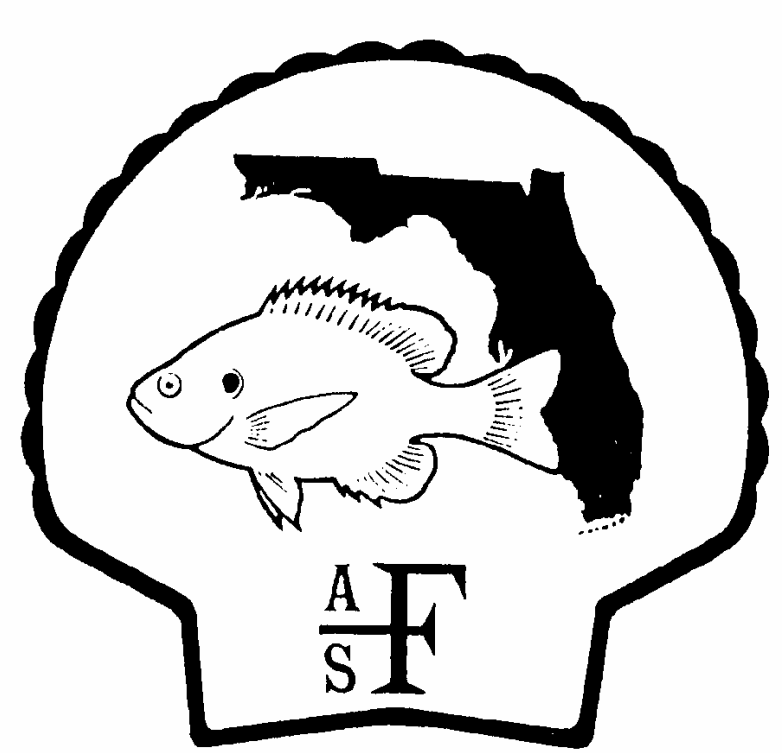

25th Annual Meeting
Florida Chapter American Fisheries Society
February 22-24, 2005

The Florida Chapter of the American Fisheries Society

Chapter Officers

President: Mike Allen, UF

President-Elect: Richard McBride, FWC-FWRI

Past-President: Wayne Bennett, UWF

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Program Chair: Richard McBride, FWC-FWRI

Raffle co-Chairs: Tom Maher and Bridget Tiffany (UWF)

Student Travel Awards & Rottmann Memorial Scholarship: Chuck Cichra (UF)

25th Anniversary Meeting A/V Specialist: Adam Richardson, FWC-FWRI

Thanks to everyone for their symposium and contributed presentations!

Thanks to all the moderators and judges!

Thanks to FWC-FWRI for financial support!

The 25th Annual Meeting of the Florida Chapter American Fisheries Society
February 22-24, 2005
Altoona, Florida

General Program – Schedule at a Glance

Tuesday, February 22

12:00pm – 1:00pm / Lunch
11:00am – 6:00pm / Registration

1:00pm – 5:30pm / Contributed Papers
6:00pm – 7:00pm / Dinner
5:30pm – 7:00pm / Poster Set Up
7:00pm – 8:00pm / Formal Poster Session
Followed by the bonfire social

Wednesday, February 23

7:00am – 8:00am / Breakfast
7:30am – 6:00pm / Registration

8:00am – 11:50am / *Symposium:*
Florida's Diadromous Fishes: biology, ecology, management, and conservation
12:00pm – 1:00pm / Lunch
1:00pm – 3:50pm / Symposium papers
3:50pm – 5:10pm / Contributed Papers
6:00pm – 7:00pm / Dinner
7:00pm – 7:30pm / A short business meeting
Awards presentation: Student Awards – Travel awards and Rottmann Scholarship
7:30pm – 8:00pm / *Special presentation:* ***25 Years of the Florida Chapter American Fisheries Society***
Followed by a RAFFLE and the bonfire social

Thursday, February 24

7:00am – 8:00am / Breakfast
7:30am – 9:00am / Registration

8:00am – 11:50am / Contributed Papers
12:00pm – 1:00pm / Lunch
1:00pm – 1:10pm / **Awards presentation**:
Best Papers- Student and Non-student
Best Posters- Student and Non-student
Power Tie and Lampshade award

Day-By-Day Agenda for the 25th Florida Chapter American Fisheries Society Meeting

Tuesday, February 22, 2005

1100 – 1800 / Registration
1200 – 1300 / Lunch
1300 – 1310 / Welcome – Mike Allen, Chapter President

Contributed Papers **Moderator: Mike Allen, University of Florida**

1310 **—** Lundy, E. Food Habits of Bluegill (*Lepomis macrochirus*) in a Reclaimed Muck Farm.

1330 **—** Porak, W. F. and W. E. Johnson. The largemouth bass population and fish community structure in Area 7 Reservoir, a marsh restoration project in Central Florida.

1350 **—** *Barthel, B. L., Porak, W. F., D. P. Philipp, W. E. Johnson, and T. W. Kassler. Geographical distribution of Florida bass populations and intergrade populations with largemouth bass in Florida.

1410 **—** *Barrientos, C., and M. S. Allen. Relation between fish assemblages and native and non-native aquatic plants at Lake Izabal, Guatemala.

1430 **—** *Morris, N. M. B., W. F Patterson, and R. Church. The artificial reef effect of World War II era shipwrecks in the Northern Gulf of Mexico.

1450 **—** *Wilkes, A. A., M. Cook, A. L. Digirolamo, J. M. Eme, J. M. Grim, B. Hohmann, S. E. LaPorte, C. M. Pomory, and W. A. Bennett. A Comparison of Damselfish Densities and Distributions on Staghorn Coral (*Acropora cervicornis*) and Coral Rubble in Dry Tortugas National Park.

1510 — BREAK **Moderator: Wayne Bennett, University of West Florida**

1530 **—** Reyier, E. A., D. H. Adams, and D. M. Scheidt. The discovery of an important winter nursery for the lemon shark, *Negaprion brevirostris*, at Cape Canaveral Florida.

1550 **—** *Wallman, H. L. and W. A. Bennett. Thermal Preference of the Atlantic stingray, *Dasytis sabina*, Relative to Satiation and Parturition State.

1610 **—** *Baremore, I. E. and J. K. Carlson. Preliminary reproductive parameters of the Atlantic angel shark with a potential example of reproductive senescence.

1630 **—** *Tiffany, B. N. and W. A. Bennett. Physiological and Behavioral Responses of Clingfish, *Gobiesox strumosus,* to High Temperature and Low Oxygen Stress.

1650 **—** *Fitchett, K. J. and W. A. Bennett. Competition, Fidelity, and Nesting Preference of gulf toadfish, *Opsanus beta*.

1710 **—** *Sandberg, J. S., W. A. Bennett, D. Smith, and P. Ryals. Comparative bimodal respiratory ability of two species of Periophthalmid mudskippers (*Periophthalmus kalolo* and *P. argentilineatus*).

1800 – 1900 / Dinner
1730 – 1900 / Poster Set Up
1900 – 2000 / Formal Poster Session (Beverages and snacks will be in the poster area;
Presenters will be available to answer questions from 7-8 pm)
Followed by the ***bonfire social***

*An asterisk indicates a student presentation

Tuesday Poster Session (7-8 pm) – *Contributed and Symposium Posters*

Bonvechio, K. I., J. Crumpton, and W. E. Johnson. American Eel, *Anguilla rostrata*, Monitoring in Florida.

*Bowen, B. R. and B. R. Kreiser. Phylogeography and divergence times of *Alosa* species separated by the Florida peninsula.

*Curtis, T. H. Distribution and movements of juvenile bull sharks, *Carcharhinus leucas*, in the Indian River Lagoon System, Florida.

Dunham, N. M. and R. E. Matheson, Jr. Preliminary life-history information on *Hippocampus zosterae* in Florida Bay, Florida.

*Dutka-Gianelli, J., and R. G. Gilmore, Jr. Movements of fat snook, *Centropomus parallelus* (Poeyi), in St. Sebastian River, Florida: preliminary results.

Egbert, M. E. and R. A. Rulifson. Atlantic needlefish *Strongylura marina* in a freshwater lake in North Carolina: evidence for anadromy?

Holder, J. C. Shortnose Sturgeon (*Acipenser brevirostrum)* Population Evaluation in the St. Johns River, Florida.

Jackson, J. B. and D. J. Nemeth. A New Method to Describe Seagrass Habitat Sampled During Fishery-Independent Monitoring.

Kovatch, L., and F. M. Parauka. Availability of Gulf Sturgeon Spawning Habitat in Northwest Florida and Southeast Alabama River Systems.

Maki, K. L., R. S. McBride, and M. Murphy. Biology of Wahoo in Florida and the Bahamas.

McBride, R. S., T. C. MacDonald , R. E. Matheson, D. A. Rydene, and P. B. Hood. Nursery habitats for ladyfish, *Elops saurus*, along salinity gradients in two Florida estuaries.

McBride, R. S. and R. E. Matheson. Florida's Diadromous Fishes: biology, ecology, management, and conservation.

McBride, R. S., J. E. Harris, and J. C. Holder. Abundance and length of American shad, *Alosa sapidissima*, collected by electrofishing in the St. Johns River, Florida.

Ockelmann-LoBello, L. M. A regional comparison of catch, harvest, and release rates and biological parameters of common snook in Florida during 2002-2004.

Ruiz-Carus, R. and R. S. McBride. The sea lamprey, *Petromyzon marinus,* Linnaeus 1758, in Florida: A winter voyager or a rare species in need of protection?

Sebastian, A. P., D. M. Tremain and L. C. Sebastian. The relationship between pigfish (*Orthopristis chrysoptera*) recruitment and spotted seatrout (*Cynoscion nebulosus*) landings in the Indian River Lagoon, Florida.

*Steward, C. A. Estimating age from otolith morphometrics in the gray angelfish (*Pomocanthus arucatus*).

Szelistowski, W. A. Semilunar reproduction and rapid juvenile growth in the needlefish *Strongylura scapularis*.

Tremain, D. M. and K. Scott. Characterization and timing of band formation in dorsal fin rays of age-0 and age-1 red drum.

Tunnell, J. and J. Bickford. An image analysis macro for measuring growth increments in otoliths.

*Whittington, B. E., Denison, S. H. and W. A. Szelistowski. Genetic structure in amphi-American land crabs.

Wednesday, February 23, 2005

0700 – 0800 / Breakfast
0730 – 1800 / Registration
0800 – 0810 / Welcome – Richard McBride, Chapter President-elect and Program Chair

Symposium: Florida's Diadromous Fishes: biology, ecology, management, and conservation

Symposium Papers **Moderator: Richard McBride, FWC-FWRI**

0810 **—** Rulifson, R.A. Anadromy, Catadromy, and Amphidromy: What's in a Name, and Who's Who in the Zoo?

0830 **—** Parauka, F.M. Florida's Gulf Sturgeon.

0850 **—** Crumpton, J. E. Ecology, history and management plan of the species American eel *Anguilla rostrata*.

0910 **—** McBride, R. S., J. C. Holder, and R. O. Williams. The biology, ecology, management, and conservation of Florida's *Alosa* species.

0930 **—** Mesing, C. M. and E. A. Long. An Overview of Florida's Striped Bass Populations.

0950 — BREAK **Moderator: Richard McBride, FWC-FWRI**

1010 **—** Gilmore, R. G., Jr., S. Frias-Torres, J. Dutka-Gianelli. Diadromus stenothermic/stenoecious tropical peripheral fishes of southeastern florida with comments on the life history of the opossum pipefish, *Microphis brachyurus lineatus*.

1030 **—** Limburg, K.E., K.A. Hattala, and A.W. Kahnle. American shad in its native range.

1050 **—** Isely, J. J., and M. M. Bailey. Passage of American shad at a low-head navigation lock on the Savannah River, South Carolina and Georgia.

1110 **—** Harris J. E., R. S. McBride, and R. O. Williams. Comparison of Life History and Population Dynamics of Hickory Shad in the St. Johns River, Florida, in the 1970's and 2000's.

1130 **—** *Murauskas, J.G. Investigating the Anadromous Behavior of Adult Hickory Shad (*Alosa mediocris*).

1200 **—** LUNCH

1300 — Announcements **Moderator: Kristin Maki, FWC-FWRI**

1310 **—** *Strickland, P. A. and C. A. Dolloff. Seasonal Movement of American Eels in Selected Tributaries of the James River, Virginia.

1330 **—** *Hyle, A. R. and J. E. Olney. Reproductive Biology of the American shad, *Alosa sapidissima*, in the Mattaponi River, Virginia.

1350 **—** *Mickle, P. F., B. R. Kreiser, S. B. Adams, and J. F. Schaefer. Understanding the Life Stages and Habitat Use of the Alabama Shad, *Alosa alabamae* in the Pascagoula River Basin.

1410 **—** *Bowen, B. R., B. R. Kreiser, W. T. Slack, P. F. Mickle and S. T. Ross. Population genetics of Alabama Shad: Conservation and management implications for an anadromous species.

1430 **—** *Trippel, N. A., M. S. Allen, and R. S. McBride. Seasonal Changes in Prey Abundance Relative to Predator Diets in the St. Johns River, Florida.

1450 — BREAK **Moderator: Kathy Guindon, FWC-FWRI**

1510 — Patterson, W. F., Z. Chen, and D. A. Winter. Distinguishing striped mullet nursery estuaries in the northern Gulf of Mexico with otolith chemical signatures.

1530 — Pine, W. E., III and M. S. Allen. Population Viability of Suwannee River Gulf Sturgeon: Inferences from Capture-Recapture and Age-Structured Models.

Contributed Papers

1550 — Krebs, J. M., A. B. Brame, and C. M. McIvor. Estuarine fish assemblages in natural and altered wetland habitats of Tampa Bay, Florida: Summary of Year 1.

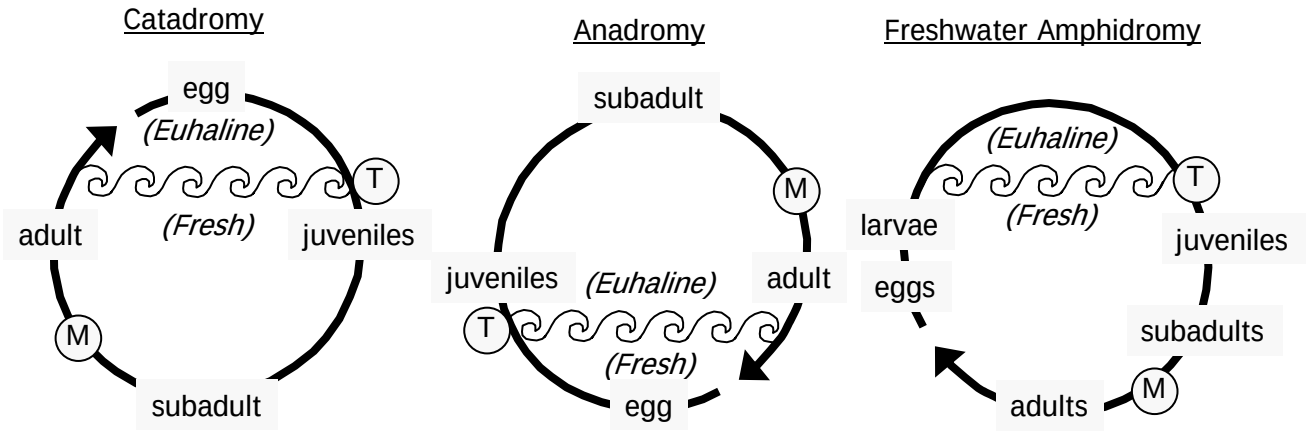
1610 — Winner, B. L., T. S. Switzer, J. Whittington, and N. Dunham. Ichthyofaunal survey of the St. Lucie estuary and effects of freshwater inflow: Too much of a good thing?

1630 — *Tyler, A. J., T. S. Switzer, and K. R. Henry. Current and historical trends in community structure in the Bishop Harbor estuary: potential influence of wastewater discharge.

1650 — Heagey, R. F. and T. S. Switzer. Comparison of a Closed Marine Area to a Similar Adjacent Habitat: Can a small estuarine reserve impact local fisheries dynamics?

1800 – 1900 / Dinner
1900 – 1930 / A short business meeting
Awards presentation: Student Awards – Travel awards and Rottmann Scholarship

1930 – 2000 / *Special presentation:* ***25 Years of the Florida Chapter American Fisheries Society***
(Allen, M., R. McBride, R. Taylor, W. Porak, and M. Hale)
Followed by a RAFFLE and the *bonfire social*



Three diadromous life cycles (above) depicted for semelparous species
(T = larval transformation; M = sexual maturation)

*An asterisk indicates a student presentation

Thursday, February 24, 2005

0700 – 0800 / Breakfast
0730 – 0900 / Registration
0800 – 0810 / Announcements

Contributed Papers **Moderator: Brent Winner, FWC-FWRI**

0810 **—** Taylor, R. G. and J. A. Whittington. Using mark-and-recapture techniques to estimate survival rates and indices of abundance of common snook from the southeast coast of Florida.

0830 **—** Nemeth, D. J., J. B. Jackson, A. R. Knapp, C. H. Purtlebaugh. The Demographics of Sand Seatrout (*Cynoscion arenarius*) in the Estuarine Waters of the Eastern Gulf of Mexico.

