

33rd Annual Meeting



**February 19 – 21, 2013
4-H Camp Ocala, Altoona, Florida**

The Florida Chapter of the American Fisheries Society

Chapter Officers

President: Kerry Flaherty, FWC

President-Elect: Travis Tuten, FWC

Past-President: Dave Kerstetter, NSU

Secretary-Treasurer: Cheree Steward, FWC

Major Contributors for our Annual Meeting

Webmaster: Bob Wattendorf, FWC

Newsletter Editor: Daryl Parkyn, UF

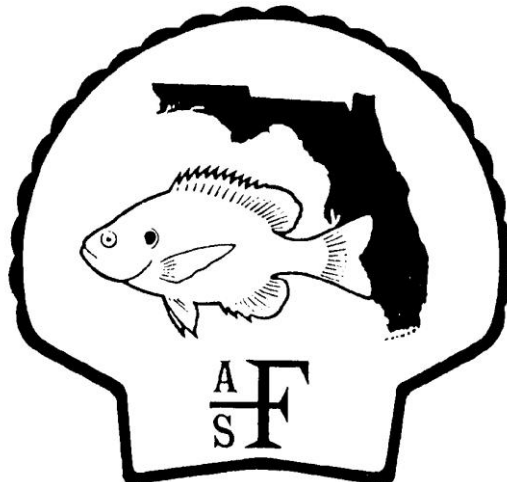
Raffle Co-Chairs: Alan Collins, NOAA (retired) and Carla Garreau, UF

Student Travel Awards: Chuck Cichra, UF

Roger Rottmann Memorial Scholarships: Chuck Cichra, UF

Rich Cailteux Award: Eric Nagid, FWC

Membership Database Manager: Larry Connor, FWC



Thank You!

Thanks to all the invited speakers!

Thanks to everyone for their contributed presentations and posters!

Thanks to all the moderators and judges!

A special thanks to the sponsors of the 33rd Annual Meeting:



33rd Annual Meeting of the Florida Chapter American Fisheries Society
February 19-21, 2013
4-H Camp Ocala, Altoona, Florida
General Program

Tuesday, February 19

11:00am – 6:00pm Registration
12:00pm – 1:30pm Lunch
1:30pm – 4:40pm Contributed Papers
5:00pm – 7:00pm Poster Setup
6:00pm – 7:00pm Dinner
7:00pm – 8:00pm Formal Poster Session
 Followed by the bonfire social

Wednesday, February 20

7:00am – 8:00am Breakfast
7:30am – 6:00pm Registration
8:00am – 12:20pm **Symposium: *Long-term monitoring: designs, problems, and results***
12:20pm – 1:20pm Lunch
1:20pm – 5:00pm Contributed Papers
5:00pm – 6:00pm Student Subunit Meeting (all students); Time to relax (all others)
6:00pm – 7:00pm Dinner
7:00pm – 8:00pm **Chapter Business Meeting**
Awards presentation:
 Student Awards – **Travel** and **Roger Rottmann Scholarship**
 Professional Awards – **Rich Cailteux**
 Followed by **THE RAFFLE, AUCTION**, and the bonfire social

Thursday, February 21

7:30am – 8:30am Breakfast
7:30am – 9:00am Registration
8:30am – 11:40am Contributed Papers
11:45am – 12:45pm Lunch
12:45pm – 1:00pm **Awards presentation:**
 Best Papers/Best Posters; Power Tie, and Lampshade Awards

Day-By-Day Agenda – 33rd Annual Meeting – Florida Chapter American Fisheries Society

Tuesday, February 19

- 11:00am – 6:00pm **Registration**
12:00pm – 1:30pm **Lunch**
1:30pm – 1:40pm **Welcome – Kerry Flaherty, Chapter President**

Contributed Papers

Moderator: Kerry Flaherty, FWC

1:40pm – Dotson, J. R., B. Thompson, N. Trippel, K. Bonvechio, K. McDaniel, B. Furse, S. Gornak, and W. E. Pouders. Effects of large-scale habitat enhancement strategies on Florida largemouth bass populations

2:00pm – *Bradshaw Settevendemio, E., M. S. Allen, and M. Netherland. *Hydrilla* impacts on dissolved oxygen and fish habitat quality in two Florida lakes

2:20pm – *Hartman, C. and J. Hill. Invasion history and species and habitat associations of non-native fishes in the Peace River, Florida

2:40pm – *Blanchard, J. R., R. G. Turingan, and R. Paperno. Laying a baseline: retrospective multivariate analyses of native/non-native species associations

3:00pm - Break

Contributed Papers

Moderator: Jennifer Rehage, FIU

3:20pm – Rubec, P. J., D. Blackwood, R. G. Gilmore, Jr., N. Robb, S. Collier, and K. O’Keife. Ecospecies: An Online Information System Created For Species Life Histories, With New Profiles For Red Snapper, Warsaw Grouper, and Speckled Hind

3:40pm – Nagid, E., T. Tuten, D. Dutterer, and K. Johnson. Using multiple-pass depletion to estimate the population density and biomass in a spring-fed Florida stream

4:00pm – Tuten, T., E. Nagid, and M. S. Allen. Use of trawl CPUE data to forecast black crappie fishery strengths

4:20pm – Allen, M. S., R. N. M. Ahrens, M. J. Hansen, and R. Arlinghaus. Utility of Minimum-Length Limits to Prevent Recruitment Overfishing while Considering Dynamic Angling Effort Patterns

4:40pm – Woodside, K., C. Paxton, and N. Kierl. Stock assessment of shoal bass *Micropterus cataractae* in the Chipola River, Florida

- 5:00pm – 7:00pm **Poster Setup**
6:00pm – 7:00pm **Dinner**
7:00pm – 8:00pm **Formal Poster Session** (Beverages and snacks will be in the poster area; Presenters will be available to answer questions)

*Student presentation, Presenter

Poster Session (7:00pm – 8:00pm)

(In alphabetical order by presenting author)

*Adams, J. L., and D. W. Kerstetter. Age and Growth of Three Coastal Pelagic Tuna Species in the Florida Straits

*Belgrad, B. The effect of stormwater on the peripheral olfactory nervous system of juvenile Coho salmon (*Oncorhynchus kisutch*)

Dunham, N., and M. O'Keefe. Estimating Length-Weight Relationships for fishes in Florida Estuaries and Assessing Geographic Differences in Growth Conditions

*Gandy, D. A., and J. S. Rehage. Nonnative Fishes in Freshwater Canals of the Florida Everglades: Implications for Better Management

Johnson, K., J. Dotson, W. Pouder, N. Trippel, and R. Eisenhauer. Effects of Hurricane-Induced Hydrilla Reduction on the Largemouth Bass Fishery at Two Central Florida Lakes

*Lee, J., and J. Rehage. Using mark-recapture techniques to evaluate recreational fisheries across hydrological seasons

*Mack, K., D. Godshall, and T. Yeghissian. Spatial and Temporal Survey of Brachyuran Recruitment in Tampa Bay

*MacLeod D., H. van der Veer, and V. Freitas. Seasonal Trends in the Condition of *Pleuronectes platessa* in the Wadden Sea

*Morrissey, J., D. Tonnes, and M. Tagal. Depleted Rockfish in the Puget Sound: Historic Catch Records & Contemporary Larval Rearing Research

*Pierce, B. and P. Mozumder. Perceptions and Preferences of Commercial Fishers in a Multi-species Fishery for Dedicated Access Privilege Frameworks

Schworm, A. E., B. L. Simcox, C. D. Hartman, M. E. Call, P. W. Stevens, D. A. Blewett. An Assessment of Fish Communities in Four Anthropogenically Impacted Peace River Tributaries

*Shaw, S. L., and M. S. Allen. Localized spatial and temporal variation in reproductive effort of Florida Bass *Micropterus salmoides floridanus*

*Soula, M., R. Boucek, J. Rehage, S. Santos. Healthy snack or junk food? Examining the nutritional quality of freshwater and estuarine prey in the Southwest Everglades Estuary

*Stephens, S., R. Ahrens, A. Adams, and D. Murie. Are conventional tagging programs adequate when evaluating large-scale movement patterns?

*Trujillo, V., and J. S. Rehage. Stress Effects of Non-Native Fish on Native Fish

*Student presentation, Presenter

Day-By-Day Agenda – 33rd Annual Meeting - Florida Chapter American Fisheries Society

Wednesday, February 20

7:00am – 8:00am **Breakfast**

7:30am – 6:00pm **Registration**

8:00am – 8:10am **Welcome – Travis Tuten, Chapter President-Elect, Program Chair**

Symposium: Long-term monitoring: designs, problems, and results

Symposium

Moderator: Travis Tuten, FWC

8:10am – Gwinn, D. How and why we monitor

8:35am – Trexler, J. Monitoring Fish and Macroinvertebrates for Everglades Management

9:05am – Jelks, H., and F. Jordan. Long-term Monitoring Informs Management and Conservation of Okaloosa Darters

9:30am – Sawyers, R. E. An overview of FWC's Freshwater Fisheries Long-term Monitoring Program

9:55am – Hoyer, M. Florida LAKEWATCH a Volunteer Lake Monitoring Program Utilizing Citizen Scientists

10:20am – Break

Symposium (continued)

Moderator: Doug Devries, NOAA

10:35am – McMichael, B. Florida's Marine Fisheries-Independent Monitoring Program

11:05am – Keene, K. History, Management, and Trends of the United States Pelagic Longline Fishery and the Associated Federal Observer Program in the Northwest Atlantic Ocean

11:30am – Pine, W. E., J. Tetzlaff, P. Frederick, and J. Seavey. Intertidal oyster resources in Florida's Big Bend – Developing a monitoring framework for a key resource along the Nature Coast

11:50am – Lombardi, L., and M. Grace. Gulf of Mexico Bottom Long-line Survey: focus Florida's waters

12:10pm – Symposium Summary and Discussion

12:20pm – Lunch

*Student presentation, Presenter

Contributed papers

Moderator: Sarah Stephens, UF

1:20pm – Flaherty, K. E., T. S. Switzer, B. L. Winner, S. F. Keenan, and A. Tyler-Jedlund. Improving indices of abundance for gray snapper in eastern Gulf of Mexico estuaries: results from four years of habitat-based sampling of polyhaline seagrass beds

1:40pm – Ahrens, R. N. M., and W. E. Pine. What does population recovery look like in a landscape of altered habitat? Informing recovery goals based on historical population size and extant habitat availability

2:00pm – Beesley, L., D. Hartwell, T. Bird, A. King, D. Gwinn, C. Sharpe, W. Koster, J. O'Connor, M. Henderson, S. Raymond, M. Jones, and J. Lieschke. Physiological tolerance broadly predicts the resistance of riverine fish species to a large-scale hypoxic blackwater event

2:20pm – Rehage, J. S. Seasonal reassembly: disentangling the effects of hydrological disturbance vs. local conditions in an ecotonal fish metacommunity

2:40pm – *Boucek, R., and J. Rehage. The power of the 1%: interactive impacts of extreme and episodic disturbances drive unexpected changes to mangrove fish communities

3:00pm – Break

Contributed Papers

Moderator: Drew Dutterer, FWC

3:20pm – Rubec, P. J., R. Cody, C. Ashbaugh, R. J. Planck, and S. Versaggi. Electronic Data Collection On Fishing Vessels To Support Fisheries Management

3:40pm – *Barbour, A., A. Adams, K. Lorenzen. Seasonal emigration and survival of juvenile common snook in mangrove nursery habitat

4:00pm – Struve, J., J. Dutka-Gianelli, and K. Lorenzen. Getting more out of passive acoustic telemetry: what aspects of spatial population behavior can passive acoustic telemetry monitor and how transferable are conclusions derived from such observations?

