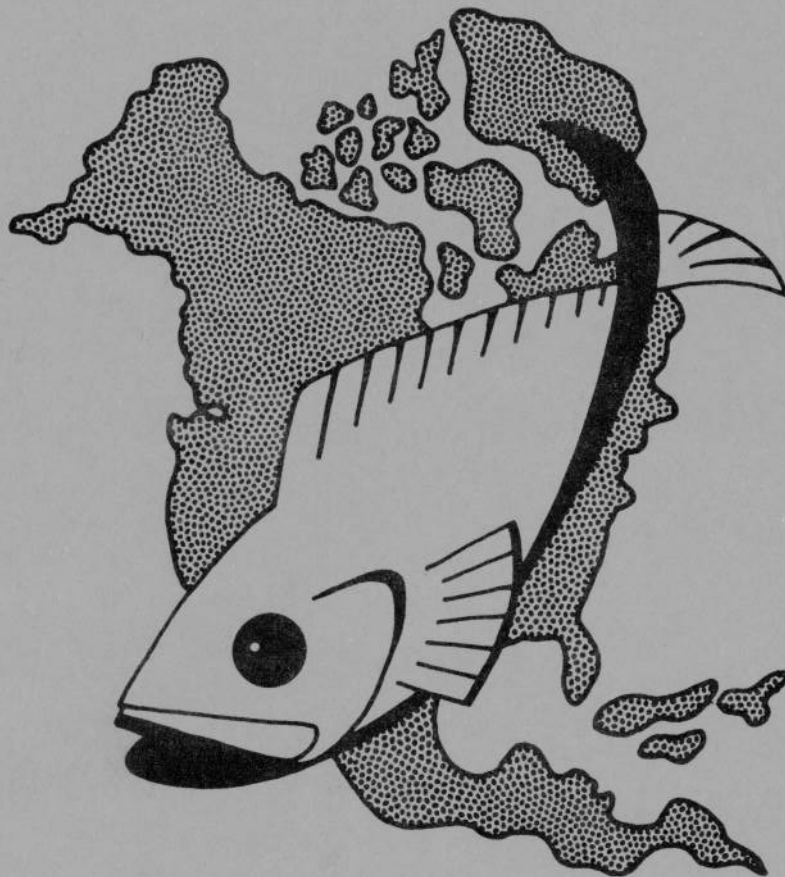


ANNUAL PROCEEDINGS  
of the  
TEXAS CHAPTER  
**AMERICAN FISHERIES SOCIETY**



SCHREINER COLLEGE  
KERRVILLE, TEXAS  
SEPTEMBER 25-26, 1987

VOLUME 10

KURZAWSKI

TEXAS CHAPTER  
OF THE  
AMERICAN FISHERIES SOCIETY

The Texas Chapter of the American Fisheries Society was organized in 1975. Its objectives are those of the parent Society — conservation, development and wise utilization of recreational and commercial fisheries, promotion of all branches of fisheries science and practice, and exchange and dissemination of knowledge about fish, fisheries and related subjects. A principal goal is to encourage the exchange of information by members of the Society residing within the State of Texas. The Chapter holds at least one meeting annually at a time and place designated by the Executive Committee.

MEMBERSHIP

Persons interested in the Texas Chapter and its objectives are eligible for membership and should apply to the Secretary-Treasurer, Gene McCarty at 24 Winn Wood, Wimberly, Texas 78676. Annual membership dues are \$8 for Active Members and \$5 for Student Members.

ANNUAL PROCEEDINGS OF THE TEXAS CHAPTER  
AMERICAN FISHERIES SOCIETY

September 25 and 26, 1987

Schreiner College  
Kerrville, Texas

1987-88 Officers

Richard Luebke, President  
Texas Parks and Wildlife Department

E.A. McCune, President Elect  
Lake Management Services, Inc.

Gene McCarty, Secretary-Treasurer  
Texas Parks and Wildlife Department

Editorial Committee: Ken Kurzawski, Chairman  
Alan Rudd  
David Terre

1988

## TABLE OF CONTENTS

	<u>Page</u>
Contributors . . . . .	iii
1987 Texas Chapter Awards . . . . .	v
Abstracts of Presentations Made During Panel Discussion on Pond Management for Recreational Fishing	
Developing Appropriate Harvest Strategies for Warmwater Fish Populations in the Southeastern United States — Dr. William Davies . . . . .	1
Use of Fertilization and Supplemental Feeding in Ponds — Charles R. Inman . . . . .	2
A Catch and Release Case History of Red River Farm and Duck Club — Wray Lawley and Ed Schulle . . . . .	3
Producing Trophy Bass in Small Impoundments — Joe Lock . . . . .	4
Managing a Largemouth Bass Fee Fishery — Brett Rowley . . . . .	5
Panel Discussion Question and Answer Session . . . . .	6
Abstracts of Papers Presented at the Annual Meeting but not submitted for Publication:	
Cormorant Depredations in Texas — James T. Davis and E.A. McCune . . . . .	11
Stress-mortality Differences Between Extensively and Intensively Reared Largemouth Bass — J. Holt Williamson and Gary J. Carmichael . . . . .	12
Fish White Muscle Parvalbumin Proteins — Donald H. Whitmore . . . . .	13
A Method for Harvesting Large Quantities of Zooplankton from Hatchery Ponds — Kerry G. Graves and Jacob C. Morrow . . . . .	14
Catch-and release Mortality of White and Black Crappie in Texas — W. Michael Childress . . . . .	15
Interactions of an Introduced Cichlid with the Native Fauna of the Lower Rio Grande, Texas and Mexico — Robert J. Edwards . . . . .	16
Hormonal Sex Control in Largemouth Bass — Gary P. Garrett . . . . .	17
Seasonal Variation in Condition Factors and Plasma Chemistry of Hatchery-reared Largemouth Bass — Gary J. Carmichael . . . . .	18

Relative Weight (Wr) Development and Application for Red Drum — David J. Lee, Jane M. Boslet, and Brian R. Murphy . . . . .	19
Technical Papers Presented at the Annual Meeting for Publication: Effect of Reduced Bag Limits on Sport Shrimp Trawl License Sales — Kyle W. Spiller . . . . .	20
Texas Chapter Awards Criteria . . . . .	28
Acknowledgements . . . . .	29

## CONTRIBUTORS

The following companies made contributions to the Texas Chapter, American Fisheries Society in 1987:

### CONTRIBUTORS

### PRODUCT OR SERVICE

BASS RESEARCH FOUNDATION  
Lake Texoma Chapter  
P.O. Box 537  
Denison, Texas 75020

