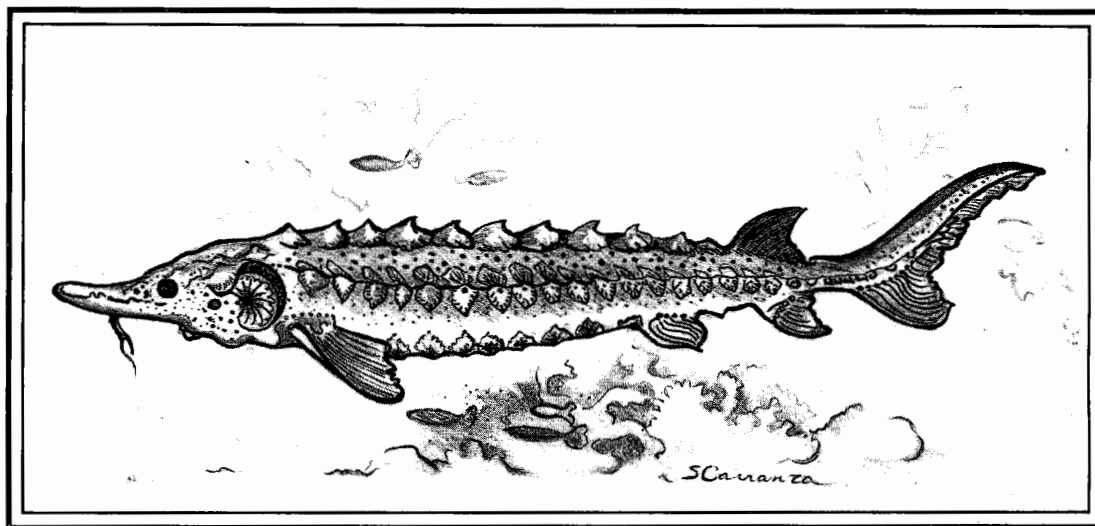


SCHULTZ

Program & Abstracts



Joint Annual Meeting

Mississippi and Louisiana Chapters American Fisheries Society

**February 6–8, 2002
The Palace Casino Resort Hotel
Biloxi, Mississippi**

PROGRAM AND ABSTRACTS

2002 Joint Annual Meeting

Mississippi and Louisiana Chapters
of the
American Fisheries Society
Biloxi, Mississippi
Palace Casino Resort Hotel
6-8 February, 2002



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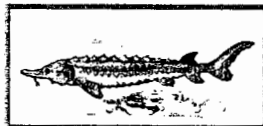
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Mississippi Gulf Coast Billfish Classic



We thank Susan Carranza for the donation of
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**JOINT MEETING OF THE MISSISSIPPI AND LOUISIANA
CHAPTERS OF THE AMERICAN FISHERIES SOCIETY
Biloxi, Mississippi, Feb. 6 - 8, 2002**

“CONNECTIONS”

Program Overview

Wednesday – February 6, 2002

Meeting Registration: 5:00 to 9:00 PM, Atrium.

Registration Social: 6:30 to 8:00 PM, Atrium.

Thursday – February 7, 2002

7:00 – Poster Setup (7:00 to 7:45), Atrium

7:45 – Welcome and Opening Remarks, Majestic Ballroom A

Invited Speakers: Majestic Ballroom A

8:15 - D. Jay Grimes. Fisheries Research at the College of Marine Sciences, The University of Southern Mississippi.

8:30 - Robert P. Romaine and Terrence R. Tiersch. Aquaculture Programs at Louisiana State University.

Activity	Time	Room
Session I	8:45 to 10:00	Majestic Ballroom A
Posters and Coffee	10:00 to 10:15	Atrium
Session II	10:15 to 12:00	Majestic Ballroom A
Lunch	12:00 to 1:30	On your own
Session IIIa	1:30 to 3:00	Majestic Ballroom A
Session IIIb	1:30 to 3:00	Palace Court 4
Posters and Coffee	3:00 to 3:15	Atrium
Session IV	3:15 to 5:00	Majestic Ballroom A
Poster Session	5:15 to 6:30	Atrium
Banquet	7:00 to 9:00	Majestic Ballroom B
Student Meetings	9:00	Majestic Ballrooms

Friday – February 8, 2002

Activity	Time	Room
Session Va	8:15 to 10:15	Majestic Ballroom A
Session Vb	8:15 to 10:15	Palace Court 4
Coffee Break	10:15 to 10:30	Atrium
Session VI	10:30 to 11:45	Majestic Ballroom A
Closing Remarks	11:45	Majestic Ballroom A
Business Meetings	12:00 to 1:30	MS LA Majestic Ballroom A Palace Court 4

Program Agenda

Wednesday – February 6, 2002

Meeting Registration – 5:00 to 9:00

Registration Social – 6:30 to 8:00

Thursday - February 7, 2002

Poster Setup – 7:00 to 7:45

Late Registration – 7:30 to 12:00

7:45 Welcome and Opening Remarks

Chet Rakocinski: USM College of Marine Sciences

Terry Tiersch: LSU Aquaculture Research Station

Introduction of special guests Dr. Gus Rassam, Executive Director, American Fisheries Society and Steve Filipek, President-Elect, AFS Southern Division

Invited Speakers

8:15 D. Jay Grimes. Fisheries Research at the College of Marine Sciences, The University of Southern Mississippi.

8:30 Robert P. Romaine and Terrence R. Tiersch. Aquaculture Programs at Louisiana State University.

Session I - 8:45 to 10:00

Moderator: Christine Pedlow, Department of Wildlife and Fisheries, Mississippi State University.

8:45 Edward J. Chesney and Donald M. Baltz. Patterns in the Expression of Nutrient Enrichment: Perspectives on Fisheries and Fisheries Habitat in Eutrophic Ecosystems.

9:00 Robin McCall*, Harriet Perry and Tom VanDevender. Gulf of Mexico Estuarine Inventory: Past and Present Biota of Mississippi Sound.

9:15 Edward A. S. Belden, Michael M. Harden And Terry L. Romaine. The Effects of Climatic Events on Louisiana and Mississippi Coastal Habitats.

9:30 Mark A. Grace. Biological Surveys to Assess the Relative Abundance and Distribution of Coastal Sharks and Teleosts of the Western North Atlantic Ocean, 1995 to 2001.

* Student presenter.

Thursday - February 7, 2002

Session I - Continued

- 9:45 Yvonne Allen, Charles A. Wilson and Rick Kasprzak. Louisiana's Artificial Reef Program: Determination of Geotechnical and Biological Properties in the Louisiana Artificial Reef Program's Reef Planning Areas: South Timbalier.

Posters and Coffee - 10:00 to 10:15

Session II - 10:15 to 12:00

Moderator: Amy Nickens, Department of Veterinary Sciences, Louisiana State University.

- 10:15 Charles Wilson, Mark Miller, Aaron Pierce and Rick Kasprzak. Comparison of the Fisheries Value of Standing, Toppled, and Partially Removed Platforms in the Northern Gulf of Mexico.
- 10:30 Shelley McNamara* and Eric D. Dibble. Establishment of Aquatic Plants for Fish Habitat Enhancement in the Littoral Zone of a Mississippi Delta Impoundment.
- 10:45 Kevin R. Rademacher and Jeffery H. Render. Fish Assemblages Around Oil and Gas Platforms in the Northeastern Gulf of Mexico: Developing a Survey Design.
- 11:00 Corey D. Clause*, Eric D. Dibble and Stephen H. Schoenholtz. Feasibility of Biological Indices Using Fish to Determine Degradation of Small Streams in North Central Mississippi.
- 11:15 Joanne Lyczkowski-Shultz, Jason Link and G. Walter Ingram, Jr. Environmental Variability and Distribution of King Mackerel *Scomberomorus cavalla* Larvae in the Gulf of Mexico.
- 11:30 Tory D. Mason* and William E. Kelso. The Effects of Hydrilla Infestation on the Food Habits of Age-0 Largemouth Bass *Micropterus salmoides* in the Atchafalaya Basin, Louisiana.
- 11:45 Christine L. Pedlow* and Eric D. Dibble. A Fish and Macroinvertebrate Population Assessment Relative to a Whole-Lake Herbicide Application.

Lunch - 12:00 to 1:30

* Student presenter.

Thursday- February 7, 2002

Session IIIa – 1:30 to 3:00

Moderator: Orlando Ferrer, Department of Wildlife and Fisheries, Mississippi State University.

- 1:30 Jack Killgore and Jan Jeffrey Hoover. Evaluation of Pallid Sturgeon in the Lower Mississippi River.
- 1:45 Glenn A. Zapfe* and Chet F. Rakocinski. Effects of Marsh Access and Restriction on the Feeding Habits and Growth of Juvenile Spot *Leiostomus xanthurus*.
- 2:00 Chec Colon-Gaud* and William E. Kelso. Macroinvertebrate Distribution and Abundance in *Hydrilla* and *Ceratophyllum* Habitats.
- 2:15 Glenn R. Parsons, Jan Hoover and Jack Killgore. Station Holding Ability in the Shovelnose Sturgeon, *Scaphirhynchus platyrhynchus*: The Effect of Pectoral Spine Removal.
- 2:30 J. Read Hendon, James R. Warren and Michael V. Buchanan. Movements of Spotted Seatrout, *Cynoscion nebulosus*, in Mississippi Coastal Waters Based on Tag-Recapture.
- 2:45 Dennis K. Riecke. Factors Affecting Fish Passage During Water Release From a Flood Control Reservoir in Mississippi.

Session IIIb – 1:30 to 3:00

Moderator: Rocky Smiley, Department of Wildlife and Fisheries, Mississippi State University.

- 1:30 Kenneth L. Riley*, Chase G. Holladay, Edward J. Chesney and Terrence R. Tiersch. Techniques for Improved Hatchery Production of Red Snapper.
- 1:45 John T. Ogle and Jeffery M. Lotz. Larval Culture of the Red Snapper, *Lutjanus campechanus*.
- 2:00 Vincent Guillory. Relationship Between Juvenile Red Drum Abundance and Blue Crab Mortality and Abundance.
- 2:15 Eric C. Herbst*, Germán A. Poleo, C. Greg Lutz and Terrence R. Tiersch. Is Variable Induction of Polyploidy in Nile Tilapia Caused by Asynchrony of Zygotic Development?

* Student presenter.

Thursday- February 7, 2002

Session IIIb – Continued

- 2:30 Kersten N. Wheeler*, Chet F. Rakocinski and Richard W. Heard. Feeding Habits of Juvenile Florida Pompano *Trachinotus carolinus* from the Beaches of Northern Gulf of Mexico Barrier Islands.
- 2:45 Jan Jeffrey Hoover, Steven G. George and K. Jack Killgore. Colonic Flushing: a Non-Destructive Technique for Studying the Diet of Pallid Sturgeon.

Posters and Coffee - 3:00 to 3:15

Session IV – 3:15 to 5:00

Moderator: Eric Herbst, School of Forestry Wildlife and Fisheries, Louisiana State University.

- 3:15 Nicole M. Crochet*, Bruce H. Comyns and James S. Franks. Spatial Distribution and Relative Abundance of the Early Life History Stages of Flyingfishes (Exocoetidae) in the Northcentral Gulf of Mexico.
- 3:30 Raymond Portis*, Tom Holman, Larry Bull and Paulinus Chigbu. Largemouth Bass and Forage Fishes in the Nearshore Areas of the Ross Barnett Reservoir: Population Characteristics and Predation by Largemouth Bass.
- 3:45 Julie A. Neer*, Bruce A. Thompson, Richard E. Condrey, Janaka A. de Silva, Jason K. Blackburn, Gary W. Peterson and Kevin P. Barry. The Role of Louisiana's Coastal Waters as Shark Nursery Habitat: Results of a Three-Year Survey.
- 4:00 Kevin P. Barry* and Richard E. Condrey. Feeding Habits of Juvenile Blacktip Sharks, *Carcharhinus limbatus*, in Timbalier Bay, Louisiana.
- 4:15 Garry Lucas. Progress on the Management of the Shoreline of Lake Charlie Capps for Fisheries Habitat.
- 4:30 Jaquelyn M. Matuszewski, Jill A. Jenkins and Rassa O. Dale. Optimizing Relative Condition Factor Equations for Four Estuarine Fish Species.
- 4:45 Rohasliney Hashim*, Donald C. Jackson and Eric D. Dibble. Benthic Macroinvertebrate and Fish Assemblages in Little Bywy Creek and Middle Bywy Creek, Natchez Trace Parkway.

* Student presenter.

Thursday - February 7, 2002

Poster Session – 5:15 to 6:30

Chec Colon-Gaud, William E. Kelso and Adam Piehler*. Suitcase Sampler for Vegetation-Dwelling Aquatic Macroinvertebrates.

Christopher Gledhill, Kevin Rademacher, Kim Foster, Paul Felts, Andrew David, John Brusher, Jennifer Arcuri, Lanora Lang and Andre Debose. Survey of Fish Assemblages Within Two Areas Closed to Fishing on the West Florida Shelf.

Dale Diaz, Kerwin J. Cuevas, William S. Perret and Jude Ledoux. Side Scan Sonar as a Tool for Oyster Reef Management.

Chase G. Holladay*, Kenneth L. Riley, Terrence R. Tiersch and Edward J. Chesney. Evaluation of Short-Term and Long-Term Storage of Red Snapper and Gray Snapper Sperm.

James R. Warren and Lisa A. Hendon. The Association of Recreational and Commercial Finfish Species with Low Profile, Inshore Reefs in Mississippi Coastal Waters.

Germán A. Poleo*, Gina W. Cheuk and Terrence R. Tiersch. Microinjection: An Alternative Way to Fertilize Fish Eggs.

Peter C. Smiley Jr.*, John R. Davis, Shelley McNamara, Rohasliney Hashim and Eric D. Dibble. Mississippi Chapter's Student Subunit of the American Fisheries Society: Past and Present.

Brady S. Trahan, G. Erick Porche, Kerwin J. Cuevas and Gregg Bray. Preliminary Findings of a Recreational Night Fishing Survey Along the Mississippi Gulf Coast.

James R. Warren, J. Read Hendon, James S. Franks and Michael V. Buchanan. Hooking Mortality of Spotted Seatrout, *Cynoscion nebulosus*, in Mississippi: Preliminary Results.

Christa M. Woodley, William C. Vervaeke*, William T. Slack and Mark S. Peterson. Occurrence of the Exotic Giant Malaysian Prawn, *Macrobrachium rosenbergii* (De Man, 1879), In Simmons Bayou, Mississippi.

Banquet – 7:00 to 9:00

Remarks by Dr. Gus Rassam and Steve Filipek

Banquet Speaker, Dr. Glenn Parsons, University of Mississippi
"Shark Research in the Gulf of Mexico: Perils and Pitfalls"

* Student presenter.

Friday - February 8, 2002

Session Va – 8:15 to 10:15

Moderator: Jason Blackburn, Coastal Fisheries Institute, Louisiana State University.

- 8:15 M. Scott Baker, Jr. and Charles A. Wilson. Use of Otolith Microchemistry to Identify Unique Nursery Areas for Red Drum in the Northern Gulf of Mexico.
- 8:30 Melissa Bahnick*, James Franks, Harriet Perry, Terry Henwood and James Warren. Use of Radiocarbon From Nuclear Bomb Testing To Help Age Yellowedge Grouper, *Epinephelus flavolimbatus*, from the Gulf of Mexico.
- 8:45 Jill A. Jenkins, Denise Flaherty*, William R. Wayman and Terrence R. Tiersch. A Chromatin Structure Assay for Cryopreserved Sperm From Lake Sturgeon *Acipenser fulvescens*.
- 9:00 Randall Kidwell* and Leandro E. Miranda. Effects of Electrofishing on Injury and Mortality of Non-game Fish.
- 9:15 Charles D. Minchew, Kenneth K. McDill, Rachel Venn Beecham*. Development and Testing of an Electrically Enhanced Seine for Use in Harvesting Channel Catfish, *Ictalurus punctatus*, from Ponds.
- 9:30 Kerwin J. Cuevas and Michael V. Buchanan. Utilizing Side Scan Sonar as an Artificial Reef Management Tool.
- 9:45 Kevin M. Boswell* and Charles A. Wilson. Comparison of Hydroacoustic Surveys to Traditional Trawl Methods for Determining Nekton Abundance in a Louisiana Estuary.
- 10:00 Jamie M. Dockstader*, John E. Supan and Jill A. Jenkins. Effects of Freezing on Oyster Ploidy Determination by Flow Cytometry.

Session Vb – 8:15 to 10:15

Moderator: Ryan Heise, Department of Biological Sciences, The University of Southern Mississippi.

- 8:15 Jorge L. Icabalceca. A Cross-Sectional Analysis of the Charter Boat Industry of Louisiana.
- 8:30 Andrew J. Fischer, Charles A. Wilson and David L. Nieland. Age and Growth of Red Snapper *Lutjanus campechanus* in the Northwestern Gulf of Mexico: Implications to the Unit Stock Hypothesis.
- 8:45 Justin Hart* and Harold L. Schramm, Jr. Angling Susceptibility of Spotted Bass in the Buttahatchee River, Mississippi.

* Student presenter.

