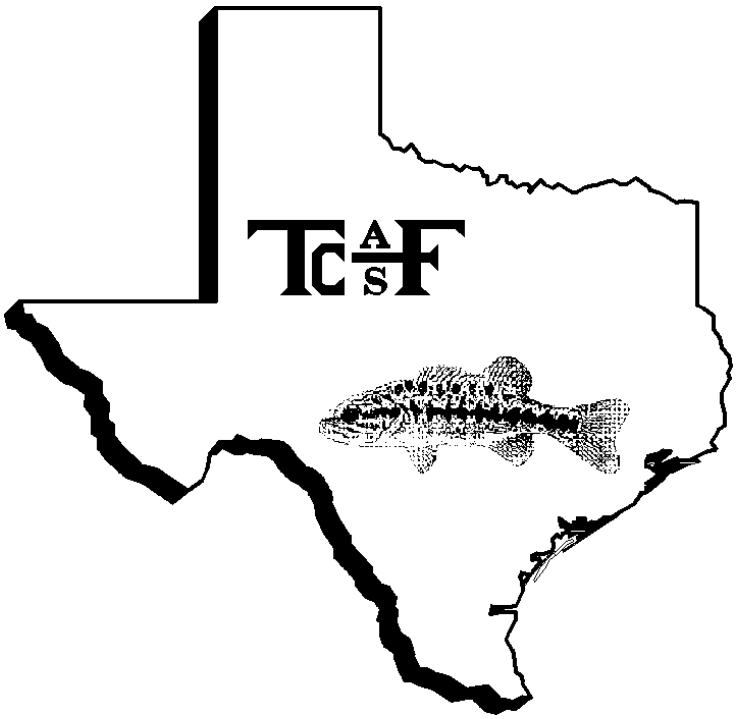
ANNUAL PROCEEDINGS
of the
TEXAS CHAPTER

AMERICAN FISHERIES SOCIETY



Galveston, Texas

27 – 29 January 2003

Volume 25

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.

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ANNUAL PROCEEDINGS OF THE TEXAS CHAPTER AMERICAN FISHERIES SOCIETY

Annual Meeting
27-29 January 2003
Galveston, Texas

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Abstracts of Posters Presented at the Annual Meeting but not Published in the Proceedings

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 Texohoma, 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 Texohoma, OK
1991	Gene McCarty	Galveston
1992	Bill Provine	Kerrville
1993	Barbara Gregg	Port Aransas
1994	Loraine Fries	Lake Travis
1995	Pat Hutson	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

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 - Kathyrn 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 Higginbothan (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, 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 Moczygemba (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)

Abbreviations:

ACE - Army Corps of Engineers
NMFS - National Marine Fisheries Service
ODWC - Oklahoma Department of Wildlife Conservation
OSU - Oklahoma State University
SCS - Soil Conservation Service
SHSU - Sam Houston State University
TAES - Texas Agricultural Extension Service
TAMU - Texas A&M University
TAMUCC – Texas A&M University-Corpus Christi
TPWD - Texas Parks and Wildlife Department
TTU - Texas Tech University
TUGC - Texas Utilities Generating Company
TXSTATE - Texas State University-San Marcos
USFWS - US Fish and Wildlife Service
UT - University of Texas at Austin
UTMSI - University of Texas Marine Science Institute
UTPA - University of Texas/Pan American

TECHNICAL SESSION ABSTRACTS

Selection of Estuarine Nursery Habitats by Wild-Caught and Hatchery-Reared Juvenile Red Drum

GREGORY W. STUNZ *(Texas A&M University-Corpus Christi, Department of Physical and Life Sciences, Corpus Christi, Texas 78412)*
THOMAS J. MINELLO *(Fishery Ecology Branch, National Marine Fisheries Service, Southeast Fisheries Science Center, Galveston Laboratory, 4700 Ave. U, Galveston, Texas 77551, tom.minello@noaa.gov)*
PHILLIP S. LEVIN *(Northwest Fisheries Science Center, 2725 Montlake Blvd. E. Seattle, Washington 98112, phil.levin@noaa.gov)*

We examined patterns of habitat selection and mortality in wild-caught and hatchery-reared early juvenile red drum *Sciaenops ocellatus*. We hypothesized that the newly recruited fish would have distinct patterns of habitat selection. Red drum were introduced to replicate mesocosms containing all possible pair-wise comparisons of four different estuarine habitat types: marsh *Spartina alterniflora*, non-vegetated bottom/sand, oyster reef *Crassostrea virginica*, and seagrass *Halodule wrightii*. Wild-caught and hatchery-reared red drum showed distinctively different patterns of habitat selection. In general, wild-caught red drum selected structured habitats, while hatchery-reared fish did not show strong habitat selection. We performed mortality experiments to analyze prey vulnerability and fish rearing-type (wild-caught or hatchery-reared) in habitats of varying structural complexity. Vulnerability of wild-caught red drum to predators was significantly lower in structurally complex habitats such as seagrass and oyster reef; the highest vulnerability was associated with the nonvegetated bottom. This habitat effect was not apparent for hatchery-reared prey. In trials using a combination of both rearing-types, there was no significant habitat effect on prey selection, but hatchery-reared red drum suffered higher overall mortality than wild-caught fish. Our results suggest that in the absence of seagrass, other habitat types such as marshes and oyster reefs may be important recruitment habitat for red drum and reinforce the conclusion that structural complexity in estuarine habitats increases survival of newly settled fishes. Our data also suggest that hatchery-reared red drum may be more vulnerable to predation than natural fishes, and that survival of stocked fish may be enhanced through habitat-related behavior modification.

Acoustic Array to Survey Red Drum Spawning Sites in the Gulf of Mexico

SCOTT A. HOLT *(University of Texas at Austin, Marine Science Institute, 750 Channel View Drive, Port Aransas, Texas 78373)*

A towed hydrophone array was used to survey for red drum *Sciaenops ocellatus* spawning sites in the coastal region of the Texas coast in the western Gulf of Mexico. The array is composed of an eight-element array in an 80 meter cable and a 200m towing cable. The array was towed at approximately 3.5 kts. from a 105 foot stern trawler during the known spawning time (both season and daily) of red drum. Red drum produce a characteristic drumming or knocking sound during courtship and spawning. Although the pulse pattern of the call is variable, the fundamental frequency is consistently around 140-160 Hz. The occurrence of red drum spawning activity was determined by listening to the tapes for characteristic sounds and by examination of spectral analysis of the data stream. We estimated that clearly identifiable calls of individual red drum could be heard over a distance of 80-100m and convergent sounds of numerous red drum over greater but undetermined distances. Individual red drum were heard regularly along the tow track. Several fish were often heard in close proximity to each other but there was no evidence of large aggregations. Although more drumming activity was heard in the vicinity of tidal inlets, drumming occurred over a relatively wide area of the shallow coastal waters. The areal extent of red drum spawning is still unknown but it is clear that spawning activity is relatively widespread in the coastal ocean.

Effects of Habitat on Growth Performance of Caged Hatchery-Produced Red Drum

R. R. VEGA *(Texas Parks & Wildlife Department, 4300 Waldron Road, Corpus Christi, Texas 78418)*
W. H. NEILL *(Texas A&M University; Department of Wildlife & Fisheries Sciences, 210 Nagle Hall, College Station, Texas 77843-2258)*
J. M. MILLER *(North Carolina State University, Department of Zoology, Box 7617, Raleigh, North Carolina 27695)*

Growth rates of hatchery-produced juvenile red drum *Sciaenops ocellatus* were used to assess habitat-quality via cage experiments at two locations in Corpus Christi, Texas. At each location, we selected sites we expected to provide habitat favorable for red drum growth ("good" habitat) and habitat less favorable for growth ("bad" habitat). The abiotic environment was synoptically measured with water-quality data loggers at each habitat site for 17 days in the first trial, and 13 days in the second. Weight-specific growth rate (%/day) of caged fish reflected the proximate abiotic environment and significantly differed between "good" and "bad" sites ($P = 0.026$), in an electric power plant cooling reservoir; in contrast, growth of caged fish did not differ ($P = 0.592$) between "good" and "bad" estuarine habitats in the Packery Channel area of Corpus Christi Bay. Environmental data, along with initial size of fish and feeding conditions were used as input for Ecophys, a simulation model of fish growth in time-varying environmental regimes. The model accurately accounted for the observed trends in growth. However, both the fish and the model attested that our *a priori* categorization of habitat as "good" or "bad" was not reliable. Mostly, this was because physicochemical environment (especially temperature and dissolved oxygen concentration) varied rapidly and substantially with weather events we could not predict.

