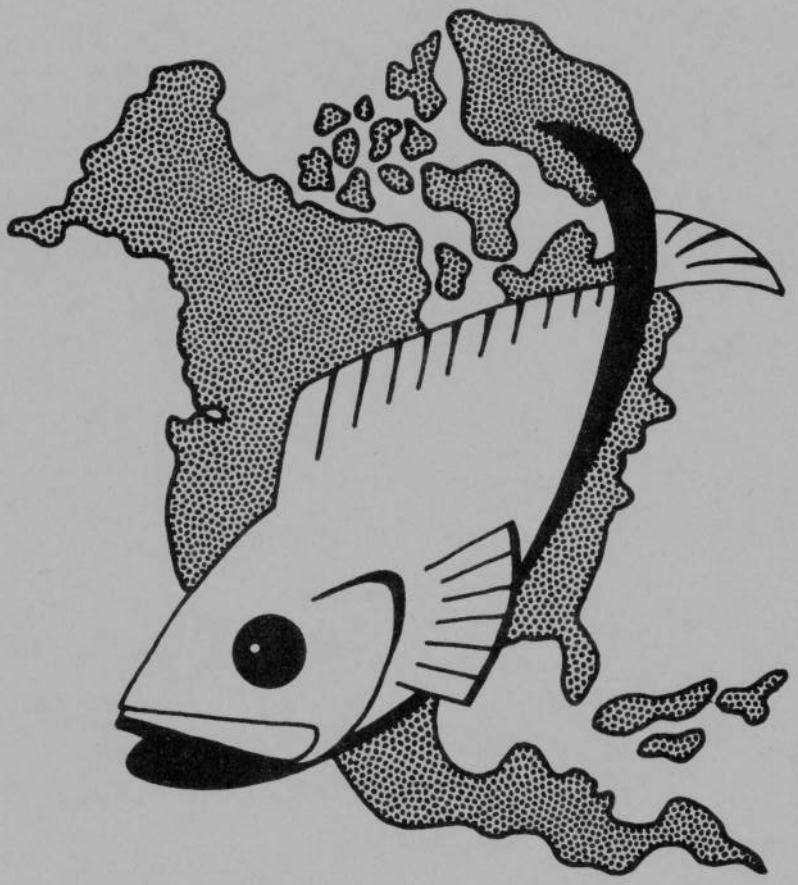
ANNUAL PROCEEDINGS of the TEXAS CHAPTER AMERICAN FISHERIES SOCIETY



LAKE TEXOMA, OKLAHOMA
SEPTEMBER 20-21, 1990

VOLUME 13

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, Pat Hutson, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, Texas 78744. Annual membership dues are $8 for Active Members and $5 for Student Members.

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AMERICAN FISHERIES SOCIETY

September 20 and 21, 1990

Lake Texoma, Oklahoma

1992

Published By:
Texas Chapter, American Fisheries Society
c/o Texas Parks and Wildlife Department
4200 Smith School Road
Austin, Texas 78744

ISSN 1064-2224

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1990 TEXAS CHAPTER AWARDS

Outstanding Fisheries Worker of the Year

The recipient for Fisheries Administration was Gene McCarty. Gene is the Director of Hatcheries for Texas Parks and Wildlife Department and is located in Austin. He was recognized for his leadership role in the funding, design, construction, and operation of new and recently renovated state fish hatcheries.

Glen Alexander and David Campbell shared the award for the Culture category. Glen, who is manager of the Possum Kingdom State Fish Hatchery, was recognized for his work with striped bass and striped bass hybrids. David, manager at Tyler State Fish Hatchery, received the award for his work in handling and spawning big bass in the Lone Star Lunker Program.

David Terre received the award for Management. David works for Texas Parks and Wildlife Department in Inland Fisheries at the San Marcos District Office. He was recognized for his participation in chapter activities and for his contribution to the statewide data base.

Scholarship Recipients

Tommy Michael Bates and Michael W. Brice were the first two recipients of the Texas Chapter, American Fisheries Society student scholarships. Bates, who attended Texas A&M University, was the 1989 recipient, while Brice, of Texas Tech University, was the 1990 honoree.

Outstanding Presentation

Joseph E. Kraai received the award for Outstanding Presentation for his paper, "Relationship of Net Annual Water Level Changes with Largemouth Bass and Smallmouth Bass in a Texas Reservoir." Joe works for the Texas Parks and Wildlife Department in Inland Fisheries at the Canyon District Office.

PANEL DISCUSSION ON "INTERJURISDICTIONAL FISHERIES MANAGEMENT"

Participants: Mr. Bob Hartman, Kansas Department of Wildlife and Parks

Mr. Allan Carter, Arkansas Game and Fish Commission

Mr. Lee Redmond, Missouri Department of Conservation

Mr. Benny Fontenot, Louisiana Department of Wildlife and Fisheries

Mr. Kim Erickson, Oklahoma Department of Wildlife Conservation

Mr. Nick Carter and Ms. Maury Osborn, Texas Parks and Wildlife Department

Moderator: Dr. James Schooley, Northeastern State University

The panel discussion consisted of a series of five formal questions presented to the members. In the following transcription, these questions and answers are appropriately numbered. Additionally, miscellaneous or follow-up questions from the floor were addressed.

QUESTION #1: HAS YOUR STATE ENTERED INTO ANY FORMAL INTERJURISDICTIONAL MANAGEMENT AGREEMENTS, AND IF SO, PLEASE OUTLINE THEM?

ANSWER #1 (ERICKSON): Oklahoma has only one. It's with Texas and has to do with reciprocal licensing on Lake Texoma. The agreement is statutory for us. I believe it's the same for Texas. It sets aside a mechanism for establishing a license that is good for fishing the entire lake regardless of residency. In other words, when you come to Lake Texoma and you're a non-resident, say from Texas, and you want to fish Texoma up in this end of the lake, which is in Oklahoma, you would be required to buy a Lake Texoma license rather than a non-resident fishing license from the State of Oklahoma. Likewise, Oklahoman's can buy a Lake Texoma license and fish the Texas portion of the lake. The idea is that we can't tell fisherman where the border is when its under water. Prior to the time when we had the reciprocal license, you stayed in Texas or you stayed in Oklahoma depending on your residency and you didn't cross an imaginary line when you bought those licenses. Our reciprocal license agreement with Texas is structured such that 70% of the revenue comes to Oklahoma since 70% of the lake is in Oklahoma and 30% goes to

Texas. How they keep that all straight in accounting in the financial end of it, I don't know. We sell somewhere around 34,000 - 35,000 licenses altogether. The license costs $7.75 per person. To the best of my knowledge, we have no other formal interjurisdictional management agreements.

A #1 (FONTENOT): We have two formal agreements, one with Texas and one with Mississippi. The one with Texas involves our border lakes, Toledo Bend Reservoir, Caddo Lake and Sabine Lake. It is essentially a reciprocal license agreement where a person fishing on the Louisiana side with a Texas license can do so legally or a Louisiana person fishing on the Texas side with a Louisiana license can fish. In our agreement we also have common bag limits and size limits on black bass, crappie, striped bass and hybrids, and on gear, white bass, yellow bass and crappie. We don't have an agreement on commercial fishing in the lakes. In fact we're going to meet with Texas next week to try to get our regulations more uniform. We also have an agreement with Mississippi. We share some common oxbow lakes and here we have both commercial and sport fishing agreements with bag limits and licenses. Also we have commercial reciprocal agreements.

A #1 (REDMOND): Missouri has 1,050 miles of the Missouri and Mississippi rivers bordering with surrounding states. Commercial and sport fishing are permitted in both rivers and portions of the St. Francis River which borders between the bootheel in extreme South Missouri and Arkansas. We have formal agreements with the surrounding states: Nebraska and Kansas on the Missouri River; Illinois, Kentucky and Tennessee on the Mississippi River; and with Arkansas on the St. Francis River. Basically, on commercial permits, a commercial fisherman with an Illinois license, for instance, can fish in a flowing water portion of the Mississippi River as long as he does not attach his commercial gear to the bank of the river or fish in the backwaters or tributaries. The limits are the same as with Illinois. If a fisherman is licensed in Illinois he has to abide by Illinois limits. We also have a formal agreement with Illinois on commercial musseling. There's quite a commercial harvest in the pool portion of the Mississippi River above St. Louis. This is dealt with basically the same as the commercial fishing portion of that regulation. Regarding sport fishing, we have formal agreements with the states that I mentioned. Basically, they're similar to the commercial permits in that a fisherman with an Illinois license, for instance, cannot fish from the Missouri bank of the common boundary with an Illinois permit. In that case, he has to abide by the limits of the most restrictive state. For the others involving sportfishing licenses, they basically abide by the state limits where the permit was issued.

Q: WITH AGREEMENTS WITH SO MANY STATES, ARE THE NATURES OF THE AGREEMENT THE SAME IN TERM OF THINGS SUCH AS DOCUMENTATION?

A (REDMOND): They're pretty much the same with a few exceptions. For instance, the most restrictive regulations are in the case of Illinois, whereas with the other states the fishermen abide by the state limits where the licenses was issued.

A #1 (HARTMAN): Since Kansas is one of the bigger states, we fortify our memorandum of understanding with Missouri by backing it up with state regulations so we have things doubly covered formally by law; that is, in fact, a reciprocal arrangement. We also have one other reciprocal arrangement that has a regulation base, that is with Texas where no license is required for individuals 65 years and older. So Texans can come to Kansas and fish if they are 65 or older and abide by Kansas regulations. We have one other semi-interjurisdictional agreement and that is with the upper Missouri River Basin states in the form of a natural resources committee. That group coordinates issues related to Missouri Basin activities, such as water releases from reservoirs, both mainstream and offstream reservoirs, that affect downstream areas.

Q: WHAT WAS THE RATIONALE BEHIND THE REGULATION ALLOWING EXEMPTION FOR PEOPLE 65 AND OLDER?

A (HARTMAN): I'm not totally familiar with the details of how it came about, but I suspect it was sometime decided between governors or high-level administrators that it would be a good thing.

A #1 (A. CARTER): Our regulations are essentially like what has already been described for the Mississippi River and the St. Francis River. We had the 65 and older agreement with Texas and Louisiana. I'm not sure why, except that someone thought it was a good idea. In reality, I think we decided we were losing money. We had more Louisiana anglers coming to Arkansas than Arkansas anglers going to Louisiana. Our reciprocal agreements pertain to both commercial and sport fishing in the Mississippi and St. Francis rivers.

A #1 (N. CARTER): Texas doesn't have any formal agreements with Mexico. The areas that haven't already been covered are the coastal areas. There are two formal processes that we use when we interface with other states, the Gulf of Mexico Fishery Management Council and the Gulf States Marine Fisheries Commission.

Q: WHAT IS THE MONEY FROM THE TEXOMA LICENSES USED FOR?

A (ERICKSON): In Oklahoma, it goes into the general fund; it is not earmarked for any specific purpose on Texoma. We put it into our fisheries programs. A lot of our efforts are geared toward management and research on Texoma so it's used indirectly, but it's not earmarked money.

Q: HAS THERE BEEN ANY PRESSURE TO EARMARK THE MONIES?

