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THE RESOURCES AGENCY
Department of Fish and Game

MOKELUMNE RIVER FISH INSTALLATION
ANNUAL REPORT FOR 1971-72 SEASON

by

Philo F. Jewett

Region 2, Inland Fisheries

Anadromous Fisheries Branch

Administrative Report No. 74-7

1974

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ABSTRACT

This report describes the operation of the king salmon (Oncorhynchus tshawytscha) spawning channel and the steelhead (Salmo gairdnerii gairdnerii) rearing program at the installation July 1, 1971 through June 30, 1972. Production tables present the numbers of adult salmonids received, and eggs and fish produced during the installation's eight years of operation. Appendix tables present daily water temperatures and copper and zinc concentrations at the facility during the 1971-72 fiscal year.

1/ Anadromous Fisheries Branch Administrative Report No. 74-7
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INTRODUCTION

This is the eighth annual report of the Mokelumne River Fish Installation. It covers the period of operation from July 1, 1971 through June 30, 1972. Copies of previous annual reports are available upon request from the Anadromous Fisheries Branch, Sacramento.

The Mokelumne River Fish Installation is located on the south bank of the Mokelumne River at the base of Camanche Dam in San Joaquin County. It is about 64 km (40 miles) southeast of Sacramento (Figure 1). Camanche Dam is presently the upper limit of anadromous fish migration in the river. The Mokelumne River enters the San Joaquin River about 98 river km (61 miles) downstream from the dam.

The Installation was constructed to compensate for the loss of fall-run king salmon and steelhead trout spawning and rearing areas blocked by Camanche Dam. It is operated by the California Department of Fish and Game. The East Bay Municipal Utility District paid construction costs and also pays the annual operating and maintenance costs.

The Installation was first operated January 1, 1964. Results of each year's salmon and steelhead operation are summarized in Tables 1 and 2.

DESCRIPTION OF INSTALLATION

The Mokelumne River Fish Installation is made up primarily of two parts: (1) a spawning channel for the natural spawning and rearing of fall-run king salmon (Figure 2), and (2) hatchery and rearing pond facilities for the artificial spawning and rearing of steelhead trout. Fish enter the fishway at the base of Camanche Dam and ascend to the holding pond. A mechanical sweep crowds the fish to the upper end of the pond where they are mechanically lifted and deposited in a tank of anesthetic to be sorted and counted. From there, steelhead are placed in a holding tank, salmon are released into the spawning channel, and any unwanted fish are returned to the river.

Steelhead are held until ripe, and then spawned. Once spawned, the are returned to the river and the eggs are hatched in incubators. When fry reach feeding stage, they are transferred to hatchery troughs. After a short time in the troughs, they are moved outside to rearing ponds. The fish are held for about one year and then released into the Mokelumne River. The pond facilities have a capacity of 100,000 yearlings.

A detailed description of the facility appears in the first annual report (Groh, 1965).