Evaluation of Stocking Success in Marine Waters - Gene-Marking of Red Drum and Spotted Seatrout Fingerlings Released into Texas Bays

ROCKY WARD, WILLIAM J. KAREL, AND IVONNE R. BLANDON *(Perry R. Bass Marine Fisheries Research Station, Texas Parks & Wildlife Department, Palacios, Texas 77465, rocky.ward@tpwd.state.tx.us)*

Texas Parks and Wildlife Department (TPWD) releases about 30 million hatchery-spawned red drum *Sciaenops ocellatus* and about 5 million spotted seatrout *Cynoscion nebulosus* fingerlings each year into Texas' bays and estuaries. Gene-marking was employed by TPWD to evaluate the success of these stockings. In the first study about two million red drum fingerlings were stocked between 1993 and 1995 into East Matagorda Bay; of these, 50% were heterozygous and 25% were homozygous for an uncommon dimeric esterase allele. Electrophoretic examinations of 6,081 red drum collected between 1993 and 1997 in TPWD resource monitoring or in creel surveys found no evidence of increased frequency of the marker-allele in supplemented year-classes. In the second study over 1,300,000 spotted seatrout fingerlings, marked with an uncommon Peptidase-B allele, were stocked into 3 sites in the lower Laguna Madre during the summer of 1994 with smaller stockings into 3 sites during the summer of 1995. The percentage of stocked individuals homozygous for the marker allele ranged from 50% to 60% and the percentage of heterozygous individuals from about 27% to 50%. Electrophoretic examinations of approximately 7,000 samples collected between 1994 and 1997 suggest spotted seatrout stockings may result in localized enhancement of natural populations.

How do Diel Fluctuations in Temperature and Dissolved Oxygen in Seagrass Beds Affect Growth of Red Drum *Sciaenops Ocellatus* Larvae*?*

R. PÉREZ-DOMÍNGUEZ AND G. J. HOLT *(Marine Science Institute, University of Texas at Austin, 750 Channel View Drive, Port Aransas, Texas 78373, rperez@utmsi.utexas.edu, joan@utmsi.utexas.edu)*

Red drum larvae migrate through coastal inlets, settling into shallow seagrass meadows during the fall in south Texas estuaries. Marked diel temperature and dissolved oxygen (DO) cycles are distinctive features of this important nursery habitat that may impact larval growth rates. Compared to a stable pelagic

environment, seagrass offers the benefit of ample food and shelter; however the accompanying environmental fluctuations may result in higher energy investments and reduced growth. In this study we exposed settlement-sized fish (4-5 mm, SL) to temperature or DO cycles to evaluate their effects on larvae growth and endocrine function. The standard length of fish grown in temperature cycles was not different from control fish reared at constant temperature. However, growth was significantly reduced in DO cycles with prolonged exposure to low DO levels. Cortisol, a hormone related with metabolism and stress, was measured to determine underlying physiological responses to diel cycles. Fish exposed to any cycle showed similar or reduced cortisol content compared to control fish. Environmentally realistic temperature and DO cycles might not result in stress response by larvae. Identification of the environmental conditions and mechanisms that result in increased growth provide valuable information for defining quality nursery habitats for red drum.

Effects of the Currently Used Herbicide Atrazine on Larvae Red Drum *Sciaenops Ocellatus* Environmental Performance

MARÍA DEL CARMEN ALVAREZ AND LEE A. FUIMAN *(University of Texas at Austin, Marine Science Institute, 750 Channel View Drive, Port Aransas, Texas 78373, malvarez@utmsi.utexas.edu, lee@utmsi.utexas.edu)*

We evaluate the effects of environmentally realistic, yet sublethal levels of the herbicide Atrazine on the growth, behavior, and survival potential of red drum larvae. Larvae were reared to settlement size and exposed to control, low, and high (0, 50, and 100 µg/ml) doses of Atrazine for 4 days. Behavioral assays evaluated survival potential, which was confirmed in the predation assays. Spontaneous swimming assay included measurements of rate of travel (mm/s), active swimming speed (mm/s), net-to-gross displacement ratio (NGDR), and level of activity (% time). In predation assay, larvae were exposed to a predatory fish and their responsiveness to an attack, response effectiveness, prey error, and capture success were measured. Results showed no significant effect of Atrazine on 96-h survival, but exposed larvae appeared to grow more slowly than controls. Treated larvae showed a significantly faster rate of travel and active swimming speed, a more convoluted path (smaller NGDR) and more activity. All doses were equally responsive and effective in the response to an attacking predator. These results indicate that even sublethal levels of Atrazine may have serious consequences for recruitment of red drum by making them more susceptible to predation and starvation during the larval period.

The Effect of Prey Swimming Behavior on Prey-Capture Kinematics and Feeding Performance in Marine-Fish Larvae

JESSICA L. BECK *(Department of Marine Biology, Texas A&M University, 5007 Ave. U, Galveston, Texas 77553)*

This study investigated the influence of zooplankton prey behavior on the feeding performance of *Sciaenops ocellatus* larvae. *Artemia franciscana* (brine shrimp), *Brachionus rotundiformis* (rotifer sp.), a ciliate species, and two species of copepods, *Nitokra lacustris* (harpactacoid sp.) and *Arcatia tonsa* (calanoid sp.) were cultured in the laboratory and filmed at 250 frames per second (fps) while swimming in a filming tank both with and without a larval fish predator, *S. ocellatus*. This experiment was conducted to determine: (1) interspecific differences in prey swimming velocity and, (2) the effects of predator presence on zooplankter swimming velocity. A Two-Way ANOVA revealed that: (1) *B. rotundiformis* swam slower *than A. franciscana*; (2) day-1 *A. franciscana* had lower swimming velocity than older *A. franciscana*; (3) copepods had higher swimming velocities than all other prey types when a larval fish predator was present. *S. ocellatus* larvae at the hyoid and hyoid-opercular stages of development were recorded at 500 fps while feeding on several prey types (*B. rotundiformis*, day-1 *A. franciscana*, day-2 *A. franciscana*). Results of t-tests comparing nine kinematic variables revealed significant differences between larval stages: maximum gape, maximum hyoid excursion, maximum lower jaw angle and duration of the gape cycle were greater in hyoid-opercular stage larvae than in hyoid stage *S. ocellatus*. However, within each stage, kinematic variables were not significantly different when feeding on different prey types. Day-1 *A. franciscana* was

the only prey type selected at both stages while day-2 *A. franciscana*, and *B. rotundiformis* were ignored by hyoid and hyoid-opercular larvae, respectively. Results of a t-test where both larval stages fed on day-1 *A. franciscana* revealed a significant increase with age for maximum hyoid excursion, time to maximum gape and gape cycle duration. It appears that prey-capture kinematics in *S. ocellatus* larvae are stereotyped within each stage and are not influenced by differences in prey swimming velocity. Conversely, prey-capture kinematics are significantly different between stages perhaps because of the changes in the larval fish feeding mechanism as development progresses.

Lipid Nutrition and Feeding of Cobia *Rachycentron Canadum* Larvae

CYNTHIA K. FAULK AND G. JOAN HOLT *(University of Texas Marine Science Institute Fisheries and Mariculture Laboratory 750 Channel View Drive, Port Aransas, Texas 78373, cfaulk@utmsi.utexas.edu, joan@utmsi.utexas)*

This study examined the feeding and lipid nutritional requirements of cobia *Rachycentron canadum* larvae. Two feeding studies were conducted to investigate the effectiveness of five dietary treatments on the growth and survival of larvae. In the first study, larvae were fed *Artemia* only or rotifers for 3 or 6 days + *Artemia*. Larvae in the second study were fed rotifers for 3, 4 or 5 days + *Artemia*. The results indicate that cobia larvae require rotifers for a minimum of 4 days following the onset of exogenous feeding. A third study examined the effect of enriching live feeds with varying levels of polyunsaturated fatty acids (PUFAs) such as docosahexaenoic acid (DHA), eicosapentaenoic acid (EPA) and arachidonic acid (ARA) on the growth of larvae through day 18 after hatching. Larvae were fed rotifers and *Artemia* enriched with live algae *Isochrysis galbana*, a commercial enrichment Aquagrow Advantage or Aquagrow Advantage spiked with ARA. Maximum larval growth occurred when live feeds were enriched with Aquagrow Advantage supplemented with arachidonic acid indicating that cobia larvae have a high requirement for PUFAs as has been shown for other marine fishes.

