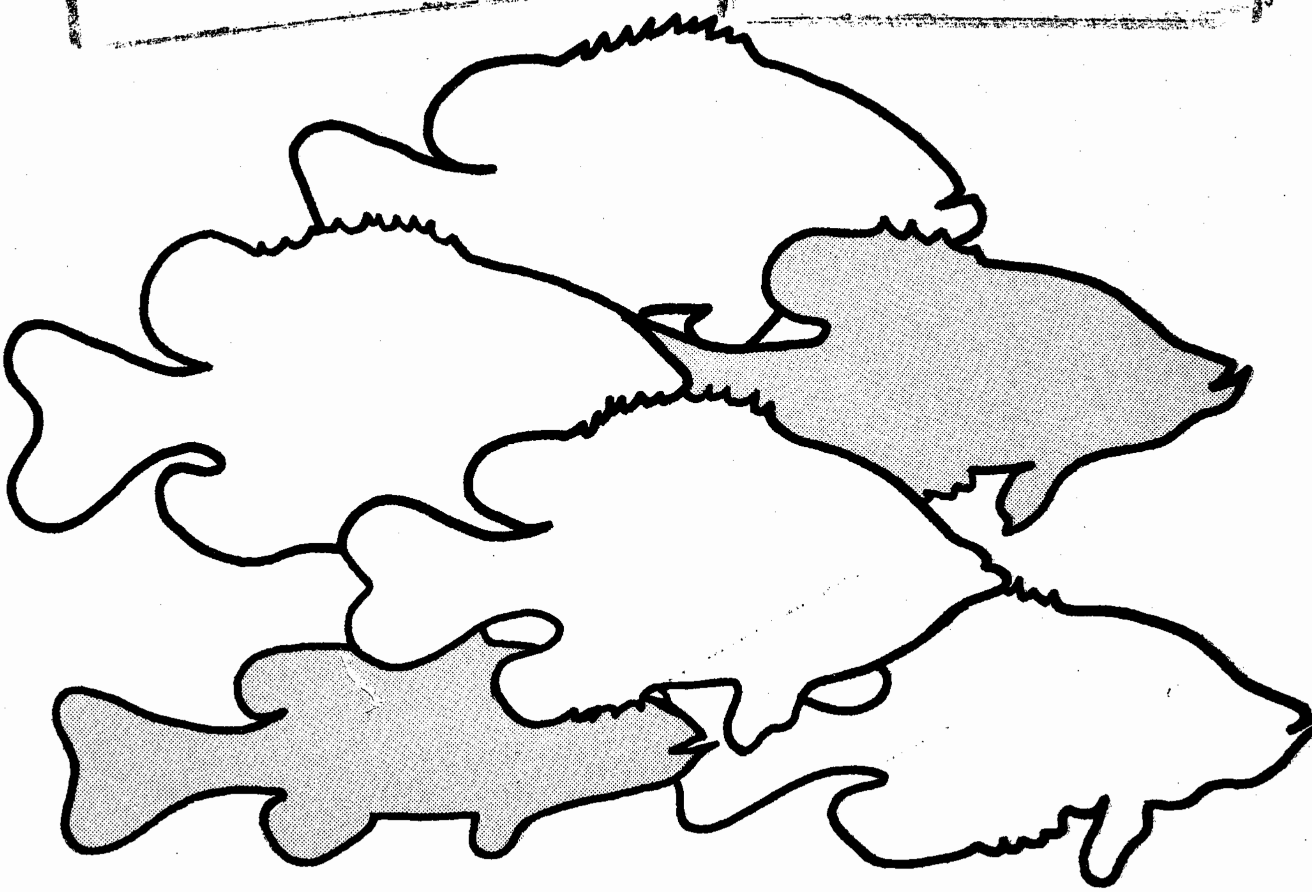
AMERICAN FISHERIES SOCIETY

PROCEEDINGS

ANNUAL MEETING
MISSISSIPPI CHAPTER



VOL. VI
February 18, 1982
Vicksburg, MS

PROCEEDINGS

ANNUAL MEETING

MISSISSIPPI CHAPTER

AMERICAN FISHERIES SOCIETY

FEBRUARY 18, 1982

VICKSBURG, MISSISSIPPI

OFFICERS

JOHN W. BURRIS, PRESIDENT
MISSISSIPPI DEPT OF WILDLIFE CONSERVATION

CARLOS H. PENNINGTON, PRES.-ELECT
WATERWAYS EXPERIMENT STATION USCOE

BENNY A. ROHR, SECRETARY-TREASURER
NATIONAL MARINE FISHERIES SERVICE

Printed by Mississippi Dept. of Wildlife Conservation
Jackson, Mississippi

PREFACE

These proceedings are the result of the eighth annual meeting of the Mississippi Chapter of the American Fisheries Society held in Vicksburg, Mississippi on February 18, 1982. The purpose of the annual meetings is to share ideas and research of individuals representing all aspects of fisheries activities in Mississippi.

The members are indebted to the hosts at the Waterways Experiment Station and others responsible for the success of the meeting. We are especially grateful to Mr. Ernie Boswell of the U. S. Geological Survey for his talk outlining the ground water resources in Mississippi. This meeting marks the first wherein papers were presented by a representative from the College of Veterinary Medicine of Mississippi State University. The catfish farming industry has shown a significant increase over the past five years and the study of disease problems of high density populations should become increasingly important.

Papers and abstracts reproduced in this document have been edited slightly to enhance reproduction, otherwise they are in the same form in which they were received. Cost of publication of the Proceeding has been met primarily by the Mississippi Department of Wildlife Conservation.

Mississippi Chapter
American Fisheries Society
December, 1982

TABLE OF CONTENTS

PROGRAM OF 1982 ANNUAL MEETING

0800-0900am	Registration.
0900-0930	Call to order and welcome by WES staff.
0930-0950	Groundwater problem in Mississippi. Mr. Ernie Boswell U.S.G.S.
0950-1000	Break
1000-1015	President's comments
1015-1130	Business Meeting
1130-1230	Tour of WES facilities (bus).
1230-1:30pm	Lunch at WES cafeteria.
1:40	Presentation of Papers.
1:40-2:00	"Management Procedures for Brown Blood Disease in Channel Catfish." Dr. P. Boswer, and W. W. Falls.
2:00-2:20	"Mirex Toxicity in Channel Catfish: A Long-term Feeding Study." Dr. P. Bowser, W. W. Falls, and H. D. Mercer.
2:20-2:40	"Macrobenthos of Ross Barnett Reservoir, Mississippi." Dr. C. Cooper and Dr. L. Knight.
2:40-3:00	"A Catalog of Mississippi Freshwater Fishes in the State's Collection." R. Weill, D. Ebert, and P. Hartfield.
3.00-3:10	Break
3:10-3:30	"Fish Community Structure in a Mississippi River Dike Field." R. Nailon and Dr. C. Pennington.
3:30-3:50	"Fish Populations of Three Mississippi River Dike Fields During Low Flow." C. Bond, J. Baker, and Dr. C. Pennington.
3:50-4:10	"The Influence of Shallow Reservoirs on Sport Fish Populations in Small Streams in National Forests in Mississippi." D. Ebert and Dr. L. Knight.
4:10-4:30	"Potential Biological Impacts of Traffic in Navigable Waterways." T. Wright
4:30-4:40	Adjourn

AMERICAN FISHERIES SOCIETY

MISSISSIPPI CHAPTER

Vicksburg, Mississippi

February 18, 1982

RESOLUTION

WHEREAS, Barry O. Freeman has faithfully served the State of Mississippi, through offices held and duties performed while a member of the Mississippi Game and Fish Commission and Mississippi Department of Wildlife Conservation from April 1955 through July 1981; and

WHEREAS, under his direction the State Lakes Program has grown to nearly 4,500 acres of managed and maintained fishing waters; and

WHEREAS, under his leadership the Fisheries Technical Staff has developed professionally to better manage the fisheries and provide service to the fisherman of the State; and

WHEREAS, his leadership and accomplishments in the field of sports fisheries husbandry has brought honor not only to him at state, regional and national levels, but has provided recognition to the State of Mississippi; and

WHEREAS, Barry Freeman has unselfishly been committed to the stewardship of fisheries resources of the State for over twenty-six years,

NOW THEREFORE, BE IT RESOLVED THAT THE MEMBERSHIP OF THE MISSISSIPPI CHAPTER OF THE AMERICAN FISHERIES SOCIETY, assembled this the 18th day of February 1982, at their annual meeting in Vicksburg, Mississippi, do herewith commend Barry O. Freeman, Chief of Fisheries, Mississippi Department of Wildlife Conservation for his outstanding service to the sportsmen of the State of Mississippi. Be it further resolved that this resolution be recorded in The Proceedings of The Mississippi Chapter of The American Fisheries Society and a copy of the resolution presented to Barry O. Freeman.

MANAGEMENT PROCEDURES FOR BROWN BLOOD DISEASE IN CHANNEL CATFISH

Dr. Paul R. Bowser and William W. Falls
College of Veterinary Medicine
Mississippi State, MS 39762

Abstract: Brown blood disease, also known as methemoglobinemia, is currently one of the leading causes of losses in the commercial catfish industry. The disease is caused by high nitrite levels in ponds. Nitrite has the ability to oxidize hemoglobin to a form known as methemoglobin. Hemoglobin can carry oxygen, whereas methemoglobin cannot. The amount of methemoglobin may become so great that mortalities result. Sodium chloride and calcuim chloride have been used to treat brown blood disease. It is thought that the monovalent chloride anion competes with the monovalent nitrite anion for uptake sites on the gills. We have found that, under conditions of high water hardness and alkalinity (200 mg.liter each), a chloride to nitrite ratio of 3:1 appears to prevent methemoglobin from exceeding 50%. In our studies, few mortalities were observed in which percent methemoglobin was less than 50%. In that brown blood disease is a condition of reduced respiratory efficiency for a fish, the adequacy of dissolved oxygen should be considered. A management procedure might include action to increase dissolved oxygen as well as a chloride treatment.

MIREX TOXICITY IN CHANNEL CATFISH
A LONG-TERM FEEDING STUDY

William W. Falls and H. Dwight Mercer
College of Veterinary Medicine
Mississippi State, MS 39762

Abstract: A long-term feeding study was initiated to determine the effects of feeding the former fire ant bait mirex to channel catfish. A secondary purpose was to evaluate the experimental protocol for studies of other agricultural chemicals. Mirex was fed to fingerling channel catfish at eight dose levels (0.001 mg/kg fish/day to 32 mg/kg fish/day for seven time periods (7 - 240 days). Following the treatments, the fish were placed on a mirex-free control ration for a 90 day withdrawal period. No lesions could be detected which could be attributed to mirex in the gills, livers or posterior kidneys of fish from any treatment. Accumulation curves showed greatest mirex residues in the tissues of those fish fed the highest doses. Fish mortalities observed during the study were attributed to infections due to *Flexibacter columnaris* and *Aeromonas hydrophilia* and to a high chlorine concentration surpassing the capacity of the charcoal bed filters. Long-term studies should place a great deal of effort in the area of providing an adequate environment for the experimental animals.

MACROBENTHOS-SEDIMENT RELATIONSHIPS IN ROSS BARNETT RESERVOIR, MISSISSIPPI[1/2/]

Charles M. Cooper and Luther A. Knight, Jr.[3/]

1/ Contribution of the Sedimentation Laboratory, ARS, U. S. Department of Agriculture, Oxford, MS 38655 and the Biology Department, University of Mississippi, University, MS 38677.

2/ Paper to be published in Proceedings of Annual Meeting of the MS Chapter, American Fisheries Society.

3/ Ecologist, USDA Sedimentation Laboratory, Oxford, MS and Professor of Biology, University of Mississippi.

