42nd Annual Meeting of the

Florida Chapter of the

American Fisheries Society

April 5th –7th, 2022

FFA Leadership Camp

Haines City, Florida

The Florida Chapter of the American Fisheries Society

Chapter Officers

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President-Elect: Chelsey Crandall, FWC
Past President: Bob Heagey, FWC
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Webmaster: Jason O'Connor, FWC
Newsletter Editor: Kyle Miller, FWC
Raffle Co-Chairs: Amanda Croteau, UWF, & Chelsey Crandall, FWC
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 (retired)
Meeting Logo Design: Wray Gabel, FWC

Special thanks to

Symposium participants & all presenters

All moderators & judges

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42nd Annual Meeting of the Florida Chapter American Fisheries Society
April 5-7, 2022

FFA Leadership Camp, Haines City, Florida

Tuesday, April 5rd

8:30am – 9:00am	Workshop registration
9:00am – 12:00pm	Workshop: Critical Thinking and Problem Solving
12:00pm – 1:00pm	Lunch for workshop participants
11:00am – 6:00pm	Meeting registration
1:20pm – 1:30pm	Welcome and Announcements
1:30pm – 5:00pm	Contributed Papers
6:00pm – 7:00pm	Dinner
7:00pm – 8:00pm	**Formal Poster Session**
	Followed by BONFIRE SOCIAL

Wednesday, April 6th

7:00am – 8:10am	Breakfast
7:00am – 6:00pm	Registration
8:10am – 8:15am	Announcements and Welcome
8:15am – 9:35am	Contributed Papers
9:50am – 12:00pm	**Symposium: *Fisheries in a Changing Climate***
12:00pm – 1:00pm	Lunch
1:00pm – 2:55pm	**Symposium: *Fisheries in a Changing Climate***
3:00pm – 4:00pm	Student Subunit Meeting
4:00pm – 5:00 pm	**Chapter Business Meeting & Award Presentations**
	Student Awards: *Travel and Roger Rottmann Scholarship*
	Professional Awards: *Rich Cailteux Award*
6:00pm – 7:00pm	Dinner
7:30pm	RAFFLE, AUCTION & BONFIRE SOCIAL

Thursday, April 7th

7:00am – 8:10am	Breakfast
7:00am – 9:00am	Registration
8:10am – 8:15am	Announcements and Welcome
8:15am – 11:55am	Contributed Papers
12:00pm – 1:00pm	**Lunch & Awards presentation:**
	Best Papers/Best Posters
	Power Tie
	Lampshade Awards

Tues. AM

Day-By-Day Agenda – 42nd Annual Meeting, 2022 - Florida Chapter American Fisheries Society

Tuesday, April 5th

8:30am-9:00am Workshop Registration
9:00am – 12:00pm Workshop: Critical Thinking and Problem Solving
12:00 pm 1:00pm Lunch for workshop participants

Tues. PM

11:00am-6:00 pm Registration

1:20pm – 1:30pm **Welcome: Daniel Nelson, Chapter President**

Contributed Papers 1 **Moderator: Nick Trippel, FWC**

1:30pm -- Lange, T., N. Trippel, J. Beaulaurier, L. Grove. What the Clip?! Assessing the Effect of Cull Clips on Mortality, Behavior, and Physiology of Largemouth Bass.

1:50pm – *Rodemann, J., R. Santos, W. James, J. Rehage. Finding a home in a fragmented world: Multi-scale habitat selection of Spotted Seatrout in an area of seagrass recovery.

2:10pm -- *Hutchins, S., B. Gemmell, M. DiMaggio. Using Acute Stressors to Suppress Escape Responses of Two Marine Copepods: Oithona colcarva and Parvocalanus crassirostris.

2:30pm – Break

Contributed Papers 2 **Moderator: Jordan Massie, FIU**

2:45pm – *Schieber, J., D. Fahy, J. Carlson. Age and growth of the yellow stingray (Urobatis jamaicensis) in Southeast Florida.

3:05pm – Lindelien, S., J. O'Connor, A. Dutterer, P. Schueller, K. Bonvechio. Evaluating the effects of dorsal spine ageing error on Largemouth Bass population metrics.

3:25pm – Williams, K., A. Trotter, J. Carroll. Using daily growth estimates of juvenile fish to address contemporary issues of habitat restoration and species range expansions.

3:45pm – Break

Contributed Papers 3 **Moderator: Matt Cleary, FWC**

4:00pm – Trotter, A., K. Williams, P. Stevens, C. Purtlebaugh, M. Allen. Reproductive Dynamics of Common Snook in a Range Expanding Population in the Northern Gulf of Mexico.

4:20pm – Froeschke, B., J. Froeschke. Distribution, habitat associations, and fishery characteristics of Wenchman (Pristipomoides aquilonaris) in the Gulf of Mexico.

