

34th Annual Meeting



February 18 – 20, 2014
4-H Camp Ocala, Altoona, Florida

The Florida Chapter of the American Fisheries Society

Chapter Officers

President: Travis Tuten, FWC

President-Elect: Chris Bradshaw, FWC

Past-President: Kerry Flaherty-Walia, FWC

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Major Contributors for our Annual Meeting

Webmaster: Eric Sawyers, FWC

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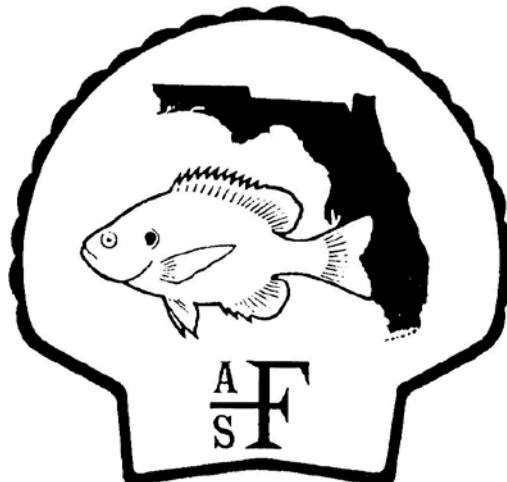
Raffle Co-Chairs: Andy Strickland, FWC and Alan Collins, NOAA

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 34th Annual Meeting:



34th Annual Meeting of the Florida Chapter American Fisheries Society
February 18-20, 2014
4-H Camp Ocala, Altoona, Florida
General Program

Tuesday, February 18

11:00am – 6:00pm Registration
12:00pm – 1:30pm Lunch
1:30pm – 5:00pm 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 19

7:00am – 8:00am Breakfast
7:30am – 6:00pm Registration
8:00am – 12:25pm **Symposium: *Research and Management: Tag Team Titans***
12:30pm – 1:30pm Lunch
1:30pm – 3:10pm **Symposium: *Research and Management: Tag Team Titans***
3:40pm – 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 20

7:30am – 8:30am Breakfast
7:30am – 9:00am Registration
8:40am – 11:20am 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 – 34th Annual Meeting – Florida Chapter American Fisheries Society

Tuesday, February 18

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

Contributed Papers

Moderator: Travis Tuten, FWC

1:40pm – Alfermann, T., A. Strickland, R. Butryn, and C. Middaugh. Nesting success and associated habitat characteristics of Shoal Bass in the Chipola River, FL

2:00pm – Hyle, R., R. McBride, and J. Olney. Determinate versus indeterminate fecundity in American Shad, an anadromous clupeid

2:20pm – *Dowling, K., and C. Johnston. The role of water availability on fish assemblage structure: effects of agricultural land use and spawning model

2:40pm – *Gandy, D. A., and J. S. Rehage. Examining Gradients in Novelty: Patterns of Fish Community Structure in an Invaded Everglades Canal Network

3:00pm - Break

Contributed Papers

Moderator: David Kerstetter, Nova

3:20pm – Bortone, S. A. Interrelationships Between Corals and Fisheries: Modifying Future Management Plans?

3:40pm – Harriger, K., J. Knight, and M. Wegener. Host fish identification for a Gulf Coast drainage endemic mussel, Purple Pigtoe *Quadrula succissa*

4:00pm – *Hartman, C. and J. Hill. Habitat and fish community associations of non-native fishes in the Peace River, Florida

4:20pm – Hill, J., K. Dowling, and C. Hartman. Risk Screen of *Arapaima Arapaima gigas* for Florida

4:40pm – Bonvechio, K. I., R. E. Sawyers, R. Bitz, and S. Crawford. Use of Mini-Fyke Nets for Sampling Shallow-Water Fish Communities in Florida Lakes

- 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)

*Appelman, M., B. Walker, and D. Kerstetter. Catch per unit effort spatial metric for pelagic longline catch and effort data from the Western North Atlantic tuna fishery

*Barker, B. D., A. Z. Horodysky, and D. W. Kerstetter. Thermal preferences and critical temperatures of invasive lionfish complex (*Pterois volitans/P. miles*)

*Crandall, C., K. Lorenzen, J. Struve, and J. Dutka-Gianelli. Engaging anglers in exploring place-based management

*Croteau, A. and C. Cichra. Evaluation of Restoration Efforts in Robinson Preserve, an Estuary in Tampa Bay, Florida

*Drexler, M. and C. Ainsworth. Modeling population connectivity and larval drift in the Gulf of Mexico and developing a cumulative contaminate exposure mortality function for pelagic larvae

*Fenton, J., E. Peebles, and D. Hollander. Species and Tissue Specific Turnover and Oil Depuration Rates of Fishes in the Gulf of Mexico

*Granneman, J. E., D. L. Jones, S. A. Murawski, and E. B. Peebles. Detecting trace element anomalies in offshore fish otoliths coincident with the Deepwater Horizon oil spill

*Hansen, N. and D. Kerstetter. Feeding Ecology of Great Barracuda (*Sphyraena barracuda*) in South Florida

*Houston, B. C., E. B. Peebles, and S. A. Murawski. Comparison of otolith-based growth rates and microchemistry in inshore fish before, during, and after the *Deepwater Horizon* oil spill

Trotta, K. A., A. Nardelli, S. Green, L. Akins and D. W. Kerstetter. Socioeconomics of the Lionfish Derby Fishery

*Lee, J. A. and J. S. Rehage. Combining mark-recapture & citizen science to evaluate seasonal dynamics of two recreational fish species

Mille, K., J. Dodrill, R. Turpin, and W. Horn. Reef fish sampling, PCB analysis results and visual monitoring associated with the Oriskany Reef, a decommissioned former Navy aircraft carrier sunk in 2006 as an artificial reef in the Northeastern Gulf of Mexico off Pensacola, FL

Struve, J. and K. Lorenzen. What do passive acoustic telemetry data reveal about fish movement?

Vecchio, J., P. Ritter, and Z. Schobernd. Using Current Fishery-Independent Techniques to Inspire Students

Wiley, C. and W. Poudier. Use of relocated adult largemouth bass following renovation of Edward Medard Reservoir

*Student presentation, Presenter

Day-By-Day Agenda – 34th Annual Meeting - Florida Chapter American Fisheries Society

Wednesday, February 19

7:00am – 8:00am **Breakfast**

7:30am – 6:00pm **Registration**

8:00am – 8:05am **Welcome – Chris Bradshaw, Chapter President-Elect, Program Chair**

Symposium: Research and Management: Tag Team Titans

Symposium: Tag Team Talks

Moderator: Chris Bradshaw, FWC

8:05am – Barbieri, L. and J. Dotson. Setting the Stage: Introduction to the ‘Research-Management: Tag Team Titans’ Symposium

8:35am – Murphy, M., and S. K. Lowerre-Barbieri. Red Drum Spawning Stock: Assessment and Ecology

9:00am – Strickland, A. and C. Paxton. The Regulation of Largemouth Bass on Lake Jackson, FL...How to Implement a Rule Change

9:25am – Muller, R. and R. Gandy. Florida’s Stone Crab Fishery: An Iterative Approach to Assessment and Research

9:50am – Matthews, M., and N. Trippel. Research and Management working together to promote and conserve the Florida bass and Florida’s prized bass fisheries

10:15am – Break

Symposium: Tag Team Talks (continued)

Moderator: Jennifer Rehage, FIU

10:30am – Cooper, W. and C. Crowley. Integration of biological research on blue crabs into stock assessment and management

10:55am – Pouder, B. and D. Dutterer. Evaluation of the potential use of minimum length limits for the Black Crappie fishery at Lake Istokpoga, Florida

11:20am – Martin, A. and B. Thompson. Bass Regulation Review: Research and Management Working Together

11:45am – Bisping S. and B. Simcox. Evaluation of Stocking Pellet-Reared advanced Fingerling Largemouth bass in small lakes

12:10pm – Lindberg, W. J., J. Dodrill, and K. Mille. Partnering Research and Construction: Rationale and Evaluation of an Artificial Reef System Designed for Enhanced Growth and Survival of Juvenile Gag, *Mycteroperca microlepis*

*Student presentation, Presenter

12:30pm – Lunch

Symposium (continued)

Moderator: Steve Bortone, Osprey

1:30pm – *Boucek, R., C. Barrientos, M. Bush, D. Gandy, C. Hartman, K. Wilson, and J. Young. Testing the relative effects of water temperature and productivity on largemouth bass condition

1:50pm – Dutka-Gianelli, J., R. Taylor, C. C. Crandall, J. Struve, and K. Lorenzen. Common Snook Research in Florida: a Case Study of Anglers, Scientists, and Managers Working Together for the Benefit of the Species

2:10pm – Freedman, J., S. Butler, M. Diana, and D. Wahl. Management and ecology of Asian carp in Illinois

2:30pm – Nault, K., B. Fontaine and B. Eisenhauer. Angling Induced Mortality of Largemouth Bass Caught and Released in a Florida Lake

2:50pm – *Camp, E., K. Lorenzen, R. Ahrens, M. Allen. Evaluation of potential stock enhancement of Florida's red drum recreational fishery: an integrated modeling approach

3:10pm – Break

Contributed Papers

Moderator: Keith Mille, FWC

3:40pm – Hill, J. E., L. L. Lawson, Jr., and S. Hardin. Assessment of Risks of Transgenic Fluorescent Ornamental Fishes to the United States Using the Fish Invasiveness Screening Kit (FISK)

4:00pm – *Wallace, A., D. Hollander, and E. Peebles. Stable isotopes in fish eye lenses as internal recorders of geographic site fidelity and movement

4:20pm – Martin, S., R. Gorecki, and M. Davis. Distribution, abundance, and habitat of three pipefish species (*Syngnathus*) in Florida

4:40pm – *Smith, G. and D. Murie. Pike Killifish Predation on Juvenile Snook

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 – 34th Annual Meeting - Florida Chapter American Fisheries Society

Thursday, February 20

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

Contributed Papers

Moderator: Andrew Dutterer, FWC

8:40am – Trippel, N., J. Hargrove, W. Porak, M. Badolato, J. Skaggs, and M. Allen. Impacts of angling for nesting Florida Bass, *Micropterus floridanus*, on nest success and recruitment

9:00am – Tuckett, Q. M., J. R. Ritch, K. M. Dowling, L. L. Lawson Jr., and J. E. Hill. Local Adaptation of Chronic Lethal Minimum Temperature in Naturalized and Farm-Raised Non-Native Green Swordtails

9:20am – Knight J., M. Wegener, K. Harriger. A Species Action Plan for the Harlequin Darter in Florida

9:40am – Smith, A. B. and B. L. Winner. Spatiotemporal distribution, relative abundance, and habitat utilization of the bluntnose stingray, (*Dasyatis say*), within select Gulf and Atlantic estuaries of Florida

10:00am – Break

Contributed Papers

Moderator: Brad Fontaine, FWC

10:20am – Wegener, M., J. Knight, K. Movement and Habitat Use of Alligator Gar in Escambia River, Florida

10:40am – Rehage, J. S., J. A Lee, R. E. Boucek and D. A. Gandy. Assessing the quality of drydown habitat for Everglades fishes: coastal natural vs. wetland artificial?

