Florida Chapter, American Fisheries Society

19th Annual Meeting

9-11 March 1999, Brooksville Florida

Introduction

The Florida Chapter of the American Fisheries Society will hold its 19th annual meeting from 9 March to 11 March, 1999 at the Withlacoochee Training Center near Brooksville, Florida. The Florida Chapter was organized in 1980 to promote the wise use of Florida's aquatic resources. Membership in the Chapter and participation in the annual meeting is open to anyone with an interest in the fish and aquatic resources of Florida.

Meeting: The theme of this year's meeting is FISHERIES ECONOMICS, MARKETING AND EDUCATION. Declining fishing license sales and angling participation (as a percentage of the population) have led to significant concerns about future funding for fisheries management activities. As a direct result, several major new national initiatives are underway. Invited speakers will present an overview on these topics from both a freshwater and saltwater perspective and include industry representatives as well as agency and university personnel. In addition to these topics, there will be a variety of contributed papers and posters on traditional fisheries topics.

The Chapter's annual business meeting will also be held during this time period. This is an opportunity to help decide the future of the Chapter and to get updated on happenings at the Division and International level, such as the retirement of Executive Director Paul Brouha, the search for his replacement and the status of the AFS Strategic Plan.

There will be bonfire socials Tuesday and Wednesday nights, and the Florida Chapter raffle Wednesday night. The meeting provides an excellent opportunity to renew old acquaintances, meet other individuals who are interested in Florida's fisheries and exchange information. Come on out and enjoy the best camaraderie our profession and avocation has to offer.

Location: The 600-acre Withlacoochee Training Center is approximately 10 miles north of Brooksville on US Highway 41. The Training Center has heated and air conditioned, dormitory-style accommodations for 96. There are motels available in Brooksville and Floral City in case

of overflow. The Training Center kitchen will provide cafeteria style meals. The kitchen staff will make every effort to accommodate special diets, so if you have a preference for vegetarian meals or require some other diet, please indicate it on the registration form.

The Training Center has a recreation building available for use after the meeting. McKethan Lake recreational area is within walking distance and features boating, picnicking, hiking, fishing, and self-guided nature trails.

Student Travel Grants: The Florida Chapter has a limited number of student travel grants available to assist students attending the meeting. These grants cover the cost of room and board. The student is responsible for the registration fee. The Florida Chapter gives preference to students who are presenting papers or posters at the meeting, but a presentation is not required. Apply to Dr. Chuck Cichra, Department of Fisheries and Aquatic Sciences, University of Florida, 7922 NW 71st Street, Gainesville, FL 32653, (352) 392-9617.

More Information: Contact Bob Wattendorf, President Elect Florida Chapter AFS, if you need more information. He can be reached at the Florida Game & Fresh Water Fish Commission, 620 South Meridian Street, Tallahassee, FL 32399; phone: 850/488-0520; fax: 850/413-0381; email: watt@mail-me.com.

Tentative Meeting Agenda

"COME EARLY FOR THE UNIFICATION DISCUSSION...

...STAY LATE FOR GRANT GILMORE'S "FORBIDDEN DEPTHS"

9 March 1999 (Tuesday)

1200-1300 Lunch

1300-1700 Registration in Foyer Area & Meeting

1300-1315 Welcome by President Grant Gilmore and Introductory Comments

1315-1400 Update on Plans for the new FISH AND WILDLIFE CONSERVATION COMMISSION that resulted from Amendment 5's passage (Click here to link to online unification updates). Mr. Ed Moyer, Director, Division of Freshwater Fisheries, GFC and Mr. Lee Schlesinger, Operations Manager, MFC will update you on the Legislature's plans for creating a new all-inclusive Fish and Wildlife Conservation Commission and answer your questions.

1400-1700 TECHNICAL SESSION (CONTRIBUTED PAPERS ON FISH/ FISHERIES TOPICS)

1400-1420 Break

1420-1440 Anne Marie Eklund, Christopher C. Koenig and Felicia C. Coleman. Recovery of jewfish (Epinephelus itajara) populations in the eastern Gulf of Mexico: assessment of population parameters and essential habitat characterization.

1440-1500 John Ransier, Buck Dennis, Randy Edwards, and Carole Neidig. The Use of Sonic tags to Track Mixed Assemblages of Wild and Hatchery-Reared Red Drum.

1500-1520 Nathan Brennan, Kenneth Leber, Steve Serfling and William B. Halstead. Evaluation of Snook Stock Enhancement in Sarasota Bay, Florida.

1520-1540 Heidi Ferrell. The Effects of Hydrodynamic and Meteorological Processes on Larval and Juvenile Fish Recruitment through Sebastian Inlet, Florida.

1540-1600 Mark Flock and Deborah Leffler. Species Composition, Relative Abundance, and Trends in Community Structure of Sub-Adult and Adult Fishes in Four Florida Estuarine Systems.

1600-1620 Robert Heagey and Julie Fine. Spatial and Temporal Distribution and Abundance of Benthic Fishes Collected in the Tampa Bay Estuary.

1620-1640 Sven Kupschus and Derek Tremain. The Influence of Environmental Parameters in Determining the Fish Assemblages of Large Mobile Species in the Indian River Lagoon, Florida.

1640-1700 Michael Mitchell, Gregg Poulakis (Speaker), David Blewett and Charles Idelberger. Species Composition, Habitat Associations, and Community Structure of Fishes and Selected Invertebrates in Charlotte Harbor, Florida.

1715-1830 Dinner

1700-1900 Poster Setup

1900-???? Bonfire Social & ***Poster Review*** (Drinks and Snacks will be available in the poster area, and the presenters will be available to answer questions)

10 March 1999 (Wednesday)

0700-0730 Breakfast

0800-1700 Registration

0800-1000 FISHERIES ECONOMICS SYMPOSIUM SPEAKERS

0800-0810 Bob Wattendorf. Welcome, Housekeeping and Introduction of Symposium Topic

0810-0830 Scott Hardin, GFC. Overview of the Value of Freshwater Fisheries in Florida-Recreational and Commercial.

0830-0850 Joe O'Hop, Steve Brown, Martha Norris, Richard Cody, DEP. Overview of the Value of Marine Fisheries in Florida-Recreational and Commercial.

0850-0910 Paul Zajicek, DACS. Overview of the Value of Freshwater and Marine Commercial Aquaculture in Florida.

0910-0930 Tony Fedler, University of Florida, Economics Terminology and Placing Florida's Fisheries Resources in a National Context.

0930-0950 Tim Adams and Richard Thomas, Commercial Fishermen. Commercial Fishing Perspective of Florida's Fisheries.

0950-1010 Break

1010-1200 FISHERIES MARKETING SYMPOSIUM SPEAKERS

1010-1030 Bob Wattendorf, GFC. Initiatives to Increase Freshwater Fishing Participation and License Sales.

1030-1050 Tonja Wilt, Visit Florida. Florida Tourism Perspective on Recreational Fishing and How to Increase Participation. (Tentative)

1050-1110 Rob Southwick. National Sportfishing Promotional Efforts-An Overview of the American Sportfishing Association, and Fishing and Boating Promotion Foundation efforts.

1110-1130 Nick Venditti, Culprit. Tackle Manufacturers Perspective on Recreational Fishing and How to Increase Participation. (Tentative)

1130-1150 Glenda Kelley, IGFA. Industry Perspective on Recreational Fishing and How to Increase Participation.

1200-1300 Lunch

1300-1500 FISHERIES EDUCATION SYMPOSIUM SPEAKERS

1300-1320 Doug Haymans, DEP. Aquatic Education Efforts in Salt Water.

1320-1340 Steve Marshall, GFC. Aquatic Education Efforts in Fresh Water.

1340-1400 Don Morrison, Oak Ridge High/Marine Biology, The Use of Fisheries in Secondary Education

1400-1420 Becky Clayton, Florida Aquarium. Aquatic Education Approaches at the Florida Aquarium.

1420-1440 Amy Richard, University of Florida. LAKEWATCH as a means of Educating the Public about the Aquatic Environment.

1440-1500 Steve Bortone, SFWMD. Communicating Environmental Issues to the Public.

1500-1520 Break

1520-1700 TECHNICAL SESSION (CONTRIBUTED PAPER)

1520-1540 Fred Bell. Economic Impact and Recreational Value of Artificial Reefs in Northwest Florida.

1540-1600 Robert Werner. The use of Aquatic Animals in Research: Regulation, Review, Responsibility and Recommendations.

1600-1620 Brent Winner, Dave Blewett and Kevin Peters. Abundance and distribution of common snook, (Centropomus undecimalus) along shoreline habitats of three Florida estuaries.

1620-1640 Michael Johnson, Lew Bullock, and Richard McBride. Fishery and Biological Data for Hogfish, Lachnolaimus maximus, in Florida.

1640-1700 Kathryn Guindon-Tisdel and Hiana Quintero. An Overview of the Fishes in the Rivers of Tampa Bay, Florida.

1715-1830 Dinner

1900-2030 Business Meeting

2030-???? Florida Chapter Raffle, Bonfire Social

11 March 1999 (Thursday)

0700-0730 Breakfast

0800-1200 Registration

0800-1000 TECHNICAL SESSION

0800-0810 Bob Wattendorf, Housekeeping Items and Introduction to Session

0810-0830 Rich Cailteux and Jeff Nordhaus. Using Angler Reports as an Alternative to Counting Fish in Creel Surveys.

0830-0850 John Chick, Sean Coyne, and Joel Trexler. Effectiveness of Airboat Electrofishing for Sampling Large Fishes in Freshwater Marshes: Coming Full Circle.

0850-0910 Steve Huskey. Dietary Switch Through Ontogeny in Largemouth Bass, Micropterus salmoides: A Comparison Between Michigan and Florida Lakes.

0910-0930 William Pine and Mike Allen. Differential Growth and Survival of Early- vs. Late-hatched Black Crappie in Lake Wauberg, Florida.

0930-0950 Ryan Taylor. The Effects of Competition and Age-structured Predation in an Everglades Fish Community.

0950-1010 Break

1010-1030 Jeffrey Hill, Charles Cichra, Leo Nico, and Carter Gilbert. Gape Limitation of the Exotic Peacock Cichlid in Florida.

1030-1050 Debra Murie and Daryl Parkyn. Age and Growth, and Total Mortality of White Grunt in the Eastern Gulf of Mexico.

1050-1110 Derke Snodgrass and Roy Crabtree. The Early Life History of Bonefish, Albula vulpes, fro the waters of the lower and middle Florida Keys.

1110-1130 Michael Wessel and Brent Winner. Development of a 183-meter Purse Seine as an

Estuarine Fish Monitoring Tool.

1130-1150 Brian Kiel and William Lindberg. Homing Behavior and Spatial Use of Gag Grouper, Mycteroperca microlepis.

1150-1200 Poster Takedown

1200-1300 Lunch

1300-1320 FLORIDA CHAPTER AWARDS

1320-1420 Grant Gilmore Presents a Behind the Scenes look at the filming of the Discovery Channel's "Forbidden Depths" about the fish populations off Cuba's Coast and the use of a deep sea submersible to discover new fishes. Plus insights into Fidel Castro's love of marine science...don't miss it.

1420-1500 Incoming Florida Chapter ExCom meet to debrief and begin planning for Y2K.

POSTER PRESENTERS

Charlene Burke and Wayne Bennett. Salinity Tolerance and Saline Mediated Changes in Chloride Cells of Sheepshead Minnow.

Jynessa Dutka-Gianelli and Debra Murie. Comparative Age and Growth of Sheepshead (Archosargus probatocephalus) in the Northeastern Gulf of Mexico.

Nann Fangue and Wayne Bennett. CTM Methodology and High Temperature Stress in the Atlantic Stingray.