A (ERICKSON): We haven't had any pressure to earmark it. You could ask the same question about all license sales if you wanted to. Of course in Oklahoma we operate off sales of fishing and hunting licenses. We get virtually no financial support from the legislature through appropriations. We have D-J, Wallop-Breaux and P-R monies, oil and gas purchases on some of our areas and a conservation check-off on the income tax forms. Other than that, most of our money comes from hunting and fishing license sales. You could ask why the total amount derived from fishing license sales isn't used exclusively for fisheries management and research. It just doesn't work that way; it can't work that way because the overall operation of the department is more than just operating fish hatcheries and working management and research fisheries biologists. You have to use the money to operate the whole department. I suppose the same thing was looked at on the Texoma license in that the money goes directly into the department and is indirectly spent on management and research of all the facilities we have in the state. Texoma does get a great share of our efforts. We may be spending more than we're receiving in income on Texoma just by the nature of the resources we have there. We have not addressed that.

Q: ARE THERE ANY FORMAL AGREEMENTS BETWEEN THE STATE OF TEXAS AND THE NATION OF MEXICO?

A (N. CARTER): I'm not sure if I can really answer that. None that I know of. There's a lot of informal agreements and exchange of information that relates to management of international border lakes.

A (OSBORN): We can't have a formal treaty. We can have some informal agreements but I think it's against the law for a state of the United States to have a formal agreement with a foreign country.

COMMENT (HARTMAN): With some funding out of the International in its meeting last week, the Mississippi River Interstate Cooperative Resource Management Agreement (MICRA) became formal in the Mississippi Basin states in the last year with the signing by each state director. Twenty-nine states and some federal agencies have joined that group that consists primarily of the fisheries chiefs of the states.

COMMENT (REDMOND): As Bob said, I think 29 states have signed the agreement. Basically, it came about as the need was recognized to cooperate in managing the paddlefish and probably the pallid sturgeon in the Missouri River. As Bob said, it involved several federal agencies in addition to the states. It was basically built around interjurisdictional species management

and working together to save habitat for these species in the rivers of the Mississippi Basin. Also, five states on the upper Mississippi River from the mouth of the Ohio River upstream -- Minnesota, Wisconsin, Illinois, Iowa and Missouri -- entered into an agreement, probably in the 1940's or 1950's, forming the Upper Mississippi River Conservation Committee and those five states worked together to collect fisheries data (including mussels) in a standard fashion. We shared the data and worked together to solve environmental problems. There are a lot of environmental problems on the upper Mississippi River from locks and dams, barge traffic, power plant intakes and what have you. It has been effective in the solving of environmental problems. Basically, I think it's the forerunner of the Mississippi Basin agreement Bob mentioned; the latter was patterned after it.

Q: ARE THERE ANY FORMAL AGREEMENTS BETWEEN STATES REGARDING TRANSPORT OF FARM-RAISED OR BAIT FISH ACROSS STATE LINES?

A (A. CARTER): We allow our (Arkansas) fish farmers to raise rudd and haul them to Texas or anywhere else they want to haul them outside of Arkansas.

Q #2: HAS YOUR STATE ENTERED INTO ANY INFORMAL AGREEMENTS?

A #2 (N. CARTER): An agreement was devised between Texas and Louisiana on Toledo Bend where we have signed letters or memorandums of understanding regarding largemouth bass regulations there. Louisiana didn't want to go to a 14-inch minimum, five-fish daily bag. We're in that process now of looking at creel as our part of the deal and they're looking at the largemouth bass populations. Oklahoma and Texas have been involved the past several years regarding problems we have in common with the management of the resources at Texoma, environmentally, in connection with the striped bass population there, but also including crappie and catfish problems resulting from telephoners and netters. Another species we have discussed informally is the paddlefish in the Mississippi River drainages. In Texas, that species is a state endangered fish. We initiated several years ago a restoration program for that species. Of course the success of that program is not very hopeful if you don't involve the state that shares your waters. In fact, it was pointed out earlier that now all the states of the Mississippi River drainage are involved.

A #2 (A. CARTER): We have informal agreements in Arkansas. I guess you'd say our state is so informal that many states don't even know about our agreements. Our field staffs have been talking and they make recommendations whenever we start our regulation process each year, and we follow through. In Arkansas, our Beaver Lake drains into Table Rock through the White River. Missouri stocks paddlefish in Table Rock and we adopted regulations on the White River to prevent our fishermen

from catching any of their paddlefish or at least trap net any. On the Mississippi River, we have an informal agreement with Mississippi. We adopted what they already had in mind as far as taking catfish commercially during January 1 through April 30. In several rivers that flow out of Arkansas into Louisiana, we adopted regulations where you can't take paddlefish during the spawning season. I'd like to comment about the rudd to clear up that issue. We do have a real state-of-the-art fish farming industry and they certainly don't want to be regulated a lot. So we allow them to raise rudd but we don't allow them to sell or stock them in our own state, but they can haul them wherever they can sell them. That's a very informal agreement that's probably not really appreciated. We do have some reciprocal license agreements and right now we are talking informally with some states. With Missouri, we have a reciprocal agreement on Table Rock and Bull Shoals which share waters with both states. The first stage of the agreement was to allow anyone to go back and forth and fish with their state's license. We in fisheries thought this might be causing a tremendous economic loss because we had a lot of people who could come into our state to buy out-of-state licenses, especially at Bull Shoals. So the idea of a Texoma license has been kicked around by us, but so far we haven't formally proposed it. But I think that's what we're going to do.

Q: IF ARKANSAS DID NOT THINK RUDD WOULD BE A GOOD FISH IN THEIR WATERS, WHY WOULD YOU ASSUME IT WOULD BE ALRIGHT TO EXPORT THEM TO OTHER STATES?

A (A. CARTER): There is absolutely no way I'm going to tell another state how to operate their fisheries management program. So if they think the fish is not appropriate for their waters they can get a law passed prohibiting them. But there is also no way I can tell my fish farmers they can't raise that fish. So I'm caught between a rock and a hard place.

Q: DO YOU THINK RUDD HAVE BEEN RELEASED IN ARKANSAS WATERS?

A (A. CARTER): Definitely in some.

Q: NOBODY HAS SAID THEY HAVE AN INFORMAL OR FORMAL AGREEMENT TO CHECK WITH THE STATE THAT'S DOWNSTREAM WHEN THEY STOCK AN EXOTIC IN THE UPSTREAM WATERS. DO WE NEED ONE?

A (FONTENOT): I think Louisiana sure needs one. We're on the bottom end of everything.

Q: IS ANYONE IN FISHERIES AGITATING TO GET THIS KIND OF CONSIDERATION?

A (REDMOND): Some folks are promoting keeping exotics out of the United States. As we saw with the grass carp, we had them

outlawed for years, but once they're in the drainages surrounding you, you might as well give up because you're going to have them. Missouri has several big commercial raisers too, and several of them are along larger rivers and once you get an act of God, such as a flood, you have the fish whether you allow them to be sold in your state or not. A few years ago we had a drought in Missouri and one of the oxbows dried up and we had a fish kill. The primary species of large fish recovered was bighead carp. They came from a fish farm. As long as you don't keep them out of a wide area, it's pretty hopeless to keep them out of one state. We finally gave up on grass carp and made them legal because they were being brought in and bootlegged at a high price and they were available in all the states surrounding Missouri. Commercial fishermen censuses in the early 1970's reported about 10,000 pounds of grass carp harvested in the Missouri and Mississippi rivers. This seems to have stabilized the last 3-4 years; the figures have been very consistent. I don't have any idea how many bigheads are being harvested.

COMMENT (FONTENOT): Lee discussed MICRA. Here is an opportunity where the efforts of the members of this pact should be to set up some kind of clearinghouse to address the release of exotics in common river systems. I would like to see this be a goal of MICRA, one of its functions.

COMMENT (HARTMAN): There is another element with the introduction of exotics, that's the aquaculture industry and its rapid explosion. We have the challenge of being in a position to coordinate and sometimes administer how aquaculture can advance. The people who are pursuing free enterprize and pursuing support from the legislature and overseers should have the sentiment of the legislators in their favor. They are never faced with the executive thing that Benny mentioned, our resource agencies controlling release ultimately of exotics brought in. There's hardly any way you can keep them from being released. And yet we have a major push nationally for rapidly expanding aquaculture. Its a challenge in Kansas as I'm certain it is in other states.

COMMENT (ERICKSON): We're seeing exactly the same picture in Oklahoma. I really sympathize with Allan and how he has to deal with the magnitude of the aquaculture industry in Arkansas. It's a completely different picture than what we in Oklahoma are having to deal with. Our aquaculture industry is trying to get its feet on the ground. Oklahoma people are looking for anything and everything they can find to make money. They see how successful it's been in Mississippi and Arkansas and everybody wants to get into the business. In Arkansas, I don't know what the total number of dollars that industry amounts to, but it's quite substantial and they have a very substantial influence on the way things are done. It's going to be a real challenge, like Bob said, to deal with this because you can't keep those fish out of the wild. That's the problem. It's not necessarily the

states that are releasing some of these exotics. In some cases it is for sport fishing, but in the case of bighead carp and rudd, those are being used for completely different purposes. It is going to be very difficult for us on the one hand to try to look like what we're interested in is protecting the resource we have without looking on the other hand like we're trying to put down a fledgling industry. These are the kinds of problems we face. Like Lee was suggesting in Missouri, the problem is stopping the fish before it gets into the United States. Once it gets in the states you have all these complexities to deal with in administering rules and regulations and it's almost impossible.

Q: DO YOU WANT TO DELEGATE THE AUTHORITY TO THE FISH AND WILDLIFE SERVICE?

A (A. CARTER): I don't think they would want it. Actually, at the International, I believe that was discussed, to develop some sort of rules regarding exotics. I'm not sure how far that got. It was a possibility that the Fish and Wildlife Service would oversee it.

COMMENT (N. CARTER): Since you brought this subject up, I'd like to mention that in Texas, Senate Bill 1507, which is called the Fish Farming Act of 1989, transferred regulations and administration from the Parks and Wildlife Department over to the Texas Department of Agriculture. That particular act did offer an opportunity for us to have a strong position in control of exotic and introduced fishes in the state. The aquaculture industry had an excellent lobby against the State and they were really able to make this a conservation act. That portion of authority remains with the Parks and Wildlife, to essentially determine what they can and cannot raise on fish hatcheries. As Kim says, that really puts me in a hot spot, because this is a very political issue. It involves economics, jobs, and opportunities. Any time you tell an aquaculturist what he can and can't raise with his catfish you're a bad guy. That's the price you have to pay, but we did get really good control over what can be raised by fish farmers as well as control over the aquarium industry, which we had no control over before.

A #2 (HARTMAN): The lower Missouri River Basin states, (Missouri, Kansas, Iowa, Nebraska and South Dakota) have recently been involved over the last 1½ - 2 years in developing a new policy and regulatory basis for controlling commercial catfish harvest. Nebraska made a case in the early 1980's that the channel catfish resources of the lower Missouri River were being excessively exploited. Few large fish existed in the populations and they produced evidence to demonstrate that fact. Certainly there was enough to consider eliminating commercial harvest of catfish. So each of the five states took action to bring about a cessation of commercial harvest of channel catfish. Kansas has

been a little slow in eliminating commercial harvest of paddlefish and we have a sturgeon that is in need of additional protection. We also intend to begin talks with Missouri, Oklahoma and Arkansas, joint efforts to manage shared paddlefish populations.