0850 **—** Purtlebaugh, C. H., and K. Henry. Essential habitat of juvenile sand seatrout (*Cynoscion arenarius*) in four estuaries along the West Coast of Florida.

0910 **—** Martignette, A. J., S. A. Bortone and J. P. Spinelli. Spotted Seatrout (*Cynoscion nebulosus*) Growth as a Indicator of Conditions in Lower Pine Island Sound.

0930 **—** Spinelli, J. P., S. A. Bortone, A. J. Martignette, and E. C. Milbrandt. Determining habitat preferences of juvenile red drum to optimize hatchery-release survival.

0950 — Break **Moderator: Ron Taylor, FWC-FWRI**

1010 **—** Greenawalt, J. M., T. K. Frazer, C. A. Jacoby, and W. S. Arnold. Population dynamics of the bay scallop fishery of Florida.

1030 **—** Lombardi-Carlson, L. A. Is there substantial biological evidence to indicate separate stocks of red grouper (*Epinephelus morio*) in the northeastern Gulf of Mexico?

1050 **—** Lounder, C. A. Big fish versus old fish of the snapper/grouper complex.

1110 **—** McDevitt, E. E., E. R. Ault, L. R. Barbieri, J. A. Colvocoresses, and P. E. Thomas. Reproductive Patterns of Gray Snapper (*Lutjanus griseus*) and Lane Snapper (*Lutjanus synagris*) in Southeast Florida.

1130 **—** Ault, E. R., L. R. Barbieri, J. A. Colvocoresses, E. E. McDevitt, P. E. Thomas. Preliminary Results from a Study of Snapper Spawning Aggregations in Southeast Florida.

1200 – 1300 / Lunch
1300 – 1310 / **Awards presentation:**
Best Papers- Student and Non-student
Best Posters- Student and Non-student
Power Tie and Lampshade award

Abstracts for the 25th Annual Meeting of the Florida Chapter American Fisheries Society

Allen[1], M., R. McBride[2], R. Taylor[2], W. Porak[3], and M. Hale[3].
2/23: 1930 — Presented by: Allen, M. S. • Non-student • Special ~ platform presentation.
[1]Department of Fisheries and Aquatic Sciences, The University of Florida, 7922 NW 71st Street, Gainesville, FL 32653, Tel: 352-392-9617, msal@ufl.edu.
[2] Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, 100 Eighth Avenue SE, St. Petersburg, FL 33701. richard.mcbride@myfwc.com, ron.taylor@myfwc.com
[3] Florida Fish and Wildlife Conservation Commission, Eustis Fisheries Research Laboratory, 601 W. Woodward Ave., Eustis, FL 32726. wes.porak@myfwc.com, marty.hale@myfwc.com.

25 Years of the Florida Chapter American Fisheries Society.

The Florida Chapter of the American Fisheries Society (AFS) was formed in 1980 to address fisheries and conservation issues for Florida's vast aquatic resources. Within only a few years (1985) the Chapter published the textbook "*Florida Aquatic Habitat and Fishery Resources*", edited by **William Seaman, Jr**. This book included detailed chapters for various Florida ecosystems, and it greatly increased both Chapter visibility and revenues due to its popularity. Shortly thereafter the parent society recognized Florida with an Outstanding Chapter Award. A decade later, the Chapter hosted the national AFS meeting in Tampa in 1995, which was organized by **Ron Taylor**, **Bob Wattendorf**, and many other Chapter members. In 2001, the Chapter hosted the Southern Division Spring meeting in Jacksonville based on the leadership of **Larry Connor** and **Kathy Guindon**. Chapter-sponsored symposia have addressed a wide range of fisheries issues during a period of rapid human population growth, including: *Marine Protected Areas, Minimum Flows and Levels, Human Dimensions and Marketing of Fisheries, Harmful Algal Blooms, Ecosystem Restoration, Quantitative Methods in Fisheries,* and *Conservation and Management of Diadromous Fishes*. Over the past quarter century, the Chapter has grown to about 200 members and has been a leader in State, Regional, and National fisheries issues. The Chapter has had three members go on to serve as President of the Southern Division AFS (**Dennis "Smokie" Holcomb, Marty Hale,** and **Larry Connor**), and a founding member became the President of the AFS (**Rich Gregory**). The Chapter has recruited future leaders in fisheries science with student travel awards, student presentation awards, sponsorship of student colloquia, and a scholarship program. In 1997, **Chuck Cichra** led the initiation of our most prestigious student award: the Roger Rottmann Memorial Scholarship, (named in memory of one of our most active members), which recognizes outstanding graduate students each year. The Florida Chapter AFS has fulfilled its mission as outlined in 1980, and we anticipate a significant role in Florida fisheries issues for the next 25 years!

Ault, E. R.[1], L. R. Barbieri[2], J. A. Colvocoresses[2], E. E. McDevitt[1], P. E. Thomas[1].
2/24: 1130 — Presented by: Ault, Erick R. • Non-student • Contributed platform presentation.
[1]Florida Fish & Wildlife Conservation Commission, Florida Wildlife Research Institute, Tequesta Field Laboratory, 19100 SE Federal Highway, Tequesta, FL 33469-1712; Tel. 561-575-5407; Email: erick.ault@myfwc.com
[2]Florida Fish & Wildlife Conservation Commission, Florida Wildlife Research Institute, 100 Eight Avenue SE, St. Petersburg, FL 33701-5095.

Preliminary Results from a Study of Snapper Spawning Aggregations in Southeast Florida.

A study of gray snapper (*Lutjanus griseus*) and lane snapper (*Lutjanus synagris*) spawning aggregations was initiated in the spring of 2004 to identify discrete aggregation sites in southeast Florida, spawning behaviors, and essential spawning habitat. The framework for this on-going study was set by a snapper life-history project conducted from winter 1998 through summer 2002. More than 60 dives were made offshore Martin and northern Palm Beach counties during the summer of 2004 to locate and observe spawning aggregations. Aggregations of gray snapper numbering 50 to 150 fish ranging in size from 200 mm TL to 350 mm TL were observed and video-documented in two separate locations on multiple occasions throughout the spawning period. Aggregations of more than 100 lane snapper ranging from 150 mm TL to 250 mm TL were observed in three separate locations. Reproductively active female gray and lane snapper were collected, suggesting that these are spawning aggregations. Behaviors associated with spawning and courtship, including nudging and chasing between two fish and in small groups

consisting of three to five fish, were noticed during several dives and captured on digital video. Thus far, increases in densities and activities in the aggregations do not seem to be associated with a particular moon phase. The aggregations of gray snapper were generally found near low, live-bottom, rocky reefs, whereas the lane snapper aggregations were found over sandy bottom just off steep (3m to 6m) reef ledges or near the substrate.

***Baremore, I. E.[1] and J. K. Carlson[2].**
2/22: 1610 — Presented by: Baremore, I. E. • Student • Contributed platform presentation.
[1]University of Florida, Department of Fisheries and Aquatic Sciences. 7922 NW 71st St, Gainesville, FL 32653. Tel (352) 328-8750; Email: ivalina@ufl.edu
[2] NOAA, National Marine Fisheries Service. 3500 Delwood Beach Rd, Panama City, FL 32408. [1]Tel (352) 392-9617 ext. 261, [2]Tel (850) 234-6541 ext. 221. [1]ivalina@ufl.edu; [2]john.carlson@noaa.gov.
Preliminary reproductive parameters of the Atlantic angel shark with a potential example of reproductive senescence.
The Atlantic angel shark, *Squatina dumerili*, is a benthic species inhabiting deep waters of the Gulf of Mexico and the Atlantic Ocean. This species is listed as prohibited by the Fisheries Management Plan for Atlantic Tunas, Swordfish, and Sharks due to the lack of biological data and a precautionary approach for species thought to be highly susceptible to exploitation. Reproductive parameters were determined for 164 sharks (76 females, 88 males) captured in the Gulf of Mexico from fishery independent and dependent sources. Males were considered mature if they possessed calcified claspers and the epididymis was tightly coiled. Mature females had well developed right ovaries with large (>10 mm) oocytes and prominent nidamental glands. Reproduction occurs by aplacental viviparity; embryos examined *in utero* were umbilically attached to individual yolk sacs. Both resting and gravid females occur simultaneously in the population, and near term embryos and neonates of similar sizes were collected for all months sampled. The average litter size is 8 (+/- 1.82) pups, and the size at birth is approximately 25 cm fork length (FL). The median length at maturity was 88.7 cm for males and 83.5 cm FL for females. In addition, one large female (112 cm FL) was examined which had no typical signs of maturity (ovary was smooth and undeveloped, uteri were contracted, no developed ova), indicating that this female was either reproductively sterile or had reached senescence. Reproductive senescence, a state at which older individuals in a population cease to reproduce, has not been documented in elasmobranchs to date.

***Barrientos, C., and M. S. Allen.**
2/22: 1410 — Presented by: Barrientos, Christian • Student • Contributed platform presentation.
Department of Fisheries and Aquatic Sciences, Universtiy of Florida, 7922 Northwest 71st Street, Gainesville, Florida 32653, USA. cabc@ufl.edu.
Relation between fish assemblages and native and non-native aquatic plants at Lake Izabal, Guatemala.
We compared the abundance and community composition of fishes among five species of aquatic plants at Lake Izabal, Guatemala. Lake Izabal is the largest lake in Guatemala, Central America and was recently invaded by a non-native aquatic weed *Hydrilla verticillata*. Fish were sampled with block nets (0.01 ha) using rotenone in June-July of 2004. Hydrilla had the higher aquatic plant biomass than the eelgrass *Vallisneria Americana* and bulrush *Scirpus spp*. of the same coverage area. Total fish biomass was positively related to plant biomass across all plant types. Fishes of the family Cichlidae were the most abundant in species richness and showed the highest biomass across all habitats sampled. The most common fish collected in all habitats and areas with no plants was the silverside *Atherinella spp*. Mojarra *Vieja maculicauda* support the primary fisheries in the lake, and we found that areas with high hydrilla coverage contained high densities and biomass of this species. Hydrilla in littoral areas of Lake Izabal is suitable habitat for fishes, containing high species richness, density and biomass compared to other aquatic plant species present.

***Barthel[1], B. L., Porak, W. F.[2] , D. P. Philipp[3], W. E. Johnson[4], and T. W. Kassler[5].**
2/22: 1350 — Presented by: Barthel, B. L. • Student • Contributed platform presentation.
[2,4] Florida Fish & Wildlife Conservation Commission, Fish & Wildlife Research Institute, 601 W. Woodward Ave., Eustis, FL 32726. Tel. 352-742-6438.
[2] wes.porak@MyFWC.com; [4] bill.johnson@MyFWC.com
[1,3] Illinois Natural History Survey, Center for Aquatic Ecology, 607 E. Peabody, Champaign, IL 61820, TEL. 217-244-5125. [1] bbarthel@uiuc.edu; [3] philipp@uiuc.edu
[5] Genetics Laboratory, Washington Department of Fish & Wildlife, 600 Capitol Way N, Olympia, WA 98501. [5] kassltwk@dfw.wa.gov.

Geographical distribution of Florida bass populations and intergrade populations with largemouth bass in Florida.

This study utilized genetic techniques to determine the geographic distribution of Florida bass (*Micropterus floridanus*), largemouth bass (*M. salmoides*) and intergrade (*M. floridanus x M. salmoides*) populations across Florida. We sampled 60 bass from each of 48 populations and 30-36 bass from each of 12 additional populations between 2001 and 2004. Six allozyme loci were analyzed by starch-gel electrophoresis, and results from two diagnostic allozymes, *IDH-B* and *AAT-B,* are presented here. Fixed allelic differences between Florida bass and largemouth bass at these two loci allowed us to determine whether populations were composed of single species or introgressed. Similar to previous surveys, populations in south Florida were typically entirely composed of Florida bass and most populations in north Florida included alleles from both species. The intergrade zone, however, extended further south than previously documented. Allele frequencies for largemouth bass were highest in the panhandle and generally declined in the east and south. There were exceptions to these general patterns; all fish collected from Lake Kingsley in north Florida were found to be Florida bass, whereas largemouth bass alleles were detected in Lake Trafford, the southern-most natural lake in the state. Thus, it cannot be assumed that a population is currently pure or intergrade based on geographic location; an assumption that had previously been held by biologists. Restriction fragment length polymorphism analyses of mtDNA will be used to assess more detailed genetic relationships among populations, in an effort to determine if multiple, unique stocks of each species of bass exist within the state. We hope that this study will promote the incorporation of genetic conservation principals into Florida's bass stocking programs (which will increase upon the completion of the Florida Bass Conservation Center) and ultimately improve the effectiveness of future management and conservations decisions.

Bonvechio, K. I.[1], J. Crumpton, and W. E. Johnson[2].
2/22 Poster Session — Presented by: Bonvechio, K. I. • Non-student • Symposium ~ Poster.
Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, 601 W. Woodward Ave., Eustis, FL 32727, Tel. 352-742-6438. [1]kim.bonvechio@myfwc.com; [2]bill.johnson@myfwc.com.

American Eel, *Anguilla rostrata*, Monitoring in Florida.

Due to concerns about the status of American eel, a Fishery Management Plan (FMP) was developed in 1999 to protect and enhance the Atlantic stock, while providing for sustainable harvest. To fulfill FMP requirements, the FWC collected fishery-dependent and -independent data on different life stages of American eel for the past five years. Fishery-independent data were collected on glass and elver-stage eels at the Guana River Dam (GRD) and Rodman Reservoir Dam (RD). Eel abundance was relatively high in 2001 and 2003 and low in 2002 and 2004, but in all years, glass eels peaked in abundance in mid- to late-January and mid-February at GRD and elvers peaked in mid to late-February at RD. Spearman-rank correlation analysis was used to assess the relationship between catch rate and measured environmental parameters. Relationships were deemed inconclusive for glass eels at GRD due to varied results among years, and no relationship was detected between environmental parameters and catch rate of elvers at either site. Size structure and condition were also compared among years and/or between sites. Size structure of glass eels at GRD were similar in all years except 2001 which was shifted towards larger individuals. Data were limited for elvers but suggest that those collected at RD were in better condition compared to GRD. Commercial harvest of eels has been declining since the early 1990's, and most of the

current harvest is concentrated in the St. Johns River and is exported live out-of-state for food. Sub-samples of the harvest did not indicate a shift in the sex-ratio of the exploited yellow eel stock, but the size structure was slightly skewed towards larger individuals in 2004 as compared to previous years. To aid in future stock assessments, current monitoring efforts will continue and changes made to improve the value of data collected.

***Bowen, B. R.[1] and B. R. Kreiser[2].**
2/22 Poster Session — Presented by: Bowen, B. R. • Student • Symposium ~ Poster.
The University of Southern Mississippi, Department of Biological Sciences, Institute for Evolutionary Biology. PO Box 5018, Hattiesburg, MS 39406. 601-266-6556, bryant.bowen@usm.edu
[2]brian.kreiser@usm.edu.

Phylogeography and divergence times of *Alosa* species separated by the Florida peninsula.

Anadromous fishes are interesting subjects for phylogeographical studies. They move through the entire watershed from headwaters to the sea and are capable of dispersing along the coastline in their marine phase. Six *Alosa* congeners were used in this study, (Blueback herring, *A. aestivalis*, Alabama shad, *A. alabamae*, Skipjack herring, *A. chrysochloris*, Hickory shad, *A. mediocris*, Alewife, *A. pseudoherangus*, and American shad, *A. sapidissima*). Four of these are found on either side of the Florida peninsula and are thought to be sister taxa (*A. alabamae* and *A. sapidissima*; *A. chrysochloris* and *A. mediocris*). These relationships were concluded using meristics before the advent of molecular tools for systematic relationships. We are using molecular markers to characterize the biogeographic events that have shaped the evolutionary history of these species. Was the movement of these fishes between the Atlantic Ocean and Gulf of Mexico (GOM) accomplished by circumnavigation of peninsular Florida or by dispersal through the Okefenokee (Gulf) Trough via the Suwannee Straits during high sea stands of the Pleistocene? The goals of this project were to estimate the divergence times of *Alosa* congeners and compare them with dates of pertinent geological events of the Florida peninsula. Mitochondrial DNA (mtDNA) control region (D-loop) sequences will be used for six congeneric *Alosa* species from drainages ranging from North Carolina to Mississippi. These results will help us to better understand species diversity, biogeographical history of local processes, and the conservation of GOM and Atlantic Ocean migratory fishes.

***Bowen, B. R.[1], B. R. Kreiser[1], W. T. Slack[2] , P. F. Mickle[1] and S. T. Ross[3].**
2/23: 1410 — Presented by: Bowen, Bryant R. • Student • Symposium ~ platform presentation.
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Population genetics of Alabama Shad: Conservation and management implications for an anadromous species.

