

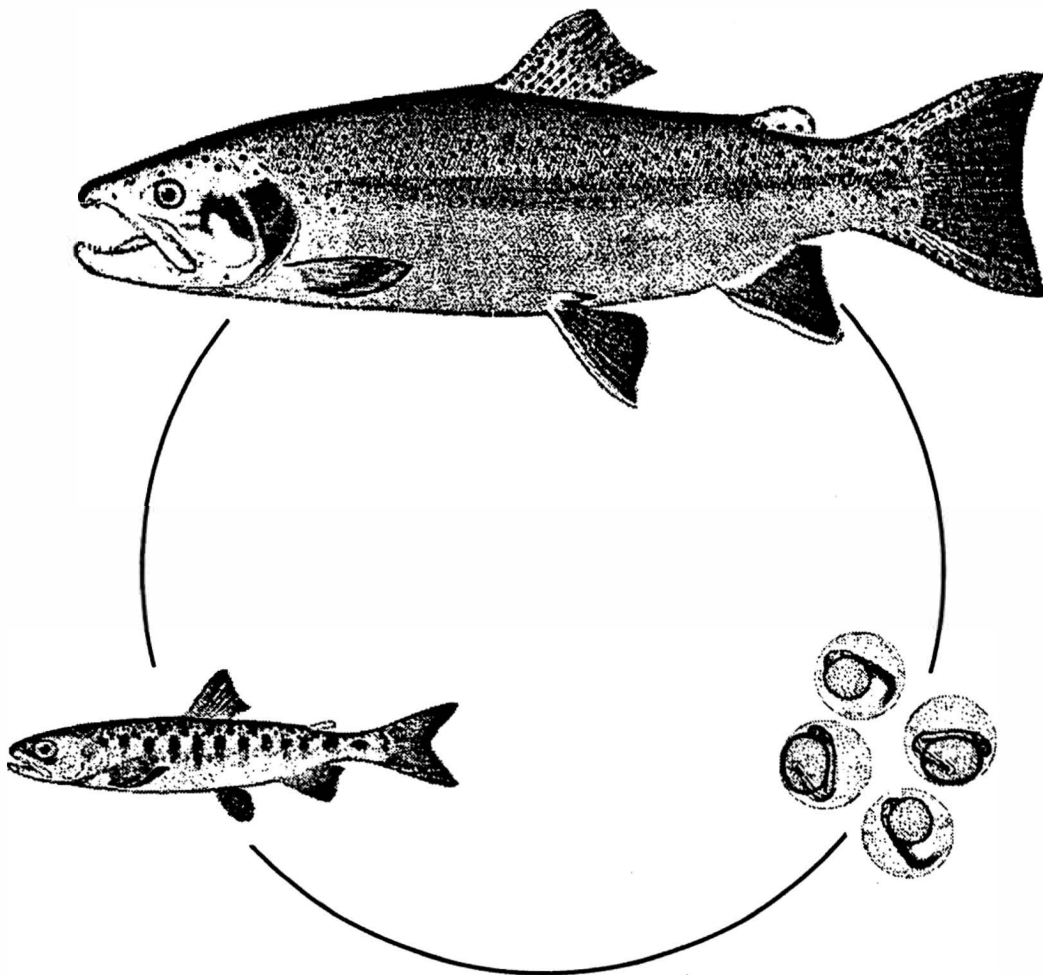
# FISHERIES DIVISION TECHNICAL REPORT

Number 91-14

December 4, 1991

## Medusa River Harvest Weir Report, 1990

Janice L. Fenske



**COMPLETED**


**MICHIGAN DEPARTMENT OF NATURAL RESOURCES  
FISHERIES DIVISION**

**Fisheries Technical Report 91-14**

**December 4, 1991**

**MEDUSA CREEK HARVEST WEIR REPORT, 1990**

**Janice L. Fenske**

PRINTED BY AUTHORITY OF Michigan Department of Natural Resources  
TOTAL NUMBER OF COPIES: 300 TOTAL COST: \$207.70 COST PER COPY: \$0.69  
Michigan Department of Natural Resources 

