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FISHERIES DIVISION

TECHNICAL REPORT

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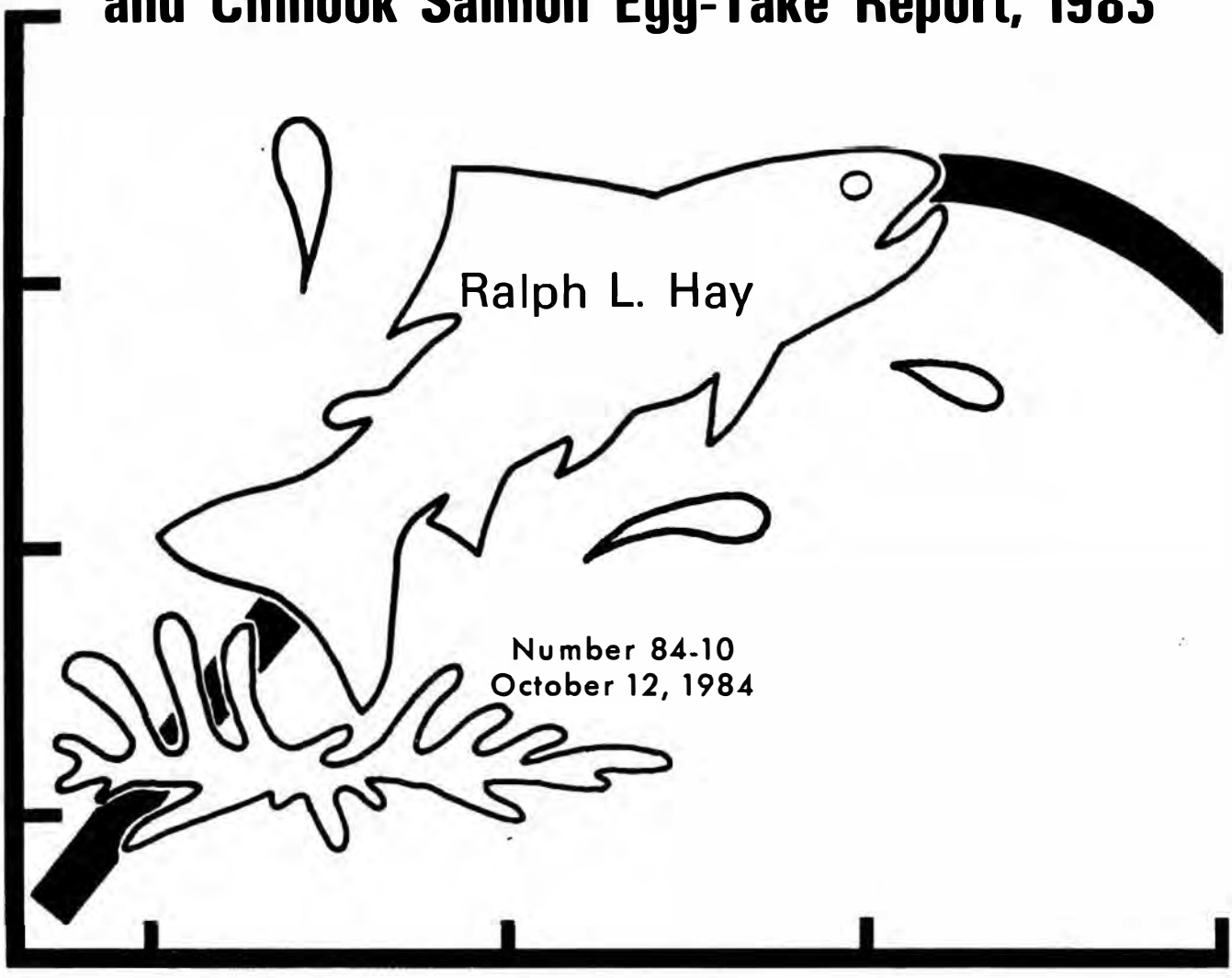

Ralph L. Hay

Number 84-10
October 12, 1984

Michigan Department of Natural Resources

MICHIGAN DEPARTMENT OF NATURAL RESOURCES
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LITTLE MANISTEE RIVER HARVEST WEIR AND CHINOOK SALMON EGG-TAKE REPORT, 1983

Ralph L. Hay

Introduction

As part of the Michigan Department of Natural Resources salmon management program for Lake Michigan, the Little Manistee River has been planted annually since 1976 with both coho and chinook salmon (Table 1). Construction of a blocking weir, fish ladder, holding ponds, and harvest facility on the river, about 5 miles upstream from Manistee Lake, Manistee County, began in 1967 and was completed in 1968 (Fig. 1). All chinook and coho salmon reaching the weir are harvested and sold to a commercial contractor. Normally, all other salmonids are passed upstream. The few salmon that enter the river when the weir is not in operation provide a limited stream fishery. The Little Manistee weir is Michigan's primary source for chinook eggs for in-state and out-of-state hatchery rearing and serves as a back-up (to the Platte River upper weir) for coho eggs. The facility is also used to monitor fall steelhead runs and each spring provides the majority of steelhead eggs for in-state hatchery rearing. Biological data have been collected on chinook and other anadromous salmonids since 1968.

From 1968 through 1978 chinook fingerlings were stocked in the Little Manistee River at an average rate of 322,157 per year (Table 1). Beginning in 1979, the planting rate was increased by over 80% to an average of 586,224 fingerlings. Substantial runs of returning adults have been produced but run size has not been closely related to stocking rate. The number of chinook actually harvested at the weir has varied between 11,136 (in 1977) and 39,359 (in 1983) (Table 2).

Chinook return to the weir at either age 0.1 (jacks), age 0.2, or age 0.3--but most commonly at age 0.2.[1] For

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[1]In aging anadromous fishes, the number preceding the period denotes age at smolting (0 for most chinook) and the number following the period represents the number of annuli formed in the Great Lakes (1, 2, or 3 for chinook).

the 1967 and 1968 year classes and plants, return rates were 1.8-1.9% at age 0.1, 3.4-3.5% at age 0.2, and 2.0-3.1% at age 0.3 (Table 3). Comparable estimates cannot be made for the 1969-82 plants because the age composition of the run has not been monitored consistently; however, for jacks alone returns have averaged 0.6%.

The return rate of chinook salmon to the weir has declined through the years. Return rates by chinook of all ages totaled 8.5% for the 1967 plant and 7.2% for the 1968 plant (Table 3). Return rates for subsequent plants cannot be estimated individually, but can be approximated by grouping data. Stocking in 1969-77, at an average rate of 313,444 fingerlings per year, produced runs averaging 20,339 jacks and adults in 1972-78. This was a return rate of 6.5%. Similarly, stocking in 1978-81, at an average rate of 513,400, produced runs averaging 13,084 in 1981-82--a return rate of only 2.6%. However, a large run did occur in 1983, suggesting that this downward trend may be reversing. These return rates represent only the weir harvest, and do not include the angler harvest, which has increased since the 1960's.

Growth rate of chinooks has fluctuated considerably (Table 4; Fig. 3). Average weight has varied from 3.0 to 9.5 pounds for age 0.1, from 10.1 to 20.9 pounds for age 0.2, and from 15.5 to 29.2 pounds for age 0.3.

Annual plants of yearling coho salmon in the Little Manistee River have varied widely, from 91,674 in 1971 to 700,002 in 1969 (Table 1). Annual runs of coho to the weir have varied from 2,314 in 1972 to 108,400 in 1970 (Table 5). The return rate of jacks (age 1.0) has been relatively low, 0.2% to 0.7%, compared to adults (age 1.1), 10.2% to 15.0% (Fig. 4). The return rate of coho does not seem to be related to stocking density and does not show a clear trend (Fig. 4).

Since 1974, the average size of coho jacks has increased slightly (Fig. 5, Table 4). However, the size of

adult coho decreased from 8.7 pounds in 1968 to less than 5.0 pounds in 1979, then increased to 7.0 pounds by 1983. It is assumed that the annual variations in size are primarily related to a combination of predator density and forage density in Lake Michigan.

The Little Manistee River is one of the top quality steelhead streams in Michigan. The fishery is supported entirely by natural reproduction. However, a plant of 100,188 fall fingerlings was made in 1974 and, from 1981 through 1983, annual plants were made in conjunction with a research project on steelhead production (Table 1). The number of steelhead returning to the weir each fall has not been consistent, ranging from 320 in 1978 to 7,523 in 1971 (Table 6). Mean weight for steelhead (all age groups) has varied from 6.5 pounds in 1973 to 9.3 pounds in 1972 (Table 6).

Small runs of anadromous brown trout occur in the Little Manistee River. The largest run, 238, was in 1975 (Table 7).

Atlantic salmon yearlings were first planted in the Little Manistee River in 1977 (Table 1). Subsequent plants have been made in an attempt to establish this new species. Until 1983 only an occasional fish had been captured.

Harvest Weir Operation, 1983

On September 6, 1983, the weir grates were installed, blocking all anadromous fish. On September 17 the ponds were filled and the fish ladder was activated. Harvest operations began on September 19. The weir remained operational until November 7, at which time the grates were removed and the building was winterized. The weir was in operation for 56 days. All harvested chinook and coho salmon were sold on contract to Tempotech Industries, Hart, Michigan.

Chinook salmon

Harvest of chinook salmon began September 19 and ended October 31, a period of 43 days. Two peak harvests occurred, the first during early October and the second near the end of October (Fig. 6). The first major run of chinook entered the facility in late September but these fish were held for ripening. A total of 39,359 chinook were harvested in 1983, a record high for the weir. The calculated total weight of all chinook, in the round, was 534,595 pounds (Table 8). The total weight, including stripped females, sold to Tempotech Industries was 493,646 pounds.

Each week of the run, biological data were obtained from a randomly selected sample of 100 chinook to provide information on age composition and growth. The total harvest consisted of 8,865 (22.5%) age-0.1 jacks weighing 39,396 pounds, 17,637 (44.8%) age-0.2 adults weighing 246,467 pounds, and 12,857 (32.7%) age-0.3 adults weighing 248,732 pounds (Table 8). The 1983 run of jacks was the second largest on record (Table 2) and represented 1.5% of the fingerlings stocked in 1982 (Fig. 2). The returning age-0.2 adults were 3.5% of the 1981 plant and the age-0.3 adults were 2.3% of the 1980 plant.