Anthropogenic effects on the environment have caused population declines in many diadromous species. Some of these impacts include loss of essential habitat, migration barriers, and poor water quality resulting from degradation of the watershed. The purpose of our project was to determine the phylogeographic relationships among the remaining natural populations of Alabama shad, *Alosa alabamae*, thus determining if drainage specific stocks exist. Genetic techniques have proven to be a useful tool in conservation biology by delimiting stock structure in other anadromous species such as salmon and sturgeon, as well as the closely related American shad. Population structure in Alabama shad was estimated using both mitochondrial DNA (mtDNA) and microsatellite marker analyses. Mitochondrial DNA control region sequences from 24 shad have been compared to date, revealing limited phylogeographic structure. Similar to other anadromous species, including American shad, heteroplasmy was observed in the control region, a finding not previously reported for Alabama shad. Microsatellite analyses with a much larger set of samples (n=276) using nine variable markers, designed for other

Alosa spp., found higher levels of population structure than previous allozyme and mtDNA restriction fragment length polymorphism analyses had revealed. These data indicate the species exists as unique populations for management considerations and contribute to the overall estimate of the health of ecosystems inhabited by this species. Markers are now available to monitor wild populations and future restoration programs if deemed necessary.

Crumpton, J. E.
2/23: 0850 — Presented by: Crumpton, J. E. • Non-student • Symposium ~ platform presentation.
Florida Fish and Wildlife Conservation Commission (Retired). 226 Woodland Drive, Eustis, FL 32726. Tel. 352-589-0037. armidillojoe@aol.com.

Ecology, history and management plan of the species American eel *Anguilla rostrata*.

This presentation will include a brief ecology, history, and summary of the Atlantic States Marine Fisheries Commission's Management plan of the American eel *Anguilla rostrata.* The American eel, although catadromous, is considered by most to be a fresh water species. Its total range includes the east coast of North America, Central America, and Northern South America. It is unique in that the American eel population is considered to be a single or panmictic one. Spawning takes place in the Sargasso Sea. Following its journey from the Sargasso in leptocephali form, it metamorphisizes through glass/elver, yellow, and silver eel stages before returning to the Sargasso. American eels mature slowly and sometime spend as much as 25 to 30 years if its life in fresh water streams connecting to the Atlantic coast from Nova Scotia to Florida. Some states support recreational fisheries, and commercial fisheries exist in all 14 Atlantic states and Nova Scotia. It is also unique in that the American eel has been commercially harvested during three of its four life stages. Recorded commercial landings date from early colonial times, however, archeological digs from areas around Florida indicate that American eel was a part of the diet of Native Indians many years even before the arrival of the Spanish in the early 1600's. Archaeological research indicates the Native Indians, with their early development of tribal economies, created specialized (commercial) fresh water fisheries long before the arrival of the white man. Historically, American eels were abundant in East coast streams, comprising more than 25% of the total fish biomass. Abundance remained fairly stable until the late 1970's and early 1980's. Since the early 1980's eel populations along the Atlantic seaboard and in the Great Lakes have plummeted. Since the late 1990's the Atlantic States Marine Fisheries Commission has developed a management plan for the American eel. In 2000 the plan was implemented. The goal of the plan was to conserve and protect the American eel resource and to ensure its continued role in ecosystems while providing opportunity for commercial, recreational, scientific, and educational use. State and government agencies are responsible for implementing research, management measures, and identification and protection of habitat in an effort to ensure the sustainability of the American eel population.

***Curtis, T. H.**
2/22 Poster Session — Presented by: Curtis, T. H. • Student • Contributed Poster.
Florida Program for Shark Research, Florida Museum of Natural History, University of Florida. PO Box 117800, Gainesville, FL 32611. Tel. 352-392-2360. tcurtis@flmnh.ufl.edu.

Distribution and movements of juvenile bull sharks, *Carcharhinus leucas*, in the Indian River Lagoon System, Florida.

The Indian River Lagoon system along Florida's Atlantic coast is a nursery ground for bull sharks (*Carcharhinus leucas*). Since bull sharks are a component of Florida's shark fisheries, proper management requires a better understanding of their ecology within their vital nursery areas. A sampling program utilizing longlines and rod and reel has been initiated to estimate the current abundance and distribution of bull sharks in this estuary. Tagging and acoustic telemetry are being used to investigate the movements and habitat use of the young sharks. To date, sampling efforts have yielded the capture of 20 young-of-the-year and juvenile bull sharks (54-94 cm FL). They were captured over a broad range of salinities, depths, and oxygen concentrations, and only in temperatures > 20°C. Four sharks have been actively tracked, providing over 65 hours of movement data. Based on these preliminary results, the daily movements of these sharks appear to be confined to comparatively small core use areas (< 4 km^2). There were no obvious changes in movement patterns between day and night. Continued tagging

and tracking efforts will provide a clearer understanding of how this important predator utilizes its nursery habitats.

Dunham[1], N. M. , and R. E. Matheson Jr.[2].
2/22 Poster Session — Presented by: Dunham, Nicole M. • Non-student • Contributed Poster.
Florida Fish and Wildlife Conservation Commission, Fish & Wildlife Research Institute. 100 8th Avenue SE, Saint Petersburg, FL 33701. Tel. (727) 896-8626. [1]Nicole.Dunham@MyFWC.com; [2]Eddie.Matheson@MyFWC.com.

Preliminary life-history information on *Hippocampus zosterae* in Florida Bay, Florida.

Seahorses, genus *Hippocampus*, are subject to a large and continuously growing international trade and have been listed for international protection by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITIES). In order to manage seahorse populations, we need to understand their basic life histories, but little biological information is available for most species. The objective of our study was to describe the relative abundance and distribution of *H. zosterae* in Florida Bay, Florida. Samples were collected from bank, basin, and near-key habitats using 1-m^2 (0.45 m high) throw traps. Seahorses and other fishes collected were preserved and later sorted and identified. During sampling periods consisting of two wet seasons (Oct 1998 and 1999) and two dry seasons (Apr-May 1999 and 2000), 256 *H. zosterae* were collected within samples taken at 18 sites. Based on these collections, we determined sex ratio, fecundity, and length-weight relationships for *H. zosterae*. We also determined the distribution and abundance of this species in relation to various habitat parameters in Florida Bay.

***Dutka-Gianelli[1], J., and R. G. Gilmore, Jr.[2].**
2/22 Poster Session — Presented by: Dutka-Gianelli, Jynessa • Student • Symposium ~ Poster.
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Movements of fat snook, *Centropomus parallelus* (Poeyi), in St. Sebastian River, Florida: preliminary results.

Centropomus parallelus, the smallscale fat snook or chucumite, occurs in estuaries and coastal freshwater tributaries throughout tropical America from Brazil to east central Florida. Although *C. parallelus* is diadromous, little is known about its life history, migration, and ecology. Three fat snook were tagged with VEMCO V8SC acoustic tags to monitor their migration relative to habitat in the St. Sebastian River between December 2003 to September 2004. VEMCO VR2 stationary receivers were deployed in an array of six stations along the river and individual fish were tracked for periods of from 21 to 211 days. Preliminary results showed that tagged fat snook made regular daily diurnal and nocturnal movements between the North Fork and South Fork of the river (54% of detections on North Fork versus 46% on South Fork). During this period, no downstream movements to the river mouth were detected. Most movement on South Fork were detected during day hours (57%), while most movements on North Fork were detected during crepuscular hours (42%). Maximum travel speed between receiver stations was estimated at 5 km/h. The distribution of spatial data suggested that tagged fat snook utilize a wide range of habitats in the river (such as channels, flats, and undercut banks) associated with areas of higher prey species abundance, and mostly along vegetated shorelines covered with emergent herbaceous and woody vegetation types.

Egbert, M. E.[1] and R. A. Rulifson[2].
2/22 Poster Session — Presented by: Egbert, M. E. • Non-student • Symposium ~ Poster.
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Atlantic needlefish *Strongylura marina* in a freshwater lake in North Carolina: evidence for anadromy?

The Atlantic needlefish, *Strongylura marina*, is a coastal epipelagic species species that is known to inhabit shallow, coastal waters along the Atlantic coast from Maine to Brazil as well as the Gulf coasts of the United States and Mexico. Because there is little commercial or recreation value of this species, the Atlantic needlefish has not been extensively researched by the scientific community. A population exists in Lake Mattamuskeet, the largest natural freshwater lake in North Carolina. This coastal lake is connected to Pamlico Sound via 4 manmade canals, and fish access to and from the lake is controlled by water control structures. The populations in Lake Mattamuskeet are of particular interest because the lake is a primarily freshwater habitat. This raises the question of why a saltwater species would be found in this habitat. This study focused of the life history of these populations found in the lake. Based on anecdotal reports in popular literature and state reports, we believe that this species may exhibit anadromy and perhaps use the lake as a spawning habitat. For this study, the lake was sampled for Atlantic needlfish from March to October of 2001. For each specimen, the gonads were removed and fixed for histological examination of gonad condition. Otoliths were removed from the specimens to be used to develop an aging system for this species. Fish collected in the spring had a high gonadosomatic index (GSI) compared to those collected in the fall, which had post-ovulatory follicles (POFs). The tentative aging system indicates that this species shows rapid in the first year of life, and becomes sexually mature around age two. However, no eggs or young-of-year were captured in the lake during the summer. While we found no direct evidence of spawning, data from previous studies complied with the data from this study indicate that Atlantic needlefish could be using this habitat for spawning purposes, like many anadromous species.

***Fitchett, K. J.[1] and W. A. Bennett[2].**
2/22: 1650 — Presented by: Fitchett, K. J. • Student • Contributed platform presentation.
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Competition, Fidelity, and Nesting Preference of gulf toadfish, *Opsanus beta*.

Reproducing gulf toadfish require hard structures such as oyster or *Atrina* shells as suitable spawning sites. Hard substrate is rare in the northwestern Gulf of Mexico and competition for desirable sites is keen. Over a three-year period we evaluated breeding season, nest structure preference, competition, and site fidelity of male gulf toadfish within 100 artificial nesting structures, constructed of polyvinyl chloride tees. All nesting structures were checked weekly for occupancy, presence of eggs or young, and guarding male toadfish were tagged. Gulf toadfish exhibited a well-defined, polygamous, bi-modal reproductive strategy; with breeding occurring from April to May and again from September to October. Nesting structures often contained multiple broods. Male toadfish displayed a strong preference for single-opening nesting structures. Intraspecific competition for nesting substrate was common and successful displacement or retention of a nest structure was influenced by body size ($p=0.0268$, $\alpha=0.05$) when eggs or young were present. Although the percentage of returning males was low between years, site fidelity was strongest between annual spawning peaks; suggesting that there was only one distinct population of toadfish breeding within the study area. Our study was the first of its kind to explore the reproductive tactics of the gulf toadfish.

Gilmore[1], R. G., Jr., [2]S. Frias-Torres, [3]J. Dutka-Gianelli.
2/23: 1010 — Presented by: Gilmore, R. Grant Jr. Ph. D. • Non-student • Symposium ~ platform presentation.
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[2]NOAA, NMFS, Southeast Fisheries Science Center, Virginia Beach Dr., Miami, FL, email: Sarah.Friastorres@noaa.gov;
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Diadromus stenothermic/stenoecious tropical peripheral fishes of southeastern florida with comments on the life history of the opossum pipefish, *Microphis brachyurus lineatus*.
At least eleven species of stenothermic tropical fishes occur in freshwater tributaries of southeastern Florida. Seven of these are captured routinely and are documented spawning either in freshwater, or within adjacent estuaries or ocean. All have limited habitat requirements making them extremely vulnerable to anthropogenic changes in regional aquatic systems, particularly freshwater tributaries to the Indian River Lagoon and Biscayne Bay. Nearly all freshwater tributaries to coastal southeastern Florida have been modified or are manipulated for flood control.
The opossum pipefish, *Microphis brachyurus lineatus*, matures, pairs and breeds solely in emergent herbaceous vegetation in freshwater tributaries thus allowing predicable occurrence and quantity of suitable habitat. The newly released larvae have been captured drifting downstream to the estuary. Earliest juvenile stages have only been captured in ocean or neritic waters, often in association with Sargassum rafts. Juveniles migrate into freshwater tributaries during the dry season, December to May, June, mature, mate and release larvae during the wet season, June to November.
A variety of human activities imperil these species. The principal habitat for the opossum pipefish, herbaceous emergent vegetation, is targeted for herbicidal removal by all Florida flood control districts. Out of season freshwater releases impact this species and its associated community. All natural tributaries where this species occurs are to be dredged by flood control districts in the near future. Increased runoff and lower water quality associated with coastal development has already been documented as deleteriously impacting syntopic tropical peripheral species. It is predicted that without protection this entire unique Florida ichthyofauna will be extirpated from the peninsula and the United States. The failure of state and federal agencies to recognize and protect this unique fauna even though considerable information and material has been gathered on their occurrence over the past 40 yrs is difficult to understand.

Greenawalt, J. M.[1], T. K. Frazer[2a], C. A. Jacoby[2b], and W. S. Arnold[3].
2/24: 1010 — Presented by: Greenawalt, J. M. • Non-student • Contributed platform presentation.
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[2] Department of Fisheries and Aquatic Sciences, University of Florida. 7922 NW 71st St. Gainesville, FL 32653. Tel. 352-392-9617. [a]frazer@ufl.edu; [b]cajacoby@ufl.edu
[3] Florida Fish & Wildlife Conservation Commission, Fish &Wildlife Research Institute. 100 Eighth Avenue, SE, St. Petersburg, FL 33701. Tel. 727-896-8626. bill.arnold@myfwc.com.
Population dynamics of the bay scallop fishery of Florida.
Bay scallops (*Argopecten irradians*) historically supported a commercial fishery along the Gulf coast of Florida. However, declines in bay scallop numbers at several locations resulted in limitations on and then complete closure of commercial harvest and changes in recreational regulations in the 1990s. Annual, spring population surveys were initiated in 1993 in Homosassa for management purposes; they are now conducted at ten locations from northwest to southwest Florida. Populations of particular interest are also surveyed in the fall, after the close of the harvest season. Data generated during these surveys were used to determine average mortality during harvest seasons. During the 2002 scallop season, numbers of recreational boats that appeared to be involved in harvesting bay scallops were counted at two popular locations, i.e., Steinhatchee and Homosassa. These data formed the basis for estimates of exploitation at both locations. Average total mortality during the harvest season, 0.352 ± 0.381 (SD), was comparable

to estimates from a previous study, but individual estimates were highly variable. Seasonal rates of exploitation at Steinhatchee in 2000 and 2001, although derived using different methods, were both 0.26. The seasonal rate of exploitation of the Homosassa population in 2002 was only 0.13. Simulations of changes in post-season densities under varying levels of exploitation suggest that healthy populations can sustain three times the fishing mortality estimated for the Steinhatchee bay scallop population given average natural mortality. However, conservative management of this fishery is recommended because of high variability in natural mortality, and the potential for recruitment limitation at low densities.

Harris J. E. [1], R. S. McBride[1] and R. O. Williams[2].
2/23: 1110 — Presented by: Maki, K. L. • Non-student • Symposium ~ platform presentation.
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[2] 620 South Meridian Street, Tallahassee, FL 32399. Tel. 850-487-0554. roy.williams@myfwc.com.
Comparison of Life History and Population Dynamics of Hickory Shad in the St. Johns River, Florida, in the 1970's and 2000's.
Hickory shad, *Alosa mediocris*, spawn in river systems from Maryland to Florida, but little published research on the life history of the species has been conducted in any state and none exists for Florida. We examined biological data for the population of hickory shad in the St. Johns River, Florida, collected during two study periods: by seine net from 1971 to 1973 and by electrofishing from 2001 to 2004. Age and spawning history were determined using scales and growth was modeled using the von Bertalanffy growth equation. Hickory shad spawn in the St. Johns River between December and March. Seasonally, they are the first of the *Alosa* species in this river to conduct their spawning migration. There appears to be a latitudinal pattern in the timing of the spawning migration for hickory shad, with individuals in more northern rivers spawning at a later date than those in southern systems. Hickory shad in the St. Johns River ranged in age from two to seven years and most individuals were three or four years old. In Florida, hickory shad are iteroparous with fewer than 50% of all individuals showing evidence of previous spawning. The distribution of ages and age at first maturity significantly increased from the 1970's to the present. It is uncertain if age at sexual maturity in the 2000's actually occurred at a later age than it did in the 1970's, or if those fish that survived to spawn in the river during the second period of the study were often older and later maturing individuals. Regardless of the mechanism, this change in age distribution and age at maturity may affect fecundity of the average individual spawning in the St. Johns River, Florida.

Heagey, R. F. [1] and T. S. Switzer[2].
2/23: 1650 — Presented by: Heagey, R. F. • Non-student • Contributed platform presentation.
Florida Fish & Wildlife Conservation Commission, Fish & Wildlife Research Institute. 100 Eighth Avenue, S.E., St. Petersburg, FL 33701. Tel. 727-896-8626. [1]bob.heagey@myfwc.com; [2]ted.switzer@myfwc.com.
Comparison of a Closed Marine Area to a Similar Adjacent Habitat: Can a small estuarine reserve impact local fisheries dynamics?
Marine protected areas (MPAs) are gaining popularity as an effective management tool for reducing rates of fisheries exploitation and for preserving marine biodiversity and critical habitats. Despite the apparent benefits of increasing the abundances and size structure of exploited fishes within MPA boundaries, scientists have yet to relate MPAs to increased fisheries production primarily due to the complexity of marine processes. A comparison of the distribution and size of sportfish, as well as of the community structure within an estuarine MPA and nearby unprotected areas could be used to evaluate the influence of estuarine MPAs on targeted fisheries. The FWC's Fisheries Independent Monitoring (FIM) program has been collecting data since June 2004 to compare the fisheries dynamics of a *de facto* protected area south of MacDill Air Force Base with a similar yet unprotected area along the east side of Weedon Island in Tampa Bay, Florida. Recruiting juvenile fishes were sampled with a small-mesh 21.3-meter seine and sub-adult and adult fishes were captured with a 183-meter haul seine. A total of 571 common snook and 533 red drum have been tagged in both areas to track and compare home range and overall movement patterns. Additionally, hook and line trips were conducted within each area to provide fisheries-

dependent data on catch and effort. Local guides were accompanied by FIM biologists who recorded such fishing effort parameters as time fished, type of bait, fishing mode, and habitat. Preliminary data collected from 24 hauls in each area with both 183-meter and 21.3-meter seines, hook and line gear, and tag returns will be presented.

