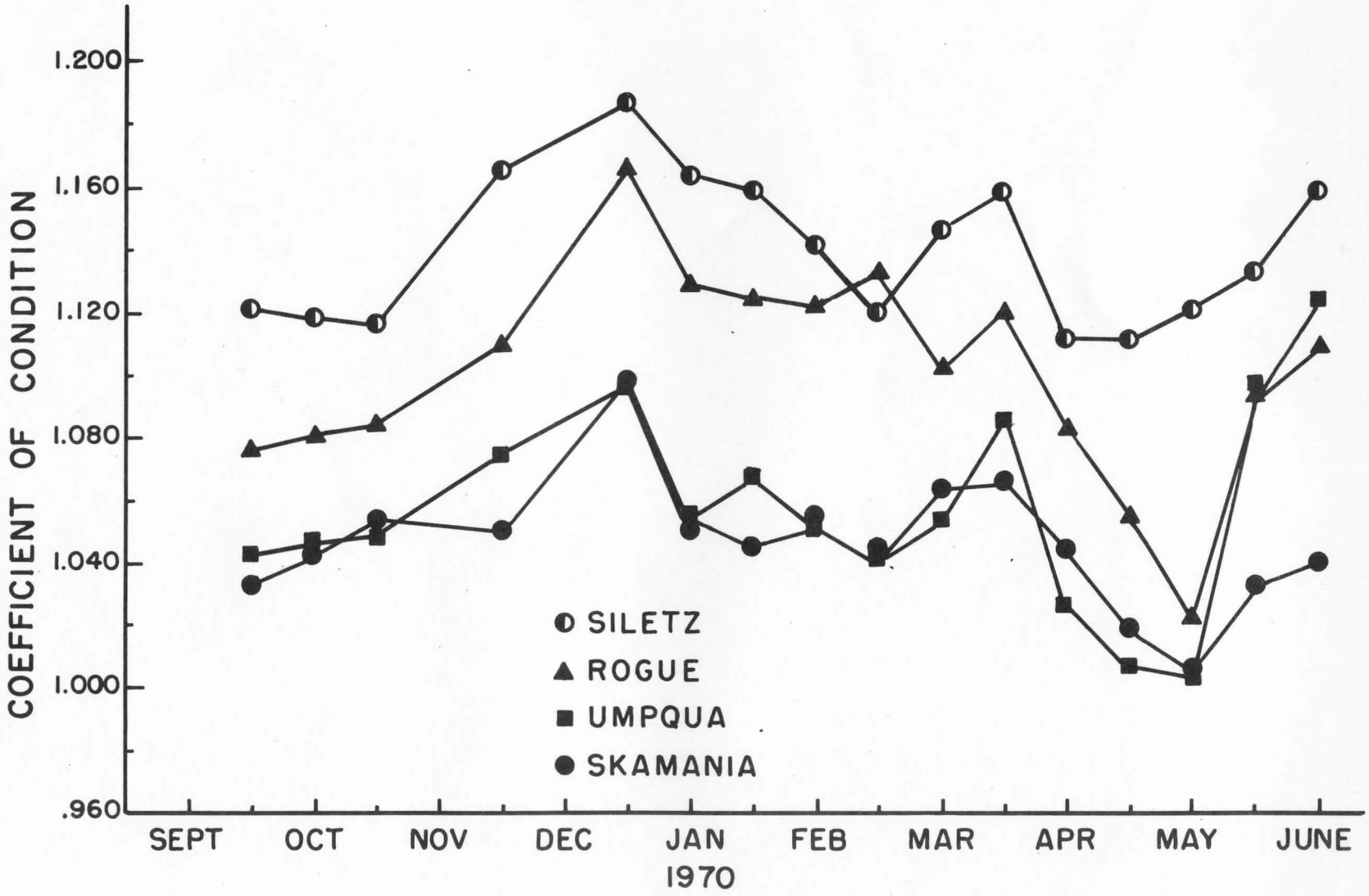

FIGURE 9. SEASONAL CHANGES IN MEAN COEFFICIENT OF CONDITION FOR JUVENILE SKAMANIA, UMPQUA, ROGUE AND SILETZ SUMMER STEELHEAD REARED UNDER CONSTANT WATER TEMPERATURE.