Females constituted 40% of the 1983 run with 0.4% being age 0.1, 38.8% age 0.2, and 65.2% age 0.3. Mean lengths and weights (males and females combined) were: age 0.1, 22.0 inches and 4.4 pounds; age 0.2, 33.6 inches and 14.0 pounds; age 0.3, 37.0 inches and 19.3 pounds (Table 9). Age-0.2 female chinook were larger than age-0.2 males, but just the opposite was true for age-0.3 chinook (Table 9).

Only one chinook (0.1%) had a fresh lamprey wound (Table 10). Likewise, only one chinook had a clip (left maxillary).

Color of skin (silver versus dark) and flesh (pink verses pale) were examined on 700 fish. Flesh color was examined in a small (1-2 inch) cut near the anal opening.

All chinook entering the facility were classified as dark skinned with pale flesh color.

The 1983 chinook egg-take operations began September 29 and ended October 21. During the 22-day period 27,971,798 eggs were collected of which 13,638,598 were for in-state rearing and 14,333,200 were for out-of-state commitments (Table 11). A total of 5,837 female chinook (ages 0.2 and 0.3) were stripped, excluding those female which yielded low-quality eggs or were otherwise unsatisfactory. Assuming that about 8,000 females were handled to provide the 28 million eggs, a total run of 20,000 chinook (8,000/40% females) should provide sufficient eggs for current in-state and out-of-state requirements.

Coho salmon

In 1983, the coho harvest coincided with the chinook harvest (September 19 through October 31, a total of 43 days) except that peak harvest of coho occurred on September 23 (Fig. 7). Since coho were not held for egg-take, the harvest dates roughly coincide with migration of coho into the river.

A total of 26,968 coho were harvested. The total weight, calculated from biological samples, was 175,157 pounds. The total weight reported shipped to Tempotech Industries, which included some calculations from sampling to determine skin and flesh color, was 185,502 pounds.

The age composition of the harvested coho was 2,704 (10.0%) age 1.0 jacks weighing 5,066 pounds and 24,264 (90.0%) age-1.1 adults weighing 170,091 pounds (Table 12). The returning age-1.0 jacks were 0.6% of the 1983 plant and the age-1.1 adults were 12.1% of the 1982 plant.

All age-1.0 coho were males and 59.2% of age-1.1 coho were female. The total run consisted of 53.2% females. Mean lengths and weights were: age 1.0, 15.9 inches and 1.9 pounds; age-1.1 males, 26.8 inches and 7.2 pounds; age-1.1 females, 26.1 inches and 6.9 pounds; age-1.1 sexes combined, 26.4 inches and 7.0 pounds (Table 13).

No lamprey wounds were observed on coho. Clips were found on 5 adults (3 right maxillary and 2 left maxillary). The Great Lakes Fisheries Commission has no record of maxillary clips being approved for coho yearlings planted in 1982 (Margaret Ross, personal communication).

Skin and flesh color were examined for 700 coho sampled at approximately weekly intervals (Table 14). Most early run coho had silver skin and all had pink flesh. As the season progressed fish lost their silver sheen and by late October most coho were dark. Flesh color also changed (from pink to pale) with time, but less rapidly than did skin color. Skin color was not always indicative of flesh color. Virtually all (98.5%) silver coho and (43.2%) of the dark coho had pink colored flesh (Table 15). Males retained their pink flesh color longer than females.

No coho eggs were taken at the Little Manistee weir in 1983.

Steelhead trout

The fall steelhead run occurred earlier than normal in 1983 and peaked during the first week in October (Fig. 8). As in most previous years, all steelhead were passed above the weir.

The 1983 run of 3,100 fish was the largest since 1975, even though the weir operated fewer days. Fifty-one percent (51%) of the returning adults were age 2.1 or 2.2 (Table 16). These two age groups also represented 62% of the total estimated weight of 21,197 pounds. Mean lengths and weights for the 10 different age groups are given in Table 17. Size of returning adults is more dependent upon years spent in Lake Michigan than on age at smolting (Fig. 9).

An intensive study of steelhead and their reproduction in the Little Manistee River is being conducted by Paul Seelbach, Institute for Fisheries Research, The University of Michigan, Ann Arbor.

Brown trout

Only 43 brown trout were passed upstream in 1983 (Table 7).

Atlantic salmon

Twelve Atlantic salmon were collected at the weir and passed upstream. All were age-1.1 Sebago strain salmon that had been planted in the Little Manistee River in 1982 as yearlings and marked with an adipose fin clip. Most were ripe males averaging about 5 pounds.

Acknowledgements

Most of the data collection and tabulation were done by Alfred Allen and Janice Sapak. George Beyerle and Paul Seelbach provided technical advice. Ludwig Frankenberger, George Beyerle, and James Schneider reviewed the report.

Summary

In 1983 the Little Manistee harvest weir was in operation from September 19 through November 7 (56 days). Harvest of chinook and coho salmon and passage of other anadromous salmonids occurred during the 43 days from September 19 through October 31.

The entire run of 39,359 chinook (493,646 pounds) and all 26,968 coho (185,502 pounds) were harvested and sold to Tempotech Industries, Hart, Michigan.

The chinook run consisted of 8,865 age-0.1 jacks (1.5% of the 1982 fingerling plant), 17,637 age-0.2 adults (3.5% of the 1981 plant), and 12,857 age-0.3 adults (2.3% of the 1980 plant). Mean sizes were: age 0.1, 22.0 inches (4.4 pounds); age 0.2, 33.6 inches (14.0 pounds); and age 0.3, 37.0 inches (19.3 pounds). During chinook egg-take operations (September 29 through October 21) 5,837 females (ages 0.2 and 0.3) were stripped to obtain 27,971,798 eggs.

The 1983 coho run was composed of 2,704 age-1.0 jacks (0.6% of the 1983 plant) and 24,264 age-1.1 adults (12.1% of the 1982 plant). Mean sizes were: age 1.0, 15.9 inches (1.9 pounds); age 1.1, 26.4 inches (7.0 pounds).

The 1983 fall steelhead run of 3,100 fish, the largest run since 1975, included 10 different age groups. Over half of the fish were age 2.1 or 2.2.

Other salmonids passed upstream included 12 age-1.1 Sebago strain Atlantic salmon and 43 brown trout.

Recommendations for 1984

Use only data from biological samples to calculate weekly weights of chinook and coho salmon harvested.

For stripped female chinook salmon (and coho if appropriate), keep separate daily and weekly totals of number and weight.

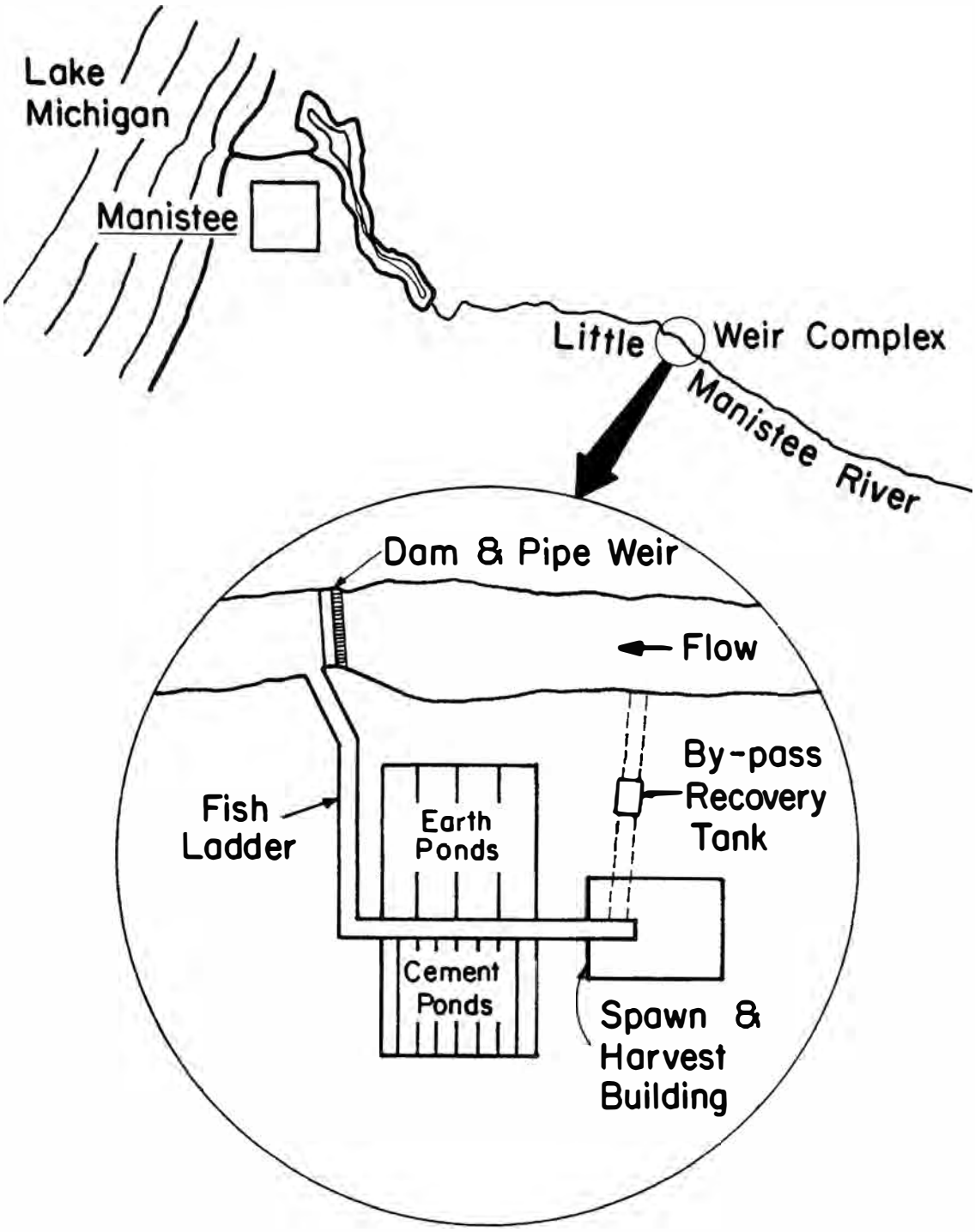


Figure 1. Location and schematic diagram of the Little Manistee River weir complex.