*Student Presentation, Presenter

4:40pm – Rogers, M. How to be unsuccessful and dismal.

5:00pm – Break

6:00pm – 7:00pm **Dinner**
7:00pm – 8:00pm **Formal Poster Session** (Beverages and snacks in the poster area)
Followed by BONFIRE SOCIAL

*Student Presentation, Presenter

Poster Session (7:00pm – 8:00pm)
(In alphabetical order by presenting author)

*Allen, K., K. Lewis, J. Garwood. Effects of changing salinity regimes on a northern Gulf of Mexico estuarine food web.

Croteau, A., H. Gancel, J. Caffrey, J. Wells. Using the Past to Inform Future Management of Perdido Bay, Florida, USA.

*Fox, C., J. Boyer, A. Durland, G. Langford, M. Langford. Mapping the Spatial Patterns of the Elasmobranch Community Throughout Hillsborough Bay, Florida

Freedman, J., J. Ferrante, W. Daniel, M. Neilson, M. Hunter. Integrating eDNA Data into the Nonindigenous Aquatic Species Database

*Ghegan, D., E. Wilse, J. Gelsleichter, Amy Hirons, D. Kerstetter. Mercury Accumulation and Trophic Position of a Dominant Mesopredatory Fish Family (Alepisauridae) and Prey in the Pelagic U.S. South Atlantic Bight

*Hall-Scharf, B., Q. Tuckett, P. Stevens, J. Patterson, J. Hill. Some Like it Hot: Thermal Tolerance of Common Snook Centrompomus undecimalis at Three Salinity Treatments.

*Hendrickson, Z., W. Daniel, C. Martin. Identifying management gaps in the prevention of Aquatic Invasive Species for the U.S.

Howard, R., T. Lange, B. Thompson. Hypoxic Conditions Within Dense Submerged Aquatic Vegetation in a Restored Wetland

*Kappos, M., D. Renegar, D. Kerstetter. Assessment of Microplastics in South Florida Forage Fishes

*Massie, J., R. Santos, R. Rezek, W.R. James, N. Viadero, R. Boucek, D. Blewett, A. Trotter, P. Stevens, J. Rehage. Primed and Cued: Linking Interannual and Seasonal Variations in Freshwater Flows to the Spawning Migrations of Common Snook in the Florida Everglades

*Murray, C., O. Markham, N. Evans, M. DiMaggio. Investigating the ontogeny of digestive function in larval Chinese algae eater (Gyrinocheilus aymoneiri) to inform feeding and weaning protocols

*Ray, B., C. Murray, M. DiMaggio. Development of Culture and Marking Techniques for Hogfish (Lachnolaimus maximus)

*Reuder, J., D. Kerstetter, S. Kessel. Vertical and diel patterns of adult lemon sharks (Negaprion brevirostris) around the southeastern Florida and western Bahamas coastal shelves

*Viadero, N., J. Rehage, R. Santos. Between Dry Rock and a Salty Place: How Hydrology influences the Habitat use of Florida Largemouth bass

*White, M., J. Rehage, R. James, R. Santos, R. Rezek. When worlds collide: multi-directional movement of fishes and their ecological importance

*Student Presentation, Presenter

Day-By-Day Agenda – 42nd Annual Meeting, 2022 - Florida Chapter American Fisheries Society

Wednesday, April 6th

7:00am – 8:10am **Breakfast**
7:00am – 6:00pm **Registration**
8:10am – 8:15am **Welcome and Announcements**

Contributed Papers 4 **Moderator: Kerry Walia, FWC**

8:15am – DiMaggio, M., C. Murray, G. Sowaske, T. Lipscomb, E. Groover. Experimental approaches to address bottlenecks in ornamental fish larviculture.

8:35am – Rehage, J., C. Gervasi. Bottom-Up Conservation: Using Stakeholder Knowledge to Inform Conservation Priorities for an Unregulated and Recreationally Valued Fish Species.

8:55am – Camp, E., N. Trippel. Learning more from what we're already doing: applying an active adaptive management plan to Florida's Community-based fisheries.

9:15am – Break

Symposium: *Fisheries in a Changing Climate* **Moderator: Drew Dutterer, FWC**

9:30am – Clark, H., S. Keenan, E. Weather, A. Knapp, T. Switzer. Factors influencing the temporal stability of reef fish habitats in the Eastern Gulf of Mexico (West Florida shelf).

9:50am – Stang, S., A. Strickland, M. Allen. Population Dynamics of Striped Bass Morone saxatilis in the Ochlockonee River Drainage.

10:10am – *Anderson, C., A. Carlson. Thermal habitat suitability for non-native fish in Florida's lotic systems.