Nonprofit conservation organization

BERKLEY AND COMPANY  
1 Berkley Drive  
Spirit Lake, Iowa 51360  
1-800-237-5539

Fishing tackle

DON BOHNE  
Laguna Park, Texas 76634  
817-622-8416

Guided fishing trips on Lake Whitney for striped bass

BOMBER BAIT COMPANY  
326 Lindsay  
Gainesville, Texas 76240  
817-665-5505

Fishing tackle

HOWARD BROWN  
110 South Kossuth  
Rockport, Texas  
512-729-2605

Guided fishing trips on Aransas Bay for red drum and spotted seatrout

GULF COAST CONSERVATION ASSOCIATION  
Randy Bright  
4801 Woodway — Suite 220W  
Houston, Texas 77056

Nonprofit conservation organization

MURRAY HATFIELD  
Route 2  
Pottsboro, Texas 75076  
214-786-4064

Guided fishing trips on Lake Texoma for striped bass

HILL COUNTRY BUDWEISER  
Bill Lange  
510 Highway 27 East  
Ingram, Texas 78025

Beverage distributor

HOOKER GUIDE SERVICE  
Dale Church  
P.O. Box 595  
Gordonville, Texas 76245  
214-523-4369

Guided fishing trips on Lake Texoma for striped bass

CONTRIBUTORS

JUNGLE LABS CORPORATION  
Tony Gergely, Vice President  
Cibolo, Texas 78108-0603  
512-658-3505

PRODUCT OR SERVICE

Chemical products for  
angling and fish culture

LAKE MANAGEMENT SERVICES INC.  
E.A. McCune  
P.O. Box 923 management  
Richmond, Texas 77469  
713-342-6018

Lake and pond design  
construction, and

LAKES OF DANBURY  
Ken Zwahr  
P.O. Box 528  
Danbury, Texas 77534  
409-922-8414

Largemouth bass fee  
fishing and fish farming

BILL MANUEL AND BILLY ROBINSON  
3902 Billy Sames  
Adkins, Texas 78101  
512-649-1765/633-3833

Guided fishing trips on  
Lakes Braunig and  
Calaveras for red drum  
and hybrid striped bass

TACKLE BOX  
Jim and Barbara Dunkle  
Route 2, Box 258 C-4  
Pottsboro, Texas 75076

Fishing tackle

WILDLIFE SUPPLY COMPANY  
301 Cass Street  
Saginaw, Michigan 48602  
517-799-8100

Instruments and aquatic  
sampling supplies

DON WOOTEN  
P.O. Box 1138  
Whitney, Texas 76692  
817-694-3390

Guided fishing trips on  
Lake Whitney for striped  
bass

In addition, a personal contribution was made by the following individual:

ROBERT NITSCH  
Route 1, Box 159  
Ballinger, Texas 76821

## 1987 TEXAS CHAPTER AWARDS

### Special Recognition in Fisheries Work

The recipient in the Special Recognition Category was:

The Sportsmen's Club of Texas (SCOT)

SCOT is a 31-year old organization with 78 affiliated clubs and over 30,000 members. It is an aggressive educational and conservation-oriented organization promoting an appreciation of fishing and fisheries resources and habitat. SCOT's principle goals range from actively educating the public on fisheries and habitat management and conservation matters to monitoring and developing policies and legislation that impact fisheries. They are involved in hearings and litigation on issues of major environmental concern to the fishing public, fisheries managers, and fish. Mr. Alan Allen, SCOT's Executive Director, accepted the award on behalf of the organization.

### Outstanding Fisheries Worker of the Year

The recipient in the Culture Category was:

Mr. Kerry G. Graves  
U.S. Fish and Wildlife Service  
San Marcos National Fish Hatchery and Technology Center  
San Marcos, Texas

Kerry Graves is a native of Lamesa. He received his BS in Aquatic Biology in 1981 from Tarleton State University. Kerry then attended Southwest Texas State University graduating with an MS in Aquatic Biology in 1985. Kerry worked his way through graduate school as a temporary fish hatchery worker at the San Marcos National Fish Hatchery until he was hired as a Fisheries Biologist in 1985. He quickly assumed the duties of Hatchery Foreman with an increasing responsibility in research. The Texas Chapter presented this award for his outstanding efforts in the past year in the development of zooplankton production, sampling, collecting, and harvesting methods that have improved larval fish production and facilitated research.

### Outstanding Presentation

The outstanding presentation was:

A Method for Harvesting Large Quantities of Zooplankton from Hatchery Ponds — Kerry G. Graves and Jacob C. Morrow, San Marcos National Fish Hatchery and Technology Center, San Marcos, Texas.

1987 AWARDS (continued)

Jacob Morrow is a native of the Jacksboro area. He began his career at the Fort Worth National Fish Hatchery (NFH), later transferring to Mescalero NFH in New Mexico. He later worked at the Attwater Prairie Chicken National Wildlife Refuge near Eagle Lake. His contributions to fish culture and research rely on a skillful synthesis of knowledge in a variety of fields including engineering, electronics, athletics, physics, politics, and philosophy.

DEVELOPING APPROPRIATE HARVEST STRATEGIES  
FOR WARMWATER FISH POPULATIONS IN  
SOUTHEASTERN UNITED STATES

by

W.D. Davies  
Department of Fisheries and Allied Aquacultures  
Auburn University, AL 36849

ABSTRACT

Factors affecting recruitment of principle predator-prey species were identified through sampling 187 farm ponds over a 10-year period, and related to fish production. Populations capable of sustaining yields of harvestable-size fish could be characterized by two variables, fertility of the system, and size structure of the predator species. Those populations falling out of the optimum range were being influenced by competing species limiting predator recruitment, or by excessive recruitment of either predator or prey species. A conceptual model emphasizing the effects of interspecific competitions and fertility levels on recruitment was developed and tested. Veritable shifts in the structure of populations under regulated harvest regimes were often noted in 2-3 years.

USE OF FERTILIZER AND SUPPLEMENTAL  
FEEDING IN PONDS

by

Charles R. Inman  
Texas Parks and Wildlife Department  
Tyler, Texas

ABSTRACT

Liquid fertilizer was more advantageous than granular fertilizer in the production of phytoplankton blooms in large ponds and lakes because of ease of application, solubility of phosphate, dispersion, control of submerged macrophytes, and lower cost. Liquid fertilizer (10-34-0) was first applied in spring after water temperature reached 60 F at a rate of 1.0 gallon per surface acre. Subsequent applications using 0.25 to 1.0 gallon per acre were made at two weeks intervals throughout the growing season to maintain a phytoplankton bloom and reduce Secchi disk visibility below 30 inches.