11:00am – Schaefer, A., and B. Thompson. Utility of game cameras to estimate angler effort on a large Florida lake

11:20am – Hill, J., J. Ritch, Q. Tuckett, K. Dowling, L. Lawson Jr. Preliminary Quantitative Analysis of Fish Diversity in Canals of the Seminole Reservation

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 34th Annual Meeting of the Florida Chapter American Fisheries Society
(In alphabet order by presenting author, *student presentation, presenter)

Alfermann, T.¹, A. Strickland¹, R. Butryn², and C. Middaugh³

Contributed presentation

¹Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, Quincy, FL

²Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, Gainesville, FL

³Arkansas Cooperative Fish and Wildlife Research Unit, Fayetteville, AR

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Nesting success and associated habitat characteristics of Shoal Bass in the Chipola River, FL

Over the past several years there has been a growing interest in the research of Shoal Bass *Micropterus cataractae*, a recently described black bass species endemic to the Apalachicola, Chattahoochee, and Flint River Systems in Florida, Alabama, and Georgia. The majority of this research has focused on movement, diet, co-occurrence with other black basses, and habitat use. As part of the Southeastern Native Black Bass Keystone Initiative, our study filled information gaps concerning reproduction and nest characteristics. We collected information on 67 shoal bass nests in April and May of 2012-2013 in the Chipola River, FL. Nests were located by visual observation and nest macrohabitat, nest depth, surface water velocity, mid-column water velocity, bottom water velocity, GPS location, adjacent habitat, and surface water temperature was recorded for each nest. Eggs or fry were estimated on a subsample of nests using a grid system. We evaluated the use of the grid system by also taking empirical counts on a subsample of nests. Nest success was estimated from nests where we counted eggs and then fry upon hatching (n=13). Mean egg and fry counts were 1,042 (range: 152-2,406) and 320 (range: 8-1,293), respectively. Most nests (94%) were found on boulder and rocky fine substrates with few to none occurring on bedrock (6%) and sand/pea gravel (0%). Mean nest depth and surface temperature was 100 cm and 23.0° C, respectively. Results suggest that spatial patterns exist regarding nest locations, with many nests clustered together and adjacent to shoal habitat.

* **Appelman, M., B. Walker, and D. Kerstetter**

Student • Poster presentation

Nova Southeastern University Oceanographic Center, Dania Beach, FL

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Catch per unit effort spatial metric for pelagic longline catch and effort data from the Western North Atlantic tuna fishery

Catch per unit effort (CPUE) is a quantitative method used to describe fisheries worldwide. CPUE can be presented as number of fish per 1000 hooks, number of fish per amount of fishing time, or with any unit of effort that best describes the fishery (i.e., search time, hooks per hour, number of trawls, etc.). CPUE is commonly used as an index to estimate relative abundance and is then applied within stock assessments so that fisheries managers can make justified decisions

for how to manage a particular stock or fishery using catch quotas, catch limits, gear or license restrictions, and so on. For commercial pelagic longline fisheries, onboard observer data are considered the only reliable data available due to the large-scale migratory behavior of HMS and because of the high costs associated with fisheries-independent surveys. Unfortunately, fishery-dependent data are heavily biased in favor of the target species and the subsequent CPUE tends to overestimate relative abundance. The spatial distribution of fish and fishing effort is essential for understanding the proportionality between CPUE and stock abundance. A spatial metric for PLL CPUE can increase the accuracy of relative abundance estimates which will in turn increase the accuracy of stock assessments and provide fisheries managers with the best information possible. This research utilizes a comprehensive eight-year (2003-2010) observer catch and effort dataset from the western North Atlantic U.S. PLL fleet targeting yellowfin tuna, swordfish, and bigeye tuna. Utilizing latitude and longitude coordinates recorded at the set and haul of each deployed section buoy, a spatial metric was created specific to the distribution of fishing effort from the longline fleet. Areas with increased habitat utilization of target and bycatch species such as bluefin tuna, marine mammals, sharks, and sea turtles, are highlighted using ArcGIS and R programming.

* **Barker, B. D.**¹, **A. Z. Horodusky**², and **D. W. Kerstetter**¹

Student • Poster presentation

¹Nova Southeastern University Oceanographic Center, Dania Beach, FL

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Thermal preferences and critical temperatures of invasive lionfish complex (*Pterois volitans/P. miles*)

Temperature preference and limits were determined for locally captured, juvenile lionfish at four different acclimation temperatures (13°C, 20°C, 25 °C and 32°C). Temperature preferences were evaluated using an automated shuttlebox system that presents temperature stimuli in a subject-driven fashion. The shuttlebox system circulates two temperatures of water within a dumbbell-shaped tank, maintaining a difference of 3°C between sides. Movement of the subject to the “warm” tank increased temperature stimulus; movements to the “cold” side decreased temperature stimuli in both tanks (maintaining the 3°C differential). Subjects move between hot and cold sides, behaviorally thermoregulating within preferred temperature ranges. Critical thermal methodology was used to determine the CTmin and CTmax of the fish, with loss of equilibrium as the endpoint. Temperature was increased or decreased by 0.33°C per minute until the end point was reached. Thermal tolerance polygons will provide a visual representation to the lower and upper thermal avoidance temperatures of the invasive lionfish, delineating the preferred thermal range of the species. A species’ thermal preference and tolerance are important mechanistic drivers affecting behavior and geographic distribution and thus are relevant to fisheries management. Thermal preference data could assist lionfish population management in pinpointing abundance hotspots, allowing removal efforts to be more efficient. Thermal tolerance describes the range in which lionfish can survive, and how this range changes with acclimation temperature. Due to increasing ocean temperatures, the current range of the invasive lionfish could expand geographically into higher latitudes, similar to expectations for native tropical fishes, with unknown implications for ecosystem processes.

Bisping, S.¹, and B. Simcox²

Tag Team Symposium presentation

¹Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, Eustis, FL

²Florida Fish and Wildlife Conservation Commission, Division of Freshwater Fisheries Management, Lakeland, FL

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Evaluation of Stocking Pellet-Reared advanced Fingerling Largemouth bass in small lakes

Supplemental stocking of Florida largemouth bass (*Micropterus salmoides floridanus*) in Florida lakes has the potential to improve fish stocks and angler catch rates in recruitment-limited systems if adequate survival can be achieved. To determine the effectiveness of stocking advanced fingerling largemouth bass in Florida, we stocked and evaluated 11 small lakes (10 to 93 ha) in 2012. The Florida Bass Conservation Center produced all advanced fingerling bass (79-147 mmTL) for this study and we stocked all lakes at a rate of 50 per acre. The study objective was to evaluate the survival and contribution of the stocked pellet reared advanced fingerling largemouth bass one and two years after released into the wild. We evaluated survival using Schnabel population estimates on each study lake one year post stocking. The contribution of stocked largemouth bass ranged 0 to 35% (mean = 9%) and survival ranged from 0 to 8% (mean < 2%). Results from this study suggest that survival of advanced fingerlings bass has not increased with recent improvements to the culture process. In spring 2013, four of the eleven lakes were re-stocked to determine if conditioning bass in “predator free enclosures” within the stocking lake for 7 days could improve survival. Two treatments were used in this experiment (conditioned and unconditioned) and were both stocked at 50 bass per acre. In spring 2014, Schnabel population estimates will be conducted on all 11 lakes to evaluate two year post stocking survival from 2012’s stocking and to compare survival between conditioned and unconditioned bass from 2013’s stocking.

Bonvechio, K. I.¹, R. E. Sawyers¹, R. Bitz², and S. Crawford¹

Contributed presentation

¹Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, Eustis, FL

² Tennessee Wildlife Resources Agency, Springfield Fish Hatchery, Springfield, TN

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Use of Mini-Fyke Nets for Sampling Shallow-Water Fish Communities in Florida Lakes

We evaluated the use of mini-fyke nets for sampling shallow-water (<1 m deep) lentic fish communities in Florida. Specifically, we wanted to determine the most effective method for deployment of mini-fyke nets and the sample size required for adequately characterizing the fish community in these habitats. Shallow-water (0.15–0.6 m) net sets, in which nets were not completely submersed, collected significantly more fish and collected a larger proportion of poeciliids; deeper-water (0.6–1.0 m) net sets, in which nets were completely submersed, collected a larger proportion of centrarchids, cyprinids, and cyprinodontids. Net placement also significantly affected overall catch and composition of the sample. “Out” sets, placed in locations away from edge habitats, tended to collect active schooling fishes like threadfin shad

Dorosoma petenense and cyprinids, whereas “in” sets, placed next to edge habitats, tended to collect species associated with shallow, vegetated habitats, particularly poecilids and ictalurid species, at greater frequencies. In many cases, collection of these fishes was unique to a particular deployment method. Although over the long term, the objectives of monitoring sampling may vary, we determined that a sampling target of 30 net sets was sufficient for characterizing the fish community in terms of percentage composition, by weight and number, species richness and species diversity. Based on our results, we recommend that, in long-term monitoring of Florida’s shallow-water lentic fish communities, mini–fyke nets be placed in shallow waters (i.e., where the net is not completely submersed) with the lead extending to the lake boundary. Furthermore, we recommend the continued use of additional types of gear to fully characterize littoral fish communities in Florida.

Bortone, S.A.

Contributed presentation

Osprey Aquatic Sciences, Inc., Tampa, FL
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Interrelationships Between Corals and Fisheries: Modifying Future Management Plans?

Many species under the management auspices of state and federal agencies off Florida are coral reef-associated fish species. However, the continuing but inevitable long-term trends in the decline in the overall health and condition of corals and coral reefs indicates that adjustments in fishery management plans might be necessary to account for these trends. Unknown, however, is the degree and extent of affect that the decline in coral health will have on these fish stocks. A workshop was held in May 2013 to explore the future for fish stocks associated with corals. The emphasis of the workshop was oriented around the Gulf of Mexico fisheries but broader perspectives were also included by the eminent researchers who attended the workshop and offered presentations and advice. An edited and peer-reviewed, 15-chapter volume (Interrelationships Between Corals and Fisheries) is in press with CRC Press (Taylor and Francis Group) and will be available July 2014. Briefly, the knowledge base from which to accurately project the future status of coral reef associated fisheries is poor but growing. Additionally, the analytical methodologies necessary to discern stock status among traditionally data-poor species are increasing in sophistication and utility as well. Moreover, many of these fish stocks, while coral-reef associated, are not necessarily coral-reef obligates. Consequently, the impact of coral reef decline on many of these stocks may not be severely impacted by trends in coral condition as long as physical reef structure remains available. Adjustments seem to be in order for stocks that are obligate coral-reef associates. Future management of coral-reef associated fish species may benefit from a significant effort towards Ecosystem Based Management. Since coral decline is a world-wide phenomenon, Florida stands to be a leader in developing science and purpose-based ecosystem-based fishery management necessary to allow these fisheries to be sustainable into the future.

