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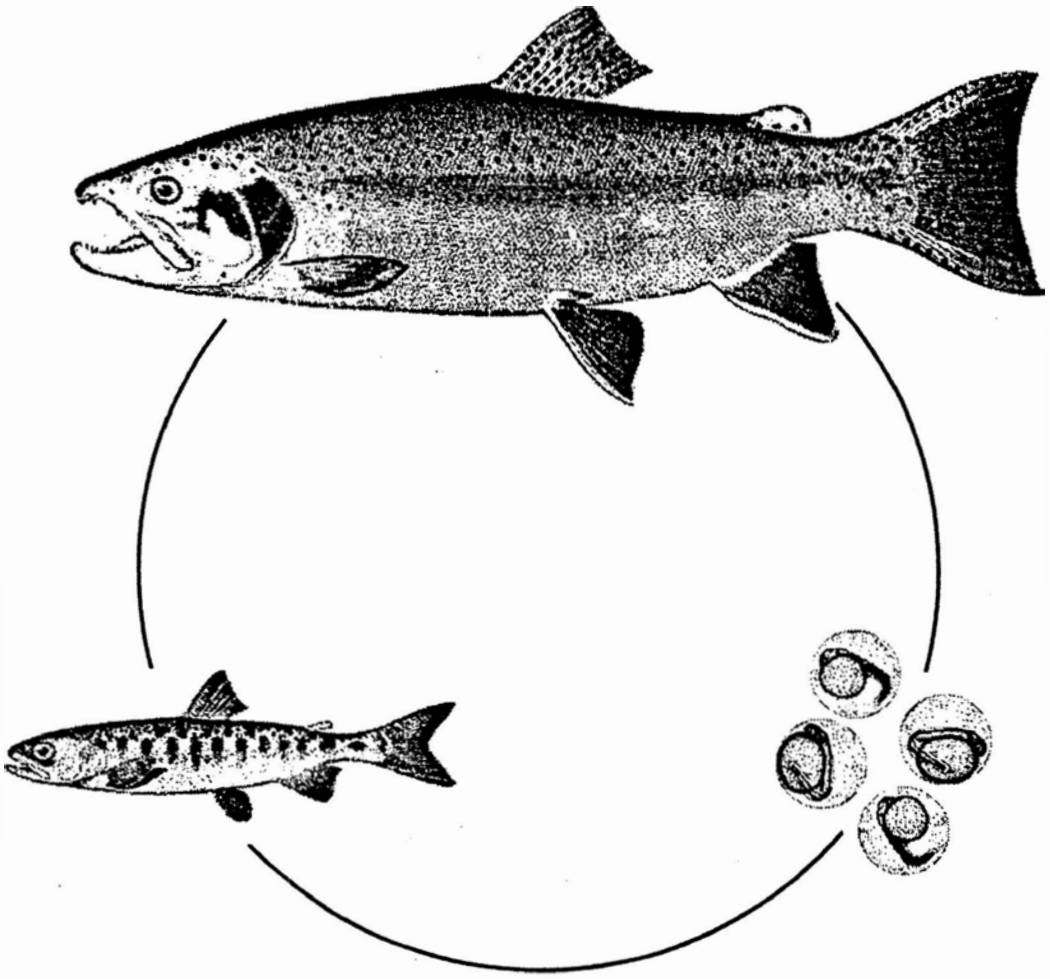

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES

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Since 1967, annual stockings of both coho salmon *Oncorhynchus kisutch* and chinook salmon *O. tshawytscha* have been made by the Michigan Department of Natural Resources (MDNR) as part of the salmon management program for Lake Michigan (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 (Figure 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. Salmon processed at the Little Manistee weir are Michigan's primary source for chinook eggs for in-state and out-of-state hatchery rearing and serve as a back-up (to the Platte River upper weir) for coho eggs. Fall steelhead *O. mykiss* runs are monitored and the majority of steelhead eggs for in-state hatchery rearing are collected at the facility each spring. Biological data have been collected on chinook and other anadromous salmonids since 1968.

From 1967 through 1978, chinook fingerlings were stocked in the Little Manistee River at an average rate of about 345,000 per year (Table 1). Beginning in 1979, the planting rate was increased by 70% to an average of nearly 588,000 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, age-0.3, age-0.4, or age-0.5—but most commonly at age-0.3.[1] For the 1967 and 1968 year classes and plants, return rates were 1.8% to 1.9% at age 0.1, 3.4% to 3.5% at age 0.2, and 2.0% to 3.1% at age 0.3 (Table 3). For the 1981-84 year classes, return rates were 0.2% to 1.5% at age 0.1, 0.1% to 3.5% at age 0.2, 1.5% to 3.2% at age 0.3, 0.2% to 1.7% at age 0.4, and less than 0.2% at age 0.5. Comparable estimates cannot be made for the 1969-80 plants because

[1]In aging anadromous fish, the number preceding the decimal denotes age at smolting (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 1, 2, 3, 4, or 5 for chinook and 0 or 1 for coho). Note: a very recent study of scale samples from the Lake Michigan fishery indicates some chinook live to age 0.4 and 0.5. This finding suggests that some spawning chinook absorb one or two annuli from their scales while in the rivers and that the aging data given in preceding reports may be underestimates.

the age composition of the run has not been monitored consistently; however, for jacks, returns have averaged 0.7%. The jack returns from the 1985-88 plants have averaged 0.5%.

The return rate of chinook salmon to the weir was high initially (1960s), declined (1970s), then increased (early 1980s). Return rates by chinook of all ages were approximately 8.5% for the 1967 plant, 7.2% for the 1968 plant, 6.8% for the 1981 plant, 9.1% for the 1982 plant, 5.6% for the 1983 plant, and only 2.1% for the 1984 plant (Table 3). Returns from plants in the 1970s must have been lower because relatively low numbers came back to the weir in 1976-77 and 1980-82 (Table 2). Large runs, averaging 31,994 fish per year, occurred from 1983 through 1987. These originated from average plants of about 565,000 smolts in 1978-86—an average return rate of about 5.7% per plant. The 1984 plant had the lowest return rate (2.1%) on record. The return rates represent only the weir harvest and do not include the angler harvest, which has increased until recent years. For those Michigan waters of Lake Michigan which were surveyed by the MDNR in 1989, an estimated 80,000 chinook salmon were harvested by sport anglers (G. Rakoczy, MDNR, personal communication).

Mean length and weight of age-0.1 (jack) chinook have fluctuated considerably (Table 4, Figure 2). Average weight has varied from 3.0 to 9.5 pounds, with especially large fluctuations during the 1970s. Overall, age-0.1 chinook salmon decreased in size from 5.9 pounds (1960s) to an average of 4.3 pounds (1980s), a 27% reduction.

Annual plants of yearling coho salmon in the Little Manistee River have varied widely from 92,000 in 1971 to 700,000 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, <0.1% to 0.7%, compared to adults (age-1.1), 1.5% to 15.0% (Table 3, Figure 3). The total return rate is usually between 11% and 15%, however, it declined to 8.5% for the 1983 plant and averaged only 3.4% for the 1984-88 plants. The return rate (1.5%) for the 1987 plant was the lowest on record (Table 3). As with chinook, these return rates represent only the weir harvest and do not include the angler harvest, which has also fluctuated annually. For those Michigan waters of Lake Michigan which were surveyed by the MDNR in 1989, an estimated 75,000 coho salmon were harvested by sport anglers (G. Rakoczy, MDNR, personal communication).

The average weight of coho jacks (age 1.0) increased slightly from 1974-83, gradually decreased through 1986, and then increased again in 1987-89 (Figure 4, Table 6). However, the size of adult coho decreased from 8.7 pounds in 1968 to less than 5.0 pounds in 1979, and has since stabilized at about 6.3 pounds. Like the chinook, there has been a decrease in average size of adult coho from the 1960s to the early 1980s, but in the last several years the average has been fairly constant. It is possible that the annual variations in size are 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 almost 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). In 1984, a small planting of three strains of summer steelhead yearlings was made to extend the steelhead fishery. The strains (Siletz, Rogue, and Umpqua River) were imported from the State of Oregon. The number of steelhead returning to the weir each fall has not been consistent, ranging from 320 in 1978 to 7,622 in 1971 (Table 7). Mean weight of steelhead (all age groups combined) has varied from 6.5 pounds in 1973 to 9.3 pounds in 1972 (Table 7). For those Michigan waters of Lake Michigan which were surveyed by the MDNR in 1989, an estimated 30,000 steelhead were harvested by sport anglers (G. Rakoczy, MDNR, personal communication). Indications are that the open-water catch will increase significantly in future years.

Small runs of anadromous brown trout *Salmo trutta* occur in the Little Manistee River. The largest run, 238, was in 1975 (Table 8). Average size has ranged from 3.4

pounds (1974) to 6.8 pounds (1979). Annual runs have steadily decreased since 1985. For those Michigan waters of Lake Michigan which were surveyed by the MDNR in 1989, an estimated 14,000 brown trout were harvested by sport anglers (G. Rakoczy, MDNR, personal communication).

Atlantic salmon *S. salar* 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 1984, only an occasional fish had been captured. Of the several strains and hybrids planted, only the Sebago strain (from Maine) showed promise.

A few pink salmon *O. gorbuscha* have been harvested in the last few years. Numbers harvested are generally less than 25.

Harvest Weir Operations, 1989

On August 14, 1989, the weir grates were installed to block anadromous fish. On September 7, the ponds were filled and the fish ladder was activated. Harvest began on September 11. The weir remained operational until October 31, at which time the grates were removed and the building was winterized. The weir was in operation for 79 days. All harvested chinook and coho salmon were sold on contract to Tempotech Industries, Hart, Michigan.

Chinook Salmon

Harvest of chinook salmon began September 11 and ended October 31, a period of 50 days. From September 11-25 only males surplus to those needed for egg-take were harvested. Harvest of spawned females began September 25. Nearly 83% of the harvest occurred from late September through the third week in October (Table 9). A total of 18,338 chinook were harvested in 1989 (Table 2). The calculated total weight of all chinook, in the round, was 222,394 pounds.

For several weeks during the run, biological data were obtained from a randomly selected sample of 800 chinook to provide information on age composition and growth. To overcome the problem of aging river fish with reabsorbed scales, chinook salmon length frequencies were converted to age frequencies by means of a length-age frequency table (Table 10). Data for this table were obtained from scale samples and length measurements collected from Lake Michigan fish during a creel survey at several sites from August through October, 1989. In applying the table to those length groups in which two or more age groups are represented, the lighter fish were assigned to the younger age group and the heavier fish to the older age group. The estimated total harvest consisted of 3,142 (17.1%) age-0.1 jacks weighing 13,482 pounds, 2,309 (12.6%) age-0.2 adults weighing 17,373 pounds, 7,720 (42.1%) age-0.3 adults weighing 99,142 pounds, 5,076 (27.7%) age-0.4 adults weighing 90,234 pounds, and 91 (0.5%) age-0.5 adults weighing 2,163 pounds (Tables 2 and 9). The 1989 run of jacks represented 0.6% of the fingerlings stocked in 1988. The returning age-0.2 adults were 0.6% of the 1987 plant, age-0.3 adults were 1.7% of the 1986 plant, age-0.4 adults were 1.0% of the 1985 plant, and age-0.5 adults were less than 0.1% of the 1984 plant (Table 3).

Females constituted about 31% of the total run—0.6% of age-0.1, 7.2% of age-0.2, 39.2% of age-0.3, and 48.3% of age-0.4 (Table 9). No age-0.5 females were collected. Mean lengths and weights of males and females combined were: age-0.1, 22.5 inches and 4.3 pounds; age-0.2, 28.2 inches and 7.5 pounds; age-0.3, 33.7 inches and 12.8 pounds; age-0.4, 36.3 inches and 17.8 pounds; and age-0.5 (males only) 40.7 inches and 23.8 pounds (Table 11). Growth was nearly linear on a weight basis (Figure 5). In general, females were slightly larger than males at each age.