4:20pm – Young, J., J. Dutka-Gianelli, J. Whittington, and R. Taylor. Using site fidelity to identify sub-populations of common snook along the east coast of Florida

4:40pm – Collins, A.B., L.R. Barbieri and P.J. Motta. One fish, two fish, where's that huge fish? Long-term tracking of goliath grouper after catch and release

5:00pm – 6:00pm **Student Subunit Meeting (All students)**

6:00pm – 7:00pm **Dinner**

7:00pm – 8:00pm **Chapter Business Meeting – Please Attend!**

Awards Presentations:

Student Awards – **Travel** and **Roger Rottmann Scholarship**

Professional Awards – **Rich Cailteux**

Followed by **THE RAFFLE, AUCTION**, and the **bonfire social**

*Student presentation, Presenter

Day-By-Day Agenda – 33rd Annual Meeting - Florida Chapter American Fisheries Society

Thursday, February 21

7:30am – 9:00am **Registration**
7:30am – 8:30am **Breakfast**
8:30am – 8:40am **Announcements**

Contributed Papers

Moderator: Angela Collins, FWC

8:40am – *Swain, M., G. Stuz, and J. Wetz. ROV Adventures: A Comparison of Standing and Cut-Off Artificial Reef Structures in the Gulf of Mexico

9:00am – DeVries, D., C. Gardner, and P. Raley. A Description and History of the NMFS Panama City Laboratory Fishery-independent Trap and Video Reef Fish Survey

9:20am – Gardner, C., D. DeVries, P. Raley, and J. Brusher. Key findings from a fishery-independent trap and camera survey for reef fish on the northern West Florida Shelf: 2004-2012

9:40am – Caillouet, R., T. Switzer, and S. Keenan. Assessing the Efficacy of Chevron Traps in Monitoring Reef Fish Populations

10:00am – Break

Contributed Papers

Moderator: Jesse Blanchard, FIU

10:20am – Lang, E. T., H. M. Lyon, G. R. Fitzhugh, and W. T. Walling. An Evaluation of Sexual Macroscopic Staging applied to Gulf of Mexico Fishes

10:40am – *Garreau, C., R. Francis-Floyd, L. J. Guillette, Jr., E. Reyier, and Roy Yanong. Development of methods for non-lethal health assessment of the red drum (*Sciaenops ocellatus*) inside NASA's Kennedy Space Center no-take fisheries reserve

11:00am – *Mack, K., and P. Key. Lethal and sublethal effects of caffeine and chlorpyrifos, individually and in combination, on *Palaemonetes pugio*

11:20am – Dotson, J. R., and A. C. Dutterer. Development and evaluation of the Florida TrophyCatch program

11:45am – 12:45pm **Lunch**

12:45pm – 1:00pm **Awards Presentation:**

Jack Dequine Best Student Paper
Best Professional Oral Presentation
Best Poster Presentation – Student and Professional
Power Tie and Lampshade awards

*Student presentation, Presenter

Abstracts for the 33rd Annual Meeting of the Florida Chapter American Fisheries Society
(In alphabet order by presenting author, *student presentation, presenter)

* **Adams, J. L., and D. W. Kerstetter**

Student • Poster presentation

Nova Southeastern University, Dania Beach, FL

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Age and Growth of Three Coastal Pelagic Tuna Species in the Florida Straits

Understanding the life history of a species is essential for fully understanding its role within an ecosystem. However, many of the fish species of high ecological value have not been studied due to their less prominent roles in local recreational and commercial fisheries in comparison to other species. This study describes the age and growth patterns of three small tuna species inhabiting South Florida waters: blackfin tuna *Thunnus atlanticus*, skipjack tuna *Katsuwonus pelamis*, and little tunny *Euthynnus alletteratus*. Tuna specimens were collected via donations obtained from various fishing tournaments and charter captains in the areas of the Florida Straits as well as gillnetting and hook-and-line by the Nova Southeastern University Oceanographic Center. Specimen counts included 199 blackfin tuna, 200 little tunny, and 70 skipjack tuna. Age was described via sagittal otoliths. They were removed, dried, sectioned, and rings were counted as well as measured. Validation of the timing of ring deposits was done by marginal increment analysis. Growth parameters were determined by comparison of fish fork length to count measurements. This comparison via the Von Bertalanffy growth equation produced a growth rate for each species. The curves indicate an average size of an individual of a given species at a certain age and also give estimations of a maximum length (L_{∞}) for each species, in addition to specific growth rate, which is indicated by the slope. Parameters of each resulting Von Bertalanffy equation was compared among species. Results were also compared with growth rates calculated in other studies from various areas.

Ahrens, R. N. M.¹, and W. E. Pine²

Contributed presentation

¹ University of Florida, SFRC, Program for Fisheries and Aquatic Sciences, Gainesville, FL

² University of Florida, Department of Wildlife Ecology and Conservation, Gainesville, FL

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What does population recovery look like in a landscape of altered habitat? Informing recovery goals based on historical population size and extant habitat availability

Most conservation efforts are motivated by over utilization of resources in the past. In the United States, the Endangered Species and Magnuson-Stevens Fisheries Conservation and Management acts are two of the largest governmental conservation programs with nearly 2500 species assigned some sort of status or regulatory action under their mandates. At their core, both seek to conserve and recover species that have declined from some historical baseline to a level where the populations are no longer in jeopardy. However, knowing the historical baseline, and then assessing whether that baseline is a realistic restoration target given changes in habitats and ecosystems, is key in designing effective conservation plans. In this paper we develop

and assess an approach for establishing quantifiable goals for the recovery of a threatened species (Gulf sturgeon *Acipenser oxyrinchus desotoi*) by (1) estimating historical population biomass prior to directed fishing and habitat modifications to inform recovery targets (2) assess the relationship between historical baselines, habitat characteristics, and extant available habitat, (3) apply these relationships to rivers where assessment using traditional stock assessment methods is not possible to provide reference points to inform recovery efforts. We found that the current population levels in four of the seven rivers included in the ESA mandated recovery plan are likely similar to or exceeding the current mean carrying capacity. In the remaining three rivers, extant Gulf sturgeon populations are likely significantly below their estimated historic carrying capacity levels, and in two of these rivers, this is likely because of habitat loss and migration barriers caused by dams. Our approach helps to establish realistic recovery criteria by explicitly acknowledging changes in habitat. This approach can also be used to assess potential benefits to species from management actions designed to aid in species recovery such as dam removals.

Allen, M. S.¹, R. N. M. Ahrens¹, M. J. Hansen², and R. Arlinghaus^{3,4}

Contributed presentation

¹ University of Florida, SFRC, Program for Fisheries and Aquatic Sciences, Gainesville, FL

² University of Wisconsin – Stevens Point, College of Natural Resources, Stevens Point, WI

³ Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Department of Biology and Ecology of Fishes, Berlin, Germany

⁴ Humboldt- Universität zu Berlin, Department of Crop and Animal Sciences, Inland Fisheries Management Laboratory, Berlin, Germany

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Utility of Minimum-Length Limits to Prevent Recruitment Overfishing while Considering Dynamic Angling Effort Patterns

Recruitment overfishing has been termed an ‘invisible’ problem in freshwater recreational fisheries, but examples show that recruitment overfishing can occur. This study developed an age-structured model to evaluate the benefits of minimum-length limits to prevent recruitment overfishing in black crappie *Pomoxis nigromaculatus* and walleye *Sander vitreus* fisheries in light of varying assumptions about how angling effort would respond to changes in fish abundance that occur due to stochastic recruitment. The simulations showed that length limits could generally prevent recruitment overfishing of black crappie and walleye, but larger length limits were required if angler effort showed weak responses to changes in fish abundance. This occurred because low angler effort responsiveness caused fishing mortality rates to potentially remain high when the stock abundance declined. By contrast, at high effort responsiveness anglers would leave the fishery after stock declines, therefore allowing recovery of stocks when stock abundance declined. Angler effort estimates for black crappie and walleye fisheries suggested that angler effort could be highly responsive for some cases and relatively stable in others, increasing the risk of recruitment overfishing in real fisheries. Recruitment overfishing should be considered seriously in freshwater recreational fisheries.

* **Barbour, A.¹, A. Adams², and K. Lorenzen¹**

Student • Contributed presentation

¹ University of Florida, SFRC, Program for Fisheries and Aquatic Sciences, Gainesville, FL

² Mote Marine Laboratory, Charlotte Harbor Field Station, Pineland, FL
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Seasonal emigration and survival of juvenile common snook in mangrove nursery habitat

This four-year study in Charlotte Harbor, Florida USA expands the understanding of ontogenetic connectivity from nursery habitat by tracking 1,917 PIT tagged juvenile common snook (*Centropomus undecimalis*). We detected 85.7% of marked individuals at least once with an array of eleven autonomous PIT tag antennae in four mangrove-fringed creeks, and divided marked fish into two size classes for analysis – Size Class 1 (SC1) (120-200 mm SL, approximately age-0) and SC2 (201-320 mm SL, approximately age-1). We found that a higher percentage of SC2 than SC1 snook emigrated, SC2 made larger movements, and we modeled SC2's rate of emigration as 2.4 times that of SC1's. We determined a need for seasonal emigration rates, with highest emigration in the fall and spring, and lowest in the coldest months. Additionally, emigration events during the fall and winter tended to be temporary movements, while emigration in the spring to summer resulted in a higher incidence of permanent emigration. Despite an expectation that SC2 individuals would lose their reliance on the creeks with increasing size and undergo an ontogenetic shift to a novel habitat, we detected a higher percentage of SC2 than SC1 returning to the creeks a year after marking. The repeated spring declines in SC1 individuals detected, concurrent with an increase in movement rate, an increase in permanent emigration, and increased detection of late-stage SC1 and early-stage SC2 individuals outside the creeks in Florida Fish and Wildlife Conservation Commission's fisheries independent monitoring program data, suggests a large-scale seasonal movement from the study creeks. Future studies should identify the additional components of juvenile snook's habitat mosaic, while investigating if spring declines and the sparsity of year-after returns are due to mortality or a lack of natal-creek homing.

