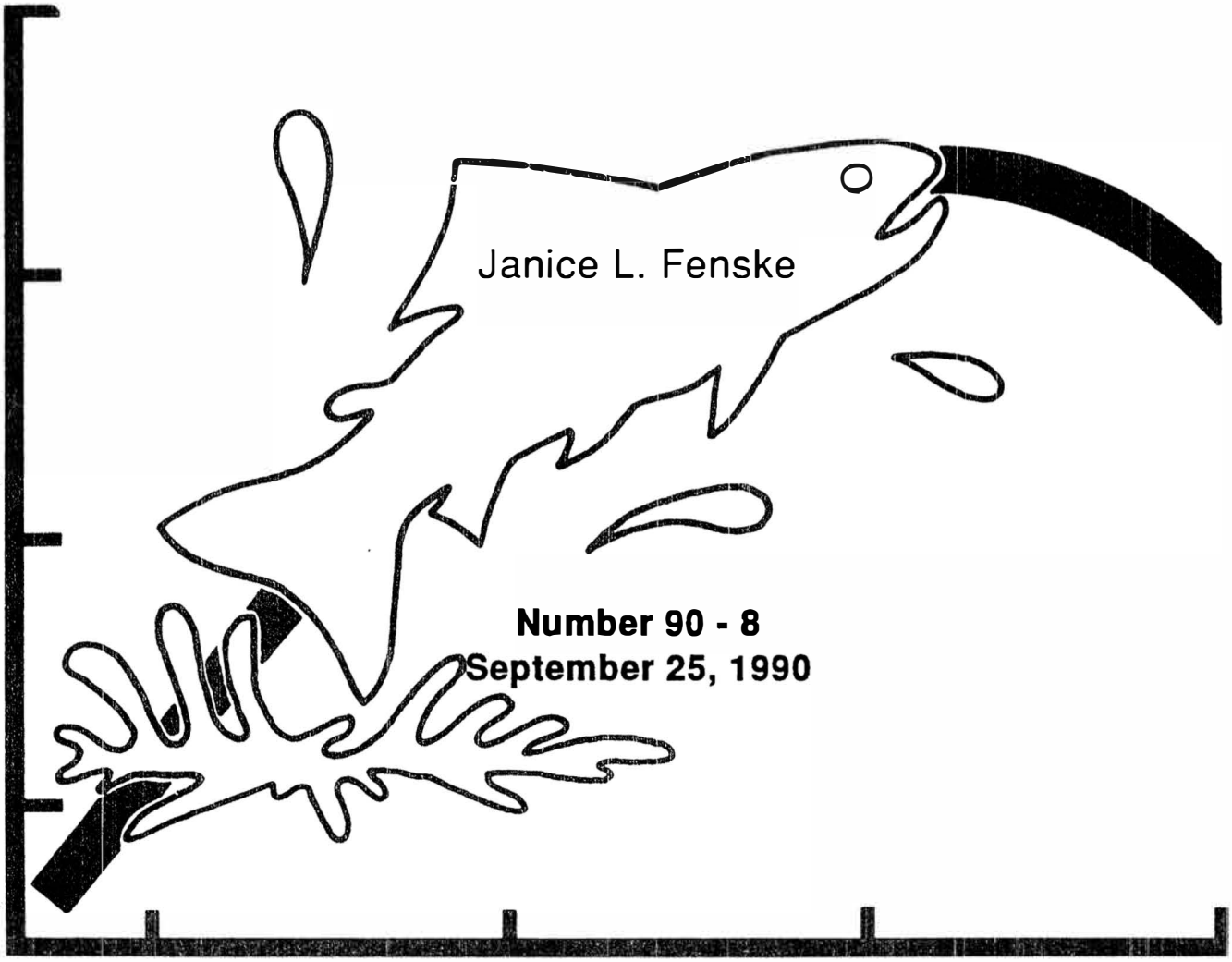
90-8

FISHERIES DIVISION

TECHNICAL REPORT

Medusa River Harvest Weir Report, 1988



Janice L. Fenske

Number 90 - 8
September 25, 1990

Michigan Department of
Natural Resources

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Chinook salmon were stocked in the northern end of Lake Michigan (Antrim, Charlevoix, and Emmet counties) in the early phase of the salmon program, 1970 to 1976; however, no more chinook were added until 1983, when the Jordan River (Antrim County) was planted. It was subsequently decided that large numbers of Pacific salmon were undesirable in this river and the planting location was moved to Medusa Creek (Charlevoix County) beginning in 1984. An average of 331,501 spring fingerling chinook have been planted annually in Medusa Creek for the past 5 years (Table 1).

