MINNESOTA DEPARTMENT OF NATURAL RESOURCES
DIVISION OF FISH AND WILDLIFE
ENVIRONMENT SECTION

1974 Progress Report on the Prairie Island Fish Population Study

By:
Robin L. Naplin
and
Joseph L. Geis
Aquatic Biologists

The contents herein are a portion of Northern States Power Company's Environmental Monitoring and Ecological Studies Program, 1974 Annual Report, Volume II.

Environmental and Governmental
Activities Department
Northern States Power Company

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INTRODUCTION

This study is part of a continuing comprehensive investigation being carried out by various consultants to determine environmental effects of the Prairie Island Nuclear Generating Plant near Red Wing, Minnesota. The purpose of this study is to determine the effects of the plant on fish populations in the Mississippi River and its backwaters near Red Wing, Minnesota.

Scope

The total study includes a fish population study and a creel survey. This report deals only with the fish population and includes 1973 laboratory work, 1974 field work, and data analysis for both years. The creel survey will be covered in a separate report.

STUDY

General

The 1974 field work was carried out in the same manner as in 1973. Sampling stations are described in the 1973 Progress Report. A tagging study was initiated this year to determine fish movements. Fish from previous tagging studies (Krosch, 1969 and Finke, 1964) show movement throughout the area from Taylors Falls, Minnesota to Lansing, Iowa. Additional tagging should give a better understanding of these movements in the area and help determine if there is one interbreeding mobile population, as speculated in the 1973 Progress Report.

This was the first year when sampling was done during three separate seasons from June 1 to October 31, 1974, inclusive. June was considered the spring season. The summer season was the period from July 1 through August 31, 1974. The remaining period from September 1, to October 31, 1974, was considered the fall season.

Study Area

Areas sampled were the same as described in 1973 and are shown in Figure 1. Each area or section consists of 10 numbered stations beginning with zero at the upstream end of the section and ending with nine at the downstream station in each section. In 1974, more extensive sampling was done than in 1973. More extensive electro-fishing was done in all areas. Two trawling stations were established in North Lake, in addition to those established in 1973. More trap netting was done in the immediate plant area and tailwaters. More gill net sets were made in Sections 0, 1, and 3. Seining was more extensive above and in the immediate plant area.

METHODS

Gear

Fish were collected using five kinds of sampling gear: trap net, electro-fisher (boom-shocker), gill net, trawl, and seine in order to monitor the abundance, condition, growth, and age of fish in the vicinity of the Prairie Island Plant. This gear is illustrated in Figures 2-6. A list of the common and scientific names and methods of capture of fish in the Prairie Island area, 1974 is shown in Appendix A.

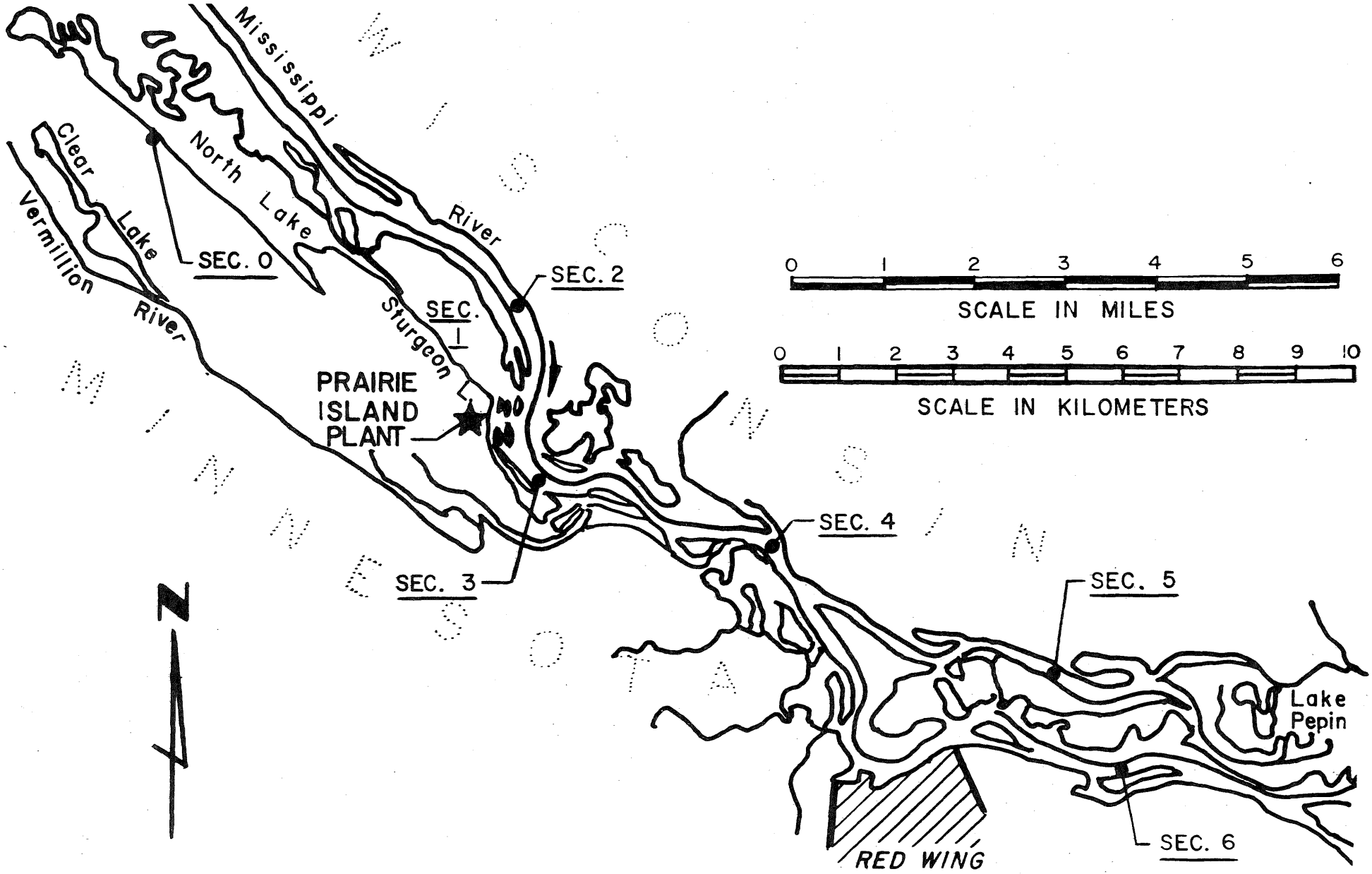


FIGURE 1. THE FISH POPULATION STUDY SECTIONS USED IN THE PRAIRIE ISLAND GENERATING PLANT AREA

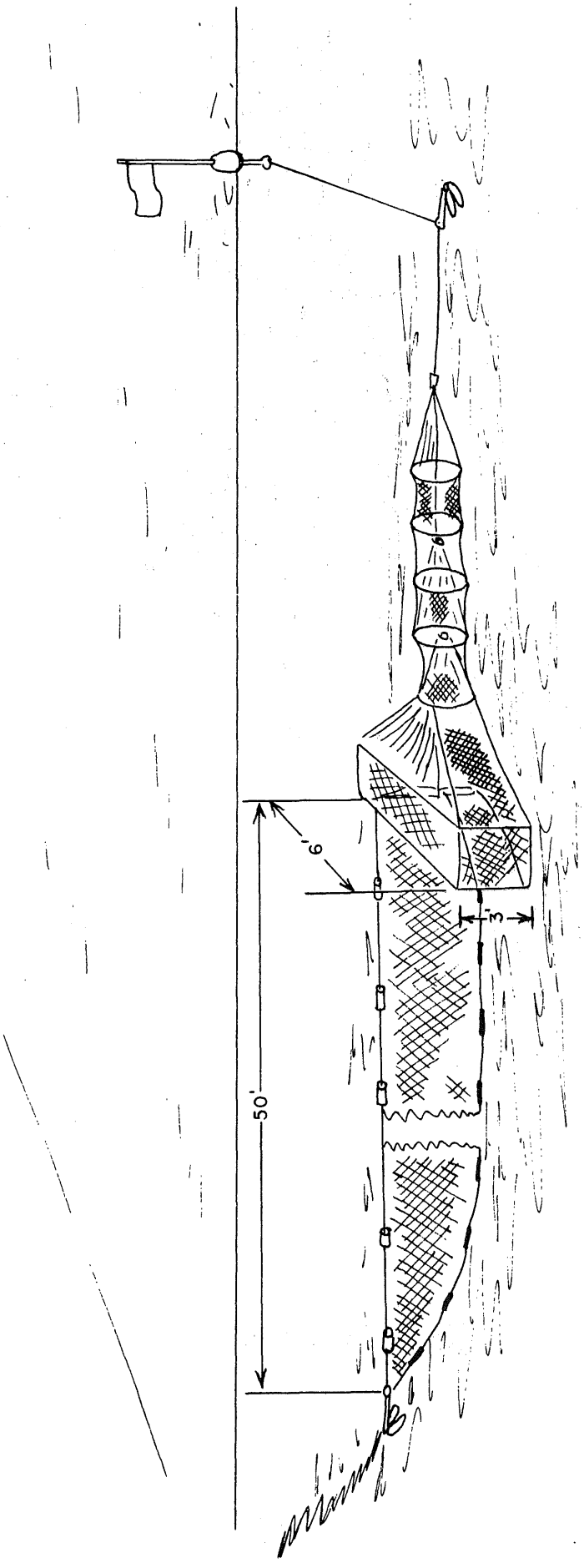


FIGURE 2. DIAGRAM OF A TRAP NET SET.

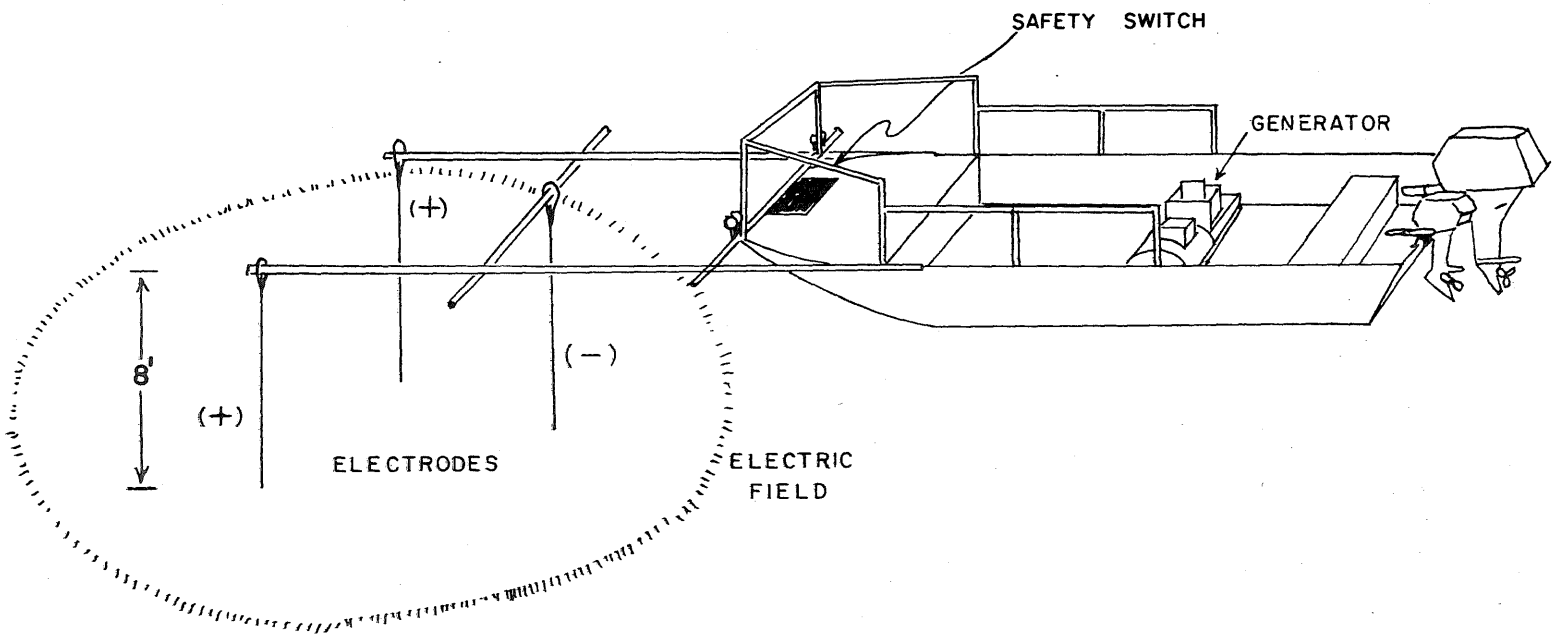


FIGURE 3. DIAGRAM OF ELECTRO-FISHING APPARATUS

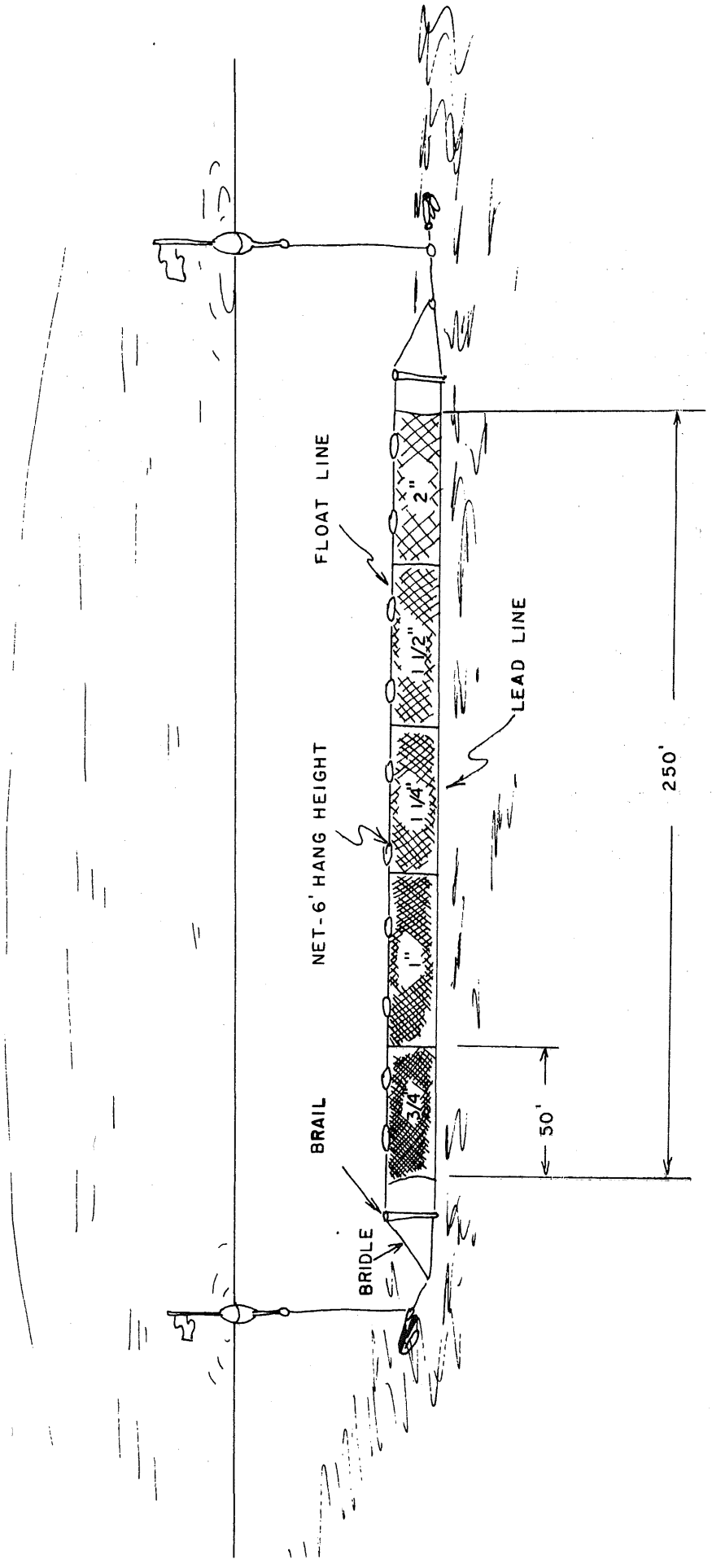


FIGURE 4. DIAGRAM OF A GILL NET SET

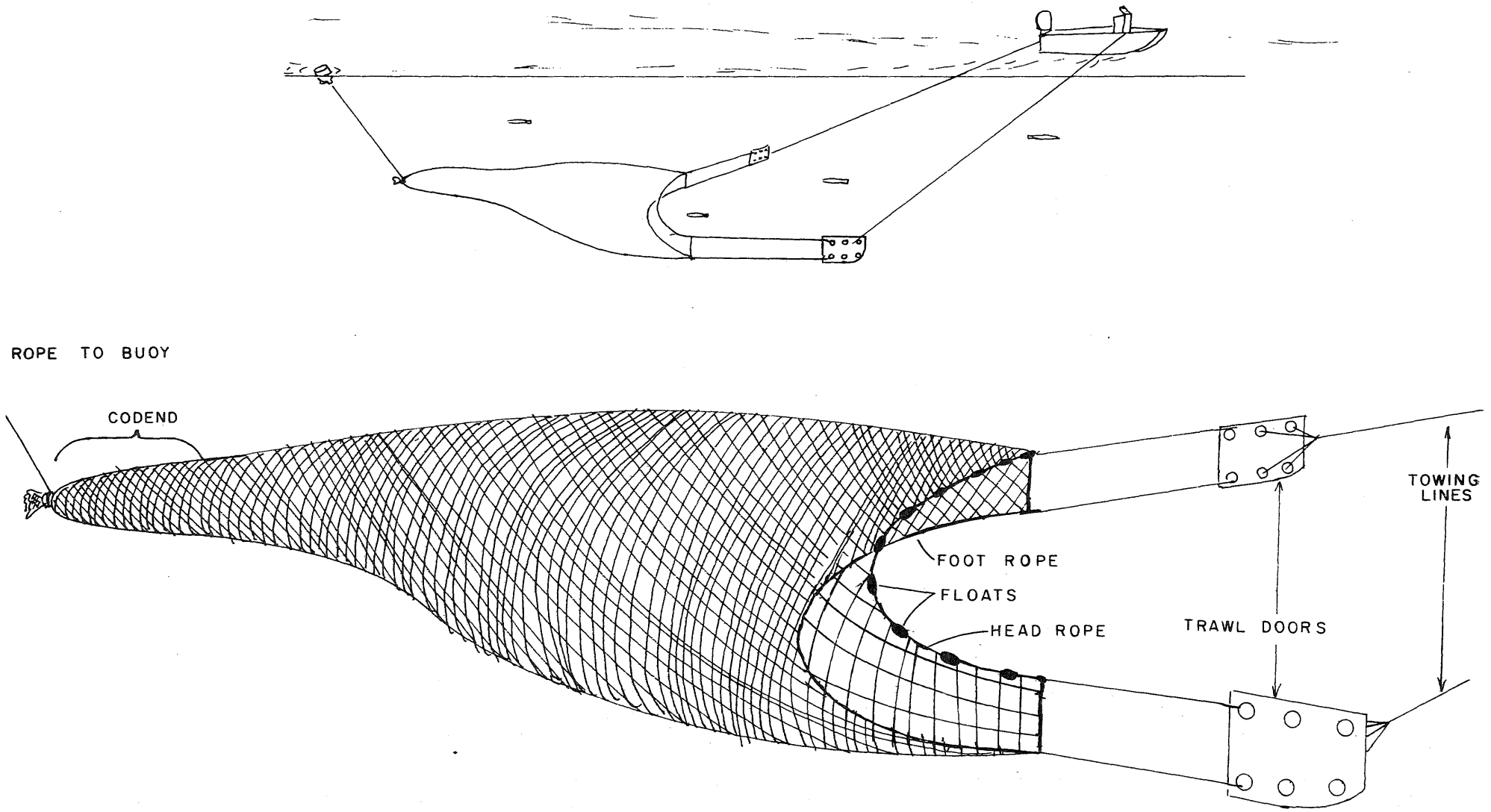


FIGURE 5. DIAGRAM OF TRAWL IN OPERATION.

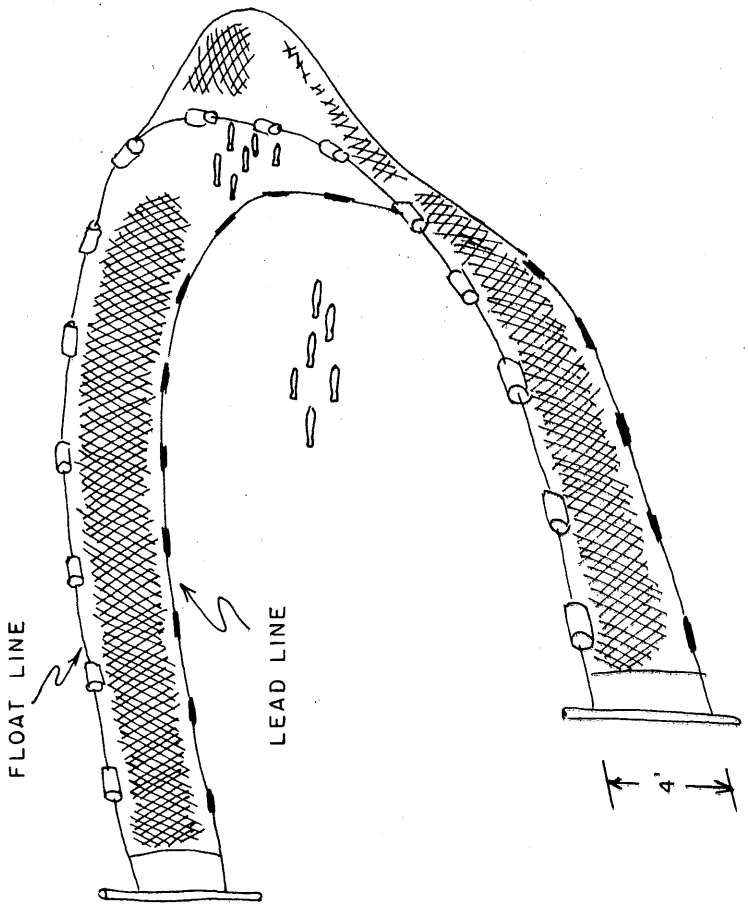


FIGURE 6. DIAGRAM OF A BAG SEINE IN OPERATION.

The trap net and electro-fisher were the most productive gear used. The majority of fish tagged were obtained by electro-fishing.

Trap netting

Trap nets were set at ten stations in each of the sections except Section 2. No trap nets were set in Section 2 because of swift current and frequent barge traffic. Trap nets set in the main channel in Sections 3 and 4 were rolled frequently by the current. This problem was solved by attaching a 10-pound anchor to the center bottom of the front frame, which greatly reduced incidences of net-rolling.

Trap nets were also used in April and May to collect fish for tagging (approximately 550 fish were tagged). All fish netted were measured (total length). Scale samples were collected and individual lengths and weights measurements were recorded during all seasons from the following species: walleye, sauger, white bass, drum, shorthead redhorse, smallmouth bass, gizzard shad, largemouth bass, white crappie, black crappie, and bluegill.

Calculations of catch-per-unit-of-effort were based on a nominal 24-hour set.

Electro-fishing

The electro-fisher is the same one utilized last year, except that 16-foot instead of 10-foot booms were used. In addition, eight-foot electrodes were also used (see Figure 3). Electrical output was regulated by adjusting engine r.p.m. An output range from 5.5 to 7.0 amperes was found to be most productive and was used for all shocking.

At various periods during the 1974 sampling season, night shocking was conducted to compare catch with normal-day shocking. Data were collected during ten hours of active shocking. Catches are expressed as catch-per-hour of shocking.

Gill netting

Gill netting was carried out in the more calm areas with ten sets in North Lake, ten sets in Sturgeon Lake, and five sets in the immediate plant area.

Nets used were standard 250 x 6-foot experimental gill nets (see Figure 4). Calculations are based on nominal 24-hour set.

Trawling

Trawling was done in the plant intake and discharge as in 1973. In addition, trawling was done in two stations in North Lake that were relatively free of obstructions. Trawl catches are expressed as catch-per-hour of trawling.

Seining

Shoreline seining was restricted to areas with water depths of less than six feet. The seine used in 1974 was 1/4 inch knotless nylon, 50 feet long and four feet deep with a 4 x 4 x 4-foot bag. This smaller seine was used because most areas seined were too small to effectively operate the 100 x 8-foot seine used in the 1973 sampling. Each haul in 1974 covered approximately 300 square meters. A total of 0.81 hectares were seined above and in the immediate plant area in 1974, as compared with 0.48 hectares in 1973. Species composition and species diversity of seine catches in 1973 and 1974 were compared.

Tagging

A fish tagging program was initiated in April, 1974. Fish were tagged with a tag consisting of a length of yellow vinyl tubing of approximately 1/16-inch diameter with a molded "T" shaped nylon anchor attached to one end. Tags are imprinted with the legend, MINN DNR ST PAUL F_____ and serially numbered. Tags are applied to fish with a special gun. A slotted hypodermic needle is inserted into the fish, and the crossbar of the anchor is forced through the needle by a plunger. During application, the upright portion of the anchor protrudes through a longitudinal slot in the needle and bends back parallel to the crossbar. The gun is then rotated approximately 180° to disengage the crossbar from the needle, and the needle is withdrawn, leaving the tag imbedded in the musculature of the fish. A slight pull on the tag causes the crossbar to return to a position perpendicualr to the upright, thus anchoring the tag (Krosch, 1968). This tagging method was used because a minimum of handling is needed to attach a tag, which reduces stress on the fish.

A total of 1,715 fish were tagged in 1974. Species tagged were walleye, sauger, white bass, northern pike, smallmouth bass, largemouth bass, channel catfish, and flathead catfish.

Scale samples

Scale aging methods were described in the 1973 progress report. Age and growth data from scales collected in 1973 were analyzed using the Iowa FORTRAN SHAD program (Mayhew, 1973). Calculations made by this program are described below in the methods for the shad program. In 1974, 4,334 scale samples

were taken from 12 species (walleye, sauger, white bass, smallmouth bass, drum, shorthead redhorse, gizzard shad, black crappie, white crappie, bluegill, and largemouth bass). The 1974 scale samples have been aged twice independently and the analysis of these data will be presented in the 1975 progress report.

Ancillary studies

Temperatures for Sturgeon Lake were recorded with a Tempscribe recording thermograph placed at Section 1, Station 4. This location had a coarse, gravel-rubble bottom and was thought to be a potential walleye and sauger spawning area. The temperature sensor was placed approximately one foot from the bottom approximately 15 feet offshore. All temperatures reported were for midnight.

A one-week study was conducted from August 12, 1974, through August 16, 1974, to help evaluate the effectiveness the intake bubbler has in keeping fish away from the immediate intake area. Each day for five consecutive days, electro-fishing was done for 30 minutes between the intake bubbler and the skimmer wall. Fish captured were released outside the bubbler at some distance away from the immediate area. Catch is expressed as number of fish per hour, the same as the other electro-fishing data.

Larval fish were sampled on 24 days between May 8, 1974 and August 26, 1974. One tow was made at each location shown in Figure 22. Tows were made with a net with one square meter frontal area and a mesh size of 787 microns. Contents of the net were removed at the end of each run in the same manner as done when sampling plankton. A concentrating cup was used to reduce the amount of water in the sample. Samples were preserved

with ten percent formalin solution and counted at a later date.

RESULTS AND DISCUSSION

Trap netting

The summary of trap net catches and length frequencies of fish trap netted are shown in Appendix B.

White bass comprised slightly more than one-fourth of all fish caught. Catches of white bass in 1974 were highest in the spring (10.85 per lift) and fall (15.75 per lift) above the plant area. Average catch of white bass during summer and fall in trap nets was 7.09 fish per lift in 1974 as compared to 3.30 fish per lift in 1973 (Hawkinson, 1974). White bass catches for spring, 1974 for all areas were two to ten times greater than catches on the St Croix from 1966-1970 (Krosch, 1971). Sauger and walleye comprised only about four percent of trap net catches in 1974. The 1974 catch of walleye ranged from 0 to 0.55 fish per lift. This is very similar to catches in 1973 (Hawkinson, 1974). The highest catches (0.40 to 0.55 fish per lift) occurred, as in 1973, in North and Sturgeon Lakes. Sauger catches in 1974 were similar to 1973 catches. The average catch for summer and fall was 1.76 fish per lift in 1973 and 1.60 fish per lift in 1974. Over 21 percent of the trap net catch in 1974 was carp. Fall catches of carp were lower than spring and summer catches. This reduction in catch was most noticeable above the plant and below Lock and Dam 3. Average catches of carp for summer and fall of 1974 were higher (5.95 fish per lift) than in 1973 (3.74 fish per lift).

Catches of freshwater drum in all areas varied throughout the 1974 sampling season. The highest catch of drum (14.80 fish per lift) occurred below Lock and Dam 3 in the spring season. The average catch of freshwater drum for summer and fall of 1974 (4.05 fish per lift) was higher than in 1973 (2.89 fish per lift) (Hawkinson, 1974).

White bass, carp, and drum comprised about 64 percent of all fish caught in all areas for the entire sampling season. Almost six percent (5.8) of the total fish caught in all areas were black crappie.

Electro-fishing

Electro-fishing results are summarized in Appendix C. Gizzard shad comprised about 23 percent of the total fish shocked for 1974. The total catch of shad was made up from summer and fall catches, as only one shad was caught in the spring season. Summer and fall catches of shad for the plant area were 60.80 and 152.20 fish per hour, respectively. These high catches are mostly made up of young-of-the year (Y/Y)shad.

Bluegill comprised almost 20 percent of total fish shocked. Catches of bluegill were low above the plant in all seasons, and were low in all areas during spring. Summer and fall catches were 80.80 - 110.20 fish per hour below Lock and Dam 3. The highest catch of bluegill (152.20 fish per hour) occurred in the plant area in the fall. Most of the bluegill caught electro-fishing in the plant area were found in areas that were recently riprapped.

Carp comprised 17.4 percent of fish shocked in 1974. The catch of carp steadily dropped from spring to fall in the plant area and above. The highest catch of carp (72.40 fish per hour) occurred below Lock and Dam 3 in the fall.

White bass catches in 1974 were similar to those in 1973. The highest catches occurred in Section 4 (44.80 fish per hour) and in the plant area(38.40 fish per hour) during the summer.

Sauger catches during summer and fall of 1974 (3.68 fish per hour) were lower than 1973 catches (7.86 fish per hour). The fall catch of sauger from tailwaters of Lock and Dam 3 in 1974 (3.20 fish per hour) was very low compared to 1973 (27.33 fish per hour).

Walleye catches were about the same in the spring (6.80 fish per hour) and fall (6.00 fish per hour) seasons but only about half as high in the summer (3.60 fish per hour) below Lock and Dam 3. The 1974 average total summer and fall walleye catch (1.88 fish per hour) is higher than the 1.29 fish per hour average in 1973. The 1974 catch was lower than 1973 above and in the plant area, but a total of 41 fish were taken below Lock and Dam 3 in 1974 to raise the average total catch of walleye (Hawkinson, 1974).

Night electro-fishing was done in October to compare with the normal day shocking. Five stations were chosen in each of Sections 0, 1, 3, and 4. All of Section 2 (ten stations) was shocked at night because of very low catches during day shocking. The data obtained during night shocking were compared to day shocking data from the same stations (Appendix C).

Shad catches for night shocking were comparatively much lower than day catches. Carp catches were higher for night shocking in the plant area but less than half the day catch below Lock and Dam 3. Day and night catch of carp above Lock and Dam 3 were very similar (Appendix C).

Walleye, sauger, and white bass night catches are considerably higher than day catches. Walleye night catches were 250 to 300 percent higher than day catches. Sauger night catches were from 250 to 1,325 percent that of day catches. White bass night catches were from 275 to 1,335 percent of the respective day catches.

