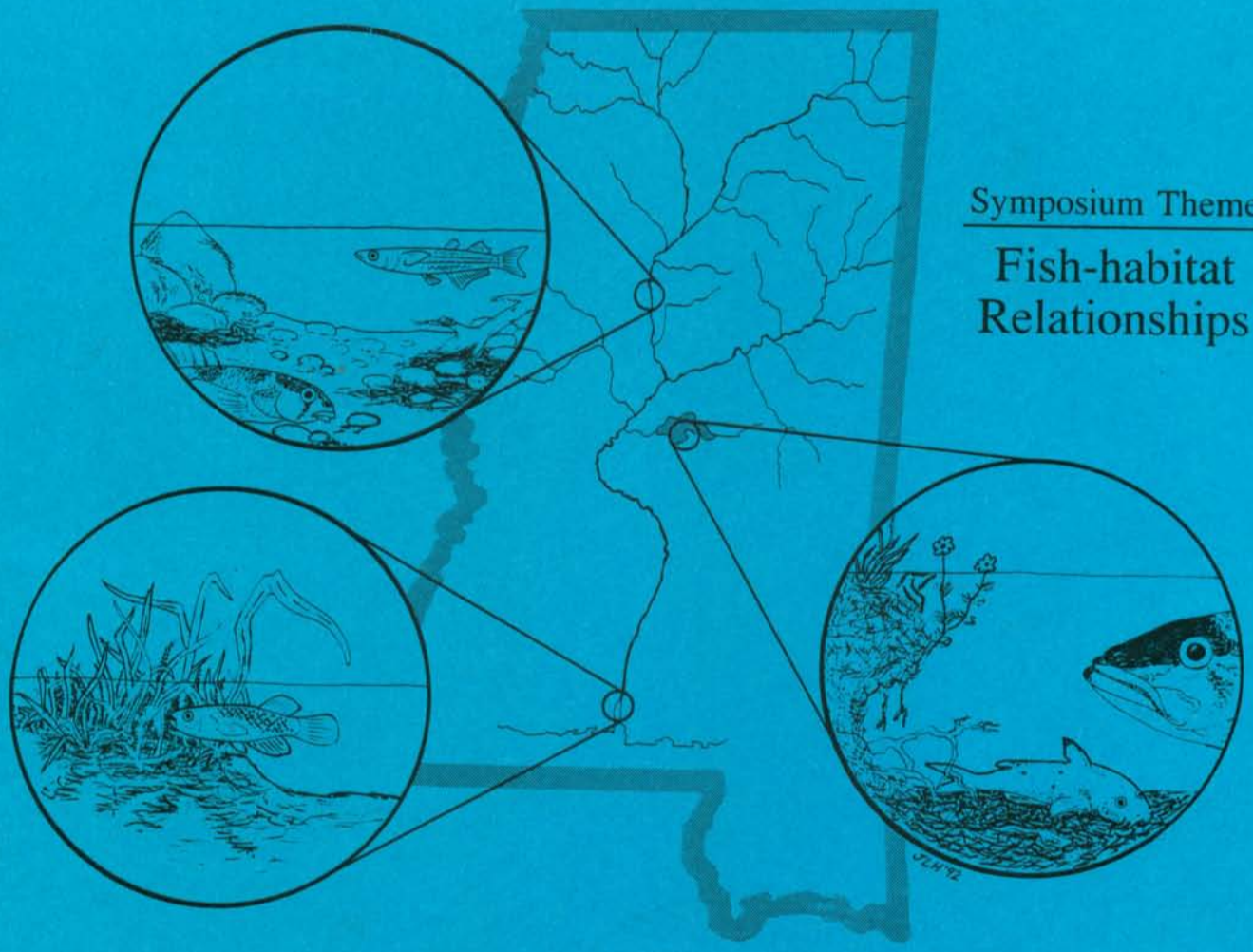

Symposium Theme

Fish-habitat Relationships

Proceedings of the Annual Meeting of the Mississippi Chapter of the American Fisheries Society

Volume XVII

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Proceedings of the Annual Meeting of the Mississippi Chapter of the American Fisheries Society