Installation of automatic fish feeders on fishing piers in small impoundments resulted in positive benefits to angling in the impoundments. Benefits included: increased harvest for several sport fishes including catfish, sunfish, crappie, and bass; increased growth of sport fishes, especially catfish and sunfish; improved physical condition of brood fish that aided forage and sport fish production; and attraction of large schools of threadfin shad to areas near feeders.

A CATCH AND RELEASE CASE HISTORY  
OF RED RIVER FARM AND DUCK CLUB

by

Wray Lawley  
Red River Farm & Duck Club  
6403 Cove Creek  
Dallas, Texas 75240

and

Ed Schwille  
Soil Conservation Service  
808B West Moore Avenue  
Terrell, Texas 75160

ABSTRACT

Members of the Red River Farm and Duck Club were dissatisfied with the quality of largemouth bass angling. Only small largemouth bass were being caught. Steps taken to improve angling were improvement of water quality, increasing the forage base by development of two, 0.5-acre pond to raise bluegill, fathead minnows, and threadfin shad, and implementation of harvest restrictions for largemouth bass and sunfish. The restrictions were removal of largemouth bass less than 14 inches and sunfish over 6 inches and releasing all bass over 14 inches. During the first year (1983), 2,600 largemouth bass were harvested and 130 were released. Average length was 9.3 inches and 0.4 pounds. In 1986, 1,883 largemouth bass were caught and 619 released, Average size improved to 13.0 inches and 1.1 pounds. The largest bass released in 1986 weighed over 9 pounds, and numerous bass over 3 pounds were caught. The maintenance of catch records has been essential to verify the success of the program and will allow future adjustments to be made as needed.

## PRODUCING TROPHY BASS IN SMALL IMPOUNDMENTS

by

Joe Lock  
Texas Agricultural Extension Service  
Overton, Texas

### ABSTRACT

Acceptable food in sufficient quantity must be available for maximum growth of female largemouth bass Micropterus salmoides with the genetic potential to reach trophy size. Catch-and-release of big bass combined with removal of small bass has been effective, but production of trophy bass is accelerated by stocking Florida largemouth bass and additional forage. Bluegill Lepomis macrochirus, shad Dorosoma spp., and golden shiners Notemigonus crysoleucas provide excellent forage but should be supplemented with tilapia Tilapia spp. if maximum production is desired. Forage and bass production can be increased by supplemental feeding.

## MANAGING A LARGEMOUTH BASS FEE FISHERY

by

Brett Rowley  
Danbury Fish Farms  
P.O. Box 528  
Danbury, Texas 77534

### ABSTRACT

The Lakes of Danbury is a sport fishing facility consisting of seven reservoirs ranging in size from 20-120 acres. The primary goal of this facility is to provide superior sportfishing for largemouth bass Micropterus salmoides. Some reservoirs are managed for high catch rates, while others are managed for fast growth of bass. Management techniques similar to those used for aquaculture are employed. These include fertilization, feeding, water level manipulations, and periodic harvest of the entire system. Forage fish are produced both in the fishing lakes and in production ponds at Danbury Fish Farms. A wide variety of forage fishes are used including traditional and non-traditional species. Of these fishes, the Tilapia spp. are the most important. Complete control over the size distribution and density of bass, as well as their food supply in each reservoir, is a key factor in the successful management of this fishery. Increased governmental regulations may hinder further development of this type of sport fishery.

POND MANAGEMENT FOR RECREATIONAL FISHING  
PANEL DISCUSSION  
QUESTION AND ANSWER SESSION

Q: DO THREADFIN SHAD COMPETE WITH SUNFISH IN A SIMILAR MANNER AS GIZZARD SHAD? IF SO, IS THEIR DETRIMENTAL EFFECT SUFFICIENT TO COUNTERACT THEIR ADVANTAGES AS BASS AND CRAPPIE FORAGE?

A: (DAVIES) Threadfin shad die when water temperatures get low whereas gizzard shad do not. I'm not going to subject my bass populations to that boom and bust sequence. Threadfin act like gizzard shad in that they do filter out the larger zooplankton, and they do compete essentially the same way with bluegill. Threadfin shad will occupy a significant portion of the standing crop usually occupied by bluegill and we know this by simply stocking them and draining. They will completely destroy the size structure of a bluegill population thereby thwarting any significant bass recruitment in a fertile system. I have recommended stocking threadfin shad in infertile systems. Some of the mainstream reservoirs coming on line in Alabama that do not have shad are not supporting more than 90 kg/hectare of fish because of their infertility. Gizzard or threadfin shad under those conditions will never occupy more than 10% of the standing crop. The crappie populations of those reservoirs that have been stocked with shad seem to benefit. We have noticed increased growth of crappies in terms of moving a year class up one year sooner than they normally would have reached harvestable size.

Q: IN DOLLARS AND CENTS WHAT IS A 10 LB. BASS WORTH?

A: (ROWLEY) That would depend entirely upon whether I'm buying or selling! Basically a person coming to the Lakes of Danbury for a trophy trip will pay approximately \$1000 to catch a large bass. Therefore I would say that a 10 lb. bass is worth on the order of \$50-100 per pound.

Q: WHAT IS YOUR BLUEGILL POPULATION LIKE AT RED RIVER FARM AND DUCK CLUB? HOW HAVE YOUR CATCH RATES CHANGED AND DO YOU HAVE PLANS TO ALTER YOUR SIZE LIMITS IN THE FUTURE?

A: (LAWLEY) I really don't have any idea, being an amateur, how our bluegill fishery is doing except that we've added bluegill and we watch for them around the edge. I don't think we're over-populated. As far as the second question, we started taking out larger fish in certain length ranges. We felt we had a heavy population of bass in the 16 inch range so in one of the fishing tournaments we kept lots of fish of that size. We will have to address the problem of changing the slot as we get more trophy fish. The only time our catch rate has changed has been this summer. One of the remarkable things about our lake during the last 3 years is that our catch rates have remained strong even during summer

months. This summer our lake has been 4 feet lower than normal due to extreme heat and lack of rainfall. I think that because of the reduced surface acreage or decreased oxygen they weren't biting as well. Since the weather has cooled they are biting better.

Q: WITH THE EVER-INCREASING POPULARITY OF FLORIDA LARGEMOUTH BASS AND TROPHY FISHING, HAVE YOU NOTED ANY DECLINE IN INTEREST IN BLUEGILL OR OTHER SUNFISH?