Bluegill night catches were 32 and 17 percent lower than day catches in the plant area and below Lock and Dam 3, respectively. The day catches of bluegill were 136.80 fish per hour in the plant area and 110.00 fish per hour below Lock and Dam 3. Many of the bluegills shocked did not float to the surface until the shocking boat had passed. It is much harder to see these fish at night when they do come to the surface behind the boat.

Smallmouth bass night catches (2.40 fish per hour) were 50 percent lower than day catches (4.80 fish per hour) in the plant area. Only three smallmouth bass were caught night shocking above the plant compared to 34 during day shocking. No smallmouth bass were caught night shocking below Lock and Dam 3.

In general, night electro-fishing catches for walleye, sauger, and white bass were at least two times higher than day catches. This must be considered in future electro-fishing operations.

Gill netting

Results of 1974 gill netting are shown in Appendix D. Walleye, sauger, channel catfish, and shad gill net catches in fall, 1974, decreased from 1973 catches. White bass, northern pike, black crappie, and carp catches in fall, 1974 increased from 1973 catches (Hawkinson, 1974). Fall walleye catches decreased from 2.37 fish per lift in 1973 to 1.56 fish per lift on 1974. Sauger catches decreased from 7.32 fish per lift in 1973 to 6.84 fish per lift in fall, 1974. Fall, 1974 channel catfish gill net catches (0.96 fish per lift) were 73 percent of 1973 catches (1.32 fish per lift). Fall shad catches in 1974 were 28.76 fish per lift for a decrease of 31 percent from 1973 catches (41.84 fish per lift). Fall white bass catches in 1974 (11.76 fish per lift) were higher than in 1973 (5.47 fish per lift). Fall northern pike catches in 1974 (0.92 fish per lift) were somewhat higher than 1973 catches (0.79 fish per lift). More black crappies were gill netted in fall, 1974, (1.36 fish per lift) than in 1973 (0.21 fish per lift). Fall, 1974 catches of carp (4.88 fish per lift) were about five times greater than 1973 catches (0.95 fish per lift).

Spring and fall, 1974 catches of northern pike were identical (0.92 fish per lift). Carp catches decreased somewhat from spring (5.96 fish per lift) to fall (4.88 fish per lift). Walleye catches were twice as high in fall (1.56 fish per lift) as in spring (0.76 fish per lift). Fall catches of sauger (6.84 fish per lift) increased from spring catches (4.20 fish per lift). The most significant differences in catches between spring and fall occurred for white bass. Fall catches of white bass (11.7 fish per lift) were almost five and one-half times higher than the spring catches (2.16 fish per lift).

Trawling

The results of 1974 trawling are shown in Appendix E. Drum comprised 46 percent of all fish caught by trawling in 1974. Most of the drum were young-of-the-year (Y/Y). Gizzard shad were almost 18 percent of the total trawl catch. The third highest number of fish caught by trawling (196) were white crappie, which comprised 13 percent of the total catch.

Highest catches of drum, channel catfish, walleye and sauger, and white bass occurred in the spring and summer sampling seasons. High numbers of shad (114), white bass (55), and white crappie (66) caused the 1974 catch per hour for North Lake to be very high for summer.

Seining

Results of 1974 shoreline seining by areas are shown in Table 1. A comparison of seine catches between 1973 and 1974 is shown in Table 2. The total number of fish caught in shoreline seining in 1973 was 4,105 and 2,105 in 1974 (Table 2). The number of species seined both years was 35. Catches for both years were compared by use of a diversity index. Diversity indices are additional tools for measuring the quality of the environment and the effect of induced stress on the structure of a community. Their use is based on the generally observed phenomenon that relatively undisturbed environments support communities having large numbers of species with no individual species present in overwhelming abundance. A low index (less than 1.0) will show dominance (90 percent or more) by one or two species, and a high index (greater than 3.5) indicates a diverse population with one or two species comprising less than 47 percent of the total catch. Values for most rivers in Minnesota range from 2.0 to 3.0 for the diversity index (Peterson, personal communication).

The two components of species diversity are: a) richness of species, and b) distribution of individuals among the species. The formula used for calculating the mean diversity ($\bar{d}$) is:

$$\bar{d} = \frac{C}{N} \left(N \log_{10} N - \sum n_i \log_{10} n_i\right)$$

where C = 3.321928 (converts base 10 logs to base 2 logs); N = total number of individuals; and ni = total number of individuals in the i^{th} species (Weber, 1973). The calculated mean diversity ($\bar{d}$) for 1973 was 2.32 and for 1974, 3.47. Both these values indicate a diverse population, not being dominated by one or two species. The lower diversity index for 1973 is a result of large numbers of Y/Y white bass (1,523) and Y/Y gizzard shad (1,729) in the catch. These two species had a very strong year class in 1973 as compared to 1974 (Table 2). Shiners and minnows (11 species) comprised over 53 percent of the total 1974 seine catch.

Table 1 - Shoreline seining catches by area for 1974

Species	Above Plant		Plant Area		Tailwaters of Lock and Dam 3		Total	
	No. of Fish	% Total	No. of Fish	% Total	No. of Fish	% Total	No. of Fish	% Total
Shortnose gar	-	-	3	1.2	1	0.1	4	0.2
Gizzard shad (YY)	162	15.8	17	7.0	150	18.0	329	15.6
Gizzard shad (Other)	2	0.2	-	-	-	-	2	0.1
Bigmouth buffalo	-	--	-	-	1	0.1	1	0.1
Smallmouth buffalo	1	0.1	2	0.8	-	-	3	0.1
Carpsucker (YY)	3	0.3	6	2.5	-	-	9	0.4
Carpsucker (Other)	11	1.1	5	2.1	2	0.2	18	0.9
Shorthead redhorse	4	0.4	1	0.4	2	0.2	7	0.3
Carp (YY)	-	-	-	-	2	0.2	2	0.1
Carp (Other)	4	0.4	2	0.8	4	0.5	10	0.5
Silver chub	100	9.7	17	7.0	40	4.8	157	7.5
Notropis species	479	46.6	56	23.0	499	59.8	1034	49.2
Common shiner	8	0.8	1	0.4	-	-	9	0.4
Emerald shiner	181	17.6	15	6.2	264	31.6	460	21.9
Roseyface shiner	85	8.3	5	2.1	172	20.6	262	12.5
Spotfin shiner	26	2.5	3	1.2	-	-	29	1.4
River shiner	2	0.2	-	-	-	-	2	0.1
Spottail shiner	171	16.6	30	12.3	63	7.6	264	12.5
Mimic shiner	-	-	1	0.4	-	-	1	0.1
Blacknose shiner	6	0.6	1	0.4	-	-	7	0.3
Other minnows	32	3.1	47	19.3	7	0.8	86	4.1
Brassy minnow	-	-	-	-	1	0.1	1	0.1
Bullhead minnow	25	2.4	28	11.5	6	0.7	59	2.8
Bluntnose minnow	7	0.7	19	7.8	-	-	26	1.2
Channel catfish	8	0.8	1	0.4	-	-	9	0.4
Yellow bullhead	-	-	-	-	1	0.1	1	0.1
Northern pike	1	0.1	-	-	1	0.1	2	0.1
Trout perch	1	0.1	-	-	-	-	1	0.1
White bass (YY)	137	13.3	24	9.9	69	8.3	230	10.9
White bass (other)	9	0.9	12	4.9	5	0.6	26	1.2

Table 1 - Shoreline seining catches by area for 1974 (Cont.)

Species	Above Plant		Plant Area		Tailwaters of Lock and Dam 3		Total	
	No. of Fish	% Total	No. of Fish	% Total	No. of Fish	% Total	No. of Fish	% Total
Yellow perch	3	0.3	-	-	1	0.1	4	0.2
Sauger (YY)	7	0.7	2	0.8	-	-	9	0.4
Sauger (Other)	2	0.2	2	0.8	4	0.5	8	0.4
Log perch	3	0.3	4	1.7	7	0.8	14	0.7
Johnny darter	2	0.2	5	2.1	1	0.1	8	0.4
Smallmouth bass	3	0.3	-	-	-	-	3	0.1
Green sunfish	-	-	4	1.7	-	-	4	0.2
Bluegill (YY)	10	1.0	9	3.7	-	-	19	0.9
Bluegill (Other)	-	-	1	0.4	6	0.7	7	0.3
Rock bass	1	0.1	2	0.8	-	-	3	0.1
White crappie (YY)	5	0.5	1	0.4	3	0.4	9	0.4
White crappie (Other)	1	0.1	2	0.8	3	0.4	6	0.3
Black crappie (YY)	14	1.4	4	1.7	12	1.4	30	1.4
Black crappie (Other)	1	0.1	3	1.2	3	0.4	7	0.3
Drum (YY)	19	1.9	11	4.5	9	1.1	39	1.9
Drum (Other)	2	0.2	-	-	2	0.3	4	0.2
Total	1027		243		835		2105	

Table 2 - Shoreline seining catches for 1973 and 1974

Species	1973 No. of Fish	1973 % Total	1974 No. of Fish	1974 & Total
Shortnose gar	2	Tr*	4	0.20
Mooneye	2	Tr*		
Gizzard shad (YY)	1729	42.10	329	15.60
Gizzard shad (Other)			2	0.10
Bigmouth buffalo	1	Tr*	1	0.10
Smallmouth buffalo	3	0.10	3	0.10
Carpsucker (YY)	98	2.40	9	0.40
Carpsucker (Other)			18	0.90
Silver redhorse	5	0.10		
Shorthead redhorse	7	0.20	7	0.30
Carp (YY)	4	0.10	2	0.10
Carp (Other)	1	Tr*	10	0.50
Silver chub	30	0.70	157	7.50
Notropis spp.	336	8.20	1034	49.20
Common shiner			9	0.40
Emerald shiner	171	4.20	460	21.90
Rosyface shiner	79	1.90	262	12.50
Spotfin shiner	1	Tr*	29	1.40
River shiner	3	0.10	2	0.10
Spottail shiner	82	2.00	264	12.50
Mimic shiner			1	0.10
Blacknose shiner			7	0.30
Other minnows	37	0.90	86	4.10
Hornyhead chub	15	0.40		
Brassy minnow			1	0.10
Silvery minnow	4	0.10		
Bullhead minnow	7	0.20	59	2.80
Bluntnose minnow	11	0.30	26	1.20
Channel catfish			9	0.40
Yellow bullhead			1	0.10
Tadpole madtom	4	0.10		
Northern pike	2	Tr*	2	0.10
Trout perch	53	1.30	1	0.10
White bass (YY)	1523	37.10	230	10.90
White bass (Other)			26	1.20
Yellow perch	28	0.70	4	0.20
Sauger (YY)	26	0.60	9	0.40
Sauger (Other)			8	0.40
Walleye	1	Tr*		
Walleye & Sauger	22	0.50		
Log perch	47	1.10	14	0.70
Johnny darter	1	Tr*	8	0.40
Smallmouth bass	2	Tr*	3	0.10
Green sunfish	1	Tr*	4	0.20
Bluegill (YY)	13	0.30	19	0.90
Bluegill (Other)			7	0.30
Rock bass	5	0.10	3	0.10
White crappie (YY)	10	0.20	9	0.40
White crappie (Other)			6	0.30

Table 2 - Shoreline seining catches for 1973 and 1974 (Cont.)

Species	1973 No. of Fish	1973 % Total	1974 No. of Fish	1974 % Total
Black crappie (YY)	12	0.30	30	1.40
Black crappie (Other)			7	0.30
Drum (YY)	100	2.40	39	1.90
Drum (Other)			4	0.20
Total	4105	99.60	2105	100.00

Tr = Trace < 0.10%

The 1974 catch shows a greater richness of species and a greater distribution of individuals among the different species than in 1973.

Analytical Methods - Abundance Index

Analyzing data collected from all types of gear presents problems. A discussion of these problems and a possible solution to them is presented below.

(1) Within limits, catch is proportional to effort.
(2) Also, within limits, catch/unit of effort is proportional to population.
(3) Each type of sampling gear has a certain efficiency for the various species of fish.
(4) Corollary to (3), each species of fish has a different vulnerability to each type of gear.
(5) There are seasonal variations of fish activity and behavior that affect (2), (3), and (4).

Hile (1962) devised a method of handling commercial fishery data from the Great Lakes in which catches from each type of gear, change in the amount of effort of each type of gear, and other factors were used to calculate an "Abundance Index", which was intended to indicate (among other things) the abundance of each species each year in comparison to their abundance during a base period.

The procedure used is as follows: The catch per unit of effort (CPE) was determined for each type of gear during a base period. For year "n", an expected catch (E) is calculated by multiplying the actual amount of effort expended during that year for each type of gear by the base period CPE of that gear. The expected catch is, therefore, the catch that would have been made if the CPE had remained the same as during the base period. Expected catches from each type of gear are added to determine

the total expected catch. The Abundance Index (Ab) is then determined by dividing the total observed catch (that was actually made) by the total expected catch. Data are collected and analyzed separately for each species of fish in the catch and for each of several statistical districts. The Abundance Index is thus automatically weighted for changing amounts of effort and for differing efficiency of each gear.

As used for the Great Lakes commercial fishing data, this method has proven to have several serious shortcomings, which, I believe, do not effect its use for analyzing data from fish sampling. A "base period" should be a period when fish populations and fishing effort are fairly stable. In the case of at least some of the Great Lakes fishery data (Hile, 1962), fishing effort was increasing and populations were declining during the base period. It has been observed in many over-exploited fisheries that as the fish population declines, the inefficient operators leave the fishery (thus reducing the amount of effort and the expected catch), while the remaining fishermen adopt more efficient methods of exploiting the remaining stock of fish (Hile, 1962). With this situation, the Abundance Index remains high or even increases, while the actual abundance of fish may be declining drastically. In many cases, the base period was prior to (and sometimes many years prior to) the study period, and hence the comparison with the base period was an extrapolation, which is riskier than interpolation.

Although this analysis has been questioned for commercial fishing data, it is felt that it has a great deal of value for analyzing sampling data from fish studies, such as the Prairie Island study. On this study, a station sampling method is used - i.e., the netting and other sampling is done at the same location each time. As much as possible, netting is done at the same time each year. Where there are two or more sampling periods with one sort of gear, each sampling period is considered

separately. This procedure tends to eliminate the effects of location and season on the catch. Several sampling methods are used to ensure that each species is sampled efficiently by at least one gear.

It is believed that this sampling program eliminates the objections to Hile's Abundance mentioned previously. In the case of the present study, the base period is the entire length of the study and catch data from each year will be compared with the average of all years. Because sampling effort and locations are held constant, gear efficiency should not change.

There are some shortcomings to this method of analysis, but these are the same difficulties of small sample size and non-random distribution of fish that present problems with other analyses. Analysis of data from several sampling methods is difficult and can be described by the often used simile of "comparing apples and oranges."

If catch trends for the several sorts of gear were the same, no problem would exist, but this frequently is not the case. For example, spring trap net catches of a species may show a fairly consistent increase, summer trap net catches show an equally consistent decrease, gill net catches tend to remain the same, and electro-fishing catches increase for the first half of the period and then steadily decrease. The general trend of all these catches is very difficult to determine by the usual methods. The Abundance Index calculation, however, will make it relatively easy to determine what trend, if any, exists. Data from each sampling station are tabulated separately, and can be readily combined to determine catch trends for groups of stations. This method will be used in the future to compare catches.

Tagging Study

The Prairie Island tagging study was initiated on April 9, 1974. Between April 9 and May 17, 1974, 1,111 fish were tagged.

An additional 604 fish were tagged between August 27 and October 16, 1974, for a season total of 1,715. About two-thirds of the fish tagged during each period were obtained by electrofishing, with the other one-third being captured with trap nets.

To date, 92 (5.4%) of 1,715 tags have been returned. Table 3 shows total tags returned for each species, percent tag return for each species, and percent of total returns comprised by each species. Krosch (1967) reported a 3.6 percent return rate from white bass from one and one-half years of tagging on Lake St. Croix. Finke (1964) reported a 4.9 percent return rate in one year from white bass tagged in the tailwaters of Lock and Dam 3. These return rates are comparable to the 3.3 percent rate of white bass in the present study. The return rates of 9.0 percent and 3.3 percent from saugers and walleyes, respectively, are lower than the 17.3 percent and 14.5 percent returns from saugers and walleyes, respectively, in one and one-half years of tagging in Lake St. Croix reported by Krosch (1967). Return rates in all studies represent minimum rather than absolute returns, because all of these studies relied on fishermen to voluntarily return the tags and all fishermen may not have reported tagged fish. Krosch worked out of a resort on the St. Croix that fishermen frequent. This helped publicize his study and could have enhanced tag returns.

The longest upstream movement in the Prairie Island study was 108.23 kilometers (km) (67.25 miles) by a white bass. The fish was tagged below Lock and Dam 3 on April 23, 1974, and was caught 82 days later (July 14, 1974) north of the Taylors Fall's Highway Bridge; an average movement of 1.32 km (0.82 miles) per day. The longest downstream movement, 136.31 km (84.7 miles), was made by a channel catfish tagged April 18, 1974, in Sturgeon Lake and caught 142 days later (September 7, 1974) below Lock and Dam 6 at Trempealeau, Wisconsin. This fish negotiated five dams in the process and traveled an average of 0.97 km (0.60 miles) per day. Finke (1964) reported tag returns ranging

Table 3 - Total fish tagged and returned, 1974

Species	Tagged Above L&D 3	Tagged Below L&D 3	Total Tagged	Total Tag Returned	% Tag Return	% of Return
Walleye	90	120	210	7	3.3	7.6
Sauger	73	479	552	50	9.0	54.3
White bass	375	348	723	24	3.3	26.1
Northern pike	101	11	112	6	5.3	6.5
Channel catfish	44	13	57	2	3.5	2.2
Flathead catfish	6	1	7	0	0	0
Smallmouth bass	27	18	45	2	4.4	2.2
Largemouth bass	1	8	9	1	11.1	1.1
TOTAL	717	998	1715	92	5.4	100

from the St. Croix River to Lansing, Iowa.

Sauger, white bass, walleye, and northern pike comprised 82 percent of the fish tagged, that is 1,408 of 1,715 tags. These same four species comprised 94.5 percent of the tag returns.

Table 4 summarizes data on the movement of sauger tagged in 1974. Of 49 saugers returned, 22 were caught downstream from the location where tagged, 18 were caught in the same general area as tagged, and 9 were caught upstream from the location tagged. The 31 sauger that moved an appreciable distance from the location tagged traveled an average of 35.97 km (22.35 miles). The range for individual fish was 12.47 km (7.75 miles) to 70.41 km (43.75 miles). Days to recapture average 54.4 days and ranged from 2 to 257 days. Fish that did not move from the tagging location had the shortest time to recapture with an average of 26.9 days. Fish that moved upstream averaged 50.6 days to recapture, and fish that moved downstream had the longest average time to recapture (78.5 days).

The 49 sauger moved an average of 0.42 km (0.26 miles) per day. Distance traveled ranged from zero for fish caught in the same general location tagged to 4.75 km (2.95 miles) per day for the fastest travelers. The 49 sauger displayed a net downstream movement of 11.88 km (7.38 miles) per fish.

Table 5 summarizes the movement of white bass tagged in 1974. Of the 24 white bass recaptured, 11 had moved downstream, and 6 showed no appreciable movement. The average distance traveled by white bass was considerably greater than for saugers; 51.10 km (31.75 miles) by white bass compared to 35.97 km (22.35 miles) by sauger.

The average time to recapture for white bass that moved downstream (92.27 days) was almost three times the average period to recapture for fish caught in the same general area as tagged or fish that had moved upstream; 33.67 and 32.29 days, respectively.

Table 4 - Movement and rate of travel of tagged sauger, 1974

	Number of Fish Tagged	Number of Fish Recaptured	% Recaptured	Number of Fish Traveled	Average Distance Traveled (Range-km.)	Average Days to Recapture (Range)	Average Distance Traveled Per Day (Range-km.)
TAGGED ABOVE L & D 3*	73	6	8.2	4	33.60 (16.50-59.14)	67.8 (16-162)	0.34 (0-0.92)
MOVEMENT:							
Upstream		2	2.7	2	17.51 (16.50-18.51)	104.5 (47-162)	0.16 (0.11-0.43)
Stationary		2	2.7	-	-	29 (16-42)	-
Downstream		2	2.7	2	49.70 (40.23-59.14)	70 (44 96)	0.71 (0.61-0.92)
TAGGED BELOW L & D 3	479	42	8.7	27	36.31 (12.47-70.41)	53.8 (2-257)	0.43 (0-4.75)
MOVEMENT:							
Upstream		7	1.4	7	33.17 (23.74-50.29)	35.1 (5-79)	0.95 (0.61-4.75)
Stationary		16	3.1	-	-	26.7 (2-178)	-
Downstream		20	4.1	20	37.50 (12.47-70.41)	79.4 (24-257)	0.47 (0.16-2.12)
TOTAL TAGGED	552	49+1**	9.0	31	35.97 (12.47-70.41)	54.4 (2-257)	0.42 (0-4.75)
MOVEMENT							
Upstream		9	1.6	9	29.68 (16.50-50.28)	50.6 (5-162)	0.58 (0.11-4.75)
Stationary		18	3.0	-	-	26.9 (2-178)	-
Downstream		22	3.9	22	38.61 (12.47-70.41)	78.5 (24-257)	0.50 (0.16-2.12)

*Lock and Dam 3

**1 Sauger, No Data

Table 5 - Movement and rate of travel of tagged white bass, 1974

	Number of Fish Tagged	Number of Fish Recaptured	% Recaptured	Number of Fish Traveled	Average Distance Traveled (Range-km.)	Average Days to Recapture (Range)	Average Distance Traveled Per Day (Range-km.)
TAGGED ABOVE L & D 3*	375	4	1.1	4	44.51 (0.64-64.37)	60 (2-125)	0.74 (0.32-5.15)
MOVEMENT:							
Upstream		2	0.5	2	28.69 (0.64-56.73)	6.5 (2-11)	4.41 (0.32-5.15)
Downstream		2	0.5	2	60.35 (56.33-64.37)	113.5 (102-125)	0.53 (0.51-0.55)
TAGGED BELOW L & D 3	348	20	5.7	14	52.75 (23.74-108.23)	60.45 (3-144)	0.61 (0-6.49)
MOVEMENT:							
Upstream		5	1.4	5	67.35 (23.74-108.23)	42.6 (8-82)	1.58 (0.32-6.29)
Stationary		6	1.7	-	-	34.67 (3-144)	-
Downstream		9	2.5	9	44.93 (28.57-68.80)	87.56 (40-136)	0.51 (0.27-1.17)
TOTAL TAGGED	723	24	3.3	18	51.06 (0.64-108.23)	60.38 (2-144)	0.63 (0-6.49)
MOVEMENT:							
Upstream		7	0.9	7	56.31 (0.64-108.23)	32.29 (2-82)	1.74 (0.32-6.49)
Stationary		6	0.8	-	-	34.67 (3-144)	-
Downstream		11	1.5	11	7.73 (28.57-68.80)	92.27 (40-136)	0.51 (0.27-1.17)

*Lock and Dam 3

White bass that moved upstream traveled the greatest average distance per day. White bass tagged above Lock and Dam 3 moved upstream 4.41 km (2.74 miles) per day. White bass tagged below Lock and Dam 3 moved upstream 1.58 km (0.98 miles) per day. Average distance travelled upstream by white bass tagged and recaptured was 1.74 km (1.08 miles) per day.

The 24 white bass displayed a net downstream movement of 5.46 km (3.39 miles) per fish. This is a little less than half the average net downstream movement by sauger; 11.88 km (7.38 miles) per fish.

Data on the movement of tagged walleye are summarized in Table 6. All walleyes returned had moved upstream or downstream from the location tagged.

Average distance traveled by all walleye was 43.68 km (27.14 miles) and ranged from 1.61 to 78.86 km (1 to 49 miles).

Average distance traveled per day by the seven walleye was 0.71 km (0.44 miles), with a range of 0.03 to 3.43 km (0.02 to 2.13 miles) per day. Walleye were the only species that displayed a net upstream movement; 2.88 km (1.79 miles) per fish for the seven walleye returned.

Table 7 summarizes data on the movement of northern pike tagged in 1974. No returns were received from fish tagged below Lock and Dam 3, probably due to the small number tagged (11 fish). Northern pike traveled the shortest average distance of the four main species; 15.93 km (9.90 miles) with a range of 1.21 to 41.04 km (0.75 to 25.5 miles). Northern pike also traveled the shortest average distance per day, 0.19 km (0.12 miles) per day. Northern pike displayed a net downstream movement of 9.53 km (5.92 miles) per fish.

The greatest average distance traveled per day for any one fish was 6.49 km (4.03 miles) per day for a white bass, which

Table 6 - Movement and rate of travel of tagged walleye, 1974

	Number of Fish Tagged	Number of Fish Recaptured	% Recaptured	Number of Fish Traveled	Average Distance Traveled (Range-km.)	Average Days to Recapture (Range)	Average Distance Traveled Per Day (Range-km.)
TAGGED ABOVE L & D 3*	90	2	2.2	2	28.78 (4.83-52.71)	128 (64-192)	0.24 (0.03-0.82)
MOVEMENT:							
Upstream		1	1.1	1	52.71	64 (64)	0.82
Downstream		1	1.1	1	4.83	192 (192)	0.03
TAGGED BELOW L & D 3	120	5	4.1	5	49.65 (1.61-78.86)	6 (23-44)	1.38 (1.05-3.43)
Upstream		3	2.5	3	36.74 (1.61-61.56)	38.7 (33-44)	0.95 (0.05-1.87)
Downstream		2	1.6	2	69.01 (59.14-78.86)	32 (23-41)	2.16 (1.45-3.43)
TOTAL TAGGED	210	7	3.3	7	43.68 (1.61-78.86)	67.3 (23-192)	0.71 (0.03-3.43)
Upstream		4	1.9	4	40.73 (1.61-61.56)	45 (33-64)	0.90 (0.05-1.87)
Downstream		3	1.4	3	47.60 (4.83-78.86)	85.3 (23-192)	0.56 (0.03-3.43)

*Lock and Dam 3

Table 7 - Movement and rate of travel of tagged northern pike, 1974

	Number of Fish Tagged	Number of Fish Recaptured	% Recaptured	Number of Fish Traveled	Average Distance Traveled (Range-km.)	Average Days to Recapture (Range)	Average Distance Traveled Per Day (Range-km.)
TAGGED ABOVE L & D 3*	101	6	6.0	5	15.93 (1.21-41.04)	71 (1-234)	0.19 (0.02-0.74)
MOVEMENT:							
Upstream		3	3.0	3	3.75 (1.21-8.85)	28 (1-71)	0.13 (0.02-0.74)
Stationary		1	1.0	1	-	1 (1)	-
Downstream		2	2.0	2	34.20 (27.36-41.04)	170.5 (107-234)	0.19 (0.11-0.39)
TAGGED BELOW L & D 3	11	0	-	-	-	-	-
TOTAL TAGGED	112	6	5.4	5	15.93 (1.21-41.04)	71 (1-234)	0.19 (0.02-0.74)
MOVEMENT:							
Upstream		3	2.7	3	3.75 (1.21-8.85)	28 (1-71)	0.13 (0.02-0.74)
Stationary		1	0.9	-	-	1 (1)	-
Downstream		2	1.8	2	34.20 (27.36-41.04)	170.5 (107-234)	0.19 (0.11-0.39)

*Lock and Dam 3

was tagged April 25, 1974 below Lock and Dam 3 and caught eight days later at the railroad bridge near Hudson, Wisconsin, 51.90 km (32.25 miles) upstream.

Walleyes moved the longest average distance, 0.71 km (0.44 miles) per day, of the four main species. White bass were next at 0.63 km (0.39 miles) per day, then saugers at 0.42 km (0.26 miles) per day, and finally northern pike at 0.19 km (0.12 miles) per day.

Of the 92 total returns, 12 were caught by anglers less than 10 days after being tagged. Two were caught within two days after being tagged.

Of 86 returns from the four main species, 61 had moved an appreciable distance when recaptured; 38 moved downstream from the area tagged; and 23 moved upstream. Twenty five fish were caught in the same general area where tagged.

SCALE SAMPLES

The length-frequency distributions of fishes used for scale samples in the Prairie Island vicinity in 1974 are shown in Appendix F.

The summer and fall, 1973 scale analyses provide much data for age and growth statistics. To aid in the calculations for age and growth, the Iowa FORTRAN SHAD Program was used (Mayhew, 1973).

Analytical Methods - FORTRAN SHAD

This program was written and revised in Iowa to aid their fisheries biologists with the tedious computations of mathematical equations associated with age and growth statistics. FORTRAN SHAD is a complete age and growth program and contains routines for length-weight regression, body condition factors, body-scale

regression, length-frequency distribution, and back calculation of body length at the end of each year of life. The program provides routines for single and multiple regression analysis, analysis of variance, plotting, and obtaining frequency distribution.

Limitations of parameters were a maximum of 400 fish in the sample, maximum age of nine-year old fish, and a maximum of 30 length intervals. Metric values were used for data collected in this study. Class intervals for obtaining frequency distribution of the total length (TL) was 15 and 25mm. If any fish in a sample exceeds 500mm, the frequency interval was set at the higher value, otherwise the interval was 15mm. The body condition factor (K) and means for TL (mm) weight (gm) and scale radius (mm) were printed for each size interval.

The condition factor, K, for the i^{th} class interval is a truncated integer

$$K = (1/L_i)^3 (W_i) \times 10^4$$

where L is equal to total length and W is equal to the weight.

For zero frequency the condition factor is not computed. The length-weight relationship for grouped means is expressed as a logrithmic regression equation

$$\log_{10} W_i = \hat{\beta}_o + \hat{\beta}_1 \ (\log_{10} L_i)$$

where $\hat{\beta}_o$ is the Y intercept, $\hat{\beta}_1$ is the slope of the regression line plotted by the computer using the raw data -- i.e., the actual lengths and weights taken from the collected fish (Mayhew, 1973).

The body-scale relationship and the back calculation of body length (TL) at the end of each year of life were derived using the Dahl-Lea direct proportion method.

$$L_{ij} - \hat{\beta}_o = \frac{\bar{S}_{ij}}{S_i} (L_j - \bar{S}_j) \quad i,j,\ldots,NAGE$$

Where L_{ij} is the estimated body length at age i, annulus j, $\hat{\beta}_o$ is the x-intercept, $\bar{S}_{ij}$ is the mean scale radius at age i, annulus j, $\bar{S}_i$ is the mean scale radius at age i, L_j is the body length at annulus j, $\bar{S}_i$ is the mean scale radius at annulus j, NAGE is the known age (Mayhew, 1973).

From this, increments of growth from year to year for each age class of fish is computed. Percent deviation of growth year to year can be calculated (Hile, 1941).

Length-Frequency Distribution

Length-frequency distributions of thirteen species of fish collected in 1973 are shown in Tables 8-20. Length groups for each species are set up as stated previously. The tables also show the average or mean length and weight for each length group. Condition factors (K) are also shown in these tables.

Condition Factor

The condition factor "K" is an expression of the relative "plumpness" or "leanness" of a fish, as expressed earlier.

If the value of "K" increases for longer fish, this indicates that the weight increases proportionately more than the cube of the length; and conversely, as "K" declines for longer fish, it indicates that the weight increases proportionately less than the cube of the length.

An important use of condition factors is for making comparisons of the relative well being of fish at different times (Rounsefell and Everhart, 1953).

