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# ELECTROFISHING SURVEY OF GREAT MIAMI RIVER SEPTEMBER 19, 1989 PREPARED BY THE UC DEPT OF BIOLOGICAL SCIENCES FOR WMCO

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# ELECTROFISHING SURVEY OF GREAT MIAMI RIVER 19 September 1989

Prepared by: Dr. Michael C. Miller
Department of Biolological Sciences
University of Cincinnati

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For: Westinghouse Materials Corporation of Ohio
P.O. Box 39704
Cincinnati, Ohio 45239

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Final Report

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# ELECTROFISHING SURVEY OF THE GREAT MIAMI RIVER

**DATE: 19 SEPTEMBER 1989**

**********

BY: Dr. Michael C. Miller, Ph.D.
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Environmental Safety Division
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INTRODUCTION:

This 1989 report is a continuation to our report on the status of the fishery of the Great Miami River in September 1988. A complete historical perspective is contained in Miller et al. (1987). This report will emphasize the comparison between the years on the status of the fishery in terms of numbers, biomass, species richness, diversity, etc. Since the samples were taken within a week of each other over the years 1984 through 1989, they are quite comparable for this level of sampling intensity. Therefore, with six years of data we should be able to follow trends in the river fauna. If deviations occur they may be apparent as changes in species composition or redundancy, changes in mean or modal length and weight, or as deviations in growth rates as observed in length-weight distributions between stations.

The samples were taken for uranium content of fillets. They were shipped as per instructions by Westinghouse Materials Company of Ohio to the IT Corporation, Oak Ridge, Tennessee. In an effort to determine a confidence interval on this analysis, bodies of numerous species or those of large biomass were divided as subsamples and shipped to a different independent laboratory for identical analysis. The fisheries analysis contained in this report focuses on the areas that are upstream of the Westinghouse Materials Company of Ohio facility at Fernald, Ohio and those potentially impacted by WMCO effluents.

METHODS:

Electrofishing with pulsed DC is amongst the most efficient methods of collecting fish samples unbiased with respect to size and species (Yoder et al. 1978). Fish were electroshocked with a 240 volt, pulsed direct current transformer at 60 cps aboard a 16 foot flat-bottom boat. The anode is located at the end of a 10 foot boom and consists of 2-6 vertical cables, extending 4-5 inches beneath the surface of the water. The cathode,which is composed of 5 three foot long cables extending well under the bow of the boat. The electroshocking transformer is powered by a gasoline driven ONAN generator delivering 3500 watts of 120 volt AC at 29 amps. The shocker delivered about 3.6-4.2 amps depending on the conductivity of the water. Two persons standing behind a railing on the bow caught fish with 10 foot long dip nets. The netters are in control of the electroshocker with a foot-operated "dead-man" switch. The fish lose their equilibrium momentarily in the immobilizing electrical field allowing them to be netted. Some fish are drawn to the anode. Thus the effective area and depth may be dependent upon species and size of fish. Large fish are supposed to be the most sensitive. Almost all recover in a aerated, central well. Some of the larger gamefish caught were identified, measured and released immediately after gill motion and equilibrium appeared normal.

The fish are placed on ice immediately after a shocking sequence and brought back to a radiation-free laboratory at the University of Cincinnati. Fishes are identified to species, weighed, measured and their gender is determined. They are then decapitated, eviserated and grouped by species group or trophic status into resealable plastic bags. These bags of fillets were weighed and adjusted to a nominal weight of => 400 gms. Fish from each station were processed as a group at a time. The area was then cleaned and fish from the next station were processed completely so that contamination between stocks could not occur.

Physical-chemical measurements from each station included: 1) temperature (C) and 2) dissolved oxygen (ppm O2) both with a YSI Model 57 meter (Yellow Springs Instruments Co), 3) percent oxygen saturation assumes 1 atm. of pressure at the ambient river temperature taken from table 6-1 in Wetzel and Likens (1978) 4) conductivity (umhos*cm-2) determined with a YSI Model 33 and 5) secchi depth (cm) as an indicator of water clarity (table 1).

SITE DESCRIPTION:

Three stations on the Great Miami River have been used for electrofishing every year since 1985 at about the same season, namely, late summer. Station I is at river mile 28 near the City of Cincinnati's Bolton Water Works, upstream of any WMCO influence. The site is a straight section of shallow pool below a sharp curve and above a small rapids. A backwater thumb projects from the section of pool behind a bar above the rapids. The shores of the thumb and river on both sides are covered with overhanging riparian vegetation, with many treefalls in the river. The average pool depth was 1.1 meters. Several snags on the bottom make this the best habitat for fish using the criteria of Yoder and Gammon (1976) found on the Wabash and the Ohio Rivers. The pool is cobble covered, the sides are moderately steep and rocky on the eastern shore. The current here is faster than that found at site 3 and slower than station 2.

Station 2 is located at river mile 24 near Stricker's Grove Park and the outfall pipe from WMCO's stormwater treatment plant. The mixing zone is a deep, fast section of river with strong eddy currents just below. This site is on the outside of a long curve, the western shore. It is steep-sided with a fairly rapid current. Some riparian trees, either standing or fallen, provide good cover and high fish species diversity. The average pool depth here is 1.8 meters. This station always has the fastest current.

Station 3 is found at river mile 19.3, the outfall of Paddy's Run, which is the historic drainage route of the WMCO facility. It is a pool created by 25 years dredging by Welch's Sand and Gravel Co. The western shore is unaffected by the dragline operations and contains many submerged and emergent macrophytes, which provide excellent cover for young fish. The eastern shore is steep gravel without vegetation and is unattractive to most fish. The average pool depth is about 2 meters. The current is the slowest here and the site is pond-like in many respects.

RESULTS:

Physio-chemical data for 19 September 1989 show a slight increase in conductivity from upriver to Paddy's Run (table 1), this is likely a result of the falling pool depth and the gradual return to the much elevated, summer season conductivity of nearly 1000 umhos/cm. The temperature increased throughout the day in a characteristic pattern of diurnal warming. The secchi depth was the same (20 cm) at all three sites. Secchi depth is a sensitive indicator of turbidity, it is the depth at which a white and black, 22 cm diameter disk disappears from view. The oxygen concentration and the percent oxygen saturation were similar at all stations (~13.0 ppm and 90%). This stability came from the increased flow from rainstorms on September 13, 14 and 15. In years past this survey was conducted when the water level on the Great Miami River was at it's summer pool depth (~3.0 ft.), this year the water level was 5.0 ft and falling on the sampling day.

This year we gathered 311 fishes from 21 species in 9 families from the three stations, collectively (table 2). The most diverse families were the Suckers (Catostomidae) and the Sunfishes (Centrarchidae) both with 6 species. The number of species per station ranged from 12 to 16. The most numerous species was the gizzard shad (Clupeidae) with 195 individuals followed by channel catfish (Ictaluridae) n=18, river carpsucker (Catostomidae) n=16, carp (Cyprinidae) n=13 and the freshwater drum (Scianidae) n=11.

We electroshocked stations 1, 2 and 3 for 48.6, 60.2 and 64 minutes, respectively. We collected 97, 69 and 145 fish from the respective stations (table 2). The susceptibility of fish to shocking varies with topography of the shore, the depth of the pool, the nature of the current and with the amount vegetation in and over the water (Yoder and Gammon, 1976). The number of fish caught per hour 119.8, 68.8 and 135.9 from sites 1, 2 and 3 reveal a very poor harvest from station 2. We believe this depression is due to the swift current found at station 2, which carried fish out of net reach and reduced the maneuverability of our boat and not because of an absence of fish or suitable habitat. These observations are not statistically different from the catches of previous years by one-way analysis of variance (table 3).

TABLE 3. THE NUMBER OF FISH ELECTROSHOCKED/hr AND THE NO. OF SPECIES IDENTIFIED AT EACH STATION BY YEAR, 1984-1989.

| | | INDIVIDUALS/hr | | | SPECIES | | |
|---|---|---|---|---|---|---|---|
| YEAR | STATION | I | II | III | I | II | III |
| 1984 | | - | - | - | 15 | 12 | 15 |
| 1985 | | 104 | 84 | 314 | 11 | 19 | 16 |
| 1986 | | 89 | 79 | 266 | 12 | 15 | 16 |
| 1987 | | 73 | 75 | 102 | 10 | 11 | 10 |
| 1988 | | 146 | 195 | 154 | 15 | 12 | 15 |
| 1989 | | 120 | 69 | 136 | 13 | 12 | 16 |
| MEAN | | 106 | 100 | 194 | 13 | 14 | 15 |

**********

ONE-WAY ANOVA COMPARISONS BY YEAR AND STATION

| VARIABLE | F RATIO | PROBABILTY |
|---|---|---|
| FISH/hr X YEAR | 0.69 | 0.6146 |
| FISH/hr X STATION | 3.51 | 0.0631 |
| SPECIES X YEAR | 1.81 | 0.1860 |
| SPECIES X STATION | 0.98 | 0.3987 |

The diversity of fishes at each station was measured by the information theory using log base 2 (H'). This index of diversity is increased by the number of species in a sample and the relative uniformity of the numbers of individuals of each species. The maximal diversity (Hmax) that can be attained in any sample is fixed by the number of species, assuming evenness in the number of individuals in all species. Gizzard shad dominated the fish community at all stations and their numbers had the greatest effect on diversity. The highest diversity and evenness was found at station 2 (H'= 2.43, E = 0.68) the site with the least shad (35 of 69 fishes). At stations 1 and 3 gizzard shad accounted for over 60% of all fish taken. This resulted in lower diversity and evenness at both stations (fig. 1). These results are not significantly different from previous years. The 6 year mean for Hbar and Evenness show the same trend as this year II>III>I. The one-way anova reveals a significant difference in evenness by station (p=0.0207, table 4).

TABLE 4. SPECIES DIVERSITY AND EVENNESS USING INFORMATION INDEX (log base 2) BY STATION AND YEAR, 1984-1989.

| | H' | | | EVENNESS | | |
|---|---|---|---|---|---|---|
| YEAR STATION | I | II | III | I | II | III |
| 1984 | 2.24 | 1.70 | 2.06 | 0.58 | 0.48 | 0.53 |
| 1985 | 2.93 | 3.82 | 1.28 | 0.85 | 0.90 | 0.32 |
| 1986 | 2.62 | 3.40 | 2.20 | 0.73 | 0.87 | 0.55 |
| 1987 | 1.68 | 2.33 | 2.78 | 0.51 | 0.89 | 0.40 |
| 1988 | 2.23 | 2.33 | 2.78 | 0.57 | 0.75 | 0.71 |
| 1989 | 2.18 | 2.43 | 1.96 | 0.59 | 0.68 | 0.49 |
| MEAN | 2.31 | 2.79 | 1.92 | 0.64 | 0.76 | 0.50 |

**********

ONE-WAY ANOVA CONPARISONS BY YEAR AND STATION

| VARIABLE | F RATIO | PROBABILITY |
|---|---|---|
| H' X YEAR | 0.61 | 0.6920 |
| H' X STATION | 3.02 | 0.0788 |
| EVENNESS X YEAR | 0.43 | 0.8164 |
| EVENNESS X STATION | 5.08 | 0.0207 * |

Differences in community structure can be seen by comparing the similarity of species composition from the three stations. The community coefficient (CC) is a measure of the proportion of species shared by any two locations. It is calculated as two times the number of shared species (c) divided by the sum of all the species found at the two sites (a and b)

$$CC = 2c / a+b$$

A CC of 1.0 means the two stations have identical species composition, while a CC of 0.0 means there are no shared species. A low CC may reflect differences of habitat due to geographical separation or a pollutional gradient. The community coefficient between stations I and II was 0.76 this is quite similar to the CC of stations II and III, 0.72. The degree of similarity between sites I and III was much lower 0.50 (table 2 and fig 2). This is likely due to the high diversity found and at station II as a result of the swift current (like site I) and the relatively deep pool (similar to site III).

We examined the mean weight and length of fish by station (fig 3). As in years past, the biggest fishes occur at station I (195.0 gm, 21.8 cm) followed closely by station II (185.6 gm, 21.0 cm) and station III a distant third (110.4 gm, 17.4 cm). Table 5 shows the historical lengths and weights of fishes at the three sites and the same pattern of I>II>III exists in the means from 1985, 1986 and 1988. A one-way analysis of variance reveals the significant difference between the stations by fish length (p =0.0326) and confirms the stability among the years.

TABLE 5. MEAN WEIGHT AND LENGTH OF FISHES CAUGHT BY STATION AND YEAR, 1985-1989.

| | | WEIGHT(gm) | | | LENGTH(cm) | | |
|---|---|---|---|---|---|---|---|
| YEAR | STATION | I | II | III | I | II | III |
| 1985 | | 623 | 376 | 115 | 23.8 | 26.3 | 18.5 |
| 1986 | | 471 | 271 | 160 | 30.5 | 23.3 | 23.8 |
| 1987 | | 180 | 260 | 130 | 26.0 | 28.0 | 23.0 |
| 1988 | | 175 | 135 | 62 | 25.0 | 23.5 | 14.5 |
| 1989 | | 195 | 186 | 110 | 21.8 | 21.0 | 17.4 |
| MEAN | | 274 | 205 | 96 | 21.2 | 20.4 | 16.2 |

**********

ONE-WAY ANOVA COMPARISONS BY YEAR AND STATION

| VARIABLE | F RATIO | PROBABILITY |
|---|---|---|
| WEIGHT X YEAR | 1.60 | 0.2496 |
| WEIGHT X STATION | 3.32 | 0.0713 |
| LENGTH X YEAR | 1.38 | 0.3100 |
| LENGTH X STATION | 4.62 | 0.0326 * |

We calculated the weight and length frequency distributions (table 6). We found the modal weight to be between 75-100 grams for fishes caught at stations II and III and 125-150 grams for fishes fro site I (fig. 4). Figure 5 represents the weight distribution as the cumulative proportion of fish. The slope of the line from each station rises with of the particular weight class. Station III has the greatest initial slope due to the predominance of small shad and sunfishes (90% of fish < 100 gm). Station II shows a very similar line since nearly 80% of these fish weigh less than 100 gm. Site I has the lowest slope as result of the absence of young-of-the year (YOY) fishes. The two-tailed Kolmogorov-Smirnov statistic showed no significant difference between sites II and III (K-S = 0.18, p=0.1054 with respect to fish weight. Station I was significantly different from II (K-S = 0.34, p=0.0002) and III (K-S = 0.41, p<0.0001).

The length frequency distributions (fig. 6) show the modal lengths of fishes at site I (20-22 cm) was greater than site II (18-2 cm) which was greater than site III (16-18 cm). The cumulative percent frequency by length diagram (fig. 7) is a sigmoid plot since few fish under 10 cm were netted. The curves from stations I and III are identical, separated only by 4 cm. Site II shows a plateau at th 30 cm interval due to a moderately large proportion of fishes of this length. The K-S statistics reveal a significant difference for all stations with respect to length: I-II = 0.26, p=0.01, II-III = 0.23, p=0.0164 and I-III =0.40, p<0.0001.

We've determined that the three stations vary in the sizes of residents and that there is some overlap in the species present at th stations. In order to determine if the fish are growing at the same rate at all three stations, we plotted length X weight of the commonest species or families at all sites. This length-weight relationship is a condition factor or fatness factor per unit length. Fish in poor condition will be longer per unit weight than fish in

good condition. Among small fish, especially Y-O-Y, the probability of overwinter survival is a function of condition. If one station had fish below the length X weight plots of the other two stations, then we could infer that growth conditions were not as good because of a lack of food or pollutional stress.

Figure 8 shows 13 carp from the three sites. The stations overlap inferring a equal growth rate. Figure 9 is a scattergram of 196 gizzard shad. A tight pattern exists up to 20 cm. As fish age or grow longer, their condition or weight will be more variable. Not surprisingly, more large shad are found at site I, the upstream station. This is likely a result of high water and fast current found this year station I, which may have washed out the young of the year or perhaps driven them to unsampled backwater reaches. The length X weight relationship for the Sucker family (Catostomidae, fig. 10) shows a large gap from 15-24 cm. This discontinuity is evidence of a group of smaller juveniles and the large adults. The scatter of all fish suggest equal growth rates. Figure 11, the scattergram of largemouth and smallmouth bass (Centrarchidae) from station III. The smallmouths make a good line below the largemouths. This basic morphological feature may be due to prey size and/or prey availability. Figure 12 shows 24 sunfish and black bass from the family Centrarchidae. These fish are all predators of invertebrates. The scattergram is in the form of a logarithmic curve, normal for data from such wide range. Stations are numbered (none from station II), species are: L=largemouth bass, S=smallmouth bass, rb=rock bass, e=longear sunfish, g=green sunfish, bg=bluegill sunfish. Figure 13 is enlargement of fig. 12 to show the interspersal of small fishes from both sites. Again, no difference in growth rate is evident.

DECORANA Summary 1984-1989

Species abundance data from communities is difficult to compare except summarized as a single number such as a diversity index or number of species found or number of fish caught. However, each index only compares a single feature of the community. Several multivariate programs allow the ecologist to compare differences between stations and years using all the numerical abundance data of species enumerated. These methods,based on ordination, describe the difference in samples by species scores. Correspondence analyses can be viewed geometricaly as the derivation of new axes, which maximally account for the sturcture of samples in a multidimensional cloud of points of species. Thus the dimensionality of the community described by species is reduced to a single axes, based on simple eigenvalue, matrix methods. The eigenvalue for each axis is a measure of the proporation of the variation in the data set explained by that axis. Correspondence ordinations have the property of maximizing the correlation of the samples and species. Consequently species and samples are ranked in the same order on first axis by iteration. We call this ordination of samples in species space, since the difference in samples or stations is determined only by differences in the abundances of species and species presence in each sample/station. The ordinate axes may be correlated with physical/chemical variables that might control the distribution of the samples or species.