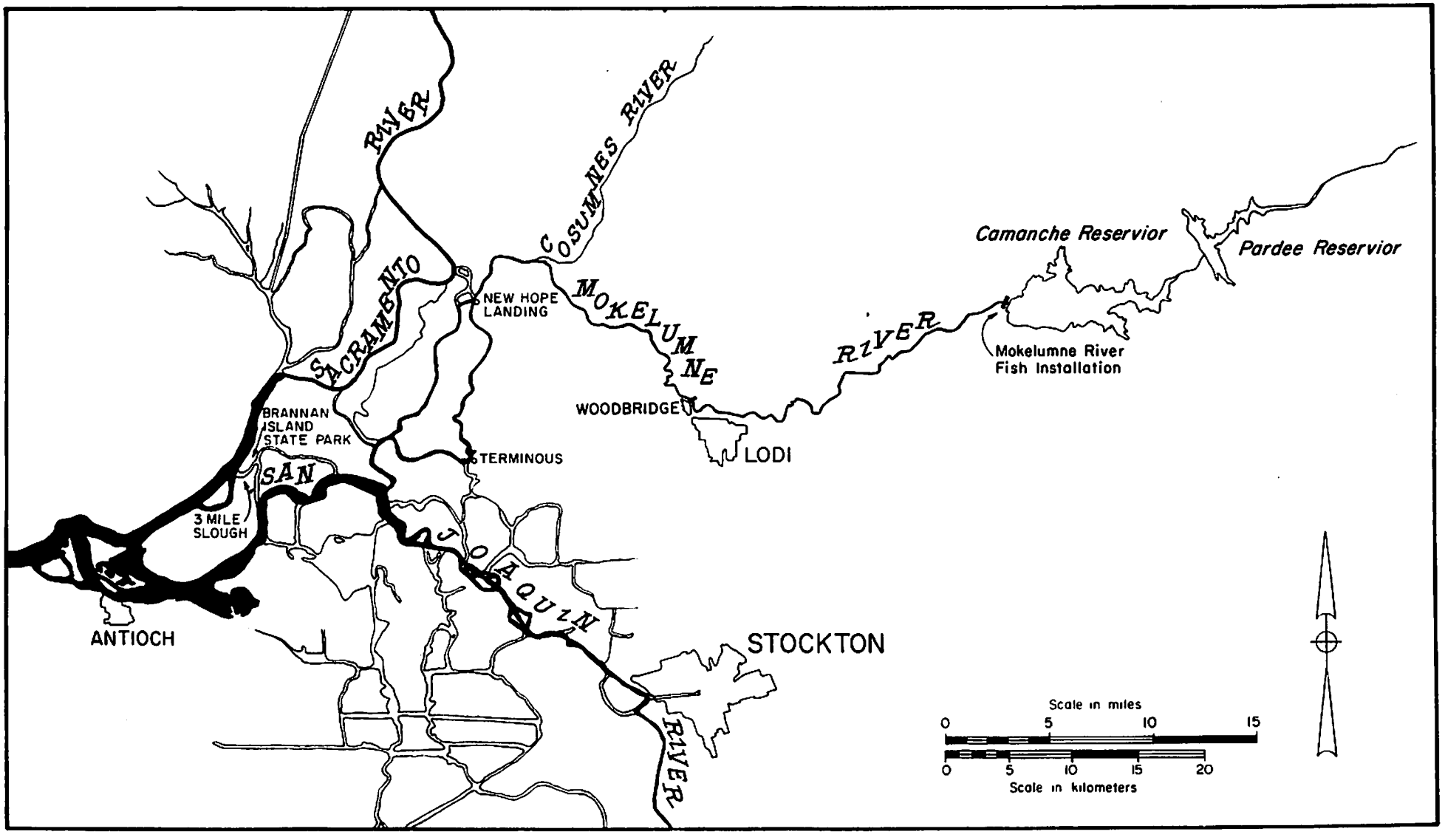

Figure 1. Map showing location of the Mokelumne River Fish Installation

TABLE 1

King Salmon Spawning Channel Annual Summaries--
Mokelumne River Fish Installation 1964-65 through 1971-72 Seasons

Season	Number of females released in channel	Number females prespawning mortality	Potential number of eggs	Estimated egg deposition	Number of outmigrants	Estimated Percent Production	
						Of potential eggs	Of eggs deposited
1964-65	178	3	947,100	927,300	73,540	7.8	7.9
1965-66	33	1	157,043	150,883	76,435	48.7	50.6
1966-67	85	4	399,758	387,562	76,796	19.2	19.8
1967-68	93	0	490,186	487,220	177,542	36.2	36.4
1968-69	159	38	568,984	557,326	37,866	6.7	6.8
1969-70	314	77	1,183,953	1,164,430	497,130	42.0	42.7
1970-71	305	36	1,352,125	1,328,178	564,670	41.8	42.5
1971-72	539	183	1,951,639	1,900,022	560,506*	*	*

TABLE 2

Steelhead Hatchery Annual Summaries--
Mokelumne River Fish Installation 1963-64 through 1971-72 Seasons

Season	Number native fish received	Number females spawned	Number eggs taken	Number eggs from Nimbus	Total eggs	Number planted as fingerlings	Number planted as yearlings
1963-64	15	**	**	**	436,300	0	0
1964-65	30	Not recorded	55,300	315,450	370,750	163,280	92,520
1965-66	30	8	30,970	331,400	362,370	131,420	84,410
1966-67	17	3	13,524	164,600	178,125	94,520	74,630
1967-68	103	13	34,869	331,200	366,069	0	82,203
1968-69	24	4	25,580	301,240	326,820	125,760	101,207
1969-70	134	14	33,300	300,810	334,110	137,695	122,822
1970-71	215	39	167,158	251,550	418,708	152,862	107,972
1971-72	4	-0-	-0-	296,800	296,800	82,180	111,926

* Outmigrants were not counted this year. Estimate based on average percent production in last seven years.
** Adult steelhead from Nimbus Hatchery and Mokelumne River Fish Installation were spawned together to obtain a total of 436,300 eggs.

