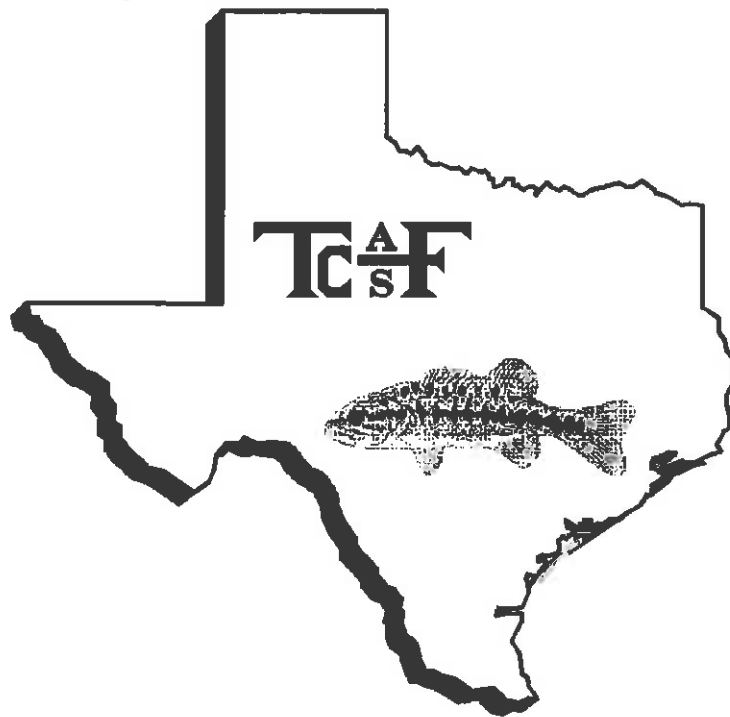


**ANNUAL PROCEEDINGS
of the
TEXAS CHAPTER**

AMERICAN FISHERIES SOCIETY



**San Marcos, Texas
11-12 February 2011**

Volume 33

TEXAS CHAPTER

AMERICAN FISHERIES SOCIETY

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

MEMBERSHIP

Persons interested in the Texas Chapter and its objectives are eligible for membership and should apply to:

Texas Chapter, American Fisheries Society
Secretary-Treasurer
Texas Parks and Wildlife Department
4200 Smith School Road
Austin, Texas 78744

Annual membership dues are \$12 for Active Members and \$5 for Student Members.

**ANNUAL PROCEEDINGS OF THE TEXAS CHAPTER
AMERICAN FISHERIES SOCIETY**

Annual Meeting
11-12 February 2011
San Marcos, Texas

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Texas Parks and Wildlife Department

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2011

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PAST TEXAS CHAPTER PRESIDENTS AND MEETING LOCATIONS

Date	President	Location
1976		College Station
1976	Ed Bonn	Lake Brownwood
1977	Jim Davis	San Antonio
1978	Bill Rutledge	San Marcos
1979	Bobby Whiteside	College Station
1980	Richard Noble	Arlington
1981	Charles Inman	Austin
1982	Gary Valentine	Kerrville
1983	Don Steinbach	Lake Texoma, OK
1984	Gary Matlock	Port Aransas
1985	Maury Ferguson	Junction
1986	Brian Murphy	San Marcos
1987	Joe Tomasso	Kerrville
1988	Dick Luebke	Abilene
1989	Mac McCune	San Antonio
1990	Bobby Farquhar	Lake Texoma, OK
1991	Gene McCarty	Galveston
1992	Bill Provine	Kerrville
1993	Barbara Gregg	Port Aransas
1994	Loraine Fries	Lake Travis
1995	Pat Huston	College Station
1996	Mark Webb	Pottsboro
1998	Katherine Ramos	Athens
1999	John Prentice	Corpus Christi
2000	Paul Hammerschmidt	Bossier City, LA
2001	Charles Munger	San Marcos
2002	Gordon Linam	Junction
2003	Gene Wilde	Galveston
2004	Gary Garrett	College Station
2005	Fran Gelwick	Grapevine
2006	Dave Terre	San Antonio
2007	Debbie Wade	Lake Jackson
2008	Art Morris	Junction
2009	Tim Bonner	Fort Worth
2010	Brian Van Zee	Athens
2011	Ken Kurzawski	San Marcos

TEXAS CHAPTER AWARDS RECIPIENTS

- 1977 Fish Culture - Don Steinbach (TAMU)
Fisheries Management - Edward Bonn (TPWD)
Fisheries Administration - David Pritchard (TPWD)
Fisheries Research - John Prentice and Richard Clark (TPWD)
- 1978 Fish Culture - Pat Hutson (TPWD)
Fisheries Education - Clark Hubbs (UT)
Fisheries Research - Clark Hubbs (UT)
Special Recognition - Edward Lyles (USFWS)
- 1979 Fish Culture - Robert Stickney (TAMU)
Fisheries Education - Richard Noble (TAMU)
Fisheries Management - Gary Valentine (SCS)
Fisheries Research - Phil Durocher (TPWD)
Special Recognition - Charles Inman (TPWD)
- 1980 None
- 1981 Fish Culture - Billy White (TPWD)
Fisheries Education - Bobby Whiteside (TXSTATE)
Fisheries Management - Steve Smith (TUGC)
Fisheries Research - Al Green (TPWD)
Special Recognition - Jim Davis (TAMU)
- 1982 Fish Culture - Roger McCabe (TPWD)
Fisheries Research - Clell Guest (TPWD)
Special Recognition - Bob Hofstetter (TPWD)
- 1983 Special Recognition - Robert Kemp (TPWD)
- 1984 None
- 1985 Fisheries Education - Donald Wohlschlag (UTMSI)
Fisheries Research - Connie Arnold (UTMSI)
- 1986 Fisheries Management - Billy Higginbotham (TAES)
Fisheries Research - Robert Colura (TPWD)
- 1987 Fish Culture - Kerry Graves (USFWS)
Special Recognition - The Sportsmen's Club of Texas
Best Presentation - Kerry Graves (USFWS)
- 1988 Honorable Mention (culture) - Loraine Fries (TPWD)
Fisheries Research - Gary Garrett (TPWD)
Special Recognition - Kirk Strawn (TAMU)
Best Presentation - Joe Fries (USFWS)
Honorable Mention (presentation) - Catherine Dryden (TAMU)

- 1989 Fish Culture - Robert Vega (TPWD)
 Fisheries Management - Joe Kraai (TPWD)
 Fisheries Administration - Gary Matlock (TPWD)
 Fisheries Research - Roy Kleinsasser and Gordon Linam (TPWD)
 Honorable Mention (research) - Bob Edwards (UTPA)
 Best Presentation - Robert Smith (TAMU)
- 1990 Fish Culture - Glen Alexander and David Campbell (TPWD)
 Fisheries Management - Dave Terre (TPWD)
 Fisheries Administration - Gene McCarty (TPWD)
 Best Presentation - Joe Kraai (TPWD)
 Scholarships - Tommy Bates (TAMU:1989), Michael Brice (TTU)
- 1991 Fish Culture - Jake Isaac (TPWD)
 Fisheries Management - Mark Webb (TPWD)
 Fisheries Administration - Pat Hutson (TPWD)
 Fisheries Research - Ronnie Pitman (TPWD)
 Special Recognition - The Wetland Habitat Alliance of Texas
 Best Presentation - Mark Stacell (TPWD)
 Scholarships - Jim Tolan (TAMUCC), Michelle Badough (TXSTATE)
- 1992 Fish Culture - Camilo Chavez (TPWD)
 Fisheries Education - Brian Murphy (TAMU)
 Fisheries Management - Ken Sellers (TPWD)
 Fisheries Research - Bob Colura (TPWD)
 Special Recognition - Bobby Farquhar, Andy Sansom, and Rudy Rosen (TPWD)
 Best Presentation - Maurice Muoneke (TPWD)
- 1993 Fisheries Management - Bruce Hysmith (TPWD)
 Special Recognition - Joe Martin and Steve Gutreuter (TPWD)
 Best Presentation - Jay Rooker (UTMSI)
 Scholarships - Erica Schlickeisen (TXSTATE), Brian Blackwell and Nancy McFarlen (TAMU)
- 1994 Fish Culture - Ted Engelhardt (TPWD)
 Fisheries Management - Steve Magnelia (TPWD)
 Fisheries Administration - Dick Luebke (TPWD)
 Special Recognition - Bob Howells (TPWD)
 Best Presentation - Travis Kelsey (TXSTATE)
 Scholarships - Kathryn Cauble (TXSTATE), Howard Elder and Kim Jefferson (TAMU)
- 1995 Fish Culture - Robert Adami (TPWD)
 Fisheries Education - Bill Neill (TAMU)
 Fisheries Management - Spencer Dumont (TPWD)
 Fisheries Administration - Roger McCabe (TPWD)
 Fisheries Research - Maurice Muoneke (TPWD)
 Special Recognition - Tom Heffernan and Robin Reichers (TPWD) S. Ken Johnson (TAMU)
 Best Presentation (s) - Robert Weller (TTU), Robert D. Doyle (ACE)
 Scholarships - Jay Rooker (UTMSI), Robert Weller (TTU), Gil Rosenthal (UT), John Findiesen and Karen Quinonez (TXSTATE)
- 1996 Fisheries Education - Billy Higginbotham (TAMU)
 Fisheries Management - Gary Garrett (TPWD)
 Fisheries Administration - Gene McCarty (TPWD)
 Fisheries Research - Ivonne Blandon (TPWD)
 Special Recognition - Reeves County Water Improvement Board
 Best Presentation (s) - Craig Paukert (OSU), Gene Guilliland (ODWC)