Length-Weight Relationship

Relationship between length and weight of fish is approximately a cubic relationship, i.e., if the length doubles, the weight

Table 8 - Length-frequency distribution of walleye, 1973

LENGTH GROUPS	NO. OF FISH	AVERAGE LENGTH	AVERAGE WEIGHT	CONDITION FACTOR (K)
264.0 - 289.0	2	272.50	200.00	0.99
289.0 - 314.0	0	0.0	0.0	0.0
314.0 - 339.0	10	329.20	358.50	1.00
339.0 - 364.0	7	353.29	440.71	1.00
364.0 - 389.0	3	383.33	545.00	0.97
389.0 - 414.0	4	409.00	680.00	0.99
414.0 - 439.0	9	428.33	825.00	1.05
439.0 - 464.0	9	450.33	916.67	1.00
464.0 - 489.0	9	477.22	1103.89	1.02
489.0 - 514.0	7	497.57	1295.00	1.05
514.0 - 539.0	3	518.33	1341.67	0.96
539.0 - 564.0	1	561.00	1820.00	1.03
564.0 - 589.0	1	588.00	1840.00	0.91
589.0 - 614.0	7	603.14	2025.00	0.92
614.0 - 639.0	2	624.50	2280.00	0.94
639.0 - 664.0	1	645.00	2805.00	1.05

Table 9 - Length-frequency distribution of sauger, 1973

LENGTH GROUPS	NO. OF FISH	AVERAGE LENGTH	AVERAGE WEIGHT	CONDITION FACTOR (K)
212.0 - 237.0	1	212.00	80.00	0.84
237.0 - 262.0	5	257.60	151.00	0.88
262.0 - 287.0	25	274.60	184.60	0.89
287.0 - 312.0	32	299.31	248.28	0.93
312.0 - 337.0	36	323.39	316.53	0.94
337.0 - 362.0	45	352.44	408.11	0.93
362.0 - 387.0	33	375.27	505.61	0.96
387.0 - 412.0	33	401.48	641.21	0.99
412.0 - 437.0	17	421.71	755.00	1.01
437.0 - 462.0	17	450.71	912.94	1.00
462.0 - 487.0	19	473.84	1049.74	0.99
487.0 - 512.0	10	496.70	1186.50	0.97
512.0 - 537.0	2	528.00	1425.00	0.97

Table 10 - Length-frequency distribution of white bass, 1973

LENGTH GROUPS	NO. OF FISH	AVERAGE LENGTH	AVERAGE WEIGHT	CONDITION FACTOR (K)
201.0 - 216.0	6	206.67	126.67	1.43
216.0 - 231.0	7	222.29	150.71	1.37
231.0 - 246.0	2	238.50	192.50	1.42
246.0 - 261.0	2	257.50	237.50	1.39
261.0 - 276.0	5	269.40	291.00	1.49
276.0 - 291.0	5	283.40	333.00	1.46
291.0 - 306.0	21	299.00	384.76	1.44
306.0 - 321.0	37	315.30	451.89	1.44
321.0 - 336.0	54	329.39	523.98	1.47
336.0 - 351.0	50	344.56	595.20	1.46
351.0 - 366.0	44	358.98	661.36	1.43
366.0 - 381.0	20	372.90	702.50	1.35
381.0 - 396.0	15	386.73	740.00	1.28
396.0 - 411.0	1	411.0	1200.00	1.73
411.0 - 426.0	2	414.50	977.50	1.37
426.0 - 456.0	0	0.0	0.0	0.0
456.0 - 471.0	1	465.00	620.0	0.62

Table 11 - Length-frequency distribution of smallmouth bass, 1973

LENGTH GROUPS	NO. OF FISH	AVERAGE LENGTH	AVERAGE WEIGHT	CONDITION FACTOR (K)
166.0 - 181.0	2	169.00	77.50	1.61
181.0 - 196.0	5	189.20	112.00	1.65
196.0 - 211.0	6	205.67	135.83	1.56
211.0 - 226.0	7	220.43	159.29	1.49
226.0 - 241.0	3	232.00	183.33	1.47
241.0 - 256.0	4	250.25	256.25	1.64
256.0 - 271.0	6	267.17	300.83	1.58
271.0 - 286.0	5	280.20	340.00	1.55
286.0 - 301.0	3	295.00	416.67	1.62
301.0 - 316.0	6	308.33	489.17	1.67
316.0 - 331.0	8	322.50	545.63	1.63
331.0 - 346.0	4	340.25	658.75	1.67
346.0 - 361.0	1	349.00	730.00	1.72
361.0 - 376.0	3	370.00	780.00	1.54
376.0 - 391.0	1	380.00	640.00	1.17

Table 12 - Length-frequency distribution of drum, 1973

LENGTH GROUPS	NO. OF FISH	AVERAGE LENGTH	AVERAGE WEIGHT	CONDITION FACTOR (K)
177.0 - 202.0	2	180.50	70.00	1.19
202.0 - 227.0	5	217.40	121.00	1.18
227.0 - 252.0	29	243.76	185.52	1.28
252.0 - 277.0	44	266.68	235.11	1.24
277.0 - 302.0	26	288.88	293.65	1.22
302.0 - 327.0	22	316.14	379.31	1.20
327.0 - 352.0	16	340.06	485.63	1.23
352.0 - 377.0	10	363.60	601.00	1.25
377.0 - 402.0	5	385.00	767.00	1.34
402.0 - 427.0	7	412.86	867.14	1.23
427.0 - 452.0	3	433.00	1088.33	1.34
452.0 - 477.0	2	469.00	1597.50	1.55
477.0 - 502.0	1	481.00	1400.00	1.26
502.0 - 527.0	1	515.00	1840.00	1.35

Table 13 - Length-frequency distribution of northern pike, 1973

LENGTH GROUPS	NO. OF FISH	AVERAGE LENGTH	AVERAGE WEIGHT	CONDITION FACTOR (K)
199.0 - 224.0	1	199.00	200.00	2.54
224.0 - 399.0	0	0.0	0.0	0.0
399.0 - 424.0	2	420.00	460.00	0.62
424.0 - 449.0	4	433.50	486.25	0.60
449.0 - 474.0	2	461.00	675.00	0.69
474.0 - 499.0	5	491.00	734.00	0.62
499.0 - 524.0	11	513.18	945.00	0.70
524.0 - 549.0	8	537.13	1006.25	0.65
549.0 - 574.0	8	556.63	1157.50	0.67
574.0 - 599.0	7	584.00	1447.86	0.73
599.0 - 624.0	6	614.50	1453.33	0.63
624.0 - 649.0	2	634.00	1435.00	0.56
649.0 - 674.0	3	659.67	1773.33	0.62
674.0 - 699.0	4	687.75	1953.75	0.60
699.0 - 724.0	1	714.00	2295.00	0.63
724.0 - 749.0	1	745.00	2840.00	0.69
749.0 - 774.0	0	0.0	0.0	0.0
774.0 - 799.0	1	790.0	3180.00	0.64
799.0 - 824.0	1	821.00	4240.00	0.77
824.0 - 849.0	1	833.00	3705.00	0.64
849.0 - 874.0	0	0.0	0.0	0.0
874.0 - 899.0	3	886.00	4813.33	0.69
899.0 - 924.0	1	915.00	4300.00	0.56
924.0 - 949.0	1	937.00	5400.00	0.66
949.0 - 974.0	1	960.00	7000.00	0.79
974.0 - 999.0	0	0.0	0.0	0.0
999.0 -1024.0	1	1010.00	7180.00	0.70

Table 14 - Length-frequency distribution of channel catfish, 1973

LENGTH GROUPS	NO. OF FISH	AVERAGE LENGTH	AVERAGE WEIGHT	CONDITION FACTOR (K)
282.0 - 307.0	1	296.00	200.00	0.77
307.0 - 332.0	2	326.50	270.00	0.78
332.0 - 357.0	2	335.50	320.00	0.85
357.0 - 382.0	2	370.00	385.00	0.76
382.0 - 407.0	3	400.67	511.67	0.80
407.0 - 432.0	3	424.00	741.67	0.97
432.0 - 457.0	2	442.00	492.50	0.57
457.0 - 482.0	6	471.50	981.67	0.94
482.0 - 507.0	2	488.00	852.50	0.73
507.0 - 532.0	1	515.00	1380.00	1.01
532.0 - 557.0	2	542.50	1400.00	0.88
557.0 - 582.0	6	566.50	1624.17	0.89
582.0 - 607.0	1	583.00	1980.00	1.00

Table 15 - Length-frequency distribution of black crappie, 1973

LENGTH GROUPS	NO. OF FISH	AVERAGE LENGTH	AVERAGE WEIGHT	CONDITION FACTOR (K)
120.0 - 135.0	6	126.50	42.00	2.07
135.0 - 150.0	13	144.38	55.38	1.84
150.0 - 165.0	14	158.43	63.93	1.61
165.0 - 180.0	5	168.60	73.00	1.52
180.0 - 195.0	1	191.00	80.00	1.15
195.0 - 210.0	2	205.50	137.50	1.58
210.0 - 225.0	4	220.75	178.75	1.66
225.0 - 240.0	4	229.00	203.75	1.70
240.0 - 255.0	5	248.00	275.00	1.80
255.0 - 270.0	11	261.18	311.82	1.75
270.0 - 285.0	7	273.29	347.14	1.70
285.0 - 300.0	5	293.40	416.00	1.65
300.0 - 315.0	0	0.0	0.0	0.0
315.0 - 330.0	1	317.00	560.00	1.76
330.0 - 345.0	0	0.0	0.0	0.0
345.0 - 360.0	2	355.00	512.50	1.15

Table 16 - Length-frequency distribution of bluegill, 1973

LENGTH GROUPS	NO. OF FISH	AVERAGE LENGTH	AVERAGE WEIGHT	CONDITION FACTOR (K)
100.0 - 115.0	18	108.28	30.28	2.39
115.0 - 130.0	33	123.09	44.55	2.39
130.0 - 145.0	12	136.33	60.00	2.37
145.0 - 160.0	4	151.50	96.25	2.77
160.0 - 175.0	7	169.14	135.71	2.80
175.0 - 190.0	5	183.80	178.00	2.87
190.0 - 205.0	5	200.40	221.00	2.75
205.0 - 220.0	1	211.00	305.00	3.25

Table 17 - Length-frequency distribution of rock bass, 1973

LENGTH GROUPS	NO. OF FISH	AVERAGE LENGTH	AVERAGE WEIGHT	CONDITION FACTOR (K)
99.0 - 114.0	10	106.90	32.50	2.66
114.0 - 129.0	7	122.71	46.43	2.51
129.0 - 144.0	15	135.80	60.67	2.42
144.0 - 159.0	8	150.88	76.88	2.24
159.0 - 174.0	12	166.00	110.00	2.40
174.0 - 189.0	10	181.30	143.00	2.40
189.0 - 204.0	6	195.50	175.00	2.34
204.0 - 219.0	2	210.00	215.00	2.32
219.0 - 234.0	1	223.00	290.00	2.62
234.0 - 249.0	2	237.50	280.00	2.09

Table 18 - Length-frequency distribution of carp, 1973

LENGTH GROUPS	NO. OF FISH	AVERAGE LENGTH	AVERAGE WEIGHT	CONDITION FACTOR (K)
101.0 - 126.0	2	105.00	25.00	2.16
126.0 - 151.0	5	137.80	46.00	1.76
151.0 - 176.0	2	163.50	70.00	1.60
176.0 - 201.0	2	194.00	112.50	1.54
201.0 - 276.0	0	0.0	0.0	0.0
276.0 - 301.0	4	291.25	405.00	1.64
301.0 - 326.0	7	314.57	430.71	1.38
326.0 - 351.0	14	337.93	515.36	1.34
351.0 - 376.0	14	364.07	612.14	1.27
376.0 - 401.0	15	386.13	704.80	1.22
401.0 - 426.0	10	415.40	905.50	1.26
426.0 - 451.0	10	437.10	1112.00	1.33
451.0 - 476.0	19	465.58	1259.21	1.25
476.0 - 501.0	8	490.88	1616.88	1.37
501.0 - 526.0	7	517.86	1915.71	1.38
526.0 - 551.0	11	537.27	1985.45	1.28
551.0 - 576.0	3	559.67	2010.00	1.15
576.0 - 601.0	10	586.80	2866.00	1.42
601.0 - 626.0	5	618.80	3180.00	1.34
626.0 - 651.0	3	633.67	3800.00	1.49
651.0 - 676.0	0	0.0	0.0	0.0
676.0 - 701.0	2	684.00	3780.00	1.18

Table 19 - Length-frequency distribution of shorthead redhorse, 1973

LENGTH GROUPS	NO. OF FISH	AVERAGE LENGTH	AVERAGE WEIGHT	CONDITION FACTOR (K)
134.0 - 159.0	1	134.00	35.00	1.45
159.0 - 184.0	0	0.0	0.0	0.0
184.0 - 209.0	1	200.00	85.00	1.06
209.0 - 234.0	1	219.00	120.00	1.14
234.0 - 259.0	4	242.25	153.75	1.08
259.0 - 284.0	3	274.67	220.00	1.06
284.0 - 309.0	7	299.14	288.57	1.08
309.0 - 334.0	3	314.67	346.67	1.11
334.0 - 359.0	13	347.00	476.92	1.14
359.0 - 384.0	11	367.09	556.36	1.12
384.0 - 409.0	15	400.20	737.33	1.15
409.0 - 434.0	21	421.95	850.71	1.13
434.0 - 459.0	23	446.61	977.39	1.10
459.0 - 484.0	22	471.05	1142.95	1.09
484.0 - 509.0	11	495.09	1247.73	1.03
509.0 - 559.0	0	0.0	0.0	0.0
559.0 - 584.0	1	582.00	2110.00	1.07

Table 20 - Length-frequency distribution of gizzard shad, 1973

LENGTH GROUPS	NO. OF FISH	AVERAGE LENGTH	AVERAGE WEIGHT	CONDITION FACTOR (K)
150.0 - 165.0	4	159.25	45.00	1.11
165.0 - 180.0	2	172.00	55.00	1.08
180.0 - 195.0	0	0.0	0.0	0.0
195.0 - 240.0	0	0.0	0.0	0.0
240.0 - 255.0	1	244.00	170.00	1.17
255.0 - 270.0	1	259.00	180.00	1.04
270.0 - 285.0	4	273.75	232.50	1.13
285.0 - 300.0	5	294.00	296.00	1.16
300.0 - 315.0	5	307.40	344.00	1.18
315.0 - 330.0	3	318.33	370.00	1.15
330.0 - 345.0	0	0.0	0.0	0.0
345.0 - 360.0	1	359.00	555.00	1.20
360.0 - 375.0	1	365.00	650.00	1.34
375.0 - 390.0	2	386.50	697.50	1.21
390.0 - 405.0	4	398.50	905.00	1.43
405.0 - 420.0	5	413.60	886.00	1.25
420.0 - 435.0	4	428.00	1028.00	1.31
435.0 - 450.0	2	436.50	1090.00	1.30
450.0 - 480.0	0	0.0	0.0	0.0
480.0 - 495.0	1	486.00	700.00	0.61

would be expected to increase by a factor of eight. If the bodily proportions of fish remained constant throughout life, a cubic relationship would hold true. Since this is not the case, and body proportions do change, it follows that the weight does not vary exactly with the cube of length (Krosch, 1969).

Length-weight relationships for 13 species of fish are shown in Figures 7-19. Grouped mean values are shown as solid points and calculated values are shown as solid points within circles.

Body-Scale Relationship

The Dahl-Lea direct proportion method was used by the computer to obtain back calculation of body length at the end of each year's growth and increments of growth. Estimated body lengths and increments of growth for five species of fish (walleye, sauger, white bass, smallmouth bass, and drum) are shown in Tables 21-30. Hile (1941) used a method to compare growth from year to year. This same method was used to compare growth of five species of fish from 1965-1972. Percent deviations from 1965-1972 average growth for these five species are shown in Table 31 and Figure 20.

Walleye and sauger deviations for 1969 and 1970 are almost directly opposite. White bass and drum growths from 1969 to 1970 were almost constant. Walleye, sauger, white bass, and smallmouth bass had an increase in growth between 1971 and 1972.

ANCILLARY STUDIES

Temperature Study

Temperatures at Station 4, Sturgeon Lake for April-June, 1974, are shown in Figure 21. Electro-fishing was conducted during April and May. Ripe walleye males were caught on April 15 below Lock and Dam 3 and on April 16 in Sturgeon Lake. Ripe walleye females were caught on April 17 below Lock and Dam 3 and on April 19 in Sturgeon Lake. The temperature at Station 4 on April 18

FIGURE 7. LENGTH-WEIGHT RELATIONSHIP OF GROUPED MEANS FOR WALLEYE, 1973

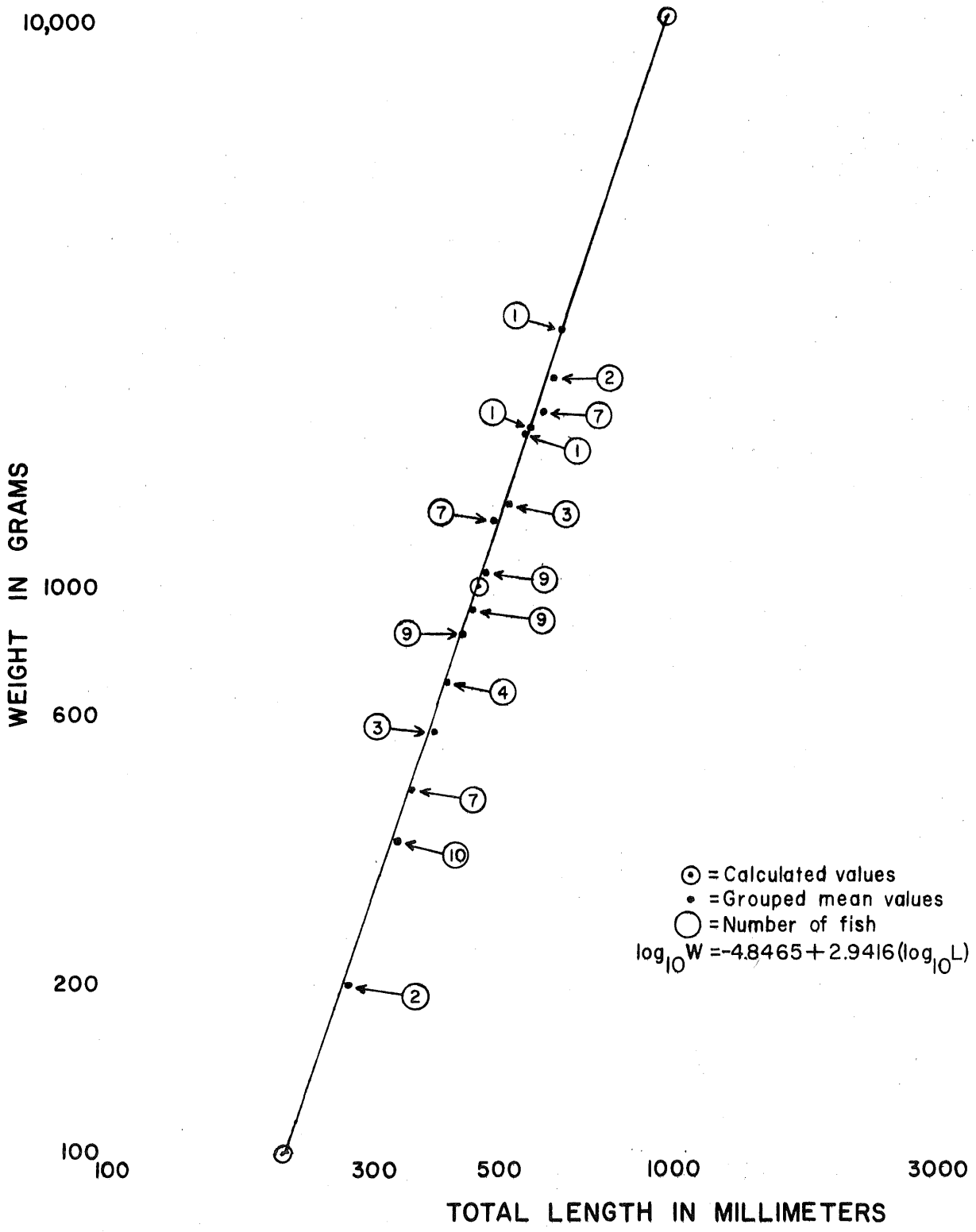


FIGURE 8. LENGTH-WEIGHT RELATIONSHIP OF GROUPED MEANS FOR SAUGER, 1973

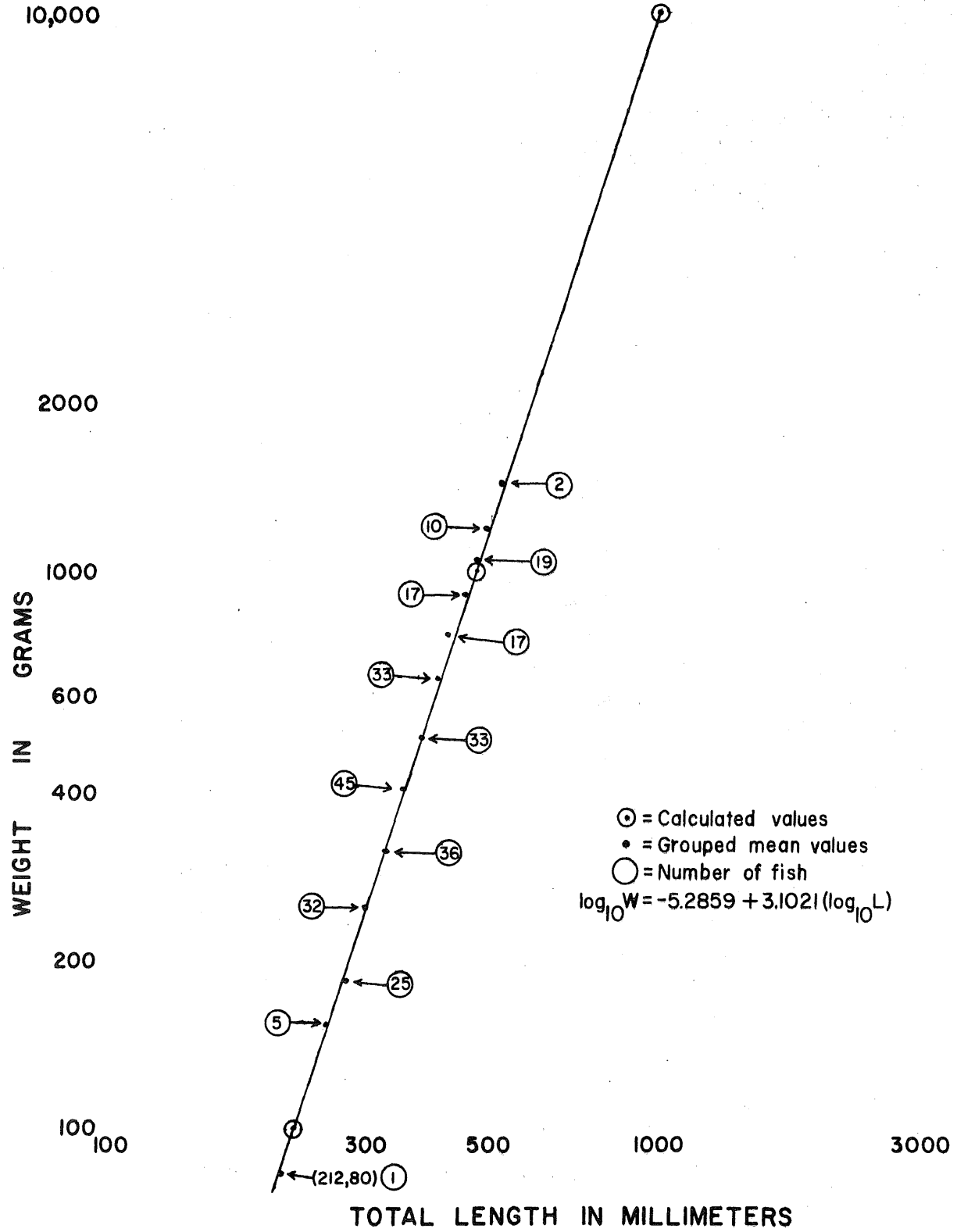


FIGURE 9. LENGTH-WEIGHT RELATIONSHIP OF GROUPED MEANS FOR WHITE BASS, 1973

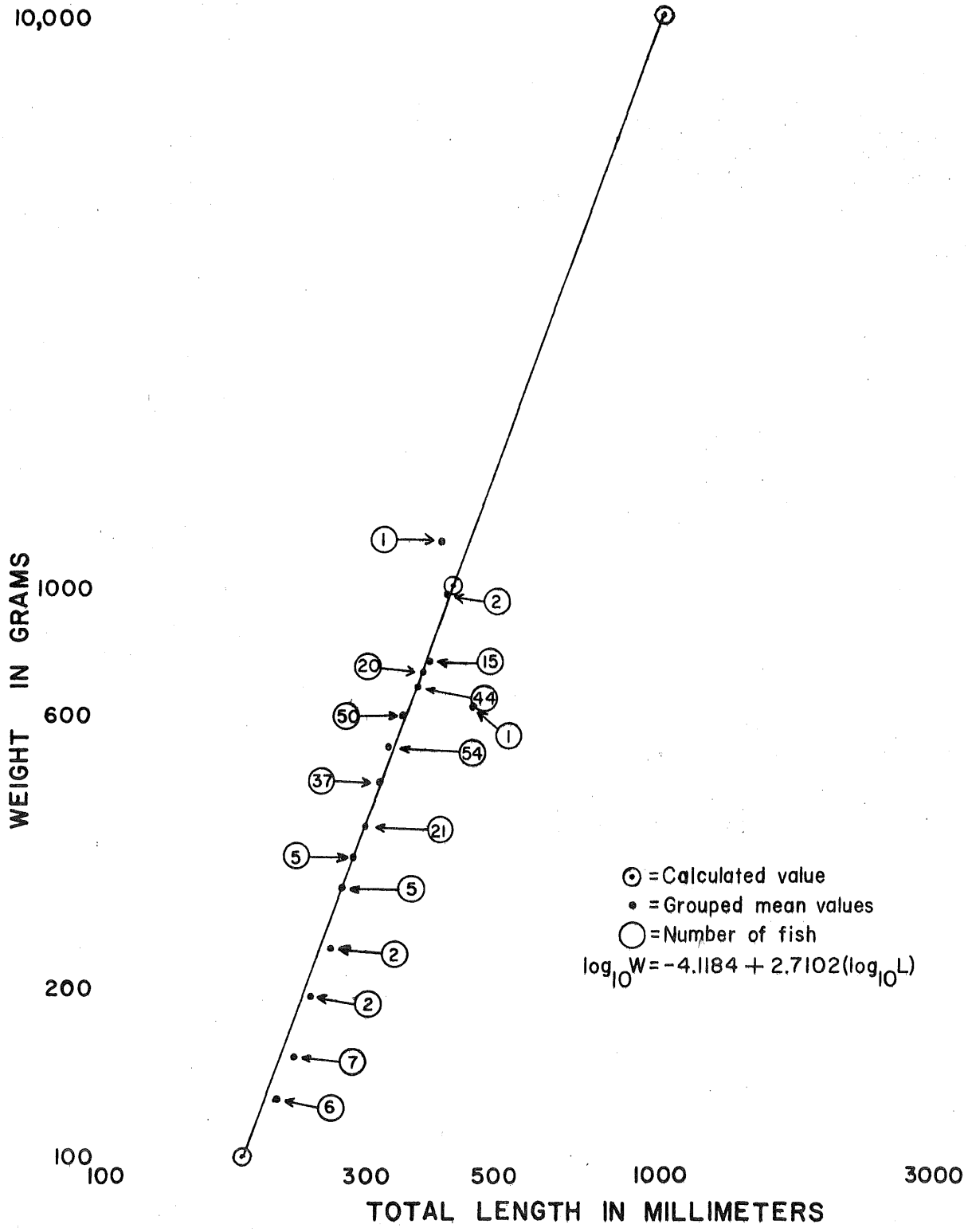


FIGURE 10. LENGTH-WEIGHT RELATIONSHIP OF GROUPED MEANS FOR SMALLMOUTH BASS, 1973.

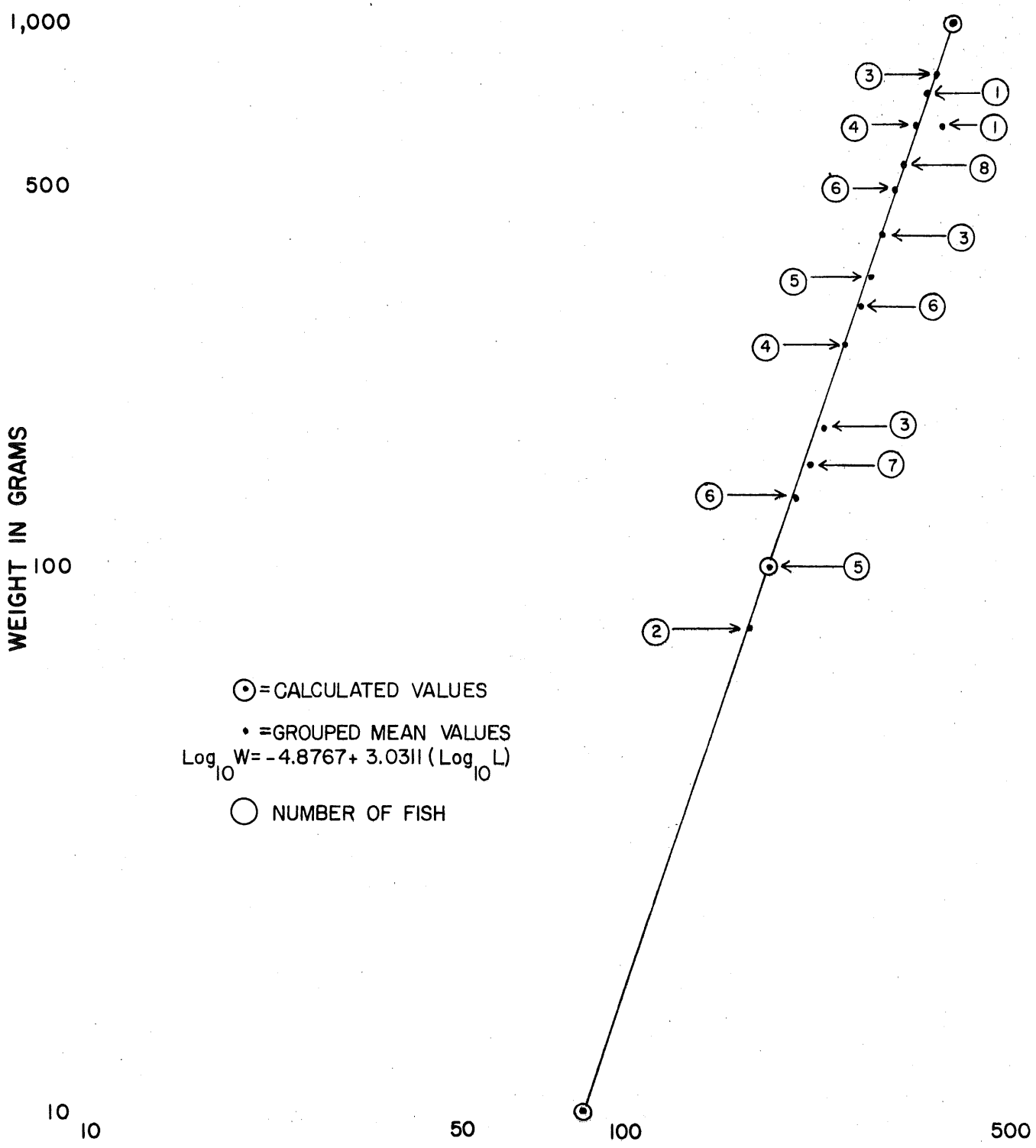


FIGURE II. LENGTH-WEIGHT RELATIONSHIP OF GROUPED MEANS FOR FRESHWATER DRUM, 1973.