Friday - February 8, 2002

Session Vb - Continued

- 9:00 Mark W. Miller* and Charles A. Wilson. Fish Composition and Biomass Associated with the West Flower Garden Bank.
- 9:15 Samuel Shephard* and Donald C. Jackson. Age and Length at Maturity of Channel Catfish: The Influence of Environmental Variables and Implications for Sustainable Management of Slat Basket Fisheries.
- 9:30 C. Brian Whaley* and Terrence R. Tiersch. Hybridization of Lepomid Sunfishes by use of Cryopreservation.
- 9:45 Jason K. Blackburn*, Bruce A. Thompson and Royal D. Suttkus. A Re-examination of the Status of *Fundulus majalis* and *Fundulus similis*. *Pigment pattern different*
- 10:00 William T. Slack, Ryan J. Heise, Mark A. Dugo and John A. Ewing, III. The Pearl Darter (Percidae: *Percina aurora*) in the Pascagoula Drainage, Mississippi.

Coffee Break - 10:15 to 10:30

Session VI - 10:30 to 11:45

Moderator: Julie Neer, Coastal Fisheries Institute, Louisiana State University.

- 10:30 Harriet M. Perry, Donald Johnson, Tom VanDevender, Douglas Shelton, Kirsten Larsen, William Graham and Christine Trigg. Anthropogenic and Natural Transport of Invasive Species to the North-Central Gulf of Mexico: Fisheries Implications.
- 10:45 Elizabeth B. Bourgeois*, Jill A. Jenkins, Jaquelyn Matuszewski and Mark McElroy. Biological Monitoring at Louisiana's Davis Pond Freshwater Diversion Structure.
- 11:00 Donald C. Jackson, Eric D. Dibble, Kirk R. Rundle* and Orlando Ferrer. Tarpon and Snook Stock Dynamics in Brackish Water Lagoons of Humacao Natural Reserve, Puerto Rico.
- 11:15 James A. Rayburn, Charles A. Wilson and Bradley J. Marler. Age-Length Relationships and Condition Factor Trends for Channel Catfish (*Ictalurus punctatus*) and Largemouth Bass *Micropterus salmoides* from Sibley Lake, Louisiana.

* Student presenter.

Where are the largest fish found earlier?

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LOUISIANA'S ARTIFICIAL REEF PROGRAM: DETERMINATION OF GEOTECHNICAL AND BIOLOGICAL PROPERTIES IN THE LOUISIANA ARTIFICIAL REEF PROGRAM'S REEF PLANNING AREAS: SOUTH TIMBALIER

Yvonne Allen, Charles A. Wilson and Rick Kasprzak¹. Coastal Fisheries Institute, Louisiana State University, Baton Rouge LA; ¹Louisiana Department of Wildlife and Fisheries, Baton Rouge, LA. allenyc@lsu.edu

With the popularity of platforms as artificial reefs and the increase in the exploitation of resources in the GOM it is imperative that quantitative studies document the effectiveness and function of artificial reefs. Scientific interest has now turned to how artificial reefs relate in size and function to natural reefs. State and federal agencies are advocating the use of artificial reefs as a fisheries management tool in the northern Gulf of Mexico but management agencies must have reliable research on which to base their advocacy.

We conducted a side-scan survey of Louisiana's South Timbalier Artificial Reef Planning Area (STPA) to map the surface features present in the STPA. Detailed acoustic substrate mosaics from side scan sonar allowed us to determine the extent and distribution of artificial reefs relative to natural reef areas. We identified in excess of 200 features, not on navigation charts, that were outside of permitted artificial reef sites in the STPA. In addition we found a large, natural hard bottom area in the NE section of the planning area which was previously unknown. This natural hard bottom area will be critical to consider when locating future artificial reefs or conservation areas. Some research suggests that these low relief-rubble areas may be essential habitats for juvenile red snapper.

Our research group has determined that the configuration of artificial reefs strongly affects productivity and species composition. This survey allowed us to determine the overlap of natural hard bottom areas and artificial reef areas. In the future, we would like to develop this idea further and determine the degree to which proximity and extent of natural reefs affects productivity on artificial reefs.

USE OF RADIOCARBON FROM NUCLEAR BOMB TESTING TO HELP AGE YELLOWEDGE GROUPER, *Epinephelus flavolimbatus*, FROM THE GULF OF MEXICO

Melissa Bahnick^{*1,3}, James Franks², Harriet Perry^{1,2}, Terry Henwood³ and James Warren². ¹Department of Coastal Sciences, ²Center for Fisheries Research and Development, College of Marine Sciences, The University of Southern Mississippi, Ocean Springs, MS; ³National Marine Fisheries Service, Pascagoula Laboratories, Pascagoula, MS. melissa.bahnick@noaa.gov

Large-scale commercial longlining in the early 1980's dramatically increased commercial harvest of yellowedge grouper in the Gulf of Mexico. Despite its commercial importance, there is a lack of available life history information on age and growth. Otoliths were obtained from the commercial harvest and National Marine Fisheries Service cruises in the northern Gulf of Mexico. Sagittal otoliths were removed from fish ($n=146$) ranging in size from 107 to 1,191 mm FL. Initial age assessment proved to be inconclusive, because otoliths were difficult to read and opaque bands were not easily interpretable. Experimental nuclear bomb testing in the late 1950's and 1960's greatly increased the oceanic levels of ^{14}C . The otoliths of fish incorporate ^{14}C which can act as a chronometer. Radiocarbon dating has been used to validate age estimates of Gulf of Mexico red snapper, *Lutjanus campechanus*, and may provide age data for yellowedge grouper. Samples of yellowedge otoliths ($n=11$) with estimated ages from 1- 40+ years were analyzed by the National Ocean Sciences Accelerated Mass Spectrometry Facility. The ^{14}C levels in the otoliths were compared to ^{14}C levels reported for otoliths from Gulf of Mexico red snapper and for corals from the Florida Keys and the Caribbean to determine an approximate birth year.

USE OF OTOLITH MICROCHEMISTRY TO IDENTIFY UNIQUE NURSERY AREAS FOR RED DRUM IN THE NORTHERN GULF OF MEXICO

M. Scott Baker, Jr. and Charles A. Wilson. Coastal Fisheries Institute, School of the Coast and Environment, Louisiana State University, 204 Wetland Resources Building, Baton Rouge, LA 70803-7503. sbaker2@lsu.edu

Although the life history of red drum has been studied extensively, no information is available concerning the relevant contribution of individual estuarine systems to "production of" juvenile red drum. Otolith microchemistry has developed into an important tool in the analysis of fisheries stock structure. Chemical analysis of otoliths via inductively coupled plasma mass spectrometry (ICPMS) allows us not only to put a permanent marker on individual fish but also to characterize a geographically distinct nursery area by its minor and trace element composition. First, in order to determine the contribution of given nursery areas, we must determine if the fingerprint for a given nursery area remains stable, both spatially and temporally. In this study, we examined otoliths of juvenile red drum sampled from six geographically distinct nursery areas collected in the spring and summer of 2000 and 2001. Analysis of Mg/Ca, Mn/Ca, Sr/Ca, and Ba/Ca ratios revealed classification accuracies of 75% and 63% for 2000 and 2001, respectively. We speculate that high year-to-year variability may be the result of the constant flux of estuarine conditions.

FEEDING HABITS OF JUVENILE BLACKTIP SHARKS, *Carcharhinus limbatus*, IN TIMBALIER BAY, LOUISIANA

Kevin P. Barry* and Richard E. Condrey. Department of Oceanography and Coastal Sciences, Coastal Fisheries Institute, School of the Coast and Environment, Louisiana State University, Baton Rouge, LA 70803-7503. pkbtke@yahoo.com

Little is known regarding the feeding habits of blacktip sharks in Louisiana coastal waters. For this reason, the identity of prey items and the presence of diel feeding patterns for juvenile blacktip sharks in Timbalier Bay were explored. An experimental gillnet was deployed for approximate three-hour sets during the summer months of 2000 and 2001. Ideally, the net was checked hourly to reduce net feeding and to keep further digestion of stomach contents by entangled sharks to a minimum. To discern diel feeding patterns, each set was conducted in one of the following time intervals: night (am), dawn, day (am), day (pm), dusk, and night (pm). The time of each shark landing was recorded, and the sharks were immediately immersed in an ice slurry to slow digestion. Prey items from each stomach were removed and preserved with 70% ethanol. These prey items are currently being weighed and identified to the lowest taxonomic level possible. Two preliminary conclusions have emerged thus far: (1) late afternoon / early evening appears to be a primary feeding time; and (2) gulf menhaden, *Brevoortia patronus*, appears to be the primary food source.

THE EFFECTS OF CLIMATIC EVENTS ON LOUISIANA AND MISSISSIPPI COASTAL HABITATS

Edward A. S. Belden, Michael M. Harden and Terry L. Romaine. Louisiana Department of Wildlife and Fisheries, P.O. Box 98000, Baton Rouge, LA 70898-9000. belden_e@wlf.state.la.us

The Louisiana Department of Wildlife and Fisheries collects hydrographic data from sixteen coastal data collection platforms (DCP's); some have been in place for forty years. Three stations are located in the area of Lake Borgne, Chandeluer Sound, Mississippi Sound, and Lake Pontchartrain and enable resource managers and researchers to investigate the hydrographic relationship between these waters and the Gulf of Mexico. Climatic events such as the severe drought from 1999-2001 effect hydrography and can cause changes in coastal habitats, e.g. brown marsh, marsh erosion, and changes in vegetated wetlands and associated changes in fish fauna. The recent three-year drought allows us to evaluate the relationships between climatic patterns, salinity, temperature and tidal influxes. This presentation will examine the relationship between weather perturbations and the hydrographic data as they affect coastal habitats.

The work is funded by grant NA76FK0429 from the National Oceanic and Atmospheric Administration. The views expressed herein are those of the authors and do not necessarily reflect the views of NOAA or any of its sub-agencies.

A RE-EXAMINATION OF THE STATUS OF *Fundulus majalis* AND *Fundulus similis*

Jason K. Blackburn*¹, Bruce A. Thompson¹ and Royal D. Suttkus². ¹Coastal Fisheries Institute, Louisiana State University, Baton Rouge, Louisiana 70803. ²Tulane University Museum of Natural History, Belle Chasse, LA 70037. jblack6@lsu.edu

There are several pairs of killifishes, Family Fundulidae, ranging along the Atlantic and Gulf coasts of the United States whose status, at times, have been under debate. *Fundulus heteroclitus*/*F. grandis*, *F. confluentus*/*F. pulvereus*, and *F. majalis*/*F. similis* have been considered distinct species, subspecies, or the same species in various studies. For most of their nomenclatorial history, *F. majalis*, the striped killifish, and *F. similis*, the longnose killifish, were recognized as separate species. Relyea (1983) presented evidence that the two forms had an intergrade zone in northeastern Florida and concluded that the best interpretation would be to consider them a single species. We provide the first morphological analysis and additional pigmentation descriptions for a re-examination of Relyea's interpretation. Discriminant Function Analysis of 24 body/fin measurements resulted in the identification of four groups, which we interpret as showing sexual dimorphism in two distinct species. We found no evidence of any intergradations among the four groups. Similar to the noticeable differences in body patterns distinguishing *F. majalis* and *F. similis* females, we present dorsal fin pigmentation differences between *F. majalis* and *F. similis* males. We conclude that *F. majalis* and *F. similis* should be recognized as separate species.

COMPARISON OF HYDROACOUSTIC SURVEYS TO TRADITIONAL TRAWL METHODS FOR DETERMINING NEKTON ABUNDANCE IN A LOUISIANA ESTUARY

Kevin M. Boswell*, and Charles A. Wilson¹. Department of Oceanography and Coastal Sciences and Coastal Fisheries Institute, Louisiana State University, Baton Rouge, LA 70803. kboswe1@lsu.edu

Knowledge of the distribution of fishes within an estuarine system is needed to make effective management use of the concept of Essential Fish Habitat (EFH) (Sustainable Fisheries Act of 1996). We recognize four basic habitat types in a typical estuary, marsh, marsh edge, open bay, and channel; wherein fish distribution and species diversity can vary depending upon factors such as season, tide, lunar cycle, storms, and light intensity. Resolution of the influence of these and other variables on EFH is confounded by limitations of traditional sampling gear. Recently, active hydroacoustics has been shown to be a useful sampling tool that avoids some of the selectivity encountered with traditional gear types. Hydroacoustics has been used to estimate fish density, abundance, and biomass associated with different habitats and to monitor fish movement.

We conducted a brief survey in coastal Louisiana to evaluate the quantitative capabilities of hydroacoustics in a shallow water setting. Our objectives were to 1) determine the nekton biomass associated with three different habitats (bay, channel, and marsh edge) and 2) compare hydroacoustics to concurrently collected wing-net data. Two, outward facing, 420 kHz 2 X 6 elliptical split-beam transducers were deployed on opposite sides of a pontoon boat, and suspended at mid-depth. Alternating between transducers, data were recorded in five-minute intervals for 30 min. at each site. Data were analyzed using Biosonics Visual Analyzer. Concurrent wing-net data were collected at each site for comparison to acoustic biomass estimates and to determine species composition.

Based on both gear types, the open bay had 10 times the biomass found in a nearby tidal channel; *Menidia beryllina* dominated (60 %) the catch in the bay and *Anchoa mitchilli* dominated (90%) in the channel. However, diurnal differences between gear types indicated net selectivity in the daytime. Based on acoustic sampling, there was no diurnal difference in channel biomass, however based on channel wing-net samples there was a nine fold greater biomass at night compared to day. Hydroacoustics has promise for measuring nekton biomass in different shallow water habitats, but requires further refinement for use in shallow water systems.

BIOLOGICAL MONITORING AT LOUISIANA'S DAVIS POND FRESHWATER DIVERSION STRUCTURE

Elizabeth B. Bourgeois*¹, Jill A. Jenkins², Jaquelyn Matuszewski³ and Mark McElroy⁴.

¹Department of Biology, University of Louisiana, Lafayette, LA 70504; ²USGS, National Wetlands Research Center, Lafayette, LA 70508; ³Johnson Controls World Services, Lafayette, LA 70506; ⁴Louisiana Department of Wildlife and Fisheries, Baton Rouge, LA 70898. beth.bourgeois@noaa.gov

The U.S. Army Corps of Engineers' Davis Pond Freshwater Diversion structure is designed to divert freshwater and its accompanying sediments from the Mississippi River into the Barataria Basin in order to combat saltwater intrusion. Commercial and recreational fish and wildlife industries are expected to benefit from the three Louisiana Freshwater Diversion projects. However, the diverted water and sediments may introduce pollutants. In this USFWS-sponsored pre-diversion biological monitoring effort, bivalves and three species of fish were collected, tissues sent out for contaminants analyses, and several physiological biomarkers were measured. The same studies will be performed in years after the water is diverted, slated to start in winter 2002.

Biomarkers are being studied from largemouth bass, *Micropterus salmoides* (LMB), blue catfish, *Ictalurus furcatus* (BC) and striped mullet, *Mugil cephalus*. These fish represent multiple trophic levels within the water column, where LMB is a representative carnivore, BC is an omnivore, and mullet are herbivores. Thirty-six fish, three of each species, were collected by electroshock from four sites, Lake Salvador, Couba Pass, Lake Cattaouitcha, and the Mississippi River, near Lafitte, Louisiana. General fish health was assessed, organs and whole fish bodies weighed, and total fish lengths recorded. Spleens were processed histologically for microscopic digital imaging and consequent measurement of macrophage aggregate area, indicative of exposure to organic contaminants. A multivariate analysis of covariance (MANCOVA) was used to test site effect, species effect, and interaction between site and species ($\alpha=0.05$). The statistical analyses revealed species differences for macrophage aggregate areas ($P = 0.0001$), and species differences in liver weights ($P = 0.0337$) and body weights ($P = 0.0049$). A species and site interaction is evident in liver weight ($P = 0.0309$). Species differences in macrophage aggregate area, liver weights, and body weights are not unexpected because of species-specific life histories and metabolic processes.

Species:	CAT	LMB	Mullet
Camp Mean Weight:	2835	257	160
Couba Pass Mean Weight:	1463	111	238
Cattaouitcha Mean Weight:	2051	190	306
Mississippi River Mean Weight:	557	300	315

Mean weights of fish by species for each sampling site.

**PATTERNS IN THE EXPRESSION OF NUTRIENT ENRICHMENT:
PERSPECTIVES ON FISHERIES AND FISHERIES HABITAT IN
EUTROPHIC ECOSYSTEMS**

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A major dilemma for management of nutrient runoff into coastal ecosystems is that eutrophication can cause ecological damage (i.e. hypoxia, harmful algal blooms), but nutrients also stimulate the production of valuable fisheries. Endpoints for what constitutes a healthy and productive systems verses over-enrichment are often unclear. The ultimate expression of nutrient enrichment at the ecosystem level is poorly understood, but is likely to depend on the physical and biological characteristics of the system and how the fauna utilize particular habitats within an ecosystem. We hypothesize that in some marine systems, characteristics of the ecosystem and the fauna can buffer nekton from either the expression of eutrophication or the negative consequences for some fishes. Because fishes are mobile they may be particularly adept at utilizing the available habitat to reduce or avoid some of the negative consequences associated with eutrophication. The ability of fishes to utilize their habitats effectively will depend on the characteristics of the basin and their habitat requirements. We compared ecosystems from around the world that have been affected by nutrient enrichment to look for difference that may explain apparent disparities in the expression of eutrophication. We will contrast the effects of eutrophication in the northern Gulf of Mexico with other eutrophic systems and provide a hypothetical framework to explain some of the observed differences in the expression of eutrophication among ecosystems.

