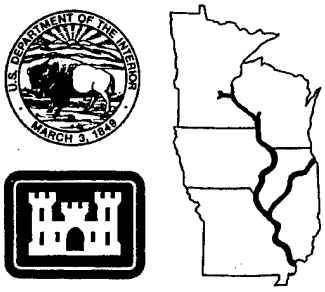

Long Term Resource Monitoring Program

Special Report

97-S001

Comparison of Catch Between 3 × 6 and 2 × 4 Fyke Nets on Upper Mississippi River Backwater Lakes

May 1997

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Comparison of Catch Between 3 × 6 and 2 × 4 Fyke Nets on Upper Mississippi River Backwater Lakes

by

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Preface

The Long Term Resource Monitoring Program (LTRMP) was authorized under the Water Resources Development Act of 1986 (Public Law 99-662) as an element of the U.S. Army Corps of Engineers' Environmental Management Program. The LTRMP is being implemented by the Environmental Management Technical Center, a U.S. Geological Survey science center, in cooperation with the five Upper Mississippi River System (UMRS) States of Illinois, Iowa, Minnesota, Missouri, and Wisconsin. The U.S. Army Corps of Engineers provides guidance and has overall Program responsibility. The mode of operation and respective roles of the agencies are outlined in a 1988 Memorandum of Agreement.

The UMRS encompasses the commercially navigable reaches of the Upper Mississippi River, as well as the Illinois River and navigable portions of the Kaskaskia, Black, St. Croix, and Minnesota Rivers. Congress has declared the UMRS to be both a nationally significant ecosystem and a nationally significant commercial navigation system. The mission of the LTRMP is to provide decision makers with information for maintaining the UMRS as a sustainable large river ecosystem given its multiple-use character. The long-term goals of the Program are to understand the system, determine resource trends and effects, develop management alternatives, manage information, and develop useful products.

This report was prepared under Task 2.2.8.5, *Evaluate and Refine the Experimental Design*, Strategy 2.2.8, *Monitor and Evaluate Fish Communities, Guilds, and Populations,* as specified in Goal 2 of the Operating Plan of the Long Term Resource Monitoring Program for the Upper Mississippi River System (USFWS 1993). This report was developed with funding provided by the Long Term Resource Monitoring Program.

Comparison of Catch Between 3 × 6 and 2 × 4 Fyke Nets on Upper Mississippi River Backwater Lakes

by

Scott A. Gritters

Abstract

The fisheries component of the Long Term Resource Monitoring Program was initiated in 1989 to acquire a baseline database of fishes in the Upper Mississippi River System. Proper gear selection is essential for providing valuable fisheries data to area managers. Types of gear used for assessments by fisheries managers are subject to individual preferences. However, lack of standardization of gear types among managers may cause confusion when comparing data sets. Two configurations of fyke nets were compared when fished in the same habitats in 1989. A large fyke net (3 × 6) and a small fyke net (2 × 4) were used in the same backwater areas and the catches compared. Large nets caught nearly 4.2 times more fish than the small nets. A 92% species overlap was noted between the two net types when measured by the Sorenson coefficient. In each type of net, 24 species of fish were collected. Species composition and abundance were similar, but not identical, in the two net types. The fish communities collected had a similarity index of 0.83 on the Morisita's Index (I_m), where 1 = identical and 0 = no similarity. A higher percentage of sunfish species and a lower percentage of miscellaneous species were caught in the larger net. Average lengths were not significantly different in the two nets, and length frequencies of black crappie (*Pomoxis nigromaculatus*) and white crappie (*P. annularis*) were nearly identical between the two nets.

Introduction

Sampling equipment used for fisheries assessments have typically been subject to manager's preference. Standardization of gear types has not been achieved, which often leads to confusion when examining historical data sets. Although, fyke nets have long been used to sample fisheries resources, different fyke net configurations have been used. Two common net sizes compared in the present study were the 3-ft by 6-ft fyke (3 × 6) and the 2-ft by 4-ft (2 × 4) fyke.

The 3 × 6 fyke net is often considered bulky to handle, and the large catches hinder prompt work-up time, resulting in stressed fish. The 2 × 4 fyke net was tested as a potential alternative for reducing sample size and minimizing fish mortality.

Methods

In July 1989, I compared the catch effectiveness of 3 × 6 and 2 × 4 trap nets at study sites in six backwater lakes of the Upper Mississippi River System in Pool 13 (Figure 1). Each lake complex included two sample sites to provide replicate data sets. Initially, a 2 × 4 or 3 × 6 fyke net was set at each replicate site for 24 h. After 24 h, the nets were interchanged and the sites fished for another 24 h. All fish were counted and length–weight information was taken on the principal species.