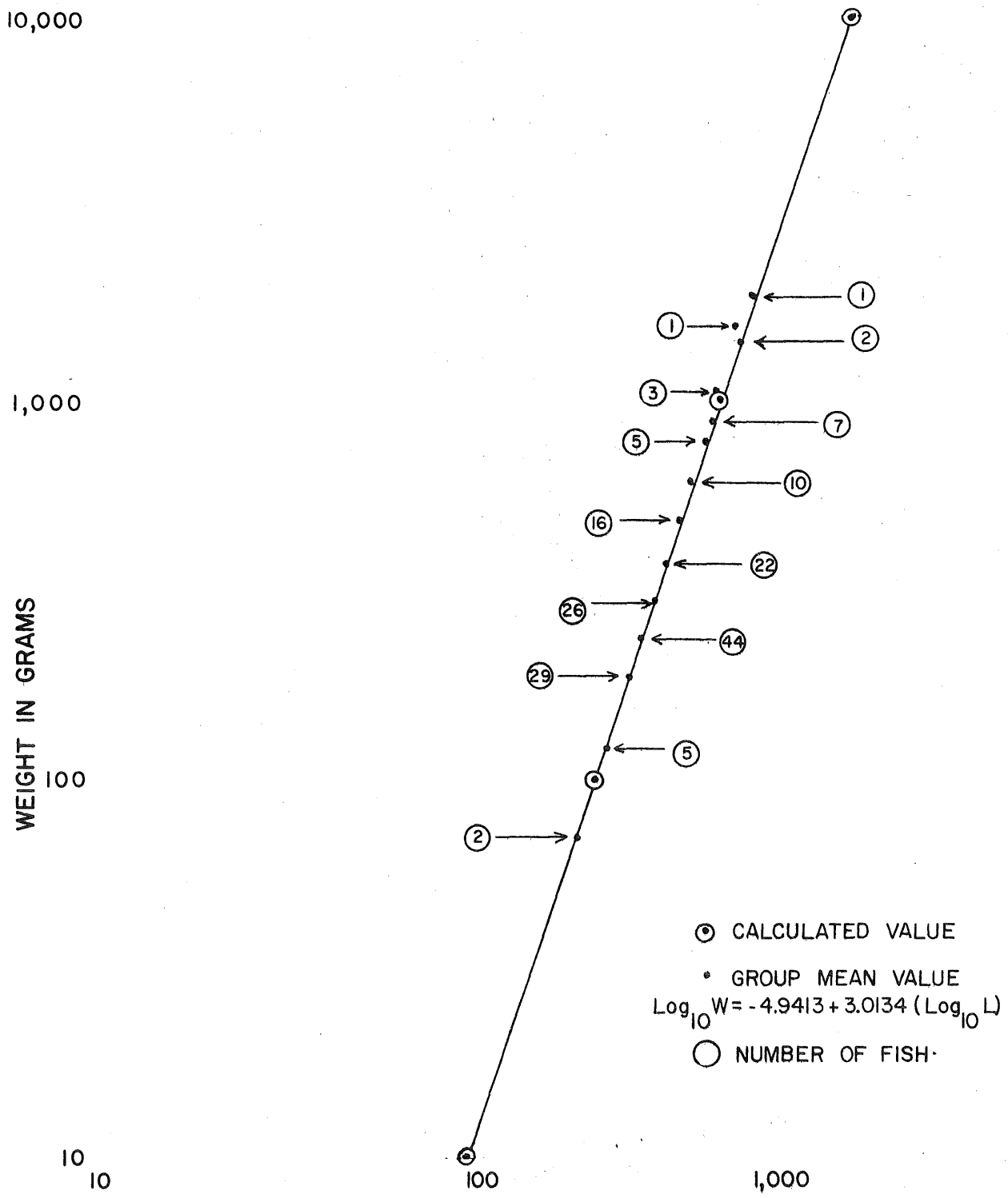


FIGURE 12. LENGTH-WEIGHT RELATIONSHIP OF GROUPED MEANS FOR NORTHERN PIKE, 1973

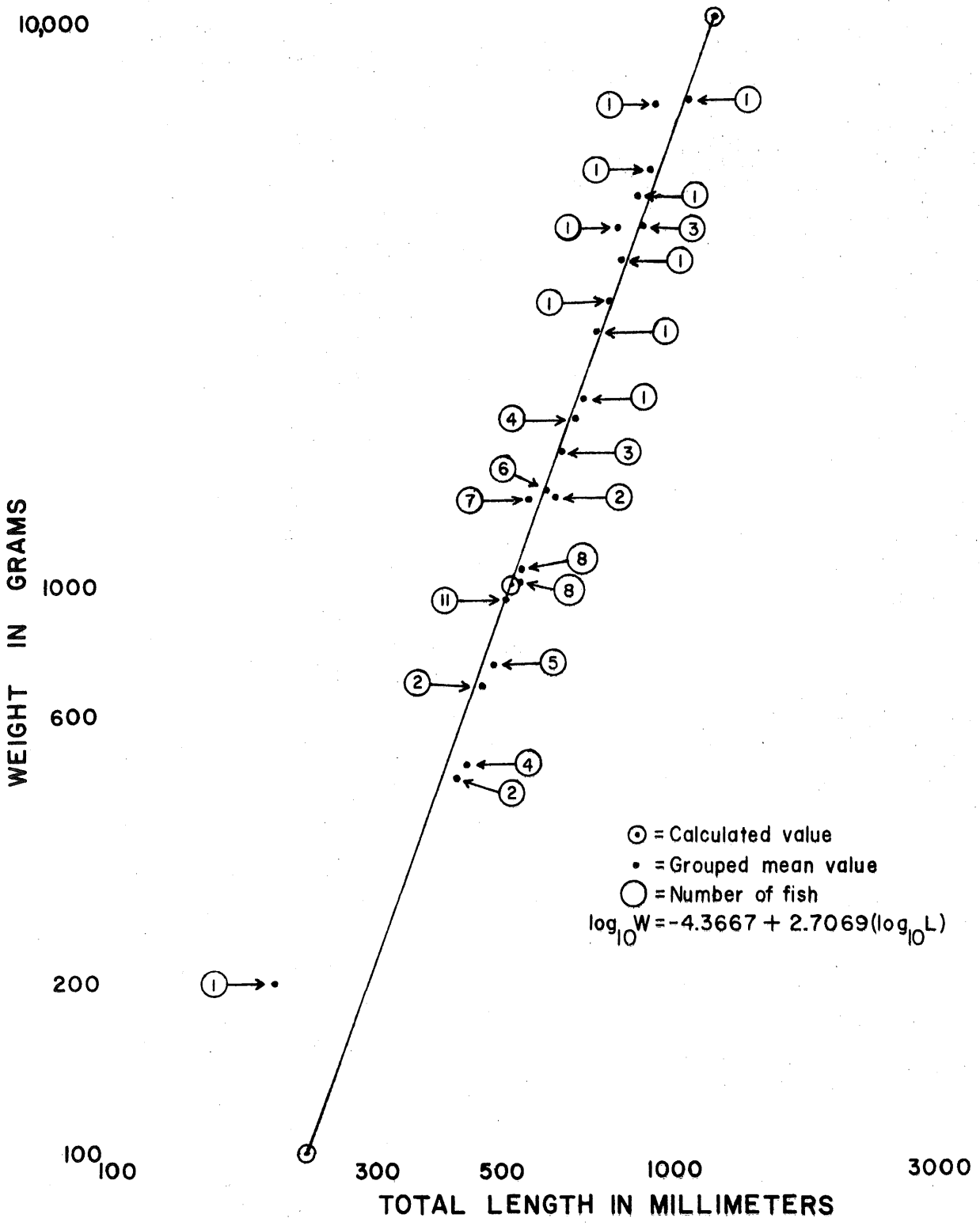


FIGURE 13. LENGTH-WEIGHT RELATIONSHIP OF GROUPED MEANS FOR CHANNEL CATFISH, 1973.

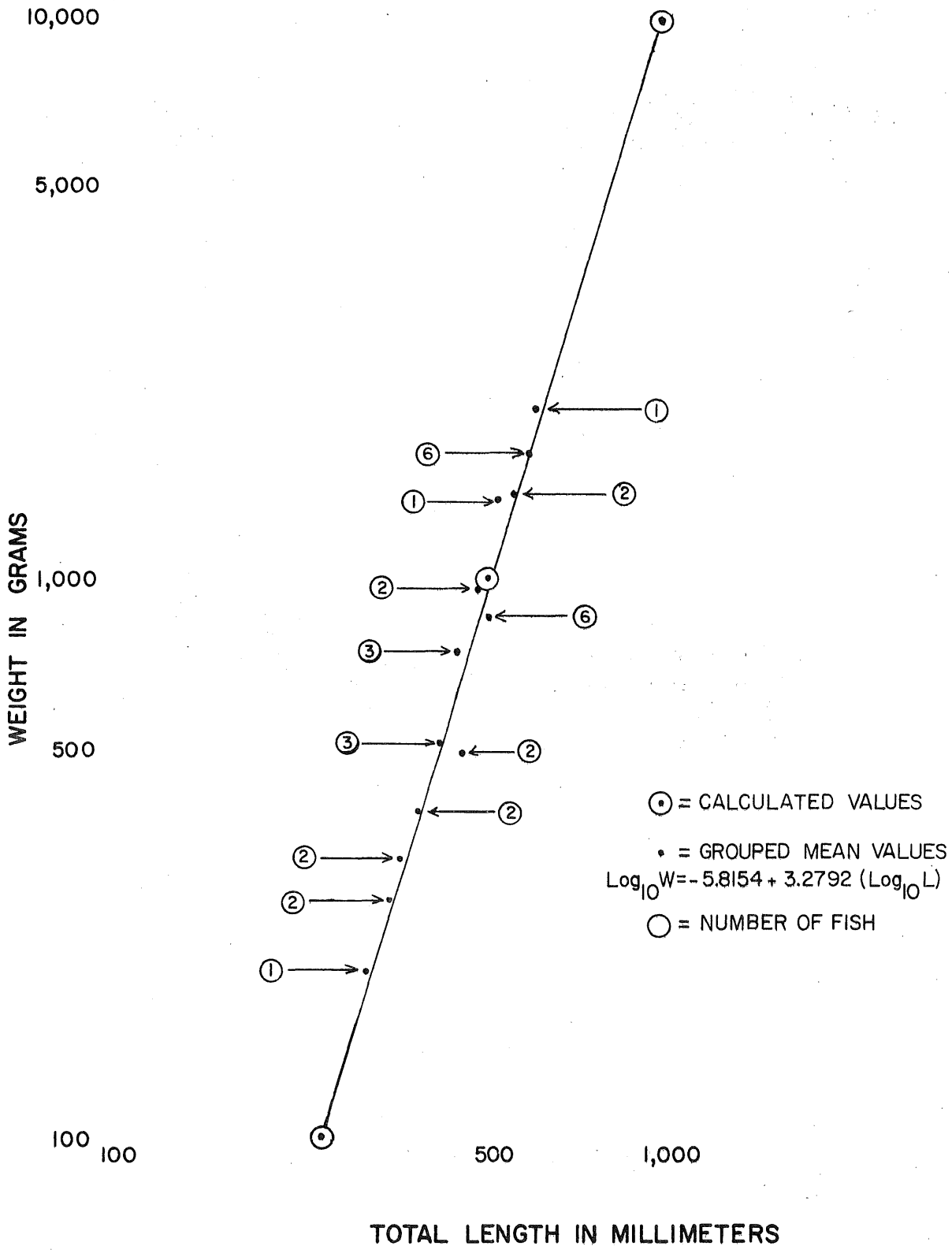


FIGURE 14. LENGTH-WEIGHT RELATIONSHIP OF GROUPED MEANS FOR BLACK CRAPPIE, 1973

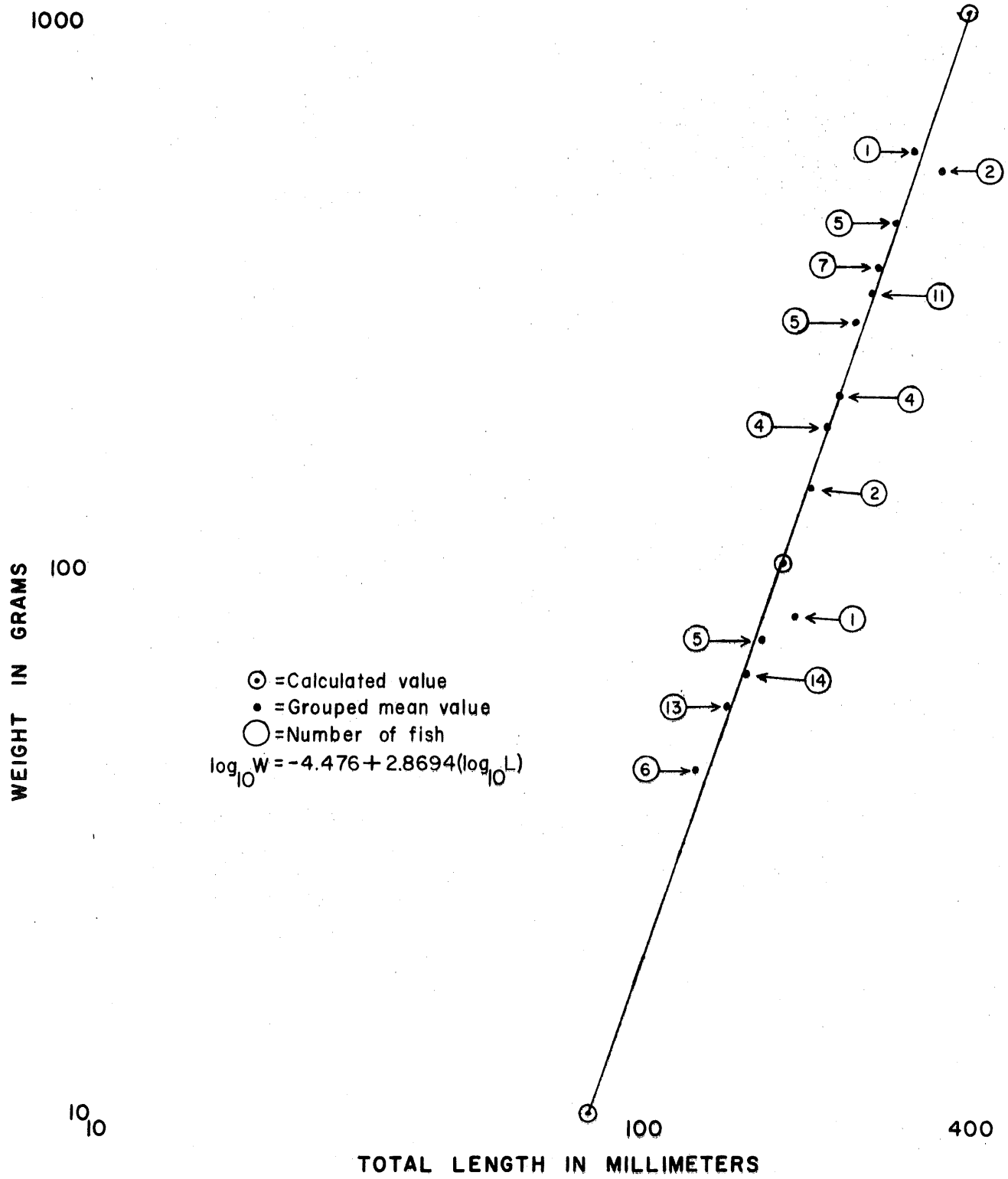


FIGURE 15. LENGTH-WEIGHT RELATIONSHIP OF GROUPED MEANS FOR BLUEGILL, 1973.

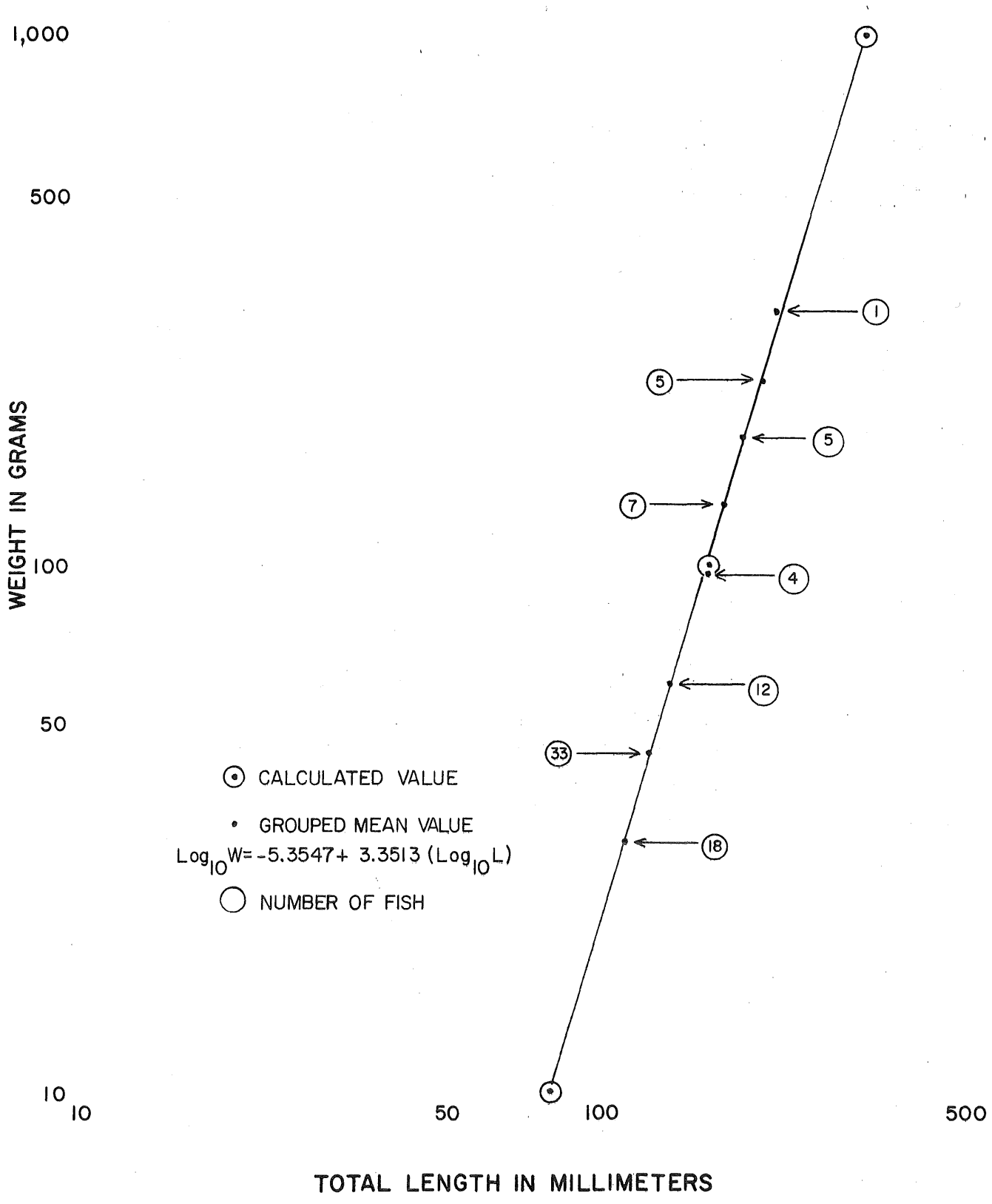


FIGURE 16. LENGTH-WEIGHT RELATIONSHIP OF GROUPED MEANS FOR ROCK BASS, 1973.

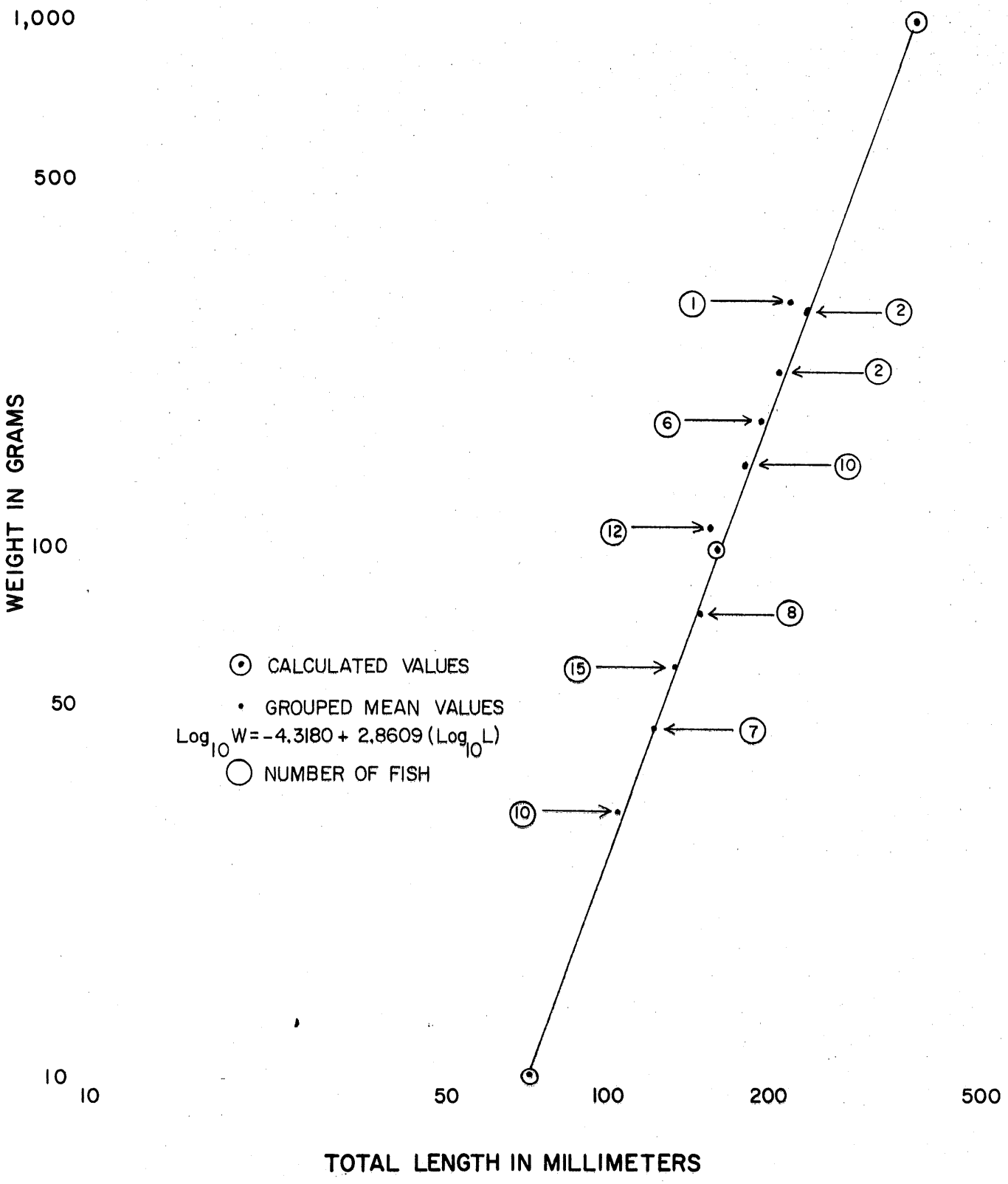


FIGURE 17. LENGTH-WEIGHT RELATIONSHIP OF GROUPED MEANS FOR CARP, 1973.

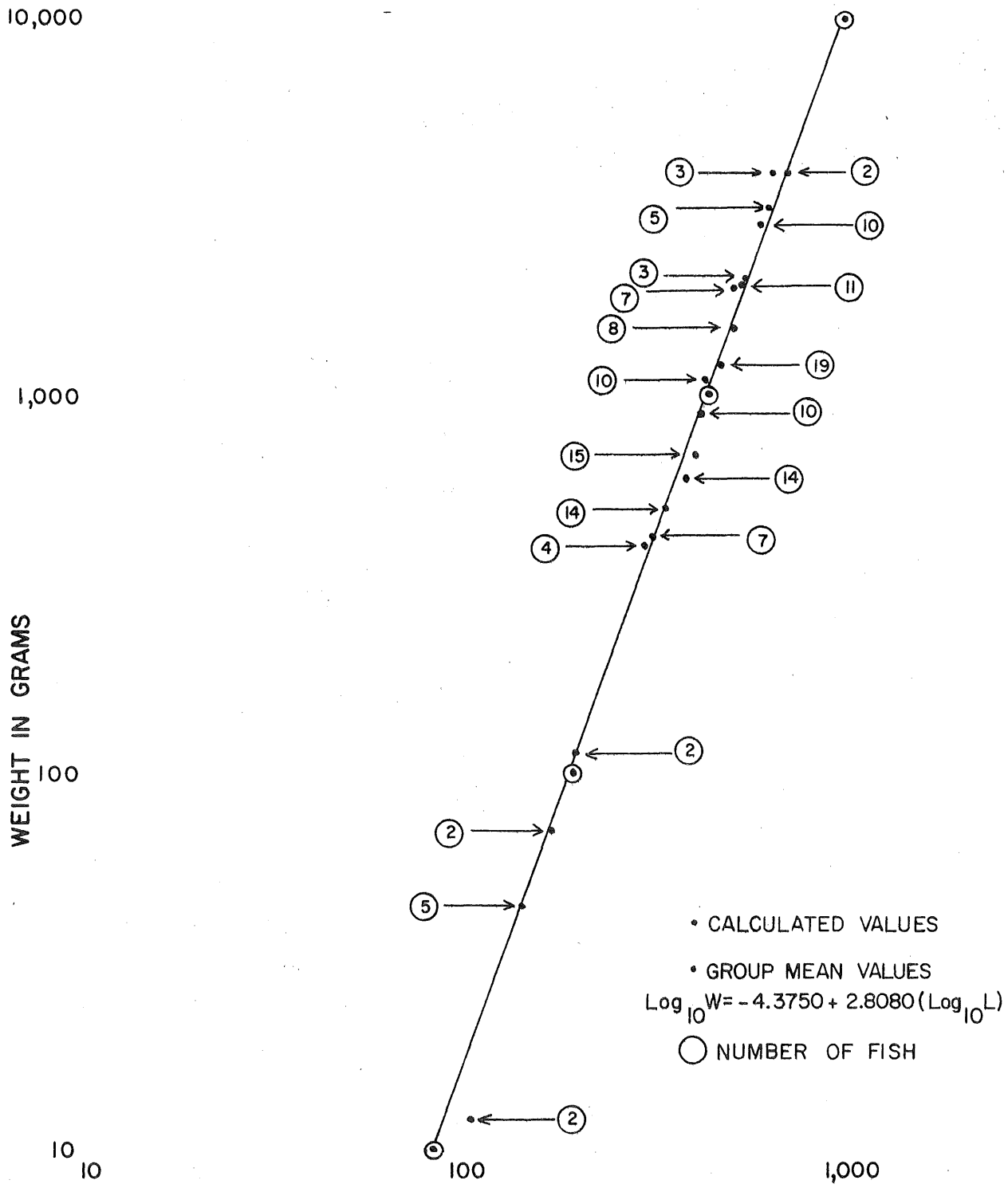


FIGURE 18. LENGTH-WEIGHT RELATIONSHIP OF GROUPED MEANS FOR SHORTHEAD READHORSE, 1973.

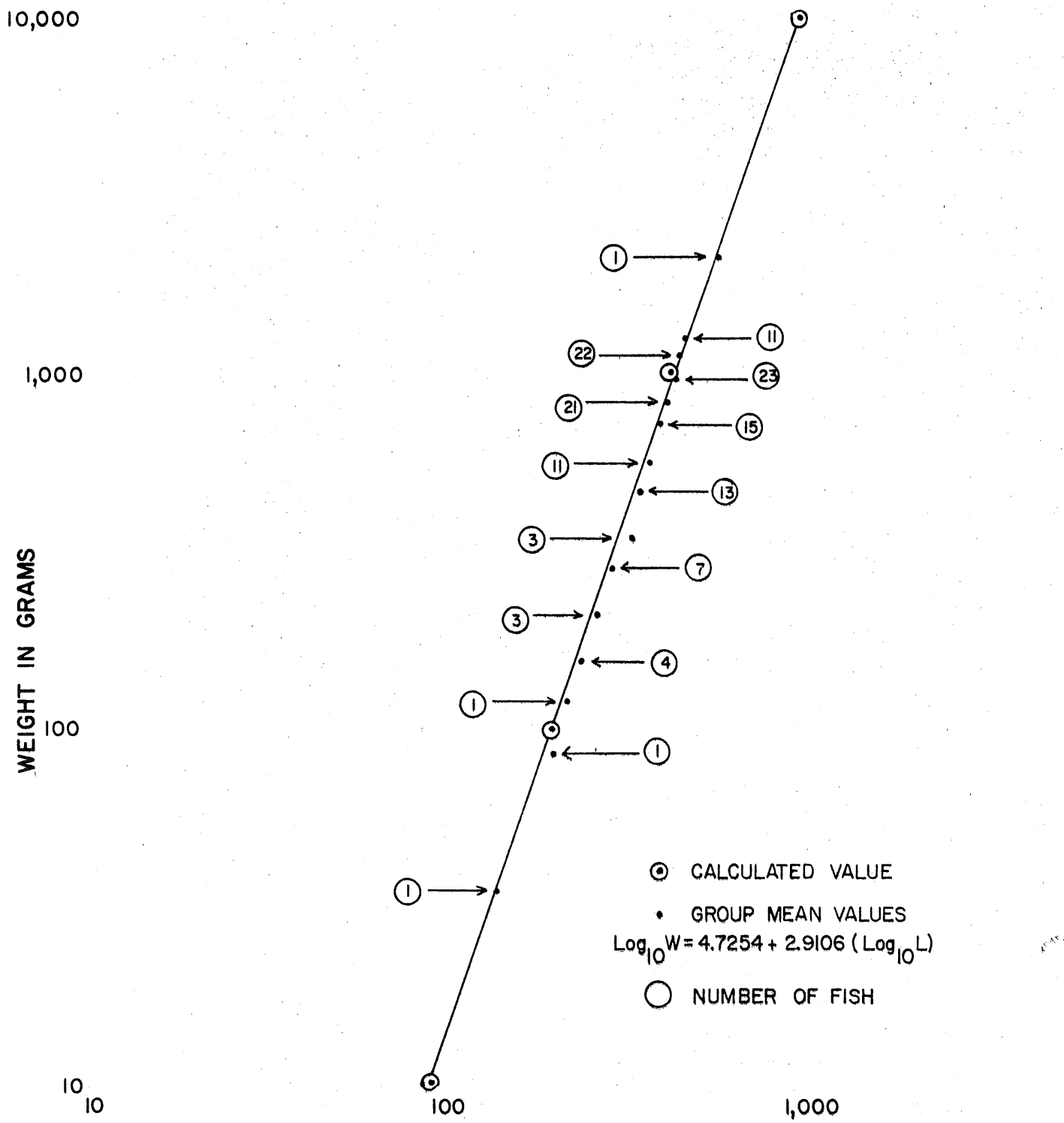


FIGURE 19. LENGTH-WEIGHT RELATIONSHIP OF GROUPED MEANS FOR GIZZARD SHAD, 1973.