Holder, J. C.
2/22 Poster Session — Presented by: Holder, J. C. • Non-student • Symposium ~ Poster.
Florida Fish & Wildlife Conservation Commission, Fish & Wildlife Research Institute, Lower St. Johns Fisheries Resources. 5450 U.S. Highway 17, DeLeon Springs, FL 32130. Tel. 386-985-7827. jay.holder@myfwc.com.

Shortnose Sturgeon (*Acipenser brevirostrum)* Population Evaluation in the St. Johns River, Florida.

The St. Johns River, FL is considered the southern most range for shortnose sturgeon in North America but little is known of the current and historic population. In the spring of 2001, biologists from the Florida Fish and Wildlife Conservation Commission Lower St. Johns Fisheries Resources Office and the United States Fish and Wildlife Service Welaka National Fish Hatchery initiated a study to determine the presence/absence of shortnose sturgeon (*Acipenser brevirostrum)* in the St. Johns River. Using a protocol developed by the National Oceanic Atmospheric Administration - National Marine Fisheries Service, gill net samples were conducted over a two-year period beginning on 3 January 2002 and ending 27 June 2003. A single shortnose sturgeon was collected in 4,493 hours of 100-m gill net sets. Historically, few shortnose sturgeon have been positively identified by biologists and commercial landings were relatively low compared to other southern states. Spawning habitat in the St. Johns River basin is limited or marginal and no sturgeon reproduction has ever been documented. A shortnose sturgeon previously tagged in Georgia was captured from the St. Johns River in August 2000. Based on these factors, shortnose sturgeon captured infrequently from the St. Johns River may be transients from other river systems.

***Hyle[1], A. R. and J. E. [2]Olney.**
2/23: 1330 — Presented by: Hyle, A. R. • Student • Symposium ~ platform presentation.
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Reproductive Biology of the American shad, *Alosa sapidissima*, in the Mattaponi River, Virginia.

The seasonal fecundity of American shad, *Alosa sapidissima*, from the Mattaponi River was calculated using estimates of spawning frequency, batch fecundity, and residence time. Spawning frequency was estimated using histological and macroscopic techniques. Histological techniques were more reliable and allowed the estimation of spawning frequency from animals containing migratory nucleus stage oocytes, hydrated oocytes, 1-day old postovulatory follicles, and 2-day old postovulatory follicles. Female shad spawn once every two to three days. Batch fecundity was estimated for 70 specimens collected in 2002 and 2003 using the gravimetric method. Batch fecundity, though highly variable, was positively linearly correlated with eviscerated weight (EW) and ranged from 12,700 to 81,000 eggs per batch. Relative batch fecundity ranged from 12.6 eggs/g EW to 68.3 eggs/g EW. Mean relative batch fecundity was 30 to 36 eggs/g EW. Residence time was obtained from a concurrent sonic tagging study and was 34 days. On average shad in the Mattaponi River release 11 to 17 batches per season. Seasonal fecundity for an average virgin (4.96 years old and 1088g EW) was estimated to be between 380,000 and 550,000 eggs. This is 1.5 to 2 times higher than mean virgin fecundity reported in previous investigations that assumed determinate fecundity. Histology was also used in an attempt to elucidate the spawning strategy of American shad as either determinate or indeterminate. Histology indicates a possible determinate strategy with the level of remnant fecundity declining during the season and a reduction in the number of partially yolked oocytes in animals that have spawned several times. These results are confounded by the observation of animals containing significant remnant fecundity exiting the river in another study; and

by the discrepancy between this study's seasonal fecundity estimates and those made assuming determinate fecundity. Therefore a hypothesis of indeterminate fecundity in American shad was not rejected.

Isely[1], J. J., and M. M. Bailey[2].
2/23: 1050 — Presented by: Isely, J. Jeffery • Non-student • Symposium ~ platform presentation.
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[2]University of Maine, Orono, ME 04469.

Passage of American shad at a low-head navigation lock on the Savannah River, South Carolina and Georgia.

We investigated population size, and the proportion of the population of American shad *Alosa sapidissima* passed through New Savannah Bluff Lock and Dam, a low-head lock and dam on the Savannah River, South Carolina and Georgia. We fit 110 American shad with radio transmitters in 2001 and 2002. All but two fish moved downstream after transmitter implantation. In 2001, a smaller proportion of American shad implanted with radio transmitters earlier in the season returned to the dam than fish released later. Over 50% in 2001, and 9% in 2002 of fish that returned to the dam passed through the lock and continued migrating upstream. In both years, the modal daily movement distance was less than 1 km. Movements greater than 5 km/d were generally associated with fish rapidly returning upstream after their initial downstream movement. Continuous diel monitoring indicated that movements greater than 0.1 km/h were more frequent at night than during the day. In both years, American shad were not uniformly distributed over the study area but were predominantly grouped just below the dam, and in a relatively large pool approximately 6 km below the dam. We estimated the population size of American shad that reached New Savannah Bluff Lock and Dam at 157,685 in 2001, and 217,077 in 2002.

Jackson, J. B.[1] and D. J. Nemeth[2].
2/22 Poster Session — Presented by: Jackson, J. B. • Non-student • Contributed Poster.
Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, Senator George Kirkpatrick Marine Lab, 11350 SW 153rd Ct., Cedar Key, Florida 32625. Tel. 352-543-9200.
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A New Method to Describe Seagrass Habitat Sampled During Fishery-Independent Monitoring.

We describe a new method, the SAV tube method (STM), for quantifying seagrass cover ratios and species composition during fisheries-independent sampling.
The method is designed to be used in shallow water habitats and does not require a snorkeler to enter the water. Tests were conducted to determine if the STM could differentiate between five Braun-Blanquet cover categories, and if STM cover ratio and species composition estimates correlated with blade counts, shoot counts, and above-ground biomass of seagrasses. The STM cover ratio estimates differentiated between all five cover categories and correlated significantly with the measured parameters of seagrass abundance. The STM species composition estimates correlated only with those obtained from above-ground biomass. To accurately estimate the cover ratio of seagrass within the 141.05 m^2 area sampled by a 21.3-m seine during fisheries-independent sampling, we determined that six STM measurements were required. Seventeen trials were conducted within such sample areas to determine if different observers would obtain statistically similar results when using the STM. One trial was significantly different for cover ratio, and two were significantly different for species composition. The STM is an accurate, consistent, and efficient way to quantify seagrass cover and species composition during fisheries-independent sampling.

Krebs, J. M.[1], A. B. Brame[2], and C. M. McIvor[3].
2/23: 1550 — Presented by: Brame, A. B. • Non-student • Contributed platform presentation.
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Estuarine fish assemblages in natural and altered wetland habitats of Tampa Bay, Florida: Summary of Year 1.

Ecological consequences of habitat alteration on nekton communities (e.g., fishes, shrimp, crabs) are poorly understood. We initiated a 3-year study to determine spatiotemporal use of natural and altered wetlands by three assemblages: marsh residents, transients, and recreational species. In 2004, we conducted seasonal seine sampling (4 seasons) of nekton in natural tidal creeks (n=21 samples/season) and two types of altered habitats: mosquito-control ditches (n=19) and water-conveyance (linear) ditches (n=9) in three Tampa Bay wetlands.

We collected 73 species totaling 72,794 individuals. Wetland residents comprised 86% of the total, and nine of the ten most abundant species. Nekton communities differed among the three regions of the estuary as well as among habitats. Species richness was similar between tidal-creek (n=62 taxa) and linear-ditch communities (n=60 taxa), but lower in mosquito ditches (n=39 taxa). Ten species of marsh residents (killifishes and livebearers) made up the largest proportion of the mosquito-ditch community (79%), but contributed less to creeks (47%) and linear ditches (34%). Schooling transients (anchovies, silversides, herrings; n=6 species) composed the largest proportion of the linear-ditch community (32%) compared to creeks (18%) and mosquito ditches (7%). Three species of mojarras, another transient, were also dominant in linear ditches (21%) compared to creeks (6%) and mosquito ditches (<1%). Recreational taxa (n=21), including spot, blue crab, red drum, pink shrimp, mullet, sheepshead, spotted seatrout, black drum, and snook were more prevalent in tidal creeks (14%) than in linear (9%) or mosquito (8%) ditches. Interestingly, mean abundances of most recreational species were twice as high in creeks as in ditches. However, snook were five times more abundant in creeks, and black drum were twice as abundant in mosquito-ditches. Blue crab and mullet were equally abundant in both habitats. These results will be useful for pre-restoration planning and post-restoration assessment of nekton community response to restoration of altered wetlands.

Kovatch[1], L., and F. M. Parauka.
2/22 Poster Session — Presented by: Parauka, Frank M. • Non-student • Symposium ~ Poster.
U.S. Fish & Wildlife Service, 1601 Balboa Ave, Panama City, FL. 32405, Tel. 859-769-0552; Email Frank_Parauka@fws.gov; [1]Student Conservation Associate.

Availability of Gulf Sturgeon Spawning Habitat in Northwest Florida and Southeast Alabama River Systems.

Availability of potential Gulf sturgeon spawning habitat was documented in northwest Florida and southeast Alabama River systems. Potential spawning sites were identified in six river systems by visually characterizing habitats that appear similar to known Gulf sturgeon spawning areas. Each river was floated downstream from the first obstruction that would (in normal years) most likely be the upper reach for Gulf sturgeon distribution. Locations of each site were recorded with a G.P.S. unit and photographed. Physical features were documented. One hundred and fifty-two sites, totaling 93 km, were identified as having characteristics similar to documented Gulf sturgeon spawning habitat. Potential spawning sites ranged from small individual sites, less than 30 m in length, to numerous sites within a longer river reach exceeding 7 km. Nearly 90% of the available Gulf sturgeon spawning habitat was located in Alabama.

Limburg, K. E.[1], K. A. Hattala[2], and A. W. Kahnle[2].
2/23: 1030 — Presented by: Limburg, Karin E. • Non-student • Symposium ~ platform presentation.
[1]SUNY College of Environmental Science & Forestry, 241 Illick Hall, Syracuse, NY 13210. Limburg, Karin E.; Tel. 315-470-6741; Email: KLimburg@esf.edu.
[2]NY State Department of Environmental Conservation, 21 South Putt Corners Road, New Paltz, NY 12601. Email: kahattal@gw.dec.state.ny.us.
American shad in its native range.
Anadromous American shad (*Alosa sapidissima* Wilson) ranges from the St. Lawrence River in Canada to the St. Johns River, Florida. Once the major commercially fished species in the U.S., catches went from a high of nearly 23,000 metric tons (1896) through a series of cascading declines to the present-day levels in the hundreds of metric tons. The declines were attributed to overfishing, habitat loss, and pollution over the past 170 years. Despite the success of fishways, modern major spawning rivers have lost approximately 4,000 km of habitat due to dams.
American shad exhibits biological variation along its geographic range. This variation includes growth rates (counter gradient), fecundity, and degree of iteroparity. Good information exists on adult migration trends, migration physiology, and on young-of-year ecology. Whereas many aspects of American shad biology have been well studied in certain systems, complete population profiles from its entire range, including accurate population size estimates, are lacking. This paper synthesizes available data and points out the gaps in information that would aid in restoration and management of this valuable species.

Lombardi-Carlson, L. A.
2/24: 1030 — Presented by: Lombardi-Carlson, Linda A. • Non-student • Contributed platform presentation.
National Marine Fisheries Service, 3500 Delwood Beach Road, Panama City, FL 32408,
Tel. (850) 234-6541 ext. 213, Email: Linda.Lombardi@noaa.gov.
Is there substantial biological evidence to indicate separate stocks of red grouper (*Epinephelus morio*) in the northeastern Gulf of Mexico?
Red grouper (*Epinephelus morio*) were collected in the northeastern Gulf of Mexico, the central area of fishery harvest in U.S. waters, by fishery-dependent sources (2000-2001). Based on geographical features, the northeastern Gulf of Mexico was divided into two regions: north (capture locations 28-30^{o}N latitude) and south (capture locations 27-24^{o}N latitude). Red grouper caught by fishery-dependent sources were compared separately by gear type and revealed significant differences in age and length by region. Red grouper from the northern region were significantly younger and smaller than fish from the southern region. By combining all gear types, only 7% of northern fish were older than 10 yrs compared to 25% in the southern region, and only 10% of the northern fish were larger than 700 mm compared to 23% in the southern region. Age class distributions were also different between the northern and southern regions with the 1996 year class dominating during 2000 and 2001 (age 4 and 5 yr olds) only in the northern age distribution. Regional data was fitted to von Bertalanffy growth curves revealing smaller asymptotic length (L_8) and faster growth coefficient (k) from the northern region (north: L_8 = 805 mm, k = 0.15, t_o = -2.28; south: L_8 = 849 mm, k = 0.05, t_o = -8.30). This implies differential life history traits by region, but does not eliminate size-based migration or the effects of fishing. Future research will be aimed at identifying whether recruitment (i.e. abundance of young age classes) is occurring throughout the west Florida shelf or differs by region.

Lounder, C. A.
2/24: 1050 — Presented by: Lounder, C. A. • Non-student • Contributed platform presentation.
National Marine Fisheries Service, Southeastern Fisheries Science Center, 3500 Delwood Beach Road, Panama City, Florida 32408. Tel. 850-234-6541; Cecelia.lounder@noaa.gov.
Big fish versus old fish of the snapper/grouper complex.
Fishery-directed port samples received at the NOAA Fisheries Panama City Laboratory include an abundance of snapper/grouper otoliths. Occasionally there is a specific request for age determination of a particularly large specimen (trophy fish) from port agents or vessel captains. Unexpectedly, trophy fish are typically of intermediate age within the range for a given species. A survey of the otolith archives was

conducted to compare longevity and trends in size-at-age for four economically important species, red snapper (*Lutjanius campechanus*), vermilion snapper (*Rhomboplites aurorubens*), gag grouper (*Mycteroperca microlepis*), and scamp (*Mycteroperca phenax*). Frequency distributions of each species were constructed by isolating the available records for length and age. Extrapolating the longest and oldest 10% illustrated a lack of correlation between size and age amongst vermilion snapper and scamp. Both red snapper and gag populations tend to show more uniform trends among the oldest and largest. There is some variation in the ranges of catch sites and the fishing gear used when comparing the oldest and largest fish, but the data did not show significant disparity for either variable.

Lundy, E.
2/22: 1310 — Presented by: Lundy, E. • Non-student • Contributed platform presentation.
Florida Fish & Wildlife Conservation Commission, Fish & Wildlife Research Institute, Lower St. Johns Fisheries Resources. 5450 U.S. Highway 17, DeLeon Springs, FL 32130. Tel. 386-985-7827. earl.lundy@myfwc.com.

Food Habits of Bluegill (*Lepomis macrochirus*) in a Reclaimed Muck Farm.

The Emeralda Marsh Conservation Area (EMCA) is composed of former ranches and muck farms and was purchased by the St. John's River Water Management District (SJRWMD) in 1991. This land was subdivided into seven "areas", flooded, and eventually stocked with fish. However, subsequent monitoring of the EMCA indicated decreased sportfish production. Subsequent habitat investigations indicated high benthos levels of organochloride pesticides (OCP's) and polychlorinated biphenyls (PCB's). Quarterly examinations of benthic invertebrate communities were performed from October 2001 until May 2002 to determine if a forage bottleneck was occurring. Bluegill (*Lepomis macrochirus*) were sampled for stomach content analysis concurrent with the invertebrates to determine if dietary limitations were effecting the population. Overall trends indicate a decrease in consumption of ostracods and copepods in bluegill as total length increased. Consumption of fish, cladocerans, grass shrimp, eggs, trichopterans, dipterans, insects, and vegetation increased with fish size throughout the year. Low consumption of benthic organisms (trichopterans, chironimids, and oligochaetes) were observed, most likely due to low densities of these organisms in the system. Overall food habits indicate foraging occurred primarily in the limited vegetative littoral zone, with little foraging occurring in open water areas.

Maki, K. L.[1], R. S. McBride[2], and M. Murphy[3].
2/22 Poster Session — Presented by: Maki, K. L. • Non-student • Contributed Poster.
Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute. 100 8th Ave SE, St. Petersburg, FL 33701. Tel. 727-896-8626. [1]kristin.maki@myfwc.com; [2]richard.mcbride@myfwc.com; [3]mike.murphy@myfwc.com.

Biology of Wahoo in Florida and the Bahamas.