- Scholarships - Chad Thomas (TXSTATE), Anna-Claire Fernandez (UTMSI), Kenneth Ostrand (TTU), Dawn Lee Johnson
 Technical Support - Jimmy Gonzales (TPWD)
 Honorable Mention (technical support) - Eric Young (TPWD)
- 1997/8 Fish Culture - Tom Dorzak (TPWD)
 Fisheries Education - Robert Ditton (TAMU)
 Special Recognition - Fred Janssen, Chris Cummings, Dan Lewis, Dan Strickland, and Gary Graham (TPWD), Jim Davis (TAMU)
 Best Presentation (s) - Timothy Bonner (TTU) and Gene Wilde (TTU)
 Scholarships - Tony Baker and Allison Anderson (TAMU), Patrick Rice (TAMU-Galveston), Laurie Dries (UT)
- 1999 Fisheries Administration - Lorraine Fries (TPWD)
 Special Recognition - Pat Hutson (TPWD, retired)
 Best Presentation (s) - Gene R. Wilde and Kenneth G. Ostrand (TTU)
 Scholarships - Scott Hollingsworth and William Granberry (TTU), Brian Bohnsack and Michael Morgan (TAMU)
- 2000 Fisheries Research - Gene R. Wilde (TTU)
 Best Presentation - J. Warren Schlechte, coauthors - Richard Luebke, and T.O. Smith (TPWD)
 Best Student Presentation - Scott Hollingsworth, coauthors - Kevin L. Pope and Gene R. Wilde (TTU)
 Special Recognition - Emily Harber, Joe L.Hernandez, Robert W. Wienecke, and John Moczygamba (TPWD), Joe N. Fries (USFWS)
 Scholarships - Mandy Cunningham and Calub Shavlik (TTU), Laurieanne Lancaster (SHSU)
- 2001 Fisheries Administration - Ken Kurzawski (TPWD)
 Fisheries Education - Kevin Pope (TTU)
 Fisheries Management - Brian Van Zee (TPWD)
 Fisheries Research - Reynaldo Patino (TTU)
 Fisheries Student - Timothy Bonner (TTU)
 Technical Support - David DeLeon (TPWD)
 Special Recognition - Rhandy Helton, Rosie Roegner, and Walter D. Dalquest (TPWD)
 Best Presentation - Jason Turner, coauthors - Jay Rooker and Graham Worthy (TAMUG), and Scott Holt (UTMSI)
 Scholarships, Undergraduate - Mandy Cunningham, and Cody Winfrey (TTU)
 Scholarship, Graduate - Abrey Arrington (TAMU), and Laurianne Dent (SHSU)
- 2002 Fisheries Administration - Leroy Kleinsasser (TPWD)
 Fisheries Management - Gordon Linam (TPWD)
 Special Recognition - Raymond Mathews, Jr. (TWDB), Austin Bass Club of the Deaf
 Best Presentation - Jay Rooker, coauthors - Bert Geary, Richard Kraus, and David Secor (TAMUG)
 Best Student Presentation - J. P. Turner, coauthor - Jay Rooker (TAMUG)
 Best Poster Presentation - Michael Lowe, Gregory Stunz, and Thomas Minello (NMFS)
 Scholarships, Undergraduate - Felix Martinez, Jr. (TTU), Stuart Willis (TAMU)
 Scholarships, Graduate - Mathew Chumchal (TCU), Michael Morgan (TAMU)
- 2003 Fisheries Culture - Dennis Smith (TPWD)
 Fisheries Education - Gene Wilde (TTU)
 Fisheries Student - Christine Burgess (TAMU)
 Special Recognition - Larry McEachron (TPWD)
 Best Presentation - Gregory Stunz (TAMUCC), coauthors Thomas Minello and Phillip Levin (NMFS)
 Best Student Presentation - Monte Brown, coauthors Felix Martinez Jr., Kevin Pope, and Gene Wilde (TTU)
 Best Poster Presentation - Suraida Nanez-James (TAMUG) and Thomas Minello (NMFS)

- 2004 Fisheries Culture - Lisa Griggs (TPWD)
 Fisheries Education - Timothy Bonner (TXSTATE)
 Fisheries Research - Dave Buckmeier (TPWD)
 Fisheries Student - Casey Williams (TXSTATE)
 Special Recognition - Deborah Wade (TPWD)
 Best Presentation - Richard Kraus and David Secor (TAMUG)
 Best Student Presentation - Tracy Leavy, coauthor Timothy Bonner (TXSTATE)
 Best Poster Presentation - Brian Scott and Gary Aron (TXSTATE)
- 2005 Fisheries Administration – Roger McCabe (TPWD)
 Fisheries Management – Todd Driscoll (TPWD)
 Fisheries Student – Bart Durham (TTU)
 Special Recognition – Jimmie Green (TPWD) and Kirk Green
 Special Recognition – The Patsy B. Hollandsworth Family Foundation
 Best Presentation – Gregory Stunz (TAMUCC), and coauthors Jay Rooker (TAMUG), Joan Holt and Scott Holt (UT)
 Best Student Presentation – Julie Hulbert, and coauthors Timothy Bonner and David Pendagrass (TXSTATE), and Joe Fries (National Fish Hatchery – San Marcos)
 Best Poster Presentation – Michael Baird (TPWD)
 Scholarships, Undergraduate – Brian Bartram (TAMUCC), John Putegnat (TAMU)
 Scholarships, Graduate – Megan Fencil (UTMSI), Casey Williams (TXSTATE)
- 2006 Fisheries Education – Kevin Pope (TTU)
 Fisheries Management – Dave Terre (TPWD)
 Fisheries Research – Loraine Fries (TPWD)
 Technical Support – Todd Robinson (TPWD)
 Special Recognition – Bruce Hysmith (TPWD)
 Special Recognition – Joan Glass (TPWD)
 Best Presentation - Richard Kraus and David Secor (TAMUG)
 Best Student Presentation - Tracy Leavy, coauthor Timothy Bonner (TXSTATE)
 Best Poster Presentation - Brian Scott and Gary Aron (TXSTATE)
 Scholarships, Undergraduate – Chris Arredondo (TAMUCC), Josh Perkin (TXSTATE)
 Scholarships, Graduate – Bart Dunham (TTU), Casey Williams (TXSTATE)
- 2007 Fisheries Administration – Larry McKinney (TPWD)
 Fisheries Culture – Gary Garrett (TPWD)
 Fisheries Management – Charlie Munger (TPWD)
 Fisheries Research – Gary Garrett (TPWD) and Bob Edwards (UTPA)
 Fisheries Student – Chris Chizinski (TTU)
 Honorable Mention (Fisheries Student) – Brad Littrell (TXSTATE)
 Technical Support – Reynaldo Cardona (TPWD)
 Special Recognition – Robert Howells (TPWD)
 Special Recognition – Fred Janssen (TPWD)
 Special Recognition – Craig Scofield (TPWD)
 Special Recognition – Sandy Henry (Science Spectrum, Lubbock)
 Best Presentation – Craig Bonds, coauthors John Taylor and Jeremy Leitz (TPWD)
 Best Student Presentation – Matthew Chumchal (OU), coauthors Michael Slattery, Ray Drenner, Matthew Drenner and Leo Newland (TCU)
 Best Poster Presentation – Richard Ott and Timothy Bister (TPWD)
 Scholarships, Graduate (M.S.) – Brian Bartram (Baylor)
 Scholarships, Graduate (Ph.D.) – John Froeschke (TAMUCC)

- 2008 Fisheries Administration – Lance Robinson (TPWD)
 Fisheries Education – Andre M. Landry, Ph. D. (TAMUG)
 Fisheries Research – Bart Durham (TTU)
 Fisheries Student – Preston Bean (TXSTATE)
 Honorable Mention – Zachary Shattuck (TXSTATE)
 Technical Support – Corey Clouse (TPWD)
 Special Recognition – Chad Thomas (TXSTATE)
 Best Presentation – Matthew Chumchal (TCU)
 Best Student Presentation – Rodney Gamez (TAMUCC)
 Best Poster Presentation – James Tolan (TPWD)
 Scholarships, Undergraduate – JoHanna Weston (UD)
 Scholarships, Graduate (M.S.) – Megan Bean (TXSTATE)
 Scholarships, Graduate (Ph.D.) – Preston Bean (TXSTATE)
- 2009 Fisheries Administration – Phil Durocher (TPWD)
 Fisheries Education – Michael Masser (TAMU)
 Fisheries Research – Ray Drenner (TCU)
 Fisheries Student – Joshua Perkin (TXSTATE)
 Honorable Mention –
 Fisheries Management – John Moczygemba (TPWD)
 Technical Support – Mike Gore (TPWD)
 Special Recognition –
 Best Professional Presentation – Ray Drenner (TCU)
 Best Student Presentation – Ted Valenti (BAYLOR)
 Best Professional Poster Presentation – Pat Bohannon (TPWD)
 Best Student Poster Presentation – Brianne Kiester (TCU)
 Scholarships, Undergraduate – Michelle Parmley (TXSTATE); Nicholas Bertrand (TXSTATE)
 Scholarships, Graduate (M.S.) – Joshua Perkin (TXSTATE)
 Scholarships, Graduate (Ph.D.) – Bridgette Froeschke (TAMUCC)
 Clark Hubbs Research Award – Ben Labay (TXSTATE)
- 2010 Fisheries Administration – Mike Ray (TPWD)
 Fisheries Research – Aaron Barkoh (TPWD)
 Fisheries Culture – Hugh Glenewinkel (TPWD)
 Fisheries Student – Ben Labay (TXSTATE)
 Fisheries Management – Richard Ott (TPWD)
 Special Recognition – Mandy Scott (TPWD)
 Best Professional Presentation – Michael Tobler (TAMU)
 Best Student Presentation – Ben Labay (TXSTATE)
 Best Professional Poster Presentation – Mike Stahl (TPWD)
 Best Student Poster Presentation – Ben Labay (TXSTATE)
 Scholarships, Undergraduate – Jake Wimberly
 Scholarships, Graduate (M.S.) – Laura Bivins
 Scholarships, Graduate (Ph.D.) – Gabriella Ahmadia
 Clark Hubbs Research Award – Seiji Miyazono
- 2011 Fisheries Administration – Art Morris (TPWD)
 Fisheries Education – Fran Gelwick (TAMU)
 Fisheries Culture – Juan Martinez (TPWD)
 Fisheries Research – Kristy Kollaus (TXSTATE)
 Fisheries Student – Katie Roach (TAMU)
 Fisheries Management – Dan Bennett (TPWD)
 Technical Support – Danny Lewis (TPWD)
 Special Recognition – Craig Bonds (TPWD)
 Special Recognition – Carl Kittel (TPWD)
 Special Recognition – Brian Van Zee (TPWD)