MACROBENTOS-SEDIMENT RELATIONSHIPS IN ROSS BARNETT RESERVOIR, MISSISSIPPI[1/]

Charles M. Cooper and Luther A. Knight, Jr.[2/]

ABSTRACT

A 1979 study of the macrobenthos of Ross Barnett Reservoir, Mississippi, identified 20 genera of invertebrates including *Hexagenia bilineata*, *Chaoborus punctipennis*, *Chironomus attenuatus*, *Tanypus stellatus* and *Coelantanypus tricolor*. Numbers, species, and biomass were influenced by factors associated with reservoir age (17 years) and sediment development in the reservoir benthic zones. Bottom materials in the reservoir were characteristically coarser, had more allochthonous organic debris, and developed layers were thinner than those normally occurring in older lakes (30-40 years) in the area. As a result, Ross Barnett Reservoir supported 50 percent of the species and 60-75 percent of the benthic productivity of older area reservoirs. Diversity was adversely affected by coarse sand or hardpan clay substrates in littoral zones. Superimposed upon this pattern were species responses to water depth. Benthos were major food sources of freshwater drum (*Aplodinotus grunniens*).

INTRODUCTION

Benthic macrofauna composes a large part of the secondary productivity of lake and reservoir ecosystems. It occupies an equally important position as a fish food component. The benthos of Ross Barnett Reservoir, Mississippi were studied during 1979 as part of a fish food preference study to ascertain (1) benthic species composition, (2) distribution by habitat, (3) consumption by freshwater drum and (4) to compare benthic productivity with other lacustrine habitats.

STUDY AREA AND METHODS

Ross Barnett Reservoir was constructed in the 1960's on the Pearl River northeast of Jackson, Mississippi, principally as a water supply for the City of Jackson and for recreation in central Mississippi. The reservoir covers 12,550 hectares at full pool. Over one-third of the reservoir is less than 1 m deep and two-thirds of the reservoir bottom was cleared of timber prior to impoundment in 1965. Since the reservoir was constructed for water supply and recreation, water level fluctuations average less than 1m and most littoral areas are not dewatered.

1/ Contribution of the Sedimentation Laboratory, USDA-ARS and University of Mississippi. Support was provided through D. J. projects F-48-1 and F-48-2, Mississippi Department of Wildlife Conservation.

2/ Ecologist, USDA Sedimentation Laboratory, Oxford, MS 39655 and Professor, Department of Biology, the University of Mississippi.

Samples of bottom substrates were taken monthly by Ekman dredge at five stations representing major benthic habitats. After seiving, samples were preserved, transported to the laboratory, sorted and counted.

The five stations sampled included: Station 1, 1.6 km upstream from State Highway 43; Station 2, 50 m below Highway 43, Station 3, 70 m NE of Main Harbor Marina off the Jackson Yacht Club, Station 4, 200 m SE of Twin Harbors, and Station 5, 100 m NW of Fannin Landing (Fig. 1). Bottom types ranged from sand overlying clay to muck-mud containing large quantities of debris (Table 1).

Table 1. Types of bottom deposits and substrate in Ross Barnett Reservoir, Mississippi

Station	Normal Water Depth (m)	Bottom Type
1	2.5	Depositional mud, high percent decomposing vegetation, allochthonous debris
2	1.0	Sandy gravel, some snag debris
3	10.0	Mud, high percent of clay, some snag debris
4	4.0	Muck-mud, some decomposing snag debris
5	2.0	Sand overlying clay

RESULTS AND DISCUSSION

Twenty genera of benthic invertebrates were collected, including three annelid worms, nine mollusks and eight larval insects (Table 2).

Table 2. Benthic invertebrates collected from Ross Barnett Reservoir, Mississippi.

Annelida

Branchiura sowerbyi
Limnodrilus sp.
Tubifex tubifex

Diptera

Chaoborus punctipennis

Chironomidae

Ablabesmia sp.
Chironomus attenuatus

Coelotanypus tricolor
Cryptochironomus digitatus
Procladius culiciformes
Tanypus stellatus

Ephemeroptera

Hexagenia bilineata

Mollusca

Corbicula manilensis
Musculum sp.
Sphaeriidae (larval)

Anodonta grandis
Lampsilis teres
Lampsilis straminea claibornensis[1/]
Ligumia subrostrata[1/]
Plectomerus dombeyana
Potamilus (Proptera) purpuratus[1/]

1/ Collected by Paul Hartfield, Mississippi Museum of Natural Sciences.

Major contributors to the benthos included *Hexagenia bilineata*, *Chaoborus punctipennis*, *Chironomus attenuatus*, *Tanypus stellatus*, and *Coelotanypus tricolor*, all of which are common inhabitants of southern lakes. Open water regions of Barnett Reservoir supported 11 species of benthos, exclusive of Mollusca. Mississippi flood control reservoirs commonly have 20-29 species (Cooper, 1980), and natural oxbow lakes in the Mississippi River delta may harbor 20-30 species of benthos, exclusive of Mollusca. Several insect taxa common to Mississippi apparently were absent from Barnett Reservoir. Some isolated littoral zones, characterized by extensive emergent macrophytes in the upper reaches of the reservoir, supported numerous other arthropods, but are not indicative of habitats in the main body of the reservoir.

Water depth and substrate influenced the distribution of benthos. *Chaoborus punctipennis* preferred water 3-5 m deep (Fig. 2). Although they occurred at other depths after reproductive periods, such habitation was sporadic. Chironomidae larval populations showed greatest densities in the 1-5 m littoral and sub-littoral regions. *Hexagenia* favored sheltered littoral zones (1 m) or the soft muds of profundal zones. Unlike most Mississippi reservoirs, Benthos distribution patterns in Barnett Reservoir followed those of stable northern lakes because of similarities in littoral and sub-littoral stability. Miller (1941) found that of 50 benthic species in Costello Lake, Ontario, 43 were littoral while Cooper (1980) reported that the majority of benthic invertebrates in several Mississippi lakes and reservoirs were profundal because of water level fluctuations.

Although benthos in Barnett Reservoir followed the distribution pattern of natural lakes, species diversity was poor in both littoral and profundal zones of the main reservoir. An examination of substrate revealed several factors that affected the suitability of habitat. While older lakes (30-40 years old) in Mississippi have a well-developed substrate (15-30 cm) of enriched mud in profundal zones, the substrate in Barnett Reservoir (17 years old) was much less developed (2-10 cm). Littoral zone substrates were also poorly developed; many were coarse sand or hardpan clay, either of which may adversely affect benthos. Although all common species preferred littoral zones, those shallow zones were not significantly (α = .05) more productive than other areas (Table 3) because of the character of their substrates. Substrate in some shallow regions was scoured by wind-generated wave action; other areas have not developed the substrate necessary for supporting diverse fauna (Swedberg, 1968). Wetzel (1975) and Ball (1948) showed that diversity and distribution of macrobenthos were affected by water quality, bottom sediment and distribution and abundance of plants. While rapid addition of sediments decreases benthic density (Lenat, et al. 1981), many species of lentic benthos (burrowers, spawlers) require a substantial depositional mud substrate (Cooper, 1977). McLachlan and McLachlan (1971) found that benthos in a newly formed Rhodesian reservoir correlated positively to the amount of organic carbon in the profundal zone and correlated negatively to coarse sand in the littoral zone.

Benthic secondary productivity in Ross Barnett Reservoir in 1979 was 7.3 g/m^2 (wet weight). The reservoir was moderately productive when compared to other Mississippi reservoirs (Cooper, 1980), even though bottom substrates were indicative of a young lake and the number of species was limited. Benthos were major food sources of freshwater drum (Aplodinotus grunniens) in Ross Barnett Reservoir. While drum under 20 mm total length utilized dipterans and planktonic copepods, larger juveniles preferred midge larvae (Chironomidae) and Hexagenia bilineata. Hexagenia bilineata was also a major item in the diet of adult drum. As sediments continue to accumulate and are enriched, both secondary productivity and species diversity should continue to increase, especially in the littoral zones. Further research should focus on quantative sediment accumulation and enrichment processes.

SUMMARY

Data collected in Ross Barnett Reservoir suggest that benthos favor stable littoral zones, but species diversity and productivity are currently limited in most areas by substrate type. As the reservoir ages and sediments accumulate and enrich the substrate, benthos productivity and diversity should increase and provide a larger food base for both juvenile and adult fish.

ACKNOWLEDGEMENTS

This paper is a contribution of the Sedimentation Laboratory, ARS, U. S. Department of Agriculture in cooperation with the Department of Biology, University of Mississippi. Partial support was received by the University from the Mississippi Dept. of Wildlife Conservation in the form of D. J. Federal Aid Projects F-48-1 and 2. Mrs. Sandra Sanders and Mr. Winfred Cook helped with manuscript preparation.

Table 3. Number of benthic organisms per m^2 and total benthic biomass (g/m^2) at five stations in Ross Barnett Reservoir, Mississippi during 1979. The total benthic biomass is given in parenthesis.

Date	Station 1	Station 2	Station 3	Station 4	Station 5
2/22/79	1944 (0.608)	749 (0.768)	706 (0.492)	288 (0.222)	72 (0.083)
3/8/79	1382 (0.384)	722 (0.477)	809 (0.638)	289 (0.329)	982 (0.685)
4/5/79	412 (0.786)	895 (1.162)	845 (1.360)	780 (1.307)	765 (1.463)
5/3/79	592 (2.058)	14 (0.007)	542 (2.309)	209 (0.170)	354 (0.729)
6/8/79	1387 (0.480)	253 (0.233)	188 (0.373)	108 (3.935)	173 (0.368)
7/5/79	491 (0.395)	253 (0.124)	304 (0.388)	138 (0.357)	152 (0.099)
8/10/79	325 (0.265)	310 (0.196)	910 (0.775)	405 (0.139)	72 (0.013)
9/14/79	123 (0.747)	578 (0.345)	245 (0.061)	462 (0.114)	29 (0.009)
10/4/79	296 (0.090)	592 (0.352)	296 (0.226)	606 (0.182)	606 (0.149)
11/7/79	253 (0.064)	412 (0.199)	224 (0.168)	556 (0.105)	14 (0.006)

LITERATURE CITED

1. Ball, R.C. Relationship between available fish food, feeding habits of fish, and total fish production in a Michigan lake. Mich. St. College Ag. Exp. Stat. Tech. Bull. 206:1-59; 1948.

2. Cooper, C.M. Abundance and production of littoral and profundal benthic fauna in a flood control reservoir. Proc. Miss. Chapter Amer. Fish. Soc. 1:25-33; 1977.

3. Cooper, C.M. Benthic productivity in Mississippi lakes and reservoirs as compared with that of northern lakes. Proc. Ann. Meet. MS. Chap. Am. Fish. Soc. 4:9-17; 1980.

4. Lenat, D.R., D.L. Penrose and K.W. Eagleson. Variable effects of sediment addition on stream benthos. Hydrobiologia 79:187-194; 1981.

5. McLachlan, A.J. and S.M. McLachlan. Benthic fauna and sediments in the newly created Lake Kariba (Central Africa). Ecology 62:801-809; 1971.

6. Miller, R.B. A contribution to the ecology of the Chironomidae of Costello Lake, Algonquin Park, Ontario. Univ. Toronto Studies, Biol. Serv. 49:1-6.

7. Swedberg, D.W. Food and growth of the freshwater drum in Lewis and Clark Lake, South Dakota. Trans. Amer. Fish. Soc. 97:442-447; 1968.