10:30am – *Castillo, N., J. Rehage, R. Santos, R. James, R. Rezek, T. Brodin, G. Hellstrom, J. Fick, R. Boucek, A. Adams. Drugs in our flats: exposure of South Florida bonefish to pharmaceuticals.

10:50am – Break

Symposium: *Fisheries in a Changing Climate* **Moderator: Ed Camp, UF**

11:00am – Tabuchi, M., V. Harwood, K. Luba, R. Paperno, T. Cody. Prevalence and antibiotic resistance characteristics of the indicator bacteria, Enterococcus species and Escherichia coli isolated from coastal marine sport fish in Florida.

11:20am – Carlson, A., M. Hoyer. Redear Sunfish occurrence, abundance, growth, and size structure as related to abiotic and biotic factors in Florida lakes.

11:40am – Hazell, J., S. Hervas, K. Lorenzen. Planning for Coral Reef Ecosystem Conservation and Enhancement in the Face of Climate Change.

*Student Presentation, Presenter

12:00pm – 1:00 Lunch

Wednesday PM

Symposium: *Fisheries in a Changing Climate* **Moderator: Nicholas Castillo, FIU**

1:00pm – *Coleman, T.S., A. Carlson. Fisheries monitoring as a catalyst for cooperative research.

1:20pm – Flaherty-Walia, K. Becoming comfortable with climate conversations – learning and implementing practical techniques from the AFS Climate Fellows' program.

1:40 pm – Lorenzen, K., C. Ainsworth, S. Baker, L. Barbieri, E. Camp, J. Dotson, and S. Lester. Climate change impacts on Florida's fisheries and options for adaptation: a discussion primer.

2:00pm - Break

2:10pm – Symposium Synthesis and Discussion

2:55 – Break

3:00pm – **Student Subunit Meeting** (all students please attend)

4:00pm- 5:00pm – **Chapter Business Meeting & Awards** – everyone please attend!
Student Awards (*Travel and Roger Rottmann Scholarship*)
Professional Awards (*Rich Cailteux)*

6:00pm – 7:00pm **Dinner**

7:30pm **RAFFLE, AUCTION**
Followed by bonfire social

*Student Presentation, Presenter

Day-By-Day Agenda – 42nd Annual Meeting, 2022 - Florida Chapter American Fisheries Society

Thursday, April 7th

7:00am – 8:10am **Breakfast**
7:00am – 9:00am **Registration**
8:10am – 8:15am **Welcome and Announcements**

Contributed Papers 5 **Moderator: Natasha Viadero, FIU**

8:15am – Tuckett, Q., C. Engle, J. van Senten, J. Hill. State response to Lacey Act changes; a survey of state Aquatic Nuisance Species coordinators.

8:35am – *Perry, D., C. McGowan, E. Camp. Hatchery Rearing Optimization: Accounting for Management Objectives.

8:55am – *Murray, C., N. Evans, S. White, A. Wood, M. DiMaggio. Utilizing digestive physiology to refine larval culture protocols for the x-ray tetra (Pristella maxillaris).

9:15am – *Chong, L., E. Pienaar, E. Camp. Recreational angler preferences for red snapper fisheries management options in the Gulf of Mexico: a stated preference choice analysis.

9:35am – Break

Contributed Papers 6 **Moderator: Travis Tuten, FWC**

9:45am – Dutterer, D., P. Schueller, N. Morales. The TrophyCatch Eyeball Challenge.

10:05am– Cleary, M., R. Paudyal. Contact tracing: following a social norm's emergence among black crappie anglers in FL.

10:25am – *Markham, O., M. DiMaggio. Effects of Algal and Prey Density on Survival, Growth, and Feeding Incidence of Larval Dascyllus auripinnis.

10:45am – Break

Contributed Papers 7 **Moderator: Bob Heagey, FWC**

10:55am – *Fisch, N., L. Chong, J. Borsum, J. Granneman, D. Perry, G. Love, B. Sharf, R. Botta, Z. Siders, E. Camp. Exploring the Effect of Current and Alternative Management Actions on a Simulated Bay Scallop Fishery.

11:15am – Webb, S., E. Ault, R. Ellis, M. Ajemian, P. Stevens. Species responses to environmental fluctuations within an urbanized estuary.

11:35am – Gentry, L., D. Chagaris, L. McEachron, S. Allen. Findings of EwE South Atlantic Region Ecosystem Model Exploration of High Red Snapper Recruitment Impacts.