Peter Hood, Roy Crabtree, and Michael Murphy. Preliminary Investigations of Red Drum Spawning Habitat in Tampa Bay.

Justin M. Krebs and Ralph G. Turingan. Prey Selectivity of a Larval Fish: Variability Among Developmental Stages.

Randall A. Myers, Mike Allen, Douglas E. Colle, and James B. Rowe. Evaluation of Stocking Advanced-Size Black Crappie Fingerlings in Florida.

Adelaide Rhodes. What's the Catch? US Trends in Consumption of Fishery Products-Aquaculture vs. Capture Fishery Products.

Jodie Rummer, Nann Fangue, and Wayne Bennett. Thermal Tolerance and Resistance Responses of Sheepshead Minnow Acclimated at Various Ambient Salinities.

Bonnie Whitlock, Richard Krause and Wayne Bennett. Potential Techniques for Quantifying

Bioenergetic Differences in Largemouth Bass in Brackish and Freshwater Habitats.

Andrew Diller, Wayne Bennett Jr., Mark Nicholas, and Troy Davis. Effects of Hurricanes on Sea Turtle Nests and Incubation Temperatures at Gulf Islands National Seashore, Florida District.

ABSTRACTS

Abstracts for Contributed Papers, Invited Symposium Speakers and Poster presenters are provided in alphabetical order by the senior author's surname. With reference to when and where the respective presentations will be made.

Authors are not required to produce a final manuscript. However, many authors have detailed speaker's notes or have prepared some of their data and analysis for publication elsewhere. Information is provided for you to directly contact the author should you require additional information.

We hope that this facilitates communications between you and other Chapter members, as well as with invited speakers, who may not yet be members. In addition, we have provided a wide outside margin for you to keep notes.

Unfortunately, the Florida Chapter cannot waive costs for registration, room and meals for speakers. Student travel grants are available (see here for more).

Commercial Fishing Perspective of Florida's Fisheries.

Tim Adams and Richard Thomas. Commercial Fishermen

Wednesday: 09:30-0950

There have been major changes in commercial fishing activities in Florida over the past ten years. The value of Florida commercial fisheries has changed significantly during the period and the influence of foreign fisheries on the seafood regional market has increased. We will discuss the repercussions of recent changes in Florida food fishery economy and make predictions for the future. Professional evaluations based on generations of Florida food fishery experience will be presented.

Economic Impact and Recreational Value of Artificial Reefs in Northwest Florida

Fred Bell. Florida State University, Department of Economics, Tallahassee, FL 32306. Phone: 850/644-7092. Email: fwbell@garnet.acns.fsu.edu

Wednesday: 3:20-3:40

Artificial reefs provide a valuable aid in recreational fishing and diving.

However, there have been few studies of the economic impact of artificial reefs on coastal communities and the added recreational value provided to anglers and divers who use artificial reefs. This study was funded by the florida department of envirnomental protection to ascertain what the economic benefits are compared to the cost of deploying artificial reefs in northwest Florida.

The area of study included bay; Walton; Okaloosa; Santa Rosa and Escambia counties in Florida. Users of artificial reefs were divided into visitors and local residents for these counties. For the five county area. It was found that in 1998 visitors spent over $357 million on such items as bait; charter boat fees and lodgings that were directly related to the use of artificial reefs. Residents of these counties spent over $57 million during

This same time period for a combined economic impact of over $415 million. This combined impact supported nearly $84 million in wages and salaries and 8,163 jobs associated with the use of artificial reefs. The deployment of Artificial reefs was associated with a considerable injection of money into the local economies by visitors plus residents. Indirect impacts by visitors were not considered in this study, but would added to the overall economic importance of artificial reefs.

The use of artificial reefs for fishing and diving enhances the value of the recreational experience. This is called "use value" by economists and measures the added output of the services provided by the recreational aid called an artificial reef. Although this "use value" is not directly measured by the market, three well know techniques were employed to estimate "use value". These techniques are the (1) turnbull; (2) dichotomous choice and (3) travel cost method. Using survey data of anglers and divers, it was found that the artificial reef system off the five counties under study added over $31 million annually to the recreational experience. Since this "use value" is an economic benefit that flows to anglers and divers over time, its asset(capitalized value) at 3% is nearly $1.2 billion. From 1978 to 1998, the state and local governments have invested about $5 million in artificial reefs off the study area. Thus, the economic implication are immense. In this study, the investment in artificial reefs created a recreational asset 240 times the initial investment.

The study methodologies and statistical analyses form the framework for evaluating in one unified model the economic impact and use value of recreational resources in not only marine coastal areas, but for inland waterbodies as well. The entire study may be obtained from Jon Dodrill of The Florida Department of Environmental Protection(850-922-4340). In addition to Dr. Bell, Dr. Mark Bonn of Florida State University and Dr. Robert V. Leeworthy of the National Oceanic and Atmospheric Administration were also authors of this study. The study is under consideration for use in southest Florida and biologists; planners and administrators may

want to apply it to their areas to document the economic payoffs from the deployment of artificial reefs.

Bringing Fisheries Biology to the Public, By Hook or By

Stephen A. Bortone, Florida Center for Environmental Studies, 2301 McGregor Boulevard, Fort Myers, Florida 33901. Phone: 941/338-2929. Email: sbortone@ces.fau.edu

Wednesday: 2:40-3:00

In trying to communicate fisheries issues to the public it is important follow several guidelines:

1) Never let an opportunity pass that permits addressing the public Opportunities arise under broad array of circumstances. With a proactive approach we each become activists' in an overall effort to communicate. Bear in mind, however, not to be unbearable!

2) Use a diversity means/media Print and video media are the most popular but clearly not the only means. Exploring and exploiting the internet has only just begun.

3) Use approaches that are appropriate for the audience Gauging the most effective means to address an audience is critical, comes with experience, and should be an out of body' experience.

4) Realize that every audience has varying levels of understanding and interest It is essential to offer something to everyone in every presentation. A series of tiered approaches can accomplish this while changing the pace. Most of all Don't be a physiologist!

5) Lately Sincerity is what it's all about and once you can fake that you've got it made!'

Evaluation of Snook Stock Enhancement in Sarasota Bay, Florida.

Nathan P. Brennan, Kenneth M. Leber, Steve A. Serfling, and William B. Halstead. Mote Marine Laboratory, 1600 Ken Thompson Parkway, Sarasota, FL 34236. Phone: 941/388-4441. Email: nbrennan@mote.org

Tuesday: 3:00-3:20

Increasing human populations, high demand for marine fishery products, combined with advances in fishing technology and effectiveness has resulted in overexploitation of fishery stocks worldwide. Natural recruitment of marine fishery stocks increasingly fail to compensate for harvest demands. In the near future, even well managed fisheries are unlikely to produce increased yields. With these concerns at hand, stock enhancement, a relatively new fishery management tool, is being tested in the State of Florida with snook, *Centropomus undecimalis*, a

high valued recreational species. Pilot studies were performed with juvenile hatchery snook released into Sarasota Bay, Florida. Brood stock were collected from wild snook captured within Sarasota Bay and eggs and larvae were reared to juvenile stages. Prior to release all juvenile snook were marked with coded-wire micro tags and fluorescent visible implant elastomer tags. Unique tag codes were given to different release groups . Since, April 1997, over 22,000 juvenile hatchery snook were released into various habitats of Sarasota Bay. Releases occurred within streams, estuaries, and along mangrove banks of offshore keys. A standardized sampling program using beach seines, and cast nets and hook and line was developed and employed monthly to monitor the status of released fish in the bay. Sampling occurred within snook habitats at the release sites and outside of the release sites. At the release sites, one month after the releases, 20-25 % of snook captured were hatchery fish. In November, 1998, after recruitment of YOY snook into the sampling habitats, 243 snook were captured and 23 (9.6%) of these were hatchery fish. Sampling in areas outside of the release sites as well as analysis of the recovered tag codes has revealed that very little migration has occurred. Most hatchery snook have remained at or near the release sites. Recaptures have shown that growth and condition of hatchery snook in the wild was excellent.

Salinity Tolerance and Saline Mediated Changes in Chloride Cells of Sheepshead Minnow

Charlene Burke and Wayne A. Bennett. University of West Florida, Department of Biology, 11000 University Parkway, Pensacola, FL 32514. Phone: 850/474-3362. Email: wbennett@uwf.edu

Poster

The sheepshead minnow, *Cyprinodon variegatus* is widely credited as the most saline tolerant teleost known. Indeed, sheepshead minnow have been found at ambient salinities of up to 142. These limits, however, are based solely on anecdotal field evidence and have never been empirically corroborated. We quantifed upper and lower salinity tolerance of sheepshead minnow acclimated at 30C and ambient salinities between 0 and~140 in the laboratory. Determination of both upper and lower tolerance limits were then plotted on ambient salinity to define the fundemental osmoregulatory niche of sheepshead minnow. The presence of sheepshead minnow in extreme saline environments suggests the existence of extraordinary osmoregulatory adaptations. Because chloride cells are the primary excretory organ for monovalent ions in teleosts, it seems reasonable to assume that the osmoregulatory ability of sheepshead minnow is associated with chloride cell ultrastructure. We examine chloride cell ultrastructure via electron microscopy for sheepshead minnow acclimated to different salinity levels. Careful comparison of gill tissue electron micrographs from sheepshead minnow acclimated at "typical" (0 to 70) and extreme (>70) salinities reveal changes in chloride cell number, number of mitochondria and the intracellular tubular network. These changes, no doubt, allow sheepshead minnow to survive osmotic habitats that prove lethal to other fishes.

Using angler reports as an alternative to counting fish in creel surveys

Rich Cailteux and Jeff Nordhaus. Florida Game & Fresh Water Fish Commission, Route 7, Box 3055, Quincy, FL 32351. Phone: 850/627-9674. Email: cailter@gfc.state.fl.us

Thursday: 8:10-8:30

Traditional creel surveys rely on physically counting and/or measuring harvested fish from anglers. However, this has a tendency to alienate a portion of the anglers which may lead to missed or erroneous data being collected. These surveys also rely on the recollection of the angler to the time spent fishing (effort estimates) and the numbers and sizes of released fish (catch). While significant errors in harvest may result from the collection of erroneous data, alienation of anglers may have farther-reaching impacts on one's management program. In an effort to determine if significant differences occurred between reported versus actual harvest estimates of major sportfish, simultaneous creel sampling was done on Lake Talquin. Estimated reported harvest of major sportfish differed by less than +/- 3% from the actual estimated harvest; black crappie, *Pomoxis nigromaculatus*, (16 fish, 0.1%), sunfish, *Lepomis* sp. (228 fish, -1.6%), catfish (Family: Ictaluridae, 78 fish, -2.3%), and largemouth bass, *Micropterus salmoides* (15 fish, -0.9%). Of the 50 boat interviews of black crappie anglers with harvest $\geq$ 5 fish, 66% knew exactly how many fish they had harvested. Thirty-eight percent of the 60 boat interviews of sunfish anglers which had harvested $\geq$ 5 fish, knew exactly how many fish they had harvested. Since our harvest estimates did not vary substantially, relying on angler reported harvest may serve as an alternative to counting fish if alienation of anglers may ultimately depend on the success or failure of your management programs.