* **Boucek, R.¹, C. Barrientos², M. Bush¹, D. Gandy³, C. Hartman², K. Wilson², and J. Young⁴**

Student • Symposium presentation

¹Florida International University, Department of Biology, Miami, FL

²University of Florida, Fisheries & Aquatic Sciences Program, Gainesville, FL

³Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, DeLeon Springs, FL

⁴Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, Tequesta, FL

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Testing the relative effects of water temperature and productivity on largemouth bass condition.

Increasing global temperatures are expected to have profound effects on freshwater fishes. In particular, those that occur in at the upper ends of their temperature tolerance range are thought to be the most imperiled. Warming global temperatures may increase physiological stress of sensitive species, which could alter their growth rates, energy demands, and reproductive success of species important for fisheries. Increasing average temperatures will also likely impact fish behavior, which may have a fitness cost.

Florida's native freshwater fishes are largely temperate that colonized peninsular Florida from the Northern United States. As such, south Florida is the southern extent of native range of many of Florida's freshwater fishes due to its sub-tropical climate. However, the relative effects of high water temperature on fish fitness compared to other environmental drivers remain understudied. Thus, in this study we tested whether temperature or another important environmental driver, water body productivity, is a better predictor of freshwater fish fitness. The model freshwater fish we examined is largemouth bass, an economically-important freshwater gamefish. We compiled bass length and weight data, productivity measures, and water temperature data, during the fall from 2010-2013 from 25 different water bodies. We compared the effects of these two environmental drivers on bass condition with regression techniques. Our results showed that there was no significant relationship between bass condition and water temperature, however there was a strong positive relationship between condition and water body productivity ($r^2 = .56$). Our results suggest that managing lake productivity may be more important in future fishery management, rather than considering strategies that adjust for predicted increases in average temperatures. Future work on these datasets include testing the effects of temperature and trophic state on different bass size classes, as well as an examination between possible effects of temperature on condition within northern and southern populations.

* **Camp, E., K. Lorenzen, R. Ahrens, and M. Allen**

Student • Symposium presentation

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

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Evaluation of potential stock enhancement of Florida's red drum recreational fishery: an integrated modeling approach

We developed an integrated bio-socio-economic model to evaluate the potential for stock enhancement with hatchery fish to achieve socio-economic and conservation objectives in recreational fisheries. As a case study, we applied this model to the red drum recreational fishery in the Tampa Bay estuary, Florida, USA. Our results suggest that stocking of juvenile fish larger than the size at which the strongest density-dependence in mortality occurs can help increase angler satisfaction and total effort (socioeconomic objectives) but are likely to result in decreases to the abundance of wild fish (conservation objective). Stocking of small juveniles that are subject to strongly density-dependent mortality after release does not achieve socio-economic outcomes (or only at excessive cost) but still leads to a reduction of wild fish abundance. The intensity of socioeconomic gains and wild fish losses depended on assumptions of dynamic angler-effort responses and importance of catch-related satisfaction. Reducing uncertainty of these key processes may be possible by well-designed, experimental stocking and this represents an important opportunity for future work. Overall, these findings suggest stock enhancement will not alleviate inherent trade-offs between socioeconomic and conservation objectives.

Cooper, W. and C. Crowley

Tag Team Symposium presentation

Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, St. Petersburg, FL

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Integration of biological research on blue crabs into stock assessment and management

Knowledge of the biological and environmental processes that drive Florida blue crab populations is essential to accurately assess the stock for fisheries management objectives. The complex life cycle and inability to age blue crabs makes this a difficult task. Researchers at FWRI have conducted multiple studies to fill in research needs for current and future stock assessments. Existing studies include application of previously developed aging methods, growth of known age populations, and exploring the prevalence and intensity of the parasitic dinoflagellate, *Hematodinium spp.* From these studies we have developed age based growth indices and models, and relationships between water quality parameters, seasonality, and presence of *Hematodinium spp.* The new growth models were used extensively in the most current stock assessment for development of age-specific mortality and selectivity estimates. Links between freshwater inflow and blue crab abundance were additionally included within the current assessment to improve model fits, which supports the potential for a salinity-driven disease prevalence mechanism. Upcoming research will focus on reproduction, movement, and dispersal of spawning females for future stock assessment efforts. In addition to the newly developed growth models, this new study will provide information on the stock structure and key

reproductive parameters, enabling the transition to a more flexible stock assessment modeling approach for future assessments.

* **Crandall, C.^{1,2}, K. Lorenzen¹, J. Struve¹ and J. Dutka-Gianelli¹**

Student • Poster presentation

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

²University of Florida, School of Natural Resources and Conservation, Gainesville, FL
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Engaging anglers in exploring place-based management

Stakeholder engagement is an important aspect of natural resource management, and research has shown that stakeholder involvement often leads to better research and management outcomes. As such, working with stakeholders has been an important aspect of a larger research initiative currently underway exploring the potential for place-based management of Florida's nearshore recreational fisheries. The project is currently focusing on snook as a case-study fishery. Stakeholder engagement methods have included targeted qualitative interviews with stakeholders in southwestern Florida, as well as in-depth stakeholder workshops in two pilot locations: Charlotte Harbor and Sarasota Bay. Interview results indicate levels of support for place-based management in Florida's fisheries. Workshop results highlighted local differences in fishing characteristics and conditions as well as local knowledge of snook status over time. Evaluations indicate that stakeholders appreciated the workshops and perceived that their input was valued and received through the workshop process, and most participants indicated interest in further workshop participation. Further stakeholder engagement will be invaluable as the project moves forward in its exploration of place-based management.

* **Croteau, A. and C. Cichra**

Student • Poster presentation

University of Florida, Fisheries and Aquatic Sciences Program, Gainesville, FL
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Evaluation of Restoration Efforts in Robinson Preserve, an Estuary in Tampa Bay, Florida

Florida's coastal habitats have been severely impacted by development, with some areas experiencing mangrove habitat loss of over 80%. In the past 100 years, Tampa Bay has lost over 44% of its mangrove and salt marsh habitats. Robinson Preserve is a 197-hectare preserve, located on the southern shore of Tampa Bay. Originally a coastal wetland, the property was ditched, drained, and used for agriculture. In 2006, over 450,000 m³ of soil were moved to restore tidal flow. While upland and salt marsh vegetation were planted, aquatic flora and fauna were left to colonize from neighboring populations. The waters of Robinson Preserve were sampled quarterly from 2007-2013 to evaluate the success of restoration activities. The preserve was divided into four regions based on water flow and connectivity to surrounding water bodies. Within each region, water quality, plankton, invertebrates, fish, and aquatic macrophytes were sampled at multiple locations using a variety of methods to estimate community composition and size structures. Temperature, dissolved oxygen, salinity, and conductivity were measured. Water

samples were analyzed for total nitrogen, total phosphorus, color, and chlorophyll-a concentrations. Phytoplankton and zooplankton were sampled with an integrated pole sampler and plankton net. Sediment samples were taken and analyzed for benthic algae (both by chlorophyll-a extraction and taxonomic enumeration). Ichthyoplankton and meroplankton assemblages were sampled using a modified light trap. Fish and invertebrates were sampled using four methods (dip net, cast net, common seine, and bag seine) to effectively sample both benthic and pelagic species across a variety of size classes and habitat features. Two models will be used to compare Robinson Preserve to both virgin ecosystems and surrounding water bodies, to evaluate the success of the restoration efforts and to predict the outcomes of future restoration strategies: habitat suitability modeling and ecosystem modeling using Ecopath with Ecosim.

Hill, J., K. Dowling, and C. Hartman

Contributed presentation

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Risk Screen of *Arapaima Arapaima gigas* for Florida

The *Arapaima Arapaima gigas* (Arapaimidae) is a large, predatory, freshwater fish from South America. It is regulated as a conditional species in Florida which allows culture of this species for food in aquaculture facilities that are certified by the Florida Department of Agriculture and Consumer Services and permitted for conditional species. These regulations include specific provisions for possession. Recent interest in developing a commercial industry in Florida raising *Arapaima* for food prompted a risk assessment. Information on this species was gathered to create a bioprofile which was then used to assess potential risk using the Fish Invasiveness Screening Kit (FISK) v2.03. FISK is an internationally recognized tool that has been used to assess risks of non-native fishes in Australia, Asia, Europe, and North America. The bioprofile and FISK were then synthesized to provide research and management recommendations. *Arapaima* is cold-sensitive and would likely survive only in south or potentially just southeast Florida. Reports of sensitivity below 16°C suggest a similar lower lethal temperature to Butterfly Peacock Bass *Cichla ocellaris* (15°C). Likely predation impacts would be due to its very large body size and correspondingly large gape size. The *Arapaima* was classified as medium risk for Florida overall (FISK score = 9), south Florida (11), and central Florida (7). Options for control of introduced *Arapaima* in Florida would be rotenone for small, isolated systems and directed removals for large, open systems. This work also pointed out several data gaps, the most important being the experimentally derived lower lethal temperature. Future research should focus on this as well as potential predation impacts, control options, and invasion history. Current regulations already act to mitigate risks of culturing this species thus our main recommendation to the agency was to maintain *Arapaima* as a conditional species.

*** Dowling, K., and C. Johnston**

Student • Contributed presentation

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The role of water availability on fish assemblage structure: effects of agricultural land use and spawning mode

Water availability has decreased in many watersheds for a host of reasons, including alteration in land use and an increase in water usage. Factors that alter the hydrology of watersheds can decrease water persistence in aquatic systems. Although aquatic organisms were historically exposed to periods of drought, and conversely, high water – prolonged drought can alter fish assemblage structure for long periods of time, and perhaps permanently. Our data for Uchee Creek, a large tributary to the Chattahoochee River in east-central Alabama, suggests homogenization of the fish fauna throughout much of the stream. In this study, we explore the role of land use and spawning mode as catalysts for this faunal change. Analysis of land use layers from 1992, 2001, and 2011 in ArcGIS have shown that there has been a steady increase in urban and agricultural land use over time in the study area. Furthermore, forested sites have shifted from mixed hardwoods to pine monoculture. Watersheds with high percentages of pine monoculture have less water available in soils, which decreases seepage into streams. Stream sites in areas with the least land use change from the historic mixed hardwood forest use have maintained their fish assemblage integrity better than more impacted sites. Since some species have spawning modes that require high water discharge, while others are most successful during low flow periods, we explored the relationship between species spawning modes, water availability and persistence in the Uchee Creek system. Our data suggest that this correlation may help explain the success of sunfishes and decrease in native minnow species throughout this watershed.