11:55am – Closing Remarks

*Student Presentation, Presenter

12:00pm – 1:00pm **Lunch & Awards Presentation**

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

*Student Presentation, Presenter

Abstracts for the 42nd Annual Meeting of the
Florida Chapter of the American Fisheries Society
(In alphabetical order by presenting author)

Effects of changing salinity regimes on a northern Gulf of Mexico estuarine food web
Presenter: Kira Allen *she/her*
Institution: University of Central Florida
Coauthors:
Kristy Lewis | University of Central Florida
Jason Garwood | Apalachicola National Estuarine Research Reserve

Abstract:
Apalachicola Bay, a northern Gulf of Mexico estuary known for its high degree of biological diversity and productivity, stands to face a changing salinity regime because of sea level rise and reduced freshwater inflow. Shifts in Apalachicola Bay salinity will likely impact commercially and ecologically important Gulf of Mexico fish and invertebrate species that inhabit the Apalachicola Bay estuary. These potential changes in individual species populations can thus alter the trophic structure of the entire estuarine food web. This study uses a coupled hydrodynamic and food web modeling approach to better understand the effects of altered salinity levels on the food web. The ensemble model is being used to simulate sea level and reduced river flow and demonstrate the range of temporal and spatial changes in species populations over time and space. Results from this study provide insight into how the dynamics of the Apalachicola Bay food web, and the human communities that rely on its living resources, may be affected by future shifts in the hydrology of the system.

Thermal habitat suitability for non-native fish in Florida's lotic systems
Presenter: Chris Anderson *He/Him/His*
Institution: 1Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, Freshwater Fisheries Research 2University of Florida, Florida Cooperative Fish and Wildlife Research Unit, School of Forest, Fisheries, and Geomatics Sciences, Fisheries and Aquatic Sciences Program
Coauthors:
Andrew Carlson | University of Florida, Florida Cooperative Fish and Wildlife Research Unit, School of Forest, Fisheries, and Geomatics Sciences and Department of Wildlife Ecology and Conservation

Abstract:
Climate change is a major phenomenon altering the distribution of non-native fishes and their ecological and socioeconomic impacts. The influence of climate change on water temperature has substantial implications for non-native fish distributions because it influences individual fish survival, growth, reproduction, and dispersal as well as population and community structure. Understanding water temperature variability and the effects of climate change on aquatic thermal regimes is critical for managing non-native fishes now and in the future, especially in Florida where nearly 200 non-native fishes have been documented. Despite the prevalence of

non-native fishes in Florida, water temperature dynamics are poorly understood in lotic ecosystems that are prone to non-native fish occurrence (e.g., south Florida canals, Kissimmee, Ocklawaha, and Choctawhatchee rivers). Thermal habitat research in Florida's lotic systems has not been conducted at sufficient spatiotemporal and ontogenetic resolution to predict when and where non-native fishes are likely to occur in the context of climate change. We will address these knowledge gaps by supplementing Florida's network of 200 water temperature loggers by deploying 75+ additional loggers in key rivers and canals that are not currently well-monitored. We will use water temperature data to model non-native fish survival, reproduction, recruitment, and dispersal under different climate change scenarios from 2022–2070. We will develop these thermal habitat suitability models into relevant products for non-native fish management, including predictive maps of species distribution and spread. Ultimately, our research will promote development of robust, spatially explicit programs for managing non-native fishes in Florida.

Learning more from what we're already doing: applying an active adaptive management plan to Florida's Community-based fisheries.

Presenter: Edward Camp *His/Him*
Institution: University of Florida
Coauthors:
Nick Trippel | FWC

Abstract:
Community-Based Fisheries (CBFs) is a loosely defined term that generally describes smaller water bodies (especially ponds) that emphasize public access to often denser human populations. In Florida, CBFs are believed to be especially important for sustaining recreational fisheries, since CBFs may comprise potential anglers first or only exposure to fishing, as well as reliable access to fish for those who may not have access to vessels or greater travel capacity. Active management of CBFs could lead to increase the effectiveness of CBFs, but there has been little empirical research to supporting management decision making. We developed an active adaptive management plan that empirically assess the potential effects of alternative management actions on key CBF metrics like effort and catch rate. We hypothesized how these metrics might be affected by several potential management actions including different stock enhancements and methods for advertising CBFs. We describe how following this adaptive management plan can greatly increase the information available to management decision-makers with small additional costs beyond the status-quo, non-adaptive management approach. We also describe the initial findings and discuss how their support for initial hypotheses, as well as how they can be used to develop additional hypothesis to test in the future. Finally we describe how this approach might be extended, both regionally across a greater number of CBFs, and more generally to other traditional (non-CBF) waters to yield valuable information about the return-on-investment of common management actions like stock enhancement.