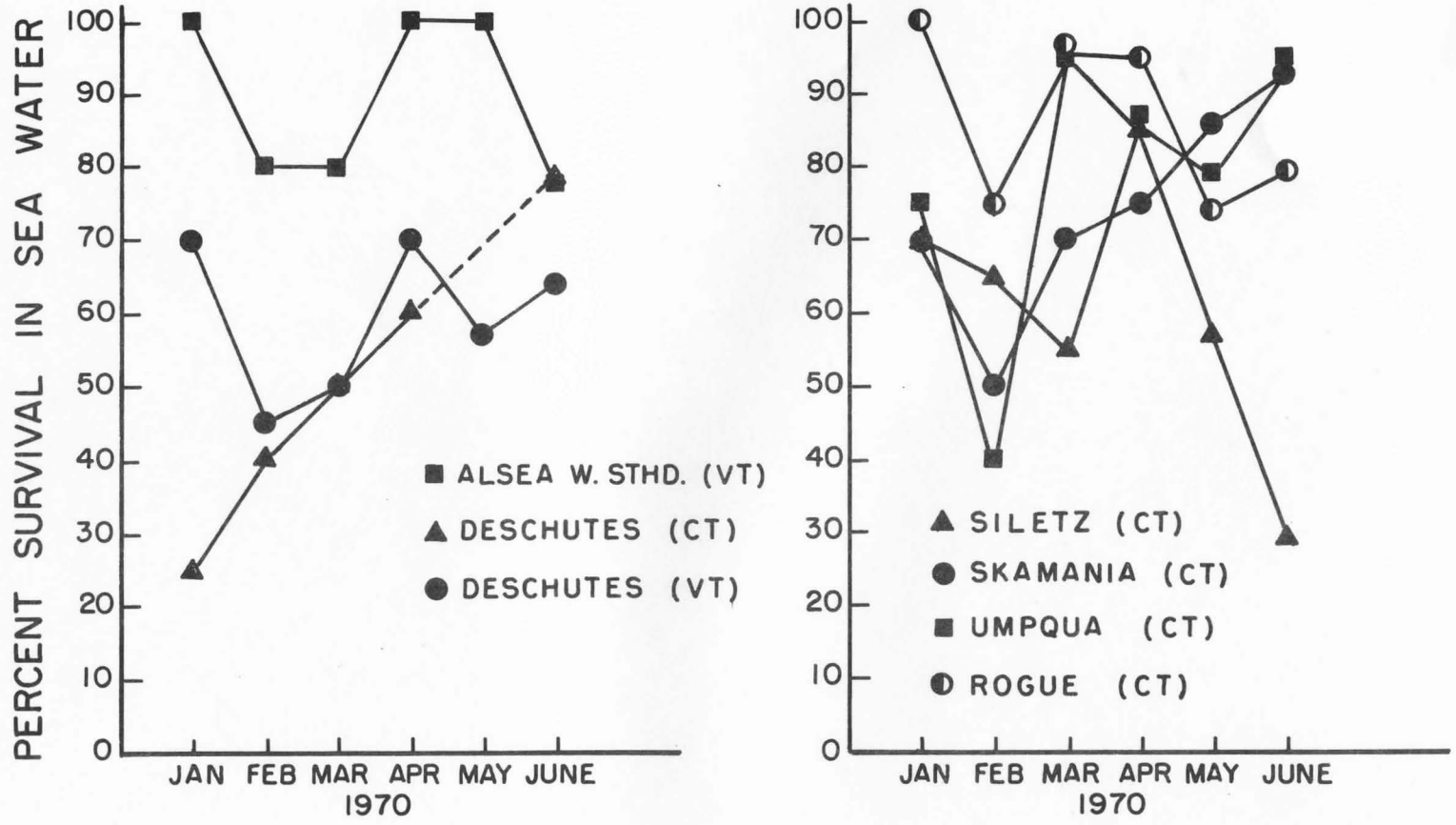

FIGURE 10. SEA-WATER SURVIVAL CURVES FOR FIVE RACES OF JUVENILE SUMMER STEELHEAD AND ONE GROUP OF WINTER STEELHEAD.