*** Drexler, M., and C. Ainsworth**

Student • Poster presentation

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Modeling population connectivity and larval drift in the Gulf of Mexico and developing a cumulative contaminate exposure mortality function for pelagic larvae

The full scope of impacts resulting from the Deepwater Horizon oil spill has yet to be fully understood. The potential negative effects on recruitment resulting from pelagic larvae interacting with the oil field have received little attention. An agent based model was developed to track passive particle movement across the entire Gulf of Mexico for numerous species and multi-species groups from the region. The model incorporates previous estimates of adult abundance over a $1/10^{\circ}$ grid and empirical calculations of the number of eggs released by those populations. The drift trajectories of 25,000 equally spaced agents, dependent upon adult abundance at that location, were estimated using daily Hybrid Coordinate Ocean Model (HYCOM). Biological data pertaining to spawning dates and the pelagic duration of larvae were incorporated for all the simulated groups. Simulations spanning multiple years were incorporated to estimate annual variability in particle movement and meta-population connectivity. In

addition to larval drift and connectivity, the individual agents are also able to track the cumulative time that each particle is exposed to a contaminant fields. The results of these simulations will be used to evaluate population connectivity for spatial ecosystem modelling experiments, such as the Atlantis ecosystem model for the Gulf of Mexico, and to investigate various larval mortality functions in response to the Deepwater Horizon event.

Dutka-Gianelli, J.¹, R. Taylor², C. C. Crandall¹, J. Struve¹, and K. Lorenzen¹

Symposium presentation

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Common Snook Research in Florida: a Case Study of Anglers, Scientists, and Managers Working Together for the Benefit of the Species.

Common snook (*Centropomus undecimalis*) is a popular gamefish in Florida. Much effort has been made to manage and understand the life history, population dynamics, and ecology of common snook stocks in Florida. Since the mid 1950's, the Florida Legislature and State resource agencies have designed and implemented regulations and restrictions on gear, bag and size limits, and seasonal closures to effectively manage and protect the species. Snook are proterandric hermaphrodites and are both catadromous and euryhaline; this complexity of life history and ecology presents challenges to scientists and managers working to develop a balanced approach to harvest versus conservation.

The snook management process in Florida is systematic and dynamic: there is interaction among scientists, anglers, and managers in research planning and management strategy development. Throughout the history of the fishery's management, detailed stock assessments have shaped the strategies and recommendations designed to maximize harvest and maintain robust spawning populations. Environmental perturbations, e.g. red tides and freezes, are taken into consideration for effective snook management.

We use time series analysis to illustrate relationships among scientific information, management strategies, and angler involvement in the snook fishery. Recent efforts involving diverse stakeholders in the decision-making process have become a major research focus that provides substantial improvement to the understanding and needs of management strategies. This research illustrates a successful case study of alternative fishery management strategies, applied research, and stakeholder involvement to derive a positive and successful management program. This comprehensive management technique is being used as a model for management and research in the various snook fisheries in Central and South America.

Currently we are developing alternative tools for modeling and visualization of spatially explicit snook populations and alternative tools for engaging diverse stakeholders in information exchange and participatory decision-making. This innovative framework could benefit stock assessment and management.

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Species and Tissue Specific Turnover and Oil Depuration Rates of Fishes in the Gulf of Mexico

We propose a new method to determine species- and tissue-specific turnover rates, simultaneous solution for time (t). The present study will analyze the $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ of different body tissues to derive information on tissue turnover rates. Different tissues will assimilate isotopic signatures at different rates because different tissues breakdown and re-synthesize at different rates, known as turnover. Because different tissues have different turnover rates, simultaneous solution for time (t) in turnover equations provides a theoretical time since an individual has experienced a change in carbon or nitrogen isotopes. Turnover rates for tissues are known to range from a few days to years. By using internal isotopic records acquired from sampling multiple tissues we can constrain the method, thus forcing it to have only one solution. A captive study whereby we will acquire empirical tissue-specific isotopic turnover rate data from fish in captivity will validate these methods. This new approach will be applied in a field study to obtain species and tissue-specific turnover rate data from commercially fished families in the Gulf of Mexico and in a captive study to evaluate changes in tissue turnover rates with respect to oil depuration. The results of this study will contribute to our understanding of the rate at which various tissues depurate oil and to filling the void in information regarding species-specific tissue turnover times as expressed in previous studies.

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Symposium presentation

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Angling Induced Mortality of Largemouth Bass Caught and Released in a Florida Lake

Since the early 1970's, voluntary and regulatory catch-and-release rates of Largemouth Bass *Micropterus salmoides* have increased in Florida. Because catch-and-release rates for Largemouth Bass are high in many systems, it is important to assess catch-and-release related mortality. We used a hook-and-line mortality study to assess the impacts of catch-and-release angling on largemouth bass mortality in relation to: hook type, lure type, fight time, and air exposure time. Up to 31 fish were caught via hook-and-line, and up to 20 control fish were electrofished during each of the 16 sampling trips in Fort Drum WMA, Florida during 2012 and 2013. Fish were tagged and held for 72 hours in cages within the lake. Hook-and-line fish (N=481) ranged from 253 to 586 mm. Mean fight time was 12 s and mean air exposure time was 49 s. control fish (N=312) had a mean air exposure time of 29 s. Mortality was low for angled (4%) and electrofished (4%) Largemouth Bass throughout the study. Fish caught in the summer (June-Sept) experienced significantly ($P < 0.05$) higher mortality (8%) than those caught in winter (Dec – Mar; <1%). Fish also tended to experience higher mortality at smaller lengths ($P = 0.07$).

Largemouth Bass hooked in the gills had a significantly higher mortality rate than any other hook location ($P < 0.05$). Results of our study suggest that catch-and-release mortality for Largemouth Bass is higher in the summer, but still low enough to cause little concern for managers. Information gained in this study could provide insight into future modeling exercises and management decisions.

Freedman, J.^{1,2}, S. Butler², M. Diana², and D. Wahl²

Symposium presentation

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Management and ecology of Asian carp in Illinois

Bighead Carp, *Hypophthalmichthys nobilis*, and Silver Carp, *H. molitrix*, together known as Asian Carp, are voracious planktivores now established throughout the Mississippi River drainage. They have been extremely successful, outcompeting native species and now comprising the majority of the fish biomass in the lower Illinois River. Thus, there is concern about their potential impacts should they invade the Great Lakes. However, insufficient data exists on their actual ecological impact, and on the best ways to sample each species. I will present research stemming from collaborative efforts involving federal and state agencies and universities to maximize sampling efficiency and determine ecological effects of Asian Carp in the Illinois River. In particular, I will focus on identifying the most effective gears for sampling Asian Carp and on the use of stable isotope analysis to determine their ecological effects on native species. Finally, I will discuss how these results can inform study designs for aquatic invasive species in Florida.

*** Gandy, D.A.¹, and Jennifer S. Rehage²**

Student • Contributed presentation

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Examining Gradients in Novelty: Patterns of Fish Community Structure in an Invaded Everglades Canal Network.

Novel ecosystems emerge from alterations to historic abiotic regimes and contain new species combinations. Novel systems provide an opportunity for insight into community assembly processes since a resorting or filtering of regional biotas is a likely consequence of a decoupling from historic conditions. Everglades canals offer an opportunity to understand the function of novel habitat for native and non-native fishes and how novel conditions in turn influence distribution, abundance and assembly patterns. In this study, we examined native and non-native fish community structure in an Everglades canal network as a function of a gradient in novel conditions, particularly the loss of wetland connectivity and the natural influence of seasonal hydrology— conditions not reflective of the historic Everglades. Our objectives were to: (1)

examine spatiotemporal variation in both the native and non-native fish communities in relation to the degree of novelty of canals, (2) quantify whether communities were randomly structured and (3) determine the relative importance of hydrological, habitat and spatiotemporal factors in driving community structure patterns. We found that as novelty increased, native species richness and abundance strongly declined, and the contribution of non-natives increased. Community structure vastly differed among canals and was strongly influenced by spatial factors and secondarily by hydrological factors. Natives and non-natives had opposing responses to key hydrologic and habitat parameters.

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Student • Poster presentation

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Detecting trace element anomalies in offshore fish otoliths coincident with the Deepwater Horizon oil spill

Fish otoliths are useful as they provide a record of both fish age and ambient water chemistry. The objective of this study was to describe the broad-scale otolith element composition of several offshore fish species collected from the Gulf of Mexico following the Deepwater Horizon (DWH) oil spill. Additionally, we determined the timing of any trace element concentration anomalies within otolith element profiles to evaluate whether they were concurrent with the DWH oil spill. We analyzed otoliths of the following offshore fish species: *Lutjanus campechanus*, *Epinephelus morio*, *Epinephelus flavolimbatus*, *Brotula barbata*, *Urophycis floridana*, and *Lopholatilus chamaeleonticeps*. Otoliths were analyzed through laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) for a suite of 26 isotopes: ⁷Li, ²³Na, ²⁴Mg, ³¹P, ⁴³Ca, ⁴⁵Sc, ⁵¹V, ⁵³Cr, ⁵⁵Mn, ⁵⁷Fe, ⁵⁹Co, ⁶⁰Ni, ⁶³Cu, ⁶⁴Zn, ⁶⁵Cu, ⁷²Ge, ⁸⁵Rb, ⁸⁸Sr, ⁸⁹Y, ¹¹⁴Cd, ¹¹⁸Sn, ¹³⁷Ba, ¹⁹⁷Au, ²⁰⁸Pb, ²³²Th, and ²³⁸U. Ablation of otoliths occurred along a transect extending from the primordium to the edge of the otolith thus providing an otolith element profile over the entire life of the individual. This technique allowed us to establish a baseline for the ambient water conditions a fish was exposed to prior to the DWH oil spill. We identified fish with trace element anomalies in their otolith profiles that occurred during the time frame of the DWH oil spill event.

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Student • Poster presentation

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Feeding Ecology of Great Barracuda (*Sphyraena barracuda*) in South Florida

Great barracuda (*Sphyraena barracuda*) are a large predatory species that is frequently caught by fishermen off of South Florida. This species exhibits an ontogenetic shift in habitat moving from seagrass and mangrove areas as juveniles to offshore reefs and wrecks as adults. The food habits of great barracuda were investigated by analyzing the stomachs of both juveniles and adults. Fish were obtained by several different fishing methods, including hook-and-line fishing,

spearfishing and a seine net. Barracuda were also donated by local fishermen and charter boat captains. Index of relative importance (IRI) was used to compare food types across size ranges. A high percentage of the stomach analyzed throughout this study were empty. As of January 2014, 251 barracuda have been analyzed, with 67 (27%) being adults. Of all 251 fish analyzed, only 55 had identifiable prey items in their stomachs. Preliminary results show that barracuda caught in the juvenile habitat fed primarily on killifish (Cyprinodontidae) and penaeid shrimp. Results with juveniles show that they were able to feed on a variety of prey items without being dependent on one particular food source. Although previous work has shown that juvenile barracuda were almost entirely piscivorous, our preliminary work has shown that penaeids play a major part (%) in their diet as well. Further research is needed to establish any seasonal trends in the adult barracuda diet. This study will provide valuable information about the feeding ecology of barracuda off South Florida, which could lead to better conservation of the species.