February 24 - February 25, 1993

Larry Nicholson, President
Mark S. Peterson, President-Elect
Bradley Marler, Secretary/Treasurer
Larry Nicholson, Local Arrangements

Wednesday, February 24, 1993

7:30pm - until Reception/social: crayfish boil

Thursday, February 25, 1993

8:00 - 9:00am Registration- Caylor Building auditorium

Mini-Symposium: Fish-Habitat Relationships

9:00 - 9:10 Opening comments--Mark S. Peterson

Mark S. Peterson (moderator)

9:10 - 9:30 **Vanishing streams and habitats- a continuing crisis in biodiversity and ecosystem integrity.**
Dr. Arthur C. Benke, University of Alabama

9:30 - 9:45 Fishes of a low-order, blackwater stream floodplain in southern Mississippi
W.T. Slack*, S.T. Ross and J.M. Huebner

9:45 - 10:00 Foraging effects by juvenile fish on the abundance of macro-invertebrates in aquatic plant habitat
K. Gerdes* and E.D. Dibble

10:00 - 10:15 Food choice by juvenile centrarchids in an aquatic plant habitat
E. Nelson* and E.D. Dibble

10:15 - 10:30 Coffee Break

Stephen T. Ross (moderator)

10:30 - 10:45 Interaction of salinity and prey salt content on growth of juvenile bluegill, *Lepomis macrochirus*
N.J. Musselman* and M.S. Peterson

10:45 - 11:00 Velocity preference of the blackside darter (*Percina maculata*)
S. Harrel*, N.H. Douglas and J.J. Hoover

11:00 - 11:15 Variation in growth rates of post-larval sciaenids: microhabitat influences
C. Rakocinski, D.M. Baltz and J.W. Fleeger

11:15 - 11:30 Summer habitat preference of large flathead catfish (*Pylodictis olivaris*) in three south Mississippi streams
B. Justice

11:30 - 1:00 Lunch Break

Technical Session: 1:00-4:00pm

Jan Jeffrey Hoover (moderator)

1:00 - 1:15	An assessment of flathead catfish resources in the Big Black River and Tallahatchie River J.M. Francis* and D.C. Jackson
1:15 - 1:30	Collection, aging, and growth of triploid grass carp in the Santee River system, South Carolina J.P. Kirk, K.J. Kilgore and L. Sanders
1:30 - 1:45	Studies of triploid and triploid-hybrid crappie G.R. Parsons
1:45 - 2:00	Support for the mutualistic hypothesis of nest association in fishes C.E. Johnson
2:00 - 2:15	Shrinkage of gape and length in YOY walleye, *Stizostedion vitreum* S. VanderKooy* and M.S. Peterson
2:15 - 2:30	Life history and population demographics of mosquitofish: native southeastern versus northern, introduced populations J.L. Haynes*
2:20 - 2:45	Coffee Break

Glenn R. Parsons (moderator)

2:45 - 3:00	Bias in reduction method for estimating population size of stream fishes S.S. Knight and C.M. Cooper
3:00 - 3:15	On the occurrence and behavior of juvenile red snapper (*Lutjanus campechanus*) on commercial shrimp grounds I.K. Workman and D.G. Foster
3:15 - 3:30	Trends in seasonal movements of cobia, *Rachycentron canadum*, tagged and released in the northern Gulf of Mexico and south Atlantic J.S. Franks
3:30 - 3:45	Species identification and temporal spawning patterns of Butterfish, *Peprilus* spp., in the south and mid-Atlantic bights T. Rotunno and R.K. Cowen
3:45 - 4:00	Current processing techniques for fish otoliths J. Warren
4:15 -	Business meeting

*= student papers.