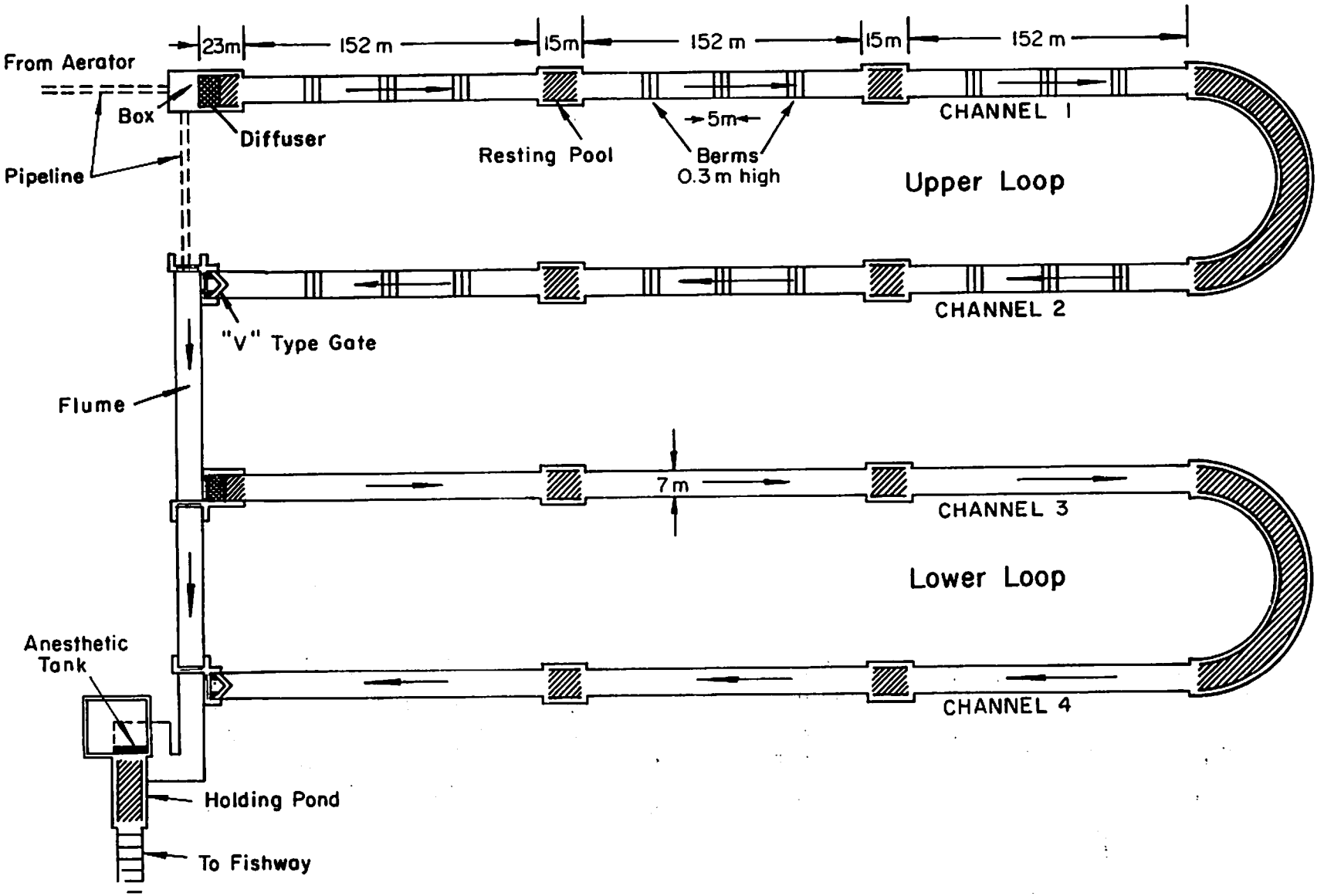

Figure 2. Diagram of the Mokelumne River Spawning Channel (not to scale).

WATER TEMPERATURES

Water temperatures were recorded continuously through the reporting period near the spawning channel entrance, except for the period, December 19, 1971 through February 11, 1972, when the recorder was broken. Recorded water temperatures ranged from 14.4 C (58 F) in September to 11.7 C (53 F) in February. Very little difference in water temperatures occurred in any 24-hour period. Daily temperatures recorded never varied more than 1.7° C (3° F) (Appendix B).

