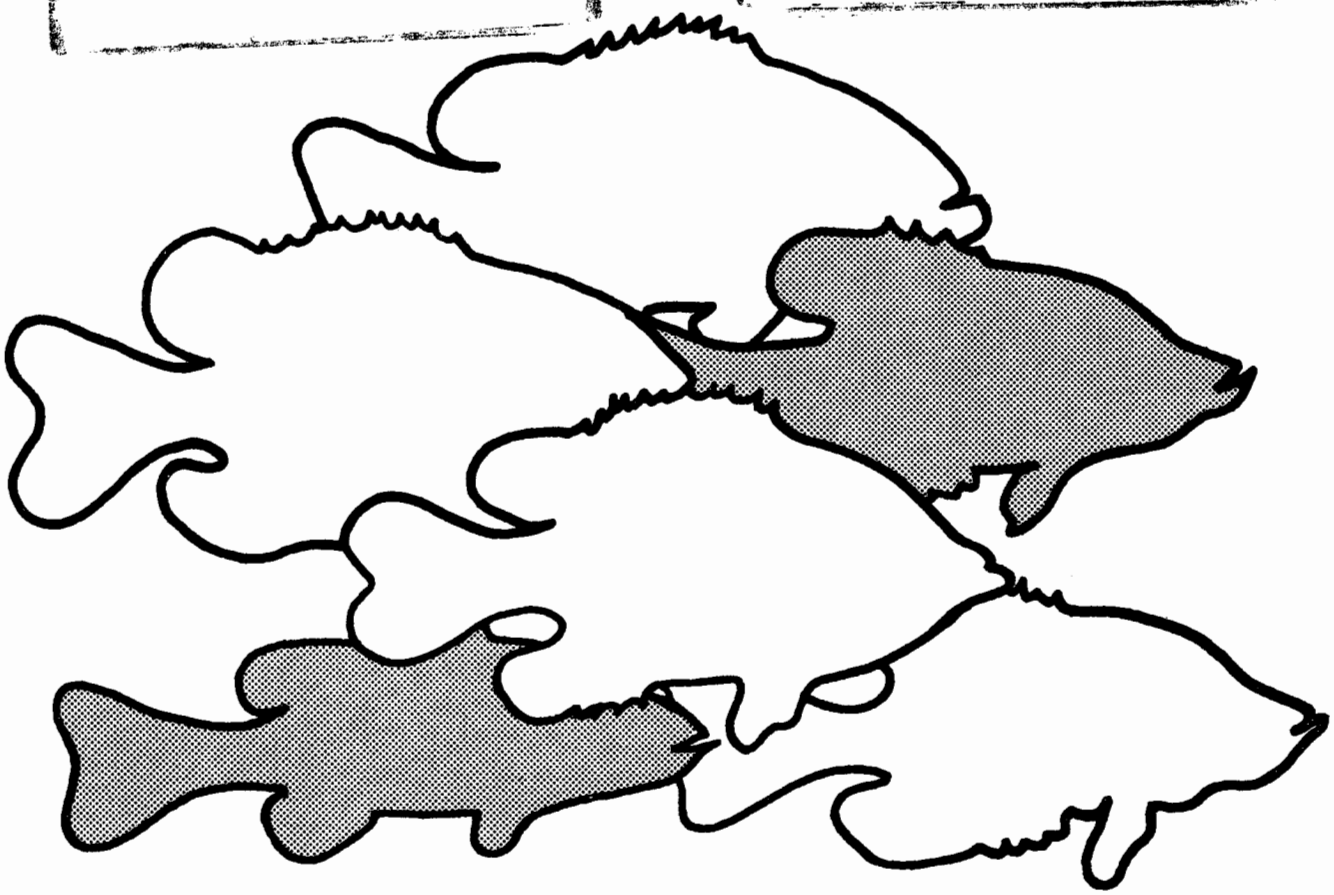
AMERICAN FISHERIES SOCIETY

PROCEEDINGS

ANNUAL MEETING
MISSISSIPPI CHAPTER



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University of
Southern Mississippi

PROCEEDINGS

ANNUAL MEETING

MISSISSIPPI CHAPTER

AMERICAN FISHERIES SOCIETY

FEBRUARY 6, 1986

UNIVERSITY OF SOUTHERN MISSISSIPPI

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FAT DEPOSITION IN CHANNEL CATFISH (*Ictalurus punctatus*) AS AFFECTED BY TWO FEEDS AND TWO STRAINS

by

James H. Tidwell and H. Randall Robinette
Department of Wildlife and Fisheries
P. O. Drawer LW
Mississippi State, MS 39762

Two strains (select and nonselect) of channel catfish (*Ictalurus punctatus*) were fed the same feed with and without the addition of top-dressed oil in ponds for 24 months. The percentage of fat in the filet was significantly affected by the strain of the fish and by the addition of oil, although these factors did not significantly affect visceral fat deposition. Total fish weight was not significantly affected by fish strain or by the addition of oil.

At less than 18 months of growout, smaller fish appeared to have smaller percentages of filet fat and visceral fat than medium and large fish, but fat differences disappeared at 24 months of growout. Fatty acid profiles tended to reflect the fatty acid of the feed fed.

A HYBRID REVEALED PREFERENCE MODEL OF MARINE TOURIST SPORTFISHING VALUE IN FLORIDA

by

Dr. Trellis G. Green
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Hattiesburg, MS 39406-5072

A hybrid revealed preference model is developed to estimate Hicksian compensating and equivalent variation values for the Florida marine tourist sportfishery. A multiple equation demand model is used to mitigate elasticity parameter bias. User values are obtained with an unrestricted full sample enumeration technique which allows catch rates, expenditures, perceptions, experience and other sportfishing demand shifters to assume their actual values. That is, only the reduced form parameters are held constant.

Results yield daily user values in the mid-forty dollar range, translating to annualized tourist benefits of some $760 million. This represents a capitalized asset value of $10 billion, suggesting that unpriced use of the sport fishery misallocates resources and foregoes self-supporting revenues.

ORIENTATION OF Lepomis macrochirus WITH RESPECT TO FLUCTUATING SALINITY

by

Mark S. Peterson, Daniel Gustafson, Jr., and Frank R. Moore
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The rate of salinity change has been implicated in salinity selection, which is an important component of habitat selection in euryhaline fishes. The impact of the rate of salinity change has never been addressed in primary freshwater fish using oligohaline marshes, where they are near their upper physiological limits. We conducted experiments on the bluegill sunfish Lepomis macrochirus to examine their orientation with respect to salinity changes under winter temperature and photoperiod and found significant differences in behavioral responses to rates of salinity change as well as the actual salinity. The responses to the two flow rates indicate orthokinesis for the ±1.0 ppt and -12.0 ppt change/hr treatments; however, a "closure" type of response is evident during the +12.0 ppt change/hr treatment.

Our results indicate that bluegill sunfish respond behaviorally to salinity change but "shutdown" when rate changes are unnatural and potentially lethal. We suggest that behavioral and physiological responses are synergistic based upon the species recent acclimatization history. Moreover, the orthokinetic response to the rate of salinity change may underly movement of bluegill sunfish into oligohaline marshes.

POND PRODUCTION OF THE FRESHWATER PRAWN *Macrobrachium rosenbergii* STOCKED AS JUVENILES AT DIFFERENT DENSITIES IN MISSISSIPPI

by

L. R. D'Abramo, J. M. Heinen, and H. R. Robinette
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Mississippi State, MS 39762

Nursed juvenile prawns *Macrobrachium rosenbergii* (mean wet weight = 0.17 g) were stocked into earthen ponds (.06 ha) at four different densities (39,536; 59,304; 79,072; 118,608/ha). At the completion of the growing season (135-146 days) survival in all ponds ranged from 80.7% to 92.6% ($\bar{x}$ = 86.9%). Average prawn weight and associated yields were related to stocking density and ranged from 15.0 to 26.5 g and 814 to 1778 kg/ha (726-1586 lbs/acre) respectively. A complementary investigation evaluated alternative methods of prawn pond culture and harvest that appear compatible with the topography of eastern and southern Mississippi.

EFFECT OF TEMPERATURE ON THE CLINICAL OUTCOME OF INFECTION WITH *Edwardsiella ictaluri* IN CHANNEL CATFISH

by

Dr. Ruth Francis-Floyd, Dr. Marshall H. Beleau,
Dr. Paul R. Waterstrat, and Dr. Paul R. Bowser
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Stoneville, MS 38776

Water temperatures of 22° to 28°C and concurrent infection with *Edwardsiella ictaluri* have been implicated in economically significant mortality of commercially produced channel catfish, *Ictalurus punctatus*. The objective of this study was to investigate this field observation and to compare clinical data from fish infected at six temperatures.

Channel catfish fingerlings were challenged with *E. ictaluri* via the intraperitoneal (IP) route with doses of 1×10^4, 1×10^5 or 1×10^6 bacteria. Control fish were treated with an equal volume of 0.85% sterile saline. Ten-day trials were conducted at 17°, 21°, 23°, 25°, 28° and 32°C.

Significant differences in mortality ($P<.05$) of control and test fish occurred only at water temperatures of 23°, 25° and 28°C. The 10-day LD_{50} values were $10^{4.3}$, $10^{4.1}$ and $10^{5.4}$ for temperatures of 23°, 25°, and 28°C, respectively. Lesions produced by intraperitoneal injection of *E. ictaluri* were comparable to those reported from natural outbreaks of the disease. It was therefore concluded that the clinical manifestation of the IP induced infection was similar to the naturally occurring disease, and that although individual fish may be susceptible to the infection at any temperature, large portions of a population are at risk only when water temperatures are in the 22° to 28°C range.

ENERGETIC VALUE OF BLUEGILL SUNFISH AND GIZZARD SHAD AS PREY TO LARGEMOUTH BASS

by

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& Wildlife Research Unit
P. O. Drawer BX
Mississippi State, MS 39762

The energetic value of a given forage is influenced by its caloric content, digestibility, and ease of capture. This study was conducted to determine whether gizzard shad (Dorosoma cepedianum) and bluegill sunfish (Lepomis macrochirus) have different energetic value to largemouth bass (Micropterus salmoides) with respect to caloric content and digestibility. Proximate analyses indicated that both prey species contained equal proportions of carbohydrate, but bluegill contained relatively more protein and shad more fat; however, the two preys provided equal total energy (cal/g). Because bass swallow their prey whole, the diameter of their gape and the prey's body depth limit the size meal they can eat. A comparison of regression functions relating prey body depth to prey weight suggested that because shad are more elongated they have a greater body depth/weight ratio, and can provide 30-40% more calories than a bluegill of equal body depth. Digestibility of the prey species, measured as the rate of gastric evacuation, was inversely related to meal size, and faster for shad. These results imply that gizzard shad have a higher nutritional value than bluegill as prey to largemouth bass, and could be energetically more profitable if labor required to capture the two species is similar. Food habits of largemouth bass in reservoirs are interpreted based on these findings.

GENETIC STUDIES OF COMMERCIALLY IMPORTANT CAMBARID CRAWFISHES

by

Craig A. Busack and Tatjana M. Adams
Department of Biology
University of Mississippi
University, MS 38677

Preliminary results of an ongoing electophoretic survey of red swamp crawfish (Procambarus clarkii) populations from Mississippi, Arkansas, Louisiana, Illinois, and Texas indicate low levels of variability exist in populations at several loci but the variation appears to be largely population-specific; a variant allele in one population rarely appears in another. Populations of white river crawfish (P. acutus) from Texas and Louisiana display substantially higher levels of variability and population differentiation than the P. clarkii populations.

FISH COMMUNITY STRUCTURE AT AN ARTIFICIALLY PLACED GRAVEL BAR ON THE TOMBIGBEE RIVER

by

K. Jack Killgore, WESER-A
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Vicksburg, MS 39180-0631

A gravel bar was constructed by the U. S. Army Engineer District, Mobile in an abandoned bendway of the Tombigbee River below Columbus Lock and Dam to provide habitat for aquatic organisms that require shallow, flowing water and gravel substrate. The fish community structure is being evaluated at the site as part of ongoing studies to document its habitat value. Standing crop estimates of fishes were made in the fall of 1985 using the Zippin depletion method. In addition, the relative abundance and species composition of fishes were compared between the gravel bar and natural bendway habitat using catch-per-unit effort data. A total of 10 families and 25 species of fish were collected from the gravel bar and adjacent sites. The highest number of species (15) was collected at the gravel bar. Species captured only at the gravel bar included the silver chub (Hybopsis storeriana), river redhorse (Moxostoma carinatum), river darter (Percina shumardi), and crystal darter (Ammocrypta asprella), listed as endangered by the State of Mississippi. This study will continue through 1986 in order to compare seasonal changes in the fish community structure and evaluate the importance of the gravel bar to the crystal darter.