A: (INMAN) No. Though workers have said that Florida bass are better predators for sunfish, I don't think that this has been measured as far as production is concerned.

Q: DO YOU HAVE ANY IDEA WHAT THE AGE AND NATURAL MORTALITY IS OF A TRULY TROPHY BASS (> 10 LBS.)?

A: (LOCKE) No. We're trying to do research upon the question of how long it takes to produce trophy bass. We're guessing in the range of 3-4 years minimum.

Q: COULD YOU SPECULATE ON WHY WEATHER EVENTS SHIFT THE BALANCE?

A: (DAVIES) That's of real interest to me because I think we understand the population dynamics in any one year well enough to make an appropriate strategy. Since I started at Auburn in 1970 we have had very good water level records, along with all of the information that you can get from the weather bureau. It appears that water quality is very important especially in these intensively fertilized ponds. In any one year you can have an extended period of time when half the light that normally falls on the earth is reduced because of cloudy weather. We can get that much variation in terms of Langley units, and when that happens we have a whole summer of poor water quality. These ponds stratify at 2-3 feet. If you have 2 days of cloudy weather the water quality deteriorates and the fish don't feed. It takes them a long time to recover from the oxygen stress, and the ill effects last longer than you might suspect. I think that a summer with lots of cloud cover depresses reproduction of bluegill. This has an adverse effect on bass recruitment to age 1 because they don't grow well and don't survive the winter months as well when they are small.

Q: WHAT PERCENTAGE OF PONDS IN ALABAMA ARE FERTILIZED?

A: (DAVIES) Good question. We just tried to determine that by having the county agents do some random surveys of ponds in their district. With the advent of liquid fertilizer there has been a 40% increase in pond fertilization. This is attributed to liquid fertilizer being easier to obtain and distribute,

as well as its increased effectiveness at soliciting a bloom. Overall about 50% of the ponds in Alabama are fertilized and being intensively managed right now. There is a real opportunity to make people aware of the potential benefits of an intensive management program.

Q: WHAT CONTROL METHOD IS BEING USED FOR VEGETATION IN ALABAMA?

A: (DAVIES) Well, I wouldn't live in a state where I couldn't use grass carp. (Applause).

Q: WHAT IS THE STANDING CROP OF BASS IN THE LAKES OF DANBURY?

A: (ROWLEY) I mentioned 2 types of lakes. In a growth lake the standing crop will be from 20-40 pounds of bass per acre. This is a low standing crop compared to "maintenance" lakes where we are actively fishing. In these lakes standing crop will range as high as 200 pounds per acre. Most of these fish will be in the 2-4 pound range as this is the size range that people want to catch. We have found that when they get much bigger than 4 pounds they get harder to catch.

Q: WHAT ABOUT DISEASE PROBLEMS IN HIGH DENSITY LARGEMOUTH BASS SYSTEMS?

A: (ROWLEY) That's a hard question to answer. I wouldn't say that disease problems are non-existent, but that most of the disease is a direct result of the catch and release program. Once the fish has been handled and traumatized then disease has the opportunity to set-in. I don't think any disease that we have seen is the result of high densities of bass. The only thing that I have to compare it with is production ponds in which we are culturing bass fingerlings. These ponds have a much higher density of bass than our fishing lakes and we've seen no disease problems other than those related to handling stress.

Q: HOW MANY ACRES WILL A FEEDER SUFFICIENTLY HANDLE?

A: (INMAN) I'd be guessing but I'd shoot for one feeder per 10 acres where possible.

Q: WHEN YOU RECOMMEND SELECTIVE ROTENONE OF GIZZARD SHAD IN A HIGH FERTILITY LOW BASS RECRUITMENT POND WHAT TIME OF YEAR DO YOU DO IT AND WHY?

A: (DAVIES) Normally in winter because rotenone won't detoxify as fast. You have to put it out evenly so there are no "hot spots". When you do this you'll kill a tremendous number of shad and the stench

is not as bad in winter. We use rotenone often for population manipulation. For example when we have a high bass density we'll rotenone in spring using 1 ppm to thin out the bass. A good rule of thumb is that if you divide by four the quantity of rotenone required to toxify the whole lake and put it along one side, you can develop a much better structure of the prey population (mainly bluegill) in these high density bass populations. You can do the same thing with .10 ppm of rotenone with gizzard shad. A low density high fertility system with gizzard shad has some real benefits if you can get some recruitment not every year, but every third year. So maybe you don't want to kill the entire shad population. We have eliminated the shad from two public reservoirs (130 and 180 acres in size) without killing very many other fish. In some cases we tried to create a void in the shad population during winter. The bass and bluegill sense that void and try to fill it along with the shad the following spring. This creates a surge of bass recruitment that will carry you 2-3 years. You do that every 2-3 years and as the shad build-up they control unwanted bass reproduction so that you can develop a trophy bass fishery or one in which maximizing the harvest is not the objective. It's like having a giant fine-tuning knob on the base of the dam. Given a liberal amount of ingenuity and some understanding of the dynamics involved, you can do anything that you want.

Q: DISCUSS THE PROS AND CONS OF BREEM AS FORAGE FISH.

A: (LOCKE) I think in most situations where we have an overpopulation of sunfish it is because of over-harvest of largemouth bass. If we initiate a catch and release system for bass where the smaller bass are kept and all those greater than 12-14 inches are released, then over-harvest is avoided and bluegill will not overpopulate.

Q: WHEN YOU SAY CATCH AND RELEASE DO YOU MEAN HOLD AND RELEASE OR IMMEDIATE RELEASE? DO YOU FEEL YOUR SYSTEM AT LAKES OF DANBURY WOULD WORK IF ANGLERS HELD FISH IN LIVE WELLS AND RELEASED ALL BASS LATER AS IN A TOURNAMENT SETTING?

A: (ROWLEY) That's opening a can of worms! We almost always use immediate release. In the event that we are transferring fish we hold them in live wells for a short period then transfer them. I feel that the type of handling that the fish get at bass tournaments results in large scale mortality of released bass. We need a better system of measuring our catch in fishing tournaments other than holding the fish in live wells for hours, putting them in plastic bags, then throwing them in laundry baskets to be weighed before releasing. I don't believe fish treated in this manner will live longer than 2-3 weeks based upon our experience at Danbury. I think that in order to assure that catch and release bass will survive, we have to use the practice of releasing them alive and in good shape rather than merely alive as determined by whether or not their gill covers are still quivering.

Q: DOES STRUCTURE INCREASE THE BASS POPULATION OR JUST CONCENTRATE IT?