Copper and Zinc Analysis

Water samples, for determination of copper and zinc concentrations were collected at the head of the upper steelhead pond. Samples were collected weekly from July 1 through December 6, and daily for the remainder of the fiscal year (Appendix). Copper and zinc caused no fish losses this year; concentrations never exceeded 0.01 and 0.08 ppm respectively.

PUBLIC RELATIONS

During the 1971-72 fiscal year, an estimated 18,000 people visited the Installation. Tours of the Installation were conducted for many special interest groups, and talks were given to sportsman clubs and civic organizations.

MARKING PROGRAM

No king salmon or steelhead were marked this fiscal year.

KING SALMON MAINTENANCE PROGRAM

History of the 1971 Run

The spawning channel was in good condition at the start of the 1971 season; no gravel cleaning was required. The gravel berms constructed for the 1968-69 season were rebuilt before the first fish was received. These berms are of uniform size, 0.3 m (1 ft) higher in elevation than the channel bottom, perpendicular to the sides of the channel, 5 m (15 ft) wide, and 46 m (150 ft) apart. Their purpose is to curtail superimposition of redds.

This season, for the first time, both loops of the spawning channel were used for spawning.

On October 4, 1971, water was released into the spawning channel. The flow was maintained between 1.5 and 1.7 m^3/sec (55-60 cfs) throughout the spawning season.

Salmon were received at the Installation from October 6 through January 1, 1972. During this period 1,291 adult salmon were received and 1,252 were retained. Thirty-nine were in poor condition and were released to the river. Three hundred and sixty-six fish entered voluntarily and 925 were hauled from the trap at Woodbridge Dam. All 1,252 salmon placed in the spawning channel were examined for marks, sex, and condition.

MARK RECOVERIES

Eighteen marked king salmon were recovered this season. All were measured to the nearest 0.6 cm (¼-inch) FL. Fish less than 61 cm FL were considered grilse. Mark recovery information is summarized in the following table:

Mark	Brood year	Number recovered	FL (range)	Release data				
				Date(s)	Area	Number	Average size	Origin
Ad	1969	1	61 cm	Mar 1969	Amer. R. at Nimbus Hatchery	257,900	swim-up	Nimbus Hatchery
Ad-RV	1968	4	64-85 cm	Apr-Aug 1969	Sacto. R. at Rio Vista	321,000	5.0 g	Coleman Hatchery
An-LP*	1969	1	37 cm	Dec 1970-Jan 1971	*	200,000	38-45 g	Feather R. Hatchery
LV	1967	3	75-88 cm	June 1968	Mokelumne River	12,700	10.2 cm	Mokelumne R. Fish Installation
RV	1967	4	67-90 cm	Apr 1968	Mokelumne River	19,000	5.1 cm	"
RV	1969	3	53-58 cm	?	?	?	?	?
LP	?	2	60-79 cm	?	?	?	?	?

* These fish were also marked with coded wire tags. One-half were released in the Sacramento River at Rio Vista, and one-half were released in the Feather River.

CARCASS RECOVERIES

Dead salmon were removed daily. The majority were recovered near the V-trap at the lower ends of channels two and four; some were taken from the resting pools and the sides of the channels. All carcasses were measured and cut open for examination. The condition of the gonads was recorded, and the eggs retained in each female were counted.

Of the 1,252 salmon originally placed in the spawning channels, 1,230 carcasses (539 females and 691 males) were recovered. Of the 539 females, 183 (33.9%) had died without spawning. I believe this loss consisted primarily of fish trucked from Woodbridge Dam that succumbed to handling and hauling stress. A total of 51,617 eggs were counted in the female carcasses.

The lengths of female spawners and the length-fecundity relationship (fecundity = 4,983.99 + 350.24 FL) (Jewett, 1972) were used to calculate potential egg deposition in the spawning channel.

This equation, applied to the 356 females spawning in the channels, resulted in an estimated potential of 1,951,639 eggs. Subtracting the 51,617 eggs found in the female carcasses gives a total estimate of 1,900,022 eggs deposited.

Downstream Migrant Production

On December 13, 1971, the flow in the spawning channels was reduced to 0.7 m^3/sec (25 cfs) where it remained for the duration of the season.