The 3 × 6 net has a 15.2-m (50-ft) lead and the 2 × 4 has a 12.2-m (40-ft) lead. Both nets have two throats and 1.9-cm (3/4-inch) mesh. Sets were made with the lead staked on the bank–water interface, and the net was set perpendicularly to the shoreline. In vegetated backwater habitat, the lead was staked 1.8 m (6 ft) from the edge of the vegetation with the net stretched perpendicularly into open water.

Results and Discussion

Two thousand seven hundred twenty-two fishes were collected in 24 net sets. The 3 × 6 net contained 81% of the total catch (2,195 fish), with an average of 182.9 fish caught per net day. The 2 × 4 net averaged 43.9 fish caught per net day. Twenty-four species of fish were identified from both nets (Table).

T. E. McCarthy (Iowa Department of Natural Resources, personal communication), found a significant difference in catch between the 2 × 4 and 3 × 6 nets. He used two separate years of data in the comparison, however, and did not separate the species collected. In 1985, the 2 × 4 net averaged 67.2 fish; in 1986, the 3 × 6 net averaged 117.6 fish. Both nets were set at identical locations.

Relative abundance was similar for most species in both net types. Bluegills (*Lepomis macrochirus*), black crappie (*Pomoxis nigromaculatus*), and white crappie (*P. annularis*) were the dominant fish species collected. The large net had a higher relative abundance of bluegills. Although bluegills composed 53.3% of the catch in the 3 × 6 net, they accounted for only 26.2% of the catch in the 2 × 4 net. Relative abundance of black crappie and white crappie was nearly identical (Table).

I used the Morisita's Index of Community similarity (I_m) to compare species composition in both net types. This index refers to the probability that individuals of the two net types will belong to the same species, relative to the probability of selecting a pair of specimens of the same species from one of the nets (Morisita 1959). The index can range from zero (no similarity) to 1 (identical) and is calculated from the formula:

$$I_m = 2E(x_i y_i)/(I_1+I_2)N_1N_2$$

where x_i is the number of individuals of species I in the 3 × 6 net, and y_i is the number of individuals of species I in the 2 × 4 net. N_1 is the total number of individuals from the 3 × 6 net, and N_2 is the total number of individuals from the 2 × 4 net. I_1 is calculated by the formula:

$$I_1 = Ex_i(x_i-1)/N_1(N_1-1)$$

and I_2 is calculated from the formula:

$$I_2 = Ey_i(y_i-1)/N_2(N_2-1).$$

The composition of fish collected by the two net types was found to be similar, but not identical, with a value of 0.83 according to Morisita's Index. The length frequencies of bluegill, black crappie, and white crappie were similar for both net types. The average lengths of black crappie in 3 × 6 and 2 × 4 nets were 151.8 and 156.8 mm, respectively. The length frequency of black crappie correlated closely and demonstrated two dominant year-class peaks (Figure 2). The average lengths of white crappie in the 3 × 6 and 2 × 4 nets were 185 and 197 mm, respectively. Length frequencies also correlated closely and demonstrated several year-class peaks in both nets (Figure 3). Bluegill size structure did not correlate as closely as did samples from crappies (Figure 4); however, the average length was similar in both net types. Bluegills averaged 125 mm in the large nets; they averaged 131.4 mm in the smaller nets.

Centrarchids were the dominant family group in both net types, composing 88% of the 3 × 6 catch and 69.4% of the 2 × 4 catch (Figure 5). The small nets contained more Catostomids and other miscellaneous fish than the large nets. Suckers composed 10.4% of the fish in small nets, but only 4.9% of those in the large nets. Other families made up only 4% of the relative abundance in the large nets, but composed 17.8% of that in the small nets. The catch of gars was similar for both nets.

Summary

The 3 × 6 fyke net is a more efficient capture tool than the 2 × 4 net. Large nets contained 4.2 times more fish than small nets. Small nets can be used as an alternative in situations where large catches should be avoided. The 3 × 6 net contained a higher percentage of sunfish (mostly bluegills) but a lower percentage of suckers and miscellaneous fishes. The overall composition of fish in both nets was similar; both nets produced an equal number of species with a high species overlap. There was no appreciable difference in the size structure and average lengths of fish caught with the two nets.