8. Wetzel, R.G. Limnology. W. B. Saunders Company, Philadelphia, PA., 1975. 525 pp.

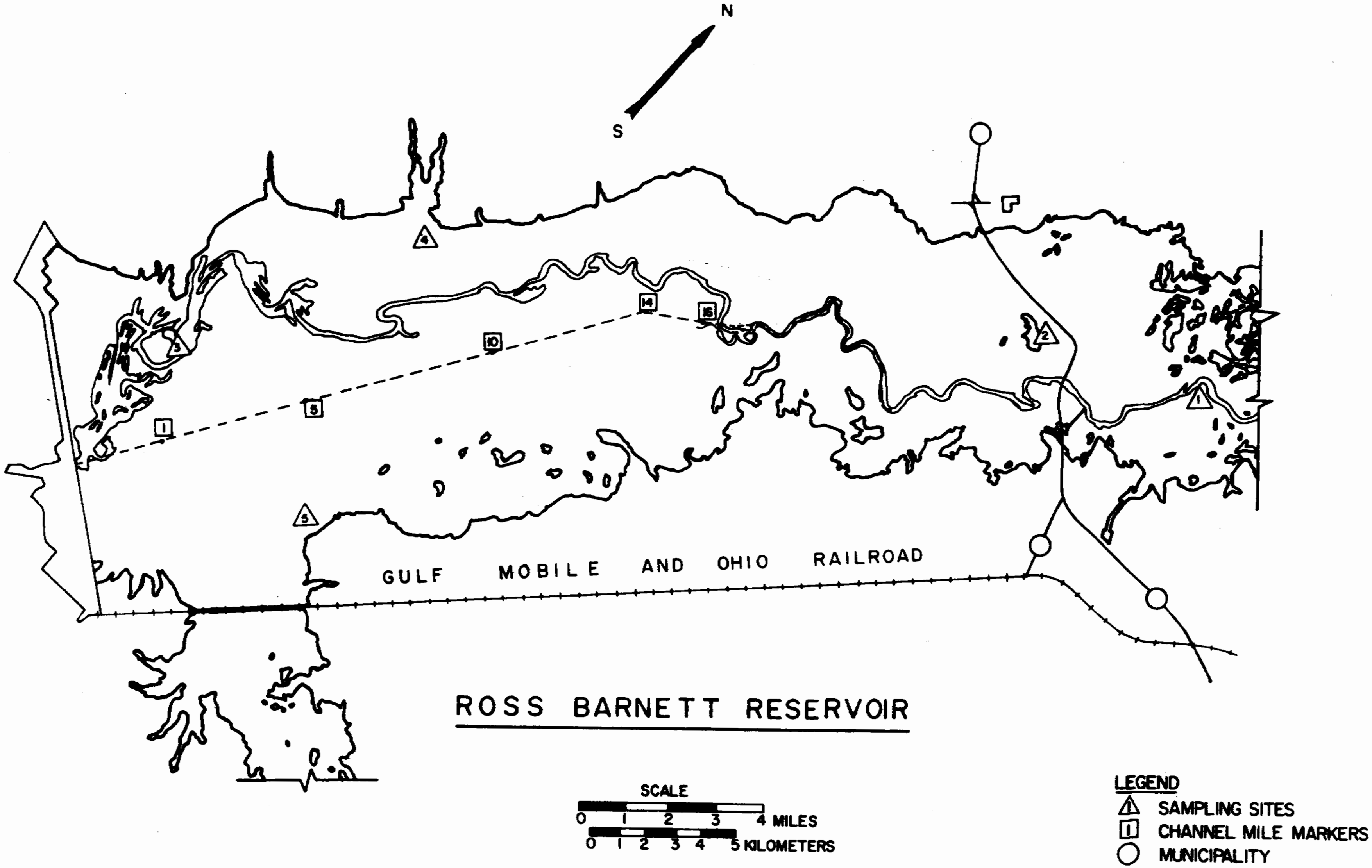


Fig. 1. Map of Ross Barnett Reservoir, Mississippi, including 1979 sampling sites.

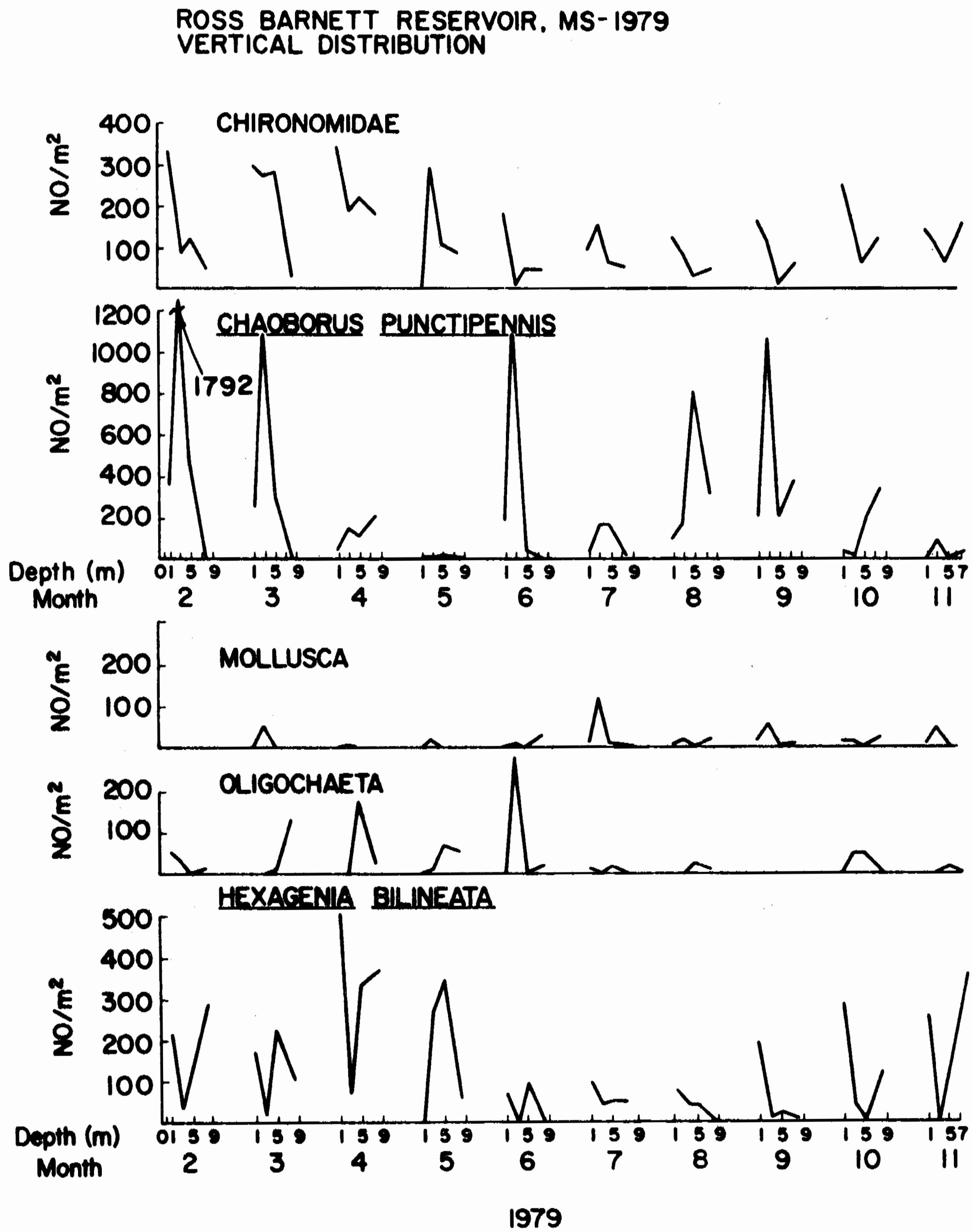


Fig. 2. Distribution of prominent benthos by depth in Ross Barnett Reservoir.

A Catalog of Mississippi Freshwater Fishes in the State's Collection.

Roger M. Weill, Mississippi Museum of Natural Science, Jackson, MS

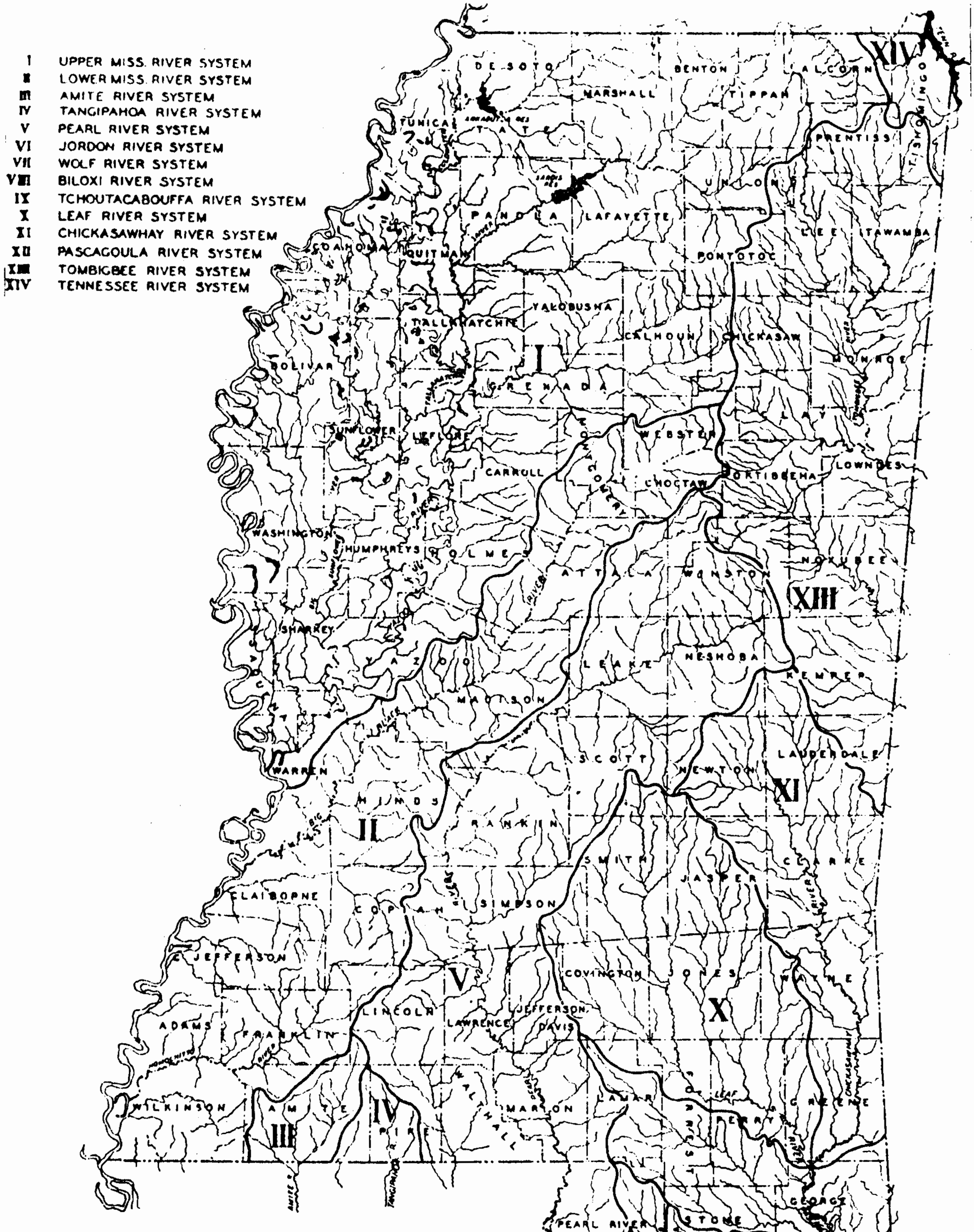
Danny J. Ebert, US Forest Service, Jackson, MS

Paul D. Hartfield, Mississippi Museum of Natural Science, Jackson, MS

ABSTRACT

Freshwater fishes have been collected for scientific purposes in the state of Mississippi since 1854 when B.L.C. Wailes surveyed various state lakes and streams. Species collections and lists following Wailes initial survey have broadened the state's record. Hay in 1880 and 1882 listed 56 and 64 species in the lower Mississippi valley with a state total of 74 species. In 1927 Hildebrand and Towers reported 45 species from the Delta region. In the thirties Hildebrand and Cook collected fishes, while Cook (1936 - 1940) led WPA crews in intensive state investigations. Cook's collections formed the backbone of the state's early collection. Fish collections donated the the state Museum have increased steadly since 1953 when B. E. Gandy assumed the directorship.