Beesley, L.¹, D. Hartwell¹, T. Bird², A. King¹, D. Gwinn⁴, C. Sharpe³, W. Koster¹, J. O'Connor¹, M. Henderson³, S. Raymond¹, M. Jones¹, and J. Lieschke¹

Contributed presentation

¹ Arthur Rylah Institute for Environmental Research, Department of Sustainability and Environment, Heidelberg, Victoria, Australia

² University of Melbourne, Victoria, Australia

³ The Murray-Darling Freshwater Research Centre, CSIRO Land and Water and La Trobe University, Mildura, Victoria, Australia

⁴ University of Florida, SFRC, Program for Fisheries and Aquatic Sciences, Gainesville, FL
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Physiological tolerance broadly predicts the resistance of riverine fish species to a large-scale hypoxic blackwater event

River-floodplain connectivity is critical to the energy budget of lowland river systems. However, floodplain inundation can negatively impact aquatic biota if it creates conditions of hypoxia. We know relatively little about the resistance of fish to hypoxic blackwater events at large spatial scales. While these events are relatively rare (in certain systems), their widespread nature means they have a great potential to affect populations and overall river health. This study describes the broad-spatial scale assessment of the effect of a near system-wide blackwater event on the fish assemblage in one of Australia's largest and most iconic river systems, the Murray. We used a BACI design in which data were taken from 58 sites, nested within eight regions, before (2010) and after (2011) a large flood event. The flood led to blackwater formation at 43 sites (75%). We examined changes in the fish assemblage using species-specific generalised models to describing site occupancy and relative abundance. The results revealed that the short term (months after the event) response of fish to blackwater varied markedly among species. Importantly, species susceptibility could be broadly predicted from information on species physiological resistance to hypoxia. Of the seven fish species we studied, those most negatively affected by hypoxic blackwater were the natives Murray cod (*Maccullochella peelii*) and Australian smelt (*Retropinna semoni*). We predict that future population recovery will reflect life history attributes, and that Australian smelt will recover considerably faster than Murray cod. Management actions to assist the Murray cod meta-population to recover and the implications of future blackwater events are discussed. The hypoxic blackwater event was associated with a positive response for two invasive alien species, particularly common carp (*Cyprinus carpio*), reflecting their tolerance to hypoxia.

*** Belgrad, B.**

Student • Poster presentation

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The effect of stormwater on the peripheral olfactory nervous system of juvenile Coho salmon (*Oncorhynchus kisutch*)

This project aims to determine the toxicity of urban stormwater runoff on Coho salmon olfaction. As stormwater contains high concentrations of dissolved copper, a known neurotoxin to fish, there exists the possibility that stormwater hinders the ability of salmon to detect odors. Since salmon rely on their sense of smell for behaviors such as natal homing and predator avoidance, any reduction in this sensory capacity may also affect their survival. Electrophysiological recordings from the olfactory epithelium (electro-olfactograms; EOGs) were used to measure the effects of stormwater on the response of olfactory neurons to a known odor, the amino acid L-serine. After a 30 min exposure to stormwater and subsequent return to fresh water, fish retained their ability to detect L-serine with no apparent difference in EOG amplitude relative to measurements taken before stormwater exposure. While juvenile salmon were unable to detect L-serine in the presence of stormwater, they did show a large EOG response to stormwater. Although stormwater contains copper and produces a significant neurological response, stormwater as a mixture does not appear to be neurotoxic to the salmon's olfactory system. Stormwater also contains dissolved organic carbon, which tends to bind to copper, inhibiting

copper's toxicity. Additionally, stormwater appears to act as a strong odor, which may mask the presence of other odors essential to salmon behavior and subsequent survival.

* **Blanchard, J. R.¹, R. G. Turingan², and R. Paperno³**

Student • Contributed presentation

¹ Florida International University, Department of Biological Sciences, Miami, FL

² Florida Tech, Department of Biological Sciences, Melbourne, FL

³ Florida Fish and Wildlife Conservation Commission, FWRI, Melbourne, FL

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Laying a baseline: retrospective multivariate analyses of native/non-native species associations

The impact of non-native fishes on native fishes is something that many have attempted to study and understand with varied success. Today, through retrospective analyses of historical data, we can begin to lay baselines from which to address this topic. Toward that end we addressed the questions of which native fishes' densities, in a freshwater tributary to the Indian River Lagoon (IRL), have historically been driven by a model non-native family, Cichlidae, and whether these patterns vary seasonally, spatially, or ontogenetically. Multivariate analyses have revealed that densities of several economically important IRL fishes have historically been influenced by the presence of cichlids and this influence varied seasonally, through ontogeny, and with substrate type. Using this information we can now focus our research efforts on describing the mechanisms behind these associations with the ultimate goal of more effective management and preservation of our natural resources.

* **Boucek, R., and J. Rehage**

Student • Contributed presentation

Florida International University, Department of Earth and Environment, Miami, FL

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The power of the 1%: interactive impacts of extreme and episodic disturbances drive unexpected changes to mangrove fish communities

The co-occurrence of unrelated extreme and episodic disturbances at ecologically relevant spatio-temporal scales may have synergistic impacts on community structure by impacting species that may be vulnerable to the first yet resistant to the second. Thus, the combination of the two events may lead to communities that differ in species abundance, evenness and richness than what would be expected if these events occurred independently.

In South Florida, an extreme 2010 coldfront was immediately followed by a severe 2011 drought. At the oligohaline reaches of a Everglades estuary, the cold front decreased water temperatures to lethal levels for many tropical fishes, while the drought increased salinities to sub-lethal and lethal levels for freshwater fishes. Thus, the aim of our study was to 1) assess the severity of the 2010 cold front and the 2011 drought, and 2) determine their impact on fish communities.

We assessed the severity of the 2010 cold front and the 2011 drought using historical Everglades City temperature records (1927-2012) and the annual number of days with no freshwater input to the estuary (1995-2012). Using trait-based analyses, we compared changes in relative abundance

of large-bodied fishes caught electrofishing from 2006-2012. Results show that the 2010 cold front was a 70-year extreme disturbance, and caused significant reductions in tropical euryhaline species, shifting dominance towards temperate freshwater species. Despite significant losses of tropical species, the 2010 cold front had no effect on total fish abundance. Conversely, the 2011 drought was less severe (decadal disturbance) but still reduced abundance for temperate freshwater species, shifting community identity back to pre-disturbance conditions. Unlike the 2010 cold front, the drought reduced total fish abundance by 60%. With forecasted increases in the frequency of episodic and extreme disturbances, we may expect co-occurrences of these events to increase, resulting in similar communities functioning at much lower abundances.

* **Bradshaw Settevendemio, E.¹, M. S. Allen¹, and M. Netherland²**

Student • Contributed presentation

¹ University of Florida, SFRC, Program of Fisheries and Aquatic Sciences, Gainesville, FL

² University of Florida, Center for Aquatic and Invasive Plants, Gainesville, FL

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***Hydrilla* impacts on dissolved oxygen and fish habitat quality in two Florida lakes**

The fast growth and dense structure of some macrophyte species can alter water chemistry and impact fish habitat quality. *Hydrilla* *Hydrilla verticillata* is an invasive aquatic weed which exhibits rapid growth and may contribute to low dissolved oxygen concentrations (hypoxia, DO <2.0 mgL⁻¹) during warm summer months. We evaluated the spatial and temporal dynamics of dissolved oxygen in three habitat types: open water, edge of hydrilla beds, and the dense hydrilla bed interior, in two Florida lakes. Our results showed that habitat type, month, and depth all significantly influenced dissolved oxygen and up to 100% of the water column was severely hypoxic (DO <1.0 mgL⁻¹) in dense and edge habitat types in late summer in the small lake. However, we found no hypoxia in the large lake. These results suggest that lake morphology and size could influence the impacts of hydrilla on water quality. Additionally, increasing edge habitat may not greatly influence DO concentrations unless substantial open-water area adjacent to dense beds is maintained for adequate water cycling.

Caillouet, R., T. Switzer, and S. Keenan

Contributed presentation

Florida Fish and Wildlife Conservation Commission, FWRI, Saint Petersburg, FL

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Assessing the Efficacy of Chevron Traps in Monitoring Reef Fish Populations

Reef fishes have long been a highly valued commercial and recreational fishery in the Gulf of Mexico. Several reef fish species are currently overfished or undergoing overfishing, and concomitant to management regulations attempting to rebuild stocks has come the need for enhanced fisheries-independent surveys. For many years fish traps have been one of the primary tools used to monitor these fishes in the southeastern United States. While there have been several studies testing the effectiveness and selectivity of traps, little work has been done to examine factors that determine trap effectiveness (e.g. presence/absence of targeted species, proximity to reef habitat, current direction). As an initial step towards answering these questions, we began outfitting all traps with cameras to visually assess the environment and

community in the sampled area. Subsamples of videos were selected to identify and enumerate all fish taxa. Preliminary results indicate that trap effectiveness varies significantly between species. Some species, such as red grouper, displayed high correlation in presence and abundance between traps and video. Other commonly observed species, such as gray snapper, were rarely captured in traps. Ultimately, it appears that traps may only be useful for a subset of species and sizes, although efforts are underway to test other traps designs for increased effectiveness.

Collins, A. B.^{1,2}, L. R. Barbieri¹, and P. J. Motta²

Contributed presentation

¹ Florida Fish and Wildlife Conservation Commission, FWRI, Saint Petersburg, FL

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One fish, two fish, where's that huge fish? Long-term tracking of goliath grouper after catch and release

Goliath grouper (*Epinephelus itajara*) have been protected from harvest within US waters for over two decades. Despite the moratorium, the species continues to be targeted for catch and release and is also caught inadvertently as bycatch during hook and line fishing for other species. Mortality due to directed or incidental fishing pressure is unclear. This study was established to identify survival of goliath grouper after catch and release events, and to quantify long term residence and behavioral patterns. Goliath grouper were caught on hook and line, fitted with acoustic tags and monitored via an array of acoustic receivers within the Gulf of Mexico (13 shipwrecks monitored within a 2,000 km² area; site depth ranged 10 – 40 m). Over a 20 month period (April 2011 – December 2012), 40 individuals (105 – 206 cm TL) were monitored for up to 461 days (14 – 461 d; mean = 206 d). Pressure sensors indicated fish position within the water column approximately every 3 minutes, providing confirmation of survival as well as information regarding diel activity patterns. In August 2011 and August 2012, coincident with spawning season, 30% of tagged fish disappeared from their resident sites. The majority of these fish returned “home” after absences ranging weeks to months. Preliminary analysis of vertical movement and diel activity patterns will be discussed. Research is ongoing, but results thus far demonstrate high site fidelity and suggest relative resilience to responsible catch and release fishing.

DeVries, D., C. Gardner, and P. Raley

Contributed presentation

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A Description and History of the NMFS Panama City Laboratory Fishery-independent Trap and Video Reef Fish Survey

The Panama City NMFS lab has conducted an annual fishery-independent trap and video survey of reef fishes on natural reefs on the inner and mid shelf of the Gulf of Mexico off the Florida panhandle and Big Bend region since 2005. The main objective of the survey is to generate indices of relative abundance of exploited reef fishes – red snapper; red grouper; gag; scamp;

vermilion, gray, and lane snappers; gray triggerfish; red porgy; white grunt; black seabass; and hogfish – for stock assessments and to inform fishery managers. Other objectives include examining: 1) spatial and temporal patterns in community structure as well as in catch, recruitment, demographics, and distribution of both exploited and unexploited species; 2) relationships between habitat and all the aforementioned metrics; and 3) the distribution, characteristics, and extent of reef habitat.

The chevron trap is efficient at capturing a broad size range of several, but not all, species of reef fish. Camera arrays are much less selective and provide abundance estimates for many more species than traps, and those estimates are usually much less biased; however, traps provide invaluable age and sex data which can be used to better interpret the video data. Stereo cameras, first used in 2009, allow collection of accurate length data and were a significant improvement over scaling lasers. Sampling design was systematic through 2009, but thereafter, after a major expansion of the sampling universe, was switched to stratified random, with proportional allocation by depth and area to ensure uniform coverage over the entire region. Although expansion of the sampling universe and depth coverage can confound interpretation of trends, modeling can be used to overcome or at least greatly lessen this problem. Survey data have been contributed to assessments on red grouper, black seabass, red snapper, and will be submitted for gag this year.