Harriger, K., J. Knight, and M. Wegener

Contributed presentation

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Host fish identification for a Gulf Coast drainage endemic mussel, Purple Pigtoe *Quadrula succissa*

Host fish requirements are unknown for many imperiled freshwater mussels (Unionidae), which impedes conservation efforts to protect them. To address the knowledge gap around host fish requirements for imperiled Florida Gulf Coast drainage mussels, Florida Fish and Wildlife Conservation Commission (FFWCC) scientists designed a facility for conducting host fish studies at a FFWCC hatchery in Holt, Florida. The goal of this study was to identify host fish for Purple Pigtoe *Quadrula succissa*, a mussel endemic to three Florida Gulf Coast drainages. Ten fish species were evaluated as potential hosts for *Q. succissa* in two separate trials during summer 2013. Potential host fish were exposed to *Q. succissa* glochidia for 30 minutes in aerated containers of water and were then held in a flow-through aquarium system for the duration of the each trial. Aquaria were flushed to collect glochidia and transformed juvenile mussels, which were counted and totaled for each fish species. Fishes that transformed viable juvenile mussels were considered hosts for *Q. succissa*. Three ictalurid fishes transformed viable juvenile mussels: Channel Catfish *Ictalurus punctatus*, Yellow Bullhead *Ameiurus natalis*, and Black Madtom *Noturus funebris*. Monitoring and management of native ictalurid populations in Florida Gulf Coast drainages may be important to the conservation of *Q. succissa*.

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Habitat and fish community 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 37 reproducing non-native fishes in peninsular Florida, few studies evaluate their use of habitat or associations with native fishes, especially outside of extreme southern Florida. The Peace River basin of central and southwest Florida is one of the largest rivers in the state and has a long history of non-native fish introduction. Our study evaluated habitat and fish community associations of the four most common non-native fishes, African Jewelfish *Hemichromis letourneuxi*, Blue Tilapia *Oreochromis aureus*, Brown Hoplo *Hoplosternum littorale*, and Vermiculated Sailfin Catfish *Pterygoplichthys disjunctivus*. Boat electrofishing sampling and habitat surveys were done 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 was 4.1% by number and 8.6% by weight. African Jewelfish and Blue Tilapia were present in shallower depths with higher flows, lower woody debris coverage and higher dissolved oxygen. Brown Hoplo was commonly associated with higher macrophyte cover, lower water clarity, higher temperatures and lower dissolved oxygen. Vermiculated Sailfin Catfish was associated with higher flow, higher habitat complexity scores and higher water clarity. For all locations, ANOSIM showed that African Jewelfish was most closely associated with Eastern Mosquitofish *Gambusia holbrooki*, Spotted Sunfish *Lepomis punctatus*, Bluegill *Lepomis macrochirus*, Seminole Killifish *Fundulus seminolis*, Largemouth Bass *Micropterus salmoides*, and Redear Sunfish *Lepomis microlophus*. Vermiculated Sailfin Catfish was most commonly associated with Spotted Sunfish, Bluegill, Eastern Mosquitofish, Redear Sunfish, Largemouth Bass and Seminole Killifish. Additional research is needed to determine ecological interactions; however, non-native fishes were not a dominant component of the fish fauna and were most associated with common, robust native species.

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Contributed presentation

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Assessment of Risks of Transgenic Fluorescent Ornamental Fishes to the United States Using the Fish Invasiveness Screening Kit (FISK)

Three species of transgenic fluorescent ornamental fishes are commercially available to the public in the United States—Zebra Danio *Danio rerio*, Black Tetra *Gymnocorymbus ternetzi*, and Tiger Barb *Systemus tetrazona*. Despite qualitative assessments of the risks of these

transgenic fishes by the U.S. Food and Drug Administration and two state agencies, critics argue that the risk assessment and approval processes were not transparent and that the results were never published or otherwise opened to scientific scrutiny. We used an internationally recognized risk screening tool, the Fish Invasiveness Screening Kit (FISK), to provide a transparent, peer-reviewed assessment for the conterminous United States. We found that the three transgenic fluorescent ornamental fishes represent a low risk of invasiveness. Potential risk is limited to the warmer regions. No potential for hybridization with native species, little history of invasiveness elsewhere, a lack of traits associated with persistence, and small body size coupled with predation-enhancing fluorescence indicate that the ability of these species to establish and cause impacts even in warm regions is limited. The conclusion of low risk using FISK was consistent with the results of unpublished, qualitative agency assessments using expert panels or in-house expertise. The risk screens pointed out few data gaps, areas of important uncertainty, or potentially elevated risk levels, thus suggesting limited gain to committing resources towards a full risk assessment. A low risk result further indicates little need for risk management actions in addition to those already existing. Risk screens such as FISK can have high value for managers because they capture important elements of risk, providing vital information for assessment and management decisions with relatively small investments in time and funding.

* **Houston, B. C., E. B. Peebles, and S. A. Murawski**

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Comparison of otolith-based growth rates and microchemistry in inshore fish before, during, and after the *Deepwater Horizon* oil spill

The Deepwater Horizon oil spill polluted thousands of miles of Louisiana coastline during the summer of 2010. Oil invaded inland coastal habitats, potentially causing species living in those areas to be exposed to toxic chemicals. The purpose of this study is to examine otoliths from four species of inshore fish for evidence of reduced growth rate and stress. Growth rate is a good indicator of overall fish condition that translates into changes in survival and lifetime reproductive potential. The width of otolith growth annuli will be compared before, during, and after the oil spill. Dendrochronology-based methods will be used to create annual growth profiles, and otolith microchemistry using laser ablation ICP-MS will be used to investigate associations between any observed reduced growth and the temporal profiles of putative oil-marker elements. Stress-indicator elements will also be analyzed within the same temporal framework.

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Contributed presentation

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Determinate versus indeterminate fecundity in American Shad, an anadromous clupeid

Historical estimates of American Shad *Alosa sapidissima* fecundity used a determinate method, estimating annual fecundity as the standing stock of oocytes at a single point of time prior to spawning. Such fecundity estimates have been reported for populations from the Canadian Maritimes to Florida, USA; applied to hypothesis tests of life history evolution; and used in demographic models to advise management policy. However, American Shad have asynchronous development of yolked oocyte clutches, which suggests that new oocytes could arise after spawning commences, biasing a determinate fecundity method as too low. If so, annual fecundity should be a product of batch size and number of batches – an indeterminate fecundity method. We investigated oocyte recruitment, atresia, and spawning intervals using gonad histology of females from the Mattaponi River, Virginia. Batch size, the number of hydrated oocytes prior to a spawning event, was estimated using a gravimetric method. Spawning duration was obtained from an independent acoustic tagging study. A size hiatus between primary and secondary oocytes was only evident in some individuals during spawning, so we conclude that an indeterminate fecundity method is necessary for this population of American Shad. Atresia was evident during spawning but was low at the end of the 2002 spawning season. Females spawned every 2.2 – 2.9 days, releasing 11-17 batches per season. Batch fecundity (range: 12,700 – 81,400) was 23% higher for repeat versus virgin spawners. A bootstrapped estimate of potential annual fecundity for a virgin female – as calculated with an indeterminate fecundity method – was 478,000 – 544,000 eggs (95% confidence interval), about double the previous (determinate) estimates from this river system (260,000 and 288,000). Until more comparisons are done with other populations, we urge caution in using the many published ‘determinate’ fecundity estimates of American Shad and other *Alosa* species.

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Poster presentation

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Socioeconomics of the Lionfish Derby Fishery

Throughout the western North Atlantic Ocean, Caribbean Sea, and the Gulf of Mexico, invasive Indo-Pacific lionfish (*Pterois volitans/miles* complex) have established dense populations, greatly impacting their host environments. Resource managers across the adopted range are working to develop strategies to minimize the destruction being caused by these fish. Lionfish tournaments – single-day events where competitors aim to collect and remove as many lionfish

as possible – have been an important tool in suppressing local populations of lionfish. As understanding increases of the potential of these events to control the lionfish population, they are becoming an increasingly important tool for resource managers and other concerned stakeholders. Tournaments can also bring economic benefits to the communities where they are held, although this impact has yet to be formally studied.

Participants at two recent South Florida derby events were interviewed on site, using a six-page survey asking them to describe (1) the lionfish derby experience; (2) non-derby related lionfish removal effort; (3) derby expenditures; and (4) personal characteristics. Respondents spent approximately \$500 per person, including expenditures nominally related to the event, such as hotel rooms and restaurant meals, creating a net benefit to the communities where they were held.

Additional lionfish derby events will be surveyed to develop a more complete picture of their socioeconomic characteristics. In addition to the analyses of these individually surveyed derby events, historical participation data will be used to place the surveyed events within the context of the overall lionfish derby fishery as a whole.

Knight J., M. Wegener, and K. Harriger

Contributed presentation

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A Species Action Plan for the Harlequin Darter in Florida

The conservation status of the harlequin darter *Etheostoma histrio* in Florida is currently unknown. A biological review group (BRG) of experts was created to assess the biological status of the harlequin darter using criteria specified in Rule 68A-27.001, F.A.C. The Biological Status Review report determined that the harlequin darter did not meet any listing criteria. However, the BRG considered current knowledge of the population size for the species to be inadequate and recommended the harlequin darter be maintained as a species of special concern until more population demographic data can be collected. Therefore, a species action plan was created in response to a Florida Fish and Wildlife Conservation Commission (FWC) directive to evaluate all species listed as threatened or species of special concern. The goal of this plan is to determine the conservation status of the harlequin darter in Florida within 10 years. This plan developed a conservation goal that will allow FWC to determine whether this species should or should not be removed from the species of special concern list. Appropriate actions were developed and are being implemented to collect valid population demographic information for harlequin darters so that a thorough status review can be completed by 2020. Sampling for the species is currently in progress. The distribution of the harlequin darter is being updated through standardized electrofishing sampling from Florida's long-term monitoring program, and a population assessment is in progress using mark-recapture and visual survey techniques. Compiling existing knowledge on harlequin darter distribution, habitat use, and threats will ensure that impacts to harlequin darter populations are minimized until actions are completed and their status is determined. This information must be obtained to accurately determine the harlequin darter conservation status in Florida.