A #2 (REDMOND): I want to emphasize the good working relationships our field biologists have had with Arkansas on Norfork and Bull Shoals the past 3 or 4 years. In the past, we haven't put a lot of effort into that area, but lately our biologists have been working closely on walleyes and stripers and I think the anglers of both states benefit from that. Our Commission is taking up the catfish issue Bob mentioned. That's an informal agreement but it's really tough for those five states and their commissions to get their act together about the same time. At one time I think South Dakota had passed the regulation and we got enough pressure that Nebraska, Kansas and Missouri have been looking at the data and going to their commissions to remove commercial harvest of channel catfish. I guess things will work out but there are a lot of things in cooperative management you have no control over.

COMMENT (HARTMAN): I might mention that the Iowa Department of Natural Resources has committed publicly to the intent of pursuing the regulation (eliminating commercial catfish harvest on the Missouri River in Iowa).

A #2: (FONTENOT): Louisiana has an informal interjurisdictional agreement as it relates to striped bass in our coastal rivers. Louisiana is a member of the Gulf States Marine Fisheries Commission which is a commission set up with members from each state with regulatory authority in the Gulf and the commission members have developed a strong management program. It's not a formal agreement but most states have adopted strategies, especially those relating to bag limits, size limits and which rivers can be stocked. It appears to be working very well. Louisiana is not a party to any formal agreements for fisheries in its marine waters. However, we participate in development of regional fishery management plans through both the Gulf States Marine Fisheries Commission and the Gulf of Mexico Fisheries Management Council. Louisiana often adopts management measures contained in these regional fisheries management plans, therefore facilitating cooperative interjurisdictional management of marine fisheries without a formal agreement. Examples include the red drum plan and the spanish mackerel plan.

COMMENT (OSBORN): I might mention that Texas is part of that process. There are also the blue crab, menhaden, shrimp, red snapper and grouper plans. We also have an informal process with Mexico called Mexas Gulf where the scientists from the Gulf states and Mexico get together and talk about fisheries issues, primarily shrimp.

A #2 (ERICKSON): I don't have much to add but Bob mentioned paddlefish and we're trying to manage them in the northeastern part of the state. And Texoma is just about as informal as you can get. It's so informal, some regulations are passed we don't even know anything about.

Q #3: HOW DO THE INFORMAL AND FORMAL AGREEMENTS WORK? WHAT IS THE GENERAL MECHANISM?

A #3 (ERICKSON): Most of the regulations are set by our Commission. They are not statutory. We involve our field level biologists, staff and administration in discussions like we're having here, getting people together to talk things over. The final decision on changes in regulations or agreements that would require some statutory change would have to go through the formal process of enacting legislation if it were statutory through our legislature, or it would be done regulatorily through our Commission. So when it involves reciprocal licensing agreements, regulations and management of research agreements, at least in Oklahoma, it can be done from the field staff and administration level. If there's no money changing hands or expenditure of funds for doing something, then our Commission doesn't have to get involved.

Q: HAS THERE BEEN ANY DISCUSSION, SINCE THERE'S INTERSTATE COMMERCE INVOLVED, OF REQUIRING AQUACULTURE TO BE RESPONSIBLE FOR THE IMPACTS OF INTRODUCING SPECIES IN OTHER STATES, AND HAS ARKANSAS THOUGHT OF USING THIS AS A JUSTIFICATION FOR STEPPING IN AND CONTROLLING THE PRODUCTION OF RUDD?

A (A. CARTER): Not to that extent. To be real honest with you, we had enough trouble just getting our Commission to approve banning the use of rudd as bait in Arkansas. We didn't take it any farther than that. In fact, the thought was if we banned it in public waters, it would lend a little more heat to the fire for other states to deal against them with their commissions or legislatures. We went to extremes through the Fish and Wildlife Service information and we talked to people in Ireland and Europe where rudd are native and finally convinced our administration and Commission to ban them in Arkansas. But as far as going to the feds and asking them to step in, no we didn't do that.

A #3 (FONTENOT): Of course Louisiana has representatives at meetings to negotiate. The resultant proposal comes back to our technical staff and once it's agreed upon by that staff and the administration, there are three outlets. Sometimes the Secretary of our Department has the authority to enact it, but it must go through an administrative procedures process at the State Capitol where it goes before a Natural Resources Committee for approval. In other cases, the Louisiana Wildlife and Fisheries Commission has authority to enact regulations or rules. Most of the time

this has to go through an Administrative Procedures Act where it's brought before a special committee of legislators for approval or disapproval. And, of course, we can bring it before the State Legislature, which is usually the last resort.

A #3 (REDMOND): In Missouri, I think agreements are handled much the same as in the other states. Field staffs basically discuss the ideas, draw up a draft proposal, circulate it amongst their resource and protection divisions, and then it goes to the directors of the respective states for signing. But in the case of fishing regulations, those, of course, are handled in our Wildlife Code Book. I think Missouri is probably still unique in that we do not have to go to the legislature to enact fish and wildlife regulations. We have a four-member commission which approves or disapproves regulations. They're published in the Missouri Register and circulated for 60 days for public comment. Public comments are taken back to the Department and if they're not really significant, the regulation becomes law in 30 days. So we sign agreements between directors and then back up and make it a state law.

A #3 (HARTMAN): In Kansas, we've actually had proposals initiated at the Director and Chief levels that have come up through the field staff. As long as the action to be taken is within the established statutory authority of the Secretary of the Department of Wildlife and Parks, we will go ahead and pursue a formal agreement. If it's something beyond our statutory authority, then we will go through the legislative process. The regulatory process is long and drawn out, maybe a little more so than Missouri's. Starting at the back end, once the Commission approves a Department-initiated regulation, then there's 45 days before it becomes law. But we go through a whole lot of gymnastics before we get to the point where the Commission addresses it. If it's a new regulatory proposal, the staff brings it before the Commission in the form of a workshop item, usually 3 months before the proposed action. That gives the commissioners an opportunity to think about it and contact their cohorts to discuss the proposal against the feedback and make some judgments about the merits of the proposal. If the commissioners don't agree, they can request another workshop, or if the staff feels the Commission didn't quite grasp all the details during the 3-month period, it can be handled as a discussion item. This is the format of elbows on the table and freedom to express themselves, even though the workshop is public (the public is invited to all Commission meetings).

A #3 (A. CARTER): In Arkansas, it's very simple and straightforward. Our Commission sets our regulations; we don't have to go to the legislative body. If an item is interjurisdictional, first the field staff will get together and draft a recommendation. They then convince the fisheries administrators and we take it to our Assistant Director and

Director and then to the Commission. As far as scheduling, we have one time each year (in August) that we actually vote on regulations which will go into effect the following January 1, unless otherwise specified. However, we accept public comment throughout the year. We actually have 12 public meetings throughout the state at which we explain what the Fisheries Division is recommending for regulation changes and what the public has recommended during the past 12 months.

A #3 (N. CARTER): The Texas process is very similar to the Arkansas, Kansas and Missouri processes. It depends on what type of agreement we're trying to negotiate. If it involves regulations, we have to go through a process that involves the field staff and public hearings followed by Commission-level hearings after which they are approved. Agreements to work together between states, such as research agreements, can be handled at the Director level.

A #3 (OSBORN): With saltwater fisheries, there's an added component due to the Gulf Council. All such councils are set up by federal regulations and they come up with management plans that we participate in but those are signed by the Secretary of Commerce. They also have public hearings. In most cases, they count on the states to then adopt regulations, but if a state does not adopt regulations that conform to the goals of the plan, they can impose federal regulations in the territorial seas.

Q #4: WHEN APPROACHING INTERJURISDICTIONAL MANAGEMENT AGREEMENTS, HOW HAVE DIFFERENCES IN MANAGEMENT PHILOSOPHIES BETWEEN THE STATES INFLUENCED THE NEGOTIATIONS?

A #4 (N. CARTER): I think the main impediment to cooperation, at least in the inland waters, is really the lack of a framework that guides the managers and administrators considering multi-state participation before proceeding with implementation of their own self-interest programs. But anyone who has had experience working through a state government process to implement management practices ought to really appreciate why dealings with other states might be overlooked or put on the back burner. Managers always find themselves in the middle of changes with the "for" and "against" groups on each side taking their pound of flesh. It just boils down to the fisheries management profession is very stressed because it deals with people. The only chance I think you have is if you're a white or black knight, depending on which perspective you uphold and be armed with the best data you can possibly get. There's still no guarantees in this business. But frankly, pulling another state or states into this process is like being a glutton for punishment. A third dimension is brought into the process magnifying the obstacles you have to deal with nearly beyond belief. Their staff and their philosophies may not be in agreement. Operational procedures, in particular in respect to

involvement of political entities at the time of change, may be a problem. And they have waged their war against their constituents as well. Despite all these problems, I think we all need to work together for the sake of the resource. What you're going to need is some policy process, in my mind, within the state which allows you to consider the other states' needs as well.

A #4 (OSBORN): In coastal waters, there have been some processes that actually got states to agree on management of our interjurisdictional species such as striped bass and shrimp. The problem is differences in attitudes and the lack of recognition of the relative importance of sport fishing versus commercial fishing, especially with the Gulf Council. In 1976, the Magnuson Act was passed making the National Marine Fisheries Service another partner with the states to technically manage the fisheries. Until that time, they had been responsible for developing commercial fisheries. The states were starting to recognize the importance of sport fishing. It took coastal a lot longer than inland fisheries to realize the importance of sport fishing. There are some relatively major philosophical differences between Texas and some of the other states, especially regarding marine fisheries and the management tools that are appropriate to use. One example foremost in my mind is quotas. Some of the management plans in place in the Gulf right now deal with quotas. When the quota is reached by the sport or commercial fishermen, the fishery is supposed to close down. The king mackerel fishery usually reaches its quota every fall or winter. At that time, the Secretary of Commerce sends us a letter asking us to close it down in state waters. We don't have statutory or regulatory authority to do that. Even if we did, we would refuse to do it because we feel those fish should be managed by bag limits and seasonal and area closures, rather than rely on voluntary angler compliance, which is basically what quotas rely on.

A #4 (A. CARTER): We (Arkansas) have our informal agreements regarding, for example, paddlefish and we do have management philosophy differences. I do see that could be a problem simply because we manage all waters we share, but at the same time we don't have any formal agreements, so all of their fishermen and all of our fishermen must know where they are and what they're doing. We haven't had enough experience to foresee what those differences might be or how they might cause problems. I think we need to work together and we have worked together.

Q: IN THOSE SHARED WATERS YOU HAVE WITH MISSOURI, HOW DO YOU PERCEIVE DIFFERENCES IN THE WAY ARKANSAS APPROACHES THAT PARTICULAR MANAGEMENT AS OPPOSED TO THE WAY MISSOURI DOES?