The freshwater fishes catalog has been divided into pre and post Cook era collections. Presented here is a catalog of fishes (1964 to 1981) that have been identified, numbered and properly maintained. The entire collection numbers over 9000 lots of fish from 14 major drainage areas. One hundred fifty eight species in 22 orders of fishes have been catalogued into the collection. This initial catalog, 1964 to 1981, represents fish collections from state, federal and university biologists.



STREAM SYSTEMS OF MISSISSIPPI

Table 1. Catalogue of freshwater fishes in the Museum of Natural Science collection from 1964 to 1981.

SPECIES	CATALOGUE NUMBER	DRAINAGE ZONE
PETROMYZONTIDAE		
Ichthyomyzon castaneus Girard		
Ichthyomyzon unicuspis Hubbs & Trautman	7041	I
Ichthyomyzon gagei Hubbs & Trautman	7033,6912,6914,7034,7035,7036,7037,7038, 7039,7042,7043,7044,7045,7046,7047,7048, 7049,7050,7051,7052,7053,7054,7055,7056, 7057,7058,7059,7060,7061,7062,7063,7064, 7065,7066,7067,7068,7069,7070,7071,7072, 7075,7346,7546,7669,7681,7697,7718,7732, 8824,8839,8819,8896,9001,9060,9077,9125	X,V,V,X,X,VI,VIII,X, X,VIII,V,V,X,X,X,X, II,X,X,V,X,V,X,VIII, V,X,XII,V,V,XII,XII,X, X,V,X,V,XII,XII,XII,XII, XIII,V,III,III,III,III,III,III, II,II,II,II,II,II,II,II
Lampetra aepyptera (Abbott)	7002,7089	V,V
Lamprey ammeocete	7090,7091,7810,7829,7854,7899,7915,7925, 7942,7961,7973,7991,8004,8011,8093,8410, 8421,8454,8479,8493,8502,8510,8530,8556, 8605,8639,8655,8701,8738,8771,8811,8825, 8837,8883,8896,8906,8918,8926,8956,8959, 8977,9093,9110,9135	XII,I,III,III,II,II,III,III, III,XII,III,III,III,II,I,I, I,II,III,II,III,III,III,III, XIII,XIII,XIII,II,II,II,II,II, II,II,II,VIII,II,II,IV,I, II,II,II,II
ACIPENSERIDAE		
Acipenser oxyrhynchus Mitchill	6952	IV
Acipenser fulvescens Rafinesque		
Scaphirhynchus albus (Forbes & Richardson)		
Scaphirhynchus platorynchus (Rafinesque)	6974	I

Table 1. (cont'd.)

SPECIES	CATALOGUE NUMBER	DRAINAGE ZONE
POLYODONTIDAE		
Polyodon spathula (Walbaum)	7502,7521	II,II
LEPISOSTEIDAE		
Lepisosteus oculatus (Winchell)	6906,6928,6940	XI,II,II
Lepisosteus osseus (Linnaeus)	7575,8309	XIII,XIII
Lepisosteus platostomus Rafinesque		
Lepisosteus spatula Lacepede	7530,7545	I,XI
AMIIDAE		
Amia calva Linnaeus	6954,6998,7074,7531,8174	II,V,VI,V,XIII
ANGUILLIDAE		
Anguilla rostrata (Lesueur)	6959,8203,8557	XII,XIII,II
CLUPEIDAE		
Alosa chrysochloris (Rafinesque)	6980,6981,6999,7073,8783	XIII,I,V,XII,I
Dorosoma cepedianum (Lesueur)	6922,6938,6966,7077,7251,7274,7289, 7443,7537,7539,7540,7543,8389,8784	II,II,XII,XIII,XIII,XIII,XIII, XIII,VI,VII,VIII,II,II,I
Dorosoma petenense (Gunther)	7076,7547,8306,8310	XII,I,XIII,XIII
HIODONTIDAE		
Hiodon alosoides (Rafinesque)	7762	I
Hiodon tergisus Lesueur	6899,7244,7477,7554,7761,8138,8782	XIII,XIII,XIII,XIII,I,XIII,I

Table 1. (cont'd.)

SPECIES	CATALOGUE NUMBER	DRAINAGE ZONE
ESOCIDAE		
Esox americanus americanus Gmelin	7029,7079,7081,7082,7084,7085,7086,7161, 7304,7319,7347,7413,7524,7525,7526,7527, 7528,7529,7532,7533,7534,7535,7542,8603, 8877	I,X,X,XII,XI,I,I,XIII, XIII,XIII,XIII,XIII,V,V,XII,VI, V,V,V,V,XII,VIII,XII,XIII, II
Esox niger Lesueur	6897,6907,6923,6961,7077,7080,7087,7093	I,II,II,XII,X,X,XII,XIII
CYPRINIDAE		
Campostoma anomalum (Rafinesque)	6996,7094,7168,7188,7214,7216,7227, 7391,7399,8156,8236,8258,8278,8311	II,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII,XIII,XIII,XIII,XII
Carassius auratus (Linnaeus)		
Cyprinus carpio (Linnaeus)	6955,7091	XII,I
Ericymba buccata Cope	7327,7645,8890,9139	XIII,II,II,II
Hybognathus hayi Jordan	7538,8209,8379	VII,XIII,XIII
Hybognathus nuchalis Agassiz	7148,7242,7243,7290,7320,7335,7369, 7381,7392,7429,7444,7522,7541,7555, 7576,8159,8180,8185,8214,8217,8224, 8237,8265,8294,8312,8371	XIII,XIII,XIII,XIII,XIII,XIII,XII XIII,XIII,XIII,XIII,XIII,XIII,XII XIII,XIII,XIII,XIII,XIII,XIII,XII XIII,XIII,XIII,XIII,XIII
Hybopsis aestivalis (Girard)	7096,7199,7275,7376,7384,7479,7581, 8151,8188,8208,8230,8238,8319	XIII,XIII,XIII,XIII,XIII,XIII,XII XIII,XIII,XIII,XIII,XIII,XIII
Hybopsis amblops (Rafinesque)	7349,8034.8320	XIII,II,XIII
Hybopsis storeriana (Kirtland)	7931,8056,8264,8297,8370,8754	V,II,XIII,XIII,XIII,II
Hybopsis winchelli	7177,7230,7248,7861,7876,8090,8263, 8298,8304	XIII,XIII,XIII,II,II,XII,XIII, XIII,XIII

SPECIES		CATALOGUE NUMBER	DRAINAGE ZONE
<u>Nocomis leptocephalus</u>	(Girard)	7183,7208,7217,7328,7495,7723,7731,7749, 7780,7804,7819,7827,7836,7839,7864,7881, 7902,7912,7920,7933,7945,7966,7977,8002, 8023,8046,8162,8211,8220,8269,8347,8374, 8462,8484,8504,8516,8522,8524,8586,8634, 8651,8671,8677,8698,8736,8765,8798,8818, 8861,8883,8891,8907,8913,8917,8928,8934, 8936,8962,8979,8989,9006,9043,9049,9062, 9072,9091,9102,9115,9129,9134,9163,9208, 9210	XIII,XIII,XIII,XIII,XIII,II,II,I V,II,II,II,II,II,II,II, V,II,II,V,II,II,II,II, II,II,XIII,XIII,XIII,XIII,XIII,XIII, II,II,II,II,II,II,II,II, II,II,II,II,II,II,II,II, II,II,II,VIII,II,II,II,II, II,II,II,II,II,I,II,II, II,II,II,II,II,II,V,II, II
<u>Notemigonus crysoleucas</u>	(Mitchill)	7088,7130,7184,7674,9159,9184,9197	VI,XIII,XIII,II,I,VIII,I
<u>Notropis atherinoides</u>	Rafinesque	8182,8416,8437,8613,8816,9042,9158,9159	XIII,I,I,I,XIII,I,I,I
<u>Notropis baileyi</u>	Suttkus & Raney	7117,7186,7228,7348,7439,7442,7494 7556,8346	XIII,XIII,XIII,XIII,XIII,XIII,XI XIII,XIII
<u>Notropis bellus</u>	(Hay)	7118,7144,7163,7172,7190,7210,7307, 7326,7349,7402,7416,7450,7493,7557, 8161,8239,8345	XIII,XIII,XIII,XIII,XIII,XIII,XII XIII,XIII,XIII,XIII,XIII,XIII,XIII XIII,XIII,XIII
<u>Notropis blennius</u>	(Girard)	7097	XIII
<u>Notropis buchanani</u>	Meek		
<u>Notropis callistius</u>	(Jordan)	7213,8163,8317	XIII,XIII,XIII
<u>Notropis camurus</u>	(Jordan & Meek)	7657,7673,7688,7698,7715,7722,7736,7756, 7814,7825,7830,7841,7858,7886,7914,7924, 7939,7948,7950,7985,7998,8021,8050,8413, 8435,8451,8482,8495,8501,8511,8523,8535, 8543,8566,8573,8594,8611,8624,8647,8662, 8672,8703,8711,8721,8730,8742,8747,8758, 8768,8791,8805,8834,8843,8864,8901,8911, 8920,8925,8938,8941,8946,8980,8998,9021, 9032,9039,9057,9064,9086,9092,9122,9137, 9221	II,II,XI,II,II,II,II,II, II,II,II,II,II,II,II,II, II,V,II,II,II,II,II,II, I,I,I,II,II,II,II,II, II,II,I,I,II,I,II,II, II,II,II,II,II,II,II,II, II,II,II,II,II,II,II,II, II,II,II,II,II,II,II,I, I,I,II,II,II,II,II,II, II

ıble 1. (cont'd.)

ᵓECIES	CATALOGUE NUMBER	DRAINAGE ZONE
ɔtropis *chrysocephalus* (Rafinesque)	7028,7101,7119,7189,7218,7305,7323,7350, 7430,7460,7492,7605,7606,7607,7608,7609, 7610,7611,7612,7613,7614,7658,7737,7754, 7815,7818,7835,7842,7853,7865,7882,7901, 7916,7921,7932,7944,7951,7984,7996,8012, 8038,8092,8158,8195,8219,8244,8277,8343, 8414,8469,8481,8496,8503,8521,8525,8544, 8585,8632,8646,8654,8690,8716,8732,8756, 8773,8833,8845,8866,8887,8894,8921,8939, 8963,8992,9009,9016,9044,9045,9073,9088, 9109,9130,9136,9164,9204,9219	I,XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII,XII,XII,XII,X,V, V,X,V,XI,VI,II,II,II, II,II,II,II,II,II,II,V, II,II,V,II,II,II,II,II, II,I,XIII,XIII,XIII,XIII,XIII,XIII, I,II,II,II,II,II,II,II, II,II,II,II,II,II,II,II, II,II,II,II,II,II,II,II, II,II,II,V,I,II,II,II, II,II,II,V,II,II
ɔtropis *cornutus* (Mitchill)		
ɔtropis *edwardraneyi* Suttkus & Clemmer	8261,8318	XIII,XIII
ɔtropis *emiliae* (Hay)	7491	XIII
ɔtropis *longirostris* (Hay)	7155,7544,7579,7656,7672,7685,7716,7809, 7826,7847,7859,7893,7941,7954,7986,8015, 8052,8392,8417,8463,8492,8520,8533,8548, 8576,8598,8627,8707,8721,8741,8749,8757, 8780,8807,8830,8835,8870,8888,8899,8914, 8935,8944,8974,9008,9059,9069,9082,9141, 9223	XIII,XII,XIII,II,II,II,II,II, II,II,II,II,V,II,II,II, II,V,I,II,II,II,II,II, I,XIII,II,II,II,II,II,II, II,II,II,II,VIII,II,II,II, II,II,II,II,II,II,II,II, II
ɔtropis *lutrensis* (Baird & Girard)		
ɔtropis *maculatus* (Hay)		
ɔtropis *roseipinnis* Hay	7515,7640,8087,8088,8097,8098,8099,8100, 8101,8851,8874	V,V,V,XII,XI,XI,XI,XI, XI,VIII,VIII
ɔtropis *shumardi* (Girard)	8380	XIII

Table 1. (cont'd.)