COMPARISON OF MACROINVERTEBRATES COLONIZING MODIFIED AND UNMODIFIED REVETMENT SURFACES

by

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WESER-A
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Vicksburg, MS 39180-0631

Concrete blocks, simulating articulated concrete mattress revetment (ACM), were submerged under five feet of water on a revetted bank of the Mississippi River near Vicksburg, Mississippi, in October 1984 and at Port Sulfur, Louisiana, in July 1985. Two groups of blocks had the top surfaces modified with either 1/4 inch deep groves placed 1 1/4 inches apart or 1/2 inch diameter by 1/4 inch deep holes placed 4 inches apart. A third group of blocks were unmodified to represent conventional ACM revetment.

Blocks were retrieved from each site in October 1985. Naidid worms and chironomid midge larvae were numerically dominant on the blocks at Port Sulfur. These blocks had dense algal growths which we believe served as the primary substrate for the colonizing macroinvertebrates. Hydropsychid caddisfly larvae and chironomid midge larvae were numerically dominant on the blocks near Vicksburg. They were free of all foreign matter other than macroinvertebrates and their cases and we conclude that the blocks served as the primary substrate for colonization. At the Vicksburg site, blocks with grooved surfaces had greater numbers of taxa and individuals than did the other blocks. At the Port Sulfur site, there were generally greater numbers of individuals on blocks with grooved surfaces.

BIOCHEMICAL GENETICS OF MISSISSIPPI LARGEMOUTH BASS POPULATIONS

by

Craig A. Busack and Kenneth W. Thompson
Department of Biology
University of Mississippi
University, MS 38677

Ron J. Garavelli
Mississippi Department of Wildlife Conservation

Largemouth bass form five sites were analyzed electrophoretically to more extensively evaluate the genetic status of Mississippi bass populations, currently believed to be natural intergrades between the northern and Florida subspecies. We found, contrary to this view, evidence that the native Mississippi bass represent the northern subspecies, with little if any natural intergradation. Although Florida bass allele frequencies as high as 46% were found in our samples, Florida bass introgression in these populations is probably entirely due to Florida bass stocking. This project was supported in part by the Mississippi Department of Wildlife Conservation project F-67.

FACTS CONCERNING THE COMMERCIAL FISHERY OF MISSISSIPPI: ANALYSIS OF THE 1982-1983 FY LICENSE SALES

by

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Receipts of commercial license and gear tag sales for FY 1982-1983 were reviewed to gather information concerning the commercial fishery in Mississippi. One thousand seven hundred eighty three (1,783) fishermen purchased 3,491 licenses and paid $65,150 for licenses and tags. The average cost per fisherman for license and tags was $36.54, but individual costs ranged from $15.50 to $625.50.

Fishing effort was distributed between fishermen as such; 920 fishermen fished gill nets, 700 fished trotlines, 725 fished hoop nets, 200 fished trammel nets, 84 fished snaglines, and 9 fisheremen fished seines. Gear tags were purchased for 6,541 hoopnets, 2,005 gill nets (1,142,129 ft.), 1,627 trotlines, 544 trammel nets (287,079 ft.), 109 snaglines, and 9 seines. The maximum gear effort by any one fisherman was 105 hoop nets, 22 gill nets, 32 trammel nets, 18 trotlines, 10 snaglines, and 1 seine. Except for hoop nets, where up to 15 could be run on original license, over 50% of the fishermen fished only one piece of commercial gear. Approximately 70% of the hoop net fishermen fished 10 or less nets and 25% fished 15 nets.

The vast majority of commercial fishermen (72%) reside (purchased their licenses) in the northwestern quadrant of the state.

INFECTIVITY OF ORALLY ADMINISTERED *Edwardsiella ictaluri**

by

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P. O. Drawer V
Mississippi State, MS 39762

The route of infection for the causative agent of enteric septicemia of catfish (ESC) *Edwardsiella ictaluri*, has been postulated to be via both the nares and gut. To further investigate the role oral infection plays in the transmission of ESC, 450 six inch long channel catfish were obtained and divided into three groups. Group A was fed a standard commercial catfish diet for two weeks and then gavaged with graded dosages of *E. ictaluri* ranging from 10^4 to 10^7 bacteria per fish. Group B was treated in a manner similar to group A except that the graded dosages of *E. ictaluri* ranged from 10^6 to 10^9 bacteria per fish. Group C was not fed for two weeks and then was gavaged with *E. ictaluri* ranging from 10^6 to 10^9 bacteria per fish. Thirty fish in each group received no bacteria and served as controls. Groups A and C were monitored for 10 days and group B for 21 days. At the end of each groups respective monitoring period, all survivors were sacrificed and bacterial cultures taken from the brain and posterior kidney. No mortalities were recorded from any group due to *E. ictaluri*. Group A had one fish and groups B and C each had two fish that yielded *E. ictaluri* upon bacterial culture. These findings suggest that the oral route of infection or *E. ictaluri* may not be the primary route of transmission.

*Read by title

SELECTED LIMNOLOGICAL CHARACTERISTICS OF BAY SPRINGS RESERVOIR, TENNESSEE-TOMBIGBEE WATERWAY*

by

Steven J. Boggs and H. Randall Robinette
Department of Wildlife and Fisheries
P. O. Drawer LW
Mississippi State, MS 39762

Physicochemical parameters were measured at four locations during the first year of impoundment of Bay Springs Reservoir in northeast Mississippi. Results indicated that stable thermal stratification and low hypolimnion dissolved oxygen concentrations occurred from May to October. During July and August, low dissolved oxygen concentrations would have limited the distribution of most warmwater fish species to depths of 4 m and above. Similarly, coolwater fish species would have been limited by low dissolved oxygen concentrations to 2 m and above during these months, but temperatures at these depths would be stressful. Thermal stratification and the resultant depletion of oxygen also produced several changes in the water quality of Bay Springs Reservoir. Most notable of these included relatively high levels of iron and manganese, and low pH levels in the hypolimnion.

*Read by title

STATUS REPORT: DEMONSTRATION EROSION CONTROL PROJECT IN THE YAZOO BASIN*

by

C. M. Cooper and S. S. Knight
USDA-ARS
P. O. Box 1157
Oxford, MS 38655

The USDA Soil Conservation Service and U. S. Army Corps of Engineers have been requested by Congress to establish six demonstration watersheds in the highly erosive Yazoo Basin foothills. The purpose of this project is to develop and illustrate management practices which provide greater control over flood waters, land and channel erosion, and sediment deposition. Other federal agencies are participating as needed; the USDA-ARS Sedimentation Laboratory is cooperating directly by documenting pre-project conditions and watershed changes and by evaluating efficiency of specific management practices and projects. Other cooperative efforts include related watershed research. Ecological research associated with the project includes: a comprehensive pre-project and post-project ecological evaluation of two of the streams; quantitative documentation of the effects of snagging and debris removal; ecological results of habitat modifications, e.g. stone dikes, grade control structures and other channel stability measures; and the effects of watershed lakes on water quality and downstream biota. This demonstration project represents an opportunity for cooperative state and federal research and the development of management practices which benefit fish and wildlife in addition to controlling upland erosion and channel instability.

*Read by title

FISHERIES POTENTIAL OF PERMANENT MAN-MADE POOLS BELOW GRADE CONTROL STRUCTURES IN HIGH GRADIENT STREAMS*

by

S. S. Knight and C. M. Cooper
USDA-ARS
P. O. Box 1157
Oxford, MS 38655

Low drop structures placed to prevent channel erosion from head cutting are becoming a common stream management tool. In order to investigate potential fisheries benefits of permanent pools below such structures, rotenone samples were conducted in four man-made pools below such structures as part of the Demonstration Erosion Control Project in the Yazoo Basin (DEC). These pools were compared to four naturally occurring scour holes. Although small, man-made pools have firm sides and bottoms which provide substrate for food organisms, excellent year-round dissolved oxygen levels, and tend to have a greater and more stable average depth than the natural pools or the stream channel. Productivity values were 337.9 kg/ha for natural pools with 106.7 kg/ha being harvestable size fish and 746.1 kg/ha for man-made pools with 321.7 kg/ha being harvestable. The percent of total weight composed of harvestable size fish was 31.6 percent for natural pools and 43.1 percent of man-made pools. By weight, largemouth bass and spotted bass made up 8 percent of the catch in natural pools and 16 percent in man-made pools. Even though the man-made pools may be too small to support heavy sports fishing pressure, they have advantages over many naturally occurring pools in fishery characteristics and provide an alternative to stream degradation which diversifies stream habitat.

*Read by title

DIFFERENTIAL AGE AND GROWTH OF *Notropis chrysocephalus* (Rafinesque) IN A FIRST-ORDER SOUTH LOUISIANA STREAM*

by

Dr. William M. Brenneman
Department of Biological Sciences
University of Southern Mississippi
Hattiesburg, MS 39406

Significant differences ($P < .01$) in age, length and weight are found between populations of *Notropis chrysocephalus* occurring above and below a waterfall on Jews Creek, West Feliciana Parish, Lousiana. Mean ages, standard lengths and weights for fish collected above and below the waterfall in September 1984, were, respectively: 1.5yr, 38.7mm, and 1.1g; 2.1yr, 44.8mm and 1.8g. Individual and population growth rates for all age intervals were higher for fish collected above the waterfall. *Notropis umbratilis* was the only syntopic congener above the waterfall, whereas *N. camurus*, *N. longirostris*, *N. umbratilis* and *N. venustus* were collected below the waterfall.

*Read by title

PHYSICAL LIMNOLOGY OF FLOOD CONTROL RESERVOIRS OF NORTHERN MISSISSIPPI: 1984 to 1985*

by

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

and

Richard E. Price
U. S. Army Corps of Engineers
Vicksburg, MS 39180

Limnological conditions of Grenada, Enid, Sardis and Arkabutla reservoirs in northern Mississippi were monitored during 1984 and 1985. These reservoirs are shallow warm water impoundments whose primary function is flood control but secondarily provide opportunities for many water related recreational activities. pH in reservoir inflow and outflow waters was normally acidic and seldom rose above neutral. Dissolved oxygen concentrations were at levels considered adequate for fishes and other aquatic organisms. Profiles were of the clinograde type. Water temperatures were seasonal (1.0 to 30°C). Turbidities ranged from about 15 to 150 NTU and conductivities varied from about 20 to 80µmhos/cm. Concentrations of nutrients, including P and K, were not excessive when compared with other regional waters such as those in the Mississippi delta. Summer thermal stratification was weak and there was little evidence of winter stagnation. During scheduled drawdown for flood control, water levels fluctuated which mitigated biological productivity, especially in the dewatered areas. Effects of drawdown (i.e. hypolimnial withdrawal) were seen in disruption of thermal stratification, redistribution of DO and temperature profiles.

This project was funded by Contract No. DACW 38-84-C-0026, U. S. Army, Corps of Engineers, Vicksburg, MS 39180.