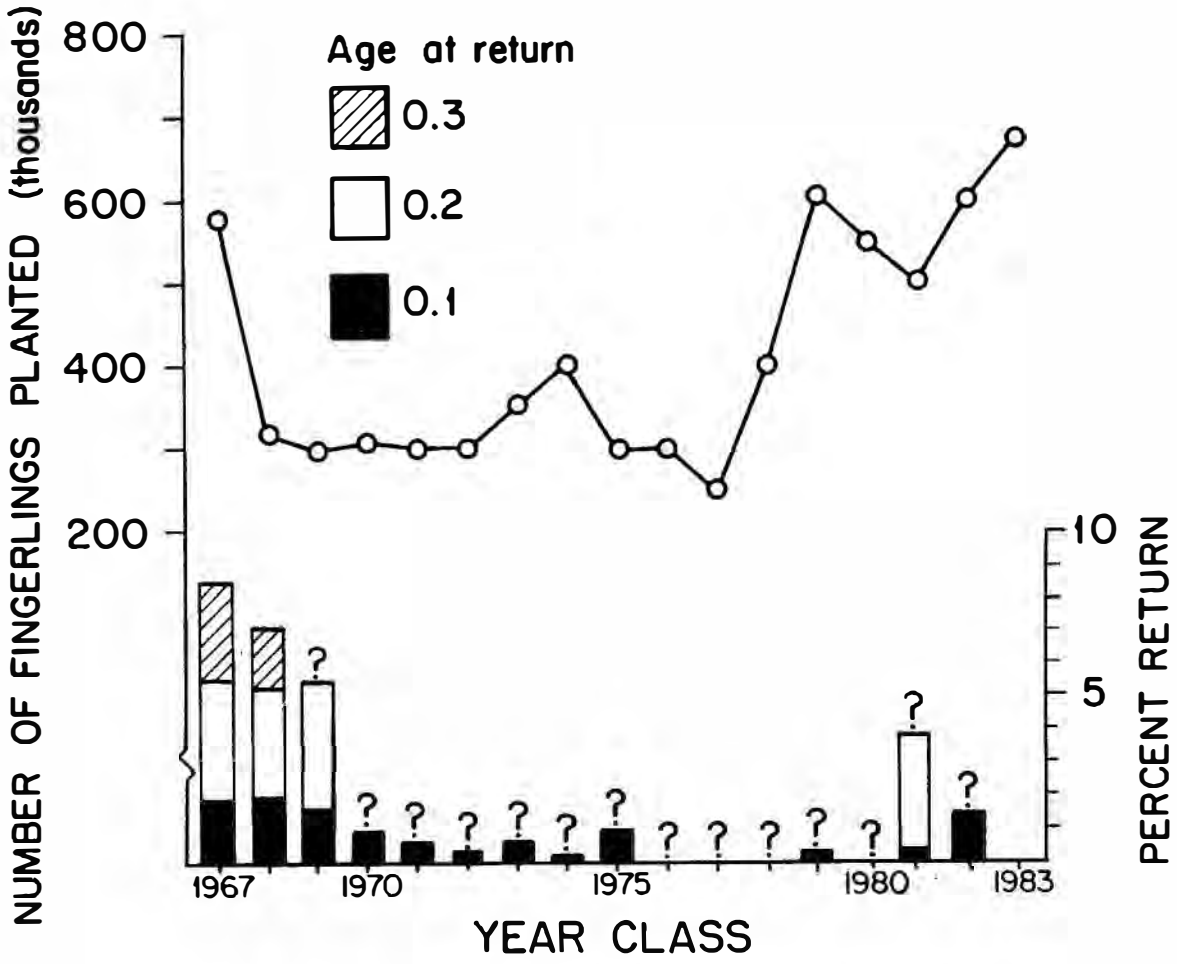


Figure 2. Percent return of chinook salmon year classes, by age, to the Little Manistee River weir compared with the number of fingerlings planted. Question marks (?) indicate return data are incomplete.

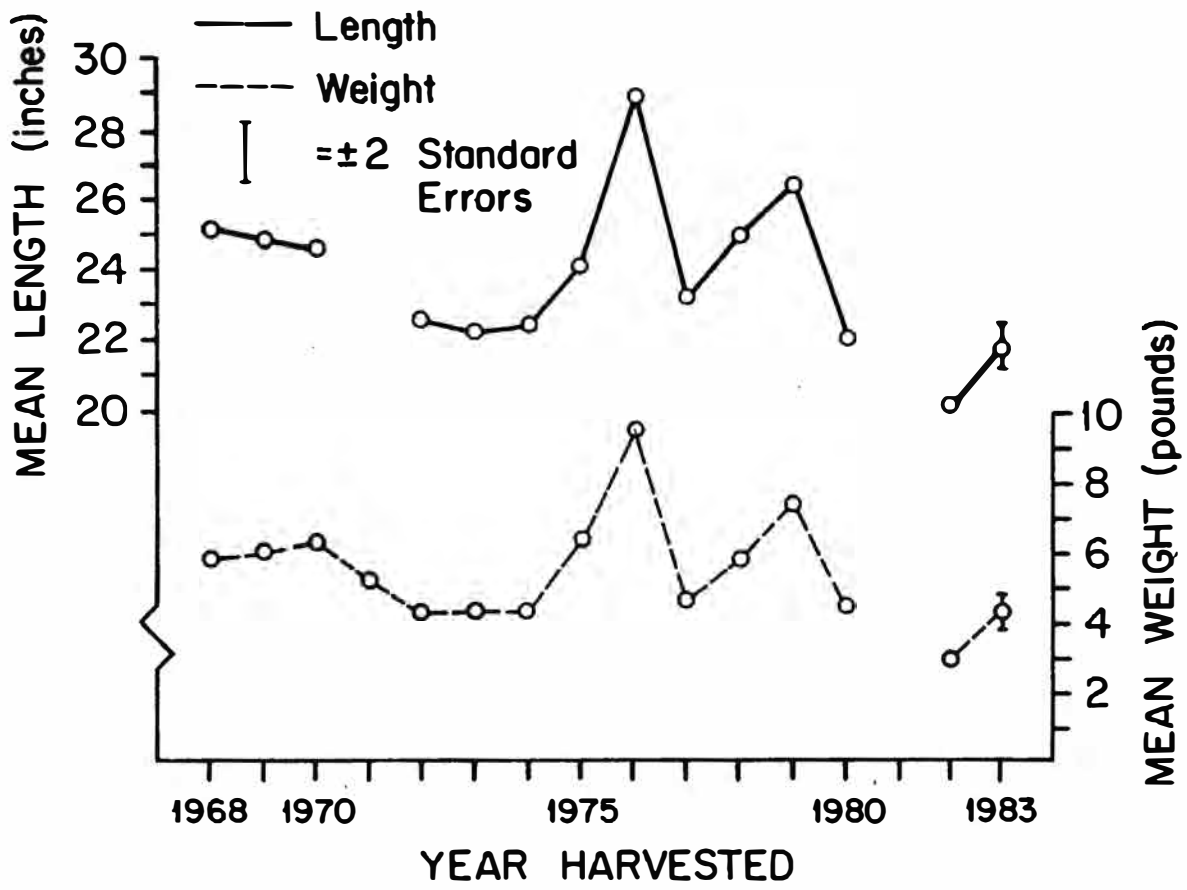
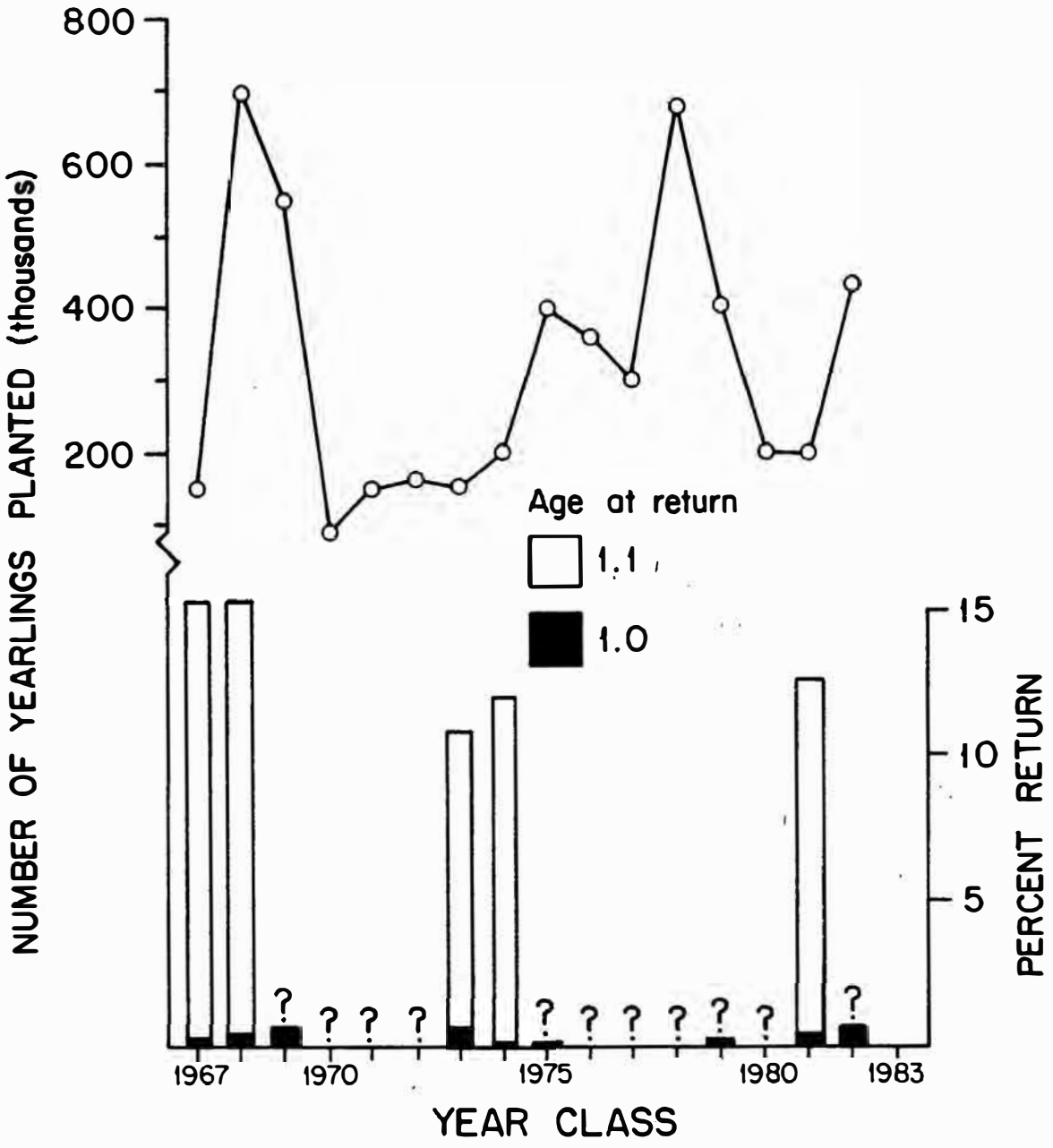


Figure 3. Mean total length (inches) and round weight (pounds) of age-0.1 (jack) chinook salmon harvested at the Little Manistee River weir.