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Combining mark-recapture & citizen science to evaluate seasonal dynamics of two recreational fish species.

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. Using a combination of mark-recapture and angler citizen-science, we assessed variation in apparent survival across multiple wet/dry seasons for largemouth bass and common snook. Program MARK was used to generate and test plausible sets of survival models for both species to determine if survival differed across seasons and by species. Preliminary results indicate apparent survival for bass varied by season, with lowest survival in the dry season, while snook apparent survival did not vary by season. Results suggest that although deep-water creeks provide refugia during periods of drydown, seasonal drying is still a significant stressor on large-bodied freshwater fish. Under current hydrological conditions, seasonal disturbance plays an important role in regulating populations. However, with increased water flow due to Everglades restoration population dynamics may shift to more density-dependent controls.

Martin, S., R. Gorecki, and M. Davis

Contributed presentation

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Distribution, abundance, and habitat of three pipefish species (*Syngnathus*) in Florida

In Florida, pipefishes of the genus *Syngnathus* are considered "species of greatest conservation need" due to their dependence on declining seagrass habitats. We documented the distributions, relative abundances, and habitat associations of three species of pipefish (*Syngnathus floridae*, *S. louisianae*, and *S. scovelli*) using Fisheries Independent Monitoring (FIM) program data collected from 2001-2010 from six Florida estuarine areas: Apalachicola Bay, Cedar Key, Tampa Bay, Charlotte Harbor, St. Johns River, and Indian River. The three species of *Syngnathus* were found in all six estuarine areas, but mean abundances varied among areas. *Syngnathus scovelli* was more abundant in more southern estuaries, and *S. floridae* was not common in east coast estuaries. We examined habitat use and availability by gear type (21.3-m seines and 6.1-m otter trawls) in each bay using catch per unit effort (CPUE). Habitat suitability

analyses were based on salinity, depth, percent cover of submerged aquatic vegetation (SAV), SAV types, bottom type, pH, dissolved oxygen, and water temperature. Habitat suitability varied greatly among all three species of pipefish and among the six sampling areas. Habitat suitability varied more for pipefish collected with otter trawls than for those collected with seines. For pipefish collected in seines, habitat suitability was higher with high percent cover of SAV, but this trend was unclear in trawl data.

Martin, A.¹ and B. Thompson²

Tag Team Symposium presentation

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Bass Regulation Review: Research and Management Working Together

Harvest regulations for largemouth bass in Florida have not been comprehensively reviewed in over 20 years. As a result of implementing the Florida Fish and Wildlife Conservation Commission's Black Bass Management Plan, a team was established to conduct a comprehensive review of bass regulations in Florida and make a recommendation on whether to keep the current regulations or propose a change. The regulation review team consists of both members of the Division of Freshwater Fisheries Management (DFFM) and the Fish and Wildlife Research Institute's (FWRI) Freshwater Fisheries Research section. The team began by setting a goal and desired future conditions. Current bass regulations were reviewed and the team investigated potential regulation changes by considering biological and social components of the regulations. Biological information such as size structure, growth rates and exploitation rates were analyzed to guide discussions and potential regulations in the review process. However, the largemouth bass fishery in Florida is largely catch and release and the outcome would be heavily influenced by human dimensions information. To develop a human dimension strategy for the review, the team consulted the expertise of a University of Florida professor. The necessary stakeholder information was gathered through a series of efforts to inform the public, distribute surveys, and conduct open house meetings across the state. The human dimensions component of the review was led by the team members from DFFM while the biological data analysis and modeling was lead by team members from FWRI. The use of the varied skill sets of management and research members produced a quality review of regulations and a recommendation for change. Discussions have also generated new research questions and projects that will help managers make future decisions regarding bass management in Florida.

Matthews, M.¹, and N. Trippel²

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Research and Management working together to promote and conserve the Florida bass and Florida's prized bass fisheries.

Florida is home to a unique species of black bass, the Florida bass (FLB), *Micropterus floridanus*. It is desirable to anglers due to fast growth rates and the large size obtained by the females. These traits have made FLB one of the most popular freshwater gamefish in the world. Although most FLB populations are not at risk of being overfished in Florida, degrading habitat quality and quantity, has reduced young-of-the-year recruitment in many fisheries. Stock enhancement is a widely used management tool applied for the purpose of improving the quality of recreational fisheries. Determining the effectiveness of supplemental stocking of FLB in low recruitment populations became a high management and research priority for FWC in the 1990s, which led to the construction of the Florida Bass Conservation Center (FBCC). Research conducted over the last ten years at the FBCC has lead to improved: incubation techniques for egg hatching mats leading to higher hatching rates, new fungus treatment protocols for eggs, an artificial pellet feed developed specifically for FLB, intensive culture protocols for production of high numbers of advanced fingerlings, stocking approaches, raceway spawning techniques on mats, genetic conservation through the use of genetic management units, genetic tracking of hatchery offspring, insights on behavior of newly stocked advanced fingerlings, reduction of domestication effects prior to stocking, and a greater understanding of the benefits of stocking fingerlings and advanced fingerlings. The outcome to this team effort has produced hatchery rearing and stocking protocols that allow management to almost "tailor" make bass to fit each individual enhancement project. Fish populations and anglers will benefit from these continuing efforts to determine stocking approaches for FLB in differing lake types throughout the state of Florida.

Mille, K.¹, J. Dodrill¹, R. Turpin², and W. Horn¹

Poster presentation

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Reef fish sampling, PCB analysis results and visual monitoring associated with the Oriskany Reef, a decommissioned former Navy aircraft carrier sunk in 2006 as an artificial reef in the Northeastern Gulf of Mexico off Pensacola, FL.

The Oriskany Reef, a decommissioned US Navy aircraft carrier, was deployed by the U.S. Navy in May 2006 in the Gulf of Mexico, 23.5 nm southeast of Pensacola, Florida as an economically valuable fishing and diving enhancement. As a cost-saving measure during vessel preparation,

the Navy requested and received from the US Environmental Protection Agency (EPA) a risk-based polychlorinated biphenyl (PCB) bulk product waste disposal permit. Supported by extensive modeling studies, the permit authorized an estimated 722 pounds of non-liquid PCBs distributed in wiring, insulation, paint and gaskets to remain onboard the vessel when sunk as an artificial reef at a depth of 212 feet.

In compliance with the monitoring requirements of the permit, we collected 408 legal size reef fish between December 2006, and April 2013 for skin-on lateral muscle fillet analysis of 209 PCB congeners. Initially the mean total PCB level across targeted species collected from the Oriskany Reef within the first two years had combined values exceeding the EPA screening value of 20 ppb. By sample round 5, collected at 2.9 years, the mean total PCB level decreased to below the EPA screening value and remained low through sample round 10, 5.9 years after sinking. The downward trends of red snapper mean total PCB levels to below screening levels and the consistently low vermilion snapper mean PCB levels presently did not result in fish consumption advisory actions. The remaining analyzed species (triggerfish, groupers, porgy) represent too few specimens sampled with too great a PCB variability among individuals of the same species to take any species specific fish consumption advisory action.

Recommendations for future artificial reef vessel selection and preparation in compliance with environmental standards are critical factors to be included for vessel artificial reef budgeting and planning.

Lindberg, W. J.¹, J. Dodrill² and K. Mille²

Symposium presentation

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Partnering Research and Construction: Rationale and Evaluation of an Artificial Reef System Designed for Enhanced Growth and Survival of Juvenile Gag, *Mycteroperca microlepis*

The Steinhatchee Fisheries Management Area (SFMA) is a federally permitted, large-area artificial reef system in the northeastern Gulf of Mexico, designed and constructed to test a bottleneck hypothesis for juvenile gag. Gag have a spatially stage-structured life history, with juveniles (ages 1-4) occupying patch reefs on the shallow continental shelf. Prior experiments demonstrated density-dependent habitat selection and growth, with the tension between mortality risk and growth potential with preference for higher quality habitat providing shelter from natural predation at the expense of more rapid growth. The SFMA is 259 km² on the shallow shelf, enhanced with 500 “conservation reefs” designed and randomly distributed to improve growth rates and survivorship of juvenile gag. The SFMA is not a “no-take marine protected area”. Instead, locations of small conservation reefs are not publicly known, which in combination with small reef size and wide dispersion is a passive constraint on directed fishing. The evaluation plan involves monitoring reefs offshore that bracket the region, a tagging study and comparisons of gag growth and mortality rates between the SFMA and adjacent, unenhanced shelf areas. Those parameter estimates will be inputs for spatial modeling of habitat effects on gag population dynamics.

Muller, R. and R. Gandy

Tag Team Symposium presentation

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Florida's Stone Crab Fishery: An Iterative Approach to Assessment and Research

The stone crab fishery started from a small cottage industry and developed to prosecute the fishery with 1.3 million plastic traps, with a large network of harvesters, buyers and sellers. During the development of this industry, science and assessment were cultivated to be iterative. Research was developed to anticipate the needs of the assessment and the assessment made research recommendations. This fishery is unusual in that the crabs are not killed when legal-sized claws are removed; however, that requirement limited the scope of the first benchmark assessment, developed in 1997, to landings and a scattering of life history information. Subsequent assessments led to a 2002 trap limitation program that generated funds to start a fisheries independent monitoring program in 2005. The monitoring program was designed to gather information for recruitment indices, catch composition, and on population dynamics. Assessments through 2011 remained limited to effort based conclusions of overfishing because the fishery lands only the claws and knowing the quantity of claws landed does not provide information on the number of crabs caught, the sex of the crabs, or the size of the crabs. With nine years of fishery-independent data along the west coast and various targeted studies, we are currently examining the relationship between claws harvested and numbers of crabs impacted by the fishery, survival rates of declawed crabs, stock recruitment relationships, and impact of disease on natural mortality estimates. Initial investigations into the development of indices from these fishery independent data suggest that the recruitment index is a good predictor of the harvest of claws three years later. Further validation of additional indices would provide a foundation for the development of more dynamic models that attempt to establish biological reference points.

Murphy M. and S. K. Lowerre-Barbieri

Tag Team Symposium presentation

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Red Drum Spawning Stock: Assessment and Ecology

Red drum supports one of the largest and most popular fisheries in the southeastern United States. Historically, annual landings in the Gulf of Mexico (GOM) varied between 1 and 3 million pounds until the mid 1980s, when the "blackened redfish" craze resulted in a huge demand for commercially caught red drum and regional inshore landing statistics documented high fishing mortality on juvenile and sub-adult red drum. Concern of recruitment over-fishing lead to federal waters in the GOM being closed to harvest for both commercial (1987) and recreational (1988) sectors and have remained closed since. In its latest assessment, the GOM red drum stock was classified as "overfished" but the assessment was limited, in large part, by

the lack of data for the offshore adult population, stemming from the federal closure of the adult fishery. Red drum spawning populations off Southwest Florida have been sampled in 1996-1998, 2006-2009, and in an on-going study started in 2012. In the ten year period between initial studies, age distributions became more extended, with increasing numbers of fish older than 14. The objective of on-going research is to improve our estimates of red drum spawning stock abundance and structure using a genetic tag/recapture approach, in conjunction with biotelemetry and aerial surveys. A total of 5,200 adult red drum have been sampled in the past two years by purse seine: three red drum spawning aggregations in 2012 and six in 2013. Fish were assessed for size, reproductive state, and genetics. An additional 100 fish have been implanted with acoustic tags and a receiver array developed off Tampa Bay and another off of Charlotte Harbor to evaluate connectivity between these nearshore spawning sites.