FEASIBILITY OF BIOLOGICAL INDICES USING FISH TO DETERMINE DEGRADATION OF SMALL STREAMS IN NORTH CENTRAL MISSISSIPPI

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Physicochemical and biological measurements are commonly used to monitor biological integrity of aquatic ecosystems. Biological assessment of fish and invertebrates are common in state and federal monitoring protocols to evaluate environmental impacts in small streams. However, the feasibility of these measurements has not been adequately tested in different ecoregions, and the biological indices used need to be better validated before they are used to accurately quantify environmental changes in small streams in Mississippi. This study experimentally evaluates the feasibility of biological monitoring using fish by comparing different biological indices with water quality parameters and physical habitat parameters from 15 small streams in north central Mississippi. Study streams were experimentally manipulated at three disturbance levels. Treatment types consisted of areas that were commercially logged with streamside management zones (SMZ), streams logged with no SMZ, and reference streams with no logging in the past 40-50 years. Experimental treatments were replicated three times during 2000. Two treatment types were replicated six times in 2001 with three replicates of the remaining treatment type. The relationship among index scores and disturbance levels was used to investigate the sensitivity of respective indices to physical disturbance within the experimental streams, and help validate the best approach in aquatic monitoring.

IBI
Shannon's
CPO5
tolerance guilds

Small stream
(1st & 2nd order)

~~Small stream~~

CPIE - per minute
per meter

MACROINVERTEBRATE DISTRIBUTION AND ABUNDANCE IN *Hydrilla* AND *Ceratophyllum* HABITATS

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Assessment of aquatic macroinvertebrate abundance and species composition can be useful for understanding aquatic system structure, water quality variation, and the forage base available to fishes. Vegetation-dwelling invertebrates are important food organisms for juvenile and adult fishes, particularly in lakes with few benthic organisms. Epiphytic invertebrate densities are typically tied to the quality and quantity of habitat available, which can be strongly influenced by the species composition of the resident macrophyte community. Many lentic habitats in the southern U.S. have been invaded by exotic hydrilla (*Hydrilla verticillata*), but the consequences of these invasions to native macroinvertebrate communities have not been determined. The goal of this study was to assess the impacts of hydrilla infestations on the littoral macroinvertebrate community in the Atchafalaya River Basin located in south central Louisiana. Our objectives were to determine the abundance and community composition of hydrilla-dwelling aquatic macroinvertebrates, evaluate the effects of macrophyte-induced reductions in water quality on macroinvertebrate densities, and compare macroinvertebrate densities between hydrilla and native coontail (*Ceratophyllum demersum*) beds. Collections were made with a trap that consisted of a 60 x 45 cm suitcase constructed of 0.5-cm thick angle aluminum with 600- μ stainless steel mesh walls. Preliminary results indicate that water quality not only affects macroinvertebrate abundance, but also influences macroinvertebrate diversity in these macrophyte beds.

SUITCASE SAMPLER FOR VEGETATION-DWELLING AQUATIC MACROINVERTEBRATES

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Aquatic macrophytes play an important role in aquatic systems, providing shelter, breeding habitat, and food for fishes and aquatic macroinvertebrates, and serving as indicators of water and habitat quality. Quantitative sampling macrophytes and their associated macrofauna, however, is often difficult due to high plant densities and differences in macrophyte morphology. Since 1960, many lentic habitats in the southern U.S. have been invaded by hydrilla (*Hydrilla verticillata*), an aggressive submerged macrophyte native to Asia. Hydrilla has become the dominant submerged macrophyte in the Atchafalaya Basin in southcentral Louisiana, and we are currently assessing the impacts of dense, virtually mono-specific hydrilla stands on water quality and macroinvertebrate distribution and abundance. As part of this study, we needed to develop an efficient, quantitative method of sampling macroinvertebrates in the dense canopy and understory habitats in littoral hydrilla beds. We devised a 60 x 45 cm suitcase trap constructed of 0.5-mm thick angle aluminum with 600- μ stainless steel mesh walls, and used it to collect vegetation-dwelling macroinvertebrates from May to September 2001. Results indicate the sampler is easy to deploy and retrieve, effective in all plant densities, permits estimation of macroinvertebrate densities by plant volume or dry weight, and is more effective than traditional net sweeps in describing the structure of the macroinvertebrate community.

SPATIAL DISTRIBUTION AND RELATIVE ABUNDANCE OF THE EARLY LIFE HISTORY STAGES OF FLYINGFISHES (EXOCOETIDAE) IN THE NORTHCENTRAL GULF OF MEXICO

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Exocoetids are important ecologically as a food source for many recreational and commercial fishes in offshore waters, including dolphinfish, wahoo, blue marlin, swordfish, and tuna. Extensive studies on distribution and abundance of flyingfishes have been conducted in the Pacific, Indian, and Atlantic oceans and also the Caribbean Sea; however, exocoetid studies are lacking in the Gulf of Mexico (GOM). Eggs, larvae, and juveniles of most exocoetid species are often associated with pelagic *Sargassum*, which often occurs in the vicinity of frontal boundaries. The purpose of this investigation was to document the spatial distribution and relative abundance of juvenile and larval exocoetids in the northcentral Gulf of Mexico with respect to *Sargassum* habitat and ephemeral small-scale frontal boundaries. Neuston collections were taken off the coasts of Mississippi and Alabama in the GOM during May, July, August, October, and December of 2000 and in May and July of 2001. Samples were taken both adjacent to *Sargassum* and/or frontal boundaries and up to two miles away from these oceanic features. The Kolmogorov-Smirnov test showed that the data was not normally distributed, and consequently the Kruskal-Wallis test was used to distinguish differences in the spatial distribution of exocoetidae abundances. Because the same data were tested multiple times, significance levels were adjusted using the sequential Bonferroni correction. Exocoetids were the most abundant taxa of fishes in neuston collections. Nine of the ten species of exocoetids ($n = 1747$) distributed in the northcentral GOM were collected at 39 of the 46 (84.8%) sites sampled. Ten minute neuston collections taken adjacent to *Sargassum* or fronts had significantly more flyingfishes ($n = 51.4$ and 63.1 , respectively) than collections taken away from *Sargassum* or fronts ($n = 20.5$ and 16.8 , respectively). *Sargassum* and fronts play an important role in the life history of flyingfishes, providing a nursery area in open, pelagic waters.

UTILIZING SIDE SCAN SONAR AS AN ARTIFICIAL REEF MANAGEMENT TOOL

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Artificial reefs generally occur over broad areas of water bottoms, which is a challenge for artificial reef managers. To date Mississippi has spent approximately 1.5 million dollars for artificial reef development in its territorial and adjacent federal waters. Side scan sonar can map large areas relatively quickly. These man-made hard bottom habitats must be monitored to ensure compliance with COE permits and navigational clearance. Side scan images can provide detailed information on latitude and longitude, orientation of materials, relief, footprint and scouring around the material. The reef can be scanned over time to determine the degree of stability (movement or subsidence) and durability (degradation of reef material). A total 150 nautical miles of transects have been surveyed to date. These transects covered approximately 6000 acres of water bottoms. Utilizing side scan sonar we have been able to detect movement of deployed material, subsidence of deployed material and have more accurately mapped all deployments surveyed. Accurate mapping of the deployments has allowed reef managers to begin strategically placing materials along a hierarchical design that Japanese researchers have found to be most productive for reef fish habitat.

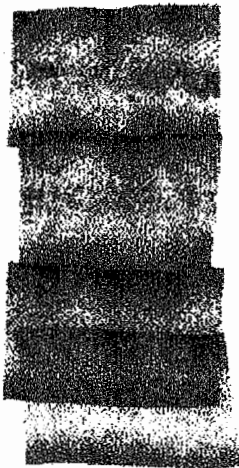


Side scan sonar image of a WWII liberty ship

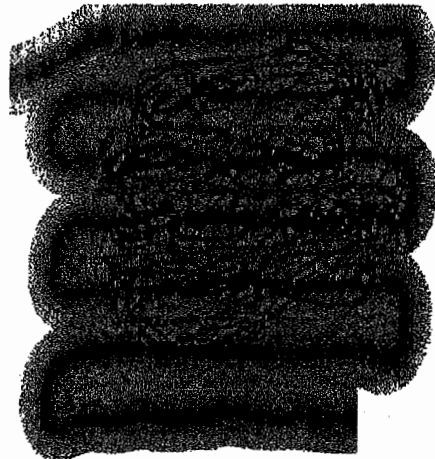
SIDE SCAN SONAR AS A TOOL FOR OYSTER REEF MANAGEMENT

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Oyster harvest from Mississippi reefs provide jobs for numerous fishermen and contribute substantially to the economy. Proper management of these reefs is vital for continued harvest. Enhanced management techniques (i.e. cultch planting) should help to ensure even greater future production. Cultch planting is a key component of management measures conducted by the Mississippi Department of Marine Resources (MDMR). The use of sounding poles, tongs, dredges or scuba equipment gauged the effectiveness of different cultch planting methods. These methods are not efficient techniques when surveying large areas for coverage rates or distribution of materials. Using side scan sonar to monitor cultch plants has a number of advantages over these previously used methods. Side scan sonar can cover large areas in less time, provide accurate measurements of coverage, and simultaneously provide differential GPS coordinates. The information acquired from side scan sonar provides a long-term record, which can be used to detect changes due to environmental catastrophes, vessel groundings and reef distribution. A side scan sonar survey was performed on two cultch plant sites and two barge grounding sites located in the western MS Sound. The cultch plant sites were located on St. Joseph reef area and the Pass Christian reef area. The St. Joseph cultch plant site was surveyed before and after cultch planting. On the Pass Christian cultch plant only a post side scan sonar survey was conducted. Preliminary barge grounding damage was assessed on Pass Marianne reef and Pass Christian tonging reef. The data was processed and input in a mosaic software program for further analysis.



St. Joseph before cultch plant.



St. Joseph after cultch plant.

EFFECTS OF FREEZING ON OYSTER PLOIDY DETERMINATION

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Oysters are extensively cultured throughout the world and research during the past two decades has led to the production of polyploids that have alternative numbers of chromosomes. The recent development of tetraploid Pacific oysters, *Crassostrea gigas*, is currently being applied to the Eastern oyster, *C. virginica*, at the Louisiana Sea Grant Bivalve Hatchery in Grand Isle, LA. Oysters resulting from a tetraploid by diploid cross are 100% triploid, as opposed to those chemically induced, and have improved performance because they spend less energy on reproduction and more on somatic growth, reducing grow-out time.

Samples of larvae or juvenile oyster hemolymph are typically shipped overnight from commercial hatcheries to laboratories for polyploidy analysis by flow cytometry. Samples are often frozen prior to shipping. Analyses occur within 24 hours, and the results are provided to the hatchery. Ploidy analyses of larval broods and juvenile individuals have varied. The goal of this experiment was to test the reliability of results based on shipped samples. The objective was to determine the effect of shipping conditions on ploidy analysis by flow cytometry.

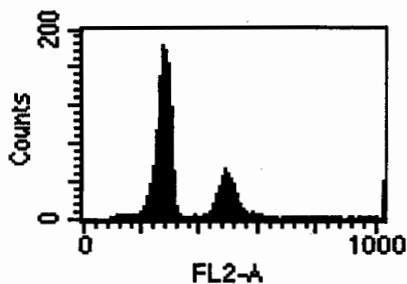


Figure 1. Oyster (left) and catfish (right) peaks on flow cytogram, indicating relative DNA amounts.

The variance of the DNA masses found in the oyster hemocytes was greater prior to shipping ($P < 0.05$), and the calculated DNA mass increased as a result of freezing from an average of 0.9403 pg to 1.218 pg. More research comparing fresh and shipped samples will be conducted.

Ploidy analyses of 7 oysters were conducted by flow cytometry on fresh and shipped hemocytes drawn from the same oyster. Channel catfish blood was used as a control. Cells were processed and stained with propidium iodide that binds to DNA and produces red fluorescence. Histogram plots of fluorescence verses cell counts were produced. Each peak channel was marked and analyzed electronically to determine DNA mass using FACSCComp software.

AGE AND GROWTH OF RED SNAPPER *Lutjanus campechanus* IN THE NORTHWESTERN GULF OF MEXICO: IMPLICATIONS TO THE UNIT STOCK HYPOTHESIS.

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Demographic variations in growth rates suggest the existence of separate stocks of red snapper *Lutjanus campechanus* in the northern Gulf of Mexico. During this three-year study, 5,074 specimens from recreational fisheries of Alabama, Louisiana, and Texas were sampled for morphometric data and otoliths. Red snapper ranged from 1 to 35 yr (199-916 mm FL), 1 to 37 yr (114-913 mm FL), and from 1 to 45 yr (267-846 mm FL) for Alabama, Louisiana, and Texas, respectively. Regression equations of log transformed (base 10) data of fork length (FL in mm) – total weight (TW in kg) relationships did differ significantly between states: $TW = 1.51 \times 10^{-5} FL^{3.03}$ ($r^2 = 0.98$) for Alabama, $TW = 1.48 \times 10^{-5} FL^{3.03}$ ($r^2 = 0.96$) for Louisiana, and $TW = 4.79 \times 10^{-6} FL^{2.84}$ ($r^2 = 0.91$). However, the relationships for Alabama and Louisiana are very similar and the biological significance of any differences is probably negligible. Von Bertalanffy growth models derived from FL at age were $L_{\infty} = 863(1 - e^{(-0.23(t))})$ for Alabama, $L_{\infty} = 845(1 - e^{(-0.25(t))})$ for Louisiana, and $L_{\infty} = 805(1 - e^{(-0.22(t))})$ for Texas. Comparisons of growth parameters indicate that growth among Alabama and Louisiana red snapper is comparable, but that red snapper from Texas appear to grow more slowly and to a lesser size than their eastern counterparts. Differences in growth rates among states were also evaluated by comparing linear regressions of mean FL and TW at age and for all individuals [10 yrs. Mean FL and TW at age also invariably show Texas red snapper to be smaller than Alabama and Louisiana red snapper. Whether these differences in growth rates are environmentally induced or result from genetic divergence remains to be determined. However, the differences in growth rates are congruent with genetic heterogeneity among populations revealed in another component of this investigation. In either case, the existence of demonstrable demographic differences would argue for the delineation of multiple red snapper management units in the northern GOM.

SURVEY OF FISH ASSEMBLAGES WITHIN TWO AREAS CLOSED TO FISHING ON THE WEST FLORIDA SHELF

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The primary goals of this project were to: 1) establish a baseline estimate of fish abundance, especially for species of groupers and snappers; 2) estimate the age structure and reproductive status for groupers and snappers; and, 3) describe significant habitat features in the Madison-Swanson and Steamboat Lumps reserves. Secondary objectives were to: 1) locate spawning aggregations of gag, scamp, and snappers; and, 2) compare selectivity of hook-and-line, fish trap and video sampling gear.

The Madison-Swanson Marine Reserve and adjacent control areas were sampled at ninety-one sites during five research cruises conducted between February and April, 2001 aboard the *RV Caretta* based at the Pascagoula NMFS Laboratory. The scientific party was supplemented with researchers and equipment from Florida State University. The Steamboat Lumps Marine Reserve was sampled during two cruises in 2001. Seven sites were sampled during the SEAMAP Reef fish survey on the NOAA Ship Oregon II on June 5, 2001, and thirty-nine sites were sampled during a cruise of the *RV Caretta* between July 21 and July 31, 2001. Gear employed during the Madison-Swanson cruises included a video camera array, which consisted of four Hi-8mm cameras (fifty-seven sites), chevron traps (ten sites), and an ROV (twenty sites). At Steamboat Lumps, a video camera array, consisting of four digital cameras was used at forty-five sites and a chevron trap at two sites.

Spawning aggregations of gag and/or scamp were confirmed at eleven sites and suspected at five others through video surveillance from twenty ROV dives within the Madison-Swanson Marine Reserve. Histological and otolith samples were taken from fifty-nine fish for reproductive and aging studies. Species collected included gag (*Mycteroperca microlepis*), scamp (*Mycteroperca phenax*), red grouper (*Epinephelus morio*), snowy grouper (*Epinephelus niveatus*), speckled hind (*Epinephelus drummondhayi*), red snapper (*Lutjanus campechanus*), silk snapper (*Lutjanus vivanus*), red porgy (*Pagrus pagrus*), knobbed porgy (*Calamus nodosus*), gray triggerfish (*Balistes capriscus*), and greater amberjack (*Seriola dumerili*). At Steamboat Lumps, sites sampled during the SEAMAP survey were located primarily on sandy substrates in the central portion of the reserve. Fish observed included honeycomb moray (*Gymnothorax saxicola*), and bandtail puffer (*Sphoeroides spengleri*). Sites sampled during the *RV Caretta* cruise were located in the northeast region of the reserve with habitat consisting of sandy substrates, fish burrows or rocky outcrops. Species observed included honeycomb moray, red porgy, scamp, red grouper, bank sea bass (*Centropristis ocyurus*), and vermilion snapper (*Rhomboplites aurorubens*).