Medusa Creek is a small, man-made stream that is a tributary to northern Lake Michigan in Charlevoix County. Its flow is due to the operation of one to three pumps used to drain the limestone quarries of the Medusa Cement Company. This stream was chosen because it was located in a good area for a salmon lake fishery and large numbers of returning surplus salmon could be controlled due to its small size and private ownership. All of the salmon that run Medusa Creek in the fall are harvested by and sold to a private contractor. An agreement exists between the private contractor and Medusa Cement Company for the use of the harvest site.

The location of the salmon blocking weir and harvest operation is approximately 150 feet upstream of the creek mouth. The harvest site was constructed in the fall of 1986 by a private contractor. A permanent harvest pond was dug adjacent to the creek, with an inlet at the upstream end to divert a portion of the creek flow through the pond and a fish ladder at the downstream end to allow passage of salmon into the pond (Figure 1). During fall harvest operations, a temporary wood rack weir is installed in the creek to prevent the salmon from migrating further upstream and to force them into the harvest pond.

Salmon harvest operations on Medusa Creek began in 1986. Few salmon returned in 1986, as would be expected because stocking at this location only began in 1984. An estimated 1,500 chinook salmon weighing 14,676 pounds were harvested during the period October 3 to November 7, 1986 (M. Shouder, Michigan Department of Natural Resources, unpublished data). In 1987, 11,230 chinook salmon weighing 131,132 pounds were harvested (Fenske 1988). This run was composed of fish aged 0.1 to 0.5. Since stocking of Medusa Creek only began in 1984, the 0.4 and 0.5 aged chinook were fish that strayed from other streams. In aging anadromous fish, the number preceding the decimal denotes age at smolthing (0 for most chinook, 1 for most coho) and the number following the decimal represents the number of annuli formed in the Great Lakes (mostly 0, 1, 2, 3, 4, or 5 for chinook and 0 or 1 for coho).

Harvest Weir Operations, 1988

The harvest pond was filled and the blocking weir installed during the first 2 weeks of September, and the harvest operation was completed on November 10. The salmon were harvested by Tempotech Industries personnel and all salmon were sold to this contractor. Fisheries Division personnel were on-site during harvest operations to monitor the harvest and collect biological data.

The first major run of chinook salmon occurred during the last week of September and the first harvest took place on September 28. The last date of harvest was October 31, for a total of 34 days of harvest operations. The majority of salmon ran during the second and third week of October, which was later than observed for the 1987 harvest season (Table 2). The total number of chinook salmon harvested was estimated at 2,353 with an estimated round weight of 22,540 pounds (Table 3).

Biological samples were taken during weeks 1, 2, 3, and 4 of the 6-week harvest operation. Each sample was randomly selected and consisted of 50 to 100 chinook. Data collected included length, weight, sex, number of lamprey scars, and fin clips. No scale samples were taken for age analysis because the reabsorption of scales on spawning chinook makes analysis from such scales inaccurate. Ages were assigned to the chinook sample based on a length-age key (Table 4). This table was derived from data collected during a sport fishery creel survey at several sites on Lake Michigan from August through November, 1988. (Insufficient biological data were collected in the 1988 creel survey at sites in Antrim, Charlevoix, and Emmet counties for use in assigning ages.) When assigning ages to fish in the biological samples from the weir, there were some cases when inch groups represented by more than one age resulted in fractions of a fish. When this occurred, the fractions were assigned to an age group based on weight.

The chinook harvest was composed of fish from ages 0.1 to 0.5, with 21.3% age 0.1, 19.0% age 0.2, 44.0% age 0.3, 15.6% age 0.4, and 0.1% age 0.5 (Table 5). Based on the four biological samples, the run was composed of 12.5% females and 87.5% males (Table 5). Mean lengths and weights for the sexes combined were as follows: age 0.1, 23.0 inches and 3.2 pounds; age 0.2, 27.3 inches and 6.0 pounds; age 0.3, 34.6 inches and 11.8 pounds; age 0.4, 37.7 inches and 16.3 pounds; and age 0.5, 40.8 inches and 20.0 pounds (Table 6, Figure 2).