SPECIES	CATALOGUE NUMBER	DRAINAGE ZONE
Notropis signipinnis Bailey & Suttkus	8102,8103,8104,8105,8106,8107,8108,8109, 8110,8111,8112,8113,8114,8115,8116,8117, 8118,8119,8120,8121,8122,8123,8124,8125, 8126,8127,8128,8129,8851	XII,XII,XII,XII,XII,X,XII,XII, XII,XII,XII,XII,XII,XII,XI,XI, V,XI,XI,V,V,V,V,V, V,X,XI,V,VIII
Notropis spilopterus (Cope)		
Notropis stilbius (Jordan)	7099,7146,7173,7209,7219,7246,7276, 7291,7325,7339,7374,7395,7402,7449, 7464,7478,7558,7578,8160,8167,8240, 8262,8301,8316	XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII
Notropis texanus (Girard)	7100,7120,7145,7164,7191,7205,7229, 7254,7306,7324,7338,7351,7373,7401, 7448,7559,7615,7616,7617,7618,7619,7620, 7621,7622,7623,7624,7625,7626,7627,7628, 7629,7630,7631,7632,7633,7634,7635,7636, 7637,7638,7639,7642,8159,8241,8315,8344, 8836,8838,8849,8865,8953,8997,9101,9113, 9206	XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XII,V,V,V,V,V, V,XII,X,XII,XII,XII,XII,XII, V,XI,VIII,X,X,X,VII,X, VII,XI,XII,V,XIII,XIII,XIII,XIII, II,II,II,II,II,II,V,II, II
Notropis umbratilis (Girard)		
Notropis venustus (Girard)	7005,7006,7007,7008,7009,7010,7011,7012, 7013,7014,7015,7016,7017,7018,7019,7020, 7021,7022,7023,7024,7025,7102,7121,7174, 7193,7272,7277,7292,7304,7322,7337, 7372,7382,7394,7436,7447,7463,7505,7508, 7509,7510,7513,7560,7580,7659,7687,7691, 7755,7952,7983,8028,8085,8086,8150,8157, 8181,8186,8225,8226,8242,8260,8292, 8300,8314,8395,8406,8415,8453,8565,8577, 8599,8622,8675,8709,8729,8746,8760,8776, 8796,8810,8815,8875,8955,8981,9010,9029, 9034,9040,9071,9194	V,V,V,V,V,V,V,V, VII,VII,VII,XI,II,V,XII,XII, XII,V,VIII,VIII,X,X,XIII,XIII, XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII,XIII,XIII,XIII,XIII, XII,XII,XII,XIII,XIII,II,II,II, II,II,II,II,VI,XII,XIII,XIII, XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,V,I,I,I,I,I, XIII,II,II,II,II,II,II,II, II,II,XIII,VIII,IV,II,I,I, I,I,II,I

able 1. (cont'd.)

PECIES	CATALOGUE NUMBER	DRAINAGE ZONE
otropis volucellus (Cope)	7247,7717,7757,7811,7822,7844,7982,8243, 8313,8436,8578,8904,8943	XIII,II,II,II,II,II,II,II, XIII,XIII,I,II,II
otropis welaka Evermann & Kendall		
otropis whipplei (Girard)		
otropis sp.	7122,7175,7375,7400,7415,7523,8024,8141, 8164,8259,8299,8390,8391,8409,8454,8475, 8497,8567,8602	XIII,XIII,XIII,XIII,XIII,II,II,XIII, XIII,XIII,XIII,II,II,I,I,II, II,I,XIII
hoxinus erythrogaster (Rafinesque)		
imephales notatus (Rafinesque)	7134,7147,7162,7170,7278,7293,7331, 7362,7370,7414,7445,7489,7512,7562,7655, 7670,7686,7699,7704,7724,7742,7752,7860, 7875,7894,7903,7940,7968,7987,8009,8022, 8245,8341,8536,8592,8666,8674,8702,8706, 8751,8759,8772,8794,8812,8832,8842,8889, 8902,8922,8933,8937,8999,9011,9019,9031, 9058,9087,9165,9173,9201,9222	XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII,XIII,XIII,XI,XIII,II, II,II,II,II,II,II,II,II, II,II,II,V,II,II,II,II, XIII,XIII,II,II,II,II,II,II, II,II,II,II,II,II,II,II, II,II,II,II,II,II,V,I, II,II,V,V,II,II
imephales vigilax (Baird & Girard)	7116,7171,7187,7245,7279,7327,7345, 7371,7383,7393,7441,7446,7462,7577, 8140,8149,8246,8266,8295,8394,8735,8750, 8793,8982,9020,9070,9121	XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII,XIII,V,II,II,II, II,II,V,II,II
emotilus atromaculatus (Mitchill)	7027,7165,7185,7352,7490,7671,7703,7803, 7892,7962,8091,8205,8575,8641,9103	V,XIII,XIII,XIII,XIII,XIII,II,II, II,II,I,XIII,I,II,II
ATOSTOMIDAE		
arpiodes carpio (Rafinesque)	8031,8399,8432,8450,9152,9189	II,II,I,I,I,I

Table 1. (cont'd.)

SPECIES	CATALOGUE NUMBER	DRAINAGE ZONE
Carpiodes cyprinus (Lesueur)		
Carpiodes velifer (Rafinesque)	7273,7280,7294,7340,7452,7582,7927, 8142,8183,8267,8321	XIII,XIII,XIII,XIII,XIII,XIII,II, XIII,XIII,XIII,XIII
Catostomus commersoni (Lacepede)		
Cycleptus elongatus (Lesueur)		
Erimyzon oblongus (Mitchill)	6905,7675,7703,7731,7763,7856,7999,8018, 8540,8593,8653,8717,8733,8767,8817,9015 9166,9174	II,II,II,II,II,II,II,II, II,II,II,II,II,II,II,V, V,V
Erimyzon sucetta (Lacepede)	6920,6925,6926,6939,9104	II,II,II,II,V,V
Erimyzon tenuis (Agassiz)	7001	I
Hypentelium etowanum (Jordan)	7192,7438,7461,7496,7564,8166,8213, 8232,8280,8373,8610,8905,9024	XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII,I,VIII,I
Hypentelium nigricans (Lesueur)	6908,7505,7641,7649,7650,7651,7652,7693, 7725,7739,7758,7817,7862,7897,7923,7972, 8001,8010,8425,8444,8477,8507,8553,8583, 8642,8668,8696,8764,8799,8819,8895,8916, 8932,8983,9037,9061,9089,9112,9124,9131, 9203	III,XII,XII,XII,XII,XII,V,II, II,II,II,II,II,II,II,II, II,II,I,I,II,II,II,II, II,II,II,II,II,II,II,II, II,II,II,I,II,II,II,II, II
Ictiobus bubalus (Rafinesque)	7451,7644,8445	XIII,I,I
Ictiobus cyprinellus (Valenciennes)		
Ictiobus niger (Rafinesque)		
Minytrema melanops (Rafinesque)	7404,8368	XIII,XIII
Moxostoma duquesnei (Lesueur)		

Table 1. (cont'd.)

SPECIES	CATALOGUE NUMBER	DRAINAGE ZONE
Moxostoma erythrurum (Rafinesque)	8322,8372	XIII,XIII
Moxostoma poecilurum (Jordan)	7231,7250,7465,7583,7648,7653,7654,7734, 7807,7816,7848,7896,7904,7959,8026,8039, 8348,8400,8426,8427,8442,8563,8582,8604, 8625,8640,8652,8720,8755,8801,8854,8876, 8990,9030,9123,9149,9201	XIII,XIII,XIII,XIII,XII,VIII,II,II II,II,II,II,II,II,II,II, XIII,II,I,I,I,I,II,XIII, II,II,II,II,II,II,II,II, II,I,II,I,II
ICTALURIDAE		
Ictalurus furcatus (Lesueur)	6895,6900,6901,6902,6963	XIII,XIII,XIII,XIII,I
Ictalurus melas (Rafinesque)	7353,7514,7692	XIII,V,V
Ictalurus natalis (Lesueur)	7354,7417,7585,7660,7976,8350,8424,8438, 8542,8574,8621,8630,8719,9023	XIII,XIII,XIII,II,II,XIII,I,I, II,I,II,II,II,I
Ictalurus punctatus (Rafinesque)	6894,6962,6989,7180,7256,7377,7584, 7661,8218,8323,8349,8401,8411,8431,8441, 8562,8618,8790,8814,9148	XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII,I,I,I,I,I, I,II,I,II,I
Noturus funebris Gilbert & Swain	7194,7220,7252,7407,7431,8197,8353	XIII,XIII,XIII,XIII,XIII,XIII,XIII
Noturus gyrinus (Mitchill)	7418,7497,7586,8178,8247,8351,9056, 9079,9220	XIII,XIII,XIII,XIII,XIII,XIII,II, II,II
Noturus hildebrandi (Bailey & Taylor)	7727,8094,8483,8692,9870	II,I,II,II,II
Noturus leptacanthus Jordan	7103,7132,7178,7221,7232,7396,7406, 7561,8281,8324,8352	XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,II,XIII,XIII

Table 1. (cont'd.)

SPECIES	CATALOGUE NUMBER	DRAINAGE ZONE
Noturus miurus Jordan	7004,7683,7710,7719,7726,7801,7824,7831, 7871,7887,7917,7927,7955,8007,8029,8043, 8402,8480,8488,8513,8529,8550,8581,8659, 8691,8821,8844,8863,8892,8920,8923,8941, 8965,8988,9051,9065,9075,9095,9117,9132, 9133,9202	I,II,II,II,II,II,II,II, II,II,II,II,II,II,II,II, II,II,II,II,II,II,II,II, II,II,II,II,II,II,II,II, II,II,II,II,II,II,II,II, II,II
Noturus munitus Suttkus & Taylor	7104,7158,7179,7253,7281,7295,7341, 7378,7385,7453,7466,7480,7587,8155, 8166,8184,8189,8200,8216,8227,8229, 8248,8268,8282,8305,8325	XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII,XIII,XIII
Noturus nocturnus (Jordan & Gilbert)	7092,7355,7577,7700,7728,7802,7870,7922, 7934,7943,7957,7975,8008,8042,8422,8464, 8485,8498,8512,8531,8552,8579,8580,8645, 8663,8734,8751,8768,8797,8809,8853,8869, 8885,8893,8951,8957,8961,8975,8991,9000, 9017,9025,9033,9038,9050,9074,9090,9105, 9114,9171,9205,9215	XI,XIII,II,II,II,II,II,II, V,II,II,II,X,III,II,I, II,II,II,II,II,II,I,II, II,II,II,II,II,II,II,VIII, VIII,II,II,I,II,II,II,II, V,I,I,I,II,II,II,II, II,V,II,II
Noturus phaeus Taylor	7926,8993	II,II
Pylodictis olivaris (Rafinesque)	8143,6956,7405,7506,7667	X,X,XIII,XI,II
APHREDODERIDAE		
Aphredoderus sayanus (Gilliams)	6997,7131,7196,7309,7356,7550,8055,8177, 8179,8210,8355,8459,8499,8525,9175	II,XIII,XIII,XIII,XIII,II,II,XIII, XIII,XIII,XIII,II,II,II,V
CYPRINODONTIDAE		
Fundulus catenatus (Storer)	7663,7679,7684,7709,7746,7821,7855,7874, 7888,7908,7967,8019,8467,8494,8541,8555, 8589,8649,8664,8673,8704,8712,8737,8743, 8761,8775,8808,8820,8857,8897,8947,8969, 8994,9005,9080,9098,9126,9138	II,II,II,II,II,II,II,II, II,II,II,II,II,II,II,II, II,II,II,II,II,II,II,II, II,II,II,II,II,II,II,II, II,II,II,II,II,II

able 1. (cont'd.)