Despite the economic importance of wahoo, Acanthocybium solandri, in many regions of the world, its biology and life history have received infrequent attention. The Fishery Management Plan for Dolphin and Wahoo in the Atlantic Region reports that estimates of age, growth and, reproduction are needed to better understand the implications of various options for managing the wahoo fishery. The study detailed here was initiated in 2003 and designed in response to the need for more and better data. Wahoo are collected year-round from fishing ports along Florida's east coast through tournament sampling, and angler-intercept and carcass-retrieval programs. Additional samples are taken in the Bahamas during the winter months. The relative utility of otoliths, scales, fin rays, fin spines, and vertebrae as ageing structures is discussed here. Whole otoliths and fin ray sections show the most promise for use as ageing structures. Reproductive seasonality is characterized from gonad-somatic indices and patterns of gametogenesis revealed in histological preparations are described. In the first two years of our study, we have collected relevant samples from more than 300 fish, which range in size from 6 to 98.5 lbs (2.7 to 44.7 kg); we have samples from another 100 fish that were archived and we plan one more year of active collecting to achieve adequate sample sizes. Our preliminary results appear consistent with the general paradigm that this species is a summer-spawning, short-lived pelagic with remarkable growth rates.

Martignette, A. J [1], S. A. Bortone[2] and J. P. Spinelli[3].
2/24: 0910 — Presented by: Martignette, A. J. • Non-student • Contributed platform presentation.
Marine Laboratory at the Sanibel-Captiva Conservation Foundation. 900A Tarpon Bay Road Sanibel, FL 33957. Tel 239-395-4617. [1]amartignette@sccf.org; [2]sbortone@sccf.org; [3] jspinelli@sccf.org.
Spotted Seatrout (*Cynoscion nebulosus*) Growth as a Indicator of Conditions in Lower Pine Island Sound.
The spotted seatrout has the potential of revealing long-term trends in the conditions of estuaries, because this species spends the majority of its life in a single estuary. Therefore, the condition of the estuary could be reflected in fish growth. Approximately 400 fish were collected from April to August 2003 from southern Pine Island Sound via hook and line. Of the 400 fish caught, 162 males and 134 females ages 1 to 4 were used for this study. Age was determined using thin cross sections of sagittal otoliths. Images of the otolith sections were captured using a digital camera connected to a dissecting scope. Measurements of otolith radii were made using an image analysis software package. The length for males ranged from 217 to 420 mm FL and for females 228 to 557 mm FL. The average size of males was smaller than females; 293.75 mm FL versus 321.36 mm FL. A regression line for the relationship between otolith radius and Fork Length was calculated for each sex. A positive correlation was shown for both sexes however the slope and y-intercept were significantly different. Females showed a faster growth rate than males; therefore, the data were separated by sex before analysis. Back-calculated size at Age 1 for year classes 1999 to 2002 showed significant differences in growth between age classes. Males and females from the 2002 year class were larger at Age 1. The 2000 year class displayed slower growth in their second year. Slightly faster growth for the 1999 year class was observed. Environment factors such as the extreme fluctuations in salinity in the estuary during 2000 may be responsible for these growth rates changes.

McBride, R. S.[1], J. E. Harris[1], and J. C. Holder[2].
2/22 Poster Session — Presented by: McBride, R. S. • Non-student • Symposium ~ Poster.
Florida Fish & Wildlife Conservation Commission, Fish & Wildlife Research Institute. [1]100 Eighth Avenue, SE, St. Petersburg, FL 33701. Tel. 727-896-8626. richard.mcbride@myfwc.com ; JEH's current email: jeharris@ncsu.edu;
[2]5450 US Hwy 17, DeLeon Springs, FL 32130. Tel. 386-985-7827. jay.holder@myfwc.com.
Abundance and length of American shad, *Alosa sapidissima* , collected by electrofishing in the St. Johns River, Florida.
American shad, *Alosa sapidissima*, is an anadromous species native to the Atlantic Coast of North America from Newfoundland to northern Florida. Historically, American shad were caught commercially and recreationally in the St. Johns River, Florida, during their spawning migration from December to May. This fishery has declined markedly in the last few decades, apparently due to population declines, and the status of the American shad population in the river system at present, is unknown. A study addressing the American shad population in the St. Johns River is currently being conducted in which shad are collected by electrofishing on a randomly determined side of the river channel. This poster summarizes the effects of sampling location (side of the river sampled) on the abundance and fork lengths of American shad collected by electrofishing from a presumed spawning area of the St. Johns River. In addition, a superstition exists that bananas can influence angler catch rates. Thus, this poster also addresses the effects of bananas on the abundance and fork lengths of American shad in this system. No significant differences (α = 0.05) were found for abundance or fork lengths of American shad collected on the right (east) as compared to left (west) side of the river. Also, no significant differences (α = 0.05) in abundance or fork length were observed for fish collected on a boat that contained bananas as compared to a boat with no bananas. These findings suggest that a comparable number of similarly sized individuals will be collected regardless of which side of this river is randomly selected for electrofishing and of whether or not bananas are present on the boat at the time of collection.

McBride, R. S.[1], J. C. Holder[2], and R. O. Williams[3].
2/23: 0910 — Presented by: McBride, R. S. • Non-student • Symposium ~ platform presentation.
Florida Fish & Wildlife Conservation Commission, Fish & Wildlife Research Institute. [1]100 Eighth Avenue, SE, St. Petersburg, FL 33701. Tel. 727-896-8626. richard.mcbride@myfwc.com ;
[2]5450 US Hwy 17, DeLeon Springs, FL 32130. Tel. 386-985-7827. jay.holder@myfwc.com ;
[3]2590 Executive Center Circle East, Suite 201, Tallahassee, FL 32301; Tel. 850-487-0554; roy.williams@myfwc.com.

The biology, ecology, management, and conservation of Florida's *Alosa* species.

This paper will review the biology, ecology, management, and conservation of the five *Alosa* species that occur in Florida. On the east coast there are three congeners. American shad (*Alosa sapidissima*) has the highest profile of these species; it was the target species for a historically important fishery and culturing industry in the U.S. Hickory shad (*Alosa mediocris*) is typically mixed with American shad in the inland fishery, but it is less abundant and very little is known about this species. Blueback herring (*Alosa aestivalis*) is an important fishery in some northern states, where it is typically mixed with alewife (*Alosa pseudoharengus*), the latter of which is the only North American *Alosa* that does not occur in our state. On the west coast there are two more congeners, neither of which supports a significant fishery and both of which are poorly understood: Alabama shad (*Alosa alabamae*) and skipjack herring (*Alosa chrysochloris*). All of these species are anadromous, with the likely exception of skipjack herring as a potadromous species. These species are planktivorous, at least as juveniles, and some become piscivorous later as adults. They are generally regarded as important forage for other fishes, birds, reptiles, and mammals, although this is not documented for all species. The east coast fishery for American shad developed rapidly as trains traveled south in the late 19th century and cultured fish were seeded wildly throughout the state. This was a valuable species well into the 20th century, but steady declines for several decades have diminished the relative importance of this fishery. Alabama shad is listed as vulnerable. Dams have contributed to these declines on both the Atlantic and Gulf coasts. Channelization and water quality were and continue to be major threats to Florida's populations, and policies concerning minimum flow levels will undoubtably affect *Alosa* species in the future.

McBride, R. S.[1], T. C. MacDonald [2], R. E. Matheson[3], D. A. Rydene[4], and P. B. Hood[5].
2/22 Poster Session — Presented by: MacDonald, T. C. • Non-student • Contributed Poster.
[1,2,3] Florida Fish & Wildlife Conservation Commission, Fish & Wildlife Research Institute. 100 Eighth Avenue, SE, St. Petersburg, FL 33701. Tel. 727-896-8626. [1]richard.mcbride@myfwc.com;
[2]macdonald.tim@myfwc.com [3]eddie.matheson@myfwc.com
[4,5] National Marine Fisheries Service, 9721 Executive Center Dr., St. Petersburg, FL. Tel. 727-570-5317
[4]david.rydene@noaa.gov; [5]peter.hood@noaa.gov.

Nursery habitats for ladyfish, *Elops saurus*, along salinity gradients in two Florida estuaries.

Ladyfish, *Elops saurus*, are recognized as an estuarine-dependent species, but no published study has described how ladyfish use estuarine habitats. Our fisheries-independent study found ladyfish to be common throughout Tampa Bay and Indian River Lagoon, Florida. In both estuaries, metamorphosing larvae were collected during several months of the year, but they were most abundant in spring. In both estuaries, age-0 ladyfish entered as metamorphosing larvae and became concentrated in waters of lower than median salinity (23-25 ppt). In Tampa Bay, which had a greater range of salinity than Indian River Lagoon did, age-0 ladyfish were found principally in mesohaline and oligohaline areas; in Indian River Lagoon, age-0 ladyfish were found in mesohaline and polyhaline waters. In autumn, age-0 ladyfish moved back to higher salinities, into lower parts of the estuaries, and even out to Gulf of Mexico beaches. These field observations are consistent with the hypothesis that ladyfish depend on estuaries, specifically positive estuaries where freshwater input exceeds evaporative processes. However, published studies also demonstrate that larval ladyfish can metamorphose and juveniles can survive in hypersaline waters, so negative estuaries may also serve as suitable nursery habitat.

McBride, R. S.[1] and R. E. Matheson[2].
2/22 Poster Session — Presented by: Matheson, R. E. • Non-student • Symposium ~ Poster.
Florida Fish & Wildlife Conservation Commission, Fish & Wildlife Research Institute. 100 Eighth Avenue, SE, St. Petersburg, FL 33701. Tel. 727-896-8626. [1]richard.mcbride@myfwc.com ; [2]eddie.matheson@myfwc.com.
Florida's Diadromous Fishes: biology, ecology, management, and conservation.
This poster tabulates Florida's diadromous fishes and comments on their biology, ecology, management, and conservation. Diadromy is a complex life-history pattern that involves true migrations between freshwater and marine biomes. These migrations occur at predictable times or at characteristic life stages for most or all individuals of these species. Diadromous fishes can be further classified as anadromous, catadromous, or amphidromous depending upon which biome is used as spawning or nursery grounds. Diadromous species represent only about 1% of all fish species worldwide, and diadromy is similarly rare among Florida fishes. Florida diadromous fishes include some of the more popular examples of diadromy — sturgeons, American eels, shads, and striped bass — and several others that are less well known. These diadromous species are very important economically and ecologically: some support important fisheries and some are abundant enough to serve as significant and predictable prey resources for other fishes and wildlife. Other diadromous species, such as Gulf sturgeon, have special conservation status. A few other species in Florida have been suggested as being diadromous, but their life-history data are ambiguous. Florida's diadromous fishes deserve more attention: because their life history encompasses essential fish habitat from non-tidal, freshwater to coastal, marine biomes, they can serve as important sentinels of the environmental health of our highly valued coastlines.

McDevitt, E. E.[1], E. R. Ault[1], L. R. Barbieri[2], J. A. Colvocoresses[2], and P. E. Thomas[1].
2/24: 1110 — Presented by: McDevitt, Erin E. • Non-student • Contributed platform presentation.
[1]Florida Fish & Wildlife Conservation Commission, Florida Wildlife Research Institute, Tequesta Field Laboratory, 19100 SE Federal Highway, Tequesta, FL 33469; Tel. 561-575-5407; Email: erin.mcdevitt@myfwc.com.
[2]Florida Fish & Wildlife Conservation Commission, Florida Wildlife Research Institute, 100 Eight Avenue SE, St. Petersburg, FL 33701-5095.
Reproductive Patterns of Gray Snapper (*Lutjanus griseus*) and Lane Snapper (*Lutjanus synagris*) in Southeast Florida.
The reproductive biology of gray snapper (*Lutjanus griseus*) and lane snapper (*Lutjanus synagris*), important components of the reef fisheries in south Florida, were studied using histologybased gonad maturity staging and the gonadosomatic index (GSI). Sampling was conducted from winter 1998 through summer 2002 using both fishery-dependent (headboats) and fishery-independent (baited chevron-wire fish traps and hook-and-line fishing) random sampling in southeast Florida. Both species are multiple spawners with group-synchronous oocyte development. We collected 453 female gray snapper and 711 female lane snapper ovaries and macroscopically and histologically examined them to determine their gonad maturity stages based on a seven-stage maturity scale. Mean length at first maturity was approximately 260 mm TL for male and female gray snapper and 175 mm TL for male and 153 mm TL for female lane snapper. Gray snapper spawning takes place from June through September and lane snapper spawning takes place from March through September, with a peak during MayJuly. Histological examinations of females caught throughout the day indicate that most individuals of both species spawn at or near dusk. The highest numbers of lane snapper females in spawning condition were captured during the week before and immediately after the full moon, but no pattern was recognized for gray snapper. These reproductive data were used in developing a study of reef fish spawning aggregations that began in the summer of 2004.

Mesing, C. M.[1] and E. A. Long[2].
2/23: 0930 — Presented by: Mesing, C. M. • Non-student • Symposium ~ platform presentation.
Florida Fish & Wildlife Conservation Commission, P.O. Box 59, Midway, FL 32343. Tel. 850-487-1645.
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An Overview of Florida's Striped Bass Populations.

Striped bass, *Morone saxatilis*, are a native fish species that occurs in Atlantic and Gulf coast river drainages of Florida. At the extreme southern extent of their range, striped bass in Florida were historically limited to the St. Marys, Nassau, and St. Johns rivers on the Atlantic coast, and from the Ochlockonee River to the Perdido River along the Gulf coast. Early researchers recognized meristic and morphological differences between striped bass native to the Gulf coast and Atlantic seaboard, and concluded Gulf fish were a separate race. By the 1960s, native striped bass populations declined significantly as a result of anthropogenic activities including the widespread use of pesticides, water quality degradation, and the construction of dams that blocked access to historical spawning areas and thermal refuges. The Apalachicola-Chattahoochee-Flint (ACF) river system striped bass population is the last naturally reproducing native population along the entire Gulf coast. Similarly, the St. Marys River likely harbors the only reproducing native population on Florida's Atlantic coast. Historically, striped bass contributed minimally to limited commercial and recreational landings in Florida's coastal and inland waters. Mark-recapture and biotelemetry studies demonstrated that striped bass in the Apalachicola River, and other Gulf of Mexico river systems, are more aptly described as potadromous (migrating within river systems) than anadromous since they generally remain within the river system throughout their lifespan. Striped bass populations along Florida's Atlantic coast are also riverine in nature and do not participate in the extensive coastal migrations undertaken by more northern populations. Numerous studies have documented the importance of cool-water (< 23ºC) thermal refuge habitat for the over-summer survival of adult striped bass in freshwater systems of Florida and other southern states. Native and/or non-native striped bass have been introduced into all river systems within the native range in Florida. Since 1987, genetic research has documented that some striped bass in the ACF river system possess unique mtDNA haplotypes and nDNA genotypes not observed in any Atlantic coast populations. More recently, fixed differences between Gulf and Atlantic alleles at three microsatellite loci and significant frequency differences at two other loci have been identified. Currently, introgression of Atlantic alleles into the ACF genome at fixed microsatellite loci has exceeded 50%. The ACF Striped Bass Restoration and Evaluation Plan is the guideline for restoration of native striped bass in the ACF system. The St. Johns River population is maintained as put-grow-and-take fishery because of limited natural reproduction and cool-water habitat.

***Mickle, P. F., B. R. Kreiser, S. B. Adams, and J. F. Schaefer.**
2/23: 1350 — Presented by: Mickle, P. F. • Student • Symposium ~ platform presentation.
University of Southern Mississippi, Department of Biological Sciences, Hattiesburg, MS 39406-5018; Tel. 601-599-4233; Email: paul.mickle@usm.edu.

Understanding the Life Stages and Habitat Use of the Alabama Shad, *Alosa alabamae* in the Pascagoula River Basin.

Information about the life history of the Alabama Shad, *Alosa alabamae,* and its presence along the Gulf coast is limited. Although the species is not listed as endangered, declines in populations have raised concerns and projects are currently underway to conduct stock assessments within the rivers where they reproduce. The Pascagoula drainage is unique compared to other drainages in that it is the only undammed major waterway in the lower forty-eight states. Within my beginning field season, first year Alabama Shad have been caught in summer holding areas. The fish appear to be using a combination of heavy current and a clear current break that has a defined edge. Spawning grounds have not yet been documented but several sites are labeled as candidates. Adults are caught entering the river January through March migrating to the spawning grounds. The focus of my research will be to document the spawning sites and season of the Alabama shad as well as identifying juvenile holding areas within the river. After habitat parameters are adequately understood, protection of essential habitat may be suggested. Understanding the life stages of the Alabama Shad and its habitat use in the river will provide crucial information toward its conservation.