The 1989 chinook egg-take operation began September 25 and ended October 31. During the 36-day period, 13.5 million eggs were collected, of which 11.6 million were for in-state rearing and 1.9 million were for out-of-state commitments (Table 12). A total of approximately 4,000 female chinook (ages 0.2, 0.3, and 0.4) were examined for egg quality. Of those, the eggs from 2,958 females were kept for hatchery rearing. Given that 4,000 females were handled to provide the 13.5 million eggs, a total run of 10,700 chinook (4,000/37.4% females) should provide

sufficient eggs for current in-state and out-of-state requirements.

In an attempt to reduce the level of bacterial kidney disease (BKD) infection in chinook, each fish spawned was examined for gross clinical signs of BKD. Eggs and sperm from fish exhibiting any of the clinical signs (cloudy ovarian fluid; "cheesy" membranes on the spleen, liver or heart; bleeding from the vent; or swollen kidneys, sometimes with "pustules") were discarded and all utensils discarded or disinfected. The prevalence rate was 8.5% in males and 19.9% in females.

Egg-take operations began when the proportion of ripe females approached 40%. The "dry" method of egg fertilization was used in 1989. The "dry" method involved mixing eggs (from several females) with sperm in a 5-gallon plastic pail without water and letting the mixture stand for 10 minutes before water hardening. The fertilized eggs were water hardened in flowing river water for 1 hour prior to transportation. The percent eye-up was normal for chinook salmon with a range of 69.8% (October 9) to 81.0% (October 4) (Table 12).

An experimental lot of about 100,000 eggs were water hardened for 30 minutes in a 100 ppm solution of Argentyne (iodine solution). The eggs were soaked in river water a few minutes before the iodine solution was added. After 30 minutes the eggs were rinsed clean in flowing river water prior to transportation. The 74% eye-up on these eggs is normal and compares favorably with the 80% eye-up in the control group. The eggs taken for Wisconsin were treated with the iodine.

No water temperatures were recorded during the egg-take operation.

A random sample of 60 spawning chinook were inspected by the state pathologist for disease and parasites. Analysis of the ovarian fluids for BKD showed that 100% of the chinook sampled were infected (J. Hnath, MDNR, personal communication).

No fin clips were found on 800 randomly examined chinook salmon.

Only 0.2% of the chinook sampled had a sea lamprey *Petromyzon marinus* wound (Table 13). This was significantly less than the 3 previous years.

Coho Salmon

In 1989, the coho harvest coincided with the chinook harvest (September 11 through October 31, a total of 50 days). The peak harvest occurred during mid-September (Table 14). Since coho were not held for egg-take, the harvest generally coincides with migration into the river. Like the chinook, the coho runs had decreased significantly by late October.

A total of 14,023 coho were harvested. The total weight calculated from biological samples was 84,229 pounds (Table 5). This was a significant increase over the previous year and more typical of the runs from 1985-87.

The age composition of the harvested coho was 1,992 (14.2%) age-1.0 jacks weighing 3,194 pounds and 12,031 (85.8%) age-1.1 adults weighing 81,035 pounds (Tables 5 and 14). The returning age-1.0 jacks were 0.5% of the 1989 plant and the age-1.1 adults were 3.4% of the 1988 plant (Table 3).

Nearly all age-1.0 and 40.2% of the age-1.1 coho were males. The total run consisted of 45.7% females. Mean lengths and weights were: age-1.0 males, 15.7 inches and 1.6 pounds; age-1.0 females, 15.6 inches and 1.8 pounds; age-1.1 males, 26.9 inches and 6.8 pounds; age-1.1 females, 26.2 inches and 6.6 pounds; age-1.0 sexes combined, 15.7 inches and 1.6 pounds; and age-1.1 sexes combined, 26.5 inches and 6.7 pounds (Table 15). Adult males were slightly larger than females.

Only 0.2% of the 800 coho sampled had lamprey wounds (Table 13). This rate was significantly less than the 1960s.

No coho eggs were collected in 1989.

A total of 800 randomly selected adult coho were examined for fin clips. Of these fish, only four (0.5%) had a fin clip. During harvest operations, an additional 68 coho were collected that had a fin clip. The only mark observed was an adipose (Ad) fin clip. Origin of the 72 Ad-clipped fish could not be determined since no coded-wire tag was recovered from the snout. It is possible that the missing Ad fin is the result of hatchery rearing, where a bacterial infection can erode

away the fin as has been observed with dorsal fins of steelhead.

Skin color was not examined on any of the coho.

In addition to the random samples, two very large coho were collected. The age-1.2 fish was 38.7 inches and 21.4 pounds. The age 1.3 fish was 37.5 inches and 17.8 pounds. Both were males with poorly developed gonads.

Steelhead Trout

Fall steelhead began entering the river in early September. Low and consistent numbers of fish entered the river throughout September and early October. The peak (60%) migration occurred in late October (Table 16). All but nine steelhead were passed above the weir.

The 1989 run of 1,130 fish was slightly better than 1988 (Table 7). Fifty-seven percent of the returning adults were age 1.2 or 2.2 (Table 16). These two age groups also represented 61% of the total estimated weight of 8,806 pounds. Mean lengths and weights for 10 different age groups are given in Table 17 and Figure 6. Size of returning adults is more dependent upon years spent in Lake Michigan than on age at smolting.

A total of 489 randomly selected steelhead were checked for fin clips. Of these fish, five (1.0%) had a fin clip. The two fin clips observed were adipose (Ad, 4 fish) and left ventral (LV, 1 fish). The Ad fish were not sacrificed in an attempt to recover the small coded-wire tag in the snout. However, aging (from scale samples) revealed that three were age 1.3, and were planted in 1986 by the MDNR at several locations in Lake Michigan and were Skamania strain of summer steelhead. Origin of the other Ad fish could not be determined since fin clip, age (from scale samples), and planting records did not coincide. The LV fish was planted in 1985 by either the Wisconsin Department of Natural Resources (WDNR) or Indiana Department of Natural Resources (IDNR). In both instances they planted Skamania. Nine (1.8%) had other marks which were right maxillary (RM, 4 fish) and left maxillary (LM, 5 fish). Two of the RM fish were planted in 1986 by the WDNR in the Manitowoc River and were Skamania. One of the RM fish was planted in 1986 by the WDNR in the Root River and was also Skamania. One of the LM fish was planted in 1986 by the WDNR in the Manitowoc River but was not a Skamania. Origins of the remaining five fish could not be decided because the marks, age (from scales), and planting records did not coincide.

Prior spawning "checks" or marks can also be determined from scale examinations. Of the 489 fish examined, 67 (13.7%) were repeat spawners. Sixteen percent of the males and 11% of the females were repeat spawners.

Brown Trout

Anadromous brown trout migrations were constant throughout the weir operation (Table 18). All brown trout were passed above the weir.

The 1989 run of 29 fish was similar to the previous year and down from peak runs in the mid-1970s (Table 8). About 55% of the returning adults were age 1.1 or 2.1 (Table 18). These two age groups represented 56% of the total estimated weight of 161 pounds. Mean lengths and weights of the seven represented age groups are given in Table 19 and Figure 7. Size of returning adults is more dependent upon years spent in Lake Michigan than on age at smolting.

A total of 27 brown trout were examined for fin clips and lamprey wounds. None of the fish had a fin clip or lamprey wound.

Brown trout are not planted in the Little Manistee River. Therefore, it is assumed that these anadromous fish are from wild stock or from hatchery stock planted in Lake Michigan at Manistee.

Atlantic Salmon

No Atlantic salmon were collected at the weir in 1989.

Pink Salmon

Three pink salmon were collected at the weir in 1989. All were age 1.0 males that averaged 18.7 inches, and 2.3 pounds.

Summary

In 1989, the Little Manistee harvest weir was in operation from August 14 through October 31 (79 days). Harvest of chinook and coho salmon and passage of other anadromous salmonids occurred from September 11 through October 31.

The entire salmon run of 18,338 chinook (222,394 pounds) and 14,023 coho (84,229 pounds) was harvested and sold to Tempotech Industries, Hart, Michigan.

The chinook run consisted of 3,142 age-0.1 jacks (0.6% of the 1988 fingerling plant), 2,309 age-0.2 adults (0.6% of the 1987 fingerling plant), 7,720 age-0.3 adults (1.7% of the 1986 fingerling plant), 5,076 age-0.4 adults (1.0% of the 1985 fingerling plant), and 91 age-0.5 adults (less than 0.1% of the 1984 fingerling plant). Mean sizes were: age 0.1, 22.5 inches (4.3 pounds); age 0.2, 28.2 inches (7.5 pounds); age 0.3, 33.7 inches (12.8 pounds); age 0.4, 36.3 inches (17.8 pounds); and age 0.5, 40.7 inches (23.8 pounds). During chinook egg-take operations (September 25 through October 31), 2,958 females (ages 0.2, 0.3, and 0.4) were stripped to obtain 13.5 million eggs. The percent eye-up ranged from 69.8% (October 9) to 81.0% (October 4).

The 1989 coho run was composed of 1,992 age-1.0 jacks (0.5% of the 1989 yearling plant) and 12,031 age-1.1 adults (3.4% of the 1988 yearling plant). Mean sizes were: age 1.0, 15.7 inches (1.6 pounds); and age 1.1, 26.5 inches (6.7 pounds).

The 1989 fall steelhead run of 1,130 fish included 10 different age groups. Fifty-seven percent of the fish were age-1.2 or age-2.2 (3 summers in Lake Michigan). Of the fourteen marked fish, seven were identified as the Skamania strain of summer steelhead planted in Lake Michigan, one was non-Skamania and the origin of the remaining six could not be determined.

The fall brown trout run of 29 fish was similar to the previous year and down from peak runs in the mid-1970s. About 55% of the returning adults were age-1.1 or age-2.1.

No Atlantic salmon returned to the weir in 1989.

Three pink salmon were collected at the weir in 1989. The age-1.0 males averaged 18.7 inches and 2.3 pounds.

Recommendations for 1990

Use only data from biological samples to calculate weekly weights of chinook and coho salmon harvested. Do not scale sample river-run chinook salmon because their scales are severely eroded and are missing annuli; instead, collect scale samples from Lake Michigan chinook in the fall. Utilize the "dry" method for chinook egg-take. This method involves mixing eggs (from several females) with sperm in a 5-gallon plastic pail without water and letting the mixture stand for 10 minutes before water hardening.

Acknowledgments

Data collection, tabulation, and scale reading were done by Alfred Allen, Janice Sapak, Pete Makoweski, Dann Manz, and Steve Lazar. Kelley Smith developed a computer program for data analyses and provided technical advice.