A (A. CARTER): Those large bodies of water are extremely hard to manage by action, by drawdowns or stocking additional sport

fishes. They're mostly managed by regulation. Since most of the waters in those reservoirs fall within Arkansas, our regulations come into play more than Missouri's ever would. We get a lot of pressure from our fishermen to adopt Missouri's regulations, such as crappie length limits, that we simply don't have biological information nor the time to collect the biological information to justify adopting. We try to actively manage by regulations the bodies that have most of the waters in the state. I'm not as familiar as I should be, I guess, with the Missouri regulations, but since most of shared waters are within Arkansas, we feel like our regulations are the driving force.

A #4 (HARTMAN): I'd like to draw on disparities or conflicts we encountered when we started discussing the elimination of channel catfish from the commercial fishery in the Missouri River. The state of Iowa had no sport harvest limits on catfish in the Missouri River, while their neighbor across the river did. Kansas was conservative with an eight-fish limit for sport fishermen. We had a larger commercial harvest. When the evidence was produced the conflicts were resolved. We all pursued a resolution to the problem. In that same arena, the Nebraska department takes great strides in assuring that the involved constituency has an opportunity to input. They hold public meetings on a regular schedule for the commercial fishermen. They go to the community and talk about problems. Kansas has never done that; I don't know that we have any plans to do that. But we don't have as many commercial fishermen. We have had a history of only one person who relies solely on commercial fishing for his livelihood. The rest are sport fishermen just taking advantage of the $25 fee to have a neat way of getting fish for fish fries. So constituency responsibility in the states depends upon development of that constituency. In Kansas when the word was out about the commercial fishermen, the one who had the most to lose went to his legislator. He would have gone to the Governor. So there is some need to be aware of the constituencies and their differences. There has been a major philosophical change within our agency. Before July, 1987, our agency was a fish and game agency. Now it's the Department of Wildlife and Parks and our new administrators have a mission up front to see that wildlife, in particular non-game types of wildlife, have equal levels of treatment. And so do the fishes. So this tremendous change in philosophical attitudes occurred right at the top end, even up to the Governor. It's been slow in some cases for our field staff to keep up with it. You mentioned crappie and the effects on adjacent states as a result of the Missouri regulations. About 5 years ago, we figured it was worth the time to spend some money to see if we thought those kinds of restrictive crappie regulations were justified. We're just now finding the results and are in the process of developing a plan we will be presenting to our commission which will begin testing a size limit on selected impoundments, but not a creel limit. We have found through work on our key impoundments that we cannot

get the creel limit low enough to actually have an impact and still be acceptable. We would have to go as low as three to five fish to have a biological impact. We also have differences that are mandated by our statutory authority, and as a result of that, deal with regulations or freedom of the Secretary of the Department to write an order. For instance, if we want a bass length limit on an impoundment, the Secretary can write an order. But if we want to open up a reservoir for salvaging because its drying up or the fish population is, for some reason, threatened, he couldn't do that. So sometimes the philosophy has to be supported by statutes.

A #4 (REDMOND): It would be desirable, I think, particularly when you have a long stretch of river such as the Mississippi River between us and Illinois, to keep the biologically supported facts in mind at all times. But when the legislature gets involved and local groups with special interests, it's tough to reach an agreement between the states when their needs are different. Back in the 1960's, we couldn't agree on the same number for a daily bag limit on walleye in the Mississippi River. We finally got ours in line with that of Illinois in 1962, through the legislative process. I think there's also a tendency in our administration that if a regulation is not drawing any complaints, it likely represents a situation where something is not broke, so we're not going to try to fix it. For example, we don't have the same regulations as Arkansas does on Bull Shoals. I think it's just differences in people. Missouri has been real conservative in using stocked fish in streams. Part of that probably reflects on us being farther north with shorter growing seasons for culturing fish. We don't have the number of commercial producers that they do in Arkansas and Louisiana and other states farther south. So we try to work more with our native stocks and regulations to try to produce quality fisheries.

A #4 (FONTENOT): I'd like to say that I believe there probably are not too many differences in the management philosophies of the technical staffs and key personnel when meeting between two states to form regulations. If they have good data and they know what's happening, they know how to manage the situation for maximum production. It's the next step up the ladder where the differences occur. For example, there are differences on Toledo Bend Reservoir between Louisiana and Texas. Louisiana is traditionally a commercial fisheries state; it has one of the biggest commercial freshwater fisheries in the nation. So we want rules to permit commercial fishing in Toledo Bend. Perhaps Texas is not as keen on commercial gear in the lake and wants to develop recreational fisheries so they want to direct regulations toward that fishing. We're in between two commissions, each commission representing different views. The result is generally some kind of compromise in a reciprocal agreement.

A #4 (ERICKSON): After five speakers you've probably heard everything that could be said about it. Speaking to the difference in management philosophies and what kind of problems those differences can create, if you have some interjurisdictional management agreement, differences in regulations are probably more controversial than reciprocal licenses and things like that. The management philosophy in the latter probably boils down to how much money that would generate. So those kinds of negotiations would revolve around how that affects the agency income-wise. But when it comes to regulations and how you can manage the fish population or anglers, it becomes more controversial and more difficult to do. You do end up with a compromise. Regarding management philosophies on largemouth bass, for example, in Oklahoma versus what I know about the management philosophy for largemouth bass in Texas, we think we can survey the lakes and reservoirs in the state and manage them on a lake-by-lake basis, placing bass regulations specifically designed for improvement or enhancement of each particular population. Texas does it on a statewide approach with some exceptions. So when it comes to negotiating an agreement on how to manage or regulate fish populations on a border lake such as Texoma, you have one state wanting to apply a regulation so it will be consistent with the others in that state, which may not be what Oklahoma thinks is necessary. Another example is that the statewide crappie regulations in Texas also apply to Texoma. We (Oklahoma) do not have that regulation and we have been negotiating to see if that regulation would benefit the crappie fishing in Texoma. We usually try to compromise with a uniform regulation in both states to make it easy for the anglers. I can see other conflicts like stocking fish. We don't have problems with Texas stocking Florida largemouth bass because we're in that business ourselves. But I can see where with other states that could be a problem, especially when dealing with contiguous waters.

Q: WHY CAN'T TEXAS AND OKLAHOMA COME TO AN AGREEMENT ON CRAPPIE REGULATIONS ON TEXOMA?

A (ERICKSON): The crappie issue is a little different from the striped bass issue in that the data, as far as Oklahoma is concerned, is not very good. We look at whatever data is available. Texas has creel information on Texoma. The issue, for those who don't know, is should Oklahoma follow along with Texas in passing a 10-inch minimum, 25-fish daily bag creel limits for Texoma? We (Oklahoma) have no size limits on Texoma for crappie. We don't have information for Texoma that shows the crappie population needs improvement. What it boils down to is we don't know that the Texas regulations would improve things on Texoma, but they could hurt. We're not ready to say whether or not that's a package we could sell to our commission and to our anglers. All they would be looking at is consistency.

Of course, Texas wants us to do it to make their regulations more enforceable.

A (N. CARTER): There may be a difference of philosophy here. We're not looking at it as not helping. Even though you may not see an immediate change in the fishery, we're not waiting until a problem occurs. We know that type of regulation is not going to hurt that population. It may benefit in the long run as far as yield goes, but also as far as smoothing out the cycles associated with crappie populations. So our philosophy is that it's not going to hurt anything and it might protect and maintain an acceptable level of fishing.

COMMENT (ERICKSON): If we're going to apply crappie size limits in Oklahoma, we're certain we have to do it to show some improvements. We have to demonstrate that it's going to benefit the angler, not necessarily an immediate benefit, but there definitely will be a noticeable improvement to the angler. On Texoma, according to the Texas creel data, over 70% of the crappie in the creel were already over 10-inches long. We're trying to sell crappie regulations in Oklahoma on a lake-by-lake basis. We want to do something that's going to show the public that it works before we go and test it on a lake where you may or may not see something. We wouldn't choose Texoma.

Q #5: HOW DO THE DIFFERENT CONSTITUENCIES IN YOUR PARTICULAR STATE INFLUENCE HOW THESE INFORMAL AND FORMAL INTERJURISDICTIONAL AGREEMENTS WORK OUT?

A #5 (ERICKSON): Oklahoma doesn't have the commerical influence to any great extent. We may to some extent when we try to change the regulations in management agreements with Kansas on paddlefish populations. We do have one very good paddlefish population in the Neosho River in extreme northeastern Oklahoma. When the water levels are up, the paddlefish go upstream into Kansas where Kansas fishermen are able to harvest them. There is some concern about that population because it is influenced not only by sport fishing, but also by commercial fishermen. So when entering into an interjurisdictional agreement with Kansas on what to do about regulations, we have to take into account both interests. Everybody wants to blame everybody else. The rest of the agreements deal mainly with the sportfishing constituency. It gets a little more sophisticated than that on Texoma. There we are talking about another form of commercialized fishermen, the guides. There are over 100 guides on Texoma. They have a very big impact on the people they fish with and explain to them their views and philosophies regarding what needs to be done with striped bass in Texoma. Their opinions can be very influential on management decisions.

A #5 (FONTENOT): When Toledo Bend was first impounded in the 1960's, Texas prohibited commercial netting; Louisiana didn't.

Subsequently, Texas kept asking Louisiana to prohibit the netting because it was detrimental to game fish. They were right. Studies showed many of the fish caught in gill nets and trap nets were game species. Consequently, my staff and I went to our commission to remove netting from Toledo Bend. But the commercial fishermen screamed and threatened so we had to compromise. The commercial fishermen said catfish was the most important species to them so the Commission should let them use hoop nets which are pretty selective for catfish. The Commission then asked if we could let them do that, so we did. That's an example of how a constituency can have an influence.

Q: WHAT KIND OF SUCCESS HAVE YOU HAD GETTING THE COMMERCIAL FISHERMEN TO RELEASE GAME FISH CAUGHT IN HOOP NETS?

A (FONTENOT): I think true commercial fishermen will release the fish. I think there may be a problem with what I call recreational hoop net fishermen. The rules are hard to enforce on a lake that size.

Q: IF YOU HAD TO DO THIS AGAIN, DO YOU THINK THE SPORT FISHERY LOBBY WOULD CHANGE THE OUTCOME?

A: (FONTENOT): I'm not sure. Commercial fishing, especially for catfish is still an important resource. Hoop nets target catfish. Perhaps if we had some other justification for eliminating it, like a biological justification, the outcome would be different.

A #5 (REDMOND): I think bringing all your constituencies along through educational efforts is beneficial. Back in the 1960's, when we came in with higher size limits on bass and stripers, we went around and talked to judges and prosecutors in the counties around the affected lakes and held meetings to explain why we were proposing changes. We drew quite a bit of opposition in the early days but eventually convinced organized constituency groups like the bass clubs. Likewise, with crappie regulations, we were able to credibly present information and convince those same judges and prosecutors. The same educational process will work on interjurisdictional issues. Usually it just takes more time.