## Medusa Creek Harvest Weir Report, 1990

Janice L. Fenske

Michigan Department of Natural Resources  
District Office #5  
1732 W. M-32  
Gaylord, Michigan 49735

Chinook salmon *Oncorhynchus tshawytscha* 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 (*Oncorhynchus* sp.) were undesirable in this river and the planting location was moved to Medusa Creek (Charlevoix County) beginning in 1984. An average of 333,100 spring fingerling chinook have been planted annually in Medusa Creek for the past 7 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. 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 1985. Few salmon returned in 1985 and 1986, as would be expected because stocking at this location only began in 1984. In 1985, 118 chinook salmon weighing 720 pounds were harvested (M. Shouder, Michigan Department of Natural Resources (MDNR), unpublished data). Some difficulties were encountered with the mechanics of the operation and there was escapement upstream so the number harvested does not represent the entire run. An estimated 1,500 chinook salmon weighing 14,676 pounds were harvested in 1986 during the period October 3 to November 7 (M. Shouder, MDNR, 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). The salmon run in 1989 was similar to 1988 in numbers and weight. An estimated total of 3,040 fish weighing 30,785 pounds were harvested in 1989 (Fenske 1991).

#### **Harvest Weir Operations, 1990**

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 6. 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 chinook salmon began entering the river in late September and the first harvest took place on October 4. The last date of harvest was November 6, for a total of 34 days of harvest operations. The majority of salmon (68%) ran during the first and second weeks of October (Table 2). The total number of chinook salmon harvested was estimated at 6,533 with an estimated round weight of 54,199 pounds (Table 3). This was a significant increase over the number harvested in the previous 2 years.

Biological samples were taken during weeks 1, 2, 3, 4, and 6 of the 6-week harvest operation. Each sample consisted of 100 to 128 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 the target

of 100 fish per sample. 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 October, 1990. (Insufficient biological data were collected in the 1990 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 48.6% age 0.1, 17.0% age 0.2, 26.1% age 0.3, 7.7% age 0.4, and 0.7% age 0.5 (Table 5). Based on the five biological samples, the run was composed of 16.1% females and 83.9% males (Table 5). Mean lengths and weights for the sexes combined were as follows: age 0.1, 22.6 inches and 4.2 pounds; age 0.2, 27.8 inches and 7.7 pounds; age 0.3, 33.7 inches and 13.3 pounds; age 0.4, 35.6 inches and 16.8 pounds; and age 0.5, 43.6 inches and 29.0 pounds (Table 6, Figure 2).

Chinook salmon have only been stocked in Medusa Creek since 1984, so total return rate can be derived for only two year classes. For the 1984 and 1985 year classes, 1.1% and 1.2%, respectively, of the fish stocked returned to the weir (Table 7). This is a very low rate of return compared to earlier data from the Little Manistee River weir which had return rates ranging from 5.6% 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 weir beginning with the 1984 year class, which had a total percent return of only 2.1 for ages 0.1-0.4 fish. Based on the return rates to date of the 1985 through 1988 year classes, it appears that total returns for these year classes will continue to be low at both weirs. However, at Medusa

Creek, 0.9% of the 1989 year class returned to the weir in 1990. This is the highest percent return of a year class at age 0.1 at Medusa Creek where previous rates ranged from <0.1% to 0.5%. There are a number of possible explanations for this improved rate of return. The most likely is that more chinook fingerlings were stocked in 1989 than indicated (see discussion below). However, this alone does not account for the improved rate because even if all of the fingerlings stocked in 1989 had survived, the number of age-0.1 chinook that returned in 1990 would still be higher (0.6) than the rates observed for previous years. Four other possible reasons for the improved rate are (1) there was better than average survival to age 0.1 of the 1989 year class, (2) a greater percent of the 1989 year class matured at age 0.1 (due to increased growth rates or holding and feeding of the fingerlings prior to stocking), (3) there was less straying of the salmon stocked at Medusa to other streams because of imprinting, and (4) there was an increase in the number of chinook straying to Medusa Creek from other streams.