Chinook salmon have only been stocked in Medusa Creek since 1984, so no total return rate can be derived for any year class. Comparison of the percent of a year class returning to the Medusa Creek weir at each age to similar data for the Little Manistee River weir (Hay 1988) indicates that year class return rates for chinook stocked in Medusa Creek are very low. The percent return for age-0.1 fish at the Little Manistee River weir has ranged from 0.4% to 1.9% (4 years). The percent return for age-0.1 fish at Medusa Creek weir was <0.1% to 0.5% for the 1984-87 year classes (Table 7). Age-0.2 fish returning to Medusa Creek were only 0.1% to 0.4% of their year classes and the percent returns for age-0.3 fish were only 0.4% to 0.8%. These percentages are much below those reported at the Little Manistee weir, which ranged from 3.1% to 3.5% for age 0.2 and 1.7% to 3.2% for age-0.3 fish. These relatively low returns do not necessarily represent poor survival of the salmon planted in Medusa Creek. Many of the nearby rivers, including the Jordan and Boyne rivers, receive large runs of chinook salmon and the runs have increased in recent years, possibly due to straying from Medusa Creek. In 1987 and 1988, the spring fingerlings planted in Medusa Creek were held in the harvest pond for about 2 weeks in an attempt to better imprint the fish to this stream.

The 1988 chinook salmon run at Medusa Creek weir should have been larger than in 1987 as an additional year class was available to return. However, the run was very low; down 79% from 1987. It was also composed of a higher percentage of young fish. In 1987, the 0.1 to 0.3 aged fish accounted for 59.8% of the harvest and in 1988 these age classes were 84.3% of the harvest. There was no indication that the number of chinook running nearby

rivers increased in 1988, so it appears that these fish did not survive to return. This poor survival was also reflected in low catch rates of chinook salmon during the 1988 sport fishery in Lake Michigan (Rakoczy and Rogers 1990).

Lamprey scarring rates were very low for the chinook salmon. Only 0.3% of the fish sampled had fresh lamprey scars and 1.2% had healed lamprey scars. No fin-clipped salmon were observed during the harvest period. Two coho salmon were collected during the first week of October. These were 22.0 and 20.8 inches in length and each weighed 2.5 pounds.

Summary

Harvest operations took place at the Medusa Creek weir in 1988 from September 28 to October 31, a total of 34 days. An estimated 2,353 chinook salmon weighing 22,540 pounds were harvested during this period. The run consisted of 12.5% females and 87.5% males. The age composition of the run was 21.3% age 0.1 (0.2% of the 1987 plant), 19.0% age 0.2 (0.1% of the 1986 plant), 44.0% age 0.3 (0.4% of the 1985 plant), 15.6% age 0.4 (0.1% of the 1984 plant); and 0.1% age 0.5. Mean lengths and weights for the combined sexes were 23.0 inches and 3.2 pounds for age 0.1, 27.3 inches and 6.0 pounds for age 0.2, 34.6 inches and 11.8 pounds for age 0.3, 37.7 inches and 16.3 pounds for age 0.4, and 40.8 inches and 20.0 pounds for age 0.5. Total harvest numbers were down significantly from 1987.

Recommendations for 1989

It is recommended that the practice of holding the spring fingerlings in the harvest pond for a few weeks to better imprint the salmon be continued in order to attain better return rates. In addition, biological samples should be collected on a weekly basis during the entire harvest season.

Acknowledgments

Data collection and tabulation were done by Harold Miller, Lyle Hollenbaugh, Jim Holser, and Brian Hoxie. Scale reading for age analysis was done by Alfred Allen, Dann Manz, Steve Lazar, Janice Sapak, and Peter Makoweski. Technical advice was given by Ralph Hay, Mason Shouder, Kelley Smith, and Steve Swan. Kelley Smith edited the report.

