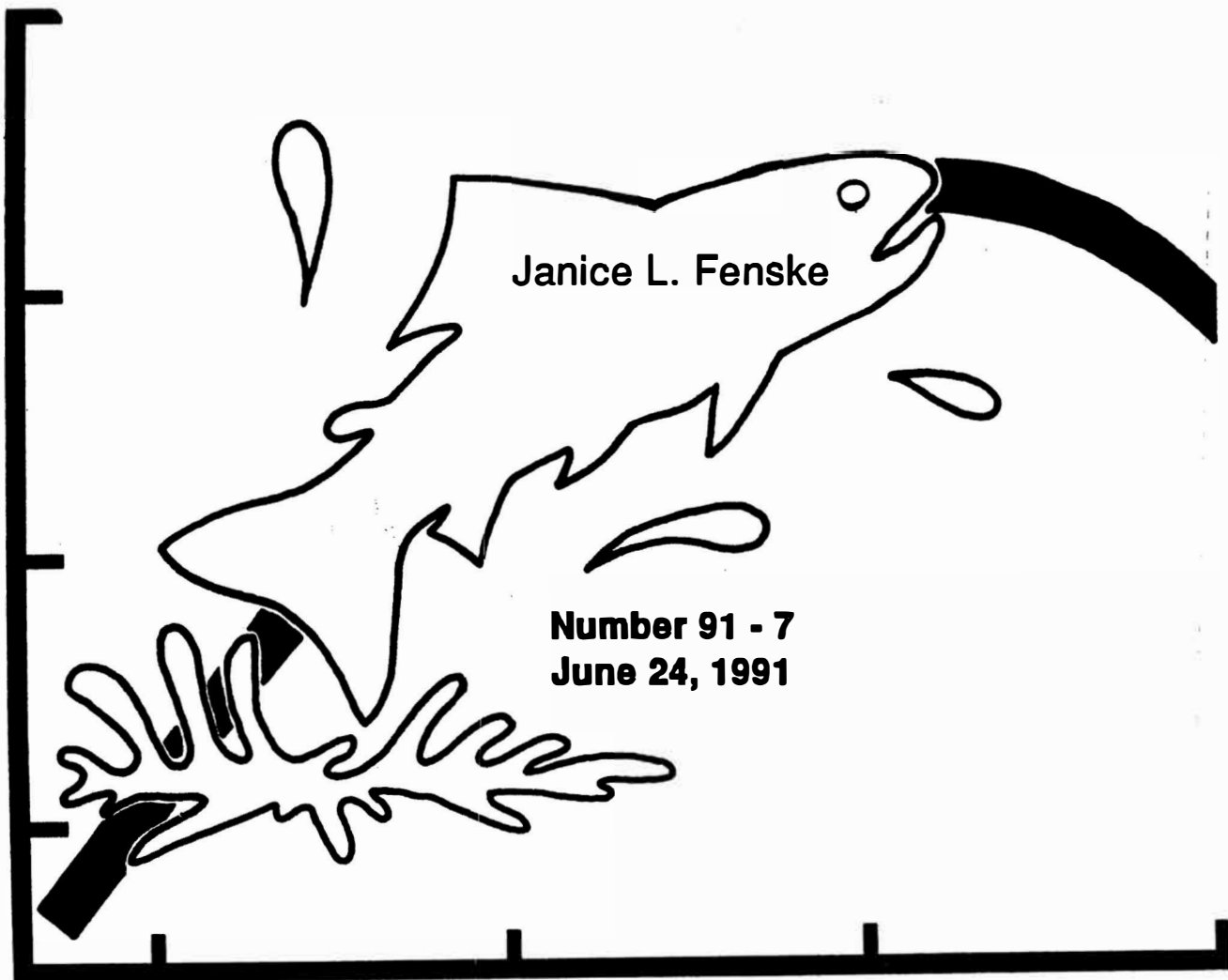


# FISHERIES DIVISION

## TECHNICAL REPORT

### Medusa Creek Harvest Weir Report, 1989



Michigan Department of  
Natural Resources

**MICHIGAN DEPARTMENT OF NATURAL RESOURCES  
FISHERIES DIVISION**

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**MEDUSA CREEK HARVEST WEIR REPORT, 1989**

**Janice L. Fenske**

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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 338,116 spring fingerling chinook have been planted annually in Medusa Creek for the past 6 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 to create a lake fishery for salmon. The stream was also suitable because large numbers of returning salmon could be controlled due to its small size and private ownership of the riparian land. 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. In 1989, a series of small stone wing dams were constructed in the creek downstream of the weir, creating deeper pools for the salmon. This was done to solve the problem of large heavy females getting stranded in the shallow creek.