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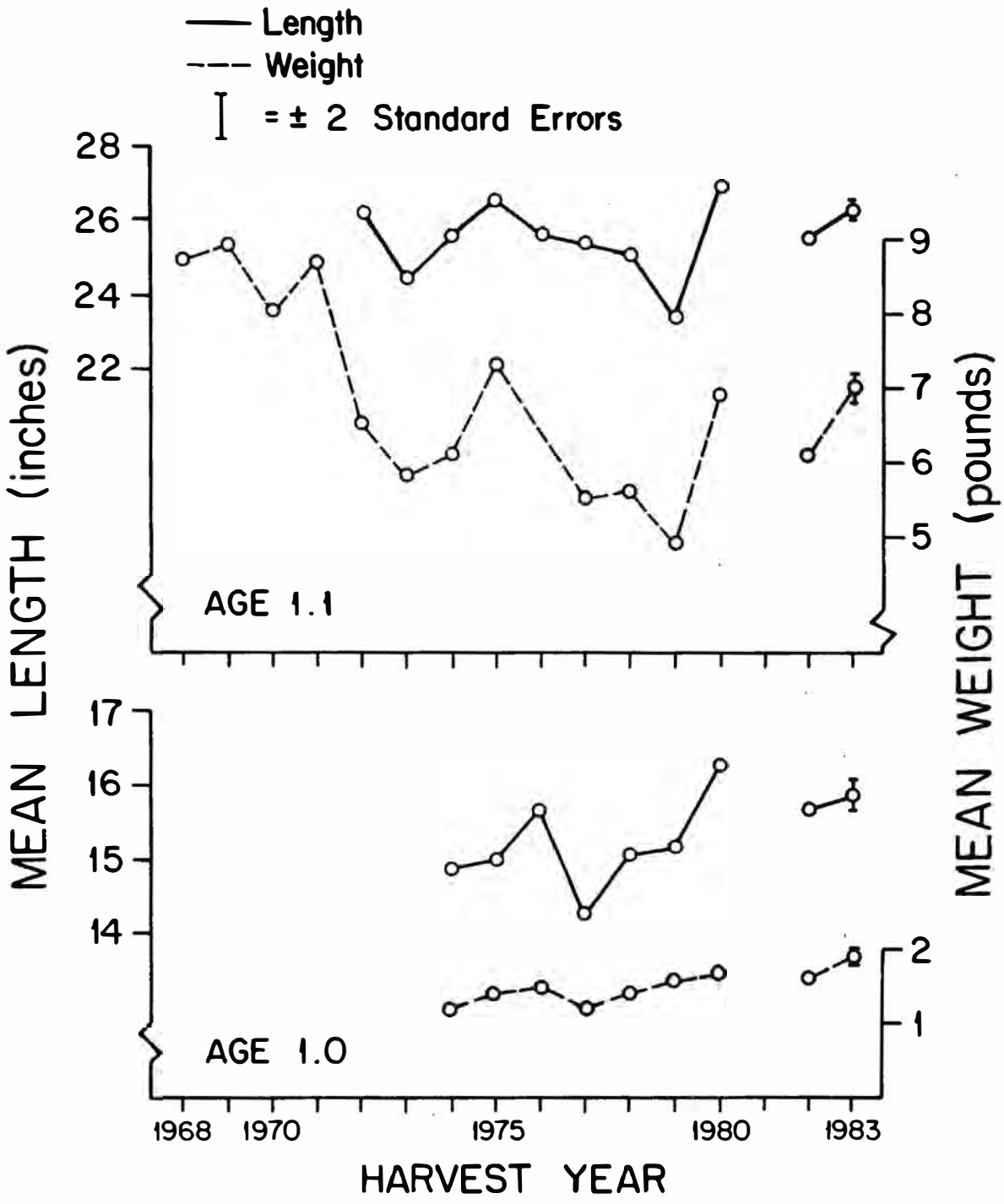

Figure 5. Mean total length (inches) and round weight (pounds) of age-1.0 and age-1.1 coho salmon harvested at the Little Manistee River weir.

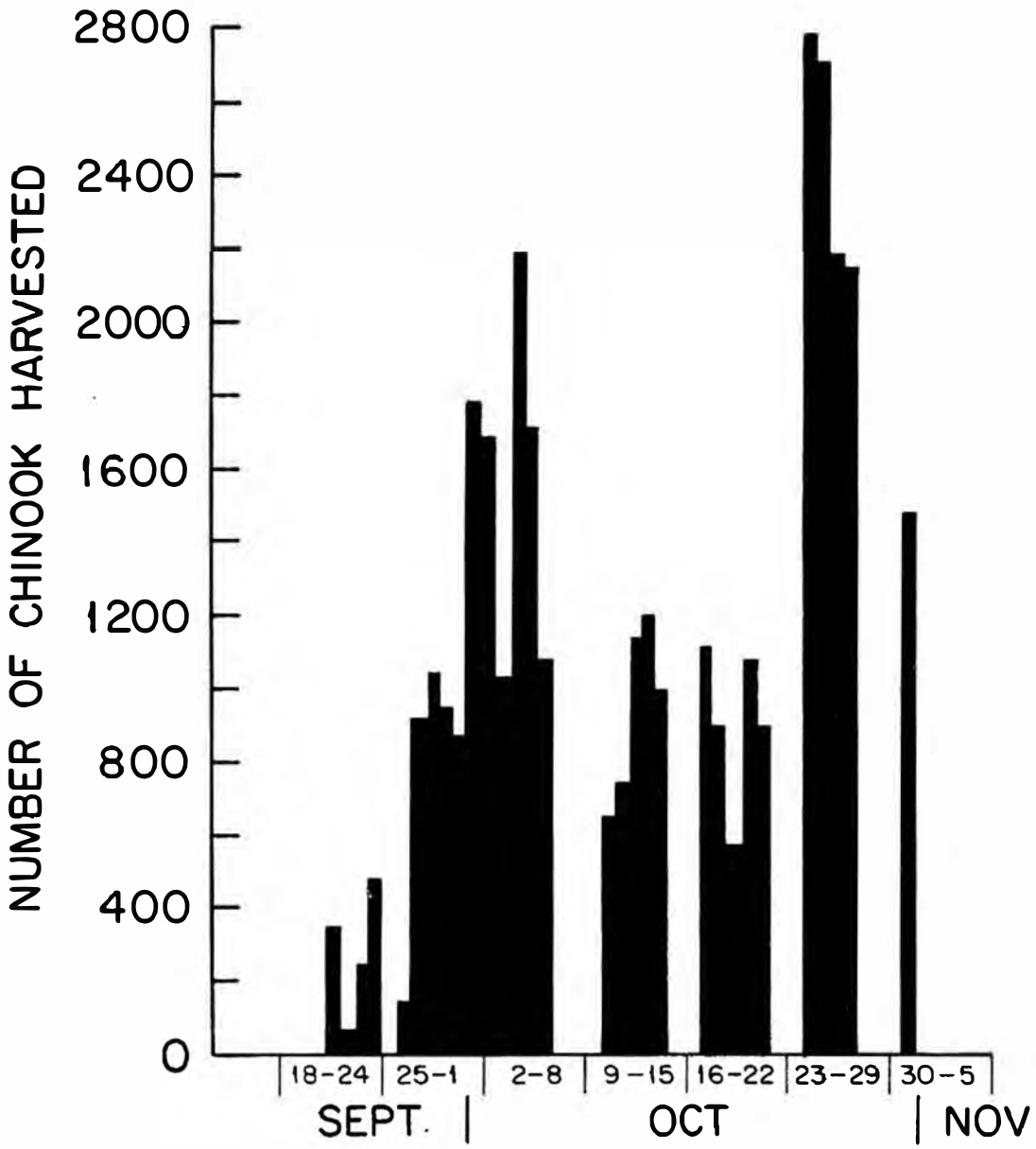

Figure 6. Periodicity of chinook salmon harvested at the Little Manistee River, fall 1983.