Ichthyofaunal Species Diversity and Similarity Indices Among Eight Sites Sampled for Young-of-the-Year Tarpon *Megalops Atlanticus* in Texas Saltmarsh Habitat

WILLIAM DAILEY AND ANDRÉ M. LANDRY, JR *(Texas A&M University at Galveston, 5007 Avenue U, Galveston, Texas 77551, gulf_tarpon@hotmail.com)*

Estuaries provide critical nursery and foraging habitat to over 80% of commercially and recreationally significant finfish species in the Gulf of Mexico. Tarpon, an estuarine-dependent and highly migratory gamefish supporting active recreational fisheries throughout its range, is a seasonal occupant of Texas nearshore waters. However, dynamics of its estuarine-dependency in the western Gulf are poorly documented. As such, fish species diversity and similarity indices were generated for eight Texas saltmarsh sites sampled monthly for young-of-the-year tarpon *Megalops atlanticus* during June through November 2002. Relative abundance (N), species richness (s), Shannon-Wiener (H', H_{max}' and E) and Simpson's (l and D_S) diversity and Jaccard's (CC_j) and Horn's (R_0) similarity indices are compared within and across sites during the 6-month collection period. Variation in fish assemblages at collection sites was largely attributable to temporal fluctuations in abundance of young-of-the-year fishes related to seasonal spawning events; however, preliminary findings indicate a contribution of factors other than spawning seasons. In addition, size-class structure for young-of-the-year tarpon captured at constituent sample sites is compared for the 2000, 2001, and 2002 collecting seasons.

Bioaccumulation of Methyl Mercury in Pelagic Fishes

JASON P. TURNER, JAY R. ROOKER, AND GARY A.GILL *(Department of Marine Biology, Texas A&M University, 5007 Ave. U, Galveston, Texas 77553)*

SCOTT A. HOLT *(Marine Science Institute, University of Texas at Austin, 750 Channelview Drive, Port Aransas, Texas 78373)*

The present study examined the levels of methyl mercury in top-level consumers from the western Gulf of Mexico. Efforts focused on determining mercury (Hg) concentrations in the tissues of commercially and recreationally important fishes. Our broad-scale survey included several pelagic taxa and concentrations of fish tissue Hg varied significantly among species. Concentrations of Hg in several taxa were above state and/or federal threshold levels. Mean concentration of fish tissue Hg of blue marlin, mako shark, wahoo, king mackerel, wahoo, and Warsaw grouper were all above the concentration recommended by the Texas Department of Health (0.7 ppm), and individuals from each taxon were occasionally above the FDA standard of 1.0 ppm. Only three species (vermilion snapper, yellowfin tuna, and dolphin) were found to have mean fish tissue Hg concentrations less than the EPA's fish tissue residue criteria concentration for non-commercial fish of 0.3 ppm. Four species (blackfin tuna, greater amberjack, yellowfin tuna, wahoo) were collected in both Louisiana and Texas during the study period and Hg concentrations in the tissue of all four species were higher in Louisiana than Texas. Finally, we used stable isotopes ($\delta^{15}N$) and fatty acids as integrative measures of trophic position and feeding history of pelagic fishes, and related observed patterns to bioaccumulation of Hg in the tissue of top-level predators. Retrospective determination of feeding histories indicated that fish tissue Hg concentration (all species pooled) was positively related to trophic position ($\delta^{15}N$), and diets (based on fatty acid profiles) of species with elevated Hg tissue concentrations were similar.

Genetic Characterization of Fish Populations: What DNA Can (and Can't) Tell You About the Biogeography, Reproductive Biology and Phylogenetics of Tunas and Billfishes

JAIME R. ALVARADO BREMER AND TIFFANY FARNHAM *(Department of Marine Biology, Texas A&M University, 5007 Ave. U, Galveston, Texas 7755, alvaradj@tamug.tamu.edu)*

Analysis of DNA data has provided useful information on the population structure, biogeography, molecular ecology, systematics, reproductive biology and historical demography of many animal and plant species. In the last ten years, genetic analyses on tunas and billfishes have provided information that is both congruent and incongruent with our expectations given the high migratory potential, and thus potential for gene flow, of the majority of these species. Similarly, orthodox and unorthodox solutions to problematic phylogenetic relationships among tunas and among billfishes have been offered. In this talk we will summarize these findings and we will discuss them in the light of their implications towards management and conservation biology.

Using Parasites to Access the Impact of Hypersalinities on Fish and Crustacean Populations

M. ANDRES SOTO, STEVEN CURRAN, AND STEVEN A. BULLARD *(Texas A&M University Kingsville (Biology) MSC 158, Kingsville Texas 78363)*

The upper Laguna Madre is a hypersaline estuary-bay system. Historically, salinities have varied from almost fresh (< 1 ppt) to extremely hypersaline (> 100 ppt). Although there is considerable data describing the affects of such fluctuating salinities on the fish and crustacean fauna, there is little information on the affects of salinity on the parasite distribution of fishes and crustaceans . Parasites have been used as biological indicators of environmental health. In environmentally stressed areas such as in polluted areas, parasites with more complicated, indirect life cycles tend to decrease in prevalence and intensity. These parasites have many life-stages and hosts, and if pollution affects one of those life-stages or host the life-cycle may be stopped. However, those parasites with less complicated, direct life cycles tend to increase in

prevalence and intensity probably because the immunological condition of hosts is compromised in polluted areas. I am using the parasite distributions in fishes and crustaceans to determine the impact of hypersalinities on fish and crustacean populations. Specifically, the following organisms are being examined for parasites: red drum *Sciaenops occelatus*; black drum *Pagonias cromis*; spotted seatrout *Cynoscion nebulosus*, some penaeid shrimps, and blue crabs *Callinectes sapidus*. These organisms commonly occur in bays and estuaries throughout the Gulf of Mexico including the Laguna Madre and are known to carry many indirectly and directly transmitted parasites. Organisms are being collected from two main sites. The first site is at the Texas A&M University-Kingsville Research Station (Site 55) located near Laguna Madre. Fishes are also being collected from Corpus Christi and Nueces Bays, TX, typical estuarine bays in which salinities usually range between 10 to 35 ppt. By examining the parasite distributions of fishes and crustaceans from these two sites the effects of hypersalinity on hosts populations can be directly measured.

Trophodynamics of Platform Reef Fishes in the Northwestern Gulf of Mexico

CARL R. BEAVER *(Harte Research Institute for Gulf of Mexico Science, Texas A&M University-Corpus Christi, 6300 Ocean Drive. NRC2300, Corpus Christi, Texas 78412)*

Two petroleum platforms in the northwestern Gulf of Mexico were studied to estimate energy flow between fouling-community elements and selected reef fishes. Foraging and production of *Paranthias furcifer*, *Epinephelus adscensionis*, and *Balistes capriscus* were examined. *Paranthias furcifer* populations and biomass varied seasonally and between structures. Populations of *E. adscensionis* and *Balistes capriscus* also varied between platforms. *E. adscensionis* and *B. capriscus* fed almost exclusively on fouling-community organisms, whereas *P. furcifer* fed primarily on planktonic organisms. *Paranthias furcifer* diets showed an increase in numbers of fouling community organisms consumed during winter. Consumption for *P. furcifer* ranged from 42.4 kcal/day to 24.9 kcal/day. *Epinephelus adscensionis* consumed 58.5 kcal/day, whereas *Balistes capriscus* consumed 78.7 kcal/day. Fish production rate from fouling community elements ranged from <0.1 g/(stock·m^2·day) for *P. furcifer* during winter to 0.7 g/(stock·m^2·day) for *B. capriscus*. This study indicates that the productive potential of platform artificial reefs lies in their ability to redirect energy flow. Filter-feeding organisms function to trap energy from the primary and secondary producers of the plankton community and redirect this energy making it available to predatory reef and pelagic fishes.

Effects of Habitat Heterogeneity on Reef Fish Distributions

RONALD L. HILL *(National Oceanic and Atmospheric Administration/National Marine Fisheries Service, 4700 Ave. U, Galveston, Texas 77551, ron.hill@noaa.gov)*
RICHARD S. APPELDOORN *(Department of Marine Sciences, University of Puerto Rico-Mayagüez, P.O. Box 5000, Mayagüez, Puerto Rico 00681, r_appeldoorn@rumac.uprm.edu)*
CONRAD W. RECKSIEK *(Department of Fisheries, Animal and Veterinary Science, University of Rhode Island, Kingston, Rhode Island 00281, conrad@uriacc.uri.edu)*
FRANCISCO E. PAGAN *(Department of Marine Sciences, University of Puerto Rico-Mayagüez, P.O. Box 5000, Mayagüez, Puerto Rico 00681, giratz@mail.caribe.net)*
GEORGE D. DENNIS *(7920 NW 71st Street Gainesville, Florida 32653, george_dennis@brd.usgs.gov)*

Habitat characteristics are important in controlling coral reef fish distributions. Habitats may also control the timing, rate, pathway, and distance of fish migrations. White grunt *Haemulon plumieri* have distinct ontogenetic stages, distinguished by habitat utilization, behavior and diet. Juveniles occur in large daytime resting schools. Subadults occur in smaller groups and may wander over broader reef areas. Adults are more solitary, occur deeper, and reside on a single reef. Length-frequency data collected along cross shelf gradients at sites in Puerto Rico and the Bahamas show shifts in mean size reflecting a general offshore ontogenetic migration, with evidence of an abrupt transition occurring at the onset of sexual maturation. Spatial distributions of grunts follow those of habitats, which control the distance traveled in any stage/habitat shift. Juvenile habitats (for at least three successive juvenile stages) occur in close proximity. As they near maturation, grunts redistribute to adult habitats over the entire shelf, perhaps in a

single migratory step. Depending upon the distribution of adult habitat, fish could stay at their resident reef or migrate as far as a shelf edge reef 12 km offshore.