BIOLOGICAL SURVEYS TO ASSESS THE RELATIVE ABUNDANCE AND DISTRIBUTION OF COASTAL SHARKS AND TELEOSTS OF THE WESTERN NORTH ATLANTIC OCEAN, 1995 TO 2001

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The United States (U.S.) National Oceanic and Atmospheric Administration (NOAA) reported commercial landings of coastal and oceanic sharks in the U.S. western North Atlantic Ocean and Gulf of Mexico increased from 135 metric tons (mts) in 1979 to 7,122 mts in 1989 (NOAA 1993). The landings increase was due to a combination of factors including increased effort, favorable market situations for shark products, and improved fishing techniques. Recreational landings during the same 10-year period decreased from 11,512 mts in 1979 to 1,666 mts in 1989 (NOAA 1993). The landing statistics for commercial and recreation shark fisheries were indicative of what was believed to be over fishing of unregulated shark fisheries of the western North Atlantic Ocean and the Gulf of Mexico. In efforts to maintain viable shark populations, the National Marine Fisheries Service (NMFS, an agency of NOAA) developed the 1993 Fisheries Management Plan (FMP) for Sharks of the Atlantic Ocean (NOAA 1993). The plan stresses the need for monitoring and assessment of shark populations to determine the efficacy of FMP measures. NMFS Mississippi Laboratories instituted field surveys (1995 - 2001), with support from the NMFS Highly Migratory Species Division, to assess distribution and relative abundance of coastal sharks in the western North Atlantic Ocean and Gulf of Mexico. Beginning 1999, survey objectives were expanded to include red snapper (*Lutjanus campechanus*) and other important commercial and recreational fish (e.g., groupers). The longline surveys provide a useful fisheries independent data base for many elasmobranchs and teleosts that are NMFS management priorities.

FISHERIES RESEARCH AT THE COLLEGE OF MARINE SCIENCES, THE UNIVERSITY OF SOUTHERN MISSISSIPPI

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The Gulf Coast Research Laboratory (GCRL), established in 1947 by the Mississippi Academy of Sciences, was for many years a separate institution of higher learning in the State of Mississippi. The University of Southern Mississippi assumed administrative authority for the GCRL in 1988, and in 1996 the Board of Trustees of the Institutions of Higher Learning created the Institute of Marine Sciences by merging the GCRL, which includes the J.L. Scott Marine Education Center and Aquarium in Biloxi, with the Center for Marine Science and the Center for Ocean and Atmospheric Modeling, both at Stennis Space Center. College status was granted to the Institute in 2001, and the Center for Fisheries Research and Development, Hydrographic Science Research Center, and Center for Trace Analysis were added to the College. Research, education and outreach activities within the College pertaining to coastal fisheries include wetlands loss, water quality, seafood monitoring, aquaculture, habitat degradation, and fish diseases. Research findings are relevant to the sustainability of coastal fisheries and fisheries habitat, advancement of aquaculture techniques, and seafood safety. Fisheries-related activities are conducted at local, regional, and international levels. College scientists also serve on various advisory boards and review panels that review fisheries and fisheries management issues.

RELATIONSHIP BETWEEN JUVENILE RED DRUM ABUNDANCE AND BLUE CRAB MORTALITY AND ABUNDANCE

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The red drum (*Sciaenops ocellatus*) - blue crab (*Callinectes sapidus*) predator-prey relationship was a controversial fisheries issue in Louisiana during the 1990s. Red drum populations increased in the early 1990s following closure of the commercial fishery, recreational restrictions, and the massive late-1989 winter fish kill; at the same time commercial landings of blue crabs declined. Red drum trammel net catch per unit effort (CPUE) in fishery independent samples was negatively correlated with blue crab 16-foot trawl CPUE and positively correlated with blue crab annual instantaneous mortality, as calculated with Hoenig's (1987) length-based mortality model. These analyses and predation literature suggest that red drum predation may have influenced blue crab populations. Caution, however, was advised before attributing interannual fluctuations in blue crab populations and mortality to red drum predation because of the potential of spurious relationships, the complexity of estuarine predator-prey interactions, and the influence of other unmeasured mortality factors.

ANGLING SUSCEPTIBILITY OF SPOTTED BASS IN THE BUTTAHATCHEE RIVER, MISSISSIPPI

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In the summer and fall of 2000, we estimated susceptibility of stock-length (³180-mm) spotted bass, *Micropterus punctulatus*, to angling in the Buttahatchee River, Mississippi. Population estimates for two segments of the river (an unaltered upstream site and a downstream site altered from gravel mining) were made from a multi-census mark and recapture effort using pulsed-DC boat mounted electrofishing equipment. Controlled angling was conducted to estimate angling susceptibility. Shallow riffles bordering the study areas were presumed to block fish movement into and out of the study areas. Population estimates and density between the sites varied greatly with the unaltered site having 2.6 spotted bass/100m of stream and 11.2 spotted bass/ha, while the altered site contained 8.3 spotted bass/100m of stream and 34.8 spotted bass/ha. Angling catch per effort for the unaltered site was 0.95 fish/h with a potential harvest of 7.1 fish/ha, and the altered site had a catch per effort of 1.1 fish/h and a potential harvest of 7.9 fish/ha. Based on these harvest rates approximately 23% and 68% of the spotted bass populations could have been removed from the altered and unaltered sites in 40 angler hours. Results indicate that spotted bass populations in the Buttahatchee River can be highly vulnerable to angling exploitation.

BENTHIC MACROINVERTEBRATE AND FISH ASSEMBLAGES IN LITTLE BYWY CREEK AND MIDDLE BYWY CREEK, NATCHEZ TRACE PARKWAY

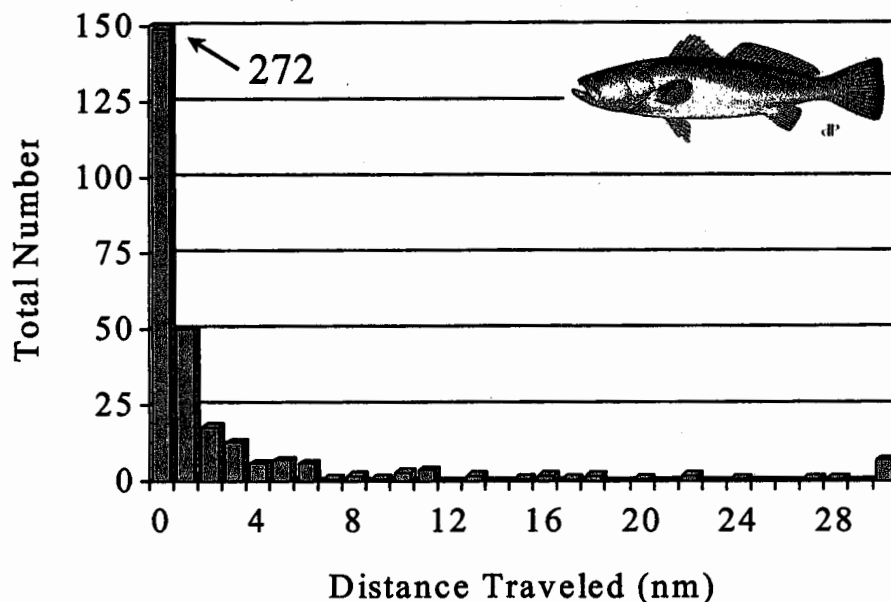
**Rohasliney Hashim*, Donald C. Jackson and Eric D. Dibble. Department of Wildlife and Fisheries, Mississippi State University, Mississippi State, MS 39762.
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A one-year study (July 2000 and June 2001) was conducted in the Little Bywy and Middle Bywy creeks along the Natchez Trace Parkway in Choctaw County, Mississippi, to characterize benthic macroinvertebrate and fish assemblages. Benthic macroinvertebrate samples were collected with Hester-Dendy multiple plate samplers while fish were collected with a Smith Root backpack portable electrofishing unit. Environmental characteristics from the two creeks were measured concurrently with the periodic sampling of macroinvertebrate and fish. Field measurements for instream features, stream habitat, and stream morphology were conducted on 4 June 2001 under minimum flow conditions. Little if any differences were discerned between the two creeks with respect to water quality. However, physical habitat features rendered Middle Bywy Creek more favorable environment for benthic macroinvertebrates and fishes compared to Little Bywy Creek. The abundance of benthic macroinvertebrates was lower in Little Bywy Creek ($774 \text{ organisms/m}^2$) than in Middle Bywy Creek ($1507 \text{ organisms/m}^2$) ($F_{1, 79, 0.05} = 0.01$). Ephemeroptera (44.8%) and Diptera (36.1%) dominated the benthic macroinvertebrate fauna. Peak abundances of the macroinvertebrates were in October 2000 and June 2001 in Middle Bywy Creek, whereas in Little Bywy Creek, peak abundances were in August and December 2000. Thirty-seven fish species were collected from both creeks collectively. There were no significant differences in the relative abundances of fishes between the creeks ($F_{1, 30, 0.05} = 0.5$). Minnows (Cyprinidae), catfishes (Ictaluridae) and sunfishes (Centrarchidae) numerically dominated the fish assemblages in both creeks. The relative abundance of fishes collected was higher in autumn than in other seasons.

MOVEMENTS OF SPOTTED SEATROUT, *Cynoscion nebulosus*, IN MISSISSIPPI COASTAL WATERS BASED ON TAG-RECAPTURE

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Movement patterns of spotted seatrout, *Cynoscion nebulosus*, were evaluated in Mississippi coastal waters through an angler-based tagging study from 1995 through 1999. During this period, over 500 anglers tagged and released 15,206 spotted seatrout along the Mississippi Gulf Coast, and 406 (2.67%) of these fish were recaptured. Over 90% of recaptured fish moved less than 10 nautical miles (nm) from point of tag/release to point of recapture, and almost 80% moved less than 2 nm. The greatest distance traveled from tag/release to recapture point by any fish was 40 nm, covering a period of 200 days. Only five fish (1.2%) moved 35 nm or greater. Due largely to minimum size regulations on this fishery, the majority of fish tagged in this study (84%) were under 14 inches in total length. Study results suggest that spotted seatrout in Mississippi waters comprise a non-migratory fish stock, as has been found for this species in coastal waters of neighboring states along the U. S. Gulf of Mexico.



Distance traveled (nautical miles) by spotted seatrout recaptured in Mississippi coastal waters from 1995 to 1999.

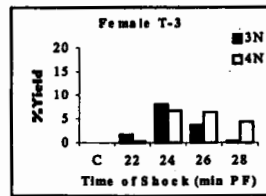
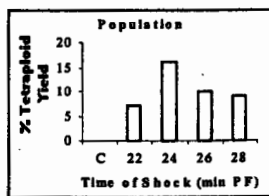
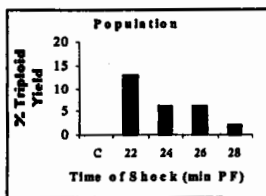
IS VARIABLE INDUCTION OF POLYPLOIDY IN NILE TILAPIA CAUSED BY ASYNCHRONY OF ZYGOTIC DEVELOPMENT?

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Ploidy, the possession of more than the normal two sets of chromosomes is a naturally occurring phenomenon in fish. Much interest has been generated in the production of sterile triploid fish (possessing three sets of chromosomes in each cell). Benefits from such fish range from the prevention of pre-harvest spawning in fishes such as tilapias (leading to overpopulation, stunting, reduced flesh quality and loss of animals due to fighting), to minimizing the risk of exotic introductions and contamination of wild gene pools, to the protection of intellectual property. One of the most promising methods for the production of completely triploid stocks is the mating of tetraploid fish (possessing four sets of chromosomes) with normal diploid fish. This method has proven to be reliable in salmonids and avoids problems associated with application of pressure, temperature change, chemicals or electric shocks to fertilized eggs (to prevent the extrusion of the second polar body), which are often used to produce triploids.

Much of the work done on the induction of polyploidy in tilapia has focused on a search for the optimal timing, intensity, and duration of shocks to fertilized eggs. Workers have identified specific windows of time of application of shocks that produce triploidy or tetraploidy, indicating that the mechanisms responsible for the prevention of the extrusion of the second polar body (triploidy) or the inhibition of first mitosis (tetraploidy) occur at specific stages of zygotic development. These windows are variable, however. Most researchers report triploidy induction to occur between 3 and 9 min post fertilization (PF) while others have reported triploid induction at 15 min PF and even 20 min PF. Reported times of shock application to produce tetraploid tilapia have varied even more, with the window being placed at 27-30, 40-50, and 60-90 min PF. Hypotheses addressing the variation among researchers regarding time of application of shock to produce polyploid tilapia include: species and strain differences; interruption of different mechanisms that result in polyploidy; methodological differences; and asynchronous development.

Our work has concentrated on the induction of tetraploidy in Nile tilapia *Oreochromis niloticus* by heat shock. We have found that a heat shock of 42°C applied for 3 min at 26 min post fertilization produced the highest tetraploid yield (16%). However, in initial experiments triploids were produced by this treatment as well. In fact, in later experiments tetraploids and triploids were produced by this treatment from single spawns. This suggests that asynchronous zygotic development occurs and plays a role in variation of polyploid induction windows.



Time of application of 42°C heat-shocks (min PF) and percent yield of triploidy and tetraploidy at the population and individual level. Control treatments (no shock) are denoted by the letter C.

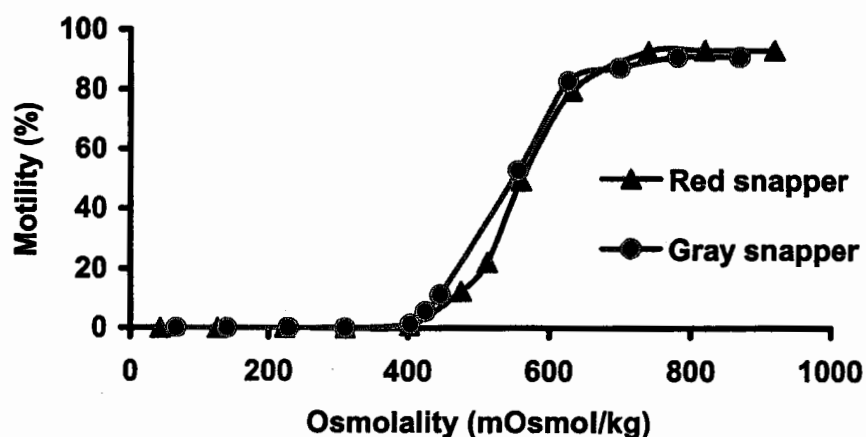
EVALUATION OF SHORT-TERM AND LONG-TERM STORAGE OF RED SNAPPER AND GRAY SNAPPER SPERM

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Short-term and long-term storage of sperm can offer benefits in the hatchery production of marine fish. Refrigerated and cryopreserved sperm can be used to improve artificial spawning by eliminating the need to hold male broodstock, allowing repeated use of sperm from high quality males, and enabling production of hybrids. As part of a larger study on the reproduction of lutjanids, we developed methods for the collection, handling, refrigerated storage, and cryopreservation of red snapper *Lutjanus campechanus* and gray snapper *Lutjanus griseus* spermatozoa.

Sperm were collected from red snapper (n = 177) and gray snapper (n = 78) males captured in the recreational fishery during the summers of 2000 and 2001. Sperm were diluted 1:4 with calcium-free Hanks' balanced salt solution (C-F HBSS), placed in 4-L Ziplock[®] plastic bags, and transported to the laboratory on ice. Undiluted red snapper seminal plasma had an osmotic pressure of 428 ± 16 mOsmol/kg (n = 19) while gray snapper seminal plasma was 411 ± 5 mOsmol/kg (n = 13). Blood plasma osmolality was 440 ± 8 mOsmol/kg for red snapper and 419 ± 8 mOsmol/kg for gray snapper. Activation studies of red snapper and gray snapper sperm found that sperm motility was suppressed by decreasing the osmotic pressure of artificial seawater (Figure 1). In a series of refrigerated storage experiments, sperm samples suspended in 200 mOsmol/kg C-F HBSS retained motility for 12 d at 4 C. Refrigerated storage experiments with the addition of 0.1% and 1.0% solutions of an antibiotic-antimycotic mixture did not significantly extend refrigerated storage times. Dimethyl acetamide, dimethyl sulfoxide (DMSO), methanol, and glycerol were evaluated as cryoprotectants. Ten percent DMSO was chosen for further study because it was least toxic to sperm samples. Red snapper sperm used in cryopreservation trials had $90 \pm 6\%$ motility before freezing and $80 \pm 23\%$ after thawing. Gray snapper sperm used in cryopreservation trials had $89 \pm 6\%$ motility before freezing and $64 \pm 24\%$ after thawing. This study demonstrated that red snapper and gray snapper sperm can be stored for short-term and long-term use in the hatchery.

Figure 1. Percent motility of undiluted red snapper and gray snapper sperm activated with artificial seawater.



COLONIC FLUSHING: A NON-DESTRUCTIVE TECHNIQUE FOR STUDYING THE DIET OF PALLID STURGEON

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Behavior and habitat of the endangered pallid sturgeon might be determined from dietary data if a non-destructive technique for sampling gut contents could be shown effective. In December 2001, we extracted gut contents from six pallid sturgeon by colonic flushing. Sturgeon 676-862 mm FL were collected in the lower Mississippi River near Vicksburg, MS. A 60 ml syringe or 250 ml plastic squeeze bottle filled with river water and equipped with narrow-gage surgical tubing was used. Tubing was introduced through the anus and inserted anteriorly to a point midway in the lower intestine (corresponding to a point midway between the pectoral and pelvic fins), after which water was slowly and steadily introduced. The expelled suspension containing water and gut contents was collected in a dissecting pan and preserved in formalin. Each sturgeon was observed for any signs of distress and then released.