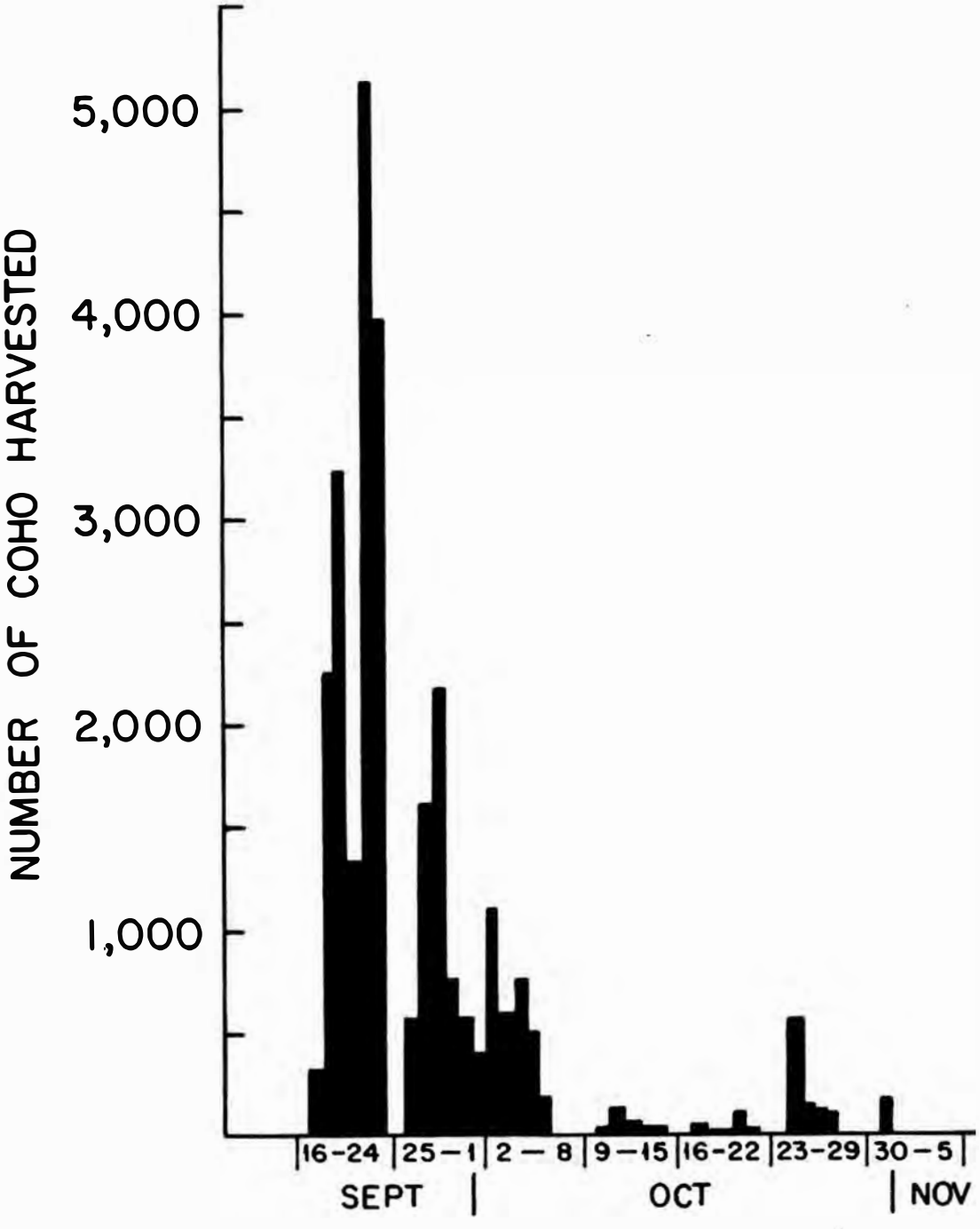

Figure 7. Periodicity of coho salmon harvested at the Little Manistee River weir, 1933.

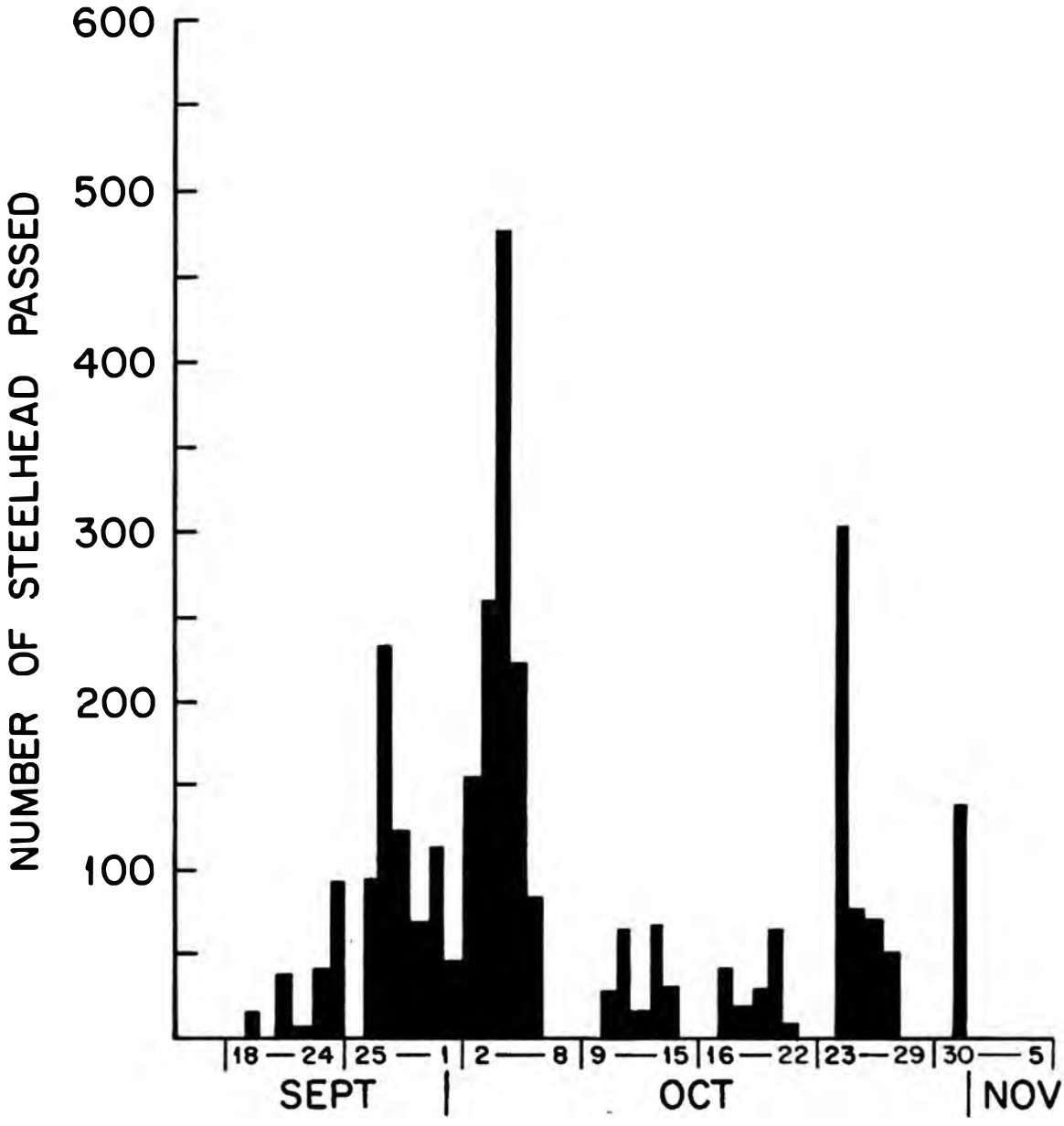

Figure 8. Periodicity of steelhead passed at the Little Manistee River weir, fall 1983.

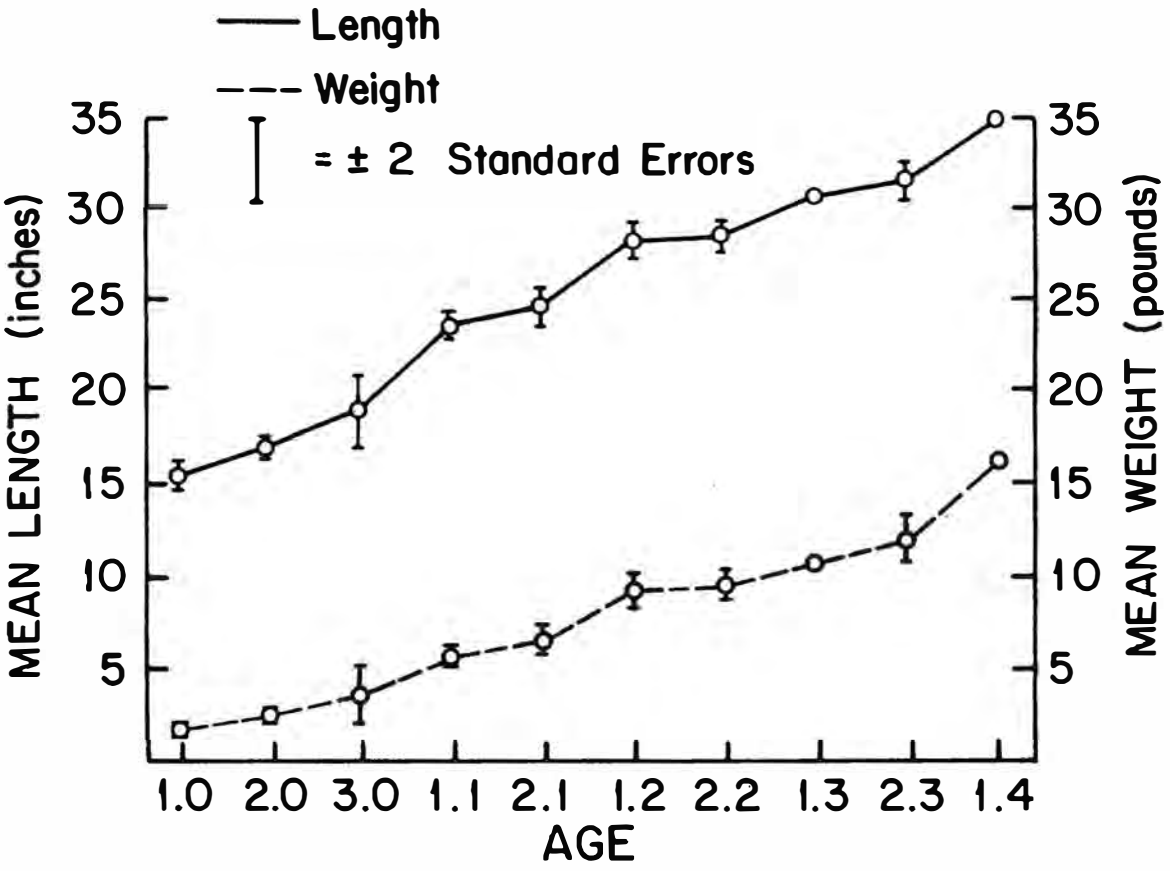

Figure 9. Mean total length (inches) and round weight (pounds) of steelhead, by age, at the Little Manistee River weir, fall 1983.

Table 1. Planting history of anadromous salmonids in the Little Manistee River since 1967. Age of fish at planting: spring fingerling (SF), fall fingerling (FF), and yearling (Y).