Effectiveness of Airboat Electrofishing for Sampling Large Fishes in Freshwater Marshes: Coming Full Circle

John H. Chick (presenter), Sean Coyne, and Joel C. Trexler, Florida International University, University Park, Miami, FL 33199. Phone: 305/348-6253. Email: chickjh@fiu.edu

Thursday: 08:30-08:50

We evaluated the effectiveness of airboat electrofishing for sampling large fishes (SL 8 cm) in shallow vegetated habitats. Concurrent block-net (0.1 ha) and electrofishing data were collected from 11 sites in freshwater marshes of the Florida Everglades. We found significant positive relationships between electrofishing catch-per-unit-effort (CPUE) and both fish density (number / 0.1 ha) and biomass (g dwt / 0.1 ha). Analysis of covariance revealed that estimates of species richness were similar for electrofishing and block-net samples after accounting for differences in the total number of individuals sampled. Airboat electrofishing had both size and species-specific biases, however, suggesting length frequency and species composition data collected with this method should be interpreted with caution. Despite these bias, CPUE from airboat electrofishing was positively related to fish density in block nets for both small (8 SL < 12 cm) and large (SL 12 cm) size classes. Residuals from the regression of CPUE and fish density were

normal with respect to water depth, conductivity, or floating-mat volume, but were positively related to emergent-stem density. This suggests that electrofishing was less effective in sparsely vegetated habitats, possibly because fish were more likely to detect and flee from the airboat, and that emergent-stem density should be used as a covariate in statistical analyses. Our study suggests CPUE from airboat electrofishing provides a useful index of the abundance of large fishes in shallow vegetated habitats.

Aquatic Education Approaches at the Florida Aquarium

Becky Clayton, Florida Aquarium, 300 South 13th Street, Tampa, Florida. Phone: 727/229-8861; Email: bclayton@flaquarium.org

Wednesday: 2:00-2:20

Effects of hurricanes on sea turtle nests and incubation temperatures at Gulf Islands National Seashore Florida District

Andrew P. Diller, Wayne A. Bennett Jr., Mark Nicholas, and Troy Davis. University of West Florida, Department of Biology, 11000 University Parkway, Pensacola, FL 32514. Phone: 850/478-5647. Email: adiller@students.uwf.edu

Poster

Gulf Islands National Seashore's (GUIS) Florida district averaged 37 nests/year from 1994 to 1998. The leading cause of hatchling mortality was nests flooded by tropical weather. Since 1994, five hurricanes and three tropical storms destroyed 27% of nests on GUIS beaches. Beach location of each nest, storm intensity, and distance determined which nests were lost. Surviving nests experienced significant decreases in incubation temperature. In 1997, temperature loggers were buried next to nine nests, six of which were affected by Hurricane Danny. Average nest incubation temperatures ranged between 26.2 and 28.6 C. Hurricane Danny reduced sand temperatures between two and three degrees for up to three days and temperatures did not return to pre-hurricane levels for up to five days. Nests located at the dune line had the highest sand temperatures and were least affected by the hurricane. In 1998, five nests had temperature loggers placed in the nest chamber. Average nest incubation temperatures ranged between 27.4 and 30.1 C. During Hurricane Earl, two nests showed temperature decreases up to eight degrees and additional loggers in near-by beach locations recorded temperature drops up to five degrees. Preliminary data may indicate a male biased sex ratio in GUIS hatchlings. Hurricanes may further increase this male bias.

Comparative Age and Growth of Sheepshead (*Archosargus probatocephalus*) in the Northeastern Gulf of Mexico

Jynessa Dutka-Gianelli and Debra J. Murie. University of Florida, 7922 NW 71st Street, Gainesville, FL 32653. Phone: 352/392-9617 ext. 261. Email: jynessa@ufl.edu

Poster

Sheepshead (*Archosargus probatocephalus)* are widespread in the southeastern United States and Gulf of Mexico. Their commercial and recreational importance has risen in recent years and developing fishery management plans requires data on the sex-specific age and growth of sheepshead. Currently, this information is known only for subspecies *A. p. oviceps* occurring off Louisiana and for subspecies *A. p. probatocephalus* off North Carolina. Age and growth of sheepshead inhabiting the northeastern Gulf of Mexico is unknown. Preliminary data suggest that sheepshead in this area are primarily *A. p. probatocephalus*. In total, 512 sheepshead were collected from Cedar Key to Steinhatchee, Florida, from March 1997 to November 1998. Fish ranged in size from 165-522 mm fork length. Ages were estimated by enumerating annuli in thin-sections of sagittal otoliths and whole scales. Age determination techniques were validated by marginal increment analysis, indicating that one annulus was deposited each year between May and June. Maximum ages of sheepshead were 14 years and 10 years for otoliths and scales, respectively. Based on ages from otoliths, female sheepshead were on average larger than male sheepshead at any give age until 6-7 years old, after which size differences were not apparent.

Recovery of jewfish (*Epinephelus itajara*) populations in the eastern Gulf of Mexico: assessment of population parameters and essential habitat characterization.

Anne-Marie Eklund, Christopher C. Koenig[1], and Felicia C. Coleman[1]. National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, FL 33149. [[1]Florida State University, Department of Biology] Phone: 305/361-4271 Email:Anne.Marie.Eklund@noaa.gov

Tuesday: 2:20-2:40

Jewfish, *Epinephelus itajara*, are large, long-lived groupers that were severely overfished on their spawning aggregations and have, subsequently, been protected from all harvest in U.S. waters since 1990. The species is now a candidate for the US threatened/endangered species list. To assess the recovery of this species, we have been monitoring the density and fidelity of adult spawning aggregations and the distribution and habitat requirements of juveniles. Our censuses on four aggregation sites continue a spearfishers' log that began in 1982. The censuses show an initial decline in abundance from 38-100 fish in 1982 to 1-8 fish 1990, followed by a gradual increase in abundance to 13-40 fish in 1998. The size structure of the aggregations suggest, however, that these adult fish are not new recruits to the population. We have tagged over 300 adults on and off aggregation sites and are now beginning to get reports of tagged fish from popular dive spots on artificial and natural reefs 65-89 nautical miles from the aggregation sites where the fish were tagged. Observations on the aggregations suggest a considerable amount of

movement of individual fish among aggregations. In June 1997 we began tagging juveniles and quantifying significant features of their habitat along mangrove shorelines of the Ten Thousand Islands area of southwest Florida. We have processed scales and dorsal fin spines and rays for age determination in juveniles. The age of the juveniles we have tagged range from 2-7 years, with a mean age of 4. Using acoustic tags, we have been able to monitor the movements of juvenile fish in the mangrove habitat and have found that they live among island undercuts and deep holes in tidal passes throughout the year. Continuing to tag and recapture individuals with the Jolly-Seber mark-recapture technique will lead to estimates of absolute density, survival, degree of site fidelity, and growth.

CTM Methodology and High Temperature Stress in the Atlantic Stingray

Nann A. Fangue and Wayne A. Bennett. University of West Florida, Department of Biology, 11000 University Parkway, Pensacola, FL 32514. Phone: 850/478-5647. Email: nfangue@students.uwf.edu

Poster

Atlantic stingrays are year-round residents of northwest Florida's shallow bays and estuaries that experience dramatic seasonal shifts in environmental temperatures. During the recent December 1998 cold front, temperatures fell to near 0C in St. Joseph Bay (our collection site) and ice formed along the Bay's margins, whereas in July of the same year, mid-day water temperatures exceeded 36C. Clearly, ambient water temperatures play a major role in survival and life history of Atlantic stingray, yet ironically, temperature tolerance has never been quantified for this or any other chondrichthoid fish. We quantified temperature tolerance of Atlantic stingray acclimated to temperatures between 20 to 31C using the critical thermal methodology (CTM). Critical thermal maxima (CTMax) of Atlantic stingray were positively correlated with ambient temperature and increased from 39.3 to 42.8C at the respective acclimation levels. Acclimation dynamics were described by the significant ($P<0.01$) linear regression model: CTMax = 0.32 acclimation temperature + 32.88. Atlantic stingray were shown to be eurythermic, and when corrected for acclimation temperature, demonstrated some of the highest CTMaxima measured for any fish. The Atlantic stingray appears to be well suited for capricious thermal environments showing a seasonal sine-wave CTMax response and maintaining a 20 to 30C differential between CTMax and environmental winter and summer temperatures respectively.

Economic's Terminology and Placing Florida's Fisheries Resources in a National Context

Tony Fedler. University of Florida, Department of Recreation, Parks and Tourism, PO Box 118208, Gainesville, FL 32611. Phone: 352/392-4042. Email:tfedler@hhp.ufl.edu

Wednesday: 09:10-09:30

The Effects of Hydrodynamic and Meteorological Processes on Larval and Juvenile Fish Recruitment through Sebastian Inlet, Florida

Heidi E. Ferrell. Florida Institute of Technology, 1711 Monterey Drive NE Apt. 303, Palm Bay, FL 32905. Phone: 407/729-0967. Email: hferrell@winnie.fit.edu

Tuesday: 3:20-3:40

Sebastian Inlet, on the east central coast of Florida, is one of five inlets leading into the Indian River Lagoon (IRL), an estuarine system of extreme value as nursery habitat for juvenile fishes. The purpose of this study was to determine if storm events and the co-occurring current flows affect the recruitment of larval and juvenile fishes through Sebastian Inlet into the IRL. Sampling was conducted nightly from mid-September 1998 to mid-October 1998. Plankton nets were suspended under the Sebastian Inlet bridge during the first two hours of nocturnal flood tide to capture fish moving into the IRL through the inlet. Recruitment was dominated by mojarras (Gerreidae), five species of snappers (Lutjanidae), jacks (Carangidae), and mullet (Mugilidae). Two major storm events occurred during this time period: Hurricane Georges in mid-September and a northeastern storm in early October. These storm events dramatically increased the abundance, density and diversity of fish species recruiting into the IRL through Sebastian Inlet. Such storm events may be key factors in determining year class success.

Species Composition, Relative Abundance and Trends in Community Structure of Sub-Adult and Adult Fishes in Four Florida Estuarine Systems

Mark E. Flock and Deborah L. Leffler. Florida Marine Research Institute, 100 8th Avenue SE, Saint Petersburg, FL 33701. Phone: 727/896-8626. Email:flock_m@epic7.dep.state.fl.us

Tuesday: 3:40-4:00

Prior to the present study, comparison of adult fish communities found in Florida's estuaries had not been possible due to the few studies that described the sub-adult and adult fish communities utilizing the diverse estuarine habitats found in Florida. In our study, we used gill net samples collected during a standardized sampling program to determine trends in fish communities among and within four Florida estuaries. Samples were collected during spring and fall from 1992 to 1995 in Tampa Bay, Charlotte Harbor, Indian River Lagoon/Banana River, and Choctawhatchee Bay/Santa Rosa Sound. Cluster and ordination via non-metric multidimensional scaling (M.D.S.) analyzes revealed patterns of differences in the composition of fish communities among estuaries and within estuaries. The fish communities in Tampa Bay and Charlotte Harbor were most similar, whereas those in Indian River and Choctawhatchee Bay/Santa Rosa Sound were unique. The two most abundant taxa collected in go estuaries were *Brevoortia spp.* and *Arius felis.* Within each estuary, fish communities varied with location and

with season except in Tampa Bay, where there were no seasonal differences. Only in the Indian River Lagoon and Choctawhatchee Bay/Santa Rosa did community structure vary with year.

"Forbidden Depths"--A behind the scenes look

Grant Gilmore. NASA/Discovery Channel. 5920 First Street, SW, Vero Beach, FL 32968. Phone: 407/853-3281. Email: rggilmorej@aol.com

Thursday: 1:20-2:20

Grant, our illustrious President, will provide a behind the scenes look at his cruise on the research vessel *Seward Johnson* and deepsea submersible, *Sealink*. During their cruise they not only discovered and described several previously unknown species, but also had a chance to interact frist hand with Fidel Castro. The Discovery Channel--Deep Secrets has kept extensive logs of the voyage. Whet your appetitite with their website, then plan to stay to hear a first hand account from Grant on Thursday afternoon.