Best Professional Presentation – David Buckmeier (TPWD)
Best Student Presentation – Sandra Bibiana Correa (TAMU)
Best Professional Poster Presentation – Rae Deaton (SEU)
Best Student Poster Presentation – Jacob Wadlington (TCU)
Scholarships, Undergraduate – Nathan Frey
Scholarships, Undergraduate – Mark Thomas
Scholarships, Graduate (M.S.) – Niki Ragan
Scholarships, Graduate (Ph.D.) – John Mohan
Scholarships, Graduate (Ph.D.) – Judson Curtis
Clark Hubbs Research Award -- Carmen G. Montana

Abbreviations:

ACE – Army Corps of Engineers
BAYLOR – Baylor University
NMFS – National Marine Fisheries Service
ODWC – Oklahoma Department of Wildlife Conservation
OSU – Oklahoma State University
SCS – Soil Conservation Service
SHSU – San Houston State University
TAES – Texas Agricultural Extension Service
TAMU – Texas A&M University – College Station
TAMUG – Texas A &M University - Galveston
TAMUCC – Texas A&M University – Corpus Christi
TCU – Texas Christian University
TCEQ – Texas Commission on Environmental Quality
TPWD – Texas Parks and Wildlife Department
TTU – Texas Tech University
TUGC – Texas Utilities Generating Company
TXSTATE – Texas State University – San Marcos
UD – University of Dallas
USFWS – U.S. Fish and Wildlife Service
UT – University of Texas – Austin
UTMSI – University of Texas Marine Science Institute
UTPA – University of Texas – Pan American
SEU – St. Edwards University

TECHNICAL SESSION ABSTRACTS

The Fishes of Texas Project – status of compilation and standardization of museum-vouchered fish collection data, online database, and related research

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Robert J. Edwards (*University of Texas - Pan American, Department of Biology*)

We documented spatial and temporal distributions of Texas' freshwater fishes by compiling museum specimen occurrence records from 33 institutions. The resulting 81,218 records include nearly all of the approximately 280 species found in Texas at 5,729 total localities sampled by 10,954 discrete collecting events from 1854 to 2009. Precise manual georeferencing of 87% of records (with estimates of placement error) facilitated discovery of probable identification errors via mapping and flagging of geographic outliers, then identification verification by specimen inspection. In some collections up to 70% of flagged records proved misidentified, emphasizing that unvouchered observations should always be interpreted cautiously. Corrections of locations and identifications extended many species' known ranges. The database continues to improve. In the last year we added data from 7 more institutions, greatly accelerated cataloging of backlogged specimens at Texas Natural History Collection, and acquired previously uncataloged specimens from other collections. Once georeferenced and added in phase 2, these new data will increase total occurrence records to > 103,000 (=27% growth). Scans of collectors' fieldnotes are linked to the records, as is an extensive gallery of fish images. Ecological Niche Models (=Species Distribution Models) generated from these data for the majority of Texas' species are accurate predictors of distributions and useful for research and management. We are also using them in explorations of faunal reactions to future climate scenarios and in computerized conservation network planning incorporating climate change and socio-economic data. A new, interactive, extensively illustrated identification key is in development, as are species accounts that link dynamically to independent online sources of knowledge about Texas' species and habitats. We invite potential users to explore www.fishesoftexas.org and to help improve the site by commenting and uploading additional photos, fieldnotes, etc. We hope all who collect fishes voucher their collections in collections that contribute data to this resource.

Assessing the decline of Barton Creek fish community using classical surveys, historic data, and species distribution modeling

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We present an analysis that uses standard survey methods, historic collection data, and species distribution models to demonstrate a method for quantifying the pre-development fish community composition of the highly urbanized Barton Creek watershed (BCW, Travis and Hays County, Texas, USA). This approach allows us to robustly reconstruct the historical fish community, assess trends and propose extirpation or exclusion mechanisms; goals previously unattainable with standard bioassessments. Fishes were surveyed in 2008 and resulting data compared to three other sources of occurrence information: (i) historical records from the Fishes of Texas museum specimen database (www.fishesoftexas.org), literature searches, field notes, and accounts of land owners and local interest groups; (ii) a nearly identical survey conducted 15 years earlier; and (iii) a modeled community based on species distribution models (SDMs). The 2008 survey found 26 species, representing 8 families, while the combination of the earlier survey and available historic collection data documented 45 species from 13 families. While differences between overall fish communities among the two surveys were not significant, notable changes included addition of 2 non-native invasive species, a 50% increase in relative abundance of a previously existing non-native invasive, and dramatic decline of a native keystone species. SDMs produced high-quality, reliable distribution models indicating species-specific potential for establishment within the study area. At least 18 species with high modeled probability of occurrence within the watershed were not found in either of the recent surveys or in any of the historic collection records, strongly suggesting that the pre-development fish fauna was markedly more diverse than historic data document. Comparison of the various data sources facilitated generation of hypotheses and substantiated inferences regarding historic biodiversity and species-specific exclusion or extirpation mechanisms, and assists managers attempting to restore historic conditions or at least assure no further declines in diversity.

Combining historical data on the Fishes of Texas with modeling to evaluate changes in ranges of fish species in Texas Coastal Prairie streams

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It seems intuitive that historical capture data would be necessary to estimate historical ranges of fish species; however, there are serious problems with this approach as sometimes applied. The two biggest problems are reliability of fish identifications and the reliability of sampling location georeference data. For this study we used the University of Texas' Fishes of Texas (FoTX) database records that have had both species identifications and georeferencing data verified, and we restricted analysis to records with high confidence of georeferencing. In addition 'Maxent' species distribution models were used to predict potential distributions. We analyzed data for six species from the Coastal Plain of Texas where we believe that the geographic range is currently expanding and six more where we have no reason to believe that the ranges have had any significant recent expansion or contraction. It appears that the species we selected for examination have expanding ranges within the Texas Coastal Plain and in addition one of the species selected for comparison purposes may also have an expanded geographic range.

Large-scale movements of spotted seatrout (*Cynoscion nebulosus*) among south Texas coastal waters using acoustic telemetry

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Recreational saltwater fishing is a multi-billion dollar industry in Texas, and spotted seatrout (*Cynoscion nebulosus*) are one of the most sought after game fish throughout Texas near-shore waters. Previous migration studies have shown limited movement and exchange of spotted seatrout among bay systems. We employed acoustic tracking technology to investigate movement patterns of spotted seatrout on a large scale. Passive acoustic ultrasonic telemetry uses an array of stationary receivers to detect signals from fish affixed with uniquely coded transmitters. A total of 81 spotted seatrout greater than 400 mm TL were captured via hook and line between 8 December 2009 and 20 October 2010 and implanted with acoustic tags: 31 within bay waters, 30 fish from surf zones, and 20 live release tournament fish. Transmitters (Vemco V13) were surgically implanted into the peritoneal cavity in the field and fish were released after a brief post surgical observation period. Movements were recorded with an array of 24 stationary receivers (Vemco VR2W) strategically placed between Port Aransas and Port Mansfield inlets. We found an overall survival of 70% between a high number of angler recaptures and receiver detections. Many long distance travels were recorded; however, movement patterns appear unpredictable. Seventy-five percent of fish tagged in surf waters were detected on our receivers in tidal inlets. Two fish from the Upper Laguna Madre were detected leaving the Laguna into CC Bay. These data suggest gulf-bay and inter-bay mixing of spotted seatrout population. These data will be useful for future management of this species.

How do Largemouth Bass Determine Sex?

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Nicholas Rathjen

The mechanism that determines sex in largemouth bass is unknown. Within fishes various genetic systems, from polygenic to heterogametic, and environmental systems, from temperature dependent to social interaction, have been documented. We used amplified fragment length polymorphisms of genomic DNA and the distribution of dominant genetic markers to evaluate possible sex determining systems in largemouth bass. A total of 64 primer combinations produced 2315 scorable polymorphic markers between equal groups of males and females (n=14 each) from two families. Forty-eight of these markers were observed with significantly different frequencies between groups (Fisher exact test, $\alpha = 0.001$) and all occurred more frequently in females than males. The number of sex biased markers observed (48) is greater than the number expected by chance (2 to 3), however, no marker was fixed in one group and absent from the other. The results suggest a genetic rather than environmental component to sex determination in largemouth bass. Our findings do not support the presence of non-recombining heterogametic sex chromosomes but are consistent with the presence of small hemizygous regions carried autosomally or on evolutionarily young sex chromosomes in females.

The influence of hydrology, light penetrance, and nutrients on production sources for fishes in six floodplain rivers

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An understanding of the controls of primary production in floodplain rivers is essential for predicting how environmental changes will influence energy transfers to higher trophic levels. We propose to use a model system consisting of six meandering rivers that differ in terms of hydrology, light penetrance, and nutrient concentrations to investigate how seasonal limitation of algal primary production causes changes in the production sources

supporting fishes. Our model system consists of two whitewater rivers with high loads of suspended sediment of fine grain size that limit algal primary production; two blackwater rivers with sandy substrates, fairly low levels of suspended sediments, and lower pH; and two clearwater rivers with low suspended sediment loads. Three of the rivers are located in Texas and have higher nutrient concentrations and relatively unpredictable hydrologic regimes, and three of the rivers are located in South America and have lower nutrient concentrations and strongly seasonal hydrologic regimes. In each of the rivers during the low- and high-water period, we will: 1) measure discharge or stage height, light penetrance, and nutrient concentrations; 2) measure respiration, net primary production, and gross primary production of the water-column and benthos in the littoral zone; 3) use stable isotope analysis (carbon, nitrogen, and deuterium) to estimate the relative proportion of autochthonous-based (algal) versus allochthonous-based (terrestrial) production sources supporting fishes; and 4) infer how hydrology, light penetrance, and nutrient concentrations interact to limit algal primary production and thus autochthonous production sources.

