7302 U-007-307.43

MILLER, M. C, ET AL, ELECTROFISHING SURVEY OF THE GREAT MIAMI RIVER, FERNALD ENVIRONMENTAL MANAGEMENT CO, CINCINNATI, OH, - (USED AS A REFERENCE IN THE OU 5 RI REPORT)

09/20/85

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REPORT

FISH OF THE GREAT MIAMI R

30 SEPT 1985

BY

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For N.L.O., Inc. Fernald Feed Materials Production Centre

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FISHERY OF THE GREAT MIAMI RIVER

20 SEPT. 1985

Introduction:

On 20 September 1985 we conducted the second annual census of fish in the Great Miami River above and below the Fernald nuclear facility between Ross and New Baltimore Ohio. The survey was done primarily to collect samples for radionuclide analysis; however, all fish were censused (length, weight and species) to compare the health of the fish stocks in the river along that gradient between upstream and downstream stations and between the two years that samples have been taken. This report breifly summarizes and presents those data.

Methods:

Fish were collected by electrofishing with a pulsed DC unit(60 pulses/sec) at 240 volts. The Anode was located on a moveable boom mounted on the front of a 16 foot John boat. The cathod was a beam of cables connected across the front of the boat. The shocked fish were retrieved with long-handled dip nets by two persons on the front of the boat. The fish were dumped into a live well with a bubbler during the collection period. Fish were electroshocked for 30 minutes at each station. At the end of that period the fish were weighed and lengthed on shore using a spring balance and a fish board in grams amd millimeters, respectively. The data were written on waterproof forms. The fish were bagged and placed in an individual cooler with ice at

each station.

Three stations relavent to the operation of the Fernald plant were selected. Station 1 was located in the pool above the Boulton Waterworks plant upstream of the crossing of I275 and the Great Miami River. Station 1 included backwaters and the margins of a slow moving pool with no riffle habitat. Station 2 was locate immediately below the outfall from the Fernald plant near Strickers Grove Amusement Park. Station 2 included fast moving water, some shallow backwaters, samll pools, and riffle areas. The habitat diversity here was greater. Station 3 was locate below the confluence of Paddy's Run Creek and the Great Miami River at Welch's Sand and Gravel. Station 3 was in an area of river that had been draglined over the year. Hence the pool was deep, but because of the narrow width it moved relatively rapidly for such a pool. The shoreline and habitat diversity had been seriously reduced. The section included pools and shallow rocky margins with little riffle.

The electrofishing began at 9:30 am and was completed at about 17:00 hrs. The sequence of stations and the times were almost identical to those in the original shocking survey on 1 October 1984. The fish were stored in a 4C coldbox overnight. Fish species identification was confirmed using several keys. The next day, the fish were cleaned in a minimal fashion for an examination of the nuclides in the muscle only. The heads were removed at the gills; the guts and internal organs removed; and the backbone including the dorsal fin was removed as well as the caudal fin. The fish were rinsed. The filets were weighed approximately on a spring balance in zip lock bags; the bag

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contents were labeled as to weight, species, date and station. Then the bags were frozen in a larger bag opened for each station. The cutting area was cleaned and flushed with water between stations. Stations were cleaned in the upstream to downstream order. The fish were maintained at -10C before shipping. They were placed in coolers, one from each station, with 1112 lbs of dry ice and shipped by overnight carrier to the anlytical laboratory in California. At no time did the fish go on Fenald property, nor were they exposed in rooms that had ever had nuclides used. Contamination from other surces would have been very unlikely.

The data were entered and analyzed using Lotus 1,2,3 on a Zenith Z111 microcomputer.

Results:

The number of fish caught at each station were 52, 41, and 159, respectively. The included individuals from 11, 19 and 16 species respectively. The most numerous fish at each station from upstream to downstream was the carp, a mixture of catastomids, and gizzard shad, respectively. The average length of fish in the sections in order was 237, 263, and 185 mm. The average weight of fish from each section by station was 623, 376, and 115 gms. The differences in weight and length were caused by difference in age and size of those dominant fish species(Table 1).

The diversity and eveness of fish from each station show that the diversity and eveness are highest at station #2 where

the number of species(19) per individual(42) as much higher than other stations(Table 2). Interestingly the large numbers of gizzard shad at station #3 were responsible for its calculated lowest diversity and eveness of all the sations, even though there were 16 species of fish collected at that site. In 1984 the species diversity and eveness were highest at station #1, then station #3 and lastly #2. In 1985 the order of diversity of stations was not the same from #2, #1, and #3. Station #2 went from being the least diverse to the most diverse in our single collection in each of two years.

The fish from the Miami River can be examined interms of totals in the river, totals by station and by species. The frequency histogram of lengths of all fish caught shows that the most numerous fish were between 100-250mm. Small fish, especially young of the year and perhaps two year old fish are significantly undersampled in our series(Fig. 1). When the length frequency is ploted by station it can be seen that the modal fish originated in Station 3 where the small gizzard shad were so numerous(Fig. 2). Station #3 had the largest fish with a mode of 250-300 mm. Station #2 two smaller modes, one at 50-100 mm and a second between 350-450 mm.

The Weight of the collection of fish from the Miami river shows that on a log scale the mode is small, 0-50 gm(Fig. 3). The slope on a semilog scale is a linear decline between 50 to 400 gm. that might be expected of small fish suffering a constant mortality at each weight class. between 350-1300 gm the number of fish at each weight class was very similar. When broken down 000006 % of fish by weight class by station, the small fish were most

common at all stations(Fig. 4). Station 3 had more small fish than station 1 and station 2. Many large fish at station 1 were the numerous old carp caught there.

The gizzard shad were most numerous at all stations in 1984. In 1985 the shad were small, most less than 150 mm with a modal size of about 150 gm fresh weight(Fig. 5). The weight/length plot shows that the fish from all three stations lie on the same curve. Thus no station has shad of consistantly better or worse condition than any other(Fig. 6). The length and weight frequency distributions show that 2 and 3 year old fish clearly present with no fish between 150-200 grams.

The carp caught by electrofishing were not surprizingly large with weights between 700 and 1300+ gms(Fig. 7). The weight/length plot for the carp(Fig. 8) shows that the all fish follow the same curve. Again, no station appears to support fish with better or worse condition.

The most numerous game fish were largemouth bass, Micropterus salmonoides. They were present equally in sizes from 50 to 1300+ gm. They were present at all stations(Fig. 9). A weight/length plot of the centrachids including bass, showed that the morphometry of that group fit the same condition curve, at least, within the resolution of the numbers actually collected(Fig. 10).

DISCUSSION

The data collected during 1985 support the proposition that the Great Miami River above and below the Fernald outfall and drainage has not been degraded between 1984 and 1985. The

biggest difference betweent the two years was the reduction in abundance of samll fish, namely gizzard shad. Presumably the prolonged, very low flow during 1985 may have contributed to the loss of the smaller fish. They would have become much more vulnerable in the reduced habitat space available for the fish community. The lowest diversity downstream below the confluence of Paddy's Run Creek was probably caused by the gravel removal making large deep pools suitable for the survival of shad. Althought the species diversity was not lower the dominance by shad influenced the index of diversity and eveness severely.