Samples were stained with Rose Bengal and allowed to settle in a graduated cylinder to determine approximate food volume. They were washed into a white enamel pan, illuminated, and magnified. All organisms (whole and partial) were handpicked, identified to the lowest practical taxon, and enumerated. Gut contents in advanced states of digestion were diluted to a known volume, sub-sampled (as 3 ml aliquots), and total numbers determined by replicated counts and extrapolation.

Food volume ranged from 1.5 to 38 ml and averaged 21 ml. We identified 20 prey categories, 4 numerically dominant, from various body parts. Larval caddisflies (mostly *Hydropsyche* sp.) averaged 45 % of prey, and were enumerated from whole organisms, and from isolated head capsules and sclerites. Fishes (mostly cyprinids), 17% of the diet, were never present as whole organisms so numbers were inferred chiefly from counts of lenses, but also from presence of pharyngeal arches, jaws, and scales. Burrowing mayflies (*Hexagenia* sp.), 14 % of prey, were enumerated from counts of mandibular tusks. Larval midges (mostly Chironomini), 11 % of prey, were usually recovered as whole organisms or as head capsules with attached body cuticle. Small numbers of emergent or terrestrial insects were found. Ontogenetic trends in diet were not obvious. Large numbers of fish were obtained from the smallest sturgeon (29) and from the largest (16), but not from those intermediate in size (0-6).

Colonic flushing offers advantages over gastric lavage, or stomach flushing, as a non-destructive means of obtaining gut contents: i) lower risk of gut perforation (due to length and straightness of the lower intestine); ii) no risk of suffusing water into the swim bladder (connected to anterior gut by pneumatic duct but isolated from posterior gut by pyloric valve); iii) briefer handling time.

A CROSS-SECTIONAL ANALYSIS OF THE CHARTER BOAT INDUSTRY OF LOUISIANA

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It is widely recognized that recreational fishing is a very important economic activity in the United States. The American Sportfishing Association (ASA) argues that nationwide and annual spending by America's 35.2 million adult anglers amounted to \$37.8 billion in 1996 (ASA, 1996). In addition, anglers' annual spending created a nationwide economic impact of about \$108.4 billion, supported 1.2 million jobs, income in the order of \$28.3 billion, added \$2.4 billion to state tax revenues, and contributed \$3.1 billion in federal income taxes (ASA, 1996).

What does all this information mean for the state of Louisiana? Louisiana is characterized by unique water resources, therefore it seems reasonable to assume that such activities are important for the state's economy. Louisiana has many registered recreational boats as part of the "for hire" or "charter boat" industry. In 1999, there were 332 licensed charter captains. According to the Louisiana Department of Wildlife and Fisheries (LDWLF), in 1999, 75% of all vessels were smaller than 25 feet. Small boats mean small number of passengers and short distance trips (mostly inshore). However, it is impossible to fully characterize the charter boat industry in Louisiana based only on the size of the boats in the fleet.

The objective of this paper is to provide an analytic description of the charter boat industry to inform major players and the general public about the structure and status of this industry at the present time. At the present moment there is little information about the charter boat industry in Louisiana on which management and investment decisions could be made.

A mail survey was conducted in 1999 to collect information and make the analysis as detailed as possible. Questions were asked about vessels, services and fees, cost, and personal information about charter boat operators. Surveys were mailed to the whole population (332 operators) with the objective of collecting information from the greatest number of operators. A total of 67 responses were received and that is the sample used in the present study.

The statistical analysis confirmed that the Louisiana charter boat industry is mostly composed of small boat (less than 25 ft) and, consequently, charter boats trips are inshore and full day (77%). Speckled Trout, Redfish and Flounder were mentioned as the main fishing target. In addition, there is positive correlation between operator's experience and the number of trips per year (0.38), boat cost (0.27) and engine power (0.35). On average, the total cost (depreciation, repairs, fixed, and variable costs) of a trip oscillate between \$525 and \$918 depending on operator's experience. Base fees for full day trips oscillate between \$347 and \$436 which apparently do not cover the costs. However, applied extra-fees (not included) may make the difference to cover trip costs. The analysis indicates that charter boat operators might have spent above 14 million dollars in the Louisiana economy in 1999. The total economic impact of such spending may be in the order of \$21 million using a conservative multiplier of 1.5. Here the associated expenses of charter boat clients have not been included and, therefore, this impact is a lower boundary. Therefore, the economic and social impact of the charter boat industry for the Louisiana economy can be much greater than \$21 million.

TARPON AND SNOOK STOCK DYNAMICS IN BRACKISH WATER LAGOONS OF HUMACAO NATURAL RESERVE, PUERTO RICO

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Tarpon (*Megalops atlanticus*) and snook (*Centropomus undecimalis* and *C. ensiferus*) are principal fisheries resources in the six brackish water lagoons located in Puerto Rico's Humacao Natural Reserve. The lagoons developed on the reserve after Hurricane David and Tropical Storm Frederick flooded the area (August 1979), and are arranged in a series that connects to the sea during periods of substantial precipitation. From March 2000 to April 2001, we recorded environmental characteristics and conducted stock assessments of tarpon and snook in the lagoons. For stock assessments we utilized experimental gill nets (N = 228) and trap nets (N = 123).

Gill nets were more effective in catching tarpon and snook than were trap nets. The serial arrangement of the lagoons was reflected in environmental gradients from essentially marine to low-salinity brackish water conditions, and also corresponded to changes in aquatic macrophyte characteristics, water clarity and relative abundance of tarpon and snook. Salinity and turbidity declined, and aquatic macrophyte density increased as distance along the lagoon series from the sea increased. Relative abundances of tarpon and snook also increased as distance from the sea increased. Relative abundances of tarpon and snook in the lagoons were related more to water clarity and aquatic macrophyte stand characteristics than to salinity. Water clarity is assumed to enhance predatory efficiency of these visually-oriented piscivores, while aquatic macrophytes and lower salinity may enhance production of *Tilapia* spp., a principal forage fish in the lagoon system.

A CHROMATIN STRUCTURE ASSAY FOR CRYOPRESERVED SPERM FROM LAKE STURGEON (*Acipenser fulvescens*)

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Four of the nine species of sturgeon in North America are listed as endangered or threatened. Included in the U.S. Fish and Wildlife Service recovery plans are directives for spawning research. Because of incomplete knowledge of sturgeon reproductive biology and asynchronous maturation of broodstock, artificial spawning methods using cryopreserved sperm offer benefits for conservation of genetic resources. In a broader study delineating cryopreservation protocols for sturgeon sperm, a mammalian DNA integrity assay was adapted for use in conjunction with other sperm quality assays. Sperm cell motility, viability, and fertilization ability were measured after cryopreserving sperm from five lake sturgeon *Acipenser fulvescens* by using two concentrations of the cryoprotectants dimethyl sulfoxide (DMSO) and methanol. The thawed sperm were assayed for motility by darkfield microscopy and viability (Table 1) by flow cytometry.

Cryoprotectant	Motility	Viability	Fertility
DMSO 5%	11%	27%	>1%
10%	17%	57%	1%
Methanol 5%	7%	17%	48%
10%	8%	27%	46%

The sperm chromatin structure assay (SCSA) is typically used in assessing cytotoxicity of chemotherapeutic drugs and for human infertility testing. The assay is based on the fact that damaged nuclei will possess less double-stranded DNA and more single-stranded DNA than intact genomic material. This assay offers a sensitive measure of the condition of genetic material, and complements results from other sperm quality assessments, such as membrane integrity (viability), cell morphology, or motility. In a preliminary study, SCSA was used to evaluate lake sturgeon sperm cryopreserved with methanol. Briefly, after exposure to acid and detergent, the cells were stained with acridine orange, and fluorescence was measured. If genetic material was damaged prior to testing, shifts in fluorescence were expected, where single-stranded DNA would fluoresce red and orange, and double-stranded DNA would fluoresce green. Relative responses are shown with arrows (Table 2). Greater and contradictory shifts were seen in samples with lower viability. Future studies should further address the relationship of SCSA values to sperm motility, viability, and fertilization.

Fish and Treatment	Green	Red	Orange	Motility	Viability
Fish 1 Methanol 10%		↑	↑	10%	21%
5%		↑↑	↑↑	5%	5%
Fish 2 Methanol 10%		↑	↑	20%	6%
5%	↓	↓		2%	>1%
Fish 3 Methanol 10%		↑↑	↑↑	18%	>1%
5%	↓	↓		2%	>1%

EFFECTS OF ELECTROFISHING ON INJURY AND MORTALITY OF NON-GAME FISH

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We conducted experiments to determine if power densities required to immobilize game fish injured non-game fish. Four species including creek chub *Semotilus atromaculatus*, bluntnose minnow *Pimephales notatus*, fingerling channel catfish *Ictalurus punctatus* (surrogates for *Noturus*), and redbfin darter *Etheostoma whipplii* were treated to various electrical settings in a laboratory tank with a homogeneous electrical field. For each species-electrical setting combination, approximately 10-20 fish were treated to levels ranging between the threshold power density required to immobilize game fish, and 3X the threshold. This tripling of the threshold was intended to simulate the range of power densities that might exist in a heterogeneous electrical field formed during electrofishing in lakes and streams. Individual fish were exposed to electricity for 15 s, held overnight for 18 h, euthanized, radiographed to inspect for spinal injury, and necropsied to inspect for hemorrhages. Mortality averaged 21% (range 0-100 depending on species and electrical setting), spinal injury 6% (0-33), and hemorrhage 3% (0-20). Bluntnose minnows appeared to be the most susceptible to mortality (mean = 53%), and high frequency configurations tended to produce more hemorrhage; no other patterns were immediately obvious.

EVALUATION OF PALLID STURGEON IN THE LOWER MISSISSIPPI RIVER

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Field studies have been conducted since August 2000 to evaluate habitat requirements and population structure of pallid sturgeon in the lower Mississippi River. As of November 2001, 310 trotlines, 178 gill nets, and 146 trawls had been deployed at 17 locations between New Orleans, LA (RM 117) and Memphis, TN (RM 595). A few locations were representative of bendways, secondary channels, and straightways, and were sampled repeatedly to evaluate sturgeon abundance over a range of stage elevations, water quality conditions, and seasons. Other locations were sampled less frequently, but provided greater geographic coverage in the lower Mississippi River.

A total of 33 pallid sturgeon and 790 shovelnose sturgeon were collected along with 31 other fish species. Pallid sturgeon ranged in size (fork length) from 104 mm (<28 grams) to 965 mm (3.5 kilograms). Shovelnose sturgeon ranged in size from 91 mm to 860 mm FL. Possibly six young-of-year pallid sturgeon (Fork Length < 200 mm) were collected with otter trawls in August-November 2001.

There was a seasonal component in catchability of sturgeon. High catches of sturgeon in late autumn and early winter corresponded to low river stages and falling water temperatures < 10 C. High catches in mid-spring corresponded to high river stages and rising water temperatures from 15 to 22 C. Summer collections with trotlines and gill nets indicate that sturgeon are inactive and difficult to capture with passive gears, but trawling is an effective technique during this time period. These trends are providing guidelines on collecting strategies to maximize catch in different river habitats.

Pallid sturgeon occurred in water with surface velocities ranging from 28-137 cm/sec, but were more common in water greater than 75 cm/sec. Individuals that were collected closer to shore were usually found in deeper water, often associated with steeper shorelines. Microhabitat characteristics corresponded to river habitats used by pallid sturgeon. The highest catch occurred near point bars that characteristically form diverse habitats. The tip of dikes also provided suitable habitat for pallid sturgeon. Several pallid sturgeon were collected on a "shelf", which is essentially a steep sloping sand bar. Those individuals collected on middle sandbars and channel habitats were usually in swift water. No pallid sturgeon were collected in secondary channels. Field studies will continue, with greater effort to expand spatial and temporal sampling of the lower Mississippi River system.

PROGRESS ON THE MANAGEMENT OF THE SHORELINE OF LAKE CHARLIE CAPPS FOR FISHERIES HABITAT

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Lake Capps is a 500 acre state-owned impoundment built in 1963 by encircling a swamp with a levee. The last couple of years MDWFP has been trying to manipulate the shoreline vegetation on a peninsula in the NW corner of the lake to improve habitat for fish. In late 1999, the level of the lake was 33 inches below customary normal pool level. Biologist had let evaporation reduce lake volume to expose and firm up the lake bottom to improve bass spawning. A poor spawn of bass occurred spring 1999: Water had been kept high in 1998, and biologist were worried that the constant inundation had made the bottom muds too flocculent for spawning. Also in November 1999, an 8 acre expanse of exposed shoreline on the peninsula was planted with two cool season grasses, ryegrass and tall fescue. The ryegrass seeding appeared to be a successful operation: Flooded vegetation with thick stems to give refuge for fish fry and young fish was present through March and April, 2000. The Department used the flooded ryegrass to enhance survival of fingerling largemouth bass that were stocked in April 2000. Whereas, no Y-O-Y bass were captured in seine survey in 1999, young bass were captured in 2000.

The low summer water levels of 1999 and 2000 resulted in quite substantial increase in the growth of vegetation on the flat of the peninsula. In fall 2000, sedges were quite prevalent and low grasses were very dense in the exposed flat at elevation 1.2 feet to 0.6 feet below the customary normal water level. Beginning at 0.6 feet below normal and extending up to about the "normal" water level a thick stand of spreading, or purple aster (*Aster patens*) was present. This aster is dense, 4-5 feet tall. The aster's stalks and stems are very firm and woody-like: It was hoped that this plant will be persistent and create excellent refuge for young fish during the spring when the area would be flooded. The aster was persistent, the woody stalks lasting through the spring. Although the stand was flooded in spring 2001, we were not able to get as much water on the stand as was thought adequate for fish nursery habitat. The flooding depth was 3 inches to less than a foot. Although the aster was present through summer 2001 this zone became dominated that year by coffeeweed (*Bevins laevis*) that over-shadowed the aster. Coffeeweed is not persistent and will have completely decomposed by time it is needed for nursery habitat in spring 2002. The catch, by seine, of y-o-y bass decreased in spring 2001. The abundance of sedges increased in 2001 in lower elevations of the exposed flats, and shoreline.

To create dense stands of woody stems that would be present with submersion of about 1 foot of water in the spring, Hybiscus seed was collected in 2000 and planted in concentrated plots in September 2001. The objective was to create thick stands that would serve as refuge for young fish and as fish attractors for crappie and bass. If this technique is successful we foresee future management requiring manipulation of these plots of hybiscus. Buttonbush seed was also collected last year and planted this September when the lake was low. The buttonbush was planted in a narrow band of exposed mud along the waters edge on the west side of the peninsula. The objective of the buttonbush planting was to create a line of dense vegetation that would act as a wind break to improve spawning habitat on the flats on the western side of the peninsula. A line of buttonbush is already present on the eastern side of the peninsula.

ENVIRONMENTAL VARIABILITY AND DISTRIBUTION OF KING MACKEREL (*Scomberomorus cavalla*) LARVAE IN THE GULF OF MEXICO

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We constructed statistical models to elucidate significant associations among factors affecting the distribution of king mackerel larvae. Station estimates of king mackerel larval density (number per 10² m) and environmental data came from annual resource surveys conducted in the U.S. Gulf of Mexico by the Southeast Area Monitoring and Assessment Program (SEAMAP). We used both presence/absence and density of king mackerel larvae as dependent variables, and corrected for adult stock size since annual larval abundance has been shown to be highly correlated with stock size across the time series, 1982 to 1994. A stepwise log-linear regression model resulted in year, latitude, and season accounting for 22% of the variability in larval density. Using a stepwise logistic model, the occurrence of larvae was best predicted (74% concordance) by longitude, year, surface salinity and surface chlorophyll. Three variables (Mississippi River discharge, surface temperature and station depth) were not retained in any of the final models. These models can be used to more precisely define the pelagic habitat of king mackerel larvae and gain useful insight into the potential influence of local environmental and climatic changes on the early survival of mackerel larvae.

THE EFFECTS OF HYDRILLA INFESTATION ON THE FOOD HABITS OF AGE-0 LARGEMOUTH BASS *Micropterus salmoides* IN THE ATCHAFALAYA BASIN, LOUISIANA

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Major changes in the ecology of the Atchafalaya Basin have undoubtedly occurred since the submerged macrophyte hydrilla *Hydrilla verticillata* invaded in the early 1970's. To determine the effects of hydrilla on age-0 largemouth bass, we identified stomach contents of 303 individuals to compare 1973-1976 and current bass food habits before and after the hydrilla invasion occurred. A minimum of 20 fish were collected bi-weekly with a boat electrofisher from three different areas in the lower Atchafalaya Basin. Two areas had moderate to high densities of hydrilla, and one area was a deep man-made canal free of submerged macrophytes, which was sampled to determine if age-0 bass diets in non-hydrilla areas were similar to those in 1973-1976 samples. Preliminary results indicate that dense hydrilla may hinder age-0 largemouth bass ability to forage on fish, thereby inhibiting a vital growth phase in the life history of this important sportfish.