Outmigrants were not counted this season. In seven prior years (1965-1971) production of downstream migrants has averaged 29.5% of egg deposition. This mean, times the 1971 estimated egg deposition, is the estimated production of outmigrants in the spawning channel--560,506 fish. Included in the total are 7,055 fish seined from the channel after June 20, when the water was shut off.

Outmigrants were released in the Mokelumne at two locations: Those leaving the channels voluntarily went directly into the river at the Installation; those seined from the channels were released at Woodbridge.

Weight samples of the fingerlings were taken only twice during the season. In early January the fish averaged 0.3 g (1,312/lb); in mid-June they averaged 7.3 g (62.4/lb).

STEELHEAD MAINTENANCE PROGRAM

History of the 1971-72 Run

The first adult steelhead this season entered the Installation on October 31, 1971, and the last one on February 23, 1972. During this period 14 fish were received: 8 males and 6 females. The males averaged 43 cm (16.9 inches) and the females 57 cm (22.5 inches) FL. No females were spawned this season. We obtained 296,800 eggs from Nimbus Hatchery. This supplement was necessary to guarantee that at least 100,000 yearlings could be raised.

Planting 1971 Brood Year Steelhead

As the steelhead from the 1971 brood year take of 418,708 eggs grew and the capacity of the ponds was reached, some of the fingerlings had to be removed. From July 1, 1971 to November 24, 1972, 82,180 surplus fish were planted in the Mokelumne River near Clements and Victor. These fish ranged in size from 11.4 to 30 g (40-15/lb). From December 1971, through May 1972, 111,926 yearlings were released in the Mokelumne River at New Hope Landing. These ranged in size from 54 to 114 g (8.4-4.0/lb).

Egg to planted fish survival of 1971 brood year steelhead was 46.3% (194,105 fish ÷ 418,708 eggs).

Three hundred and ninety-one 1971 brood year steelhead were retained as broodstock.

Disease

At the suggestion of Department pathologists, 90,000 of the 1971 brood year steelhead were destroyed. A 10% incidence of SRCD was found in this lot. There were no other significant disease problems affecting salmon or steelhead this report period.

Marked Steelhead Recoveries

Four adult marked steelhead were recovered at the Installation as follows:

Mark	Brood year	recovered	Release data				Origin
			Date	Area	Number	Average wt. (g)	
RV	1970	3	1/71	New Hope Landing	20,435	17	Mokelumne R. Fish Installation
RV	1970		3/71	"	20,435	97	"
Ad	?	1	?	?	?	?	?

REFERENCES

Groh, Frederick H. 1965. Annual report Mokelumne River Fish Installation from January 1, 1964 to June 30, 1965. Calif. Dep. Fish and Game, Inland Fish. Admin. Rep. 65-21. 28 p.

Jewett, Philo F. 1972. Mokelumne River Fish Installation annual report for 1970-71 season. Calif. Dep. Fish and Game, Anad. Fish. Admin. Rep. 72-9. 20 p.

Appendix

Water Temperatures and Concentrations of Zinc and Copper, Mokelumne River Fish Installation, 1971-72 Season

Date	Water temperature (C) Max.	Min.	Zinc* (ppm)	Copper* (ppm)	Date	Water temperature (C) Max.	Min.	Zinc* (ppm)	Copper* (ppm)
July 1	12.2	11.1	0.07	0.01	Aug. 1	12.8	11.1		
2	12.2	11.1			2	12.8	11.1		
3	12.2	11.1			3	12.8	11.7		
4	12.2	11.1			4	12.8	11.7		
5	12.2	11.1			5	12.8	11.7	0.06	0.01
6	12.2	11.1	0.09	0.01	6	12.8	11.7		
7	12.8	11.7			7	12.8	11.1		
8	12.8	11.7			8	12.8	11.1		
9	12.8	11.7			9	12.8	11.1		
10	12.8	11.7			10	12.8	11.1		
11	12.8	11.7			11	12.2	11.1		
12	12.8	11.1			12	12.8	11.7	0.06	0.01
13	12.8	11.1			13	12.8	11.7		
14	12.2	11.1			14	12.8	11.7		
15	12.2	11.1	0.08	0.01	15	12.8	11.7		
16	12.2	11.1			16	12.8	11.7		
17	12.2	11.1			17	12.8	11.7		
18	12.2	11.1			18	12.8	11.7	0.07	0.01
19	12.2	11.1			19	12.8	11.7		
20	12.2	11.1			20	13.3	12.2		
21	12.8	11.1			21	13.3	11.7		
22	12.8	11.1	0.06	0.01	22	12.8	11.7		
23	12.8	11.1			23	12.8	11.7		
24	12.8	11.7			24	12.8	11.7		
25	12.8	11.7			25	12.8	11.7		
26	12.8	11.1			26	12.8	11.7	0.06	0.01
27	12.8	11.1			27	12.8	11.7		
28	12.8	11.1			28	13.3	12.2		
29	12.8	11.7	0.06	0.01	29	13.3	12.2		
30	12.8	11.1			30	13.3	12.2		
31	12.2	11.1			31	13.3	12.2		

* Detection limit is 0.01 ppm.