Prevention of Surface Death of Marine Fish Larvae by the Addition of Egg White into Rearing Water

TATSUYA KAJI *(Fisheries and Mariculture Laboratory, University of Texas Marine Science Institute, 750 Channelview Drive, Port Aransas, Texas 78373, tatsuyak@kais.kyoto-u.ac.jp)*
MASAAKI KODAMA AND HIROSHI ARAI *(Tokyo Sea Life Park, Rinkai 6-2-3, Edogawa, Tokyo 134-8587, Japan,mkodama@pop12.odn.ne.jp, naso@tky3.3web.ne.jp)*
MASARU TANAKA AND MASATOMO TAGAWA *(Division of Applied Biosciences, Graduate School of Agriculture, Kyoto University, Sakyo, Kyoto 606-8502, Japan, masatnk@kais.kyoto-u.ac.jp, tagawa@kais.kyoto-u.ac.jp)*

We tried to prevent the 'surface death' of marine fish larvae by the addition of chicken egg white (EW) into the rearing water. Larvae of striped bonito *Sarda orientalis* at the first feeding stage were transferred to plastic beakers at a density of 10 larvae/l, in absence or presence of EW (80 ml/l). Numbers of surviving larvae of the EW treated group were significantly and constantly higher than those of the control group. In particular, survival rates at the next day after the transfer were less than 30% in the control, but 100% in the EW treated group. A second experiment evaluated mortality as well as the location of the dead larvae. Significantly higher mortality was again found in the control group with more than 70% of the dead larvae located on the water surface. In a third experiment, an oil film added to the water surface prevented larval death after transfer as well as the use of dissolved EW. Since the oil film is known to prevent 'surface trap' of larvae and decrease the 'surface death' in a grouper species, the addition of EW was considered to have a similar effect in preventing death.

Public Opinion and Support an Urban Fishery Program in Lubbock, Texas

MONTE J. BROWN, FELIX MARTINEZ JR , KEVIN L. POPE, AND GENE R. WILDE *(Wildlife and Fisheries Management Institute, Mailstop 2125, Texas Tech University, Lubbock, Texas 79409, brown_monte@hotmail.com, felmarti@ttu.edu, kevin.pope@ttu.edu, gene.wilde@ttu.edu)*

Due to the continuing trend of urbanization, natural resource managers and city officials must consider new ways of providing residents with opportunities to connect with nature. A growing number of state and federal fishery management agencies are proposing and implementing fishery programs in urban areas such as Lubbock. However, there is no consensus on how to fund such programs or whether, and how much, anglers are willing to pay to support urban fishing programs. We conducted a telephone survey of 2800 Lubbock residents (400 per month) from June 2002 to December 2002. Respondents (approximately 43% participation) were chosen at random from a list of Lubbock City phone numbers. Each respondent was asked about their fishing activity in local lakes, their species and management preferences, and whether they are willing to purchase a fishing stamp to support an intensively managed urban fishery program in city waters. Most (>50%) respondents indicated that they would likely take a child fishing if an intensively managed urban fishery program was implemented.

Short-term Mortality and Dispersal of Stocked Fingerling Largemouth Bass

DAVID L. BUCKMEIER, ROBERT K. BETSILL, AND J. WARREN SCHLECHTE *(Texas Parks and Wildlife Department, Heart of the Hills Fisheries Science Center, HC 7 Box 62, Ingram, Texas 78025, David.Buckmeier@tpwd.state.tx.us, rkb@ktc.com)*

To determine if stocking strategies are cost-effective, mortality and dispersal of stocked fish need to be evaluated. We tagged fingerling (30-46 mm) largemouth bass *Micropterus salmoides* with coded wire tags and stocked them at six sites (3,000/site) in a Texas reservoir to monitor dispersal and to determine if predation, starvation, and transport stress were important sources of mortality within the first days after

stocking. For most stocked fish, dispersal was limited; however, a few stocked fish moved greater than 1500 m within 5 d. In addition, dispersal differed across sites. Mortality associated with transport stress averaged 4% after 72 h and did not differ among sites. Starvation was unlikely because most stocked fish fed within 12 h of stocking. Predation may have been a significant source of mortality at some stocked sites. Assuming only 10% of the predators were collected, greater than 20% of the stocked largemouth bass may have been consumed within 12 h of stocking. Individual predators consumed up to 1% of the stocked fish for a given site and predators included largemouth bass, smallmouth bass *M. dolomieu*, freshwater drum *Aplodinotus grunniens*, and white bass *Morone chrysops*.

Fish as Indicators of Habitats in the South Sulphur River

CHRISTINE C. BURGESS AND FRANCES P. GELWICK *(Texas A&M University, Department of Wildlife and Fisheries Sciences, 2258 TAMU, College Station, Texas 77843-2258, ccburgess@tamu.edu, fgelwick@tamu.edu)*

The South Sulphur River, located in northeast Texas, offers a chance to study fish communities in channelized versus unchannelized reaches within the same river. Channelization leads to the homogenization of rivers, which decreases available habitat for fishes to exploit. Sites were partitioned into one of four types of hydraulic habitats where present: pools, riffles, runs, and backwaters. The channelized reach consisted primarily of pools with uniform depth and flow, while the unchannelized reach was comprised of pools, runs, riffles, and backwaters of varying depth and flow. An indicator species analysis revealed that relatively few species were indicators of a particular habitat type. Freckled madtoms were indicators of riffle habitat and bluegills were found to be indicators of backwater areas. Both habitats were found primarily in the unchannelized reach. Canonical correspondence analysis showed that freckled madtoms and redfin shiners were associated with the higher velocity riffles and runs found in unchannelized areas, while ghost shiners, slough darters, and orangespotted sunfish were associated with the lower velocities of pools that dominated the channelized areas. The major differences between channelized and unchannelized reaches were due to the presence of fastwater riffle habitat. Riffle habitat, while not found in great abundance, was present only in the unchannelized reach during our study. With the exception of the freckled madtom and the redfin shiner, the South Sulphur River contains mostly generalist species that can readily adapt to changes in the environment and exploit a variety of habitats.

Temperature Effects on Gonadal and Somatic Growth of Channel Catfish

MICHAEL TODD BYERLY *(405 #1 Kline Avenue, Lubbock, Texas 79416, mtbbyerly@cs.com)*
REYNALDO PATIÑO *(Texas Cooperative Fish and Wildlife Research Unit, Texas Tech University, Lubbock, Texas 79409-2120, reynaldo.patino@ttu.edu)*
ROBERT K. BETSILL *(Heart of the Hills Fisheries Science Center, HC 7, Box 62, Ingram, Texas 78025, rkb@ktc.com)*

Channel catfish are a popular recreational fish and an important commercial fish species. In many Texas community lakes, channel catfish are managed as a "put-and-take" fish species. These "put-and-take" fisheries demand a large quantity of fish and often hatcheries are overcrowded and result in smaller than desired fish size. Research into heat-based technology and its application to fish culture may have the potential to increase somatic growth of channel catfish by reducing reproductive development or halting it all together. In this study, channel catfish fry were held for a period of 28 days-at either 27°C (control), 34°C, or 36° C, then grown-out for four months. The size of the fish and the condition of the gonads will be determined before the treatments, immediately after the treatments, and following the pond grow-out period. The objectives are to determine the effect of heat on gonadal condition and somatic growth, and whether the effects are indefinite. We expect decreased gonadal growth in fish exposed to higher temperatures thereby increasing somatic growth potential. Initial results indicate that gonadal growth was suppressed at temperatures of 34°C and 36°C immediately upon completion of the treatments although somatic growth may have also been negatively impacted at this time.