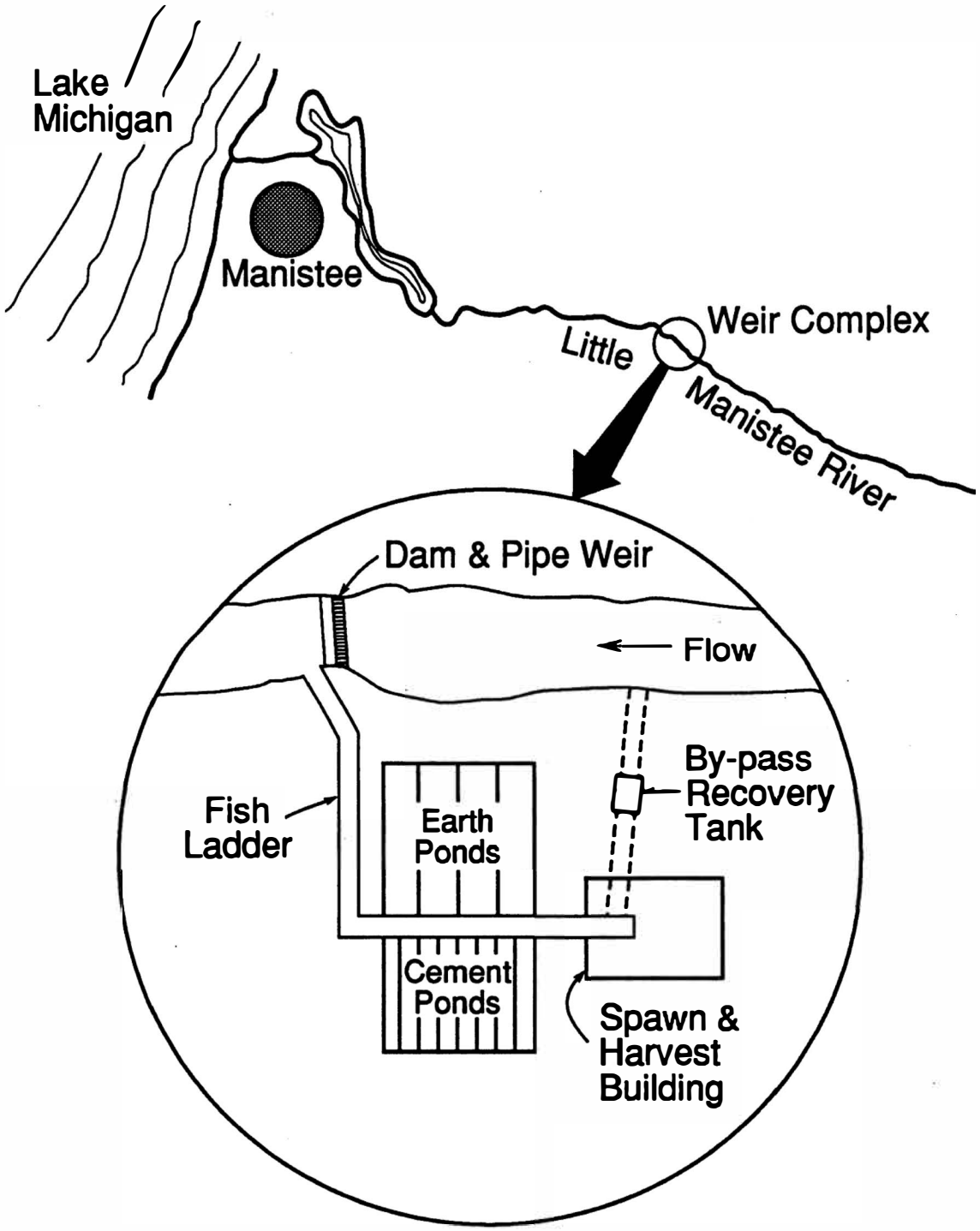

Figure 1.—Location and schematic diagram of the Little Manistee River weir complex.

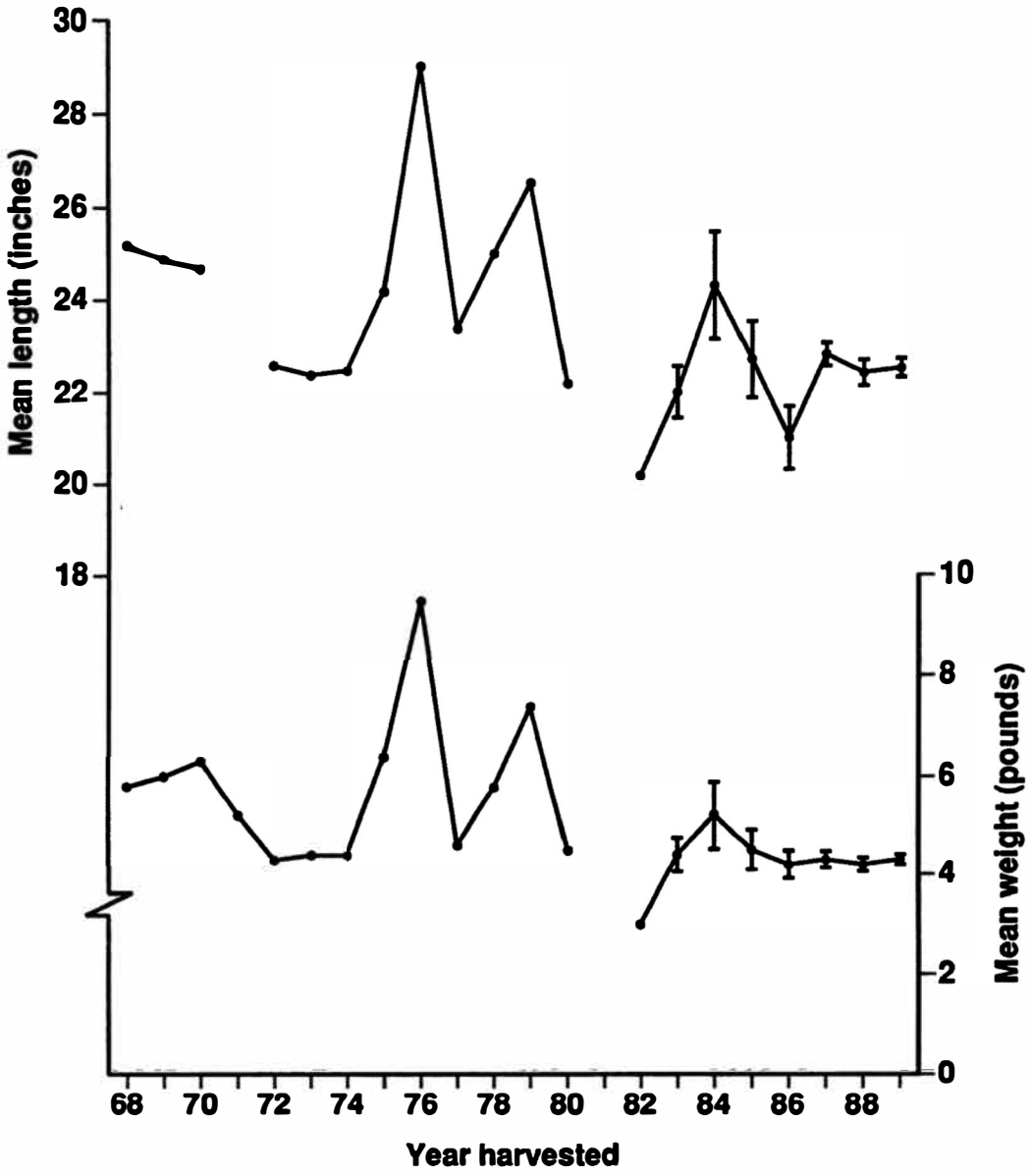

Figure 2.—Mean total length (inches) and round weight (pounds) of age-0.1 jack) chinook salmon harvested at the Little Manistee River weir, fall 1968-89. Vertical bars indicate two standard errors.

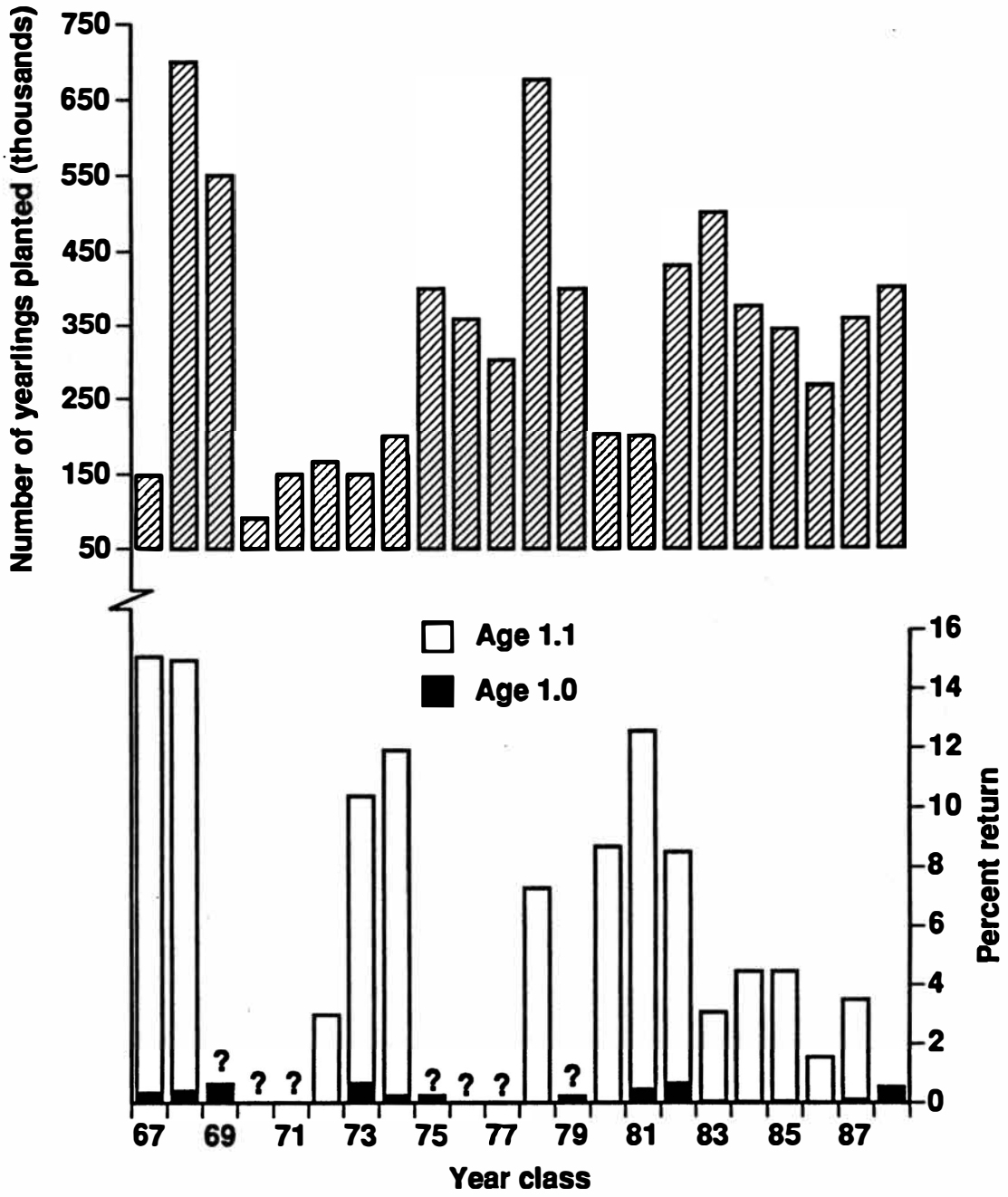

Figure 3.—Percent return, by age, of coho salmon year classes to the Little Manistee River weir compared with the number of yearlings planted. Question marks (?) indicate incomplete return data.