Importance of river-reservoir connectivity for migratory reservoir fishes

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Increased demands for water in Texas will lead to greater hydrologic variability in Texas' rivers and reservoirs. Recent research in the Colorado River of Texas suggests as water levels decrease, the greatest reduction in littoral habitat will occur in river-reservoir transitional zones. Connectivity to upstream riverine habitats may be broken entirely for extended periods, threatening migratory reservoir fish species that use lotic habitats for part of their life cycle. In response, the Texas Parks and Wildlife Department (TPWD) is currently studying the movement patterns and habitat associations of white bass (*Morone chrysops*), blue catfish (*Ictalurus furcatus*), and gray redhorse (*Moxostoma congestum*) in a reservoir within the Colorado River basin. Ultrasonic telemetry is being used to evaluate the timing, frequency and hydrologic conditions associated with fish movement between river and reservoir habitats. In addition, use of mainstem river and reservoir tributaries is being monitored to allow identification of areas important to these reservoir migrants. Ultimately, coarse-scale physical habitat data can be used to develop habitat suitability indices and to provide a baseline for evaluating habitat within the Colorado River system. Preliminary data suggests seasonal variation in movement through the transition zone for two of the three study species. Understanding the movement patterns, habitat requirements and potential threats to these species will allow TPWD to provide technical information needed for responsible decisions about water allocations for fish, fishing, and aquatic recreation.

Using stable isotope to reveal food web structures in the Mekong River and its tributaries

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The food web is a central idea in community ecology; it provides information about complexity and interactions in ecosystems in a manner that is simultaneously detailed and holistic that enables construction of dynamic models essential for management of fish stocks as well as the ecosystems that support them. Food webs are often described as structures that channel energy flow through ecological communities via consumer-resource interactions. Stable isotopes have been widely used in the recent food web studies because it provides researchers with information on historical diets of organisms with distinct isotope signatures. Stable carbon and nitrogen isotopes can be used to indicate dietary differences, carbon flow pathways and consumer trophic positions on a continuum. In this study, I applied stable isotope techniques to study food webs of four rivers in Northeastern Cambodia-namely the Sekong, Sesan, Srepok (the so-called the 3S rivers) and the Mekong River stretch from the Cambodian-Laos border to the border between Stung Treng and Kratie provinces in Cambodia. Tissue samples

from common fish species were surveyed and analyzed for ratios of stable isotopes of carbon and nitrogen. Isotopic data were used to estimate production sources supporting fish stocks, as well as their trophic position. Other dominant food web components, such as phytoplankton, periphyton and fine particulate organic matter, aquatic/terrestrial macroinvertebrates, and aquatic/riparian macrophytes were analyzed as well.

Food Web Structure of Shallow Floodplain Habitats: Oueme River, West Africa

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In the Oueme River basin, a floodplain river in Benin, Africa, artificial ponds along the river channel, whedos, are used as annual fisheries. When the Oueme River breaches its banks in the high water season the whedos are inundated and supplied with a random sample of fishes from the river. The objective of this project is to catalogue the shift in food web structure of the whedos between the beginning of the dry season, when the whedos become isolated, and the time of which they are harvested using stable isotope analysis. Data has been collected from 11 whedos, the floodplain, and the river channel of the Oueme River. The data shows consistent food web structure among the whedos in that the community is dominated by predatory fishes with adaptations to low oxygen environments. Food web structure differs from the flood plain and river channel habitats in that species composition is far more restricted in the whedos.

Ecomorphological correlates in temperate floodplain centrarchid fishes

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Ecomorphological correlations were examined among ten species of centrarchid fishes in two floodplain rivers in Texas: The Brazos and Neches Rivers, at two spatial scales: macrohabitats (main channel, oxbows) and meshohabitats (sandbanks, vegetated patches, woody debris). Principal components analysis (PCA) based on 24 morphological variables yielded two dominant axes that explained 80.76% of variation in the centrarchid assemblages. PCA showed that body size, head dimensions, and mouth position were important characters for species segregation in morphological space. Morphology was also a good predictor of feeding behavior and habitat use. The morphological diversity of centrarchid fishes ranges between the forms exhibited by predominant ecomorphs: piscivore, molluscivore, insectivore, and piscivore/crayfish predators. Morphological diversity was examined to test the idea that assemblage structure is nonrandom, with structurally complex habitats supporting more species with more functional morphology than simple habitats. Results support the hypothesis that centrarchids partition habitats and food resources as indicated by morphology, but that other factors like behavior and physiology together also play an important role in structuring the ecosystem of these floodplain water bodies.

Spatial and temporal implications of electrofishing in a large floodplain river ecosystem

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The goal of our study was to determine if sampling time (day versus night) affected fish community descriptors used by fisheries managers in mesohabitats of a large floodplain river. This study was conducted in the Arkansas River, AR during fall 2007 and 2008. Fish were collected in backwater lakes and dike field

macrohabitats using boat electrofishing. Macrohabitats were further divided into backwater shoreline, dike zone, interdike zone and tip zone mesohabitats. Community characteristics (catch per unit effort (CPUE), richness, diversity, evenness, and relative abundance) were compared among mesohabitats and diel periods. In addition, CPUE of 17 common species were evaluated. Community CPUE between diel periods was similar for all mesohabitats, except for interdike zone, where night was greater. Diversity and evenness of day and night samples were similar. Diel richness was similar in backwater, tip zone, and dike zone (2008) mesohabitats. Richness was greater at night in interdike zone and dike zone (2007) mesohabitats. Overall, there were eight unique species collected during the day and seven at night. In the backwater, smallmouth buffalo *Ictiobus bubalus* had a greater CPUE during the day. Largemouth bass, yellow bass *Morone mississippiensis*, channel catfish *Ictalurus punctatus*, freshwater drum *Aplodinotus grunniens*, white crappie *Pomoxis annularis*, and bluegill *Lepomis macrochirus* CPUEs were greater at night. In the dike mesohabitats largemouth bass (tip) and gizzard shad *Dorsoma cepedianum* (interdike) were greater during the day. Yellow bass (interdike), bluegill (dike and interdike), black crappie *Pomoxis nigromaculatus* (interdike), and freshwater drum (interdike) CPUEs were greater at night. Based on my findings both day and night electrofishing should be conducted for a community assessment.

Population dynamics of alligator gar in the Trinity River, Texas

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The popularity of alligator gar *Atractosteus spatula* trophy fisheries in Texas have increased substantially in recent years. The most popular destination is the Trinity River, which originates near Dallas and flows for > 1,100 km to the Gulf of Mexico. In 2007 the Texas Parks and Wildlife Department initiated efforts to estimate alligator gar population metrics, movements, and habitat use in the Trinity River. It appears the population is able to sustain current harvest, but is at risk of losing the trophy component due to overfishing. Alligator gar have low natural mortality, live more than 50 years, are slow to mature, and have variable recruitment likely associated with spring flooding. While growth of young fish can be very fast (up to 122 cm in 3 years), it takes about 20 years for fish to attain a length of 183 cm. We estimate the population of alligator gar ≥ 107 cm in the upper Trinity River (about 300 km) is ~9,200 fish, of which ~4% of the population is harvested annually under the 1 fish per day harvest regulation. Population models suggest current harvest is near the maximum that is sustainable. Telemetry showed most fish remained within 20 km of the original site of capture, although some fish moved > 100 km in only a few days. There was little intermingling of fish tagged near the estuary with fish tagged further upstream, suggesting there may be multiple stocks in the river. Alligator gar primarily used deep pools during normal and low flow periods and used tributary or backwater habitats during spring floods when flows exceeded 250 m³/s. If the popularity of this fishery continues to grow, increased harvest will likely reduce size and age structure. Harvest regulations that are independent of fishing effort could be used to maintain trophy fisheries.

Feeding ecology of introduced smallmouth bass in the Devils River, Texas

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Foraging habits of introduced smallmouth bass (ages 0 – 5) were examined from the Devils River, Texas, to assess potential impacts of an introduced piscivore on the native fish community, which includes a number of imperiled species. A total of 59 smallmouth bass ranging 59 – 475 mm in total length (TL) were collected during the summer of 2008 and their stomach contents quantified. Smallmouth bass displayed rapid growth within their first year (up to 166 mm TL) and fed initially on aquatic insects before switching to primarily crayfish and piscine prey. Smallmouth bass (100 – 300 mm TL) exhibited the widest diet breadth, but diets of all size classes suggested opportunistic foraging habits. Among identified piscine prey items, centarchid was the most abundant group (50%), followed by cyprinid (25%) and ictalurid (17%). Prey items of similar size to imperiled species were found in individuals ranging 104 mm – 332 mm TL, suggesting the potential for imperiled species predation. Results from this study can be used in future management approaches to maintain both an intact native fish assemblage and a thriving recreational fishery.

Winter feeding ecology of the blacktail shiner (*Cyprinella venusta*) in the Llano River

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The food items fishes feed on and why they feed on them have long been interesting questions to aquatic ecologists. Fishes feed on a wide variety of organisms and plants, often utilizing food items from the adjacent terrestrial landscape. Using fish diet analyses, Surber samples, and drift net samples, we investigate the winter diets of blacktail shiners (*Cyprinella venusta*) in both run and pool type habitats. We wish to investigate whether or not fishes in these different habitats appear to be utilizing food items from the drift versus the benthos. Lastly, if they do appear to be utilizing drifting food items, we investigate whether or not the terrestrial component of the drift makes up a significant portion of their overall diets. Based on preliminary analyses, blacktail shiners in fast runs appear to have very different feeding habits than congeners in pools; their stomachs tended to contain more prey items per fish and the stomach remains appear to be less digested which indicates they are feeding more often. No terrestrial food items have been found in diets but terrestrial foods, especially formicids, have been found in drift net samples.