Evaluation of an Oyster Reef Closure to Commercial Fishing in Galveston Bay, Texas

JAN CULBERTSON AND LANCE ROBINSON *(Texas Parks and Wildlife, Coastal Fisheries, 1502 Pine Drive FM517, Dickinson, Texas 77539, jan.culbertson@tpwd.state.tx.us, Lance.Robinson@tpwd.state.tx.us)*

With the passage of the Sustainable Fisheries Act of 1996, regional fishery management councils are now required to identify essential fish habitat, anthropogenic impacts to these areas and actions necessary to protect them. Oyster reefs provide such habitat in the inshore waters of Texas and support the second most valuable commercial fishery in the state. Over 3,700 hectares of oyster reef can be found in Galveston Bay and produced 4.4 million pounds of meats, valued at $10.6 million in 2001. Conflicts between private property owners (pier) and the commercial oyster lease industry during the late 1980's resulted in the closure of the April Fool Reef complex (approximately 43.21 ha). This reef has not been commercially fished for the past twelve years, and represents an area where comparisons between fished and unfished oyster reefs can be evaluated. Recent disease and enforcement issues prompted Texas Parks and Wildlife Department to allow a special transplant day in October 2002. Catch rates of market (≥ 76.2 mm) and small (25.4 – 76.1mm) oysters prior to the closure ranged from 420-1,582^{-h} and from 880-5,135^{-h}, respectively. Mean lengths of market (≥ 76.2 mm) and small (25.4 – 76.1mm) oysters prior to the closure ranged from 88.0 – 90.1 mm and 49.7 – 52.2 mm, respectively. Current catch rates in 2002 from this reef complex are 2,170 no.$^{-h}$ (market) and 4,810 no.$^{-h}$ (small). Mean lengths of market and small oysters in 2002 from this reef complex are 91.4 mm and 51.mm, respectively. Plans are underway to conduct side-scan sonar surveys to evaluate gear impacts on the reef.

The Identification of Polymorphic Microsatellite DNA Loci in Largemouth Bass

DIJAR J. LUTZ-CARRILLO AND TIMOTHY H. BONNER *(Department of Biology/Aquatic Station, Southwest Texas State University, San Marcos, Texas 78666, dijarlc@hotmail.com, TBonner@swt.edu)*

LORIANE T. FRIES *(Texas Parks & Wildlife Department, A.E. Wood Fish Hatchery, San Marcos, Texas 78666)*

Federal and state agencies have made significant investments in the selective breeding and stocking of the largemouth bass *Micropterus salmoides*. It is vital that positive identifications of its subspecies can be made in order to evaluate the impact of this investment and more efficiently manage the fishery. The objectives of this study are to identify the range of alleles that exist for each subspecies at several microsatellite loci and produce a practical protocol for the discrimination of these subspecies. Microsatellite DNA loci are a recent class of genetic markers that offer several advantages over the methods currently employed. The identification of individuals, populations, subspecies, and their contributions to intergrade populations and offspring may soon be viable with microsatellite loci. The genomes of eight distinct populations (N=50), of northern *M. salmoides salmoides* and Florida largemouth bass *M. salmoides floridanus*, will be examined for polymorphic microsatellite loci. Fifty microsatellite primers, previously isolated in four other species of centrarchids, will be optimized for PCR amplification of *M. salmoides*, and screened for yields on 0.8% agarose gels. M-13 labeled primers will then be re-optimized and screened against the genomes of each individual for polymorphisms and the products scored on acrylamide gels.

Presence of *Prymnesium Parvum* in Possum Kingdom Reservoir

JOAN GLASS *(Texas Parks & Wildlife Department, Joan.Glass@tpwd.state.tx.us)*

A major fish kill occurred for seven months on Possum Kingdom Reservoir, from January until July 2001. The fish losses were from toxins from the golden algae *Prymnesium parvum*. An ambient water survey of Possum Kingdom Reservoir following this kill revealed that this alga is a constant component of the lakes planktonic population.

Telephone Surveys for Recreational Fishing Effort: Random Digit Dialing Versus an Angler License Frame

GERRY W. GRAY *(U.S. Federal Drug Administration, Center for Devices and Radiological Health, Division of Biostatistics, HFZ-542, 1350 Piccard Dr., Rockville, Maryland 20850)*
J. WARREN SCHLECHTE *(Texas Parks and Wildlife Department, Inland Fisheries Research, Heart of the Hills Fisheries Science Center, HC7 Box 62, Ingram, Texas 78025)*
JOHN F. WITZIG *(National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Northeast Regional Office, One Blackburn Dr., Gloucester, Massachusetts 01930)*
ALAN B. LOWTHER *(National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Office of Science and Technology, 1315 East-West Highway, Silver Spring, Maryland 20910)*

In Oregon in 1993, the Marine Recreational Fishery Statistics Survey conducted complementary access-point and telephone surveys to estimate fishing effort derived from an angler-license frame (ALF) versus random-digit dialing (RDD) of coastal counties. We constructed the angler-license frame from all in-state, fishing-license holders for 1992. For both the ALF and RDD, we used a telephone survey to collect the number of trips per angler, and then expanded for anglers who were not on the frame using parameters derived from the access-point survey. We estimated effort for four modes of fishing: (a) natural bank angling, (b) man-made (e.g., piers and jetties) bank angling, (c) private and rental boat angling, and (d) party and charter boat angling. Effort estimates for all modes were similar regardless of the estimation method used. However, for all modes of fishing except party-charter, the angler-license frame was more cost-effective (i.e., gave substantially lower variance for the same cost). The angler-license frame reduced the proportional standard error by 20-30% with no increase in cost for shore and private boat modes; the party-charter mode showed no gains in precision due to the inconsistent pattern of license buying among anglers in this stratum. The efficiency of using a list-based frame could be improved with the establishment of separate saltwater angling licenses. Getting accurate information on license ownership during dockside interviews remains a challenge.

Longevity of Hybrid Striped Bass *Morone Saxatilis* x *M. Chrysops* in a West Texas Reservoir

GALEN D. JONS AND SPENCER C. DUMONT *(Texas Parks and Wildlife Department, 5325 N. 3rd, Abilene, Texas 79603, Galen.Jons@tpwd.state.tx.us, Spencer.Dumont@tpwd.state.tx.us)*

On 19 July 2002, otoliths and muscle tissue were collected from a hybrid striped bass *Morone saxatilis* x *M. chrysops* caught by an angler at Hubbard Creek Reservoir. This fish was 587 mm total length and weighed 1923 g. The otoliths from this fish were prepared according to the Texas Parks and Wildlife Department's Inland Fisheries Procedures Manual. Analyses indicated that the fish was at least seventeen, and likely eighteen, years old at time of capture. According to stocking records, these fish were stocked into Hubbard Creek Reservoir in 1979 and 1984. Assuming that no backcrossing occurred between the 1979 stocked fish and white bass *M. chrysops*, the stocking date would verify the fish as eighteen years old. Muscle tissue analyses revealed the fish to indeed be a hybrid, but could not confirm the fish as a first-generation hybrid. Other examples of long-lived hybrid striped bass have been collected from Hubbard Creek Reservoir and one example from nearby Lake Abilene. Lack of available forage and low fishing pressure likely contributed to the longevity of hybrid striped bass in Hubbard Creek Reservoir.

Effect of Catch-and-Release Fishing on Growth of Largemouth Bass

KEVIN L. POPE AND GENE R. WILDE *(Wildlife and Fisheries Management Institute, Mailstop 2125, Texas Tech University, Lubbock, Texas 79409, kevin.pope@ttu.edu, gene.wilde@ttu.edu)*

Catch-and-release fishing has increased in popularity in recent years and plays an increasingly important role in fishery management. Although the magnitude of catch-and-release mortality is fairly well documented, potential sublethal effects have received little attention. We conducted an experiment to

directly assess the effects of catch-and-release fishing on growth of largemouth bass *Micropterus salmoides*. Our results suggest an angling mortality rate of 0% for largemouth bass caught on plastic grubs. There were no differences ($P > 0.16$) in growth as measured by an increase in length, weight, or condition between caught and uncaught fish over a 32-day fishing and recovery period. Although we documented that catch-and-release angling has no effect on largemouth bass growth, previous studies have documented sublethal effects on growth and reproduction in other species, suggesting that the occurrence and magnitude of sublethal effects are species and fisheries specific.