Detrended correspondence analysis uses an algorithm to complute the ordinate axes that iterates to a solution which effectively and unambiguously eliminates the relationship between the axes. Moreover, the algorithm computes rescales the segments of the species ordination, trying to equalize the average within-sample dispersion of species scores along the sample ordination axes. Findly, the differences on the x and y axes are in standard deviation units (x100)of species turnover, so that communities greater than two standard deviations apart are very probably statisically significant. Hence points more than 200 units apart are significantly different based on species composition.

The separation of samples in species space can be weighed by differences in species presence/absence using that transformation of the data. Rare species are as important as common species in this mode. Or the the ordination can be computed with the relative abundances of the component species. Thus, the more common species are much more important to the computation than rare species. The proportion of the variation in samples explained in species space or vice versa is measured by the eigenvalue. Hence the closer the eigenvalue is to one the greater the ability of the species abundances are to explain the distribution of samples on ordination axes 1, 2 or 3. In all cases the first axes computed explains the greatest proportion of the variation in samples. The second axies is statistically unrelated to the second axis.

Using DECORANA program from Cornell Ecology Program (for DEtrended CORespondence ANAlysis)the comparisons of stations in the Great Miami River using species abundances (Fig. 14) and presence/absence (Fig.15,16) was computed.
In Figure 14, species not found in 2 samples over 6 years were deleted from the computation. The eigenvalues for both axes were very low (0.28 and 0.06). By connecting the stations across years most of the separation is along the first axis. In general the greatest variation between years was found at station 2 > 1 > 3, respectively.

The same DECORANA using presence/absence transform, instead of abundance data, the eigenvalues are somewhat higher, 0.34 and 0.21 for axes 1 and 2, respectively (Fig. 15). In species space variation of stations was progressively greater from station 1 < 3 < 2. That is, station 2 had the greatest variation among years. When the stations for axes 1 and 2 were connected by year, 84,85,86 and 87 varied on axes 1 while 88 and 89 varied along axes 2. The fish characterized by P/A were clearly separated from the others in 1987 on the first axis. In most years station 2 was furthest to the left and staion 1 furthest to the right on axis 1. By examining the underlying species decorana in sample space, the '87 samples were drawn to the right by occurence of high fin carpsucker, suckermouth minnow, yellow bulhead and channel catfish. The 1985 and 1986 samples at station 2 were drawn to the left in the ordination by the presence of shorthead redhorse, blue catfish, shorthead redhorse, brownbullhead and mooneye. Station 2 was a fast water station with a cobble-sized bottom, ideal for the true river fishes, namely redhorses and catfish.

In 1989, station 2 was pulled to the top on the second axis by the presence of small mouth bass (Fig. 16 and 17). In 1988 at station 3 and 1984 at stions 2 & 3, the second ordinate axes was loaded to the bottom (Fig. 16) by presence of warmouth, redhorse, white crappie and skipjacek herring. Station 2 varied the most between years in composition of its fishery depending upon flow, temperature and pollution form upriver. The drought years of 1987 and 1988 pulled station 3 across the range of the fist ordinate axis (Fig. 15). Using the abundance data in the ordination (Fig. 14) station 3 was least variable. The fish community of station 3 was most ponded and hence least affected by year to year flow variation in September when gizzard shad was the dominant ( 5 of 6 years).

SUMMARY

The fishery of the Great Miami River been stable over the last six years, 1984-1989. The largest fish occur upstream of the WMCO facility at Fernald, OH, at station I and tend to get smaller as one goes downstream (station II > station III). The diversity (H') of the fish community is greatest at site II, where the WMCO effluent pipe dischrages into the river. Slightly lower diversity is upstream at site I and the most redundent community is found at site III, the confluence of Paddy's Run and the Great Miami River. The greatest number of species occur at site III>II>I, in that order. This jumble of dominance indicators is a result of the variable habitat found at the three stations. The stations were chosen primarily to capture fish which may have impacted upon by WMCO effluent or runoff. Secondary consideration is the availability of a convenient launch site. Despite the habitat differences, fish from all three sites appear to be the same condition of health, as seen in the length X weight plots. In conclusion, fishes of the Great Miami River show significant differences in length by station and in community evenness by station. Over the past six years, 1984-1989, the inter year variation in the fishery detected by DECORANA has been as great as consistent differences between stations(Figs 15 and 16). The interyear variation is largely caused by the immigration of other species, especially, Ohio Rivers species into this range (19-25 RM from Ohio). Much of that may be caused by the differences in late summer discharge (87 and 88 being drought years). The causation will become more obvious as the number of sample years increases.

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# DIVERSITY OF FISH BY STATION
# GREAT MIAMI RIVER, 1989

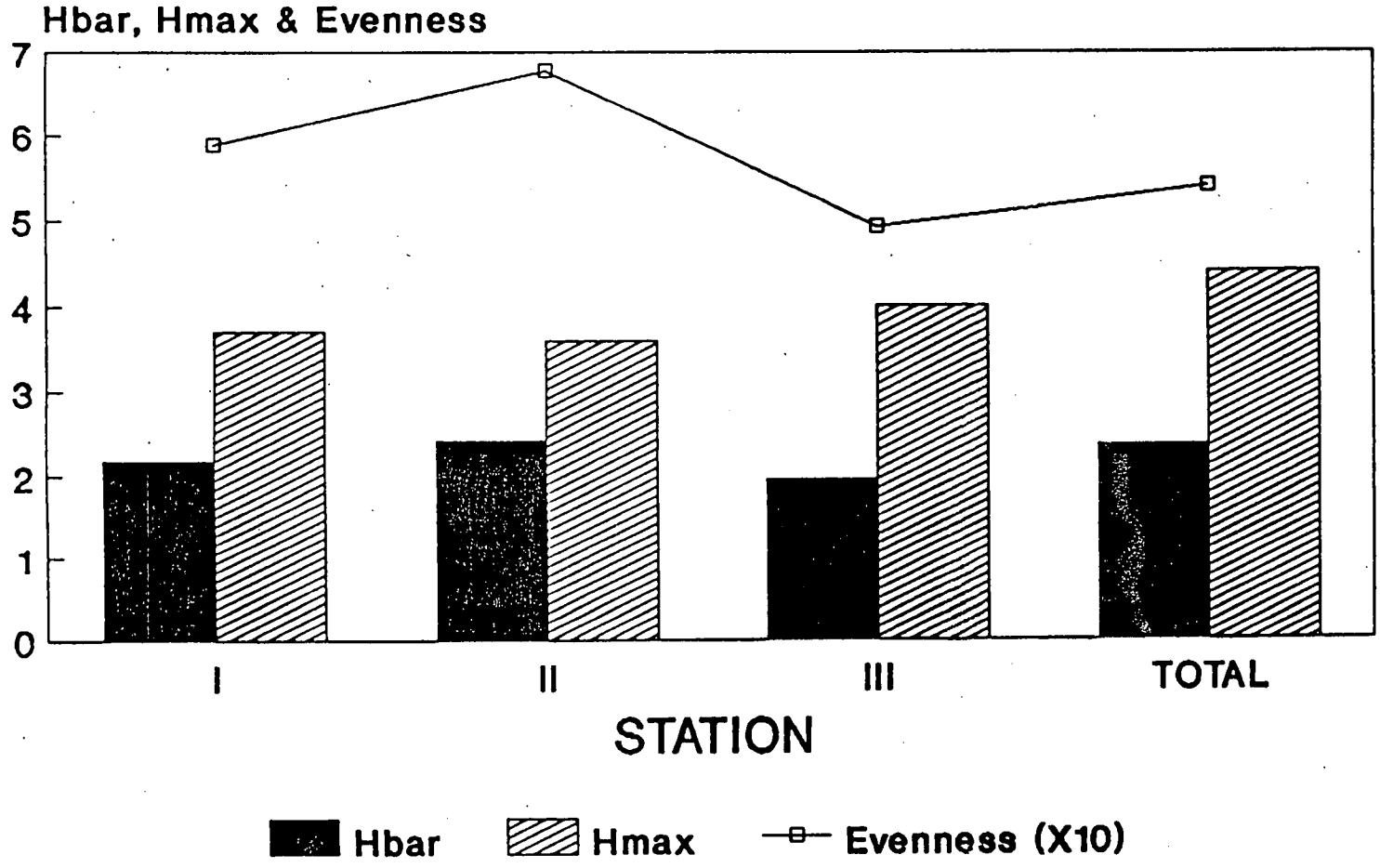


Figure 1.

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# MEAN FISH SIZE, BY STATION
# GREAT MIAMI RIVER, 1989

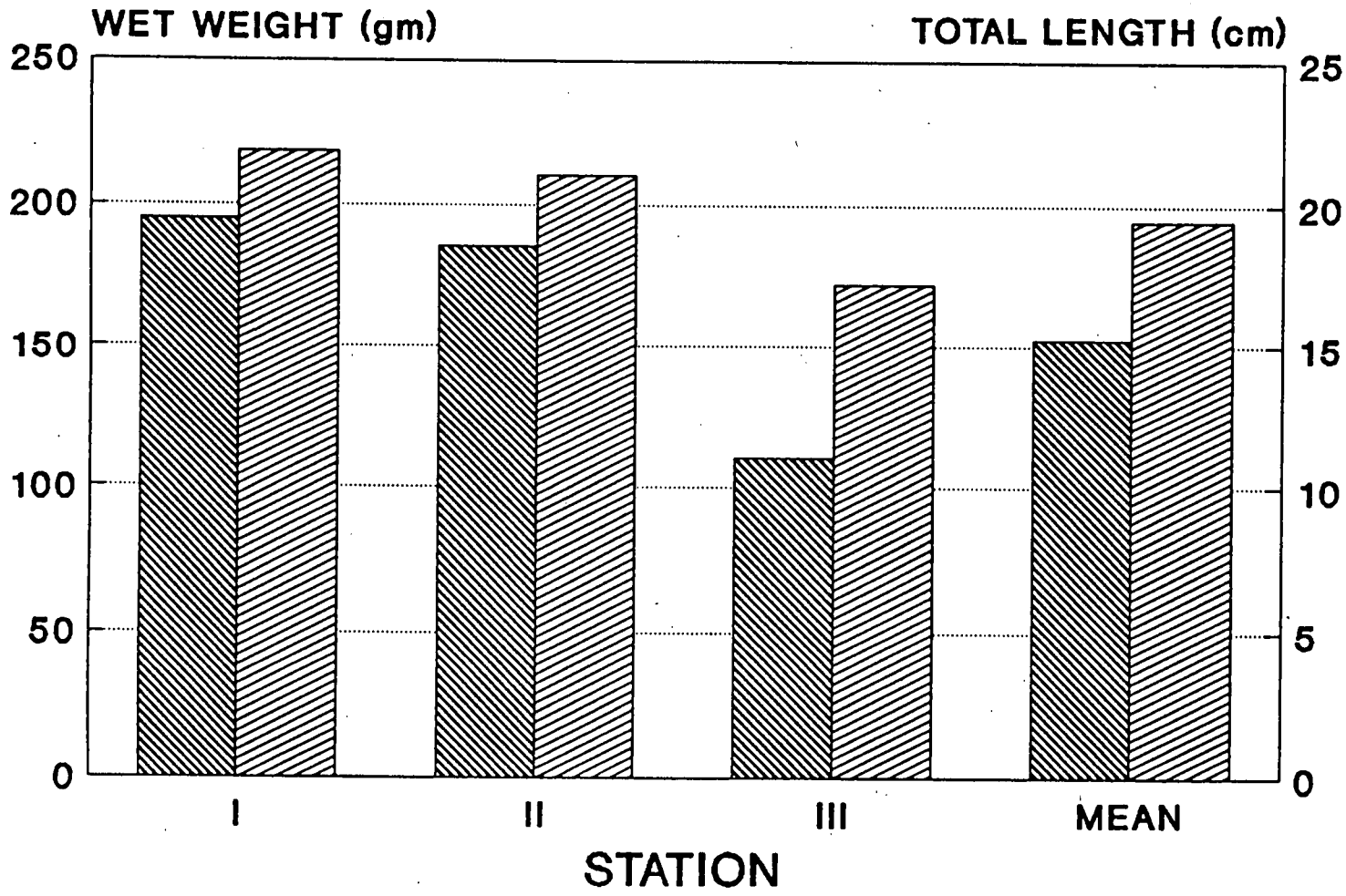


Figure 3.

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# LENGTH FREQEUNCY DISTRIBUTION
# GREAT MIAMI RIVER SEPT. 1989

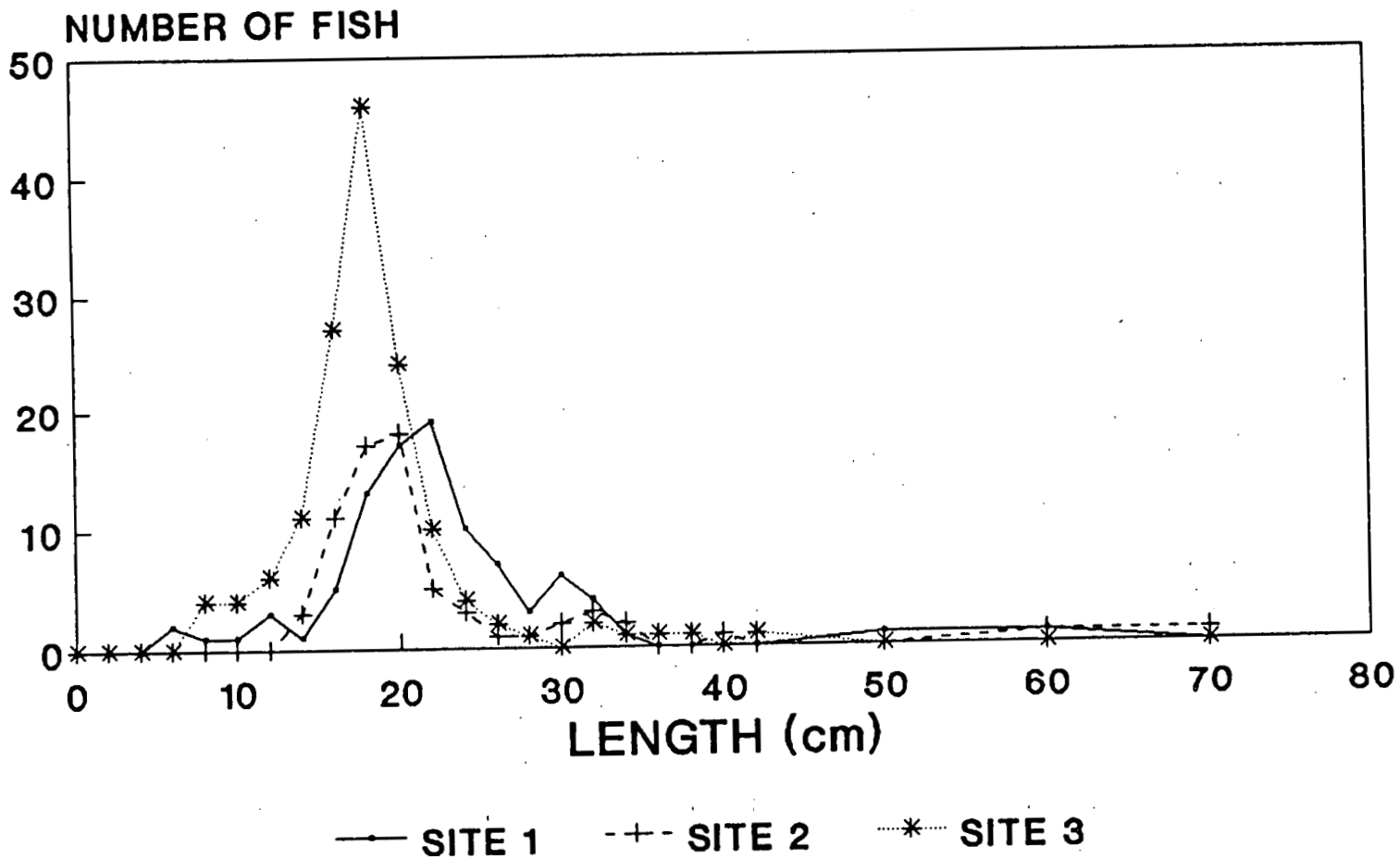


Figure 6

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# CUMULATIVE WEIGHT DISTRIBUTION
## GREAT MIAMI RIVER SEPT. 1989

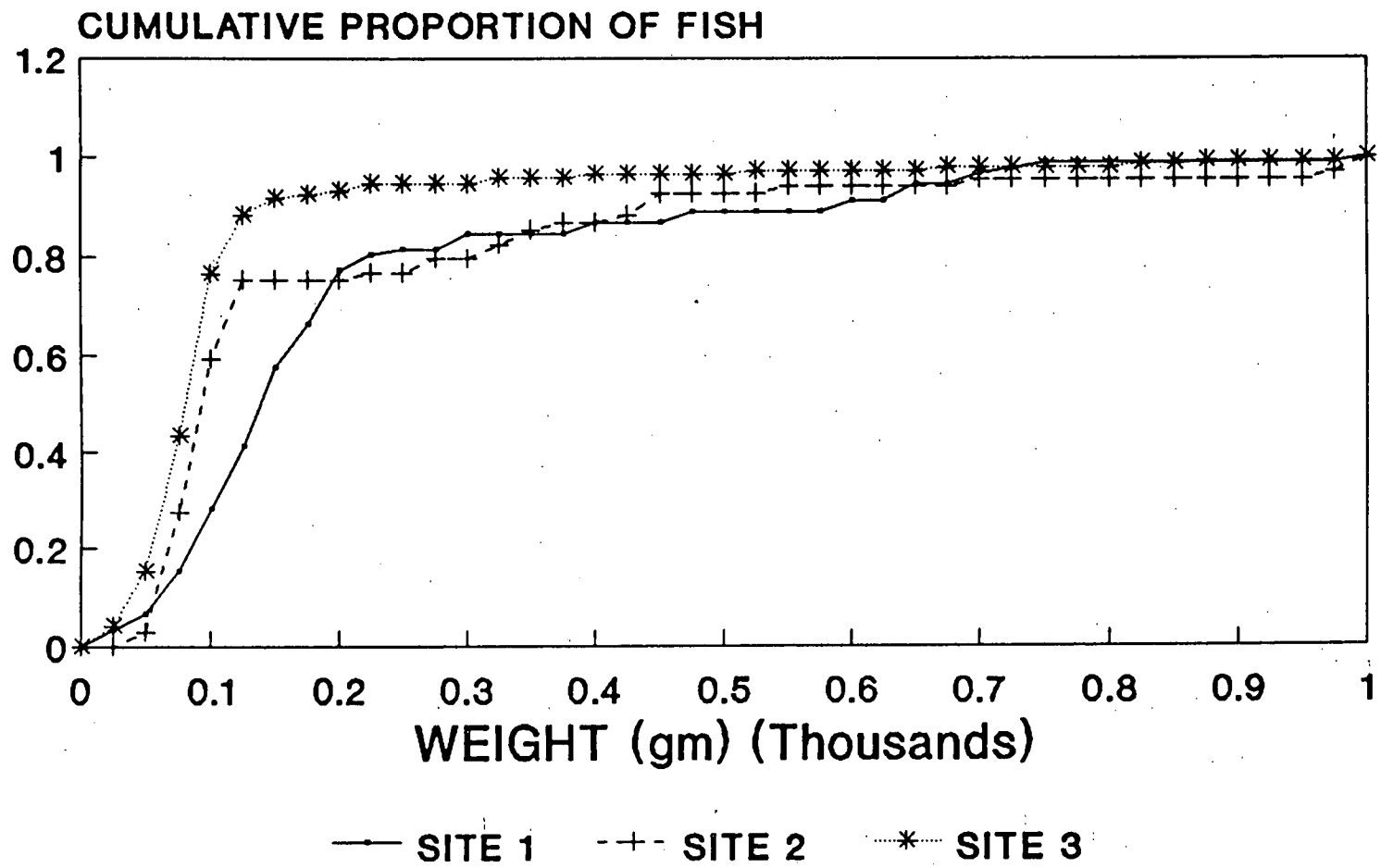


Figure 5



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Figure 7: CUMULATIVE LENGTH DISTRIBUTION
GREAT MIAMI RIVER SEPT. 1989