A: (INMAN) I think everyone knows that it will concentrate the fish. I believe that it leads to reduction of bass populations by increasing the harvest. As for increasing the overall population of bass then it depends upon what kind of structure you are asking about. If you are talking about vegetation then I would have to say yes.

Q: DO YOU NEED AS MUCH FERTILIZER WHEN A FEEDING PROGRAM IS USED?

A: (INMAN) Let me point out again concerning feeders, that in almost all of the situations that I was referring to they were used as attractors not necessarily supplemental feed. The use of the food by the sunfish or other forage fish certainly helped their condition, but in most instances they were used as attractors for harvest.

## CORMORANT DEPREDATION IN TEXAS

by

Dr. James T. Davis  
Texas Agricultural Extension Service  
Texas A&M University  
College Station, Texas 77843

and

E.A. McCune  
Lake Management Services, Inc.  
P.O. Box 923  
Richmond, Texas 77469

### ABSTRACT

A survey of fish-rearing operations in Texas was initiated by the Fish Farmers of Texas, Incorporated in conjunction with the Texas Agricultural Extension Service to determine the amount of fish lost to cormorants, the time of year losses occurred, the number of cormorants involved, and the success of control measures. Forty-one of the 43 respondents reported losses to cormorants. Most of losses were attributed to the double-crested cormorant *Phalacrocorax auritus*. Among respondents who placed a value on their losses, the average loss was \$108 per acre. The highest reported loss (\$1,765 per acre) was for an operation that raised red drum *Sciaenops ocellata*. Most of the damage occurred during October through March. Flocks of cormorants ranged from 2-300 birds. Many of the respondents had been in aquaculture less than 3 years; therefore, long term trends in losses could not be determined. Three respondents that each had over 7 years experience indicated their losses had doubled over the last 3 years. Most control measures, either passive such as noise-making devices or active such as shooting, were only marginally effective. The survey highlighted the need for the development of more effective control measures and the need for research into methods for altering cormorant feeding and roosting habits.

STRESS-MORTALITY DIFFERENCES BETWEEN  
EXTENSIVELY AND INTENSIVELY  
REARED LARGEMOUTH BASS

by

J. Holt Williamson  
and  
Gary J. Carmichael  
National Fish Hatchery and Technology Center  
Route 1, Box 159-D  
San Marcos, Texas 78666

ABSTRACT

Stress due to confinement in a net caused higher mortalities in largemouth bass Micropterus salmoides that had been extensively-reared in ponds on zooplankton and other invertebrates than in those that were intensively-reared in raceways on pelleted feed. Fish that were intensively-reared weighed more than the fish that were reared in ponds, although both groups were sized with a bar-grader. Intensively-reared fish had 3 and 8% mortalities after 13 and 16 hour net-confinements, respectively, compared to 34 and 38% for those fish reared in ponds. Fish reared intensively may be better able to tolerate the stress of harvest, handling, and transportation than extensively-reared fish.

## FISH WHITE MUSCLE PARVALBUMIN PROTEINS

by

Donald H. Whitmore  
Department of Biology  
The University of Texas at Arlington  
Arlington, Texas 76019

### ABSTRACT

Parvalbumin is a class of protein characterized by its acidity, calcium-binding capacity and low molecular weight. It is found in considerable quantities in the white skeletal muscle of fishes and amphibians. Partially purified parvalbumins from a variety of fish species were analyzed. Data substantiate the utility of parvalbumins in species identification, fish hybridization studies and exploring phylogenetic relationships. Parvalbumins can be used to resolve routine fisheries management and enforcement problems.

A METHOD FOR HARVESTING LARGE QUANTITIES OF  
ZOOPLANKTON FROM HATCHERY PONDS

by

Kerry G. Graves

and

Jacob C. Morrow

National Fish Hatchery and Technology Center

Route 1, Box 159-D

San Marcos, Texas 78666

ABSTRACT

A method for harvesting live zooplankton with a propeller-lift pump was tested in nine, 0.1 acre, unfertilized hatchery ponds. Zooplankton collections made at night with a light suspended over the pump intake were more effective than collections made at night without the light or during the day. This method should be convenient and economical for collecting large quantities of live zooplankton from hatchery ponds.

CATCH-AND-RELEASE MORTALITY OF  
WHITE AND BLACK CRAPPIE IN TEXAS

by

W. Michael Childers  
Texas Parks and Wildlife Department  
Heart of the Hills Research Station  
Junction Star Route Box 62  
Ingram, Texas 78025

ABSTRACT

Catch-and-release experiments were conducted on white crappie Pomoxis annularis during May in 1986 and 1987 in hatchery ponds at Heart of the Hills Research Station, Texas, and on black crappie P. nigromaculatus during February and August 1987 at Lake Fork, Texas. At Heart of the Hills, white crappie were caught from one pond using rod and reel with minnows as bait, released into adjacent ponds, and held 18 days before draining ponds to determine mortality. At Lake Fork, black crappie were released into a vertical net enclosure and held for 15 to 18 hours. Forty-three percent mortality was observed in the white crappie pond experiments; log-linear analysis of the data indicated that mortality was significantly related to an interaction of year, length class (above or below 178 mm total length), and amount of handling prior to release (lip or body grasping). Mortality of Lake Fork black crappie in February was 77%, and in August only 19%. Log-linear analysis of Lake Fork data indicated that mortality was a significant function of the interaction of season and amount of handling (fin-clipped or unclipped), but was not significantly related to length class (less than 203 mm total length (TL), from 203 to 253 mm TL, and greater than 253 mm TL).

INTERACTIONS OF AN INTRODUCED CICHLID WITH THE  
NATIVE FAUNA OF THE LOWER RIO GRANDE,  
TEXAS AND MEXICO

by

Robert J. Edwards  
Pan American University  
Edinburg, Texas 78539

ABSTRACT

The blue tilapia *Tilapia aurea* was not recorded from the lower Rio Grande prior to the mid-1970's. Since that time the species has extensively colonized the lower river and has become one of the dominant members of the fish community, inhabiting nearly every aquatic habitat in the area. Studies conducted since 1980 show extensive overlap in habitat use, feeding habits and spawning territories between blue tilapia and native fishes. A severe winter cold period in late 1983 drastically reduced the blue tilapia population; however, the species rapidly rebounded and reestablished former levels of abundance. The success of the blue tilapia and the similarity of many of its life history characteristics to those of other dominant fishes suggest that such characteristics as generalized food habits, good colonizing ability and adaptability to often stressful environments are important factors in determining the species composition of the lower Rio Grande fish communities.