***Morris, N. M. B.[1], W. F. Patterson[2], and R. Church[3].**
2/22: 1430 — Presented by: Morris, N. M. B. • Student • Contributed platform presentation.
[1&2]Department of Biology, University of West Florida, 11000 University Parkway, Pensacola, FL 32514. Tel. 850-857-6123. [1]nmm7@students.uwf.edu and [2]wpatterson@uwf.edu. [3]C & C Technologies, 730 East Kaliste Saloom Road, Lafayette, LA 70508. Tel 337-261-0660. robert.church@cctechnol.com.
The artificial reef effect of World War II era shipwrecks in the Northern Gulf of Mexico.
We examined community structure of fishes associated with six World War II era shipwrecks that ranged in depth 87 to 1,964 m. This was accomplished mainly with video collected with a remotely operated vehicle (ROV) flown along transects over, immediately adjacent to, and 300 m away from wreck sites. Fishes also were collected with fish traps and a suction sampler attached to the ROV. Fishes were identified from video to lowest taxonomic level possible and enumerated; samples from traps and the suction sampler aided identification. Stable isotope analysis (C, N and S) of fish and invertebrate muscle samples also was conducted to estimate trophic structure and source(s) of carbon. Statistical analysis of community structure estimates revealed significant differences existed among wreck sites (ANOSIM: $p < 0.01$) and among sample locations within sites (ANOSIM: $p < 0.01$). At the three shallowest sites (87, 143, and 554 m depth, respectively) reef- or structure-associated fishes were predominant over wreck sites. At the shallowest site, the community was dominated by Lutjanid species. The fish community at 143 m site was dominated by small sea basses (Serranidae subfamily Anthiinae) associated with the branching azooxanthellae coral, *Oculina*, but large numbers of amberjack (*Seriola dumerili*) and several large Epinephelus groupers also were present. The slimehead, *Hoplostethus occidentalis*, and structure-associated scorpionfishes dominated the community at the 554 m site, which was covered with *Lophelia* thickets. Fish communities over deep wrecks were similar to those away from wrecks and consisted mostly of Ophidiiformes, Halosaurid, Macrourid and Anguiliformes species, listed in order from highest to lowest relative abundance. Results from stable isotope analyses are complex but are used to estimate trophic position as well as the percentage of diet derived from phytoplankton- versus chemosynthetic-based food webs.

***Murauskas, J. G.**
2/23: 1130 — Presented by: Murauskas, J. G. • Student • Symposium ~ platform presentation.
East Carolina University. East Fifth Street, Greenville, NC. 27858. Tel: 252-948-3877, Email: Joshua.Murauskas@ncmail.net.
Investigating the Anadromous Behavior of Adult Hickory Shad (*Alosa mediocris*).
Hickory shad (*Alosa mediocris*) were captured during the spring migration of 2004 to help identify aspects of anadromy, including reproductive development, bioenergetics, endocrinology, and environmental parameters. Hypotheses were: 1) reproductive maturation will progress with time and distance traveled, and environmental conditions with strong relationships involving hormones and energetics, 2) increases and/or changes of activity throughout the endocrine system will ensue as migration proceeds, and 3) energy reserves will decrease with time and distance traveled, provided cessation of feeding. Fish were sampled from four regions: 1) Atlantic Ocean, 2) Pamlico Sound, 3) Pamlico River, and, 4) the Tar-Pamlico River system spawning grounds. Levels of oestradiol-17 (E_2), testosterone (T), and prolactin were measured from blood samples using ELISA assays. Gonad tissues were examined through cross-sectioning, fecundity estimates, and determination of oocytes size-class ratios. Flesh samples were used to examine stored energy through lipid extraction using the Soxhlet method. Stomach contents were analyzed for feeding habits, scale samples taken for spawning periodicity, and otoliths for age. Fish were measured and weighed, with environmental and spatial data recorded at each site. Analyses are not complete; however, preliminary results support the above hypotheses. Gonadal development increased dramatically from the ocean to spawning grounds. GSI peaked sharply in early March, and dropped quickly afterwards. Microscopic analysis of oocytes showed changes in structure and size in accord with GSI. Stomach analysis showed that hickory shad are indeed piscivorous and stop feeding at an undefined point sometime in early migration. Mesentery fat followed a similar pattern, dropping by region. K-factors dropped with time and longitude as well, but were less pronounced in females due to egg development. Lastly, basic life history traits were supported, including: length, weight and sex ratios, and age structure of the migrating population, although numbers appear to be greater than

previous studies suggesting a rebounding population.

Nemeth, D. J.[1] , J. B. Jackson[2], A. R. Knapp[3] , C. H. Purtlebaugh[4].
2/24: 0830 — Presented by: Nemeth, D. J. • Non-student • Contributed platform presentation.
Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, Senator George Kirkpatrick Marine Lab, 11350 SW 153rd Ct., Cedar Key, Florida 32625. Tel. 352-543-9200.
[1]doug.nemeth@myfwc.com; [2]jered.jackson@myfwc.com; [3]anthony.knapp@myfwc.com;
[4]caleb.purtlebaugh@myfwc.com.
The Demographics of Sand Seatrout (*Cynoscion arenarius*) in the Estuarine Waters of the Eastern Gulf of Mexico.
Sand seatrout (*Cynoscion arenarius*) were collected through a fisheries-independent sampling program in three Florida estuaries during October 2001 through September 2003. Otoliths from specimens greater than 90mm standard length were extracted and processed for aging. A total of 1,080 sand seatrout were captured from the estuarine areas of Cedar Key, Tampa Bay, and Charlotte Harbor collectively. Estimated ages of fish sampled ranged from zero to six years. Linear growth models fit data for male sand seatrout from Cedar Key and Charlotte Harbor. Von Bertalanffy growth functions (VBGF) fit data for females from all estuaries and male sand seatrout from Tampa Bay. The VBGFs were not significantly different between females, but females were different from Tampa Bay males. Female size at age was greater than that of males in all estuaries and females matured at a smaller size than males. Increase in the gonadosomatic index coincided with an increase in mean monthly water temperature in each estuary. Annual mortality rates were within the range reported for this species and other closely-related species.

Ockelmann-LoBello, L. M.
2/22 Poster Session — Presented by: Ockelmann-LoBello, Lisa M. • Non-student • Contributed Poster.
Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, SEFSC, 75 Virginia Beach Drive, Miami, Florida, 33149. Tel. 305-361-4566; lisa.ockelmann-lobello@myfwc.com.
A regional comparison of catch, harvest, and release rates and biological parameters of common snook in Florida during 2002-2004.
Florida's recreational snook fishery is managed as two separate, genetically different stocks: the Atlantic stock, with a two fish per person per day bag limit, and the Gulf stock, with a one fish per person per day bag limit. The slot sizes for both stocks are 26 inches minimum and 34 inches maximum, total length. Intercept data were collected from anglers returning from fishing trips for snook in nine regions of south Florida. The Atlantic and Gulf coasts were divided into north, central, and south regions; Everglades National Park was divided into western and eastern regions; and the Florida Keys was one region. Catch data per trip when snook were targeted included number of anglers; time spent fishing; sizes and number of snook caught, kept, and released; bait type; tide; and time of catch. "Zero effort' was recorded when snook were targeted but not caught, resulting in a true catch-per-unit-effort (CPUE) that may be used as a proxy for local abundance indices and a harvest index. For each snook examined, total length was recorded, otoliths were collected for ageing purposes, gonads were sampled to determine sex and reproductive condition, and genetic material was taken to assign stock affinity. Donated carcasses provided additional data. The catch data and biological parameters varied by region and may be related to the differences in bag limits, fishing pressure, fishing ethics, habitat, and the genetic differences between regional populations. Currently, Florida Keys snook are assigned to the Gulf stock but may be reassigned to the Atlantic stock pending results of the genetic analyses. Results include data from 28,878 anglers who made a total of 12,388 trips and spent 118,317 hours targeting snook during 2002 - 2004. These data will provide the basis for a robust population assessment of Florida's snook scheduled for September, 2005.

Parauka, F. M.
2/23: 0830 — Presented by: Parauka, F. M. • Non-student • Symposium ~ platform presentation.
U.S. Fish & Wildlife Service, 1601 Balboa Avenue, Panama City, FL 32405; Tel. 850-769-0552; Email. Frank_Parauka@fws.gov.

Florida's Gulf Sturgeon.

The Gulf sturgeon *Acipenser oxyrinchus desotoi* is anadromous, migrating up coastal freshwater river systems in the spring to spawn and emigrating from these systems in the fall to overwinter in the marine bays, estuaries and Gulf of Mexico. Gulf sturgeons were historically quite abundant in the coastal rivers from Tampa, Florida to the Mississippi River and were actively fished commercially in Florida for eggs to make caviar and flesh for smoking. Gulf sturgeon landings peaked to more than 350,000 pounds in the early 1900s. Gulf sturgeon numbers decreased rapidly and recovery was further hampered by the loss of habitats through the construction of dams and deterioration of water quality. The Gulf sturgeon was listed as a species of special concern by the Florida Game and Fresh Water Fish Commission in 1987 and was listed as "threatened" under the U.S. Endangered Species Act in 1991. A Gulf Sturgeon Recovery/Management Plan was formulated in 1993 with priority tasks identified that would prevent further reduction of existing wild populations of Gulf sturgeons and would allow delisting. Prior to and especially since the inception of the recovery plan, numerous state and federal agencies, universities and non-government institutions and individuals have undertaken the task to learn more about the Gulf sturgeon and unravel the many life history mysteries that will eventually be answered in order to facilitate its recovery.

Patterson, W. F[1]., Z. Chen[2], and D. A. Winter[3].
2/23: 1510 — Presented by: Patterson, W. F. • Non-student • Symposium ~ platform presentation.
[1]Department of Biology, University of West Florida, 11000 University Parkway, Pensacola, FL 32514. Tel. 850-857-6123. wpatterson@uwf.edu.
[2]Department of Chemistry and Biochemistry, Old Dominion University, 4541 Hampton Boulevard, Norfolk, VA 23529. Tel. (757)683-4078. zchen@odu.edu.
[3]Department of Geology, University of California, Davis, One Shields Avenue, Davis, CA 95616. Tel. 530-752-9225. dawinter@ucdavis.edu.

Distinguishing striped mullet nursery estuaries in the northern Gulf of Mexico with otolith chemical signatures.

Striped mullet, *Mugil cephalus*, are distributed worldwide in temperate, subtropical, and tropical estuaries and coastal waters. They are ubiquitous in estuaries along the US southeast coast where they are among the most ecologically important fish species. Mullet also are economically important as they support significant fisheries throughout the northern Gulf of Mexico (Gulf). Despite their ecological and economic importance, relatively little is know about mullet population structure among Gulf regions. To address this problem, we tested the efficacy of using otolith chemistry as a natural tag to examine mullet population connectivity. Juveniles were sampled in estuarine systems from Louisiana through northwest Florida in summer 2001 (n = 192) and 2002 (n = 194). Sagittal otoliths were extracted from samples and analyzed with sector field-inductively coupled plasma-mass spectrometry (Ba, Ca, Mg, Mn, and Sr) and isotope ratio-mass spectrometry (δC^{13} and δO^{18}). Otolith chemical signatures were significantly different among estuarine systems (MANOVA: Pillai's Trace = 0.752; $F_{21;1,122} = 17.87$; $p < 0.001$) and years (MANOVA: Pillai's Trace = 0.168; $F_{7;372} = 10.71$; $p < 0.001$). Therefore, linear discriminant function (LDF) analysis was performed for each year separately; classification accuracy was estimated with the crossvalidation procedure in SAS. In 2001, computed LDFs distinguished estuarine systems with an overall accuracy of 70.1%, while accuracy in 2002 improved to 80.0%. Results from this study indicate otolith chemical signatures may serve as ideal natural tags of mullet estuarine nursery areas. Future work should continue to examine the spatial and temporal variability of juvenile signatures, as well as examine otolith chemistry at the core of adult otoliths to estimate nursery area and population mixing.

Pine, W. E., III[1] and M. S. Allen[2].
2/23: 1530 — Presented by: Pine, W. E. III • Non-student • Symposium ~ platform presentation.
[1]Fisheries Assessment and Ecosystem Management, Center for Fisheries Enhancement, Mote Marine Laboratory 1600 Ken Thompson Parkway, Sarasota, FL 34236. Tel. 941-388-4441 ext. 356. Email bill_pine@mote.org [2]Department of Fisheries and Aquatic Sciences, The University of Florida, 7922 NW 71st Street, Gainesville, FL 32653 Tel. 352-392-9617 ext 252.

Population Viability of Suwannee River Gulf Sturgeon: Inferences from Capture-Recapture and Age-Structured Models.

The Suwannee River, Florida population of the Gulf of Mexico sturgeon Acipenser oxyrinchus desotoi was evaluated using a capture-recapture approach and an age-structured model to examine population trends from 1986 through 1995. The capture-recapture analysis revealed a positive rate of change in the adult population indicating that the Gulf sturgeon population in the Suwannee River was slowly increasing during the mid-1980's through the mid-1990's. The age-structured model revealed that the population was highly sensitive to changes in egg to age-1 mortality, percent of females that spawn annually, and adult mortality. The model predicted that even slight increases in annual adult mortality (from 16% to 20%) resulted in population decline for Suwannee River Gulf sturgeon. Population trends were consistent for both modeling procedures and were similar to published reports. Although this population is currently expanding, caution should be taken to protect adult fish from any fishing mortality or bycatch. Managers should be patient and willing to monitor populations for extended periods of time (~20 years) before detecting changes in the adult population given attributes of Gulf sturgeon such as late sexual maturation, few mature females spawning each year, and high early life mortality.

Porak, W. F.[1] and W. E. Johnson[2].
2/22: 1330 — Presented by: Porak, W. F. • Non-student • Contributed platform presentation.
Florida Fish & Wildlife Conservation Commission, Fish & Wildlife Research Institute, 601 W. Woodward Ave., Eustis, FL 32726. TEL. 352-742-6438. [1]wes.porak@MyFWC.com; [2]bill.johnson@MyFWC.com.

The largemouth bass population and fish community structure in Area 7 Reservoir, a marsh restoration project in Central Florida.

The Emeralda Marsh Conservation Area (EMCA) in Central Florida is the site of a 6,500-acre marsh restoration project that is being managed by the St Johns River Water Management District. Following inundation of Area 7 Reservoir in the EMCA in 1994, extensive stocking of largemouth bass, habitat improvement projects and a total catch-and-release rule for bass anglers failed to produce a sustainable bass fishery. Growth and condition (mean W_r = 101) of largemouth bass is good. However, age samples indicated that largemouth bass reproduction and recruitment was typically poor in Area 7 Reservoir. Several missing year classes were observed in largemouth bass age samples, but a relatively strong year class was produced in 2003. There is evidence of endocrine disruption and early life-stage mortality in largemouth bass from this reservoir, which along with poor spawning and nursery habitat, provide conditions that are unsuitable for successful recruitment. The number and biomass of fish sampled from Area 7 Reservoir using 0.25-acre block nets in September 2001 were extremely low, with a mean of 120 fish (27 lbs) per acre in open water nets (N = 3) and 423 fish (75 lbs) per acre in littoral nets (N = 3). No largemouth bass were collected in any of the block nets. Open-water block net samples were dominated by white catfish *Ictalurus catus* (51%), gizzard shad *Dorasoma cepedianum* (16%) and brown bullhead *Ictalurus nebulosus* (14%), and littoral samples were dominated by white catfish (41%) and brown bullhead (28%). Fish productivity appears to be limited by a low abundance of zooplankton and benthic invertebrates.

Purtlebaugh[1], C. H., and K. Henry[2].
2/24: 0850 — Presented by: Purtlebaugh, C. H. • Non-student • Contributed platform presentation.
[1]Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, Senator George Kirkpatrick Marine Lab, 11350 SW 153rd Ct., Cedar Key, Florida 32625. caleb.purtlebaugh@myfwc.com Tel. 352-543-9200.
[2]Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, 7922 71st St., Gainesville, FL 32653. kristin.henry@myfwc.com Tel. 352-392-9617.

Essential habitat of juvenile sand seatrout (*Cynoscion arenarius*) in four estuaries along the West Coast of Florida.

The sand seatrout (*Cynoscion arenarius*) is an ecologically and economically important species in estuarine and nearshore waters of the Gulf of Mexico. However, comprehensive information on the essential habitat of juvenile sand seatrout is limited. We analyzed data from a long-term fisheries-independent monitoring program to assess the spatial and temporal distribution of sand seatrout relative to various habitat parameters found in four estuaries (Apalachicola Bay, Cedar Key, Tampa Bay, and Charlotte Harbor) along the Gulf coast of Florida. A total of 26,133 sand seatrout were collected during monthly stratified-random sampling from January 1996 through December 1997 and January 2001 through December 2003. Specimens were collected with 21.3m seines and 6.1m otter trawls; the majority of sand seatrout were captured in the trawl from water $\geq$ 1.8-m deep. Juvenile sand seatrout ($\leq$ 100-mm SL) recruited into the estuaries from May through October in Apalachicola Bay and Cedar Key and April through December in Tampa Bay and Charlotte Harbor. Abundances were highest in transitional zones in Apalachicola Bay and Cedar Key and in river zones in Tampa Bay and Charlotte Harbor. Juvenile sand seatrout were most abundant in salinities ranging from 10.6 to 18.5 PSU and over mud substrate and non-vegetated bottoms.

Reyier, E. A.[1], D. H. Adams[2] and D. M. Scheidt[1].
2/22: 1530 — Presented by: Reyier, E. A. • Non-student • Contributed platform presentation.
Dynamac Corporation, Kennedy Space Center, FL 32899. 321-476-4131[1]. Florida Fish and Wildlife Conservation, Fish and Wildlife Research Institute. 1220 Prospect St., Suite 285, Melbourne, FL 32901. 321-984-4828[2]. Eric.Reyier-1@ksc.nasa.gov, Doug.Adams@myfwc.com, Douglas.Scheidt-1@ksc.nasa.gov.