Fishes of a low-order, blackwater stream floodplain in southern Mississippi

William T. Slack*, Stephen T. Ross and James M. Huebner
University of Southern Mississippi

In July 1991, we began investigating potential floodplain use by stream fishes in Beaverdam Creek, a 4th order tributary of Black Creek. The study area is a 2nd order site and includes a 450 m stream reach along with adjacent fringing floodplains. To document floodplain occurrences, we are using passive capture techniques (directional fyke nets and wire mesh minnow traps), as well as actively seining the inundated floodplains. In addition, randomly chosen stream sections are sampled quarterly. Eleven flooding events were sampled from January to November 1992. Thirty-one species have been documented from the immediate study area representing 11 families. Three hundred and forty-nine individuals representing 28 species have been documented on the floodplain. Numerically dominant species on the floodplain are *Lythrurus roseipinnis*, *Cyprinella venusta*, *Fundulus olivaceus*, *Luxilus chrysocephalus* and *Etheostoma swaini*. Quarterly samples have documented 22 species from the channel yielding 802 individuals. Species numerically dominant in the channel are *L. roseipinnis*, *E. swaini*, *F. olivaceus*, *Percina nigrofasciata* and *Noturus leptacanthus*. Only 3 channel species, *Notropis signipinnis*, *Hypentelium nigricans* and *Etheostoma stigmaeum* have not been documented from the floodplain.

Foraging effects by juvenile fish on the abundance of macro-invertebrates in aquatic plant habitat

Keith Gerdes* and Eric D. Dibble
U.S. Army Engineer Waterways Experiment Station
Vicksburg, MS

Submersed plants offer habitat complexity that serves as important refuge and forage sites for both fish and their prey. Available macro-invertebrates supply food for juvenile fish inhabiting these areas. The rate at which fish impact their food resource determines its availability and is important to growth and survival of fish. We quantify the effect that juvenile fish have on the abundance of macro-invertebrates by comparing aquatic plant habitats containing fish with habitats void of fish. Experiments were replicated in three different ponds (0.25 acres). Hydrilla was planted and an identical assemblage of fish was stocked in each pond. Ponds were divided in half by a permalon barrier to prevent migration of fish and macro-invertebrates. All macro-invertebrate samples were collected by plant removal and sweep-nets during two 3-day periods. Fish had a significant ($P>0.01$) impact on the total abundance of macro-invertebrates in aquatic plants, and the effect juvenile fish have on specific macro-invertebrates groups will be discussed.

Food choice by juvenile centrarchids in an aquatic plant habitat

Erik Nelson* and Eric D. Dibble
U.S. Army Engineer Waterways Experiment Station
Vicksburg, MS

The availability of food is important to the growth and survival of fish. A variety of potential food items inhabit aquatic plant habitats, yet little is known about specific food choices by juvenile fish. The quantification of foraging behavior by juvenile fish is a prerequisite for understanding the causal mechanisms regulating growth and survival in fish. We measured food choice by two juvenile centrarchids: largemouth bass (*Micropterus salmoides*), and bluegill (*Lepomis macrochirus*). Experiments were conducted in three ponds. Food availability was determined in each pond by measuring the abundance of macro-invertebrates with sweep-nets. Fish were collected, and food consumption was determined by measuring stomach contents. Selectivity index was used to determine food preference by fish. Differences in food selection by largemouth bass and bluegill will be discussed.

Interaction of salinity and prey salt content on growth of juvenile bluegill, *Lepomis macrochirus*

Natalie J. Musselman* and Mark S. Peterson
Mississippi State University

Members of the freshwater fish family Centrarchidae are abundant in low-salinity saltmarsh systems along the Atlantic and Gulf coasts. It has been indicated that their distribution along the estuarine axis is influenced by salinity. Ambient salinity in conjunction with salt incorporation via prey consumption (prey dependent) could potentially affect distribution and growth. This experiment was an attempt to determine whether external salinity (0, 5, 10 $^{0}/_{00}$) and/or a salt-rich diet (0, 2, 4 % NaCl) had an effect on growth of juvenile bluegill, *Lepomis macrochirus*, collected from coastal drainages in Mississippi. Over a 58 day period, 5 replicates of each of the 9 possible treatments (salinity X diet) were fed twice daily with all extra food removed after 5 minutes. Initial, mid-term (30 da), and final (58 da) wet weights (WW) were recorded. Initial WW and mean growth rates across all treatments were not different ($p > 0.05$) and ranged from 3.28-4.52 g and .03-.07 g/day, respectively. Although mean WW increased in all treatments, the changes in WW were not different ($p > 0.05$) and ranged from 1.74-3.78 g. This indicates that juvenile bluegill growth is not significantly influenced by salinity up to 10 $^{0}/_{00}$ nor is growth influenced by diets with NaCl up to 4 %.