Acknowledgments

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Table. Number of fish captured by species and relative abundance for 3 × 6 and 2 × 4 nets, Upper Mississippi River System, Pool 13, 1989.

Species		Number		Relative abundance (%)	
		3 × 6	2 × 4	3 × 6	2 × 4
Family Lepisosteidae:					
Longnose gar	(*Lepisosteus platostomus*)	3	2	0.1	0.4
Shortnose gar	(*L. osseus*)	64	10	2.9	1.9
Family Amiidae:					
Bowfin	(*Amia calva*)	3	3	0.1	0.6
Family Clupeidae:					
Gizzard shad	(*Dorosoma cepedianum*)	5	17	0.2	3.2
Family Cyprinidae:					
Common carp	(*Cyprinus carpio*)	28	39	1.3	7.4
Golden shiner	(*Notemigonus crysoleucas*)	14	5	0.6	0.9
Family Catostomidae:					
River carpsucker	(*Carpiodes carpio*)	2	0	0.1	0.0
Smallmouth buffalo	(*Ictiobus bubalus*)	8	5	0.4	0.9
Spotted sucker	(*Minytrema melanops*)	47	29	2.1	5.5
Shorthead redhorse	(*Moxostoma macrolepidotum*)	52	21	2.4	4.0
Family Ictaluridae:					
Yellow bullhead	(*Ameiurus natalis*)	4	6	0.2	1.1
Black bullhead	(*A. melas*)	2	3	0.1	0.6
Channel catfish	(*Ictalurus punctatus*)	2	3	0.1	0.6
Family Esocidae:					
Northern pike	(*Esox lucius*)	3	1	0.1	0.2
Family Percichthyidae:					
Yellow bass	(*Morone mississippiensis*)	2	1	0.1	0.2
Family Centrarchidae:					
Pumpkinseed	(*Lepomis gibbosus*)	87	28	4.0	5.3
Warmouth	(*L. gulosus*)	0	1	0.0	0.2
Orangespotted sunfish	(*L. humilis*)	0	1	0.0	0.2
Bluegill	(*L. macrochirus*)	1,171	138	53.3	26.2
Largemouth bass	(*Micropterus salmoides*)	19	2	0.9	0.4
White crappie	(*Pomoxis annularis*)	212	44	9.6	8.3
Black crappie	(*P. nigromaculatus*)	442	152	20.1	28.8
Family Percidae:					
Yellow perch	(*Perca flavescens*)	7	3	0.3	0.6
Sauger	(*Stizostedion canadense*)	9	5	0.4	0.9
Walleye	(*S. vitreum*)	2	0	0.1	0.0
Family Sciaenidae:					
Freshwater drum	(*Aplodinotus grunniens*)	7	8	0.3	1.5
Total		2,195	527		