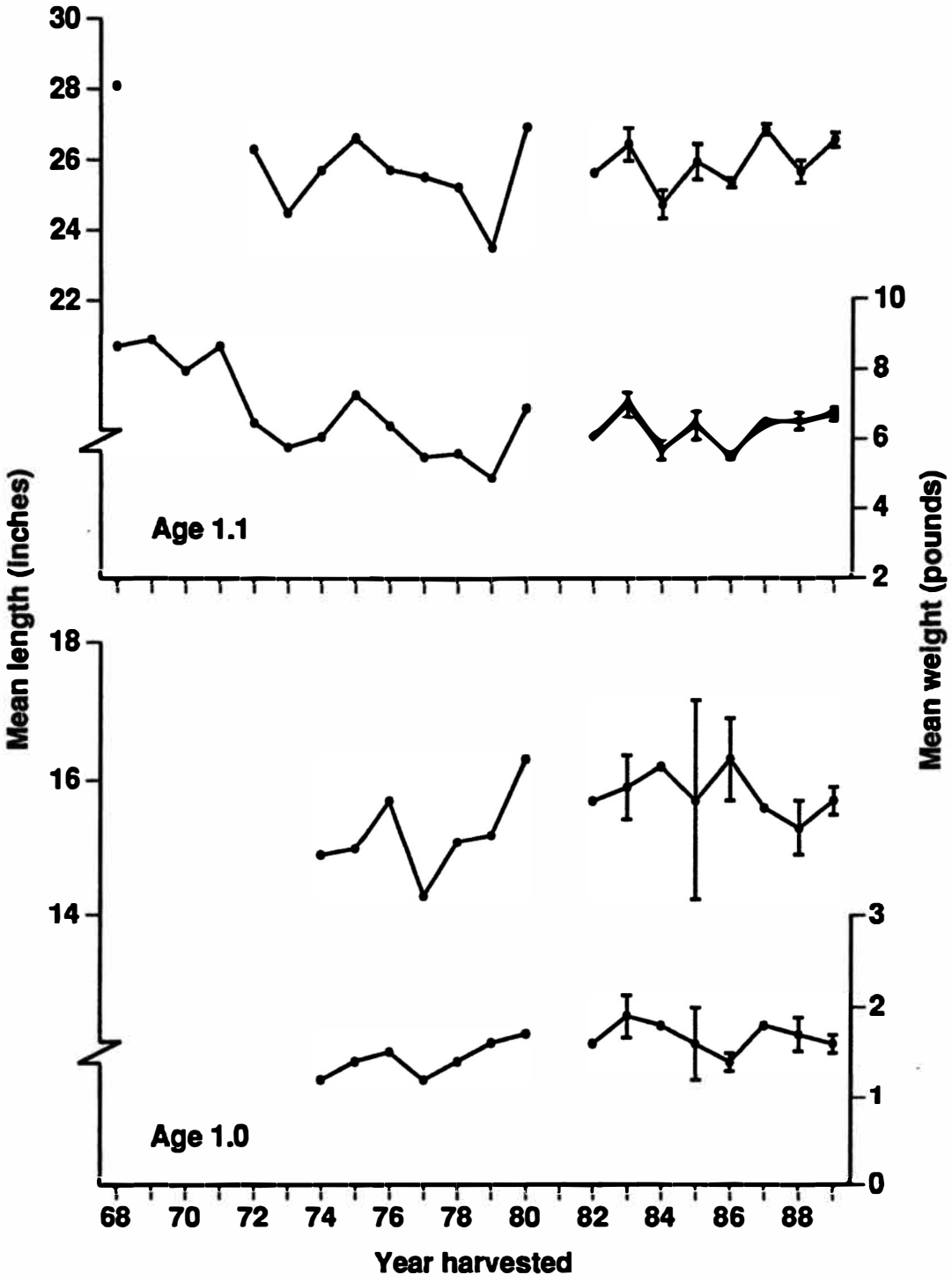

Figure 4.—Mean total length (inches) and round weight (pounds) of age-1.0 and age-1.1 coho salmon harvested at the Little Manistee River weir, fall 1968-89. Vertical bars indicate two standard errors.

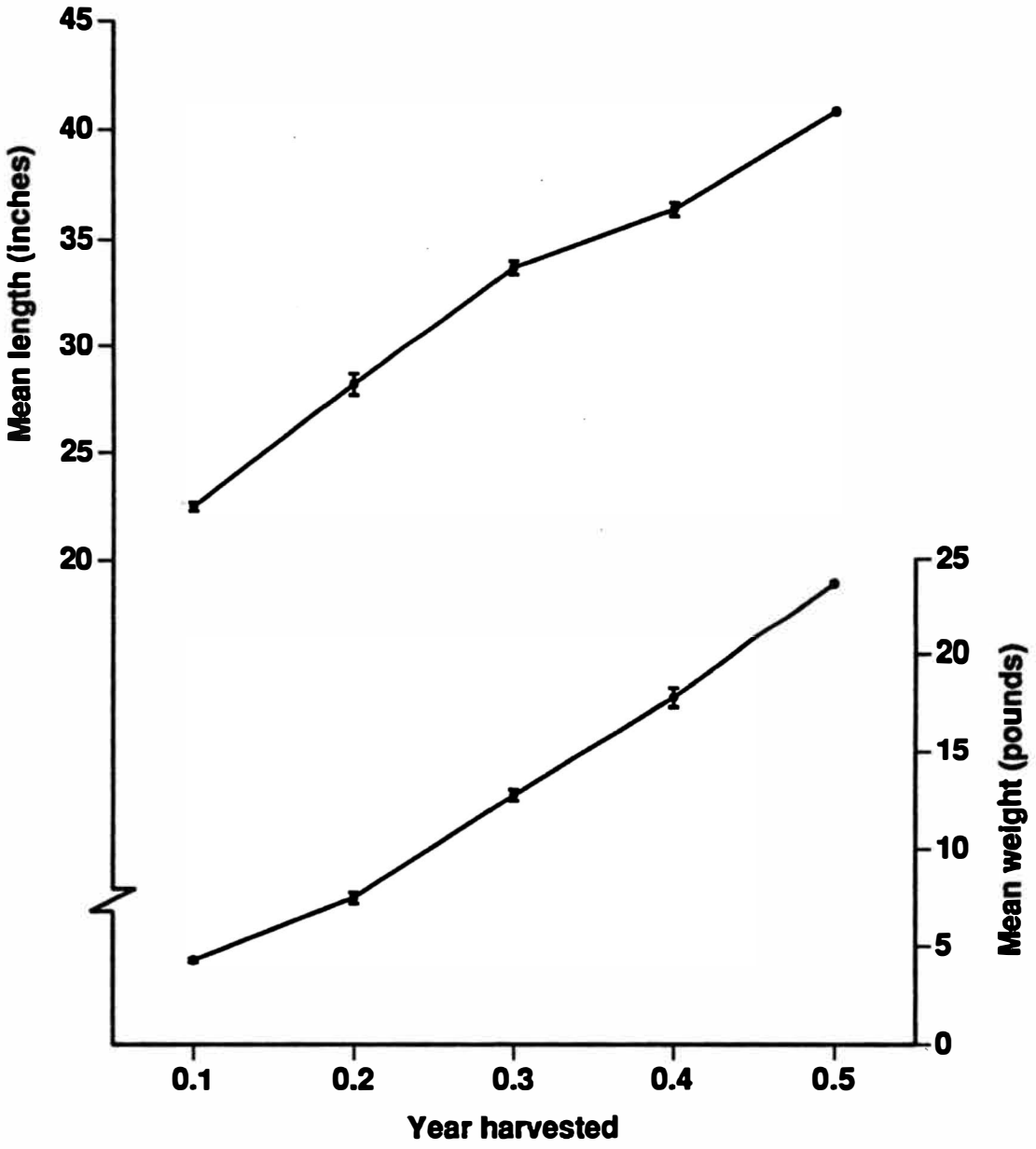

Figure 5.—Mean total length (inches) and round weight (pounds), by age, of chinook salmon harvested at the Little Manistee River weir, fall 1989. Vertical bars indicate two standard errors.

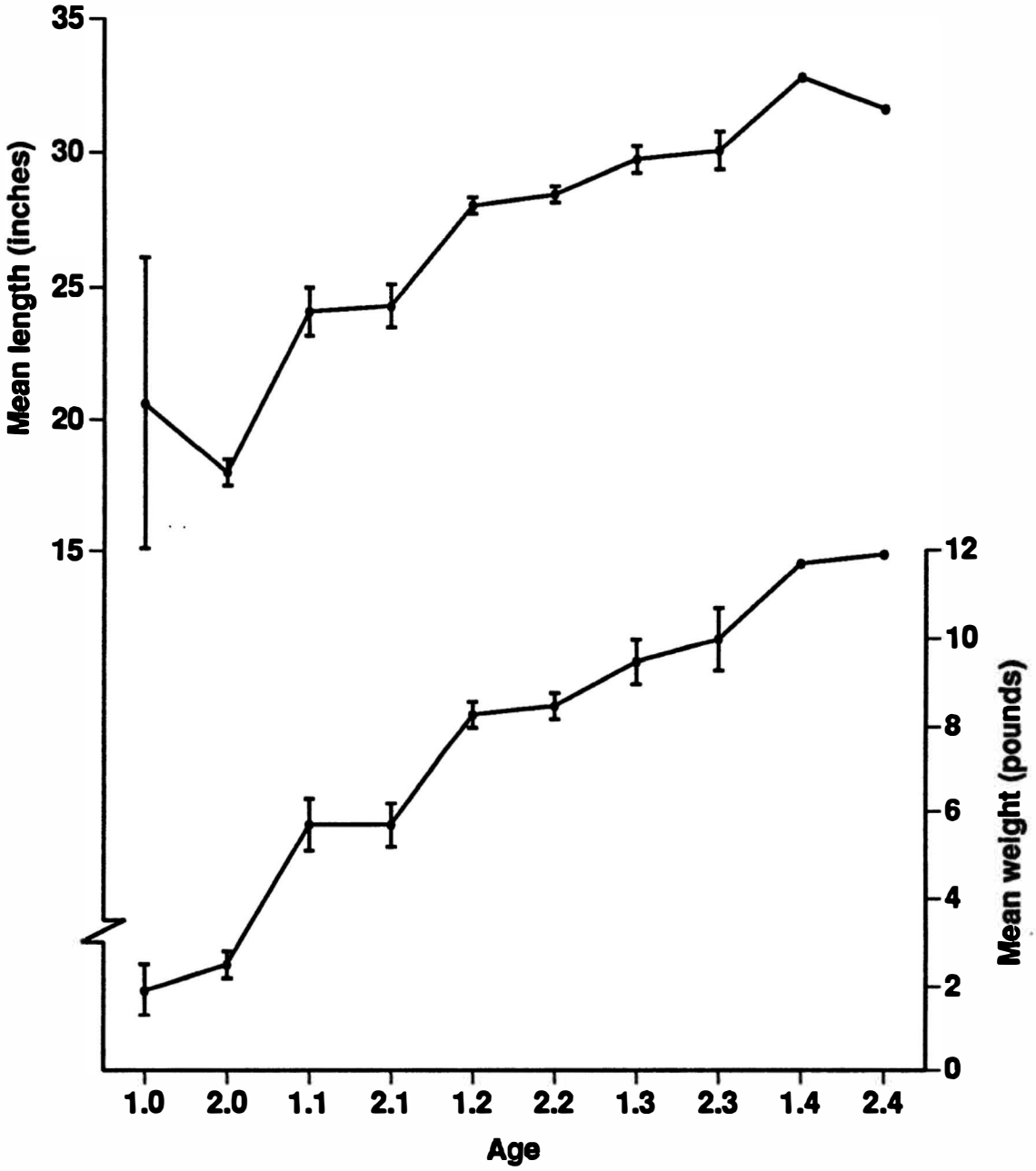

Figure 6.—Mean total length (inches) and round weight (pounds), by age, of steelhead passed upstream at the Little Manistee River weir, fall 1989. Vertical bars indicate two standard errors.