Velocity preferences of the blackside darter (*Percina maculata*)

Sherry Harrel*, Neil H. Douglas, and Jan Jeffrey Hoover
Northeast Louisiana University and
U.S. Army Engineer Waterways Experiment Station

The blackside darter is declining in abundance throughout portions of its range and is considered threatened in Texas, but quantitative descriptions of its habitat are lacking. We studied velocity preferences of this species from the Cypress Bayou system, east Texas, by observing captive fish in an artificial stream in the laboratory, and by correlating fish abundance with stream velocities in the field. In the artificial stream, darters were rarely observed in velocities greater than 30 cm/s. In the absence of cover, darter abundance was bimodal at 0 cm/s and 10-15 cm/s; in the presence of cover (elevated tiles), darter abundance was unimodal at 5-10 cm/s. Temporal effects were observed: in the absence of cover, the second mode became more pronounced, with darters frequenting faster water over time. Laboratory observations were comparable to results obtained in the field. The majority of darters were collected in reaches with mean velocities < 15 cm/s; very few darters were collected in velocities of 20-35 cm/s, and none were collected in velocities > 35 cm/s.

Variation in growth rates of post-larval sciaenids: microhabitat influences.

Chet Rakocinski[1], Donald M. Baltz[2], and John W. Fleeger[2]
[1]Gulf Coast Research Laboratory and [2]Louisiana State University

Growth rates reflect recruitment success for early life-history stages of fishes. Otolith microstructure revealed considerable variation in growth rates of individual post-larval spotted seatrout (*Cynoscion nebulosus*) and red drum (*Sciaenops ocellatus*), collected on a fine spatial scale from ecotonal marsh-edge microhabitats using a 1.19 m^2 drop sampler. For spotted seatrout between 11 and 33 days old, the growth rate averaged 0.9 mm $\cdot$ d^{-1}. After adjusting for size-related variation in the widths of outer daily growth increments of otoliths, a mulivariate growth model for spotted seatrout included several microhabitat variables, such as salinity, distance from the marsh edge, emergent stem density, and a diet variable. Moreover, some microhabitat variables were fit as quadratic relationships, indicating optimal growth rates at intermediate levels of those variables. By contrast, only salinity was included in the red drum growth model, but this variable also was fit best by a quadratic relationship. Spotted seatrout occurred over a wider range of environmental conditions, seasons and ages, probably accounting for the stronger relationship between microhabitat and growth for this species. The existence of connections between microhabitat and growth variation for these commercially important fishes illustrates the nursery value of the marsh-edge ecotone.

Summer habitat preference of large flathead catfish (*Pylodictis Olivaris*) in three south Mississippi streams

Billy Justus, Mississippi Office of Pollution Control

The flathead catfish (*Pylodictis olivaris*) makes an excellent target organism when evaluating environmental contmination by lipophilic chemicals because the species possesses a relatively high lipid percentage, is piscivorous, and is often a major component of the freshwater sport and commercial fishery. The MS Department of Environmental Quality, Office of Pollution Control (OPC) is increasingly relying on tissue analysis of this species before issuing consumption advice to the public for a given stream reach. The larger, older flatheads, approximate a worst case scenario when evaluating health risks to the fishing public. The OPC began sampling for large catfish in the summer of 1990 and has now completed three sampling seasons during which three streams were intensively sampled. In 1992, 35 flatheads between 10 and 25 lbs were collected and analyzed for dioxin. Large flatheads are patchily distributed throughout these river systems. Our experience has denoted that in low conductivity water, flatheads, and particularly larger flatheads, are capable of sensing DC current and eluding samplers if electrofishing gear is in constant use. This necessitates that samplers position electrofishing gear in the immediate vicinity of large flatheads before electrofishing. Habitats which frequently produce large flatheads are discussed.