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Table 1: Fish Electroshocked from the Great Miami River on 20 Sept. 1985 below Ross(#1), below New Baltimore(#2) and above Miamitown(#3).

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SITE	SPECIES	9-20-1985 WT	LENGTH	FISH CODES FAMILY
1	1	208	270	CATOSTOMIDAE
1	1	66	190	CATOSTOMIDAE
1	1	140	242	CATOSTOMIDAE
1	1	204	256	CATOSTOMIDAE
1	1	194	258	CATOSTOMIDAE
1	1	288	296	CENTRARCHIDAE
1	1	84	193	CENTRARCHIDAE
1	2	1150	420	CENTRARCHIDAE
1	2	1300	450	CENTRARCHIDAE
1	2	850	400	CENTRARCHIDAE
1	2	1090	425	CENTRARCHIDAE
1	2	810	410	CENTRARCHIDAE
1	2	800	380	CENTRARCHIDAE
1	2	860	390	CENTRARCHIDAE
1	2	1045	430	CENTRARCHIDAE
1	2	882	395	CENTRARCHIDAE
1	2	770	370	CLUPEIDAE
1	2	1300	480	CYPRINIDA
1	2	970	410	CYPRINIDAE
1	2	800	375	CYPRINIDAE
1	2	684	350	CYPRINIDAE
1	2	1025	410	HIODONTIDAE
1	3	76	160	ICTALURIDAE
1	3	956	380	ICTALURIDAE
1	3	76	165	ICTALURIDAE
1	3	48	139	PERCIDAE
1	3	380	300	SCIAENIDAE
1	3	194	235	
1	3	440	310	
1	3	96	177	
1	5	64	133	
1	5	8	55	
1	5	18	58	
1	5	10	68	
1	5	1	45	
1	5	70	140	
1	5	4	61	
1	5	10	76	
1	6	94	142	
1	8	14	81	
1	8	20	87	
1	8	24	95	
1	8	18	77	
1	13	380	305	
1	15	420	358	
1	18	584	340	
1	18	564	340	
1	19	8	85	
1	20	4	47	
1	20	1	41	
1	20	2	41	
1	20	0.5	32	
2	1	140	230	
2	1	200	265	
2	1	92	196	
2	1	46	165	
2	1	190	260	
2	1	250	285	
2	1	94	200	
2	1	100	230	
2	1	200	265	
2	2	744	370	
2	2	1300	510	
2	2	1300	425	
2	2	1020	410	
2	3	264	250	
2	5	3	60	
2	6	60	130	
2	6	92	135	
2	6	16	80	

SPECIES	COMMON NAME
12	HIGHFIN CARPSUCKER
13	RIVER CARPSUCKER
14	REDHORSE
21	GOLDEN REDHORSE
24	NORTHERN HOG SUCKER
25	SHORTHEAD REDHORSE
26	QUILLBACK CARPSUCKER
27	SILVER REDHORSE
3	LARGE MOUTH BASS
4	SMALL MOUTH BASS
5	BLUEGILL SUNFISH
6	LONGEAR SUNFISH
7	WHITE CRAPPIE
8	RED EAR SUNFISH
9	GREEN SUNFISH
10	WHITE BASS
19	SPOTTED BASS
20	SUNFISH, UNIDENT.
29	BLACK CRAPPIE
1	GIZZARD SHAD
2	CYPRINUS CARPIO
16	EMERALD SHINER
17	PIMEPAHLES
28	MINNOW, UNIDENT.
30	MOONEYE
15	CHANNEL CATFISH
22	FLATHEAD CATFISH
23	BLUE CATFISH
11	SAUGER
18	DRUM

1 to 30 are species codes species in list to left.

site #1: Great Miami River below Ross bridge.

Site #2: Great Miami River below New Baltimore Bridge.

Site #3: Great Miami River above Miamitown bridge at Bennett Gravel Quarry.

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2	6	20	90
2	10	184	245
2	12	656	380
2	12	540	340
2	13	4	65
2	15	200	300
2	15	120	250
2	15	190	380
2	15	256	310
2	16	2	54
2	16	2	54
2	18	200	250
2	21	252	275
2	21	316	300
2	22	720	420
2	22	1380	510
2	23	1916	640
2	24	260	265
2	25	430	340
2	26	432	325
2	27	1320	470
2	28	1	50
2	28	2	70
3	1	125	230
3	1	50	160
3	1	85	200
3	1	38	160
3	1	100	200
3	1	36	147
3	1	95	205
3	1	28	144
3	1	94	205
3	1	28	140
3	1	110	210
3	1	31	140
3	1	120	210
3	1	28	140
3	1	116	210
3	1	20	140
3	1	95	210
3	1	28	140
3	1	108	213
3	1	30	140
3	1	110	215
3	1	20	140
3	1	140	220
3	1	20	140
3	1	132	220
3	1	32	138
3	1	148	224
3	1	28	135
3	1	125	225
3	1	24	135
3	1	144	228
3	1	24	132
3	1	89	200
3	1	28	132
3	1	150	230
3	1	30	132
3	1	144	232
3	1	38	132
3	1	130	235
3	1	38	132
3	1	150	235
3	1	22	132
3	1	146	236
3	1	125	220
3	1	115	220
3	1	160	240
3	1	110	225
3	1	160	245
3	1	136	227
3	1	185	255
3	1	140	230
3	1	90	200
3	1	130	230
3	1	88	195
3	1	140	232

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3	1	92	195
3	1	150	235
3	1	83	185
3	1	128	235
3	1	72	185
3	1	155	235
3	1	78	183
3	1	140	240
3	1	55	180
3	1	175	240
3	1	70	180
3	1	12	98
3	1	75	175
3	1	16	100
3	1	58	170
3	1	16	109
3	1	60	180
3	1	28	125
3	1	60	170
3	1	56	167
3	1	50	170
3	1	45	165
3	1	20	120
3	1	52	164
3	1	16	110
3	1	54	162
3	1	17	113
3	1	100	205
3	1	16	113
3	1	92	205
3	1	18	114
3	1	105	210
3	1	20	124
3	1	120	210
3	1	20	124
3	1	110	216
3	1	18	114
3	1	170	240
3	1	18	120
3	1	170	255
3	1	21	118
3	1	65	195
3	1	30	130
3	1	80	185
3	1	24	130
3	1	78	180
3	1	16	115
3	1	20	120
3	1	26	130
3	1	50	165
3	1	28	130
3	1	95	200
3	1	24	129
3	1	105	210
3	1	20	128
3	1	110	215
3	1	20	115
3	1	180	250
3	1	14	116
3	1	85	190
3	1	20	116
3	1	66	180
3	1	24	128
3	1	56	162
3	1	25	127
3	1	110	210
3	1	21	126
3	1	90	195
3	1	15	125
3	1	48	166
3	1	24	125
3	1	20	120
3	1	106	205
3	1	65	185
3	1	22	125
3	2	92	165
3	2	1300	455
3	2	676	365