*Read by title

ANNUAL MEETING
MISSISSIPPI CHAPTER AFS
UNIVERSITY OF SOUTHERN MISSISSIPPI
February 6, 1986

8:00 - 9:00 a.m. Registration

9:00 - 9:05 a.m. Opening Remarks - Jack Herring, President, Mississippi Chapter AFS

9:05 - 9:45 a.m. Keynote Speaker - a representative from the Southern Division AFS

9:45 - 10:00 a.m. Break

10:00 - 11:30 a.m. Business Meeting

11:30 - 1:00 p.m. Lunch

MODERATOR - Jack Herring

1:00 - 1:15 p.m. FAT DEPOSITION IN CHANNEL CATFISH (Ictalurus punctatus) AS AFFECTED BY TWO FEEDS AND TWO STRAINS -- James H. Tidwell* and H. Randall Robinette, Mississippi State University

1:15 - 1:30 p.m. A HYBRID REVEALED PREFERENCE MODEL OF MARINE TOURIST SPORTFISHING VALUE IN FLORIDA -- Dr. Trellis G. Green*, University of Southern Mississippi

1:30 - 1:45 p.m. ORIENTATION OF Lepomis macrochirus WITH RESPECT TO FLUCTUATING SALINITY -- Mark S. Peterson*, Daniel Gustafson, Jr., and Frank R. Moore, University of Southern Mississippi

1:45 - 2:00 p.m. POND PRODUCTION OF THE FRESHWATER PRAWN Macrobranchium rosenbergii STOCKED AS JUVENILES AT DIFFERENT DENSITIES IN MISSISSIPPI -- L. R. D'Abramo*, J. M. Heinen, and H. R. Robinette, Mississippi State University

2:00 - 2:15 p.m. EFFECT OF TEMPERATURE ON THE CLINICAL OUTCOME OF INFECTION WITH Edwardsiella ictaluri IN CHANNEL CATFISH -- Ruth Floyd*, M. H. Beleau, Paul R. Waterstrat and Paul R. Bowser, College of Veterinary Medicine, Mississippi State University, Stoneville, MS

2:15 - 2:30 p.m. ENERGETIC VALUE OF BLUEGILL SUNFISH AND GIZZARD SHAD AS PREY TO LARGEMOUTH BASS -- L. E. Miranda*, Mississippi Cooperative Fish and Wildlife Research Unit, Mississippi State University

2:30 - 2:45 p.m. Break

MODERATOR - Jack Herring

2:45 - 3:00 p.m. GENETIC STUDIES OF COMMERCIALLY IMPORTANT CAMBARID CRAWFISHES -- Craig A. Busack* and Tatjana M. Adams, University of Mississippi

3:00 - 3:15 p.m. FISH COMMUNITY STRUCTURE AT AN ARTIFICIALLY PLACED GRAVEL BAR ON THE TOMBIGBEE RIVER -- K. Jack Killgore*, U. S. Army Corps of Engineers, Vicksburg, MS

3:15 - 3:30 p.m. COMPARISON OF MACROINVERTEBRATES COLONIZING MODIFIED AND UNMODIFIED REVETMENT SURFACES -- C. Rex Bingham*, C. H. Pennington, and Richard L. Kasul, U. S. Army Corps of Engineers, Vicksburg, MS

3:30 - 3:45 p.m. BIOCHEMICAL GENETICS OF MISSISSIPPI LARGEMOUTH BASS POPULATIONS -- Craig A. Busack*, Kenneth W. Thompson, and Ron J. Garavelli, University of Mississippi and Mississippi Department of Wildlife Conservation

3:45 - 4:00 p.m. FACTS CONCERNING THE COMMERCIAL FISHERY OF MISSISSIPPI: ANALYSIS OF THE 1982-1983 FY LICENSE SALES -- Garry Lucas*, Mississippi Department of Wildlife Conservation

INFECTIVITY OF ORALLY ADMINISTERED Edwardsiella ictaluri** -- F. N. Stiles, Jr. and J. R. MacMillan, Mississippi State University

SELECTED LIMNOLOGICAL CHARACTERISTICS OF BAY SPRINGS RESERVOIR, TENNESSEE-TOMBIGBEE WATERWAY** -- Steven J. Boggs and H. Randall Robinette, Mississippi State University

STATUS REPORT: DEMONSTRATION EROSION CONTROL PROJECT IN THE YAZOO BASIN** -- C. M. Cooper and S. S. Knight, USDA-ARS

FISHERIES POTENTIAL OF PERMANENT MAN-MADE POOLS BELOW GRADE CONTROL STRUCTURES IN HIGH GRADIENT STREAMS** -- S. S. Knight and C. M. Cooper, USDA-ARS

DIFFERENTIAL AGE AND GROWTH OF Notropis chrysocephalus (Rafinesque) IN A FIRST-ORDER SOUTH LOUISIANA STREAM** -- Dr. William M. Brenneman, University of Southern Mississippi

PHYSICAL LIMNOLOGY OF FLOOD CONTROL RESERVOIRS OF NORTHERN MISSISSIPPI: 1984 to 1985** -- Luther A. Knight, Jr. and Richard E. Price, University of Mississippi and U. S. Army Corps of Engineers

4:00 p.m. Adjourn

* Denotes speaker
** To be read by title

FACTS CONCERNING THE COMMERCIAL FISHERY OF MISSISSIPPI: ANALYSIS OF THE FY 1982-1983 LICENSE SALES

Paper
by

GARRY
LUCAS

Fisheries Biologist,
Mississippi Department Wildlife Conservation
29 January 1985

FACTS CONCERNING THE COMMERCIAL FISHERY OF MISSISSIPPI: ANALYSIS OF THE FY 1982-1983 LICENSE SALES

ABSTRACT

Receipts of commercial license and gear tag sales for FY 1982-1983 were reviewed to gather information concerning the commercial fishery in Mississippi. One thousand seven hundred eighty three (1783) fishermen purchased 3491 licenses and paid $65,150 for licenses and tags. The average cost per fisherman for license and tags was $36.54, but individual costs ranged from $15.50 to $625.50.

Fishing effort was distributed between fishermen as such; 920 fishermen fished gill nets, 700 fished trotlines, 725 fished hoop nets, 200 fished trammel nets, 84 fished snaglines, and 9 fishermen fished seines. Gear tags were purchased for 6541 hoopnets, 2005 gill nets (1,142,129 ft.), 1627 trotlines, 544 trammel nets (287,079 ft.), 109 snaglines, and 9 seines.

The maximum gear effort by any one fisherman was 105 hoop nets, 22 gill nets, 32 trammel nets, 18 trotlines, 10 snaglines, and 1 seine. Except for hoop nets, where up to 15 could be run on the original license, over 50% of the fishermen fished only one piece of commercial gear.

The vast majority of commercial fishermen (61%) reside (purchased their licenses) in the northwestern quadrant of the state.

FACTS CONCERNING THE COMMERCIAL FISHERY OF MISSISSIPPI: ANALYSIS OF THE FY 1982-1983 LICENSE SALES

The commercial fishery in Mississippi is regulated in part by a complicated licensing regime where most types of fishing gear require both a license and a tag for each piece of gear (Table 1). This licensing system does have some advantages. One advantage is that a rough evaluation of fishing effort can be obtained from an analysis of license and gear tag sales.

The Mississippi Department of Wildlife Conservation (MDWC) has received complaints from commercial fishermen, administrators of the license program, and conservation officers to reduce the paper work associated with commercial license sales. In response to those complaints the Fisheries Division of MDWC decided to analyze the sale receipts of commercial licenses and gear tags for Fiscal Year 1982-1983. The objective of the analysis was two fold; 1) obtain information to make recommendations to the state legislature on changes to licensing of commercial fishermen and 2) gather much needed data that has been long lacking concerning fishing effort of the commercial fishery of Mississippi.

METHODS

The main office of MDWC in Jackson has receipts of all license sales and tag sales. The receipts of commercial and gear tag sales for fiscal year 1982-1983 were reviewed during the winter of 1984 to gather information concerning the commercial fishery. FY 82-83 was the last year that complete receipt returns were available at the time the analysis was undertaken. The following information was extracted from the receipts and placed on the state computer; licensee name and address, type license purchased, county where license was purchased, type and number of gear tags purchased, license fee, tag fee, and date of purchase.

After being run through the computer the data was scrutinized for irregularities and corrected as best as possible. Most irregularities involved names of fishermen where different names were used for different licenses purchased. For example; Robert X. at one purchase may use Bobby X. on another license purchase. The same thing occurred with Edward-Ed, William-Bill, Sam-Samuel, and others. Also a fishermen when buying several licenses at the same time may put his full name (John Doe for example) on the first license and initials (J. Doe for example) on the remaining. Many of these could be corrected at the time of computer entry or later by comparing residence.

A more serious problem was trying to read some of the hand writing of conservation officers through a third copy receipt duplicate. All commercial licenses in Mississippi are sold by conservation officers. In summary the results presented are, do to the above mentioned reasons, not 100% accurate but have enough accuracy for the desired use.

To assess local fishing effort the state was divided into geographical areas based on county where license was purchased. A description of the counties that make up the geographical areas is presented in Table 2. Geographical areas are not equal in regards to number of counties, population density or area. The geographical areas created were perceived as indicative of a drainage area. An estimate of the number of fishermen by geographical area was determined by dividing the total revenue of an area by the average license and tag cost of a fisherman.

For gear effort determination it is assumed that all tags and licenses sold resulted in gear actually being fished. Although listed in this paper as fishing effort in actuality the gear effort for gill nets and trammel nets is the number of licenses sold, while gear effort for hoop nets, trotlines, snaglines, and seines is the number of tags sold.

SURVEY RESULTS

During the 1982-1983 FY (July 1982 - June 1983) 1783 commercial fishermen purchased 3491 licenses and paid $ 65,150 for licenses and tags. The average cost per fisherman for licenses and tags was $36.54, but individual cost ranged from $ 15.50 to $625.50. The mode was $16.50 with 30% of the fishermen paying this amount in license and tag fees. The average license cost per fisherman was $ 33.40 while tag cost was $ 3.14. Fifty seven percent (57%) of the fisherman paid $16.00 or less in license fees and 32% paid only $.50 in tag fees.

Fifteen counties of the 83 counties in Mississippi had no record of commercial license sales.

Gill nets were fished by 920 fishermen. Fishermen who fished gill nets paid an average of $ 34.78 for gill net licenses. Two thousand five (2005) gill nets of approximately 1,142,129 feet were fished. This averages 2.2 nets (1,241 ft) per fishermen who fished gill nets and 1.09 nets per fisherman over all fishermen whether they fished gill nets or not. The number of nets per fisherman ranged from 1 to 22 (<600 ft to 13,200 ft) with over 50% of the gill net fishermen fishing only one net (600 ft or less) (Table 3). Only 34 gill nets were licensed to permit them to be longer than 200 yards.

Trammel nets were fished by 200 fishermen. Trammel net fishermen fished an average of 2.72 trammel nets (1,432 ft) per man which equates to a total of 544 nets of approximately 287,087 feet. The number of nets per fisherman ranged from 1 to 32 with 70% of the fishermen fishing only one net and 20% fishing 2 nets. Trammel net fishermen averaged $ 40.00 per man for trammel net licenses. Only 11 trammel nets were licensed to permit them to be

longer than 200 yards.

Hoop nets were fished by 725 fishermen. Six thousand five hundred forty one (6541) hoop nets were fished with an average of 9.02 nets per hoop net fisherman: This equates to 3.58 nets per fisherman over all commercial fisherman. The number of hoop nets per fisherman ranged from 1 to 105. To fish hoop nets a fisherman must purchase a combination hoop net-trotline-snagline license which permits a fisherman to fish up to 15 hoop nets, 1 trotline and 1 snagline. Although 30% of the fishermen ran 15 or more hoop nets the average number purchased on the original licensed was only 7. Hoop net fishermen paid an average of $22.07 per man for hoop net licenses.

Seven hundred (700) fishermen fished a total of 1,627 trotlines with an average of 2.3 lines per trotline fisherman: This equates to 0.89 trotlines per fisherman over all commercial fishermen. The number of trotlines per fisherman ranged from 1 to 18 with over 50% of the fishermen fishing only one line and 40% fishing 2-6 trotlines. The trotline fisherman paid $8.57 per man in license costs but this value is an underestimate since the value does not include the $15.00 paid when a hoop net is also purchased in the combination hoop net-trotline-snagline license. That money is included in Hoop net revenue. The $8.57 value is the average of licenses that included only trotline tag sales.

Eighty four (84) fishermen fished from 1 to 10 snaglines (average 1.3 per fisherman) and 9 fishermen fished a total of 9 seines of 4,114 feet. Of these 9 seines 5 were longer than 50 yards and the remaining 4 were less than 50 yards.

The majority of commercial fishermen purchased their licenses in the northwestern quadrant of the state; an area that includes the counties that border the Mississippi River north of Vicksburg, the C.O.E. Reservoirs, and the counties that make up the Mississippi Delta interior. The upper Mississippi River geographical area lead all other areas in the state in total license revenue. gill net gear effort, trammel net gear effort, trotline gear effort, seining effort, and number of fishermen. The Delta interior had the most effort in hoop net effort. The upper Pearl River Geographical area was prominent in hoop net effort.

License revenue over the past 4 years indicates that the commercial fishery has remained stable over that time period. License revenue in Fiscal Years 1981-82, 1982-83, 1983-84 and 1984-85 was $60,400, $65,200, $65,100 and $65,700, respectfully (personal communication with Carolyn Briscoe, Accountig Section, MDWC).

DISCUSSION

The commercial fishery of Mississippi is composed of mostly part-time commercial fishermen. A large number of fishermen used only one or two units of gear, which is an insufficent amount for a person to earn a living from. Unfortunately one of the limitations of this study is lack of a time factor associated with effort. Although part-time fishermen make up a large percentage of the number of fishermen their effective fishing effort may be less than that of full time commercial fishermen when measured in gear unit days, or a similar unit of measurement that has time associated with it. Further research, such as a mail questionnaire survey, is needed in this regard.

What percentage of the part-time commercial fishermen sell their catch? In Mississippi a commercial fishing license is required to fish hoop nets, gill nets, trammel nets, snaglines, seines, or to run trotlines with more than a total of 100 hooks. A license is required to run these gears regardless of whether the fish caught are sold or used for personal consumption. It is plausible that many fishermen use commercial gear just to "catch a mess of fish". Some fishermen may be purchasing commercial licenses, such as the combination hoop net-trotline-snagline license to sell a surplus in catch caught with sport gear.