Redear Sunfish occurrence, abundance, growth, and size structure as related to abiotic and biotic factors in Florida lakes

Presenter: Andrew Carlson

Institution: University of Florida, Florida Cooperative Fish and Wildlife Research Unit
Coauthors:
Mark Hoyer | University of Florida, LAKEWATCH Program

Abstract:
Panfish support popular, socioeconomically valuable fisheries across the United States. Whereas Bluegill (Lepomis macrochirus) and Black Crappie (Pomoxis nigromaculatus) receive considerable research attention, Redear Sunfish (L. microlophus) are seldom studied despite their wide distribution, large size, socioeconomic contributions, and invasion potential in parts of their introduced range. We evaluated Redear Sunfish occurrence, density, relative abundance, growth, and size structure in 60 Florida lakes with varied surface area (2–12,412 ha), trophic state (oligotrophic to hypereutrophic), and macrophyte abundance (0.3–100 percent of lake volume inhabited [PVI]), a range of environmental conditions over which Redear Sunfish populations have scarcely been investigated. Lake surface area, chlorophyll-a concentration, and macrophyte abundance explained 98% of variation in Redear Sunfish occurrence. Redear Sunfish density increased asymptotically with calcium concentration, whereas relative abundance (electrofishing fish/hr) peaked at intermediate surface area (50–100 ha) and chlorophyll-a (20 µg/L). Mean length at age 3 declined with increasing macrophyte abundance and was parabolically related to Redear Sunfish density, peaking at approximately 450 fish/ha. Proportional size distribution (PSD) and PSD of preferred-length fish were also negatively related to macrophyte abundance, and PSD declined with increasing Redear Sunfish density. Our results suggest that Redear Sunfish fisheries with abundant individuals of quality size (≥180 mm) require large (>100 ha), fertile (>20 µg/L chlorophyll-a) lakes with calcium concentrations >5 mg/L, moderate macrophyte abundance (PVI 0–25), and Redear Sunfish densities between 200 and 700 fish/ha. Our modeling approach can help managers predict Redear Sunfish occurrence, density, relative abundance, growth, and size structure based on a suite of abiotic and biotic variables.

Drugs in our flats: exposure of South Florida bonefish to pharmaceuticals

Presenter: Nicholas Castillo *he/him*
Institution: Florida International University
Coauthors:
Jennifer Rehage | Florida International University
Rolando Santos | Florida International University
Ryan Rezek | Coastal Carolina University
Tomas Brodin | SLU University
Gustav Hellstrom | SLU University
Jerker Fick | Umea University
Ross Boucek | Bonefish and Tarpon Trust
Aaron Adams | Bonefish and Tarpon Trust

Abstract:
In recent years, pharmaceutical contaminants have been recognized as an increasingly important class of emerging contaminants; however, very little is known about the presence and threats of pharmaceutical contaminants on large spatial scales in marine ecosystems.

Although previous studies have established the presence of pharmaceutical contaminants in South Florida coastal waters, biomonitoring of internal tissue concentrations can allow for estimates of organismal effects that are difficult to extrapolate from water analysis alone, and importantly, is the starting point for examining toxicological effects. In order to determine the potential exposure and threat of pharmaceutical contaminants to flats fisheries, we sampled bonefish throughout South Florida from Biscayne Bay through areas west of Key West. We tested for the presence of 104 different pharmaceuticals in 93 bonefish and found pharmaceutical prevalence to be widespread, with every bonefish having at least one pharmaceutical. Throughout South Florida, bonefish are exposed to a diverse suite of pharmaceuticals from different drug classes; a cocktail of drugs that can affect important behaviors in survival and population stability. By investigating the presence of pharmaceutical contaminants on both a large and small spatial scale, this study aims to assess the extent of pharmaceutical contamination in open coastal marine systems, serve as an assessment of water quality, aid in wastewater management reform, and establish the potential threat posed by pharmaceuticals to fisheries and marine biota.

Recreational angler preferences for red snapper fisheries management options in the Gulf of Mexico: a stated preference choice analysis

Presenter: Lisa Chong *she/her*
Institution: University Of Florida
Coauthors:
Elizabeth Pienaar | University of Georgia
Edward Camp | University of Florida

Abstract:
The conservation of fish populations and the economic value of recreational fisheries are threatened in many popular fisheries in the US. The red snapper fishery, one of the most popular yet contentious fisheries in the Gulf of Mexico (GOM), is caught in a spiral of shorter seasons, more restrictive size limits, and lowered bag limits despite rebuilding progress. These measures have failed to adjust to anglers' behavior and provided little incentive to reduce their effort and contain fishing mortality. Therefore to create more effective harvest regulations, fishery managers need a basic knowledge of the extent to which anglers prefer current and proposed red snapper management options. This study investigated the choices anglers make about hypothetical GOM red snapper recreational fishing trips. In 2019, we administered two stated preference choice experiments surveys to recreational anglers. The first experiment investigated how anglers would respond to changes in current management regulations (i.e. bag and size limits and season length). The second experiment explored the potential for using a harvest tag system, which is a rights-based approach commonly used in wildlife and hunting management that assigns a right to specified quantity of red snapper during a specified time. We then used the survey data to fit random utility models, which provides empirical estimates about which trip attributes such as travel distance influence angler satisfaction and decisions. We also used a latent class model to explore preference heterogeneity among respondents. We found that the more conservative harvest restrictions like shorter seasons were least preferred as expected. Respondents were heterogeneous in terms of potentially using harvest tags as an alternative to status quo management. Our results will provide better information about stated

preferences and behaviors of red snapper recreational anglers about current and potential management regulations.