A #5 (HARTMAN): In Kansas, we're certainly influenced by constituencies every day. For example, regarding crappie regulations, the initial push for Kansas to look at their crappie populations was the result of a sportscaster on his program stating that Kansas was ignoring the lead of Missouri. He felt so strongly that he came before our commission and told them as much. The technical staff felt our crappie populations were affected differently, so we set out to measure if they were different. We found they were different in the flat basins of Kansas than in the Ozarkian impoundments in Missouri. As a result, our populations respond differently and our anglers have

different opportunities. Regarding the Missouri River commercial fishing situation, Kansas has a very limited commerical fishing constituency at the legislative level. A constituency we have no control over is the commercial growers. Our agency control was forfeited as a result of legislative action in 1965. Our commercial growers could do pretty much whatever they wanted to and have no obligation to our agency. As long as they operate on private property, they can produce, harvest and sell fish as they please. However, in January 1991, we will implement a variety of regulations that require not only licensing, but examinations of facilities and products. We are the only state that prohibits non-residents from hunting deer in our state. That's solely because of our Kansas deer hunter constituency and their willingness to take their views all the way to the legislature.

A #5 (A. CARTER): In Arkansas, our agency is not responsible for, nor does it have authority over, fish farmers. As far as interjurisdictional constituencies, I think dollars and cents will greatly influence their stand on any given issue.

A #5 (N. CARTER): We have similar problems to those already brought up. We have problems with our border waters with both commercial and sportfishing constituencies. On the Toledo Bend situation, we brought up the 10-inch minimum, 25-fish daily bag on crappie as a statewide proposal, which means Toledo Bend would have come under that regulation if it had passed. The marina operators association came to us and said they thought we were right and that the crappie needed it, but if Louisiana didn't do it too, they didn't want us to do it. They said it would cause their customers to go across to the Louisiana side where the limits were more liberal. That was a very good argument in front of our commission and they have been very successful every time. The Oklahomans didn't complain so we were successful in getting those crappie regulations passed on Texoma. So the various constituencies have an impact on both sides of a border.

A #5 (OSBORN): I think the Texas Parks and Wildlife Department has gotten virtually every constituency group mad at some time, and occasionally all mad at the same time. We affect their lives and their livelihood. We affect commercial fishermen, we affect people's leisure time. I think our administrators are becoming more sensitive to the needs of the different groups of people they affect. We need to continue to search for more creative ways of doing things that make it easier for everyone. In the coastal fisheries arena, we have some extremely powerful constituency groups. We have the Gulf Coast Conservation Association that is largely the influence that had red drum removed from the commercial market. Right now the biggest interjurisdictional constituency conflict centers around red drum, red snapper and shrimp. We must keep in mind that biologists don't fish. We're having to work more and more with the various constituencies and are recognizing their importance.

We've always had public hearings to allow these groups to voice their opinions. For example, commercial trotliners came forward when we proposed outlawing trotlines, and even though they were a small group, they delayed things for a year; they definitely had an impact. Also, we need to find out what our constituencies want. We're doing a mail survey on an annual basis. We're doing on-site creel questioning that deals with motivations, attitudes and satisfaction of sport fishermen. We're entering into a new era in coastal management in Texas. Both our shrimp and oyster management plans set up an advisory committee. Members include people that represent the whole gamut of competition within the industry for those species. That has been an incredible experience dealing with those diverse constituency groups. The advisory groups recommended sweeping changes, but when we went to our public hearings, the opposition was surprisingly light.

Q: DOES ANYONE HAVE ANY INFORMATION THAT SUGGESTS FISHING GUIDES ARE BECOMING ORGANIZED AS OTHER CONSTITUENCY GROUPS HAVE BEEN?

A (A. CARTER): We have organized guides and guide associations in Arkansas. On our trout streams we have guide organizations that have a large impact on what we do. The warmwater guides are not as organized.

A (ERICKSON): Guides in Oklahoma are not licensed and they are not organized.

Q: WOULD STATES BE WILLING TO NOT ASK THAT THEIR STATE LAWS BE ENFORCED UNDER THE LACEY ACT UNTIL THEY WERE SENT TO SOME CLEARINGHOUSE FOR DISTRIBUTION?

A (N. CARTER): No, I don't think Texas would be willing to do that at all. I look at this as an aquaculture association problem and think they should help their members keep up with the applicable laws. I don't think that should be the state's responsibility.

A (ERICKSON): Oklahoma would not be interested in foregoing the Lacey Act either.

A (FONTENOT): The same for Louisiana.

A (REDMOND): Likewise for Missouri.

A (A. CARTER): We (Arkansas) certainly wouldn't vote for that.

TEXAS BEACH SEINE PROGRAM - PRELIMINARY ANALYSIS

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Abstract

In 1987, the Texas Parks and Wildlife Department initiated a semi-monthly gulf-beach seining program. Sampling was conducted using two seine types: a beach seine, 60.9 m long X 1.8 m deep with 76-mm stretched #12 monofilament mesh; and a bag seine, 18.3 m long X 1.8 m deep with 19-mm stretched nylon multifilament mesh and a 1.8-m centrally located bag of 13-mm stretched nylon multifilament mesh. From October 1987 to May 1989, 1,680 seine samples were collected along the 586 km of Texas' Gulf of Mexico shoreline. There were 89 species of fishes and 50 species of shellfishes caught during the study. The dominant fish and shellfish varied with area sampled and season. The dominant fishes coastwide were Atlantic threadfin Polydactylus octonemus, Florida pompano Trachinotus carolinus, bay anchovy Anchoa mitchilli and striped mullet Mugil cephalus while the dominant shellfishes were seabob Xiphopenaeus krloyeri and speckled swimming crab Arenaeus cribrarius. Temporal patterns in finfish abundance were most influenced by recruitment.

A COMPARISON OF ABSORBABLE SUTURES IN LARGEMOUTH BASS LIVER BIOPSY SURGERY

by

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ABSTRACT

Longevity and healing response of four types of absorbable sutures were evaluated for 8 weeks post-surgery in 25 largemouth bass Micropterus salmoides that underwent liver biopsy. Natural gut, chromic acid treated gut, polyglactin 910 (Vicryl), and polydioxanone monofilament (PDS) were compared. Both types of gut sutures were absorbed in 4 to 5 weeks. Gut sutures elicited slight to moderate tissue reactions and healing was complete within 6 weeks. Most Vicryl sutures remained intact more than 6 weeks and caused moderate to strong tissue reactions. Healing with Vicryl sutures generally took 6 to 8 weeks. Monofilament sutures showed little sign of absorption in 8 weeks and we projected they would last over 3 months. Tissue reaction to the monofilament was very low, with complete healing taking place within 2 weeks. We concluded gut or chromic gut sutures would be suitable for most surgical situations where healing was expected to be fairly rapid (2 to 3 weeks at water temperature >15 C) and fast suture absorption was desirable. Vicryl sutures would be suitable where extended wound support would be necessary (up to 6 weeks) and intact sutures would not be an irritant. Monofilament sutures would be suitable when healing would be expected to be slow, such as in cold water, and long term support would be beneficial (up to 3 months). Monofilament sutures elicited the least tissue reaction and incisions healed the fastest indicating they also would be suitable when rapid healing was needed and sutures were to be removed.

ZOOPLANKTON SAMPLING IN HATCHERY PONDS: A PRELIMINARY EVALUATION

by

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Abstract

Three 0.04-hectare ponds were sampled for zooplankton using a tube sampler. Each pond was divided into six equal-volume regions. Five samples were taken from each region in a stratified random design. Samples were taken on 9 May 1989, between 8 AM and 10 AM and between 10 PM and midnight. Variability in counts of total zooplankton per liter was consistently lower within strata in the samples taken at night. Counts from night samples were significantly different ($P < 0.05$) than those from morning samples in two of the three ponds. Significant differences in counts between strata within a pond were noted in two ponds sampled at night. Strata sampled at night generally produced more means within the 95% confidence interval of the mean estimated using pooled morning and night data ($N=60$) than did the strata sampled in the morning (50% and 28%, respectively). Number of random samples (entire pond, morning or night) required to estimate the actual mean zooplankton per liter within ± 30% (with 95% confidence) exceeded 20 at population levels below 100 but was reduced to about five at higher levels.

A COMPARISON OF TWO SOLUTIONS USED IN CHANNEL CATFISH EGG SEPARATION

by

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Abstract

The performance of two chemical solutions used to dissolve the glycoprotein matrix of channel catfish Ictalurus punctatus spawns was compared. The two chemical solutions examined were 1.5% sodium sulfite and a combination of 1.5% sodium sulfite and 0.2% papain. The efficacy of the solutions was evaluated by comparing the ratios of live fry obtained per kilogram of egg mass. No significant difference in the performance of the solutions was detected and it was concluded that the use of papain is not warranted.

FOOD AND HABITAT OVERLAPS AMOUNG JUVENILE *MICROPTERUS* AND *MORONE* IN A SOUTHWESTERN RESERVOIR

by

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ABSTRACT

Food and habitat use of juvenile largemouth bass *Micropterus salmoides*, spotted bass *Micropterus punctulatus*, striped bass *Morone saxatilis*, and white bass *Morone chrysops* were determined over a 6-year period in Lake Texoma (Oklahoma-Texas). Largemouth bass, spotted bass, and white bass were native to the river basin and reservoir; striped bass were introduced. Diet overlaps (based on numbers or weight) were highest between the two *Morone* and between the two *Micropterus* species, and also were substantial (if based on prey weight) between largemouth bass and striped bass and between largemouth bass and white bass. Diet overlaps between field-caught striped bass and largemouth bass were sufficiently high to suggest potential trophic competition between juveniles, but the two species occupied substantially different juvenile habitats. Spatial segregation seemed sufficient to ameliorate potential competition between the two species. A laboratory experiment to test for trophic shifts by coexisting juvenile largemouth bass and striped bass indicated non-significant or only marginally significant changes in diets of largemouth bass in the presence of striped bass. Juvenile striped bass overlapped more in habitat and foods with juvenile white bass than with largemouth bass, suggesting a greater potential for negative interactions between the two *Morone* species.

LENGTH AND BAG LIMITS RELATED TO POPULATION STRUCTURE AND HARVEST OF WHITE CRAPPIE IN THREE TEXAS RESERVOIRS

by

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Abstract

In 1985, the harvest regulations on crappie Pomoxis spp. were changed from no limits to a 254-mm minimum length and 25-fish daily bag limit at three Texas reservoirs. The objective was to increase size of the stocks, thereby increasing average size and total weight harvested. Changes in crappie stock structure and harvest were monitored after the limits were imposed. Frame netting was conducted in the fall from 1986 to 1988. Randomized creel surveys were conducted 1 year before and 3 years after regulatory change. The proportion of stock-size crappie longer than 254 mm (RSD_{254}) increased significantly at two of the three reservoirs and remained at acceptable levels at the third. Mean weight of white crappie harvested increased at one of the two sites where RSD_{254} increased. Total yield (kg/hectare) increased at all three sites. Few anglers harvested 25 crappie/day, either before or after the regulation was imposed. Results indicate minimum length limits can alleviate growth over-fishing. Where growth over-fishing is not occurring, they can maintain yield in spite of increased pressure. In addition, a minimum length limit may moderate or eliminate the variability or cycles inherent in crappie fisheries. Similarity of response between Lakes Palestine and Meredith, and predictability of response at Lake Whitney as compared to the other reservoirs is indicative of biological benefit from the limits.