Appendix (continued)

Date	Water temperature (C) Max.	Min.	Zinc* (ppm)	Copper* (ppm)	Date	Water temperature (C) Max.	Min.	Zinc* (ppm)	Copper* (ppm)
Sept.1	13.3	12.2			Oct. 1	14.4	13.3		
2	13.3	12.2	0.06	0.01	2	14.4	13.3		
3	13.3	12.2			3	13.9	12.2		
4	13.3	12.2			4	13.3	12.2		
5	13.3	12.2			5	13.3	12.2		
6	13.3	12.2			6	13.3	12.2		
7	13.3	12.2			7	13.3	12.2	0.05	0.01
8	13.3	12.2			8	13.3	12.2		
9	13.3	12.2			9	12.2	11.7		
10	13.3	12.2	0.06	0.01	10	12.2	11.7		
11	13.3	12.2			11	12.2	11.1		
12	13.3	12.2			12	12.2	11.1		
13	13.3	12.2			13	12.2	11.1		
14	13.3	11.7			14	12.2	11.1	0.05	0.01
15	13.3	12.2			15	12.2	11.1		
16	13.3	12.2	0.06	0.01	16	12.2	11.1		
17	13.3	12.2			17	12.2	11.1		
18	13.3	12.2			18	12.2	11.1		
19	13.9	12.2			19	11.7	11.1		
20	13.9	12.8			20	11.7	11.1		
21	13.9	12.8			21	11.7	11.1	0.05	0.01
22	13.9	12.8			22	11.7	11.1		
23	13.9	12.8	0.12	0.01	23	11.7	11.1		
24	13.9	13.3			24	11.7	11.1		
25	14.4	13.3			25	11.7	11.1		
26	14.4	13.3			26	11.7	11.1		
27	14.4	13.3			27	11.7	11.1		
28	14.4	13.3			28	11.7	11.1	0.06	0.01
29	14.4	13.3			29	11.7	11.1		
30	14.4	13.3	0.06	0.01	30	11.7	11.1		
					31	11.7	11.1		

* Detection limit is 0.01 ppm.

Appendix (continued)

Date	Water temperature (C) Max.	Min.	Zinc* (ppm)	Copper* (ppm)	Date	Water temperature (C) Max.	Min.	Zinc* (ppm)	Copper* (ppm)
Nov. 1	11.7	11.1			Dec. 1	12.8	11.7	0.01	0.01
2	11.7	11.1			2	12.8	11.7		
3	11.7	11.1			3	12.8	11.7		
4	11.7	11.1	0.02	0.01	4	12.8	11.7		
5	11.7	11.1	0.03	0.01	5	12.8	11.7		
6	11.7	11.1			6	12.8	11.7		
7	11.7	11.1			7	12.8	11.7	0.01	0.01
8	11.7	11.1			8	12.8	11.7	0.01	0.01
9	11.7	11.1			9	12.8	11.7	0.01	0.01
10	11.7	11.1			10	12.8	11.7	0.02	0.01
11	11.7	11.1	0.02	0.01	11	12.8	11.7	0.01	0.01
12	11.7	11.1			12	12.8	11.7	0.02	0.01
13	11.7	11.1			13	12.8	11.7	0.01	0.01
14	11.7	11.1			14	12.8	11.7	0.02	0.01
15	11.7	11.1			15	12.8	11.7	0.02	0.01
16	11.7	11.1			16	12.8	11.7	0.01	0.01
17	11.7	11.1			17	12.8	11.7	0.01	0.01
18	11.7	11.1	0.02	0.01	18	12.8	11.7	0.02	0.01
19	11.7	11.1			19	Thermograph		0.02	0.01
20	11.7	11.1			20	broken		0.01	0.01
21	11.7	11.1			21			0.02	0.01
22	11.7	11.1			22			0.01	0.01
23	11.7	11.1			23			0.02	0.01
24	11.7	11.1			24			0.01	0.01
25	12.8	11.7	0.01	0.01	25			0.01	0.01
26	12.8	11.7			26			0.01	0.01
27	12.8	11.7			27			0.02	0.01
28	12.8	11.7			28			0.02	0.01
29	12.8	11.7			29			0.02	0.01
30	12.8	11.7			30			0.02	0.01
					31			0.02	0.01

* Detection limit is 0.01 ppm.