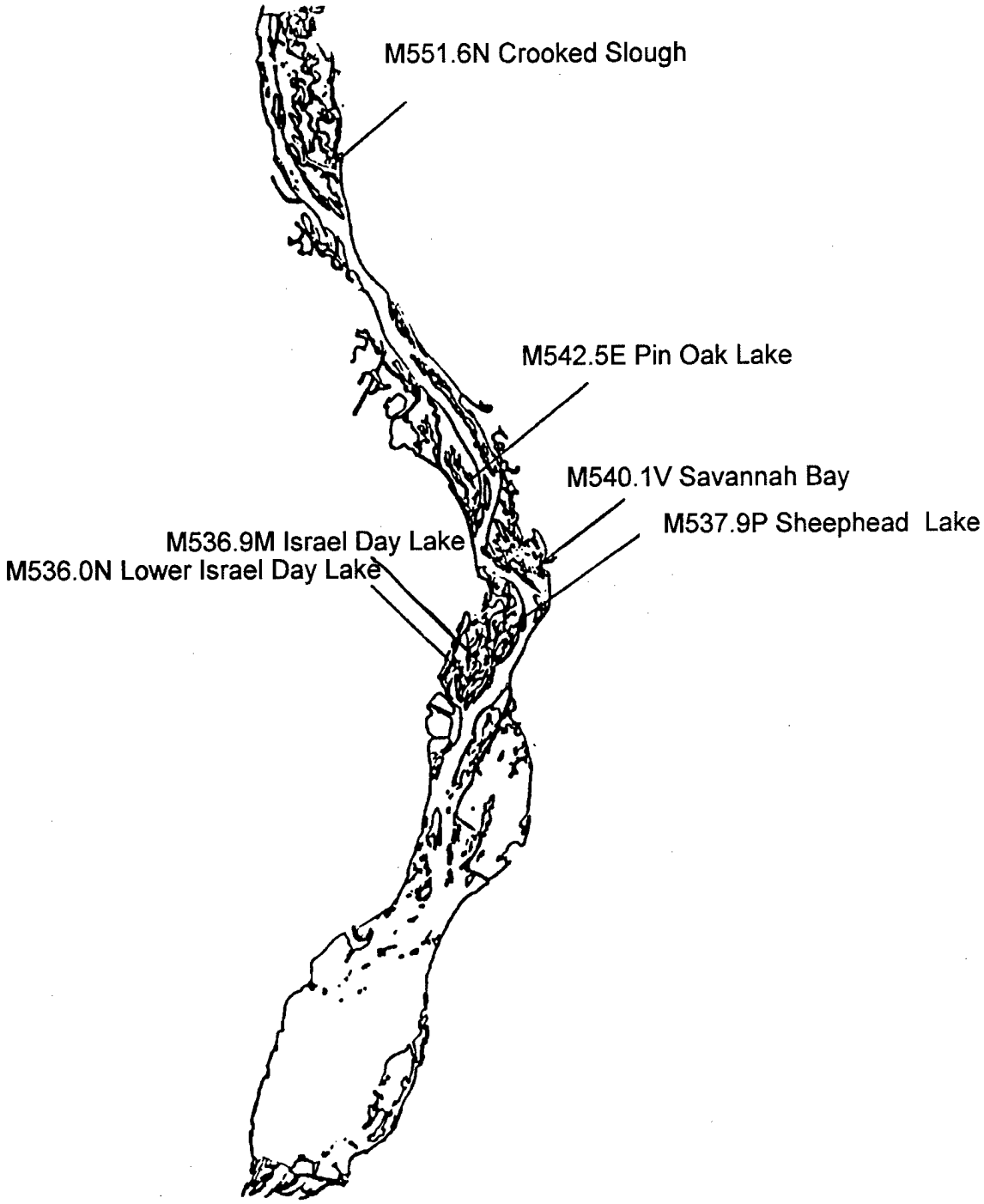

Figure 1. Backwater lakes sampled, Upper Mississippi River System, Pool 13, 1989.