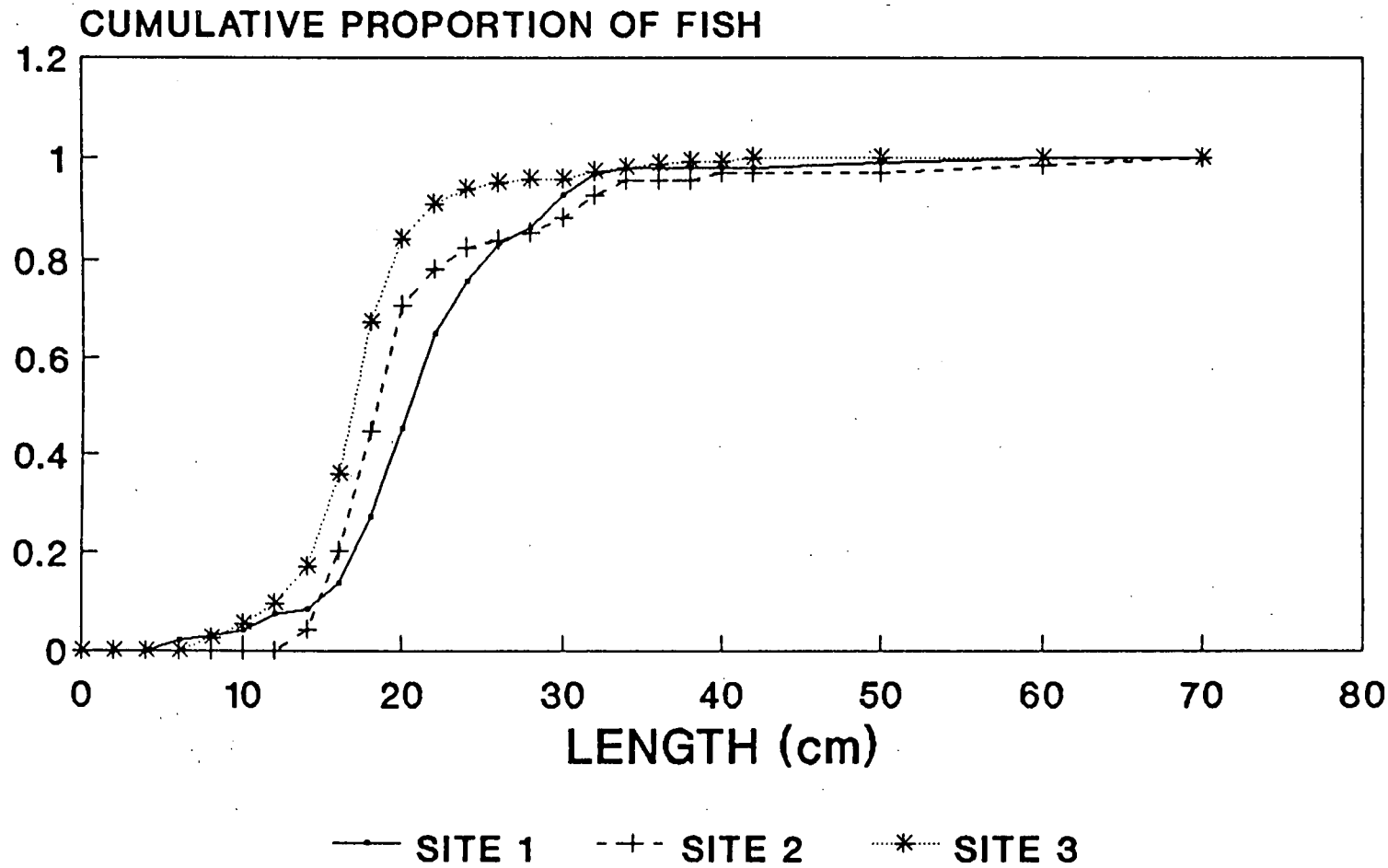


Figure 7



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Figure 8:

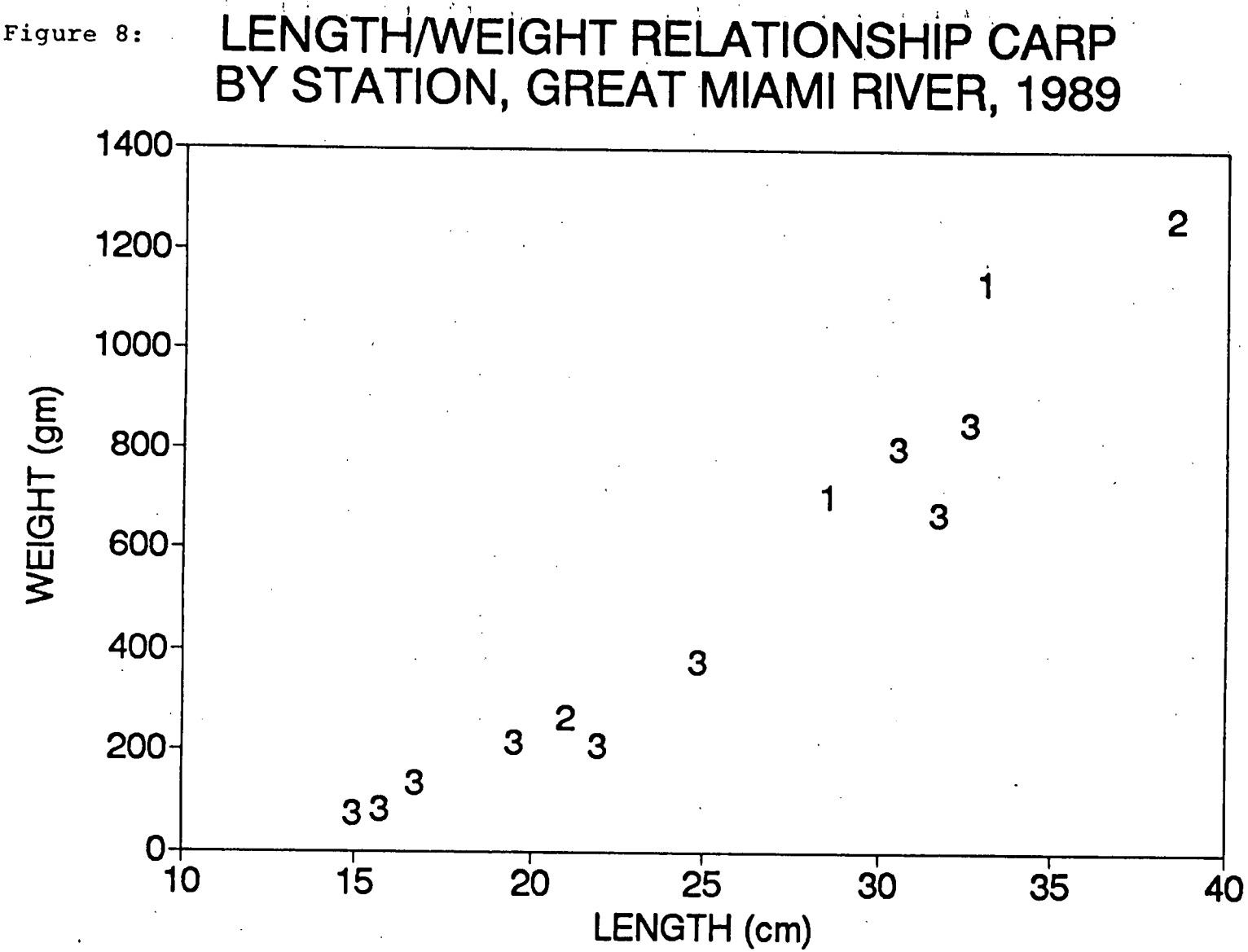




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Fig. 9 LENGTH/WEIGHT RELATIONSHIP GIZZARD SHAD BY STATION, GREAT MIAMI RIVER, 1989

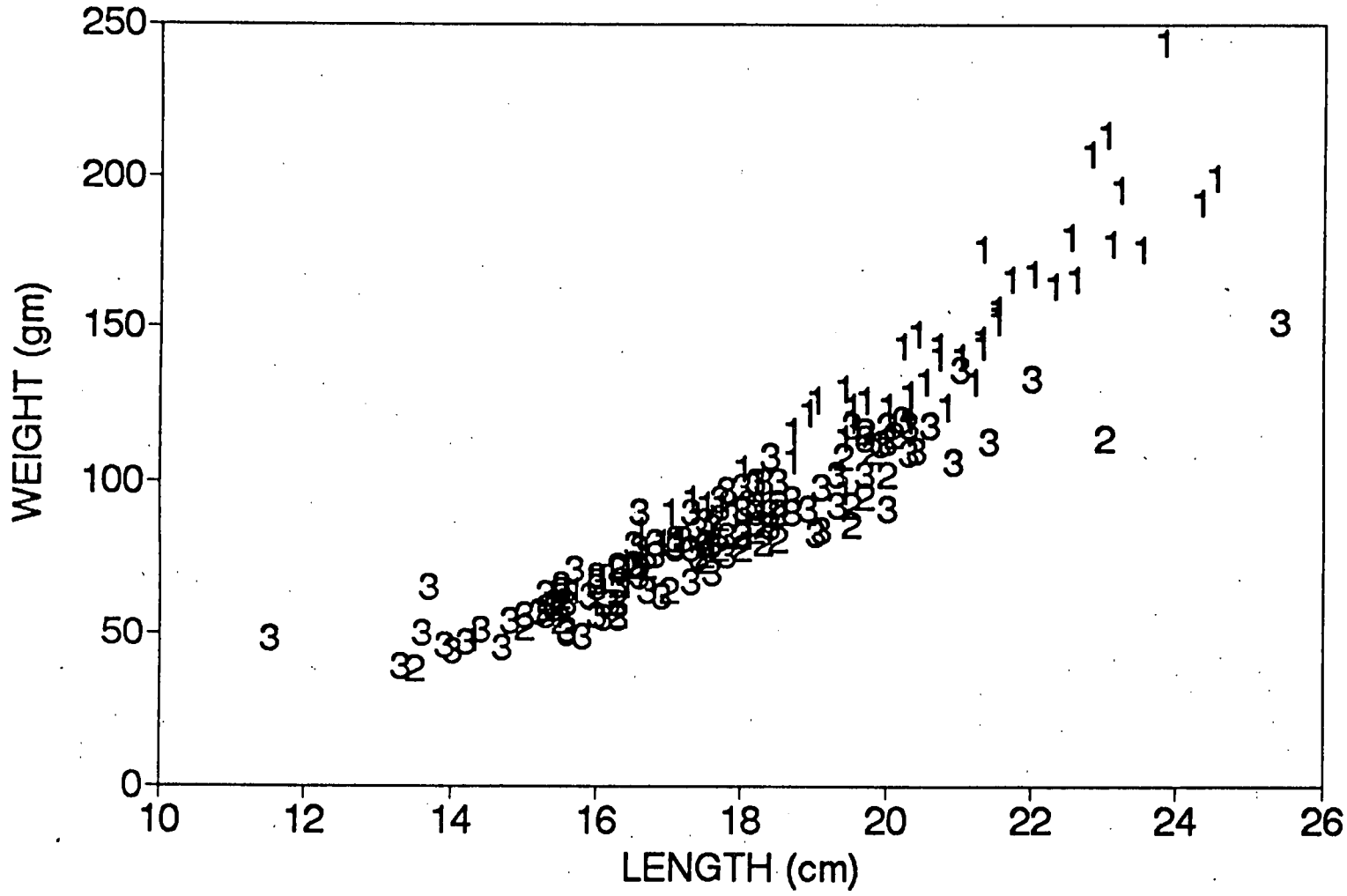




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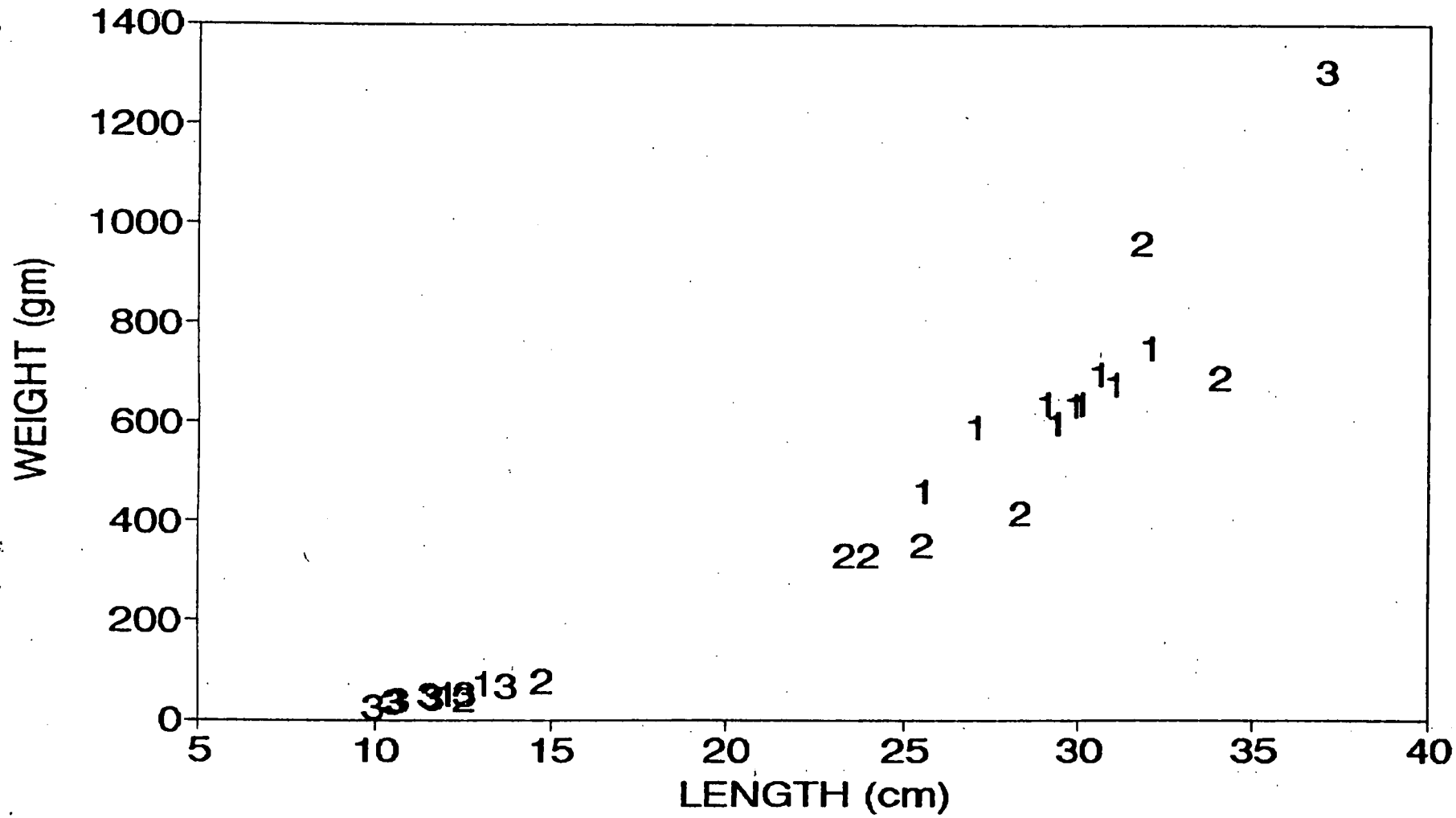
Fig. 10: LENGTH/WEIGHT RELATIONSHIP SUCKERS BY STATION, GREAT MIAMI RIVER, 1989




000022

Figure 11:

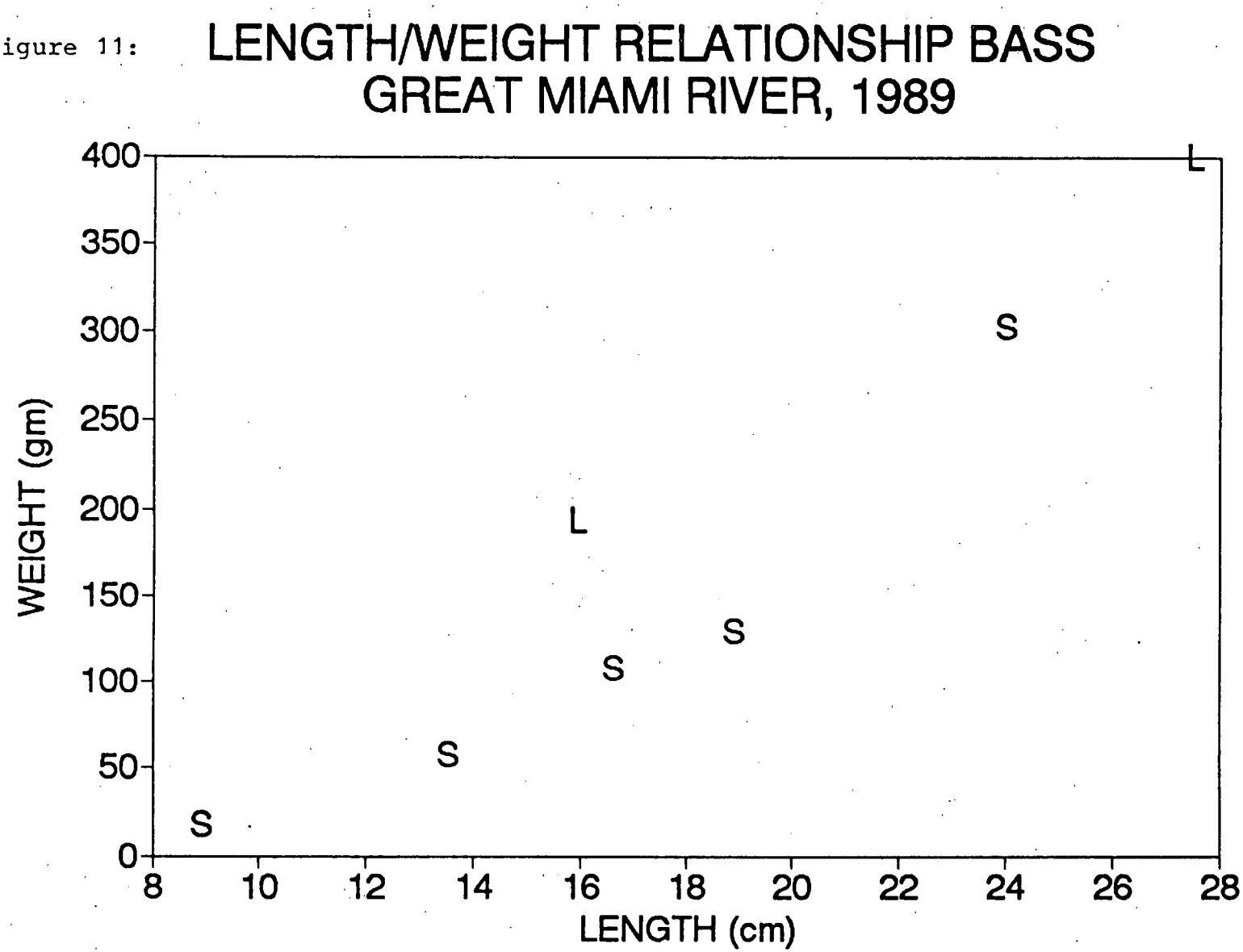





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Fig. 12: LENGTH/WEIGHT RELATIONSHIP CENTRARCHIDS BY STATION, GREAT MIAMI RIVER, 1989

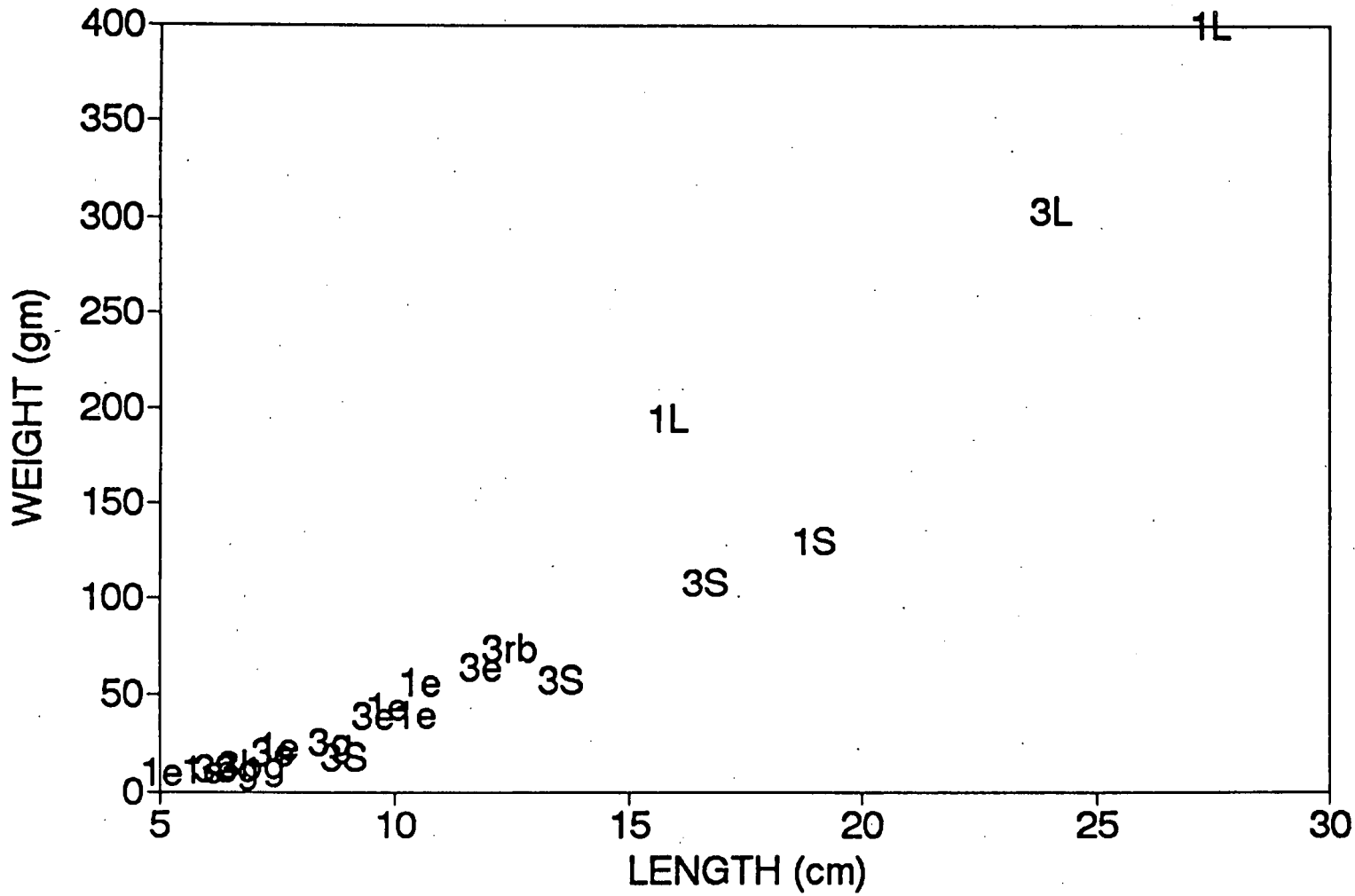


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Fig. 13 LENGTH/WEIGHT RELATIONSHIP CENTRARCHIDS BY STATION, GREAT MIAMI RIVER, 1989

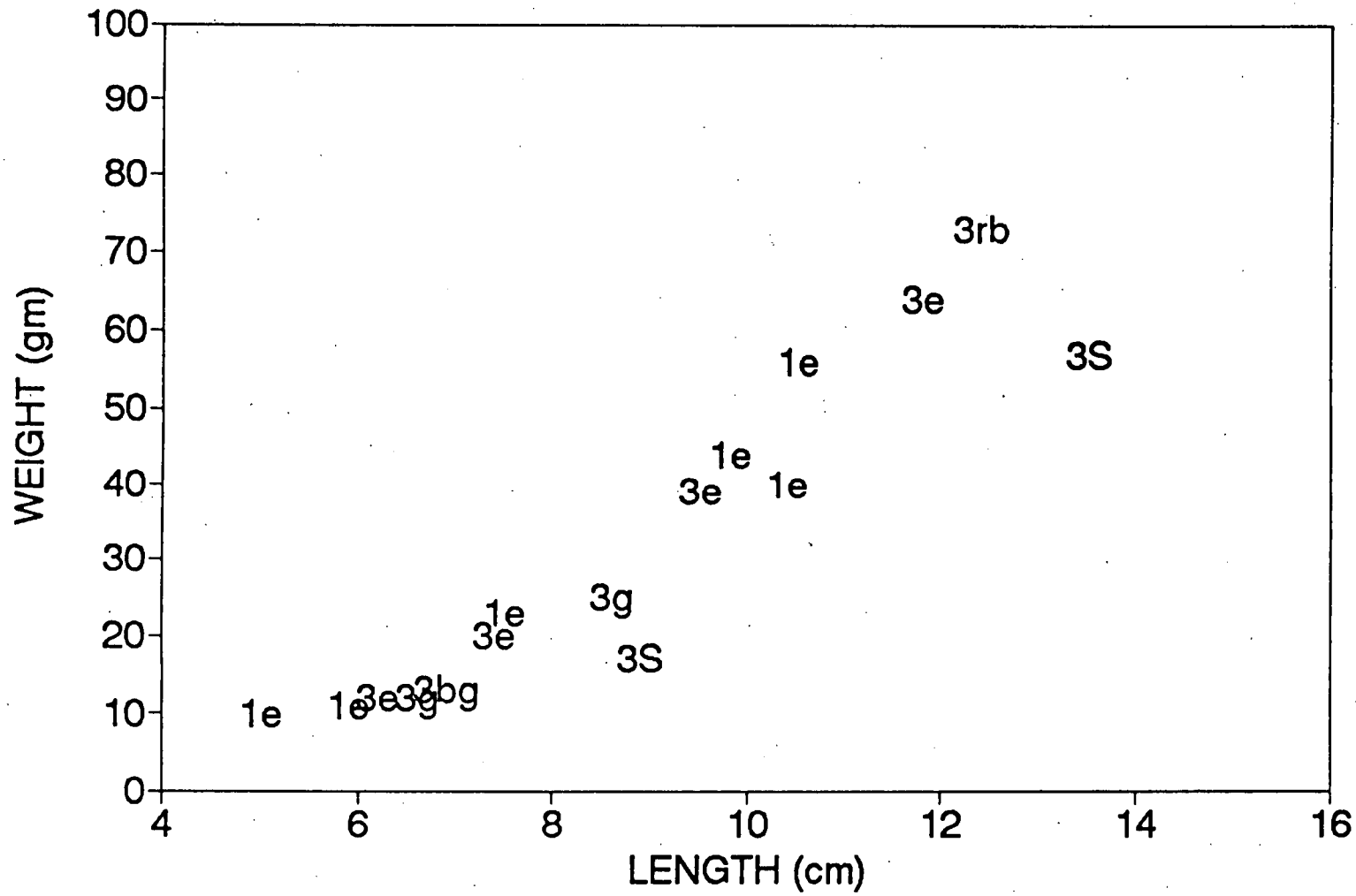




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Figure 14:

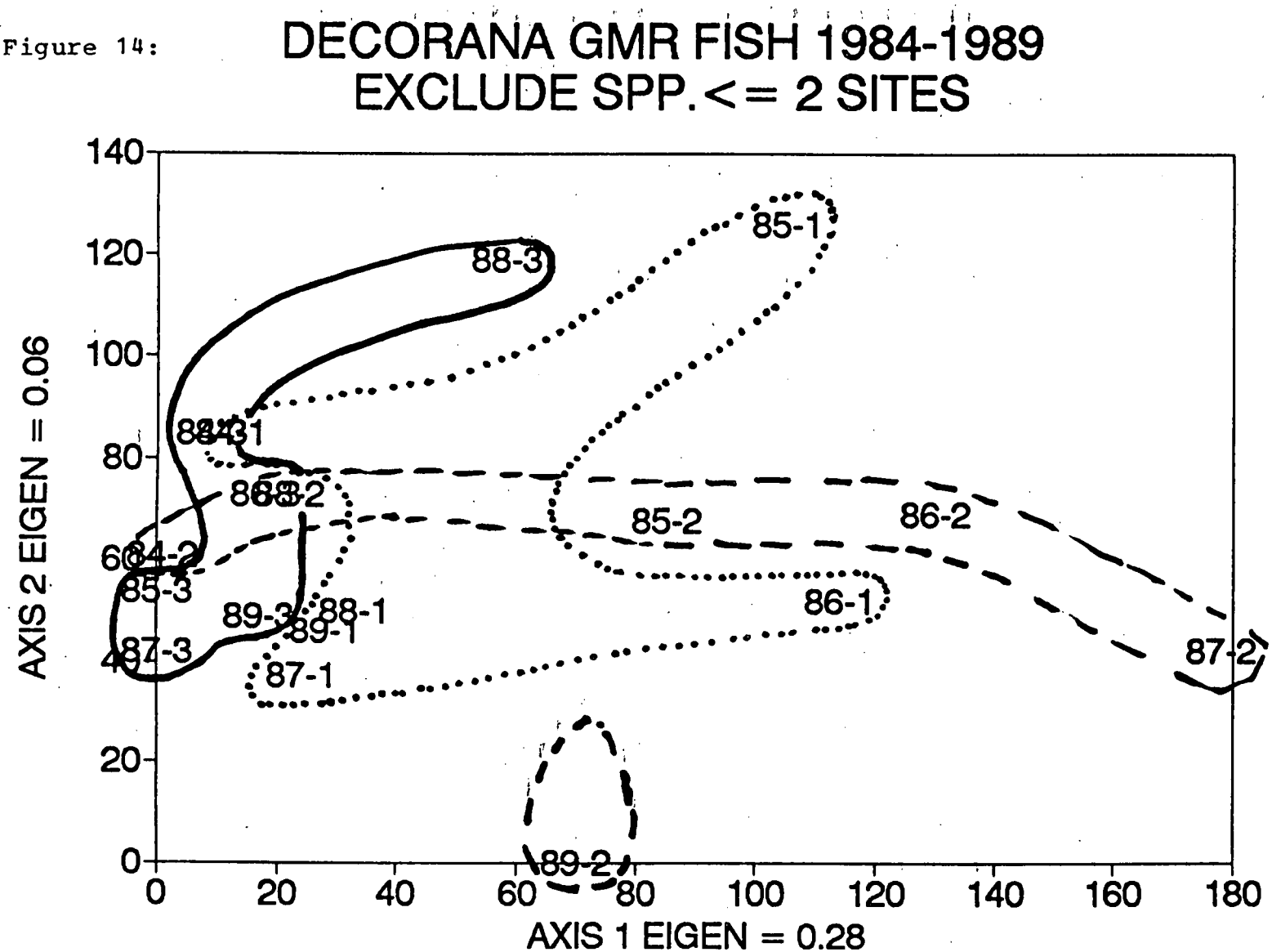




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Figure 15:

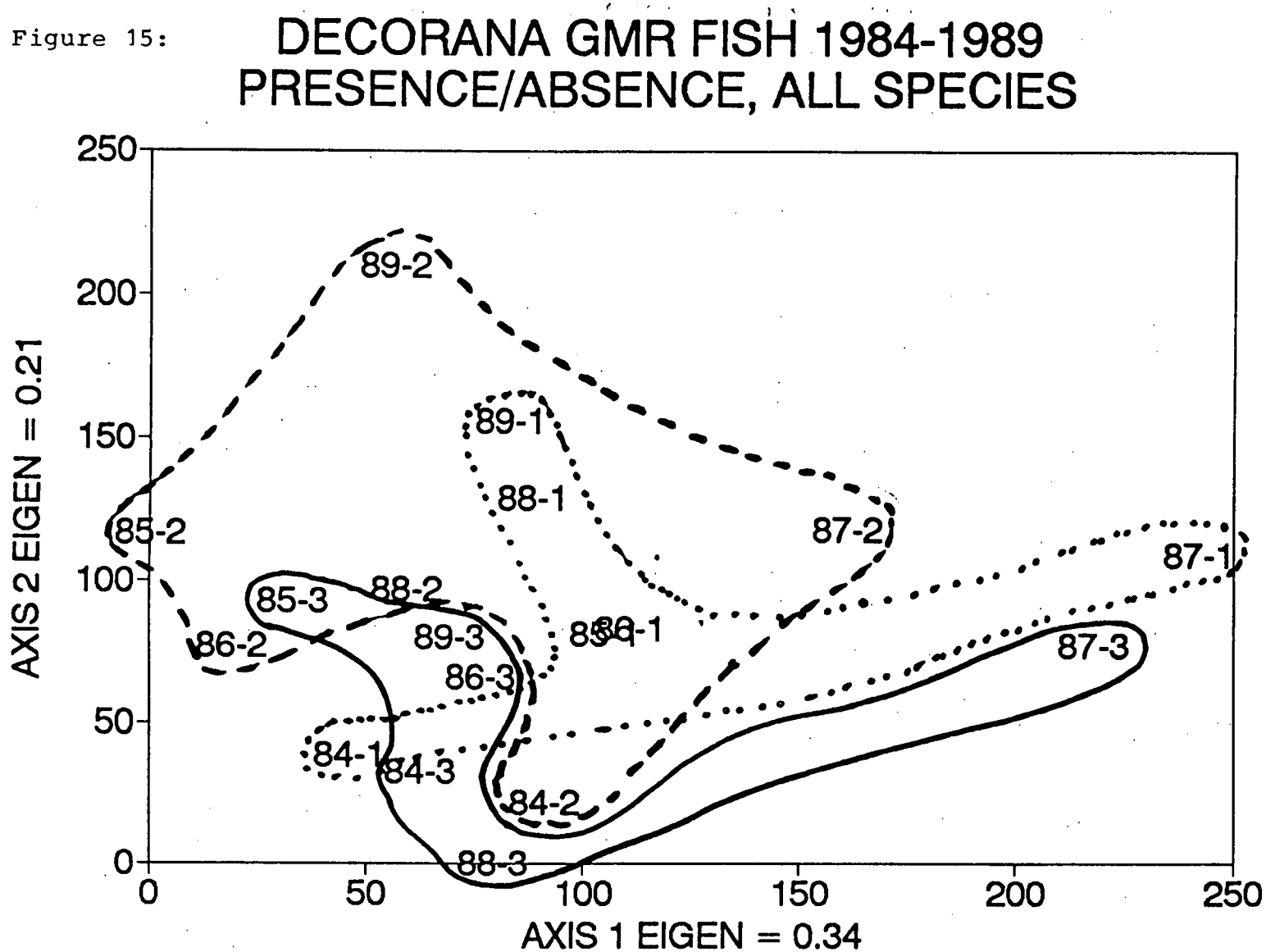




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Figure 16:

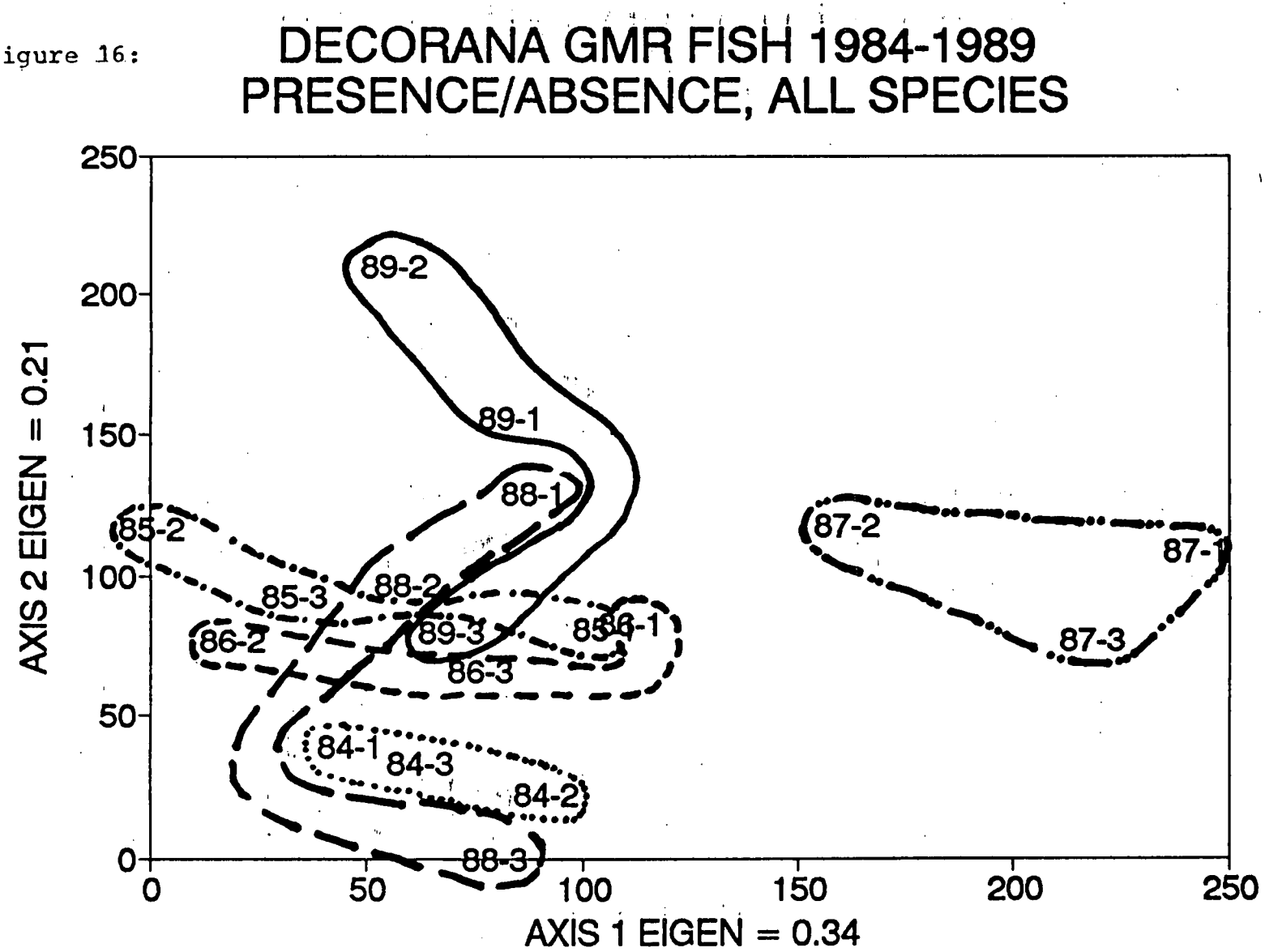
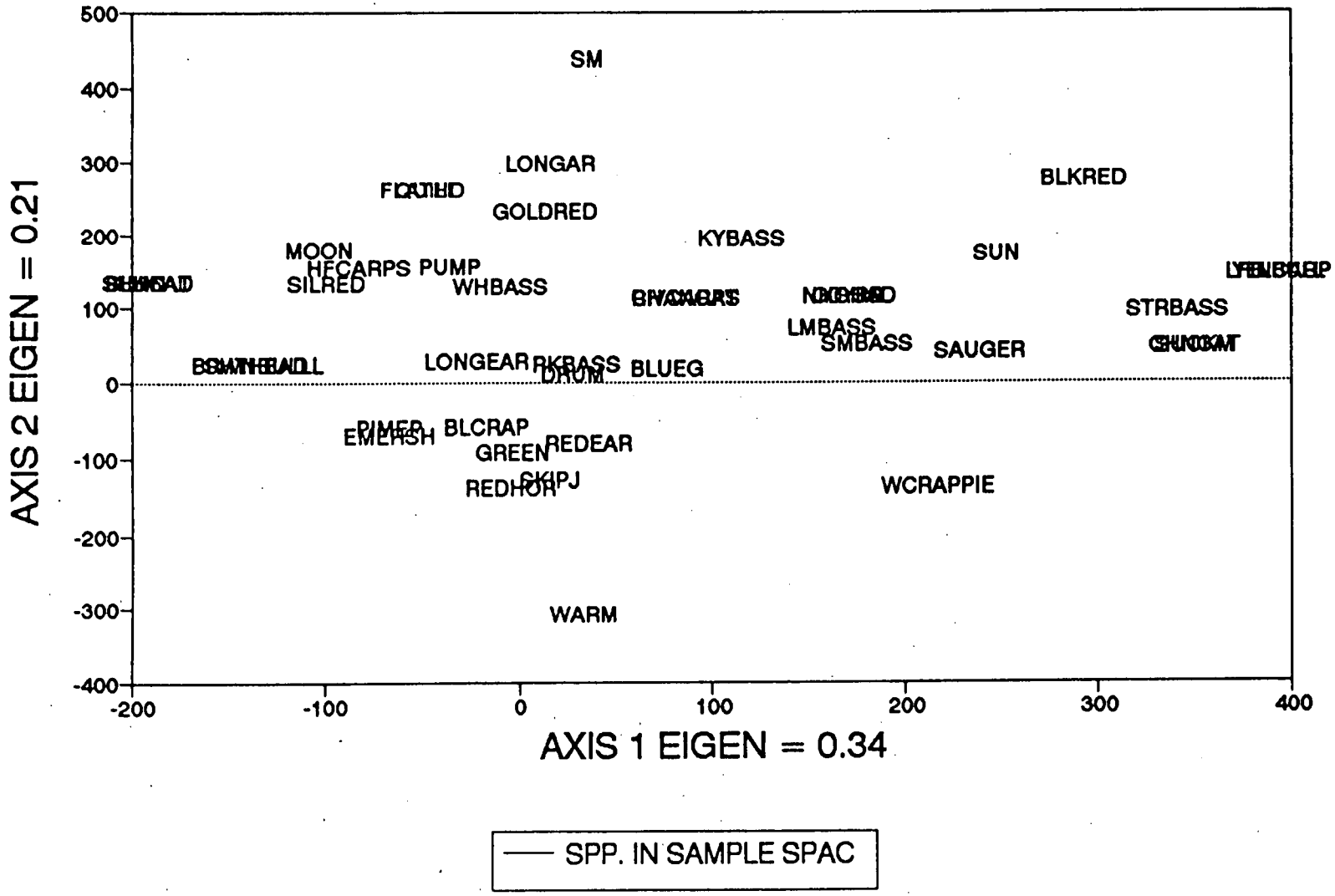


Figure 17:

# DECORANA GMR FISH 1984-1989 PRESENCE/ABSENCE, ALL SPECIES




SPP. IN SAMPLE SPAC

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Table 1. Physical characteristics of Great Miami River 19 Sept. 1989 below Ross (#1), below New Baltimore (#2) and above Miamito

| | TEMP. ( C) | OXYGEN (ppm) | % O2 SAT. | COND. (umho) | SECCHI ) (cm) | TIME |
|---|---|---|---|---|---|---|
| SITE 1 | 15.8 | 13.00 | 88.9 | 455 | 20 | 9:00 |
| SITE 2 | 19.2 | 13.20 | 91.7 | 488 | 15 | 11:24 |
| SITE 3 | 19.9 | 12.90 | 88.2 | 500 | 20 | 14:45 |

River stage dropping from 5.4' to 3.6' over 18-20 Sept. 1989.

Table 2. Family, species and numbers of fish collected by station in Great Miami River, Sept. 19, 1989.

| SPECIES | FAMILY | SITE 1 | SITE 2 | SITE 3 | TOTAL |
|---|---|---|---|---|---|
| LONG NOSE GAR | LEPISOSTEIDAE | 4 | 2 | 1 | 7 |
| GIZZARD SHAD | CLUPEIDAE | 60 | 35 | 100 | 195 |
| SKIPJACK HERRING | CLUPEIDAE | | | 1 | 1 |
| CYPRINUS CARPIO | CYPRINIDAE | 2 | 2 | 9 | 13 |
| RIVER CARPSUCKER | CATOSTOMIDAE | 8 | 1 | 7 | 16 |
| QUILLBACK | CATOSTOMIDAE | 2 | 1 | | 3 |
| HIGHFIN | CATOSTOMIDAE | | 3 | | 3 |
| BLACK REDHORSE | CATOSTOMIDAE | | 2 | | 2 |
| SILVER REDHORSE | CATOSTOMIDAE | | | 1 | 1 |
| SM.MOUTH BUFFALO | CATOSTOMIDAE | 1 | 1 | | 2 |
| CHANNEL CATFISH | ICTALURIDAE | 5 | 10 | 3 | 18 |
| FLATHEAD CATFISH | ICTALURIDAE | | 2 | | 2 |
| WHITE BASS | PERCICHTHYIDAE | 1 | 1 | 7 | 9 |
| LARGE MOUTH BASS | CENTRARCHIDAE | 5 | | 1 | 6 |
| SMALL MOUTH BASS | CENTRARCHIDAE | 1 | | 3 | 4 |
| BLUEGILL SUNFISH | CENTRARCHIDAE | | | 1 | 1 |
| LONGEAR SUNFISH | CENTRARCHIDAE | 6 | | 4 | 10 |
| GREEN SUNFISH | CENTRARCHIDAE | | | 2 | 2 |
| ROCK BASS | CENTRARCHIDAE | | | 1 | 1 |
| SAUGER | PERCIDAE | 1 | | 3 | 4 |
| DRUM | SCIAENIDAE | 1 | 9 | 1 | 11 |
| | INDIVIDUALS/STATIO | 97 | 69 | 145 | 311 |
| | SPECIES/STATION | 13 | 12 | 16 | 21 |
| | MIN. SHOCKED | 48.6 | 60.2 | 64 | 172.8 |
| | FISH SHOCKED/HOUR | 119.8 | 68.8 | 135.9 | 108.0 |
| | # INDIVIDUALS/SP. | 7.5 | 5.8 | 9.1 | 14.8 |

| | I | II | III | MEAN |
|---|---|---|---|---|
| Hbar/ind | 2.18 | 2.43 | 1.96 | 2.37 |
| Hmax | 3.70 | 3.58 | 4.00 | 4.39 |
| Evenness | 0.59 | 0.68 | 0.49 | 0.54 |
| 10(EVENS) | 5.88 | 6.77 | 4.91 | 5.39 |

diversity measures log base 2

| SITES | 1-2 | 2-3 | 1-3 |
|---|---|---|---|
| COMM.COEF | 0.76 | 0.72 | 0.50 |

Table 3: THE NUMBER OF FISH ELECTROSHOCKED/hr AND NO. OF SPECIES IDENTIFIED AT EACH STATION BY YEAR, 1984-1989.

| | INDIVIDUALS | | | SPECIES | | |
|---|---|---|---|---|---|---|
| Year\\Station | I | II | III | I | II | III |
| 1984 | - | - | - | 15 | 12 | 15 |
| 1985 | 104 | 84 | 314 | 11 | 19 | 16 |
| 1986 | 89 | 79 | 266 | 12 | 15 | 16 |
| 1987 | 73 | 75 | 102 | 10 | 11 | 10 |
| 1988 | 146 | 195 | 154 | 15 | 13 | 15 |
| 1989 | 120 | 69 | 136 | 13 | 12 | 16 |
| MEAN | 88.7 | 83.7 | 162.0 | 12.7 | 13.7 | 14.7 |

**********

ONE-WAY ANOVA COMPARISONS BY YEAR AND STATION

| VARIBLE | F RATIO | PROBABILITY |
|---|---|---|
| FISH/hr X YEAR | 0.69 | 0.6146 |
| FISH/hr X STATION | 3.51 | 0.0631 |
| SPECIES X YEAR | 1.81 | 0.1860 |
| SPECIES X STATION | 0.98 | 0.3987 |

Table 4: SPECIES DIVERSITY AND EVENNESS USING INFORMATION INDEX (log base 2) BY STATION AND BY YEAR, 1984-1989.

| | Hbar/INDIVIDUAL | | | EVENNESS | | |
|---|---|---|---|---|---|---|
| Year\\Station | I | II | III | I | II | III |
| 1984 | 2.24 | 1.70 | 2.06 | 0.58 | 0.48 | 0.53 |
| 1985 | 2.93 | 3.82 | 1.28 | 0.85 | 0.90 | 0.32 |
| 1986 | 2.62 | 3.40 | 2.20 | 0.73 | 0.87 | 0.55 |
| 1987 | 1.68 | 3.07 | 1.26 | 0.51 | 0.89 | 0.40 |
| 1988 | 2.23 | 2.33 | 2.78 | 0.57 | 0.75 | 0.71 |
| 1989 | 2.18 | 2.43 | 1.96 | 0.59 | 0.68 | 0.49 |
| MEAN | 2.31 | 2.79 | 1.92 | 0.64 | 0.76 | 0.50 |

**********

ONE-WAY ANOVA COMPARISONS BY YEAR AND STATION

| VARIBLE | F RATIO | PROBABILITY |
|---|---|---|
| Hbar X YEAR | 0.61 | 0.6920 |
| Hbar X STATION | 3.02 | 0.0788 |
| EVENNESS X YEAR | 0.43 | 0.8164 |
| EVENNESS X STATION | 5.08 | 0.0207 * |

Table 5: MEAN WEIGHT AND LENGTH OF FISHES CAUGHT BY STATION AND YEARS, 1984-1989

| | WEIGHT gm | | | LENGTH cm | | |
|---|---|---|---|---|---|---|
| Year\\Station | I | II | III | I | II | III |
| 1984 | - | - | - | - | - | - |
| 1985 | 623.0 | 376.0 | 115.0 | 23.8 | 26.3 | 18.5 |
| 1986 | 471.0 | 271.0 | 160.0 | 30.5 | 23.3 | 23.8 |
| 1987 | 180.0 | 260.0 | 130.0 | 26.0 | 28.0 | 23.0 |
| 1988 | 175.0 | 135.0 | 62.0 | 25.0 | 23.5 | 14.5 |
| 1989 | 195.0 | 186.0 | 110.0 | 21.8 | 21.0 | 17.4 |
| MEAN | 274 | 205 | 96 | 21.2 | 20.4 | 16.2 |

**********

ONE-WAY ANOVA COMPARISONS BY YEAR AND STATION

| VARIBLE | F RATIO | PROBABILITY |
|---|---|---|
| WEIGHT X YEAR | 1.60 | 0.2496 |
| WEIGHT X STATION | 3.32 | 0.0713 |
| LENGTH X YEAR | 1.38 | 0.3100 |
| LENGTH X STATION | 4.62 | 0.0326 * |

Table 6. Length and weight frequency distributions of fish electroshocked from Great Miami River, Sept. 19, 1989