Dotson, J. R., and A. C. Dutterer

Contributed presentation

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Development and evaluation of the Florida TrophyCatch program

TrophyCatch is a fishery-dependent monitoring program for trophy-sized largemouth bass (>8 lbs) that offers unique incentives (e.g., replica mounts) for anglers to document and report trophy catches that are voluntarily released. The objectives of the program are to reduce fishing mortality of trophy fish, increase state-wide catches of trophy fish, monitor long-term trends in trophy catches, and evaluate management actions and environmental conditions that produce trophy fish. Prior to the development of TrophyCatch, little verified information existed on catch and harvest rates of trophy-sized largemouth bass. To evaluate the efficacy of TrophyCatch to meet objectives a reward-based tagging study was conducted in 2012 to estimate mean annual state-wide catch and exploitation rates of trophy-sized largemouth bass. These estimates will serve as baseline information prior to the implementation of TrophyCatch. Biologists tagged 160 trophy-sized largemouth bass in 49 water bodies with varying trophic state, habitat characteristics, water quality, size, angling demographics, and fish communities to provide a realistic estimate of the state-wide average. Mean annual catch and exploitation rates of trophy-sized largemouth bass were 0.21 (95% CI = 0.14 – 0.27) and 0.04 (95% CI = 0.01 – 0.08), respectively. Preliminary estimates from this study indicate that catch and exploitation rates of trophy-sized fish are similar to all legal-sized fish (>14 in TL; Kerns et al. 2012). However, the exploitation rate of fish greater than 10 pounds was 0.15 (95% CI = 0.04 – 0.31), indicating that anglers are more likely to harvest a fish greater than 10 pounds. The primary reason for harvest was taxidermy, which suggests that TrophyCatch may influence fishing mortality by offering replica mounts as an incentive to release fish. TrophyCatch launched October 1, 2012, and this study will continue

for 5 years to evaluate changes in catch and exploitation rates of trophy fish, as well as angler participation.

Dunham, N., and M. O’Keefe

Poster presentation

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Estimating Length-Weight Relationships for fishes in Florida Estuaries and Assessing Geographic Differences in Growth Conditions

Length-weight models are a predictive tool that can be used to estimate individual weights and total biomass for populations with a known length-structure. Although these models play an important role in fisheries assessments and ecosystem-based modeling, a comprehensive index of length-weight relationships for Florida’s common estuarine fishes has not been compiled. The purpose of this project is to create a comprehensive length-weight index for estuarine fishes for the state of Florida and to determine if the condition of these species differed significantly based on geographic location. The lengths, weights, and variables for each specimen were collected from 1989 to 2012 to generate linear and non-linear regressions. A total of 251 species of fish were evaluated, generating 875 regressions. Individuals were collected from seven Florida estuaries; several specimens are recreationally important species from multiple habitats and salinity gradients. These estuarine areas included Apalachicola Bay, Cedar Key, Tampa Bay, Charlotte Harbor, Northeast Florida, Northern Indian River Lagoon, and Southern Indian River Lagoon. Length-weight relationships were modeled for each species in each area using log-transformed data; and analysis of covariance was used to identify geographic variations in the condition of each species. When possible, data were combined for species with length-weight relationships that did not differ significantly among estuarine areas, thus allowing one model to characterize the length-weight relationship for an individual species across multiple areas. Results indicate coastal (i.e., Gulf vs. Atlantic) differences in the length-weight relationships for *Mugil cephalus*, *Archosargus probatocephalus*, *Centropomus undecimalis* and *Hippocampus erectus*.

Flaherty, K. E., T. S. Switzer, B. L. Winner, S. F. Keenan, and A. Tyler-Jedlund

Contributed presentation

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Improving indices of abundance for gray snapper in eastern Gulf of Mexico estuaries: results from four years of habitat-based sampling of polyhaline seagrass beds

Gray snapper support extensive recreational fisheries in estuarine and coastal waters throughout the eastern Gulf of Mexico. Because gray snapper exhibit an estuarine-dependent life history, it is possible to estimate the relative strength of juvenile recruitment to the estuary which is critical for the effective assessment of the population. Prior evaluation of multi-year fisheries-

independent monitoring data collected within Florida Gulf coast estuaries indicated that gray snapper appeared to inhabit polyhaline seagrass beds that were underrepresented in ongoing monitoring efforts. Accordingly, additional habitat-based monitoring effort, designed to target seagrass habitats, was implemented. Shoal and deep-water polyhaline seagrass habitats were sampled with 183-m haul seines and 6.1-m otter trawls, respectively. The frequency of occurrence, catch-per-unit-effort, and size structure of gray snapper collected from long term monitoring and new polyhaline seagrass surveys were compared. This recent (2008 - 2011) habitat-based sampling on polyhaline seagrass habitats resulted in increased catches and reduced variability in abundance indices for gray snapper within each estuarine system, resulting in reductions in the coefficient of variation of annual recruitment indices. Continued sampling of polyhaline seagrass habitat is recommended to improve our ability to detect changes in the relative abundance of gray snapper through time.

* **Gandy, D. A., and J. S. Rehage**

Student • Poster presentation

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Nonnative Fishes in Freshwater Canals of the Florida Everglades: Implications for Better Management

Nonnative species pose a serious threat to the ecological integrity and biodiversity of natural ecosystems, including those within protected areas. Presently in Everglades National Park (ENP), fourteen nonnative fishes are established, yet we know little about how they interact with native biota, their response to hydrological disturbance including restoration efforts, and their overall impact. A subset of these nonnative fishes are new invasions since 2000, several of them accompanying restoration projects. Additional invasions of nonnative fishes may be expected as the number of nonnative fishes established outside of the protected natural areas continues to increase. Ongoing research examines the impact of nonnative fishes on lower trophic levels and ecosystem processes, how their impact is mediated by hydrology, the potential for new invasion threats from bordering canals, and the alternatives for their containment.

This study examines the spatiotemporal dynamics of fish communities, both native and nonnative, in canals bordering ENP. Our questions include the following: (1) What factors drive community structure in canals? (2) How do canals function as conduits for nonnative fishes? (3) How does the inclusion of nonnative fish species alter fish community structure?

Fishes are sampled via boat-mounted electrofishing. Fish communities appeared distinct among canals, with nonnative fishes composing between 8-70%. Habitat complexity and other abiotic factors seem to be influencing natives and nonnatives differently. Because restoration efforts in this region will impact water management, there is a strong need to better understand how these canals function as habitat. In addition, canals are being used by restoration projects to deliver water to Everglades marshes often with little consideration of their role in the spread of nonnative taxa. Our findings suggest a need for more effective management of nonnative fishes while they are confined to the canal systems.

Gardner, C., D. DeVries, P. Raley, and J. Brusher

Contributed presentation

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Key findings from a fishery-independent trap and camera survey for reef fish on the northern West Florida Shelf: 2004-2012

The NMFS Panama City lab has been conducting a fishery-independent trap and camera survey of natural reefs on the inner shelf of the eastern Gulf of Mexico between Destin and Cedar Key in depths from 8 to 50 m since 2004. Objectives include establishing an age-based annual index of abundance of young exploited reef fish, examining regional catch, recruitment, demographic, distribution patterns and habitat associations. A combination of stationary video cameras (incorporated in 2005 and stereo cameras in 2009) and chevron traps have been the primary sampling tools used.

Video data clearly documented an eastward expansion of red snapper into the Big Bend in 2009, with less than 10% frequency of occurrence in the Big Bend from 2005-2008 to over 40% in 2009-2010 and dropping to ~20% in 2011. Modal size of red snapper taken in traps was fairly stable in 2005-2007, ranging from 300 to 350 mm TL, then steadily increased through 2011, when it was 375 to 425 mm TL. Strong year classes of red grouper (1999, 2002, and 2006) were tracked as well as evidence of depth effects on fish size. Video data indicated that gag occupy the same areas and depths as red grouper, however, the relative abundance of gag was noticeably lower than red grouper west of Cape San Blas. This survey documented likely effects of a major red tide event in 2005 on several reef fish species (white grunt, black sea bass, red grouper). Long term monitoring on a regional scale will be invaluable for future assessments as well as providing baseline data to compare the effects of natural and anthropogenic events.

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Student • Contributed presentation

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Development of methods for non-lethal health assessment of the red drum (*Sciaenops ocellatus*) inside NASA's Kennedy Space Center no-take fisheries reserve

Despite significant value of the Florida red drum (*Sciaenops ocellatus*) fishery, a lack of sex and stress hormone data are available. Current non-lethal health assessment programs do not collect this information. This was the first study to assess sex and stress hormones for adult red drum in Florida, with the goal of developing protocols defining "health" and providing baseline data.

This project incorporated the Stock Enhancement Research Facility (SERF) external health index with blood chemistry analysis of glucose, cortisol, 11-ketotestosterone (11-KT) and 17 β -estradiol (E₂). Red drum (n=126) were collected from NASA's Kennedy Space Center waters, the oldest

fully protected no-take fisheries reserve in the United States, during three different reproductive periods to evaluate seasonal variation and effect of reproductive activity on stress response. Fish in all periods scored near or above the “healthy” level for the SERF health index. The lower scores were attributed to wild fish having more parasites than cultured fish. On average condition factor ranked all fish as excellent-exceptional. Glucose, cortisol, and E₂ levels were significantly different among reproductive periods. Cortisol values ranged between 0.93 – 1.25 ng/ml, well below typical 10 ng/ml found in teleosts. 11-KT was significantly elevated during the reproductive period for both sexes. Blood collection occurred in less than three minutes and may have minimized the glucose and cortisol response associated with handling. Results from this study illustrate the potential value of future comparisons of red drum near the study area, the range of the species, and as a model for other sciaenids.

Gwinn, D.

Symposium presentation

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How and why we monitor

Ecological monitoring represents one of the largest expenditures of many natural resource management and scientific organizations and the reasons to monitor the environment vary widely. Reasons cited in the literature often include informing state-dependent management, active adaptive management, academic, political, and curiosity driven. Although the purpose of specific monitoring programs is diverse, the qualities that promote successful programs are ubiquitous. Clear objectives, efficient design, clear links to decision processes, regular reporting and stable funding is responsible for many programs realizing their full potential. The literature suggests that monitoring programs have had a poor record of success of the last 3-4 decades, indicating a clear need to improve their ability to provide important ecological insights. Fortunately, there is an increasing wealth of literature to guide the effective design and improvement of existing programs. I discuss the different components of monitoring programs and highlight important areas to stimulate the exchange of ideas with the aim of improving the success of ecological monitoring.