DIET OVERLAP BETWEEN SAUGEYE AND LARGEMOUTH BASS IN THUNDERBIRD RESERVOIR, OKLAHOMA

by

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ABSTRACT

Walleye Stizostedion vitreum vitreum x sauger S. canadense hybrids (saugeye) and largemouth bass Micropterus salmoides ≥350 mm total length were sampled in 1988 and 1989 to determine food habits and diet overlap. Shad Dorosoma spp. were the most important prey of both largemouth bass and saugeye. Both predators were opportunistic, eating a variety of prey items. Although diet overlap was high, competition for food was not apparent and would not be likely to occur unless forage became limited.

OAK VERSUS CEDAR-TREE FISH ATTRACTOR COMPARISIONS BY ANGLING AND ELECTROFISHING

by

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ABSTRACT

Two experiments were conducted to compare use by fish of oak and cedar brush piles constructed in Southwest Oklahoma. In a reservoir electrofishing test, sunfish Lepomis spp. and sub-adult largemouth bass Micropterus salmoides (<200 mm) were 2.7-times more abundant in cedars. Larger bass (≥200 mm) were slightly more abundant in cedars, but the sample size was low. Large crappie Pomoxis spp. (≥275 mm) were more numerous in oaks, but the abundance of smaller crappie was similar in the two brush types. In a pond angling experiment, significantly larger bass were caught from oaks initially. The difference was not significant when multiple captures were included in the analysis. Cedars with dense foliage attract small fish more effectively than oaks. Large predators may prefer oaks (with larger interstices), but also will utilize cedars.

INTENSIVE CULTURE OF PADDLEFISH FINGERLINGS

by

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and

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Abstract

Intensive culture of paddlefish Polyodon spathula was evaluated as a practical and reliable alternative to pond culture. Evaluation of two feeding regimes and two container types was conducted. A total of 39,100 paddlefish were reared to 35 mm TL in 15 days. Growth was better for paddlefish reared exclusively on commercial feed than for paddlefish fed initially with plankton and then converted to commercial feed. Growth was better for paddlefish reared in rectangular troughs than circular tanks. No difference was found in survival among container types or feeding regimes.

EVALUATION OF A YEAR-ROUND PUT-AND-TAKE RAINBOW TROUT FISHERY IN THE MOUNTAIN FORK RIVER

by

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ABSTRACT

The 19-km Mountain Fork River, Oklahoma put-and-take year-round rainbow trout Oncorhynchus mykiss stocking program was successful in terms of angler utilization by providing 68,091 angler-hours of recreation. The harvest rate of 0.6 trout/hour compared favorably with those from other Oklahoma trout fisheries. However, the estimated harvest of 39,940 trout (41.5% of the 96,250 trout stocked) was much below that experienced in other areas. Water quality, other than temperature, was satisfactory. Water temperatures for approximately the first 9.6 km of stream were satisfactory during the entire study. However, temperatures for the lower 9.6 km became critical during August, September and 2 weeks of October, 1989.

POPULATION CHARACTERISTICS OF SMALLMOUTH BASS IN STREAMS OF EASTERN OKLAHOMA

by

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ABSTRACT

Streams in eastern Oklahoma sustain peripheral populations of smallmouth bass Micropterus dolomieui, primarily in the Illinois River system in the northeast and the Little River system in the southeast. We determined distributions and abundances of smallmouth bass in these systems. In tributaries of the Illinois River, the smallmouth bass was the most abundant micropterine bass with a mean biomass of 97 kg/hectare. Largemouth bass M. salmoides and spotted bass M. punctatus were present in low numbers, except in backwater or downstream areas. In the Little River system, smallmouth bass occurred at low abundances (mean biomass 2.2 kg/hectare) and were sympatric (same pool) with spotted and largemouth bass throughout upland reaches. The total mean biomass of the three congeners combined was 12.1 kg/hectare. The individual biomass estimates of any of the three basses would be indicative of a poor stream bass fishery, but the combined estimates are typical of published estimates. The southeast assemblage is probably maintained by extremely variable flows during the spawning season and near-intermittency during summer drought. In the northeast, adequate and homogeneous flow regimes sustain smallmouth bass populations at above average abundances and preclude competition with congeners.

POST-MORTEM WEIGHT GAIN IN LARGEMOUTH BASS

by

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Abstract

Largemouth bass Micropterus salmoides held at 10.7 and 26.7 C in insulated fiberglass tanks were killed with a solution of rotenone and inspected daily to determine days-to-surfacing and change in body weight. Fish held at 10.7 C surfaced in 3-12 days, while fish held at 26.7 C surfaced within 24 hours. Fish at each temperature gained weight after death. Analysis of weight gain in fish held at 10.7 C produced no significant relationship between weight-gain and period of submergence for fish submerged 7 or more days. Weight gain was an exponential function of total length in fish held at 10.7 C and a logarithmic function of total length in fish held at 26.7 C.

FACTORS AFFECTING STRIPED BASS SPAWNING SUCCESS IN THE ARKANSAS RIVER DURING PERIODS OF NORMAL AND SIMULATED-HYDROPOWER DISCHARGES FROM KAW DAM

by

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ABSTRACT

We collected striped bass Morone saxatilis ichthyoplankton in the Arkansas River to determine baseline characteristics of striped bass spawning prior to the initiation of hydropwer operations at Kaw Dam, Oklahoma. Sampling with conical plankton nets was conducted twice weekly at five locations during March through May of 1987 and 1988. We morphometrically aged the eggs and placed them into 5-hour age categories. Spawning activity was significantly influenced by photoperiod and water temperatures. Striped bass egg densities were highest at the lowermost sampling stations, and back-calculation of spawning locations indicated spawning was concentrated 15 to 40 km downstream of Kaw Dam at the confluence of the Salt Fork River, the largest tributary in this river reach, suggesting discharge is critical to spawning success in this system. However, spawning was concentrated farther downstream during periods of simulated-hydropower discharges from Kaw Dam. Eggs spawned in the upstream reaches of the Arkansas River are more likely to survive; accordingly, fluctuations in discharge resulting from hydropower generation at Kaw Dam may negatively influence striped bass spawning success in this river system.

A QUICK AND PRECISE METHOD OF PREPARING AND SECTIONING CATFISH SPINES FOR EXAMINATION

by

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Abstract

The increased use of length limits in the management of fish populations has increased the need for managers to collect age and growth information on various sport fishes. Examination of annual rings formed on the pectoral spines has been used in age determinations of catfishes Ictalurus spp. Several methods for sectioning catfish spines have been described. This paper describes a method of quickly, efficiently and precisely sectioning spines by embedding them in plastic vials filled with clear casting resin, and sectioning them with a band saw using a wooden jig to hold the vial and guides to insure all cut sections are of uniform thickness to aid in age determination. This method requires 16 man-hours and $15.30 to prepare and examine 100 spines. Initial, one-time equipment costs are $209.00

CURRENT STATUS OF THE STRIPED BASS FISHERY IN LAKE TEXOMA

by

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ABSTRACT

Striped bass Morone saxatilis were stocked into Texoma Reservoir from 1965 through 1974 as a biological tool to assist in controlling abundant gizzard shad Dorosoma cepedianum populations as well as to provide additional sport fishing opportunities. This study was designed to continue monitoring trends in various fish populations of a large reservoir having a developing striped bass population. Largemouth bass Micropterus salmoides abundance and structure remained above average during 1989. Fluctuations in spotted bass Micropterus punctulatus, white bass Morone chrysops and white crappie Pomoxis annularis populations have been observed in the past several years. Below average reproductive success was observed for striped bass and white bass in 1989. Low lake levels and below average rainfall at the time of spawning had a negative effect on year class production. Development of strong year classes of striped bass has generally followed 5-year cycles beginning in 1974, followed by sexual maturity and increased densities of spawning adults in 1979, 1984 and 1985. The second highest spawn of striped bass was recorded in 1988. Adult striped bass densities were negatively influenced as a result of the discharge of flood waters during the early summer of 1982, 1987 and 1989. Below average water temperatures and winterkill of threadfin shad D. petenense also has been identified as another limiting factor on white bass and striped bass populations. Densities of trophy-size striped bass in excess of 508 mm appear to be improving but below levels of previous years. Numerous small striped bass were observed during the past several years. Forage fish densities in 1989 were very good and contributed to excellent body condition of all sport fishes.

RELATIONSHIP OF NET ANNUAL WATER LEVEL CHANGES WITH LARGEMOUTH AND SMALLMOUTH BASS IN A TEXAS RESERVOIR

by

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ABSTRACT

Cove rotenone sampling and creel surveys were conducted in 8 years of an 11-year period to determine relationships between net annual water level fluctuations and spawning success, recruitment, and harvest of largemouth bass Micropterus salmoides and smallmouth bass M. dolomieui. Young-of-the-year density for both species appeared to be independent of net annual water level change. Densities of largemouth bass between 102 and 253 mm TL showed a strong relationship with water level changes from the previous year. Both density of harvestable size (≥ 254 mm) largemouth bass and their harvest demonstrated strong relationships with water level changes from 2 years earlier. No relationships were found between either smallmouth bass recruitment or harvest and water level fluctuations. Management strategies for improving bass fisheries in fluctuating reservoirs include smallmouth bass introductions where production criteria are adequate, stocking largemouth bass fingerlings during years with rising water and low broodfish density, and restrictive length limit regulations.

Introduction

Many West Texas reservoirs experience extreme water level fluctuations because most were constructed on intermittent rivers to supply municipal water (Bamberg 1987; Follis 1987; Kraai 1987). Manipulation of water levels for management of fish populations is impractical. Droughts are common and may last for several years, although infrequent periods of heavy precipitation may result in rapid rises in water level (Larkin and Bomar 1983). Water level may drop 2-3 m/year for several years or rise 3-5 m in a few months. Many of these reservoirs have little or no rooted aquatic vegetation and most inundated terrestrial vegetation has decayed. Growth of terrestrial vegetation often occurs on exposed substrate which, when inundated, provides nursery cover for larval and juvenile fishes.

The impact of long-term water level fluctuations on populations of largemouth bass Micropterus salmoides and smallmouth bass M. dolomieui has not been documented for Texas reservoirs. Knowledge of the responses of black bass to

environmental influences should allow managers the opportunity to formulate strategies for minimizing negative impacts.

Aggus and Elliot (1975), Keith (1975) and Rainwater and Houser (1975) reported the amount and duration of flooded shoreline vegetation in Arkansas reservoirs influenced survival of young bass during their first summer. In Lake Carl Blackwell, Oklahoma, strong year classes of largemouth bass were correlated with flooding of terrestrial vegetation (Shirley and Andrews 1977; Summerfelt and Shirley 1978). Similar findings were presented for California waters by Brouha and Von Geldern (1979) and Van Woert (1980). Durocher et al. (1984) found a positive correlation between vegetation abundance and density of largemouth bass for 30 Texas reservoirs. Other studies have shown decreases in year class strength of largemouth bass in years of declining water levels (Jackson 1957; Bross 1967; Aggus and Elliot 1975; Keith 1975). These variations in year class strength can result in "boom or bust" population cycles for largemouth bass.

Smallmouth bass do not appear to be as severely affected by water level fluctuation as largemouth bass. Robbins and Mathur (1976) found smallmouth bass had successful year class production in Pennsylvania ponds with water level fluctuations up to 1.5 m during the spawning season. Abundance of rocky habitat and warming summer water temperature are the primary limiting factors influencing spawning and recruitment of smallmouth bass (Coble 1975). Vogele and Rainwater (1975) found that smallmouth bass, unlike largemouth bass which preferred thick vegetation and brush for spawning, preferred open areas of rock and gravel near stumps in Bull Shoals Reservoir.