Whether part-time fishermen have different desires than full time fishermen in regards to target species is not known. This difference in desires for specific fish may have important management implications in regards to specific species management. The upper Pearl River had a relatively high level of fisherman effort, most of it associated with hoop nets. It is plausible that these fishermen are targeting for catfish. What effect the close proximity of the Jackson metropolitan area has on this level of effort is speculative. A large portion of the Big Black River is included in the upper Pearl River geographical area; This area has a popular hoop net fishery which may be a major component of the overall fishery of this stream.

Risotto and Turner (1985) stated that the optimal level of effort for the lower mississippi drainage was 7,000 to 8,000 fishermen, either part-time or full-time. (The area included Arkansas, and parts of Louisiana, Oklahoma, Texas and Mississippi.) It is estimated that no fewer than 1250 fishermen and no more than 1550 Mississippi fishermen fish in the lower mississippi drainage. At the most the Mississippi commercial fishery is using 22% of the optimal allocation of effort associated with this regional area. This level of fishing effort, as a share for Mississippi, would probably be within an optimal allocation of the regional effort to each of the five states.

The present licensing structure is set up to favor the use of hoop nets. The license and tag cost for 15 hoop nets is less than the cost for 2 gill nets or 2 trammel nets. Hoop nets generally are fished in current and the general public believes they catch less game fish as compared to gill nets. Favoring hoop

nets may have been a scheme to direct commercial fishermen away from reservoirs and direct their effort towards the rivers. Reservoirs generally have much higher sport fisherman usage than rivers. Also hoop nets are less visible and do not interfere with sport tackle to the same degree as gill or trammel nets.

Trotlines are also discriminated against. They too can be highly visible gear.

One of the proposals to change the licensing structure is to instigate a system where the fisherman buys one commercial fishing license that encompasses all legal commercial gear, then he buys a tag for each piece of gear. The implementation of a single commercial license could reconstruct the fishery. More hoop net fishermen were fishing 15 hoop nets than any other denomination of hoop net units. This level of gear effort is the maximum amount of nets that can be run on the original hoop net license: Additional nets cost $2.00 each. Would a single license be an incentive to fishermen to switch from hoop nets to gill nets? If hoop net fishermen stayed with hoop nets would they fish more or less nets than at present?

One of the advantages of the present multiple license system is the ability to regulate the commercial fishery by its parts. If one type of gear is too abundant, while other types of gears are neglected, then an option to control the abundant gear is to increase the license cost of that type gear. If the single license system was enacted then specific types of gear could not be individually regulated (short of being outlawed) and the fishery as a whole would have to be regulated just to control one problem gear type.

Although this survey did not answer all the questions the MDWC had concerning the commercial fishery of Mississippi, it did shed some light on commercial fishing effort. It proved to be helpful to the Mississippi Commission on Wildlife Conservation. The Commission decided that the small number of seiners in the state was not justified in regards to licensing and enforcement, especially in regards to a brewing conflict between seiners and fishermen trying to establish fish attractors in public lakes: The Commission outlawed the use of seines in Mississippi waters.

If a change in the commercial licensing system does come about the MDWC has, in this survey, baseline data to assess what effect a change in the licensing structure would have on the commercial fishery.

ACKNOWLEDGEMENT

Appreciation is given to the staff of the Data Processing Section of MDWC for doing a excellent job of entering data from license and tag receipts onto the state computor.

REFERENCES

Risotto, Stephen P., and R. Eugene Turner. 1985. Annual Fluctuation in Abundance of the Commercial Fisheries of the Mississippi River and Tributaries. North Amer. Jour. Fish. Manage. 5 (4):557-574

Table 1. MISSISSIPPI COMMERCIAL FISHING LICENSES (FY 1982-1983)

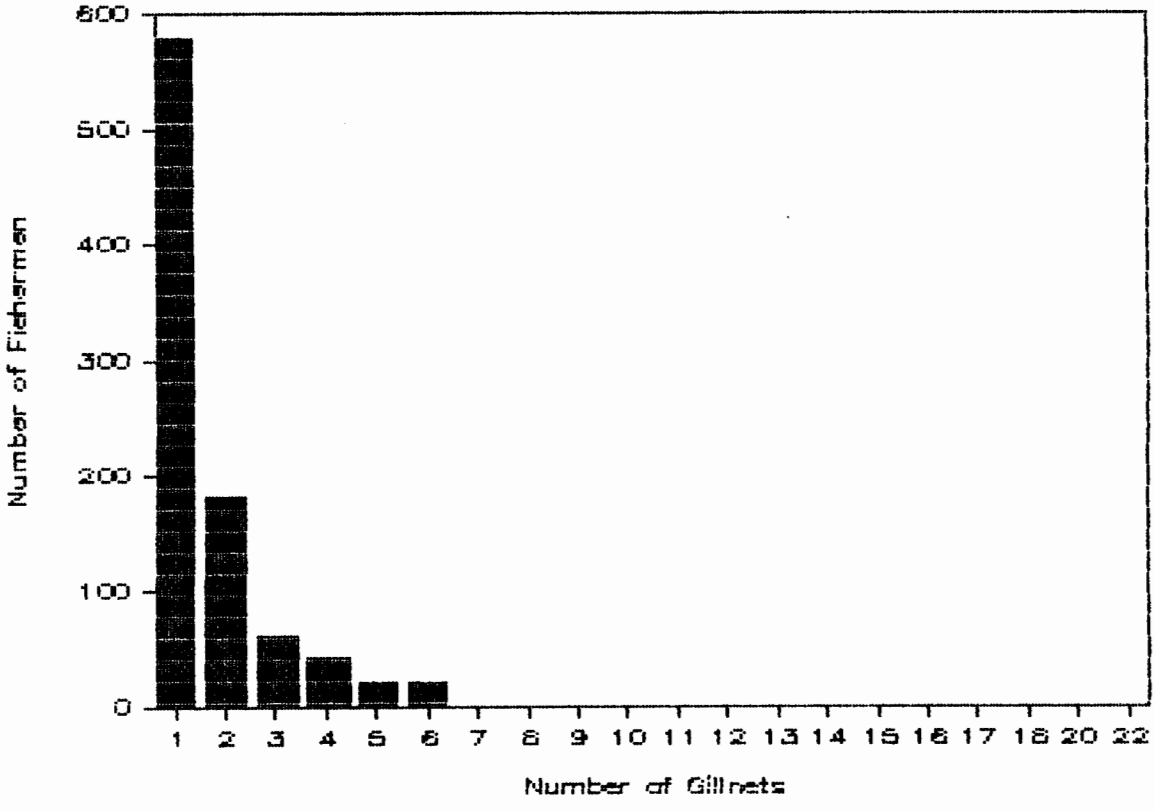
1) Combination Hoop net - trotline - snagline			$15.00
(15 hoop nets, 1 ea. trotline and snagline)			
additional hoop net			$2.00
additional trotline			$5.00
additional snagline			$5.00
2) Trammel net	(600 ft or less)		$16.00
3) Gill net	(600 ft or less)		$16.00
	ea. additional 100 ft		$7.00
4) Seine		1 to 50 yds.	$15.00
		50 to 200 yds.	$16.00
5) Minnow Dealer		retail	$10.00
		wholesale	$50.00
In addition to a license each piece of gear requires a tag		each	$.50

Table 2. Division of certain Mississippi Counties into Geographical areas.

Geographical areas	Counties		Principal Drainage
C.O.E Reservoir (COE)	Desoto Tate Panola Lafayette	Yalobusha Grenada Calhoun	tributaries to Yazoo & Tallahatchie rivers
Miss. River-Delta (MSD)	Tunica Coahoma Bolivar	Washington Issaquena Warren	Miss. River north of Warren Co.
Mississippi Delta (DEL)	Sharkey Leflore Sunflower Tallahatchie	Quitman Humphreys Yazoo	Mississippi Delta-Yazoo River drainage
Miss. River-S.W. (MSS)	Adams Jefferson	Wilkinson Clairborne	Miss.River south of Warren Co.
Pascagoula (PAS)	Clark Greene Wayne Jones Perry	George Lauderdale Jackson Forrest	Pascagoula River
Pearl River-Upper (PRU)	Leake Madison	Rankin Hinds	Pearl R. north of Jackson
Pearl River-Lower (PRL)	Lincoln Walthall Simpson	Lawrence Marion Copiah	Pearl R. south of Jackson
Pearl River-Coastal (PRL)	Pearl River Hancock		Pearl River near the coast
Tombigbee River (TOM)	Clay Monroe Lee	Lowndes Itawamba Noxubee	Tombigbee River
Tenneesee River (TEN)	Alcorn	Tishomingo	Tennesee River