Factors influencing the temporal stability of reef fish habitats in the Eastern Gulf of Mexico (West Florida shelf)

Presenter: Harrison Clark *Mr.*
Institution: Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, 100 8th Avenue SE, St. Petersburg, FL 33701
Coauthors:
Sean Keenan | Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute
Eric Weather | Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute
A. Knapp | Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, Senator George Kirkpatrick Field Lab
Ted Switzer | Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute

Abstract:
Accurate mapping and identification of benthic habitat types and coverage in the eastern Gulf of Mexico (GOM) is a critical component of fisheries independent monitoring surveys aimed at delivering reef fish abundance and size composition data in support of assessment and management efforts. Since 2010 the FWC-FWRI Fisheries Independent Monitoring (FIM) program has conducted randomized mapping surveys along the west Florida shelf with side-scan sonar. Incorporating these mapping data into long-term surveys relies on an assumption that habitats supporting reef-fish communities are relatively stable through time. To address the validity of this assumption, a study was conducted in 2018 to strategically re-map previously mapped areas. Data from re-mapped areas were processed and manually digitized following identical protocols used for the initial survey. Following digitization, a comparison of habitat presence/absence on a spatial scale of 0.1nmx 0.1nm primary sampling units was conducted to identify changes in benthic habitats across the eastern GOM. Metrics such as age since initial scan, habitat type, habitat relief, depth and latitude were evaluated to identify potential drivers of habitat change. Preliminary results indicate that while much of the eastern GOM remained stable, certain habitat types and depth strata may have higher rates of change that warrant additional quantifying effort. Additionally, the findings of this study indicate that large-scale environmental perturbations, such as hurricane events, are catalysts for rapid broad-scale habitat changes. While obtaining new habitat mapping is important to developing accurate fisheries surveys, it is evident from this study that also examining rates and causes of benthic habitat change is critical to understanding how these changes may contribute to increased uncertainty in survey data.

Contact tracing: following a social norm's emergence among black crappie anglers in FL

Presenter: Matt Cleary *He/Him/His*
Institution: Florida Fish and Wildlife Conservation Commission

Coauthors:
Ramesh Paudyal | Florida Fish and Wildlife Conservation Commission

Abstract:
Few gamefish have the uncanny ability to unify anglers across generations and walks of life in the way black crappie do. Their expansive geographical distribution, affordable tackle, high table-fare quality, and thrilling "thump" have reeled many anglers in from a young age and kept them in the boat or on the pier for many years down the line. This presentation details the process of revising Florida's black crappie (Pomoxis nigromaculatus) fishing regulations and learning that anglers' stated behaviors for self-regulation of harvestable-sized fish conflict with Von Bertalanffy model results and harvest vulnerability data. Content analysis from virtual meetings with stakeholders and results from a mail survey of resident and non-resident anglers revealed a stated behavior pattern wherein anglers selectively harvest fish 10 inches or longer where no legal regulation existed. This stated behavior was said to emerge from out-of-town anglers transposing their knowledge of crappie regulations from up north, to Florida's waters. Cognitive dissonance existed among resident anglers' negative attitudes toward out-of-state anglers and their positive attitudes toward this self-regulation pattern that seems to be rooted in black crappie harvest regulations in northern states. Further conversations with resident anglers are recommended to determine the influence of this mismatch between angler behavior and biological recommendations on the acceptance of harvest regulations.

Fisheries monitoring as a catalyst for cooperative research.
Presenter: Tyler Steven Coleman
Institution: Florida Cooperative Fish and Wildlife Research Unit, Department of Wildlife Ecology and Conservation, University of Florida
Coauthors:
Andrew K. Carlson | U.S. Geological Survey, Florida Cooperative Fish and Wildlife Research Unit, School of Forest, Fisheries, and Geomatics Sciences and Department of Wildlife Ecology and Conservation, University of Florida

Abstract:
We provide an overview of emerging fisheries research collaborations between FWC and the Florida Cooperative Fish and Wildlife Research Unit at the University of Florida. We highlight the fisheries management value of these cooperative projects and illustrate how they expand the knowledge base on Florida's freshwater fisheries. For example, one project focuses on Florida's Black Crappie Pomoxis nigromaculatus fisheries. The Black Crappie is a popular and widely distributed sport fish in the United States. Therefore, evaluating the population dynamics of this species in a changing climate is important from multiple perspectives, including angler satisfaction and fisheries sustainability. Fish growth and survival are known to vary with latitude, a point of particular importance for species at the southern end of their range. We assessed how Black Crappie growth varied with latitude across Florida over two decades. Utilizing data mainly from the FWC Freshwater Fisheries Long-term Monitoring Program, we found that Black Crappie growth was fastest in northern Florida but declined significantly through time in southern Florida. As mean daily temperature increases throughout Florida and the Southeast in a changing climate, continued research on Black Crappie

populations relative to latitude will be important for developing adaptive management programs.