Impacts of golden alga on fish populations in reservoirs of the Upper Colorado River and Brazos River basins

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Several reservoirs in the Upper Colorado River (UCR) and Brazos River (BR) basins have experienced toxic blooms of golden alga (GA) and associated fish kills since 2001, potentially impacting their popular fisheries. The objectives of the present study are to: 1) determine if fish populations are impacted by toxic GA blooms in similar manner between river basins, 2) determine species differences in tolerance to toxic GA blooms, and 3) assist ongoing development of best management practices for impacted reservoirs. We used Before-After-Control-Impact analysis on catch-per-unit-effort (CPUE) data collected during TPWD fisheries surveys (1990-2010). This analysis determines whether fish populations have declined and not recovered following an impact, a pattern termed “sustained” disturbance. Unfortunately, the dissimilar sampling schedules among reservoirs did not allow determination of “pulsed” disturbances, where populations exhibit an initial decline and then recover. In the UCR, white bass, bluegill, river carpsucker, freshwater drum, and channel, flathead and blue catfishes all exhibited sustained disturbances; gizzard shad, longnose gar and white crappie did not. In the BR, blue catfish was the only

species that appeared to exhibit a sustained disturbance. Largemouth bass did not exhibit sustained disturbances in either system based on total CPUE; however, proportional size distribution showed a sustained disturbance in the UCR but not in the BR, indicating dominance by smaller size classes in the UCR that may be the result of stocking. Results from this study indicate that: 1) not all basins affected by GA are impacted in the same manner; namely, the incidence of sustained disturbances in the UCR are far greater than in the BR; 2) populations of certain species are more tolerant than others; and 3) current management plans may be sufficient to maintain populations of most species in the BR, whereas new management options may benefit recovery of fisheries in the UCR.

Reproductive and trophic ecology of two sympatrically occurring cyprinids in the Rio Grande Basin, Texas

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The genus *Dionda* (family Cyprinidae) consists of at least 12 species, all of which inhabit groundwater-dominated streams within the western Gulf slope drainages of North America. Purposes of this study were to quantify trophic and reproductive characters of two sympatrically occurring *Dionda* (*D. argentosa* and *D. diaboli*) and to assess relationships among life-history traits, feeding behavior, and groundwater-dominated streams. From September 2009 to August 2010, *D. argentosa* and *D. diaboli* were collected monthly from the Devils River, Rio Grande Basin, Texas, and *D. diaboli* from Pinto Creek, Rio Grande Basin, Texas. Population structure (number of age groups, longevity, growth rates, sex ratios), reproductive effort (spawning season, spawning periodicity), and diets (gut contents, stable isotope) were determined for each species by drainage. *Dionda argentosa* had a protracted spawning season, from January through November, whereas *D. diaboli* spawned from January through July. Both species produced multiple clutches of oocyte cohorts throughout the reproductive season.

Angler attitudes and opinions concerning blue catfish management at a local scale

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Popularity of blue catfish *Ictalurus furcatus* angling has recently increased throughout Texas. Fisheries managers with Texas Parks and Wildlife Department (TPWD) have recognized this trend and have begun to evaluate factors influencing blue catfish management. A prevalent factor associated with management of any fish species is attitudes and opinions of anglers. Hence, a mail-out survey was developed to gauge angler attitudes and opinions as they pertain to blue catfish angling preferences and management. Surveys were mailed to 1,000 randomly selected Texas fishing license holders in an eight-county area around Abilene, Texas. A total of 292 surveys were returned and 103 (35%) anglers were identified as blue catfish anglers. Generally, blue catfish anglers indicated that they were 'moderately satisfied' with blue catfish angling in the Abilene-area. Most blue catfish anglers preferred to eat blue catfish < 24 in (86%) and thought a trophy blue catfish was > 30 in (80%). Abilene-area blue catfish anglers generally agreed with the current harvest regulation (87% support) and a regulation with an increased minimum length limit (63% support). Anglers generally opposed a reduced bag limit (65% opposition) and a slot length limit (77% opposition). These results provide information about the social component of Abilene-area blue catfish fisheries and will be used to shape future management actions for local reservoirs.

Attitudes, opinions, and economic impact of jugline anglers on three Texas reservoirs

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As part of a larger study, contact information for jugline anglers targeting catfish were obtained from jugs placed in three Texas reservoirs where an experimental 30"-45" slot limit on blue catfish had just been enacted. A total of 59 surveys were mailed. Discounting the 7 surveys returned with bad addresses, we experienced a 54% response rate. Catching a "trophy" blue catfish was a low priority for most jugline anglers, although less than a third of the responses were opposed to the new regulation. Only 18% indicated that they were going to fish less where the regulation was in effect. The majority of anglers indicated that they considered blue catfish 50 lbs and larger to be "trophies". Information obtained as to the number of hooks used by jugline anglers indicated that the current regulation limiting hooks to 100 per angler exceeds the number used by a large margin, rendering it ineffective at reducing angler effort. Most anglers indicated that they didn't keep blue catfish larger than 30" prior to implementation of the regulation. However, the majority of the harvest reported post-regulation (76%) was caught by the upper quartile of anglers.

Surveying Texas' freshwater catfish anglers

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We developed a statewide survey of catfish anglers to identify angler types, characteristics, and desires. The survey combined a traditional design with a stated choice method. For the stated choice portion we presented respondents with paired hypothetical fishing-trip scenarios and asked them to choose the trip they most preferred. Trip scenarios varied by the relative number of catfish caught and harvested, the relative size of catfish caught, the type of water body on which the trip took place, the level of site development, and the distance traveled. We had a response rate of 57% (after excluding surveys that were undeliverable) for the mail-based survey of 1078 catfish anglers. Results suggest a diversified group of anglers, but with some strong commonalities. Anglers are predominantly older males who have fished for years and fish >20 days annually. They have median incomes of \$60,000 to \$80,000, are college-educated, fish predominantly from boats with rod-and-reel, and have approximately \$7300 invested in their fishing equipment. Most consider a trophy catfish to be greater than 30". The biggest issue our anglers had with the amenities was there was often too much litter. Angler choice was most affected by distance traveled. The second most important predictor of angler choice was the relative size of catfish caught followed by number caught and harvested. Anglers preferred larger reservoirs (100+ acres) and rivers compared to smaller reservoirs. Anglers also preferred access sites with boat ramps. We have concerns that our surveys are not getting sufficient input from low-avidity and low-income anglers. Future TPWD management goals and actions will be developed based on this and related surveys of catfish anglers.

Short-Term Survival in the Wild of Advanced Florida Largemouth Bass Fingerlings Reared in Hatchery Ponds on Artificial or Natural Food

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Advanced Florida largemouth bass *Micropterus salmoides floridanus* fingerlings (150 mm total length) were produced in hatchery ponds from 38-mm fish. During production, these fish were either fed a commercial pellet feed or forage fish (fathead minnow *Pimephales promelas*). Short-term (72-h) survival of these fish in the wild was compared in two lakes (treatment) and one hatchery pond (control). Fish were tagged and 10 fish from each group (pellet- vs. forage-fed) were placed in each of 9 cages. These cages were randomly selected and placed in the study lakes and pond at 3 cages per water body. To determine potential cage effect on fish survival, 50 fish

(25 per group) were stocked into the pond along with the caged fish and designated un-caged fish. All cages were retrieved, and pond draining to harvest the un-caged fish was started, after 72 h. Survival was determined for each cage and for each group of fish in a cage. Similarly, survival values for the un-caged fish were calculated. For caged fish, overall survival values for lakes (56%) and hatchery pond (62%) were similar ($p = 0.4657$). Survival of the pellet-fed bass was 85% for lakes compared to 97% for ponds. For forage-fed bass survival was 27% for lakes or pond. For pond fish, overall survival was 62% for those in cages and 72% for those not in cages. Survival of pellet-fed fish was 97% for caged fish and 96% for un-caged fish. Forage-fed fish survived better outside the cage (48%) than inside the cage (27%). Our results revealed that whereas overall survival was similar between lakes and the pond, the pellet-fed fish survived better in cages than the forage-fed fish. There appeared to be a negative cage effect on survival of the forage-fed fish.

Life history aspects of a relict ironcolor shiner population in a novel spring environment

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Ironcolor shiner (*Notropis chalybaeus*) is generally absent from groundwater-dominated systems throughout its range; however, a relict, disjunct population occurs within the spring-fed upper reaches of the San Marcos River in central Texas. We conducted monthly seining collections within the restricted 2.2 km headwater range of the species to assess food habits and reproductive life history within a unique spring-run environment. Prey items were dominated by aquatic insects including Diptera (16% by weight), Ephemeroptera (13%) and Odonata (5%), as well as terrestrial insects (9%). The population consisted of four age groups with a maximum life span of 2.5 years. Reproductive ecology showed a protracted spawning season ranging March-December during which multiple clutches were produced. Sexual maturity was reached at approximately one year (36 mm SL), mean mature oocyte diameter was ~0.8 mm, and number of mature oocytes per clutch ranged 46-326. Comparisons among ironcolor shiner populations in the San Marcos River and thermally dynamic Marshalls Creek of Pennsylvania revealed mature female size was larger ($P < 0.01$) and mature oocyte diameter smaller ($P < 0.01$) in the upper San Marcos River, though number of oocytes did not differ ($P < 0.01$) nor did relationships between standard length and oocyte size (ANCOVA $F_{1,37} = 2.29$, $P = 0.14$). Literature accounts regarding ironcolor shiner oocyte diameters follow a latitudinal gradient and suggest a trade-off between oocyte size and reproductive season length. These findings provide further evidence for the roles of photoperiod and water temperature in structuring the reproductive seasonality of freshwater fishes, and suggest a strong linkage between thermally stable groundwater and the demography of spring-dwelling fishes. In this manner, aquifer depletion and alteration of thermal regimes threaten spring-dwelling fishes by disrupting naturally occurring reproductive cues.