OPTIMIZING RELATIVE CONDITION FACTOR EQUATIONS FOR FOUR ESTUARINE FISH SPECIES

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In a multi-agency study of the Calcasieu Estuary in southwest Louisiana, ecosystem bioindicators from several trophic levels are being studied. This study focuses on relative condition factor (Kn) of fish as impacted by industrial effluents. The Kn is a numerical expression of overall fish physiological condition that can delineate deviations of an individual fish from the population average weight for length. While many factors can influence Kn, season and sex are two major variables. Seasonal differences in Kn throughout the year are primarily due to the developmental stage of the gonads. In order to determine Kn of four estuarine species collected in April and October 2000, length-weight relationships were determined by least-squares regression methods of $\log_{10}(\text{weight})$ on $\log_{10}(\text{length})$ using historic Louisiana Department of Wildlife and Fisheries data of fish collected from 1995-1999 from the Louisiana coast. The historic data included species, total length, weight, sex, and month of capture. After the removal of outliers, regression equations were obtained for red drum (n=812), black drum (n=596), speckled trout (n=7409), and southern flounder (n=109). Statistical analyses of the length-weight relationships indicated significant seasonal (fall or spring) differences for red drum, seasonal and sex interaction differences for black drum and speckled trout, and no differences among season, sex, or their interaction for southern flounder. Based on these results, separate regression equations were developed for the significantly different subpopulations. The slopes and intercepts from the subpopulation regression equations were used to determine Kn for the Calcasieu Estuary fish data, based on the equation $\text{Kn} = W/aL^b$. The Kn was then used to measure possible differences in fish condition between 11 contaminated and 3 reference sites within the Calcasieu Estuary. Significant site differences were found in Kn for both red drum and speckled trout, but not for black drum and southern flounder. The average Kn (pooled over all sex, season, and species data) for the contaminated sites was lower than that for the reference sites. Consequently, Kn can be reliably used as an indicator of fish physiological condition as long as careful consideration is given to data in order to generate appropriate models for the species under study.

GULF OF MEXICO ESTUARINE INVENTORY: PAST AND PRESENT BIOTA OF MISSISSIPPI SOUND

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The three counties that comprise the Mississippi coastline exhibit some of the highest population growth rates in the state. As development along the gulf coast continues, greater pressure is placed on our marine resources by various user groups. In the late 1960s, in anticipation of future development, the Gulf of Mexico Estuarine Inventory (GMEI) program was initiated to provide coastal managers with access to concise data on marine and estuarine communities. In 2001 the Mississippi Department of Marine Resources and the Gulf Coast Research Laboratory were awarded funding to resurvey the original sites to determine the affect of coastal development on marine ecosystems. Two hundred and fifty-one species of finfish were identified in the original survey. The present study has identified 99 species of finfish to date. In both surveys the bay anchovy, *Anchoa mitchilli*, was numerically dominant.

ESTABLISHMENT OF AQUATIC PLANTS FOR FISH HABITAT ENHANCEMENT IN THE LITTORAL ZONE OF A MISSISSIPPI DELTA IMPOUNDMENT

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Native vegetation is a vital component within aquatic ecosystems. It provides habitat for fish and other wildlife, stabilizes sediments, mediates nutrient cycles, improves water quality, and retards excessive growth of nuisance species by competing for light and nutrients. The goal of this project was to reestablish a variety of native aquatic plants to enhance fish habitat in Lake Charlie Capps, an impoundment located in northwest Mississippi. We collected emergent and submersed native aquatic plant species from different locations in the region as potential candidates for re-establishment. Plants were cultured in growing tanks and transplanted to study sites in the lake in July 2001. A total of 450 plants was planted within eight exclosures located at five sites in the lake littoral zone. Plant growth was monitored by measuring stem density and growth, twice a month for the remainder of the growing season. Fish were sampled at study sites for baseline data to evaluate future impacts that new plants may have on fish populations. Larval and adult fish populations were sampled May to August 2001 within available microhabitat. Plant growth suggests successful introduction of three emergent plant species: *Eleocharis quadrangulata*, *E. montevidensis* and *Sagittaria latifolia*. A total of 1,515 larval fish was collected by light-traps and tow-nets. Three families and 11 species from 1,659 adult fish were collected by electrofishing. Preliminary data suggests the establishment of a viable native aquatic plant community if feasible in Lake Charlie Capps. Further plant introductions and future monitoring is necessary to evaluate long term success and growth of the aquatic plants and their effects on fish populations and habitat.

FISH COMPOSITION AND BIOMASS ASSOCIATED WITH THE WEST FLOWER GARDEN BANK

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The West Flower Garden Bank is a National Marine Sanctuary located at the edge of the U.S. continental shelf approximately 173km south east of Galveston, Texas (27° 52'N, 93° 49'W). It is the largest and northernmost living coral reef located in the Gulf of Mexico, and rests atop a *Jurassic Era* derived salt dome. The beautiful colors of the reef that could be seen below the surface earned it's name "the flower garden" from the fisherman who have been attracted to this rich fishing ground since the late 1800's, but has attracted scientific interest only in recent decades. The reef consists of three major terraces each with distinctive geological and biotic features. These terraces are comprised of a living coral cap, an algal nodule zone, and a large area of ancient drowned coral. Previous surveys have been limited primarily to visual surveys utilizing divers and towed video sleds. In June 1999, we conducted the first hydroacoustic survey of the West Flower Garden Bank to assess the density and distribution of fish associated with this reef system. We used logistic regression to determine a binary relationship of the fish distribution with respect to the geological features, biotic zonation, and varying bottom types associated with the reef system. Fish densities were highest at the shallowest terrace. High densities of fish were also noted along steep slopes surrounding the mid-level terraces. We may therefore be able to use the hydroacoustic signatures of different bottom types to predict fish distribution and abundance.

DEVELOPMENT AND TESTING OF AN ELECTRICALLY ENHANCED SEINE FOR USE IN HARVESTING CHANNEL CATFISH, *Ictalurus punctatus*, FROM PONDS

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Harvest trials were conducted to compare the catch efficiencies of a conventional seine and an electrically enhanced seine in removing channel catfish, *Ictalurus punctatus*, from ponds. Trials were conducted in twelve 0.10-ha ponds that had been stocked with either 1200 (8 ponds) or 1800 (4 ponds) fingerlings. At the end of the growing season, 4 ponds with 1200 fingerlings and 2 ponds with 1800 fingerlings were harvested with each type of seine. Each pond was seined twice. The electrically enhanced seine caught significantly more fish than the conventional seine on the 1st seining ($P=0.0124$; $P<0.0001$), 2nd seining ($P=0.0114$; $P=0.0479$), and total harvest efficiencies ($P=0.0037$; $P<0.0001$) for the ponds with 1200 and 1800 fish respectively. The electrically enhanced seine is a potentially valuable tool for fish farmers, but it requires further testing in larger ponds, an increased replication of ponds, and testing in ponds with higher stocking densities. The results of this study indicate that electricity can be used to significantly improve the catch efficiencies of a conventional seine when harvesting catfish from ponds.

THE ROLE OF LOUISIANA'S COASTAL WATERS AS SHARK NURSERY HABITAT: RESULTS OF A THREE-YEAR SURVEY

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In an effort to obtain more insight into the role that Louisiana's nearshore coastal waters function as nursery habitat for sharks in the northcentral Gulf of Mexico, a three-year study was initiated in late 1998. This study was funded by the Coypu Foundation and conducted by researchers at the Coastal Fisheries Institute, Louisiana State University (LSU). The sampling program, focused on the Timbalier/Terrebonne Bay complex, used a 186 m long experimental gillnet consisting of six different mesh panels to capture sharks. Additional samples were obtained from Louisiana Department of Wildlife and Fisheries, as well as from other researchers at LSU. A total of 985 sharks were caught in the experimental gillnets between May 1999 and September 2001. Eight species of sharks representing two families, Carcharhinidae (6 species) and Sphyrnidae (2 species), were encountered during the 320.7 hours of fishing. Neonate, young of the year (YOY), and juvenile blacktip, *Carcharhinus limbatus*, sharks constituted the majority of the gillnet catch (57%) for all three years, followed by the Atlantic sharpnose shark, *Rhizoprionodon terraenovae* (16%), and then the bull shark, *Carcharhinus leucas* (12%). Finetooth sharks, *Carcharhinus isodon*, were collected in all life history stages and this may be the first documented record of the species in Louisiana waters. Neonate, YOY, and juvenile elasmobranchs dominate the assemblage in Louisiana's coastal waters and barrier island systems. The Louisiana barrier island habitat serves as an important nursery area for sharks however these habitats are undergoing rapid deterioration from coastal erosion. The ultimate impact of this habitat loss may be devastating to Louisiana elasmobranch assemblages.

LARVAL CULTURE OF THE RED SNAPPER, *Lutjanus campechanus*

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The Gulf Coast Research Lab has successfully reared larvae of the red snapper for the last four summers as part of a U.S. Gulf of Mexico Marine Stock Enhancement Program funded by the U.S. National Marine Fisheries Service. An extensive copepod production system based on a "brown water culture technique" is used to provide prey to the larvae which are cultured in an intensive clear water larval rearing system.

The naturally rich "brown" bay water of Mississippi Sound is used as a sole feed for native copepods which are cultured in 100m² tanks. As the copepods feed and clear the water, one half the volume of the tank is replaced with new "brown water". The effluent is sieved and the copepods retained. The copepods are size fractioned and unused copepods returned to the cultures. Copepod densities in the tanks are 13 to 18 times higher than the density of copepods in the adjoining bay. A total of 6 copepod production tanks produced an average of 4.4 million nauplii per day over a six month period during 2001. The extensive culture system proved to be resilient to fluctuating salinity and power outages lasting up to 7 hours.

Larvae are reared in 1000- L black tanks, with light aeration and no water exchange. At stocking 10,000 larvae are placed into 500L of water (20 larvae/L). After the first week the water level is slowly increased to 1000L. Routine tank maintenance is not initiated until after the second week. Targeted prey density is 2-3 copepods/ml. If prey density is low at first feeding, low survival can be expected. During 2001 6,020 fish were harvested from larval rearing. A total of 19,166 fish have been produced out of the hatchery over the past four years. Overall survival of fish in the hatchery during 2001 was half that of the previous year (2.5% compared to 5.1%). Two tropical depressions over the site reduced the salinity of the bay water below that of previous years. Typically larval mortality occurs during the first 6 days as first feeding occurs and an additional mortality event occurs around day 19 when there is an increase in morphogenesis. In 2001, larvae were successfully cultured indoors under artificial lights. Indoor tanks had an overall survival of 4.9% whereas larval rearing tanks located outdoors had a survival of 0.7%. Prolonged rain and cloudy conditions resulted in lower light levels outdoors and may have affected survival. Culture of the fish indoors reduced tank-to-tank survival variation. However, the use of 20,000 lux over a 14 hour period produced algal blooms in the indoor tanks, whereas outdoor larval rearing tanks remained clear throughout the rearing period.

Survival during larval rearing remains the major constraint to mass culture of red snapper. However, losses occur in the nursery as well. In fact, losses of fish in the nursery was higher in 2001 (86%) than in the previous year (31%). During the nursery period, daily counts are taken of mortalities. Nursery tanks are siphoned daily and waste water examined for dead fish. Despite such care a large number of fish (40%) were unaccounted for, suggestive of cannibalism.

STATION HOLDING ABILITY IN THE SHOVELNOSE STURGEON, *Scaphirhynchus platyrhynchus*: THE EFFECT OF PECTORAL SPINE REMOVAL

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Shovelnose sturgeon were collected from the Mississippi River between 27 July and October 10, 2001. Immediately upon collection the pectoral spine was removed from one group of fish while a control group was unclipped. Fish were immediately returned to the lab and held in 1300 liter recirculating tanks at 21 to 26 °C. After a minimum recovery time of 24 hours, fish were placed in a 1000 liter "Brett" type swim tunnel and their ability to maintain station in current was tested by subjecting fish to increasing velocities beginning at 10 cm/sec. After a 60 minute swimming bout the speed was increased 10cm/sec. This was repeated until the fish could no longer maintain station. We calculated critical station holding ability for each fish tested. There was no significant effect of temperature, fish standard length, nor time in the lab on critical station holding ability. Likewise, we found no significant effect (ANOVA, $P=0.869$, $DF=1,17$) of spine removal on station holding ability (spine clipped fish critical station holding speed= 60.1 ± 4.2 S.E. cm/s; unclipped fish speed= 59.2 ± 3.0 S.E. cm/s). In addition, tail beat frequency at each speed was not significantly different between clipped and unclipped fish. These results suggest that under the conditions reported here, removal of the pectoral spine has little or no effect on station holding ability in shovelnose sturgeon.

A FISH AND MACROINVERTEBRATE POPULATION ASSESSMENT RELATIVE TO A WHOLE-LAKE HERBICIDE APPLICATION

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Eurasian watermilfoil (*Myriophyllum spicatum*) is an exotic aquatic plant that has infiltrated many freshwater lakes throughout the United States. It is an excellent competitor with few naturally-occurring predators, frequently outcompeting native plants and overtaking entire ecosystems. Prolific growth of this plant reduces native plant abundance and diversity, and can alter macroinvertebrate and fish abundance important to foraging largemouth bass (*Micropterus salmoides*) and bluegill (*Lepomis macrochirus*) that inhabit vegetated sites. The objective of this study was to monitor community changes within vegetated habitats important to foraging fish after a whole-lake treatment of the herbicide fluridone (Sonar AS) in a Michigan Lake. The herbicide treatment was conducted October 2000 to selectively eradicate Eurasian watermilfoil. Changes in available plant biomass and density were monitored, and abundance and diversity of macroinvertebrates and juvenile fish were measured after the herbicide treatment. Habitat use and a stomach analysis for caloric intake of fish were examined to determine energetic differences by foraging fish across plant beds. Preliminary results show an overall decrease in plant biomass from pre-herbicide treatment (273.4 g) to post-herbicide treatment (95.2 g) and an increase in native species from 312 plants/m² to 837 plants/m². The complete elimination of Eurasian watermilfoil stimulated new growth of native plants causing a major shift in available vegetated habitats, macroinvertebrate populations and foraging fish.

ANTHROPOGENIC AND NATURAL TRANSPORT OF INVASIVE SPECIES TO THE NORTH-CENTRAL GULF OF MEXICO: FISHERIES IMPLICATIONS

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In the marine environment, shipping activities are generally considered to be the primary route of introduction for invasive aquatic species in coastal waters. New and re-current introductions of non-endemic fauna to the northern Gulf of Mexico suggest that both anthropogenic and natural processes operate to provide mechanisms of transport. Ballast water discharge of megalopae is thought to be responsible for the continuing occurrence of the portunid crab, *Callinectes bocourti* (A. Milne Edwards, 1879) in estuaries of Mississippi and Alabama. The recent discovery of non-indigenous mytiloid mussels [the blue mussel, *Mytilus edulis* Linnaeus, 1758, and the Santo Domingo mussel, *Brachidontes domingensis* (Lamarck, 1819)] in the seawater piping system of a naval vessel in drydock in the north-central Gulf of Mexico may portend the establishment of populations of these species in coastal waters. Meteorological and ocean circulation processes may also transport southern Gulf and Caribbean fauna northward. The development of red tides associated with the dinoflagellate *Karenia brevis* (Davis) G. Hansen and Moestrup *comb. nov.* [formerly *Gymnodinium breve* Davis, 1948; *Ptychodiscus brevis* (Davis) Steidinger] occurred in the north central Gulf following the passage of Tropical Storm Josephine in October of 1996. The cnidarian invasions in the summer of 2000 appear to be related to ocean circulation processes. *Phyllorhiza punctata* von Lendenfeld 1884, a scyphomedusa native to the Indo-Pacific and introduced to the tropical Atlantic and Caribbean in the late 1960's and *Drymonema dalmatinum* Haeckel 1880, reported from the Caribbean, are thought to have been transported to northern Gulf waters via the Loop Current. In light of increasing international trade and predictions of global climate changes, it is essential to identify and understand the mechanisms by which species expand into new geographical niches and the impact these introductions have on coastal ecosystems and fishery resources.

MICROINJECTION: AN ALTERNATIVE WAY TO FERTILIZE FISH EGGS

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Recently our laboratory has shown that direct injection of sperm cells into the cytoplasm of oocytes will yield fertilization in fish. We injected single sperm into eggs of zebrafish, *Danio rerio*, and obtained phenotypically normal larvae. These results have opened new areas of research, ranging from basic reproductive biology to the production of hybrids with commercial value that otherwise would not be possible. Another potential application is the use of sperm preserved by methods other than freezing, which could be useful for protection of genetic diversity in endangered species. Despite the potential of this technique, many details need to be addressed in order to improve efficiency: our experiments yielded 16% fertilization and 3 normal hatching larvae out of 188 injections, with an occurrence of 30% abnormal larvae.

Chromosomal damage by the micropipette at the injection site (micropyle) was one possible explanation for the low yield. To test this, we identified the location of maternal DNA (chromosomes) by fixing eggs in 4% paraformaldehyde at 30 seconds after fertilization and staining DNA with the dye Hoechst 33342. We found that maternal chromosomes were localized $38 \pm 9 \mu\text{m}$ from the site of the injection which suggests that impairment of the embryos could occur if injections are not performed carefully. However, fish produced by injections made $100 \mu\text{m}$ from the micropyle were also developmentally compromised.