An assessment of flathead catfish resources in the Big Black River and Tallahatchie River

Jay M. Francis* and Donald C. Jackson
Mississippi State University

Flathead catfish (*Pylodictis olivaris*) stocks were assessed with hoopnets (4.3 m long, 7 hoops, 1.07 m hoop diameter, 3.81 cm bar mesh cotton netting) in the Big Black River (N=780 48-h sets) and the Tallahatchie River (840 48-h sets) during spring and summer flow regimes from 1989-1992. Catch per unit of effort (CPUE) was 0.9 ± 0.3 kg/net-night and 1.0 ± 0.3 kg/net-night in the Big Black River and the Tallahatchie River, respectively. In the Big Black River, mean length and weight of flathead catfish were 53.1 ± 1.8 cm and 2.6 ± 0.3 kg (N=311 fish). In the Tallahatchie River, mean length and weight of flathead catfish were 51.1 ± 1.9 cm and 2.0 ± 0.2 kg (N=413 fish). There were no significant differences ($p > 0.05$) between the two rivers with respect to means and variances of CPUE, mean length or mean weight. In both systems, flathead catfish stocks were well structured with mean proportional stock densities of 82% for the Big Black River and 75% for the Tallahatchie River. Relative stock densities (preferred) were also similar for the two rivers: 22%, Big Black River; 23%, Tallahatchie River.

Collection, aging, and growth of triploid grass carp in the Santee Cooper system, South Carolina

James P. Kirk, K. Jack Killgore, Larry Sanders, and James V. Morrow
U. S. Army Engineer Waterways Experiment Station, Vicksburg, MS

In Lakes Marion and Moultrie, sixty-nine triploid grass carp (*Ctenopharyngodon idella*) were readily collected during May-June 1992 by bow fishing when conventional collecting techniques failed. Scales from these fish exhibited recognizable annuli, but lapilliar otoliths and pectoral spines also showed potential as aging structures. The weight to length relationship derived from fish measured at stocking and collection was: weight = 0.0000027 length$^{3.25}$ with an r^2 = 0.99. Backcalculations of total length and weight provided the following estimates of fish size: Age 1) 361 mm, 0.6 kg; Age 2) 698 mm, 4.9 kg; Age 3) 821 mm, 8.3 kg; Age 4) 908 mm, 11.5 kg. Future research will: 1) attempt in increase collection sample size to improve estimates of mortality and 2) refine aging techniques by validating the use of otoliths and scales.

Studies of triploid and triploid-hybrid crappie

Glenn R. Parsons
The University of Mississippi

Triploid fish are desirable in some situations because they do not mature, may not invest energy in producing gonadal tissue and therefore, may grow to larger sizes after maturity than diploids. Additionally, triploids may be useful in situations where overpopulation and associated stunting occur. In this presentation, the results of a study in which the potential for production and use of triploid-hybrid crappie is reported. The objectives of this study were (1) to produce triploid-hybrid crappie, (2) to compare the growth of diploid hybrids with triploid hybrids, (3) to evaluate the pressure shock technique for the production of triploids and (4) to evaluate the potential for using larval fish for identification of triploids. Using the black-stripe color morph of the black crappie, we successfully produced black-stripe, triploid-hybrid crappie using the cold shock technique. There were no differences in growth rates between diploid-hybrid and triploid-hybrid crappie up to about 1.3 years. Pressure shock was found to be an effective method for inducing triploidy in white crappie.