Pouder, B.¹ and D. Dutterer²

Tag Team Symposium presentation

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Evaluation of the potential use of minimum length limits for the Black Crappie fishery at Lake Istokpoga, Florida

Lake Istokpoga's Black Crappie fishery has historically been viewed as one of the top crappie fisheries in Florida. In recent years, organized angler groups have voiced concern to fishery managers within the Florida Fish and Wildlife Conservation Commission (FWC) that the quality of the crappie fishery was in decline. These stakeholders suggested that overfishing was occurring and that a minimum length limit was needed to regulate exploitation. To evaluate the risk of overfishing and possible regulation measures, reduced uncertainty for several key population and fishery parameters was needed. During 2011 and 2012, FWC researchers and managers implemented a reward-based tagging study to measure annual angler exploitation rate and a vulnerability-to-harvest schedule for the population. Additionally, we measured size and age at sexual maturity for female crappie. These projects enabled us to tune age-structured population models more specifically to the Lake Istokpoga crappie fishery. Model results suggest that the fishery is not currently experiencing recruitment or growth overfishing; however, the potential for recruitment overfishing is realistic if our measurement of exploitation was erroneously low or if annual exploitation were to increase from 20 to 40%. The requested 10-inch minimum length limit would effectively eliminate the threat of recruitment overfishing, but anglers would likely sacrifice a fraction of total harvest – possibly unnecessarily. These tradeoffs will be presented to stakeholders, and their opinions will be taken into consideration in the decision of whether or not to move forward with a new harvest regulation.

Rehage, J. S.¹, J. A Lee¹, R.E. Boucek¹, and D. A. Gandy²

Contributed presentation

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Assessing the quality of drydown habitat for Everglades fishes: coastal natural vs. wetland artificial?

Understanding both the behavioral drivers and the spatial implications of animal movement is a longstanding core theme in community ecology. In tropical pulsing systems such as the Florida Everglades, seasonal hydrology creates a temporally-variable habitat mosaic that influences patterns of animal abundance and distribution across both coastal and freshwater habitats. In response to this seasonal variation in habitat availability, fish move into deeper habitats, but little is known about their relative quality. We compared the quality of coastal mangrove creeks and inland manmade canals as drydown habitats for key mesoconsumers, known to use both habitats during the dry season (largemouth bass and bowfin). In creeks, we also compared the performance of these mesoconsumers to that of estuarine common snook. We assessed variation in patterns of abundance, size distribution and body condition, as well as their movements and distribution within each habitat. Boat electrofishing and PIT tagging mark-recapture techniques were used to sample fishes in both habitats over three years. Numbers of bass and bowfin were higher in canals, but condition was higher in creeks. Size distribution and movement rates also varied, with a greater contribution of juveniles and smaller individuals in canals. In creeks and at the peak of the dry season, freshwater mesoconsumers were two to five times more abundant than snook. Results suggests tradeoffs in habitat quality that likely influence the movement decisions of fishes, and highlight the importance of refuge habitats to population dynamics in pulsing systems, a role that may be increasingly important in the face of anthropogenic hydrological disturbance. Our findings also emphasize the importance of animal movement and spatial processes in driving ecological patterns across varied landscapes. We discuss results in the context of climate change (i.e., sea level rise in coastal creeks), and implications for recreational fisheries.

Hill, J., J. Ritch, Q. Tuckett, K. Dowling, L. Lawson Jr.

Contributed presentation

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Preliminary Quantitative Analysis of Fish Diversity in Canals of the Seminole Reservation

The Big Cypress and Brighton Reservations of the Seminole Tribe of Florida are located near Lake Okeechobee of south Florida. Adjacent areas of south Florida have a high diversity of non-native fishes of tropical origin which are rarely captured in the rest of the state. Access to fishery resources is typically restricted to Tribal members; thus, little is known outside the Tribe about the composition of both native and non-native fishes in this area. Following an invitation to sample fish by the Seminole Tribe, we quantitatively sampled both reservations in mid-August

2013. We used boat electrofishing on 12 canals (two, 10-minute transects per canal) to understand the composition and size structure of both native and non-native fishes. In the total 240 minutes of sampling, 1,677 fish were captured totaling 216,292 g with a species richness of 30 (23 native, 7 non-native). Native fishes dominated the fish assemblage and included most species known to occur in the region. Of the 23 native species, 6 are classified as sport fish. These fish in order of number abundance included Bluegill, Largemouth Bass, Redear Sunfish, Warmouth, Spotted Sunfish and Black Crappie. Sport fish accounted for 79.6% of the fish collected and 64.7% of the total biomass. Culturally important species such as Bowfin, Florida Gar, and Longnose Gar were common (5.7% of fish collected, 20.3% of total biomass). The non-native fishes in order of number abundance included Sailfin Catfish, Spotted Tilapia, Blue Tilapia, Brown Hoplo, Walking Catfish, African Jewelfish and Mayan Cichlid. Non-native fishes accounted for 2.6% of the fish collected and 7.3% of the total biomass. Canals in this region have a lower density and diversity of non-native fishes than expected. This result was found despite the close proximity to source populations of non-native fishes in canals of south Florida.

Schaefer, A. and B. Thompson

Contributed presentation

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Utility of game cameras to estimate angler effort on a large Florida lake

Freshwater fisheries biologists interested in collecting catch, effort, and success data traditionally utilize roving or access creel surveys. However, these survey methods may incur high labor and fuel costs, allowing managers to only survey “marquee” fisheries; leaving little information on small water bodies or low effort systems. Motion activated cameras originally developed for use by hunters and wildlife biologists to monitor game animal activity are an attractive option for monitoring fishing effort due to low operating cost. Lake Apopka is a large (12,464 ha) degraded system that receives low angler effort and has only four primary access points. A large scale restoration project is underway on Lake Apopka and there is a need to monitor long term trends in angler effort. In this study we used infra-red sensing cameras placed at access points and a traditional roving creel survey to compare estimated angler effort and cost between the two methods. Total effort estimates for the peak season (December through April) were $5,447 \pm 649$ hours (mean \pm SE) and 6,220 hours for the roving creel and camera census, respectively. Labor was approximately 300 man hours for the roving creel and 130 man hours for the camera census. Our results show that cameras may be a cost effective method to estimate angler effort on select systems with low effort and minimal access points.

Smith, A. B.¹ and B. L. Winner²

Contributed presentation

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Spatiotemporal distribution, relative abundance, and habitat utilization of the bluntnose stingray, (*Dasyatis say*), within select Gulf and Atlantic estuaries of Florida.

The bluntnose stingray (*Dasyatis say*) is one of the most abundant species of Dasyatid ray in the northern Gulf of Mexico and the western Atlantic; however, its distribution and abundance has been insufficiently documented in Florida waters. Ecologically, bluntnose stingrays are important components of the marine food web, primarily consuming infaunal and benthic invertebrates and demersal teleosts. They are also a major dietary component of some coastal shark species. Long-term (1990-2012) fisheries-independent monitoring data, collected using seines and trawls, from seven major estuarine systems along Florida's Gulf and Atlantic coasts were analyzed for trends in spatiotemporal distribution and relative abundance of *D. say*. Overall, 6,759 *D. say* were collected (53,995 net sets, all gears combined) from the seven estuarine systems over a 22 year period. A broad size range of *D. say* was collected in all estuaries, ranging from 46 to 1,090 mm disk width (DW). Sex ratios of *D. say* were variable among gear types and estuaries, with males more prevalent in trawls and females more prevalent in haul seines. Recruitment of young-of-year rays (~ 200 mm DW) typically occurred during early summer months (May – July), with some latitudinal variation among estuaries. Spatially, *D. say* were prevalent in all estuaries; found near river mouths, throughout the bay, and along nearshore coastal shorelines. Although *D. say* were present in most estuaries year-round, temporal abundance in higher latitudes was restricted to late spring and summer months, possibly due to their water temperature preference of > 19 °C. Although annual catch rates of *D. say* have been typically low (< 1 ray/haul) in most estuaries, long term trends have been variable. Future quantitative analyses will incorporate an array of physiochemical and habitat variables, collected at the time of capture, in order to ascertain any correlation between *D. say* abundance and these parameters.

*** Smith, G. and D. Murie**

Student • Contributed presentation

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Pike Killifish Predation on Juvenile Snook

Pike killifish is an established non-native fish species in Florida that is found in both fresh and estuarine waters. It was first established in south Florida in 1957 with a secondary establishment occurring in the Tampa Bay area in 1994. Negative ecological impacts, related to decreases in small-bodied fish abundances, have been linked to pike killifish in both of these regions. Recent increases in the range and abundance of pike killifish in Tampa Bay and overlap in habitat usage has led to concerns about potential competition with, and predation on, early-juvenile common

snook (<100 mm SL). Predation of pike killifish on early-juvenile snook was investigated through stomach content analysis and predation trials. Predation trials consisted of presenting fasted, large adult (>90 mm SL) pike killifish a potential prey item and recording whether the prey item was alive, had been attacked, or had been consumed after approximately 48 hours. Prey items consisted of snook, snook with their anal spine removed, mosquitofish, and pike killifish over several size ranges. Preliminary analysis of pike killifish stomach contents and predation trials suggest that large adult (≥ 90 mm SL) pike killifish are capable of consuming snook up to approximately 50 mm SL in lab conditions, but in the wild they may rarely consume snook (no snook found in 128 pike killifish stomachs examined to date). Predation trials also showed that mosquitofish, regardless of size, were always preyed upon significantly more than snook, which indicated that snook were either a less preferred prey or that snook possessed some feature(s) that reduced pike killifish predation. However, it does not appear that the snook's enlarged anal spine significantly deters pike killifish predation as there was no significant difference in the predation rates of similar-sized snook with and without their anal spine removed.