Another important issue to consider when performing intracytoplasmic sperm injection (ICSI) is the diversity of physiological and morphological characteristics among fish gametes which necessitates modification of techniques for various taxa. We have performed ICSI in representatives of three different genera: *Danio rerio* (zebrafish), *Ictalurus punctatus* (channel catfish), and *Oreochromis niloticus* (Nile tilapia). The characteristics that must be considered when performing ICSI include spawning period and conditions, gamete size and activation characteristics, adhesive properties of eggs, transparency of the chorion, size and localization of the micropyle, and the economic value of the species studied (Table 1).

Table 1. Characteristics of three teleost fishes for performance of intracytoplasmic sperm injection (ICSI).

Species	Spawning period	Egg size (mm)	Holding pipette diameter (mm)	Gamete activation mechanism	Adhesive eggs	Micropyle identification	Transparent chorion	ICSI application
Zebrafish	Year-round	0.8	0.2-0.3	Sperm, osmotic Eggs, osmotic	No	Difficult	Yes	Research model
Tilapia	Year-round	1.7	0.8-1.0	Sperm, osmotic Eggs, sperm interaction	No	Easy	Yes	Genetic improvement
Catfish	March-May	4.0	2.0	Sperm, osmotic Eggs, Sperm interaction	Yes	Easy	No	Genetic improvement

We have demonstrated that ICSI in fish is possible, but further study of fertilization mechanisms are needed to improve its efficiency and to integrate this technique with other genetic tools for application in fish species.

LARGEMOUTH BASS AND FORAGE FISHES IN THE NEARSHORE AREAS OF THE ROSS BARNETT RESERVOIR: POPULATION CHARACTERISTICS AND PREDATION BY LARGEMOUTH BASS.

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Understanding spatial and temporal patterns in the abundance and size structure of fish populations is important for evaluating predator-prey interactions, competition, and responses to abiotic conditions. We compared largemouth bass *Micropterus salmoides* and forage fish abundance and size structure among three sites in the nearshore areas of the Ross Barnett Reservoir from July 1999 to July 2000. One site was located in the northern region of the reservoir just south of HWY 43 near dense beds of aquatic vegetation. Another site was situated in the central portion north of Roses Bluff, whereas a third site (Pelahatchie Bay) was located near the dam site. We also examined the relative importance of bluegill sunfish, threadfin and gizzard shad, and silversides in the diet of bass.

Threadfin shad *Dorosoma petenense* (69%) was the most abundant species followed by bluegill sunfish *Lepomis machrochirus* (9.2%) and gizzard shad *Dorosoma cepedianum* (8.5%). The CPUE (#/hr) of largemouth bass varied among seasons and sites ranging from 0.0 to 49.3. CPUE was significantly higher in Pelahatchie Bay and South 43 than in North Roses Bluff during spring (ANOVA, $P = 0.0001$), but not in fall (ANOVA, $P = 0.694$). Mean size of bass was similar among areas (ANOVA, $P = 0.7837$); average size varied from $19.67 \pm 2.11SE$ (South 43) to $23.72 \pm 1.49SE$ (Pelahatchie Bay) in spring, whereas in fall it ranged from $22.86 \pm 2.76SE$ (North Roses bluff) to $30.22 \pm 3.07SE$ (South 43). Mean CPUE of bluegill sunfish was comparable among sites except in March (ANOVA, $P = 0.005$) when CPUE was lower (Fisher PLSD = 0.637, $P < 0.05$) in North Roses bluff (0.67) than in South 43 (20.67) or Pelahatchie Bay (32.0). Bluegill mean size was higher in North Roses Bluff ($11.04 \pm 0.29SE$) than in Pelahatchie Bay ($9.69 \pm 0.46SE$) or South 43 ($9.3 \pm 0.42SE$) during spring.

Shad, especially threadfin shad, was the most important in bass diet both in numbers (63.0%) and frequency of occurrence (54.2%) followed by silversides (20.4% by number and 14.6% by frequency of occurrence). Bluegill sunfish was rare in the stomachs of bass. Sampling is continuing to characterize spatial variation in largemouth predation on forage fishes.

FISH ASSEMBLAGES AROUND OIL AND GAS PLATFORMS IN THE NORTHEASTERN GULF OF MEXICO: DEVELOPING A SURVEY DESIGN.

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A pilot survey was conducted in 1995 by the National Marine Fisheries Service, Mississippi Laboratories to develop a survey design for assessing fishes associated with the offshore oil and gas platforms in the Gulf of Mexico. Eight platforms of various sizes, configurations and depths were sampled with a pan and tilt video camera, stationary video cameras and a remotely operated vehicle (ROV). Differences in fish species observed, and their abundances as measured by the different gear types, were evaluated to determine an optimal sampling design for large-scale surveys. Forty-four taxa from 19 families were observed over all platforms and all gears. More taxa were observed within the confines of the platforms, and in close proximity to the platforms than were observed away from the platforms. Camera orientation was important in detecting some species, e.g., groupers were only observed within the confines of the platforms. The number of taxa observed did not vary with depth or among platforms, however, there were differences in fish density with depth and among platforms. More red snapper were seen at depths > 25 m, while more gray snapper were found at depths < 20 m. Total fish densities were lower at platforms with barnacles as the dominant attached fauna and higher at platforms with higher relief epifauna (octocorals, sponges and bryozoans). Red snapper densities were higher at platforms with higher relief epifauna and gray snapper densities were higher at barnacle-dominated platforms. There was no difference in fish density with platform age nor any relationship between platform age and attached faunal types.

AGE-LENGTH RELATIONSHIPS AND CONDITION FACTOR TRENDS FOR CHANNEL CATFISH (*Ictalurus punctatus*) AND LARGEMOUTH BASS (*Micropterus salmoides*) FROM SIBLEY LAKE, LOUISIANA

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Sibley Lake, a 2,250-acre reservoir, is located in northwest Louisiana and was constructed in 1958 as a water supply for the city of Natchitoches. Channel catfish (*Ictalurus punctatus*) and largemouth bass (*Micropterus salmoides*) were among eight species collected from Sibley Lake as part of a biomonitoring program during 1989 through 1994, 1996, and 2001. The program was initiated in 1989 and consisted of collecting eight species: spotted gar (*Lepisosteus oculatus*), gizzard shad (*Dorosoma cepedianum*), common carp (*Cyprinus carpio*), channel catfish, hybrid striped bass (*Morone saxatilis x chrysops*), largemouth bass, bluegill (*Lepomis macrochirus*), and white crappie (*Pomoxis annularis*). During this period, a total of 147 channel catfish and 206 largemouth bass were collected using electrofishing, gill nets, and hoop nets and aged using spines (channel catfish), and scales and otoliths (largemouth bass). Laboratory analyses of filets from these fish included percentage lipid determination (beginning in 1990). Channel catfish ranged in ages from young-of-the-year (YOY) to 12 years while largemouth bass ages ranged from YOY to 9 years. Mean condition factors for channel catfish were 1.01 in 1989 and 0.93 in 2001 and ranged from 0.79 (1994) to 1.11 (1993). Mean condition factors for largemouth bass were 1.41 in 1989 and 1.31 in 2001 and ranged from 1.24 (1994 and 1996) to 1.51 (1992). Percentage lipid content for channel catfish ranged from 0.75 (1993) to 2.37 (1994) and from 0.45 (1990) to 0.70 (1993) for largemouth bass. Channel catfish and largemouth bass showed similar trends in condition factors and percentage lipid content with largemouth bass peaking in 1992 and 1993, respectively and channel catfish peaking in 1993 and 1994, respectively.

FACTORS AFFECTING FISH PASSAGE DURING WATER RELEASE FROM A FLOOD CONTROL RESERVOIR IN MISSISSIPPI

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Study objectives were to use a conduit net to relate operational and environmental factors with fish passage. Fish passage was inversely correlated ($P < 0.05$) with pool elevation and positively correlated with discharge volume and night samples. Fish passage was not significantly correlated ($P > 0.15$) with release velocity or water temperature. Regression equations explained 49-68% of the variability in fish passage. Nearly 85% of all fish and 97% of all shad were discharged during December 1993 - February 1994. Gizzard shad, white crappie, black crappie and freshwater drum comprised 78.52%, 15.34%, 1.54% and 1.41% of the total numerical loss, respectively. Fish in the 9 and 10 centimeter groups accounted for 66.37% of the catch while those over 20 centimeters comprised just 2.75%. Tailwater tag recaptures comprised 9.7% of all recaptures and 1.2% of all tagged fish, but tag mortality and tag shedding were not assessed. The tailwater crappie fishery appeared to be dependant on fish passage. These data suggest that fish passage could be reduced by maintaining higher pool elevations during the winter; reducing night time releases and avoiding releases > 1000 cfs during the fall and winter. Negative impacts to the Enid Lake fishery resulting from fish passage were not evident.

TECHNIQUES FOR IMPROVED HATCHERY PRODUCTION OF RED SNAPPER

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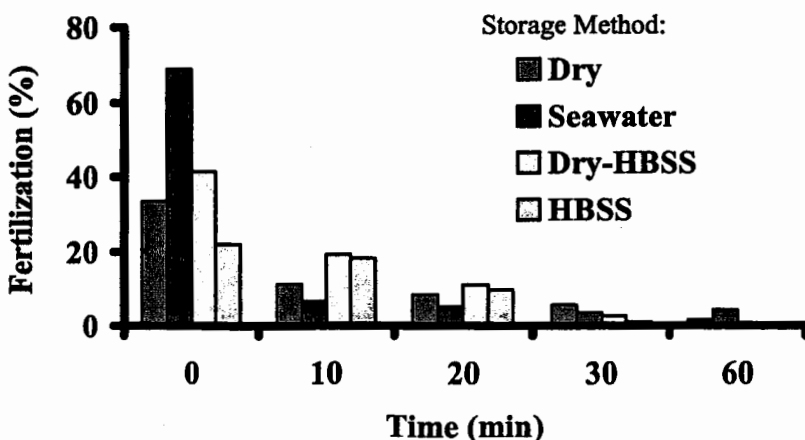
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The rapid global development of mariculture in recent years has increased the demand for a reliable supply of larvae and juveniles for grow-out operations. Some subtropical marine species, such as the red snapper *Lutjanus campechanus*, are difficult to culture because they do not readily complete maturation or spawn freely in captivity. While hormone-induced strip spawning is currently the standard method of spawning red snapper, this method often results in poor fertilization and limited success in larval rearing. Research conducted at the Louisiana Universities Marine Consortium and the Louisiana State University Aquaculture Research Station evaluated the role of gamete quality in the production of red snapper. The specific objectives were to: 1) develop improved criteria for evaluating the reproductive condition of female broodstock; 2) determine the effect of sperm density on fertilization success, and 3) evaluate the short-term storage of eggs.

Female red snapper were captured in the wild and transported to the hatchery where they were prepared for spawning by injection with a 500 IU/kg priming dose and a 1000 IU/kg resolving dose of human chorionic gonadotropin. Oocytes collected by catheterization were used to assess the reproductive condition of females. Females exhibiting synchronous development with oocyte diameters ranging from 0.3 to 0.6 mm were monitored closely for maturation and ovulation.

The viability of red snapper sperm was determined by microscopic examination of the motility of sperm samples. Samples with high motility (> 80%) were selected for use in fertilization trials. Fresh sperm with densities ranging from 1.0×10^5 to 8.5×10^8 cells/ml were applied to eggs to determine the optimal sperm density and to provide a standard for comparison in fertilization trials. There was no significant effect of sperm density on fertilization rates within the range of 500 to 4.2 million spermatozoa per egg. Red snapper eggs stored at room temperature (25 C) were fertilized with fresh sperm at 10-min intervals after stripping from female broodstock. Eggs were incubated dry, in natural seawater (35‰), in 200 mOsmol/kg Hanks' balanced salt solution (HBSS), or dry with HBSS added with fresh sperm. Fertilization rates were highest when eggs were fertilized within 10 min after stripping (Figure 1). This study demonstrates that refinement of hatchery techniques could improve fertilization success and larval survival in red snapper.

Figure 1. Red snapper eggs were fertilized with fresh sperm at 10-min intervals after stripping. Fertilization rate was assessed at neurulation (12 h), and were significantly reduced within 10 min of collection ($P = 0.03$).



AQUACULTURE PROGRAMS AT LOUISIANA STATE UNIVERSITY

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With a plentiful water supply, flat terrain conducive to diversified production and abundant oyster grounds, Louisiana is a national leader in aquaculture. In 2000, some 2,000 producers harvested nearly 100 million pounds of cultivated aquatic animals with a farm and processor value of \$200 million. Louisiana aquaculture is among the most diverse in the USA, with nearly 100,000 acres of crawfish, 12,000 acres of channel catfish, and oyster leases that exceed 400,000 acres. Louisiana is the nation's largest producer of farm-raised alligators. Other commercial aquaculture crops in Louisiana include tilapia, turtles, bait minnows, game fish, and soft crabs.

Louisiana State University established research, teaching, and extension programs in aquaculture in 1965. Presently, these programs are directed by 21 faculty representing 10 administrative units including the Aquaculture Research Station and Rice Research Station, School of Forestry, Wildlife, and Fisheries, Departments of Food Science, Biological and Agricultural Engineering, Agricultural Economics and Agribusiness, Civil and Environmental Engineering, Veterinary Science, the School of Veterinary Medicine, and the Louisiana Sea Grant program. LSU offers a B.S. in wildlife and fisheries with a concentration in aquaculture, and M.S. and Ph.D. degrees in several academic departments with specialization in aquaculture. The aquaculture research facilities are among the largest in the USA with 200 earthen ponds, 200+ outdoor tanks, and extensive wet and dry laboratories to address research areas in genetics and reproduction, diseases, engineering, food science, production management, nutrition, and water quality. LSU faculty work closely with the Louisiana Department of Wildlife and Fisheries (LDWF), and cooperative efforts exist with faculty at other Louisiana universities including Nicholls State University, Northwestern State University of Louisiana, and the University of Southwestern Louisiana, and the Louisiana Universities Marine Consortium (LUMCON).

Many of the technologies developed by LSU aquaculture scientists are utilized in commercial operations in Louisiana and elsewhere. For example, much of the filtration technology used in recirculating systems throughout the USA were developed by faculty in the Department of Civil and Environmental Engineering. Production methods used in Louisiana's crawfish farming industry were largely developed by LSU scientists. In 1999 LSU Agricultural Center aquaculture scientists rapidly responded with an emergency research program to investigate the environmental impact of a rice insecticide implicated, along with drought, in significant reductions in farm-raised crawfish. In 2000, LSU aquacultural scientists working with representatives of the state's aquaculture industries, and other state agencies including Agriculture and Forestry, Wildlife and Fisheries, Economic Development, Natural Resources, and Environmental Quality developed and published a Louisiana Aquaculture Plan, that includes 20 recommendations to serve as a road map for future aquaculture development in the state. Further details on the LSU Agricultural Center's aquaculture research and educational programs can be viewed at web site address at <http://www.agctr.lsu.edu/inst/research/stations/Aquaculture>.

AGE AND LENGTH AT MATURITY OF CHANNEL CATFISH: THE INFLUENCE OF ENVIRONMENTAL VARIABLES AND IMPLICATIONS FOR SUSTAINABLE MANAGEMENT OF SLAT BASKET FISHERIES

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The majority of rivers in Mississippi are characteristically slow, turbid and meandering. Fisheries in such waters have traditionally focused on catfishes and these species have attained a cultural significance which transcends their recognized status as sport fish. Among the catfish, the channel catfish *Ictalurus punctatus* is the species most commonly targeted because of its catchability and renown as table fare.

This species is managed on a statewide basis in Mississippi, being subject to a comprehensive minimum retention size of 12 inches for commercially-caught fish. Such a broad approach is challenged by studies showing that channel catfish populations around North America exhibit varying age and growth characteristics. This project will collect fish from different lake and river systems throughout Mississippi in order to compare system-specific age and length at maturity. Initial results suggest significant difference in mean length at age between lake and river systems and among rivers. This variation between populations in close geographic relation may stimulate reassessment of management tactics for the species.

A significant aspect of management for channel catfish concerns informed regulation of commercial fishing gears. Commercial harvest is primarily undertaken with trotlines, hoopnets, and slat baskets, the latter being recently legalized and the source of some contention. The selection characteristics of slat baskets will be determined experimentally and this data subsequently related to growth patterns of channel catfish populations in specific waters. If there appears to be a need for management on a more local scale then appropriate gear regulation will be possible.

It is already recognized that channel catfish populations vary in terms of age and growth. The third element of this study will be an examination of the specific environmental variables that influence this divergence, and their relative importance in the process. Aspects of water quality, land use and hydrological status will be addressed using multivariate statistical analyses.

THE PEARL DARTER (PERCIDAE: *Percina aurora*) IN THE PASCAGOULA DRAINAGE, MISSISSIPPI

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The pearl darter was described in 1994 and historically occurred in the Pearl and Pascagoula drainages of Louisiana and Mississippi. The species has not been collected in the Pearl drainage since 1973 and is considered extirpated from that drainage. Collections in the Pascagoula drainage indicate that the pearl darter has never been very abundant in the drainage, however it continues to persist. The primary objective of this project was to survey the Pascagoula River for pearl darters from Merrill (George Co.) downstream to the divergence of the East and West channels near Poticaw Bayou (Jackson Co.). Historically, few specimens have been documented from this reach of the Pascagoula and the apparent distributional hiatus is likely an artifact of sampling bias (e.g., few samples and inappropriate habitat).