Patterns of endemism and species richness of fishes of the western Gulf slope

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Taxa richness and endemism among animals are influenced by current environmental conditions as well as ancestral biotic conditions. We tested patterns in taxa richness and endemism among Western Gulf Slope (WGS) fishes against water availability gradients and their ancestral origins to assess conformity of species diversity among Texas drainages. A total of 155 species of native fishes was plotted among 196 sub-basins of the WGS. Taxa richness was highest in eastern WGS and lowest in the western WGS of Texas, closely conforming to the rainfall gradient. Numbers of endemic fishes, however, were highest in the western WGS and lowest in the eastern WGS. Three regions of note are the Brazos Basin, which exhibited a pronounced increase in endemism compared to adjacent Eastern drainages; the Guadalupe Basin, which contained the greatest number of endemic taxa in the Edwards Plateau; and the Rio Grande and Pecos Basins which contained the greatest numbers of endemic taxa in the WGS. Widespread fishes exhibiting ranges within as well as beyond the WGS were primarily of eastern ancestral origin, while endemic species' ancestors largely evolved to the north or southwest of the WGS.

This study found current and historical environmental conditions, ancestral biological conditions, time of residence, isolation, dispersal, and extirpation, all played significant roles in determining current native distributions of WGS fishes.

Inferring trophic resource partitioning among Amazonian floodplain serrasalmid fishes from $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ stable isotopes, stomach content and eco-morphological data

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Species coexistence mediated by partitioning of resources has been demonstrated in a wide array of communities including invertebrates, vertebrates and plants. Partitioning of resources can occur along any dimension of a species' niche such as food, habitat and time. Resource partitioning occurs when a local population reduces the width of its niche, on one or more dimensions, as influenced by environmental conditions, availability of resources, or competition. If species are competing for limiting resources, specialization would result in narrower niche width, thus decreasing niche overlap. Although niche overlap is not a direct measurement of competition, it provides a good measure of niche similarity among coexisting species. Here we assess trophic resource partitioning among nine sympatric fish species of the family Serrasalminidae (pacus and piranhas) in a floodplain of the Amazon River. We use data on stomach contents and stable isotopes to calculate trophic niche width and overlap among the species. We also test for correlations between dietary, isotopic, morphologic and taxonomic matrices to evaluate the degree to which fish morphology and phylogenetic relationships influences trophic similarity. Mean trophic niche overlap was much higher among species within phylogenetic clades than the mean for the whole assemblage, in particular for the terminal clade of the Serrasalminids which is comprised of predatory piranha species. Patterns of trophic niche overlap obtained from the analysis of stomach contents were similar to those observed in the plots of $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ stable isotopes, except for one species of frugivorous fish which seem to assimilate more C depleted food items in comparison with other frugivorous species, aligning with the piranhas. Morphology was correlated with diet and isotopic signatures. We discuss the importance of resource partitioning versus other mechanisms influencing species coexistence in this Neotropical fish assemblage.

Harvest and Survival of Channel Catfish in Community Fishing Lakes

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One of Texas Parks and Wildlife Department's management practices for community fishing lakes is regular stocking of channel catfish. Stocking is thought to be a cost-effective way to provide fishing opportunity to urban communities. Standard sampling by district biologists indicate that these fish do not remain in the lakes through the year, but it is unknown whether the fish are being harvested or they are dying without being caught. Two panhandle community lakes were surveyed using hoop nets and creel surveys for 14 months in an attempt to determine the fate of stocked channel catfish. Results of the surveys indicate that anglers were not harvesting the channel catfish. Hoop net data indicate that the channel catfish are disappearing from the lakes within five months of stocking when angling pressure is the lowest and no channel catfish were observed as harvested in either creel survey during the 14 months.

Abundance and distribution of the threatened minnows *Campostoma ornatum* and *Notropis chihuahua* in the Trans-Pecos region of Texas

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The Rio Grande and its tributaries in the Trans-Pecos region of Texas have been impacted by a variety of anthropogenic activities such as dewatering, reduced water quality, impoundment, channelization, and the introduction of non-native species. These environmental manipulations have negatively affected the native fishes leading to extirpations and population declines throughout the region. *Campostoma ornatum* and *Notropis chihuahua* inhabit Rio Grande tributaries streams in the Trans-Pecos region and are considered as Threatened. Little is known about their current status and the potential causes of their population decline in the Trans-Pecos region. We hypothesize that the distribution and abundance of the threatened minnows in these spring-fed habitats can be modeled by three primary processes: 1) adequate fish dispersal from the tributaries occurring through the river, 2) local environmental conditions that are maintained by spring flow, and 3) the abundance of introduced species such as the plains killifish, *Fundulus zebrinus*. We used classification and regression trees to analyze variation in abundance/incidence of the fish species from Alamito, Terlingua and Tornillo creeks, as well as the Rio Grande proper based on local environmental factors (e.g., conductivity and maximum depth), abundance of nonnative species (*Fundulus zebrinus*), season, and isolation (distance from Rio Grande). The analyses indicated that the distance between the Rio Grande and tributary localities, and maximum depth were the most important predictors for the abundance and occurrence of both species at the study sites.

The San Jacinto River watershed management initiative: a model for integrated resource management

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The San Jacinto River along with its watershed in southeastern Texas is nationally recognized as important and imperiled. In 2006 the river was listed by American Rivers as the ninth most endangered river in the United States. In addition, Lake Houston, the lower of two mainstream impoundments on the San Jacinto River and the main surface water supply for the 6 million residents in the Houston MSA, was named as a water to watch by the Reservoir Fisheries Fish Habitat Partnership in 2009. The San Jacinto River Watershed Management Initiative is a community based program coordinated by Texas Parks and Wildlife Department designed as an umbrella to bring components and partners together for information sharing, problem solving, and funding acquisition to better manage this socio-economically important resource.

Refining Un-ionized Ammonia Treatments for Golden Alga Control in Striped bass Production Ponds

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Ammonia can limit fish production by reducing fish growth or survival, yet ponds infested with the ichthyotoxic golden alga *Prymnesium parvum* are best managed with ammonia. We investigated tolerance of ammonia by juvenile striped bass to validate the 0.14- to 0.25-mg NH₃-N/L treatments used at Texas state hatcheries to control this alga in striped bass *Morone saxatilis* and palmetto bass (female striped bass × male white bass *M. chrysops*) fingerling production ponds and to determine if the maximum treatment (0.25 mg NH₃-N/L) can be increased as the fish grow. These NH₃-N treatments were identified for 4- to 6-d-old sunshine bass (female

white bass × male striped bass) with the maximum treatment as the maximum tolerable concentration (MTC; the concentration 90% of sunshine bass survives for 48 h). We exposed striped bass of different ages (4, 10, 20, and 28 d old) separately to NH₃-N treatments of 0 (control), 0.2, 0.4, 0.6, 0.8, 1.0, 1.2 mg/L for 96 h in McDonald egg hatching jars. Treatments consisted of four replicates each. Twenty fish were exposed to 5.5 L of each treatment solution in each replicate jar and mortalities were observed. We measured total ammonia, pH, and total dissolved solids to calculate corresponding NH₃-N and to estimate the MTC and no-effect-level (NOEL) values of NH₃-N. The mean 48-h MTC was 0.2 mg NH₃-N/L with 95% confidence limits of 0.15-0.25 – a range similar to the current treatment range. Ammonia tolerance was greatest for the 28-d-old fish, followed by the 10- and 4-d-old fish, in that order; and least for the 20-d-old fish. Based on the 48-h MTC values, the 0.25-mg NH₃-N/L treatment can be increased to 0.37 mg NH₃-N/L for 10-d-old fish but must be decreased to 0.1 mg NH₃-N/L for 20-d-old fish. The treatment can be increased to 0.4 mg NH₃-N/L for 28-d-old fish. The NOEL values were 0.54 mg/L at 24 h for 4-d-old fish, 0.25 mg/L at 72 h for 10-d-old fish, and 0.36 mg/L at 96 h for 28-d-old fish. Our results revealed that whereas the current treatments seem appropriate, proper manipulation of NH₃-N levels is necessary to achieve the best striped bass survival.

An Evaluation of Liberal and Conservative Water Use in Fingerling Channel Catfish Production Ponds

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We evaluated liberal and conservative water use in channel catfish *Ictalurus punctatus* grow-out ponds at three Texas Parks and Wildlife Department fish hatcheries to further refine best management practices for the production of 229-mm channel catfish. For the conservative water use treatment, ponds were flushed with water at 757 L/min when morning dissolved oxygen was less than 4.0 mg/L or afternoon pH \geq 9.5. Flushing of these ponds was discontinued on the day that morning dissolved oxygen was \geq 4.0 mg/L or when afternoon pH fell below 9.5. Ponds that received the liberal treatment were flushed continuously at approximately 379 L/min, beginning 30 days after fish stocking. Ponds in both treatments were aerated continuously beginning on day 30 post-stocking. Each treatment used 5 replicate ponds at each fish hatchery which were stocked with 90-mm total length fingerlings at 21,500 fish/ha and reared to 253 mm in 91 days. Fish growth, feed conversion, and survival did not differ between treatments. The liberal treatment consumed about 4 times more water than the conservative treatment. Liberal water use reduced pond pH by 0.4 and increased dissolved oxygen by 1.1 mg/L compared to conservative water use. Ammonia in the liberal water use ponds was frequently higher than the conservatively managed ponds. Culturists frequently employ the liberal water use strategy to prophylactically control the potential for high ammonia, high pH and low dissolved oxygen in catfish ponds. However, we found that the conservative water use strategy allowed ample opportunity to manage and maintain suitable water quality for channel catfish production. The use of liberal amounts of fresh water to manage ammonia levels in catfish production ponds does not appear to be necessary at the fish stocking density used in this study.