LENGTH FREQUENCY DISTRIBUTION

| cm | SITE | SITE 2 | SITE 3 | TOTAL |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 0 | 0 |
| 4 | 0 | 0 | 0 | 0 |
| 6 | 2 | 0 | 0 | 2 |
| 8 | 1 | 0 | 4 | 5 |
| 10 | 1 | 0 | 4 | 5 |
| 12 | 3 | 0 | 6 | 9 |
| 14 | 1 | 3 | 11 | 15 |
| 16 | 5 | 11 | 27 | 43 |
| 18 | 13 | 17 | 46 | 76 |
| 20 | 17 | 18 | 24 | 59 |
| 22 | 19 | 5 | 10 | 34 |
| 24 | 10 | 3 | 4 | 17 |
| 26 | 7 | 1 | 2 | 10 |
| 28 | 3 | 1 | 1 | 5 |
| 30 | 6 | 2 | 0 | 8 |
| 32 | 4 | 3 | 2 | 9 |
| 34 | 1 | 2 | 1 | 4 |
| 36 | 0 | 0 | 1 | 1 |
| 38 | 0 | 0 | 1 | 1 |
| 40 | 0 | 1 | 0 | 1 |
| 42 | 0 | 0 | 1 | 1 |
| 50 | 1 | 0 | 0 | 1 |
| 60 | 1 | 1 | 0 | 2 |
| 70 | 0 | 1 | 0 | 1 |
| | 0 | 0 | 0 | 0 |
| SUM | 95 | 69 | 145 | 309 |

tics of Great Miami River 19 Sept. 1989
ow New Baltimore (#2) and above Miamito

| % O2 SAT. | COND. (umho) | SECCHI (cm) | TIME |
|---|---|---|---|
| 88.9 | 455 | 20 | 9:00 |
| 91.7 | 488 | 15 | 11:24 |
| 88.2 | 500 | 20 | 14:45 |

WEIGHT FREQUENCY DISTRIBUTION

| gm | SITE 1 | SITE 2 | SITE 3 | TOTAL |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |
| 25 | 3 | 0 | 6 | 9 |
| 50 | 3 | 2 | 16 | 21 |
| 75 | 8 | 17 | 41 | 66 |
| 100 | 12 | 22 | 48 | 82 |
| 125 | 12 | 11 | 17 | 40 |
| 150 | 15 | 0 | 5 | 20 |
| 175 | 8 | 0 | 1 | 9 |
| 200 | 10 | 0 | 1 | 11 |
| 225 | 3 | 1 | 2 | 6 |
| 250 | 1 | 0 | 0 | 1 |
| 275 | 0 | 2 | 0 | 2 |
| 300 | 3 | 0 | 0 | 3 |
| 325 | 0 | 2 | 2 | 4 |
| 350 | 0 | 2 | 0 | 2 |
| 375 | 0 | 1 | 0 | 1 |
| 400 | 2 | 0 | 1 | 3 |
| 425 | 0 | 1 | 0 | 1 |
| 450 | 0 | 3 | 0 | 3 |
| 475 | 2 | 0 | 0 | 2 |
| 500 | 0 | 0 | 0 | 0 |
| 525 | 0 | 0 | 1 | 1 |
| 550 | 0 | 1 | 0 | 1 |
| 575 | 0 | 0 | 0 | 0 |
| 600 | 2 | 0 | 0 | 2 |
| 625 | 0 | 0 | 0 | 0 |
| 650 | 3 | 0 | 0 | 3 |
| 675 | 0 | 0 | 1 | 1 |
| 700 | 2 | 1 | 0 | 3 |
| 725 | 1 | 0 | 0 | 1 |
| 750 | 1 | 0 | 0 | 1 |
| 775 | 0 | 0 | 0 | 0 |
| 800 | 0 | 0 | 0 | 0 |
| 825 | 0 | 0 | 1 | 1 |
| 850 | 0 | 0 | 0 | 0 |
| 875 | 0 | 0 | 1 | 1 |
| 900 | 0 | 0 | 0 | 0 |
| 925 | 0 | 0 | 0 | 0 |
| 950 | 0 | 0 | 0 | 0 |
| 975 | 0 | 1 | 0 | 1 |
| 1000 | 0 | 0 | 0 | 0 |
| 1500 | 1 | 2 | 1 | 4 |
| 2000 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 |
| SUM | 92 | 69 | 145 | 306 |

Table 7: Species Occurences in Electroshocking Samples taken from the Great Miami River between 1984 and 1989.

5452

| SP.CODE | COMMON NAME | year / FAM.CODE | 1984 84-1 | 84-2 | 84-3 | 1985 85-1 | 85-2 | 85-3 | 1986 A6 | B6 | C6 | 1987 A7 | B7 | C7 | 1988 A8 | B8 | C8 | 1989 A9 | B9 | C9 | GRAND TO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | GIZZARD SHAD | 1 | 65 | 85 | 171 | 7 | 9 | 131 | 17 | 13 | 114 | 36 | 11 | 93 | 54 | 65 | 54 | 60 | 35 | 100 | |
| 2 | CYPRINUS CARPIO | 3 | 3 | 3 | 13 | 15 | 3 | 3 | 31 | 12 | 1 | 6 | 3 | 3 | 7 | 8 | 2 | 2 | 2 | 9 | |
| 3 | LARGE MOUTH BASS | 7 | 1 | 0 | 12 | 8 | 1 | 3 | 2 | 1 | 16 | 2 | 0 | 2 | 3 | 6 | 12 | 5 | 0 | 1 | |
| 4 | SMALL MOUTH BASS | 7 | 4 | 6 | 4 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 2 | 0 | 1 | 3 | 9 | 1 | 0 | 3 | |
| 5 | BLUEGILL SUNFISH | 7 | 6 | 0 | 11 | 8 | 1 | 6 | 0 | 1 | 7 | 1 | 0 | 0 | 2 | 6 | 14 | 0 | 0 | 1 | |
| 6 | LONGEAR SUNFISH | 7 | 7 | 0 | 23 | 1 | 4 | 3 | 3 | 7 | 9 | 0 | 0 | 0 | 0 | 0 | 40 | 6 | 0 | 4 | |
| 7 | WHITE CRAPPIE | 7 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | |
| 8 | RED EAR SUNFISH | 7 | 0 | 0 | 2 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 9 | GREEN SUNFISH | 7 | 5 | 2 | 8 | 0 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 2 | |
| 10 | WHITE BASS | 6 | 3 | 3 | 2 | 0 | 1 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 3 | 3 | 8 | 1 | 1 | 7 | |
| 11 | SAUGER | 8 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 0 | 0 | 0 | 1 | 1 | 0 | 3 | |
| 12 | HIGHFIN CARPSUCKER | 4 | 1 | 0 | 1 | 0 | 2 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | |
| 13 | RIVER CARPSUCKER | 4 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 8 | 2 | 0 | 2 | 1 | 1 | 1 | 9 | 8 | 1 | 7 | |
| 14 | REDHORSE | 4 | 2 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 14 | 0 | 0 | 0 | |
| 15 | CHANNEL CATFISH | 5 | 1 | 2 | 2 | 1 | 4 | 2 | 7 | 13 | 2 | 0 | 3 | 1 | 2 | 6 | 40 | 5 | 10 | 3 | |
| 16 | EMERALD SHINER | 3 | 2 | 4 | 9 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 17 | PIMEPAHLES | 3 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | |
| 18 | DRUM | 9 | 2 | 1 | 0 | 2 | 1 | 1 | 2 | 6 | 5 | 0 | 18 | 0 | 3 | 0 | 3 | 0 | 0 | 0 | |
| 19 | SPOTTED BASS | 7 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | |
| 20 | SUNFISH (UNIDENT.) | 7 | 0 | 0 | 0 | 4 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | |
| 21 | GOLDEN REDHORSE | 4 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 5 | 8 | 0 | 6 | 0 | 1 | 0 | 0 | 1 | 9 | 1 | |
| 22 | FLATHEAD CATFISH | 5 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 0 | |
| 23 | BLUE CATFISH | 5 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 24 | NORTHERN HOGSUCKER | 4 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 25 | SHORT HEAD REDHORSE | 4 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 26 | QUILLBACK CARPSUCKER | 4 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | |
| 27 | SILVER REDHORSE | 4 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | |
| 28 | MINNOW UNIDENT. | 3 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 29 | BLACK CRAPPIE | 7 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | |
| 30 | MOONEYE | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 31 | ROCK BASS | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 1 | |
| 32 | SKIPJACK HERRING | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | |
| 33 | STIPPED BASS | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 7 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 34 | WARMOUTH BASS | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | |
| 35 | LONGNOSE GAR | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 4 | 2 | 1 | |
| 36 | PUMPKINSEED | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | |
| 37 | BLACK REDHORSE | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | |
| 38 | SMALLMOUTH BUFFALO | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | |
| 39 | CHANNEL MIMIC SHINER | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 40 | LONGFIN CARPSUCKER | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 41 | SUCKERMOUTH MINNOW | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 42 | YELLOW BULLHEAD | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 43 | SHORTHEAD REDHORSE | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 44 | BROWN BULLHEAD | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | total fish recovered | | 104 | 113 | 263 | 52 | 40 | 160 | 73 | 79 | 180 | 51 | 56 | 122 | 85 | 111 | 217 | 97 | 69 | 145 | 2017 FIS |
| | station code | | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | |

APPENDIX 1. Fish identification, species, length (cm), wet wt.(gm) and sex
GREAT MIAMI RIVER FISH SURVEY SEPT. 19,1989

by MICHAEL MILLER, ROBERT REPASKY, ROBERT DAVENPORT, WILLIIAM ROWE, REBECCA BI
UNIVERSITY OF CINCINNATI
and CRAIG DODD, WMCO

STATION 1 BOLTON WATERWORKS

| SAMP | COMMON NAME | FAMILY | LENGTH cm | WEIGHT gm | GENDER SEX | SPECIES |
|---|---|---|---|---|---|---|
| 1 | LONG-NOSE GAR | LEPISOSTEIDAE | 44 | RELEASED | | Lepisosteus osseus |
| 2 | LONG-NOSE GAR | LEPISOSTEIDAE | 55 | RELEASED | | Lepisosteus osseus |
| 3 | LONG-NOSE GAR | LEPISOSTEIDAE | 53 | 397 | M | Lepisosteus osseus |
| 4 | LONG-NOSE GAR | LEPISOSTEIDAE | 43 | 222 | M | Lepisosteus osseus |
| 5 | GIZZARD SHAD | CLUPIDIDAE | 19.4 | 97 | F | Dorosoma cepedianum |
| 6 | GIZZARD SHAD | CLUPIDIDAE | 16.4 | 66 | I | Dorosoma cepedianum |
| 7 | GIZZARD SHAD | CLUPIDIDAE | 21.3 | 176 | M | Dorosoma cepedianum |
| 8 | GIZZARD SHAD | CLUPIDIDAE | 20 | 124 | M | Dorosoma cepedianum |
| 9 | GIZZARD SHAD | CLUPIDIDAE | 24.3 | 192 | F | Dorosoma cepedianum |
| 10 | GIZZARD SHAD | CLUPIDIDAE | 22.8 | 208 | F | Dorosoma cepedianum |
| 11 | GIZZARD SHAD | CLUPIDIDAE | 15.4 | 64 | I | Dorosoma cepedianum |
| 12 | GIZZARD SHAD | CLUPIDIDAE | 21.3 | 144 | I | Dorosoma cepedianum |
| 13 | GIZZARD SHAD | CLUPIDIDAE | 24.5 | 200 | M | Dorosoma cepedianum |
| 14 | GIZZARD SHAD | CLUPIDIDAE | 20.8 | 124 | I | Dorosoma cepedianum |
| 15 | GIZZARD SHAD | CLUPIDIDAE | 22.6 | 166 | M | Dorosoma cepedianum |
| 16 | GIZZARD SHAD | CLUPIDIDAE | 23.2 | 196 | M | Dorosoma cepedianum |
| 17 | GIZZARD SHAD | CLUPIDIDAE | 19.5 | 120 | M | Dorosoma cepedianum |
| 18 | GIZZARD SHAD | CLUPIDIDAE | 20.3 | 128 | M | Dorosoma cepedianum |
| 19 | GIZZARD SHAD | CLUPIDIDAE | 19 | 126 | I | Dorosoma cepedianum |
| 20 | GIZZARD SHAD | CLUPIDIDAE | 18.9 | 122 | I | Dorosoma cepedianum |
| 21 | GIZZARD SHAD | CLUPIDIDAE | 19.4 | 130 | I | Dorosoma cepedianum |
| 22 | GIZZARD SHAD | CLUPIDIDAE | 18.2 | 100 | I | Dorosoma cepedianum |
| 23 | GIZZARD SHAD | CLUPIDIDAE | 17.7 | 92 | I | Dorosoma cepedianum |
| 24 | GIZZARD SHAD | CLUPIDIDAE | 18.2 | 100 | I | Dorosoma cepedianum |
| 25 | GIZZARD SHAD | CLUPIDIDAE | 23.5 | 176 | F | Dorosoma cepedianum |
| 26 | GIZZARD SHAD | CLUPIDIDAE | 22.5 | 180 | M | Dorosoma cepedianum |
| 27 | GIZZARD SHAD | CLUPIDIDAE | 16.6 | 84 | I | Dorosoma cepedianum |
| 28 | GIZZARD SHAD | CLUPIDIDAE | 21 | 140 | F | Dorosoma cepedianum |
| 29 | GIZZARD SHAD | CLUPIDIDAE | 22.3 | 164 | M | Dorosoma cepedianum |
| 30 | GIZZARD SHAD | CLUPIDIDAE | 17.3 | 94 | I | Dorosoma cepedianum |
| 31 | GIZZARD SHAD | CLUPIDIDAE | 22 | 168 | M | Dorosoma cepedianum |
| 32 | GIZZARD SHAD | CLUPIDIDAE | 20.7 | 140 | F | Dorosoma cepedianum |
| 33 | GIZZARD SHAD | CLUPIDIDAE | 23 | 214 | F | Dorosoma cepedianum |
| 34 | GIZZARD SHAD | CLUPIDIDAE | 15.7 | 64 | I | Dorosoma cepedianum |
| 35 | GIZZARD SHAD | CLUPIDIDAE | 16.4 | 72 | I | Dorosoma cepedianum |
| 36 | GIZZARD SHAD | CLUPIDIDAE | 21.5 | 156 | M | Dorosoma cepedianum |
| 37 | GIZZARD SHAD | CLUPIDIDAE | 17.9 | 90 | I | Dorosoma cepedianum |
| 38 | GIZZARD SHAD | CLUPIDIDAE | 21.2 | 132 | F | Dorosoma cepedianum |
| 39 | GIZZARD SHAD | CLUPIDIDAE | 20.3 | 120 | F | Dorosoma cepedianum |
| 40 | GIZZARD SHAD | CLUPIDIDAE | 21.5 | 152 | F | Dorosoma cepedianum |
| 41 | GIZZARD SHAD | CLUPIDIDAE | 14.3 | 48 | I | Dorosoma cepedianum |
| 42 | GIZZARD SHAD | CLUPIDIDAE | 21.3 | 146 | F | Dorosoma cepedianum |
| 43 | GIZZARD SHAD | CLUPIDIDAE | 18.7 | 116 | I | Dorosoma cepedianum |
| 44 | GIZZARD SHAD | CLUPIDIDAE | 21.7 | 166 | M | Dorosoma cepedianum |
| 45 | GIZZARD SHAD | CLUPIDIDAE | 19.4 | 114 | I | Dorosoma cepedianum |
| 46 | GIZZARD SHAD | CLUPIDIDAE | 20.7 | 144 | M | Dorosoma cepedianum |
| 47 | GIZZARD SHAD | CLUPIDIDAE | 18.7 | 107 | I | Dorosoma cepedianum |
| 48 | GIZZARD SHAD | CLUPIDIDAE | 16.9 | 80 | I | Dorosoma cepedianum |
| 49 | GIZZARD SHAD | CLUPIDIDAE | 20.7 | 140 | M | Dorosoma cepedianum |
| 50 | GIZZARD SHAD | CLUPIDIDAE | 19.7 | 126 | I | Dorosoma cepedianum |