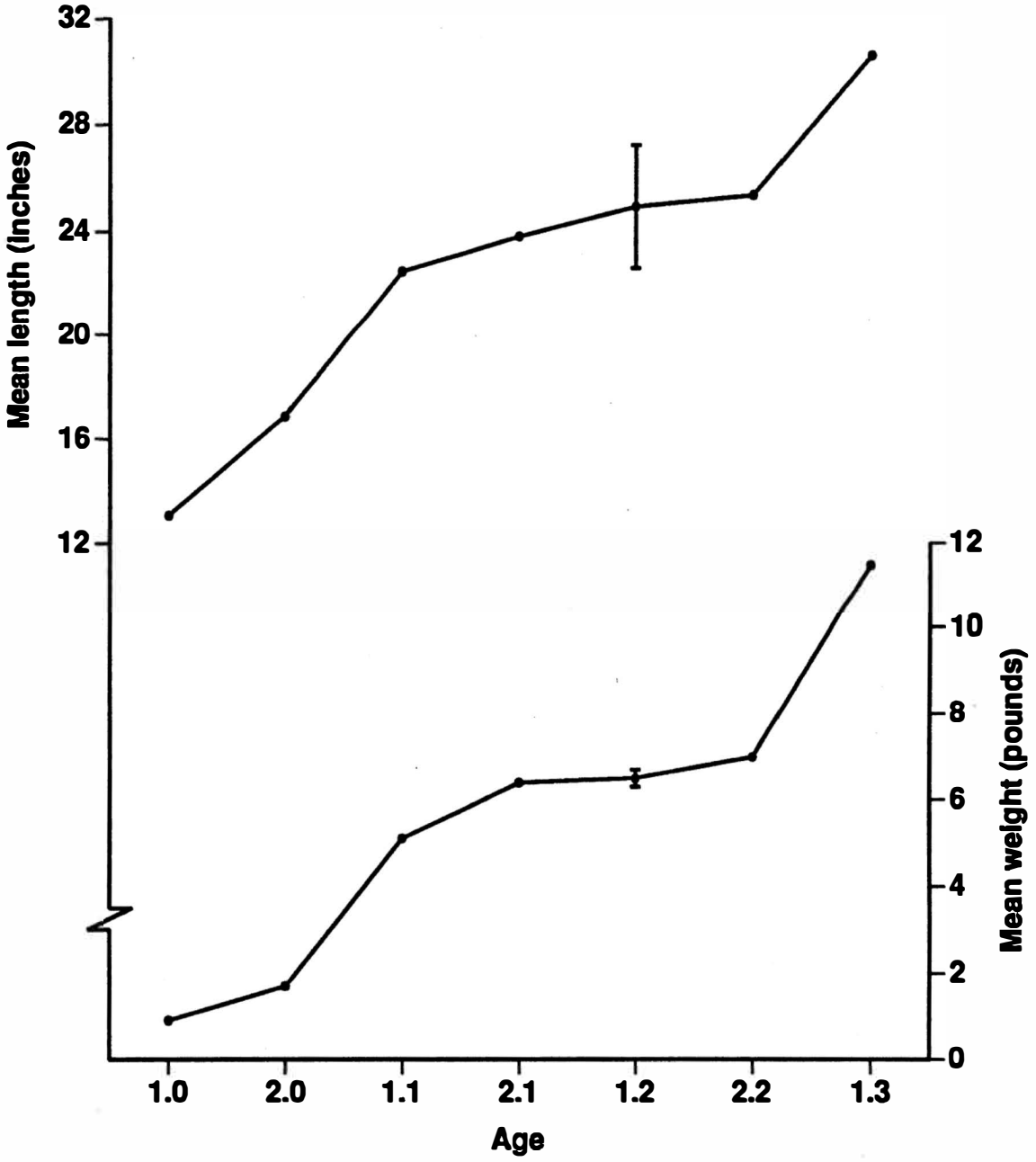

Figure 7.—Mean total length (inches) and round weight (pounds), by age, of brown trout passed upstream at the Little Manistee River weir, fall 1989. Vertical bars indicate two standard errors.

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

Planting year	Salmon			Trout	
	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)
1984	805,773	500,066	—	5,079	(Y)[1]
	—	—	—	5,000	(Y)[2]
	—	—	—	4,817	(Y)[3]
1985	500,012	375,283	—	—	
1986	450,273	343,121	—	—	
	19,721[4]	—	—	—	
1987	372,325	266,914	—	—	
	63,321[4]	—	—	—	
1988	523,400	358,250	—	—	
	78,143[4]	—	—	—	
1989	659,858	400,883	—	—	
	60,494[4]	—	—	—	
Total	10,598,998	7,803,913	67,056	293,861	(FF)
	—	—	—	92,024	(Y)
Average	460,826	339,301	16,764	97,954	(FF)
	—	—	—	23,006	(Y)

[1]Siletz River strain of summer steelhead.

[2]Rogue River strain of summer steelhead.

[3]Umpqua River strain of summer steelhead.

[4]Triploid chinook salmon.

Table 2.—Number, by age, of chinook salmon harvested at the Little Manistee River weir, fall 1968-89. Weight (pounds) is in parentheses.

Year	Age[1] 0.1	0.2	0.3	0.4	0.5	Adults[2]	Mortalities[3]	Total
1968	9,597	—	—	—	—	—	1,633	11,230
1969	5,175	18,693	—	—	—	—	2,420	26,288
1970	4,670	11,100	18,420	—	—	—	—	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)
1984	5,914	18,342	8,376	—	—	—	—	32,632
	—	—	—	—	—	—	—	(436,057)
1985	2,005	6,326	19,437	5,990	248	—	—	34,006
	—	—	—	—	—	—	—	(442,153)
1986	397	1,025	13,850	6,849	10	—	—	22,131
	—	—	—	—	—	—	—	(298,188)
1987	3,229	3,962	12,191	11,482	977	—	—	31,841
	—	—	—	—	—	—	—	(373,420)
1988	2,114	1,973	6,849	1,556	27	—	—	12,519
	(8,879)	(16,968)	(91,777)	(26,919)	(556)	—	—	(145,099)
1989	3,142	2,309	7,720	5,076	91	—	—	18,338
	(13,482)	(17,373)	(99,142)	(90,234)	(2,163)	—	—	(222,394)

[1]See footnote on Page 2 about aging.

[2]Ages 0.2 through 0.5 combined.

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

Table 3.—Numbers, and in parentheses percent, by age, of chinook and coho salmon in various year classes returning to the Little Manistee River weir 1 to 5 years after stocking.

Year class	Number stocked	Age[1] 0.1	0.2	0.3	0.4	0.5	Total
				Chinook			
1967	590,830	11,230	20,588	18,420	—	—	50,238
		(1.9)	(3.5)	(3.1)	—	—	(8.5)
1968	321,912	5,700	11,100	6,415	—	—	23,215
		(1.8)	(3.4)	(2.0)	—	—	(7.2)
1981	500,204	2,077	17,637	8,376	5,990	10	34,090
		(0.4)	(3.5)	(1.7)	(1.2)	(<0.1)	(6.8)
1982	600,294	8,865	18,342	19,437	6,849	977	54,470
		(1.5)	(3.1)	(3.2)	(1.1)	(0.2)	(9.1)
1983	677,250	5,914	6,326	13,850	11,482	27	37,599
		(0.9)	(0.9)	(2.0)	(1.7)	(<0.1)	(5.6)
1984	805,773	2,005	1,025	12,191	1,556	91	16,868
		(0.2)	(0.1)	(1.5)	(0.2)	(<0.1)	(2.1)
1985	500,012	397	3,962	6,849	5,076	—	16,284
		(0.1)	(0.8)	(1.4)	(1.0)	—	(3.3)
1986	450,273	3,229	1,973	7,720	—	—	12,922
		(0.7)	(0.4)	(1.7)	—	—	(2.9)
1987	372,325	2,114	2,309	—	—	—	4,423
		(0.6)	(0.6)	—	—	—	(1.2)
1988	523,400	3,142	—	—	—	—	3,142
		(0.6)	—	—	—	—	(0.6)

Table 3.—Continued:

Year class	Number stocked	Age[1] 1.0	Age[1] 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)
1973	150,067	979 (0.7)	15,334 (10.2)	16,313 (10.9)
1974	200,601	492 (0.2)	23,525 (11.7)	24,017 (12.0)
1981	200,000	873 (0.4)	24,264 (12.1)	25,137 (12.6)
1982	429,612	2,704 (0.6)	33,764 (7.9)	36,468 (8.5)
1983	500,066	218 (<0.1)	15,177 (3.0)	15,395 (3.1)
1984	375,283	79 (<0.1)	16,599 (4.4)	16,678 (4.4)
1985	343,121	125 (<0.1)	15,016 (4.4)	15,141 (4.4)
1986	266,914	85 (<0.1)	4,004 (1.5)	4,089 (1.5)
1987	358,250	463 (0.1)	12,031 (3.4)	12,494 (3.5)
1988	400,883	1,992 (0.5)	— —	1,992 (0.5)

[1]See footnote on Page 2 about aging.

Table 4.—Mean total length (L, in inches) and weight (W, in pounds), by age, of chinook salmon harvested at the Little Manistee River weir, fall 1968-89. For chinook in 1972-75 and 1982, lengths and weights shown under age 0.2 are for ages 0.2 and older combined.

	Age[1]									
	0.1		0.2		0.3		0.4		0.5	
Year	L	W	L	W	L	W	L	W	L	W
1968	25.2	5.8	—	—	—	—	—	—	—	—
1969	24.9	6.0	34.2	15.9	—	—	—	—	—	—
1970	24.7	6.3	34.7	16.6	39.8	23.0	—	—	—	—
1971	—	5.2	—	15.0	—	22.7	—	—	—	—
1972	22.6	4.3	35.6	17.7	—	—	—	—	—	—
1973	22.4	4.4	36.0	17.8	—	—	—	—	—	—
1974	22.5	4.4	34.9	16.7	—	—	—	—	—	—
1975	24.2	6.4	37.1	20.2	—	—	—	—	—	—
1976	29.0	9.5	37.5	20.9	41.7	29.2	—	—	—	—
1977	23.4	4.6	34.6	15.0	38.1	20.1	—	—	—	—
1978	25.0	5.8	30.3	10.1	35.0	15.5	—	—	—	—
1979	26.5	7.4	34.6	15.1	35.7	16.9	—	—	—	—
1980	22.2	4.5	34.3	15.4	36.4	19.3	—	—	—	—
1981	—	—	—	—	—	—	—	—	—	—
1982	20.2	3.0	35.3	14.5	—	—	—	—	—	—
1983	22.0	4.4	33.6	14.0	37.0	19.3	—	—	—	—
1984	24.3	5.2	34.3	13.4	38.3	18.9	—	—	—	—
1985	22.7	4.5	30.8	9.5	34.4	13.4	37.3	17.7	41.1	22.0
1986	21.0	4.2	28.3	7.6	33.6	12.7	36.9	17.1	42.0	25.5
1987	22.8	4.3	27.7	7.2	33.1	11.3	35.9	15.1	38.5	19.8
1988	22.4	4.2	29.3	8.6	34.3	13.4	36.6	17.3	40.3	20.6
1989	22.5	4.3	28.2	7.5	33.7	12.8	36.3	17.8	40.7	23.8

[1]Ages of chinook prior to 1977 were determined from length-frequency distributions; in 1977-80 and 1983-89 from scale samples and length-frequency distributions. See footnote on Page 2 about aging.

Table 5.—Number, by age, of coho salmon harvested at the Little Manistee River weir, fall 1968-89. 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)
1984	218	33,764	—	33,982
	—	—	—	(192,071)
1985	79	15,177	—	15,256
	—	—	—	(96,798)
1986	125	16,599	—	16,724
	—	—	—	(92,165)
1987	85	15,016	—	15,101
	—	—	—	(97,809)
1988	463	4,004	—	4,467
	(787)	(26,026)	—	(26,813)
1989	1,992	12,031	—	14,023
	(3,194)	(81,035)	—	(84,229)

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

Table 6.—Mean total length (L, in inches) and weight (W, in pounds), by age, of coho salmon harvested at the Little Manistee River weir, fall 1968-89.

Year	Age 1.0		Age 1.1	
	L	W	L	W
1968	—	—	28.1	8.7
1969	—	—	—	8.9
1970	—	—	—	8.0
1971	—	—	—	8.7
1972	—	—	26.3	6.5
1973	—	—	24.5	5.8
1974	14.9	1.2	25.7	6.1
1975	15.0	1.4	26.6	7.3
1976	15.7	1.5	25.7	6.4
1977	14.3	1.2	25.5	5.5
1978	15.1	1.4	25.2	5.6
1979	15.2	1.6	23.5	4.9
1980[1]	16.3	1.7	26.9	6.9
1981	—	—	—	—
1982	15.7	1.6	25.6	6.1
1983	15.9	1.9	26.4	7.0
1984	16.2	1.8	24.7	5.7
1985	15.7	1.6	25.9	6.4
1986	16.3	1.4	25.3	5.5
1987	15.6	1.8	26.8	6.5
1988	15.3	1.7	25.6	6.5
1989	15.7	1.6	26.5	6.7

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

Table 7.—Number and mean total length (L, in inches) and weight (W, in pounds) of steelhead (ages combined) collected at the Little Manistee River weir, fall 1968-89.

Year	Number				Total	
	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]	18	3,488	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	—	—	2,031	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
1984	1,830	—	79	1,909	26.0	7.1
1985	6,187	—	169	6,356	27.1	7.4
1986	4,646	16[2]	58	4,720	26.0	7.3
1987	1,421	—	29	1,450	27.6	7.8
1988	1,044	—	6	1,050	26.8	7.6
1989	1,121	—	9	1,130	27.3	7.9

[1]Transferred to Big Manistee and Pine rivers.

[2]Summer strain steelhead transferred to Wolf Lake Hatchery.

Table 8.—Number and mean total length (L, in inches) and weight (W, in pounds) of brown trout (ages combined) collected at the Little Manistee River weir, fall 1968-89.