Reproductive ecology of the red shiner in the Double Mountain Fork of the Brazos River, Texas

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The red shiner *Cyprinella lutrensis* is a native cyprinid found in many streams and rivers of the central United States. Previous studies have shown that the species has a protracted spawning season and produces multiple clutches of ova. The latter result, however, was obtained in artificial pools and has not been confirmed in wild populations. In this study we present an analysis of the reproductive ecology of the red shiner in the Double Mountain Fork of the Brazos River, Texas through histological analyses and ova counts conducted across two

consecutive years. We found that the red shiner produces multiple clutches of ova throughout the late spring and summer and that reproductive output is suppressed by very low and high flow events.

Developing Fish Habitat Suitability Criteria for the Lower San Antonio River Basin

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The Texas Instream Flow Program and San Antonio River Authority are conducting an instream flow study on the Lower San Antonio River Basin with the goal of developing flow recommendations to support a sound ecological environment. Fish habitat utilization data were collected at four sites on the lower San Antonio River and one site on lower Cibolo Creek under a variety of base flow conditions. Multivariate analysis was used to group 37 species or life stage categories into six habitat guilds. Habitat suitability criteria for depth, velocity, and substrate were then developed for each fish habitat guild. Suitability criteria for each guild will be combined with two-dimensional hydraulic models to calculate habitat availability for a range of base flow conditions. Habitat-flow relationships, along with information and data from other disciplines, will be used to guide instream flow recommendations.

Using Envelope Curves to Derive Fish Habitat Suitability Indices for Instream Flow Assessments

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Habitat suitability indices for fish and other aquatic organisms are used in instream flow assessments of rivers and streams. These indices are then coupled with a hydraulics model to develop habitat-flow relationships. For species rich warmwater streams, practitioners often use multivariate techniques to assign fish species to habitat guilds and then use statistical tools such as non-parametric tolerance limits to define suitability criteria for depth, velocity and substrate for all members of a guild. One emerging approach is to use envelope curves to integrate species-specific curves. One advantage of this approach is that rare species can be weighted equally with very abundant species. This presentation will explore an application of envelope curve development used in Texas' ongoing environmental flow process (SB 3) in the Colorado/Lavaca river and Guadalupe/San Antonio river basins and discuss field sampling, data analysis and other issues relevant to habitat suitability indices.

Never enough data, never enough time: theoretical and practical sticking points in determining environmental flows

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Texas, like many regions of the world, faces major challenges in balancing competing interests for allocation of finite supplies of freshwater. One component of water planning is provision for environmental flows to sustain fluvial and estuarine ecosystems. Recent legislative mandates and activities by natural resource agencies and diverse stakeholder groups are addressing environmental flows in Texas. The question is simple: how much water does a river need? The answer is not simple. Holistic approaches for establishing environmental flows have the advantage of being general, rapid and cheap, but they tend to be crude and without ecological justification. Holistic approaches have been relied upon to provide environmental protection, for better or worse, for the past 40 years. Now we have more knowledge about river ecology, and there is greater public interest in the values provided by fluvial ecosystems. There is greater awareness that to maintain critical ecological functions and to support native biodiversity, environmental flow recommendations must take the form of flow regimes. The overarching goal is to conserve the timing, magnitude and duration of flow components that are essential features of the natural flow regime. But what is essential? And what is a natural regime in the context of multiple environmental impacts? Here I examine some of the pros and cons of data-intensive, habitat-focused methods for assessing environmental flows, and discuss their basic assumptions with regard to current theories of community ecology and recent evidence from river research. In many cases, these basic assumptions are false, and efforts to accumulate ever-greater amounts of field data cannot improve the reliability of ecological inferences. Two alternatives are available: an approach that examines responses of key indicator species to flow components in mesohabitats throughout their life cycles, and testing community and ecosystem responses to flow scenarios using complex, individual-based models.

POSTER SESSION ABSTRACTS

Effect of parasites on reproductive investment in three species of livebearing fishes (Family Poeciliidae)

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Livebearing fishes in the family Poeciliidae are highly susceptible to a variety of parasites. Moreover, several poeciliids inhabit streams and rivers in close proximity, providing an excellent opportunity to comparatively test the effects of parasites on hosts. Here, we investigated the potential for parasitic infection to influence host reproduction for both males and females of three livebearers (*Gambusia affinis*, *Gambusia geisleri*, and *Poecilia latipinna*) in Texas. We compared the effects of parasites on reproductive investment across two populations for each species. We found no differences in parasite infection across populations for any of our focal species. But, *G. affinis* and *G. geisleri* were more infected overall than *P. latipinna*. Contrary to our expectations, we found no strong relationship between parasite load and host reproduction except for *G. affinis* females. In both the San Marcos and Blanco Rivers, parasite load explained about 12 % of the variation in female reproductive investments (measured as GSI). In general, parasites do not appear to be strong predictors of reproduction in some livebearers, but this affect may vary seasonally and calls for future investigation.

Potential Behavioral Reproductive Isolation Between Two Sympatric Livebearing Fishes in Texas: the Endangered Pecos Gambusia (*Gambusia nobilis*) and the Largespring Gambusia (*Gambusia geiseri*)

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Hybridization is of major concern for conservation of endangered species because, despite decreases in fitness (e.g. hybrid sterility), many vertebrates (especially fishes) do hybridize with closely related species. There are several documented cases of hybridization in livebearing fishes (family Poeciliidae) as some species are sympatric. Further, several livebearers are either invasive or endangered, providing an ideal system to test for reproductive isolation. The largespring gambusia (invasive) and Pecos gambusia (endangered) coexist in the San Solomon Cienega in west Texas. Research suggests that the invasive may gradually be replacing the endangered species in the cienega, a cause for concern because this is one of the few remaining habitats for the Pecos gambusia. While no solid evidence of hybridization is reported, recent field observations suggest a possible cross, as Pecos gambusia males were observed mating with largespring gambusia females. In addition, some individuals in the cienega share morphological features of both species, suggesting hybridization might be occurring. Therefore, testing for potential behavioral reproductive isolation in this system is important at this time. Here we present data from four behavioral experiments testing association preferences of each *Gambusia* species (both males and females) using a dichotomous choice experimental design. This design gives indirect insight into both mating and shoaling preferences. Preliminary analyses suggest no differences in association preferences for female or males of either species, suggesting a lack of discrimination. If further analyses are consistent with this pattern, our results will support the potential for hybridization of these two species, which may result in additional conservation management of the endangered Pecos gambusia.

An update on the current status of the endangered Pecos gambusia (*Gambusia nobilis*) and Comanche springs pupfish (*Cyprinodon elegans*) in Phantom Spring, Texas

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Springs of the desert southwest are home to many endemics, including the Pecos gambusia (*Gambusia nobilis*) and the Comanche Springs pupfish (*Cyprinodon elegans*). Both are fishes endemic to the Phantom Springs complex in west Texas and are federally listed as endangered. Historically, several of the springs within this complex were dried due to irrigation. However, efforts were made to restore some of springs and preserve the organisms inhabiting them. Both *G. nobilis* and *C. elegans* inhabit the headwaters of this complex, Phantom Cave. Until recently, these head waters and the two endangered fishes that inhabit it, have not been monitored regularly. Therefore, it was our goal to census both species over two seasons in 2010 to update their current status within Phantom Cave. We also sought to determine whether the invasive *Gambusia geisieri* was present in the spring.

Finally, we provide habitat parameters for the spring and its adjacent canal. Here, we present data from our first full census with the intent to provide immediate information on these two species and the spring.

Stream Fragmentation Thresholds for Great Plains Pelagic-Spawning Fishes

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We present a mechanistic pathway by which human alteration of streams has caused the decline of a unique reproductive guild of Great Plains stream-dwelling fishes. Stream fragmentation related to impoundments, diversion dams, and stream dewatering has effectively created a mosaic of large river fragments throughout the Great Plains of central North America. We analyzed longitudinal fragment lengths (measured in river km) and literature accounts of population status for eight species among 60 fragments to derive species-specific thresholds in stream length associated with population persistence. Fragment lengths were a strong predictor of population status among species and differed ($F_{2,21} = 30.14$, $P < 0.01$) according to population status for extirpated (mean = 136 ± 21 km), declining (226 ± 69), and stable (458 ± 137) populations. Fragment length explained 71% of reported extirpations and estimated minimum thresholds in fragment length explained 67% of variation in population persistence among eight species. Literature accounts suggest this pattern exemplifies declines among at least 14 North American species that occur throughout a third of the contiguous United States and have shown declines over the past 60 years. By this account stream fragmentation presents a substantial challenge to the conservation of biodiversity in North America. Conservation management insights inferred from our findings suggest measures that restore connectivity within fragmented river systems will likely benefit imperiled pelagic-spawning fishes.

Stable isotope analysis reveals food web structure and watershed impacts along the fluvial gradient of a Mesoamerican coastal river

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Ecosystem processes and biological community structure are expected to change in a relatively predictable manner along fluvial gradients within river basins. Such predictions are heavily based on temperate rivers, and food web variation along fluvial gradients in Mesoamerican rivers has received limited attention. In this study, we analyzed carbon and nitrogen stable isotope ratios of basal carbon sources and dominant consumer species to examine aquatic food web structure along the fluvial gradient of the Monkey River Basin, Belize. Similar to previous studies in other regions, consumer species richness and functional diversity increased along the downstream fluvial gradient, due in part to the addition of estuarine species in lower reaches and increasing diversity of piscivorous species along the gradient. Aquatic food webs in upstream reaches were primarily supported by allochthonous production sources, and in-stream sources increased in importance along the downstream gradient. Our study system traversing the Maya Mountain Marine Area Transect also provided a unique opportunity to test the utility of primary consumer $\delta^{15}\text{N}$ as an indicator of watershed impacts within a tropical basin with a diverse biota and a different type of agricultural impact than typically studied (i.e. banana

plantations vs. tilled row cropping). As expected, primary consumer $\delta^{15}\text{N}$ at sites draining impacted watersheds was enriched compared to values from forested reference sites. Assessment of primary consumer $\delta^{15}\text{N}$ may be a feasible option for monitoring watershed impacts on aquatic food webs in service of the ridge-to-reef conservation strategy adopted for this watershed as well as in other tropical river basins.