Patterns in Stream Fish Assemblages Inhabiting Three Independent Drainage Basins on Peason Ridge Wildlife Management Area, Fort Polk (U.S. Army), Louisiana

TRACY LEAVY, CASEY WILLIAMS, AND TIMOTHY H. BONNER *(Department of Biology/Aquatic Station, Southwest Texas State University, San Marcos, Texas 78666, tl1040@swt.edu, cw1057@swt.edu, TBonner@swt.edu)*

DANNY HUDSON *(Oak Ridge Institute for Science and Education, Public Works, Environmental and Natural Resource Division, 1823 23rd St., Fort Polk, Louisiana 71459)*

Peason Ridge is a 33,500-acre Wildlife Management Area (WMA) managed for multi-use purposes by the US Army. The WMA supports numerous activities including military training exercises, hunting, and fishing. The geographic location of the WMA is unique in that it encompasses headwater reaches of three major water drainages in Louisiana: Kisatchie Bayou drainage (tributary of the Red River), Calcasieu drainage, and the Anacoco drainage (tributary of the Sabine River). The purpose of this study was to assess spatial and temporal trends in fish assemblage structures for eight streams under various levels of anthropogenic modifications. Variations in fish relative abundance and catch-per-unit effort were correlated to physical and chemical parameters of streams during fall, winter, spring, and summer. Likewise, fish assemblage variations were compared within and among drainage basins to develop a generalized model for natural and anthropogenic-induced variation in fish assemblage structure.

A Test of Compensatory Reproduction in the Fountain Darter Along a Temperature Gradient

DUSTY MCDONALD AND TIMOTHY H. BONNER *(Department of Biology/Aquatic Station, Southwest Texas State University, San Marcos, Texas 78666, dm1075@swt.edu, TBonner@swt.edu)*

We tested for compensatory reproduction among fluctuating temperatures and parasite infestation for the endangered fountain darter *Etheostoma fonticola*. Adult fish were exposed to fluctuating water temperatures of 24-26, 26-28, and 28-30˚C for 21 d and compared number of eggs and total number of larvae to the optimum temperature of 24°C. Of those, half of the fishes for each temperature treatment were infected with the cercariae form of *Centocestus formosanus*, an exotic digenetic trematode, (mean = 512 cysts). Total egg, healthy egg, and larval production were compared among temperature and parasite treatments with a two-factor analysis of variance ($\alpha = 0.05$). All response variables were log10 (n+1) transformed to improve sphericity and normality. Cercariae infestation did not significantly affect total egg ($P = 0.43$), healthy egg ($P = 0.69$), or larval production ($P = 0.054$). Currently, critical habitat of the fountain darter is 26.7°C, but our results exhibit that <26°C is the optimal habitat.

2002 Texas Abandoned Crab Trap Removal Program

ARTUSSEE D. MORRIS *(Texas Parks and Wildlife Department, 6300 Ocean Drive, Suite 2500, Corpus Christi, Texas 78412, art.morris@tpwd.state.tx.us)*

Abandoned crab traps have been identified as a significant source of delayed mortality of blue crab *Callinectes sapidus* and a variety of other organisms. Additionally, these traps often create user conflicts,

visual pollution and can have negative effects on sensitive habitats throughout their range of use. From 23 February to 3 March 2002, the Texas Parks and Wildlife Department conducted a first of its kind abandoned crab trap removal program. With the support of a significant volunteer effort, 8,070 traps were removed from Texas bay systems, ranging from 86 in the lower Laguna Madre to 3,214 in Galveston Bay. Observations were conducted on the contents of 453 traps removed during this program. A total of 21 species of organisms were observed, with blue crab and stone crab *Menippe adina* representing 76% of all species seen. Also, information on the condition of the traps was noted: 7% were observed resting on seagrass; 42% had some sort of owner identification present; 34% were considered in a fishable condition; 34% had degradable panels present with 41% of those open; and 67% had escape rings present. The numerous benefits associated with removing abandoned crab traps give reason to continue the program in the future.

Species Composition, Diversity, and Relative Abundance of Fishes, Macrocrustaceans, and Plankton in the Cedar Bayou Intake Canal, Cooling Pond, and Adjacent Waters of Galveston Bay in Conjunction with the Cedar Bayou Electric Generating Station, Near Baytown, Texas

KURTIS K. SCHLICHT *(4888 Loop Central Drive, Suite 600, Houston, Texas 77081, kschlicht@ensr.com)*

Bag seine, trawl, gill net, and plankton collections were made weekly during the month of July 2002, to determine species composition, diversity, and abundance of fish, macrocrustaceans, and plankton in the intake canal, cooling pond, and Galveston Bay waters adjacent to CenterPoint Energy's Cedar Bayou Generating Station, Baytown, Texas. Hydrological and meteorological data were recorded at each sampling station. Traditional metrics were calculated, including relative abundance, species richness, Shannon-Wiener Index of Diversity, community coefficients, and percent dominance. A total of 10,013 fish and macrocrustaceans were captured during this study. Fish comprised 76% of the total number of organisms captured and were represented by 41 different species. Macrocrustaceans were represented by 7 different species. Mean species richness was 20.0 per sample area, mean diversity was 2.97, and mean abundance was 3,338 individuals per area. Results of community similarities estimates between samples averaged 49% for bag seines, 54% for trawls, and 68% for gill nets. Percent dominance averaged 65.6% for the three sample areas. Data collected and presented in this study indicates the cooling pond is very similar in terms of species richness, diversity, and relative abundance when compared to the surrounding ecosystems.

The Response of Grass Carp to a High Flow Event in a Texas Reservoir

CHAD THOMAS, TIMOTHY H. BONNER, AND THOMAS ARSUFFI *(Southwest Texas State University, Department of Biology/Aquatic Station, San Marcos, Texas 78666, texasrig@hotmail.com, TBonner@swt.edu, ta04@swt.edu)*

We tracked 24 radio-tagged grass carp in Lake Austin, Texas, to determine within lake movements and emigration from the target area. During the third month of tracking, a large storm event inundated the lake with flows exceeding 700 cms (mean annual flow [1899 – 1999] = 65 cms). Post flood, 23 tags were relocated in the reservoir. Twelve of the tagged fish were identified as active (substantial movement detected), nine fish were identified as inactive (no substantial movement detected; possibly dead fish, expelled tag, or sedentary fish), and two were identified as of unknown status (insufficient data points). Of the active fish, seven moved upstream 200 m to 10 km, one moved downstream 500 m, and four remained within 100 m from pre-flood location during the flood event. Pre-flood tracking of the one missing fish suggested that this tag was inactive. In contrast to similar grass carp studies, no fish emigrated from the target area although sufficient opportunities existed. We hypothesized that the lack of widespread movement in this study was because of high amounts of suitable forage available in the lake during the tracking period.

Longitudinal Distribution and Habitat Associations of Regionally Endemic Fishes in East Texas and Central Louisiana Streams

CASEY S. WILLIAMS AND TIMOTHY H. BONNER *(Department of Biology/Aquatic Station, Southwest Texas State University, San Marcos, Texas 78666, cw1057@swt.edu, TBonner@swt.edu)*

DAVID BYRD *(Kisatchie National Forest, 2500 Shreveport Highway, Pineville, Louisiana, 71360, dcbyrd@fs.fed.us)*

Notropis sabinae, *Notropis atrocaudalis*, and *Etheostoma whipplei* are indigenous to streams of east Texas and western Louisiana with the *N. sabinae* currently listed as a species of concern by the U.S. Forest Service (Region 8). The purpose of this study was to describe general life history aspects of each with emphasis on spatial and temporal patterns in abundance and habitat associations. In addition, we assessed differences in total fish assemblage structure between streams under different levels of anthropogenic influence: a highly impacted urban stream (Banito Creek and La Nana Bayou, Nacogdoches County, TX) and a pristine, scenic river (Kisatchie Bayou, Natchitoches Parish, LA).

An Overview of the Growing Numbers of Indochinese Seafood Dealers and Commercial Fishermen Based on License Sales and Landings

JEFF WINCHESTER AND REBECCA HENSLEY *(Texas Parks and Wildlife Department, Coastal Fisheries, Dickinson Marine Lab, 1502 Pine Drive, Dickinson, Texas 77539, Jeff.Winchester@tpwd.state.tx.us, Rebecca.Hensley@tpwd.state.tx.us)*

Since 1985, based on license sales, there has been an increase in the Indochinese seafood dealers and commercial fishermen. Licensed seafood dealers are required to complete a Monthly Aquatic Products Report (MAPR) listing commonly caught finfish, shellfish, and total weight and price paid for each species. Species bought and sold, but not listed on the MAPR as a common species are reported as unclassified food or unclassified scrap. These unclassified food/scrap landings will be discuss with respect to the increases in the Indochinese license sales. In addition to unclassified products, the market demands for Asian products (e.g., ethnic, medicinal) has increased the potential for non-indigenous species introductions. Citations for over 20 prohibited species have been issued since 1995. Some, but not all of these species include snakehead *Channa sp*., piranha *Serrsalmus sp*. and apple snail *Pomacea canaliculata*. Non-indigenous species utilization as well as potential crossover species will also be discussed.