* **Hartman, C.¹, and J. Hill²**

Student • Contributed presentation

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Invasion history and species and habitat associations of non-native fishes in the Peace River, Florida

Non-native fishes may impact receiving ecosystems, altering community structure and potentially habitat use of native fishes. Despite 36 reproducing non-native fishes in peninsular Florida, few studies evaluate their associations with native fishes or their use of habitat. Most research on non-native fishes focuses on canals and marshes in southeastern Florida. The Peace

River drainage basin of central and southern Florida is one of the largest in the state, has a long history of non-native fish introduction, and has had a series of fish surveys and fisheries studies documenting species occurrence and fish community metrics. Our study (a) reviewed the history of non-native fish introduction within the basin and (b) evaluated the four most common non-native species to determine their associations with native fishes and their habitat use. Of the four most common non-natives, blue tilapia *Oreochromis aureus* was the first non-native documented in the basin in 1961, followed by brown hoplo *Hoplosternum littorale* and vermiculated sailfin catfish *Pterygoplichthys disjunctivus* in 1989, and African jewelfish *Hemichromis letourneuxi* in 2003. Boat electrofishing sampling and habitat surveys were collected in the mainstem quarterly from 2008 to 2009 and from four major tributaries in 2010 and 2011. Sixty-six species totaling 20,655 individual fish with biomass of 1,593 kg were collected during 1,543 transects. Total contribution of six species of non-native fishes collected across years was 3.6% by number and 8.8% by weight. Blue tilapia was found in deeper, slow moving water with abundant macrophytes, brown hoplo was associated with shallower, backwater areas, vermiculated sailfin catfish was more common in shallower tributaries with woody debris and rocky outcroppings, and African jewelfish was associated shallow, slow moving water and abundant macrophytes. Despite over 50 years of introductions, non-native fishes were not a dominant component of the fish fauna of the Peace River.

Hoyer, M.

Symposium presentation

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Florida LAKEWATCH a Volunteer Lake Monitoring Program Utilizing Citizen Scientists

LAKEWATCH began in 1986 as an unfunded project helping citizens answer questions about lake management issues. The program was designed following the land grant ethic incorporating research, teaching and extension. Through rapid word of mouth the LAKEWATCH story spread with ever increasing numbers of people wanting to participate and learn about their lake. The Florida Legislature in 1991 officially established Florida LAKEWATCH within the Department of Fisheries and Aquatic Sciences at UF/IFAS (Chapter 91-69; s. 240.5329, F.S.; now F.S. 1004.49). Since the initiation of LAKEWATCH the program has worked with thousands of citizen scientists collecting information on over 1000 lakes, 200 coastal locations, 150 streams/rivers and multiple spring systems. Basic water chemistry parameters (emphasizing nutrients and chlorophyll concentrations) are analyzed monthly at each location but there is also considerable monitoring for aquatic plants, fish populations and aquatic bird populations. The program has helped train over 50 graduate students in varying aspects of lake management and help instruct multiple undergraduates throughout the 25+ years of LAKEWATCH's existence. This presentation will describe the design and organization of the LAKEWATCH, the problems encountered along the way and the multiple successes of the LAKEWATCH program.

Jelks, H.¹, and F. Jordan²

Symposium presentation

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Long-term Monitoring Informs Management and Conservation of Okaloosa Darters

Okaloosa Darters (*Etheostoma okaloosae*) are small benthic fish restricted to six small drainages flowing through Eglin Air Force Base in northwestern Florida. Okaloosa Darters were added to the Endangered Species List in 1973 primarily because of limited geographic distribution, degradation of habitat, and potential competition with Brown Darters (*E. edwini*). Since 1995, we have monitored populations of Okaloosa and Brown Darters at 12 to 58 sites using visual census and three-pass removal sampling techniques to understand status, distribution, and response to habitat restoration. Initially, we sampled two 20-meter reaches at 12 sites in the spring and fall. We determined that there was no significant difference between paired reaches or seasons, so we added nine additional sites and counted darters at one 20-meter reach in late summer when young-of-year darters were large enough to identify. Our three-pass removal methods allow us to estimate both abundance and detection at each site. In a comparison with seine methods, visual census methods proved to be much more precise and accurate over the variety of habitats sampled. Increases in number of darters coincided with habitat restoration activities at Eglin. Correlations between darter numbers and either in-stream habitat or broad climatic variables are mixed. A combination of count and removal estimates provides logistically feasible, biologically compelling, and scientifically defensible support for informing management and conservation actions. In 2011, Okaloosa darters were downlisted by USFWS from endangered to threatened based substantially on our data.

Johnson, K.¹, J. Dotson¹, W. Poudert², N. Trippel³, and R. Eisenhauer⁴

Poster presentation

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Effects of Hurricane-Induced Hydrilla Reduction on the Largemouth Bass Fishery at Two Central Florida Lakes

The recruitment of juvenile largemouth bass (*Micropterus salmoides*) is often positively correlated with the presence of submersed aquatic vegetation, including hydrilla (*Hydrilla verticillata*). Lakes Weohyakapka and St. Johns Water Management Area, Florida, experienced severe impacts from multiple hurricanes in August and September 2004, resulting in the loss of all submersed aquatic vegetation, which had been primarily hydrilla. We assessed at both lakes changes in largemouth bass population size structure, recreational fishing effort and success, angler expenditures, and catches of trophy fish in relation to disparate levels of hydrilla coverage for prestorm (1999 to 2004) and poststorm (2005 to 2009) periods. Tests revealed significant differences at both lakes in the population size structure between prehurricane (moderate to high

percentage coverage of hydrilla) and posthurricane (no hydrilla) periods. At both lakes, the population size structure comprised more juvenile (age-1) largemouth bass before the hurricanes, indicating that a decline in recruitment strength coincided with the absence of hydrilla posthurricanes. Declines in directed fishing effort, angler expenditures, and angler catches of trophy-size fish also occurred following the absence of hydrilla posthurricanes. This demonstrates an important link between radical changes in hydrilla coverage with recruitment of juvenile largemouth bass and the strength of the largemouth bass fishery. We suggest management actions that aquatic resource managers could take to mitigate fisheries impacts due to hurricane-influenced changes in aquatic macrophyte coverage.

Keene, K.

Symposium presentation

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History, Management, and Trends of the United States Pelagic Longline Fishery and the Associated Federal Observer Program in the Northwest Atlantic Ocean

Pelagic longlining, defined in this report as a fishery based on horizontally drifting hook and line gear used to capture tuna and swordfish in the open ocean, can be traced to the early 7th century in Japan. Over the centuries, the advancement of technology and technique for commercial pelagic longlining has allowed increased efficiency of fishing and consequent overfishing, leading to a need for catch and take regulation. Government scientists, responsible for regulatory recommendations, found it difficult to acquire data for this distant-water fishery; thus, research biologists were sent aboard the pelagic longline vessels to observe and record data for catch and bycatch. This started what is known today as the Pelagic Longline Observer Program or Pelagic Observer Program (POP). There is little prior documentation of the history and evolution of the pelagic longline fishery in the Northwestern Atlantic Ocean (NAO) and its associated POP. This professional paper seeks to define and describe this commercially important fishery, and to document measures used to manage it. The paper covers three main topics: 1) the history, status, and trends of pelagic longlining in the NAO; 2) management of the fishery and associated POP; and, 3) data summation for the fishery, as gathered and processed by the POP.

Woodside, K., C. Paxton, and N. Kierl

Contributed presentation

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Stock assessment of shoal bass *Micropterus cataractae* in the Chipola River, Florida

A stock assessment of shoal bass *Micropterus cataractae* was conducted in the upper Chipola River in Jackson and Calhoun Counties, Florida from 2007 to 2012 to aid in the conservation of black basses. Shoal bass are currently listed as a species of “Special Concern” by the American Fisheries Society and are a harvested species in Florida. Previous shoal bass research in Florida was limited in terms of quantified habitat use or numbers of individual specimens sampled.

Although one of the potential threats to shoal bass in the Chipola River has been described as sedimentation; no information existed regarding abundance or assessed the existing population as a sport fishery. Shoal bass and sympatric largemouth bass *M. salmoides* were collected by electrofishing from three study reaches. Modified Schnabel population estimates from mark recaptured fish were used to describe abundance in 2009, 2010, and 2011. A roving creel survey was conducted in 2010 and 2011 to provide effort, catch, success, and harvest estimates. Relative condition indicated that shoal bass were in average to optimal condition. Mean total length-at-age was described by von Bertalanffy growth curves for shoal bass collected in 2008 and 2010; growth varied by year. Total annual mortality (A) for shoal bass averaged 57% and was greater than total annual mortality for largemouth bass ($A = 32\%$, $P = 0.0088$). Missing or under-represented year-classes from the 2008 and 2010 shoal bass age samples indicated recruitment fluctuations. Strong shoal bass year classes were associated with low median flows and low flow variation in spring and summer. An abundant population of shoal bass exists in the Chipola River and the fishery receives low angling harvest and directed effort. However, shoal bass remain potentially threatened by sedimentation, variable hydrologic events, and its confined range and habitat requirements.

Lang, E. T., H. M. Lyon, G. R. Fitzhugh, and W. T. Walling

Contributed presentation

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An Evaluation of Sexual Macroscopic Staging applied to Gulf of Mexico Fishes

During 2011, a congressionally supplemented fisheries survey (6 vessels) was conducted Gulf-wide from April to October. Fish captured on hook-and-line gear were macroscopically sexed and staged for reproductive condition. For a subset of randomly selected fish, as well as all female red snapper, gonads were dissected and histologically examined. To obtain further detail on a hermaphroditic species, macroscopic and histological data on red grouper (*Epinephelus morio*) were extracted from archives at the Panama City NOAA fisheries laboratory. During the survey, most gonochorists (9 species) were sexed correctly (97%) in contrast to hermaphrodites (7 species, 68% correct). The red grouper data set, which afforded a larger sample size from more experienced readers also indicated some error in assigning 'field' sex to a hermaphrodite in that 81% ($n = 2,153$) were sexed correctly. Almost all errors were due to misidentifying males as females. Rarely were histological females misidentified. This result may occur because testes of protogynous fish retain the ovarian form. Macroscopic classification of reproductive stage (males and females) ranged from 55-68% correct in gonochorists and 53-55% for protogynous hermaphrodites. Although spawning females were often classified correctly more errors were associated with inactive, spent and maturing stages. These findings may reflect the difficulty in discerning early development and atresia of oocytes with the naked eye. Spawning males, especially hermaphrodites, were often misclassified as maturing which may indicate that the histological readiness to spawn may not always equate with 'running ripe' condition (extruded milt) in the field. Additional training may help reduce error in macroscopic staging. However, we believe these results indicate a need for routine collection and fixation of reproductive tissues by on-board observers which will enable histological assessment of spawning condition (fraction etc.) and sex ratio of our most economically important stocks.

* **Lee, J., and J. Rehage**

Student • Poster presentation

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Using mark-recapture techniques to evaluate recreational fisheries across hydrological seasons

Mangrove fringed estuaries provide important ecosystem services for marine and freshwater fish communities in the Everglades, particularly within the Shark River Estuary (SRE). Within this region mangrove lined creeks function as critical habitat for freshwater species, providing refugia during periods of drydown. Further, the SRE's unique oligohaline ecotone and high biotic connectivity between the slough and estuary support both estuarine snook (*Centropomus undecimalis*) and freshwater largemouth bass (*Micropterus salmoides*) populations, making this area a targeted spot for recreational fishermen. However, despite the importance of these fisheries to the local economy little is still known about how these populations respond to seasonal variation in hydrology or to the changes in hydrology that may result from ongoing restoration efforts.

Current knowledge gained from long term ecological monitoring within the SRE have indicate that fish dynamics are influenced by hydrological regimes, showing high seasonal variation in abundance. This study proposes to expand upon our existing knowledge of the recreational fish species in this area through the development of a mark-recapture program in this region. The main objectives of this study will assess recreational fisheries in the SRE across hydrological seasons using mark-recapture techniques to: 1.) Determine population estimates and survivorship; 2) Assess growth rates and evaluate body condition and fitness; 3.) Determine movement patterns within the estuary; and 4.) Expand recapture efforts by integrating recreational anglers through the creation of a citizen science program.