The low return rates at the Medusa Creek weir are 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 but problems occurred. On May 18, 301,110 were stocked in the pond and held until May 23 when vandalism to the structure resulted in some mortalities. The pond was restocked on May 30 with 222,000 fish which were held through June 5 when mortalities again occurred due to a power outage. It was estimated that 371,190 of the total 523,110 fingerlings stocked in the pond in 1989 survived to enter Lake Michigan. Because of the difficulties encountered with holding the fingerlings in 1989, the salmon were stocked directly into the stream in 1990. A study was initiated in 1990 at Medusa Creek to evaluate the survival and movement of the stocked fingerling chinook salmon. All of the fingerlings stocked in this stream in 1990 were

marked with oxytetracycline and 33% of them also had micro-wire tags. This study should help evaluate the benefits of holding salmon fingerlings.

Sea lamprey *Petromyzon marinus* scarring rates were very low for the chinook salmon. Only 0.7% of the fish sampled had healed lamprey scars and none had fresh lamprey scars. No fin-clipped salmon were observed during the harvest period. No species other than chinook salmon returned to the weir during the 1990 harvest operations.

### Summary

Harvest operations took place at the Medusa Creek weir in 1990 from October 4 to November 6, a total of 34 days. An estimated 6,533 chinook salmon weighing 54,199 pounds were harvested during this period. The run consisted of 16.1% females and 83.9% males. The age composition of the run was 48.6% age 0.1 (0.9% of the 1989 plant), 17.0% age 0.2 (0.4% of the 1988 plant), 26.1% age 0.3 (0.6% of the 1987 plant), 7.7% age 0.4 (0.2% of the 1986 plant); and 0.7% age 0.5 (<0.1% of the 1985 plant). Mean lengths and weights for the combined sexes were 22.6 inches and 4.2 pounds for age 0.1, 27.8 inches and 7.7 pounds for age 0.2, 33.7 inches and 13.3 pounds for age 0.3, 35.6 inches and 16.8 pounds for age 0.4, and 43.6 inches and 29.0 pounds for age 0.5. Total harvest numbers were up significantly from the 1988 and 1989 runs. The increase was due to a higher rate of return of age 0.1 males, and age-0.2 and age-0.3 males and females.

### Acknowledgments

Data collection and tabulation were done by Jeff Stevens, Jerry Meggison, Mason Shouder, 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.