Year	Number			Mean	
	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
1984	134	7	141	22.4	5.3
1985	162	15	177	23.2	6.2
1986	89	10	99	22.4	5.6
1987	46	2	48	23.7	6.5
1988	22	5	27	21.0	4.3
1989	29	0	29	22.7	5.5

Table 9.—Summary of the number and weight, by age and sex, of chinook salmon harvested at the Little Manistee River weir, fall 1989.

Week beginning	Male		Female[1]		Total	
	Number	Pounds	Number	Pounds	Number	Pounds
Age 0.1						
09-10	246	1,133	18	77	264	1,210
09-17	79	346	—	—	79	346
09-24	149	667	—	—	149	667
10-01	1,122	4,774	—	—	1,122	4,774
10-08	836	3,644	—	—	836	3,644
10-15	556	2,248	—	—	556	2,248
10-22	110	475	—	—	110	475
10-29	26	118	—	—	26	118
Total	3,124	13,405	18	77	3,142	13,482
(Percent)	(17.0)	(6.0)	(0.1)	(<0.1)	(17.1)	(6.1)
Age 0.2						
09-10	176	1,519	70	688	246	2,207
09-17	109	850	6	46	115	896
09-24	410	2,892	—	—	410	2,892
10-01	816	5,987	51	367	867	6,354
10-08	228	1,588	—	—	228	1,588
10-15	344	2,651	26	247	370	2,898
10-22	37	277	—	—	37	277
10-29	23	162	13	99	36	261
Total	2,143	15,926	166	1,447	2,309	17,373
(Percent)	(11.7)	(7.2)	(0.9)	(0.7)	(12.6)	(7.8)
Age 0.3						
09-10	387	4,401	352	4,646	739	9,047
09-17	122	1,521	73	1,043	195	2,564
09-24	1,304	15,961	671	9,666	1,975	25,627
10-01	1,071	13,000	714	9,991	1,785	22,991
10-08	836	10,910	646	8,767	1,482	19,677
10-15	794	9,359	423	5,681	1,217	15,040
10-22	99	1,114	59	804	158	1,918
10-29	83	1,075	86	1,203	169	2,278
Total	4,696	57,341	3,024	41,801	7,720	99,142
(Percent)	(25.6)	(25.8)	(16.5)	(18.8)	(42.1)	(44.6)

Table 9.—Continued:

Week beginning	Male		Female[1]		Total	
	Number	Pounds	Number	Pounds	Number	Pounds
Age 0.4						
09-10	405	6,859	106	1,820	511	8,679
09-17	164	2,880	55	981	219	3,861
09-24	745	13,336	410	7,037	1,155	20,373
10-01	510	9,211	765	14,255	1,275	23,466
10-08	532	9,264	722	12,749	1,254	22,013
10-15	212	3,752	291	5,259	503	9,011
10-22	26	434	37	716	63	1,150
10-29	30	506	66	1,175	96	1,681
Total	2,624	46,242	2,452	43,992	5,076	90,234
(Percent)	(14.3)	(20.8)	(13.4)	(19.8)	(27.7)	(40.6)
Age 0.5						
09-10	—	—	—	—	—	—
09-17	—	—	—	—	—	—
09-24	37	862	—	—	37	862
10-01	51	1,229	—	—	51	1,229
10-08	—	—	—	—	—	—
10-15	—	—	—	—	—	—
10-22	—	—	—	—	—	—
10-29	3	72	—	—	3	72
Total	91	2,163	—	—	91	2,163
(Percent)	(0.5)	(1.0)	—	—	(0.5)	(1.0)

[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.

Table 10.—Length-age distribution (in percent of inch group) for chinook salmon scale sampled during creel census at Ludington, Manistee, Frankfort, and Grand Traverse Bay August-October 1989.[1]

Length (inches)	Age					
	0.0	0.1	0.2	0.3	0.4	0.5
<13	100	—	—	—	—	—
14	—	—	—	—	—	—
15	—	—	—	—	—	—
16	—	—	—	—	—	—
17	—	—	—	—	—	—
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

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

Table 11.—Mean total length (inches) and weight (pounds), by age and sex, of chinook salmon harvested at the Little Manistee River 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
09-10	Length	22.2	20.7	27.9	30.2	32.1	33.6
		(1.697)	—	(1.194)	(2.095)	(0.950)	(0.836)
	Weight	4.6	4.3	8.6	9.8	11.4	13.2
		(0.342)	—	(2.191)	(0.974)	(0.836)	(1.609)
09-17	Length	22.0	—	28.3	28.0	32.8	34.5
		(0.679)	—	(1.031)	—	(1.308)	(0.948)
	Weight	4.4	—	7.8	7.6	12.5	14.3
		(0.388)	—	(0.567)	—	(1.121)	(1.199)
09-24	Length	22.5	—	27.1	—	33.5	34.5
		(1.340)	—	(1.427)	—	(0.958)	(1.084)
	Weight	4.5	—	7.1	—	12.2	14.4
		(0.624)	—	(0.750)	—	(0.952)	(1.250)
10-01	Length	22.7	—	28.4	30.4	33.7	34.4
		(0.386)	—	(1.104)	—	(0.762)	(0.913)
	Weight	4.3	—	7.3	7.2	12.1	14.0
		(0.232)	—	(0.635)	—	(0.913)	(1.023)
10-08	Length	22.7	—	27.4	—	34.4	33.7
		(0.405)	—	(1.781)	—	(1.088)	(0.822)
	Weight	4.4	—	7.0	—	13.1	13.6
		(0.221)	—	(0.793)	—	(1.096)	(0.900)
10-15	Length	22.1	—	28.6	31.2	33.0	33.4
		(0.530)	—	(1.160)	—	(0.792)	(1.006)
	Weight	4.0	—	7.7	9.5	11.8	13.4
		(0.333)	—	(0.654)	—	(0.863)	(0.933)
10-22	Length	22.8	—	28.0	—	32.7	33.5
		(0.506)	—	(1.510)	—	(0.781)	(1.118)
	Weight	4.3	—	7.5	—	11.2	13.6
		(0.283)	—	(0.724)	—	(0.750)	(1.223)
10-29	Length	23.0	—	28.4	28.5	34.1	34.0
		(0.803)	—	(1.422)	(2.691)	(1.013)	(0.851)
	Weight	4.5	—	7.1	7.6	13.0	14.0
		(0.469)	—	(1.044)	(2.769)	(1.039)	(0.969)
Weighted seasonal mean	Length	22.5	20.7	28.0	30.2	33.5	34.0
		(0.215)	—	(0.571)	(1.751)	(0.399)	(0.401)
	Weight	4.3	4.3	7.4	8.7	12.2	13.8
		(0.124)	—	(0.356)	(0.876)	(0.417)	(0.468)
Sexes combined	Length	22.5		28.2		33.7	
		(0.214)		(0.546)		(0.291)	
	Weight	4.3		7.5		12.8	
		(0.123)		(0.333)		(0.329)	

Table 11.—Continued:

Week beginning	Measure-ment	Age 0.4		Age 0.5	
		Male	Female	Male	Female
09-10	Length	36.0	35.4	—	—
		(0.958)	(1.910)	—	—
	Weight	16.9	17.2	—	—
		(1.111)	(2.112)	—	—
09-17	Length	36.7	35.8	—	—
		(1.032)	(0.873)	—	—
	Weight	17.6	17.8	—	—
		(1.196)	(1.382)	—	—
09-24	Length	37.1	35.8	40.7	—
		(1.061)	(0.876)	—	—
	Weight	17.9	17.2	23.3	—
		(1.368)	(1.087)	—	—
10-01	Length	37.2	36.1	40.7	—
		(1.263)	(0.915)	—	—
	Weight	18.1	18.6	24.1	—
		(1.922)	(1.602)	—	—
10-08	Length	36.9	35.4	—	—
		(1.466)	(0.829)	—	—
	Weight	17.4	17.7	—	—
		(1.722)	(1.317)	—	—
10-15	Length	36.8	36.0	—	—
		(1.794)	(0.906)	—	—
	Weight	17.7	18.1	—	—
		(2.223)	(1.204)	—	—
10-22	Length	36.2	36.5	—	—
		(1.258)	(1.530)	—	—
	Weight	16.7	19.3	—	—
		(1.700)	(2.444)	—	—
10-29	Length	36.9	35.8	41.1	—
		(1.705)	(0.654)	—	—
	Weight	16.9	17.8	24.0	—
		(2.051)	(1.135)	—	—
Weighted seasonal mean	Length	36.8	35.8	40.7	—
		(0.527)	(0.421)	—	—
	Weight	17.6	17.9	23.8	—
		(0.683)	(0.673)	—	—
Sexes combined	Length	36.3		40.7	
		(0.348)		—	
	Weight	17.8		23.8	
		(0.473)		—	

Table 12.—Summary of the chinook egg-take operation at the Little Manistee River weir, fall 1989.

Date	Number of females stripped	Number of eggs collected	Percent eye-up	Destination
09-25	132	605,919	—	Thompson
09-26	153	701,460	—	Thompson
09-27	113	392,740	77.6	Platte River
09-28	131	581,040	73.9	Platte River
10-02	256	1,097,000	76.3	Platte River
10-04	259	1,282,000	81.0	Wolf Lake
10-05	271	1,375,000	—	Wolf Lake
10-06	267	1,237,400	79.0	Platte River
10-09	253	1,172,840	69.8	Platte River
10-10	250	1,188,360	—	Wolf Lake
10-11	223	952,000	—	Wolf Lake (MSU)[1]
10-12	205	943,000	—	Indiana
10-13	211	976,470	—	Wisconsin
10-16	126	552,000	—	Wolf Lake (MSU)[1]
10-17	100	460,000	—	Baldwin Hatchery (MSU)[1]
10-31	8	36,800	—	Bill Young (MSU)[1]
Total	2,958	13,554,029	—	
In-state	2,542	11,634,559	—	
Out-of-state	416	1,919,470	—	

[1]MSU = Michigan State University.

Table 13.—Percent lamprey scarring of anadromous salmonids captured at the Little Manistee River weir, fall 1968-89.

Year	Salmon		Trout	
	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	<0.1
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
1984	0.1	0.1	0.0	0.0
1985	0.5	0.2	0.0	0.0
1986	1.4	0.1	0.2	0.0
1987	1.1	0.0	0.0	0.0
1988	1.2	0.6	0.0	0.0
1989	0.2	0.2	0.0	0.0

Table 14.—Summary of the number and weight, by age and sex, of coho salmon harvested at Little Manistee River weir, fall 1989.

Week beginning	Male		Female		Total	
	Number	Pounds	Number	Pounds	Number	Pounds
Age 1.0						
09-10	785	1,172	—	—	785	1,172
09-17	313	630	—	—	313	630
09-24	358	609	—	—	358	609
10-01	355	493	14	25	369	518
10-08	65	99	—	—	65	99
10-15	85	139	—	—	85	139
10-22	8	13	—	—	8	13
10-29	9	14	—	—	9	14
Total	1,978	3,169	14	25	1,992	3,194
(Percent)	(14.1)	(3.8)	(0.1)	(<0.1)	(14.2)	(3.8)
Age 1.1						
09-10	1,937	12,622	2,513	17,612	4,450	30,234
09-17	743	5,344	900	5,877	1,643	11,221
09-24	1,003	7,532	1,027	6,797	2,030	14,329
10-01	596	4,121	454	2,979	1,050	7,100
10-08	208	1,334	377	2,288	585	3,622
10-15	664	4,470	664	4,093	1,328	8,563
10-22	45	289	57	357	102	646
10-29	443	2,897	400	2,423	843	5,320
Total	5,639	38,609	6,392	42,426	12,031	81,035
(Percent)	(40.2)	(45.8)	(45.6)	(50.4)	(85.8)	(96.2)

Table 15.—Mean total length (inches) and weight (pounds), by age and sex, of coho salmon harvested at the Little Manistee River weir, fall 1989. Two standard errors in parentheses.