The objectives of this study were to identify relationships between net annual water level fluctuation and density of young-of-the-year, juvenile, and recruited largemouth and smallmouth bass, and their harvest in Meredith Reservoir, Texas.

Methods

Meredith Reservoir, located on the Canadian River 60 km north of Amarillo, Texas, was impounded in 1965 and serves as a municipal water supply. The surface area at conservation pool, 895 m above mean sea level (MSL), is 6,447 hectares. The reservoir has a maximum depth of 39 m at conservation pool, approximately 33% of the basin has steep sides and the majority of the shoreline is littered with rocks and boulders. Aquatic vegetation was very limited throughout the study and was found to cover less than 1% of the reservoir in 1983 (Durocher et al. 1984). Largemouth bass were stocked in 1965, 1966 and 1973 and smallmouth bass were stocked annually from 1974 through 1977. A 254-mm minimum length limit on black bass was in effect during the study.

Information regarding water level elevation was obtained from the Canadian River Municipal Water Authority, Sanford,

Texas. Elevation data were gathered on the last day of each month using a floating Steven's continuous water surface detector and recorder.

Largemouth and smallmouth bass densities (mean number per hectare) were estimated by summer cove rotenone sampling in 1976, 1979 and 1981 through 1986. Coves ranged in size from 0.41 to 1.05 hectares. Area and average depth of each cove were measured to determine volume. Area was determined by triangulation and average depth was determined by making a series of averaged random depth measurements. Coves were blocked with barrier nets constructed of 19-mm bar mesh. Nets were set the night before treatment and bundled along the float line so fish could move freely underneath. Net lead lines were released to the bottom 2 hours after sunset the night before treatment. Treatment began at or before 0800 hours and 5% liquid rotenone was dispersed throughout the coves at a rate of one part per million. Fish were collected for 2 days after rotenone application and separated by species and length (25.4 mm) groups and counted.

Creel surveys were used to determine harvest (mean number per hectare) of largemouth and smallmouth bass in spring. They were conducted on 5 weekend days and 4 week days selected randomly from April through June, 1978 through 1982, and 1984 through 1986. Creel methods consisted of angler interviews (for catch estimates) and roving angler counts (for pressure estimates) conducted during two randomly selected time periods between sunrise and sunset. The number of anglers in each party, hours fished, number of fish caught and species sought were recorded. Data were expanded to provide estimates of fish harvest and angler effort.

Various data were paired for correlation analyses. Density of three length groups of largemouth and smallmouth bass, $\leq$ 101 mm total length (TL) young-of-the-year (YOY), 102-253 mm TL (juveniles) and 254-305 mm TL (recruits), and harvest were paired with net annual water level change (ΔWL) to determine whether they were correlated. Net annual water level fluctuation was chosen because it represented a time period of substantial duration to impact future bass densities. Sizes assigned to the three length groups are based on age and growth data for both species in Meredith Reservoir (Kraai 1985). Density of YOY was paired with ΔWL for the year being sampled. Density of juveniles was paired with ΔWL from 1 year earlier. Both density of recruits and harvest were paired with ΔWL from 2 years before. Pairing was based on the period over which water level changes would be expected to impact the corresponding size groups. Regression analysis was used to test the null hypothesis that pairs of variables were independent and not linearly related (Neter and Wasserman 1984). Data were transformed ($\log_{10}$).

Results and Discussion

The reservoir area ranged from 2,800 to 4,500 hectares (876 - 887 m MSL) during the study (1976 to 1986). Correlations with water level fluctuations within calendar years were not attempted because of the irregular occurrence of minor water level changes of short duration. Such short-term events could mask the significance of any relationships resulting from the long-term fluctuations focused on in this study. Relationships identified in this study were based on a total of 8 data-collection years. Supportive data from reservoirs which experience similar environmental conditions could strengthen the conclusions reported here.

Largemouth Bass

Densities of largemouth bass YOY fluctuated during the 11-year study (Table 1) and were not significantly correlated with WL (Figure 1). Although the largest net water level increases at Meredith Reservoir were during 1981 and 1982, few YOY were collected. Conversely, the highest density of YOY occurred during 1984, a year with continually falling water levels. Broodfish availability may explain some of the variability in YOY production. Reynolds and Babb (1978) found that autumn density of Age-0 largemouth bass was a function of the density of Age-3 and older adults. No fish $\geq$ 254 mm were collected in 1979 or 1981 and no YOY were collected in the 1981 samples. The highest density of brood-size fish occurred in 1983, 1 year before the largest number of YOY was produced (Table 1). Increases in reservoir water levels during the spawning season have been correlated with largemouth bass reproductive success (Jackson 1957; Bross 1967; Aggus and Elliot 1975; Keith 1975; Rainwater and Houser 1975; Shirley and Andrews 1977; Summerfelt and Shirley 1978), however, the influence of broodfish abundance was not addressed in these papers.

Densities of juveniles were positively correlated with WL from the previous year (Figure 1). Changes in juvenile densities were not related to YOY density from the previous year. The highest estimate of YOY occurred in 1984, yet few juveniles were collected in 1985 (Table 1). Availability of cover probably influenced survival to this size (Aggus and Elliot 1975; Durocher et al. 1984).

Densities of recruits were positively correlated with WL from 2 years earlier (Figure 1). Water level increases occurred in 1981 and 1982 and densities of recruits were highest during 1983 and 1984. Densities never exceeded 1.98 fish/hectare 2 years after a decline in water level. Changes in density of recruits were not related to density of juveniles from the previous year.

There was a significant positive correlation between largemouth bass harvest and 2-year lagged WL (Figure 1). From 1974 through 1981 water levels steadily declined. Harvest did not exceed 0.01 fish/hectare from 1979 to 1982 (Table 2). The

rises experienced in 1981 and 1982 resulted in flooding of approximately 2,020 hectares of terrestrial vegetation (Kraai 1985). Largemouth bass reached 254 mm in Meredith Reservoir during their third growing season (Kraai 1985); therefore, both the 1981 and 1982 year classes were available to anglers in 1984. Harvest increased to 1.65 fish/hectare in 1984 (Table 2). During 1983 and 1984 water level again decreased and largemouth bass harvest rates were 0.17 fish/hectare in 1985 and 0.22 fish/hectare in 1986.

Smallmouth Bass

Smallmouth bass stocking was completed in 1977 and reproduction and recruitment were apparent by 1979 (Table 1). There was no significant correlation between ΔWL and densities of YOY, juveniles, or recruits (Figure 2). Water level fluctuation did not appear to account for variation in spawning success and recruitment in Meredith Reservoir. Abundant rocky habitat was available along shorelines during the entire study and water temperatures consistently warmed throughout the summer months.

Smallmouth bass harvest generally increased during this study (Table 2). Following declining water levels their harvest (mean=0.27 fish/hectare) was consistently higher than for largemouth bass (mean=0.03 fish/hectare). From 1984 through 1986 smallmouth bass harvest ranged from 1.57 to 1.98 fish/hectare. Smallmouth bass harvest rate, unlike that of largemouth bass, was not significantly correlated with ΔWL (Figure 2). Rideout and Oatis (1975) studied the dynamics of smallmouth bass and largemouth bass in Quabbin Reservoir, Massachusetts, which experienced significant water level fluctuations. Largemouth bass dominated the black bass fishery during the first 10 years and smallmouth bass became the major component of the fishery during the next 10 years. Like Meredith Reservoir, Quabbin Reservoir experienced declining harvest for largemouth bass following years with water level decreases and a trend of increasing smallmouth bass harvest. Shasta Lake in California, a reservoir which experiences large annual summer drawdowns, has a similar history in which smallmouth bass became the primary component of the black bass fishery after an initial period of 10-15 years of largemouth bass dominance (Van Woert 1980). At the conclusion of the present study the smallmouth bass fishery at Meredith Reservoir dominated the black bass fishery except for periods 2 years following water level rises.

Smallmouth bass adapted well to these three geographically distinct reservoirs (Quabbin, Shasta, and Meredith) and contributed substantially to their fisheries. Largemouth bass fisheries in these reservoirs steadily deteriorated after initial years of high production and only brief resurgences occurred following water level rises.

Management Implications

Management strategies for black basses in fluctuating reservoirs primarily have been directed at controlling the timing of water level changes (Ploskey 1986; Willis 1986). Such strategies are impractical in many reservoirs in western and southwestern regions of the United States. Reservoirs meeting the criteria described by Coble (1975) for production, which have fluctuating water levels and limited inundated vegetative cover, should benefit from smallmouth bass introductions. Additionally, knowledge of the relationship between water level changes and largemouth bass determined in the present study could provide the means for improved largemouth bass fisheries in these reservoirs. Stocking fingerling largemouth bass during years with rising water level and low broodfish density could produce a strong year class during years when it otherwise would not occur. Regulations such as restrictive minimum length limits would likely sustain improved catch rates for a longer period after water level rises while increasing adult densities and possibly harvest (in terms of biomass).

Acknowledgments

Funding for this research was provided by the Federal Aid in Sport Fish Restoration Act, Project F-30-R of the Texas Parks and Wildlife Department. Special thanks go to James O. Parks and James T. Hoy for assistance in all aspects of this study, to Charles R. Munger for his assistance with statistical analysis and to William C. Provine, Richard W. Luebke and Joe N. Fries for editorial help.

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Table 1. Annual estimated density (number per hectare) of largemouth and smallmouth bass, by size group, collected during summer cove rotenone sampling, Meredith Reservoir, Texas.

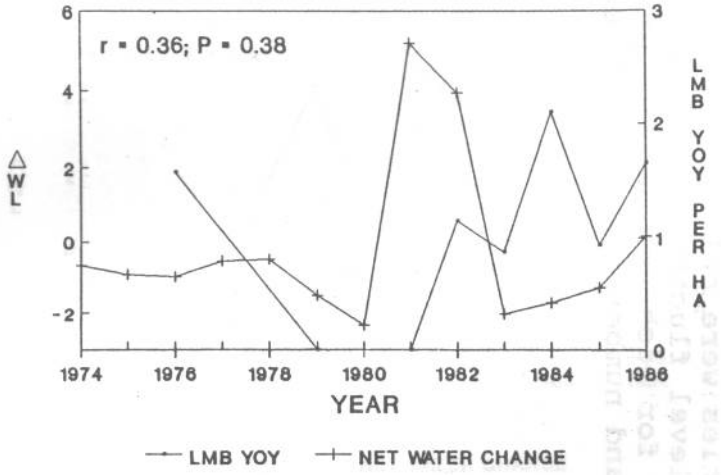
Length(mm)	1976	1979	1981	1982	1983	1984	1985	1986
				Largemouth bass				
≤ 101	40.18	0.00	0.00	14.13	7.35	127.79	8.48	44.88
102-253	2.94	0.00	1.62	12.13	17.15	6.29	0.93	1.15
254-305	0.00	0.00	0.00	0.00	29.65	5.93	0.94	1.16
				Smallmouth bass				
≤ 101	0.98	1,801.61	0.00	17.00	19.60	298.64	16.98	32.32
102-253	1.47	11.42	3.23	4.85	58.50	40.45	16.93	12.67
254-305	0.00	0.00	0.00	1.24	2.47	0.00	3.80	3.48

Table 2. Estimated harvest for largemouth bass and smallmouth bass, Meredith Reservoir, Texas, determined from creel surveys, April through June. Standard errors are in parentheses.