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 smolting, 0 for most chinook and the number following the decimal represents the number of annuli formed in the Great Lakes mostly 0-5 for chinook.) In 1988, the number of chinook salmon harvested at the Medusa Creek weir dropped significantly. Only 2,353 fish weighing 22,540 pounds were harvested, a decrease of 79% from 1987 (Fenske 1990).

### Harvest Weir Operations, 1989

The harvest pond was filled and the blocking weir installed on September 6 and the harvest operation was completed on November 2. The salmon were harvested by Tempotech Industries personnel and all salmon were sold to this contractor. As in previous years, no eggs were taken at this weir and all of the salmon were shipped in the round. 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 27. The last date of harvest was October 30, for a total of 34 days of harvest operations. The run was fairly constant with the exception that no fish ran during the week of October 16 (Table 2). The total number of chinook salmon harvested was estimated at 3,040 with an estimated round weight of 30,785 pounds (Table 3).

Biological samples were taken during weeks 1, 2, 3, 5, and 6 of the 6-week harvest operation. Each sample consisted of 100 to 129 chinook. Samples were taken by randomly selecting a tote of fish and collecting data from each fish in the tote. Usually part of a second tote was used to reach in the target of 100 fish per sample. Data collected included length, weight, sex, number of lamprey wounds and 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 October, 1989. (Insufficient biological data were collected in the 1989 creel survey at sites in Charlevoix County 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 29.9% age 0.1, 16.1% age 0.2, 32.4% age 0.3, 21.3% age 0.4, and 0.3% age 0.5 (Table 5). Based on the five biological samples, the run was composed of 24.7% females and 75.3% males (Table 5). Mean lengths and weights for the sexes combined were as follows: age 0.1, 23.1 inches and 4.4 pounds; age 0.2, 26.1 inches and 6.2 pounds; age 0.3, 33.6 inches and 12.7 pounds; age 0.4, 36.0 inches and 17.1 pounds; and age 0.5, 40.3 inches and 22.5 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 only one year class. For the 1984 year class, 1.1% of the fish stocked returned to the weir. This is a very low rate of return compared to earlier data from the Little Manistee River weir which had return rates ranging from 5.5% to 9.1% for the year classes 1981 to 1983 (Hay 1990). However, there was a significant change in the return rates at the Little Manistee River weir beginning with the 1984 year class, which had a total percent return of only 2.0. Based on the return rates to date of the 1985 through 1987 year classes, it appears that total returns for these year classes will continue to be low at both weirs. This poor survival of the chinook salmon was also reflected in low catch rates of chinook during the 1989 sport fishery in Lake Michigan (Rakoczy, Michigan Department of Natural Resources, personal communication).

The low return rates at the Medusa Creek weir are also somewhat attributable to straying of the returning salmon to nearby

streams (Fenske 1990). The salmon fingerlings were held in the harvest pond in 1987 and 1988 for about 2 weeks in an attempt to better imprint the fish to Medusa Creek. In 1989, the fingerlings were again stocked in the pond for imprinting. Vandalism to the water inlet structure of the pond resulted in significant mortalities so a second plant of fish was made in the pond. Mortalities once again occurred, this time due to power failure of the pumps at the Medusa Cement Company. The number of fish that survived from these two plants was conservatively estimated to be 371,190.

Lamprey scarring rates were very low for chinook salmon harvested at the weir. Only 0.2% of the fish sampled had fresh lamprey scars and 0.6% 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. No other fish species were present.

#### Summary

Harvest operations took place at the Medusa Creek weir in 1989 from September 27 to October 30, a total of 34 days. An estimated 3,040 chinook salmon weighing 30,785 pounds were harvested during this period. The run consisted of 24.7% females and 75.3% males. The age composition of the run was 29.9% age 0.1 (0.3% of the 1988 plant), 16.1% age 0.2 (0.2% of the 1987 plant), 32.4% age 0.3 (0.3% of the 1986 plant), 21.3% age 0.4 (0.2% of the 1985 plant); and 0.3% age 0.5. Mean lengths and weights for the combined sexes were 23.1 inches and 4.4 pounds for age 0.1, 26.1 inches and 6.2 pounds for age 0.2, 33.6 inches and 12.7 pounds for age 0.3, 36.0 inches and 17.1 pounds for age 0.4, and 40.3 inches and 20.0 pounds for age 0.5. Total harvest numbers were similar to the 1988 harvest and considerably below the 1987 harvest.