Lombardi, L.¹, and M. Grace²

Symposium presentation

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Gulf of Mexico Bottom Long-line Survey: focus Florida's waters

The NOAA Fisheries annual bottom long-line survey is conducted in the U.S. South Atlantic and Gulf of Mexico. This survey commenced in 1995 as a pilot study given the lack of any large-scale, standardized survey to monitor shark abundances as requested by the 1993 Fishery Management Plan for small and large coastal sharks. During the first six years of this survey, changes were made to gear type (hook-type J, C), spatial coverage (Mexican waters, depths), vessel use (R/V Oregon II, R/V Caretta) and species focus (sharks, reef fish). Since 2001 the survey's gear consists of monofilament mainline (426 kg, 1 nm length), two radar reflector buoys (attached at the start and end of the mainline), 5-kg weights clipped on the mainline at the beginning, mid-line, and end to enable the mainline to rest on the ocean floor, and 100 gangions (3.66 m length) with #15/0 circle hooks clipped to the mainline at a spacing of one per tenth of a nautical mile. Sampling sites are randomly selected among three depth strata (9–55 m, 56–183 m, and 184–366 m) and the number of sites are proportion to the area of continental shelf within

each depth stratum (first depth stratum 50%, second depth stratum 40%, and 10% in the third depth stratum). Indices of abundance and catch per unit effort (CPUE) have been calculated by this survey for numerous reef fish (e.g. red snapper, red grouper), deep water teleosts (e.g., yellowedge grouper, golden tilefish), and coastal sharks (e.g., Atlantic sharpnose, tiger). In addition, this survey also provides discard and by-catch information that can be compared to data reported by the commercial longline industry. The survey is conducted for eight weeks, of which, four weeks are allocated to the waters of Florida's east and west coasts.

* **Mack, K., D. Godshall, and T. Yeghissian**

Student • Poster presentation

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Spatial and Temporal Survey of Brachyuran Recruitment in Tampa Bay

The brachyuran life cycle is complex, and involves several larval stages before metamorphosis to juvenile, and then adult stages. Studying recruitment at the megalopal stage allows for more accurate identification, grants better population predictions, and capitalizes on the natural settling response of the megalopae. In Tampa Bay, brachyuran megalopae follow one of two dispersal methods. In some species, recruitment occurs after larvae are flushed into the coastal ocean, develop, and reinvade nursery habitat. In other species, larvae are released directly into the nursery habitat where they are retained, develop, and recruit. These developmental differences between species, in addition to variation in seasonal, lunar, diel, and environmental conditions can lead to variation in recruitment patterns on various long and short term scales. This study used passive collectors to survey temporal and spatial variation in brachyuran recruitment within Tampa Bay. In addition, the phototactic and geotactic tendencies of megalopae of commonly collected species were examined. To date, eight species have been identified with *Callinectes sapidus* and *Panopeus herbstii* being the most abundant and consistently collected. Preliminary results indicate that megalopae prefer to settle at night and may be negatively phototactic. Further conclusions and implications of the study will be discussed in detail during the presentation.

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Student • Contributed presentation

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Lethal and sublethal effects of caffeine and chlorpyrifos, individually and in combination, on *Palaemonetes pugio*

Organic wastewater contaminants (OWCs) are commonly identified in bodies of water which receive wastewater input from sewage treatment facilities or local runoff. Pharmaceuticals, personal care products, and insecticides are among the most abundant OWCs. The effects of these contaminants on non-target organisms and their environments is an area of strong ecological interest. This study sought to determine the lethal and sublethal effects of caffeine, an emerging OWC, and chlorpyrifos, a well-known insecticide, on grass shrimp (*Palaemonetes*

pugio), an economically and ecologically significant bioindicator species. Adult and larval grass shrimp were exposed to varying concentrations of caffeine, chlorpyrifos, or a mixture of the two for 24 or 96 hours. LC50 and EC50 measurements were calculated for all treatments. Additional toxicity measurements were calculated to determine the individual roles of caffeine and chlorpyrifos in mixture. Results indicate that larvae are more susceptible to all three treatments than adults, and that caffeine is only lethal in extremely high concentrations. The two compounds were found to have no additive toxicity in mixture. While caffeine is an increasing anthropogenic contaminant, it is unlikely have a significant impact at currently occurring impacts.

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Seasonal Trends in the Condition of *Pleuronectes platessa* in the Wadden Sea

The European Plaice, *Pleuronectes platessa*, is an important fisheries species in the North Atlantic Ocean. In the Dutch Wadden Sea, hatching occurs between February and March and juveniles develop in intertidal sand flats. During the early months of their lives, young fish grow at a predictable maximum rate. However, it has been previously shown that during the summer months Plaice fall below the maximum predicted growth rate which may be due to an increase in interspecific competition. The purpose of this study was to begin to determine to what extent this deviation from the predicted maximum growth rate is reflected in the condition, i.e. caloric value, of the fish. Fish from the summer months of June, July and August were sampled from the Wadden Sea using a beam trawl. The captured fish were measured and dried before they were analyzed with an IKA C2000 Bomb Calorimeter. Results showed a small, but noticeable decrease in the condition of the fish over the course of the summer. Further data from an entire year should give a much stronger picture of this phenomenon.

McMichael, B.

Symposium presentation

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Florida's Marine Fisheries-Independent Monitoring Program

Florida's Marine Fisheries Independent Monitoring (FIM) program is an important component in the management of Florida's estuarine, coastal, and offshore fisheries and ecosystems. The FIM program, initiated in 1989, was originally developed to provide a status update on the relative abundance of red drum in Tampa Bay. Throughout the 1990's, this concept was expanded to assess relative abundance trends for all species collected in six large estuarine areas throughout the state. In addition to abundance data, the FIM program collections provide information on community structure, habitat associations, and classical fisheries parameters (e.g., age, growth, and reproduction). Developing around the core FIM program have been numerous supportive projects that provide information beyond classical fisheries objectives, including mercury concentration in edible tissues, fish health, fish diet, genetic identification of stocks, isotope

analyses to define nutrient pathways, and otolith microchemistry to identify linkages between juvenile and adult habitats. The FIM data have proven instrumental beyond their original stock assessment role, having been used to assess the impacts of events (e.g., cold fronts, oil spills, acid spills) and long-term perturbations (e.g., freshwater withdraws, climate change) on fish abundance, fish health, and community structure. In 2008 the FIM program was further expanded to include coastal and offshore waters along Florida's Gulf coast out to 60 fathoms. This expansion required development of a different suite of sampling gears and techniques and a good working relationship with federal partners (NOAA/NMFS) and user groups (commercial and recreational anglers). Strategies from the inshore program have been used in developing the offshore program, such that FIM collects data on all encountered species, their habitat utilization, life history parameters, and health. This presentation will provide an overview of the strategies utilized in developing the FIM program, including discussion on how we got where we are today and will give examples of how the data are used in the management of Florida's fisheries and aquatic ecosystems.

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Depleted Rockfish in the Puget Sound: Historic Catch Records & Contemporary Larval Rearing Research

Accurate reports of fishery stocks are becoming an increased necessity with the threat of overfishing. In Puget Sound, rockfish populations are in decline and need to be regulated with appropriate fishing restrictions. Aquaculture can supplement the stock as it returns to natural levels if properly regulated. However, rockfish mature very slowly and will need to be efficiently raised to produce populations high enough to impact the decline. Our study aimed to 1) digitalize and analyze historic rockfish recreational catch records from 1974-1977, and 2) investigate the viability of micro-particulate feed in commercial aquaculture. From these records rockfish populations were assessed for possible present day comparisons of abundance and diversity. Rockfish catch per unit effort (CPUE) was an average of 8.38 rockfish per fishing trip, with about two rockfish per person on an average trip of four anglers. Observed species composition was 35.0% copper (*Sebastes caurinus*), 23.0% quillback (*S. maliger*), 18.20% black (*S. melanops*) and 15.6% brown rockfish (*S. auriculatus*). The remaining 7% were mainly yellow eye (*S. rubberimus*) and yellow tail (*S. flavidus*), with bocaccio (*S. paucispinis*), greenstriped (*S. elongatus*), canary (*S. pinniger*), redstripe (*S. proriger*), rough eye (*S. aleutianus*) and widow (*S. entomelas*) rockfish taken in miniscule amounts. Comparison of relative abundances of ESA-listed bocaccio, canary and yelloweye rockfish to present day abundances will be important in future studies to determine how these populations have changed since the 1970s. During feeding trials, no differences between micro-particulate and live food were found in feeding success rate and frequency. There was, however, a difference in the time of early flexion formation – a milestone for larval growth - with the micro-particulate group lagging behind the other trials. We conclude that micro-particulate feed is a viable supplement to a primary diet of live food but cannot at this point be considered a replacement diet.

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Contributed presentation

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Using multiple-pass depletion to estimate the population density and biomass in a spring-fed Florida stream

Florida Statute 373.042 authorizes the state's water management districts to set minimum stream flows and lake levels (MFL) at thresholds "at which further withdrawals would be significantly harmful to the water resources or ecology of the area." Several Districts have used 15% habitat loss as a benchmark in defining significant harm, above which the loss in habitat is considered significant, and below which habitat loss is considered acceptable. This statistic results from a species-based habitat framework called the Physical Habitat Simulation Model (PHABSIM), composed by a system of models for simulating available stream habitat. PHABSIM integrates hydrological and biological input models to produce the output of weighted usable area (WUA). WUA quantifies the amount of microhabitat available for a target organism over a range of stream discharges. The model assumption is that habitat is the primary factor that limits population abundance. Therefore, the model assumes that population abundance is positively related to WUA. In order to validate the utility of this model and examine the relationships between fish populations and WUA, a method for estimating fish abundance and community composition was needed. We used a multiple-pass depletion approach to sample the fish community to derive fish density and biomass estimates in a spring-fed Florida stream. Density and biomass estimates substantially declined with stream flow from 2010 to 2012. Density and biomass estimates were poorly correlated with catch rates for some species, which indicates that traditional catch per unit effort estimates would have led to misinterpretations of their population abundance trends.

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Perceptions and Preferences of Commercial Fishers in a Multi-species Fishery for Dedicated Access Privilege Frameworks

The decline of the world's fisheries and the inability of traditional management frameworks to maintain them, has led managers to adopt new, alternative management frameworks. These frameworks include the use of Dedicated Access Privileges (DAP). The use of dedicated access privilege frameworks such as Individual Fishery Quotas (IFQ) and Individual Transferable Quotas, (ITQ) have been shown to have varying popularity among factors within the commercial fishing industry and with managers. Here, commercial fishers' preference for alternative management frameworks is examined in the context of the unique multispecies fishery of the Florida Keys. By surveying commercial fishers in Monroe County, Florida, it was found that the size of operation plays no role in affecting fisher perception of dedicated access privileges. Furthermore, fishers who are organized are less likely to support dedicated access privilege

frameworks. Finally, the fishing industry does not support the implementation of dedicated access privileges in the Florida Keys, fearing as a result of such implementation, a subsequent reduction of fleet size. These findings can provide inputs for managers in developing effective management plans in the region.