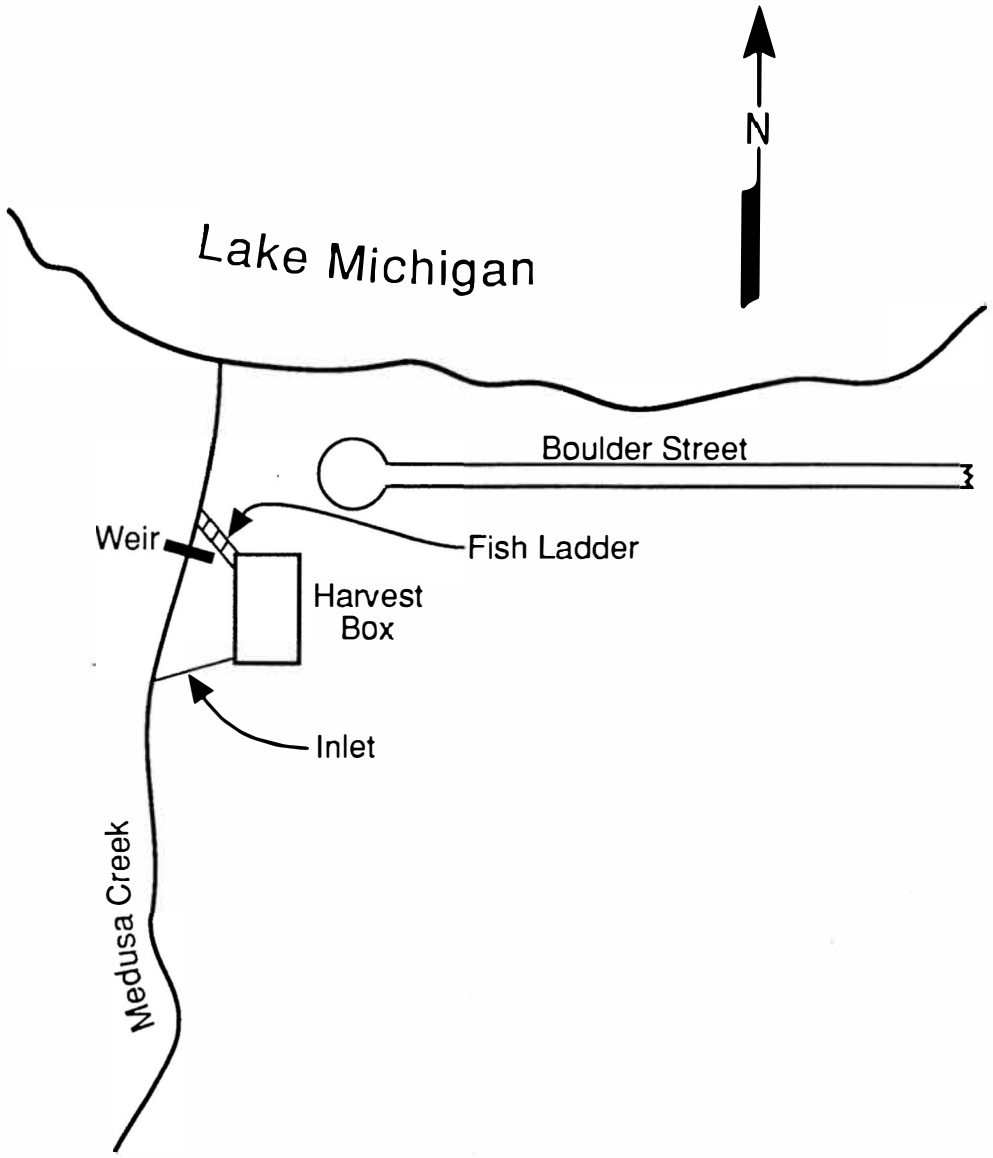

Figure 1.—Location and schematic diagram of the Medusa Creek weir complex, less than 1-mile west of Charlevoix, Michigan.