Support for the mutualistic hypothesis of nest association in fishes

Carol E. Johnston
USDA Forest Service, Forest Hydrology Lab., Oxford, MS

Nest association, or the habit of spawning in the nest of another species, is a widespread reproductive strategy among North American fishes, and is especially common in minnows. The hosts of nest associates include sunfishes, basses and nest-building minnows. The benefits to associates of spawning in association with another species could include increased offspring survivorship due to physical characteristics of the host nest or from the parental care of the host. Benefits could also be gained through a selfish herd or dilution effect, where an individual's offspring are less likely to be eaten by predators due to the presence of the offspring of other individuals in the nest. Hosts could also benefit from the selfish herd or dilution effect, and mechanisms to prevent associates from using nests may not have evolved because hosts benefit from the strategy. Although numerous descriptive accounts of nest associations have been published, no experimental work examining the costs and benefits of the strategy to the participants has been conducted, and the nature of the relationship (i.e., parasitic, mutualistic or commensalistic) is unknown. The objective of this study was to determine the nature of the nest associate/host relationship by examining the benefits of the strategy to both hosts and associates. Associates were found to benefit, in terms of reproductive success, from the parental care of hosts, and not from characteristics of the nest itself. Hosts that spawned with associates had higher reproductive success than those that did not. Since both associates and hosts benefit from the strategy, at least in some systems, nest association can be viewed as mutualistic.

Shrinkage of gape and length in YOY walleye, *Stizostedion vitreum* (Mitchill)

Steve VanderKooy* and Mark S. Peterson
Mississippi State University

Studies of gape-limited foraging in piscivores seek to evaluate a predator's ability to consume prey of a range of sizes. Body measurements are made on formalin-alcohol preserved specimens which are correlated with the maximum dimension of prey items either from the diet or directly from the habitat. It is also known that fish shrink when preserved. We are involved in a project that in part was designed to evaluate this shrinkage problem in YOY walleye. Two measurements were made on 108 YOY walleye at the time of death: gape (maximum throat diameter) and standard length (SL). Fish were immediately preserved in 10% formalin and then stored in 50% isopropyl alcohol. Gape and SL were remeasured at 2 and 4 month intervals. Using a multivariate repeated measures ANOVA, we documented a decrease ($p < 0.05$) in SL at 4 months compared to 2 months and initial values. However, gape decreased ($p < 0.05$) among all time periods. This suggests that: 1) gape shrinks at a faster rate than SL; 2) separate conversions must be made when determining live from preserved measurements; and 3) accurately predicting the available prey size a gape-limited piscivore can swallow requires knowledge of piscivore and prey shrinkage.

Life history and population demographics of mosquitofish: native southeastern versus northern, introduced populations

Jody L. Haynes*
Mississippi State University

Life history and demographic traits of *Gambusia affinis* were studied in three populations in southeastern Louisiana and the results are compared with reports on similar traits of northern, introduced populations. Southern mosquitofish have low tolerance of cold temperatures and relatively low overwinter mortality. Females are not known to overwinter sperm and produce relatively few, large offspring. Asynchronous reproduction is the general rule. Mosquitofish in northern areas exhibit high cold-tolerance but are still faced with extreme overwinter mortality. Females are capable of overwinter sperm retention, produce large numbers of small offspring, and regularly exhibit synchronous reproduction. Although plasticity of life history traits is common in G. affinis, it is theorized that the diversity of differences exhibited by some northern populations represents genetically-based life history shifting rather than phenotypic flexibility of similar genotypes.

Bias in reduction method for estimating population size of stream fishes.

S. S. Knight and C. M. Cooper
USDA, Agricultural Research Service,
National Sedimentation Laboratory

Catch-effort methods of population estimation are based on the relationship between catch per effort and cumulative catch. These methods may be biased if the collection technique used, such as electrofishing, violates the underlying assumptions of the method. A study was conducted to determine if fish learn to avoid capture with subsequent sampling attempts, thus resulting in underestimates of standing stock. Four 100 m stream reaches were repeatedly sampled at either 15, 30, 60 or 120 minute intervals, and total numbers and weights of fish were estimated using the Leslie Method. Sampling was followed by a total fish kill in order to measure actual numbers and weight of fish present. The 15 minute interval sampling resulted in percent differences between observed weight and estimated weight of fish that were significantly higher than all other sampling schemes. The high 15 minute interval average difference was followed by a lower difference for the 30, 60, and 120 minute intervals as might be expected if fish "forgot" the electrofishing experience as time increased between runs.