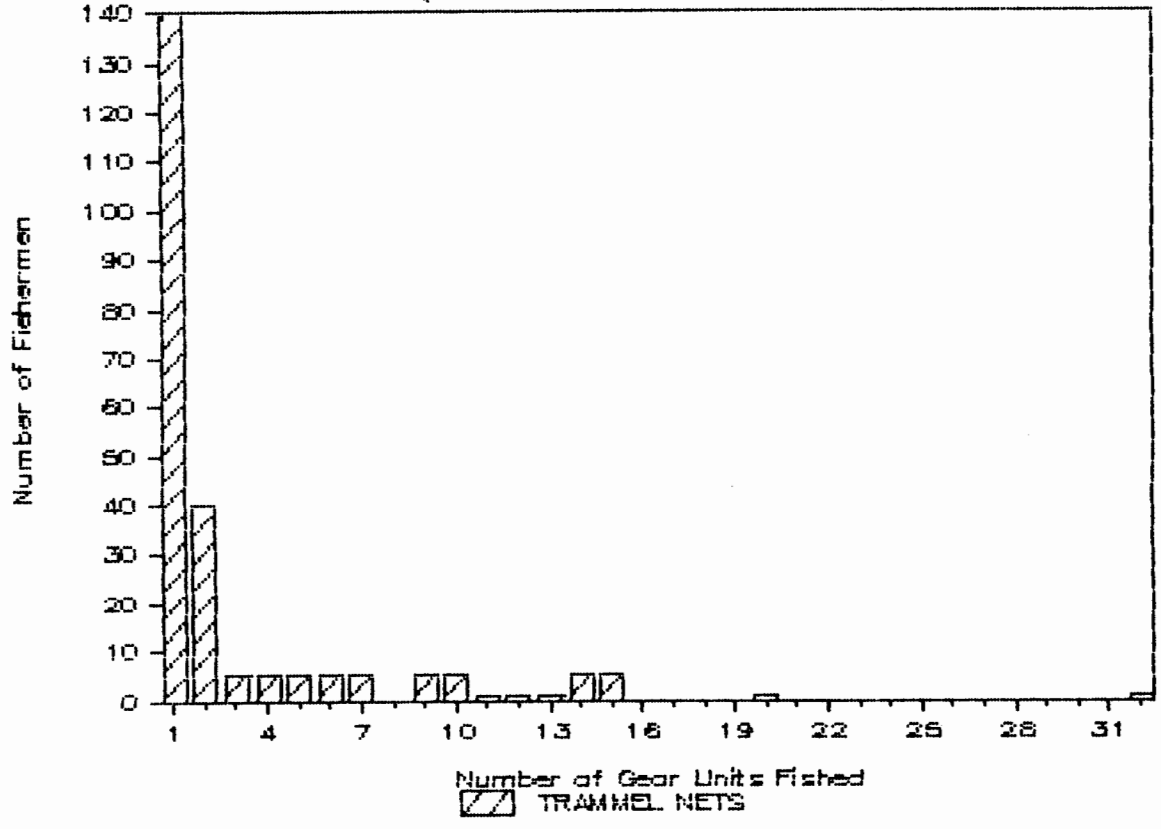
DISTRIBUTION OF NUMBER OF GILLNETS

FISHED BY COMMERCIAL FISHERMEN



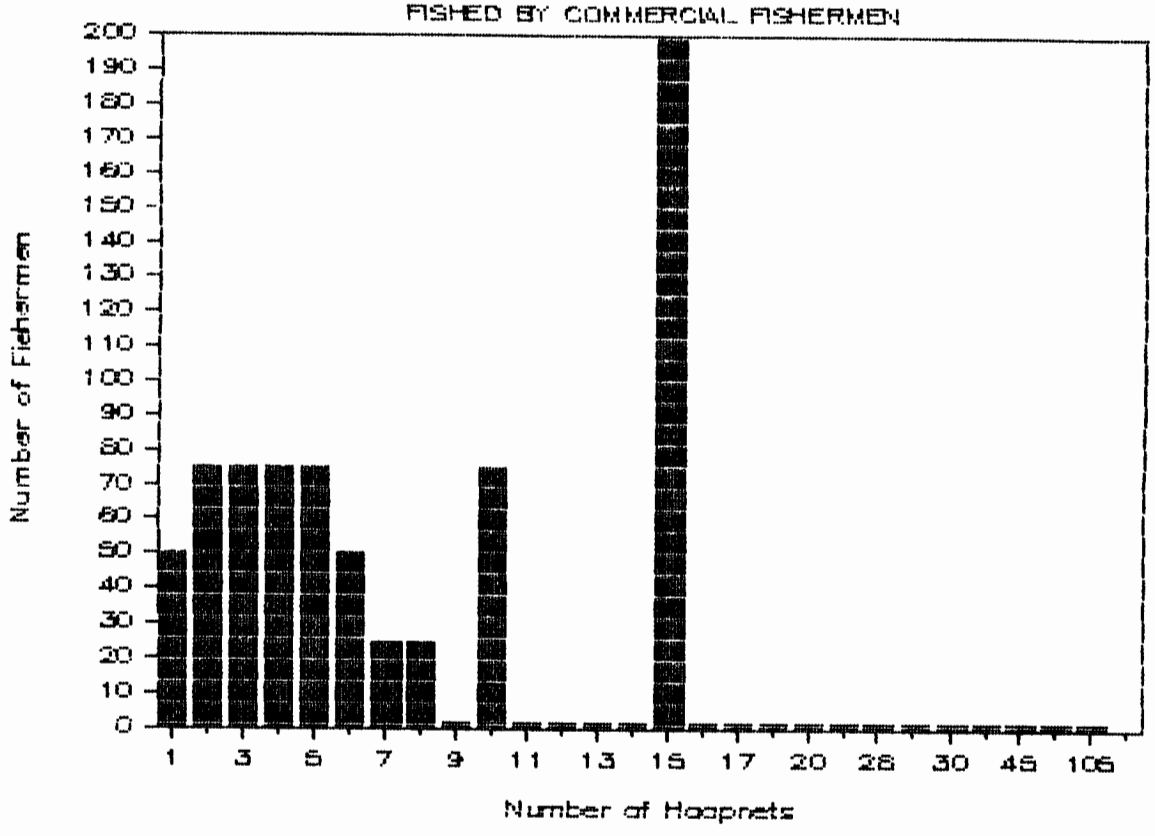
DISTRIBUTION OF NUMBER OF TRAMMEL NETS

(GEAR EFFORT EPR FISHERMAN)