POSTER SESSION ABSTRACTS

An Un-Ionized Ammonia Spectrum for Control of the Toxic Alga *Prymnesium Parvum* in Sunshine Bass Female *Morone Chrysops* x Male *M. Saxatilis* Production Ponds

AARON BARKOH *(Texas Parks and Wildlife Department, Heart of the Hills Fisheries Science Center, HC 7, Box 62, Ingram, Texas 78025, aaron@ktc.com)*

DENNIS SMITH *(Texas Parks and Wildlife Department, Dundee State Fish Hatchery, Route 1, Electra, Texas 76360. Dennis.Smith@tpwd.state.tx.us)*

J. WARREN SCHLECHTE *(Texas Parks and Wildlife Department, Heart of the Hills Fisheries Science Center, HC 7, Box 62, Ingram, Texas 78025, wschlech@ktc.com)*

JOHN PARET *(Texas Parks and Wildlife Department, Possum Kingdom State Fish Hatchery, 600 S Hwy 16, Graford, Texas 76449, John.Paret@tpwd.state.tx.us)*

Prymnesium parvum has caused substantial mortalities in farmed fish. To control *P. parvum,* ammonium sulfate has been used; however, results have been mixed because the effectiveness of ammonium sulfate depends on temperature and pH. Inconsistent results may be due, at least in part, to

calculation of treatment rates using the ammonium sulfate concentration instead of the concentration of the lethal agent, un-ionized ammonia. We estimated the effective minimum un-ionized ammonia required to control *P. parvum*, yet allow production of fingerling sunshine bass. In one study, we crossed five ammonium sulfate concentrations (0, 3, 5, 10, and 15 mg/L) with two pH levels (8 and 9) and three temperatures (15, 20, and 25 C) to estimate mortality of *P. parvum*. Each treatment combination was replicated three times using a new population of *P. parvum* each time. In the second study, we estimated mortality of 3-5-d-old sunshine bass fry subjected to seven ammonium sulfate treatments (0, 3, 5, 8,10, 15, and 20 mg/L) at pH 8.5 and 20 ^{o}C. Mortality, total ammonia-nitrogen, pH, and temperature were measured before treatments and at 24 and 48 h post treatment. The un-ionized ammonia concentrations generated in the ammonium sulfate treatments were calculated for statistical analyses to establish relationships with mortality. Results revealed that un-ionized ammonia of 0.21 mg/L seems to be the minimum effective concentration for controlling *P. parvum*. Approximately 90% of the sunshine bass survived 0.3-mg/L un-ionized ammonia in 48 h. We recommend using 0.2-0.3-mg/L un-ionized ammonia for therapeutic treatment of sunshine bass fingerling production ponds that become infested with *P. parvum*

Assessing Florida Largemouth Bass Introgression in Texas Reservoirs: Efficient Sampling from Observing Spatial Heterogeneity

ROBERT K. BETSILL, J. WARREN SCHLECHTE, AND DAVID L. BUCKMEIER *(Texas Parks and Wildlife Department, Inland Fisheries Research, Heart of the Hills Fisheries Science Center, HC7 Box 62, Ingram, TX 78025, rkb@ktc.com, Warren.Schlechte@tpwd.state.tx.us, daveb@ktc.com)*

We determined the spatial pattern of introgression of Florida largemouth bass *Micropterus salmoides floridanus* within three embayments of a large, Texas reservoir and assessed the ability of various simulated sampling strategies to yield accurate and precise estimates of genetic composition. Introgression (percent of fish exhibiting one or more *M. s. floridanus* alleles at two diagnostic loci) was spatially heterogeneous. Sampling simulations suggested 60 to 90 fish were necessary for relatively unbiased estimates of genetic composition. Systematic sampling was the most efficient means of estimating genetic composition. Precise and accurate estimates of genetic composition are needed to improve the efficiency and effectiveness of Texas' largemouth bass stocking program. By considering heterogeneity of genetic composition, we could prescribe an efficient sampling protocol addressing sample size and distribution of sampling effort.

Determining Effective and Efficient Stocking Rates for Largemouth Bass

DAVID L. BUCKMEIER, J. WARREN SCHLECHTE, AND ROBERT K. BETSILL *(Texas Parks and Wildlife Department, Inland Fisheries Research, Heart of the Hills Fisheries Science Center, HC7 Box 62, Ingram, TX 78025, daveb@ktc.com, Warren.Schlechte@tpwd.state.tx.us, rkb@ktc.com)*

Texas Parks and Wildlife Department (TPWD) has stocked Florida largemouth bass *Micropterus salmoides floridanus* (FLMB) to alter the genetic composition of largemouth bass populations since 1972. Because most stocked fingerling largemouth bass remain within 1 km of their stocking sites, TPWD's standard stocking rates of 10-41 fish/surface ha typically yield 10,000-100,000 fish/stocked site. Effectiveness and cost efficiency of these stocking rates are unknown. We determined the percent contribution of stocked fingerling largemouth bass in Toledo Bend Reservoir, when stocked at three rates (1,000, 10,000, and 100,000 fish/site) and calculated associated production and stocking costs. Three weeks after stocking, stocked fish contributed to the age-0 cohort at all treatments ($P<0.013$). About 5 months after stocking, stocked fish continued to contribute to the cohort at the 10,000- and 100,000-fish treatments; however, their contribution was no longer detectable at the 1,000-fish treatment. Average contribution of stocked fish was 5.4%and 14.9% in sites stocked with 10,000 and 100,000 fish, respectively. On a per site basis, total costs associated with the 10,000- and 100,000-fish treatments were $3,122 and $21,122 respectively. Thus, stocking at a rate of 10,000 fish/site was more efficient at altering the genetic composition of Toledo Bend Reservoir's largemouth bass population because we observed a 1.7% contribution for every $1,000 spent, compared to only 0.7% when sites were stocked with 100,000 fish.

Regional Variation in Growth of Channel Catfish in Texas

BART W. DURHAM, GENE R. WILDE, AND KEVIN L. POPE *(Department of Range, Wildlife, and Fisheries Management, Texas Tech University, Box 42125, Lubbock, TX 79409-2125, bart.w.durham@ttu.edu, gene.wilde@ttu.edu, kevin.pope@ttu.edu)*

We studied variation in length of channel catfish *Ictalurus punctatus* in 144 Texas reservoirs. Mean total length (TL) of channel catfish age 1-7 was 234, 277, 327, 365, 396, 430, 437 mm respectively. We used correlation analysis and linear and multiple regression to assess the relationship between mean length at age and three climactic (latitude, longitude, and length of growing season) and five morphoedaphic (conductivity, morphoedaphic index [MEI], mean depth, maximum depth, and surface area) variables. Growth of ages 3-6 channel catfish was negatively correlated ($P < 0.05$) with longitude. Growth of age 7 channel catfish was positively correlated with surface area. No significant correlations were found between length at age and latitude, length of growing season, conductivity, MEI, mean depth, or maximum depth. However, growing season length exhibited a significant ($P < 0.05$) quadratic relationship with length at age. This model explained 6-17% of the variation in channel catfish length at age. Length at age was greatest at growing seasons of approximately 270 days and decreased with longer and shorter lengths of season. Our results provide the first evidence that length of growing season on a regional scale may play a role in the growth patterns of channel catfish.

The Abundance of the Western Gulf Stone Crab *Menippe Adina* in Nueces Bay and Laguna Salada

CLARISA Y. GARCIA, VANESSA C. PEREZ, AND M. ANDRES SOTO *(Texas A&M University Kingsville, Department of Biology, Kingsville, TX. 78363)*

Menippe adina (Western Gulf Stone Crab) is commercially important and is found coastally in the western Gulf of Mexico. To conserve the fishery it is important to obtain more knowledge about the population structure of this crab from Texas waters. We undertook this study to compare the affects of salinity and season on the number and size of *M. adina* caught from Nueces Bay and Laguna Salada, Texas. Samples were taken approximately every two weeks from one site in Nueces Bay and Laguna Salada. Water temperature, salinity and other physical parameters were recorded at each site. Four samplers were placed on the bay bottom near fishing pier pilings. The samplers were hollow cylinders enclosed at one end and filled with oyster shells. During collections, samplers are lifted and placed in a larger container, and oyster shells are rinsed. All remaining contents are sifted through a 2000-micrometer sieve. Stone Crabs are placed in Davidson's fixative and all other specimens are placed in 10% formalin. Samples are brought back into lab where they are placed in 70% ethanol within two to three days. The carapace widths of stone crabs were measured. All *M. adina* caught during this project were caught at Nueces Bay. The Catch Per Unit Effort (CPUE) ranged between 0.5 and 6.0. The majority of *M. adina* caught were between 10-30 mm carapace width (C.W.).