On the occurrence and behavior of juvenile red snapper (*Lutjanus campechanus*) on commercial shrimp grounds in the northeastern Gulf of Mexico

Ian K. Workman and Danial G. Foster
National Marine Fisheries Service
Mississippi Laboratories, Pascagoula Facility

Red snapper (*Lutjanus campechanus*) are the subject of significant overfishing in the southeastern United States, and regulations are being implemented to reduce fishing mortality and restore them to a 20 percent spawning potential ratio by the year 2007. One source of mortality that must be reduced is the incidental capture of juvenile red snapper in shrimp trawls. The National Marine Fisheries Service (NMFS) is conducting research to develop shrimp trawl modifications to reduce snapper bycatch. An important part of this research is the study of juvenile red snapper behavior on commercial shrimp grounds and in relation to trawling gear. An area of high juvenile red snapper abundance was identified off the coast of Mississippi. Most of the snapper were observed around structures or objects on the bottom which they appeared to use for refuge or orientation. Those occurring over barren bottom had no apparent point of orientation. When encountered by shrimp trawls, most juvenile snapper rose abive the trawl footrope and fell back into the trawl. These observations have directed research toward modifying shrimp trawls to release juvenile red snapper after they enter rather than preventing them from entering a shrimp trawl.

Trends in seasonal movements of cobia, *Rachycentron canadum*, tagged and released in the northern Gulf of Mexico and South Atlantic

James S. Franks
Gulf Coast Research Laboratory, Ocean Springs, MS

As part of a life history study of cobia, *Rachycentron canadum*, a valuable pelagic sportfish species in the Gulf of Mexico, over 4,000 specimens were tagged and released in the northern Gulf and south Atlantic during 1988-92. Subsequent recaptures (238 as of January 1, 1993) have provided significant insight into seasonal movements and annual migratory patterns of the species. The majority of recaptures occurred within 200 miles of the tag/release site, some occurring up to 3 years after tagging, however, several long term/long distance recaptures (2-3 years; 2,400 km) indicate that some segments of the population are highly migratory.

Species identification and temporal spawning patterns of butterfish, *Peprilus* spp., in the south and mid-Atlantic bights

Teresa K. Rotunno and Robert K. Cowen
Marine Sciences Research Center, SUNY Stony Brook, NY

Three species of the stromateoid genus *Peprilus* occur in the Atlantic Ocean along the eastern coast of the United States: *P. triacanthus* (Atlantic butterfish), *P. burti* (Gulf butterfish) and *P. paru* (harvestfish). *P. triacanthus* and *P. paru* reportedly spawn from May through August and June through July, respectively; whereas, *P. burti* spawns twice yearly from February through May and September through November. Larvae and juveniles of *Peprilus* spp. were collected in samples taken from the South and Mid-Atlantic Bights during both the spring and summer of 1988 and 1989. Morphometric, meristic and pigment characters were analyzed to identify the species of *Peprilus* present in our samples. Caudal vertebrae counts (18-19) and the number of ventral midline melanophores (11-15) of specimens sampled are consistent with those known for *P. triacanthus*. Ageing of fish by otolith analysis estimated larval and juvenile growth rates of approximately 0.23 mm/day. Backcalculation of birthdates suggests either two spawning events for *P. triacanthus*; late January through mid-March and early June through late July, or one extended spawning period beginning in late January and ending in late July. Therefore, it appears that *P. triacanthus* is spawning for a much longer duration than previously thought. It's possible that *P. triacanthus* spawns during the spring in the South Atlantic Bight and summer in the Mid-Atlantic Bight as a strategy to extend the duration of its spawning period. This is similar to other north-south migrating species and warrants further study.

Current processing techniques for fish otoliths

James Warren
Gulf Coast research Laboratory
Ocean Springs, MS

Fish otoliths are currently being used extensively and have become a valuable tool in the determination of age and estimates of length-at-age for fish. Over 5000 otoliths of various saltwater species have been processed by the Gulf Coast Research Laboratories' fisheries age and growth laboratory. Otolith preparation is of utmost importance for the accurate reading and interpretation of the information stored in this calcarious structure. Each species has presented a unique set of processing protocols that have been optimized for otolith extraction, laboratory processing and subsequent analysis of data. The current techniques and the use of the data in fisheries research and management are presented.