An Overview of the Fishes in the Rivers of Tampa Bay, Florida

Kathryn Guindon-Tisdel and Iliana Quintero, Florida Department of Environmental Protection, Florida Marine Research Institute, 100 Eighth Avenue SE, St. Petersburg, FL 33701. Phone: 727/896-8626. Email: tisdel_k@epic7.dep.state.fl.us

Wednesday: 4:40-5:00

Low-salinity (<18 ppt) estuarine habitats are known to be essential nursery areas for a variety of young-of-the-year fishes, including many that are economically valuable. In Tampa Bay, much of this habitat occurs in the Alafia, Little Manatee, and Manatee rivers. We used the first two years of data from an ongoing fisheries-independent monitoring program to describe the species composition and abundance of fishes from the tidal portions of these rivers. Fish were collected monthly with 23-m seines and 6.1-m trawls according to a stratified-random sampling design. Overall mean relative fish abundance varied significantly between the three rivers (Tukey, $p < 0.05$). The highest abundance of economically important species was observed in the Manatee River (28 fish/100 m2); however, the difference was not significant between the three rivers ($p > 0.05$). Species diversity was highest in the Manatee River ($H = 1.7$), and species richness was highest in the Little Manatee River ($D = 8.4$). Species richness and diversity were lowest in the Alafia River. Abundances of juvenile *Sciaenops ocellatus, Centropomus undecimalis,* and *Cynoscion nebulosus* and of other economically valuable species also varied significantly between the three rivers and between locations within each river. As a result of these observed variations in abundance, future work is planned to detail the fish community structure in the three rivers and to relate fish abundance to hydrological and physical habitat characteristics.

Overview of the Value of Freshwater Fisheries in Florida--Recreational and Commercial

Scott Hardin. Florida Game & Fresh Water Fish Commission, 620 South Meridian St., Tallahassee, FL 32399. Phone: 850/488-4068; Email:hardins@gfc.state.fl.us

Wednesday: 08:10-08:30

The value of Florida's freshwater fisheries cannot be measured just in terms of dollars and cents. If you've ever had the opportunity to take a kid fishing and seen their face light up, or relaxed on a cool stream after a stressful day of work, or are deeply committed to the beauty and wonder of nature--you know our fisheries are in reality priceless. Nevertheless, some economic figures will help put the importance of these resources into context.

Florida's freshwater sport fishery generates over $1.4 billion in economic output. This provides recreational opportunities to 1.14 million anglers, who take 16.5 million trips. To support these anglers requires jobs for an estimated 18,873 workers and generates $37.4 million in tax revenue.

Commercial harvest fisheries add an additional $13 million to the overall value. Commercial aquaculture, is now under the Florida Department of Agriculture and Consumer Services, but the freshwater portion contributes approximately $16 million worth of freshwater bait, $1 million worth of stockable gamefish, and also provides catfish, sunshine bass, and tilapia that somewhat helps reduce the harvest pressure on native freshwater species.

Aquatic Education Efforts in Salt Water

Doug Haymans. Florida Department of Environmental Protection, 1900 Commonwealth Blvd. MS 210, Tallahassee, FL 32399. Phone: 850/488-6058. Email: haymans_d@epic6.dep.state.fl.us

Wednesday: 1:00-1:20

The Florida Department of Environmental Protection's Division of Marine Resources is committed to educating Florida's citizens and visitors about the natural wonders of the marine environment which surrounds them. Through the use of school programs, facility tours, field studies, and teaching clinics the DMR has successfully reached thousands of Florida students. Through exhibits at boat shows and outdoor events thousands more residents and visitors have learned about what the DMR is doing to help them protect the environment. This presentation will focus on several aspects of DMR's outreach program including Kids' and Ladies Fishing Clinics, the Florida Marine Research Institute and it's Cedar Key Field station and its newly created Florida Foundation for Responsible Angling, a not-for-profit foundation supporting marine education for saltwater anglers.

Spatial and temporal distribution and abundance of benthic fishes collected in the Tampa Bay Estuary

Robert F. Heagey and Julie M. Fine. Florida Marine Research Institute, 100 8th Avenue SE, Saint Petersburg, FL 33701. Phone: 727/896-8626. Email: heagey_r@epic7.dep.state.fl.us

Tuesday: 4:00-4:20

Trawl samples were collected and examined by staff of the Department of Environmental Protection, Florida Marine Research Institute's Fisheries Independent Monitoring program from 1989 to 1997 in order to determine the species composition and spatial and temporal variability of demersal fish that inhabit deeper (>1.0 m), less vegetated portions of Tampa Bay. Five physiographic regions of Tampa Bay (Hillsborough Bay, Old Tampa Bay, middle Tampa Bay, lower Tampa Bay and the rivers of Tampa Bay) were sampled during spring (March -June) and fall (September December); half of the samples were taken during night hours and half during daytime hours. Beginning in 1996, a year-round sampling strategy was instituted in which 30 sites were sampled during daytime hours each month. A total of 232,297 animals were collected (145,953 fishes taken from river samples and 86,344 taken from the four bay regions) in 1,733 trawl samples. The engraulids dominated all regions (52-68%),except the lower bay, where sparids (20.4%) and triglids (19.8%) were dominant. Mean species diversity in the night trawls was significantly higher than in the day trawls. Mean species diversity in the d ver samples was significantly lower than in each of the bay regions. Several species exhibited differential catch rates by season or time of day. *Anchoa mitchilli* were most common in spring daytime trawls (8.0 per 1OOm^2), whereas *Penaeus duorarum* were mostly caught in fall nighttime trawls (2.2 per 1OOm^2). *Cynoscion arenarius* predominantly occurred in fall daytime tows (2.0 per 1OOm^2). Additional discussions will compare demersal fish communities from the five different regions of the bay.

Gape Limitation of the Exotic Peacock Cichlid in Florida, Including a Comparison with the Native Largemouth Bass

Jeffrey E. Hill, Charles E. Cichra, Leo G. Nico, and Carter R. Gilbert. Department of Fisheries and Aquatic Sciences, University of Florida, 7922 NW 71st Street, Gainesville, FL 32653. Phone: 352/392-9617 ext. 236; Email: jcichla@aol.com.

Thursday: 10:10-10:30

This study determined that gape width of the peacock cichlid *Cichla ocellaris* (Perciformes: Cichlidae), as indicated by external mouth width, is a reliable estimator of the maximum size of forage ingested. Gape limitation is important in determining theoretical prey availability to the predator population and is one possible axis of interspecific interaction between co-occurring predators. The peacock cichlid was introduced into southeastern Florida canals by the Florida Game and Fresh Water Fish Commission. The primary biological justification was an unbalanced forage to predator biomass ratio due to an overabundance of exotic species,

especially spotted tilapia *Tilapia mariae*. Regression models of gape width versus length were developed for peacock cichlid and largemouth bass *Micropterus salmoides*. Peacock cichlid gape limitation estimates were tested by analysis of stomach contents and a laboratory forage experiment. No forage fish body depth exceeded the gape width of the predator in the stomach contents analysis. Three individuals ate bluegill *Lepomis macrochirus* slightly exceeding (less than 5 %) estimated gape size in the experiment. Gape width versus total length regression slopes for peacock cichlid and largemouth bass were compared and found statistically different. Peacock cichlid gape was larger below 86 mm TL, while above this length, largemouth bass gape was larger.

Preliminary Investigations of Red Drum Spawning Habitat in Tampa Bay

Peter Hood, Roy Crabtree, and Michael Murphy. Florida Marine Research Institute, 100 8th Avenue SE, Saint Petersburg, FL 33701. Phone: 727/896-8626; Email: hood_p@epic7.dep.state.fl.us

Poster

We conducted preliminary investigations to determine where red drum were spawning in Tampa Bay. This study had two components: 1) a hydroacoustic survey to locate areas where male red drum were emitting drumming sounds associated with reproduction and 2) assessing the reproductive status of schools of red drum captured offshore with purse nets. In the hydroacoustic survey, we used hydrophones to listen for male drumming. This portion of the study was conducted from September 8 to November 12, 1998 in the coastal waters of Tampa Bay. With the exception of one occasion, all male red drum drumming was heard in the Tampa Bay ship channel, and no drumming was heard in waters outside of Tampa Bay. Drumming was heard from October 6 to November 3, 1998, at depths between 13 and 17 m. Seven purse-net collections (one in February and six in September-October) were made in nearshore coastal waters between 1996 and 1998. Ovaries from fish captured in September-October contained oocytes that were in the final stages of oocyte maturation (i.e., spawning was imminent). Based on these observations, we believe there are at least two groups of red drum spawning in the Tampa Bay region: one in the bay, and another in nearshore coastal waters.

Dietary Switch Through Ontogeny in Largemouth Bass, Micropterus salmoides: A Comparison Between Michigan and Florida Lakes.

Steve Huskey. Florida Institute of Technology, Melbourne, FL 32901. Email care of Dr. Turingan:turingan@fit.edu

Thursday: 08:50-09:10 The food habits of two populations (Florida and Michigan) of largemouth bass, Micropterus salmoides, werc investigated to explore intraspecific variation in food resource utilization of this wide-ranging North American species. Florida bass were sampled via

electroshocking, seining, and hook and line in three lakes of the St. Johns River waterway: Kenansville Lake, Stick Marsh/Farm 13 Reservoir, and Garcia Lake, Indian River County, Florida. Bass from Michigan were sampled via electroshocking, gill nets, trap nets, and hook and line in four isolated lakes in southwest Michigan: Portage, Brandywine, Eagle, and Barton. Standard length and total length were recorded and stomach contents were removed via tube-purging. Gut contents were preserved in either 10% formalin or 4% para-formaldehyde and classified into the following major divisions: Plankton, Insect, Shrimp, Crawdad, Fish, and Other. Volumetric analysis of gut contents has determined that the onset of piscivory between these two populations occurs at a different size class, and the maintenance of this piscivorous feeding behavior through ontogeny occurs to a lesser degree in Florida bass. Michigan bass have a much greater tendency to continue feeding on fish once piscivory is achieved.

Fishery and biological data for hogfish, *Lachnolaimus maximus*, in Florida

Michael Johnson, Lew Bullock, and Richard McBride, Florida Marine Research Institute, South Florida Regional Laboratory, Suite 119, 2796 Overseas Highway, Marathon, FL 33050; Phone: 305/289-2330; johnson_mr@epic7.dep.state.fl.us

Wednesday: 4:10-4:30

Hogfish are the largest and most valuable wrasse species in Florida's waters. Recreational and commercial fishers combined caught an annual average of 400,000 pounds during the last 12 years. Declining landings and catch rates, together with rapidly increasing prices per pound, suggest that problems may persist for hogfish populations despite fishery regulations enacted in 1994. Hogfish are hermaphroditic (protogynous) and there is concern that the minimum size limit of 12 inches may be too small to allow females to change to males in heavily fished areas. We are currently reviewing data from the Florida Marine Fisheries Information System, the Marine Recreational Fishery Statistics Survey, and special collections of hogfish. More than 1500 fish have been collected using spears, trawls, and traps. Otoliths were removed for aging and gonads have been fixed for characterizing reproduction. Here, we present our methods of reproductive staging using histological preparations. We will also present preliminary results on the associations between morphometric and pigmentation characters and reproductive development, and we will compare the sizes at first maturity and sexual transformation for fish collected in the northeastern Gulf of Mexico v. the Florida Keys.

Industry Perspective on Recreational Fishing and How to Increase Participation

Glenda Kelly. International Game Fish Association, 300 Gulf Stream Way, Dania Beach, FL 33004. Phone: 954/927-2628. Email:igfa@ix.netcom.com

Wednesday: 11:30-11:50

The International Game Fish Association is the organization that sets the standards and rules for ethical sport fishing. In January, the IGFA formally opened its World Fishing Center, putting us in the unique position to promote and expand the public's awareness of recreational angling and aquatic resources.