Week beginning	Measurement	Age 1.0		Age 1.1	
		Male	Female	Male	Female
09-10	Length	15.3	—	26.0	26.4
		(0.509)	—	(0.782)	(0.672)
	Weight	1.5	—	6.5	7.0
		(0.212)	—	(0.569)	(0.487)
09-17	Length	16.3	—	27.0	26.0
		(0.432)	—	(1.120)	(0.501)
	Weight	2.0	—	7.2	6.5
		(0.175)	—	(0.715)	(0.428)
09-24	Length	15.8	—	27.8	26.3
		(0.515)	—	(0.530)	(0.516)
	Weight	1.7	—	7.5	6.6
		(0.176)	—	(0.470)	(0.406)
10-01	Length	15.4	15.6	27.8	26.6
		(0.327)	—	(0.810)	(0.515)
	Weight	1.4	1.8	6.9	6.2
		(0.144)	—	(0.527)	(0.381)
10-08	Length	16.0	—	26.6	26.1
		(0.799)	—	(1.075)	(0.719)
	Weight	1.5	—	6.4	6.1
		(0.206)	—	(0.690)	(0.390)
10-15	Length	16.3	—	26.8	26.0
		(1.060)	—	(0.956)	(0.753)
	Weight	1.6	—	6.7	6.2
		(0.449)	—	(0.640)	(0.519)
10-22	Length	16.4	—	27.1	26.3
		(0.785)	—	(0.695)	(0.358)
	Weight	1.6	—	6.4	6.3
		(0.285)	—	(0.518)	(0.292)
10-29	Length	16.2	—	27.1	26.0
		—	—	(0.667)	(0.633)
	Weight	1.6	—	6.5	6.1
		—	—	(0.486)	(0.471)
Weighted seasonal mean	Length	15.7	15.6	26.9	26.2
		(0.243)	—	(0.350)	(0.299)
	Weight	1.6	1.8	6.8	6.6
		(0.099)	—	(0.250)	(0.219)
Sexes combined	Length	15.7		26.5	
		(0.241)		(0.230)	
	Weight	1.6		6.7	
		(0.098)		(0.167)	

Table 16.—Summary of the number and weight, by age and sex, of steelhead passed upstream at the Little Manistee River weir, fall 1989.

Week beginning	Male		Female		Total	
	Number	Pounds	Number	Pounds	Number	Pounds
Age 1.0						
09-10	1	2	—	—	1	2
09-17	—	—	1	1	1	1
09-24	2	3	—	—	2	3
10-01	—	—	—	—	—	—
10-08	—	—	—	—	—	—
10-15	1	2	1	2	2	4
10-22	—	—	—	—	—	—
10-29	—	—	14	29	14	29
Total	4	7	16	32	20	39
(Percent)	(0.4)	(0.1)	(1.4)	(0.4)	(1.8)	(0.4)
Age 2.0						
09-10	2	4	—	—	2	4
09-17	—	—	—	—	—	—
09-24	1	1	—	—	1	1
10-01	—	—	1	2	1	2
10-08	—	—	2	5	2	5
10-15	3	8	3	5	6	13
10-22	—	—	—	—	—	—
10-29	7	15	22	60	29	75
Total	13	28	28	72	41	100
(Percent)	(1.2)	(0.3)	(2.5)	(0.8)	(3.7)	(1.1)
Age 1.1						
09-10	2	13	3	19	5	32
09-17	2	3	2	11	4	14
09-24	1	4	2	13	3	17
10-01	2	12	2	19	4	31
10-08	1	6	1	6	2	12
10-15	1	5	1	5	2	10
10-22	2	8	1	6	3	14
10-29	22	106	29	174	51	280
Total	33	157	41	253	74	410
(Percent)	(2.9)	(1.8)	(3.7)	(2.9)	(6.6)	(4.7)

Table 16.—Continued:

Week beginning	Male		Female		Total	
	Number	Pounds	Number	Pounds	Number	Pounds
Age 2.1						
09-10	2	7	6	34	8	41
09-17	—	—	1	5	1	5
09-24	3	19	1	5	4	24
10-01	1	5	3	18	4	23
10-08	1	6	4	21	5	27
10-15	1	4	—	—	1	4
10-22	1	3	—	—	1	3
10-29	43	241	43	263	86	504
Total	52	285	58	346	110	631
(Percent)	(4.6)	(3.2)	(5.2)	(3.9)	(9.8)	(7.2)
Age 1.2						
09-10	11	88	14	107	25	195
09-17	5	49	3	23	8	72
09-24	8	70	14	109	22	179
10-01	9	80	13	106	22	186
10-08	—	—	9	70	9	70
10-15	24	184	19	152	43	336
10-22	4	31	4	29	8	60
10-29	145	1,248	217	1,776	362	3,024
Total	206	1,750	293	2,372	499	4,122
(Percent)	(18.4)	(19.9)	(26.1)	(26.9)	(44.5)	(46.8)
Age 2.2						
09-10	8	71	14	115	22	186
09-17	7	56	3	23	10	79
09-24	11	94	6	52	17	146
10-01	7	59	4	34	11	93
10-08	3	22	5	40	8	62
10-15	11	101	6	38	17	139
10-22	—	—	—	—	—	—
10-29	22	198	36	315	58	513
Total	69	601	74	617	143	1,218
(Percent)	(6.2)	(6.8)	(6.6)	(7.0)	(12.8)	(13.8)

Table 16.—Continued:

Week beginning	Male		Female		Total	
	Number	Pounds	Number	Pounds	Number	Pounds
Age 1.3						
09-10	—	—	3	28	3	28
09-17	2	20	1	8	3	28
09-24	—	—	3	29	3	29
10-01	4	37	1	11	5	48
10-08	5	52	1	10	6	62
10-15	29	251	10	87	39	338
10-22	2	23	5	43	7	66
10-29	36	388	29	260	65	648
Total	78	771	53	476	131	1,247
(Percent)	(7.0)	(8.8)	(4.7)	(5.4)	(11.7)	(14.2)
Age 2.3						
09-10	7	71	3	25	10	96
09-17	5	47	1	8	6	55
09-24	9	90	5	52	14	142
10-01	9	95	2	21	11	116
10-08	3	30	—	—	3	30
10-15	14	145	12	109	26	254
10-22	—	—	—	—	—	—
10-29	22	208	7	91	29	299
Total	69	686	30	306	99	992
(Percent)	(6.2)	(7.8)	(2.7)	(3.5)	(8.8)	(11.3)
Age 1.4						
09-10	2	25	—	—	2	25
09-17	—	—	—	—	—	—
09-24	—	—	—	—	—	—
10-01	—	—	—	—	—	—
10-08	—	—	1	10	1	10
10-15	—	—	—	—	—	—
10-22	—	—	—	—	—	—
10-29	—	—	—	—	—	—
Total	2	25	1	10	3	35
(Percent)	(0.2)	(0.3)	(0.1)	(0.1)	(0.3)	(0.4)

Table 16.—Continued:

Week beginning	Male		Female		Total	
	Number	Pounds	Number	Pounds	Number	Pounds
Age 2.4						
09-10	—	—	—	—	—	—
09-17	—	—	—	—	—	—
09-24	—	—	—	—	—	—
10-01	1	12	—	—	1	12
10-08	—	—	—	—	—	—
10-15	—	—	—	—	—	—
10-22	—	—	—	—	—	—
10-29	—	—	—	—	—	—
Total	1	12	—	—	1	12
(Percent)	(0.1)	(0.1)	—	—	(0.1)	(0.1)

Table 17.—Mean total length (inches) and weight (pounds), by age and sex, of steelhead passed upstream at the Little Manistee River weir, fall 1989. Two standard errors in parentheses.

Week beginning	Measure-ment	Age 1.0		Age 2.0		Age 1.1	
		Male	Female	Male	Female	Male	Female
09-10	Length	16.2	—	16.5	—	26.5	25.9
		—	—	(0.101)	—	(0.099)	(0.611)
	Weight	1.7	—	1.8	—	6.4	6.4
		—	—	(0.600)	—	(0.600)	(0.851)
09-17	Length	—	14.7	—	—	26.3	24.0
		—	—	—	—	(0.400)	(0.700)
	Weight	—	1.4	—	—	6.7	5.6
		—	—	—	—	(0.600)	(0.300)
09-24	Length	15.5	—	15.0	—	21.2	26.7
		(1.500)	—	—	—	—	(0.098)
	Weight	1.3	—	1.4	—	3.5	6.6
		(0.100)	—	—	—	—	(0.400)
10-01	Length	—	—	—	17.7	26.0	25.3
		—	—	—	—	(5.900)	(0.900)
	Weight	—	—	—	2.4	6.2	9.3
		—	—	—	—	(3.800)	(5.200)
10-08	Length	—	—	—	18.0	25.4	24.6
		—	—	—	(3.800)	—	—
	Weight	—	—	—	2.5	5.7	5.6
		—	—	—	(1.800)	—	—
10-15	Length	17.5	15.1	17.2	16.2	24.6	23.6
		—	—	(1.900)	(2.200)	—	—
	Weight	2.4	1.7	2.6	1.7	5.4	5.3
		—	—	(0.500)	(0.400)	—	—
10-22	Length	—	—	—	—	17.9	24.7
		—	—	—	—	(0.500)	—
	Weight	—	—	—	—	3.8	5.7
		—	—	—	—	(2.700)	—
10-29	Length	—	22.6	17.7	18.8	23.2	24.3
		—	(7.700)	—	(0.769)	(3.580)	(0.412)
	Weight	—	2.1	2.2	2.7	4.8	6.0
		—	(0.900)	—	(0.570)	(2.322)	(0.294)
Weighted seasonal mean	Length	16.2	21.7	17.2	18.4	23.5	24.5
		—	(7.129)	(0.658)	(0.599)	(2.439)	(0.292)
	Weight	1.6	2.0	2.2	2.6	5.1	6.2
		—	(0.833)	(0.173)	(0.432)	(1.582)	(0.209)
Sexes combined	Length	20.6		18.0		24.1	
		(5.545)		(0.538)		(0.919)	
	Weight	1.9		2.5		5.7	
		(0.648)		(0.337)		(0.646)	

Table 17.—Continued:

Week beginning	Measure-ment	Age 2.1		Age 1.2		Age 2.2	
		Male	Female	Male	Female	Male	Female
09-10	Length	20.8	24.6	28.2	27.6	29.0	28.2
		(4.000)	(0.868)	(0.861)	(0.510)	(0.868)	(0.539)
	Weight	3.6	5.7	8.0	7.6	8.8	8.2
		(0.500)	(0.420)	(0.829)	(0.607)	(0.785)	(0.566)
09-17	Length	—	21.2	29.5	26.8	27.9	27.2
		—	—	(1.681)	(0.808)	(0.810)	(0.611)
	Weight	—	4.7	9.7	7.8	8.0	7.7
		—	—	(1.796)	(0.306)	(0.814)	(0.546)
09-24	Length	25.7	24.6	29.0	27.8	28.7	28.2
		(1.943)	—	(0.975)	(0.642)	(1.299)	(0.950)
	Weight	6.2	5.2	8.8	7.8	8.5	8.7
		(1.172)	—	(0.949)	(0.661)	(1.270)	(0.843)
10-01	Length	23.5	25.2	28.7	28.2	28.4	28.3
		—	(0.200)	(0.529)	(0.486)	(1.124)	(0.976)
	Weight	5.2	5.8	8.9	8.1	8.4	8.4
		—	(0.657)	(1.124)	(0.519)	(1.066)	(0.640)
10-08	Length	25.5	23.6	—	27.1	27.2	27.6
		—	(2.347)	—	(0.640)	(0.696)	(0.889)
	Weight	6.4	5.3	—	7.8	7.5	7.9
		—	(1.750)	—	(0.563)	(0.067)	(0.945)
10-15	Length	21.6	—	27.4	27.3	28.8	26.0
		—	—	(0.883)	(0.920)	(1.361)	(1.741)
	Weight	4.0	—	7.7	8.0	9.1	6.3
		—	—	(0.900)	(1.061)	(1.301)	(1.234)
10-22	Length	19.1	—	27.5	26.6	—	—
		—	—	(1.955)	(0.984)	—	—
	Weight	3.0	—	7.7	7.1	—	—
		—	—	(1.534)	(1.087)	—	—
10-29	Length	24.7	24.1	28.4	27.8	28.9	28.6
		(2.038)	(0.824)	(0.630)	(0.526)	(1.634)	(1.024)
	Weight	5.6	6.1	8.6	8.2	9.0	8.8
		(1.058)	(0.974)	(0.655)	(0.471)	(0.833)	(1.007)
Weighted seasonal mean	Length	24.4	24.2	28.3	27.7	28.7	28.1
		(1.693)	(0.587)	(0.415)	(0.363)	(0.493)	(0.469)
	Weight	5.5	6.0	8.5	8.1	8.7	8.3
		(0.879)	(0.693)	(0.431)	(0.325)	(0.262)	(0.458)
Sexes combined	Length	24.3		28.0		28.4	
		(0.790)		(0.278)		(0.319)	
	Weight	5.7		8.3		8.5	
		(0.524)		(0.261)		(0.261)	