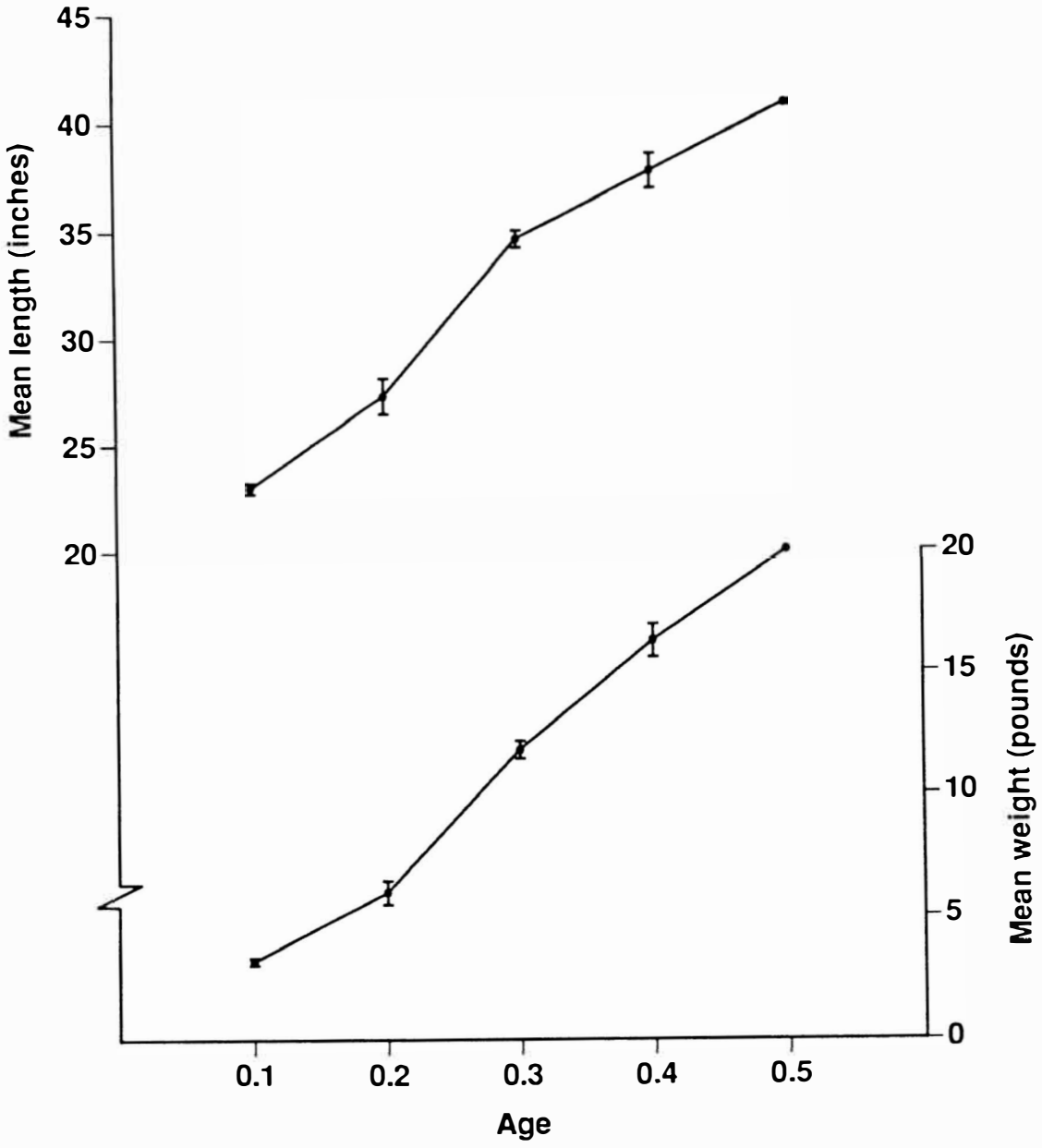

Figure 2.–Mean total length (inches) and round weight (pounds), by age, of chinook salmon harvested at the Medusa Creek weir, fall 1988. Vertical bars represent two standard errors.

Table 1.—Number of spring fingerling chinook salmon planted in Medusa Creek, Charlevoix County, 1984-88.

Planting year	Number planted
1984	500,108
1985	243,820
1986	299,975
1987	306,200
1988	307,400
Total	1,657,503

Table 2.—Number, by week, of chinook salmon harvested at the Medusa Creek weir, fall 1988.

Week	Week beginning	Number harvested
1	09/26	419
2	10/03	216
3	10/10	650
4	10/17	822
5	10/24	0
6	10/31	246
Total		2,353

Table 3.—Number, by age, of chinook salmon harvested at Medusa Creek weir, fall 1987-88. Weight (pounds) is in parentheses and was estimated using seasonal means.