Blooms of the Ichthyotoxic Flagellate *Prymnesium Parvum* in U.S. Waters. An Emerging Problem?

JOAN GLASS AND JACK RALPH *(Texas Parks & Wildlife Department)*
ALAN LEWITUS *(University of South Carolina)*
PAUL ZIMBA *(U. S. Dept. of Agriculture)*
CARMELO TOMAS *(University of North Carolina, Wilmington)*

Persistent blooms of *Prymnesium parvum* were implicated in recurrent fish kills in Texas river/reservoirs resulting in the death of 12.4×10^6 fish and an estimated loss of 4.4 million dollars. In 2002 alone $2- \times 10^6$ killed fish were reported from the Brazos, Red and Colorado Rivers. From Sept. 2001 through Sept. 2002, one aquaculture facility in North Carolina had blooms in 18 of 22 ponds with loss of $318,000 harvest value.

Bioenergetics for Inland Silversides

CALEB G. HUBER, CHRIS J. CHIZINSIKI, AND KEVIN L. POPE *(Wildlife and Fisheries Management Institute, Mailstop 2125, Texas Tech University, Lubbock, Texas 79409, calebgh@hotmail.com, cchizins@ttu.edu, kevin.pope@ttu.edu)*

Inland silversides *Menidia beryllina* are native to the eastern coast of the USA. Inland silversides have been introduced into numerous inland water bodies as forage fish for species such as largemouth bass *Micropterus salmoides* and striped bass *Morone saxatilis*. Through these introductions inland silversides have displaced brook silversides *Labidesthes sicculus*, a native species. We are developing a bioenergetics model for inland silversides as a tool to further fisheries research and gain biological insight into inland silversides. Fish were captured and brought into the laboratory where respiration experiments were conducted at five temperatures (10, 15, 18, 25, and 30°C). This information will help us create a bioenergetics model that will facilitate assessments of inland silversides as potential prey and competitor.

Food Habits of Largemouth and Spotted Bass

FELIX MARTINEZ JR., CHRIS J. CHIZINSKI, AND KEVIN L. POPE *(Wildlife and Fisheries Management Institute, Texas Tech University, Lubbock, Texas)*
CASEY L. HARTHORN *(New Mexico Game and Fish, Las Cruces, New Mexico)*
SHAWN DENNY *(New Mexico Game and Fish, Roswell, New Mexico)*

We documented largemouth bass *Micropterus salmoides* and spotted bass *M. punctulatus* food habits from Brantley and Sumner reservoirs, New Mexico. Fish were collected monthly by night electrofishing during May 2001 through May 2002. Stomach contents were removed by using acrylic tubes and preserved. Stomach samples were enumerated and identified to order for insects and family for other categories. In Brantley Lake, bass ate mainly fish, whereas bass in Sumner Lake ate mainly crayfish. However, seasonal variation in diet composition occurred for both species.

Development of Histopathology Laboratory and Preliminary Studies to Determine the Prevalence of Viruses in Penaeid Shrimp

VANESSA C. PEREZ AND M. ANDRES SOTO *(Texas A&M University Kingsville, Biology , MSC 158, Kingsville, Texas 78363)*

Indigenous and non-indigenous viruses have been known to infect wild and cultured penaeid shrimp. *Baculovirus penaei* (Bp), an indigenous virus, is known to infect wild- caught brown, *Farfantepenaeus aztecus,* and pink, *Farfantepenaeus duorarum,* shrimp from the northern Gulf of Mexico. However, there is little information on the prevalence of this virus from shrimp from Texas Waters. Taura syndrome virus (TSV), an exotic virus, was found infecting farmed *Litopenaeus vannamei* in the mid 1990's. TSV caused up to 90 % mortality to these shrimp. In addition another exotic virus, White spot syndrome virus, (WSSV), was found to severely infect farmed *L. setiferus* and *L. vannamei* in 1995 from Texas and caused up to 95% mortality to those shrimp. In addition, WSSV has been found infecting wild-caught blue crabs (*Callinectes sapidus*) from Texas. However, no information exists on the prevalence of TSV or WSSV in wild populations of shrimp. The objectives of this study are to develop a histopathology laboratory at the Biology Department of Texas A&M University Kingsville and to histologically examine wild caught brown, pink, and white shrimp for lesions and inclusions caused by Bp, TSV, WSSV, and other exotic viruses.

Gut analysis of the Headwater Catfish *Ictalurus Lupus* in the Devils River and Independence Creek

CHAD THOMAS, BRAD LITTRELL, JACKIE WATSON, CASEY WILLIAMS, AND TIMOTHY H. BONNER *(Department of Biology/Aquatic Station, Southwest Texas State University, San Marcos, Texas 78666, TBonner@swt.edu)*

We examined the gut contents of headwater catfish *Ictalurus lupus* collected from Independence Creek (Pecos River drainage) and Dolan Creek (Devils River drainage). Gut contents of Independence Creek fish consisted of algae and detritus (85% of total weight), insects (10%), crustaceans (3%), and other (2%). Gut contents of Dolan Creek fish consisted of algae and detritus (91%), insects (5%), other (5%), and crustaceans (0.6%). Fewer insects and crustaceans in the diet Dolan Creek fish may be attributed to lower diversity in mesohabitats at Dolan Creek or competition with the introduced smallmouth bass *Micropterus dolomieu*. However, condition factors and length/weight relationships were not substantially different for *I. lupus* between sites. In general, *I. lupus* consumes greater amounts of algae and lesser amounts of insects and fish than their sympatric congener *I. punctatus*.

The Effect of Visible Implant Elastomer Tags on Growth and Survival of Juvenile Blue Crabs *Callinectes Sapidus*

SURAIDA NAÑEZ-JAMES (Texas A&M University at Galveston, 5007 Ave U, Galveston, TX 77551 suraida.nanez-james@noaa .gov)
THOMAS J. MINELLO *(NOAA Fisheries, Galveston Lab, 4700 Ave U, Galveston, TX 77551, tom.minello@noaa.gov)*

We examined the utility of visible implant elastomer (VIE) tags for measuring growth in juvenile blue crabs. In a 14-day laboratory experiment, we measured the effects of the tags on growth and survival. A total of 36 juvenile (14-27 mm CW) blue crabs *Callinectes sapidus* were placed in individual cylindrical fiberglass tanks with 57 l of filtered seawater and fed *ad lib*. In one treatment (12 replicate tanks), VIE tags were injected into the muscle of the fifth pereiopod. In the second treatment, tags were injected into the muscle under a thoracic sternite. The remaining 12 crabs were not tagged and served as a control. Over the 14-day experiment, the crabs grew at an average rate of 0.46 mm CW/day (SE= 0.046) and 0.07 g/day (SE= 0.01). All 36 blue crabs survived and molted at least once. There was no significant difference in growth rate, expressed as an increase in carapace width ($P = 0.183$) or an increase in wet weight ($P = 0.122$), among the three treatments. Tag retention, however, was 75% in the fifth pereiopod and 100% under the thoracic sternite. These results indicate that VIE tags placed under a thoracic sternite should be useful for identifying experimental blue crabs in short term laboratory or field experiments because they have a high retention rate, are easy to insert, are readily visible in juvenile crabs, and have no apparent effect on growth or survival.

Some Parasites of Black Drum *Pogonias Cromis* from Laguna Salada, TX

MONICA C. ELIZONDO, LANCE TOMPKINS, STEVEN CURRAN, AND M. ANDRES SOTO *(Texas A&M University-Kingsville Biology Department, 920 University Blvd. MSC 158, Kingsville, TX 78363, mon_elizondo@yahoo.com)*

Black drum (*Pogonias cromis*) were examined for metazoan parasites. All fish were caught in Laguna Salada, TX using hook and line. The fish were kept alive until dissections were performed back at the laboratory. The mean size of fish examined was 32 cm. Digeans were found in the pyloric caeca, nematodes were found in the intestine, juvenile cestodes (tapeworms) and aspidogastreans were found in the rectum, and acanthocephalans (thorny-headed worms) were found in the intestine and rectum.

Carp Fishing Tournaments in Croatia

ZELJKO VUKOVICH (*Ministry of Environmental Protection, Djakovo, Croatia)*
GENE R. WILDE *(Wildlife and Fisheries Management Institute, Texas Tech University, Lubbock,Texas)*

Carp *Cyprinus carpio* is the most commonly sought fish in Europe. Fishing tournaments for carp have been conducted in Europe for a number of years, but only recently in Croatia. We describe carp tournament rules and regulations and present results from a tournament held in Croatia.

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