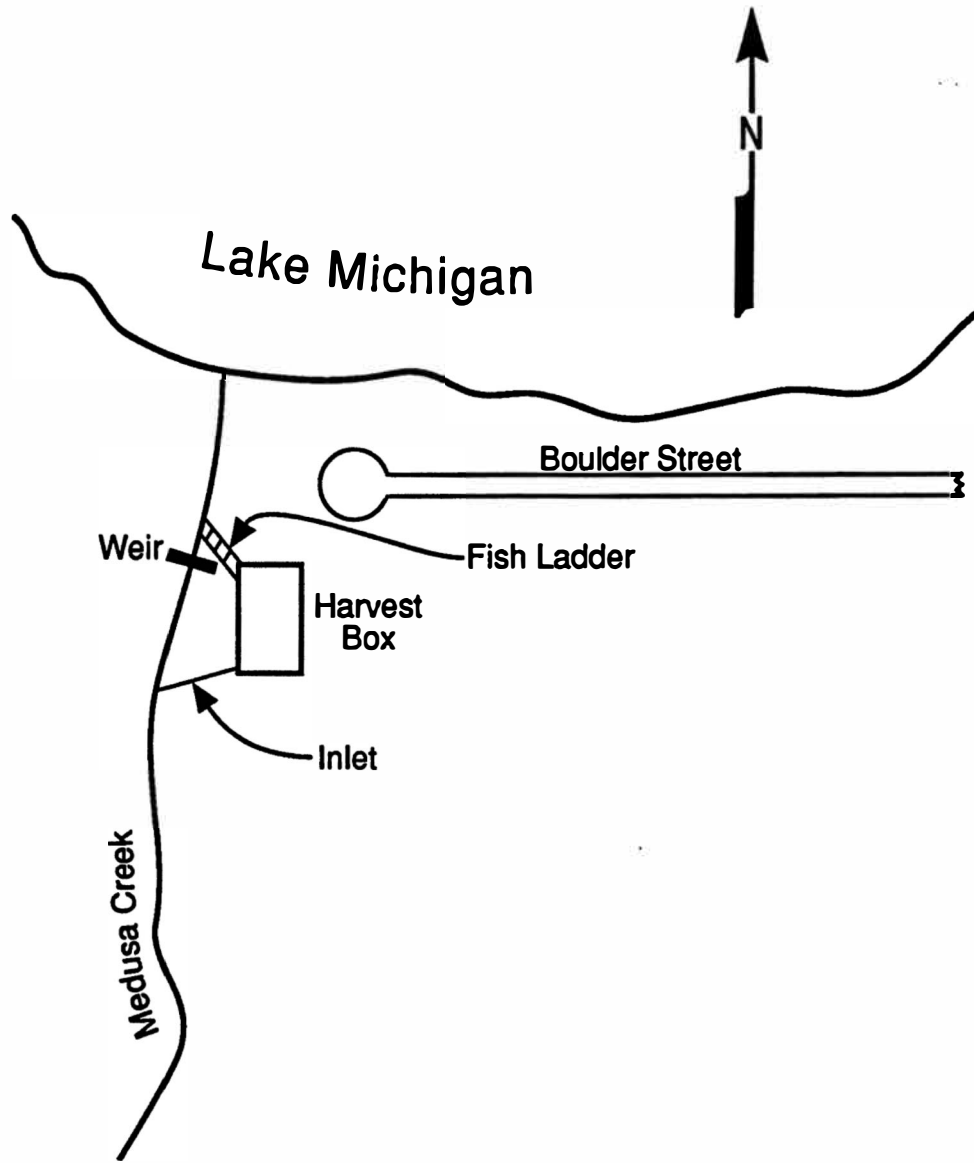


Figure 1.—Location and schematic diagram of the Medusa Creek weir complex, less than 1-mile west of Charlevoix, Michigan.