3	3	1300	410
3	3	116	200
3	3	616	337
3	4	92	200
3	5	24	104
3	5	194	204
3	5	168	184
3	5	90	160
3	5	88	160
3	5	90	155
3	6	79	138
3	6	78	139
3	6	76	138
3	12	162	228
3	13	456	345
3	15	2	67
3	15	112	238
3	16	2	70
3	16	2	70
3	18	548	350
3	21	316	286
3	21	228	285
3	22	344	340
3	27	1280	440
3	29	166	220
3	30	204	270

Count	No. Spp.	Weight	Length	Mean wt	Mean Ln
52	11	32.406	12.373	623.1826	23.79423
41	19	15.434	10.769	376.4390	26.26585
159	16	18.370	29.461	115.5345	18.52893
		kilograms	meters	gm	cm

SPECIES DIVERSITY OF FISHES CAUGHT ABOVE AND BELOW THE
FERNALD FEED MATERIALS PRODUCITON CENTER, N.L.O.
20 SEPT. 1985

STATION	#1 BOULTON	#2 OUTFALL	#3 PADDY'S RUN
NO. SPECIES	11	19	16
NO. INDIVIDUALS	52	42	157
SHANNON-WEAVER DIVERSITY INDEX H(LOG 2) RANGE 0-5	2.926	3.818	1.283
Hmax	3.46	4.25	4.00
EVENESS Range 0-1	0.846	0.898	0.320
SIMPSON' INDEX of DOMINANCE range 0-1	0.236	0.137	0.994

Table 3: Fish species captured in the Great Miami River, 20 Sept. 1985 by station.

Family	Species		Station #1	Station #2	Station #3
Clupeidae	Dorosoma cepedianum	gizzard shad	+	+	+
Hiodontidae	Hiodon tergisus	mooney			+
Cyprinidae	Cyprinus carpio	carp	+	+	+
	Notropis atherinoides	emerald shiner		+	+
	Pimephales sp.	minnow unident.		+	
Catostomidae	Carpiodes cyprinus	quillback carpsucker		+	
	Carpiodes velifer	highfin carpsucker		+	+
	Carpiodes carpio	river carpsucker	+	+	+
	Hypentelium nigricans	N. hog sucker		+	
	Moxostoma macrolepidotum	shorthead redhorse		+	
	Moxostoma anisurum	silver redhorse		+	+
	Moxostoma erythrurum	golden redhorse		+	+
Ictaluridae	Ictalurus punctulatus	channel catfish	+	+	+
	Ictalurus furcatus	blue catfish		+	
	Pylodictis olivaris	flathead catfish		+	+
Percichthyidae	Morone chrysops	white bass		+	
Centrachidae	Micropterus salmoides	largemouth bass	+	+	+
	Micropterus dolomieui	smallmouth bass			+
	Micropterus puntuclatus	spotted bass	+		
	Lepomis megalotis	longear sunfish	+	+	+
	Lepomis microlophus	redear sunfish	+		
	Lepomis macrochirus	bluegill sunfish	+	+	+
	Pomoxis negormaculatus	black crappie			+
	Lepomis sp. unident.	sunfish unident.	+		
Sciaenidae	Aplodinotus grunniens	Freshwater drum	+	+	+
Total Number of Species	23		11	19	16

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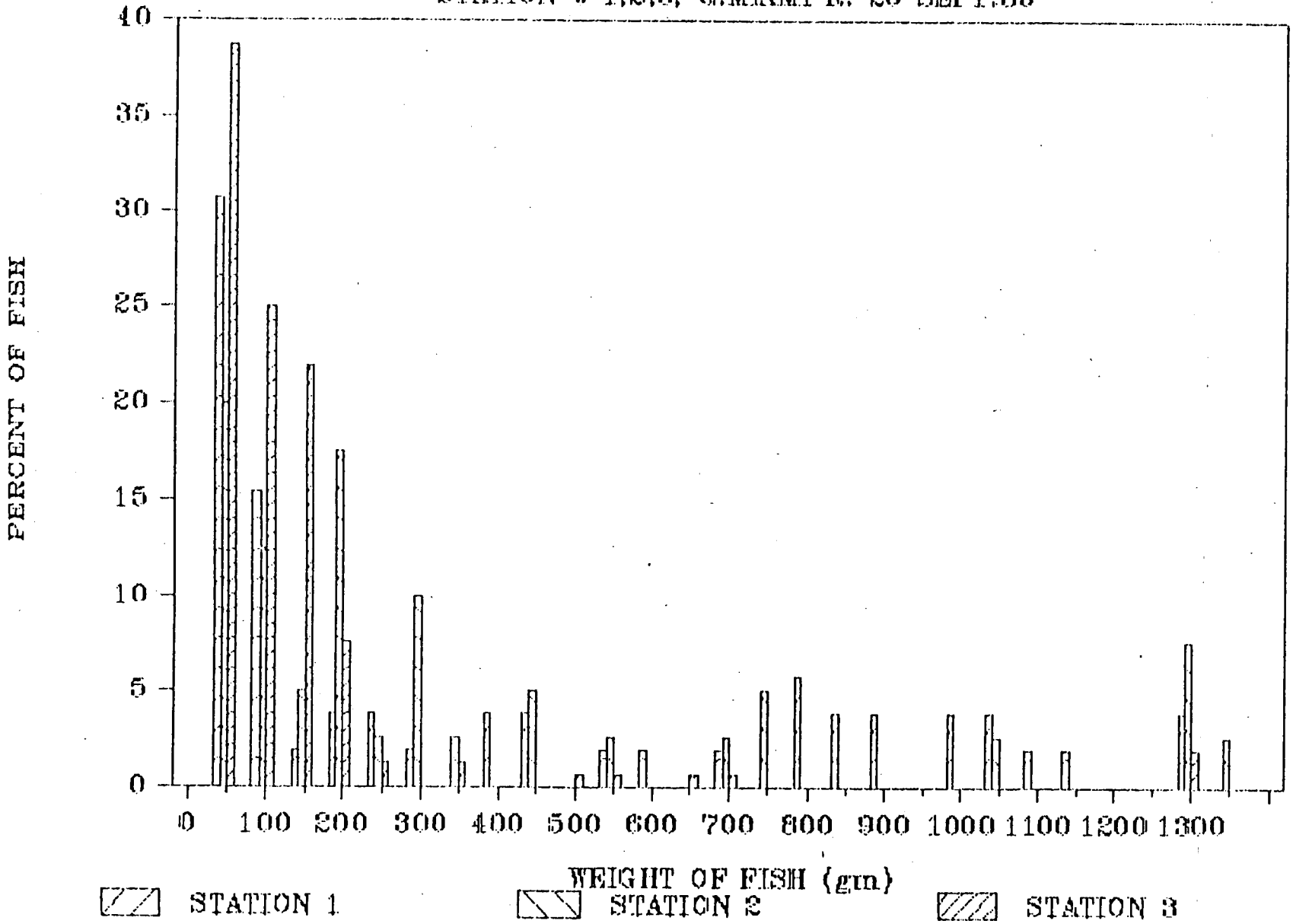
WEIGHT PERCENT FREQUENCY BY STATION