The discovery of an important winter nursery for the lemon shark, *Negaprion brevirostris*, at Cape Canaveral Florida.

The lemon shark, *Negaprion brevirostris*, is a large coastal carcharhinid with tropical affinities whose early life history has been extensively studied. Along the east coast of North America, known high-value nurseries for this species consist of quiescent lagoons and shallows of South Florida and the Bahamas. Recently, observations along Atlantic beaches of Cape Canaveral have documented a significant population of juvenile lemon sharks. The behavior of these animals is peculiar in that they aggregate inside sheltered longshore troughs along an otherwise high-energy coastline, a behavior that facilitates both visual counts and collection. Biweekly visual surveys along a fixed nine kilometer length of beach have demonstrated that juvenile lemon sharks are present in the littoral zone year-round but are most common (in groups of up to 338 animals) from November until April. 144 sharks have been captured to date using cast nets and hook and line. Sizes ranged from 48 - 149 cm precaudal length, with estimated ages of 0.5 to 8.7 years. Limited tag returns demonstrate that a portion of this population is migratory, traveling as far as North Carolina (645 km). These aggregations are now largely protected within the Kennedy Space Center no-entry security zone. The local conditions that facilitate such large aggregations are unknown but Cape Canaveral is considered a climactic transition zone and possesses the most expansive sub-tidal shoals along the Florida east coast. Given the high number of sharks documented and the small area of suitable habitat surveyed to date, Cape Canaveral beaches may eventually be recognized as one of the most important nursery areas for lemon sharks in the United States.

Ruiz-Carus, R. and R. S. McBride.
2/22 Poster Session — Presented by: Ruiz-Carus, Ramon • Non-student • Symposium ~ Poster.
Florida Fish & Wildlife Conservation Commission, Fish & Wildlife Research Institute. 100 Eighth Avenue SE, St. Petersburg, FL 33701-5020. Tel. (727) 896-8626; Email: ramon.ruiz-carus@myfwc.com; richard.mcbride@myfwc.com.

The sea lamprey, *Petromyzon marinus,* Linnaeus 1758, in Florida: A winter voyager or a rare species in need of protection?

Sea lamprey occur along the east coast of North America from the Gulf of St. Lawrence to northern Florida. In addition, there are three records of sea lamprey caught from the Gulf of Mexico. In Florida, sea lamprey were first observed in the vicinity of Lake George, a lake on the St. Johns River, in 1897. During the subsequent century, only eight verified lamprey were caught from Florida locales. In 1992, the Florida Committee on Rare and Endangered Plants and Animals designated sea lamprey as rare to indicate that this species, although not currently endangered or threatened, was potentially at risk because it was found only within a restricted geographic area or habitat in Florida. However, there is no evidence that sea lampreys were any more abundant in Florida's past or that there was once a breeding population in Florida, so it cannot be stated that their population has declined in any significant manner. The rare individuals that have been found may be all "hitchhikers" who parasitized their anadromous hosts at northern latitudes and held on during their host's migration to Florida. The observations of sea lamprey caught in Florida agree with this hypothesis. In particular, sea lamprey has shown no evidence of sexual maturity, which is consistent with our understanding that this species does not reproduce in Florida.

Rulifson, R. A.
2/23: 0810 — Presented by: Rulifson, R. A. • Non-student • Symposium ~ Keynote address.
Institute for Coastal and Marine Resources, and Department of Biology, East Carolina University, Greenville, NC 27858-4353. Tel. 252-328-9400. rulifsonr@mail.ecu.edu.

Anadromy, Catadromy, and Amphidromy: What's in a Name, and Who's Who in the Zoo?

Diadromous fish species are those that make obligatory migrations between saltwater and fresh water at predictable times and at predictable life stages in order to complete the life cycle. Anadromous species are those that live as adults in saltwater but spawn in freshwaters; catadromous species live in freshwaters as adults but migrate to sea to spawn. Both lifestyles are gametic behaviors; amphidromy is a non-gametic obligatory migration between habitats for reasons not related to spawning. Diadromy is erratically scattered in the Chondrichthyes and Osteichthyes around the world, and most diadromous species are primitive or ancient rather than advanced forms. In North America, we tend to focus on representatives from the sturgeons, shads and herrings, salmons, temperate basses, and American eel. Are there other species fitting these criteria? Are the criteria stable across the range of species? Are we too restrictive in our notion of diadromy? We have used the striped bass, Atlantic needlefish, and hickory shad as models to develop hypotheses about these and other questions.

***Sandberg, J. S.[1], W. A. Bennett[2], D. Smith[3], and P. Ryals[4].**
2/22: 1710 — Presented by: Sandberg, J. S. • Student • Contributed platform presentation.
University of West Florida, Department of Biology, 11000 University Pkwy, Pensacola, Fl, 32514. Tel. 850-473-7289. [1]jss18@students.uwf.edu, [2]wbennett@uwf.edu; [3]djsmitc@essex.ac.uk; [4]pryals@uwf.edu.

Comparative bimodal respiratory ability of two species of Periophthalmid mudskippers (*Periophthalmus kalolo* and *P. argentilineatus*).

Mudskippers (family Gobiidae) are tropical, amphibious fishes capable of utilizing both air and water as a respiratory medium. The mudskippers *Periophthalmus kalolo* and *Periophthalmus argentilineatus* sympatrically inhabit mangal environments of Hoga Island, southeast Suluwesi, Indonesia. Coexisting mudskipper species often demonstrate different aquatic and aerial oxygen extraction abilities that presumably allow them to partition their habitat and reduce direct competition. We compared oxygen uptake of *P. kalolo* and *P. argentilineatus* in water and air to assess the potential respiratory basis for habitat partitioning in Hoga mangals. Aquatic and aerial respiration was examined using flow-through and manometric respirometry. Respective mass corrected oxygen uptake values for *P. kalolo* and *P.*

argentilineatus were 0.311 and 0.290 mg/g/h in aquatic trials and 0.298 and 0.271 mg/g/h in aerial trials. Except for aerial versus aquatic oxygen uptake in *P. argentilineatus* at 26°C ($p = 0.05$), uptake values were statistically indistinguishable between species within the same medium and within species between media (Student t-test; $p = 0.08$). In the absence of a respiratory basis for habitat partitioning, and assuming similar foraging and dietary requirements reported by others, it is not immediately clear how *P. kalolo* and *P. argentilineatus* effectively partition the mangal environment. However, the ability to exploit both aerial and aquatic environments with equal efficiency no doubt allows mudskippers to avoid both aerial and aquatic predation as well as exploit a wider range of mangal resources.

Sebastian, A. P.[1], D. M. Tremain[2] and L. C. Sebastian[3].
2/22 Poster Session — Presented by: Sebastian, A. P. • Non-student • Contributed ~ Poster.
Florida Fish & Wildlife Conservation Commission, Fish & Wildlife Research Institute. 1220 Prospect Avenue, Melbourne, FL 32901. Tel. 321-984-4828. [1]agustin.sebastian@myfwc.com; [2]derek.tremain@myfwc.com; [3]laura.sebastian@myfwc.com.

The relationship between pigfish (*Orthopristis chrysoptera*) recruitment and spotted seatrout (*Cynoscion nebulosus*) landings in the Indian River Lagoon, Florida.

In the Indian River Lagoon (IRL), spotted seatrout are commercially harvested primarily by hook and line with pigfish (50 to 100 mm standard length [SL]) as the primary bait. Commercial fishers have spoken out against the current regulations (fishery open only June-August) and have suggested that annual variations in the onset of pigfish recruitment can result in reduced landings if bait-sized pigfish are not available during portions of the specified three-month season. They have, therefore, argued for an extended harvest season. To examine this issue, analyses were conducted to determine whether annual variations in recruitment timing or abundance of young-of-the-year (YOY) pigfish had an influence on their availability as a bait source and subsequently influenced spotted seatrout commercial landings in the IRL. Length frequency and abundance data from 21.3-m and 183-m seine collections taken by the Fisheries Independent Monitoring program 1998-2003 were examined to determine annual variations in both the timing of initial recruitment (at 15-20 mm SL) and availability of larger YOY pigfish (50-100 mm SL) during the three-month fishery season. Fisheries-Dependent Monitoring data for spotted seatrout were analyzed to obtain seasonal and monthly commercial landings from 1998 to 2003 in Brevard and Indian River counties. There was little annual variation in the timing of pigfish recruitment during the study period, although there were differences in the abundance and potential availability of YOY and subadult pigfish during some years. Spotted seatrout commercial landings also varied between years; however, we did not find a consistent relationship between landings and pigfish abundance estimates. Our results may be attributable to environmental, economic, or regulatory factors that affect the fishery but are independent of pigfish abundance.

Spinelli, J. P.[1], S. A. Bortone[2], A. J. Martignette[3], and E. C. Milbrandt[4].
2/24: 0930 — Presented by: Spinelli, J. P. • Non-student • Contributed platform presentation.
Marine Laboratory at the Sanibel-Captiva Conservation Foundation. 900A Tarpon Bay Road Sanibel, FL 33957. Tel 239-395-4617. [1]jspinelli@sccf.org; [2]sbortone@sccf.org; [3]amartignette@sccf.org; [4]emilbran@sccf.org.

Determining habitat preferences of juvenile red drum to optimize hatchery-release survival.

Our objective was to determine the preferred habitat of juvenile (<200 mm SL) red drum (*Sciaenops ocellatus*) to help ensure maximum survivability of hatchery raised fish that may be released into the wild. Sampling for red drum was conducted using the protocol developed by the Florida Fish and Wildlife Research Institute's Fishery Independent Monitoring program for the 21.3 m seine with 3.1mm mesh. Sampling was conducted from March through December 2004 in lower Pine Island Sound, Matlacha Pass and in the Caloosahatchee River east to the Orange River. At each sample site water quality, general weather and sea conditions, distance to shore and shoreline type (mangrove, rip-rap, sand, seawall, vegetation, none) were recorded. In addition, bottom composition (seagrass species, drift algae, attached algae, oysters) percent coverage was recorded. Species and abundance data was recorded for all fish caught. A total of 127,150 fish were collected representing 79 species at 139 sample sites. Several sites were sampled more than once for a total of 201 samples, each with three replicates. A total of 102 wild

red drum (96% < 200 mm SL) were caught. An analysis of the sites showed similar patterns noted by FWRI staff in that juvenile red drum were found further upstream during the dry season and downstream during the wet season. Other patterns of specific/preferred habitat associations were not apparent in the Caloosahatchee River Estuary. Existing patterns may not be detectable due to the low frequency of occurrence of red drum or the disruptive storm events of the 2004 summer season. Treatment variables for the anticipated release include red drum size, habitat type and acclimation condition.

***Steward, C. A.**
2/22 Poster Session — Presented by: Steward, C. A. • Student • Contributed Poster.
Florida Institute of Technology. 150 West University Boulevard, Melbourne, Fl. 32901. Tel. 407-671-3458. csteward@fit.edu.

Estimating age from otolith morphometrics in the gray angelfish (*Pomocanthus arucatus*).
Individual fish age is necessary for constructing an accurate picture of population dynamics. Many studies estimate fish age by counting otolith annuli. This method of ageing fish is both subjective and expensive. Counting otolith annuli requires specialized equipment to prepare the otolith, trained technicians to operate such equipment, and trained and experienced otolith readers. Even among experienced readers, age estimates for the same fish can vary between readers and between laboratories. This study is part of the first age determination for *Pomacanthus arcuatus*, a large tropical angelfish associated with the coral reefs of the western Caribbean and harvested for the marine aquarium trade. The goal of this study is to use otolith morphometrics and fish size to create a mathematical age model for *Pomacanthus arcuatus.* Based on the pattern of growth in the otoliths of *Pomacanthus arcuatus*, morphometrics used to create the model include otolith length, width, thickness and weight. Fish length is included because of variable growth rates among fish. A useful model would reduce the subjectivity of age estimation to the measurement of the chosen parameters. Necessary equipment includes only a milligram scale and a light microscope with an ocular micrometer. A good model should estimate fish age within one year of the age estimated by otolith annuli counts ("standard age"). Variation in age estimates between the model and the standard age should be no greater than the variation in standard age determination between two different readers. The model will be developed using stepwise forward regression to develop a multiple regression equation to predict fish age from otolith morphometrics. By choosing the otolith parameters that are the best predictors of age in the gray angelfish, the model will contain the fewest variables possible to obtain the highest possible precision.

***Strickland, P. A.[1] and C. A. Dolloff[2].**
2/23: 1310 — Presented by: Strickland, P. A. • Student • Symposium ~ platform presentation.
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[2]Virginia Tech Department of Fisheries and Wildlife Sciences. 1650 Ramble Road, Blacksburg, VA 24061 Tel. 540-231-4864. adoll@vt.edu.

Seasonal Movement of American Eels in Selected Tributaries of the James River, Virginia.
The seasonal movement of twenty-two American eels *Anguilla rostrata* was monitored from July 2000 through June 2001 via radio telemetry. Eels were captured using backpack electroshockers in Shoe Creek, South Fork of Tye River, and South Fork of Piney River, Virginia. Each fish was implanted with a model 10-28 radio transmitter provided by Advanced Telemetry Systems (ATS). Eels tracked in all three streams were similar in size (500-700 mm). Eels location was determined bi-weekly via triangulation. A Kruskal-Wallis test was used to determine if total distance moved (TDM) varied among seasons. Wilcoxon's two-sample test was then used to determine between which seasons, differences in TDM existed. Eels exhibited the greatest amount of movement in summer 2000 and the least amount of movement in winter 2000-01. From late October 2000 through May 2001, eels appeared to be buried within the interstitial spaces of the stream bottom and under stream banks.

Szelistowski, W.A.
2/22 Poster Session — Presented by: Szelistowski, W. A. • Non-student • Contributed Poster.
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Semilunar reproduction and rapid juvenile growth in the needlefish *Strongylura scapularis*.

Reproduction tied to lunar cycles is common in atherinomorphs, but only anecdotally reported in belonids. This study presents evidence of semilunar reproduction in the needlefish *Strongylura scapularis* in the Gulf of Nicoya, Costa Rica. Length-frequency distributions of larvae and small juveniles taken every other day from mangroves over a 5-week period suggested that cohorts recruited at 2-week intervals. To test whether recruitment periodicity was tied to a semi lunar reproductive rhythm, I plotted cumulative size-frequency distributions of young *S. scapularis* from these and 104 additional collections made between 1984-2004, representing all calendar months, as a function of lunar day. Distributions showed that *S. scapularis* recruited year-round on a strict semilunar rhythm, with recently-hatched larvae (approximately 6 mm SL) appearing 1-2 days before new and full moons, and growing rapidly (2.8 - 2.9 mm day^{-1}) to approximately 90 mm within a month. Larvae were uncommon in mangroves until approximately a week after hatching, suggesting that *S. scapularis* recruit from outside the study site. Semilunar reproduction in this species may function to disperse offspring to mangrove nursery sites.

Taylor[1], R. G. and J. A. Whittington[2].
2/24: 0810 — Presented by: Taylor, Ronald G. • Non-student • Contributed platform presentation.
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Using mark-and-recapture techniques to estimate survival rates and indices of abundance of common snook from the southeast coast of Florida.

Mark-and-recapture experiments were conducted with common snook in Jupiter and Lake Worth inlets during the closed summer seasons of 1985-1997 to estimate annual survival rates of the exploited population based on angler-reported recaptures and to estimate abundance of the local population. Of the 15,785 snook that were caught with hook-and-line, we measured and tagged 14,797 with Floy internal anchor tags and released them. Anglers reported 3,067 recaptures of the 13,402 snook that comprised the legal recapture data set. Model 1 of Brownie's 'Estimate' was employed to compute long-term recovery and survival rates The mean annual recovery rate was 12.627 (0.272 SE) and ranged from 7.723 (0.695 SE) in 1989 to 18.005 (1.074 SE) in 1996. Mean annual survival rate was 55.05 (0.86 SE) and ranged from 31.95 (4.13 E) in 1996 and 75.91 (7.01 SE) in 1987. Mean total instantaneous mortality (Z) was 0.597 and ranged from 0.276 in 1987 to 1.141 in 1996. We simultaneously conducted annual Schnabel multi-census experiments to estimate indices of abundance in the same areas using the same tagging data. Numbers of recaptures ranged from 8 in 1990 to 72 in 1997. The population abundance index ranged from 7,606 (4,992, 12,287) in 1985 and 38,039 (23,619, 62,613) in 1995, a significant increase. There was no detectable long-term trend nor any other significant change in the population indices except for the 1995 estimate. Annual population abundance is shown to be independent of total instantaneous mortality rates.

***Tiffany, B. N.[1] and W. A. Bennett[2].**
2/22: 1630 — Presented by: Tiffany, B. N. • Student • Contributed platform presentation.
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Physiological and Behavioral Responses of Clingfish, *Gobiesox strumosus,* to High Temperature and Low Oxygen Stress.