SPECIES	CATALOGUE NUMBER	DRAINAGE ZONE
Fundulus chrysotus (Gunther)	7995	XII
Fundulus grandis Baird & Girard		
Fundulus jenkinsi (Evermann)		
Fundulus notatus (Rafinesque)	7271,7419,7518,7519,7520,7680,7712,7745, 7808,7891,7900,7913,7946,7988,8000,8020, 8051,8434,8471,8509,8570,8595,8612,8620, 8633,8650,8661,8693,8728,8704,8813,8831, 8846,8862,8886,8900,8940,8968,9083,9097, 9118,9128,9146,9157,9179,9214	XIII,XIII,II,XI,II,II,II,II, II,II,V,II,II,II,II,II, II,I,II,II,I,II,I,II, II,II,II,II,II,II,II,II, II,II,II,II,II,II,II,II, II,II,VI,I,VIII,II
Fundulus notti (Agassiz)	7329,7989,8055,8423,9106	XIII,II,II,I,V
Fundulus olivaceus (Storer)	7105,7212,7233,7308,7357,7420,7499, 7563,8096,8449,8277,8326,8354	XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,I,XIII,XIII,XIII,XIII
Fundulus pulvereus (Evermann)		
Fundulus similis (Baird & Girard)		
POECILIIDAE		
Gambusia affinis (Baird & Girard)	7106,7133,7517,7588,7664,7994,8095,8250, 8596,8628,8748,9193,	XIII,XIII,I,XIII,II,XII,I,XIII, XIII,XIV,II,II,I
Heterandria formosa Agassiz		
Poecilia latipinna (Lesueur)		
ATHERINIDAE		
Labidesthes sicculus (Cope)	6950,6951,7206,7889,7909,7969,8340,8375, 8396,8905,8452,8568,8715,8770	V,V,XIII,II,II,II,XIII,XIII, V,I,I,I,II,II

Table 1. (cont'd.)

SPECIES	CATALOGUE NUMBER	DRAINAGE ZONE
Menidia beryllina (Cope)		
PERCICHTHYIDAE		
Morone chrysops (Rafinesque)		
Morone mississippiensis Jordan & Eigenmann		
Morone saxatilis (Walbaum)	6909,6910,6953,6973,6982	I,I,II,II,II
CENTRARCHIDAE		
Ambloplites ariommus Viosca	6956,7257,7311,7432,7437,7553,7646,7647, 7695,7713,7740,7750,7751,7910,7958,8212, 8532,8705,8903,8967,9045,9216	XII,XIII,XIII,XIII,XIII,XIII,V,V, II,II,II,II,II,II,II,XIII, II,II,II,II,II,II
Centrarchus macropterus (Lacepede)	6916,6932,6933,6934,6941,6976,8175	II,II,II,II,II,II,XIII
Elassoma zonatum Jordan	7002,7310,8356	II,XIII,XIII
Lepomis cyanellus Rafinesque	6967,7124,7195,7234,7269,7330,7358, 7433,7500,7589,7665,7676,7714,7721,7747, 7805,7850,7868,7911,7936,8033,8048,8206, 8221,8358,8408,8418,8486,8508,8546,8608, 8616,8657,8700,8713,8745,8795,8823,8879, 8950,8958,9003,9014,9027,9035,9063,9108, 9190	XII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,II,II,II,II,II,II, II,II,II,V,II,II,XIII,XIII, XIII,I,I,II,II,II,XIII,II, II,II,II,II,II,II,IV,I, II,II,II,V,I,I,II,V,I, I
Lepomis humilis (Girard)		
Lepomis macrochirus Rafinesque	6904,6911,6915,6918,6924,6931,6962,6984, 7107,7124,7270,7296,7360,7379,7425, 7434,7591,7828,7838,7845,7849,7869,7898, 7907,7938,7992,8044,8251,8361,8367,8407, 8419,8428,8446,8460,8560,8597,8606,8609, 8617,8670,8722,8777,8785,8789,8948,9013,	I,I,V,II,II,II,II,V, XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,II,II,II,II,II,V, II,V,XII,II,XIII,XIII,XIII,II, I,I,I,II,I,XIV,XIII,I, II,II,II,II,I,I,IV,V,

Table 1. (cont'd.)

SPECIES	CATALOGUE NUMBER	DRAINAGE ZONE
Lepomis macrochirus (cont'd.)	9028,9107,9145,9151,9156,9180,9191	I,V,V,I,I,VIII,I
Lepomis megalotis (Rafinesque)	6917,6927,6958,7108,7125,7166,7211,7235, 7282,7314,7331,7361,7424,7435,7454, 7481,7552,7565,7590,7666,7694,7711,7806, 7837,7843,7852,7867,7885,7919,7935,7960, 7981,7996,8013,8037,8252,8270,8327,8360, 8447,8472,8539,8551,8569,8588,8601,8614, 8644,8658,8669,8710,8744,8778,8786,8792, 8806,8822,8856,8872,8878,8908,8949,8995, 9036,9047,9081,9111,9154,9181	V,II,XII,XIV,XIII,XIII,XIII,XIII, XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,II,XIII,XIII,II,II,II,II, II,II,II,II,II,V,II,II, II,II,II,XIII,XIII,XIII,XIII,I, II,II,II,I,II,XIII,II,II, II,II,II,II,II,I,II,II, II,II,XIII,II,II,IV,IV,II, I,II,II,II,I,VIII
Lepomis microlophus (Gunther)	7455,7993,8328	XIII,XII,XIII
Lepomis punctatus (Valenciennes)	6914,7313,7363,7738,7980,8196,8201,8222, 8359,8473	V,XIII,XIII,II,II,XIII,XIII,XIII, XIII,XIII
Micropterus dolomieui Lacepede	8369	XIII
Micropterus punctulatus (Rafinesque)	6965,7031,7109,7215,7268,7283,7297,7483, 7501,7502,7667,7708,7840,7851,7863,7895, 7905,7937,7979,8016,8053,8144,8330,8446, 8457,8538,8564,8619,8643,8656,8667,8699, 8718,8800,8855,8871,9012,9022,9048,9143, 9167,9212	XII,I,XIII,XIII,XIII,XIII,XIII,XIII, XII,I,II,II,II,II,II,II, II,V,II,II,II,XIII,XIII,I, II,II,I,II,II,II,II,II, II,II,II,XIII,V,I,II,V, V,II
Micropterus salmoides (Lacepede)	6929,6935,6945,6946,6968,7129,7156,7176, 7267,7284,7364,7426,7456,7482,7592, 8192,8253,8329,8362,8397,8412,8430,8440, 8788,9150,9182,9188	II,V,V,V,II,XIII,XIII,XIII, XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII,XIII,V,I,I,I, I,I,VIII,I
Pomoxis annularis Rafinesque	6930,6942,6943,6944,6988,7126,7422,7516, 8377	II,II,II,II,I,XIII,XIII,I, XIII
Pomoxis nigromaculatus (Lesueur)	7128	XIII

Table 1. (cont'd.)

SPECIES	CATALOGUE NUMBER	DRAINAGE ZONE
PERCIDAE		
Ammocrypta asprella (Jordan)	7154,7161,7258,7285,7301,7390,7470, 7488,8174,8271,8307,8366	XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII,XIII,XIII
Ammocrypta beani Jordan	7110,7182,7566,7978,8147,8254,8376, 8392,8461,8976,9052	XIII,XIII,XIII,II,XIII,XIII,XIII, V,II,II,II
Ammocrypta meridiana Williams	7115,7153,7207,7302,7600,8184,8255, 8293,8338	XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII
Ammocrypta vivax Hay		
Etheostoma asprigene (Forbes)	9002	II
Etheostoma caeruleum Storer	7678,7682,7706,7720,7813,7823,7857,7883, 7918,7949,7965,7971,8006,8017,8477,8487, 8506,8519,8527,8587,8648,8665,8694,8731, 8739,8802,8827,8841,8860,8898,8929,8973, 8985,9084,9119,9211	II,II,II,II,II,II,II,II, II,II,II,II,II,II,II,II, II,II,II,II,II,II,II,II, II,II,II,II,II,II,II,II, II,II,II,II
Etheostoma chlorosomum (Hay)		
Etheostoma fonticola (Jordan & Gilbert)	7511	V
Etheostoma gracile (Girard)		
Etheostoma histrio Jordan & Gilbert	7389,7459,7476,8289	XIII,XIII,XIII,XIII
Etheostoma nigrum Rafinesque	7366,7410,7427,7846,7906,7970,8030,8137, 8170,8235,8274,8336,8364,8590,8859,8881, 8927,9053,9068,9099,9127,9144	XIII,XIII,XIII,II,II,II,II,XIV, XIII,XIII,XIII,XIII,XIII,II,II,II, II,II,II,II,II,V
Etheostoma parvipinne Gilbert & Swain	8193	XIII
Etheostoma proeliare (Hay)	7137,7202,7318	XIII,XIII,XIII

Table 1. (cont'd.)

SPECIES	CATALOGUE NUMBER	DRAINAGE ZONE
Etheostoma rupestre Gilbert & Swain	7111,7151,7203,7222,7240,7265,7287, 7298,7344,7365,7388,7411,7458,7469, 7475,7487,7567,7597,8171,8273,8290, 8337,8378	XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII
Etheostoma squamiceps Jordan		
Etheostoma stigmaeum (Jordan)	7112,7136,7201,7223,7316,7344,7398, 7419,7568,8169,8204,8286,8291,8335	XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII,XIII,XIII,XIII,XIII
Etheostoma swaini (Jordan)	7138,7152,7197,7224,7241,7266,7288, 7412,7569,7598,8146,8172,8287,8591,8781, 8848,8873,8987,9018,9067,9100	XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII,XIII,XIII,II,II,II, II,VIII,II,V,II,II
Etheostoma whipplei (Girard)	7317,7334,7428,7599,8207,8489,8361,8708, 8880,8924,8972,9007,9066,9078,9218	XIII,XIII,XIII,XIII,XIII,II,II,II II,II,II,II,II,II,II
Etheostoma zonale (Cope)	7689,7690,7741,7759,7832,7872,7884,7964, 7990,8005,8035,8049,8474,8490,8500,8515, 8526,8695,8779,8803,8829,8840,8882,8912, 8915,8930,8954,8964,8986,9054,9085,9096, 9120,9217	V,X,II,II,II,II,II,II, II,II,II,II,II,II,II,II, II,II,II,II,II,II,II,II, II,II,IV,II,II,II,II,II, II,II
Etheostoma zoniferum (Hubbs & Cannon)		
Etheostoma sp.	7570,8047,8223,8288,8308,8449,8572,8960, 9153	XIII,II,XIII,XIII,XIII,I,I,I, I
Percina caprodes (Rafinesque)	7157,7236,7259,7471,8256,8331	XIII,XIII,XIII,XIII,XIII,XIII
Percina lenticula Richards & Knapp	7260	XIII
Percina maculata (Girard)	7315,7367,7472,7833,8198,8420,8468,8626, 8659,8676,8804,8826,8858,8910,8931,8945, 8966,8984,9026,9076,9094,9116,9140,9142	XIII,XIII,XIII,II,XIII,I,II,II, II,II,II,II,II,II,II,II, II,II,I,II,II,II,II,V

Table 1. (cont'd.)