#### Recommendations for 1990

It is recommended that the practice of holding the spring fingerlings in the harvest pond for a few weeks to better imprint the salmon only be done if the holding pond can be secured from vandals.

#### Acknowledgments

Data collection and tabulation were done by Jeff Stevens, Paul Gelderblom, 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.

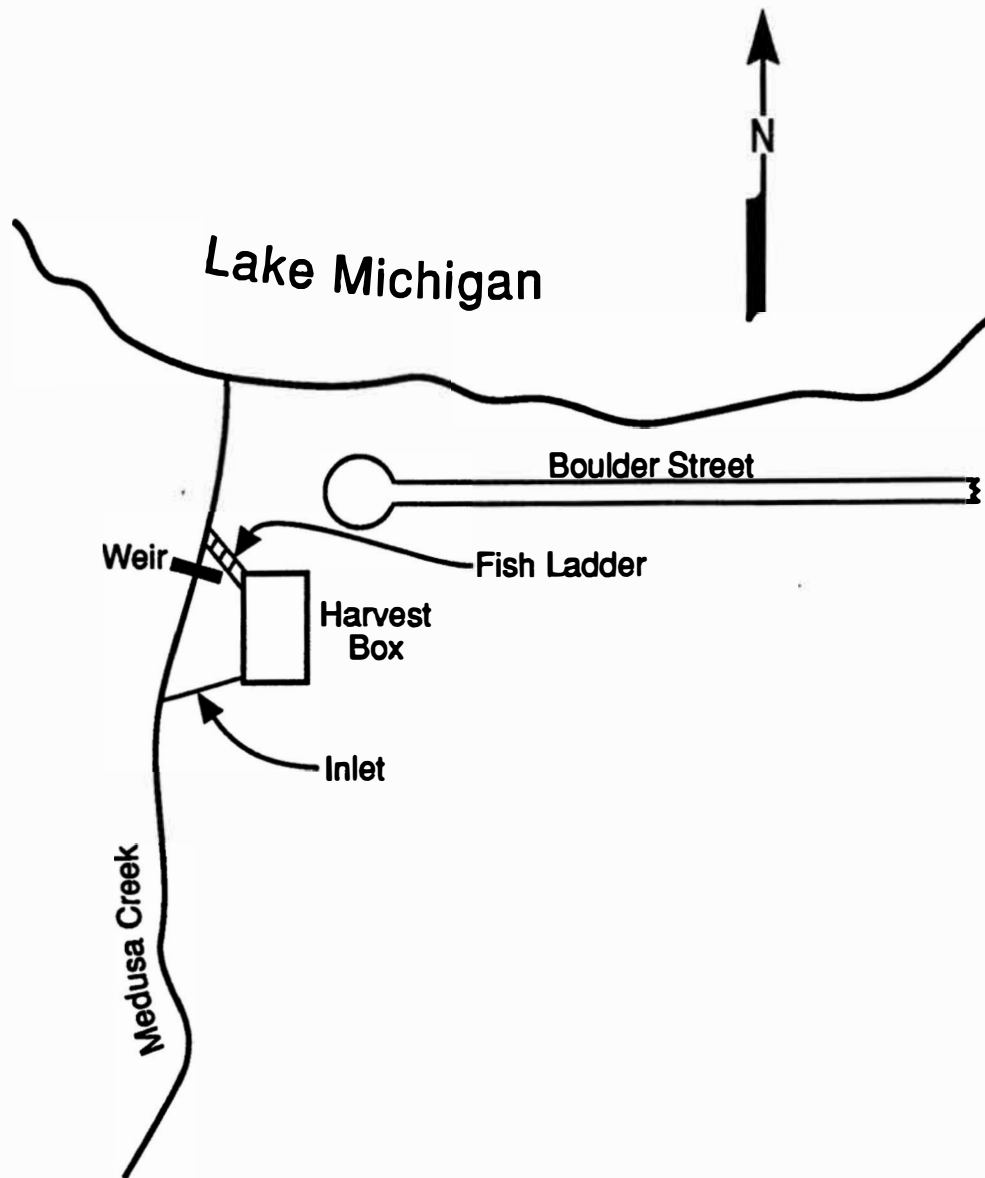


Figure 1.—Location and schematic diagram of the Medusa Creek weir complex, less than 1-mile west of Charlevoix, Michigan.