STATION # 1,2,3, G.MIAMI R. 20 SEPT.85



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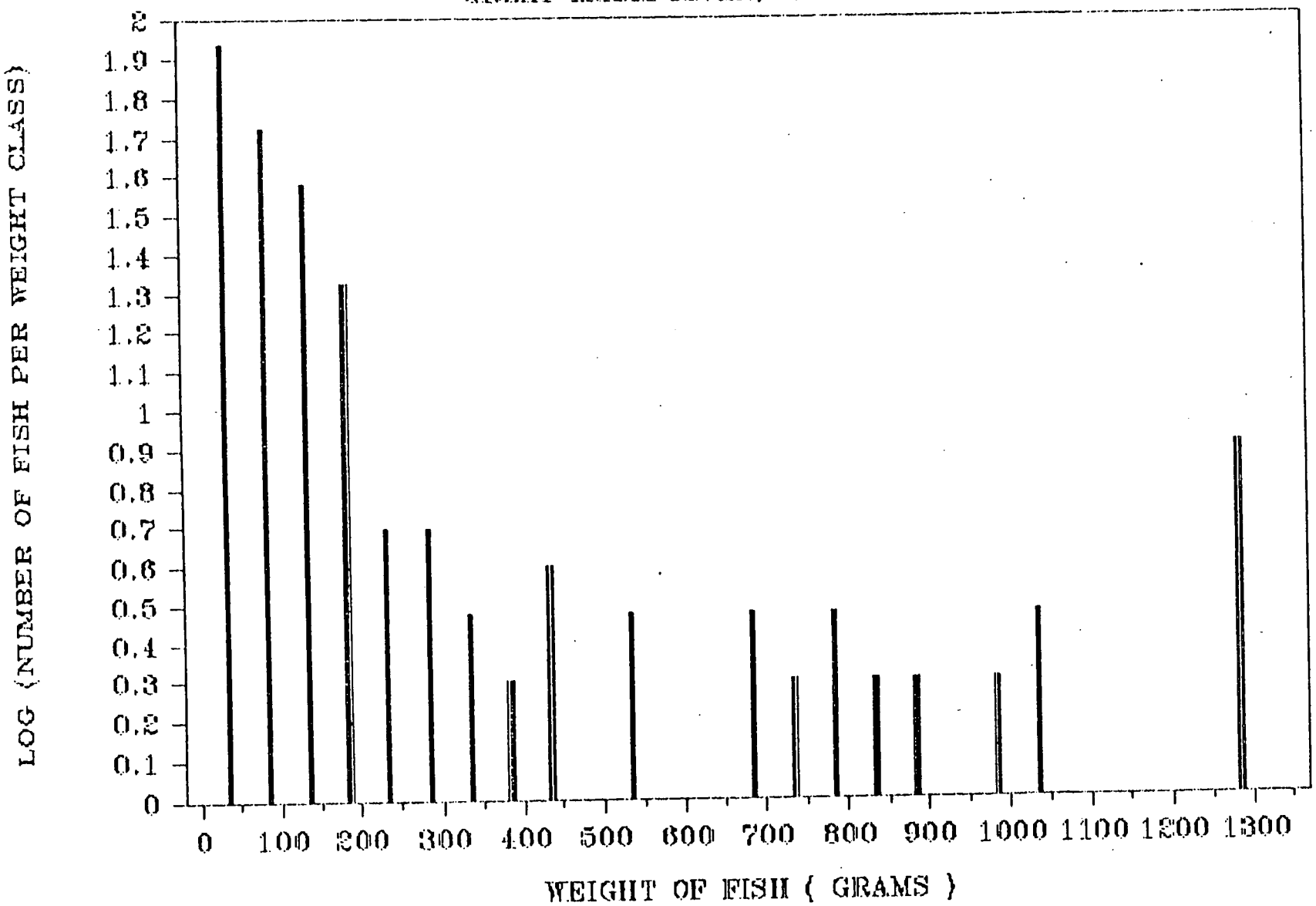
WEIGHT FREQUENCY HISTOGRAM, ALL FISH

GREAT MIAMI RIVER, 20 SEPT. 1985



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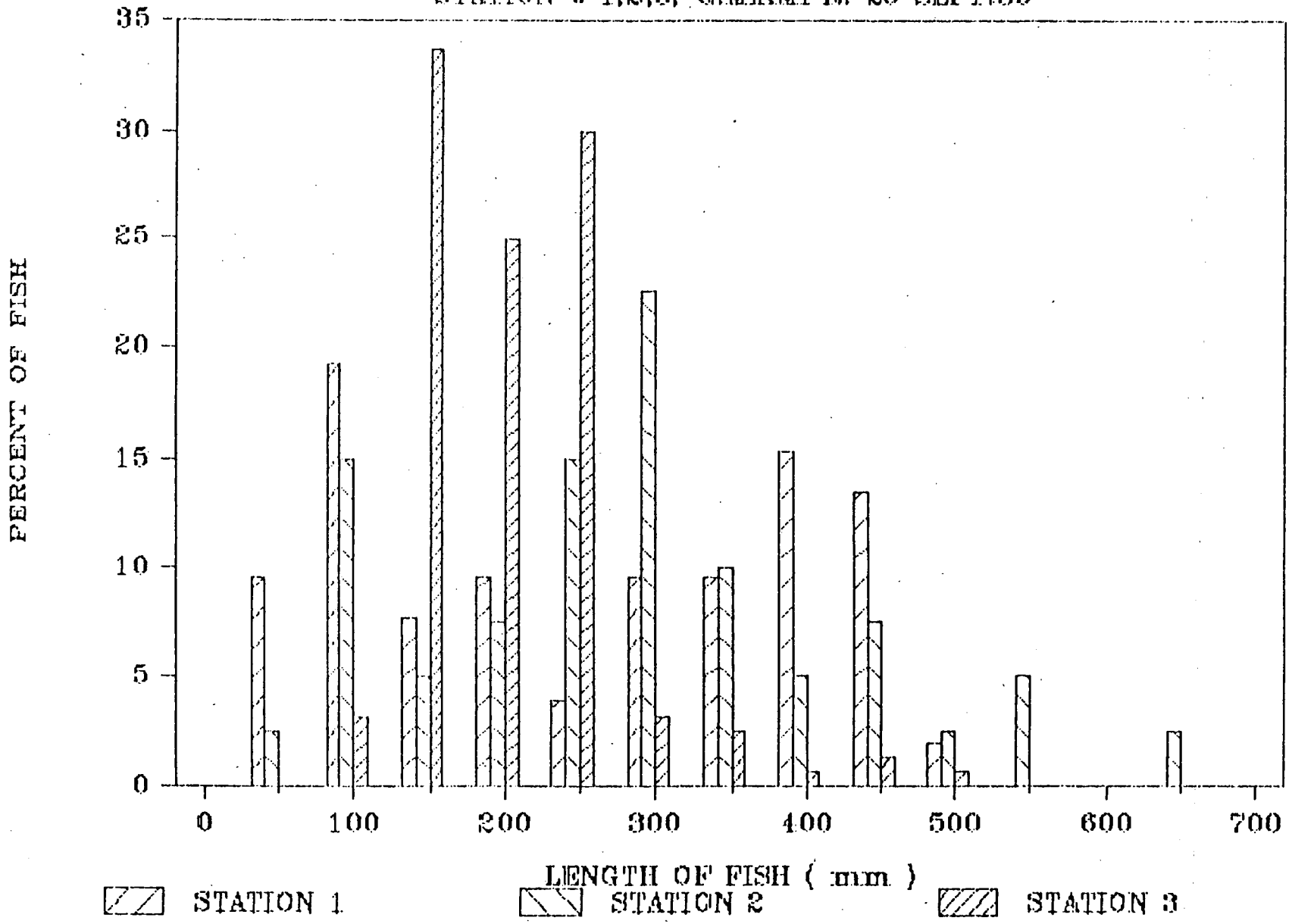
LENGTH PERCENT FREQUENCY BY STATION