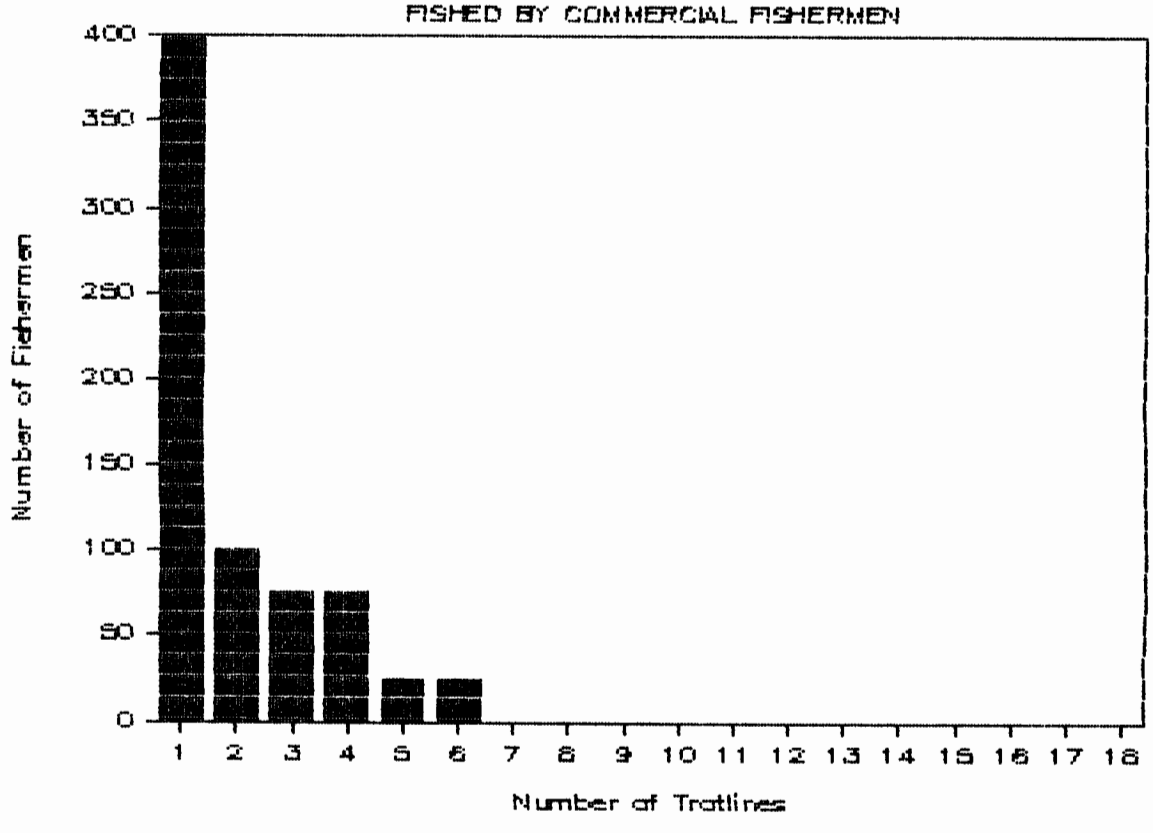
DISTRIBUTION OF NUMBER OF HOOPNETS

FISHED BY COMMERCIAL FISHERMEN

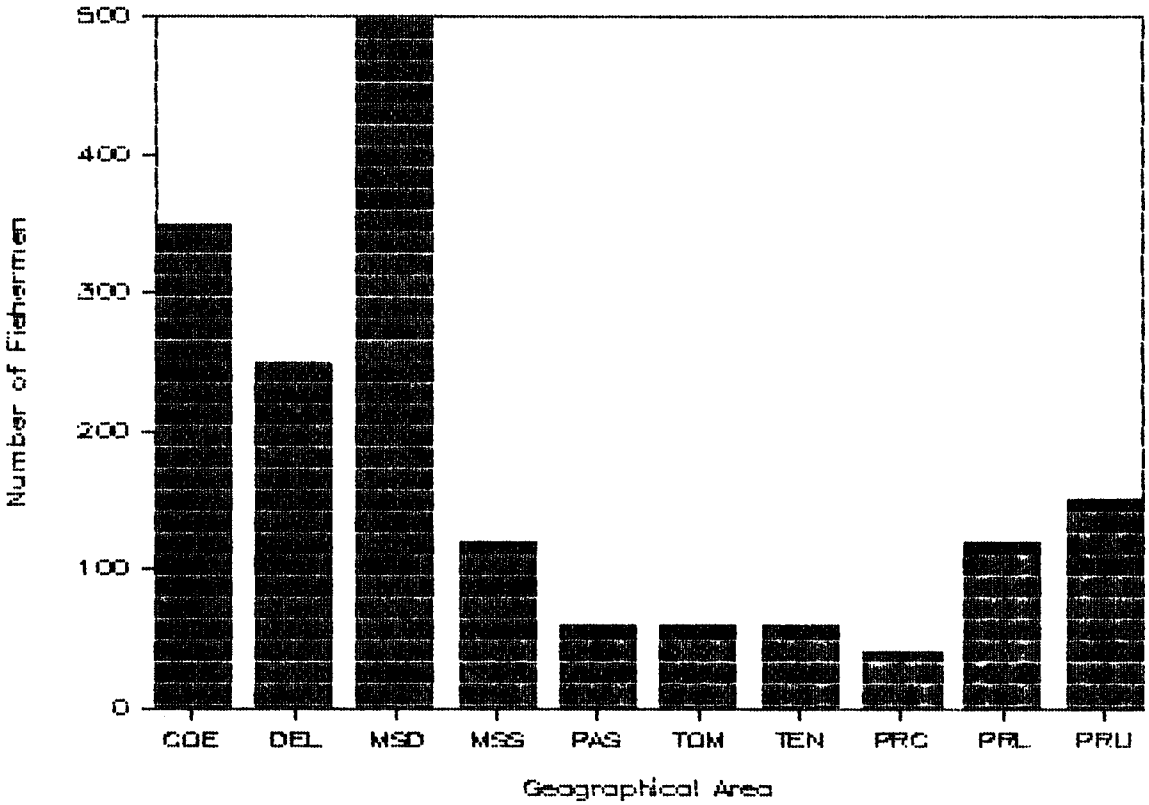


DISTRIBUTION OF NUMBER OF TROTLINES

FISHED BY COMMERCIAL FISHERMEN

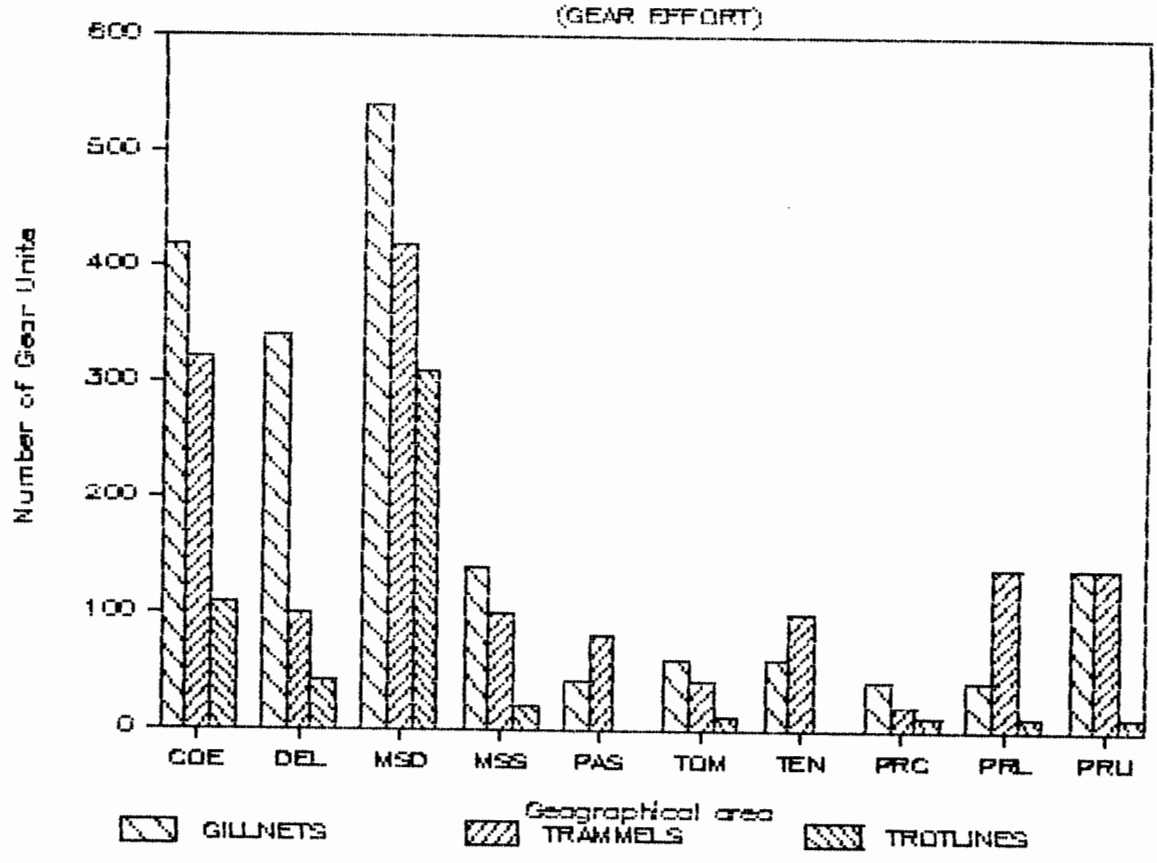


DISTRIBUTION OF NUMBER OF FISHERMEN



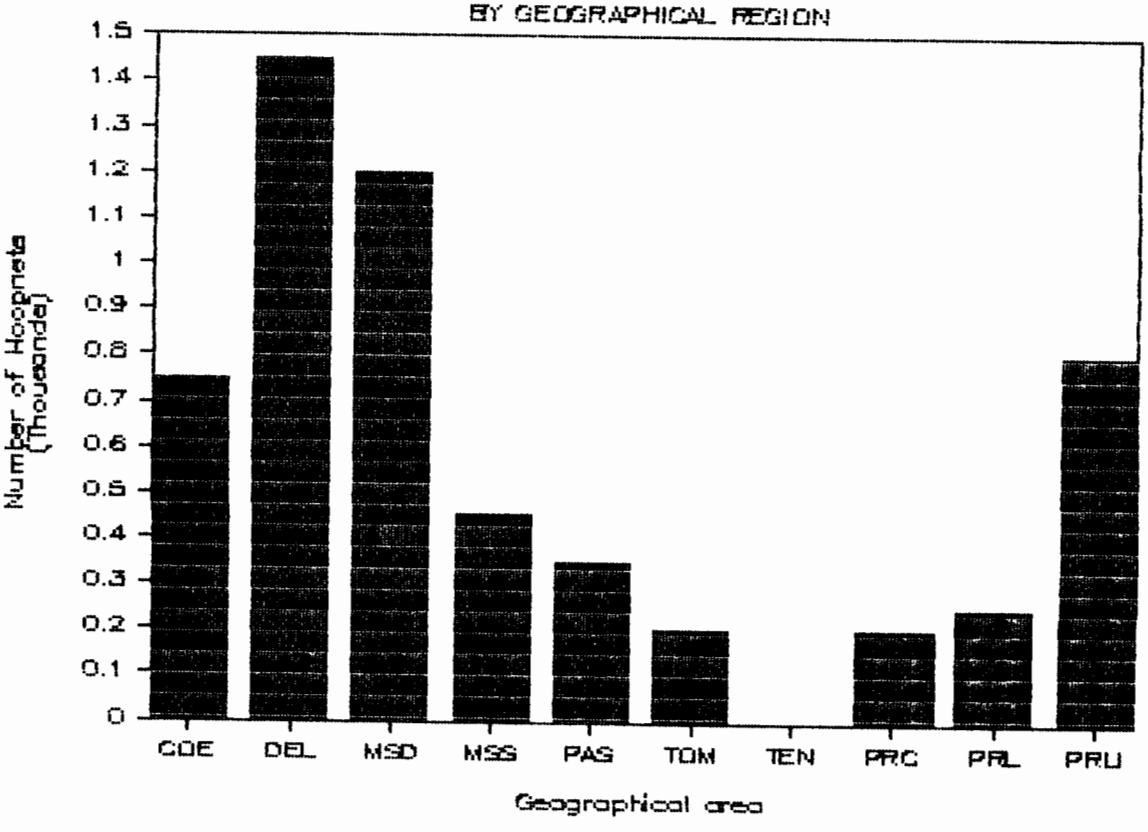
GEOGRAPHICAL DISTRIBUTION OF FISHING

(GEAR EFFORT)



NUMBER OF HOOPNETS FISHED

BY GEOGRAPHICAL REGION



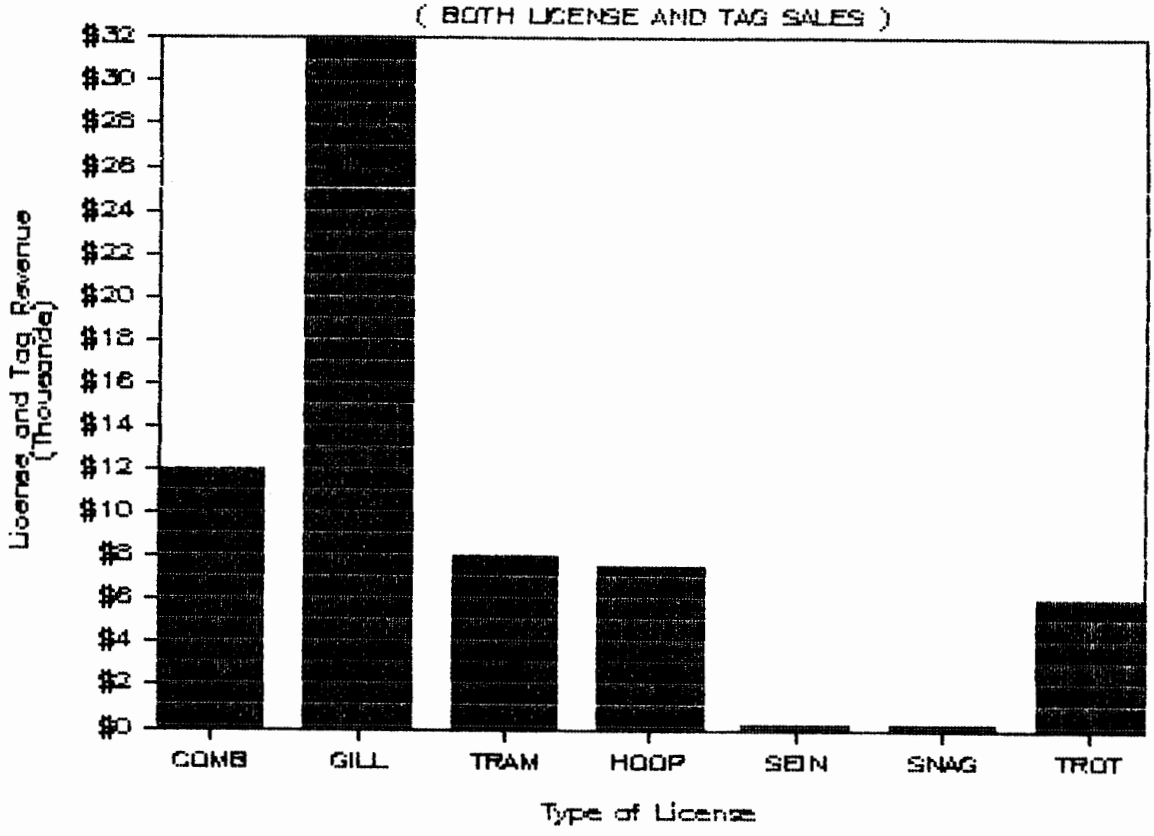
DISTRIBUTION OF LICENSE AND TAG COST PAID BY COMMERCIAL FISHERMEN DURING FY 1982-1983

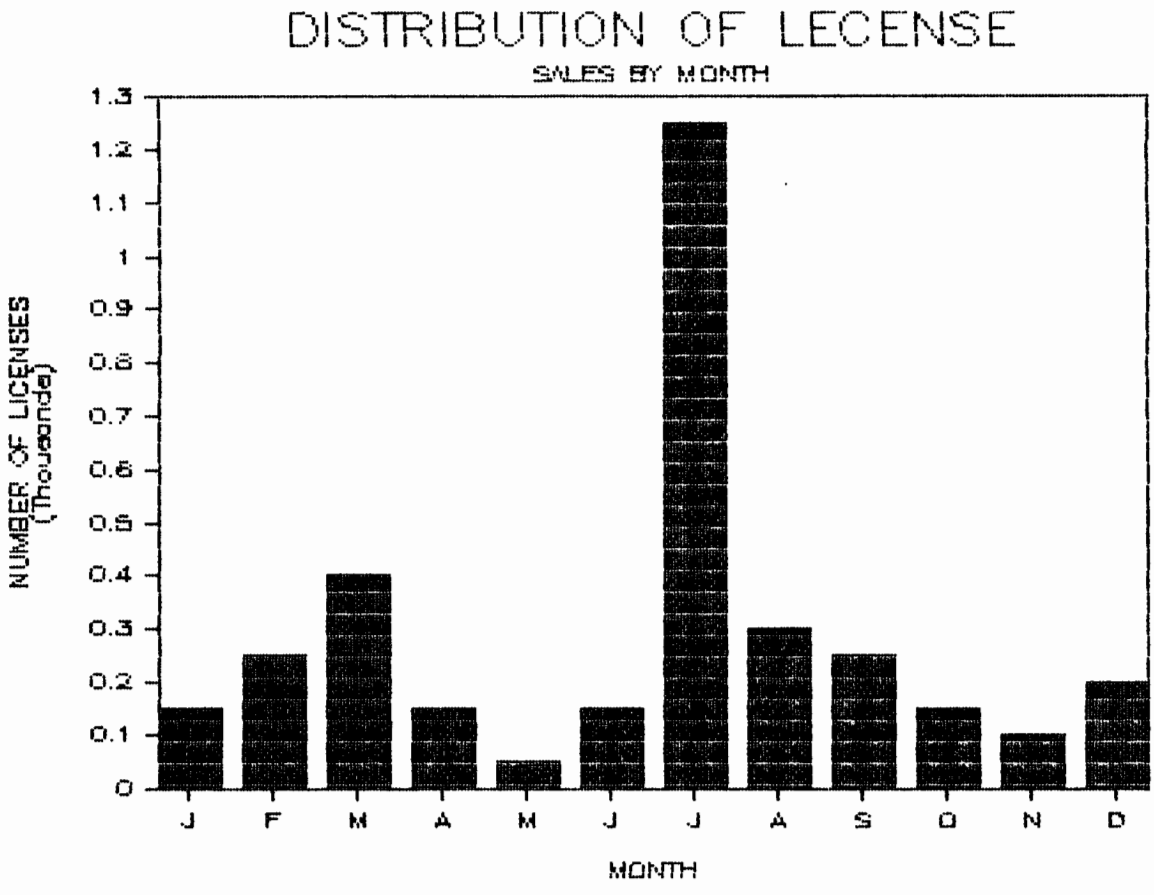
LICENSE AND TAG COST	PERCENTAGE OF FISHERMEN
$15.50-21.00	53%
$21.00-30.00	10
$31.00-40.00	16
$41.00-60.00	8
$61.00-100	8
$101-150	2
$151-200	1
$201-300	1
> $300	0.4

Specific Peaks (within above distribution)	Percentage of fishermen
$16.50	30%
$22.50-23.00	5
$33.00	10
$49.50	3
$66.00	2

REVENUE BY TYPE LICENSE

(BOTH LICENSE AND TAG SALES)




DISTRIBUTION OF LECENSE
SALES BY MONTH
NUMBER OF LICENSES
(Thousands)
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
J
F
M
A
M
J
J
A
S
O
N
D
MONTH

STATUS REPORT: ECOLOGICAL ASPECTS - DEMONSTRATION EROSION CONTROL PROJECT IN THE YAZOO BASIN[1]

C. M. Cooper and S. S. Knight, USDA-ARS, Oxford, MS 38655[2]

ABSTRACT

The USDA Soil Conservation Service and U. S. Army Corps of Engineers have been directed by Congress to establish erosion control demonstration erosion control projects (DEC) in six watersheds in the highly erosive Yazoo Basin foothills. The purpose of this project is to develop and illustrate management practices which provide greater control of floodwaters, land and channel erosion, and sediment deposition. The Agricultural Research Service-USDA Sedimentation Laboratory is documenting pre-project conditions and watershed changes, evaluating the efficiency of specific management practices and structures, and performing related watershed research in hydrology and sediment transport. Research associated with the project includes: comprehensive pre-project and post-project ecological evaluations of two of the streams; quantitative documentation of the effects of snagging and debris removal; ecological results of habitat modifications, e.g. stone dikes, grade control structures and other channel stability measures; and the effects of watershed lakes on water quality and downstream biota. This demonstration project presents an opportunity for cooperative state and federal research and the development of management practices which benefit fish and wildlife in addition to controlling upland erosion and channel instability.

INTRODUCTION

Instream suspended sediment and bedload materials from erosion are, by volume, the largest polluting agents in the U. S. (Fowler and Heady, 1981). Off-site damages from erosion and sedimentation have major adverse impacts on America's water resources. Intensive agriculture can leave soil unprotected, resulting in accelerated erosion. Even forests erode (0.001 - 3.3 tons/acre/yr). Erosion of agricultural lands depends on rainfall, cover, slope, soil type, and antecedent moisture, to name a few conditions, but generally rates are alarming (Table 1). Annual erosion rates in Mississippi vary from less than 1 to 200 tons/acre.

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[1]Contribution of the USDA Sedimentation Laboratory, Agricultural Research Service, U. S. Department of Agriculture, Oxford, MS.

[2]Ecologist and Ecologist (Post-doctorate), USDA-ARS, Oxford, MS 38655.

Table 1. Average Annual erosion rates in selected states (Brown, 1984).