# HORMONAL SEX CONTROL IN LARGEMOUTH BASS

by

Gary P. Garrett  
Texas Parks and Wildlife Department  
Heart of the Hills Research Station  
Junction Star Route Boy 62  
Ingram, Texas 78025

## ABSTRACT

Experiments were conducted to determine the potential for controlling sex in largemouth bass Micropterus salmoides by administering steroid hormones (17-estradiol, estrone, 17-methyltestosterone and androsterone) to larvae through food. In one experiment, a commercial, pellet food was soaked in hormone (50 or 100 mg/kg). In a second experiment, other fish were fed live brine shrimp Artemia gracilis reared in culture media containing hormone (5 mg/L). Both methods were successful in masculinizing females, but only the live brine shrimp method was 100% successful in changing sex in either direction.

SEASONAL VARIATION IN CONDITION FACTORS AND PLASMA  
CHEMISTRY OF HATCHERY-REARED LARGEMOUTH BASS

by

Gary Carmichael  
National Fish Hatchery and Technology Center  
Route 1, Box 159-D  
San Marcos, Texas 78666

ABSTRACT

Physical and physiological factors that indicate reproductive condition, osmoregulatory state, and body condition vary throughout the year. Knowledge of this variation for important game species may be useful to fisheries managers and fish-culturists, for planning and monitoring purposes. The objective of this study was to describe such variation in hatchery-reared largemouth bass *Micropterus salmoides*, which often play an important role in state and private stocking programs for sport fishing and aquaculture. Largemouth bass were fed pelleted feed to satiation at least three times weekly for 13-months. Fish were sampled monthly. Relative gonad weight (Gr) ranged from 0.1 to 0.9 in male, and from 0.6 to 10.0 in female fish. Relative weight (Wr) ranged from 96 to 115 for all fish, throughout the year. Osmoregulatory indicators (plasma chloride and osmolality) varied from 90 meg/L to 115 meg/L (chloride) and from 273 mOsm/L to 311 mOsm/L (osmolality). Hematocrit ranged from 24.3 to 45.6%. Seasonal variations in health and condition factors were observed in largemouth bass. These variations should be recognized by fishery managers and fish-culturists when handling, stocking, and/or monitoring hatchery or wild populations.

RELATIVE WEIGHT ( $W_r$ ) DEVELOPMENT AND APPLICATION  
FOR RED DRUM

by

David J. Lee,  
Jane M. Boslet, and  
Brian R. Murphy  
Department of Wildlife and Fisheries Sciences  
Texas A&M University  
College Station, Texas 77843

ABSTRACT

Interpretation of Fulton-type condition factors (i.e.,  $K$  or  $C$ ) is complicated by their length-specific nature. The Relative Weight ( $W_r$ ) index was developed to solve this problem by standardizing index values across a large range of lengths. Relative Weight is calculated as

$$W_r = W / W_s \times 100$$

where  $W$  is the observed weight of a fish of a given length, and  $W_s$  is the length-specific Standard Weight for that species. Standard Weight relationships typically have been developed as a linear regression through the 75-percentile of observed weights over a range of lengths of fish from a large number of populations. We took a new approach to  $W_s$  development for red drum *Sciaenops ocellatus* where a 75-percentile regression relationship was calculated from weight-length regression formulas previously described in the literature for 12 populations of the species. The upper- and lower-range endpoints of each of the previously defined relationships were used to limit their contributions to  $W_s$  to only those samples which included a given range of fish sample lengths. The Standard Weight relationship for red drum was defined by this technique as

$$\log W_s = -3.858 + 2.265 (\log \text{Standard Length})$$

Application of this formula to previously published data produced very low  $W_r$  values for red drum in a cage-culture system.

## EFFECT OF REDUCED BAG LIMITS ON SPORT-SHRIMP TRAWL LICENSE SALES

by

Kyle W. Spiller  
Texas Parks and Wildlife Department  
Corpus Christi, Texas 78418

### ABSTRACT

Bag limits have been used by fisheries managers to minimize the potential for overharvest and indirectly reduce fishing pressure on selected species. Bag limits were reduced from 45.4 kg/boat to 6.8 kg/person/day for sport-shrimp trawl license holders in 1979. Computer records of sport-shrimp trawl licenses sold from 1960 to 1986 were examined to determine the effect of reduced bag limits on the number of licensed sport shrimpers. Sale of licenses increased 17% from 1960 (8,837) to 1979 (10,349). Sale of sport-shrimp trawl licenses decreased 60% by 1986 (4,147) after bag limits were reduced. Fishing pressure on shrimp stocks by this user group were reduced.

### INTRODUCTION

Shrimp *Penaeus* spp. are sought by both commercial and sport fishermen in Texas marine waters. Reported commercial landings are more than 37 million kg/year (Osburn et al. 1986). Sport shrimpers land about 0.4 million kg of shrimp/year for personal consumption and bait (King 1973).

Otter trawls, seines, cast nets, bait traps and push nets are used by sport shrimpers. However, because seines, cast nets, bait traps and push nets are not licensed the extent of their use is unknown.

Sport shrimpers using otter trawls have been licensed since 1960 and are restricted to using one otter trawl/boat. The trawl cannot exceed 6.1 m in width and doors can be no larger than 38 by 76 cm (State of Texas 1985). The mesh size must be smaller than five stretched meshes in 22.2 cm.

Catch limits (heads-on) for sport shrimpers are 1.8 "l"/person or 3.8 "l"/boat from bait bays and major bays throughout the year. In addition, 6.8 kg/person/day can be harvested in major bays during spring (15 May-15 Jul) and fall (15 Aug-15 Dec)(State of Texas 1985).

Most licensed sport shrimpers reside in coastal counties or adjacent inland counties and use boats 4.8 to 6.4 m in length (GMFMC 1981). Most of the effort by sport shrimpers is in the Galveston and Matagorda Bay systems (King 1973).

Fishing pressure on shrimp stocks has increased dramatically in recent years; the number of commercial shrimp boat licenses has doubled since 1964 (Texas Parks and Wildlife Department 1987). Bag limits have been used by fisheries managers to minimize overharvest and indirectly reduce fishing pressure on selected species (Lackey and Nielsen 1980). One indirect measure of the recreational fishing pressure on shrimp stocks is the number of sport-shrimp trawl licenses sold each year. In 1979, the Texas Legislature reduced bag limits 85% from 45.4 kg/boat to 6.8 kg/person/day for sport-shrimp trawl license holders. The objective of this paper is to determine the effect of reduced bag limits on the number of licensed sport shrimpers.