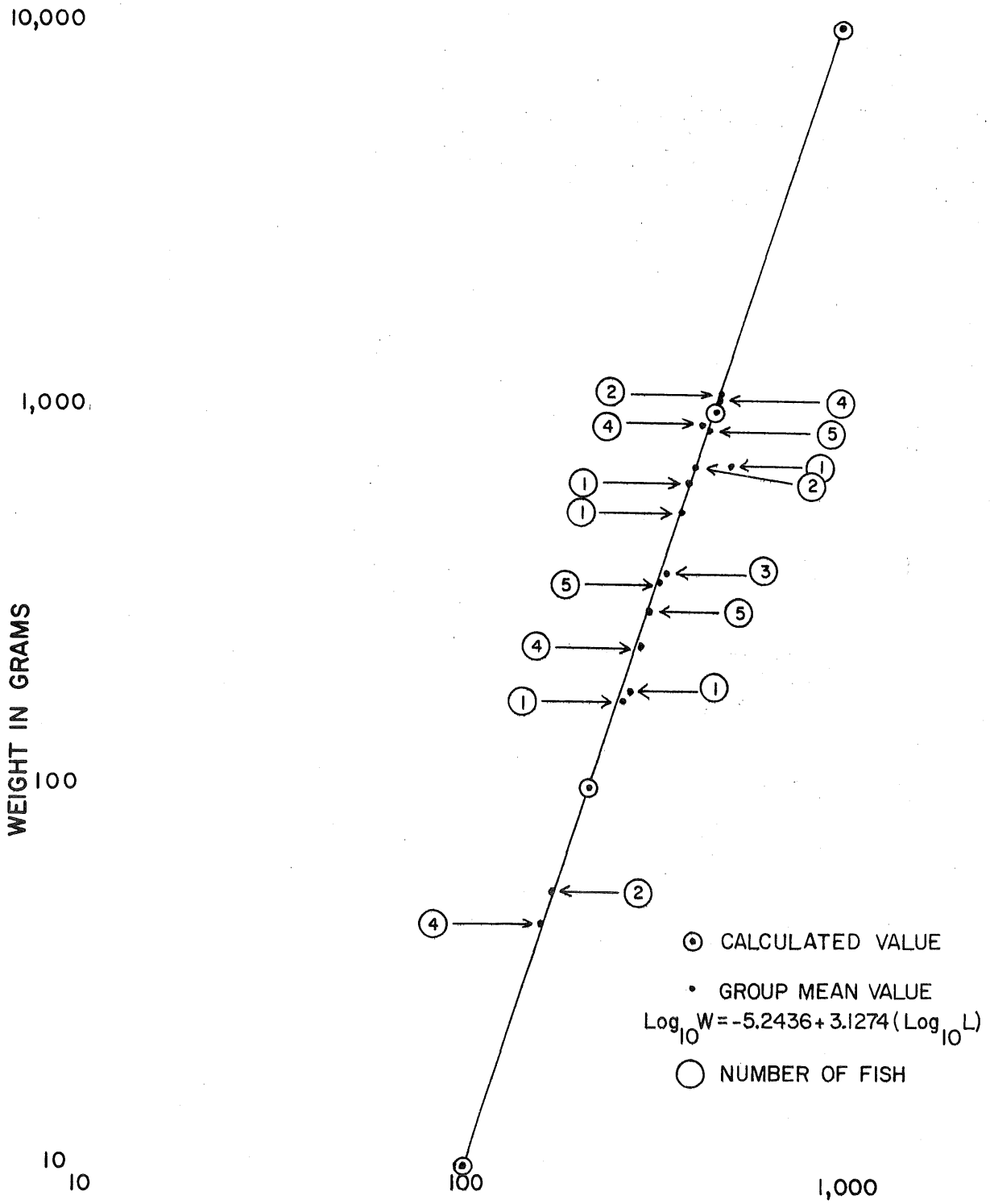


Table 25 - Estimated body length of white bass at annulus formation, 1973 sample

Year Class	Number of Fish	NUMBER OF ANNULI I	II	III	IV	V	VI	VII
1972	18	95.32						
1971	30	120.97	232.14					
1970	123	116.56	233.07	305.38				
1969	71	116.39	236.04	302.06	348.25			
1968	22	108.72	235.20	304.51	348.29	373.27		
1967	5	101.60	195.56	273.31	314.57	342.00	362.13	
1966	2	105.98	236.57	299.22	326.40	343.76	359.61	375.47
GRAND AVERAGE LENGTH		109.36	228.10	296.90	334.38	353.01	360.87	375.47

Table 26 - Increments of growth of white bass, 1973

Year Class	Number of Fish	YEAR OF GROWTH 1	2	3	4	5	6	7
1972	18	95.33						
1971	30	120.98	111.17					
1970	123	116.56	116.51	72.31				
1969	71	116.39	119.65	66.02	46.19			
1968	22	108.72	126.47	69.31	43.78	24.98		
1967	5	101.60	93.96	77.75	41.27	27.43	20.13	
1966	2	105.98	130.59	62.65	27.18	17.36	15.85	15.85
GRAND AVERAGE LENGTH		109.36	116.39	69.61	39.60	23.26	17.99	15.85

Table 27 - Estimated body length of smallmouth bass at annulus formation, 1973 sample

Year Class	Number of Fish	NUMBER OF ANNULI I	II	III	IV
1972	16	64.50			
1971	22	59.70	163.81		
1970	22	65.72	156.35	249.62	
1969	4	60.56	143.02	224.23	282.51
GRAND AVERAGE LENGTH		62.62	154.39	236.92	282.51

Table 28 - Increments of growth of smallmouth bass, 1973

Year Class	Number of Fish	YEAR OF GROWTH 1	2	3	4
1972	16	64.50			
1971	22	59.70	104.11		
1970	22	65.72	90.63	93.26	
1969	4	60.56	82.45	81.21	58.28
GRAND AVERAGE LENGTH		62.62	92.40	87.24	58.28

Table 29 - Estimated body length of drum at annulus formation, 1973 sample

Year Class	Number of Fish	NUMBER OF ANNULI I	II	III	IV	V	VI	VII
1972	4	67.48						
1971	32	97.61	200.76					
1970	65	88.06	187.56	250.71				
1969	33	85.28	186.38	252.24	301.81			
1968	27	81.08	180.52	238.94	294.67	333.36		
1967	9	88.27	183.09	251.54	314.01	362.62	395.65	
1966	3	73.38	196.09	263.87	318.80	371.17	422.00	454.86
GRAND AVERAGE LENGTH		83.02	189.07	251.46	307.33	355.72	408.83	454.86

Table 30 - Increments of growth of drum, 1973

Year Class	Number of Fish	YEAR OF GROWTH 1	2	3	4	5	6	7
1972	4	67.48						
1971	32	97.61	103.15					
1970	65	88.06	99.50	63.15				
1969	33	85.28	101.10	65.86	49.57			
1968	27	81.08	99.44	58.42	55.74	38.69		
1967	9	88.27	94.81	68.46	62.47	48.61	33.03	
1966	3	73.38	122.71	67.77	54.94	52.37	50.83	32.86
GRAND AVERAGE LENGTH		83.02	103.45	64.73	55.68	46.55	41.93	32.86

Table 31 - Percentage deviations of growth from 1965-1972 average for five species of fish in the Prairie Island area

Species	Percent Deviation From Average Growth In Calendar Year							
	1965	1966	1967	1968	1969	1970	1971	1972
White bass	-	-	10.46	22.16	4.22	3.71	6.16	8.06
Sauger	-	-6.38	-17.36	-10.98	-1.16	10.51	4.05	8.54
Walleye	-0.70	-1.99	-0.42	-4.40	6.77	-5.25	-1.13	6.45
Smallmouth bass	-	-	-	-	-	-16.34	-6.88	6.88
Drum	-	-	26.16	0.51	3.72	3.34	1.64	-9.19

FIGURE 20. PERCENT DEVIATIONS FROM AVERAGE GROWTH FOR FIVE SPECIES: WALLEYE, SAUGER, WHITE BASS, SMALL-MOUTH BASS & DRUM AT PRAIRIE ISLAND, 1973

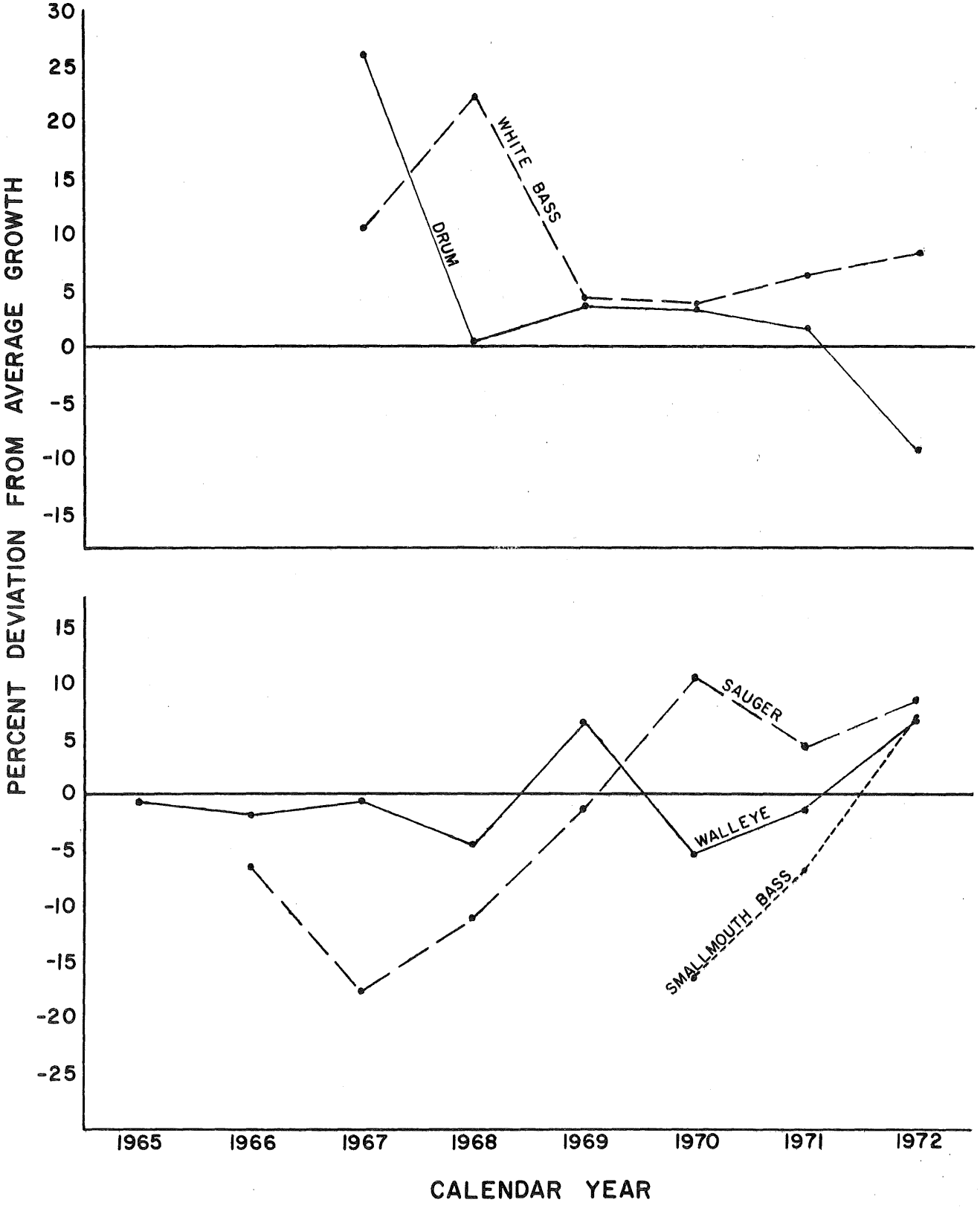
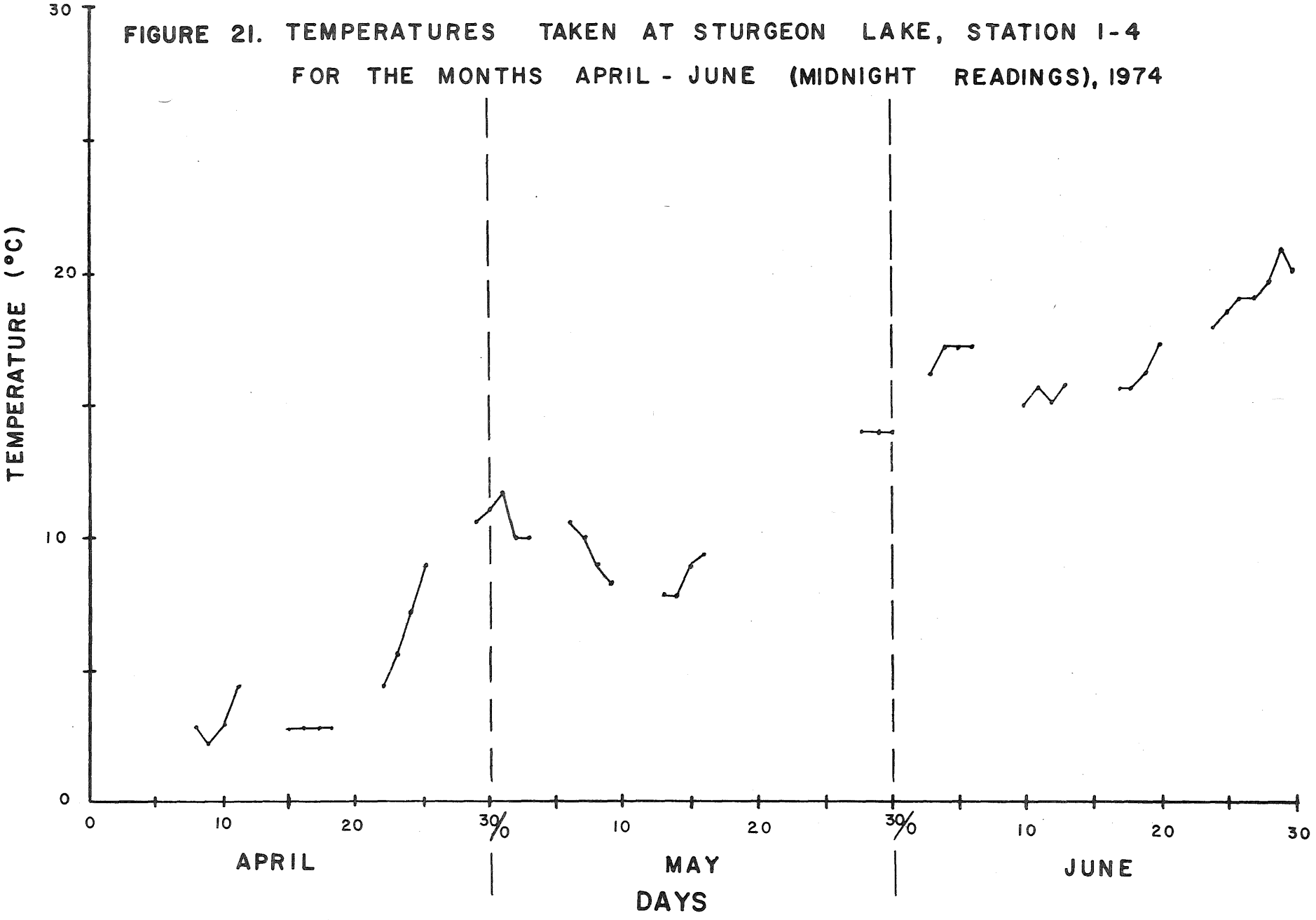


FIGURE 21. TEMPERATURES TAKEN AT STURGEON LAKE, STATION 1-4 FOR THE MONTHS APRIL - JUNE (MIDNIGHT READINGS), 1974



was 2.8°C (37°F). This was somewhat below a statewide range of 5.6°C (42°F) - 11.1°C (52°F) for 1974 (Daley, personal communication, 1975). On April 30, temperatures in Sturgeon Lake reached the upper range of 11.1°C. These temperatures and dates are very close to those when the Section of Fisheries was stripping walleye below Lock and Dam 3. Ripe female walleye were stripped from April 17 to April 26, 1974 below Lock and Dam 3 (Sternberg, personal communication, 1975).

Ripe sauger males were found at Station 4 on April 24 and ripe females were found on May 1, 1974. The temperature ranged from 7°C to 11° from April 24 - May 16. This is within the range for spawning saugers (Scott and Crossman, 1973, Carufel, 1963, and Priegel, 1969). Ripe female sauger were found on April 25, 1974 below Lock and Dam 3. Based on this information, it appears that walleye and sauger may spawn in Sturgeon Lake along the north shore.

Intake Bubbler Study

The summary of electro-fishing catch for the intake bubbler study August 12-16, 1974 is shown in Table 32. Length-frequency of fishes caught electro-fishing for the intake bubbler study are shown in Appendix G. Daily catches of the most abundant species are shown in Table 33.

The greatest percentage (38.26%) of the total catch for the bubbler study was white bass. Carp (14.78%) were the second most abundant species caught. Other abundant species caught were: rock bass (12.93%), gizzard shad (11.64%), bluegill (6.83%), green sunfish (3.69%), drum (2.77%), and black crappie (2.21%). All other species caught (Table 32) comprised 6.89 percent of the total catch.

Table 32 - Summary of electro-fishing catch for intake bubbler study, August 12-16, 1974

Species	Total (wk.)	% Total
Shortnose gar	1	0.18
Longnose gar	1	0.18
Gizzard shad	63	11.64
Shorthead redhorse	6	1.10
Carp	80	14.78
Silver chub	4	0.73
Emerald shiner	2	0.63
Roseyface shiner	1	0.18
Bullhead minnow	1	0.18
Channel catfish	5	0.92
Flathead catfish	1	0.18
White bass	207	38.26
Sauger	2	0.63
Walleye	5	0.92
Smallmouth bass	4	0.73
Largemouth bass	3	0.55
Green sunfish	20	3.69
Bluegill	37	6.83
Rock bass	70	12.93
White crappie	1	0.18
Black crappie	12	2.21
Drum	15	2.77
	541	100.0

Table 33 - Electro-fishing daily catches of most abundant species for intake bubbler study, August 12-16, 1974

Date	8/12		8/13		8/14		8/15		8/16	
Species	Number Caught	% of Daily Catch	Number Caught	% of Daily Catch	Number Caught	% of Daily Catch	Number Caught	% of Daily Catch	Number Caught	% of Daily Catch
Gizzard shad	16	16.16	16	13.55	4	3.38	19	18.09	8	7.92
Carp	21	21.21	22	18.64	23	19.49	7	6.66	7	6.93
White bass	18	18.18	34	28.81	57	48.30	43	40.95	55	54.45
Green sunfish	3	3.03	3	2.54	3	2.54	7	6.66	4	3.96
Bluegill	12	12.12	9	7.62	4	3.38	7	6.66	5	4.95
Rock bass	17	17.17	20	16.94	16	13.55	11	10.47	6	5.94
Black crappie	5	5.05	0	0	2	1.69	3	2.85	2	1.98
Drum	2	2.02	3	2.54	1	0.85	5	4.76	4	3.96
Other	5	5.05	11	9.32	8	6.78	3	2.85	10	9.90
Total	99	100	118	100	118	100	105	100	101	100
Total Catch Per Hour	198.0		236.0		236.0		210.0		202.0	

The total number of fish caught each day remained about the same (around 100). The number of white bass caught increased through the week. The number of white bass caught on Friday (55) was three times greater than the catch on the preceding Monday (18). Carp numbers remained constant the first three days (21-23) but dropped to seven for Thursday and Friday. Catches of the remaining abundant species (Table 33) fluctuated during the sampling period.

All of the gizzard shad and most of the white bass caught were young-of-the-year (Y/Y). Most of the carp caught were adults, 30-65 cm. Most sizes of rock bass and bluegill were represented in the sample (Appendix F).

Most of the carp were caught near the bubbler. The carp may have been attracted to the bubbler because of suspended matter caused by the bubble screen. The abundance of rock bass, bluegill, and black crappie in the area between the bubbler and skimmer wall could possibly be due to the increase of good habit. Riprap appears to be very good habitat for centrarchid fish. The above information indicates the intake bubbler was not effective in keeping fish away from the immediate intake area.

Larval Towing

Tows were made in the Prairie Island area in order to catch larval fish. Four sampling stations are shown in Figure 22. Catches of larval fish are recorded in Table 34. This section attempts to determine (a) the time when maximum numbers of larval fish are present, and (b) effects of wind upon catches of larval fish.

Logarithms of numbers of ichthyoplankton per 50 meters of tow were plotted against calendar days (Figure 23) in an attempt to illustrate seasonal variations and to isolate extreme values. A line of central tendency was fitted by inspection.

FIGURE 22. DIAGRAM OF LARVAL FISH TOWS AT PRAIRIE ISLAND, 1974.

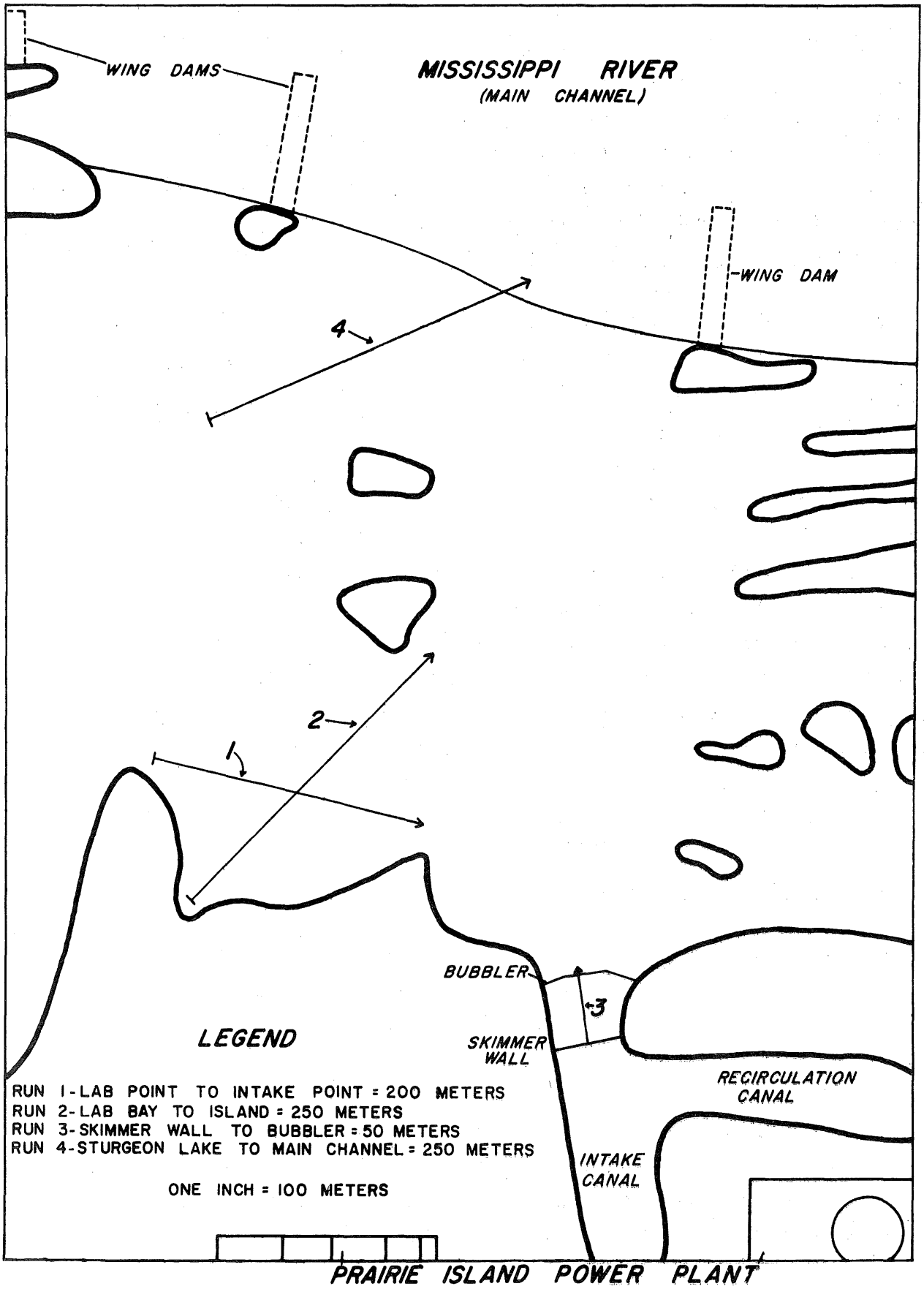
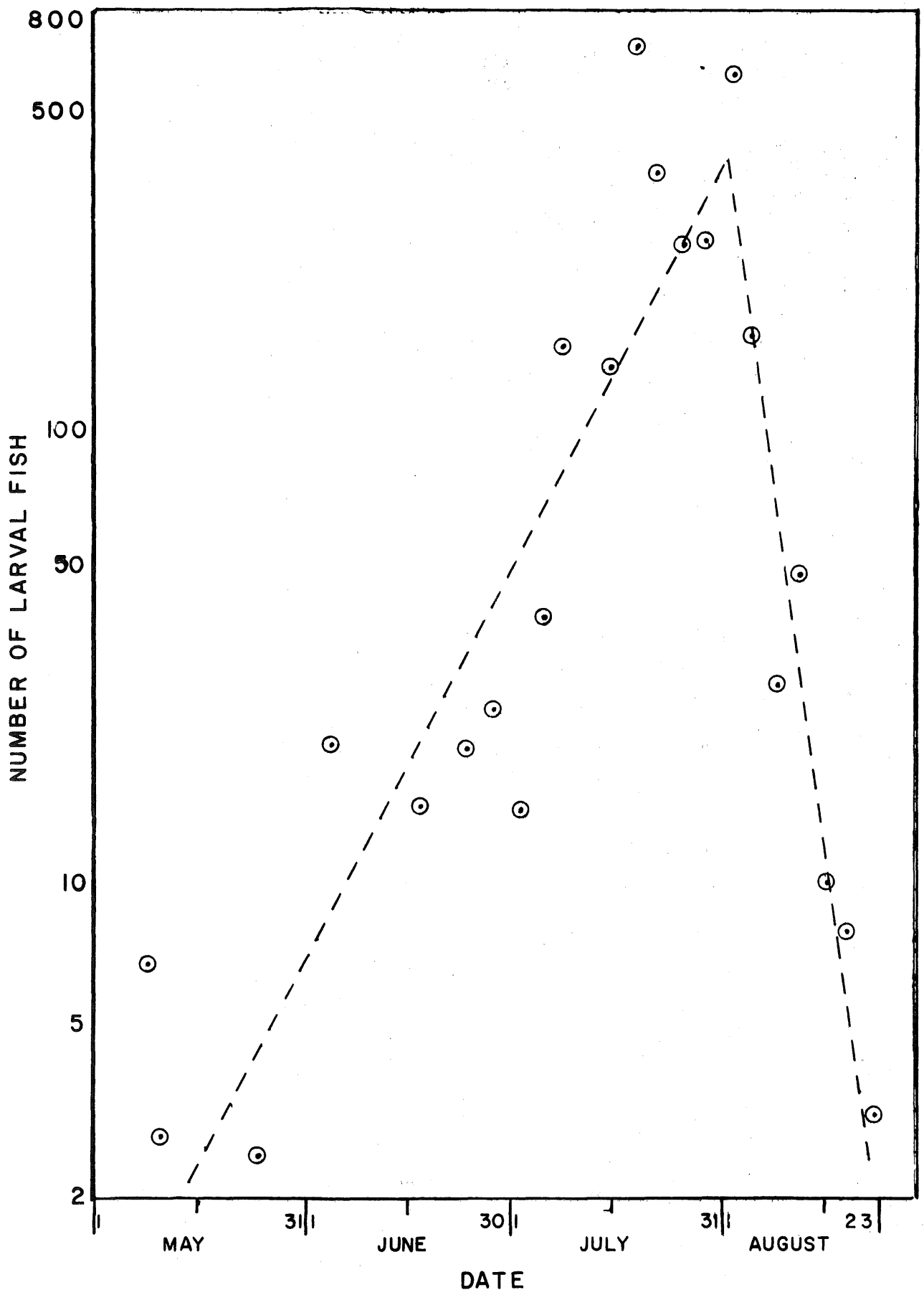


Table 34 - Summary of larval towing for 1974

Date	Tow No. 1 Catch		Tow No. 2 Catch		Tow No. 3 Catch		Tow No. 4 Catch	
	Total Number	Number per 50M*Tow	Total Number	Number per 50M*Tow	Total Number	Number per 50M*Tow	Total Number	Number per 50M*Tow
5- 8-74	0	0.00	7	1.40	18	18.00	4	0.80
5-10-74	15	3.75	22	4.40	0	0.00	92	18.40
5-24-74	1	0.25	31	6.20	1	1.00	3	0.60
6- 4-74	22	5.50	2	0.40	48	48.00	4	0.80
6-10-74	126	31.50	334	66.80	44	44.00	7	1.40
6-17-74	61	15.25	36	7.20	21	21.00	5	1.00
6-24-74	60	15.00	67	13.40	30	30.00	1	0.20
6-28-74	140	35.00	125	25.00	12	12.00	9	1.80
7- 2-74	115	28.75	55	11.00	3	3.00	5	1.00
7- 5-74	34	8.50	500	100.00	5	5.00	3	0.60
7- 8-74	400	100.00	1024	204.80	140	140.00	34	6.80
7-15-74	1009	252.25	314	62.80	84	84.00	34	6.80
7-19-74	1746	436.50	6900	1380.00	211	211.00	182	36.40
7-22-74	1762	440.50	1800	360.00	278	278.00	61	12.20
7-26-74	470	117.50	62	12.40	608	608.00	16	3.20
7-29-74	2257	564.25	342	68.40	127	127.00	37	7.40
8- 2-74	103	25.75	-	-	1155	1155.00	-	-
8- 5-74	250	62.50	280	56.00	354	354.00	12	2.40
8- 9-74	193	48.25	70	14.00	18	18.00	6	1.20
8-12-74	342	85.50	179	35.80	19	19.00	7	1.40
8-16-74	31	7.75	18	3.60	18	18.00	4	0.80
8-19-74	41	10.25	24	4.80	8	8.00	3	0.60
8-23-74	14	3.50	3	0.60	5	5.00	13	2.60
8-26-74	1	0.25	1	0.20	-	-	1	0.20
TOTAL	9,193	-	12,196	-	3,207	-	543	-
NUMBER OF TOWS	24		23		23		23	
AVERAGE CATCH PER 50M TOW		95.76		106.05		139.43		4.72

*Meter

FIGURE 23. MEAN NUMBER OF LARVAL FISH PER 50 M. TOW FROM STATIONS 1, 2, AND 3.



Numbers of ichthyoplankton caught peaked during the last two weeks of July and the first week of August, 1974 (Figure 24). Means were calculated for catches during two-week blocks of time throughout the sampling period using data from Tow 3. These means again show that catches peaked during late July and early August.

Stations 2 and 4 had lower catches of larval fish than the other two stations. Tows at Stations 2 and 4 were made perpendicular to the current.

Wind direction and velocity are recorded continuously at the Prairie Island Generating Plant. These records were compared with catches of larval fish to determine whether or not there was any relationship between wind and catch rates. Two methods of comparison were used.

In the first method the line of central tendency in Figure 23 was used to point out extremely high or low catch values. The date for each extreme value was noted. Average wind direction and velocity were determined for the 24-hour period preceding each tow. When comparing this wind data for the days when high or low catches were made, no relationship was evident.

The following abnormally high values from the means for 1, 2, and 3 taken from Table 35.

Date	Wind Direction	Wind Velocity (mph)
6-4-74	S	10-60
6-10-74	NNW	20-40
		(7 pm on 6-9 until 10 am on 6-10)
	NE	20
		(9 am - 7 pm on 6-9-74)
7-8-74	SE	20
7-19-74	W	0-5
8-2-74	S	15

FIGURE 24. MEAN TOW NET CATCHES AT STATION NO. 3 DURING SUCCESSIVE PERIODS, MAY-AUGUST 1974.