	Salmon			Trout
Planting year	Chinook (All SF)	Coho (All Y)	Atlantic (All Y)	Steelhead
1967	590,830	433,215		
1968	321,912	148,365		
1969	300,000	700,002		
1970	308,900	550,012		
1971	301,868	91,674		
1972	300,908	150,067		
1973	356,140	165,714		
1974	402,330	150,067		100,188(FF)
1975	300,144	200,601		
1976	301,300	400,282		
1977	250,200	358,832	7,497	
1978	400,028	302,980	15,000	
1979	603,098	675,000		
1980	550,272	400,158		
1981	500,204	202,815	19,529	93,673(FF) 30,700(Y)
1982	600,294	200,000	25,030	100,000(FF) 30,000(Y)
1983	677,250	429,612		16,428(Y)
Total	7,065,678	5,559,396	67,056	293,861(FF) 77,128(Y)
Average	415,628	327,023	16,764	97,954(FF) 25,709(Y)

Table 2. Number of chinook salmon harvested, by age, at the Little Manistee River weir, 1968-83. Weight (pounds) is in parentheses.

	Age					
Year	0.1	0.2	0.3	Adult[1]	Mortalities[2]	Total
1968	9,597	0	0	---	1,633	11,230
1969	5,175	18,693	0	---	2,420	26,288
1970	4,670	11,100	18,420	---	0	34,190
1971	2,885	11,913	6,415	---	---	21,213
1972	1,900	---	---	23,094	---	24,994
1973	1,153	---	---	15,323	---	16,476
1974	1,938	---	---	21,412	806	24,156
1975	762	---	---	27,106	1,360	29,228
1976	2,738	12,560	805	---	56	16,159
1977	---	---	---	---	---	11,136
1978	---	---	---	---	---	20,230
1979	---	---	---	---	---	22,925
1980	1,891	6,620	7,250	---	---	15,761 (234,366)
1981	---	---	---	---	---	11,811 (188,939)
1982	2,077	---	---	12,281	---	14,358 (165,412)
1983	8,865	17,637	12,857	---	---	39,359 (534,595)

[1]Ages 0.2 and 0.3 combined.

[2]Mortalities are included under age group headings in some years.

Table 3. Numbers, and in parentheses percent, of chinook and coho salmon in the 1967 and 1968 year classes returning to the Little Manistee River weir at ages 0.1 to 0.3.

Year class	Number stocked	Age 0.1	Age 0.2	Age 0.3	Total
Chinook					
1967	590,830	11,230 (1.9)	20,588 (3.5)	18,420 (3.1)	50,238 (8.5)
1968	321,912	5,700 (1.8)	11,100 (3.4)	6,415 (2.0)	23,215 (7.2)

Year class	Number stocked	Age 1.0	Age 1.1	Total
Coho				
1967	148,365	501 (0.3)	22,306 (15.0)	22,807 (15.4)
1968	700,002	2,880 (0.4)	105,006 (15.0)	107,886 (15.4)

Table 4. Mean total length (L, in inches) and weight (W, in pounds) of chinook and coho salmon harvested at the Little Manistee weir, 1968-83. (For chinook in 1972-75 and 1982, lengths and weights shown under age 0.2 are for ages 0.2 and 0.3 combined.)

	Chinook, age[1]						Coho, age[2]			
	0.1		0.2		0.3		1.0		1.1	
Year	L	W	L	W	L	W	L	W	L	W
1968	25.2	5.8	---	---	---	---	---	---	28.1	8.7
1969	24.9	6.0	34.2	15.9	---	---	---	---	---	8.9
1970	24.7	6.3	34.7	16.6	39.8	23.0	---	---	---	8.0
1971	---	5.2	---	15.0	---	22.7	---	---	---	8.7
1972	22.6	4.3	35.6	17.7	---	---	---	---	26.3	6.5
1973	22.4	4.4	36.0	17.8	---	---	---	---	24.5	5.8
1974	22.5	4.4	34.9	16.7	---	---	14.9	1.2	25.7	6.1
1975	24.2	6.4	37.1	20.2	---	---	15.0	1.4	26.6	7.3
1976	29.0	9.5	37.5	20.9	41.7	29.2	15.7	1.5	25.7	6.4
1977	23.4	4.6	34.6	15.0	38.1	20.1	14.3	1.2	25.5	5.5
1978	25.0	5.8	30.3	10.1	35.0	15.5	15.1	1.4	25.2	5.6
1979	26.5	7.4	34.6	15.1	35.7	16.9	15.2	1.6	23.5	4.9
1980	22.2	4.5	34.3	15.4	36.4	19.3	16.3	1.7	26.9	6.9
1981	---	---	---	---	---	---	---	---	---	---
1982	20.2	3.0	35.3	14.5	---	---	15.7	1.6	25.6	6.1
1983	22.0	4.4	33.6	14.0	37.0	19.3	15.9	1.9	26.4	7.0

[1]Ages of chinook prior to 1977 were determined from length-frequency distributions; in 1977-80 and 1983, from scale samples and length-frequency distributions.

[2]Ages of coho in 1980 were determined from a length-frequency distribution.

Table 5. Number of coho salmon harvested, by age, at the Little Manistee River weir, 1968-83. Weight (pounds) is in parentheses.

Year	Age 1.0	Age 1.1	Mortalities[1]	Total
1968	490	58,422	1,336	60,248
1969	2,831	21,925	430	25,186
1970	3,300	102,100	3,000	108,400
1971	---	---	---	59,123
1972	---	---	---	2,314
1973	---	---	---	11,872
1974	939	4,928	262	6,129
1975	470	14,633	760	15,863
1976	978	23,480	47	24,505
1977	---	---	---	25,255
1978	---	---	---	23,696
1979	---	---	---	27,925
1980	900	49,104	---	50,004 (353,043)
1981	---	---	---	(96,733)
1982	873	17,585	---	18,458 (110,745)
1983	2,704	24,264	---	26,968 (175,157)

[1]Mortalities are included under age group headings in some years.

Table 6. Number and mean length (L, in inches) and weight (W, in pounds) of steelhead (ages combined) reaching the Little Manistee River weir in fall 1968-83.

	Number				Mean	
Year	Passed	Transferred	Mortalities	Total	L	W
1968	1,297	0	25	1,322	25.1	7.3
1969	2,987	0	56	3,043	25.6	7.8
1970	7,322	0	89	7,411	---	8.7
1971	7,523	0	99	7,622	---	8.8
1972	3,515	0	46	3,561	27.4	9.3
1973	421	1,478[1]	27	1,926	24.3	6.5
1974	2,270	1,200[1] 350	18	3,838	26.4	7.3
1975	4,722	1,300[1]	99	6,121	26.7	8.0
1976	503	45	30	578	26.8	7.6
1977	2,031	---	---	2,013	26.7	6.8
1978	320	---	---	320	---	---
1979	640	---	---	640	25.6	6.7
1980	1,111	---	---	1,111	25.6	7.0
1981	849	---	---	849	---	---
1982	347	---	---	347	25.2	6.9
1983	3,100	---	---	3,100	24.3	6.8

[1]Transferred to Big Manistee and Pine rivers.

Table 7. Number and mean length (L, in inches) and weight (W, in pounds) of brown trout passed at the Little Manistee River weir, 1968-83.

	Number			Mean	
Year	Passed	Mortalities	Total	L	W
1968	28	---	28	---	---
1969	36	---	36	---	---
1970	123	---	123	---	5.6
1971	69	---	69	---	---
1972	5	---	5	---	---
1973	45	3	48	---	---
1974	159	2	161	19.4	3.4
1975	238	0	238	21.8	5.0
1976	104	2	106	22.9	5.8
1977	98	---	98	19.3	3.5
1978	51	---	51	---	---
1979	100	---	100	23.4	6.8
1980	28	---	28	18.6	3.4
1981	101	---	101	---	---
1982	62	---	62	21.4	4.9
1983	43	---	43	22.4	6.0

Table 8. Summary of harvest, mortalities, and total run of chinook salmon, by age and sex, at the Little Manistee River weir in 1983. Weight of stripped females was recalculated into round weight, therefore, the total weight of chinook does not correspond with weight shipped out to Tempotech Industries.

Week beginning	Male		Female		Total	
	Number	Pounds	Number	Pounds	Number	Pounds
Age 0.1						
9/18	439	1,888	---	---	439	1,888
9/25	2,391	10,281	---	---	2,391	10,281
10/02	2,381	10,476	---	---	2,381	10,476
10/09	655	3,013	---	---	655	3,013
10/16	587	2,818	---	---	587	2,818
10/23	1,272	5,851	---	---	1,272	5,851
10/30	117	515	29	174	146	689
Total	7,842	34,842	29	174	7,871	35,016
Mortalities[1]	990	4,356	4	24	994	4,380
Total run	8,832	39,198	33	198	8,865	39,396
(Percent)	(22.4)	(7.3)	(0.1)	(0.1)	(22.5)	(7.4)
Age 0.2						
9/18	417	5,004	124	1,748	541	6,752
9/25	1,822	23,868	455	7,416	2,277	31,284
10/02	2,151	29,038	1,075	16,125	3,226	45,163
10/09	1,169	15,898	1,169	17,418	2,338	33,316
10/16	903	13,455	1,128	16,694	2,031	30,149
10/23	2,838	36,326	1,761	26,063	4,599	62,389
10/30	279	4,213	367	5,652	646	9,865
Total	9,579	127,802	6,079	91,116	15,658	218,918
Mortalities	1,211	16,106	768	11,443	1,979	27,549
Total run	10,790	143,908	6,847	102,559	17,637	246,467
(Percent)	(27.4)	(26.9)	(17.4)	(19.2)	(44.8)	(46.1)
Age 0.3						
9/18	45	796	101	1,636	146	2,432
9/25	398	7,403	626	11,706	1,024	19,109
10/02	538	10,330	1,536	28,723	2,074	39,053
10/09	515	9,630	1,169	21,860	1,684	31,490
10/16	812	16,078	1,083	20,577	1,895	36,655
10/23	1,468	29,507	2,446	48,675	3,914	78,182
10/30	191	3,896	484	9,970	675	13,866
Total	3,967	77,640	7,445	143,147	11,412	220,787
Mortalities	504	9,878	941	18,067	1,445	27,945
Total run	4,471	87,518	8,386	161,214	12,857	248,732
(Percent)	(11.4)	(16.4)	(21.3)	(30.1)	(32.7)	(46.5)

[1]Mortalities, by age and sex, calculated using the formula: total mortalities x percent of age and sex in total harvest.