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Symposium presentation

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Intertidal oyster resources in Florida's Big Bend – Developing a monitoring framework for a key resource along the Nature Coast

The Big Bend region of Florida's Gulf coast is recognized by governmental agencies and NGOs as retaining some of the highest quality oyster reefs in the Gulf of Mexico region and in the world. Commercial fishermen and longtime residents have observed large changes in the distribution of oyster resources in recent decades despite limited coastal development. Fisheries independent information on oyster resources in the Big Bend is limited however so we developed a two-stage framework to assess oyster resources along a 50-km stretch of coastline using a combination of aerial surveys and statistically robust field assessments. Using information from a 30 year history of aerial surveys, we were able to confirm observations by fishermen of large changes in the distribution of intertidal oyster resources in this area. We then used information on the spatial distribution of intertidal oysters to assess the size structure, density, and viability of oyster resources in this area. Based on these results we used a power analyses to determine that our most reliable population metric to monitor to assess changes in oyster reef population demographics would be to monitor oyster viability. In general across all our sites less than 100 samples would be required to detect a change of 10% or more in population viability at a power >0.5. Other population metrics such as size structure or density would require much higher numbers of samples to much larger effect sizes (most > 50%) to have similar statistical power. Given their importance from an ecological and economic perspective and their sessile life histories, oyster populations are likely an ideal candidate species to include in coastal monitoring programs designed to assess ecosystem responses to disturbance or restoration actions.

Rehage, J. S.

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Seasonal reassembly: disentangling the effects of hydrological disturbance vs. local conditions in an ecotonal fish metacommunity

The relative role of local vs. regional and spatial factors in structuring communities is a longstanding core theme in ecology, yet the interplay of these factors with recurrent disturbance regimes remains under examined. Using a six-year time series, we evaluated the relative contribution of local abiotic, regional hydrological disturbance, spatial and temporal factors to the assembly of a mangrove fish community. We examine their effects on total fish abundance

and richness, and on the abundance of functional groups, in order to better understand the strength of these structuring processes on estuarine, freshwater, predatory, prey and nonnative components. Seasonal dispersal of freshwater organisms from marshes to estuarine creeks upon marsh drying drove abundance patterns. These movements were accompanied by upstream movements of estuarine predators, and by increases in nonnatives at upstream creeks. Total abundance and richness were driven by both local conditions and regional hydrological disturbance, and showed little spatial structuring among creeks. Hydrological disturbance played a stronger structuring role on the freshwater and nonnative groups, while estuarine taxa were more heavily influenced by local abiotic conditions. Spatial structure played a small but significant role on total, freshwater predator and nonnative abundance, and was relatively unimportant for other groups; while temporal factors appeared unimportant overall. Patterns were most consistent with the species sorting and mass effects paradigms. Results show the differential response of functional groups to local factors vs. regional processes, and highlight the need for a functional approach to improving our understanding of the structuring forces of metacommunities.

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Contributed presentation

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Ecospecies: An Online Information System Created For Species Life Histories, With New Profiles For Red Snapper, Warsaw Grouper, and Speckled Hind

The Florida Estuarine Living Marine Resources (FLELMR) System was created in the early 1990's to summarize information concerning life histories of marine fish and invertebrate species in coastal areas of Florida. Originally housed on a MacIntosh desktop computer, the information was not widely accessible. About a year ago, the Fish and Wildlife Research Institute obtained a grant from the South Atlantic Fisheries Management Council to create a web-enabled information system called Ecospecies. The outline for the species life history profile was expanded to include headings that cover almost everything known about each species, in order to provide managers, scientists, and the public with comprehensive synthesized information. Ninety existing profiles from FLELMR were reformatted to the new outline and added to Ecospecies. Three new profiles were created for Red Snapper, Speckled Hind, and Warsaw Grouper. The profiles provide citations and references to published and unpublished gray literature. In addition to summarizing the biology of species, the new system summarizes population parameters important for stock assessments and management of commercial and recreational fisheries. The intent is to create a dynamic system that can be easily accessed and updated by scientists.

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Electronic Data Collection On Fishing Vessels To Support Fisheries Management

Long-term Fisheries Dependent Monitoring (FDM) is usually conducted on shore at sites where fish are landed. The FDM staff associated with the Trip Interview Program (TIP), gather data from captains of commercial fishing vessels. Likewise, those with the Marine Recreational Information Program (MRIP) collect data from recreational fishermen. The data reported by the fishermen are often imprecise concerning when and where fish were caught. Likewise, catch and effort data collected may be biased. Length frequencies gathered on shore lack measurements of fish discarded at sea, because they were below mandated minimum lengths. Better data can be collected on-board fishing vessels. From 1984-1986, electronic fish measuring boards (FMB) were developed and tested on a Canadian Department of Fisheries and Oceans (DFO) research vessel in the Gulf of St. Lawrence. Fishermen and DFO staff on the boat quickly learned to use the FMB to record trawl survey data. More data were collected with less time and effort, because the FMB allows the user to both measure fish and record data. In 2001 and again in 2005, electronic logbook (ELB) systems were developed; which were used by captains of shrimp fishing vessels to record catch and effort in the Gulf of Mexico. The ELB systems were also linked to global positioning systems (GPS) and data loggers to simultaneously gather location, depth, salinity, and temperature data. The ELB data were used to create habitat suitability models for pink shrimp on the West Florida Shelf. Data collection at sea provides more accurate information to support modeling, stock assessments, and fisheries management.

Sawyers, R. E.

Symposium presentation

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An overview of FWC's Freshwater Fisheries Long-term Monitoring Program

In 2006, the Florida Fish and Wildlife Conservation Commission (FWC) established its long-term monitoring (LTM) program to monitor fish assemblages and sport fishes on important Florida lakes using a variety of approaches. Since most statewide sampling efforts support management actions, species-specific or fish community monitoring, or research interests, a manual was developed to standardize data collection procedures to meet these objectives. Standardized methodology was established for electrofishing, gill net, mini fyke net, trawl, and angler creel survey data to reduce sampling bias and allow general comparison among systems and across years. These data are stored in a database system that facilitates electronic data validation and entry, error-checking, centralized data storage, and data retrieval. Prior to LTM, data collection varied among offices and even over time for a single system. Not surprising, the widespread adoption of new standardized methods and new data entry procedures by staff were early challenges. Sampling methods have evolved to improve gear effectiveness and efficiency

and also to address systems having unique circumstances, such as reservoirs. The number of LTM water bodies has expanded from the original 30 to around 65, which includes the addition of a river monitoring program in 2008. More impressive is that our database currently contains data representing 143 water bodies and over 160 fish species. The value of the database and of the standardized methods has become widely accepted as this data continually becomes more available and useful. We receive data requests from a variety of state agencies, universities, and the general public. Data requests from outside of FWC are primarily for fish community data, however sport fish data are primarily used internally for making fish management decisions. Examples of both will be discussed.

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Poster presentation

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An Assessment of Fish Communities in Four Anthropogenically Impacted Peace River Tributaries

Human development that results in increased groundwater and surface water withdrawals, poses a significant threat to the ecology of streams in Florida. Fish are excellent indicators of ecosystem health and previous studies have shown that changes in water levels and floodplain inundation frequency may reduce habitat availability and substantially alter fish communities. The Florida Fish and Wildlife Conservation Commission conducted research to assess fish assemblage, habitat use, and water quality parameters in four anthropogenically impacted tributaries of the Peace River. We sampled 886 transects throughout Charlie, Horse, Prairie, and Shell creeks from the summer of 2010 to spring 2012, collecting 10,401 fish representing 49 different species. Using two-dimensional non-metric scaling ordination (MDS) and Cluster analysis, we determined that Charlie and Horse creeks displayed similar fish assemblage structures, while Prairie and Shell creeks were also similar. According to SIMPER analysis, a total of nine fish species contributed >5% to the average dissimilarity between paired tributaries. Results from the principal component analysis identified three major axes (water depth/current velocity, habitat coverage, temperature/dissolved oxygen) of environmental variability for those nine species. Prairie and Shell creeks, which are impounded, were numerically dominated by bluegill sunfish *Lepomis macrochirus*, while Charlie and Horse are more dynamic systems and are numerically dominant by coastal shiners *Notropis petersoni* and eastern mosquitofish *Gambusia holbrooki*. Average depths were generally greater in transects sampled in Prairie and Shell as compared to Charlie and Horse; however other habitat characteristics (e.g., woody debris) were similar. Distinct differences in fish communities between tributaries were believed to be a result of differences in hydro-dynamics. Understanding how flow regimes can impact fish communities in lotic systems is important when establishing MFLs, which are intended to reduce significant ecological impacts.

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Student • Poster presentation

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Localized spatial and temporal variation in reproductive effort of Florida Bass *Micropterus salmoides floridanus*

A lack of data surrounding annual reproductive effort for fish populations has resulted in little information on the impact of variable annual reproductive effort on recruitment. The objective of this study was to quantify total annual reproductive effort of Florida Bass across a series of central Florida lakes. Snorkel surveys were used to estimate reproductive effort (broods/spawner) in four lakes in north central Florida from 2010 to 2012. Mark-recapture was used to estimate the abundance of Florida Bass at each lake in each year. All lakes contained Florida Bass populations of high density and showed evidence for relatively slow growth. Average relative weight of all populations was low ranging from 65.4 to 68.8 for all bass over 25.0 cm. Reproductive effort varied among lakes and across years, and two reproductive strategies were observed, multiple spawning events per adult and skip spawning. Devils Hole Lake produced the highest reproductive effort in all three seasons with multiple spawning events per adult ranging from 1.09 broods/spawner in 2012 to 3.72 broods/spawner in 2011 (median 3.13 in 2010). All other lakes exhibited skip spawning behavior with the proportion of non-reproductive adults varying across years. Picnic Lake exhibited the lowest effort overall with 0.04 broods/spawner in 2011 and 0.02 broods/spawner in 2012. Effort in Keys Pond ranged from 0.25 in 2010 to 0.51 broods/spawner in 2011 (median 0.34 in 2012). Big Fish Lake reproductive effort varied from 1.16 broods/spawner in 2010 to 0.05 and 0.00 broods/spawner in 2011 and 2012. Spawner abundance for these populations was not related to annual reproductive effort which is a general assumption for many recruitment models. Variability in annual reproductive effort may be more common than anticipated clouding relationships between spawner abundance and recruitment thus total annual reproductive effort may provide a more effective measure for examining recruitment relationships.

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Healthy snack or junk food? Examining the nutritional quality of freshwater and estuarine prey in the Southwest Everglades Estuary.

In the Southwest Everglades, the movements of fishes are largely dictated by seasonal rainfall patterns. When rain subsides at the onset of the dry season, freshwater marsh floodplains begin to desiccate. This causes marsh aquatic inhabitants to seek out the deepest habitats in the landscape; including first and second order oligohaline creeks. Fish species include both smaller bodied secondary consumers such as dollar sunfish (*Lepomis marginatus*), bluefin killifish (*Lucania goodei*) and palemoid shrimp as well as larger bodied fishes like largemouth bass (*Micropterus salmoides*). At the same time an estuarine consumer species, snook (*Centropomus undecimalis*), triples in abundance presumably to capitalize on marsh prey. When this marsh dry

down occurs, these two predators are entirely dependent upon marsh prey (snook primarily consume sunfishes while bass consume cyprinodontoids; both consume invertebrates once fish populations are depleted.) and largely exclude estuarine prey. This reason however, is largely unknown. Consumers may preferentially select prey that maximizes their energetic intake to meet nutritional demands. Thus, the aim of our study was to understand the nutritional quality of estuarine and marsh prey using a stoichiometric approach in order to determine if marsh prey are more energetically/nutritionally valuable than estuarine prey. Defining quality in terms of carbon: nitrogen and carbon: phosphorus ratios, we hypothesize that freshwater prey will have higher C: N and C: P ratios than estuarine prey. Because consumers are preferentially selecting freshwater prey over estuarine prey, we believe that freshwater prey offer some fitness gain that can be linked to energetics or nutrition. A total of 26 species, prey and predator, were sampled to determine their carbon: nitrogen: phosphorus stoichiometric ratios as well as their caloric content. Prey samples were sacrificed while muscle plugs were taken from a subset of predators caught. Our findings may suggest that marsh dry down results in abundant and high quality prey resources for both estuarine and freshwater consumers.