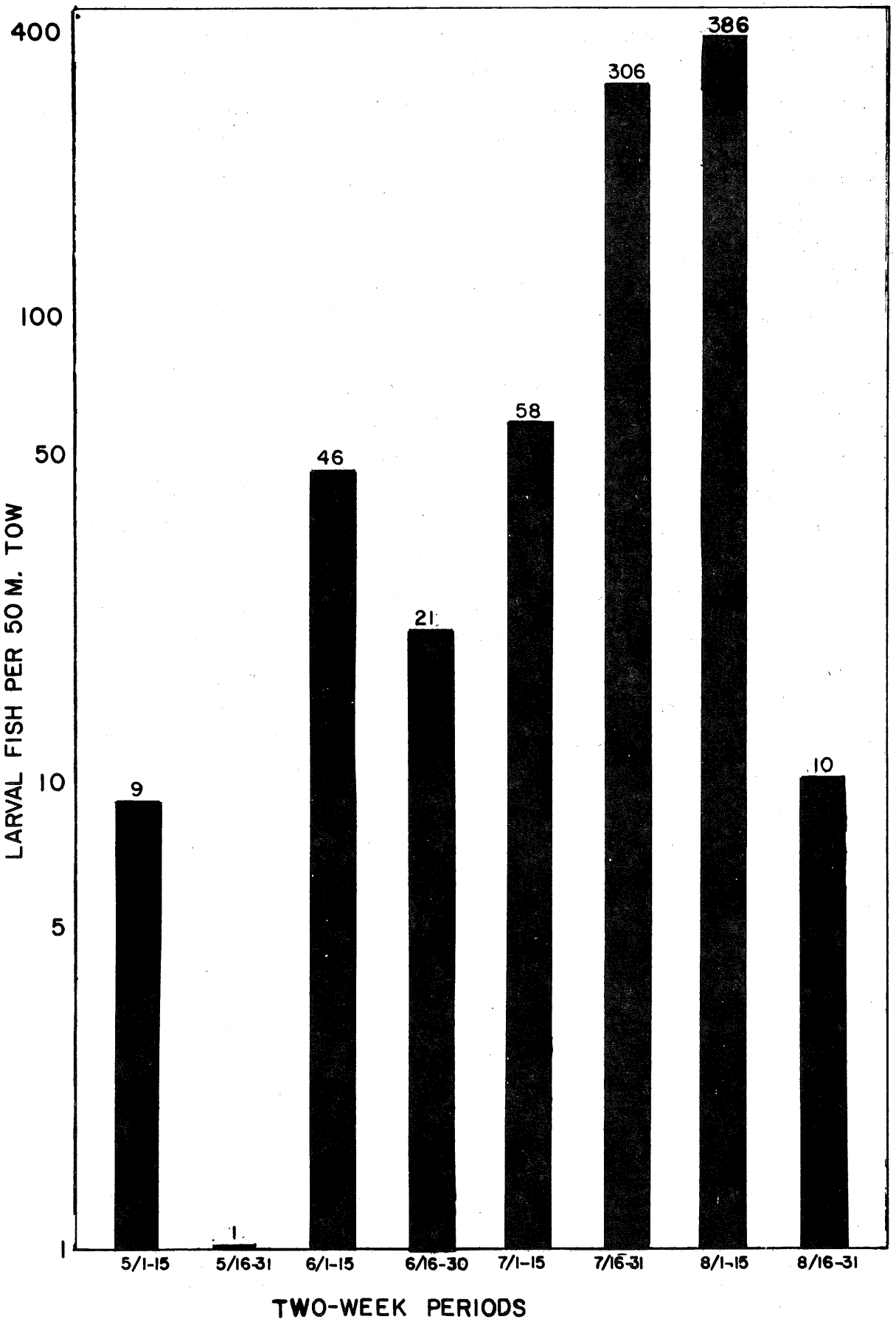


Table 35 - Wind direction and velocity and means of catches for tow nos. 1,2, & 3 (for 24 hrs. preceding each sampling date)

Date	Direction	Velocity (mph)	Mean catch per 50M tow, Tows 1,2, & 3
5-24-74	NW	35	2.48
6-4-74	S	10-60	19.80
6-10-74	NNW	20-40 (7PM on 6-9 until 10AM on 6-10-74)	47.43
	NE	20 (9AM-7PM on 6-9-74)	
6-17-74	NW	20	14.48
6-24-74	Variable	0-8 during night	19.47
	NE	20 daylight hours	
6-28-74	S	20	24.00
7-2-74	SE	20	14.25
7-5-74	NW	30 (9AM-7PM on 7-4-74)	37.83
	Variable	0-5 (7PM-11PM on 7-4-74)	
	SE	10 (11PM-9AM on 7-5-74)	
7-8-74	SE	20	148.27
7-15-74	W	5	133.02
7-19-74	W	0-5	675.83
7-22-74	NW	20	359.50
7-26-74	W to SE (Var.)	0-10 (Var.)	245.97
7-29-74	WNW	25	253.22
8-2-74	S	15	590.38
8-5-74	NW	15-20 (9AM-9PM on 8-4-74)	157.50
		Calm (9PM-9AM on 8-5-74)	
8-9-74	E	18	26.75
8-12-74	SW	30	46.77
8-16-74	SSW	20 (9AM on 8-15-74 to 2AM on 8-16-74)	9.78
	W	5-10 (2AM-10AM on 8-16-74)	
8-19-74	WSW	20 (9AM-7PM on 8-18-74)	7.68
	Variable	0-10 (7PM-5AM on 8-19-74)	
	E	10 (5AM-9AM on 8-19-74)	

A second method was also used to compare wind directions with larval fish catch data. Catch data from Tow Station 3 were divided according to direction of the winds during the 24 hours preceding each tow (Table 36). Sampling days for which winds were quite variable in direction were not included. Wind direction was divided into two categories: winds coming from the west, northwest, north, or northeast; and those coming from the east, southeast, south, and southwest. The numbers of larval fish per 50M tow were listed for each of the 18 days of relatively constant wind. A median was calculated for these 18 values. Two-thirds (66.7%) of the tows made during the west-northeasterly winds yielded catches above the median. Only 33.3 percent of the tows made during the east-southwesterly winds yielded catches above the median (Figure 25). This seems to show that wind direction has an effect upon catch of larval fish. It appears that westerly, west northwesterly and northwesterly, southeasterly and southerly winds move larval fish into the intake canal area. More information is needed before a definite relationship between wind direction and larval fish catches can be established.

An attempt was made to correlate extreme catches (either high or low) at Station 3 with wind velocity. Catches on days when wind velocity was 20 mph or more were compared with catches on days when winds were less than 20 mph. A chi-square test showed that there was no significant relationship between wind velocity and catches of larval fish.

SUMMARY OF CONCLUSIONS

White bass comprised more than 25 percent of all fish trap netted in 1974. White bass, carp, and drum comprised more than 64 percent of the 1974 total trap summer and fall net catch. 1974 trap net catches of white bass and carp were twice as high as 1973 catches. Walleye and sauger comprised only four percent of the 1974 total trap net catch.

Experimental night electro-fishing was done in 1974. Walleye, sauger, and white bass catches at night were about twice as high

Table 36 - Wind directions and larval fish catches for Tow #3, May 24 - August 19, 1974

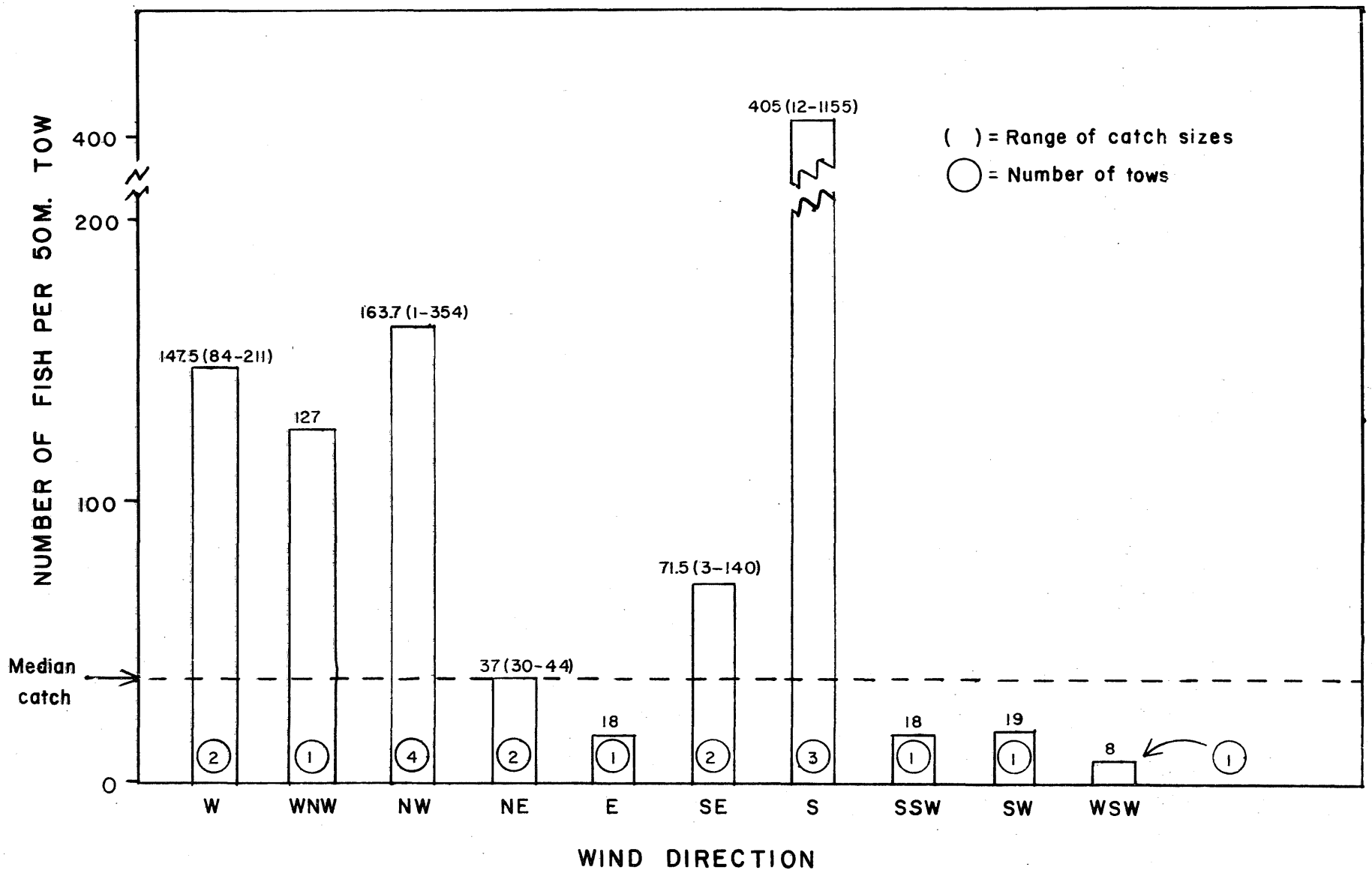
Wind from 270° -89° bearing (W, NW, N, NE)		Wind from 90°-269° bearing (E, SE, S, SW)	
Date	No./50M* Tow	Date	No./50M* Tow
5-24-74	1	6-4-74	48
6-10-74	44	6-28-74	12
6-17-74	21	7-2-74	3
6-24-74	30	7-8-74	140
7-15-74	84	8-2-74	1155
7-19-74	211	8-9-74	18
7-22-74	278	8-12-74	19
7-29-74	127	8-16-74	18
8-5-74	354	8-19-74	8

66.7% above median catch**

*Meter

**Median catch = $\frac{37 \text{ larval fish}}{50\text{M Tow}}$

FIGURE 25. TOW NET CATCHES AT STATION NO. 3 VS. WIND DIRECTION MAY 24–AUGUST 12, 1974.



as day catches. Fall 1974 net catches of carp were more than five times that of 1973 catches. Almost 50 percent of fishes caught trawling were drum.

Seining results indicate a greater richness of species and greater distribution of individuals among species in 1974 than in 1973.

Hile's Abundance Index will be used to compare year to year variations in combined catches of all types of gear. The longest upstream movement in 1974 was 108.23 km (67.25 miles) to Taylors Falls, Wisconsin by a white bass. The longest downstream movement in 1974 was 136.31 km (84.7 miles) to below Lock and Dam 6 at Trempealeau, Wisconsin by a channel catfish. Additional years of tagging may further substantiate trends in fish movement in the Prairie Island area.

The data from 1973 scale samples were used in age and growth computations. Length-weight relationships for the 1973 fish are directly proportional. An increase in growth from 1971 to 1972 was seen in walleye, sauger, white bass, and smallmouth bass. The deviations in growth for 1969-1970 are directly opposite for walleye and sauger.

Station 1-4 in Sturgeon Lake appears to be suitable for walleye and sauger spawning.

The intake bubbler did not effectively keep fish from the immediate plant intake.

Larval fish catches were highest during late July and early August. Movement of larval fish into the intake canal area may be caused by westerly, northerly, and northeasterly winds. A chi-square test showed no significant relationship between wind velocity and catches of larval fish.

CONDITIONS AND OBSERVATIONS TO BE INVESTIGATED

Trap net sets will be made for four consecutive days at three stations in each area in order to obtain more statistically valid data. Gill nets will be set for two consecutive days at each of four stations in North and Sturgeon Lakes and the plant area. Night electro-fishing should be conducted in all areas during the entire sampling season for 1975.

If possible, an updated SHAD program will be initiated when available from Iowa State University. Scale samples will be taken in summer and fall from walleye and sauger, and scale samples from other species will be taken in the fall.

A more continuous and extensive temperature study will be conducted in association with spawning. Electro-fishing will be used in an attempt to locate spawning areas in North and Sturgeon Lakes above the plant. Drift nets will be used to locate the source of larval fish that become available for entrainment into the plant. Entrainment studies in the Prairie Island vicinity will begin in 1975. An intake bubbler evaluation study is presently underway.

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Submitted by:

Robin L Naplin
Aquatic Biologist

Joseph L. Geis
Aquatic Biologist

Approved by:

Oliver M Jarvenpa, Chief
Environment Section
Division of Fish and Wildlife

Date: June 19, 1975

APPENDICES A through G

Appendix A - Common and scientific names and methods of capture of fish in the Prairie Island area, 1974

Common Name*	Scientific Name*	Method of Capture				
		Trap net	Gill net	Trawl	Electro-fishing	Seine
Silver lamprey	Ichthyomyzon unicuspis	x			x	
Chestnut lamprey**	Ichthyomyzon castaneus**					
Lake sturgeon***	Acipenser flavescens***					
Shortnose gar	Lepisosteus platostomus	x	x	x	x	x
Longnose gar	Lepisosteus osseus	x	x		x	
Bowfin	Amia calva	x	x		x	
Mooneye	Hiodon tergisus	x	x	x	x	
Goldeye	Hiodon alosoides	x	x	x		
Gizzard shad	Dorosoma cepedianum	x	x	x	x	x
Bigmouth buffalo	Ictiobus cyprinellus	x	x	x	x	x
Smallmouth buffalo	Ictiobus bubalus	x	x	x	x	x
Carpsucker species	Carpoides species	x	x	x	x	x
White sucker	Catostomus commersoni	x	x		x	
Spotted sucker	Minytrema melanops	x				
Silver redhorse	Moxostoma anisurum	x			x	
Northern or Shorthead redhorse	Moxostoma macrolepidotum	x	x		x	x
River redhorse	Moxostoma carinatum	x				
Carp	Cyprinus carpio	x	x	x	x	x
Silver chub	Hybopsis storeriana			x	x	x
Pugnose minnow	Opsopoeodus emiliae			x	x	
Golden shiner	Notemigonus crysoleucas				x	
Common shiner	Notropis cornutus				x	x
Emerald shiner	Notropis atherinoides			x	x	x
Rosyface shiner	Notropis rubellus				x	x
Spotfin shiner	Notropis spilopterus				x	x
River shiner	Notropis blennius					x
Spottail shiner	Notropis hudsonius			x	x	x
Mimic shiner	Notropis volucellus					x
Blacknose shiner	Notropis heterolepis					x
Brassy minnow	Hybognathus hankonsoni					x
Silvery minnow	Hybognathus nuchalis				x	
Fathead minnow	Pimephales promelas				x	
Bullhead minnow	Pimephales vigilax			x	x	x
Bluntnose minnow	Pimephales notatus				x	x
Channel catfish	Ictalurus punctatus	x	x	x	x	x
Black bullhead	Ictalurus melas	x	x			
Brown bullhead	Ictalurus nebulosus	x	x			
Yellow bullhead	Ictalurus natalis	x	x			x

Appendix A Cont.- Common and scientific names and methods of capture of fish in the Prairie Island area, 1974 (Con't.)

Common Name*	Scientific Name*	Method of Capture				
		Trap net	Gill net	Trawl	Electro-fishing	Seine
Flathead catfish	Pylodictis olivaris	x			x	
Tadpole madtom	Noturus gyrinus					
Northern pike	Esox lucius	x	x		x	x
American eel	Anguilla rostrata	x				
Trout perch	Percopsis omiscomaycus			x		x
White bass	Morone chrysops	x	x	x	x	x
Yellow perch	Perca flavescens	x	x	x	x	x
Sauger	Stizostedion canadense	x	x	x	x	x
Walleye	Stizostedion vitreum	x	x	x	x	
Log perch	Percina caprodes				x	x
Johnny darter	Etheostoma nigrum					x
Smallmouth bass	Micropterus dolomieui	x	x		x	x
Largemouth bass	Micropterus salmoides	x			x	
Green sunfish	Lepomis cyanellus				x	x
Pumpkinseed	Lepomis gibbosus			x	x	
Bluegill	Lepomis macrochirus	x	x		x	x
Hybrid sunfish	Lepomis macrochirus X?				x	
Rock bass	Ambloplites rupestris	x	x		x	x
White crappie	Promoxis annularis	x	x	x	x	x
Black crappie	Promoxis nigromaculatus	x	x	x	x	x
Freshwater drum	Aplodinotus grunniens	x	x	x	x	x
Burbot	Lota lota	x			x	

*Common and scientific names according to Accepted Common and Scientific Names in American Fisheries Society's Special Publication No. 6 (1970)

**Captured in the trash basket in the plant screen house

***Caught by a commerical fisherman

Appendix B. Summary of trap net catches by area, spring.

Species	Above Plant No.	Above Plant Catch/Lift for 20 lifts	Plant Area No.	Plant Area Catch/Lift for 10 lifts	Below Lock & Dam 3 No.	Below Lock & Dam 3 Catch/Lift for 10 lifts
Silver lamprey	-	-	-	-	-	-
Shortnose gar	20	1.00	2	0.20	-	-
Longnose gar	21	1.05	-	-	-	-
Bowfin	2	0.10	-	-	-	-
Mooneye	2	0.10	-	-	-	-
Goldeye	-	-	-	-	-	-
Gizzard shad	2	0.10	-	-	-	-
Bigmouth buffalo	4	0.20	1	0.10	-	-
Smallmouth buffalo	1	0.05	-	-	-	-
Carpsucker spp.	4	0.20	-	-	1	0.10
White sucker	2	0.10	2	0.20	-	-
Spotted sucker	-	-	-	-	-	-
Silver redhorse	5	0.25	1	0.10	-	-
Shorthead redhorse	39	1.95	17	1.70	2	0.20
River redhorse	1	0.05	-	-	-	-
Carp	132	6.60	70	7.00	69	6.90
Channel catfish	1	0.05	-	-	1	0.10
Black bullhead	1	0.05	1	0.10	-	-
Brown bullhead	-	-	-	-	-	-
Yellow bullhead	-	-	-	-	-	-
Flathead catfish	-	-	1	0.10	1	0.10
Northern pike	40	2.00	-	-	1	0.10
American eel	-	-	-	-	-	-
White bass	217	10.85	30	3.00	64	6.40
Yellow perch	-	-	1	0.10	-	-
Sauger	26	1.30	5	0.50	2	0.20
Walleye	10	0.50	3	0.30	2	0.20
Smallmouth bass	-	-	-	-	-	-
Largemouth bass	-	-	-	-	-	-
Bluegill	1	0.05	1	0.10	1	0.10
Rock bass	2	0.10	3	0.30	5	0.50
White crappie	1	0.05	5	0.50	1	0.10
Black crappie	22	1.10	-	-	5	0.50
Freshwater drum	67	3.35	70	7.00	148	14.80
Burbot	-	-	-	-	1	0.10

Appendix B. (Cont.) Summary of trap net catches by area, summer.

Species	Above Plant No.	Above Plant Catch/Lift for 20 Lifts	Plant Area No.	Plant Area Catch/Lift for 10 Lifts	Below Lock & Dam 3 No.	Below Lock & Dam 3 Catch/Lift for 10 Lifts
Silver lamprey	-	-	1	0.10	-	-
Shortnose gar	41	2.05	6	0.60	3	0.30
Longnose gar	4	0.20	1	0.10	-	-
Bowfin	8	0.40	-	-	3	0.30
Mooneye	4	0.20	1	0.10	-	-
Goldeye	1	0.05	-	-	-	-
Gizzard shad	1	0.05	-	-	-	-
Bigmouth buffalo	2	0.10	-	-	-	-
Smallmouth buffalo	-	-	-	-	2	0.20
Carpsucker spp.	13	0.65	2	0.20	-	-
White sucker	3	0.15	-	-	2	0.20
Spotted sucker	-	-	-	-	-	-
Silver redhorse	11	0.55	-	-	-	-
Shorthead redhorse	100	5.00	29	2.90	8	0.80
River redhorse	-	-	-	--	-	-
Carp	152	7.60	81	8.10	65	6.50
Channel catfish	1	0.05	2	0.20	-	-
Black bullhead	-	-	2	0.20	-	-
Brown bullhead	-	-	1	0.10	-	-
Yellow bullhead	-	-	-	-	-	-
Flathead catfish	1	0.05	-	-	-	-
Northern pike	36	1.80	5	0.50	23	2.30
American eel	1	0.05	-	-	1	0.10
White bass	146	7.30	12	1.20	24	2.40
Yellow perch	-	-	-	-	-	-
Sauger	23	1.15	-	-	3	0.30
Walleye	11	0.55	1	0.10	2	0.20
Smallmouth bass	-	-	1	0.10	-	-
Largemouth bass	-	-	-	-	1	0.10
Bluegill	10	0.50	2	0.20	1	0.10
Rock bass	6	0.30	3	0.30	-	-
White crappie	4	0.20	6	0.60	2	0.20
Black crappie	55	2.75	2	0.20	13	1.30
Freshwater drum	107	5.35	110	11.00	27	2.70
Burbot	-	-	-	-	-	-

Appendix B. (Cont.) Summary of trap net catches by area, fall.

Species	Above Plant No.	Above Plant Catch/Lift for 20 Lifts	Plant Area No.	Plant Area Catch/Lift for 10 Lifts	Below Lock & Dam 3 No.	Below Lock & Dam 3 Catch/Lift for 10 Lifts
Silver lamprey	-	-	-	-	-	-
Shortnose gar	58	2.90	1	0.10	1	0.10
Longnose gar	-	-	-	-	1	0.10
Bowfin	1	0.05	-	-	-	-
Mooneye	1	0.05	-	-	-	-
Goldeye	-	-	-	-	-	-
Gizzard shad	1	0.05	-	-	-	-
Bigmouth buffalo	8	0.40	-	-	-	-
Smallmouth buffalo	2	0.10	1	0.10	-	-
Carpsucker spp.	4	0.20	1	0.10	-	-
White sucker	1	0.05	-	-	2	0.20
Spotted sucker	-	-	-	-	1	0.10
Silver redhorse	4	0.20	-	-	1	0.10
Shorthead redhorse	66	3.30	13	1.30	1	0.10
River redhorse	-	-	-	-	-	-
Carp	64	3.20	64	6.40	50	5.00
Channel catfish	-	-	-	-	-	-
Black bullhead	1	0.05	7	0.70	-	-
Brown bullhead	-	-	1	0.10	-	-
Yellow bullhead	-	-	1	0.10	-	-
Flathead catfish	2	0.10	-	-	1	0.10
Northern pike	15	0.75	1	0.10	1	0.10
American eel	-	-	-	-	-	-
White bass	315	15.75	47	4.70	23	2.30
Yellow perch	-	-	-	-	-	-
Sauger	22	1.10	7	0.70	9	0.90
Walleye	8	0.40	-	-	4	0.40
Smallmouth bass	1	0.05	-	-	-	-
Largemouth bass	-	-	-	-	-	-
Bluegill	29	1.45	19	1.90	12	1.20
Rock bass	3	0.15	4	0.40	-	-
White crappie	5	0.25	2	0.20	2	0.20
Black crappie	25	1.25	19	1.90	62	6.20
Freshwater drum	28	1.40	21	2.10	31	3.10
Burbot	-	-	-	-	1	0.10

Appendix B Cont. - Length-frequency of fishes caught in trap nets, spring

Total Length in Centimeters	Short-nose gar	Long-nose gar	Bowfin	Mooneye	Gizzard shad	Bigmouth buffalo	Small-mouth buffalo	Carp-sucker spp.	White sucker
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9									
8.0 - 9.9									
10.0 - 11.9									
12.0 - 13.9									
14.0 - 15.9									
16.0 - 17.9								1	
18.0 - 19.9									
20.0 - 21.9									
22.0 - 23.9									
24.0 - 25.9								1	
26.0 - 27.9									
28.0 - 29.9					1				
30.0 - 31.9									
32.0 - 33.9				2					
34.0 - 35.9									
36.0 - 37.9									
38.0 - 39.9					1	1			
40.0 - 44.9						1		2	2
45.0 - 49.9						1	1		2
50.0 - 54.9	3							1	
55.0 - 59.9	8					2			
60.0 - 64.9	8								
65.0 - 69.9	3								
70.0 - 74.9		13	2						
75.0 - 79.9		4							
80.0 - 84.9		3							
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9		1							
100.0 - +									
Adults not meas.									
Total = Y/Y+A	22	21	2	2	2	5	1	5	4

Appendix B Cont. - **Length-frequency of fishes caught in** trap nets, spring (Cont.)

Total Length in Centimeters	Silver red-horse	Short-head redhorse	Carp	Channel Catfish	Black Bullhead	Flat-head catfish	Northern pike	White bass	Yellow perch
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9									
8.0 - 9.9									
10.0 - 11.9									
12.0 - 13.9									
14.0 - 15.9									
16.0 - 17.9									
18.0 - 19.9			3						
20.0 - 21.9			4						1
22.0 - 23.9								1	
24.0 - 25.9								5	
26.0 - 27.9		2	4		1			6	
28.0 - 29.9		1	1					7	
30.0 - 31.9		1	7					43	
32.0 - 33.9		6	5	1				75	
34.0 - 35.9		8	7					81	
36.0 - 37.9		10	10					47	
38.0 - 39.9		5	9			1		28	
40.0 - 44.9		17	39	1			3	7	
45.0 - 49.9		8	66			1	2	3	
50.0 - 54.9	3	1	55				4		
55.0 - 59.9	2		40				2		
60.0 - 64.9	1		14				14		
65.0 - 69.9			3						
70.0 - 74.9			2				4		
75.0 - 79.9							4		
80.0 - 84.9							2		
85.0 - 89.9							2		
90.0 - 94.9							3		
95.0 - 99.9							1		
100.0 - +									
Adults not meas.		1	2		1			12	
Total = Y/Y+A	6	60	271	2	2	2	41	315	1

Appendix B Cont. - Length-frequency of fishes caught in trap nets, spring (Cont.)

Total Length in Centimeters	Sauger	Walleye	Bluegill	Rock bass	White crappie	Black crappie	Fresh-water drum	Burbot	
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9									
8.0 - 9.9									
10.0 - 11.9									
12.0 - 13.9				1					
14.0 - 15.9			1	1		1			
16.0 - 17.9				3		6			
18.0 - 19.9				3		2	1		
20.0 - 21.9			2	1	3		1		
22.0 - 23.9						3	17		
24.0 - 25.9						3	30		
26.0 - 27.9						7	46		
28.0 - 29.9	2				2	3	40		
30.0 - 31.9	10				2	2	41		
32.0 - 33.9	7	2					26	1	
34.0 - 35.9	4	1					37		
36.0 - 37.9	3						27		
38.0 - 39.9	3						13		
40.0 - 44.9	3	1					5		
45.0 - 49.9	1	5							
50.0 - 54.9		5					1		
55.0 - 59.9		1							
60.0 - 64.9									
65.0 - 69.9									
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Adults not meas.				1					
Total = Y/Y+A	33	15	3	10	7	27	285	1	

Appendix B Cont. - Length-frequency of fishes caught in trap nets, summer

Total Length in Centimeters	Silver lamprey	Short-nose gar	Long-nose gar	Bowfin	Mooneye	Goldeye	Gizzard shad	Big-mouth buffalo	Carp-sucker spp.
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9									
8.0 - 9.9									
10.0 - 11.9									
12.0 - 13.9									
14.0 - 15.9									4
16.0 - 17.9									3
18.0 - 19.9									
20.0 - 21.9									3
22.0 - 23.9									
24.0 - 25.9									
26.0 - 27.9									
28.0 - 29.9									
30.0 - 31.9					2				
32.0 - 33.9					2				
34.0 - 35.9		1			1				
36.0 - 37.9						1			
38.0 - 39.9									
40.0 - 44.9							1		3
45.0 - 49.9		1		2				2	
50.0 - 54.9		8		1					
55.0 - 59.9		24		3					2
60.0 - 64.9		14		4					
65.0 - 69.9		2							
70.0 - 74.9		1	3	1					
75.0 - 79.9			1						
80.0 - 84.9									
85.0 - 89.9			1						
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Adults not meas.	1	1							
Total = Y/Y+A	1	52	5	11	5	1	1	2	15

Appendix B Cont. - Length-frequency of fishes caught in trap nets, summer (Cont.)

Total Length in Centimeters	American eel	White bass	Sauger	Walleye	Small-mouth bass	Large-mouth bass	Bluegill	Rock bass	White crappie
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9									
8.0 - 9.9									
10.0 - 11.9									
12.0 - 13.9									
14.0 - 15.9							2	5	4
16.0 - 17.9		6					4	4	2
18.0 - 19.9		3				1	4		
20.0 - 21.9		2					3		
22.0 - 23.9		2			1				
24.0 - 25.9				1	1				3
26.0 - 27.9		7			1				1
28.0 - 29.9		5							1
30.0 - 31.9		10	2	1					1
32.0 - 33.9		39	6						
34.0 - 35.9		63	4						
36.0 - 37.9		33	6						
38.0 - 39.9		10	2						
40.0 - 44.9		2	5	1					
45.0 - 49.9				3					
50.0 - 54.9				1					
55.0 - 59.9				1					
60.0 - 64.9				3					
65.0 - 69.9									
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9	1								
95.0 - 99.9	1								
100.0 - +									
Adults not meas.			1						
Total = Y/Y+A	2	182	26	14	3	1	13	9	12

Appendix B Cont. - Length-frequency of fishes caught in trap nets, summer (Cont.)

Total Length in Centimeters	White sucker	Silver redhorse	Short-head redhorse	Carp	Channel catfish	Black bullhead	Brown bullhead	Flat-head catfish	Northern pike
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9									
8.0 - 9.9									
10.0 - 11.9									
12.0 - 13.9									
14.0 - 15.9									
16.0 - 17.9									
18.0 - 19.9									
20.0 - 21.9			1	1			1		
22.0 - 23.9						1			
24.0 - 25.9				1		1			
26.0 - 27.9				5					
28.0 - 29.9			1	6					
30.0 - 31.9			7	26	1				
32.0 - 33.9			3	22	1				
34.0 - 35.9			16	25					
36.0 - 37.9			19	23					
38.0 - 39.9			15	7					
40.0 - 44.9	4		42	38	1				3
45.0 - 49.9	1		33	61					5
50.0 - 54.9		6		47				1	16
55.0 - 59.9		4		22					16
60.0 - 64.9		1		8					10
65.0 - 69.9				3					6
70.0 - 74.9				1					2
75.0 - 79.9									3
80.0 - 84.9									
85.0 - 89.9									1
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Adults not meas.				2					2
Total = Y/Y+A	5	11	137	298	3	2	1	1	64

Appendix B Cont. - Length- frequency of fishes caught in trap nets, summer (Cont.)