Strickland, A.¹ and C. Paxton²

Tag Team Symposium presentation

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The Regulation of Largemouth Bass on Lake Jackson, FL...How to Implement a Rule Change

We present biological and human dimensions data used to develop a regulation change for bass fishing on Lake Jackson, Leon County, FL. Lake Jackson, a 4,000 acre lake, is a shallow water body with an average depth of 7 feet. Historically Lake Jackson has fluctuating water levels and is known for periodic, naturally occurring dry-downs where the lake de-waters through natural sinks. In 2000, an 18-inch minimum size limit regulation for bass was implemented to protect largemouth bass fingerlings that were stocked. Since 2000, the lake level has fluctuated but always supported an abundance of bass due to high recruitment and abundant aquatic vegetation. Length-frequency data from long-term monitoring samples indicated that approximately 90% of the largemouth bass population was less than 18 inches in total length. An angler attitude survey in 2011 indicated that 61% of anglers were not satisfied with the regulation of an 18" minimum size limit. Ninety-six percent (96%) of anglers preferred changing the regulation to some form of a maximum size limit from 15 to 17 inches total length. Consequently, in September 2013, a 16" maximum size limit for bass was implemented on Lake Jackson. Angler harvest and attitudes will be evaluated in spring of 2014.

Struve, J. and K. Lorenzen

Poster presentation

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What do passive acoustic telemetry data reveal about fish movement?

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 also hold clues about the spatial differentiation of local fish populations. However, the information content of passive acoustic telemetry data is difficult to assess. While the data are often numerous at short time scales, they also typically display large gaps at time scales required for long-term population management. We explore movement indicators derived from passive acoustic telemetry data at different time scales and examine their functional relationship using movement models based on random walk. We examine the trade-off between the number of movement observations available at different time scales and the ability of such observations to reveal management relevant long-term displacement and residence behavior using an example data set of acoustically tagged common snook (*Centropomus undecimalis*) from Sarasota Bay. Estimates of the annual displacement rate obtained from movement observation at shorter time scales suffer from bias that reduces with increasing length of the observation period. Long-term recordings provide better estimates, but the probability of observing long-term displacement is low. We discuss the effect of uncertainty in the annual local movement rate within a spatially explicit population assessment tool for snook. Our analysis has important consequences for the design of telemetry studies and for the assessment of local populations that are heavily influenced by estimated movement rates.

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Contributed presentation

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Impacts of angling for nesting Florida Bass, *Micropterus floridanus*, on nest success and recruitment

Nesting black bass *Micropterus* spp exhibit parental care during the spring spawning season. Anglers often intentionally target black bass that are guarding nests. Previous studies of largemouth *M. salmoides* and smallmouth bass *M. dolomieu* have shown that catching fish off of nests will increase predation of eggs and larvae, which can reduce individual nest success. Little work has been done evaluate whether this indirect fishing-associated mortality could influence

population level recruitment and no work has been done to look at impacts bed fishing has on Florida bass *M. floridanus*. During this study, nine replicate ponds were stocked with adult Florida bass, forage fish, and nest predators, and brush piles and vertical structure were placed into the ponds to simulate a natural system. Ponds were snorkeled every other day throughout the spawning season to track nest success and abandonment. In five of the ponds, every nest located was angled. Angled fish were held in a cage within the pond for one hour before being released back into the pond. No angling was conducted on the other four control ponds. Nests were considered successful if swim up fry were observed. Nest success rates were 52% for fished ponds and 45% for unfished ponds. Off the fish caught off of nests, 50% returned to that nest and ended up with swim up fry. Ponds were drained nine months after stocking in order to compare young-of-the-year recruitment between fished and unfished ponds.

Tuckett, Q. M., J. R. Ritch, K. M. Dowling, L. L. Lawson Jr., and J. E. Hill

Contributed presentation

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Local Adaptation of Chronic Lethal Minimum Temperature in Naturalized and Farm-Raised Non-Native Green Swordtails

The distribution of non-native fish in Florida is thought to represent the outcome of a match between the habitat and the traits of an organism. Thermal tolerance, in particular, is one of the dominant organismal traits limiting the establishment and persistence of non-native fish in Florida. Lost in the details, perhaps, is the dynamic nature of both organism and environment. For example, recent evidence suggests evolutionary processes can occur on human time scales, significantly affecting organismal traits, perhaps even altering thermal tolerance in fishes. Further, climate change may alter the thermal landscape. In this study we ask: can local adaptation of non-native fish alter lower temperature tolerance? We chose to address this question using green swordtails (*Xiphophorus hellerii*), a commonly released ornamental fish originating from Central America with potentially locally established populations. Seven populations (Thailand farm raised, 2 Florida farm raised, 2 interior Florida and 2 coastal Florida populations) were purchased or wild caught, transported to the lab, acclimated at a common temperature and then tagged with visible implant elastomer. Forty fish from each population were haphazardly assigned to 1 of 6 experimental tanks or 1 of 2 control tanks. Stocking density was 5 fish per population per tank. Highly variable chronic lethal minimum temperatures (CLmin) were found for individual fish, ranging from 5.5 to 11.3 °C. Significant population differences were found. Wild caught populations (range 6.1 to 7.1°C) exhibited lower CLmin than farm raised populations (7.9 to 8.0 °C) and were nearly 50% lower than imports (8.9 °C). The two interior populations exhibited lower CLmin than the coastal populations. Females had lower average CLmin than males (7.1 vs. 7.6 °C). These results suggest thermal adaptation could be an important pathway promoting persistence of non-natives. Further, contemporary physiological adaptation to subtropical temperatures could increase the probability of non-native species establishment.

Vecchio, J.¹, P. Ritter², Z. Schobernd³

Poster presentation

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Using Current Fishery-Independent Techniques to Inspire Students

One way to ignite student imagination is to create labs which utilize modern research techniques. Labs which employ out-dated techniques and have predictable outcomes often fail to spark scientific curiosity or inspire creativity in students. The NOAA Teacher-At-Sea program places classroom teachers aboard NOAA research cruises in an effort to bring current research and monitoring efforts alive in the classroom. During August 2013, two secondary school science teachers participated in a Southeast Fishery Independent Survey (SEFIS) cruise aboard the NOAA Ship *Pisces*. During this cruise, the scientists and teachers developed a novel high school-level lab utilizing SEFIS video data and the mean-count video analysis method. During the lab, students count two common species [tomtate (*Haemulon aurolineatum*) and gray triggerfish (*Balistes capricus*)] once each minute for a total read time of twenty minutes. Students then calculate mean number per species on their video. They also combine data for the entire class and calculate a variety of statistics for the global dataset. In this lab, students learn how to create questions and manipulate data through the use of modern research techniques. In order to inspire the next generation, the current generation of working scientists must collaborate with educators to create lessons that utilize modern techniques, include open-ended questions, and get students genuinely involved in the scientific process.

*** Wallace, A., D. Hollander, and E. Peebles**

Student • Contributed presentation

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Stable isotopes in fish eye lenses as internal recorders of geographic site fidelity and movement

We evaluated eye lenses as potential recorders of isotopic histories because they are deposited in concentric circles, much like otoliths and tree rings, and because they are chemically-inert after deposition. We conducted four different stable-isotope tests on eye lenses from Red Snapper, Red Grouper, Gags, and White Grunt. The first test was a low-resolution comparison of multiple individuals from each species (4-6 sections per lens). Red Snapper and Gags were isotopically the most variable across the radial measurement of the lens, suggesting broad-scale isotopic changes over time. Red Snapper individuals separated into two distinct groups with respect to $\delta^{15}\text{N}$ and Gags separated into two groups based on $\delta^{13}\text{C}$. Two Gags with the greatest variation were chosen for high-resolution temporal analysis using their second eye lenses. The first-order patterns from the high-resolution analysis mimicked those from the low-resolution analysis but identified early-life-stage details that were not apparent in the low-resolution test. For the third test, left- versus right-eye variation was compared via high-resolution methods. The White Grunt's left and right eye radial isotopic patterns for both $\delta^{15}\text{N}$ and $\delta^{13}\text{C}$ were almost identical,

suggesting the earlier variations observed among individual fish were not artifacts. The final test evaluated intra-laminar variation. Multiple samples were analyzed from different spots within the same lamina. Seven laminae from several different species were analyzed and no significant difference within laminae was found. However, if minor variation did occur within laminae, the magnitude of intra-laminae changes was as small as differences between left and right lenses. Eye lenses show promise for reconstructing the isotopic histories of individual fish, and these histories can be compared with regional-scale isoscapes to reconstruct individual site-fidelity, migration and trophic-level histories.

Wegener, M., J. Knight, and K. Harriger

Contributed presentation

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Movement and Habitat Use of Alligator Gar in Escambia River, Florida

The population status of alligator gar *Atractosteus spatula* in Florida is currently unknown, but is thought to be declining throughout its historical range. Harvest of this species in Florida was prohibited in 2006; however abundance estimates are needed to assess this suspected decline in population size. Therefore, a project was initiated to examine habitat use, movement, and home range of alligator gar in the Escambia River. Twenty-two alligator gar (TL range: 93 to 190 cm) were captured in gill nets and tagged with external transmitters. Long-term movement and habitat data were collected by active day-time tracking and passive tracking via fixed station receivers. Arrays of fixed station receivers collected data continuously for 24 hours and were used to estimate short-term movement and habitat information. Preliminary findings indicate alligator gar tend to use main-stem river habitat during the daytime period in summer months. Conversely, alligator gar use oxbow habitat at night during the summer months and spend most of their time in this habitat during winter months. Movement appears to be related to surface water temperature and season. Alligator gar move little during winter, but become highly mobile during late spring and summer. Understanding movement patterns and habitat use could lead to increased catch; making an accurate estimate of abundance possible. This information will be helpful in assessing the status of alligator gar in Florida and ultimately re-evaluating the current regulation.

Wiley, C. and W. Poudier

Poster presentation

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Use of relocated adult largemouth bass following renovation of Edward Medard Reservoir

Edward Medard Reservoir is a 312 ha impoundment located in Hillsborough County. The reservoir was dewatered during November 2009-December 2010 to allow for repairs to the dam structure. During the peak of the drawdown, DFFM personnel renovated the remaining water in

the reservoir using rotenone to remove the relatively high biomass of exotic and rough fish species. Sportfish were stocked following refilling of the reservoir to begin the reestablishment of the sport fishery, including largemouth bass. Feedback from the public indicated a desire to return the largemouth bass fishery in Medard Reservoir to pre-drawdown conditions. To address this need, 6,643 adult largemouth bass from connecting waterbodies were relocated to Medard Reservoir during late spring 2012. Standardized electrofishing conducted during spring 2013 collected largemouth bass at a rate of 0.95 bass/min. Of the 399 largemouth bass collected, 137 (34%) were identified as relocated fish from Hillsborough Reservoir. Relocated fish accounted for 77% of the fish \geq 406 mm. Volunteer anglers were recruited to assist with documenting relocated largemouth bass in their catch. Of the 70 bass documented by these volunteer anglers, 48 (69%) were relocated fish. In the short-term, relocation of adult largemouth bass provided a method for quickly returning a largemouth bass fishery in a public resource to pre-renovation conditions.

Notes/Comments about meeting