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Are conventional tagging programs adequate when evaluating large-scale movement patterns?

Spatial information is becoming increasingly important to fisheries managers as distribution models and habitat information are incorporated into stock assessments. Conventional tagging programs are often used to collect movement information for a wide range of species (from large oceanic migrators to territorial reef fish). Often these programs are developed haphazardly without an assessment of the viability of the programs or the utility of the information collected. To successfully evaluate movement parameters, allocation of tags must reflect the spatial and temporal dynamics of the targeted species. Such programs should be considered systematically, since too few recaptures effects precision and accuracy of movement rate parameters and too many recaptures represents ineffective use of resources. We evaluate the volunteer based conventional tagging program for permit (*T. falcatus*) from multiple perspectives. Simulations were developed to assess the tag numbers required to parameterize advection–diffusion movement models. Tag shedding and retention rates were determined from a captive study. Qualitative reviews from angler surveys direct volunteer tagging effort towards areas with likely participation. Finally, intensive tagging effort in a small-scale pilot study indicates recapture rates and involves anglers through volunteer work and education sessions. Together, these steps systematically evaluate potential experimental design for a long-term tagging program.

Struve, J., J. Dutka-Gianelli, and K. Lorenzen

Contributed presentation

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Getting more out of passive acoustic telemetry: what aspects of spatial population behavior can passive acoustic telemetry monitor and how transferable are conclusions derived from such observations?

Evaluating the impact of spatially explicit interferences with fish populations such as local restocking, habitat restoration, or implementation of local fishing regulations requires a good understanding of the spatial behavior of fish populations. Means to obtain such information are limited, but passive acoustic telemetry studies provide potential information about mid-term movement and spatial behavior of tagged individuals. Such information may hold clues about the spatial differentiation of local fish populations. However, the ecological information content of passive acoustic telemetry data is difficult to assess. While the data are often numerous in time, they also typically display large gaps, and are limited by mortality of tagged individuals, acoustic instruments failure, and the spatial extent and number of receivers deployed. In this paper, we explore simple ecological parameters that can be derived from passive acoustic telemetry data. The long-term displacement rate is a parameter with a lot potential. We examine the displacement rate and the habitat use of acoustically tagged common snook (*Centropomus undecimalis*) recorded by receiver arrays deployed along the Florida west and east coasts. The displacement rate of individuals changes across specific habitats and during different time of the year, allowing conclusions about the relative importance of different foraging patterns, specific habitat preferences, transit habitats, and the onset of seasonal migrations. From these observations, we make further inferences about parameters that are directly relevant for fisheries management, such as the expected residence time and the probability of spawning.

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ROV Adventures: A Comparison of Standing and Cut-Off Artificial Reef Structures in the Gulf of Mexico

A remotely operated vehicle (ROV) was used to survey three different standing and cut-off petroleum platforms off the Texas coast in the Gulf of Mexico. Standing and cut-off rigs were paired based on location and depth then compared for fish abundance and diversity. There was similar species diversity among the platforms. In the standing rigs there was a higher density of fish in the upper water column (0-20 m); at the cut-off there was a higher density at the top of the platform. Species found at each site were sorted into trophic levels based on NOAA criteria. Standing rigs had many herbivores in the photic zone (0-15 m), while the cut-off rigs only had *Sphyraena barracuda* in that zone. This is a pilot research project for a much larger data set to ultimately understand the role of artificial reefs in the Gulf of Mexico and to provide science-based reasoning to evaluate further removal of petroleum platforms.

Trexler, J.

Symposium presentation

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Monitoring Fish and Macroinvertebrates for Everglades Management

Fisheries monitoring in the Everglades has a long history, driven by concerns for conservation of apex predators like wading birds and alligators, as well as recreational fisheries. I will discuss two long-term monitoring projects that focus on forage fishes and macroinvertebrates, which we define as fishes below 8-cm standard length and macroinvertebrates that are retained on a 2-mm sieve. These animals are targeted because they are food for wading birds, and other apex predators, and because they can be sampled quantitatively at the landscape scale. One of these programs uses repeated sampling at fixed plots to maximize the power for trend detection, while the other uses a GRTS sampling design to provide spatial data that can be scaled up and accommodate changing habitat patterns anticipated with restoration. We use the data from these programs to conduct assessments of Everglades management and evaluation modeling of scenarios for alternative restoration plans. The fixed-plot study has revealed a long-term decrease of small-fish biomass and crayfish biomass between 1996 and 2012 in both Shark River and Taylor Sloughs in Everglades National Park that is not mirrored in Water Conservation Area 3A. This trend was present in the residuals of fish biomass after accounting for time passed between drying events, water recession rate, and depth. Forage-fish species composition also changed over this period. In 2001, crayfish biomass revealed a step-like drop in these two areas, and has remained lower than in the late 1990's. This change is coincident with a change in crayfish species composition. The landscape monitoring program samples only once per year, in the wet season, and has been on-going since 2005. To date this work has been used for delineating restoration baseline conditions and evaluation modeling, and has contributed to evaluation of alternative scenarios for the Central Everglades Planning Process (CEPP).

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Effects of large-scale habitat enhancement strategies on Florida largemouth bass populations

Many of Florida's natural lakes have experienced degradation of habitat resulting from anthropogenic influences, including the introduction of non-native aquatic plant species, advanced eutrophication due to increased nutrient loading, and water stabilization, all of which can impact largemouth bass *Micropterus salmoides floridanus* fisheries. Over the past forty years, the Florida Fish and Wildlife Conservation Commission (FWC) and cooperating agencies have employed a variety of enhancement strategies to combat these habitat changes. We provide

an historical overview of these habitat changes, large-scale habitat enhancement strategies that have been conducted, and resulting effects these strategies have had on largemouth bass recruitment and fisheries. We provide a case study evaluation of four different enhancement strategies: (1) directed water level drawdown conducted on Lake Griffin, Florida in 1984; (2) mechanical removal of macrophyte and organic sediment under dewatered conditions at Lake Tohopekaliga, Florida in 2004; (3) hydraulic dredging of macrophyte and organic sediment under inundated conditions at Lake Panasoffkee, Florida from 2005-2008; and (4) lake-wide herbicide treatment of hydrilla over a 25-year period at Lake Istokpoga, Florida. Each case study demonstrates a large-scale habitat enhancement strategy that was aimed at improving degraded habitat in a natural system. We document changes in the habitat resulting from enhancement activities and evaluate their effect on largemouth bass populations. We show that a variety of habitat enhancement strategies can be utilized to improve habitat on natural systems influenced by anthropogenic impacts to maintain quality largemouth bass fisheries or improve declining largemouth bass fisheries. Fishery managers should consider the use of large-scale habitat enhancement strategies to improve habitat in degraded systems and enhance largemouth bass fisheries.

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Student • Poster presentation

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Stress Effects of Non-Native Fish on Native Fish

Non-indigenous (NI) species pose a serious threat to the ecological integrity and biodiversity of natural ecosystems including those found within National Parks. Interspecific aggression and territoriality by NI species can exclude natives from preferred microhabitats when there is a high overlap of resource utilization. Prolonged social conflicts induced by NI species can prove to be chronic stressors to natives, causing the stress response to become maladaptive. The hormone cortisol is a common stress mediator in fishes which characteristically increases during exposure to acute and chronic stressors. Temporary elevations of cortisol are thought to be adaptive and the fish returns back to basal cortisol levels after the stressor to avoid tissue damage. But during cases of prolonged stress there can be detrimental effects on a fish's growth and immune response. In the seasonally flooded Everglades wetlands, sunfishes serve as essential predators in aquatic communities, including solution holes of the Rocky Glades region. The NI African jewelfish, *Hemichromis letourneuxi*, found in south Florida canals since the 1950s, are increasing their range through rapid expansion and have been found in the same microhabitats as native sunfishes. Jewelfish are aggressive and territorial, thus they are predicted to be more successful in acquiring space, displacing native species in habitats where they are dominant such as solution holes. The aims of this study are to 1) Determine changes in ecosystem composition when African jewelfish are present among dollar sunfish and other native species in solution holes & 2) Determine differences in cortisol levels of dollar sunfish, both male and female, in the presence of African jewelfish versus native competitors.

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Use of trawl CPUE data to forecast black crappie fishery strengths

Black crappie *Pomoxis nigromaculatus* support some of Florida's largest and most popular freshwater fisheries. However, angler effort, catch, and harvest of black crappie are often highly variable from year to year at many systems throughout Florida, and in other states. This variability has been labeled as 'boom-or-bust', and has been contributed to erratic year class strengths driving fisheries. We used multiple years of creel survey results and trawl catch data (age and length) collected at Lochloosa Lake, to develop simple linear regression models to investigate if trawl CPUE's could be used as a tool to forecast the recreational crappie fishery. The relationship between CPUE of crappie \geq age-1 and creel estimates for angler effort, catch, and harvest over a year later were all significantly positive. The relationship between CPUE of crappie > 229 mm TL and angler harvest data 3 to 4 months later was also significantly positive. These relationships suggest that our trawl samples may be useful for forecasting crappie fishery strength in the near future and over a year away. We suggest that collection of this data should be continued in order to evaluate if these relationships remain significant with additional years of monitoring. Use of trawl CPUE data to forecast fishery strengths can be a powerful tool, allowing biologist to provide information to both the local stakeholders and managers, which could then be used to promote and regulate the fishery.

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Using site fidelity to identify sub-populations of common snook along the east coast of Florida

Long-term acoustic monitoring data collected to determine spatial distribution and temporal patterns of movement, including site fidelity, may be used to identify demographic sub-populations within a continuous stock. We studied the movements of 281 common snook, *Centropomus undecimalis*, on the east coast of Florida from 2008 to 2012 using passive acoustic telemetry. Common snook were captured in rivers, estuaries, inlets and reefs along 200 km of coastline and were surgically implanted with acoustic transmitters (tagged). Previous studies have shown that common snook are long ranging along the east coast of Florida, which is comprised of a single genetic stock, suggesting that mixing is continuous and frequent. However, we found that 1) long-distance movements are confined to the spawning season (April to October) except in cases of an environmental event (e.g. lethal water temperatures) and 2) the majority of the population exhibits high site fidelity to spawning sites and non-spawning habitat among years with only a minor portion of the population showing little or no loyalty to particular locations. For example, one individual showed the highest site fidelity to the same non-spawning

site and spawning site continually for four years. Site fidelity, particularly to spawning sites, can be detrimental to a species if the environment is altered, for example by increased pollution or alterations of water flow. These types of data can be utilized to identify and quantify the extent of exchange between sub-populations of fish, thus informing resource managers if management on a sub-population level is appropriate and necessary.

Notes/Comments about meeting