Table 4. Sea-water survival statistics for five races of juvenile steelhead

Treatment	Date exposure started	Age (days post-hatch)	Mean FL(cm)	Mean Wt.(g)	Number animals exposed	Length of exposure	Fraction alive after exposure	Percent survival (range)
Deschutes (Constant temp.)	1/22/70	276	16.2	48.9	20	20	5/20	25 (20-30)
	2/20/70	305	17.8	65.4	20	20	8/20	40 (30-50)
	3/20/70	333	19.6	84.6	20	20	10/20	50 (10-90)
	4/20/70	364	21.2	102.7	20	20	12/20	60 (50-70)
	5/22/70	396	22.1	119.8	14	20	2/14	14 (0-29)
	6/16/70	421	22.3	129.3	14	20	11/14	79 (71-86)
Deschutes (Variable temp.)	1/22/70	276	14.9	36.2	20	20	14/20	70 (60-80)
	2/20/70	305	17.0	53.0	20	20	9/20	45 (40-50)
	3/20/70	333	18.3	64.2	20	20	10/20	50 (50-50)
	4/20/70	364	19.0	69.5	20	20	14/20	70 (70-70)
	5/22/70	396	20.3	87.0	14	20	8/14	57 (57-57)
	6/16/70	421	21.0	103.7	14	20	9/14	64 (57-71)
Siletz (Constant temp.)	1/22/70	267	17.0	57.4	20	20	14/20	70 (50-90)
	2/20/70	296	18.3	71.2	20	20	13/20	65 (60-70)
	3/20/70	324	19.6	90.8	20	20	11/20	55 (50-60)
	4/20/70	355	20.8	104.7	20	20	17/20	85 (80-90)
	5/22/70	387	21.1	112.1	14	20	8/14	57 (43-71)
	6/16/70	412	22.2	131.6	14	20	4/14	29 (14-43)
Skamania (Constant temp.)	1/22/70	281	16.5	48.6	20	20	14/20	70 (70-70)
	2/20/70	310	17.6	58.4	20	20	10/20	50 (40-60)
	3/20/70	338	19.2	79.0	20	20	14/20	70 (60-80)
	4/20/70	369	20.5	92.4	20	20	15/20	75 (70-80)
	5/22/70	401	22.3	118.2	14	20	12/14	86 (71-100)
	6/16/70	426	23.2	133.8	14	20	13/14	93 (86-100)
Umpqua (Constant temp.)	1/22/70	273	16.5	49.4	20	20	15/20	75 (70-80)
	2/20/70	302	16.8	51.5	20	20	8/20	40 (20-60)
	3/20/70	330	18.6	72.9	20	20	19/20	95 (90-100)
	4/20/70	361	19.6	79.3	20	20	17/20	85 (80-90)
	5/22/70	393	20.3	94.5	14	20	11/14	79 (57-100)
	6/16/70	418	20.6	104.1	14	20	13/14	93 (86-100)
Rogue (Constant temp.)	1/22/70	270	16.1	49.0	20	20	20/20	100 (100-100)
	2/20/70	299	17.7	65.0	20	20	15/20	75 (60-90)
	3/20/70	327	18.8	78.7	20	20	19/20	95 (90-100)
	4/20/70	358	21.2	102.7	20	20	19/20	95 (70-100)
	5/22/70	390	21.9	117.3	14	20	11/14	74 (71-86)
	6/16/70	415	22.6	131.8	14	20	11/14	79 (71-86)

Table 5. Mean plasma osmotic concentration (m-osmol/l) of juvenile steelhead of the 1969 brood that survived a 20-day exposure to seawater (30 o/oo) during the months of April through July 1970

Month	Deschutes[a] (NT)[b] Sea water	Deschutes[a] (NT)[b] Fresh water	Deschutes (CT)[c] Sea water	Deschutes (CT)[c] Fresh water	Alsea (NT) Sea water	Alsea (NT) Fresh water
April	344.4 ±20.6[d]	294.4 ± 4.0	331.6 ±12.6	290.4 ± 5.6	311.2 ±13.2	314.8 ± 9.0
May	351.0 ±13.6	296.0 ± 9.5	340.4 ±16.8	295.5 ±13.5	327.8 ±15.1	335.0 ±21.6
June	383.4 ±20.9	296.8 ± 4.2	365.5 ±48.5	307.4 ±13.0	345.0 ±30.9	317.0 ±14.1
July	357.6 ±16.1	300.2 ± 9.6	365.5 ±17.1	281.6 ±19.2	352.8 ±12.5	295.2 ±15.1
Grand mean	359.1 ±17.8	296.8 ± 6.8	350.7 ±23.7	293.7 ±12.8	334.2 ±17.9	315.5 ±15.0

[a]Monthly sample sizes ranged from 4 to 6 fish in each group in fresh or seawater.

[b]Normal seasonal water temperature cycle (6.9 to 18.6°C).

[c]Constant water temperature (12°C).

[d]± 1 standard error.

Future plans and recommendations

Because of the relative ineffectiveness of the scoop-type downstream-migrant traps, they will be abandoned and effort concentrated on other devices. Renovating the trapping facility at the irrigation diversion in the lower river could increase its effectiveness in capturing migrants. The construction of small weirs on tributary streams has been a successful technique for capturing smolts and fry and could be expanded to other tributaries. Electrofishing from a drift boat might be successful in capturing steelhead out-migrants in the main river.

Migration data in combination with the length-frequency distribution for the 1970 release of Deschutes steelhead reared under variable temperature at Cedar Creek Hatchery indicate that a small return can be expected in 1971. Therefore, it seems advisable to de-emphasize the creel program for adult steelhead in the forthcoming year, allowing more time for checking the spring trout fishery for the catch of juvenile steelhead and for capturing and tagging adult steelhead and resident rainbow by electrofishing. Some information on returning hatchery fish can be collected while electrofishing and at the Pelton trap.

The plans for the summer of 1971 include two electrofishing crews. One will work on the lower river (Kloan area) concentrating on tagging adult steelhead on a fulltime basis. The second will concentrate on steelhead tag recaptures and on tagging adult steelhead at the Mack's Canyon area two days each week. Other days will be spent in tagging resident rainbow and incidental steelhead captured above the Maupin area. The approach can provide information on steelhead movement, population estimates, harvest rates, as well as similar information for resident rainbow.

A weak point in the program on the Deschutes is the lack of information on the magnitude of catch of the Indian dip-net fishery at Sherar's Falls. The fishery has not been monitored using a sound statistical program. A reliable estimate of the harvest of steelhead and chinook is necessary to evaluate the hatchery program and develop a fishery management plan for the Deschutes River.

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