SPECIES	CATALOGUE NUMBER	DRAINAGE ZONE
Percina nigrofasciata (Agassiz)	7113,7225,7237,7368,7440,7467,7571,7643, 7705,7729,7748,7811,7820,7834,7873,7963, 7974,8003,8014,8045,8136,8194,8284,8403, 8433,8470,8491,8505,8514,8549,8561,8600, 8852,8952,9041,9055,9183	XIII,XIII,XIII,II,II,II,II,XIV, VIII,XIII,XIII,XIII,II,II,II,II, II,II,II,II,XIV,XIII,XIII,I, I,II,II,II,II,II,I,XIII, VIII,IV,I,II,VIII
Percina ouachitae (Jordan & Gilbert)	7150,7181,7204,7226,7239,7261,7298, 7333,7387,7408,7468,7474,7486,7572, 7596,7942,8154,8168,8191,8231,8234, 8275,8285,8302,8334,8363	XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII,XIII,XIII
Percina sciera (Swain)	7114,7135,7149,7200,7262,7286,7300, 7343,7380,7386,7397,7457,7473,7484, 7573,7593,8041,8089,8145,8153,8167,8190, 8199,8202,8228,8233,8257,8276,8283, 8303,8332,8465,8517,8537,8678,8971	XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,II,II,XIII,XIII,XIII,XIII XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,II,II,II,II,II,II
Percina shumardi (Girard)	7238,7263,7332,7485,7594,8152,8215, 8272,8296,8333	XIII,XIII,XIII,XIII,XIII,XIII,XIII, XIII,XIII,XIII
Percina uranidea (Jordan & Gilbert)	7548	II
SCIAENIDAE		
Aplodinotus grunniens Rafinesque	6896,6903,7264,8032,8339,8429,8443,8787, 9153	XIII,XIII,XIII,II,XIII,I,I,I, I
COTTIDAE		
Cottus carolinae (Gill)		

FISH COMMUNITY STRUCTURE IN A MISSISSIPPI RIVER DIKE FIELD

Robert W. Nailon and C. H. Pennington
Waterways Experiment Station, Corps of Engineers
Vicksburg, MS 39180

Abstract: A study was conducted in the Lower Mississippi River at the Cracraft Dike Field during the summer 1980 to determine the impacts of dike construction on the riverine fish communities. Water quality samples and fish were collected during the low-flow river stages in two dike pools and the adjacent main channel border. Water quality differences between pooled and main channel areas were apparent with greater mean surface temperature, pH, and dissolved oxygen readings found in pooled habitats, while conductivity levels were greater in the main channel border. Catch analysis indicated strong differences between pooled and riverine habitats with higher mean catch per effort and relative abundance data in pooled habitat than in the main channel border.

FISH POPULATIONS OF THREE MISSISSIPPI RIVER DIKE FIELDS DURING LOW FLOW

Carolyn L. Bond
C. H. Pennington
J. A. Baker
Waterways Experiment Station, Corps of Engineers
Vicksburg, MS 39180

Abstract: Fish were collected from three dike fields within a 60-mile stretch of the Lower Mississippi River near Greenville, MS. Sampling was done during two consecutive low flow periods (September 1979 and September 1980), when portions of the dike fields were isolated from the main flow of the river. Differences in species composition and density were found between the dike fields in both sampling efforts. Populations within a dike field also showed variation from 1979 to 1980.

THE INFLUENCE OF SHALLOW RESERVOIRS ON SPORT FISH POPULATIONS IN SMALL STREAMS IN NATIONAL FORESTS IN MISSISSIPPI

Danny J. Ebert, U.S. Forest Service, Jackson, Mississippi 39204

Luther A. Knight, Jr., Department of Biology, University of Mississippi, University, Mississippi 38677

ABSTRACT

From 1978 to 1981, the U.S. Forest Service surveyed fish populations of streams in the National Forests in Mississippi. Tailwater areas of PL 566 flood retarding reservoirs ranging from 2 to 100 hectares were sampled to ascertain the sport fish populations and to compare them with natural stream composition. Sport fishes composed 61.5% of the fish samples from the tailwaters. Dominant sport species were blue-gill (*Lepomis macrochirus*) and largemouth bass (*Micropterus salmoides*), while other panfish included green sunfish (*Lepomis cyanellus*) and longear sunfish (*Lepomis megalotis*). From 500 to 1500 m downstream, sport fish populations were 20.1% of the total composition, with dominant species minnows (*Notropis* spp.), madtoms (*Noturus* spp.), bullhead catfish (*Ictalurus* spp.), and green sunfish (*L. cyanellus*). Based on these preliminary findings, the U.S. Forest Service has begun a program of site clearing around the tailwater areas to provide easier access by fishermen.

INTRODUCTION

There are approximately 0.45 million hectares of timber land in the National Forests in Mississippi (Fig. 1). Within these forests (Table 1) there are 2,238 Km of streams and 1,109.8 hectares of lakes. During the past 25 years, the Soil Conservation Service has constructed over 50 PL 566 reservoirs on U.S. Forest Service lands to help control flooding and erosion. The lakes were usually constructed on either first or second order streams in areas with small watersheds (2 to 12 hectares). The primary sources of water in the reservoirs are ground water and surface runoff; thus there are extreme variations in flow.

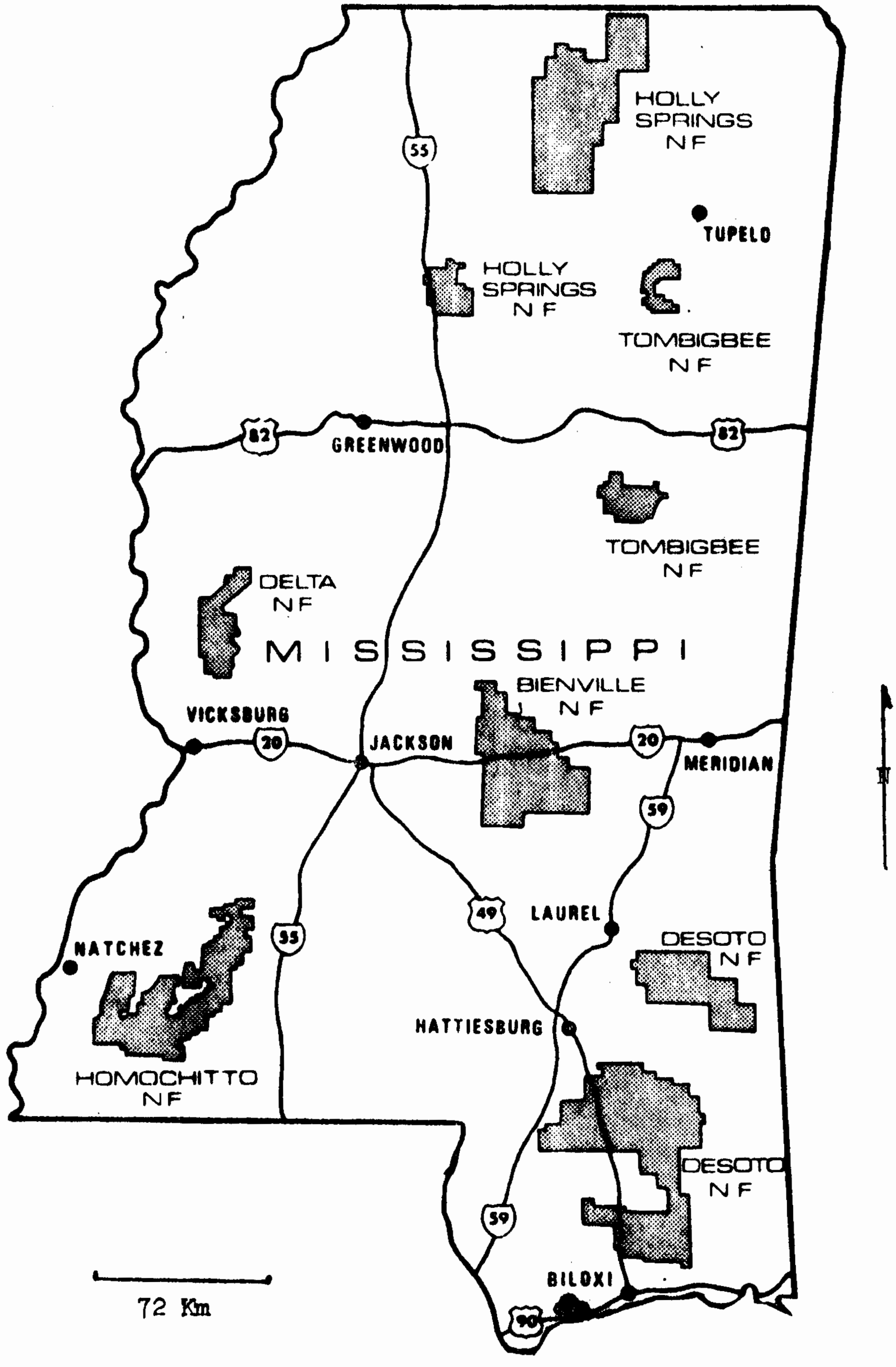


Figure 1. National forests in Mississippi.

Table 1. Stream and Lake resources data for Districts in the National Forests in Mississippi. (November 1980).

District	Number Forest Streams	Type[1]	Km	Km Surveyed[2]	Number Lakes	Type[1]	Hectares	Hectares Lakes Surveyed
Bienville	44	W	286	56	4	W	52.6	52.6
Delta	15	W	177	37	40	W	178.1	178.1
DeSoto	98	W	790	343	19	W	138.4	120.6
Holly Springs	45	W	343	269	34	W	542.3	258.2
Homochitto	49	W	381	138	3	W	12.2	12.2
Tombigbee	25	W	261	76	12	W	186.2	57.9
Total (National Forests in Mississippi)	276	W	2238	919	112	W	1109.8	679.6

[1]Km and hectares of stream and lakes by fishery type---W = Warmwater and other. Streams includes intermittent streams used by fish for part of their life cycle and streams or portions of streams with fishery potential but limited use due to natural or man made barriers.

[2]Intensive enough survey to show fishery resource tradeoffs in the land-use management decision process.

The construction of dams and flood control reservoirs on large rivers has alleviated some flooding, aided navigation and produced power. To sportsmen, the tailwater areas of the reservoirs have provided concentrations of sport fish readily accessible to angling (Pfitzer 1967, Aggus et al. 1977, and Schneider et al. 1977). Small reservoirs such as the ones in Mississippi National Forest have not been fully used as fishery resources. The U.S. Forest Service recently began a program of management of aquatic resources in the National Forests in Mississippi, with initial stages consisting of lake and stream inventories, lake renovation and restocking, and stream and lake habitat improvement (Ebert and Knight 1980, 1981).

This study examines fish populations in tailwater areas of shallow reservoirs in the National Forests in Mississippi, with emphasis on the Puskus Creek system in the Holly Springs National Forest. The purpose of the study was to ascertain if and how flood retarding reservoirs have affected stream fish populations.

MATERIALS AND METHODS

The investigation was conducted on selected streams in the six National Forests in Mississippi (Fig. 1). First and second order streams on which flood retarding reservoirs (2 to 100 hectares) had been constructed (1960-1978) were surveyed for sport fish composition.

Samples were collected 500 to 1000 m upstream from the reservoirs, in the immediate tailwaters and 500 to 1500 m downstream of the dams. Seventy one percent of the lakes were sampled between 1978 and 1981.

Fish samples were collected at quarterly intervals in 57% of streams from June 1978 to June 1981. The remainder of the streams were sampled at least three times. Backpack electrofishing, seining, poisoning with rotenone and angling were used to collect specimens. Fish were killed and preserved in 10% formalin in the field, returned to the laboratory, identified and transferred to 70% propanol. All specimens were cataloged in the freshwater fishes collections of the Department of Biology, University of Mississippi, and the Mississippi Museum of Natural Science.

Sport fish abundance for sample areas was estimated by percentage of total fish population present within a 35 m sample. Simple percentages were used because of the survey's broad nature and large number of systems in varying habitats.