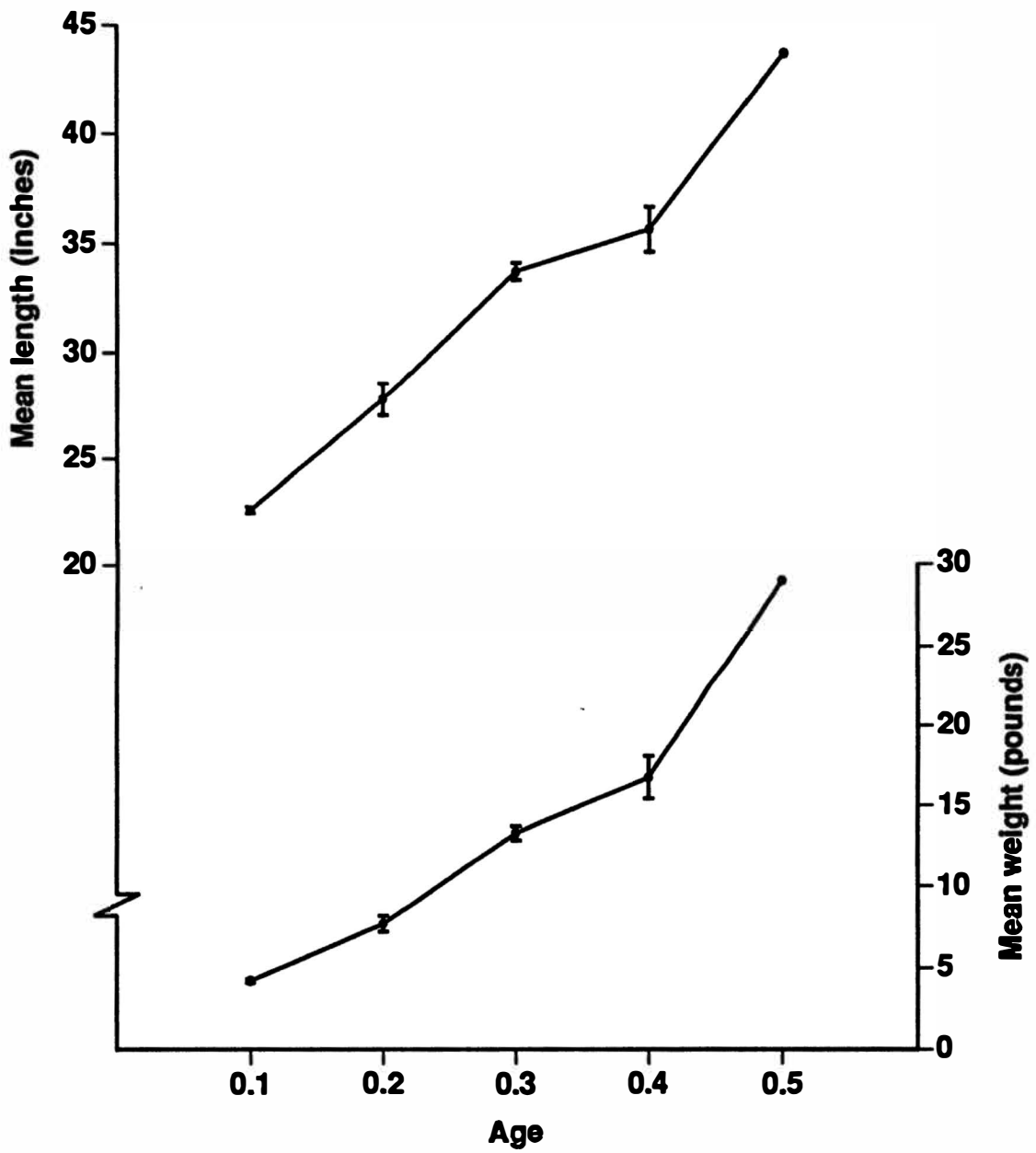


Figure 2.—Mean total length (inches) and round weight (pounds), by age, of chinook salmon harvested at the Medusa Creek weir, fall 1990. Vertical bars represent two standard errors.

Table 1.—Number of spring fingerling chinook salmon planted in Medusa Creek, Charlevoix County, 1984-90.

Planting year	Number planted
1984	500,108
1985	243,820
1986	299,975
1987	306,200
1988	307,400
1989	371,190
1990	303,006
<b>Total</b>	<b>2,331,699</b>

Table 2.—Number, by week, of chinook salmon harvested at the Medusa Creek weir, fall 1990.

Week	Week beginning	Number harvested
1	10/01	1,526
2	10/08	2,897
3	10/15	926
4	10/22	741
5	10/29	0
6	11/05	443
<b>Total</b>		<b>6,533</b>



Table 3.—Number, by age, of chinook salmon harvested at Medusa Creek weir, fall 1987-90. 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)
1990	3,175 (13,274)	1,108 (8,563)	1,703 (22,659)	504 (8,455)	43 (1,248)	6,533 (54,199)

Table 4.—Length-age distribution (in percent by inch group) for chinook salmon scale-sampled during the creel census at Ludington, Manistee, Frankfort, and Grand Traverse Bay, August-October, 1990.<sup>1</sup>

Length (inches)	Age				
	0.1	0.2	0.3	0.4	0.5
13	—	—	—	—	—
14	—	—	—	—	—
15	—	—	—	—	—
16	—	—	—	—	—
17	100	—	—	—	—
18	100	—	—	—	—
19	100	—	—	—	—
20	100	—	—	—	—
21	100	—	—	—	—
22	100	—	—	—	—
23	100	—	—	—	—
24	67	33	—	—	—
25	17	83	—	—	—
26	—	100	—	—	—
27	—	100	—	—	—
28	—	70	30	—	—
29	—	75	25	—	—
30	—	59	35	6	—
31	—	54	38	8	—
32	—	40	40	20	—
33	—	5	80	15	—
34	—	—	92	8	—
35	—	—	67	33	—
36	—	—	62	38	—
37	—	—	50	50	—
38	—	—	25	75	—
39	—	—	—	100	—
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 1990.