The IGFA World Fishing Center is designed to tell the story and celebrate the history of fishing and of the IGFA and pay tribute to the legacy of sportfishing pioneers and fishing greats. We also want to interest the public in pursuing the sport of fishing locally and worldwide, promote ethical angling and habitat conservation and display the science and artistry of this important international sport.

The IGFA World Fishing Center brings the sport of fishing to life through state-of-the-art exhibits and displays, life size sculptures and models, dynamic multi-media presentations, interactive computer technologies and virtual-reality experiences. Our programs foster the life long pursuit of understanding, advocacy and action on behalf of the world's fish populations and aquatic habitats. The theme for the IGFA World Fishing Center is the "essence of fishing." We want anglers and non-anglers to experience the nature of fishing-from the behaviors and habitats of fish, to the technology of tackle, the thrill of the catch; from the history of the sport, to great anglers and enthusiasts, to the world's best fishing spots.

The 60,000 square foot museum houses seven major galleries, a 12,000 volume research library, rare book room, a learning laboratory, the Fishing Hall of Fame and headquarters for IGFA. Outside are a marina, demonstration areas and a unique living laboratory, the 3.5-acre John A. Morris Wetlands. Conservation of fish and aquatic resources is a theme that is apparent throughout the state-of-the-art center.

Homing Behavior and Spatial Use of Gag Grouper, *Mycteroperca microlepis*

Brian L. Kiel and William J. Lindberg. 8228 SW 42nd Avenue, Gainesville, FL 32608. Phone: 352/392-9617 ext 237. Email: bkiel@grove.ufl.edu

Thursday: 11:30-11:50

While the life history of most reef fishes is well known, little is known about fish movements. Yet, this information can play an important role in refining our population estimates and fishery management plans. The purpose of this study was to examine movement behavior and spatial use of gag grouper, *Mycteroperca microlepis*. Specifically, the objectives of this study were to (1) demonstrate that juvenile-to-adult gag have the ability to home after experimental displacement, (2) to determine at what distances juvenile-to-adult gag can home from, and (3) to experimentally test those distances. Tagged gag also provided information pertaining to home range size, site fidelity, and diel use of space. Eighteen ultrasonically tagged gags were displaced up to eight kilometers to determine homing distances. Homing behavior was then tested at three and four kilometers and at two and three kilometers (N=90 tagged gag). Results indicate that gag displaced at two kilometers tested significantly better at homing than gag displaced three and

four kilometers. Additionally, gag home range size was small and gag site fidelity was very strong with gag maintaining a close association with a core area. It was concluded that gag can home and that homing decreases as distance displaced increases.

Prey Selectivity of a Larval Fish: Variability Among Developmental Stages

Justin M. Krebs and Ralph G. Turingan. Florida Institute of Technology, Melbourne, FL 32901. Email: jkrebs@winnie.fit.edu

Poster

It has been hypothesized that larval fish mortality due to starvation is a major cause of low recruitment into natural populations of marine fishes. The consequences of this may have serious implications for the stability of a population and therefore requires further investigation.

Factors that appear to influence successful prey capture by larval fishes include (1) development of feeding and sensory mechanisms and (2) environmental parameters. A first step in understanding the role of these factors in prey selection by larval fishes (variation in type and number consumed) is to look at several factors that can be experimentally manipulated. While much research has concentrated independently on both the feeding ecology of larvae and their morphological and behavioral development, little is known of the correlative properties of feeding success and development during the early life history stage.

Variability of prey size selectivity was studied throughout the development of larval red drum, Sciaenops ocellatus. Larvae at specific developmental stages (first feeding, pre-flexion, notochord flexion and metamorphosis) were presented prey of three discrete sizes at one of three light intensities. The number of prey ingested, as well as the mean prey size selected, were determined and these values were compared between developmental stages and light intensities. Developmental complexity of the oral jaw (ossification and structural integration) and opercular series, as well as visual sensitivity, will be considered when comparing prey selectivity between stages of development.

The influence of environmental parameters in determining the fish assemblages of large mobile species in the Indian River Lagoon, Florida.

Sven R. Kupschus & Derek M. Tremain. Florida Marine Research Institute, Indian River Field Laboratory, 1220 Prospect Ave. (Suite 285), Melbourne, FL. Phone: 407/952-2662. Email: kupschus_s@a1@epic7.dep.state.fl.us.

Tuesday: 4:20-4:40

We collected 576 haul seine samples to monitor adult and subadult fish populations in the Indian River Lagoon (IRL) from November 1996 to May 1998. We used two ordination techniques to

analyze the forty most abundant species (98.9% of the total catch) and to determine the effects of latitude, distance from inlets, temperature, salinity, water depth, lunar period, sampling month, seagrass cover, time of day, and shore vegetation on catch composition.

We observed a transition in species assemblages from north to south, correlated with latitude and temperature by detrended correspondence analysis. Temperate estuarine species such as *Sciaenops ocellatus, Pogonias cromis,* and *Mugil curema* dominated samples in the northern part of the IRL. These species were replaced by more tropical marine species such as *Sphyraena barracuda, Lutjanus synagris,* and *Diapterus plumeri* in the south. Other important environmental factors on the secondary and tertiary axes were water depth (associated with the presence of clupeids and gerreids), seagrass cover (associated with the presence of *Bairdiella chrysoura, Lagodon rhomboides,* and *Orthopristis chrysoptera*) and sampling month (associated with the presence of seasonally abundant species such as *L. rhomboides, O. chrysoptera,* and *Lachnolaimus maximus*.)

The results of the discriminate function analysis confirm a major north-south split in community assemblages, with the greatest rate of change found near latitude 28N. This split coincided with the most northerly extent of tidal effects in the Indian River as well as the approximate boundary between warm-temperate Carolinian and tropical Caribbean faunal provinces. The first division proximally describes the presence of *S. ocellatus* north of this latitude and *Selene vomer, Centropomus undecimalis,* and *S. barracuda* south of this latitude. The environmental data identified intermediate distances from inlets and intermediate salinities as the conditions responsible for this first split. Subsequent subdivisions in the species data were mainly correlated to more extreme values for the above environmental variables.

The ordination techniques used in this study indicated that the changes in fish assemblages in the Indian River Lagoon follow a north-south trend, but because latitude, distance from inlets, temperature, and salinity covaried, a causal relationship could not be assigned. Depth, seagrass cover, and sampling month accounted for a significant fraction of the remaining variance. However, both techniques explained less than 20% of the total variance, indicating that the species associations were dynamic and flexible.

Aquatic Education Efforts in Florida's Fresh Water

Steve Marshall. Florida Game & Fresh Water Fish Commission. 8535 Northlake Blvd., West Palm Beach, FL 33412. Phone: 561/791-4730. Email: marshas@gfc.state.fl.us

Wednesday: 1:20-1:40

The Florida Game and Fresh Water Fish Commission's Division of Fisheries provides education programs to its constituents with two main goals in mind. First, to improve the quality of aquatic resources by changing people's behavior toward helping conserve and restore habitat. Second, to promote freshwater fishing opportunities that encourage the public to abide by rules and ethics in order to minimize adverse impacts on aquatic resources and resource users. Fishing clinics,

seminars and special events that are thematically centered around fisheries and fishing are some of the tools used to accomplish our goals. Mentor programs like Summer Teacher Internships and Student Internships help us spread the word of the benefits of proper aquatic habitat management. The production and distribution of curriculum materials to schools further the process of educating the next generation on the proper use and protection of aquatic environments. These curriculum materials, which are designed for classroom use, are coupled with on-site visits and hands-on programs at our aquatic education centers located in Boca Raton and west of Tallahassee. Specialty programs like, Becoming an Outdoor Woman and Ladies Bait Your Own Hook, are other avenues used to promote our message. One additional way we expand our message is by assisting in the refinement or implementation of aquatic related programs overseen by others such as: Aquatic Wild; Hooked on Fishing Not on Drugs; the Fishing Tackle Loaner Program; and the 4-H Sportfishing Program. Through these and other education efforts, the Division of Fisheries seeks to create constituents and anglers for Florida's vast and diverse freshwater habitats.

Species Composition, Habitat Associations, and Community Structure of Fishes and Selected Invertebrates in Charlotte Harbor, Florida

Michael E. Mitchell, Gregg R. Poulakis, David A. Blewett, and Charles F. Idelberger. Florida Marine Research Institute, Charlotte Harbor Field Station, 1481-A Market Circle, Port Charlotte, FL 33953. Phone: 941/255-7403.

Tuesday: 4:40-5:00

Charlotte Harbor's large open basin, abundant seagrasses, and extensive mangrove shoreline provide productive habitat for a diverse fish community. In the present study, more than 3 million fishes and invertebrates representing 215 species were collected in seines, trawls, and experimental gillnets as part of a fisheries-independent monitoring program from 1989-1997. Thirty-six of the species collected represent new records for Charlotte Harbor. In a spatial analysis of the seine data, a total of 82 taxa and 1,095,259 individuals were identified and enumerated from the 1260 stratified-random samples collected in the bay. Community data were analyzed by using heirarchical agglomerative cluster analysis and nonmetric multidimensional scaling. Bray-Curtis similarities and Euclidean distance were used as the distance measures for biotic and abiotic data, respectively. A percentage similarity technique was also used to assess the contribution of each species to within- and among-group similarities. Samples collected along shorelines with overhanging vegetation (mangrove group) and samples collected >5m away from shore over seagrasses (flats group) formed the two major habitat groups in the analysis. Similarity analysis indicated that the mangrove group and the flats group had within-group similarities of 78% and 80%, respectively, and an average dissimilarity of 28%. The mangrove group was distinguished by *Menidia spp., Fundulus majalis, Eucinostomus harengulus, and Centropomus undecimalis.* The flats group was distinguished by *Orthopristis chrysoptera, Bairdiella chrysoura, Cynoscion nebulosus, Mugil gyrans,* and *Syngnathus floridae.* Combinations of 3-6 environmental variables best described the biotic ordination, with

correlation coefficients ranging from 0.59 to 0.67. Salinity and depth were the most descriptive abiotic parameters identified in the analysis.

The Use of Fisheries in Secondary Education

Don Morrison. Aquatic Sciences Instructor, Oak Ridge High School, 6000 S. Winegard Rd. Orlando, FL 32809 (407) 855-2911 voicemail ext. 550

Wednesday: 1:40-2:00

Secondary education is a unique forum that allows the introduction of many diverse subject areas to a captive audience. This captive audience is not always open to the subject matter that you want to teach. One of the most important aspects in teaching any subject is "hooking" the student. How do you get the students interested so they want to learn? Some of the common questions students ask are, "Why do I have to know this?" or "What good is this to me?"

Florida, due to its vast aquatic and marine habitats, offers an opportunity for the introduction of fishery sciences to secondary students that few states can match. I use fisheries in my classroom to teach students about the local marine and aquatic habitats and how these habitats affect them. By the use of hands on activities and labs including dissection, I show students what is in their environment and how it can help or harm them.

In my marine science classes, I rely heavily on classroom lab activities. I normally do a comparative anatomy lab using live specimens followed soon after with a dissection of the same or similar species. This allows students a different perspective of the animal that they would not normally receive by dissection alone. On occasion, I've been known to provide an edible sample of the species under study.

Oak Ridge High School's aquaculture facility offers a unique opportunity for my limnology students. In this facility, the students culture and maintain a polyculture of different species (currently channel catfish and tilapia). Students learn from hands on experience the importance of water chemistry, bionitrofication, fish growth rate, and several other important chemical and physical parameters. This class is taught mainly using a hands-on approach, involving the use of field studies of local environments to teach water chemistry, species identification, sampling techniques along with several other different limnology techniques.

In my experience, fisheries education in secondary schools is an untapped resource to better promote the understanding of fishery science objectives and to nurture the next generation of fishery scientists.