Total Length in Centimeters	Black crappie	Fresh-water drum							
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9									
8.0 - 9.9									
10.0 - 11.9	1								
12.0 - 13.9	7								
14.0 - 15.9									
16.0 - 17.9	21	13							
18.0 - 19.9	22	2							
20.0 - 21.9	4	5							
22.0 - 23.9	3	14							
24.0 - 25.9	3	36							
26.0 - 27.9	6	44							
28.0 - 29.9	2	49							
30.0 - 31.9	1	26							
32.0 - 33.9		25							
34.0 - 35.9		17							
36.0 - 37.9		5							
38.0 - 39.9		3							
40.0 - 44.9		4							
45.0 - 49.9		1							
50.0 - 54.9									
55.0 - 59.9									
60.0 - 64.9									
65.0 - 69.9									
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Adults not meas.									
Total = Y/Y+A	70	244							

Appendix B Cont. - Length-frequency of fishes caught in trap nets, fall

Total Length in Centimeters	Short-nose gar	Long-nose gar	Bowfin	Mooneye	Gizzard shad	Big-mouth buffalo	Small-mouth buffalo	Carp-sucker spp.	White sucker
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9									
8.0 - 9.9									
10.0 - 11.9									
12.0 - 13.9									
14.0 - 15.9									
16.0 - 17.9									
18.0 - 19.9									
20.0 - 21.9									
22.0 - 23.9									
24.0 - 25.9							1	1	
26.0 - 27.9							1		
28.0 - 29.9								1	
30.0 - 31.9					1				
32.0 - 33.9				1					
34.0 - 35.9									1
36.0 - 37.9							1		
38.0 - 39.9									
40.0 - 44.9						3			1
45.0 - 49.9								1	1
50.0 - 54.9	8	1				4		1	
55.0 - 59.9	29		1			1		1	
60.0 - 64.9	18								
65.0 - 69.9	3								
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Adults not meas.	1								
Total = Y/Y+A	59	1	1	1	1	8	3	5	3

Appendix B Cont. - Length-frequency of fishes caught in trap nets, fall (Cont.)

Total Length in Centimeters	Spotted sucker	Silver redhorse	Short-head redhorse	Carp	Black bullhead	Brown bullhead	Yellow bullhead	Flathead catfish	Northern pike
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9									
8.0 - 9.9									
10.0 - 11.9									
12.0 - 13.9									
14.0 - 15.9									
16.0 - 17.9									
18.0 - 19.9					1				
20.0 - 21.9									
22.0 - 23.9					1				
24.0 - 25.9				1	2				
26.0 - 27.9				2	3				
28.0 - 29.9				2	1	1			
30.0 - 31.9			1	6			1		
32.0 - 33.9			1	15					
34.0 - 35.9			2	16					
36.0 - 37.9			6	12					
38.0 - 39.9	1		15	9					
40.0 - 44.9			24	37				1	
45.0 - 49.9		1	27	33				1	1
50.0 - 54.9		3	4	23					1
55.0 - 59.9				14					
60.0 - 64.9		1		3				1	5
65.0 - 69.9				5					4
70.0 - 74.9									2
75.0 - 79.9									1
80.0 - 84.9									
85.0 - 89.9									1
90.0 - 94.9									
95.0 - 99.9									1
100.0 - +									
Adults not meas.									1
Total = Y/Y+A	1	5	80	178	8	1	1	3	17

Appendix B Cont. - Length-frequency of fishes caught in trap nets, fall (Cont.)

Total Length in Centimeters	White bass	Sauger	Walleye	Small-mouth bass	Bluegill	Rock bass	White crappie	Black crappie	Fresh-water drum
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9									
8.0 - 9.9									
10.0 - 11.9					3				
12.0 - 13.9					37			2	
14.0 - 15.9	1				8	4		32	
16.0 - 17.9					7	1	4	12	1
18.0 - 19.9	1				2	2	2	10	15
20.0 - 21.9	27				2		1	17	12
22.0 - 23.9	37			1				18	6
24.0 - 25.9	12						1	4	4
26.0 - 27.9	1	1						4	4
28.0 - 29.9	5	1	2					2	12
30.0 - 31.9	9	2	1				1	3	6
32.0 - 33.9	46	6							4
34.0 - 35.9	113	7							8
36.0 - 37.9	87	5							2
38.0 - 39.9	31	5	1						5
40.0 - 44.9	10	7	2						
45.0 - 49.9		4	2						
50.0 - 54.9			2						
55.0 - 59.9			2						1
60.0 - 64.9									
65.0 - 69.9									
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Adults not meas.	5				1			2	
Total = Y/Y+A	385	38	12	1	60	7	9	106	80

Appendix B Cont. - Length-frequency of fishes caught in trap nets, fall (Cont.)

Total Length in Centimeters	Burbot								
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9									
8.0 - 9.9									
10.0 - 11.9									
12.0 - 13.9									
14.0 - 15.9									
16.0 - 17.9									
18.0 - 19.9									
20.0 - 21.9									
22.0 - 23.9									
24.0 - 25.9									
26.0 - 27.9									
28.0 - 29.9									
30.0 - 31.9									
32.0 - 33.9									
34.0 - 35.9									
36.0 - 37.9									
38.0 - 39.9									
40.0 - 44.9	1								
45.0 - 49.9									
50.0 - 54.9									
55.0 - 59.9									
60.0 - 64.9									
65.0 - 69.9									
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Adults not meas.									
Total = Y/Y+A	1								

Appendix C - Summary of day electro-fishing catches by area, spring

Species	Above Plant		Plant Area		Below Lock & Dam 3	
	No.	Catch/Hour (7.5 Hours)	No.	Catch/Hour (2.5 Hours)	No.	Catch/Hour (2.5 Hours)
Silver lamprey	-	-	-	-	-	-
Shortnose gar	2	0.27	-	-	-	-
Longnose gar	-	-	-	-	-	-
Bowfin	1	0.13	-	-	-	-
Mooneye	3	0.40	-	-	-	-
Goldeye	-	-	-	-	-	-
Gizzard shad	-	-	1	0.40	-	-
Bigmouth buffalo	3	0.40	2	0.80	4	1.60
Smallmouth buffalo	-	-	-	-	1	0.40
Carpsucker spp.	62	8.27	3	1.20	1	0.40
White sucker	-	-	-	-	2	0.80
Silver redhorse	2	0.27	-	-	1	0.40
Shorthead redhorse	53	7.07	17	6.80	24	9.60
Carp	214	28.53	152	60.80	73	29.20
Silver chub	24	3.20	2	0.80	-	-
Pugnose minnow	-	-	-	-	-	-
Golden minnow	-	-	1	0.40	-	-
Common shiner	-	-	-	-	-	-
Emerald shiner	28	3.73	-	-	2	0.80
Rosyface shiner	10	1.33	-	-	2	0.80
Spotfin shiner	-	-	-	-	-	-
Spottail shiner	-	-	1	0.40	-	-
Silvery minnow	-	-	-	-	-	-
Fathead minnow	-	-	-	-	-	-
Bullhead minnow	1	0.13	-	-	-	-
Bluntnose minnow	3	0.40	-	-	-	-
Channel catfish	6	0.80	4	1.60	1	0.40
Flathead catfish	-	-	-	-	-	-
Northern pike	5	0.67	1	0.40	5	2.00
White bass	76	10.13	12	4.80	97	38.80
Yellow perch	3	0.40	-	-	-	-
Sauger	36	4.80	8	3.20	30	12.00
Walleye	7	0.93	1	0.40	17	6.80
Log perch	-	-	-	-	-	-
Smallmouth bass	20	2.67	3	1.20	9	3.60
Largemouth bass	-	-	1	0.40	-	-
Green sunfish	2	0.27	-	-	-	-
Pumpkinseed	-	-	3	1.20	-	-
Bluegill	15	2.00	5	2.00	17	6.80
Hybrid sunfish	-	-	-	-	-	-
Rock bass	17	2.27	8	3.20	45	18.00
White crappie	-	-	-	-	1	0.40
Black crappie	2	0.27	1	0.40	6	2.40
Freshwater drum	68	9.07	11	4.40	25	10.00
Burbot	-	-	-	-	-	-

Appendix C Cont.- Summary of day electro-fishing catches by area, summer

	Above Plant		Plant Area		Below Lock & Dam 3	
	No.	Catch/Hour (7.5 Hours)	No.	Catch/Hour (2.5 Hours)	No.	Catch/Hour (2.5 Hours)
Silver lamprey	-	-	-	-	-	-
Shortnose gar	-	-	3	1.20	-	-
Longnose gar	-	-	1	0.40	-	-
Bowfin	2	0.27	-	-	-	-
Mooneye	-	-	-	-	1	0.40
Goldeye	-	-	-	-	-	-
Gizzard shad	140	18.67	152	60.80	54	21.60
Bigmouth buffalo	1	0.13	1	0.40	5	2.00
Smallmouth buffalo	2	0.27	6	2.40	1	0.40
Carpsucker spp.	27	3.60	7	2.80	4	1.60
White sucker	-	-	-	-	-	-
Silver redhorse	-	-	-	-	-	-
Shorthead redhorse	23	3.07	18	7.20	20	8.00
Carp	139	18.53	121	48.40	67	26.80
Silver chub	19	2.53	5	2.00	2	0.80
Pugnose minnow	-	-	-	-	-	-
Golden minnow	-	-	-	-	-	-
Common shiner	-	-	-	-	-	-
Emerald shiner	25	3.33	2	0.80	16	6.40
Rosyface shiner	8	1.07	8	3.20	4	1.60
Spotfin shiner	-	-	-	-	-	-
Spottail shiner	4	0.53	-	-	-	-
Silvery minnow	-	-	-	-	-	-
Fathead minnow	-	-	1	0.40	-	-
Bullhead minnow	2	0.27	2	0.80	-	-
Bluntnose minnow	-	-	-	-	-	-
Channel catfish	4	0.53	24	9.60	4	1.60
Flathead catfish	1	0.13	2	0.80	1	0.40
Northern pike	2	0.27	-	-	4	1.60
White bass	69	9.20	96	38.40	112	44.80
Yellow perch	8	1.07	6	2.40	-	-
Sauger	32	4.27	18	7.20	25	10.00
Walleye	6	0.80	-	-	9	3.60
Log perch	5	0.67	5	2.00	3	1.20
Smallmouth bass	27	3.60	21	8.40	27	10.80
Largemouth bass	-	-	1	0.40	5	2.00
Green sunfish	1	0.13	41	16.40	3	1.20
Pumpkinseed	-	-	-	-	-	-
Bluegill	25	3.33	252	100.80	202	80.80
Hybrid sunfish	-	-	3	1.20	3	1.20
Rock bass	2	0.27	54	21.60	34	13.60
White crappie	-	-	1	0.40	-	-
Black crappie	4	0.53	11	4.40	6	2.40
Freshwater drum	76	10.13	76	30.40	12	4.80
Burbot	-	-	1	0.40	2	0.80

Appendix C Cont. - Summary of day electro-fishing catches by area, fall

Species	Above Plant		Plant Area		Below Lock & Dam 3	
	No.	Catch/Hour (7.5 Hours)	No.	Catch/Hour (2.5 Hours)	No.	Catch/Hour (2.5 Hours)
Silver lamprey	-	-	-	-	2	0.80
Shortnose gar	3	0.40	-	-	-	-
Longnose gar	1	0.13	-	-	-	-
Bowfin	-	-	-	-	-	-
Mooneye	2	0.27	-	-	-	-
Goldeye	-	-	-	-	-	-
Gizzard shad	540	72.00	388	152.20	100	40.00
Bigmouth buffalo	-	-	-	-	-	-
Smallmouth buffalo	-	-	-	-	-	-
Carpsucker spp.	9	1.20	-	-	-	-
White sucker	2	0.27	-	-	1	0.40
Silver redhorse	-	-	-	-	-	-
Shorthead redhorse	11	1.47	6	2.40	7	2.80
Carp	96	12.80	35	14.00	181	72.40
Silver chub	25	3.33	6	2.40	2	0.80
Pugnose minnow	3	0.40	-	-	-	-
Golden minnow	-	-	-	-	-	-
Common shiner	1	0.13	-	-	-	-
Emerald shiner	6	0.80	1	0.40	2	0.80
Rosyface shiner	3	0.40	3	1.20	-	-
Spotfin shiner	1	0.13	-	-	-	-
Spottail shiner	16	2.13	4	1.60	1	0.40
Silvery minnow	1	0.13	-	-	-	-
Fathead minnow	-	-	-	-	-	-
Bullhead minnow	3	0.40	10	4.00	-	-
Bluntnose minnow	2	0.27	-	-	-	-
Channel catfish	2	0.27	1	0.40	4	1.60
Flathead catfish	-	-	1	0.40	-	-
Northern pike	4	0.53	-	-	5	2.00
White bass	47	6.27	16	6.40	41	16.40
Yellow perch	7	0.93	3	1.20	1	0.40
Sauger	7	0.93	2	0.80	8	3.20
Walleye	15	2.00	2	0.80	15	6.00
Log perch	4	0.53	1	0.40	1	0.40
Smallmouth bass	36	4.80	11	4.40	14	5.60
Largemouth bass	-	-	6	2.40	25	10.00
Green sunfish	11	1.47	50	20.00	9	3.60
Pumpkinseed	-	-	-	-	-	-
Bluegill	52	6.93	342	136.80	275	110.00
Hybrid sunfish	1	0.13	8	3.20	1	0.40
Rock bass	9	1.20	52	20.80	14	5.60
White crappie	12	1.60	12	4.80	-	-
Black crappie	16	2.13	9	3.60	14	5.60
Freshwater drum	47	6.27	4	1.60	2	0.80
Burbot	-	-	-	-	-	-

Appendix C. Cont.- Day electro-fishing catches from selected stations by area, fall

Species	Above Plant		Plant Area		Tailwaters Lock & Dam 3	
	No.	Catch/Hour (5 Hours)	No.	Catch/Hour (1.25 Hours)	No.	Catch/Hour (1.25 Hours)
Silver lamprey	-	-	-	-	-	-
Shortnose gar	3	0.60	-	-	-	-
Longnose gar	1	0.20	-	-	-	-
Bowfin	-	-	-	-	-	-
Mooneye	1	0.20	-	-	-	-
Goldeye	-	-	-	-	-	-
Gizzard shad	386	77.20	252	201.60	22	17.60
Bigmouth buffalo	-	-	-	-	-	-
Smallmouth buffalo	-	-	-	-	-	-
Carpsucker spp.	5	1.00	-	-	-	-
White sucker	2	0.40	-	-	-	-
Silver redhorse	-	-	-	-	-	-
Shorthead redhorse	9	1.80	3	2.40	3	2.40
Carp	69	13.80	15	12.00	86	68.80
Silver chub	20	4.00	3	2.40	2	1.60
Pugnose minnow	3	0.60	-	-	-	-
Golden shiner	-	-	-	-	-	-
Common shiner	1	0.20	-	-	-	-
Emerald shiner	5	1.00	-	-	-	-
Rosyface shiner	3	0.60	2	1.60	-	-
Spotfin shiner	1	0.20	-	-	-	-
Spottail shiner	5	1.00	1	0.80	1	0.80
Silvery minnow	-	-	-	-	-	-
Fathead minnow	-	-	-	-	-	-
Bullhead minnow	3	0.60	4	3.20	-	-
Bluntnose minnow	2	0.40	-	-	-	-
Channel catfish	2	0.40	1	0.80	1	0.80
Flathead catfish	-	-	-	-	3	2.40
Northern pike	2	0.40	-	-	-	-
Trout perch	-	-	-	-	-	-
White bass	23	4.60	3	2.40	23	18.40
Yellow perch	4	0.80	2	1.60	1	0.80
Sauger	3	0.60	2	1.60	8	6.40
Walleye	12	2.40	1	0.80	10	8.00
Log perch	4	0.80	1	0.80	-	-
Smallmouth bass	34	6.80	6	4.80	9	7.20
Largemouth bass	-	-	1	0.80	7	5.60
Green sunfish	1	0.20	17	13.60	3	2.40
Pumpkinseed	-	-	-	-	-	-
Bluegill	2	0.40	144	115.20	62	49.60
Hybrid sunfish	-	-	1	0.80	-	-
Rock bass	5	1.00	17	13.60	1	0.80
White crappie	1	0.20	1	0.80	-	-
Black crappie	6	1.20	3	2.40	5	4.00
Freshwater drum	24	4.80	1	0.80	1	0.80
Burbot	-	-	-	-	-	-

Appendix C Cont.- Night electro-fishing catches from selected stations by area, fall

Species	Above Plant		Plant Area		Below Lock & Dam 3	
	No.	Catch/Hour (5 Hours)	No.	Catch/Hour (1.25 Hours)	No.	Catch/Hour (1.17 Hours)
Silver lamprey	-	-	-	-	-	-
Shortnose gar	-	-	-	-	-	-
Longnose gar	-	-	-	-	-	-
Bowfin	1	0.20	-	-	-	-
Mooneye	6	1.20	1	0.80	2	1.71
Goldeye	-	-	-	-	-	-
Gizzard shad	116	23.20	97	77.60	1	0.86
Bigmouth buffalo	1	0.20	1	0.80	-	-
Smallmouth buffalo	1	0.20	-	-	-	-
Carpsucker spp.	19	3.80	3	2.40	16	13.71
White sucker	-	-	-	-	2	1.71
Silver redhorse	1	0.20	-	-	2	1.71
Shorthead redhorse	21	4.20	5	4.00	29	24.85
Carp	74	14.80	31	24.80	37	31.70
Silver chub	98	19.60	6	4.80	45	38.56
Pugnose minnow	-	-	-	-	-	-
Golden shiner	-	-	-	-	-	-
Common shiner	-	-	-	-	-	-
Emerald shiner	2	0.40	1	0.80	-	-
Rosyface shiner	7	1.40	2	1.60	3	2.57
Spotfin shiner	-	-	-	-	-	-
Spottail shiner	16	3.20	-	-	-	-
Silvery minnow	-	-	-	-	-	-
Fathead minnow	-	-	-	-	-	-
Bullhead minnow	3	0.60	1	0.80	-	-
Bluntnose minnow	-	-	-	-	-	-
Channel catfish	6	1.20	1	0.80	1	0.86
Flathead catfish	-	-	-	-	-	-
Northern pike	-	-	-	-	3	2.57
Trout perch	1	0.20	-	-	-	-
White bass	100	20.00	40	32.00	59	50.56
Yellow perch	4	0.80	1	0.80	-	-
Sauger	18	3.60	5	4.00	99	84.83
Walleye	30	6.00	3	2.40	23	19.71
Log perch	1	0.20	-	-	-	-
Smallmouth bass	3	0.60	3	2.40	-	-
Largemouth bass	-	-	-	-	1	0.86
Green sunfish	3	0.60	-	-	-	-
Pumpkinseed	-	-	-	-	-	-
Bluegill	3	0.60	46	36.80	10	8.57
Hybrid sunfish	-	-	-	-	-	-
Rock bass	1	0.20	3	2.40	3	2.57
White crappie	-	-	-	-	-	-
Black crappie	-	-	2	1.60	5	4.28
Freshwater drum	85	17.00	5	4.00	17	14.57
Burbot	-	-	-	-	-	-

Appendix C Cont. - Length-frequency of fishes caught by day electro-fishing, spring

Total Length in Centimeters	Short-nose gar	Bowfin	Mooneye	Gizzard shad	Big-mouth buffalo	Small-mouth buffalo	Carp-sucker spp.	White sucker	Silver redhorse
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9									
8.0 - 9.9							2		
10.0 - 11.9							9		
12.0 - 13.9							13		
14.0 - 15.9							13		
16.0 - 17.9							14		
18.0 - 19.9							4		
20.0 - 21.9							1		
22.0 - 23.9									
24.0 - 25.9									
26.0 - 27.9							1		
28.0 - 29.9						1			
30.0 - 31.9			2	1					
32.0 - 33.9									
34.0 - 35.9			1		1				
36.0 - 37.9									
38.0 - 39.9					1		2		1
40.0 - 44.9							2	2	1
45.0 - 49.9					3				
50.0 - 54.9							2		
55.0 - 59.9		1							
60.0 - 64.9	1						1		1
65.0 - 69.9	1								
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Adults not meas.							2		
Total = Y/Y+A	2	1	3	1	5	1	66	2	3

Appendix C Cont.- Length-frequency of fishes caught by day electro-fishing, spring (Con't.)

Total Length in Centimeters	Short-head redhorse	Carp	Silver chub	Golden shiner	Emerald shiner	Rosyface shiner	Spottail shiner	Bull-head minnow	Blunt-nose minnow
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9									
8.0 - 9.9									
10.0 - 11.9	8								
12.0 - 13.9	7								
14.0 - 15.9	14								
16.0 - 17.9	4	2							
18.0 - 19.9		3							
20.0 - 21.9		5							
22.0 - 23.9	2	4							
24.0 - 25.9	4	3							
26.0 - 27.9	3	11							
28.0 - 29.9	3	6							
30.0 - 31.9	5	9							
32.0 - 33.9	5	18							
34.0 - 35.9	2	9							
36.0 - 37.9	5	21							
38.0 - 39.9	8	46							
40.0 - 44.9	16	80							
45.0 - 49.9	6	104							
50.0 - 54.9	1	68							
55.0 - 59.9		34							
60.0 - 64.9		5							
65.0 - 69.9		1							
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Adults not meas.		1	26	1	30	12	1	1	3
Total = Y/Y+A	93	430	26	1	30	12	1	1	3

Appendix C Cont. - Length-frequency of fishes caught by day electro-fishing, spring (Cont.)

Total Length in Centimeters	Channel catfish	Northern pike	White bass	Yellow perch	Sauger	Walleye	Small-mouth bass	Large-mouth bass	Green sunfish
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9									1
8.0 - 9.9			4				1		1
10.0 - 11.9			32	1			5		
12.0 - 13.9			34	1			6		
14.0 - 15.9			24		7		2		
16.0 - 17.9			11		25				
18.0 - 19.9				1	14	3			
20.0 - 21.9			1		2	5	5		
22.0 - 23.9			2		4	2	2		
24.0 - 25.9					5	1	1		
26.0 - 27.9			4		4	1	3		
28.0 - 29.9			3		7	2	4		
30.0 - 31.9			10		2	1	2		
32.0 - 33.9	2		10		1	1			
34.0 - 35.9			20		1				
36.0 - 37.9	2		19		1	1	1		
38.0 - 39.9		1	9						
40.0 - 44.9	1		2			2			
45.0 - 49.9	3				1	2		1	
50.0 - 54.9	1	3				2			
55.0 - 59.9		5				1			
60.0 - 64.9	1	1				1			
65.0 - 69.9	1	1							
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Adults not meas.									
Total = Y/Y+A	11	11	185	3	74	25	32	1	2

Appendix C Cont. - Length-frequency of fishes caught by day electro-fishing, spring (Cont.)

Total Length in Centimeters	Pumpkinseed	Bluegill	Rock bass	White crappie	Black crappie	Freshwater drum			
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9	1	1	1						
6.0 - 7.9	1	4	10						
8.0 - 9.9		18	3		1	4			
10.0 - 11.9	1	6	11			15			
12.0 - 13.9		3	2			16			
14.0 - 15.9		2	12		1	12			
16.0 - 17.9		1	16		3	4			
18.0 - 19.9		2	11		2				
20.0 - 21.9			4		1	3			
22.0 - 23.9						4			
24.0 - 25.9						4			
26.0 - 27.9						8			
28.0 - 29.9				1		5			
30.0 - 31.9					1	2			
32.0 - 33.9						3			
34.0 - 35.9						4			
36.0 - 37.9									
38.0 - 39.9						7			
40.0 - 44.9						7			
45.0 - 49.9									
50.0 - 54.9									
55.0 - 59.9						2			
60.0 - 64.9									
65.0 - 69.9									
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Adults not meas.						4			
Total = Y/Y+A	3	37	70	1	9	104			

Appendix C Cont. - Length frequency of fishes caught by day electro-fishing, summer

Total Length in Centimeters	Short-nose gar	Long-nose gar	Bowfin	Mooneye	Gizzard shad	Bigmouth buffalo	Small-mouth buffalo	Carp-sucker spp.	Short-head redhorse
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9					10				
4.0 - 5.9					13			1	
6.0 - 7.9					31				3
8.0 - 9.9					44			4	
10.0 - 11.9				1	86				
12.0 - 13.9					61				
14.0 - 15.9					1			7	1
16.0 - 17.9								6	8
18.0 - 19.9								2	10
20.0 - 21.9								7	4
22.0 - 23.9					1		3	2	
24.0 - 25.9							3	5	
26.0 - 27.9							2		1
28.0 - 29.9		1							1
30.0 - 31.9									4
32.0 - 33.9								1	
34.0 - 35.9							1		5
36.0 - 37.9									3
38.0 - 39.9						3		1	4
40.0 - 44.9			1			4		1	12
45.0 - 49.9			1					1	4
50.0 - 54.9									
55.0 - 59.9	2								
60.0 - 64.9	1								
65.0 - 69.9									
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Adults not meas.					99				
Total = Y/Y+A	3	1	2	1	346	7	9	38	60

Appendix C Cont.- Length frequency of fishes caught by day electro-fishing, summer (Cont.)

Total Length in Centimeters	Northern pike	White bass	Yellow perch	Sauger	Walleye	Log-perch	Small-mouth bass	Large-mouth bass	Green sunfish
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									1
4.0 - 5.9		5	2						16
6.0 - 7.9		54	8				2		3
8.0 - 9.9		98		4			1		8
10.0 - 11.9		8		14	5		1	1	6
12.0 - 13.9			3	8			3		7
14.0 - 15.9		2		1			6		3
16.0 - 17.9		13		3			18		1
18.0 - 19.9		28		4			12		
20.0 - 21.9		24		11			2		
22.0 - 23.9		5		6	1		4	3	
24.0 - 25.9		2		3	1		6	1	
26.0 - 27.9				1			5	1	
28.0 - 29.9		1		2			2		
30.0 - 31.9		2		2			4		
32.0 - 33.9		4		1			4		
34.0 - 35.9		15		3			2		
36.0 - 37.9		11		1			2		
38.0 - 39.9		4		3					
40.0 - 44.9	1	1		5	1				
45.0 - 49.9				2	2				
50.0 - 54.9	3				3				
55.0 - 59.9	1								
60.0 - 64.9	1				1				
65.0 - 69.9					1				
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Adults not meas.			1	1		13	1		
Total = Y/Y+A	6	277	14	75	15	13	75	6	45

Appendix C Cont.- Length frequency of fishes caught by day electro-fishing, summer (Cont.)

Total Length in Centimeters	Carp	Silver chub	Emerald shiner	Rosyface shiner	Spot-tail shiner	Fathead minnow	Bullhead minnow	Channel catfish	Flathead catfish
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9	1								
4.0 - 5.9	2								
6.0 - 7.9									
8.0 - 9.9	4								
10.0 - 11.9	1								
12.0 - 13.9									
14.0 - 15.9									
16.0 - 17.9									1
18.0 - 19.9									
20.0 - 21.9									
22.0 - 23.9	1								
24.0 - 25.9	2								
26.0 - 27.9	6								
28.0 - 29.9	8								
30.0 - 31.9	17							2	1
32.0 - 33.9	12							3	
34.0 - 35.9	20							6	
36.0 - 37.9	21							4	
38.0 - 39.9	12							4	1
40.0 - 44.9	63							10	
45.0 - 49.9	90							1	
50.0 - 54.9	47							1	
55.0 - 59.9	14								
60.0 - 64.9	4							1	
65.0 - 69.9	1								
70.0 - 74.9	1								
75.0 - 79.9									1
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Adults not meas.		26	43	12	12	1	2		
Total = Y/Y+A	327	26	43	12	12	1	2	32	4

Appendix C Cont. - Length frequency of fishes caught by day electro-fishing, summer (Cont.)

Total Length in Centimeters	Bluegill	Hybrid sunfish	Rock bass	White crappie	Black crappie	Fresh-water drum	Burbot		
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9	43					1			
4.0 - 5.9	13		1		1	10			
6.0 - 7.9	36		6		1	47			
8.0 - 9.9	171	2	27			21			
10.0 - 11.9	236	3	13			2			
12.0 - 13.9	36	1	9		6				
14.0 - 15.9	24		14	1	5	7			
16.0 - 17.9	9		12			19			
18.0 - 19.9	4		5		3	13			
20.0 - 21.9			3		2	2	1		
22.0 - 23.9						1			
24.0 - 25.9					1	3			
26.0 - 27.9					2	12			
28.0 - 29.9						8	1		
30.0 - 31.9						2			
32.0 - 33.9									
34.0 - 35.9						2	1		
36.0 - 37.9						1			
38.0 - 39.9						2			
40.0 - 44.9						8			
45.0 - 49.9						2			
50.0 - 54.9						1			
55.0 - 59.9									
60.0 - 64.9									
65.0 - 69.9									
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Adults not meas.	7								
Total = Y/Y+A	579	6	90	1	21	164	3		

Appendix C Cont. - Length-frequency of fishes caught by day electro-fishing, fall

Total Length in Centimeters	Silver lamprey	Short-nose gar	Long-nose gar	Mooneye	Gizzard shad	Carp-sucker spp.	White sucker	Short-head redhorse	Carp
Y/Y not meas.					917				
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9					4				
8.0 - 9.9					34	2		5	
10.0 - 11.9					41			2	
12.0 - 13.9					20				
14.0 - 15.9					5		1		
16.0 - 17.9					3	1			
18.0 - 19.9							1	1	
20.0 - 21.9						1		2	
22.0 - 23.9								4	
24.0 - 25.9								1	
26.0 - 27.9						1			
28.0 - 29.9			1						1
30.0 - 31.9	1				2				2
32.0 - 33.9				2	2				2
34.0 - 35.9									5
36.0 - 37.9								4	9
38.0 - 39.9							1		7
40.0 - 44.9						2		3	35
45.0 - 49.9								2	84
50.0 - 54.9						2			86
55.0 - 59.9		2							51
60.0 - 64.9									24
65.0 - 69.9		1							4
70.0 - 74.9									2
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Adults not meas.	1								
Total = Y/Y+A	2	3	1	2	1028	9	3	24	312

Appendix C Cont. - Length frequency of fishes caught by day electro-fishing, fall (Cont.)

Total Length in Centimeters	Silver chub	Pugnose minnow	Common shiner	Emerald shiner	Rosyface shiner	Spotfin shiner	Spottail shiner	Silvery minnow	Bullhead minnow
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9									
8.0 - 9.9									
10.0 - 11.9									
12.0 - 13.9									
14.0 - 15.9									
16.0 - 17.9									
18.0 - 19.9									
20.0 - 21.9									
22.0 - 23.9									
24.0 - 25.9									
26.0 - 27.9									
28.0 - 29.9									
30.0 - 31.9									
32.0 - 33.9									
34.0 - 35.9									
36.0 - 37.9									
38.0 - 39.9									
40.0 - 44.9									
45.0 - 49.9									
50.0 - 54.9									
55.0 - 59.9									
60.0 - 64.9									
65.0 - 69.9									
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Adults not meas.	33	3	1	9	6	1	21	1	3
Total = Y/Y+A	33	3	1	9	6	1	21	1	3

Appendix C Cont. - Length frequency of fishes caught by day electro-fishing, fall (Cont.)

Total Length in Centimeters	Blunt-nose minnow	Channel catfish	Flat-head catfish	Northern pike	White bass	Yellow perch	Sauger	Walleye	Log perch
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9						1			
8.0 - 9.9					16	8			
10.0 - 11.9					48				
12.0 - 13.9					15		2		
14.0 - 15.9						1	6		
16.0 - 17.9							1	6	
18.0 - 19.9								4	
20.0 - 21.9			1		12	1	2	1	
22.0 - 23.9					5		1		
24.0 - 25.9					1		2		
26.0 - 27.9									
28.0 - 29.9									
30.0 - 31.9							1	1	
32.0 - 33.9					3				
34.0 - 35.9					1			1	
36.0 - 37.9					3				
38.0 - 39.9									
40.0 - 44.9		3					2	8	
45.0 - 49.9		1						3	
50.0 - 54.9		2		1				3	
55.0 - 59.9				2					
60.0 - 64.9		1		3				1	
65.0 - 69.9				1				3	
70.0 - 74.9								1	
75.0 - 79.9				1					
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Adults not meas.	2								6
Total = Y/Y+A	2	7	1	8	104	11	17	32	6

Appendix C Cont. - Length-frequency of fishes caught by day electro-fishing, fall (Cont.)