During summer months, shallow bays and inlets along coastal Florida can be one of the harshest environments known. Fishes inhabiting these areas must endure extreme shifts in temperature and dissolved oxygen. The skilletfish, *Gobiesox strumosus*, can be found in these waters inhabiting empty bivalve shells in the shallow (<3m) sea grass beds of St. Joseph Bay, Bay County, Florida. Therefore *G.*

strumosus must be physiologically well suited to withstand thermal and oxic extremes. The purpose of our study was to elucidate physiological and behavioral adaptations of skilletfish in response to thermal and oxic stress. In our study, skilletfish acclimated at 12, 22 and 32C had CTMax of 33.2, 38.1 and 39.4C respectively. Additionally, we found that at all acclimation temperatures oxygen consumption decreased linearly as oxygen concentration decreased and that skilletfish can survive periods of anoxia up to 30 minutes. By using a suite of physiological and behavioral adaptations to ameliorate thermal and oxic stress, *G. strumosus* have access to abundant resources in areas that may preclude fishes less tolerant to hyperthermic and hypoxic conditions.

Tremain, D. M.[1] and K. Scott[2].
2/22 Poster Session — Presented by: Tremain, Derek • Non-student • Contributed poster.
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Characterization and timing of band formation in dorsal fin rays of age-0 and age-1 red drum.

Preliminary investigations into the potential use of dorsal fin rays for aging subadult and adult red drum suggested a direct relationship between the number of fin ray bands and the number of otolith annuli to approximately 5-6 years of age. However, variability in fin ray band counts for same-age fish were recorded, which could limit the usefulness of this aging method. The observed variability was related, in part, to an unclear characterization of specific fin ray bands during the early life history stages (young-of-year and age-1). To resolve this uncertainty, we first tracked the development of bands in dorsal fin rays of hatchery-raised red drum to 19-months of age to determine the specific timing and characteristics of early band formation. Fish were raised from a single cohort in outdoor ponds under natural photoperiod and temperature conditions located at the FWC's Stock Enhancement Research Facility. Results indicated that a solid translucent core consistently formed in the fin ray by age 6 months and that additional well-defined bands developed at approximately 12 and 19 months of age the second of these coinciding with first annulus formation on the otolith. To assess the applicability of these characteristics among wild specimens, we compared the known ages of 15 wild hatchery-released and recaptured specimens with their ages estimated from fin ray band characteristics. In this comparison, estimated fish ages were equal to known ages in only seven of the 15 specimens (47%). Although band formation was consistent in hatchery-reared specimens raised under uniform conditions, band formation in wild fish from heterogeneous environments showed considerable variation, which suggests that the previously identified variability in fin ray band counts among same-age fish may not be reconcilable at this time.

***Trippel, N. A.[1], M. S. Allen[2], and R. S. McBride[3].**
2/23: 1430 — Presented by: Trippel, N. A. • Student • Symposium ~ platform presentation.
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Seasonal Changes in Prey Abundance Relative to Predator Diets in the St. Johns River, Florida.

We assessed seasonal shifts in abundance of juvenile American shad *Alosa sapidissima,* hickory shad *A. mediocris,* and blueback herring *A. aestavalis* relative to predator diets in the St. Johns River, Florida during 2004. Our sampling area near Palatka, Florida, is used as a summer staging area for juvenile *Alosa* spp. The seasonal abundance of pelagic prey fishes was assessed using catch rates from surface trawls. Predators common to this area of the river included largemouth bass *Micropterus salmoides*, striped bass *Morone saxatilis*, black crappie *Pomoxis nigromaculatus*, longnose gar *Lepisosteus osseus*, and Florida gar *Lepisosteus platyrhincus*. These predators were collected using electrofishing, and stomach contents were removed using acrylic tubes. Bay anchovies *Anchoa mitchilli* and threadfin shad *Dorosoma petenense* were the most abundant prey species throughout the year. Atlantic croaker *Micropogonias undulatus* were most abundant during spring, and Atlantic menhaden *Brevoortia smithi* became abundant during the fall samples. Diet contents of predators shifted with trends in prey

availability, as measured in the surface trawl. *Alosa* spp. were rare in samples of prey availability and predator diets through the study period. Thus, juvenile *Alosa* spp. were not an important prey item for predators even during months when they were present, likely due to their low abundance relative to other prey groups. We found no evidence that these predators selectively switched to Alosa spp. as prey during the summer/fall downstream migration of shad juveniles.

Tunnell, J.[1] and J. Bickford[2].
2/22 Poster Session — Presented by: Tunnell, J. • Non-student • Contributed Poster.
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An image analysis macro for measuring growth increments in otoliths.
Image-Pro Plus is an image analysis software application developed by Media Cybernetics, Inc. in support of the growing need for scientific imaging. Auto-Pro functions are used to perform actions within the application and allow macros to be written in a language specific to the program. We designed an Image-Pro Plus macro for fast and effective image analysis of otolith growth increments at a production level. The macro consists of four parts: a point to point distance function which defines the calculation of the distance between two given points; two user dialog functions which define case actions for an initial user form and a main user form; a function to initiate Microsoft Excel, establishing a link between the two applications; and the main subroutine which calls each function, labels the spreadsheet, activates Image-Pro toolbars, collects user input and data, dumps data into the Excel spreadsheet, and saves the Excel file to a predetermined drive. A "For...Next" loop is used to repeat the sequence of events a given number of times.

***Tyler, A. J[1]., T. S. Switzer[2] and K. R. Henry[3,a].**
2/23: 1630 — Presented by: Tyler, A. J. • Student • Contributed platform presentation.
Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, 100 8th Avenue SE, St. Petersburg, FL 33701. Tel. (727) 896-8626. [1]mandy.tyler@myfwc.com; [2]ted.switzer@myfwc.com; [3] kristin.henry@myfwc.com. [a] Present address: Florida Fish and Wildlife Conservation Commission, 7922 NW 71st Street, Gainesville FL 32653.
Current and historical trends in community structure in the Bishop Harbor estuary: potential influence of wastewater discharge.
In early 2003, the Department of Environmental Protection began discharging treated wastewater from the Piney Point phosphate-production facility into the Bishop Harbor estuary as a means to reduce the threat of a catastrophic acid spill. To monitor the effects of wastewater inflow on the faunal community within Bishop Harbor, the Fisheries-Independent Monitoring program conducted intensive stratified-random sampling from November 2003 through October 2004 using 21.3-m seines. These data were compared with historical data collected during fixed-station sampling using similar gear from January to December 1993. Historical and recent spatial patterns in community structure were explored in separate analyses using PRIMER; qualitative comparisons between the two study periods allowed us to evaluate the influence of wastewater discharge on the faunal community within Bishop Harbor. Within both historical and recent data, catch was dominated by large abundances of bay anchovy, *Anchoa mitchilli*; pinfish, *Lagodon rhomboides*; mojarras, *Eucinostomus* spp.; and rainwater killifish, *Lucania parva*. Among historical data, distinct spatial differences in community structure were detected along a gradient from the head to the mouth of the estuary: *A. mitchilli* and *Lucania parva* were rare near the mouth of the harbor but abundant throughout the rest of the estuary, whereas *Lagodon rhomboides* and pigfish, *Orthopristis chrysoptera*, were rare near the head of the estuary. Spatial patterns in community structure were much less distinct within recent data. Similar spatial patterns were evident during the two study periods with respect to pinfish and pigfish abundances; however, bay anchovy and rainwater killifish were substantially more abundant near the mouth of the estuary during the recent study. Although wastewater discharge does not appear to have negatively influenced faunal composition within the Bishop Harbor estuary, subtle changes to the distribution and abundance of specific species appear evident.

***Wallman, H. L.[1] and W. A. Bennett[2].**
2/22: 1550 — Presented by: Wallman, H. L. • Student • Contributed platform presentation.
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Thermal Preference of the Atlantic stingray, *Dasytis sabina*, Relative to Satiation and Parturition State.

Temperature is the most important and least well documented environmental entity affecting reproduction and feeding of elasmobranch fishes, but it is unclear to what extent these fish may exploit behavioral thermoregulation to optimize metabolic processes. Laboratory thermal preference determinations are important to understanding behavioral processes because they provide the vital quantitative link between environment, physiology, and adaptive behavior. Temperature preference data were collected on Atlantic stingrays, *Dasyatis sabina*, to assess the fish's ability to behaviorally optimize feeding and reproduction. Trials were run in a temperature preference apparatus comprised of a small inner thermal gradient suspended in a larger outer tank. Groups of male and pregnant female Atlantic stingrays exhibited statistically higher preferred median temperatures (26.2 and 26.1°C, respectively) than non-pregnant females (25.3°C) (one-way ANOVA on ranked data; $F=3.87$; $df=29$; $P<0.033$). Median preferred temperatures in unfed stingrays of both genders ranged from 24.5 to 31.0 ºC, whereas, fed fish preferred temperatures between 23.5 to 27.5 ºC. Male stingrays showed no subtle differences in median preferred temperatures before or after feeding. However, unfed female stingrays preferred warmer temperatures before feeding (26.8 ºC) and after feeding fish preferred significantly cooler water temperatures of 25.7 ºC (sign test; $P<0.088$, $\alpha=0.10$). While overall differences were subtle, small preference adjustments can have important physiological consequences. For example, the 1°C increase pregnant females over non-pregnant fish would reduce gestation time by as much as two weeks. Likewise, by moving to cooler water after feeding, stingrays may increase nutrient uptake efficiency by reducing evacuation rates.

***Whittington, B. E.[1], Denison, S. H.[2] and W. A. Szelistowski[3].**
2/22 Poster Session — Presented by: Whittington, B. E. • Student • Contributed Poster.
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Genetic structure in amphi-American land crabs.

Terrestrial crabs in the genera *Aratus*, *Goniopsis*, *Cardisoma*, *Coenobita*, *Gecarcinus*, and *Ucides* are harvested for human consumption, the pet trade, and as bait throughout coastal tropical America and southern Florida. Each genus is represented by similar forms in the western Atlantic and eastern Pacific, but the taxonomic status for these amphi-American pairs is inconsistent, and includes pairs that are considered to be conspecific, others which are recognized as clearly distinct species, and still others whose relationships are debated. The purpose of this study is to test the hypothesis that each of these pairs diverged approximately 3 mya with the rise of the Central American isthmus, and therefore represent geminate pairs. For specimens collected from 3 Atlantic sites (Caribbean, Atlantic Florida, Gulf of Mexico) and one Pacific site, we are comparing sequences of the mitochondrial 16 s rRNA gene, which is widely used as a marker to distinguish between closely-related species and to time their divergences. Preliminary results suggest that species in the mangrove tree crab genera *Aratus* and *Goniopsis* are geminate pairs that diverged around the time of the isthmian uplift. Species in the hermit crab genus *Coenobita* exhibited substantially greater genetic differences, suggesting that they split at an earlier date or that the rate of molecular evolution is more rapid in this group. Analysis of the remaining genera (all giant land crabs) and intraspecific comparisons among Atlantic sites are in progress. An understanding of genetic population structure may be useful in management of these exploited species.

***Wilkes[1], A. A., M. Cook[2], A. L. Digirolamo[3], J. M. Eme[4], J. M. Grim [5], B. Hohmann[6], S. E. LaPorte[7], C. M. Pomory[8], and W. A. Bennett[9].**
2/22: 1450 — Presented by: Wilkes, A. A. • Student • Contributed platform presentation.
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A Comparison of Damselfish Densities and Distributions on Staghorn Coral (*Acropora cervicornis*) and Coral Rubble in Dry Tortugas National Park.
Reef structure and conformation play a key role in determining damselfish population dynamics and structure. Alterations in reef structure occurring due to extreme weather conditions, coral diseases and physical damage resulted in massive structural changes and loss of damselfish habitat throughout the Caribbean. The Dry Tortugas National Park (DTNP) is arguably one of the most extensive and pristine hermatypic coral reefs in the continental U.S. Areas of DTNP coral reef tract have been drastically impacted in the past fifty years by instances of coral disease and extreme temperature. Damselfish distribution and density depend heavily on structural integrity of the reef system, yet no previous work has been done to study how coral death has effected damselfish populations. Our research used snorkeling techniques to quantify densities of eight damselfish species (dusky-*Pomacentrus fuscus*, long fin-*Stegastes diencaeus*, beaugregory-*Stegastes leucostictus*, yellow tail-*Chrysiptera parasema*, three spot-*Dascyllus trimaculatus*, sergeant major-*Abudefduf saxatilis*, cocoa-*Pomacentrus variabilis* and night sergeant-*Abudefduf concolor*) naturally found on staghorn patch reef, *Acropora cervicornis*, and reef rubble east of Garden Key in DTNP. Dusky, long fin, cocoa, beaugregory, yellowtail, three spot and sergeant major inhabited live staghorn coral with respective densities of 1.01, 0.01, 0.22, 0.12, 0.25, 0.48 and 0.56 fish/m^2. Coral reef rubble showed populations of dusky, cocoa, beaugregory, yellowtail, three spot and sergeant major damselfish with respective densities of 0.41, 1.57, 1.97, 0.19, 0.12 and 0.28 fish/m^2 indicating major differences between live staghorn and coral rubble. Long fin and night sergeant were absent from the coral rubble suggesting their inability to re-colonize the reduced three dimensional structure. Loss of living staghorn coral and its replacement by less structurally complex coral rubble fields in DTNP may result in major changes in damselfish population structure. Understanding how damselfish populations are changing within DTNP may provide insight helpful to understanding coral decline and damselfish distribution throughout the Caribbean.

Winner, B. L.[1], T. S. Switzer[2], J. Whittington[3], and N. Dunham[4].
2/23: 1610 — Presented by: Winner, Brent L. • Non-student • Contributed platform presentation.
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Ichthyofaunal survey of the St. Lucie estuary and effects of freshwater inflow: Too much of a good thing?
In Florida, the effects of altering freshwater inflow on estuarine systems have recently gained increased attention. Although most estuarine systems in Florida are threatened by reductions in freshwater input, the current levels of freshwater inflow from Lake Okeechobee into the St. Lucie estuary have been increased via a series of canals designed for flood control. While variations in freshwater input and salinity are critical to estuarine-dependent nekton, large or sustained pulses of freshwater and associated nutrients, organic matter, and sediment may alter community structure and the distribution of specific populations. Our objectives were to characterize the faunal community within the St. Lucie estuary, to identify temporal and spatial patterns of fish community structure, and to relate observed patterns to environmental variability. Monthly fisheries-independent monitoring (n=905 hauls) was conducted in the St. Lucie estuary and adjacent Indian River Lagoon from April 1998 through March 2004 by using a 183-m center-bag haul seine. Sampling effort was stratified into four zones: the north fork, south fork, and lower St. Lucie estuary, and the adjacent Indian River Lagoon. A total of 90,696 individuals representing 151 species were collected. Species abundance and richness were lowest within the north and south forks of the St. Lucie River and highest within the Indian River Lagoon. In all three spatial zones within

the St. Lucie estuary, *Diapterus auratus* was the most abundant species, followed by *Mugil curema* and *Archosargus probatocephalus. Lagodon rhomboides*, *D. auratus,* and *M. curema* were the most abundant species in the Indian River Lagoon zone. Economically important species such as *M. curema*, *M. cephalus*, *A. probatocephalus,* and *Centropomus undecimalis* were among the six most abundant taxa throughout the study area. Preliminary results suggest that large influxes of fresh water into the St. Lucie estuary cause changes in fish community structure and may compromise the health of resident fishes.

Quotes

We rented a flats boat, and cast conventionally as we made our way upstream. Around the first bend, we lost sight of the road, and in long stretches thereafter – as much as half or three-quarters of a mile – saw no houses or structures of any kind. The river was intimate, less than a hundred yards across, and edged with lily pads, hyacinths, and grassy cutbanks, not to mention cabbage palms – young bulbous cabbage palms, old columnar cabbage palms. Look up to cast and you saw water turkeys, eagles, hawks, ibises, crows, egrets, buzzards, Louisiana herons, great blue herons, herring gulls, kingfishers, and cormorants, identified by Sam. A pileated woodpecker. We were not in some everglade or even a state park. Around us were the St. Johns floodplain savannahs. We were twenty miles northeast of Orlando, and twenty west of the ocean. At frequent intervals, oranges floated by.

We scouted the river to Lemon Bluff – firm ground ten feet higher than the river, and lined with cottages and small houses. We saw longhorn cattle there that looked head-on like sailplanes. We saw an ornamental citrus tree with lemons, grapefruit, oranges, and tangerines growing on various branches. Lemon Bluff is a storied place to fish for shad. We fished there, at the mouth of Le Fils Slough, and caught no shad. We drifted back down the river half a mile and anchored besides a high cutbank, which Fred Cross had marked with an X on the map. Flicking a dart from his ultra-light, Sam brought in a leaping buck shad. With a very small dart on a fly rod, I brought in a leaping buck shad. Sam got another. With a spinning rod, I tied on a rig I'd bought from the people who rented us the skiff—a spoon with a shad-dart dropper—and caught two roe shad on one cast. Then Sam had a buck that got off the hook. Under the cutbank the current was particularly evident. When an orange went by, it was moving smartly. We were reading line 1 in the ledger of the slow St. Johns: Where the current is most concentrated, so are the shad.

McPhee, John. 2002. Chapter 7: The shad alley. In: The Founding Fish. Farrar, Straus, and Giroux. New York. (pp: 142-143)

Notes