Age and Growth and Total Mortality of White Grunt in the Eastern Gulf of Mexico

Debra J. Murie, and Daryl C. Parkyn. University of Florida, 7922 NW 71st Street, Gainesville, FL 32653. Phone: 352/392--9617 ext 245. Email: dmurie@nervm.nerdc.ufl.edu

Thursday: 10:30-10:50

Spawning and non-spawning total mortality and sex-specific age and growth were determined for white grunt (*Haemulon plumieri*) collected from the head-boat fishery between St. Petersburg and Crystal River, Florida. Grunts were sampled during the peak of their reproductive season (April-June) and in the subsequent post-spawning period (July-October). Based on sectioned otoliths, male grunts attained a larger size than females for all fish over two years of age. Females reached an asymptotic length at about 320 mm total length while male growth curves were asymptotic near 340 mm. Marginal increment analysis determined that a single annulus was deposited yearly, primarily during April-June. White grunts recruited into the fishery at 2 years of age and most fish landed were in age classes 2, 3, and 4. Maximum observed age of grunts was 18 years for females and 15 years for males. An ANCOVA determined that instantaneous total mortality (Z) estimates from catch curves did not differ among spawning females, spawning males, post-spawning females, and post-spawning males. A pooled Z-estimate (-0.357) was used to calculate a total annual mortality (*A*) of 30% (*A*=25-35% with 95% confidence limits).

Evaluation of Stocking Advanced-Size Black Crappie Fingerlings in Florida.

Randall A. Myers, Mike Allen,[1] Douglas E. Colle,[1] and James B. Rowe. Florida Game and Fresh Water Fish Commission, 7922 NW 71st Street, Gainesville, Florida 32653. Phone: 352/392-9617, ext. 240. Email: myersr@gfc.state.fl.us
[1]University of Florida

Poster We examined the feasibility of mass culturing advanced-size black crappie fingerlings (90-160 mm total length, TL) and assessed the effectiveness of micro-wire tags for marking fingerlings for stocking evaluations. Approximately 142,000 advanced fingerlings were reared in four 0.4-ha ponds during spring-fall 1997. An inverse relationship existed between total length and density of fingerlings in culture ponds ($R2 = 0.93$, TL= 155912 + -991(density), $P < 0.01$). We used coded wire tags to mark fish prior to stocking. In January 1998, Lake Jeffords (65 ha) was stocked with wire-tagged fingerlings (315/ha). Mortality was assessed 24 hours after stocking by placing 100 fish into cages located at the lake. Mortality averaged 76%, resulting in an estimated final stocking rate of 76/ha survivors at 24 h after stocking. Conversely, untagged fish stocked into another lake had only 5% mortality after 24 h. Thus, high mortality of tagged fish was likely related to extra handling during the tagging process. Contribution of stocked fingerlings to the population was assessed during fall 1998.

Overview of the Value of Marine Fisheries in Florida--Recreational and Commercial

Joe O'Hop, Steve Brown, Martha Norris, Richard Cody and S. Holliman. Florida Department of Environmental Regulation. 100 8th Avenue SE, Saint Petersburg, FL 33701. Phone: 727/896-8626; Email: ohop_j@epic7.dep.state.fl.us

Wednesday: 08:30-08:50

Florida's estuarine and marine habitats support a rich diversity of marine life which in turn support valuable recreational and commercial fisheries. Each year, over 2 million recreational anglers participate in saltwater fishing in Florida, taking more than 20 million fishing trips and spending more than US$2 billion on trip-related costs, equipment, transportation, food, and lodging. Annually, more than 16,000 fishermen, over 1,200 wholesale and 4,000 retail seafood dealers participate in commercial fishing in Florida. Over 350,000 commercial fishing trips are reported each year, resulting in over US$200 million in dockside sales of saltwater products such as fish and invertebrates destined for food and bait markets as well as marine life for the tropical aquarium and shell shop industries. The dockside sales represent only a small portion of the economic impact to Florida of our commercial fisheries. The for-hire fisheries (head/party boats, charter boats, and guide fishing) also contribute to the value of our fisheries both in services for marine recreational anglers and sometimes in commercial sales of fish in Florida. Recreational and commercial fishing support a diverse array of related industries, and are important parts of the state's economy.

Differential growth and survival of early vs. late - hatched black crappie in Lake Wauberg, Florida

William E. Pine and Mike S. Allen. Department of Fisheries and Aquatic Sciences, University of Florida, Gainesville, FL 32653. Phone: 352/392-9617. Email: wep@gnv.ifas.ufl.edu

Thursday: 9:10-9:30

Black crappie *Pomoxis nigromaculatus*, like many fishes, exhibit highly variable recruitment due to varying larval and juvenile abundance, growth, and survival during early life. To evaluate factors related to recruitment, we examined how hatch date, growth rate, and survival varied among 7-day cohorts of juvenile black crappie at Lake Wauberg, Florida (100-ha hypereutrophic natural lake). Fish were collected weekly in spring 1998 and then twice per month during summer 1998 using an otter trawl (3.7-m mouth, 4.6-m body, 8.4-mm bar mesh body, 6.4 mm bar mesh bag). Black crappie recruited to the trawl at approximately 20-mm and were first collected on April 16. Collections continued until all fish exceeded 100 days old (August 25). Based on daily otolith increments, the majority (>90%) of hatching occurred over a two-month period (March 4-May 5). Survival rates were highly variable among 7-day cohorts and instantaneous mortality ranged from 0.04 to 0.42 (4% to 34% daily mortality). However, late-hatched fish (e.g., May 14) experienced more rapid growth rates (0.98 mm/day) than did early-hatched fish (e.g., March 4, 0.68 mm/day, one - way analysis of variance, $P<0.05$). Rapid growth of late - hatched fish relative to early - hatched fish could be advantageous for survival to

adulthood. Thus late-hatched black crappie may have exhibited higher recruitment to adulthood than early-hatched fish in this study.

The Use of Sonic Tags to Track Mixed Assemblages of Wild and *Hatchery-Reared Red Drum*

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Tuesday: 2:40-3:00

The first hatchery release of Florida Department of Environmental Protection (FDEP) red drum in Biscayne Bay occurred in early 1990. Since that time, several different techniques (trammel nets, beach seines, hook-and-line, and voluntary angler tag returns) have been utilized in an attempt to assess the survival and contribution of these fish. Although volunteer angler returns have provided data on over 103 legal and 5 over-slot red drum, the frequency of these returns is low and the quality of this information is often suspect. Periodic field sampling attempts by FDEP scientists using traditional netting and fishing techniques resulted in the recovery of only 4 fish. In early October 1998, 800 legal-sized hatchery-reared red drum (457 - 609 mm TL) received both coded-wire and internal-anchor tags prior to being released as part of an ongoing external tag retention study. At the same time, 60 red drum (483 - 508 mm TL) were tagged with sonic tags (operational for 14-months). In mid-October, the sonically tagged fish were mixed randomly with the coded-wire/internal-anchor tagged fish. These mixed groups were released over two weeks at three sites in southern Biscayne Bay. Within two months of their release, the sonic fish led FDEP and Mote Marine Laboratory sampling teams to recover 61 tagged and 4 unmarked legal-sized red drum. These fish originated from 3 different release groups, including groups released prior to this experiment. Preliminary results suggest that the release of a relatively small number of sonically tagged red drum may be an effective method for locating and tracking a larger group of non-sonically tagged hatchery fish.

What's the Catch? US Trends in Consumption of Fishery Products--Aquaculture vs. Capture Fishery Products.

Adelaide Rhodes. Florida State University, Dept. of Geography, Bellamy Building, FSU, Tallahassee, FL, 32306-2190. Phone: 850:645-0129 . Email:arhodes@odie.ispa.fsu.edu

Poster

According to the U.S. National Marine Fisheries Service's most recent annual summary on the imports and exports of fishery products, 1997 U.S. imports of edible fishery products were valued at $7.8 billion, a $1 billion increase over 1996. At the same time, exports fell from $2.9

billion to $2.6 billion. Taking into account the re-export of edible fishery products, the U.S. trade deficit for edible fishery products increased from $3.77 billion in 1996 to $5.09 billion in 1997, which represents a 35% increase in one year.

This growing deficit in fishery products, edible and non-edible, is receiving increased attention from federal government agencies that provide oversight for commercial fishing and aquaculture. Recent policy documents, such as the National Oceanic and Atmospheric Administration's Fisheries Strategic Plan adopted in 1997, propose that the fishery products deficit could be reduced- if national production strateoies focused on the aouaculture of higher value products (i.e., shrimp, which United States consumers prefer).

This presentation attempts to answer fundamental questions underlying the proposed expansion of domestic aquaculture for the purposes of alleviating the trade deficit in fishery products. For example, how much of the seafood consumed in the U.S. is composed of aquaculture products? Because of an apparent lack of domestic production in the high value sectors, are we being forced to import more and more of these products? Are there opportunities for diversification and expansion of domestic aquaculture that the U.S. could utilize to erase some of the growing fishery products trade deficit? These questions are not addressed in official U.S. statistics on the fishery products trade balance, because no distinction is made between cultivated and captured products for imports or exports.

This presentation will compare U.S. and world trade statistics for aquaculture and capture fishery products in order to determine the impact that each has on the overall U.S. fishery products trade deficit. Separating the value of cultivated versus captured fishery products should provide a clearer understanding of the trends in U.S. fishery product consumption and production. These trends are critical to determining the appropriateness of increasing domestic aquaculture production for reducing the U.S. trade deficit in fishery products.

LAKEWATCH as a means of Educating the Public about the Aquatic Environment

Amy Richard. LAKEWATCH, University of Florida, 7922 NW 71st St., Gainesville, FL 32653. Phone: 352/392-9617 x 228. Email: arich@gnv.ifas.ufl.edu

Wednesday: 2:20-2:40

The success of Florida LAKEWATCH is based on the simple idea that citizens want to be involved in a cooperative approach to managing Florida waters - and they are willing to put their money (sweat equity) where their mouth is.

Once this became obvious to a handful of people at the University of Florida's Department of Fisheries and Aquatic Sciences, the seed was planted and eleven years later, LAKEWATCH continues to build and maintain a bridge between the public and water management decision makers.

To achieve this goal, Florida LAKEWATCH:

* Recruits, trains, certifies and provides sampling materials to volunteers who use their own boat for collecting water samples, and data, on diverse water bodies statewide;
* Facilitates a working partnership among government, regulatory agencies, businesses, farmers and ranchers, developers, city planners, realtors, students, researchers and the public - by providing an open forum at meetings for folks to discuss water management issues and concerns;
* Utilizes University of Florida's water chemistry laboratory in the Department of Fisheries and Aquatic Sciences to analyze samples. Florida LAKEWATCH data are used to document nutrient levels (nitrogen and phosphorus), algae content, and water clarity. Over time, a baseline of information is established, providing a useful tool for managing Florida's diverse waters;
* Uses a computer database and communications network at UF's Institute of Food and Agricultural Sciences, as well as a pre-existing state database to provide data to anyone who wants it, including volunteers themselves, interested citizens, lake management groups, schools, as well as government and regulatory agencies.
* Provides educational opportunities through various publications including regular newsletters; educational materials on how to interpret water monitoring data, basic limnology concepts, and how-to create lake management associations, etc.; acting as a roving lake management library for the public by providing a selection of articles and publications at regional meetings, and most importantly,
* Maintains an open and on-going communication link with thousands of citizens, one-on-one, with regular phone calls and e-mail, and at annual regional meetings at dozens of locations across the state.