Table 9. Mean total length (inches) and weight (pounds) of chinook salmon, by age and sex, harvested at the Little Manistee River weir in 1983. Standard error of one mean ($S_{\bar{x}}$) in parentheses.

Week beginning	Measurement	Age 0.1 Male	Age 0.1 Female	Age 0.2 Male	Age 0.2 Female	Age 0.3 Male	Age 0.3 Female
9/18	Length	21.7 (0.233)		32.5 (0.549)	34.0 (0.270)	37.8 (0.854)	35.3 (0.472)
	Weight	4.3 (0.133)		12.0 (0.541)	14.1 (0.415)	17.7 (1.259)	16.2 (0.413)
9/25	Length	21.6 (0.163)		32.9 (0.632)	35.4 (0.460)	36.8 (0.262)	36.8 (0.377)
	Weight	4.3 (0.090)		13.1 (0.635)	16.3 (0.348)	18.6 (0.799)	18.7 (0.594)
10/02	Length	21.5 (0.292)		33.1 (0.653)	34.3 (0.474)	37.8 (0.595)	36.6 (0.456)
	Weight	4.4 (0.175)		13.5 (0.700)	15.0 (0.509)	19.2 (0.586)	18.7 (0.407)
10/09	Length	22.4 (0.387)		33.9 (0.616)	34.2 (0.330)	37.9 (0.495)	36.0 (0.398)
	Weight	4.6 (0.148)		13.6 (0.619)	14.9 (0.442)	18.7 (0.650)	18.7 (0.513)
10/16	Length	23.2 (0.296)		34.8 (0.580)	34.0 (0.363)	37.9 (0.427)	36.1 (0.458)
	Weight	4.8 (0.225)		14.9 (0.751)	14.8 (0.574)	19.8 (0.688)	19.0 (0.621)
10/23	Length	22.9 (0.415)		33.3 (0.483)	33.8 (0.430)	38.4 (0.533)	36.7 (0.292)
	Weight	4.6 (0.289)		12.8 (0.534)	14.8 (0.498)	20.1 (0.707)	19.9 (0.528)
10/30	Length	24.9 (0.324)	24.9 (1.000)	35.2 (0.682)	33.9 (0.418)	38.3 (0.799)	36.7 (0.414)
	Weight	4.4 (0.236)	6.0 (1.151)	15.1 (0.783)	15.4 (0.512)	20.4 (0.917)	20.6 (0.609)
Weighted seasonal mean	Length	22.0 (0.278)	24.0 (1.000)	33.4 (0.584)	34.0 (0.403)	38.0 (0.504)	36.5 (0.384)
	Weight	4.4 (0.168)	6.0 (1.151)	13.3 (0.629)	14.9 (0.490)	19.6 (0.705)	19.2 (0.523)
Sexes combined	Length	22.0 (0.281)		33.6 (0.513)		37.0 (0.426)	
	Weight	4.4 (0.171)		14.0 (0.575)		19.3 (0.586)	

Table 10. Percent lamprey scarring of anadromous salmonids captured at the Little Manistee River harvest weir, 1968-83.

	Salmon		Trout	
Year	Chinook	Coho	Steelhead	Brown
1968	3.7	4.3	6.0	---
1969	4.7	2.5	0.9	---
1970	4.0	1.0	2.0	---
1971	2.8	1.5	0.0	---
1972	---	0.4	---	---
1973	0.7	0.0	0.0	---
1974	0.8	0.9	0.0	0.0
1975	1.0	0.4	0.3	0.0
1976	0.0	0.0	0.0	tr
1977	0.0	0.0	0.0	0.0
1978	---	---	---	---
1979	---	---	---	---
1980	0.3	0.2	0.0	0.0
1981	---	---	---	---
1982	0.0	0.0	0.0	0.0
1983	0.1	0.0	0.0	0.0

Table 11. Summary of the chinook egg-take operation at the Little Manistee River weir, 1983.

Date	Number of females stripped	Number of eggs collected	Destination
9/29	372	1,436,630	Platte River
9/30	502	2,526,282	Platte River
10/01	257	1,170,150	Platte River
10/02	408	1,909,380	Platte River
10/03	248	1,119,040	Platte River
10/04	440	1,958,320	Platte River
10/05	251	1,252,504	Thompson
10/06	181	814,500	Indiana
10/10	230	1,083,600	Illinois
10/11	218	1,024,600	Illinois
10/12	464	2,266,292	Wolf Lake
10/13	355	1,904,000	New York
10/14	344	1,716,900	New York
10/17	221	1,184,400	North Dakota (Garrison Dam)
10/18	160	761,600	South Dakota (Gavins Pt.)
10/18	236	1,094,800	South Dakota (Blue Dog Hatchery)
10/19	210	1,108,800	North Dakota & Montana
10/20	360	1,792,000	New York
10/21	360	1,764,000	New York
10/21	20	84,000	Pennsylvania
Total	5,837	27,971,798	
In-state		13,638,598	
Out-of-state		14,333,200	

Table 12. Summary of coho salmon harvested, by age and sex, at the Little Manistee River weir, 1983.

	Age 1.0		Age 1.1					
	Male		Male		Female		Total	
Week beginning	Number	Weight	Number	Weight	Number	Weight	Number	Weight
9/18	1,934	3,481	5,641	40,051	8,542	57,231	14,183	97,282
9/25	352	739	2,468	18,016	3,056	21,698	5,524	39,714
10/02	338	709	1,045	8,256	1,690	12,506	2,735	20,762
10/09	6	10	117	866	157	1,115	274	1,981
10/16	8	19	83	564	121	823	204	1,387
10/23	29	38	385	2,464	549	3,678	934	6,142
10/30	10	18	69	469	94	620	163	1,089
Total	2,677	5,015	9,808	70,686	14,209	97,671	24,017	168,357
Mortalities[1]	27	51	101	727	146	1,007	247	1,734
Total run	2,704	5,066	9,909	71,413	14,355	98,678	24,264	170,091
(Percent)	(10.0)	(2.9)	(36.7)	(40.8)	(53.2)	(56.3)	(90.0)	(97.1)

[1]Mortalities, by age and sex, calculated using the formula: total mortalities x percent of age and sex in total harvest.

Table 13. Mean length (inches) and weight (pounds) of coho salmon, by age and sex, harvested at the Little Manistee River weir, 1983. Standard error is in parentheses.

Week beginning	Measurement	Age 1.0 Male	Age 1.1 Male	Age 1.1 Female
9/18	Length	15.8 (0.180)	27.2 (0.322)	26.1 (0.176)
	Weight	1.8 (0.104)	7.1 (0.218)	6.7 (0.142)
9/25	Length	16.2 (0.436)	26.9 (0.266)	26.2 (0.213)
	Weight	2.1 (0.156)	7.3 (0.213)	7.1 (0.175)
10/02	Length	16.0 (0.270)	27.4 (0.264)	26.1 (0.162)
	Weight	2.1 (0.116)	7.9 (0.248)	7.4 (0.145)
10/09	Length	15.0 (0.0)	27.4 (0.211)	26.5 (0.159)
	Weight	1.6 (0.707)	7.4 (0.193)	7.1 (0.157)
10/16	Length	16.5 (0.288)	27.2 (0.245)	26.1 (0.180)
	Weight	2.4 (0.158)	6.8 (0.239)	6.8 (0.150)
10/23	Length	15.3 (0.545)	26.8 (0.398)	26.5 (0.200)
	Weight	1.3 (0.191)	6.4 (0.267)	6.7 (0.176)
10/30	Length	16.2 (0.405)	27.3 (0.327)	26.5 (0.232)
	Weight	1.8 (0.148)	6.8 (0.242)	6.6 (0.169)
Weighted seasonal mean[1]	Length	15.9 (0.230)	26.8 (0.303)	26.1 (0.183)
	Weight	1.9 (0.115)	7.2 (0.222)	6.9 (0.151)

[1]The weighted seasonal means for all coho in 1983 was 26.4 (±0.232)inches and 7.0 (±0.180) pounds.

Table 14. Percent of coho with silver skin and pink flesh at different sampling dates, Little Manistee River weir, 1983.

Sampling date	Percent	
	Silver skin	Pink flesh
9/19	76	100
9/26	44	98
10/03	54	90
10/10	40	72
10/17	31	65
10/27	7	15
10/31	7	12

Table 15. Relationship between skin color and flesh color, by sex, for coho salmon sampled at the Little Manistee River weir, 1983. Number of fish examined is in parentheses.

Sex and skin color	Percent	
	Pink flesh	Pale flesh
Male, silver (92)	98.9	1.1
Female, silver (177)	98.3	1.7
Sexes combined (269)	98.5	1.5
Male, dark (224)	47.3	52.7
Female, dark (207)	38.6	61.4
Sexes combined (431)	43.2	56.8

Table 16. Summary of number and weight (in parentheses) of steelhead, by age and sex, passed upstream at the Little Manistee River weir, fall 1983. No females ages 3.0 and 1.4 were passed.