	Age					
Year	0.1	0.2	0.3	0.4	0.5	Total
1987	1,460 (6,132)	1,067 (7,149)	4,189 (49,011)	4,200 (63,000)	314 (5,840)	11,230 (131,132)
1988	501 (1,603)	447 (2,682)	1,035 (12,213)	367 (5,982)	3 (60)	2,353 (22,540)

Table 4.—Length-age distribution (in percent by inch group) for chinook salmon scale-sampled during the creel census at Pentwater, Ludington, Manistee, Frankfort, Leland, Grand Traverse Bay, Manistee Lake, Big Manistee River, Betsie River, and Platte River, August-November, 1988.[1]

Length (inches)	Age				
	0.1	0.2	0.3	0.4	0.5
13	---	---	---	---	---
14	---	---	---	---	---
15	100	---	---	---	---
16	100	---	---	---	---
17	100	---	---	---	---
18	100	---	---	---	---
19	100	---	---	---	---
20	100	---	---	---	---
21	100	---	---	---	---
22	100	---	---	---	---
23	100	---	---	---	---
24	29	71	---	---	---
25	20	80	---	---	---
26	---	100	---	---	---
27	---	100	---	---	---
28	---	100	---	---	---
29	---	80	20	---	---
30	---	62	38	---	---
31	---	54	46	---	---
32	---	23	77	---	---
33	---	---	96	4	---
34	---	---	83	17	---
35	---	---	68	32	---
36	---	---	75	25	---
37	---	---	53	47	---
38	---	---	46	54	---
39	---	---	67	33	---
40+	---	---	---	75	25

[1]Table developed by District 6 personnel at the Harrietta warehouse.

Table 5.—Summary of the number and weight, by age and sex, of chinook salmon harvested at the Medusa Creek weir, fall 1988.

Week beginning	Male		Female[1]		Total	
	Number	Pounds	Number	Pounds	Number	Pounds
Age 0.1						
09/26	88	281	---	---	88	281
10/03	55	199	---	---	55	199
10/10	224	683	---	---	224	683
10/17	81	284	---	---	81	284
---[2]	53	156	---	---	53	156
Total	501	1,603	---	---	501	1,603
(Percent)	(21.3)	(7.1)	---	---	(21.3)	(7.1)
Age 0.2						
09/26	50	317	8	62	58	379
10/03	49	300	---	---	49	300
10/10	116	750	---	---	116	750
10/17	177	974	---	---	177	974
---[2]	46	272	1	7	47	279
Total	438	2,613	9	69	447	2,682
(Percent)	(18.6)	(11.6)	(0.4)	(0.3)	(19.0)	(11.9)
Age 0.3						
09/26	181	2,237	8	108	189	2,345
10/03	84	990	---	---	84	990
10/10	209	2,458	43	473	252	2,931
10/17	258	2,991	145	1,724	403	4,715
---[2]	84	973	23	259	107	1,232
Total	816	9,649	219	2,564	1,035	12,213
(Percent)	(34.7)	(42.8)	(9.3)	(11.4)	(44.0)	(54.2)
Age 0.4						
09/26	80	1,278	4	58	84	1,336
10/03	24	369	2	40	26	409
10/10	36	580	22	352	58	932
10/17	129	2,217	32	456	161	2,673
---[2]	31	525	7	107	38	632
Total	300	4,969	67	1,013	367	5,982
(Percent)	(12.8)	(22.0)	(2.8)	(4.5)	(15.6)	(26.5)

Table 5.—Continued:

Week beginning	Male		Female[1]		Total	
	Number	Pounds	Number	Pounds	Number	Pounds
Age 0.5						
09/26	---	---	---	---	---	---
10/03	2	40	---	---	2	40
10/10	---	---	---	---	---	---
10/17	---	---	---	---	---	---
---[2]	1	20	---	---	1	20
Total	3	60	---	---	3	60
(Percent)	(0.1)	(0.3)	---	---	(0.1)	(0.3)

[1]Weight of stripped females was recalculated into round weight and, therefore, the total weight of chinook does not correspond with the weight shipped to Tempotech Industries.