Appendix (continued)

Date	Water temperature (C) Max.	Min.	Zinc* (ppm)	Copper* (ppm)	Date	Water temperature (C) Max.	Min.	Zinc* (ppm)	Copper* (ppm)
Jan. 1	Thermograph		0.01	0.01	Feb. 1	Thermograph		0.02	0.01
2	broken		0.01	0.01	2	broken		0.02	0.01
3			0.01	0.01	3			0.02	0.01
4			0.01	0.01	4			0.02	0.01
5			0.01	0.01	5			0.02	0.01
6			0.01	0.01	6			0.02	0.01
7			0.01	0.01	7			0.02	0.01
8			0.01	0.01	8			0.02	0.01
9			0.01	0.01	9			0.02	0.01
10			0.01	0.01	10			0.02	0.01
11			0.01	0.01	11			0.02	0.01
12			0.01	0.01	12	8.9	8.3	0.02	0.01
13			0.01	0.01	13	8.9	8.3	0.02	0.01
14			0.01	0.01	14	9.4	8.9	0.02	0.01
15			0.01	0.01	15	10.0	9.4	0.03	0.01
16			0.02	0.01	16	10.0	9.4	0.03	0.01
17			0.02	0.01	17	10.0	9.4	0.03	0.01
18			0.02	0.01	18	10.0	9.4	0.03	0.01
19			0.02	0.01	19	10.0	8.9	0.03	0.01
20			0.02	0.01	20	10.0	8.9	0.04	0.01
21			0.02	0.01	21	10.0	8.9	0.03	0.01
22			0.02	0.01	22	10.0	8.9	0.03	0.01
23			0.02	0.01	23	10.0	8.9	0.03	0.01
24			0.02	0.01	24	10.0	8.9	0.03	0.01
25			0.02	0.01	25	10.0	8.9	0.03	0.01
26			0.02	0.01	26	10.0	8.9	0.02	0.01
27			0.02	0.01	27	10.0	8.9	0.02	0.01
28			0.02	0.01	28	10.0	8.9	0.02	0.01
29			0.02	0.01	29	10.0	8.9	0.02	0.01
30			0.02	0.01					
31			0.02	0.01					

* Detection limit is 0.01 ppm.

Appendix (continued)

Date	Water temperature (C) Max.	Min.	Zinc* (ppm)	Copper* (ppm)	Date	Water temperature (C) Max.	Min.	Zinc* (ppm)	Copper* (ppm)
Mar. 1	10.0	8.9	0.02	0.01	Apr. 1	10.6	9.4	0.03	0.01
2	10.0	8.9	0.02	0.01	2	10.6	9.4	0.03	0.01
3	10.0	8.9	0.02	0.01	3	10.6	9.4	0.03	0.01
4	10.0	8.9	0.02	0.01	4	10.6	9.4	0.03	0.01
5	10.0	8.9	0.02	0.01	5	10.6	9.4	0.03	0.01
6	10.0	8.9	0.02	0.01	6	10.6	9.4	0.03	0.01
7	10.0	8.9	0.02	0.01	7	10.6	9.4	0.04	0.01
8	10.0	8.9	0.02	0.01	8	10.6	9.4	0.04	0.01
9	10.0	8.9	0.02	0.01	9	10.6	9.4	0.05	0.01
10	10.0	8.9	0.02	0.01	10	10.6	9.4	0.04	0.01
11	10.0	8.9	0.02	0.01	11	10.6	9.4	0.05	0.01
12	10.0	8.9	0.02	0.01	12	10.6	9.4	0.05	0.01
13	10.0	8.9	0.02	0.01	13	10.6	9.4	0.04	0.01
14	10.0	8.9	0.02	0.01	14	10.6	9.4	0.04	0.01
15	10.0	8.9	0.02	0.01	15	10.6	9.4	0.04	0.01
16	10.0	8.9	0.02	0.01	16	10.6	9.4	0.05	0.01
17	10.0	8.9	0.02	0.01	17	10.6	9.4	0.05	0.01
18	10.0	8.9	0.02	0.01	18	10.6	9.4	0.04	0.01
19	10.0	8.9	0.02	0.01	19	10.6	9.4	0.04	0.01
20	10.0	8.9	0.02	0.01	20	10.6	9.4	0.04	0.01
21	10.0	8.9	0.02	0.01	21	10.6	9.4	0.04	0.01
22	10.0	8.9	0.02	0.01	22	10.6	9.4	0.04	0.01
23	10.0	8.9	0.02	0.01	23	10.6	9.4	0.04	0.01
24	10.0	8.9	0.02	0.01	24	10.6	9.4	0.04	0.01
25	10.0	8.9	0.02	0.01	25	10.6	9.4	0.04	0.01
26	10.0	8.9	0.03	0.01	26	10.6	9.4	0.05	0.01
27	10.0	8.9	0.04	0.01	27	10.6	9.4	0.04	0.01
28	10.0	8.9	0.03	0.01	28	10.6	9.4	0.04	0.01
29	10.0	8.9	0.04	0.01	29	10.6	9.4	0.04	0.01
30	10.0	8.9	0.03	0.01	30	10.6	9.4	0.04	0.01
31	10.0	8.9	0.03	0.01					