Sampling efforts during Summer 2000 and Spring 2001 yielded 81 total samples (2000 = 71; 2001 = 10, including visitation to some sites sampled during 2000). Pearl darters were present at 28 sites yielding 120 specimens; however, the majority of the sites had relatively low abundances (1-4 individuals) of pearl darters. Pearl darters were typically found associated with the following features: scour holes on the inside bend of the river downstream from a point bar; banks with fairly good slope with water depth reaching 1.5 m at a distance of 4-7 m from shore; and substratum primarily of coarse sand with an accumulation of detritus in troughs perpendicular to the shoreline. Length frequency histograms for all data combined (2000-2001) indicate two age classes. Linear regression of size (standard length) versus river kilometer where sample was conducted (2000 data only) indicates no significant longitudinal pattern along the river (i.e., fish size did not vary with distance downstream). Numerous young-of-the-year were collected during the Spring at several localities providing evidence of recruitment in the Pascagoula River.

MISSISSIPPI CHAPTER'S STUDENT SUBUNIT OF THE AMERICAN FISHERIES SOCIETY: PAST AND PRESENT

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In May 1983, the Fisheries Club was first recognized as an official student organization by the Student Faculty Organization Committee of Mississippi State University (MSU). The goal at that time for the club, as stated in original by-laws was: "to provide a vehicle for social and professional interaction among fisheries students and professionals at MSU and to promote communication and professionalism among fisheries students and faculty at MSU." Since its beginnings, the Fisheries Club was involved with the Mississippi Chapter of the American Fisheries Society (MS Chapter-AFS). In cooperation between the Fisheries Club and the MS Chapter-AFS, the Fisheries Club was accepted as an official subunit by the MS Chapter-AFS in February 1999. Currently, the MSU membership represents the only formal student subunit within the MS Chapter-AFS and consists of undergraduate students, graduate students and faculty interested in fisheries, aquaculture, and aquatic ecology. The Student Subunit seeks to provide its members with opportunities for professional development, promote interaction among fisheries students and faculty at MSU, as well as increase student involvement with the MS Chapter-AFS. Our past and current activities involve guest speakers, educational workshops, participation with the annual meeting of the Mississippi Chapter-American Fisheries Society, and community service projects.

PRELIMINARY FINDINGS OF A RECREATIONAL NIGHT FISHING SURVEY ALONG THE MISSISSIPPI GULF COAST

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The Mississippi Department of Marine Resources (MDMR) in cooperation with the Gulf States Marine Fisheries Commission (GSMFC) and the National Marine Fisheries Service (NMFS) conducted a night shore fishing pilot survey along the Mississippi Gulf Coast during the 2001 calendar year using the Marine Recreational Fisheries Statistics Survey (MRFSS) protocol. The MRFSS is a nationwide program developed to provide a database on marine recreational fishing activity, identify notable changes in recreational catch and effort trends, and evaluate the long-term implications of management measures. Historically night fishing activities were considered to be similar with daytime fishing because little or no data were available to test the theory. The purpose of this research was to determine if catch and harvest rates of recreational shore anglers fishing at night along the Mississippi Gulf Coast were different from day time catch and harvest rates. The preliminary catch information from the night survey was compared with daytime MRFSS catch estimates to determine if significant differences existed between day and night fishing activities. Preliminary results indicate that although the time spent fishing is similar between day and night, there are differences in catch composition and species catch per effort between day and night fishing. For species with large catch rate differences between day and night time fishing, it may be necessary to continue night surveys to improve the accuracy of MRFSS catch and harvest estimates.

HOOKING MORTALITY OF SPOTTED SEATROUT, *Cynoscion nebulosus*, IN MISSISSIPPI: PRELIMINARY RESULTS

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Spotted seatrout is one of the most highly sought sport fish in Mississippi coastal waters and is currently managed utilizing a daily bag limit of fifteen fish and a fourteen inch total length (TL) minimum size limit. The current minimum size limit has been in place approximately ten years. From 1992 to 1995 an allowance was enacted for the retention of five undersized fish between twelve and fourteen inches. This allowance effectively moved the minimum size to twelve inches for this time period. During the fall of 1995 the undersize allowance was eliminated which had the effect of increasing the minimum size back to fourteen inches. Increasing the minimum size limit to conserve fish focuses attention on the survival of undersize fish that are caught and released. Enumeration of survival of these fish is important in conducting a stock assessment where the values are used to develop overall mortality estimates for the species.

Spotted seatrout were taken by hook and line on 17 separate sampling trips at three primary locations on the Mississippi Gulf Coast during August-November of 2001. A total of 119.0 man hours of angling effort produced 80 spotted seatrout less than 14 inches TL. These trout were either placed directly in a holding cage (pier fishing) or were transported via a water filled, non-aerated 125 quart cooler aboard a sampling vessel less than 1 mile to the cage. The fish were retained in the cooler less than 2 hours. Live bait and barbed "J" hooks were used for angling. Water temperature ranged from 19.0 - 32.2 C. The fish were held for three days in the cages that were tied to a pier in approximately 2 to 4 feet of water. The cages were checked every twenty-four hours for dead fish. Overall, five fish were found dead with 72 hours of hooking. Two of these dead fish were believed to have been impacted by pinfish that were placed into the cage by unknown persons. With these fish removed from the analysis our estimate of hooking mortality was 3.75% and 6.25% when these fish were included.

These preliminary results suggest that most undersize spotted seatrout survive the hooking experience. These results to date indicate that a return to an allowance for undersize fish to be retained in order not to "waste" hooked fish that would be expected to die is not necessarily valid. We plan to increase sampling effort, cover all seasons, and to add artificial baits and treble hooks to the protocol over the next two years.

THE ASSOCIATION OF RECREATIONAL AND COMMERCIAL FINFISH SPECIES WITH LOW PROFILE, INSHORE REEFS IN MISSISSIPPI COASTAL WATERS

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The establishment of artificial fishing reefs to enhance marine fisheries has been well documented in offshore waters, and several studies support an observed increase in recreationally caught fish at these sites. Several state agencies have begun to construct similar low profile reefs in inshore coastal waters in hopes of increasing the numbers of and access to popular recreational and commercial finfish species. The increased establishment of low profile artificial reefs in Mississippi coastal waters has led to a need for information on the association of fish populations, particularly important exploited fishery species, with these reefs. The primary purpose of this study was to monitor the species composition of finfish on selected low profile artificial reefs along the Mississippi coast. Four inshore reefs, each with an associated adjacent control site, were sampled over two years. Two reef sites sampled were composed of concrete rubble and two of oyster shell/rock. Collections taken with gill nets and trawls yielded a total of 84 species from 427 samples. Gill net samples were dominated primarily by menhaden, *Brevoortia patronus*, with frequent catches of spot, *Leiostomus xanthurus*, Spanish mackerel, *Scomberomorus maculatus*, sand seatrout, *Cynoscion arenarius*, and southern kingfish, *Menticirrhus americanus*. The bay anchovy, *Anchoa mitchilli*, was the most abundant species found in trawl samples, which also frequently included striped anchovies, *A. hepsetus*, sand seatrout and croaker, *Micropogonias undulatus*. Spotted seatrout, Spanish mackerel, croaker, southern kingfish, and sand seatrout were the primary recreational/commercial species collected with sufficient sample sizes for statistical analyses. On-site abundances were statistically higher than off-reef numbers for spotted seatrout and croaker taken from the Long Beach sites. No other significant differences were detected for other on-reef vs. off-reef comparisons, suggesting that low profile inshore reefs are generally not as attractive/productive as those found in offshore waters.

HYBRIDIZATION OF LEPOMID SUNFISHES BY USE OF CRYOPRESERVATION

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Sunfishes of the genus *Lepomis* have been cultured in the United States for the last 50 years. Hybridization of sunfishes has yielded characteristics such as acceptance of commercial feed, tolerance of low dissolved oxygen, and potential marketability for commercial food fish production. The hybrid of green sunfish *Lepomis cyanellus* (female) × bluegill *Lepomis macrochirus* has been the most researched hybrid sunfish in the past 15 years.

Hybrid sunfish can be produced by artificial spawning. Green sunfish can be injected with 100 µg/kg of synthetic leutenizing hormone releasing hormone analogue (LHRHa) and stripped of eggs 24 hours later. In the summer of 2001, 34 green sunfish females were injected and 24 released eggs when stripped.

Sperm storage is also important in artificial spawning of hybrid sunfish. Sperm can be stored at 4 °C for short periods of time (about 1 week). Sperm of bluegill was suspended in Hanks' balanced salt solution prepared at 300 mOsmol/kg and were stored at 4°C. Motility was evaluated at 24-hour intervals. Initial motility was $75 \pm 7\%$ and declined to $45 \pm 14\%$ after 24 hours. Motility was $21 \pm 19\%$ after 216 hours and no motility (<2%) was observed after 240 hours (Figure 1).

Long-term storage of sperm can be accomplished by cryopreservation. Acute toxicity experiments are used to determine the concentration of each cryoprotectant that causes the least decline of motility between addition of cryoprotectants and initiation of freezing. Bluegill sperm was exposed to 10% concentrations of four cryoprotectants and motility was estimated at 15-min intervals for 60 min (Figure 2). Sperm of bluegill was cryopreserved at the T.E. Patrick Dairy Improvement Center at Louisiana State University using protocols for cryopreservation of dairy bull sperm. The two cryoprotectants chosen for cryopreservation were methanol and glycerol. Post thaw motilities were $32 \pm 21\%$ for methanol and $4 \pm 4\%$ for glycerol. Fertilization rates with green sunfish eggs were $16 \pm 24\%$ for sperm frozen with methanol and $8 \pm 8\%$ for sperm frozen with glycerol.

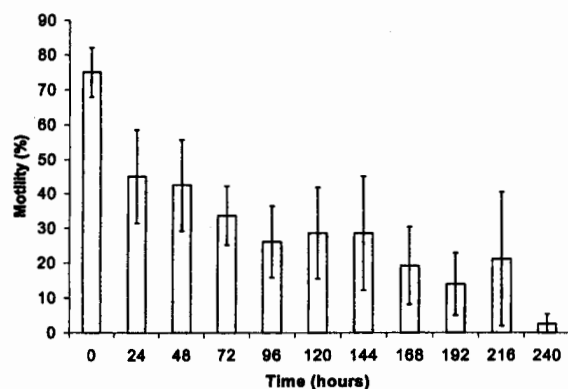


Figure 1. Storage of bluegill sperm at 4 °C

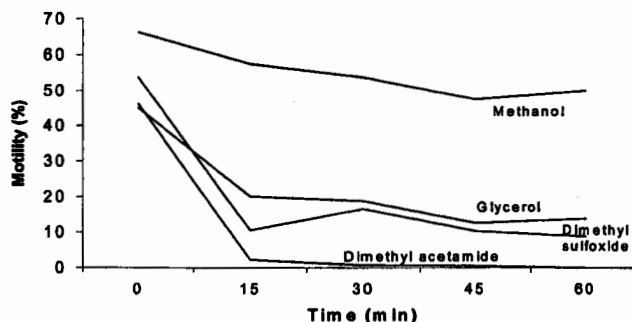


Figure 2. Acute toxicity of cryoprotectants (10%) to bluegill sperm

FEEDING HABITS OF JUVENILE FLORIDA POMPARO (*Trachinotus carolinus*) FROM THE BEACHES OF NORTHERN GULF OF MEXICO BARRIER ISLANDS

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Florida pompano are well known for being sought after by commercial and recreational fisherman for their delectable flesh. Relatively little information is available on the feeding habits of Florida pompano (*Trachinotus carolinus*) from the northern Gulf of Mexico. During the summer months (May-September 2001) pompano were collected from 3 barrier islands in Mississippi, Alabama, and Florida, and their feeding habits were compared based on their size and collection site. The digestive tracts of the pompano were found to contain a variety of invertebrates and larval fish. During the summer/ fall months, juvenile pompano are opportunistic feeders utilizing the most readily available food resources within the habitats in which they forage. In addition, we found that the diversity of the pompano diet increases as the fish matures. Shallow water habitats offer a diverse array of potential prey items for this commercially important fish.

TAXONOMIC STATUS OF THE TEXAS GOLDEN GREEN SUNFISH

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A protein phenotype of golden green sunfish was developed by isoelectrically focusing soluble sarcoplasmic proteins for comparison to phenotypes of normally colored green sunfish (*Lepomis cyanellus*) and other sunfishes. Patterns produced by the golden greens were indistinguishable from those of the normally colored green sunfish controls. Thus, the golden green was shown to be a green sunfish and not a hybrid, as had been hypothesized. Orangespotted sunfish (*L. humilis*) from the Blanco River, Texas produced protein phenotypes different from those previously published.

COMPARISON OF THE FISHERIES VALUE OF STANDING, TOPPLED, AND PARTIALLY REMOVED PLATFORMS IN THE NORTHERN GULF OF MEXICO

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Artificial reefs have been embraced as management tools by a wide range of user groups (commercial, recreational, and federal and state resource managers). While these groups view artificial reefs positively, little information exists on associated nekton assemblages, particularly at deepwater artificial reefs. The northern Gulf of Mexico boasts the largest artificial reef complex in the world and despite platform acceptance and use as artificial reef material, little is known about the ecological importance of these structures. Previous researchers have documented species composition and abundance of fishes at several platforms and estimated that standing platforms can seasonally serve as habitat for 10,000-30,000 fishes, many of which are of recreational and commercial importance. Similar estimates of fish abundance at platforms reconfigured as artificial reefs are not available.

The purpose of this research was to examine the effect of artificial reef profile on the associated fish community. Measurements and comparisons were made of the abundance, species composition, and size frequency distribution of fishes associated with a toppled platform, a partially removed platform, and a standing production platform. Our primary goal was to gain insight into the habitat value of platforms cited as artificial reefs. Through the use of mobile dual beam hydroacoustics and a remotely operated vehicle (ROV), it was found that both partially removed and toppled platforms in 100 m of water had significantly fewer fish than a nearby standing platform. Both artificial reef configurations supported approximately 2500 fish compared to 12,000 around the standing platform. Fish densities at all three sites varied with depth, time of day, and platform side. Based on ROV surveys at both reef sites, conversion of platforms to artificial reefs retains reef dependent species but eliminates most of the pelagic species, particularly the pelagic planktivores found at standing platforms.

OCCURRENCE OF THE EXOTIC GIANT MALAYSIAN PRAWN, *Macrobrachium rosenbergii* (DE MAN, 1879), IN SIMMONS BAYOU, MISSISSIPPI.

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The decline of fisheries species worldwide due, in part, to overfishing and habitat degradation has resulted in an increase in land-based and offshore aquaculture facilities. Poor management practices and/or unpredictable natural events like hurricanes, however, allow for the release of exotic species into local environments. Exotic species used in aquaculture, due to their high reproduction rate, favorable growth rates, and wide range of environmental tolerance, typically survive well in these new habitats. The ability of exotic species to alter population, community and ecosystem structure and function is well documented. Recently, the occurrence of the Giant Malaysian prawn, *Macrobrachium rosenbergii*, has been confirmed in the wild in Mississippi based on collections we made between January and November 2001. Forty specimens ranging from 22.9 - 119.4 mm total length were collected in various locations between May and November 2001 from Simmons Bayou, Mississippi. These exotics co-occurred with native crustacea like *Macrobrachium ohione* (Ohio river shrimp), *Palaemonetes pugio* (daggerblade grass shrimp), *P. vulgaris* (marsh grass shrimp), *Callinectes sapidus* (blue crab), *Farfantepenaeus aztecus*, (brown shrimp) and *Litopenaeus setiferus* (white shrimp). Between May and November, water temperature ranged from 11.5 - 29.7 °C, salinity ranged from 0 - 13.5 ppt, dissolved oxygen ranged from 1.1 - 11.5 mg/L, and current speed ranged from 0 - 5.3 m/s. The sex ratio for juveniles, males and females was 2:30:8, and no females collected were berried. Further assessment of the risk presented by this non-indigenous species and its interactions with native shrimp species needs to be pursued.

EFFECTS OF MARSH ACCESS AND RESTRICTION ON THE FEEDING HABITS AND GROWTH OF JUVENILE SPOT *Leiostomus xanthurus*

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Cold fronts that cycle through the northern Gulf of Mexico produce atmospheric conditions that force water into and out of the estuaries, both raising and lowering water levels. This frontal induced fluctuation of water levels potentially affects recruitment success of juvenile estuarine-dependent fishes by limiting marsh access. Access to marsh-edge habitat may offer both refuge from predation and increased food availability. We compared the feeding habits of juvenile spot, *Leiostomus xanthurus*, during periods of marsh edge access and restriction. Variation in feeding presumably translates into differential growth, thereby affecting recruitment success. Marsh restricted fish showed variable feeding relationships; whereas marsh access fish showed significant ontogenetic feeding relationships. However, large fish under both conditions consumed similar and large amounts of food. Restricted fish consumed much greater amounts of polychaetes than marsh access fish, but both groups of fish consumed meiofauna to a similar extent. The degree of variability in daily growth, as determined from otolith microstructure, cross-correlated significantly with percent daily marsh access over a 38 d period. These findings imply that interannual variability in prevailing weather patterns can indirectly affect estuarine recruitment variability through effects on feeding and subsequent growth.

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