Using the Past to Inform Future Management of Perdido Bay, Florida, USA
Presenter: Amanda Croteau *she/her*
Institution: University of West Florida
Coauthors:
Haley Gancel | Pensacola and Perdido Bays Estuary Program
Jane Caffrey | University of West Florida

Abstract:
Historical ecology is an interdisciplinary field focused on the interaction between society and the environment and how those interactions effect past, current, and future landscapes and their associated natural resources. Applied historical ecology uses historical knowledge and applies it to ecosystem management (e.g., habitat restoration targets). In 2018, the EPA funded the Pensacola and Perdido Bays Estuary Program (PPBEP), a place-based, non-regulatory program in the northern Gulf of Mexico. PPBEP is developing a management plan and assessing the current state of their estuaries and watersheds to improve the health and condition of their estuaries. To better understand current ecological conditions, we searched documents, newspapers, narrative accounts, maps, and photos to piece together the historical extent of oysters in Perdido Bay. We found that oysters were not historically abundant throughout the bay, but there were regions with historical harvest for personal consumption and even transport to Pensacola for sale. These results are useful to PPBEP which is implementing an oyster management plan in Pensacola Bay and is in need of oyster related information for Perdido Bay to determine if large-scale oyster restoration is warranted and feasible within that bay system.

Experimental approaches to address bottlenecks in ornamental fish larviculture
Presenter: Matthew DiMaggio
Institution: Tropical Aquaculture Laboratory, University of Florida
Coauthors:
Casey Murray | University of Florida
Grace Sowaske | University of Florida
Elizabeth Groover | University of Florida

Abstract:
Ornamental fishes represent a lesser-known segment of global aquaculture production. Sales of individual, live, small-bodied organisms, make this commodity somewhat unique in the aquaculture industry. With thousands of species in the freshwater and marine ornamental trade, the diversity of life history strategies and production techniques can be daunting. Consequently, there exists a great need for research that optimizes culture practices for species currently in production, and investigations to define preliminary protocols for species that have yet to be commercialized. Ornamental fish larvae can be exceedingly fragile and specific environmental and nutritional requirements must be characterized to formulate effective culture protocols. The larviculture phase accounts for the greatest observed mortality

throughout the commercial production cycle. Events such as first feeding, swim bladder inflation, flexion, weaning, and metamorphosis represent significant bottlenecks that must be overcome to improve efficiency. A wholistic approach that integrates the culture environment and management strategies with the ontogeny of species-specific development processes is prudent to maximize survival and growth of ornamental fish larvae. This presentation will explore approaches used at the University of Florida's Tropical Aquaculture Laboratory to define effective larviculture protocols in marine and freshwater ornamental species.

The TrophyCatch Eyeball Challenge

Presenter: Drew Dutterer
Institution: Florida Fish and Wildlife Conservation Commission, Freshwater Fisheries Research
Coauthors:
Paul Schueller | Florida Fish and Wildlife Conservation Commission, Center for Biostatistics and Modeling
Nia Morales | University of Florida, Wildlife Ecology and Conservation

Abstract:
TrophyCatch is the Florida Fish and Wildlife Conservation Commission's long-running angler recognition and citizen science program for trophy largemouth bass in Florida. It is largely web-based, and anglers participate in the program by uploading photographic documentation and data about their catches to the TrophyCatch website. Besides a catch gallery of over 12 thousand trophy bass with search functionality, angler engagement extends to social media, including Facebook and Instagram. Hence, digital photographs of large bass are at the crux of the program. Over the years, we've been privy to numerous conversations about whether certain bass were in fact as large as purported. Often, subjective interpretation of bass size from a photo has been the foundation of staunch viewpoints, sometimes counter to available quantitative data. We designed the TrophyCatch Eyeball Challenge to assess anglers' ability to accurately guess the weights of trophy bass in photos across an array of sizes of both bass and people holding them. The Eyeball Challenge was implemented as a series of online surveys through Qualtrics survey software and was widely distributed through email and across the worldwide web during the summer of 2020. After thousands of anglers completed the survey, we learned that angler experience was not a good predictor of weight guessing acuity. However, orientation of the bass relative to the person holding it had significant effects. Ultimately, the data suggest that it's not nearly as easy as many think to accurately judge the size of a fish in a photo, so one should do so cautiously.