#### MATERIALS AND METHODS

Texas Parks and Wildlife Department (TPWD) computer records of sport-shrimp trawl licenses sold each fiscal year (1 Sept-31 Aug) from 1960 to 1986 were examined.

#### RESULTS AND DISCUSSION

The reduced bag limits in 1979 for sport-shrimp trawl license holders corresponds with a substantial decrease in license sales through 1986. Sale of sport-shrimp licenses increased 17% from 1960 (8,837) to 1979 (10,349), then decreased 60% to 4,147 by 1986 after bag limits were reduced in 1979 (Figure 1).

The reduction in the number of sport-shrimp trawl license holders reduced the legal fishing pressure on shrimp stocks from this user group. The bag limit reduction in 1979 may be a primary cause for the decrease in fishing pressure by sport shrimpers. The number of licensed sport fishermen has generally increased since 1979 (Figure 2 after Osburn and Ferguson 1987), but the number of sport shrimp trawlers has dramatically declined. The cost of the sport-shrimp trawl license does not seem to be a factor in reducing fishing pressure. The cost of the sport shrimp trawl license in 1977 was \$5 and was not increased until 1983-84 (\$10). The cost was again increased in 1985-86 (to \$15). The commercial landings have fluctuated from 1977 to 1986, and there has been no dramatic decline in the landings that would explain the reduced recreational fishing pressure on shrimp (Osburn et al. 1986).

One study has assessed the effects of size limits on marine fisheries management regulations (Meador and Green 1986). However, no studies were found that assessed the effect of bag limits on license sales in marine waters.

## ACKNOWLEDGEMENTS

I wish to express my appreciation to Hal Osburn for his help in preparing this paper. I would also like to thank Lynn Benefield, Larry McEachron, Gary Saul, Terry Cody, C.E. Bryan and Tom Heffernan for their review of the paper.

#### LITERATURE CITED

- Gulf of Mexico Fisheries Management Council (GMFMC). 1981. Draft update of fishery management plan for shrimp Gulf of Mexico. United States Department of Commerce, National Oceanic and Atmospheric Association, National Marine Fisheries Service.
- King, B. D. 1973. Harvest of shrimp by Texas sport fishermen. Coastal Fisheries Project Reports 1973. Texas Parks and Wildlife Department, Coastal Fisheries Branch. Austin, Texas.
- Lackey R., and L. A. Nielsen, editors. 1980. Fisheries management. John Wiley and Sons, Incorporated. New York, New York.
- Meador, K. L., and A. W. Green. 1986. Effects of a minimum size limit on spotted seatrout recreational harvest. *North American Journal of Fisheries Management* 6:509-518.
- Osburn, H. R., G. E. Saul, and C. L. Hamilton. 1986. Trends in Texas commercial fishery landings, 1977-1985. Management Data Series Number 107. Texas Parks and Wildlife Department, Coastal Fisheries Branch. Austin, Texas.
- Osburn, H. R., and M. O. Ferguson. 1987. Trends in finfish landings by sport-boat fishermen in Texas marine waters, May 1974-May 1986. Management Data Series Number 119. Texas Parks and Wildlife Department, Coastal Fisheries Branch. Austin, Texas.
- State of Texas. 1985. Texas Parks and Wildlife Laws. West Publishing Company. St. Paul, Minnesota.
- Texas Parks and Wildlife Department. 1987. The Texas shrimp fishery a report to the Governor and the 70th legislature. Texas Parks and Wildlife Department, Coastal Fisheries Branch. Austin, Texas.

Figure 1. Total number of sport-shrimp trawl licenses sold in Texas by fiscal year (1960-1986).