STATION # 1,2,3, G.MIAMI R. 20 SEPT.85



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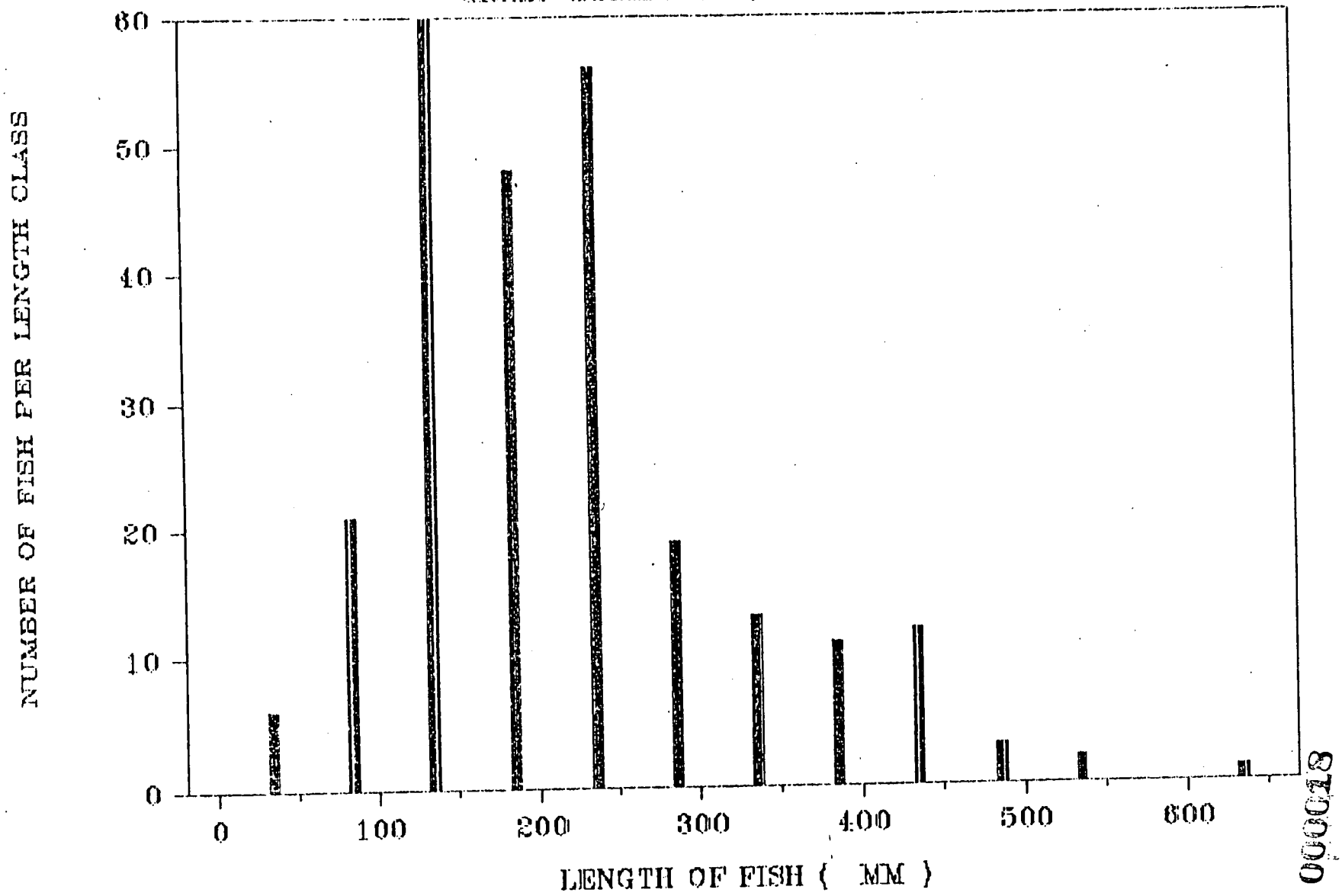
LENGTH FREQUENCY HISTOGRAM, ALL FISH

GREAT MIAMI RIVER, 20 SEPT. 1985



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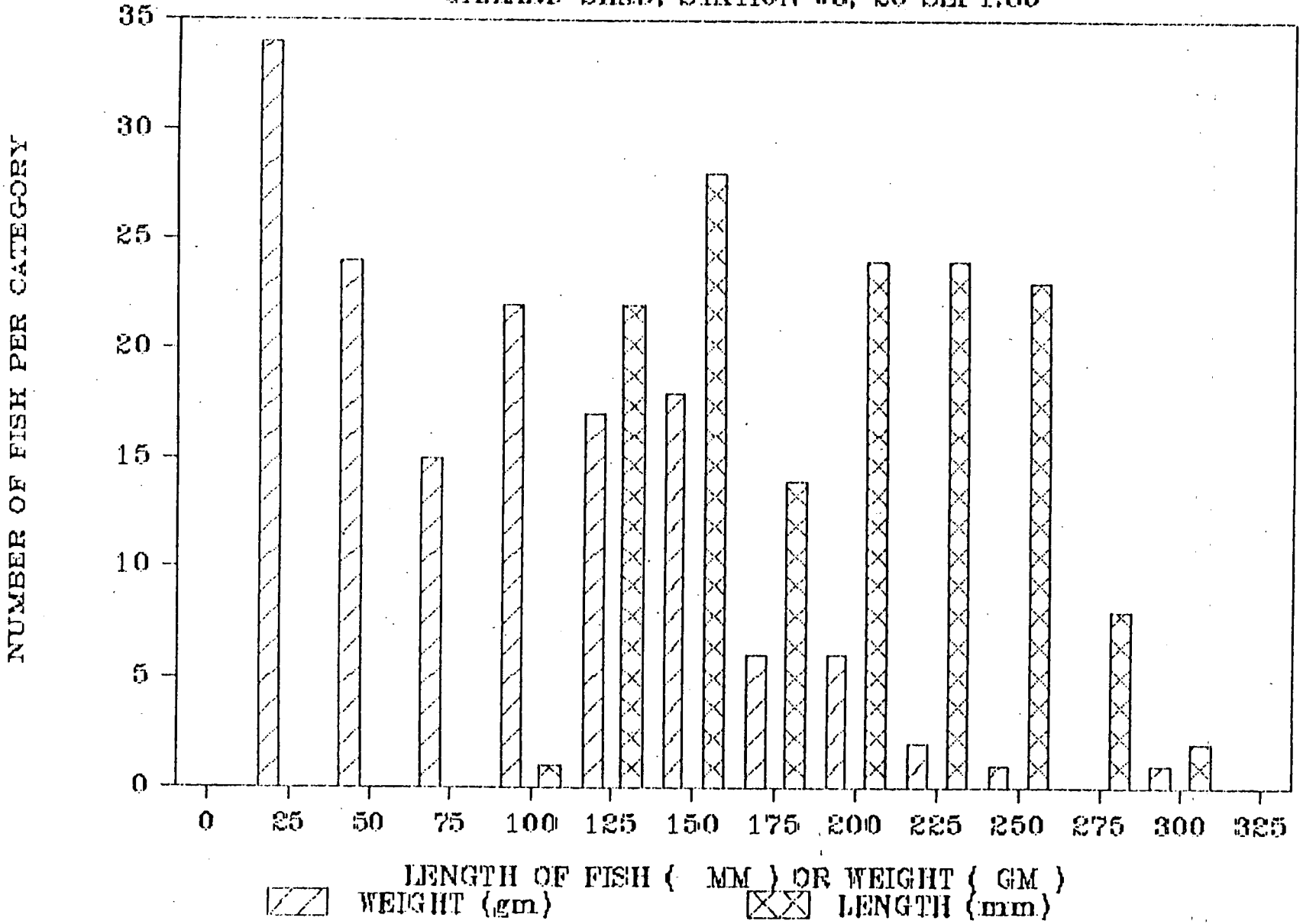
FREQUENCY DIST. BY LENGTH AND WEIGHT