	Age							
	1.0			2.0			3.0	1.4
Week beginning	Male	Female	Total	Male	Female	Total	Male	Male
9/18	11 (15)		11 (15)	61	7 (19)	68	---	---
9/25	48 (77)		48 (77)	171		171	---	7 (113)
10/02	120 (240)	24 (50)	144 (290)	192	24 (62)	216	24 (91)	---
10/09	17 (31)		17 (31)	25		25	---	---
10/16	10 (22)		10 (22)	37		37	---	---
10/23	25 (40)		25 (40)	101		101	---	---
10/30	7 (16)		7 (16)	18	6 (16)	24	---	1 (16)
Total	238 (441)	24 (50)	262 (491)	605 (1,467)	37 (97)	642 (1,564)	24 (91)	8 (129)
Percent of run								
Number	7.7	0.8	8.5	19.5	1.2	20.7	0.8	0.3
Weight	2.1	0.2	2.3	6.9	0.4	7.3	0.4	0.6

Table 16. Continued:

Week beginning	Age 1.1 Male	1.1 Female	1.1 Total	2.1 Male	2.1 Female	2.1 Total	1.2 Male	1.2 Female	1.2 Total
9/18	2 (14)	2 (12)	4 (26)	21 (136)	18 (110)	39 (246)	3 (24)	11 (98)	14 (122)
9/25	---	7 (43)	7 (43)	55 (346)	62 (397)	117 (743)	34 (326)	48 (403)	82 (729)
10/02	---	12 (70)	12 (70)	168 (1,210)	132 (845)	300 (2,055)	60 (570)	72 (691)	132 (1,261)
10/09	6 (29)	2 (11)	8 (40)	10 (62)	23 (145)	33 (207)	8 (69)	17 (153)	25 (222)
10/16	2 (12)	2 (11)	4 (23)	15 (106)	23 (156)	38 (262)	6 (55)	---	6 (55)
10/23	---	---	---	60 (396)	60 (408)	120 (804)	15 (141)	30 (282)	45 (423)
10/30	1 (6)	---	1 (6)	10 (76)	14 (114)	24 (190)	1 (9)	3 (26)	4 (35)
Total	11 (61)	25 (147)	36 (208)	339 (2,332)	332 (2,175)	671 (4,507)	127 (1,194)	181 (1,653)	308 (2,847)
Percent of run									
Number	0.4	0.8	1.2	10.9	10.7	21.6	4.1	5.8	9.9
Weight	0.3	0.7	1.0	11.0	10.3	21.3	5.6	7.8	13.4

Table 16. Continued:

Week beginning	Age 2.2 Male	2.2 Female	2.2 Total	1.3 Male	1.3 Female	1.3 Total	2.3 Male	2.3 Female	2.3 Total
9/18	23 (205)	36 (331)	59 (536)	---	---	---	2 (22)	3 (38)	5 (60)
9/25	55 (534)	144 (1,339)	199 (1,873)	20 (228)	---	20 (228)	14 (179)	20 (240)	34 (419)
10/02	132 (1,294)	168 (1,613)	300 (2,907)	24 (278)	---	24 (278)	12 (185)	36 (385)	48 (570)
10/09	42 (433)	35 (343)	77 (776)	2 (23)	---	2 (23)	17 (219)	4 (50)	21 (269)
10/16	27 (265)	33 (277)	60 (542)	---	2 (17)	2 (17)	4 (45)	4 (54)	8 (99)
10/23	101 (919)	50 (440)	151 (1,359)	20 (180)	---	20 (180)	35 (388)	5 (66)	40 (454)
10/30	38 (369)	29 (264)	67 (633)	---	---	---	6 (73)	6 (67)	12 (140)
Total	418 (4,019)	495 (4,607)	913 (8,626)	66 (710)	2 (17)	68 (727)	90 (1,111)	78 (900)	168 (2,011)
Percent of run									
Number	13.5	16.0	29.5	2.1	0.1	2.2	2.9	2.5	5.4
Weight	18.9	21.7	40.6	3.3	0.1	3.4	5.2	4.2	9.4

Table 17. Summary of mean length (inches) and weight (pounds) of steelhead, by age and sex, passed upstream at the Little Manistee River weir, fall 1983. No age 1.4 females were passed. Standard error of the mean is in parentheses.

Week beginning	Measurement	Age 1.0 Male	Age 1.0 Female	Age 2.0 Male	Age 2.0 Female	Age 3.0 Male	Age 3.0 Female
9/18	Length	14.3 (0.508)		16.2 (0.225)	16.2 (0.251)		
	Weight	1.4 (0.142)		2.0 (0.092)	2.0 (0.067)		
9/25	Length	14.6 (0.298)		16.7 (0.190)			
	Weight	1.6 (0.164)		2.4 (0.087)			
10/02	Length	15.4 (0.371)	16.5 (0.50)	16.9 (0.315)	17.0 (0.0)	19.0 (1.00)	
	Weight	2.0 (0.138)	2.1 (0.20)	2.6 (0.199)	2.6 (0.0)	3.8 (0.752)	
10/09	Length	15.6 (0.263)		19.6 (0.336)			
	Weight	1.8 (0.156)		2.1 (0.102)			
10/16	Length	16.8 (0.583)		17.2 (0.407)			
	Weight	2.2 (0.265)		2.4 (0.152)			
10/23	Length	15.4 (0.130)		17.2 (0.268)			
	Weight	1.6 (0.130)		2.5 (0.132)			
10/30	Length	17.2 (0.735)		17.7 (0.444)	18.8 (0.351)		
	Weight	2.3 (0.356)		2.3 (0.284)	2.7 (0.350)		
Weighted seasonal mean	Length	15.3 (0.378)	16.5 (0.50)	17.0 (0.273)	17.1 (0.104)	19.0 (1.00)	
	Weight	1.8 (0.156)	2.1 (0.20)	2.4 (0.141)	2.5 (0.069)	3.8 (0.752)	
Sexes combined	Length	15.4 (0.389)		17.0 (0.263)		19.0 (1.00)	
	Weight	1.9 (0.160)		2.4 (0.137)		3.8 (0.752)	

Table 17. Continued:

Week beginning	Measurement	Age 1.1 Male	Age 1.1 Female	Age 2.1 Male	Age 2.1 Female	Age 1.2 Male	Age 1.2 Female
9/18	Length	26.0 (0.0)	23.0 (0.0)	24.8 (0.534)	24.0 (0.447)	29.5 (0.500)	27.8 (0.703)
	Weight	6.9 (0.0)	5.9 (0.0)	6.5 (0.385)	6.1 (0.289)	8.0 (0.255)	8.9 (0.468)
9/25	Length		24.0 (0.0)	24.6 (0.420)	24.3 (0.236)	28.8 (0.20)	27.0 (0.534)
	Weight		6.1 (0.0)	6.3 (0.087)	6.4 (0.365)	9.6 (0.226)	8.4 (0.285)
10/02	Length		23.0 (0.0)	24.8 (0.376)	24.4 (0.338)	28.8 (0.800)	27.8 (0.477)
	Weight		5.8 (0.0)	7.2 (0.326)	6.4 (0.316)	9.5 (0.584)	9.6 (0.687)
10/09	Length	22.7 (1.186)	25.0 (0.0)	24.8 (0.80)	24.3 (0.320)	27.5 (0.957)	27.9 (0.581)
	Weight	4.9 (0.869)	5.5 (0.0)	6.2 (0.570)	6.3 (0.299)	8.6 (0.692)	9.0 (0.482)
10/16	Length	24.0 (0.0)	23.0 (0.0)	25.8 (0.366)	25.3 (0.366)	29.3 (0.667)	
	Weight	6.2 (0.0)	5.4 (0.0)	7.1 (0.371)	6.8 (0.236)	(9.2) (0.292)	
10/23	Length			25.0 (0.477)	25.2 (0.322)	29.0 (0.577)	28.0 (0.477)
	Weight			6.6 (0.469)	6.8 (0.300)	9.4 (1.184)	9.4 (0.578)
10/30	Length	24.0 (0.0)		26.3 (0.360)	25.4 (0.207)	28.0 (0.0)	27.5 (1.500)
	Weight	6.2 (0.0)		7.6 (0.367)	6.7 (0.231)	9.0 (0.0)	8.6 (1.651)
Weighted seasonal mean	Length	23.6 (0.647)	23.4 (0.0)	24.9 (0.422)	24.6 (0.317)	28.8 (0.603)	27.6 (0.532)
	Weight	5.6 (0.474)	5.8 (0.0)	6.9 (0.326)	6.6 (0.310)	9.4 (0.540)	9.1 (0.546)
Sexes combined	Length	23.5 (0.198)		24.7 (0.370)		28.1 (0.562)	
	Weight	5.8 (0.145)		6.7 (0.319)		9.2 (0.543)	

Table 17. Continued:

Week beginning	Measurement	Age 2.2 Male	2.2 Female	1.3 Male	1.3 Female	2.3 Male	2.3 Female	1.4 Male
9/18	Length	28.7 (0.444)	28.2 (0.431)			31.0 (0.0)	32.0 (0.0)	
	Weight	8.9 (0.522)	9.2 (0.354)			10.8 (0.0)	12.6 (0.900)	
9/25	Length	28.2 (0.491)	28.4 (0.280)	30.3 (0.334)		31.5 (0.500)	30.3 (0.334)	35.0 (0.0)
	Weight	9.7 (0.491)	9.3 (0.244)	11.4 (0.551)		12.8 (0.552)	12.0 (0.319)	16.2 (0.0)
10/02	Length	28.6 (0.491)	28.2 (0.395)	31.5 (0.500)		34.0 (0.0)	30.0 (0.577)	
	Weight	9.8 (0.432)	9.6 (0.427)	11.6 (0.652)		15.4 (0.0)	10.7 (1.009)	
10/09	Length	29.8 (0.236)	28.8 (0.488)	30.0 (0.0)		31.9 (0.500)	31.5 (0.500)	
	Weight	10.3 (0.286)	9.8 (0.393)	11.7 (0.0)		12.9 (0.304)	12.6 (0.442)	
10/16	Length	29.8 (0.422)	28.2 (0.219)		29.0 (0.0)	33.0 (1.000)	32.0 (1.000)	
	Weight	9.8 (0.447)	8.4 (0.177)		8.6 (0.0)	11.2 (1.400)	13.4 (1.851)	
10/23	Length	29.2 (0.473)	28.0 (0.258)	29.8 (0.251)		31.0 (0.488)	31.0 (0.0)	
	Weight	9.1 (0.460)	8.8 (0.281)	9.0 (0.680)		11.1 (0.651)	13.2 (0.0)	
10/30	Length	29.3 (0.277)	28.7 (0.209)			32.5 (0.204)	30.0 (1.224)	32.0 (0.0)
	Weight	9.7 (0.269)	9.1 (0.226)			12.2 (0.661)	11.1 (1.008)	16.5 (0.0)
Weighted seasonal mean	Length	29.0 (0.434)	28.3 (0.334)	30.6 (0.359)	29.0 (0.0)	31.8 (0.420)	30.4 (0.523)	34.6 (0.0)
	Weight	9.6 (0.423)	9.3 (0.323)	10.8 (0.610)	8.6 (0.0)	12.3 (0.503)	11.5 (0.777)	16.2 (0.0)
Sexes combined	Length	28.6 (0.380)		30.5 (0.348)		31.2 (0.468)		34.6 (0.0)
	Weight	9.4 (0.369)		10.7 (0.592)		12.0 (0.630)		16.2 (0.0)