Thermal Tolerance and Resistance Responses of Sheepshead Minnow Acclimated at Various Ambient Salinities

Jodie L. Rummer, Nann A. Fangue, and Wayne A. Bennett. University of West Florida, Dept. of Biology, 11000 University Parkway, Pensacola, FL 32514. Phone: 850/478-5647. Email: jrummer@students.uwf.edu

Poster

Fish isolated in shallow Florida tide pools may endure diel temperature shifts of 20C or more as well as simultaneous, rapid, large-scale changes in ambient salinity. No fish is more successful at exploiting these harsh habitats than the sheepshead minnow *Cyprinodon variegatus*. Studies of sheepshead minnow responses to changing salinity-temperature regimens may provide useful insight into how other fishes in more hospitable environments cope with similar, though less extreme, problems. We used traditional static dose-response methods (i.e., the Fry technique) to estimate 12-h thermal tolerance and resistance of sheepshead minnow acclimated at ambient salinities of 0 (freshwater), 10 (isotonic), 35 (seawater) and 70 (transition salinity between osmoregulation and osmoconformation). Fish demonstrated no significant change ($P>0.05$) in incipient lethal temperatures ($P<0.001$) - temperatures lethal to 50% of fish at 12-h - (values between 39.3 and 40.5C) at these salinities. However, median lethal exposure times - time to

50% mortality - of fish acclimated at 31C and plunged into 41.4C decreased significantly ($P<0.001$) with increasing ambient salinity from 97.9 min at 0 to 18.51 min at 70. Our results suggest that sheepshead minnow survival is more heavily influenced by resistance than tolerance and imply that temperature responses of fishes are more meaningful if resistance is included with traditional thermal tolerance measures.

Early life history of bonefish, Albula vulpes, from the waters of the lower and middle Florida Keys

Derke Snodgrass and Roy Crabtree. Florida Marine Research Institute, 2796 Overseas Highway, Suite 119, Marathon, FL 33050. Phone: 305/289-2330. Email: snodgrass_d@epic7.dep.state.fl.us

Thursday: 10:50-11:10

We captured 682 young-of-the-year bonefish, Albula vulpes, in 55 collections made between July 1994 and July 1998 in the waters of the Florida Keys. Bonefish were captured with a 21.3-m beach seine constructed with 3.2-mm mesh along ocean-side sandy beaches with scattered patches of turtle grass (Thalassia testudinum) in water from 0.3 to 1.3m deep. Both metamorphic leptocephali (n=106) and juveniles (n=576) were captured. Bonefish leptocephali recruited to sandy beaches during winter and early spring and were found in water temperatures ranging from 16.0 to 28.2 C and salinities ranging from 10.4 to 37.0 ppt. Leptocephali ranged in length from 20 to 55mm SL and were captured during December-April. Juveniles ranged in length from 19 to 142mm SL and were captured during all months but were most abundant during January-April. Most juveniles were less than 100mm long, and larger juveniles (100 to140mm) were present only during August-October. Mean lengths of juveniles increased linearly during April-October at a rate of o.6mm per day. Juveniles longer than 140mm either moved to a habitat that we did not sample or were able to avoid our seine. Stomach contents from 139 bonefish ranging from 21 to 142mm SL were examined. Juvenile bonefish fed on a variety of polychaetes and small crustaceans, principally copepods, amphipods, and caridean shrimps.

National Sportfishing Marketing & Promotion

Rob Southwick, Director, Fishing Tackle Loaner Program, American Sportfishing Association, Phone: 904/277-9765; email: southaso6@pipeline.com

Wednesday: 10:50-11:10

Sportfishing is like any other activity. To maintain and increase participation, we must actively promote its benefits and advantages to infrequent anglers and non-participants. This is done via marketing and promotion efforts. These efforts occur at the local, state and national level.

At the national level, efforts should focus on supporting local sportfishing promotion activities. Local organizers understand the preferences and nuances of each community and have access to fishing sites and promotional outlets (media, schools, etc). National partners often have access to items missing at the local level such as equipment, regional and national media, and contacts to other potential sponsors. By working together as partners, national and local level sportfishing event organizers compliment each other's strengths to reach more people with increased effectiveness.

National sportfishing promotions include the ASA's Fishing Tackle Loaner Program and Future Fisherman Foundation, 4-H and National Fishing Week (both sponsored in part by the ASA), and private efforts such as the All-American Fishing Derby. The Fishing Tackle Loaner Program will help you establish local loaner programs and provide access to discounted tackle and free posters, advertisements and other promotional aids. Do not overlook other local and national partners outside of the fishing world such as Rotary, Civitan/Ruritan, Boys and Girls Clubs, and others who may want to use fishing to further their own community-oriented goals.

The Effects of Competition and Age-structured Predation in an Everglades Fish Community.

Ryan C. Taylor. Florida International University, Miami, FL 33199.
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Thursday: 09:30-09:50

I conducted a series of experiments to examine the potentially interactive effects of competition and age-structured predation in an Everglades fish community. My study focused on three of the most abundant Everglades fish species: the eastern mosquitofish, *Gambusia holbrooki*, the sailfin molly, *Poecilia latipinna*, and the bluefin killifish, *Lucania goodei*. These three species represent approximately two-thirds of all fish found in Everglades' marshes. All three species co-occur in the same habitat and have overlapping diets.

To examine the effects of competition and predation, I conducted three

experiments in outdoor mesocosm tanks. My first experiment was designed to be most sensitive to the effects of size-structured predation and asked if adult fish of any of the three species were important predators on juvenile fish.

The second experiment relaxed the effects of predation to more fully address the effects of competition. Here I looked for evidence of competition between juvenile mosquitofish and juvenile sailfin mollies. I also looked for evidence of competition between the juveniles and adults of any of the three species. The final experiment added an additional level of complexity, and I asked if interactions among adults of different species ameliorated the results found in the first experiment. In this portion of my study, adults of different species were added to tanks in various combinations, rather than using single species adult-juvenile interactions.

The results of my experiments suggest that adult mosquitofish are important predators on both juvenile sailfin mollies and juvenile mosquitofish. Both species of juvenile fish suffered high levels of mortality in the presence of adult mosquitofish, whereas juvenile mortality was low in the presence of adult sailfin mollies or bluefin killifish. The level of survivorship for juvenile fish did not increase when adult mosquitofish were placed in tanks with other adult species, suggesting that interactions between adult species do not interfere with the predatory ability of adult mosquitofish.

Growth rates of juvenile mosquitofish were strongly affected by density. They exhibited much slower growth rates in tanks containing high densities compared to tanks containing low densities of juvenile mosquitofish. Growth rates of juvenile sailfin mollies were unaffected by the density of juvenile mosquitofish. Growth rates of juvenile sailfin mollies were affected by the presence of adult mollies. They exhibited the slowest growth rates in the presence of adult mollies, although this result was non-significant.

My experiments demonstrate that predation and competition may have important regulatory effects in this fish community. The effects of predation and competition on juvenile mosquitofish were both strong, indicating that mosquitofish populations may be regulated by intraspecific processes. Competition between adult and juvenile sailfin mollies was weak but the effects of predation by adult mosquitofish on juvenile mollies was strong. Thus, interspecific processes may be more important in the population dynamics of sailfin mollies.

Tackle Manufacturer's Perspective on Recreational Fishing and How to Increase Participation

Nick Venditti. Classic Fishing Products & Culprit Lures. P.O. Box 121249, Clermont, FL 34712. Phone: 407/656-6133. Email: culprit@mindspring.com

Wednesday: 11:10-11:30

Initiatives to Increase Fishing Participation and License Sales.

Bob Wattendorf. Florida Game & Fresh Water Fish Commission, 620 South Meridian Street, Tallahassee, FL 32399. Phone: 850/488-0520; Email: watt@mail-me.com

Wednesday: 10:10-10:30

From 1979 through 1989 there was a slow but fairly steady increase in freshwater resident fishing license sales, going from 460,000 per year to 542,000 per year. However, that trend has reversed in the past decade declining to a 20 year low in 1997 of 398,000. There is no evidence to show this is a result of lessening quality of the fisheries themselves or that it was a response to crowding. Consequently, we believe that taking a marketing perspective can and will reverse this

trend. Moreover, we consider angling participation to be critical to the future conservation and restoration of the resource since funding for management comes almost exclusively from user fees. These include license revenues, the Federal Aid in SportFish Restoration excise tax on tackle, import duty on boats and motorboat fuel tax, and a transfer of some of the Florida boat registration fees.

Marketing initiatives to increase freshwater fishing participation and license sales begin with trying to change the agency culture to be more oriented toward customer satisfaction and attentive to the specific needs of anglers and other aquatic resource users. Increasing access, providing additional training, more how-to and where-to fishing information are all part of this effort. In addition, however, we have also tried some more specific marketing approaches such as the five- year fishing license promotion. This effort was initiated for the first time in the country in 1997, using a value-added package to get anglers to purchase a specific license. The result, with little advertising, was a nearly seven-fold increase in five-year licenses sold during the two-month promotion. In 1998, we repeated the promotion for two-months and generated nearly 12 times as many five-year licenses sold as compared to the baseline. The promotion is taking place again right now and promises to do just as well.

The Use of Aquatic Animals in Research: Regulation, Review, Responsibility and Recommendations

Robert M Werner, Florida State University, Laboratory Animal Resources, 101 Biomedical Research Facility, Tallahassee, FL 32306. Phone: 850/664-4262. Email: nwerner@mailer.fsu.edu

Wednesday: 3:40-4:00

Regulations for using aquatic animals vary depending on the species, the intended procedures, location of capture, intended use, as well as requirements of the funding agency. Capture and use of many species is regulated by state governments and some by Federal agencies. Most workers are familiar regulations regarding capture and holding of animals but there is less understanding of funding agency requirements. For example the National Science Foundation and the National Institutes of Health have specific requirements regarding all vertebrate animal use at awardee institutions and failure to comply can jeopardize all funding at the institution.

Review and approval of research using animals and oversight of care and use is the cornerstone of assuring appropriate use, relied upon by some funding agencies. An appropriately constituted Institutional Animal Care and Use Committee(IACUC) is expected to provide this function.

Responsibility for appropriate animal use falls on the Principal Investigator but also extends to the IACUC, the Institutional Official in charge and ultimately to the Institution. Public concern as to the use of animals in research increasingly extends to all species. Responsiveness to concerns will assure the public, which is the ultimate source of most research funding, that animals are used responsibly.

Recommendations as to appropriate guidelines for aquatic species use have been made in "Guidelines for Use of Fishes in Field Research" prepared by the American Society of Ichthyologists and Herpetologists, The American Fisheries Society, and the American Institute of Fishery Research Biologists. These guidelines address Principal Investigator assurances, the role of the IACUC, and many specific procedures such as handling, restraint, anesthesia, and euthanasia. The AFS has recently adopted a position statement titled "Responsible Use of Fish and Other Aquatic Organisms" which includes as part of policy that any use of aquatic species should be conducted in accordance with the best scientific and professional information available and consistent with humane practices, including those outlined in "Guidelines for Use of Fishes in Field Research" and Guide for the Care and Use of Laboratory Animals (National Institutes of Health).