Week beginning	Male		Female		Total	
	Number	Pounds	Number	Pounds	Number	Pounds
<b>Age 0.1</b>						
10/01	840	3,381	14	77	854	3,458
10/08	1,147	4,918	—	—	1,147	4,918
10/15	439	1,884	—	—	439	1,884
10/22	441	1,911	—	—	441	1,911
11/05	294	1,103	—	—	294	1,103
Total	3,161	13,197	14	77	3,175	13,274
(Percent)	(48.4)	(24.3)	(0.2)	(0.1)	(48.6)	(24.5)
<b>Age 0.2</b>						
10/01	126	1,043	56	525	182	1,568
10/08	488	3,287	86	874	574	4,161
10/15	144	1,116	24	268	168	1,384
10/22	96	694	19	174	115	868
11/05	62	503	7	79	69	582
Total	916	6,643	192	1,920	1,108	8,563
(Percent)	(14.0)	(12.3)	(2.9)	(3.5)	(17.0)	(15.8)
<b>Age 0.3</b>						
10/01	196	2,450	98	1,554	294	4,004
10/08	574	7,362	373	5,122	947	12,484
10/15	167	2,084	88	1,272	255	3,356
10/22	64	800	70	1,012	134	1,812
11/05	42	548	31	455	73	1,003
Total	1,043	13,244	660	9,415	1,703	22,659
(Percent)	(16.0)	(24.4)	(10.1)	(17.4)	(26.1)	(41.8)
<b>Age 0.4</b>						
10/01	140	2,191	42	763	182	2,954
10/08	143	2,217	57	1,112	200	3,329
10/15	16	276	48	872	64	1,148
10/22	13	205	38	709	51	914
11/05	7	110	—	—	7	110
Total	319	4,999	185	3,456	504	8,455
(Percent)	(4.9)	(9.2)	(2.8)	(6.4)	(7.7)	(15.6)
<b>Age 0.5</b>						
10/01	14	378	—	—	14	378
10/08	29	870	—	—	29	870
10/15	—	—	—	—	—	—
10/22	—	—	—	—	—	—
11/05	—	—	—	—	—	—
Total	43	1,248	—	—	43	1,248
(Percent)	(0.7)	(2.3)	—	—	(0.7)	(2.3)

Table 6.—Mean total length (inches) and weight (pounds), by age and sex, of chinook salmon harvested at the Medusa Creek weir, fall 1990. Two standard errors in parentheses.

Week beginning	Measurement	Age 0.1		Age 0.2		Age 0.3	
		Male	Female	Male	Female	Male	Female
10/01	Length	22.5 (0.324)	23.6 —	28.8 (2.513)	31.6 (1.226)	33.4 (0.891)	35.1 (1.355)
	Weight	4.0 (0.204)	5.5 —	8.3 (1.582)	9.4 (2.016)	12.5 (0.955)	15.9 (1.714)
10/08	Length	22.7 (0.347)	—	26.2 (1.254)	30.7 (0.872)	33.6 (0.791)	33.4 (1.104)
	Weight	4.3 (0.248)	—	6.7 (0.659)	10.2 (0.667)	12.8 (1.001)	13.7 (0.813)
10/15	Length	22.6 (0.368)	—	27.8 (1.468)	32.0 (0.306)	33.6 (0.572)	35.0 (1.014)
	Weight	4.3 (0.221)	—	7.8 (0.898)	11.2 (1.453)	12.5 (0.702)	14.5 (1.048)
10/22	Length	22.6 (0.291)	—	27.3 (1.753)	30.2 (1.617)	33.4 (0.547)	34.2 (0.662)
	Weight	4.3 (0.175)	—	7.2 (1.086)	9.2 (0.667)	12.5 (0.803)	14.5 (0.958)
11/05	Length	22.5 (0.292)	—	29.2 (1.286)	31.9 (1.400)	34.0 (1.066)	34.5 (1.325)
	Weight	3.8 (0.182)	—	8.1 (0.786)	11.3 (1.500)	13.0 (1.252)	14.7 (1.333)
Weighted seasonal mean	Length	22.6 (0.163)	23.6 —	27.1 (0.789)	31.1 (0.539)	33.5 (0.468)	34.0 (0.660)
	Weight	4.2 (0.110)	5.5 —	7.3 (0.440)	10.0 (0.665)	12.7 (0.581)	14.3 (0.541)
Sexes combined	Length	22.6 (0.162)		27.8 (0.771)		33.7 (0.384)	
	Weight	4.2 (0.110)		7.7 (0.481)		13.3 (0.436)	