Total Length in Centimeters	Small-mouth bass	Large-mouth bass	Green sunfish	Bluegill	Hybrid sunfish	Rock bass	White crappie	Black crappie	Fresh-water drum
Y/Y not meas.							3		
0.1 - 1.9									
2.0 - 3.9			1	34		1			
4.0 - 5.9			12	136		3			
6.0 - 7.9			5	53	1	4	10	5	1
8.0 - 9.9	4	4	20	119	3	27	6	3	16
10.0 - 11.9		8	22	179	2	17			24
12.0 - 13.9		4	8	93	2	5		2	1
14.0 - 15.9	3		2	27	1	6		13	
16.0 - 17.9	6			12		6	2	3	
18.0 - 19.9	14	5		1		5	2	4	2
20.0 - 21.9	6	4		2		1	1	2	
22.0 - 23.9	5	1		1				1	1
24.0 - 25.9	3	1							
26.0 - 27.9	4							3	
28.0 - 29.9	2	2							1
30.0 - 31.9	3	1						1	2
32.0 - 33.9	6								1
34.0 - 35.9	2								
36.0 - 37.9	2								2
38.0 - 39.9	1	1							
40.0 - 44.9									2
45.0 - 49.9									
50.0 - 54.9									
55.0 - 59.9									
60.0 - 64.9									
65.0 - 69.9									
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Adults not meas.									
Total = Y/Y+A	61	31	70	657	9	75	24	37	53

Appendix C Cont.- **Length-frequency of fishes caught by night electro-fishing, fall**

Total Length in Centimeters	Bowfin	Mooneye	Gizzard shad	Big-mouth buffalo	Carp-sucker spp.	White sucker	Silver redhorse	Short-head redhorse	Carp
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9			1						
6.0 - 7.9			3						
8.0 - 9.9			10					2	
10.0 - 11.9			26		3				1
12.0 - 13.9		7	15						
14.0 - 15.9		2	8		1			3	
16.0 - 17.9			7		2			3	
18.0 - 19.9					3			7	
20.0 - 21.9					3			5	
22.0 - 23.9					4		1	8	
24.0 - 25.9					4			1	1
26.0 - 27.9				1	8			1	1
28.0 - 29.9					2			2	1
30.0 - 31.9								2	5
32.0 - 33.9								2	3
34.0 - 35.9								3	7
36.0 - 37.9						1		5	8
38.0 - 39.9						1		2	4
40.0 - 44.9					3	1	2	7	18
45.0 - 49.9	1				3			3	45
50.0 - 54.9					1			1	26
55.0 - 59.9								3	12
60.0 - 64.9									5
65.0 - 69.9									2
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Adults not meas.			143		1		1		
Total = Y/Y+A	1	9	213	1	38	3	4	60	139

Appendix C
Cont. - Length-frequency of fishes caught by night electro-fishing, fall (Cont.)

Total Length in Centimeters	Silver chub	Emerald shiner	Rosyface shiner	Spottail shiner	Bull-head minnow	Channel catfish	Northern pike	Trout perch	White bass
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9									
8.0 - 9.9									21
10.0 - 11.9									96
12.0 - 13.9									42
14.0 - 15.9									2
16.0 - 17.9									
18.0 - 19.9									4
20.0 - 21.9									15
22.0 - 23.9									9
24.0 - 25.9						1			
26.0 - 27.9						1			
28.0 - 29.9									
30.0 - 31.9									
32.0 - 33.9									
34.0 - 35.9						1			
36.0 - 37.9									
38.0 - 39.9									
40.0 - 44.9						2			
45.0 - 49.9									
50.0 - 54.9						1			
55.0 - 59.9									
60.0 - 64.9									
65.0 - 69.9									
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +							1		
Adults not meas.	135	2	12	16	4			1	
Total = Y/Y+A	135	2	12	16	4	6	1	1	189

Appendix C
Cont. - Length-frequency of fishes caught by night electro-fishing, fall (Cont.)

Total Length in Centimeters	Yellow perch	Sauger	Walleye	Log perch	Small-mouth bass	Large-mouth bass	Green sunfish	Bluegill	Rock bass
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9								3	
6.0 - 7.9								1	
8.0 - 9.9	4						2	3	1
10.0 - 11.9					1			21	
12.0 - 13.9		2					1	18	
14.0 - 15.9		15	2					6	3
16.0 - 17.9		7	8					2	2
18.0 - 19.9		1	7		1	1			1
20.0 - 21.9		8	1		1				
22.0 - 23.9		10							
24.0 - 25.9		13	1						
26.0 - 27.9		10							
28.0 - 29.9		5	3						
30.0 - 31.9		4	7						
32.0 - 33.9		7	7						
34.0 - 35.9		8	3						
36.0 - 37.9		4							
38.0 - 39.9		7							
40.0 - 44.9		19	7						
45.0 - 49.9		2	5						
50.0 - 54.9									
55.0 - 59.9									
60.0 - 64.9			2						
65.0 - 69.9			1						
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Adults not meas.				1					
Total = Y/Y+A	4	122	54	1	3	1	3	54	7

Appendix C

Cont. - Length-frequency of fishes caught by night electro-fishing, fall (Cont.)

Total Length in Centimeters	Black crappie	Fresh-water drum							
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9		1							
8.0 - 9.9		24							
10.0 - 11.9		25							
12.0 - 13.9		6							
14.0 - 15.9	1	2							
16.0 - 17.9	2	2							
18.0 - 19.9		9							
20.0 - 21.9		2							
22.0 - 23.9		2							
24.0 - 25.9		2							
26.0 - 27.9		4							
28.0 - 29.9		1							
30.0 - 31.9		4							
32.0 - 33.9		1							
34.0 - 35.9									
36.0 - 37.9		1							
38.0 - 39.9									
40.0 - 44.9									
45.0 - 49.9									
50.0 - 54.9									
55.0 - 59.9									
60.0 - 64.9									
65.0 - 69.9									
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Adults not meas.		1							
Total = Y/Y+A	3	86							

Appendix D - Summary of gill net catches by season and area, 1974

Species	SPRING Above Plant No.	SPRING Above Plant Catch/Lift (for 20 Lifts)	SPRING Plant Area No.	SPRING Plant Area Catch/Lift (for 5 Lifts)	FALL Above Plant No.	FALL Above Plant Catch/Lift (for 20 Lifts)	FALL Plant Area No.	FALL Plant Area Catch/Lift (for 5 Lifts)
Shortnose gar	21	1.05	6	1.20	58	2.90	-	-
Longnose gar	19	0.95	-	-	2	0.10	-	-
Bowfin	1	0.05	-	-	2	0.10	-	-
Mooneye	2	0.10	-	-	7	0.35	-	-
Goldeye	-	-	-	-	4	0.20	2	0.40
Gizzard shad	1	0.05	1	0.20	602	30.10	117	23.40
Bigmouth buffalo	2	0.10	-	-	1	0.05	-	-
Smallmouth buffalo	-	-	-	-	14	0.70	2	0.40
Carpsucker spp.	1	0.05	-	-	-	-	1	0.20
White sucker	1	0.05	-	-	1	0.05	-	-
Shorthead redhorse	34	1.70	6	1.20	27	1.35	9	1.80
Carp	112	5.60	37	7.40	110	5.50	12	2.40
Channel catfish	7	0.35	1	0.20	18	0.90	6	1.20
Black bullhead	1	0.05	-	-	-	-	-	-
Brown bullhead	-	-	-	-	1	0.05	-	-
Yellow bullhead	-	-	-	-	-	-	1	0.20
Northern pike	17	0.85	6	1.20	19	0.95	4	0.80
White bass	38	1.90	16	3.20	249	12.45	45	9.00
Yellow perch	-	-	-	-	6	0.30	9	1.80
Sauger	96	4.80	9	1.80	140	7.00	31	6.20
Walleye	18	0.90	1	0.20	37	1.85	2	0.40
Smallmouth bass	1	0.05	1	0.20	-	-	-	-
Bluegill	-	-	-	-	1	0.05	-	-
Rock bass	2	0.10	4	0.80	2	0.10	-	-
White crappie	1	0.05	1	0.20	18	0.90	8	1.60
Black crappie	5	0.25	4	0.80	26	1.30	8	1.60
Freshwater drum	13	0.65	2	0.40	21	1.05	1	0.20

Appendix D Cont. - Length frequency of fishes caught in gill nets, spring

Total Length in Centimeters	Short-nose gar	Long-nose gar	Bowfin	Mooneye	Shad	Big-mouth buffalo	Carp-sucker spp.	White sucker	Short-head redhorse
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9									
8.0 - 9.9									
10.0 - 11.9									
12.0 - 13.9									
14.0 - 15.9									2
16.0 - 17.9							1		
18.0 - 19.9									
20.0 - 21.9						1			
22.0 - 23.9						1			
24.0 - 25.9									1
26.0 - 27.9									1
28.0 - 29.9									1
30.0 - 31.9				2					1
32.0 - 33.9									3
34.0 - 35.9									3
36.0 - 37.9					1				5
38.0 - 39.9									4
40.0 - 44.9					1				12
45.0 - 49.9			1					1	5
50.0 - 54.9	5								1
55.0 - 59.9	6								
60.0 - 64.9	12								
65.0 - 69.9	3	1							
70.0 - 74.9		4							
75.0 - 79.9	1	8							
80.0 - 84.9		1							
85.0 - 89.9		1							
90.0 - 94.9		1							
95.0 - 99.9		2							
100.0 - +		1							
Adults not meas.									1
Total = Y/Y+A	27	19	1	2	2	2	1	1	40

Appendix D Cont. - Length frequency of fishes caught in gill nets, spring (Con't.)

Total Length in Centimeters	Carp	Channel catfish	Black bullhead	Northern pike	White bass	Sauger	Walleye	Small-mouth bass	Rock bass
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9									
8.0 - 9.9									
10.0 - 11.9									
12.0 - 13.9					3			1	2
14.0 - 15.9	3				2				1
16.0 - 17.9	11		1		1				1
18.0 - 19.9	9								1
20.0 - 21.9	11					1	2		
22.0 - 23.9	7					3		1	
24.0 - 25.9	8					2	1		
26.0 - 27.9	9				2	6			
28.0 - 29.9	7				1	5	1		1
30.0 - 31.9	10	1			5	9			
32.0 - 33.9	22				20	11	1		
34.0 - 35.9	12				14	10			
36.0 - 37.9	9				6	10	2		
38.0 - 39.9	5	1				16	2		
40.0 - 44.9	11	5				22	3		
45.0 - 49.9	7	1				8	4		
50.0 - 54.9	4			5		2	3		
55.0 - 59.9	3			3					
60.0 - 64.9				7					
65.0 - 69.9				2					
70.0 - 74.9				3					
75.0 - 79.9				2					
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9				1					
100.0 - +									
Adults not meas.	1								
Total = Y/Y+A	149	8	1	23	54	105	19	2	6

Appendix D Cont. - Length frequency of fishes caught in gill nets, spring (Con't.)

Total Length in Centimeters	White crappie	Black crappie	Fresh-water drum						
Y/Y not meas.		1							
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9									
8.0 - 9.9									
10.0 - 11.9	1	5							
12.0 - 13.9	1		2						
14.0 - 15.9		1							
16.0 - 17.9		2							
18.0 - 19.9									
20.0 - 21.9									
22.0 - 23.9			3						
24.0 - 25.9			2						
26.0 - 27.9			2						
28.0 - 29.9			1						
30.0 - 31.9									
32.0 - 33.9			2						
34.0 - 35.9			1						
36.0 - 37.9									
38.0 - 39.9									
40.0 - 44.9									
45.0 - 49.9									
50.0 - 54.9									
55.0 - 59.9									
60.0 - 64.9									
65.0 - 69.9									
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Adults not meas.									
Total = Y/Y+A	2	9	13						

Appendix D Cont. - Length frequency of fishes caught in gill nets, fall

Total Length in Centimeters	Short-nose gar	Long-nose gar	Bowfin	Mooneye	Goldeye	Shad	Big-mouth buffalo	Small-mouth buffalo	Carp-sucker spp.
Y/Y not meas.						590			
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9									
8.0 - 9.9									
10.0 - 11.9						6			
12.0 - 13.9						47			
14.0 - 15.9						34		1	
16.0 - 17.9						25			
18.0 - 19.9						2			1
20.0 - 21.9									
22.0 - 23.9									
24.0 - 25.9								1	
26.0 - 27.9					1	1		5	
28.0 - 29.9					1			7	
30.0 - 31.9						4		1	
32.0 - 33.9					1	2			
34.0 - 35.9				2					
36.0 - 37.9		1				2	1		
38.0 - 39.9				3	2	1			
40.0 - 44.9			2	2	1	4		1	
45.0 - 49.9						1			
50.0 - 54.9									
55.0 - 59.9	23								
60.0 - 64.9	27	1							
65.0 - 69.9	6								
70.0 - 74.9	1								
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Adults not meas.	1								
Total = Y/Y+A	58	2	2	7	6	719	1	16	1

Appendix D Cont. - Length Frequency of fishes caught in gill nets, fall (Con't.)

Total Length in Centimeters	White sucker	Short-head redhorse	Carp	Channel catfish	Brown bullhead	Yellow bullhead	Northern pike	White bass	Yellow perch
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9									
8.0 - 9.9								1	
10.0 - 11.9									
12.0 - 13.9								10	7
14.0 - 15.9								2	3
16.0 - 17.9									2
18.0 - 19.9								3	1
20.0 - 21.9		1						31	1
22.0 - 23.9		1						31	1
24.0 - 25.9						1		16	
26.0 - 27.9		1			1			4	
28.0 - 29.9		1	4					2	
30.0 - 31.9		1	8					6	
32.0 - 33.9		2	17					28	
34.0 - 35.9		2	23	1				79	
36.0 - 37.9		3	15	5				56	
38.0 - 39.9		7	3	2				20	
40.0 - 44.9	1	10	23	9				2	
45.0 - 49.9		7	18	4				2	
50.0 - 54.9			7	1			4		
55.0 - 59.9			3				7		
60.0 - 64.9			1	2			5		
65.0 - 69.9							4		
70.0 - 74.9							1		
75.0 - 79.9							1		
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9							1		
100.0 - +									
Adults not meas.									
Total = Y/Y+A	1	36	122	24	1	1	23	294	15

Appendix D Cont. - Length frequency of fishes caught in gill nets, fall (Con't.)

Total Length in Centimeters	Sauger	Walleye	Bluegill	Rock bass	White crappie	Black crappie	Fresh-water drum		
Y/Y not meas.									
0.1 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9									
8.0 - 9.9									
10.0 - 11.9									
12.0 - 13.9	1					1	2		
14.0 - 15.9			1		1	15			
16.0 - 17.9				1	8	8	3		
18.0 - 19.9					12	3	7		
20.0 - 21.9	1	1		1	1	5	5		
22.0 - 23.9	1					2			
24.0 - 25.9	3								
26.0 - 27.9	11	1			2				
28.0 - 29.9	9	2					1		
30.0 - 31.9	4	5					3		
32.0 - 33.9	6	2							
34.0 - 35.9	19	1							
36.0 - 37.9	18						1		
38.0 - 39.9	16	4							
40.0 - 44.9	43	4							
45.0 - 49.9	32	13							
50.0 - 54.9	6	4							
55.0 - 59.9	1	2							
60.0 - 64.9									
65.0 - 69.9									
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Adults not meas.					2				
Total = Y/Y+A	171	39	1	2	26	34	22		

Appendix E - Summary of trawl catches by season and area, 1974

Species	SPRING North Lake No.	SPRING North Lake Catch/Hr. (14 min.)	SPRING Plant Area No.	SPRING Plant Area Catch/Hr. (29 min.)	SUMMER North Lake No.	SUMMER North Lake Catch/Hr. (14 min.)	SUMMER Plant Area No.	SUMMER Plant Area Catch/Hr. (18 min. 25 sec.)	FALL North Lake No.	FALL North Lake Catch/Hr. (11 min. 10 sec.)	FALL Plant Area No.	FALL Plant Area Catch/Hr. (28 min. 5 sec.)
Shortnose gar	-	-	-	-	-	-	-	-	1	5.26	-	-
Mooneye	-	-	-	-	-	-	5	16.13	-	-	-	-
Goldeye	-	-	-	-	-	-	2	6.45	-	-	-	-
Gizzard shad	-	-	-	-	114	495.65	-	-	124	652.63	25	53.19
Bigmouth buffalo	-	-	-	-	-	-	-	-	-	-	2	4.26
Smallmouth buffalo	1	4.35	-	-	1	4.34	1	3.23	-	-	4	8.51
Carpsucker spp.	-	-	-	-	-	-	-	-	1	5.26	-	-
Carp	1	4.35	14	29.17	2	8.69	15	48.39	1	5.26	19	40.26
Silver chub	11	47.83	7	14.58	2	8.69	2	6.45	1	5.26	12	25.53
Pugnose minnow	-	-	-	-	-	-	10	32.26	-	-	-	-
Emerald shiner	-	-	1	2.08	3	13.04	-	-	8	42.11	-	-
Spottail shiner	8	34.77	-	-	-	-	-	-	1	5.26	-	-
Bullhead minnow	-	-	-	-	1	4.34	-	-	-	-	-	-
Channel catfish	-	-	1	2.08	5	21.74	20	64.52	-	-	2	4.26
Madtom (tadpole)	-	-	1	2.08	-	-	-	-	-	-	1	2.13
Trout perch	2	8.69	2	4.17	10	43.48	37	119.35	8	42.11	6	12.77
White bass	2	8.69	-	-	55	239.13	2	6.45	4	21.05	1	2.13
Yellow perch	-	-	-	-	2	8.69	-	-	-	-	-	-
Sauger	-	-	5	10.42	-	-	3	9.68	-	-	1	2.13
Walleye	2	8.69	1	2.08	-	-	-	-	2	10.53	1	2.13
Bluegill	-	-	-	-	-	-	-	-	2	10.53	-	-
White crappie	1	4.35	-	-	66	286.96	-	-	127	668.42	2	4.26
Black crappie	1	4.35	1	2.08	10	43.68	3	9.68	7	36.84	1	2.13
Freshwater drum	4	17.39	24	50.00	37	160.87	492	1587.10	51	268.42	74	157.45

Appendix E Cont. - Length-frequency of fishes caught by trawling, spring

Total Length in Centimeters	Small-mouth buffalo	Carp	Silver chub	Emerald shiner	Spot-tail shiner	Channel catfish	Tadpole madton	Trout perch	White bass
0.0 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9									
8.0 - 9.9									
10.0 - 11.9									1
12.0 - 13.9									
14.0 - 15.9									
16.0 - 17.9	1								
18.0 - 19.9									
20.0 - 21.9									
22.0 - 23.9									
24.0 - 25.9									
26.0 - 27.9		1							
28.0 - 29.9									
30.0 - 31.9						1			
32.0 - 33.9		1							
34.0 - 35.9		1							1
36.0 - 37.9		2							
38.0 - 39.9									
40.0 - 44.9		2							
45.0 - 49.9		4							
50.0 - 54.9		3							
55.0 - 59.9		1							
60.0 - 64.9									
65.0 - 69.9									
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Y/Y not measured									
Adult not measured			18	1	8		1	4	
TOTALS	1	15	18	1	8	1	1	4	2

Appendix E Cont. - Length-frequency of fishes caught by trawling, spring (Cont.)

Total Length in Centimeters	Sauger	Walleye	White crappie	Black crappie	Fresh-water drum				
0.0 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9					1				
8.0 - 9.9									
10.0 - 11.9					2				
12.0 - 13.9					4				
14.0 - 15.9				2					
16.0 - 17.9									
18.0 - 19.9					1				
20.0 - 21.9		2							
22.0 - 23.9					2				
24.0 - 25.9					7				
26.0 - 27.9					9				
28.0 - 29.9									
30.0 - 31.9	2								
32.0 - 33.9		1							
34.0 - 35.9					1				
36.0 - 37.9	2								
38.0 - 39.9									
40.0 - 44.9	1								
45.0 - 49.9									
50.0 - 54.9									
55.0 - 59.9									
60.0 - 64.9									
65.0 - 69.9									
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Y/Y not measured									
Adult not measured			1		1				
TOTALS	5	3	1	2	28				

Appendix E Cont. - Length-frequency of fishes caught by trawling, summer

Total Length in Centimeters	Mooneye	Goldeye	Gizzard shad	Small-mouth buffalo	Carp	Silver chub	Pugnose minnow	Emerald shiner	Bull-head minnow
0.0 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9									
8.0 - 9.9									
10.0 - 11.9									
12.0 - 13.9									
14.0 - 15.9									
16.0 - 17.9									
18.0 - 19.9									
20.0 - 21.9				2					
22.0 - 23.9									
24.0 - 25.9					3				
26.0 - 27.9									
28.0 - 29.9					1				
30.0 - 31.9					2				
32.0 - 33.9					1				
34.0 - 35.9					2				
36.0 - 37.9					1				
38.0 - 39.9									
40.0 - 44.9									
45.0 - 49.9					2				
50.0 - 54.9					3				
55.0 - 59.9									
60.0 - 64.9									
65.0 - 69.9									
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Y/Y not measured	4	2	114		2				
Adult not measured						4	10	3	1
TOTALS	4	2	114	2	17	4	10	3	1

Appendix E Cont. - Length-frequency of fishes caught by trawling, summer (Cont.)

Total Length in Centimeters	Channel catfish	Trout perch	White bass	Yellow perch	Sauger	White crappie	Black crappie	Fresh-water drum	
0.0 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9									
8.0 - 9.9									
10.0 - 11.9								1	
12.0 - 13.9							2		
14.0 - 15.9								2	
16.0 - 17.9								6	
18.0 - 19.9							1	1	
20.0 - 21.9									
22.0 - 23.9								2	
24.0 - 25.9								3	
26.0 - 27.9									
28.0 - 29.9					1				
30.0 - 31.9					1				
32.0 - 33.9						1			
34.0 - 35.9					1				
36.0 - 37.9									
38.0 - 39.9									
40.0 - 44.9									
45.0 - 49.9									
50.0 - 54.9									
55.0 - 59.9									
60.0 - 64.9									
65.0 - 69.9									
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Y/Y not measured			57			65	10	514	
Adult not measured	25	47		2					
TOTALS	25	47	57	2	3	66	13	529	

Appendix E Cont. - Length-frequency of fishes caught by trawling, fall

Total Length in Centimeters	Short-nose gar	Gizzard shad	Big-mouth buffalo	Small-mouth buffalo	Carp-sucker spp.	Carp	Silver chub	Emerald shiner	Spot-tail shiner
0.0 - 1.9									
2.0 - 3.9									
4.0 - 5.9		6							
6.0 - 7.9		10							
8.0 - 9.9		11			1				
10.0 - 11.9		5							
12.0 - 13.9		10							
14.0 - 15.9		11							
16.0 - 17.9		4							
18.0 - 19.9		1							
20.0 - 21.9									
22.0 - 23.9				1					
24.0 - 25.9									
26.0 - 27.9				1					
28.0 - 29.9						3			
30.0 - 31.9						4			
32.0 - 33.9				1					
34.0 - 35.9						3			
36.0 - 37.9						2			
38.0 - 39.9						2			
40.0 - 44.9				1		3			
45.0 - 49.9			1			2			
50.0 - 54.9									
55.0 - 59.9	1								
60.0 - 64.9									
65.0 - 69.9			1						
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Y/Y not measured		91				1			
Adult not measured							13	8	1
TOTALS	1	149	2	4	1	20	13	8	1

Appendix E Cont. - Length-frequency of fishes caught by trawling, fall (Cont.)

Total Length in Centimeters	Channel catfish	Tadpole madtom	Trout perch	White bass	Sauger	Walleye	Bluegill	White crappie	Black crappie
0.0 - 1.9									
2.0 - 3.9		1							
4.0 - 5.9								3	
6.0 - 7.9	2			1				43	3
8.0 - 9.9				1				15	
10.0 - 11.9				2				1	
12.0 - 13.9				1					1
14.0 - 15.9									3
16.0 - 17.9						2		2	
18.0 - 19.9									
20.0 - 21.9									
22.0 - 23.9									
24.0 - 25.9									
26.0 - 27.9									
28.0 - 29.9									
30.0 - 31.9									
32.0 - 33.9									
34.0 - 35.9						1			
36.0 - 37.9									
38.0 - 39.9									
40.0 - 44.9					1				
45.0 - 49.9									
50.0 - 54.9									
55.0 - 59.9									
60.0 - 64.9									
65.0 - 69.9									
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Y/Y not measured								65	1
Adult not measured			14				2		
TOTALS	2	1	14	5	1	3	2	129	8

Appendix E Cont. - Length-frequency of fishes caught by trawling, fall (Cont.)

Total Length in Centimeters	Fresh-water drum								
0.0 - 1.9									
2.0 - 3.9	1								
4.0 - 5.9	7								
6.0 - 7.9	17								
8.0 - 9.9	47								
10.0 - 11.9	23								
12.0 - 13.9									
14.0 - 15.9									
16.0 - 17.9	1								
18.0 - 19.9	4								
20.0 - 21.9	1								
22.0 - 23.9									
24.0 - 25.9	1								
26.0 - 27.9	1								
28.0 - 29.9									
30.0 - 31.9	1								
32.0 - 33.9									
34.0 - 35.9									
36.0 - 37.9									
38.0 - 39.9									
40.0 - 44.9									
45.0 - 49.9									
50.0 - 54.9									
55.0 - 59.9									
60.0 - 64.9									
65.0 - 69.9									
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Y/Y not measured	21								
Adult not measured									
TOTALS	115								

Appendix F - Length-frequency of fishes used for scale samples in the Prairie Island vicinity, 1974

Total Length in Centimeters	Gizzard shad	Short-head redhorse	White bass	Sauger	Walleye	Small-mouth bass	Large-mouth bass	Bluegill	White crappie
0.0 - 1.9									
2.0 - 3.9								2	
4.0 - 5.9								8	
6.0 - 7.9	1		3					18	14
8.0 - 9.9	5	4	14	3		8	4	111	9
10.0 - 11.9	37	10	64	11	5	8	10	154	5
12.0 - 13.9	32	9	48	6		10	4	125	4
14.0 - 15.9	8	18	37	15		15		62	6
16.0 - 17.9	4	13	32	31	8	23		33	18
18.0 - 19.9	4	11	32	15	7	19	6	14	20
20.0 - 21.9		7	71	16	11	10	5	10	6
22.0 - 23.9	1	8	52	16	3	13	3	1	
24.0 - 25.9		5	25	15	4	11	2		4
26.0 - 27.9	1	10	18	22	2	11			3
28.0 - 29.9	1	8	18	28	6	8	2		4
30.0 - 31.9	8	18	69	34	10	8	1		4
32.0 - 33.9	3	18	160	36	7	9			1
34.0 - 35.9		35	237	46	4	4			
36.0 - 37.9	3	50	157	41	4	2			
38.0 - 39.9	3	52	62	47	8		1		
40.0 - 44.9	6	122	17	90	24				
45.0 - 49.9	1	79	3	50	34	1			
50.0 - 54.9		8		9	22				
55.0 - 59.9					8				
60.0 - 64.9					9				
65.0 - 69.9					2				
70.0 - 74.9					1				
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
TOTALS	118	485	1119	531	179	160	38	538	98

Appendix F Cont. - Length-frequency of fishes used for scale samples in the Prairie Island vicinity, 1974 (Con't.)

Total Length in Centimeters	Black crappie	Fresh-water drum							
0.0 - 1.9									
2.0 - 3.9									
4.0 - 5.9									
6.0 - 7.9	9	2							
8.0 - 9.9	7	7							
10.0 - 11.9	9	34							
12.0 - 13.9	23	22							
14.0 - 15.9	71	20							
16.0 - 17.9	55	45							
18.0 - 19.9	46	47							
20.0 - 21.9	30	25							
22.0 - 23.9	27	37							
24.0 - 25.9	11	67							
26.0 - 27.9	22	100							
28.0 - 29.9	9	88							
30.0 - 31.9	8	64							
32.0 - 33.9		46							
34.0 - 35.9		54							
36.0 - 37.9		34							
38.0 - 39.9		29							
40.0 - 44.9		20							
45.0 - 49.9		1							
50.0 - 54.9		1							
55.0 - 59.9		2							
60.0 - 64.9									
65.0 - 69.9									
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
TOTALS	334	745							

Appendix G - Length-frequency of fishes caught by electro-fishing for intake bubbler study August 12-16, 1974

Total Length in Centimeters	Short-nose gar	Long-nose gar	Gizzard shad	Short-head redhorse	Carp	Silver chub	Emerald shiner	Rosy-face shiner	Bull-head minnow
0.0 - 1.9									
2.0 - 3.9			3						
4.0 - 5.9			13		1				
6.0 - 7.9			25						
8.0 - 9.9			9						
10.0 - 11.9			8						
12.0 - 13.9			5						
14.0 - 15.9									
16.0 - 17.9									
18.0 - 19.9									
20.0 - 21.9									
22.0 - 23.9									
24.0 - 25.9									
26.0 - 27.9		1		1					
28.0 - 29.9									
30.0 - 31.9				1	3				
32.0 - 33.9					12				
34.0 - 35.9					7				
36.0 - 37.9					19				
38.0 - 39.9					11				
40.0 - 44.9				3	11				
45.0 - 49.9				1	9				
50.0 - 54.9					4				
55.0 - 59.9	1				1				
60.0 - 64.9					1				
65.0 - 69.9									
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
Not measured						3	3	1	1
TOTALS	1	1	63	6	79	3	3	1	1

Appendix G Cont. - Length-frequency of fishes caught by electro-fishing for intake bubbler study August 12-16, 1974 (Cont.)

Total Length in Centimeters	Channel Catfish	Flat-head catfish	White bass	Sauger	Walleye	Small-mouth bass	Large-mouth bass	Green Sunfish	Bluegill
0.0 - 1.9									
2.0 - 3.9									7
4.0 - 5.9			1						
6.0 - 7.9			46				1	2	
8.0 - 9.9			133				2	10	6
10.0 - 11.9			16		1			5	9
12.0 - 13.9					2			3	8
14.0 - 15.9			1						3
16.0 - 17.9			1						1
18.0 - 19.9		1	1						3
20.0 - 21.9			3						1
22.0 - 23.9									
24.0 - 25.9									
26.0 - 27.9				1					
28.0 - 29.9	1								
30.0 - 31.9				1					
32.0 - 33.9	1		2			2			
34.0 - 35.9	1		3			1			
36.0 - 37.9	1					1			
38.0 - 39.9			2		1				
40.0 - 44.9	1								
45.0 - 49.9									
50.0 - 54.9					1				
55.0 - 59.9									
60.0 - 64.9									
65.0 - 69.9									
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
TOTALS	5	1	209	2	5	4	3	20	38

Appendix G Cont. - Length-frequency of fishes caught by electro-fishing for intake bubbler study August 12-16, 1974 (Cont.)

Total Length in Centimeters	Rock bass	White crappie	Black crappie	Fresh-water drum					
0.0 - 1.9									
2.0 - 3.9			3						
4.0 - 5.9			1						
6.0 - 7.9	12		1	1					
8.0 - 9.9	34	1	1	1					
10.0 - 11.9	23								
12.0 - 13.9			1						
14.0 - 15.9	1								
16.0 - 17.9									
18.0 - 19.9			2	1					
20.0 - 21.9			1						
22.0 - 23.9			2						
24.0 - 25.9									
26.0 - 27.9				3					
28.0 - 29.9				2					
30.0 - 31.9				2					
32.0 - 33.9									
34.0 - 35.9				3					
36.0 - 37.9				2					
38.0 - 39.9									
40.0 - 44.9									
45.0 - 49.9									
50.0 - 54.9									
55.0 - 59.9									
60.0 - 64.9									
65.0 - 69.9									
70.0 - 74.9									
75.0 - 79.9									
80.0 - 84.9									
85.0 - 89.9									
90.0 - 94.9									
95.0 - 99.9									
100.0 - +									
TOTALS	70	1	12	15					