Do wastewater treatment plants cause abnormal effects in fish?

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There is a growing concern that pharmaceuticals in wastewater effluents could induce physiological abnormalities, such as reproductive impairment and developmental anomalies, in fishes and other aquatic organisms. There is little or no information concerning the effects that 400+ wastewater treatment plants in Harris County, Texas have on aquatic biota. This study examined the western mosquitofish, *Gambusia affinis*, to seek evidence of physiological disruption due to proximity to wastewater treatment plant (WWTP) effluents in the bayous of Houston. Five study sites were chosen, and mosquitofish were sampled 250 m above and below the WWTP outflows. Preliminary results did not reveal a statistically significant difference ($\alpha=0.05$) in standard length, log gonadosomatic index (GSI) or log hepatosomatic index (HSI) above and below the WWTP. Based on this set of preliminary samples collected during late summer and fall, there seems to be no major effects from WWTP effluents, however, this conclusion is tentative until more specimens have been collected and examined and water samples have been analyzed. This ongoing research project will describe the reproductive ecology of mosquitofish populations in Houston bayous to establish baseline indicators for future research and monitoring efforts.

Survey of mercury concentrations in largemouth bass (*Micropterus salmoides*), white bass (*Morone chrysops*), and white crappie (*Pomoxis annularis*) from six Dallas-Fort Worth area reservoirs

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Largemouth bass (*Micropterus salmoides*) are routinely monitored for mercury (Hg) in Texas reservoirs. Other piscivorous game-fish that may have high concentrations of Hg, such as white bass (*Morone chrysops*) and white crappie (*Pomoxis annularis*), are monitored less frequently because they are difficult to catch. We examined Hg concentrations in largemouth bass, white bass, and white crappie from six Dallas-Fort Worth area reservoirs: Benbrook Lake, Eagle Mountain Lake, Grapevine Lake, Lake Lewisville, Joe Pool Lake, and Lake Ray Hubbard. Fish were collected using electroshocking, trap nets and hook and line. For all species Hg concentrations were positively correlated with total length. Hg concentrations of each species were significantly different between reservoirs, indicating that some reservoirs were more contaminated with Hg than others. In the majority of reservoirs Hg concentrations in largemouth bass did not differ from Hg concentrations in white bass and white crappie. These data suggest that Hg concentrations in largemouth bass may be representative of Hg concentration in other piscivorous game-fish and is an appropriate target species for monitoring studies.

Relationships between water quality and toxic golden alga blooms in reservoirs of West Texas

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Toxic blooms of golden alga (GA, *Prymnesium parvum*) have caused massive fish-kills in Texas reservoirs, ponds, and streams. Toxic GA blooms typically last a few days or weeks, do not occur every year, and are generally a winter phenomenon. In some reservoirs of the Upper Colorado River (UCR), however, blooms can last several months, occur annually, and often extend into summer. Due to the relative severity of their blooms, water quality conditions in UCR reservoirs seem to be ideal for GA growth and toxic expression. A study was begun in January 2010 to quantify GA cell density, ichthyotoxicity, and water quality conditions in three severely impacted UCR reservoirs (Moss Creek, Colorado City, E.V. Spence); two reference reservoirs in the Concho River (CR) that have not experienced toxic GA blooms (Twin Buttes, Nasworthy); and three sites in O.H. Ivie reservoir, which is fed by the UCR and CR and has also not experienced major toxic blooms. The study is currently ongoing, but preliminary analyses have shown that salinity and total hardness are greater in impacted UCR than CR reservoirs, with intermediate levels observed at the O.H. Ivie sites. The effects of salinity and hardness on ichthyotoxicity of lake water collected during toxic blooms were further examined in laboratory experiments. Toxicity was low when salinity was experimentally reduced (≤ 1.2 ppt) regardless of hardness level, but at higher salinity (≥ 2.5 ppt), an apparent positive relationship between hardness and toxicity was observed. Thus, water salinity and total hardness seem to interactively influence GA ichthyotoxicity. Overall, these findings suggest that measures to control lake water hardness and/or salinity could be a management option for reducing GA bloom formation and toxicity. Continued monitoring of UCR reservoirs and additional laboratory experiments will provide further insight into the water quality conditions that contribute to GA blooms.

Calculating habitat suitability for Texas fishes from expert perception: a request for participation

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Habitat suitability models are an integral part of instream flow assessments and are used to estimate the level of fish-habitat associations in riverine environments. Development of suitability models from field observations is labor intensive and can lack adequate inferences when ranges of flows or habitat conditions are not available during the period of observation. To minimize both of these potential concerns, we developed a web-based survey that allows field biologists to quantify habitat associations based on experience and perception. Success of this survey ultimately depends on the number of expert participants. Information provided herein describes the survey in more detail with a specific invitation for participation by Texas Chapter AFS members.

Growth of blue catfish in three Texas reservoirs

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As part of a larger study, otoliths were obtained from blue catfish collected in three Texas reservoirs with an experimental 30"-45" blue catfish slot limit. Catfish ranged from 75 to 1,100 mm and were collected by low-pulse DC electrofishing and by juglining. Growth was extremely variable both within and among reservoirs, with dominant year classes clearly evident. Possible links to stocking efforts and environmental factors are explored. Implications of large variations in growth to the success of the experimental regulation are also discussed.

Texas Mussels in National Museums: A Survey of Biodiversity Collections for Records of Texas Freshwater Mussels

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We requested records of Texas freshwater mussels (Unionidae) from 14 institutional biodiversity collections in the United States and Canada, all but two of which were outside of Texas. Results of these queries were standardized and collated into a database consisting of 4368 records, dating from 1829 to 2005. Staff of the Institute of Renewable Natural Resources georeferenced all records based on verbatim locality data attached to each record. Precision of locality data varied from exact coordinates to generalized locations such as county or river basin, and georeferenced records were categorized accordingly. Taxonomies under which many of these records are being curated did not reflect current usage as compiled by Howells et al. (1996), so synonyms were assigned according to that reference and the MUSSEL Project Simpson-Haas Index available online. Based on this revised taxonomy, our database comprises records of at least 50 unionid species currently recognized from Texas, and includes 577 records of 11 species currently petitioned for listing as federally endangered or threatened. This latter subset of records dates from 1889 to 2005. Future uses of these data include investigations of geospatial trends in the historical distribution of Texas freshwater mussels, and surveys of sites known to have hosted mussel species that have not been recently observed. Accuracy of the database will also need to be improved via direct verification of the taxonomic identity of voucher specimens. These efforts await further funding and training of personnel in unionid taxonomy.

Preliminary Population Estimates, Microhabitat and Gut Content Analyses of the Endangered Clear Creek Gambusia, *Gambusia heterochir*

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The Clear Creek gambusia, *Gambusia heterochir*, is a small livebearing fish (family Poeciliidae) endemic to the headwaters of the San Saba River, Texas and known only to one spring (Clear Creek) near Menard, Texas. It has never been documented in any other location, although Hubbs (1957) postulated that *G. heterochir* may have inhabited other areas but was outcompeted by its native congener *Gambusia affinis*. As a result, *G. heterochir* was listed as endangered in 1966. Known threats (e.g. habitat destruction and potential hybridization with *G. affinis*) coupled with stochastic (or random) events make this organism highly susceptible to extinction. In 1982, US Fish and Wildlife Service formulated a recovery plan for "securing the survival" of *G. heterochir*, which called for regular monitoring of the spring. Since that time, Hubbs (2001), monitored population densities of *G. heterochir* and measured spring habitat parameters and water quality. However, these data were based on relative abundance and were not true population estimates. Until this study, no population estimates have been made for *G. heterochir* and moreover, much of the data on relative abundance of *G. heterochir* and habitat parameters remain unpublished. Here we present data from preliminary population estimates from spring 2010. On 14 May, we conducted a population estimate of the upper pool using depletion sampling with minnow traps. We collected and released 2,385 individuals in this process. Additionally, we identified primarily *G. heterochir* and a few *G. affinis* in the head pool with no apparent hybrids. Finally, we quantified microhabitats and gut contents of *G. heterochir*. Further analyses are currently being performed and will be presented here. With these data, a true population

viability analysis can be conducted to provide minimum population numbers necessary for long-term survival of *G. heterochir*.

An Assessment of Oyster Reef and Shoreline Habitat Use by Estuarine Finfish in East Matagorda Bay and Galveston Bay, Texas.

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To assess the role of oyster reefs as finfish habitat in upper Texas' estuarine systems, species assemblages and abundance differences were compared between shoreline habitat and open water oyster reef habitat in East Matagorda Bay and Galveston Bay, Texas. Texas Parks & Wildlife Department (TPWD) 183 m gill nets were deployed in East Matagorda Bay for two ten week periods per year (spring and fall) from 2005-2007. Each week one net was set on oyster habitat and two nets were set on shoreline habitat (spartina marsh, seagrasses, lake shoreline, geotubes, shell and sand flats). Non-parametric analysis (multi-dimensional scaling (MDS) and analysis of similarities (ANOSIM)) using PRIMER software indicated a significant difference ($p < 0.001$) in community abundances and species assemblages between shoreline and reef habitat with seven species contributing >58% of the dissimilarity between habitats. The main distinguishing species were Pogonias cromis, black drum (more abundant on reef habitat) and Ariopsis felis, hardhead catfish (more abundant on shoreline habitat). Additionally, differences between Cynoscion nebulosus, spotted seatrout, gender ratios were observed with a greater proportion of male spotted seatrout found on oyster vs. shoreline habitat. A similar study was conducted in Galveston Bay, Texas, in the fall of 2009 and spring 2010. Analysis again shows a significant difference ($p < 0.001$) in community abundances and species assemblages with eight species of finfish contributing >60% of the dissimilarity between habitats. The main contributing species were Brevoortia patronus, Gulf menhaden, and Pogonias cromis, black drum, (more abundant on reef habitat) and Sciaenops ocellatus, red drum, (more abundant on shoreline habitat). Differences between bay systems will be examined.

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