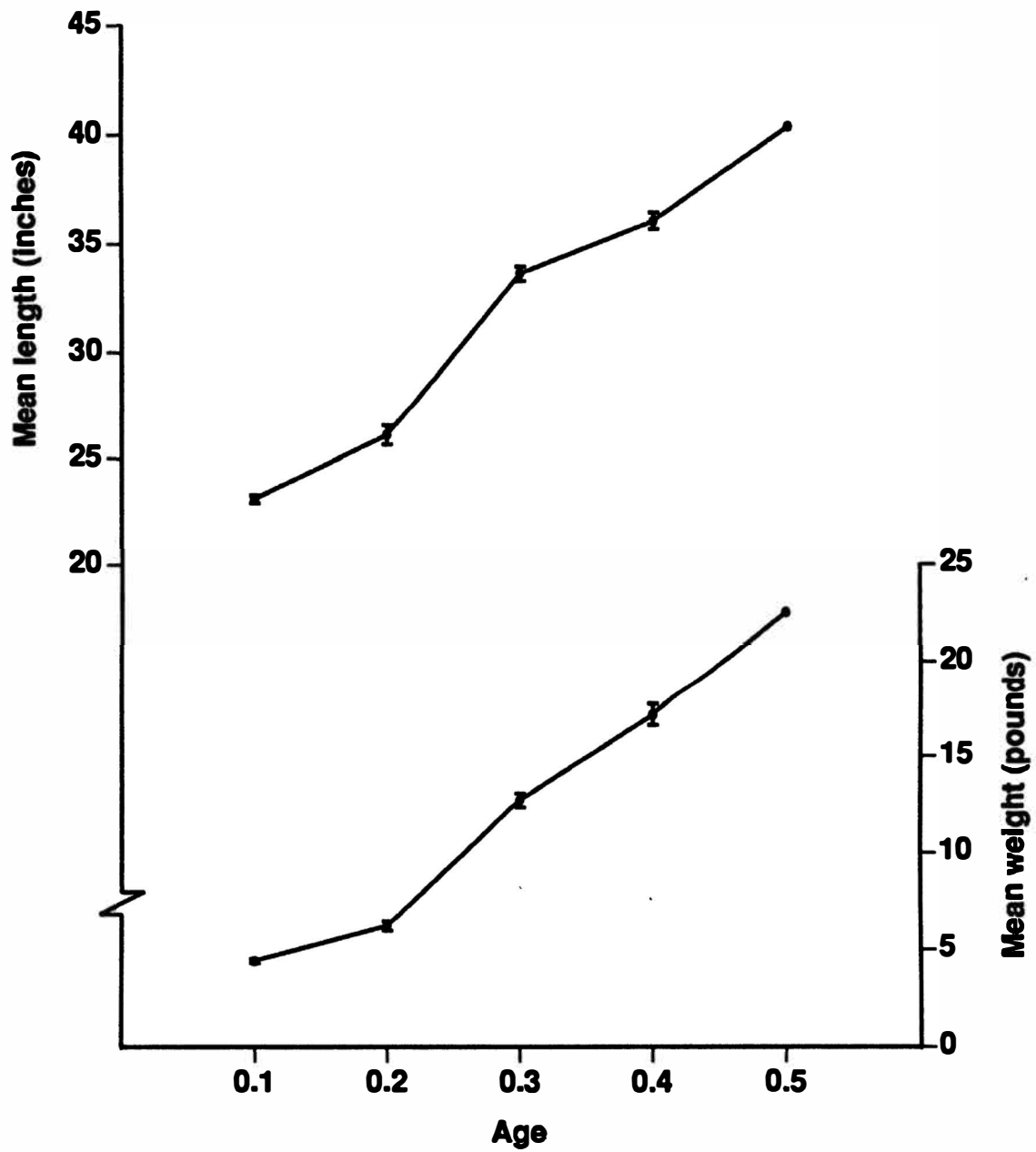


Figure 2.—Mean total length (inches) and round weight (pounds), by age, of chinook salmon harvested at the Medusa Creek weir, fall 1989. Vertical bars represent two standard errors.