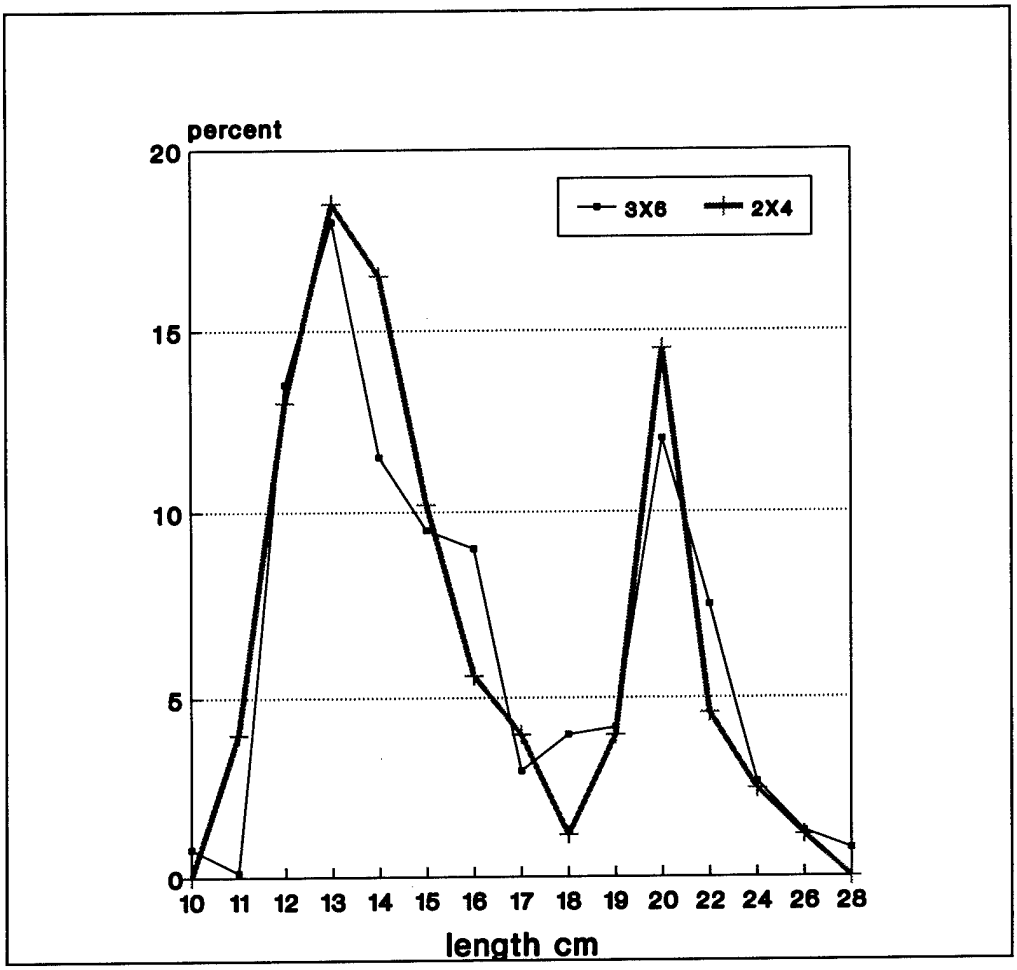

Figure 2. Length frequency of black crappie (*Pomoxis nigromaculatus*) collected by length class during 3 x 6 and 2 x 4 net comparisons.

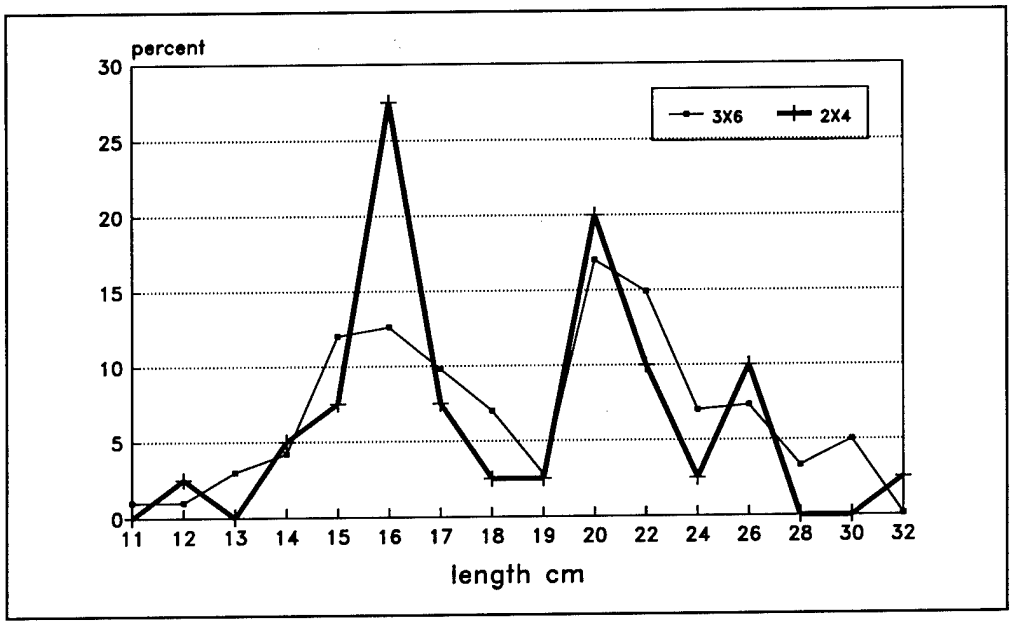

Figure 3. Length frequency of white crappie (*Pomoxis annularis*) collected during 3 x 6 and 2 x 4 net comparisons.