* Detection limit is 0.01 ppm.

Appendix (continued)

Date		Water temperature (C) Max.	Min.	Zinc* (ppm)	Copper* (ppm)	Date		Water temperature (C) Max.	Min.	Zinc* (ppm)	Copper* (ppm)
May.	1	10.6	9.4	0.04	0.01	June	1	11.1	10.0	0.04	0.01
	2	10.6	9.4	0.04	0.01		2	11.1	10.0	0.05	0.01
	3	10.6	9.4	0.05	0.01		3	11.1	10.0	0.04	0.01
	4	10.6	9.4	0.04	0.01		4	11.1	10.0	0.04	0.01
	5	10.6	9.4	0.05	0.01		5	11.1	10.0	0.04	0.01
	6	10.6	9.4	0.04	0.01		6	11.1	10.0	0.05	0.01
	7	10.6	9.4	0.04	0.01		7	11.1	10.0	0.04	0.01
	8	10.6	9.4	0.06	0.01		8	11.1	10.0	0.05	0.01
	9	10.6	9.4	0.04	0.01		9	11.1	10.0	0.04	0.01
	10	10.6	9.4	0.06	0.01		10	11.1	10.0	0.04	0.01
	11	10.6	9.4	0.05	0.01		11	11.1	10.0	0.04	0.01
	12	10.6	9.4	0.04	0.01		12	11.1	10.0	0.04	0.01
	13	10.6	9.4	0.04	0.01		13	11.7	10.6	0.04	0.01
	14	10.6	9.4	0.04	0.01		14	11.7	10.6	0.04	0.01
	15	10.6	9.4	0.08	0.01		15	11.7	10.6	0.04	0.01
	16	10.6	9.4	0.04	0.01		16	12.2	11.1	0.04	0.01
	17	10.6	9.4	0.04	0.01		17	12.2	11.1	0.04	0.01
	18	10.6	9.4	0.05	0.01		18	12.2	11.1	0.05	0.01
	19	10.6	9.4	0.04	0.01		19	12.2	11.1	0.04	0.01
	20	10.6	9.4	0.04	0.01		20	12.2	11.1	0.04	0.01
	21	10.6	9.4	0.04	0.01		21	12.2	11.1	0.04	0.01
	22	10.6	9.4	0.04	0.01		22	12.2	11.1	0.04	0.01
	23	10.6	9.4	0.04	0.01		23	12.2	11.1	0.04	0.01
	24	10.6	9.4	0.04	0.01		24	12.2	11.1	0.04	0.01
	25	10.6	9.4	0.04	0.01		25	12.2	11.1	0.04	0.01
	26	10.6	9.4	0.04	0.01		26	12.2	11.1	0.04	0.01
	27	11.1	10.0	0.04	0.01		27	12.2	11.1	0.04	0.01
	28	11.1	10.0	0.04	0.01		28	12.2	11.1	0.04	0.01
	29	11.1	10.0	0.04	0.01		29	12.2	11.1	0.04	0.01
	30	11.1	10.0	0.04	0.01		30	12.2	11.1	0.04	0.01
	31	11.1	10.0	0.04	0.01						

* Detection limit is 0.01 ppm.