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|---|---|---|---|---|---|---|
| 51 | GIZZARD SHAD | CLUPIDIDAE | 23.8 | 244 | M | Dorosoma cepedianum |
| 52 | GIZZARD SHAD | CLUPIDIDAE | 23.1 | 178 | F | Dorosoma cepedianum |
| 53 | GIZZARD SHAD | CLUPIDIDAE | 17.5 | 92 | I | Dorosoma cepedianum |
| 54 | GIZZARD SHAD | CLUPIDIDAE | 17.5 | 92 | I | Dorosoma cepedianum |
| 55 | GIZZARD SHAD | CLUPIDIDAE | 20.5 | 132 | M | Dorosoma cepedianum |
| 56 | GIZZARD SHAD | CLUPIDIDAE | 20.4 | 148 | M | Dorosoma cepedianum |
| 57 | GIZZARD SHAD | CLUPIDIDAE | 18 | 104 | M | Dorosoma cepedianum |
| 58 | GIZZARD SHAD | CLUPIDIDAE | 19.5 | 124 | M | Dorosoma cepedianum |
| 59 | GIZZARD SHAD | CLUPIDIDAE | 21.5 | 154 | I | Dorosoma cepedianum |
| 60 | GIZZARD SHAD | CLUPIDIDAE | 19.5 | 124 | I | Dorosoma cepedianum |
| 61 | GIZZARD SHAD | CLUPIDIDAE | 16.6 | 80 | I | Dorosoma cepedianum |
| 62 | GIZZARD SHAD | CLUPIDIDAE | 17 | 90 | I | Dorosoma cepedianum |
| 63 | GIZZARD SHAD | CLUPIDIDAE | 16.2 | 70 | I | Dorosoma cepedianum |
| 64 | GIZZARD SHAD | CLUPIDIDAE | 20.2 | 144 | F | Dorosoma cepedianum |
| 65 | CARP | CYPRINIDAE | 33 | 1138 | F | Cyprinus carpio |
| 66 | CARP | CYPRINIDAE | 28.5 | 705 | F | Cyprinus carpio |
| 67 | RIVER CARPSUCKER | CATOSTOMAIDAE | 30.5 | 696 | F | Carpiodes carpio |
| 68 | RIVER CARPSUCKER | CATOSTOMAIDAE | 29.8 | 635 | F | Carpiodes carpio |
| 69 | RIVER CARPSUCKER | CATOSTOMAIDAE | 30 | 638 | F | Carpiodes carpio |
| 70 | RIVER CARPSUCKER | CATOSTOMAIDAE | 29.3 | 599 | F | Carpiodes carpio |
| 71 | RIVER CARPSUCKER | CATOSTOMAIDAE | 29 | 637 | F | Carpiodes carpio |
| 72 | RIVER CARPSUCKER | CATOSTOMAIDAE | 25.5 | 460 | F | Carpiodes carpio |
| 73 | RIVER CARPSUCKER | CATOSTOMAIDAE | 31 | 678 | F | Carpiodes carpio |
| 74 | RIVER CARPSUCKER | CATOSTOMAIDAE | 32 | 749 | F | Carpiodes carpio |
| 75 | QUILLBACK | CATOSTOMAIDAE | 13 | 73 | I | Carpiodes cyprinus |
| 76 | QUILLBACK | CATOSTOMAIDAE | 12 | 52 | I | Carpiodes cyprinus |
| 77 | SM-MOUTH BUFFALO | CATOSTOMAIDAE | 27 | 590 | M | Ictiobus bubalus |
| 78 | CHANNEL CATFISH | ICTALURLIDAE | 32 | 458 | M | Ictalurus punctatus |
| 79 | CHANNEL CATFISH | ICTALURLIDAE | 29 | 295 | M | Ictalurus punctatus |
| 80 | CHANNEL CATFISH | ICTALURLIDAE | 26 | 295 | M | Ictalurus punctatus |
| 81 | CHANNEL CATFISH | ICTALURLIDAE | 26.5 | 281 | M | Ictalurus punctatus |
| 82 | CHANNEL CATFISH | ICTALURLIDAE | 18.7 | 101 | M | Ictalurus punctatus |
| 83 | WHITE BASS | PERCICHTHYIDA | 16 | 192 | M | Monroe chrysops |
| 84 | LARGE-MOUTH BASS | CENTRARCHIDAE | 26 | RELEASED | | Micropterus salmoides |
| 85 | LARGE-MOUTH BASS | CENTRARCHIDAE | 24 | RELEASED | | Micropterus salmoides |
| 86 | LARGE-MOUTH BASS | CENTRARCHIDAE | 26 | RELEASED | | Micropterus salmoides |
| 87 | LARGE-MOUTH BASS | CENTRARCHIDAE | 27.5 | 400 | M | Micropterus salmoides |
| 88 | LARGE-MOUTH BASS | CENTRARCHIDAE | 15.9 | 194 | F | Micropterus salmoides |
| 89 | SMALL-MOUTH BASS | CENTRARCHIDAE | 18.9 | 129 | M | Micropterus dolomieui |
| 90 | LONG-EAR SUNFISH | CENTRARCHIDAE | 5 | 10 | I | Lepomis megalotis |
| 91 | LONG-EAR SUNFISH | CENTRARCHIDAE | 5.9 | 11 | I | Lepomis megalotis |
| 92 | LONG-EAR SUNFISH | CENTRARCHIDAE | 7.5 | 23 | I | Lepomis megalotis |
| 93 | LONG-EAR SUNFISH | CENTRARCHIDAE | 9.8 | 44 | F | Lepomis megalotis |
| 94 | LONG-EAR SUNFISH | CENTRARCHIDAE | 10.5 | 56 | M | Lepomis megalotis |
| 95 | LONG-EAR SUNFISH | CENTRARCHIDAE | 10.4 | 40 | M | Lepomis megalotis |
| 96 | SAUGER | PERIDAE | 24.5 | 179 | M | Stizostedion canadense |
| 97 | DRUM | SCIAENIDAE | 19 | 158 | M | Aplodinatus gunniens |
| | | MEAN | 21.801 | 195.0412 | | |

GREAT MIAMI RIVER FISH SURVEY SEPT. 19,1989
MICHAEL MILLER, ROBERT REPASKY, ROBERT DAVENPORT, WILLIIAM ROWE, REBECCA BIXBY,
UNIVERSITY OF CINCINNATI
CRAIG DODD, WMCO

STATION 2 STRIKER'S GROVE

| SAMPLE # | | | LENGTH | WEIGHT | GENDER | FAMILY | SPECIES |
|---|---|---|---|---|---|---|---|
| 1 | LONG-NOSE GAR | LEPISOSTEIDAE | 53.4 | 429 | M | Lepisosteus osseus | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2 | LONG-NOSE GAR | LEPISOSTEIDAE | 67.3 | 1016 | F | Lepisosteus osseus |
| 3 | GIZZARD SHAD | CLUPIDIDAE | 19.7 | 95 | M | Dorosoma cepedianum |
| 4 | GIZZARD SHAD | CLUPIDIDAE | 19.5 | 86 | M | Dorosoma cepedianum |
| 5 | GIZZARD SHAD | CLUPIDIDAE | 20 | 118 | F | Dorosoma cepedianum |
| 6 | GIZZARD SHAD | CLUPIDIDAE | 16.3 | 72 | I | Dorosoma cepedianum |
| 7 | GIZZARD SHAD | CLUPIDIDAE | 16.3 | 56 | I | Dorosoma cepedianum |
| 8 | GIZZARD SHAD | CLUPIDIDAE | 17.5 | 76 | I | Dorosoma cepedianum |
| 9 | GIZZARD SHAD | CLUPIDIDAE | 18.3 | 80 | I | Dorosoma cepedianum |
| 10 | GIZZARD SHAD | CLUPIDIDAE | 19.8 | 110 | F | Dorosoma cepedianum |
| 11 | GIZZARD SHAD | CLUPIDIDAE | 16.5 | 72 | I | Dorosoma cepedianum |
| 12 | GIZZARD SHAD | CLUPIDIDAE | 18.3 | 86 | I | Dorosoma cepedianum |
| 13 | GIZZARD SHAD | CLUPIDIDAE | 20 | 102 | F | Dorosoma cepedianum |
| 14 | GIZZARD SHAD | CLUPIDIDAE | 17 | 64 | F | Dorosoma cepedianum |
| 15 | GIZZARD SHAD | CLUPIDIDAE | 17.5 | 74 | M | Dorosoma cepedianum |
| 16 | GIZZARD SHAD | CLUPIDIDAE | 18.5 | 93 | M | Dorosoma cepedianum |
| 17 | GIZZARD SHAD | CLUPIDIDAE | 18.2 | 84 | I | Dorosoma cepedianum |
| 18 | GIZZARD SHAD | CLUPIDIDAE | 15.3 | 58 | I | Dorosoma cepedianum |
| 19 | GIZZARD SHAD | CLUPIDIDAE | 19.5 | 86 | M | Dorosoma cepedianum |
| 20 | GIZZARD SHAD | CLUPIDIDAE | 19.4 | 108 | F | Dorosoma cepedianum |
| 21 | GIZZARD SHAD | CLUPIDIDAE | 18.5 | 90 | M | Dorosoma cepedianum |
| 22 | GIZZARD SHAD | CLUPIDIDAE | 17.7 | 88 | M | Dorosoma cepedianum |
| 23 | GIZZARD SHAD | CLUPIDIDAE | 17.5 | 79 | I | Dorosoma cepedianum |
| 24 | GIZZARD SHAD | CLUPIDIDAE | 23 | 114 | F | Dorosoma cepedianum |
| 25 | GIZZARD SHAD | CLUPIDIDAE | 19.7 | 116 | I | Dorosoma cepedianum |
| 26 | GIZZARD SHAD | CLUPIDIDAE | 20.1 | 115 | F | Dorosoma cepedianum |
| 27 | GIZZARD SHAD | CLUPIDIDAE | 15.5 | 54 | I | Dorosoma cepedianum |
| 28 | GIZZARD SHAD | CLUPIDIDAE | 18 | 82 | I | Dorosoma cepedianum |
| 29 | GIZZARD SHAD | CLUPIDIDAE | 18.5 | 81 | I | Dorosoma cepedianum |
| 30 | GIZZARD SHAD | CLUPIDIDAE | 17.7 | 78 | I | Dorosoma cepedianum |
| 31 | GIZZARD SHAD | CLUPIDIDAE | 19.5 | 92 | I | Dorosoma cepedianum |
| 32 | GIZZARD SHAD | CLUPIDIDAE | 15 | 52 | I | Dorosoma cepedianum |
| 33 | GIZZARD SHAD | CLUPIDIDAE | 18 | 78 | I | Dorosoma cepedianum |
| 34 | GIZZARD SHAD | CLUPIDIDAE | 15.5 | 60 | I | Dorosoma cepedianum |
| 35 | GIZZARD SHAD | CLUPIDIDAE | 13.5 | 38 | I | Dorosoma cepedianum |
| 36 | GIZZARD SHAD | CLUPIDIDAE | 16.7 | 72 | I | Dorosoma cepedianum |
| 37 | GIZZARD SHAD | CLUPIDIDAE | 15.5 | 62 | I | Dorosoma cepedianum |
| 38 | CARP | CYPRINIDAE | 38.5 | 1265 | F | Cyprinus carpio |
| 39 | CARP | CYPRINIDAE | 21 | 266 | M | Cyprinus carpio |
| 40 | BLACK REDHORSE | CATOSTOMADAE | 34 | 688 | F | Moxostoma duquesnei |
| 41 | BLACK REDHORSE | CATOSTOMADAE | 25.5 | 351 | M | Moxostoma duquesnei |
| 42 | QUILLBACK | CATOSTOMADAE | 24 | 330 | M | Carpiodes cyprinus |
| 43 | HIGHFIN CARPSUCKE | CATOSTOMADAE | 14.7 | 77 | M | Carpiodes velifer |
| 44 | HIGHFIN CARPSUCKE | CATOSTOMADAE | 23.3 | 332 | M | Carpiodes velifer |
| 45 | HIGHFIN CARPSUCKE | CATOSTOMADAE | 12.5 | 42 | I | Carpiodes velifer |
| 46 | RIVER CARPSUCKER | CATOSTOMADAE | 28.3 | 416 | M | Carpiodes carpio |
| 47 | SMALL-MOUTH BUFFA | CATOSTOMADAE | 31.8 | 958 | M | Ictiobus bubalus |
| 48 | FLATHEAD CATFISH | ICTALURLIDAE | 26.5 | 308 | U.C.CO | Pylodictis olivaris |
| 49 | FLATHEAD CATFISH | ICTALURLIDAE | 32 | 528 | U.C.CO | Pylodictis olivaris |
| 50 | CHANNEL CATFISH | ICTALURLIDAE | 32.3 | 440 | M | Ictalurus punctatus |
| 51 | CHANNEL CATFISH | ICTALURLIDAE | 31.3 | 439 | M | Ictalurus punctatus |
| 52 | CHANNEL CATFISH | ICTALURLIDAE | 29.2 | 314 | M | Ictalurus punctatus |
| 53 | CHANNEL CATFISH | ICTALURLIDAE | 19.4 | 108 | I | Ictalurus punctatus |
| 54 | CHANNEL CATFISH | ICTALURLIDAE | 17.2 | 74 | I | Ictalurus punctatus |
| 55 | CHANNEL CATFISH | ICTALURLIDAE | 20.7 | 116 | I | Ictalurus punctatus |
| 56 | CHANNEL CATFISH | ICTALURLIDAE | 15.5 | 51 | I | Ictalurus punctatus |
| 57 | CHANNEL CATFISH | ICTALURLIDAE | 16.5 | 104 | I | Ictalurus punctatus |
| 58 | CHANNEL CATFISH | ICTALURLIDAE | 16.5 | 64 | I | Ictalurus punctatus |
| 59 | CHANNEL CATFISH | ICTALURLIDAE | 18.2 | 90 | I | Ictalurus punctatus |
| 60 | WHITE BASS | PERCICHTHYIDA | 16.7 | 122 | F | Monroe chrysops |
| 61 | DRUM | SCIAENIDAE | 19.5 | 59 | M | Aplodinatus gunniens |

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|---|---|---|---|---|---|---|
| 62 | DRUM | SCIAENIDAE | 16 | 72 | M | Aplodinatus gunniens |
| 63 | DRUM | SCIAENIDAE | 21.3 | 253 | F | Aplodinatus gunniens |
| 64 | DRUM | SCIAENIDAE | 15.9 | 88 | M | Aplodinatus gunniens |
| 65 | DRUM | SCIAENIDAE | 15 | 76 | I | Aplodinatus gunniens |
| 66 | DRUM | SCIAENIDAE | 15.5 | 83 | I | Aplodinatus gunniens |
| 67 | DRUM | SCIAENIDAE | 16.3 | 85 | M | Aplodinatus gunniens |
| 68 | DRUM | SCIAENIDAE | 20.7 | 220 | M | Aplodinatus gunniens |
| 69 | DRUM | SCIAENIDAE | 14 | 70 | I | Aplodinatus gunniens |
| | | MEAN | 20.986 | 185.5797 | | |

GREAT MIAMI RIVER FISH SURVEY SEPT. 19,1989

MICHAEL MILLER, ROBERT REPASKY, ROBERT DAVENPORT, WILLIIAM ROWE, REBECCA BIXBY,
UNIVERSITY OF CINCINNATI
CRAIG DODD, WMCO

STATION 3 WELCH'S SAND AND GRAVEL NEAR PADDY'S RUN

| SAMPLE # | | FAMILY | LENGTH | WEIGHT | GENDER | SPECIES | SPECIES |
|---|---|---|---|---|---|---|---|
| 1 | LONG-NOSE GAR | LEPISOSTEIDAE | 41.5 | 192 | M | Lepisosteus osseus | |
| 2 | SKIPJACK HERRING | CLUPEIDAE | 12.5 | 26 | I | Alosa chrysochloris | |
| 3 | GIZZARD SHAD | CLUPEIDAE | 19.3 | 92 | M | Dorosoma cepedianum | |
| 4 | GIZZARD SHAD | CLUPEIDAE | 19.5 | 118 | M | Dorosoma cepedianum | |
| 5 | GIZZARD SHAD | CLUPEIDAE | 22 | 133 | M | Dorosoma cepedianum | |
| 6 | GIZZARD SHAD | CLUPEIDAE | 19.9 | 112 | F | Dorosoma cepedianum | |
| 7 | GIZZARD SHAD | CLUPEIDAE | 18.4 | 90 | I | Dorosoma cepedianum | |
| 8 | GIZZARD SHAD | CLUPEIDAE | 17.8 | 97 | F | Dorosoma cepedianum | |
| 9 | GIZZARD SHAD | CLUPEIDAE | 18.2 | 92 | F | Dorosoma cepedianum | |
| 10 | GIZZARD SHAD | CLUPEIDAE | 18 | 83 | M | Dorosoma cepedianum | |
| 11 | GIZZARD SHAD | CLUPEIDAE | 18.7 | 90 | I | Dorosoma cepedianum | |
| 12 | GIZZARD SHAD | CLUPEIDAE | 18.2 | 100 | M | Dorosoma cepedianum | |
| 13 | GIZZARD SHAD | CLUPEIDAE | 21 | 136 | F | Dorosoma cepedianum | |
| 14 | GIZZARD SHAD | CLUPEIDAE | 18.4 | 108 | F | Dorosoma cepedianum | |
| 15 | GIZZARD SHAD | CLUPEIDAE | 19.3 | 102 | M | Dorosoma cepedianum | |
| 16 | GIZZARD SHAD | CLUPEIDAE | 20.4 | 110 | F | Dorosoma cepedianum | |
| 17 | GIZZARD SHAD | CLUPEIDAE | 17.6 | 85 | I | Dorosoma cepedianum | |
| 18 | GIZZARD SHAD | CLUPEIDAE | 18.9 | 91 | M | Dorosoma cepedianum | |
| 19 | GIZZARD SHAD | CLUPEIDAE | 17.5 | 87 | M | Dorosoma cepedianum | |
| 20 | GIZZARD SHAD | CLUPEIDAE | 16.6 | 72 | I | Dorosoma cepedianum | |
| 21 | GIZZARD SHAD | CLUPEIDAE | 15.5 | 66 | I | Dorosoma cepedianum | |
| 22 | GIZZARD SHAD | CLUPEIDAE | 20.3 | 118 | F | Dorosoma cepedianum | |
| 23 | GIZZARD SHAD | CLUPEIDAE | 25.4 | 152 | F | Dorosoma cepedianum | |
| 24 | GIZZARD SHAD | CLUPEIDAE | 20.2 | 120 | F | Dorosoma cepedianum | |
| 25 | GIZZARD SHAD | CLUPEIDAE | 20.3 | 109 | F | Dorosoma cepedianum | |
| 26 | GIZZARD SHAD | CLUPEIDAE | 20 | 113 | F | Dorosoma cepedianum | |
| 27 | GIZZARD SHAD | CLUPEIDAE | 17.1 | 79 | M | Dorosoma cepedianum | |
| 28 | GIZZARD SHAD | CLUPEIDAE | 18.5 | 100 | M | Dorosoma cepedianum | |
| 29 | GIZZARD SHAD | CLUPEIDAE | 19.7 | 102 | M | Dorosoma cepedianum | |
| 30 | GIZZARD SHAD | CLUPEIDAE | 18.3 | 100 | M | Dorosoma cepedianum | |
| 31 | GIZZARD SHAD | CLUPEIDAE | 17.6 | 79 | I | Dorosoma cepedianum | |
| 32 | GIZZARD SHAD | CLUPEIDAE | 18 | 98 | F | Dorosoma cepedianum | |
| 33 | GIZZARD SHAD | CLUPEIDAE | 18.7 | 94 | M | Dorosoma cepedianum | |
| 34 | GIZZARD SHAD | CLUPEIDAE | 18.2 | 90 | M | Dorosoma cepedianum | |
| 35 | GIZZARD SHAD | CLUPEIDAE | 18 | 91 | F | Dorosoma cepedianum | |
| 36 | GIZZARD SHAD | CLUPEIDAE | 19.7 | 114 | F | Dorosoma cepedianum | |
| 37 | GIZZARD SHAD | CLUPEIDAE | 17.5 | 80 | M | Dorosoma cepedianum | |
| 38 | GIZZARD SHAD | CLUPEIDAE | 21.4 | 113 | F | Dorosoma cepedianum | |