**Table 1.—Number of spring fingerling chinook salmon planted in Medusa Creek, Charlevoix County, 1984-89.**

<b>Planting year</b>	<b>Number planted</b>
1984	500,108
1985	243,820
1986	299,975
1987	306,200
1988	307,400
1989	371,190
<b>Total</b>	<b>2,028,693</b>

**Table 2.—Number, by week, of chinook salmon harvested at the Medusa Creek weir, fall 1989.**

<b>Week</b>	<b>Week beginning</b>	<b>Number harvested</b>
1	09/25	329
2	10/02	914
3	10/09	775
4	10/16	0
5	10/23	710
6	10/30	312
<b>Total</b>		<b>3,040</b>



**Table 3.—Number, by age, of chinook salmon harvested at Medusa Creek weir, fall 1987-89. Weight (pounds) is in parentheses and was estimated using seasonal means.**

Year	Age					Total
	0.1	0.2	0.3	0.4	0.5	
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)
1989	908 (4,005)	489 (3,039)	986 (12,489)	648 (11,049)	9 (203)	3,040 (30,785)

Table 4.—Length-age distribution (in percent by inch group) for chinook salmon scale-sampled during the creel census at Pentwater, Ludington, Manistee, Frankfort, and Grand Traverse Bay, August-October, 1989.<sup>1</sup>

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	57	43	—	—	—
25	—	100	—	—	—
26	—	100	—	—	—
27	—	100	—	—	—
28	—	100	—	—	—
29	—	78	22	—	—
30	—	17	83	—	—
31	—	15	85	—	—
32	—	5	81	14	—
33	—	—	67	33	—
34	—	—	53	47	—
35	—	—	50	50	—
36	—	—	44	56	—
37	—	—	33	67	—
38	—	—	33	67	—
39	—	—	33	67	—
40+	—	—	—	75	25

<sup>1</sup>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 1989.

Week beginning	Male		Female		Total	
	Number	Pounds	Number	Pounds	Number	Pounds
<b>Age 0.1</b>						
09/25	49	222	—	—	49	222
10/02	201	914	—	—	201	914
10/09	295	1,223	—	—	295	1,223
10/23	231	1,031	—	—	231	1,031
10/30	132	615	—	—	132	615
<b>Total</b>	<b>908</b>	<b>4,005</b>	<b>—</b>	<b>—</b>	<b>908</b>	<b>4,005</b>
<b>(Percent)</b>	<b>(29.9)</b>	<b>(13.0)</b>	<b>—</b>	<b>—</b>	<b>(29.9)</b>	<b>(13.0)</b>
<b>Age 0.2</b>						
09/25	53	335	—	—	53	335
10/02	73	456	—	—	73	456
10/09	155	903	23	176	178	1,079
10/23	110	671	—	—	110	671
10/30	66	414	9	84	75	498
<b>Total</b>	<b>457</b>	<b>2,779</b>	<b>32</b>	<b>260</b>	<b>489</b>	<b>3,039</b>
<b>(Percent)</b>	<b>(15.0)</b>	<b>(9.0)</b>	<b>(1.1)</b>	<b>(0.8)</b>	<b>(16.1)</b>	<b>(9.9)</b>
<b>Age 0.3</b>						
09/25	105	1,163	23	288	128	1,451
10/02	155	1,915	155	2,216	310	4,131
10/09	109	1,347	116	1,473	225	2,820
10/23	143	1,716	105	1,459	248	3,175
10/30	39	465	36	447	75	912
<b>Total</b>	<b>551</b>	<b>6,606</b>	<b>435</b>	<b>5,883</b>	<b>986</b>	<b>12,489</b>
<b>(Percent)</b>	<b>(18.1)</b>	<b>(21.5)</b>	<b>(14.3)</b>	<b>(19.1)</b>	<b>(32.4)</b>	<b>(40.6)</b>
<b>Age 0.4</b>						
09/25	82	1,420	16	282	98	1,702
10/02	174	2,935	146	2,560	320	5,495
10/09	47	721	31	527	78	1,248
10/23	50	858	72	1,230	122	2,088
10/30	12	207	18	309	30	516
<b>Total</b>	<b>365</b>	<b>6,141</b>	<b>283</b>	<b>4,908</b>	<b>648</b>	<b>11,049</b>
<b>(Percent)</b>	<b>(12.0)</b>	<b>(19.9)</b>	<b>(9.3)</b>	<b>(15.9)</b>	<b>(21.3)</b>	<b>(35.9)</b>

Table 5.—Continued:

Week beginning	Male		Female		Total	
	Number	Pounds	Number	Pounds	Number	Pounds
<b>Age 0.5</b>						
09/25	—	—	—	—	—	—
10/02	9	203	—	—	9	203
10/09	—	—	—	—	—	—
10/23	—	—	—	—	—	—
10/30	—	—	—	—	—	—
<b>Total</b>	9	203	—	—	9	203
<b>(Percent)</b>	(0.3)	(0.7)	—	—	(0.3)	(0.7)

Table 6.—Mean total length (inches) and weight (pounds), by age and sex, of chinook salmon harvested at the Medusa Creek weir, fall 1989. Two standard errors in parentheses.