[2]Combination of weeks when chinook salmon were harvested but no biological data were collected. Estimation of number and weight by age and sex in these weeks was done using the distributions calculated from the 4 weeks in which biological samples were obtained.

Table 6.—Mean total length (inches) and weight (pounds), by age and sex, of chinook salmon harvested at the Medusa Creek weir, fall 1988. Two standard errors in parentheses.

Week beginning	Measure-ment	Age 0.1		Age 0.2		Age 0.3	
		Male	Female	Male	Female	Male	Female
09/26	Length	22.6	---	27.4	31.5	35.0	35.3
		(0.381)	---	(1.504)	(0.200)	(0.754)	(4.400)
	Weight	3.2	---	6.3	7.8	12.4	13.5
		(0.201)	---	(1.025)	(0.500)	(0.739)	(6.000)
10/03	Length	23.1	---	27.3	---	34.3	---
		(0.253)	---	(1.126)	---	(0.781)	---
	Weight	3.6	---	6.1	---	11.8	---
		(0.163)	---	(0.612)	---	(0.724)	---
10/10	Length	23.3	---	28.9	---	35.2	33.7
		(0.463)	---	(1.678)	---	(0.830)	(1.784)
	Weight	3.0	---	6.5	---	11.8	11.0
		(0.264)	---	(0.981)	---	(0.846)	(1.317)
10/17	Length	22.5	---	26.0	---	34.5	33.7
		(0.707)	---	(1.609)	---	(0.938)	(1.258)
	Weight	3.5	---	5.5	---	11.6	11.9
		(0.447)	---	(0.905)	---	(0.823)	(1.245)
Weighted seasonal mean	Length	23.0	---	27.2	31.5	34.8	33.7
		(0.257)	---	(0.864)	(0.173)	(0.426)	(0.984)
	Weight	3.2	---	6.0	7.8	11.9	11.8
		(0.150)	---	(0.495)	(0.433)	(0.398)	(0.955)
Sexes combined	Length	23.0		27.3		34.6	
		(0.257)		(0.852)		(0.396)	
	Weight	3.2		6.0		11.8	
		(0.150)		(0.486)		(0.367)	

Table 6.—Continued:

Week beginning	Measure-ment	Age 0.4 Male	Age 0.4 Female	Age 0.5 Male	Age 0.5 Female
09/26	Length	37.5	35.3	---	---
		(1.000)	---	---	---
	Weight	16.0	14.5	---	---
		(0.957)	---	---	---
10/03	Length	37.1	38.3	40.8	---
		(1.056)	---	---	---
	Weight	15.4	20.0	20.0	---
		(0.954)	---	---	---
10/10	Length	38.1	36.6	---	---
		(2.486)	(1.933)	---	---
	Weight	16.1	16.0	---	---
		(2.478)	(2.082)	---	---
10/17	Length	38.9	34.3	---	---
		(1.130)	(1.500)	---	---
	Weight	17.2	14.3	---	---
		(1.179)	(1.500)	---	---
Weighted seasonal mean	Length	38.2	35.3	40.8	---
		(0.665)	(1.130)	---	---
	Weight	16.5	15.1	20.0	---
		(0.678)	(1.167)	---	---
Sexes combined	Length	37.7		40.8	
		(0.812)		---	
	Weight	16.3		20.0	
		(0.679)		---	

Table 7.—Numbers, and in parentheses percent, by age, of chinook salmon in various year classes returning to Medusa Creek weir 1 to 5 years after stocking.

Year	Number stocked	Age 0.1	0.2	0.3	0.4	0.5	Total
1983	315,495[1]	---	---	---	4,200	3	4,203
		---	---	---	(1.3)	(<0.1)	(1.3)
1984	500,108	90	608	4,189	367	---	5,254
		(<0.1)	(0.1)	(0.8)	(0.1)	---	(1.1)
1985	243,820	193	1,067	1,035	---	---	2,295
		(0.1)	(0.4)	(0.4)	---	---	(0.9)
1986	299,975	1,460	447	---	---	---	1,907
		(0.5)	(0.1)	---	---	---	(0.6)
1987	306,200	501	---	---	---	---	501
		(0.2)	---	---	---	---	(0.2)

[1]Stocked in the Jordan River.

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