Development of a 183-meter Purse Seine as an Estuarine Fish Monitoring Tool

Michael Wessel and Brent Winner. Florida Department of Environmental Protection, Fisheries Independent Monitoring Program, 100 8th Avenue SE, Saint Petersburg, FL 33701. Phone: 727/896-8626. Email:WESSEL_M@epic7.dep.state.fl.us

Thursday: 11:10-11:30

The purse seine is an ancient fishing gear that has been used for centuries in subsistence fisheries throughout the world. The development of the purse seine in commercial fisheries occurred principally in the 20th century. In North America, the first large-scale use of the purse seine was in the menhaden fishery in the 1940s. Since that time, purse seines have revolutionized the Pacific tuna, northwest Pacific salmon and North Sea herring fisheries because of their efficiency in capturing these schooling fish. Though successful in commercial fisheries, the use of purse seines in scientific experiments has been limited. When they have been used, scientists have modified the purse seine design to fit specific collection needs when other types of gear have been unsuccessful. We tested the feasibility of using a purse seine modified to fish in estuarine waters, away from the shoreline, where other fishing gear has had limited success in capturing adult fishes. We conducted a pilot study using a contracted commercial vessel and gear. We made 41 sets in waters 1.0-3.3m deep near the mouth of Tampa Bay. Sets were made over unvegetated sand and mud/sand bottoms, and over various densities of seagrass to represent the major habitats of the Tampa Bay estuary. Results suggested that the purse seine could sample these habitats; provide samples that were representative of the sample area; and capture a broad size range of many species, including those of recreational importance, such as spotted seatrout (Cynoscion nebulosus). This information led to the development and testing of a 183-meter purse seine and purse seine vessel for use in the Florida Marine Research Institute's Fisheries-Independent Monitoring (FIM) program. The design of the vessel and gear were refined, procedures and protocol were established and mark-recapture experiments were performed to estimate gear efficiency. This paper will describe the development of the 183-meter purse seine in the FIM program and comment on its use as a fisheries-independent monitoring tool.

Potential techniques for quantifying bioenergetic differences in largemouth bass in brackish and freshwater habitats.

Bonnie P. Whitlock, Richard A. Krause and Wayne A. Bennett. University of West Florida, 11000 University Parkway, Pensacola, FL 32514. Phone: 850/478-5647. Email: bwhitlock@students.uwf.edu

Poster

Most freshwater fishes are osmotically adapted to low saline waters, but a few, including largemouth bass, *Micropterus salmoides*, tolerate relatively wide salinity ranges. Interestingly,many data suggest that largemouth bass inhabiting brackish marshes achieve smaller maximum sizes than their freshwater counterparts. This size disparity may be due to bioenergetics and the balanced energy budget. Largemouth bass inhabiting brackish water marshes may have to expend more of their total energy budget for osmoregulatory needs at the expense of growth than do largemouth bass inhabiting strictly freshwater environments. In addition, largemouth bass inhabiting brackish marshes have been shown to have different diets than freshwater bass that may lead to deficiencies in nutrition. The diet of freshwater bass is almost exclusively comprised of smaller prey fish while that of marsh bass is made up of less than 50% fish. The invertebrates that make up the bulk of the marsh bass diet may provide less nutrition per weight than the typical small prey fish. Marsh bass have also been shown to have different body shape than the freshwater largemouth bass. This difference in morphometry may be due to alternative growth strategies and partitioning of energy. Several procedures can be undertaken to more adequately quantify differences in the balanced energy budgets between the two populations of largemouth bass. Comparison of morphometric measurements can provide information on the locations of nutritional deposition. Bomb calorimetry conducted on the stomach contents of both populations of largemouth bass can provide information on the energy content of their respective diets. Comparisons of somatic and reproductive growth and their use in the basic energy budget furnishes information on energy deposition, as will respirometry measurements that in addition can provide information on total metabolic rates and energy partitioning in the basic energy equation. These techniques can provide the statistical data and insight which will ultimately be utilized to help determine the factors that affect bioenergetics and the balanced energy equation between the two populations of fish.

Florida Tourism Perspective of Recreational Fishing and How to Increase Participation

Tonja Wilt. Visit Florida. PO Box 1100, Tallahassee, FL 32302. Phone: 850/488-5607. Email: kpost@flausa.com

Wednesday: 10:30-10:50

Abundance and distribution of common snook, *Centropomus undecimalis*, along shoreline habitats of three Florida estuaries.

Brent L. Winner, Dave Blewett, and Kevin M. Peters. Florida Marine Research Institute, 100 8th Avenue SE, Saint Petersburg, FL 33701. Phone: 727/896-8626. Email: winner_b@epic7.dep.state.fl.us

Wednesday: 4:00-4:20

The common snook, *Centropomus undecimalis*, is one of the most sought-after gamefish in the inshore waters of southern Florida and is most commonly found in coastal, estuarine, and riverine waters from Cape Canaveral on the Atlantic coast to Tampa Bay on the Gulf coast. The objective of this study was to describe the abundance, habitat preference, and spatial and temporal distribution of subadult and adult snook along shoreline habitats in three Florida estuaries. Sampling was conducted from June 1996 through May 1998 in Tampa Bay and Charlotte Harbor and from June 1997 through May 1998 in the Indian River Lagoon. In our study, we divided the Indian River Lagoon into northern (north of Cape Malabar) and southern (south of Cape Malabar) areas because of zoogeographical differences in hydrology and ichthyofauna. Monthly stratified-random sampling was conducted with a 183-m (38-mm stretch mesh) haulseine. A total of 3,395 snook were collected in 1,192 haulseine collections. Snook catch per unit effort was highest in the southern Indian River Lagoon (5.72 fish/haul), where they were present in 70% of the hauls. Snook ranged in size from 142 to 1136 mm standard length. Length-frequency distributions were similar among estuaries. All estuaries exhibited seasonal variations in snook catch, with the most fish captured during the late spring and early summer months (May and June). A general linear model was used along with regression, correlation, and post hoc tests to relate variability in snook catches with various physical and habitat-related parameters. Baitfish presence and salinity contributed significantly to the model in all estuaries. The largest catches of snook (> 40 fish/haul) were typically collected during summer months in high-salinity waters shaded by overhanging vegetation along gently sloping, inundated shorelines in areas containing sea grass. However, we collected subadult and adult snook along a variety of areas and shoreline habitats, including mangrove forests, sandy beaches, seawalls, and salt marshes.

Overview of the Value of Freshwater and Marine Commercial Aquaculture in Florida

Paul Zajicek. Florida Department of Agriculture and Consumer Services, Bureau of Aquaculture. Email:zajicep@doacs.state.fl.us

Wednesday: 08:50-09:10

Florida aquaculturists produce ornamental fish, aquatic plants, hard clams, alligators, oysters, tilapia, catfish, sport and game fish, and a number of other species. During 1997, the value of aquacultural sales exceeded $102 million from 696 active producers. The variety of species

produced and markets satisfied by Florida farmers defines one of the most diverse and challenging agricultural sectors of any state in the nation.

POST MEETING UPDATE MAILED TO "FISHERIES" MAGAZINE

President: Grant Gilmore

President Elect: Bob Wattendorf

Secretary Treasurer: Doug Haymans

Past President: Larry Connor

The theme for our symposium was Florida Fisheries--Economics, Marketing and Education. Invited speakers covered these topics from the perspectives of industry, tourism, management agencies and universities and included both freshwater and saltwater aspects. In addition a wide variety of excellent contributed papers and 10 posters (our most ever) were presented on traditional fisheries topics. All abstracts are available on line at http://nersp.nerdc.ufl.edu/~fafs/.

Items of interest at the business meeting included Grant Gilmore's discussion of the lack of saltwater papers presented at the 1999 Southern Division mid-term meeting in Chattanooga. He pointed out that there are a minimum of 50 university, agency and private marine labs in the Division and that something should be done to encourage their participation. Larry Connor, Secretary-Treasurer of the Southern Division urged us to host the 2001 mid-term meeting and suggested it would give us an opportunity to actively seek quality papers including marine topics. A motion to host the meeting, with the first choice of venues being in Jacksonville, due to ease of access by both road and air, passed. (Note: Subsequently, we heard that the Southern Division has taken us up on the offer, and we are pursuing a facility with Larry Connor as arrangements chair and setting up a program committee).

Grant Gilmore complimented Bob Wattendorf on the chapters' new web site (http://nersp.nerdc.ufl.edu/~fafs/) and especially commented on the utility for future officers due to ease of access to Roger's Rules of Orders, our Procedures Manual and our Charter all being on-line. He encouraged members to log on and use the various links to follow important legislative issues including special links pertaining to the creation of a new Florida Fish and Wildlife Conservation Commission, which was mandated by a constitutional referendum passed by the electorate in November 1998. The new agency will include the former Game and Fresh Water Fish Commission, Marine Fisheries Commission and portions of the Department of Environmental Protection.

Chuck Cichra reported on the Roger Rottman Memorial Scholarship. The Committee selected University of Florida student Joel Carlin to receive the $500 scholarship and due to the extemely high caliber of applicants the Committee personally contributed to fund a second $200 scholarship for Bonnie Whitlock. In the future, it is hoped that the investment account will allow endowment of two scholarships without affecting principle. One will be for a Ph.D. student and the other for an M.S. or undergraduate.

Last year's raffle allowed us to pay room and board at the Chapter Meeting for ten students, and

the Raffle Committee chaired by Doug Haymans raised enough in 1999 to fund ten more students next year.

The Newsletter is now being edited by John Benton and compliments and expressions of sympathy were bestowed upon him. John plans to try to publish the newsletter quarterly and Bob Wattendorf indicated he could put the letters on the website as soon as they went out. There is already an archive of past newsletters on the website. A proxy will be set up to allow individuals that want to be advised by email of new postings to receive automatic notification.

Steve Miller, Chair of the Legislative Committee pointed to the utility of the web in keeping everyone informed of important bills. He encouraged individuals to write on their own expressing their views on conservation issues.

Grant Gilmore commended Larry Connor for an excellent job in putting together a Directory of members, along with a very useful list of fisheries offices. The latter is now posted on our web site with links, where available. Members chose not to have their personal names and contact information placed on the web at this time.

The issue of membership lists then entered into a discussion of selling the list for Chapter benefits, such as raffle donations or cash for various projects. In the end a resolution was passed allowing transfer of the list under the following conditions:

1. To the AFS and its subunits without further stipulation.
2. To like-minded societies or associations dealing with conservation issues or professional development.
    1. Cover letters shall stipulate the list is not for further sale or distribution to other parties.
    2. Cover letters shall request a reciprocal list to be used for recruiting new members.
3. No member of the Chapter shall distribute the membership directory and handbook or current mailing list to commercial ventures without first having received approval from a quorum of Chapter members. Requests for the list should include reasonable compensation to the Chapter and stipulations about further use.

Doug Haymans was elected as the new president elect and Peter Hood became the new Secretary Treasurer. When Bob Wattendorf assumed the Presidency, he commended Grant Gilmore for his leadership efforts, in particular in calling attention to the needs of Caribbean fisheries biologists. Grant will head a Chapter effort to sponsor a symposium at the Gulf Caribbean Fisheries

Initiative meeting in Key West during November 1999. The proposal to officially seek a name change for the Chapter to include the Caribbean was deferred until an *ad hoc* committee could determine if the Caribbean fisheries biologists would consider such a move to be helpful or "imperialistic."

Bob also commended Larry Connor for the wide array of contributions that he has made to the Chapter and noted that although officially he would be stepping down from the Executive Committee his leadership would still be relied on as we prepare for the Southern Division Mid-Term Meeting.

Other resolutions that passed authorized the Secretary-Treasurer to pay off our AFS-2000 pledge a year early and to extend our thanks to the Clemson Chapter for their support of our raffle. In addition, Bob Wattendorf was directed to write a letter to the appropriate State Legislative Committee Chairs in support of the Florida Forever Act. Due to some minor concerns, a pledge was made to post the draft letter for a week on the web site to allow member comments before the final was mailed. (Note this was accomplished, as directed, and the Florida Forever Act did pass the Legislature providing more funding for future environmental land acquisition and management). Wattendorf also sought and received a resolution allowing a task force to review the Parent Society Strategic Plan if it passes, as expected, at the mid-term. The task force will recommend at next year's Chapter Meeting either adopting, or modifying and adopting the plan, as suggested in the "Fisheries" article that presented the draft to members.

Finally, Wattendorf requested and received approval to use Chapter funds to conduct a survey of members, including those who do not typically attend Chapter Meetings to determine what non-attending and potential members want from the Chapter and to see if some other time or venue would result in better attendance. A copy of the survey will be mailed with the news letter and another version posted on the web.