Week beginning	Measurement	Age 0.1		Age 0.2		Age 0.3	
		Male	Female	Male	Female	Male	Female
09/25	Length	23.2 (0.6)	—	26.4 (1.3)	—	32.6 (0.8)	33.4 (1.4)
	Weight	4.5 (0.4)	—	6.3 (0.5)	—	11.1 (0.8)	12.5 (1.5)
10/02	Length	23.2 (0.5)	—	26.0 (1.7)	—	33.6 (1.3)	34.2 (0.9)
	Weight	4.5 (0.2)	—	6.3 (0.8)	—	12.4 (1.5)	14.3 (0.8)
10/09	Length	23.2 (0.3)	—	26.1 (0.9)	29.6 (1.9)	33.9 (1.3)	33.3 (1.0)
	Weight	4.1 (0.2)	—	5.8 (0.5)	7.7 (1.5)	12.4 (1.4)	12.7 (0.9)
10/23	Length	23.1 (0.4)	—	25.7 (0.6)	—	33.5 (0.9)	33.9 (0.8)
	Weight	4.5 (0.2)	—	6.1 (0.3)	—	12.0 (0.8)	13.9 (0.9)
10/30	Length	22.7 (0.3)	—	25.2 (0.4)	29.4 (0.4)	33.9 (0.8)	32.9 (1.3)
	Weight	4.7 (0.2)	—	6.3 (0.3)	9.3 (1.2)	11.9 (0.9)	12.4 (1.3)
Weighted seasonal mean	Length	23.1 (0.2)	—	25.9 (0.4)	29.6 (1.3)	33.5 (0.5)	33.8 (0.4)
	Weight	4.4 (0.1)	—	6.1 (0.2)	8.1 (1.0)	12.0 (0.5)	13.5 (0.4)
Sexes combined	Length	23.1 (0.2)	—	26.1 (0.4)	—	33.6 (0.3)	—
	Weight	4.4 (0.1)	—	6.2 (0.2)	—	12.7 (0.4)	—

Table 6.—Continued:

Week beginning	Measurement	Age 0.4		Age 0.5	
		Male	Female	Male	Female
09/25	Length	36.9 (0.9)	35.9 (1.7)	—	—
	Weight	17.3 (1.2)	17.6 (1.7)	—	—
10/02	Length	36.5 (1.0)	35.7 (0.7)	40.3 —	— —
	Weight	16.9 (1.4)	17.5 (1.1)	22.5 —	— —
10/09	Length	35.0 (1.4)	35.0 (2.3)	—	—
	Weight	15.3 (1.7)	17.0 (2.7)	—	—
10/23	Length	36.9 (1.4)	35.4 (1.0)	—	—
	Weight	17.2 (2.0)	17.1 (1.3)	—	—
10/30	Length	36.5 (3.8)	35.0 (0.8)	—	—
	Weight	17.3 (5.1)	17.2 (1.7)	—	—
Weighted seasonal mean	Length	36.4 (0.6)	35.5 (0.5)	40.3 —	— —
	Weight	16.8 (0.7)	17.3 (0.7)	22.5 —	— —
Sexes combined	Length	36.0 (0.4)		40.3 —	
	Weight	17.1 (0.5)		22.5 —	

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					Total
		0.1	0.2	0.3	0.4	0.5	
1983	315,495 <sup>1</sup>	— —	— —	— —	4,200 (1.3)	3 (<0.1)	4,203 (1.3)
1984	500,108	90 (<0.1)	608 (0.1)	4,189 (0.8)	367 (0.1)	9 (<0.1)	5,263 (1.1)
1985	243,820	193 (0.1)	1,067 (0.4)	1,035 (0.4)	648 (0.2)	— —	2,943 (1.2)
1986	299,975	1,460 (0.5)	447 (0.1)	986 (0.3)	— —	— —	2,893 (1.0)
1987 <sup>2</sup>	306,200	501 (0.2)	489 (0.2)	— —	— —	— —	990 (0.3)
1988 <sup>2</sup>	307,400	908 (0.3)	— —	— —	— —	— —	908 (0.3)

<sup>1</sup>Stocked in the Jordan River.

<sup>2</sup>Fingerlings held and imprinted in pond.

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