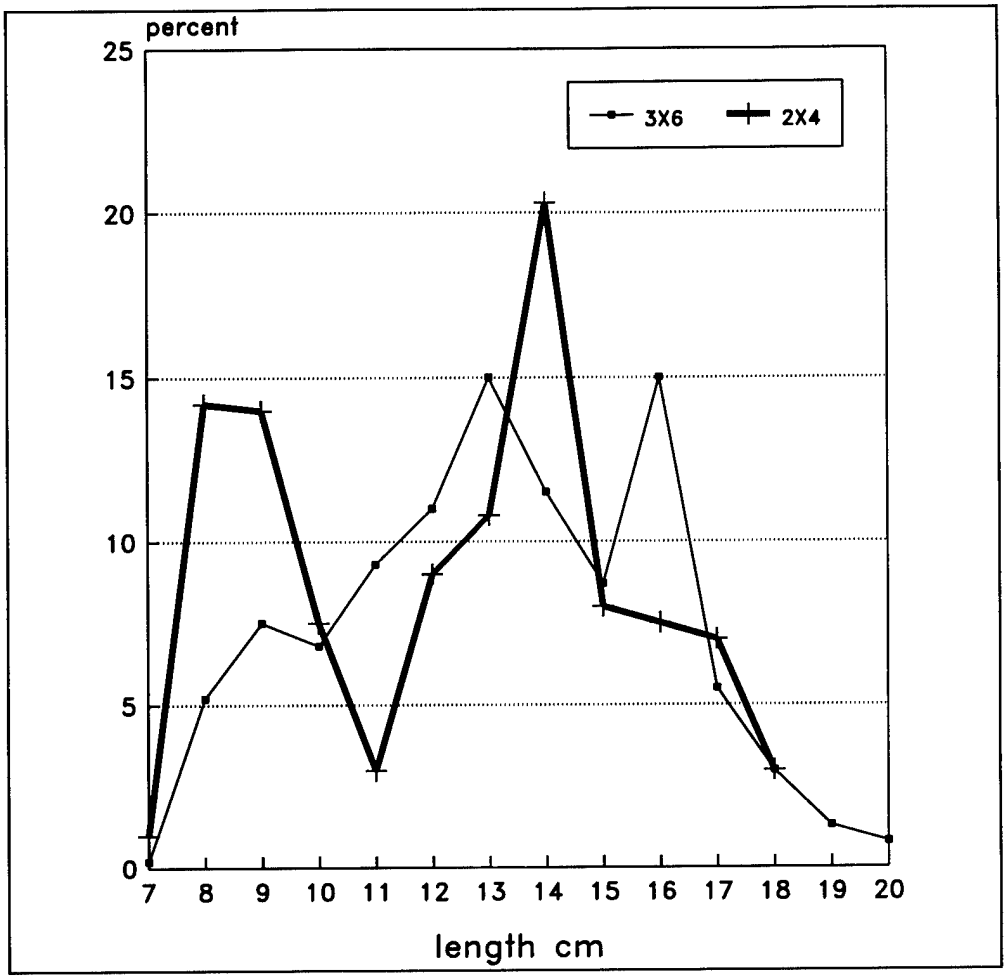

Figure 4. Length frequency of bluegill (*Lepomis macrochirus*) collected during 3 x 6 and 2 x 4 net comparisons.

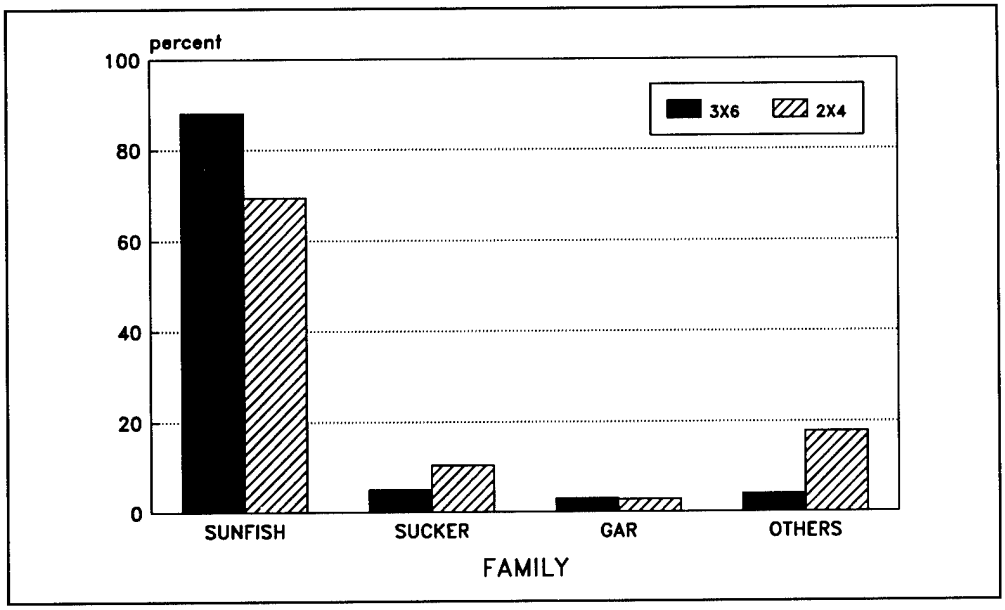

Figure 5. Relative abundance of family groups in 3 x 6 and 2 x 4 fyke nets.

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