GIZZARD SHAD, STATION #3, 20 SEPT.85



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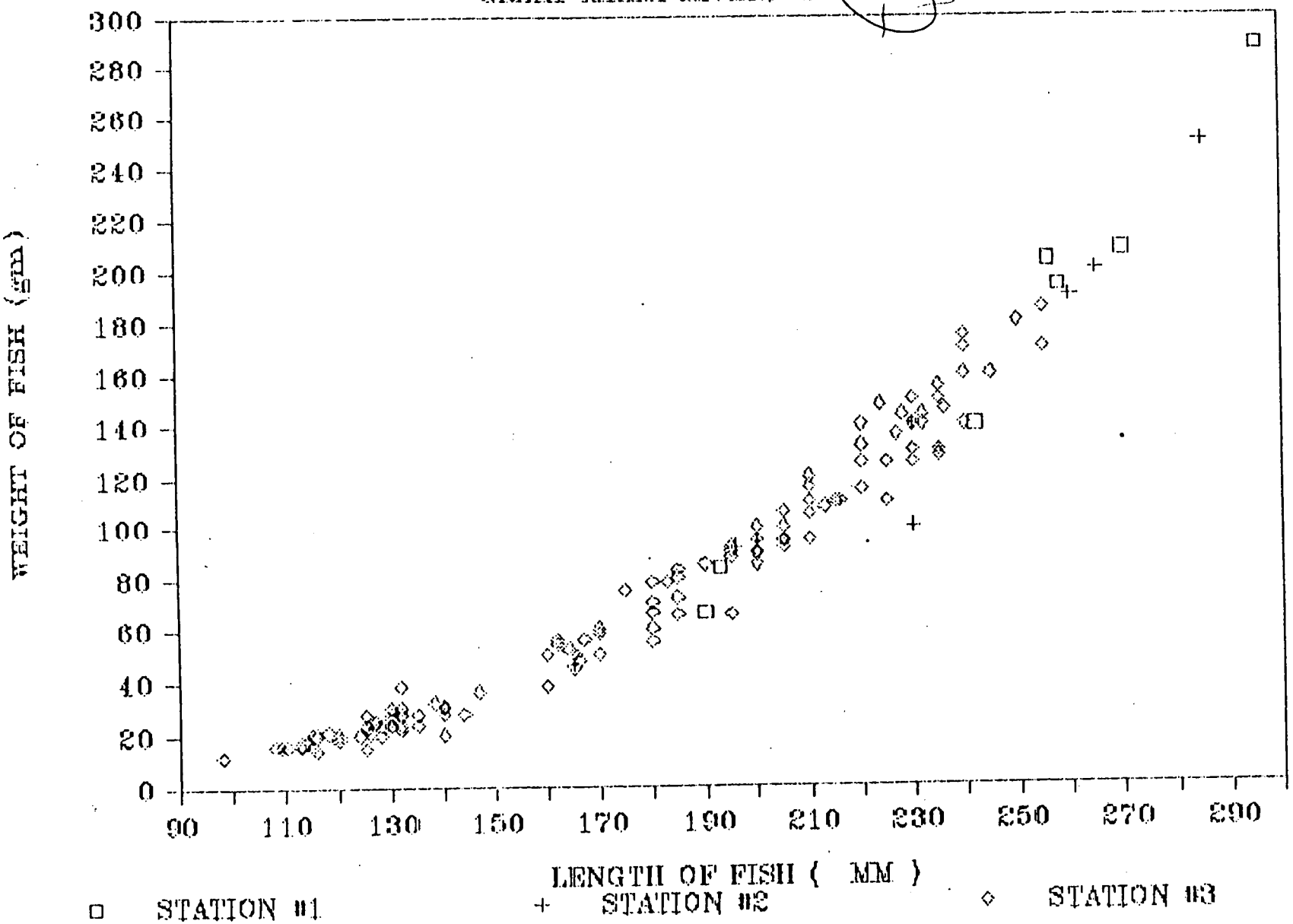
WEIGHT/LENGTH FOR GIZZARD SHAD