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|---|---|---|---|---|---|---|
| 39 | GIZZARD SHAD | CLUPEIDAE | 16.5 | 79 | F | Dorosoma cepedianum |
| 40 | GIZZARD SHAD | CLUPEIDAE | 17.1 | 81 | M | Dorosoma cepedianum |
| 41 | GIZZARD SHAD | CLUPEIDAE | 17.4 | 84 | M | Dorosoma cepedianum |
| 42 | GIZZARD SHAD | CLUPEIDAE | 17.6 | 85 | F | Dorosoma cepedianum |
| 43 | GIZZARD SHAD | CLUPEIDAE | 17.7 | 94 | F | Dorosoma cepedianum |
| 44 | GIZZARD SHAD | CLUPEIDAE | 16.8 | 80 | I | Dorosoma cepedianum |
| 45 | GIZZARD SHAD | CLUPEIDAE | 19 | 83 | M | Dorosoma cepedianum |
| 46 | GIZZARD SHAD | CLUPEIDAE | 17.2 | 81 | I | Dorosoma cepedianum |
| 47 | GIZZARD SHAD | CLUPEIDAE | 20.6 | 118 | F | Dorosoma cepedianum |
| 48 | GIZZARD SHAD | CLUPEIDAE | 20 | 91 | M | Dorosoma cepedianum |
| 49 | GIZZARD SHAD | CLUPEIDAE | 16.8 | 76 | F | Dorosoma cepedianum |
| 50 | GIZZARD SHAD | CLUPEIDAE | 16.6 | 90 | M | Dorosoma cepedianum |
| 51 | GIZZARD SHAD | CLUPEIDAE | 15.7 | 71 | M | Dorosoma cepedianum |
| 52 | GIZZARD SHAD | CLUPEIDAE | 17.3 | 90 | M | Dorosoma cepedianum |
| 53 | GIZZARD SHAD | CLUPEIDAE | 18.1 | 93 | M | Dorosoma cepedianum |
| 54 | GIZZARD SHAD | CLUPEIDAE | 20.9 | 106 | M | Dorosoma cepedianum |
| 55 | GIZZARD SHAD | CLUPEIDAE | 16.5 | 73 | M | Dorosoma cepedianum |
| 56 | GIZZARD SHAD | CLUPEIDAE | 16 | 69 | M | Dorosoma cepedianum |
| 57 | GIZZARD SHAD | CLUPEIDAE | 13.6 | 50 | M | Dorosoma cepedianum |
| 58 | GIZZARD SHAD | CLUPEIDAE | 16.6 | 78 | I | Dorosoma cepedianum |
| 59 | GIZZARD SHAD | CLUPEIDAE | 16.3 | 71 | M | Dorosoma cepedianum |
| 60 | GIZZARD SHAD | CLUPEIDAE | 16 | 67 | I | Dorosoma cepedianum |
| 61 | GIZZARD SHAD | CLUPEIDAE | 16.6 | 69 | M | Dorosoma cepedianum |
| 62 | GIZZARD SHAD | CLUPEIDAE | 15.9 | 62 | M | Dorosoma cepedianum |
| 63 | GIZZARD SHAD | CLUPEIDAE | 17.3 | 78 | F | Dorosoma cepedianum |
| 64 | GIZZARD SHAD | CLUPEIDAE | 17.6 | 70 | I | Dorosoma cepedianum |
| 65 | GIZZARD SHAD | CLUPEIDAE | 18 | 82 | M | Dorosoma cepedianum |
| 66 | GIZZARD SHAD | CLUPEIDAE | 17.1 | 78 | M | Dorosoma cepedianum |
| 67 | GIZZARD SHAD | CLUPEIDAE | 16.3 | 66 | M | Dorosoma cepedianum |
| 68 | GIZZARD SHAD | CLUPEIDAE | 15.5 | 64 | M | Dorosoma cepedianum |
| 69 | GIZZARD SHAD | CLUPEIDAE | 14.7 | 45 | I | Dorosoma cepedianum |
| 70 | GIZZARD SHAD | CLUPEIDAE | 16.9 | 62 | M | Dorosoma cepedianum |
| 71 | GIZZARD SHAD | CLUPEIDAE | 15.6 | 60 | F | Dorosoma cepedianum |
| 72 | GIZZARD SHAD | CLUPEIDAE | 18.4 | 85 | M | Dorosoma cepedianum |
| 73 | GIZZARD SHAD | CLUPEIDAE | 19.1 | 98 | F | Dorosoma cepedianum |
| 74 | GIZZARD SHAD | CLUPEIDAE | 17.3 | 67 | I | Dorosoma cepedianum |
| 75 | GIZZARD SHAD | CLUPEIDAE | 16.7 | 64 | M | Dorosoma cepedianum |
| 76 | GIZZARD SHAD | CLUPEIDAE | 16 | 56 | F | Dorosoma cepedianum |
| 77 | GIZZARD SHAD | CLUPEIDAE | 17.8 | 76 | F | Dorosoma cepedianum |
| 78 | GIZZARD SHAD | CLUPEIDAE | 14.4 | 51 | M | Dorosoma cepedianum |
| 79 | GIZZARD SHAD | CLUPEIDAE | 15.2 | 57 | M | Dorosoma cepedianum |
| 80 | GIZZARD SHAD | CLUPEIDAE | 15.3 | 56 | I | Dorosoma cepedianum |
| 81 | GIZZARD SHAD | CLUPEIDAE | 17.4 | 75 | M | Dorosoma cepedianum |
| 82 | GIZZARD SHAD | CLUPEIDAE | 16 | 56 | I | Dorosoma cepedianum |
| 83 | GIZZARD SHAD | CLUPEIDAE | 19.1 | 84 | F | Dorosoma cepedianum |
| 84 | GIZZARD SHAD | CLUPEIDAE | 16.3 | 55 | M | Dorosoma cepedianum |
| 85 | GIZZARD SHAD | CLUPEIDAE | 16.3 | 60 | I | Dorosoma cepedianum |
| 86 | GIZZARD SHAD | CLUPEIDAE | 16.2 | 60 | I | Dorosoma cepedianum |
| 87 | GIZZARD SHAD | CLUPEIDAE | 16 | 65 | M | Dorosoma cepedianum |
| 88 | GIZZARD SHAD | CLUPEIDAE | 17.8 | 82 | M | Dorosoma cepedianum |
| 89 | GIZZARD SHAD | CLUPEIDAE | 15.4 | 58 | M | Dorosoma cepedianum |
| 90 | GIZZARD SHAD | CLUPEIDAE | 15 | 56 | M | Dorosoma cepedianum |
| 91 | GIZZARD SHAD | CLUPEIDAE | 14.8 | 54 | M | Dorosoma cepedianum |
| 92 | GIZZARD SHAD | CLUPEIDAE | 15.3 | 63 | I | Dorosoma cepedianum |
| 93 | GIZZARD SHAD | CLUPEIDAE | 13.9 | 46 | I | Dorosoma cepedianum |
| 94 | GIZZARD SHAD | CLUPEIDAE | 15.8 | 49 | I | Dorosoma cepedianum |
| 95 | GIZZARD SHAD | CLUPEIDAE | 16.1 | 55 | I | Dorosoma cepedianum |
| 96 | GIZZARD SHAD | CLUPEIDAE | 15.6 | 50 | I | Dorosoma cepedianum |
| 97 | GIZZARD SHAD | CLUPEIDAE | 14.2 | 47 | I | Dorosoma cepedianum |
| 98 | GIZZARD SHAD | CLUPEIDAE | 15.6 | 51 | I | Dorosoma cepedianum |

| | | | | | | |
|---|---|---|---|---|---|---|
| 99 | GIZZARD SHAD | CLUPEIDAE | 13.3 | 39 | I | Dorosoma cepedianum |
| 100 | GIZZARD SHAD | CLUPEIDAE | 14 | 44 | I | Dorosoma cepedianum |
| 101 | GIZZARD SHAD | CLUPEIDAE | 13.7 | 65 | I | Dorosoma cepedianum |
| 102 | GIZZARD SHAD | CLUPEIDAE | 11.5 | 48 | I | Dorosoma cepedianum |
| 103 | CARP | CYPRINIDAE | 32.6 | 852 | F | Cyprinus carpio |
| 104 | CARP | CYPRINIDAE | 31.7 | 671 | M | Cyprinus carpio |
| 105 | CARP | CYPRINIDAE | 30.5 | 802 | F | Cyprinus carpio |
| 106 | CARP | CYPRINIDAE | 24.8 | 376 | M | Cyprinus carpio |
| 107 | CARP | CYPRINIDAE | 19.5 | 213 | M | Cyprinus carpio |
| 108 | CARP | CYPRINIDAE | 21.9 | 208 | M | Cyprinus carpio |
| 109 | CARP | CYPRINIDAE | 16.7 | 132 | M | Cyprinus carpio |
| 110 | CARP | CYPRINIDAE | 14.9 | 73 | I | Cyprinus carpio |
| 111 | CARP | CYPRINIDAE | 15.7 | 82 | I | Cyprinus carpio |
| 112 | RIVER CARPSUCKER | CATOSTOMADAE | 11.6 | 43 | I | Carpoides carpio |
| 113 | RIVER CARPSUCKER | CATOSTOMADAE | 10.5 | 36 | I | Carpoides carpio |
| 114 | RIVER CARPSUCKER | CATOSTOMADAE | 12.5 | 51 | I | Carpoides carpio |
| 115 | RIVER CARPSUCKER | CATOSTOMADAE | 10.6 | 37 | I | Carpoides carpio |
| 116 | RIVER CARPSUCKER | CATOSTOMADAE | 9.9 | 27 | I | Carpoides carpio |
| 117 | RIVER CARPSUCKER | CATOSTOMADAE | 13.7 | 65 | I | Carpoides carpio |
| 118 | RIVER CARPSUCKER | CATOSTOMADAE | 11.5 | 48 | I | Carpoides carpio |
| 119 | SILVER REDHORSE | CATOSTOMADAE | 37 | 1307 | M | Moxostoma anisurum |
| 120 | CHANNEL CATFISH | ICTALURLIDAE | 27.3 | 318 | M | Ictalurus punctatus |
| 121 | CHANNEL CATFISH | ICTALURLIDAE | 34.3 | 515 | M | Ictalurus punctatus |
| 122 | CHANNEL CATFISH | ICTALURLIDAE | 16.5 | 69 | I | Ictalurus punctatus |
| 123 | WHITE BASS | PERCICHTHYIDA | 16.1 | 86 | I | Monroe chrysops |
| 124 | WHITE BASS | PERCICHTHYIDA | 16.5 | 97 | I | Monroe chrysops |
| 125 | WHITE BASS | PERCICHTHYIDA | 16.3 | 87 | I | Monroe chrysops |
| 126 | WHITE BASS | PERCICHTHYIDA | 15.9 | 93 | M | Monroe chrysops |
| 127 | WHITE BASS | PERCICHTHYIDA | 16.5 | 101 | I | Monroe chrysops |
| 128 | WHITE BASS | PERCICHTHYIDA | 15.6 | 85 | I | Monroe chrysops |
| 129 | WHITE BASS | PERCICHTHYIDA | 13.9 | 58 | I | Monroe chrysops |
| 130 | SMALLMOUTH BASS | CENTRARCHIDAE | 16.6 | 108 | I | Micropterus dolomieui |
| 131 | SMALLMOUTH BASS | CENTRARCHIDAE | 13.5 | 57 | I | Micropterus dolomieui |
| 132 | SMALLMOUTH BASS | CENTRARCHIDAE | 8.9 | 17 | I | Micropterus dolomieui |
| 133 | LARGEMOUTH BASS | CENTRARCHIDAE | 24 | 303 | M | Micropterus salmoides |
| 134 | LONG-EAR SUNFISH | CENTRARCHIDAE | 11.8 | 64 | M | Lepomis megalotis |
| 135 | LONG-EAR SUNFISH | CENTRARCHIDAE | 9.5 | 39 | I | Lepomis megalotis |
| 136 | LONG-EAR SUNFISH | CENTRARCHIDAE | 7.4 | 20 | I | Lepomis megalotis |
| 137 | LONG-EAR SUNFISH | CENTRARCHIDAE | 6.2 | 12 | I | Lepomis megalotis |
| 138 | ROCK BASS | CENTRARCHIDAE | 12.4 | 73 | I | Ambloplites rupestris |
| 139 | GREEN SUNFISH | CENTRARCHIDAE | 8.6 | 25 | I | Lepomis cyanella |
| 140 | GREEN SUNFISH | CENTRARCHIDAE | 6.6 | 12 | I | Lepomis cyanella |
| 141 | BLUEGILL | CENTRARCHIDAE | 6.9 | 13 | I | Lepomis macrochirus |
| 142 | SAUGER | PERCIDAE | 22.6 | 128 | M | Stizostedion canadense |
| 143 | SAUGER | PERIDAE | 22.5 | 119 | M | Stizostedion canadense |
| 144 | SAUGER | PERIDAE | 23.4 | 139 | M | Stizostedion canadense |
| 145 | DRUM | SCIAENIDAE | 15.6 | 90 | M | Aplodinatus gunniens |
| | | MEAN | 17.382 | 110.3655 | | |

| | | | |
|---|---|---|---|
| I | MEAN | 21.801 | 195.0412 |
| II | MEAN | 20.986 | 185.5797 |
| III | MEAN | 17.234 | 110.513 |
| MEAN | | 19.447 | 152.7226 |

APPENDIX 2.

5452

BAG LIST OF 1989 GREAT MIAMI RIVER FISH SUY SENT FOR RADIOASSAY

| BAG # | REP. | CONTENT | MASS(g | SITE |
|---|---|---|---|---|
| 1 | A | SHAD | 390 | 1 |
| 1 | B | SHAD | 422 | 1 |
| 2 | A | SHAD | 416 | 1 |
| 2 | B | SHAD | 436 | 1 |
| 3 | A | CARP | 370 | 1 |
| 3 | B | CARP | 268 | 1 |
| 4 | A | SHAD | 376 | 1 |
| 4 | B | SHAD | 408 | 1 |
| 5 | A | SHAD | 428 | 1 |
| 5 | B | SHAD | 416 | 1 |
| 6 | | SHAD | 275 | 1 |
| 7 | A | CARPSUCKR | 380 | 1 |
| 7 | B | CARPSUCKR | 472 | 1 |
| 8 | A | CARPSUCKR | 560 | 1 |
| 8 | B | CARPSUCKR | 647 | 1 |
| 9 | A | CARPSUCKR | 540 | 1 |
| 9 | B | CARPSUCKR | 546 | 1 |
| 10 | | SHAD | 350 | 1 |
| 11 | | GAR | 264 | 1 |
| 12 | | GAR&SAUGR | 324 | 1 |
| 13 | | CARP | 352 | 1 |
| 14 | | CARP | 360 | 1 |
| 15 | | CATFISH | 344 | 1 |
| 16 | | CATFISH | 228 | 1 |
| 17 | | CATFISH | 228 | 1 |
| 18 | | WHT+LG.M | 262 | 1 |
| 19 | | LG+SMBASS | 240 | 1 |
| 20 | | L.EAR SUN | 104 | 1 |
| 21 | | DRUM | 272 | 2 |
| 22 | | DRUM | 276 | 2 |
| 23 | | DRM&WHBS | 216 | 2 |
| 24 | | GAR | 560 | 2 |
| 25 | | GAR | 576 | 2 |
| 26 | | RDH&QLLB | 276 | 2 |
| 27 | | REDHORSE | 300 | 2 |
| 28 | | HIGHFIN | 360 | 2 |
| 29 | | REDHORSE | 236 | 2 |
| 30 | A | CARPSUCKR | 396 | 2 |
| 30 | B | CARPSUCKR | 468 | 2 |
| 31 | A | C.S&BFFL | 306 | 2 |
| 31 | B | C.S&BFFL | 348 | 2 |
| 32 | | CARPSUCKR | 226 | 2 |
| 33 | | CATFISH | 224 | 2 |
| 34 | | CATFISH | 258 | 2 |
| 35 | | CATFISH | 256 | 2 |
| 36 | | CATFISH | 260 | 2 |
| 37 | | CATFISH | 70 | 2 |
| 38 | A | SHAD | 384 | 2 |
| 38 | B | SHAD | 378 | 2 |
| 39 | A | SHAD | 486 | 2 |
| 39 | B | SHAD | 488 | 2 |
| 40 | A | SHAD | 61 | 2 |
| 40 | B | SHAD | 54 | 2 |
| 41 | | SUNFISH | 138 | 3 |
| 42 | | WHT.BASS | 396 | 3 |
| 43 | | LGM.BASS | 302 | 3 |
| 44 | | SAUGER | 258 | 3 |
| 45 | | DRUM | 153 | 3 |
| 46 | | GAR | 151 | 3 |
| 47 | | CATFISH | 526 | 3 |
| 48 | A | REDHORSE | 336 | 3 |
| 48 | B | REDHORSE | 360 | 3 |
| 49 | A | CARP | 516 | 3 |
| 49 | B | CARP | 462 | 3 |
| 50 | A | CARP | 352 | 3 |
| 50 | B | CARP | 406 | 3 |
| 51 | A | SHAD | 260 | 3 |
| 51 | B | SHAD | 312 | 3 |
| 52 | A | SHAD | 248 | 3 |
| 52 | B | SHAD | 222 | 3 |
| 53 | A | SHAD | 354 | 3 |
| 53 | B | SHAD | 384 | 3 |
| 54 | | CARPSUCKR | 84 | 3 |
| 55 | A | SHAD | 328 | 3 |
| 55 | B | SHAD | 366 | 3 |
| 56 | A | SHAD | 416 | 3 |
| 56 | B | SHAD | 363 | 3 |
| 57 | A | SHAD | 576 | 3 |
| 57 | B | SHAD | 678 | 3 |

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