Tennessee	14.1 tons/acre
Missouri	11.4
Mississippi	10.9
Iowa	9.9
Texas	14.9
Colorado	8.9

Nationally, water erosion removes 1.5 to 2 billion tons of U.S. topsoil annually. The Mississippi River alone carries 331 million tons of soil to the Gulf of Mexico each year (Brown, 1984). Elsewhere in the world, with the ever increasing demand for food and space, trends are similar. Between 1950 and 1973, demand for grain doubled; it will do so again by 2000 (Brown, 1984). Erosion is a major problem on about 30% of U. S. farmland, yet traditional erosion control methods are becoming less cost effective and less attractive as farm overhead increases. In response to critical erosion problems on land and in stream channels of many hill lands and piedmont regions, Congress has directed the U. S. Army Corps of Engineers and the USDA Soil Conservation Service to establish six demonstration watersheds in which a systematic watershed soil conservation and flood control program can be developed. The program has been named the Demonstration Erosion Control Project in the Yazoo Basin (DEC Project). The USDA-ARS Sedimentation Laboratory is participating in the DEC Project by documenting pre-project conditions and watershed changes, and by evaluating efficiency of specific management practices and structural measures. This status report describes (1) the six watersheds, their problems, some specific remedial measures planned for each, and (2) outlines ecological research associated with the project.

DEC WATERSHEDS

The six watersheds are located in the loess region of the highly erosive Yazoo Basin foothills of northern Mississippi (Fig. 1). Two of the streams empty into flood control reservoirs in the loess hills; four others enter rivers or drain directly into the flat "delta" alluvium.

Watershed: Hickahala and Senatobia Creeks

The watersheds of Hickahala and Senatobia Creeks are in Tate, Marshall and Panola Counties. The town of Senatobia is the largest population center in the watershed. Hickahala Creek flows into Coldwater River just above Arkabutla Lake. The watershed area is about 135,000 acres which includes about 40,000 acres in row crops and 50,000 acres in pasture.

Bank caving and channel degradation are major problems and extensive channel filling and dead wood and debris accumulation occurs in the downstream portion of the channel system. Flooding of agricultural lands and the sewage lagoon at Senatobia, and local levee breaks are also problems. Sediment-laden water from the creeks cause periodic water quality problems in Arkabutla Lake. The U. S. Army Corps of Engineers and Soil Conservation Service developed a plan to reduce flooding, erosion and sedimentation problems including 6 major and 40 minor grade control structures, channel bank stabilization, extensive channel cleanout in the lower end of the watershed, and land treatment measures.[3]

Watershed: Long Creek

Long Creek Watershed is located in Panola County about 5 miles south of Batesville. The watershed area is 55,000 acres including 12,000 acres in row crops and 18,000 acres in pasture.

Channel bank and bed erosion are major problems. Flooding occurs infrequently. The Corps of Engineers has already installed 13 specially designed and instrumented grade control structures in Goodwin Creek, a tributary of Long Creek. These existing works were considered in developing the plan for Long Creek. The joint plan developed for the watershed includes 10 major grade control structures and about 100 minor grade control structures, streambank stabilization and land treatment measures.

Watershed: Hotophia Creek

Hotophia Creek watershed is located in Panola County about 3 miles east of Batesville. The creek enters the Little Tallahatchie River downstream from Sardis Lake. The watershed area is 21,000 acres including 5,000 acres in row crops and 3,000 acres in pasture.

Hotophia Creek has extreme channel bank instability resulting in channel degradation and extensive bank erosion. Large sediment loads from the bank and bed erosion are deposited the Little Tallahatchie River, thereby reducing the capacity of the river channel and impairing the ability to release stored floodwaters from Sardis Lake. At present, 6 grade control structures have been built on Hotophia Creek by the Corps of Engineers and 5 floodwater retention structures have been built by the Soil Conservation Service. The joint plan, which considers existing measures, emphasizes reduction of erosion and degradation problems and includes 3 major grade control structures and 20 minor grade control structures, streambank stabilization and land treatment measures.

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[3]Specific watershed plans were acquired from Peter Forsythe, Special Projects Coordinator, Soil Conservation Service, Jackson, Mississippi.

Watershed: Otoucalofa Creek

Otoucalofa Creek watershed is located in Yalobusha, Lafayette and Calhoun Counties. The creek flows into Yocona River within the boundary of Enid Lake. The town of Water Valley is the major population center in the watershed. There are about 71,000 acres in the drainage area including 15,000 acres in row crops and 12,000 acres in pasture.

Problems in the watershed include severe erosion of hill lands and erosion of streambanks. Agricultural land is periodically flooded and extensive urban flooding occurs in Water Valley during major storms. At the lower end of the watershed, channel filling occurs and results in deposition of sediments on agricultural land. Devastating flooding occurred in 1983. The joint plan developed includes a major grade control structure and about 75 minor grade control structures, streambank stabilization, 15 floodwater retarding structures, channel cleanout, and land treatment measures.

Watershed: Batupan Bogue

Batapan Bougue watershed is located in Grenada, Carroll, Montgomery, and Webster Counties. The City of Grenada is located in the lower end of the watershed at the point where Batupan Bogue enters the Yalobusha River just downstream from Grenada Dam. The watershed area is about 163,000 acres including some 25,000 acres in row crops and 30,000 acres in pasture.

The watershed problems include periodic major urban flooding in portions of the City of Grenada, agricultural flooding, erosion of hill lands, streambank erosion and sedimentation damages. Devastating record floods occurred in 1982 and 1983. The joint plan includes 15 major grade control structures and about 200 minor grade control structures, streambank stabilization, 10 floodwater retarding structures, land treatment, and channel cleanout.

Watershed: Black Creek

Black Creek watershed lies primarily in Holmes County with a portion of the drainage area in Carroll County. Black Creek enters the delta as part of the Hillside Floodway near Howard, Mississippi. The drainage area is about 220,000 acres including 30,000 acres in row crops and 35,000 acres in pasture. The City of Lexington is the largest population center in the watershed.

Problems in the watershed include extensive erosion of hill lands and erosion of about 150 miles of streambanks. Lexington experiences some flood problems from Black Creek during major storms and extensive flooding of agricultural land occurs. Where the creek enters the delta, channel filling, damage to local levees, sediment deposition on

lands, and road damages add to the overall problem. Some floodwater retarding structures have been constructed in the watershed. Many project features would require coordination with the U. S. Fish and Wildlife Service which operates the Hillside Wildlife Refuge (Hillside Floodway). The proposed plan includes 6 major grade control structures, 175 minor grade control structures, 13 additional floodwater retarding structures, streambank stabilization, land treatment including terracing, channel cleanout, and levee construction in the lower end or delta portion of the watershed.

Ecological Research:

Baseline water quality research will include collection of samples quarterly at several selected sites on all six watersheds for one year, and weekly samples on Otoucalofa and Long Creeks. Temperature, conductivity, dissolved oxygen, pH, and total dissolved suspended sediments, nutrients and coliforms will be be measured. Baseline biological data will include surveys of invertebrates, fish, bank vegetation and habitat enumeration on Otoucalofa and Long Creeks. Seasonal storm sampling for several residual and current-use pesticides will also help to assess stream conditions. These water quality and ecological evaluations should adequately document pre-project conditions. The U. S. Geological Survey will be installing several water quality and sediment monitoring sites to document long term changes. The U. S. Army Corps of Engineers Waterways Experiment Station will be helping solve hydraulic problems associated with design of structures planned for the project.

Several specific experiments are planned to assess ecological changes that may result from stream management practices. These include determination of changes in aquatic biota that result from snag and debris removal, alteration of habitat by lateral and transverse stone dikes, and ecological changes resulting form the placement of grade control structures.

This project allows for game, fish and water quality management strategies to be incorporated into watershed conservation measures. It also provides unique opportunities for innovative research in fisheries and wildlife since project scope allows for experimentation as a part of the demonstration.

SUMMARY

A large scale demonstration erosion control project is being initiated by the U. S. Army Corps of Engineers and the Soil Conservation Service on 6 watersheds in the highly erosive Yazoo Basin foothills. The objectives are to develop and implement upland conservation management practices and stream channel stabilization measures which provide greater control of floodwaters, land and channel erosion, and sediment deposition in stream channels and lakes, and on agricultural lands.

This project will provide opportunities for scientists and fisheries and wildlife managers to cooperate with federal action agencies to improve water quality and fish and wildlife habitat. Ecological research being conducted by the Agricultural Research Service - USDA Sedimentation Laboratory includes evaluations of pre- and post- project conditions to document the impacts of various structural and non-structural channel management measures on stream ecology.

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Fowler, J. M. and E. O. Heady. 1981. Suspended sediment production potential on undisturbed forestland. J. Soil and Water Conserv. 36:47-50.

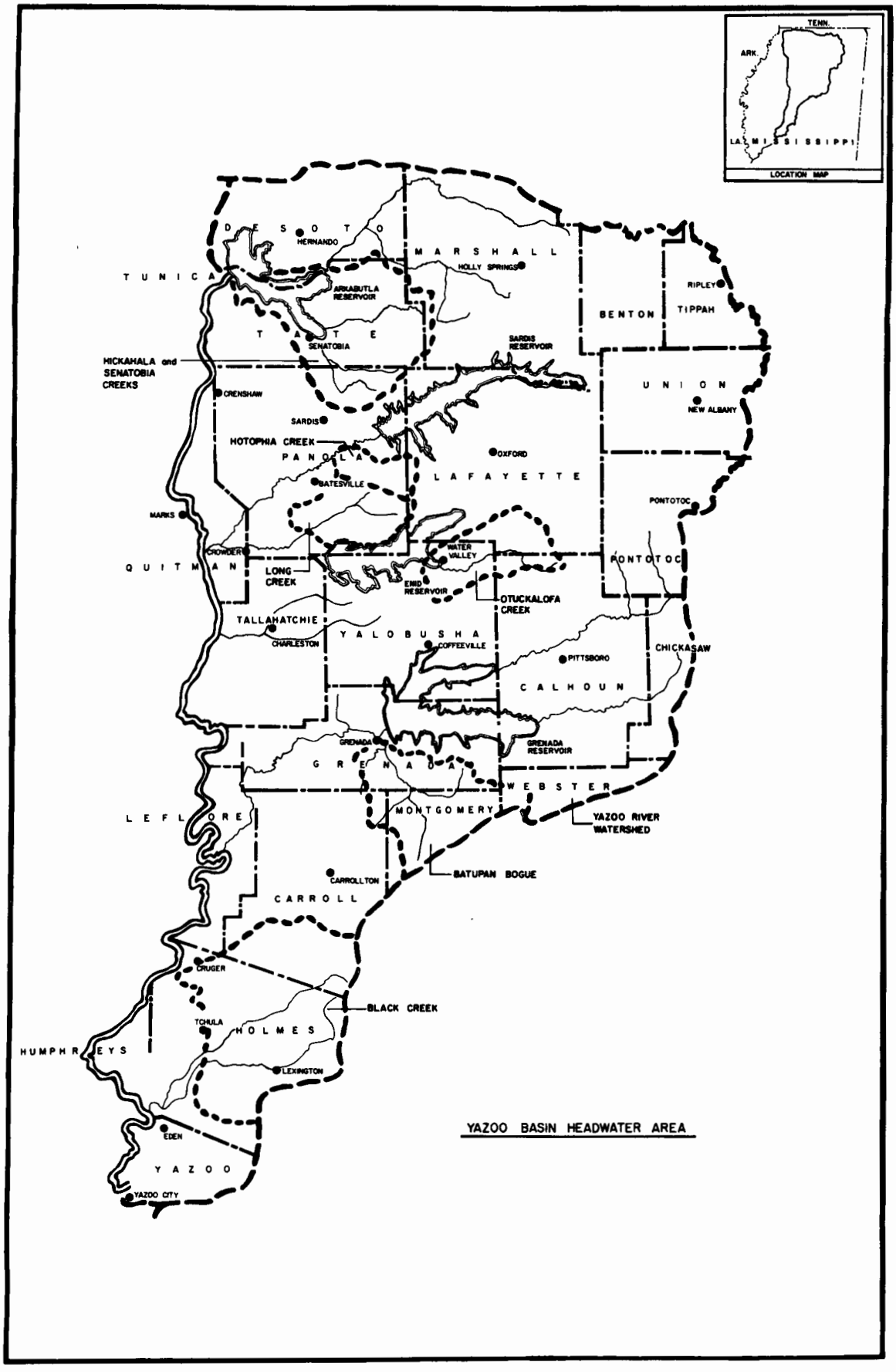

Figure 1. Map of Yazoo Basin headwaters with Demonstration Erosion Control (DEC) watersheds enumerated.