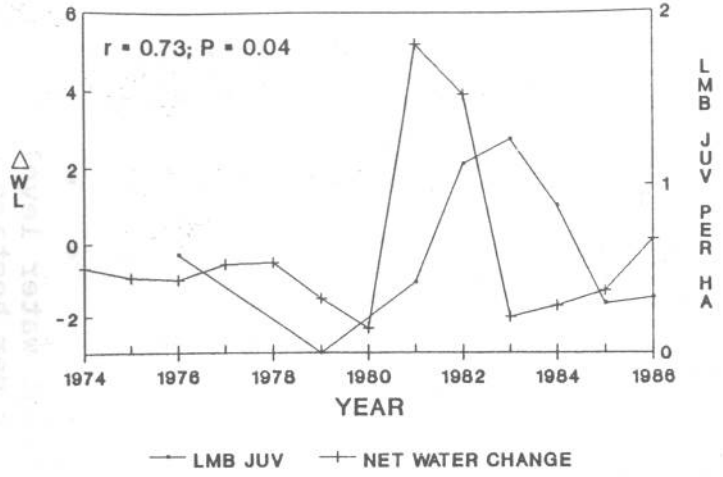
	Number harvested per hectare	
Year	Largemouth Bass	Smallmouth Bass
1978	0.14 (0.114)	0.26 (0.153)
1979	0.01 (0.015)	0.29 (0.161)
1980	0.00 (0.000)	0.04 (0.022)
1981	0.01 (0.022)	0.57 (0.121)
1982	0.01 (0.012)	0.19 (0.114)
1984	1.65 (0.581)	1.64 (0.375)
1985	0.17 (0.054)	1.57 (0.378)
1986	0.22 (0.064)	1.98 (0.479)

Figure 1. Relationship between net annual water level fluctuation (ΔWL), and number per hectare of largemouth bass (LMB) young-of-the-year (YOY), juvenile, recruits, and number harvested, Meredith Reservoir, Texas, 1974-1986. The correlation coefficient and probabilities were calculated by pairing net annual water level fluctuation (ΔWL) with the numbers ($\log_{10}$) of YOY for each year, juveniles 1 year later, and recruits and number harvested 2 years later.

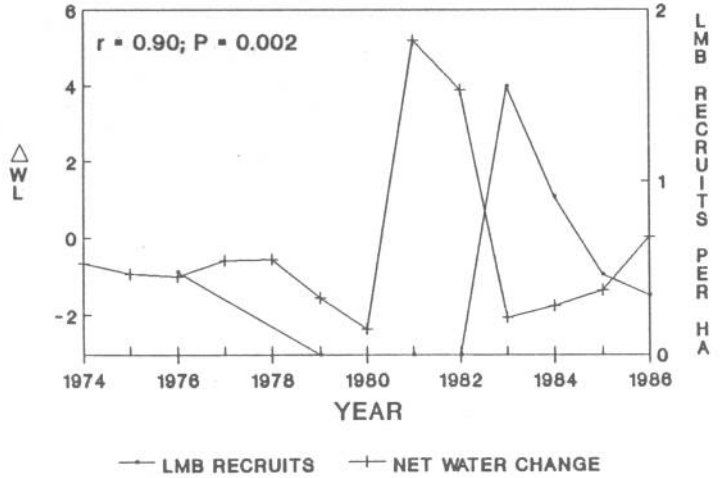
WATER LEVEL-LMB YOY



WATER LEVEL-LMB JUVENILES



WATER LEVEL-LMB RECRUITS



WATER LEVEL-LMB HARVEST

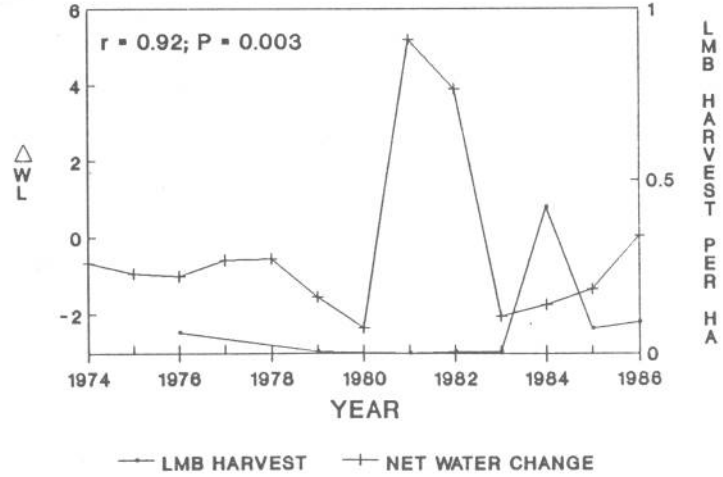
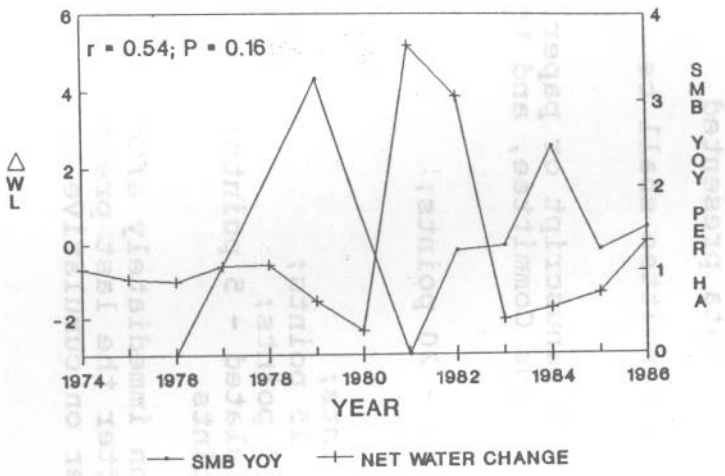
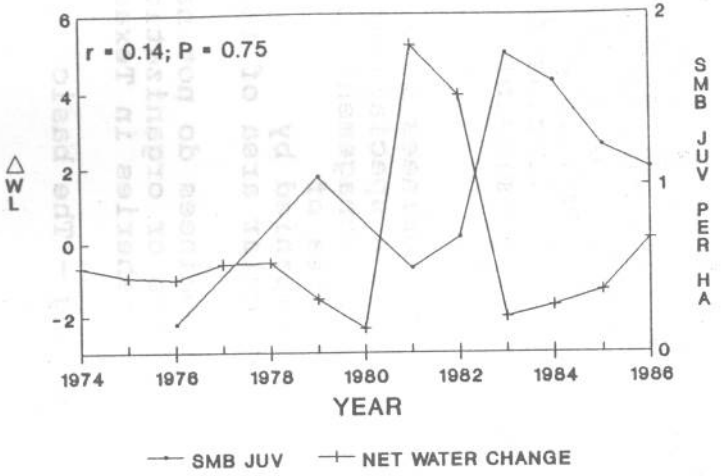


Figure 2. Relationship between net annual water level fluctuation (ΔWL), and number per hectare of smallmouth bass (SMB) young-of-the-year (YOY), juvenile, recruits, and number harvested, Meredith Reservoir, Texas, 1974-1986. The correlation coefficient and probabilities were calculated by pairing net annual water level fluctuation (ΔWL) with the numbers (log_{10}) of YOY for each year, juveniles 1 year later, and recruits and number harvested 2 years later.

WATER LEVEL-SMB YOY



WATER LEVEL-SMB JUV



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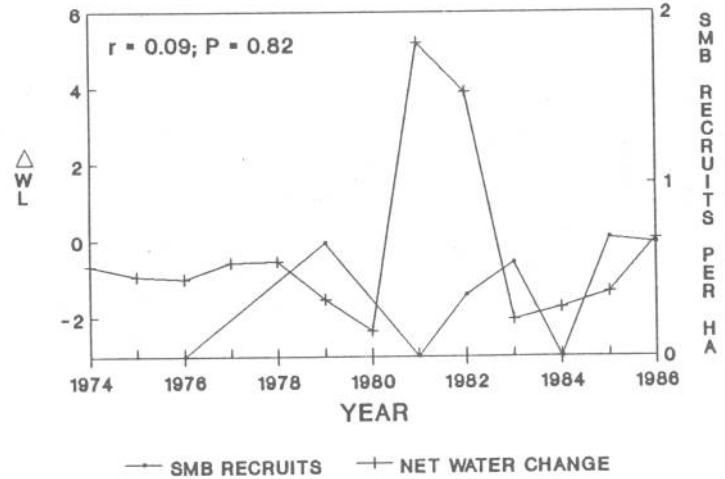
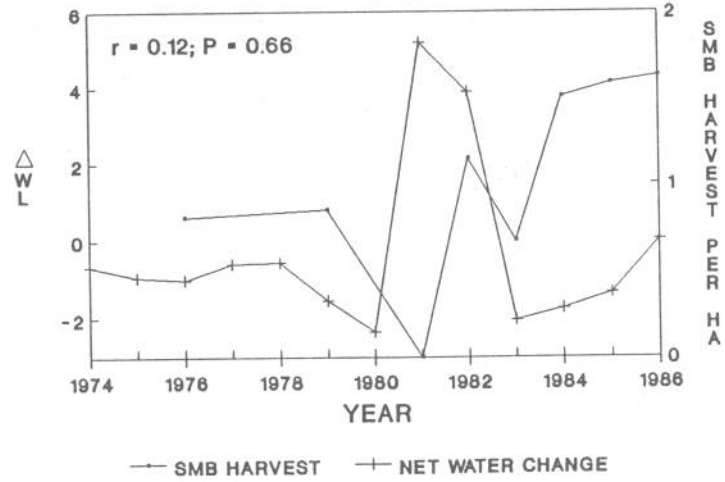


WATER LEVEL-SMB HARVEST



TEXAS CHAPTER AWARDS CRITERIA

A total of seven awards may be presented on an annual basis, assuming nominations are received. Only members in good standing may make nominations. If nominations reviewed by the Awards Committee are found to be inadequate in one or all categories, awards need not be given in any or all areas. If multiple nominations are received and more than one nominee is considered outstanding, then honorable mentions awards are permissible. The awards and their associated criteria are:

Outstanding Fisheries Worker of the Year - The nominees must be Chapter members in good standing. There are five specialization categories: Administration, Culture, Education, Management, and Research. An award may be presented in each area of specialization. All nominations must be accompanied by supporting data on contributions to <u>one</u> 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 substantial contributions 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.

ACKNOWLEDGMENTS

We wish to thank Annette M. Sudyka, Texas Parks and Wildlife Department for her assistance in putting the proceedings together and to Dr. James Davis and Lee Bartlett, Texas Agricultural Extension Service for their assistance in arranging reproduction and binding of the proceedings.

Citation:

American Fisheries Society, Texas Chapter, Annual Proceedings Volume 13. Lake Texoma, Oklahoma.