Table 6.—Continued:

Week beginning	Measurement	Age 0.4		Age 0.5	
		Male	Female	Male	Female
10/01	Length	34.9 (1.715)	35.8 (2.615)	41.6 —	— —
	Weight	15.6 (1.752)	18.2 (3.712)	27.0 —	— —
10/08	Length	35.4 (2.979)	36.3 (2.500)	44.5 —	— —
	Weight	15.5 (3.421)	19.5 (4.000)	30.0 —	— —
10/15	Length	37.8 (9.900)	35.8 (1.090)	— —	— —
	Weight	17.3 (10.500)	18.2 (1.476)	— —	— —
10/22	Length	35.8 (7.300)	36.3 (1.770)	— —	— —
	Weight	15.8 (7.500)	18.7 (1.994)	— —	— —
11/05	Length	36.8 (7.900)	— —	— —	— —
	Weight	15.8 (7.500)	— —	— —	— —
Weighted seasonal mean	Length	35.3 (1.600)	36.0 (1.040)	43.6 —	— —
	Weight	15.7 (1.777)	18.7 (1.547)	29.0 —	— —
Sexes combined	Length		35.6 (1.025)	43.6 —	— —
	Weight		16.8 (1.320)	29.0 —	— —

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	99 (<0.1)	608 (0.1)	4,189 (0.8)	367 (0.1)	9 (<0.1)	5,272 (1.1)
1985	243,820	193 (0.1)	1,067 (0.4)	1,035 (0.4)	648 (0.3)	43 (<0.1)	2,986 (1.2)
1986	299,975	1,460 (0.5)	447 (0.1)	986 (0.3)	504 (0.2)	— (—)	3,397 (1.1)
1987 <sup>2</sup>	306,200	501 (0.2)	489 (0.2)	1,703 (0.6)	— (—)	— (—)	2,693 (0.9)
1988 <sup>2</sup>	307,400	908 (0.3)	1,108 (0.4)	— (—)	— (—)	— (—)	2,016 (0.7)
1989 <sup>3</sup>	371,190	3,175 (0.9)	— (—)	— (—)	— (—)	— (—)	3,175 (0.9)

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

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

<sup>3</sup>Estimate of number planted - see text for discussion.

## References

- Fenske, J. L. 1991. Medusa Creek harvest weir report, 1989. Michigan Department of Natural Resources, Fisheries Technical Report 91-7, Ann Arbor.
- Fenske, J. L. 1990. Medusa Creek harvest weir report, 1988. Michigan Department of Natural Resources, Fisheries Technical Report 90-8, Ann Arbor.
- Fenske, J. L. 1988. Medusa Creek harvest weir report, 1987. Michigan Department of Natural Resources, Fisheries Technical Report 88-8, Ann Arbor.
- Hay, R. L. 1990. Little Manistee River harvest weir and chinook salmon egg-take report, 1986. Michigan Department of Natural Resources, Fisheries Technical Report 90-6, Ann Arbor.

Report approved by W. C. Latta  
Richard D. Clark, Jr., Editor  
Kelley D. Smith, Editorial Board Reviewer  
Alan D. Sutton, Graphics  
Grace M. Zurek, Word Processor