Number X 1,000

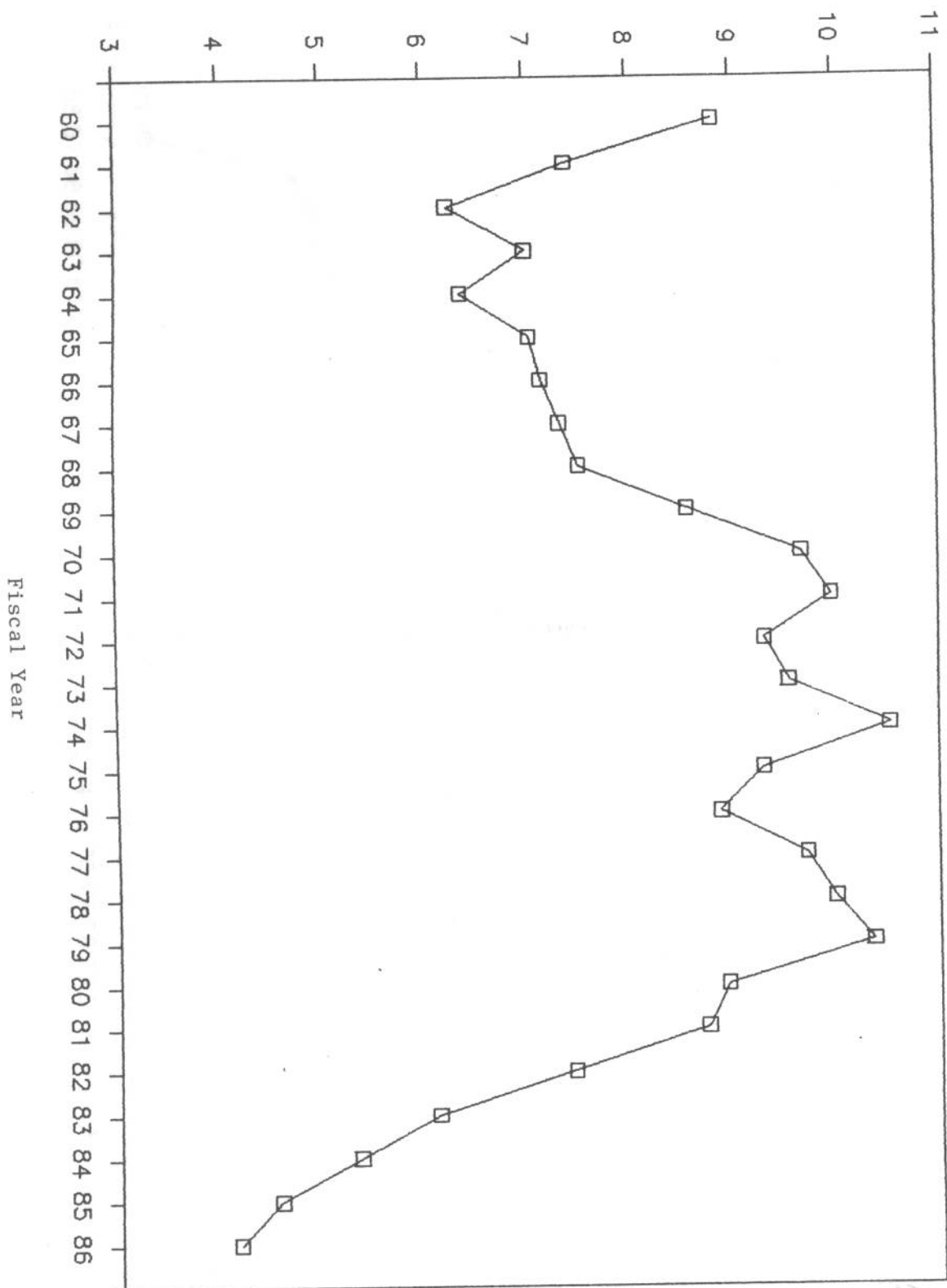
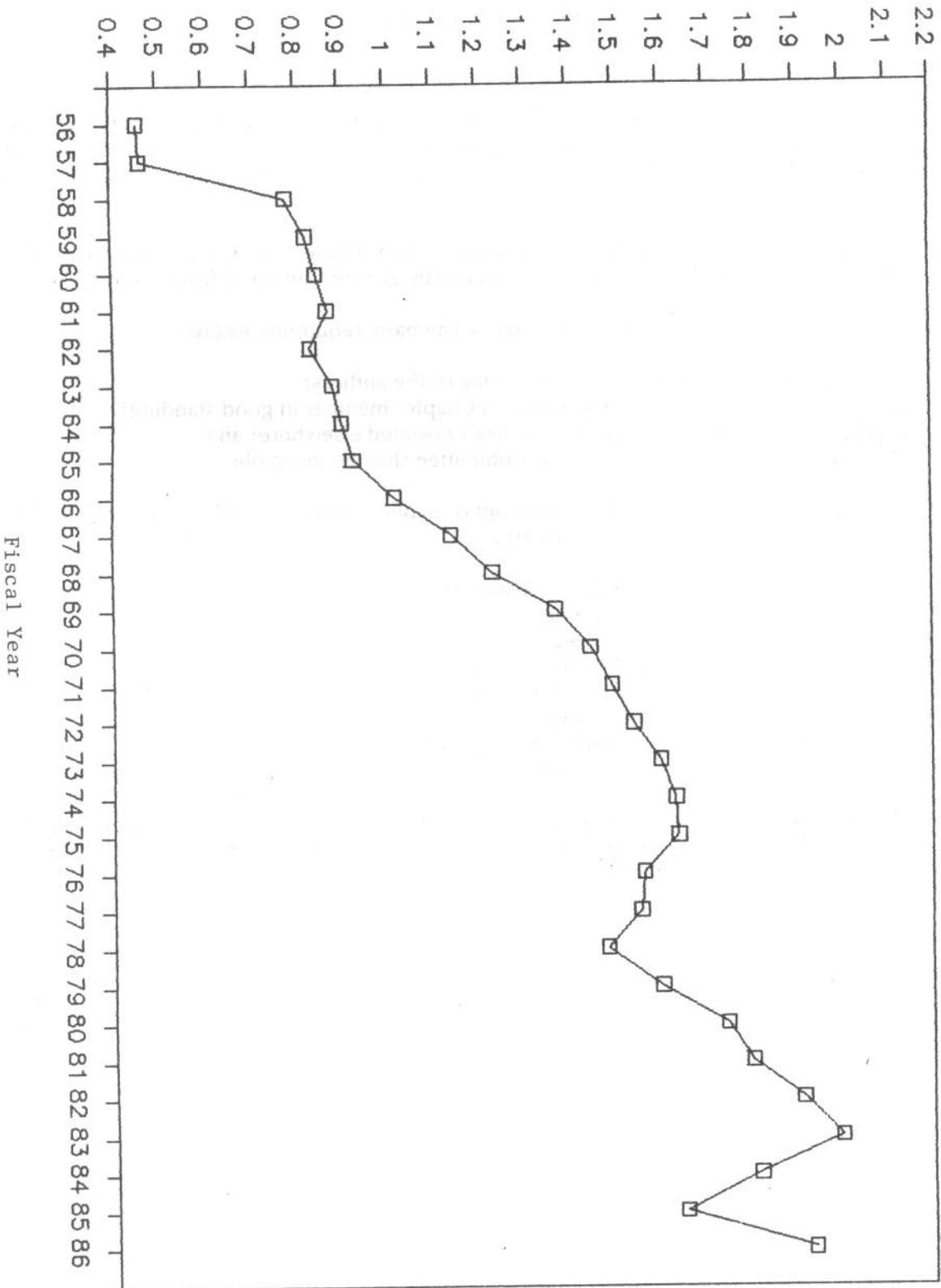


Figure 2. Number of recreational fishing licenses sold in Texas by fiscal year (1956-1986).

Number X 1,000,000



## CHAPTER AWARDS CRITERIA

Criteria for the three award areas are:

Outstanding Fisheries Worker of the Year — The nominees must be members of Chapter members in good standing. There are four areas of focus: Culture, Research, Education, and Management. All nominations must be accompanied by supporting data focusing on contributions to one particular area of focus.

Special Recognition in Fisheries Work — The nominees do not have to be Chapter members. They may be individuals or organizations that have made a substantial contribution to fisheries in Texas.

Outstanding Presentation at the Annual Meeting — The basic requirements are:

- a. The presentation must be made by one of the authors;
- b. At least one of the authors must be a Chapter member in good standing;
- c. The presentation must not be on data presented elsewhere; and
- d. Members of the current Awards Committee shall be ineligible.

The award is for the presentation not a manuscript or paper. Criteria for evaluation, made by the Awards Committee, and their relative values are:

- a. Scientific and research value — 20 points;
- b. Management value — 15 points;
- c. Scope — 10 points;
- d. Verbal presentation — 20 points;
- e. Audio-visual presentation — 15 points;
- f. Conciseness and clarity — 10 points;
- g. Intelligent discussion stimulated — 5 points; and
- h. Other considerations — 5 points.

Judges will evaluate each presentation immediately after it is given. They will not confer until after the last presentation. The decision will be made based either on cumulative point totals or relative rankings.

## ACKNOWLEDGEMENTS

We wish to thank Bobby Farquhar for organizing the panel discussion and Dr. James Davis for arranging reproduction and binding of the proceedings.

Proceedings of the Texas Chapter, American Fisheries Society, 10. Schreiner College, Kerrville,  
Texas.