FISHERIES POTENTIAL OF PERMANENT MAN-MADE POOLS BELOW GRADE CONTROL STRUCTURES IN HIGH GRADIENT STREAMS[1]

C. M. COOPER and S. S. KNIGHT[2]

ABSTRACT

The use of grade control structures to prevent channel erosion from head cutting is becoming a common management tool in high gradient streams. To investigate the potential fisheries benefits of drop structure pools, rotenone sampling was conducted in four man-made pools below grade control structures as part of the Demonstration Erosion Control Project (DEC) in the Yazoo Basin. These pools were compared to four naturally occurring scour holes in the same watersheds. Although small, the permanent pools have excellent year-round dissolved oxygen levels, firm sides and bottoms which provide substrate for food organisms and tend to have a greater and more stable average depth than natural pools or stream channels. Productivity values were 338 kg/ha for natural pools with 106.7 kg/ha harvestable size fish and 746 kg/ha for man-made pools with 321.7 kg/ha harvestable. Harvestable size fish composed 31.6% of total weight for natural pools and 43.1% for man-made pools. By weight, largemouth and spotted bass composed 8.3% of the catch in natural pools and 16% in man-made pools. While small man-made pools will not support heavy sports fishing pressure, they have advantages over many natural pools in fishery characteristics and offer protection from stream degradation while providing habitat diversity.

INTRODUCTION

During the past 50 years channel degradation by headcutting has been documented in many streams in the upper Yazoo Basin because of steep channel gradients and alluvial channel beds. Higher order stream gradients may be measured in cm/km while gradients in smaller tributaries increase to m/km as streams cut through unconsolidated to weakly consolidated loess into underlying sands and gravels. Head cutting can be prevented by a series of grade control structures placed at strategic points along the length of these streams. Since drop structures alone tend to fail from water scoured holes immediately downstream, structure design includes riprap lined stilling basins and energy dissipating baffle piers (Little and Daniel, 1982: Little and Murphey, 1982).

Although designed to prevent channel degradation, secondary benefits may be derived from these structures in the forms of improvements in the fisheries associated with these high gradient

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[1]Contribution of the USDA Sedimentation Laboratory, Agricultural Research Service, U. S. Department of Agriculture, Oxford, MS.

[2]Ecologist and Ecologist (Post-Doctorate)

streams. Nineteen percent of all warmwater fishing in fresh water occurs in streams and rivers, thus emphasizing the importance of streams as a fisheries resource and the need to develop management practices for wise use of this resource (Stroud 1981). Since numerous grade control structures have been constructed or planned in six demonstration watersheds that will be used to develop a systematic and universally applicable land and water treatment program (Demonstration Erosion Control Project of the Yazoo Basin - DEC), we investigated fisheries potential of grade control structure pools on Tillatoba and Long creeks in light of the need to develop additional fisheries resources. Specifically, our goal was to compare the fisheries characteristics of natural scour holes with man-made pools below grade control structures.

MATERIALS AND METHODS

Rotenone sampling was conducted on four grade control stilling basins and four naturally occurring pools on Long and the North Fork of Tillatoba creeks in Panola and Tallahatchie counties in north Mississippi during the summer and fall of 1985. Surface area of the pools ranged from 13 to 950 m^2 with a total volume of 1074 m^3 for natural pools and 1329 m^3 for man-made pools. Bottom substrate of the natural pools was typically sand on clay although occasionally some gravel was present. The bottom of the stilling basins consisted of rock riprap partially covered by sand and gravel. Sides of the natural pools were steep and consisted of sandy clay to clay. Sides of the man-made pools were covered in rock riprap.

Each sampling site was blocked off by 3 mm mesh seines. Block nets were placed below all sites and above those sites where fish could move upstream. Rotenone was initially dispensed in a large enough quantity to obtain a concentration of 1 to 2 mg/L throughout each pool. Additional rotenone was dispensed from a backpack sprayer to compensate for rotenone displaced by flowing water. Potassium permanganate crystals were placed in cloth bags and anchored to a rope stretched across the creek downstream of each pool to neutralize outflowing rotenone. Collections were started as soon as fish began to surface and continued until fish could no longer be found on the surface or shallow bottom. All fish were weighed and measured on site or preserved in 10% formalin and later transferred to 70% ethanol. Scales were removed from some species for age determination.

RESULTS AND DISCUSSION

Man-made pools produced 76 kg of fish compared with 62 kg of fish from natural pools (Table 1). On a per volume basis, however, man-made and natural pools had equal total production. Natural pools contained 11 kg of fish typically characterized as predatory and 51 kg of fish usually classified as prey species. Man-made pools produced 12 additional kilograms of predatory fish and 1 kilogram of prey fish more

than natural pools. Of the total weight of fish from natural and man-made pools, 20 kg from natural scour holes and 33 kg from man-made pools were considered to be fish of harvestable size. On a per volume basis of harvestable fish, natural pools produced 0.001 kg/m^3 compared with 0.025 kg/m^3 for man-made pools.

Table 1. Total Weights of fish collected by rotenone sampling of natural and man-made pools.

	NATURAL POOLS	MAN-MADE POOLS
Total Weight (kg)	61.9	75.8
Predator Weight (kg)	10.6	23.3
Prey Weight (kg)	51.3	52.4
Harvestable Weight (kg)	19.5	32.7
Volume (m^3)	1074	1329
Total weight/volume (kg/m^3)	0.06	0.06
Harvestable weight/volume (kg/m^3)	0.001	0.025

Channel catfish and carpsucker made up the greatest proportion of catch by weight from both pool types (Figure 1). Other dominant groups in natural pools were bullheads (7.1%), sunfish (7.1%) and spotted bass (5.4%). In man-made pools the other dominant groups were bullheads (10.9%), largemouth bass (9.9%) sunfish (8.2%) and gizzard shad (8.2%). Carp and spotted bass acoounted for 7.6% and 6.1% of the catch from man-made pools.

The percent by weight of the total catch (E value) indicated that bluegill accounted for a greater proportion of the catch in man-made pools than in natural pools. Largemouth bass, spotted bass and blue gill, the most common "game" species, produced E values of 2.9, 5.4 and 1.3, respectively, for natural pools and E values of 9.8, 6.0, and 2.4 for man-made pools. The weight of three predominant species accounted for 9.6% and 18.3% for natural and man-made pool, respectively. The ratio of forage to carnivorous fish (F/C) was 4.83 for natural pools and 2.24 for man-made pools. Both of these values are within the F/C ratio range for balanced lakes (1.5 to 10); however, the F/C ratio for man-made pools indicated a slight predator crowding (Swingle 1950). Another common index of stock condition is the A_t value or total weight of harvestable fish expressed as a percentage of the total

catch. This value was 31.6% for natural pools and 43.1% for artificial pools. An A_t value between 33% and 90% is acceptable for successful fishing (Swingle 1950). Proportional stock density (PSD), the proportion of quality size fish in a population, is a good indicator of fishing quality. The PSD range required for sustained quality fishing is 45% to 65%. PSD's for spotted bass was 50% for natural pools and 64% for man-made pools. The 64% for man-made pools also indicated a large standing stock of fish available for harvest (Anderson and Gutreuter 1983).

SUMMARY

Man-made pools below grade control structures were similar to naturally occurring scour holes in terms of total number and weight of fish as well as weight per volume. However, more "game" species and a larger percentage of harvestable size fish were found in man-made pools. Since pool habitat has the highest quality of fishing in low order warmwater streams, man-made pools provide an additional fisheries resource. Measures designed to manage stream hydrologic problems do not always produce beneficial effects on fish and wildlife. The use of grade control structures offer some exciting prospects to stream managers in terms of enhancing existing game fish stocks and at the same time controlling stream channel degradation.

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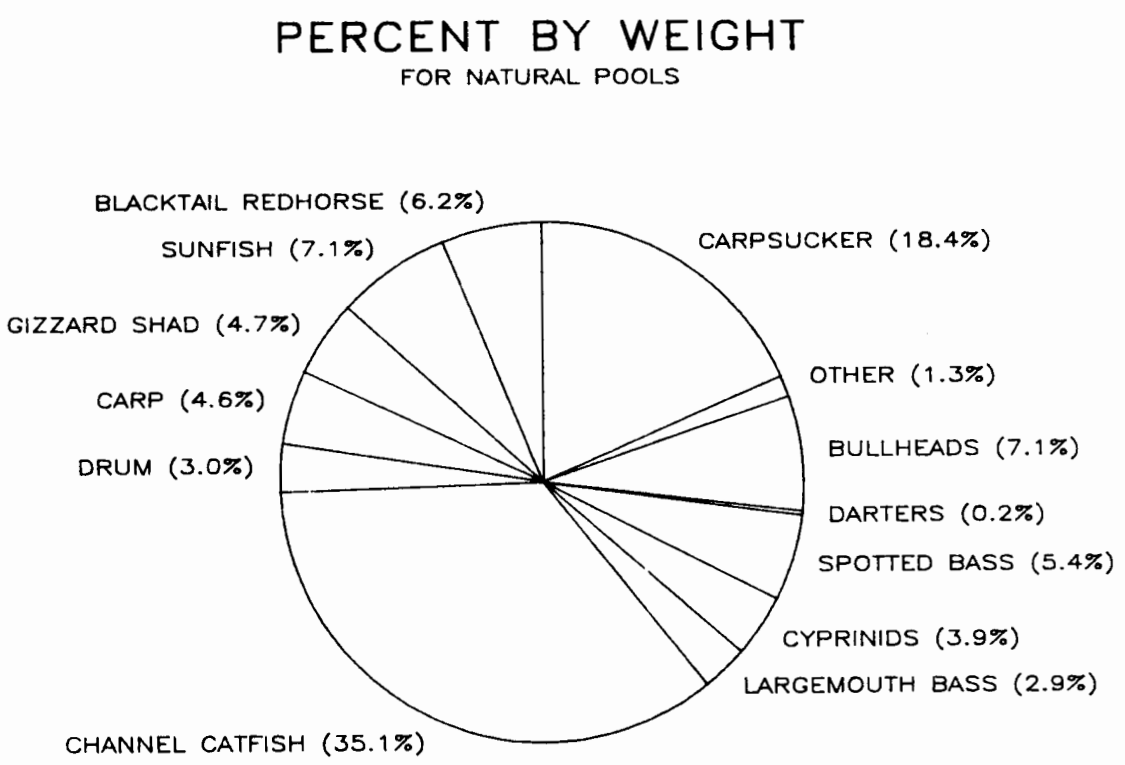

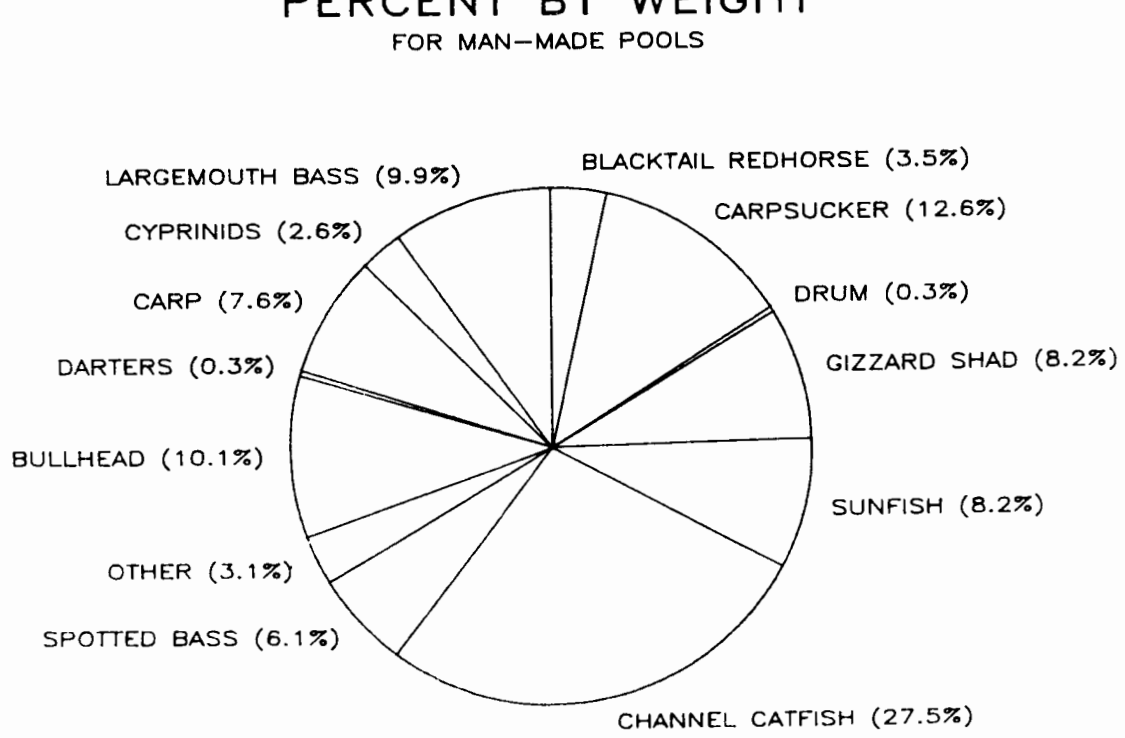

Figure 1. Percent by weight of fish for natural and man-made pools.