DESCRIPTION OF SAMPLING SITES

Tailwater areas included spillpools leading into the natural unmodified or short channelized segments of the streams. In the channelized portions several years had elapsed and adequate cover had been re-established. All streams were moderately shaded, predominately by bottomland hardwoods, slow-flowing (0.03 to 0.08 m^3s), relatively turbid (18 to 76 FTU's), relatively warm (4° to 32°C), acid (6.2 to 6.9 with clay or hard mud bottoms and without significant riffle areas. Stream sample sites had variable depths (0.2 to 0.8 m) and widths (2.5 to 10.5 m). Alkalinity and pH varied seasonally with flow induced by runoff, while oxygen was always near saturation in tailwater areas.

RESULTS AND DISCUSSION

Sixteen lake samples and 230 stream samples from 21 streams were collected from June 1978 through May 1981, representing over 10,000 fish specimens. Sport fish composed 61.5% of the total number of fish from 30 spill-pool samples. In unmodified portions of the streams, game fish composed 20.0% of the total number (Table 2). The high numbers of sport fishes in the tailwaters may be due to several factors. Populations of fishes in the impoundments in our study are not overcrowded (Ebert and Knight 1980, 1981).

Table 2. Percent sport fish in spill pool and 500 m downstream of spill pool areas in 21 stream-flood retarding lake systems (June 1978 to May 1981). (Sport fish = *Micropterus salmoides*, *Micropterus punctulatus*, *Lepomis macrochirus*, *Lepomis microlophus*, *Pomoxis nigromaculatus* and *Ictalurus punctatus*.)

Lake (ha)	Stream (order)	%Sport Fish Spill Pool	%Sport Fish 500 m Downstream
*Puskus (24.3)	second	55	16
*W. Cypress (12.5)	second	42	6
*Denmark (8.1)	second	67	25
E. Cypress (11.3)	second	46	25
*Friendship (8.1)	second	85	31
*Spring (7.3)	first	25	25
*Chewalla (101.2)	second	44	18
*Curtis (16.2)	second	64	17
Snow (16.2)	second	41	21

Table 2 (Con't).

Wagner (16.5)	second	40	19
Shelby (8.1)	second	71	15
*Autry (8.1)	second	74	25
*Cox (7.3)	first	63	16
*Turkey Fork (105.2)	second	57	22
*Davis (32.4)	second	86	19
Simmons (12.1)	second	91	20
Shurlock (12.1)	second	84	25
*Texas (16.2)	second	69	12
*Choctaw (32.4)	second	55	11
*Marathon (8.1)	second	81	20
Grapevine (8.1)	second	52	33
Average		61.5	20.0

*Fish population sample

Our results are similar to Groen and Schmulbach (1978) who found that sport fishes in large reservoirs are usually more concentrated in tailwaters than in other areas. Schneider et al. (1977) also showed a high percentage of sport fishes (50%) in combined creel at TVA's Gallatin, Kingston and John Sevier steam plant discharge pools. Other explanations include overpopulation and emigration of adults in tailwater areas from upstream impoundments (Mathis, 1964). Sport fishes are generally opportunistic predators and their abundance is usually closely associated with the abundance and availability of suitable prey.

Other investigators (Minkley 1963, McDonough and Barr 1977) have pointed out that, because of the predictable longitudinal changes in properties of streams, biota of flowing waters should also display longitudinal zonation. Therefore, anything which alters the natural condition of the stream, such as dams, removal of cover or channeling, should disrupt the usual distribution of biota, including fishes, in the system. Few of the streams immediately in the area of dam construction or in the channelized portions of Forest Service lakes have had sufficient time to recover in terms of fish structure replacement, development of eddies and pools, riffles, and overstory cover.

Lynch et al. (1977) discussed the effects on water temperature and amplitude of diel temperature as a result of removal of shading over cover. Effects on fish are often seen in metabolic rates, dissolved oxygen uptake and migration patterns. These effects were noted in the fish composition downstream beyond the influence of spillway activity where populations were more like those normally expected in natural unmodified waters. In Puskus Creek (Fig. 2), for example, spillpool fishes averaged between 58 and 94% of the total fish sample, but downstream over 15 to 52% were game fishes. Specimens from the tailwaters were generally larger and in better overall condition than those in other segments of the creeks. Pfitzer (1967) noted that native or introduced species of fishes in tailwater areas of high dams had better condition factors than natural stream or river fish populations.

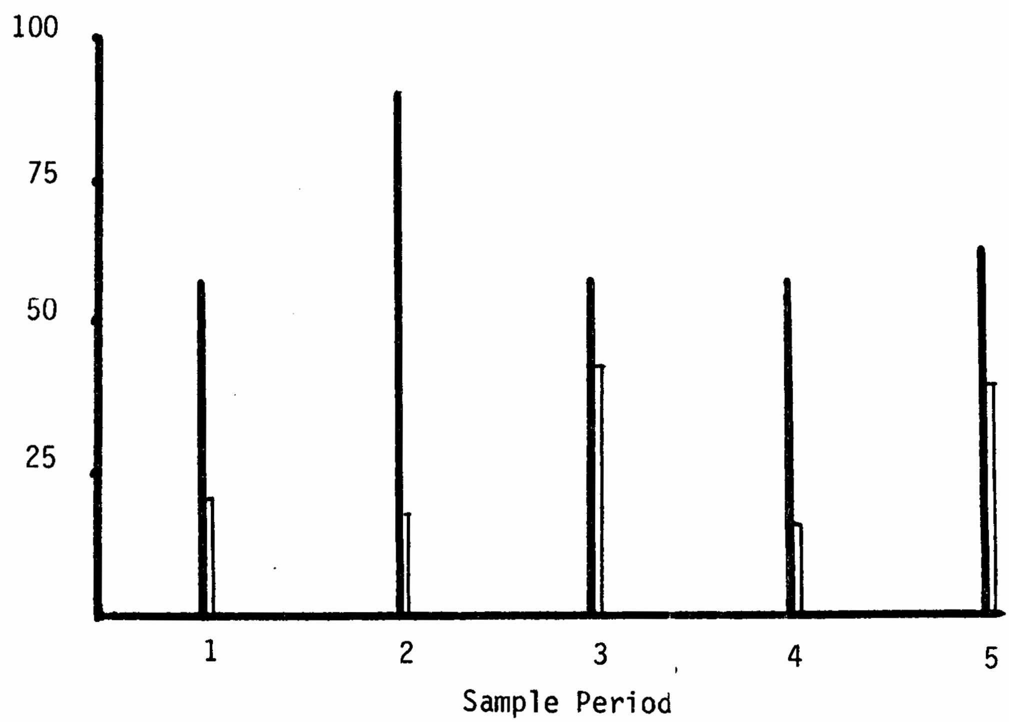


Figure 2. Puskus Creek spillpool and stream fish population data, as percentage of sport fish per sample. Solid bar, stream 500 to 1500 m downstream from dam, open bar, spillpool area.

Substantial populations of sport fishes, including large-mouth bass (M. salmoides), bluegill (L. macrochirus), and spotted bass (Micropterus punctulatus), black crappie (Poxomis nigromaculatus) and channel catfish (I. punctatus), were concentrated in both the tailwaters and downstream areas from the reservoirs. The major game fish in the unmodified portions of the streams was the spotted bass, M. punctulatus. Natural stream areas, beginning at about 500 m downstream, were progressively poorer in sport fish populations, minnows, suckers and other forage species dominated the natural areas. Upstream areas of the reservoirs were primarily headwater habitats, with madtoms (Noturus nocturnus), darters (Etheostoma whipplei and Etheostoma zonale), and topminnows (Fundulus notatus) predominating.

MANAGEMENT PRACTICES

The three-year study has shown a need for placement of fish structures, especially spawning beds and brushtop attractors in several reservoirs, and bank stabilization and rock dam structures to provide pools below spillways. Many of the systems investigated in this study support sizable populations of game fishes, but have been fished very little.

The spillway areas of a majority of the PL 566 lakes are not readily accessible to fishermen; this inaccessibility is a major factor limiting participation of anglers in tailwater fishing areas in the National Forests in Mississippi. The U.S. Forest Service has, therefore, begun programs of clearing areas around the spillpools and providing access trails extending some 30 meters downstream. Several areas, including Chewalla Lake, Puskus Lake, Turkey Fork Lake and Choctaw Lake spillpools, having fishing trail areas for anglers. It is anticipated that this easier access will encourage increased use of the resource.

The original purpose of these reservoirs was to control flooding; thus, discharge must be regulated accordingly. During dry conditions, small reservoirs on first-order streams may not be sufficiently full to provide discharge for extended summer periods. Aggus et al. (1977) pointed out that erratic release of waters and the resulting increased water temperature in tailwaters when discharge was low over extended periods adversely affected trout fisheries. In the small southern flood retarding reservoirs, lake waters and tailwaters are similar in water quality and, therefore, apparently do not adversely affect the predominantly warm water fishes to any extent.

LITERATURE CITED

Aggus, L.R., D.I. Morais and R.F. Baker. 1977. Evaluation of the trout fishery in the tailwater of Bull Shoals Reservoir, Arkansas 1971-1973. Proc. Ann. Conf. Southeast Assn. Fish and Wildl. Agn. 31:565-573.

Ebert, D.J. and L.A. Knight, Jr. 1980. Lake and pond management in the National Forests in Mississippi. Miss. Chapt. Amer. Fish Soc. 4:28-33.

Ebert, D.J. and L.A. Knight, Jr. 1981. Management of warmwater stream systems in the Holly Springs National Forest, Mississippi. pp. 382-387 in Warm Water Streams Symposium. Southern Div., Amer. Fish. Soc.

Groen, C.L. and J.C. Schmulbach. 1978. The sport fishery of unchannelized and channelized middle Missouri River. Trans. Amer. Fish. Soc. 107(3) 412-418.

Lynch, J.A., E.S. Corbett and R. Hoopes. 1977. Implications of forest management practices on the aquatic environment. Fisheries. 2:16-22.

Mathis, W.P. 1964. An attempt to improve stream fishing by manipulating the lakes in the stream basin. Proc. Ann. Conf. Southeast. Assn. Game and Fish Comm. 18:341-357.

McDonough, T.A. and W.C. Barr. 1977. An analysis of fish associations in Tennessee and Cumberland drainage impoundments. Proc. Ann. Conf. Southeast Assn. Fish. and Wildl. Agn. 31:555-563.

Minkley, W.L. 1963. The ecology of a spring stream, Doe Run Meade Co., Kentucky Wildl. Mono. 11:124.

Pfitzer, D.W. 1967. Evaluation of tailwater fishery resources resulting from high dams. pp. 477-488 in Res. Fish. Resour. Symp. Southern Div., American Fisheries Society.

Schneider, R.W., and A.O. Smith and V.P. Mitchell, Jr. 1977. Characteristics of sport fishing activity in three warm water discharges. Proc. Ann. Conf. Southeast. Assn. Fish. and Wildl. Agn. 31:546-554.

POTENTIAL BIOLOGICAL IMPACTS OF TRAFFIC IN NAVIGABLE WATERWAYS

Thomas D. Wright
US Army Engineer Waterways Experiment Station
WESEN (AHG/ESD/EL)
Vicksburg, MS 39180

Abstract: The Tennesse-Tombigbee Waterway, one of the largest navigation construction projects of the US Army Corps of Engineers, has been the object of extensive litigation throughout its development. One of the primary areas of controversy concerns the potential impacts of navigation traffic upon the aquatic ecosystem, including the fish, plankton, benthos, and aquatic plants.

An analysis of potential impacts indicates that few direct (primary) biological impacts are to be expected. Instead, indirect (secondary) biological impacts may result from alterations in the physical and chemical environment. An indepth literature survey revealed only a small amount of documentation of secondary impacts and that dealt largely with the impacts on individual organisms. A major hiatus exists in the literature regarding extrapolation from the organismal level to communities and ecosystems, and there is question as to whether this is possible with current technology resources. Laboratory and field investigations that could lead to problem resolution are proposed.