Table 17.—Continued:

Week beginning	Measure-ment	Age 1.3		Age 2.3		Age 1.4	
		Male	Female	Male	Female	Male	Female
09-10	Length	—	30.5	30.8	28.6	34.2	—
		—	(1.947)	(1.120)	(0.636)	(1.300)	—
	Weight	—	9.3	10.2	8.3	12.5	—
		—	(1.267)	(1.288)	(0.811)	(0.300)	—
09-17	Length	31.0	28.3	29.0	27.1	—	—
		(0.400)	—	(1.167)	—	—	—
	Weight	9.8	7.9	9.3	7.6	—	—
		(1.700)	—	(1.578)	—	—	—
09-24	Length	—	29.5	30.6	30.1	—	—
		—	(4.276)	(1.762)	(1.766)	—	—
	Weight	—	9.5	10.0	10.5	—	—
		—	(3.800)	(1.670)	(1.973)	—	—
10-01	Length	30.5	29.6	31.3	31.5	—	—
		(1.245)	—	(1.003)	(0.099)	—	—
	Weight	9.2	11.4	10.6	10.5	—	—
		(1.936)	—	(1.010)	(3.000)	—	—
10-08	Length	30.1	29.1	30.0	—	—	29.8
		(0.504)	—	(0.346)	—	—	—
	Weight	10.4	9.6	10.0	—	—	10.1
		(0.823)	—	(0.636)	—	—	—
10-15	Length	28.7	28.4	30.3	29.0	—	—
		(0.349)	(0.630)	(1.053)	(0.802)	—	—
	Weight	8.6	8.7	10.3	9.1	—	—
		(0.455)	(0.721)	(1.128)	(0.802)	—	—
10-22	Length	31.5	28.7	—	—	—	—
		(2.500)	(1.076)	—	—	—	—
	Weight	11.6	8.6	—	—	—	—
		(3.500)	(0.869)	—	—	—	—
10-29	Length	31.2	29.1	29.4	30.7	—	—
		(1.076)	(1.163)	(3.339)	—	—	—
	Weight	10.8	9.0	9.5	13.0	—	—
		(1.396)	(1.100)	(2.839)	—	—	—
Weighted seasonal mean	Length	30.2	29.0	30.1	29.6	34.2	29.8
		(0.466)	(0.630)	(0.993)	(0.219)	—	—
	Weight	9.9	9.0	10.0	10.2	12.5	10.1
		(0.605)	(0.597)	(0.847)	(0.219)	—	—
Sexes combined	Length	29.7		30.0		32.7	
		(0.486)		(0.670)		—	
	Weight	9.5		10.0		11.7	
		(0.497)		(0.733)		—	

Table 17.—Continued:

Week beginning	Measure-ment	Age 2.4 Male	Age 2.4 Female
09-10	Length	—	—
		—	—
	Weight	—	—
		—	—
09-17	Length	—	—
		—	—
	Weight	—	—
		—	—
09-24	Length	—	—
		—	—
	Weight	—	—
		—	—
10-01	Length	31.5	—
		—	—
	Weight	11.9	—
		—	—
10-08	Length	—	—
		—	—
	Weight	—	—
		—	—
10-15	Length	—	—
		—	—
	Weight	—	—
		—	—
10-22	Length	—	—
		—	—
	Weight	—	—
		—	—
10-29	Length	—	—
		—	—
	Weight	—	—
		—	—
Weighted seasonal mean	Length	31.5	—
		—	—
	Weight	11.9	—
		—	—
Sexes combined	Length	31.5	
		—	
	Weight	11.9	
		—	

Table 18.—Summary of the number and weight, by age and sex, of brown trout passed upstream at the Little Manistee River weir, fall 1989.

Week beginning	Male		Female		Total	
	Number	Pounds	Number	Pounds	Number	Pounds
Age 1.0						
09-10	—	—	—	—	—	—
09-17	—	—	—	—	—	—
09-24	—	—	—	—	—	—
10-01	2	2	—	—	2	2
10-08	—	—	—	—	—	—
10-15	—	—	—	—	—	—
10-22	—	—	—	—	—	—
Total	2	2	—	—	2	2
(Percent)	(6.9)	(1.2)	—	—	(6.9)	(1.2)
Age 2.0						
09-10	—	—	—	—	—	—
09-17	—	—	—	—	—	—
09-24	—	—	—	—	—	—
10-01	—	—	—	—	—	—
10-08	—	—	2	3	2	3
10-15	—	—	—	—	—	—
10-22	—	—	—	—	—	—
Total	—	—	2	3	2	3
(Percent)	—	—	(6.9)	(1.9)	(6.9)	(1.9)
Age 1.1						
09-10	1	7	1	4	2	11
09-17	1	7	—	—	1	7
09-24	1	6	1	6	2	12
10-01	—	—	1	2	1	2
10-08	—	—	—	—	—	—
10-15	1	5	1	6	2	11
10-22	1	4	1	4	2	8
Total	5	29	5	22	10	51
(Percent)	(17.2)	(18.0)	(17.2)	(13.7)	(34.5)	(31.7)

Table 18.—Continued:

Week beginning	Male		Female		Total	
	Number	Pounds	Number	Pounds	Number	Pounds
Age 2.1						
09-10	3	21	—	—	3	21
09-17	—	—	—	—	—	—
09-24	—	—	2	11	2	11
10-01	—	—	—	—	—	—
10-08	—	—	—	—	—	—
10-15	—	—	1	7	1	7
10-22	—	—	—	—	—	—
Total	3	21	3	18	6	39
(Percent)	(10.3)	(13.0)	(10.3)	(11.2)	(20.7)	(24.2)
Age 1.2						
09-10	—	—	—	—	—	—
09-17	—	—	—	—	—	—
09-24	—	—	—	—	—	—
10-01	1	8	—	—	1	8
10-08	3	18	—	—	3	18
10-15	—	—	—	—	—	—
10-22	—	—	—	—	—	—
Total	4	26	—	—	4	26
(Percent)	(13.8)	(16.1)	—	—	(13.8)	(16.1)
Age 2.2						
09-10	2	17	—	—	2	17
09-17	—	—	—	—	—	—
09-24	—	—	—	—	—	—
10-01	—	—	1	5	1	5
10-08	—	—	—	—	—	—
10-15	1	6	—	—	1	6
10-22	—	—	—	—	—	—
Total	3	23	1	5	4	28
(Percent)	(10.3)	(14.3)	(3.4)	(3.1)	(13.8)	(17.4)
Age 1.3						
09-10	—	—	—	—	—	—
09-17	1	12	—	—	1	12
09-24	—	—	—	—	—	—
10-01	—	—	—	—	—	—
10-08	—	—	—	—	—	—
10-15	—	—	—	—	—	—
10-22	—	—	—	—	—	—
Total	1	12	—	—	1	12
(Percent)	(3.4)	(7.5)	—	—	(3.4)	(7.5)

Table 19.—Mean total length (inches) and weight (pounds), by age and sex, of brown trout passed upstream at the Little Manistee River weir, fall 1989. Two standard errors in parentheses.

Week beginning	Measure-ment	Age 1.0		Age 2.0		Age 1.1	
		Male	Female	Male	Female	Male	Female
09-10	Length	—	—	—	—	24.4	21.4
		—	—	—	—	—	—
	Weight	—	—	—	—	6.7	4.4
		—	—	—	—	—	—
09-17	Length	—	—	—	—	23.5	—
		—	—	—	—	—	—
	Weight	—	—	—	—	6.8	—
		—	—	—	—	—	—
09-24	Length	—	—	—	—	23.1	22.9
		—	—	—	—	—	—
	Weight	—	—	—	—	5.7	6.1
		—	—	—	—	—	—
10-01	Length	13.1	—	—	—	—	17.9
		(4.100)	—	—	—	—	—
	Weight	0.9	—	—	—	—	2.2
		(0.800)	—	—	—	—	—
10-08	Length	—	—	—	16.9	—	—
		—	—	—	—	—	—
	Weight	—	—	—	1.7	—	—
		—	—	—	—	—	—
10-15	Length	—	—	—	—	23.3	24.3
		—	—	—	—	—	—
	Weight	—	—	—	—	5.1	6.4
		—	—	—	—	—	—
10-22	Length	—	—	—	—	22.7	21.3
		—	—	—	—	—	—
	Weight	—	—	—	—	4.4	3.5
		—	—	—	—	—	—
Weighted seasonal mean	Length	13.1	—	—	16.9	23.4	21.6
		—	—	—	—	—	—
	Weight	0.9	—	—	1.7	5.7	4.5
		—	—	—	—	—	—

Sexes combined					
	Length	13.1	16.9	22.5	
		—	—	—	
	Weight	0.9	1.7	5.1	
		—	—	—	

Table 19.—Continued:

Week beginning	Measure-ment	Age 2.1		Age 1.2		Age 2.2	
		Male	Female	Male	Female	Male	Female
09-10	Length	24.0	—	—	—	26.4	—
		(1.217)	—	—	—	(3.600)	—
	Weight	6.9	—	—	—	8.3	—
		(1.368)	—	—	—	(4.800)	—
09-17	Length	—	—	—	—	—	—
		—	—	—	—	—	—
	Weight	—	—	—	—	—	—
		—	—	—	—	—	—
09-24	Length	—	22.9	—	—	—	—
		—	(1.800)	—	—	—	—
	Weight	—	5.4	—	—	—	—
		—	(1.700)	—	—	—	—
10-01	Length	—	—	27.4	—	—	23.2
		—	—	—	—	—	—
	Weight	—	—	8.0	—	—	5.2
		—	—	—	—	—	—
10-08	Length	—	—	24.1	—	—	—
		—	—	(4.000)	—	—	—
	Weight	—	—	6.1	—	—	—
		—	—	(0.300)	—	—	—
10-15	Length	—	25.0	—	—	25.0	—
		—	—	—	—	—	—
	Weight	—	7.0	—	—	6.4	—
		—	—	—	—	—	—
10-22	Length	—	—	—	—	—	—
		—	—	—	—	—	—
	Weight	—	—	—	—	—	—
		—	—	—	—	—	—
Weighted seasonal mean	Length	24.0	23.6	24.9	—	25.9	23.2
		—	—	(2.309)	—	—	—
	Weight	6.9	6.0	6.5	—	7.7	5.2
		—	—	(0.173)	—	—	—

Sexes combined					
	Length	23.8	24.9	25.3	
		—	(2.309)	—	
	Weight	6.4	6.5	7.0	
		—	(0.173)	—	

Table 19.—Continued:

Week beginning	Measure-ment	Age 1.3 Male	Age 1.3 Female
09-10	Length	—	—
		—	—
	Weight	—	—
		—	—
09-17	Length	30.5	—
		—	—
	Weight	11.5	—
		—	—
09-24	Length	—	—
		—	—
	Weight	—	—
		—	—
10-01	Length	—	—
		—	—
	Weight	—	—
		—	—
10-08	Length	—	—
		—	—
	Weight	—	—
		—	—
10-15	Length	—	—
		—	—
	Weight	—	—
		—	—
10-22	Length	—	—
		—	—
	Weight	—	—
		—	—
Weighted seasonal mean	Length	30.5	—
		—	—
	Weight	11.5	—
		—	—
Sexes combined	Length	30.5	
		—	
	Weight	11.5	
		—	

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