GREAT MIAMI RIVER, 20-OCT, 85



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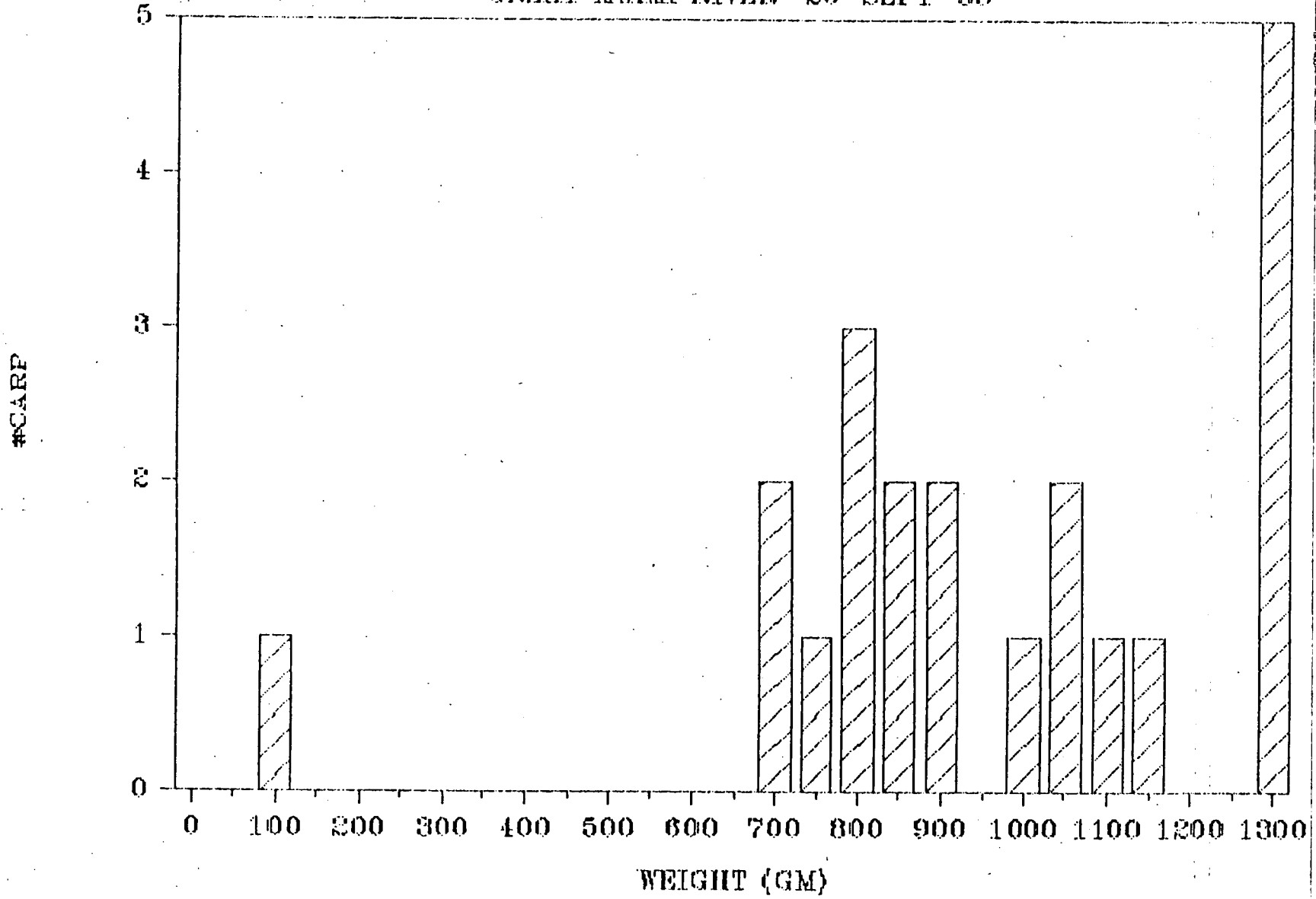
WEIGHT FREQUENCY FOR CARP

GREAT MIAMI RIVER 20-SEPT-85



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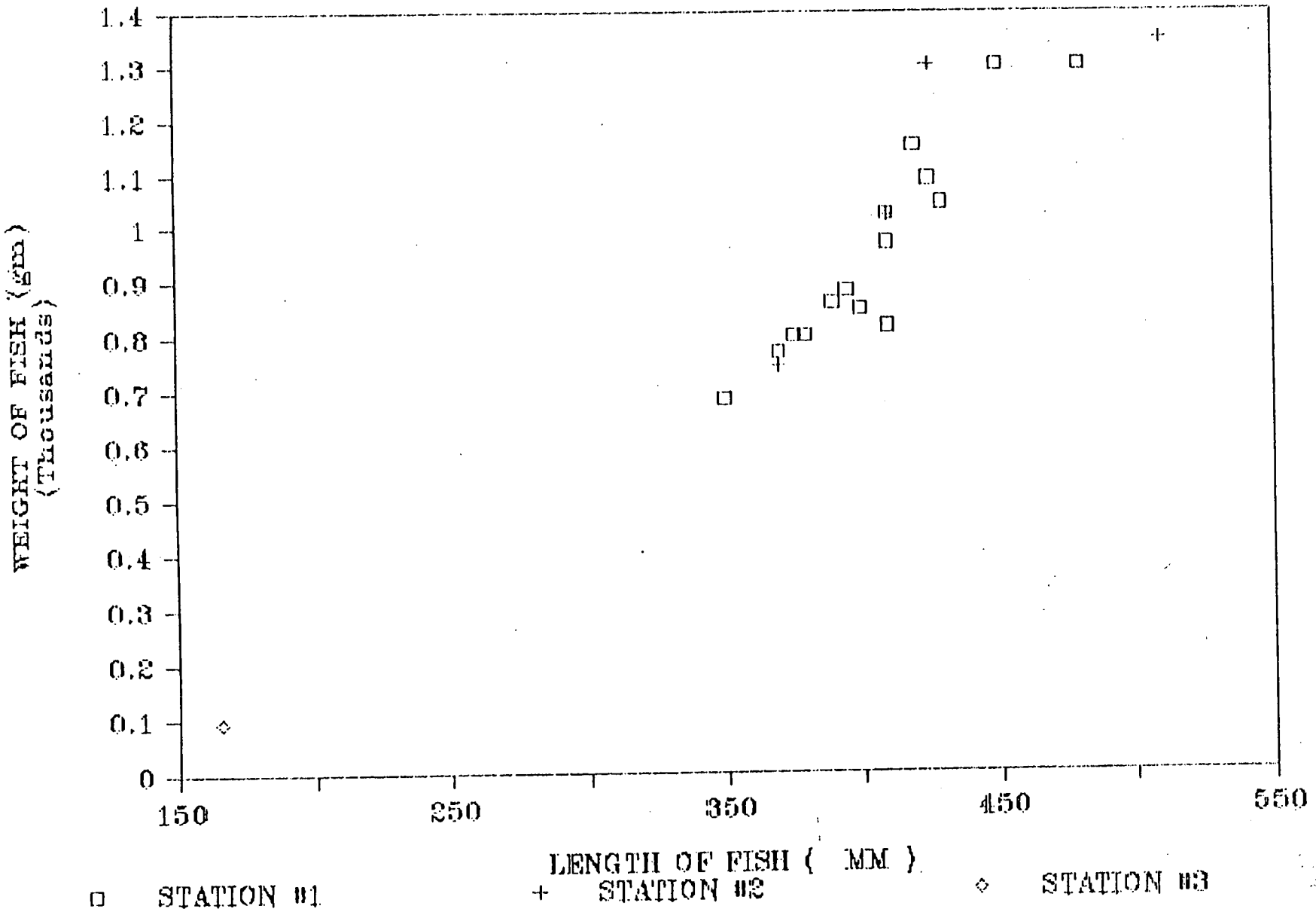
WEIGHT/LENGTH FOR CYPRINUS CARPIO, CARI

GREAT MIAMI RIVER. 20-OCT. 85



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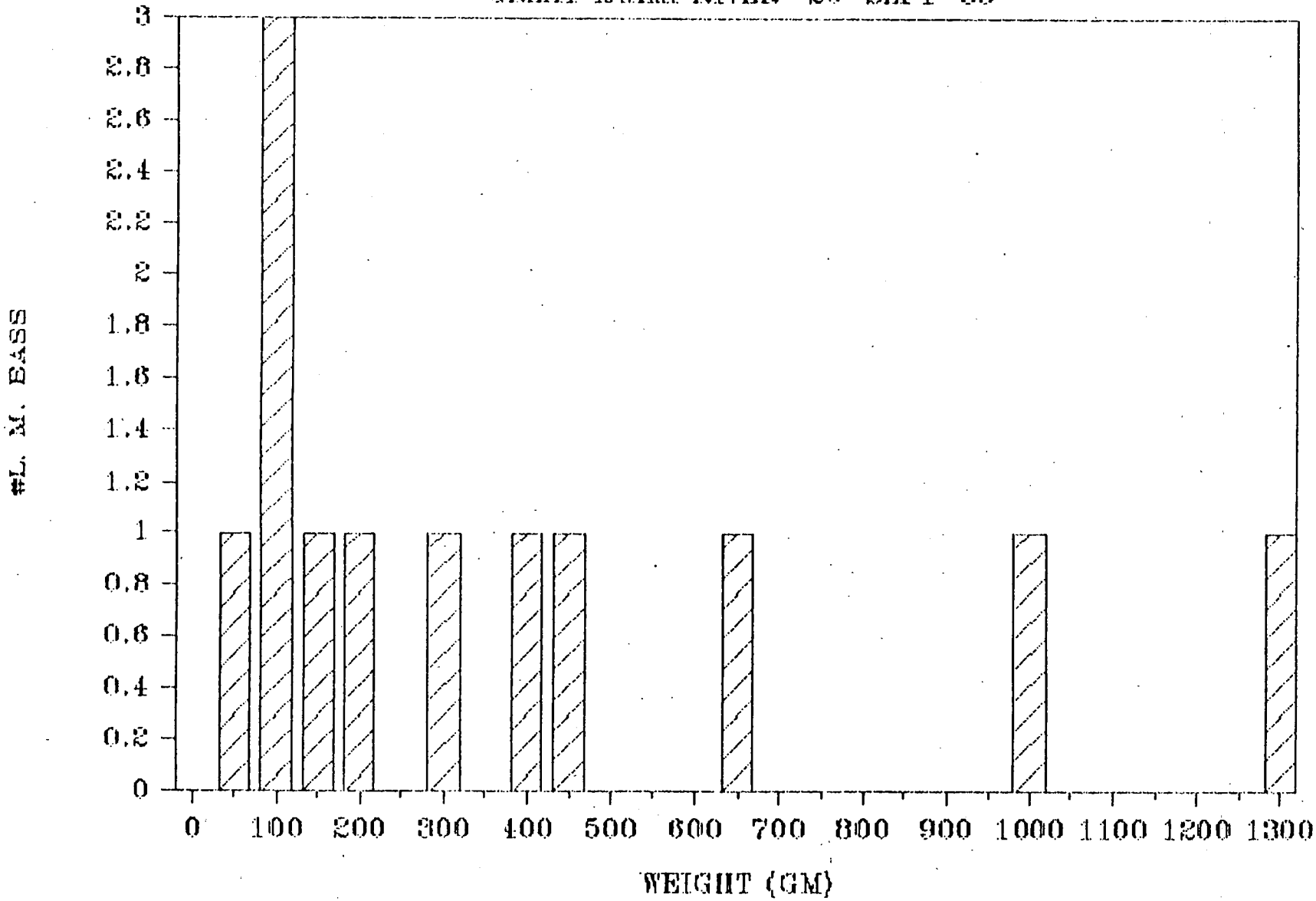
WEIGHT FREQUENCY FOR L. M. BASS

GREAT MIAMI RIVER 20-SEPT-85



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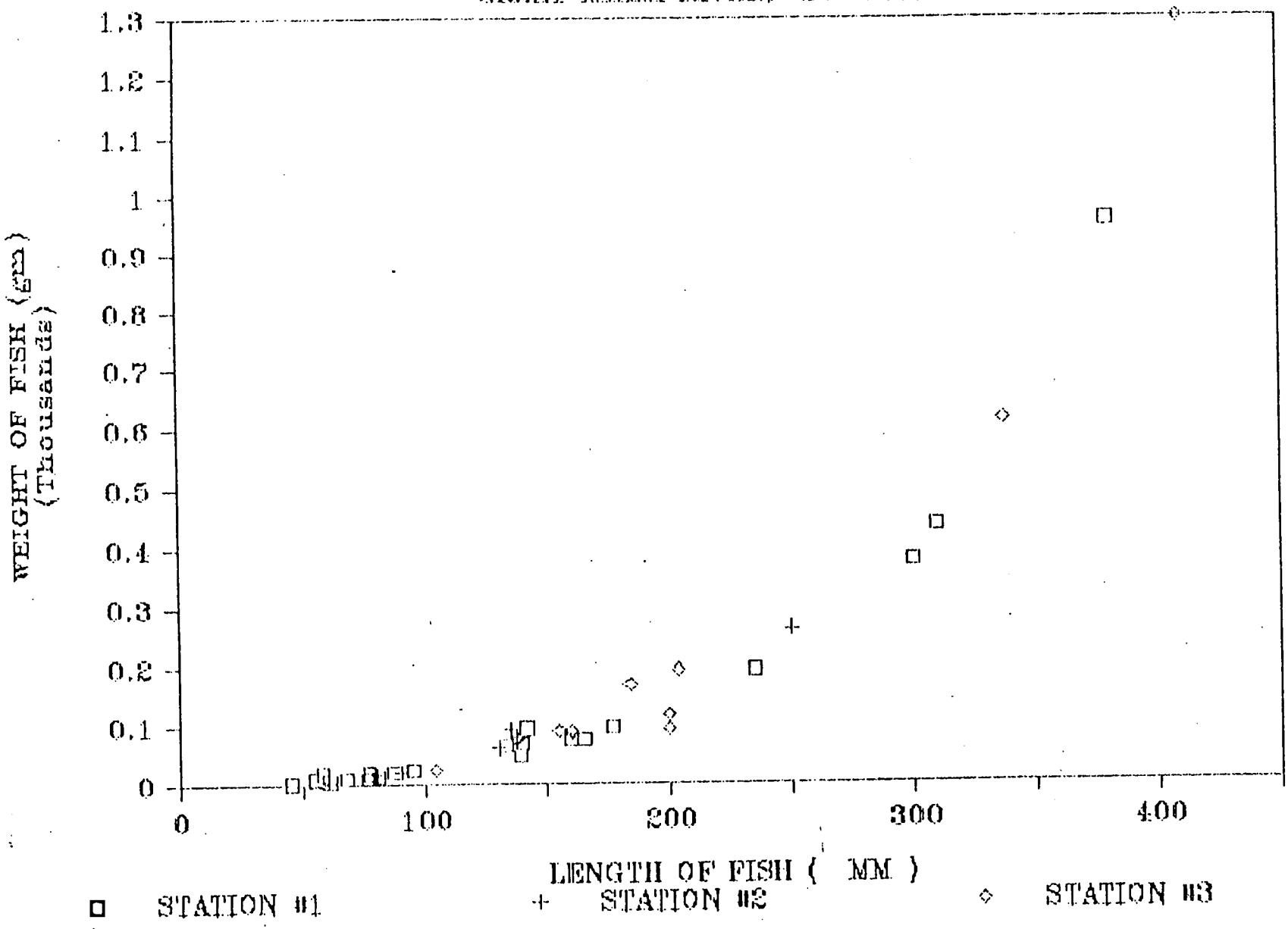
WEIGHT/LENGTH FOR BASS AND PANFISH

GREAT MIAMI RIVER, 20-OCT. 85



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