Exploring the Effect of Current and Alternative Management Actions on a Simulated Bay Scallop Fishery

Presenter: Nicholas Fisch
Institution: University of Florida
Coauthors:
Lisa Chong | University of Florida
John Borsum | University of Florida
Diana Perry | University of Florida
Gabrielle Love | University of Florida

Brittany Sharf | Florida Sea Grant
Botta Robert | University of Florida
Zach Siders | University of Florida
Ed Camp | University of Florida

Abstract:
The bay scallop (Argopecten irradians), is an economically important bivalve that supports a popular family-oriented fishery in shallow waters on the Gulf Coast of Florida. Once abundant in the state from Pensacola to West Palm Beach, populations currently persist in isolated patches, primarily concentrated in seagrass beds along the Big Bend region and west to St. Joseph Bay. Current regulations for the recreational fishery involve a combination of county or region-specific harvest seasons and bag limits. Bay scallops possess a unique life history not commonly encountered in fisheries management. They are an annual species, are semi-sessile, and are thought to spawn coincident with the recreational fishery season. This unique life history allows for potentially unintuitive responses to management actions, which combined with data limitations has stymied evaluations of both current and alternative management actions. This is a key challenge given some evidence of increasing effort and lower bay scallop abundances in some regions. We used simulation modeling to explore the effect of current and alternative management strategies on bay scallop populations and fishery metrics. We achieved this by developing an age structured population model for bay scallops that accounted for their semelparity and seasonal spawning, and tested the effects of different management regulations that varied in how much they accounted for this biology. Our results indicate that biologically designed regulations, such as limiting harvest until more scallops had spawned (via later seasons, or rolling bag limits), performed well across initial exploitation and effort levels for both population spawning output and fisher harvest per unit effort. This suggests that biologically-designed harvest regulations which consider the overlap of harvest and spawning seasons are likely to provide ecological and socioeconomic advantages over alternate approaches for bay scallop fisheries in Florida. In addition, regulations such as later harvest seasons and rolling bag limits may buffer against uncertainty in the exploitation of different populations.

Becoming comfortable with climate conversations – learning and implementing practical techniques from the AFS Climate Fellows' program

Presenter: Kerry Flaherty-Walia *she/her*
Institution: Florida Fish and Wildlife Conservation Commission

Abstract:
Agency fisheries biologists are often called upon to communicate their expertise on species and life history requirements to assess their sensitivity to climate change effects. Most notably, in Florida, sub-tropical and tropical fish habitat (mangroves) and species distributions are expanding northward in real time. Florida Fish and Wildlife Conservation Commission biologists conduct research to document changing fish distributions and movement patterns, participate in climate change vulnerability assessments, and develop publications on how fish communities may respond to changes in temperature (e.g., milder winters), flooding regimes, and habitat (e.g., use of mangroves vs. saltmarsh). As ecosystem changes associated with temperature

regime shifts become more evident, communication with the public about this research is becoming increasingly important, but often scientists are not comfortable or effective in presenting their research to stakeholders. Therefore, the American Fisheries Society has implemented the Climate Fellows program geared towards agency fisheries scientists that provides in-depth training for communicating with non-scientific audiences about the impacts to fish and fisheries from climate change. The one-year program includes a 5-week workshop on the "And, But, Therefore" narrative method of science communications, participation in training workshops on climate change, development of messaging reflecting each participant's professional experience that will resonate with a particular audience, testing of messaging through peer review, and assessment of impact through before-after surveys and interviews. As a current participant in the Climate Fellows program, I will present ways in which I incorporated current research into some of the communication techniques and suggest how to implement these methods into everyday work.

Mapping the Spatial Patterns of the Elasmobranch Community Throughout Hillsborough Bay, Florida

Presenter: Catherine Fox
Institution: Florida Southern College
Coauthors:
Josh Boyer | Florida Southern College
Allison Durland | Florida Southern College
Melanie Langford | Florida Southern College

Abstract:
Spatial ecology provides important information about species' movements, spatial arrangements, populations, and the effect of different habitats on individual species' ecological roles. Hillsborough Bay offers a unique ecosystem with a variety of habitats, such as freshwater river mouths, shallow-water estuaries, and seagrass beds, that allow different elasmobranchs to fulfill specific niches in the bay. Previous studies have shown that sharks use these areas as feeding grounds, a safe place to give birth, and a nursery for young sharks. While over a dozen shark and ray species have been documented in the Gulf of Mexico, more data is required to establish a thorough understanding of the movement patterns, migration paths, life history, and biology of these animals. Our objective is to observe, document, and track elasmobranch communities in the eastern Hillsborough Bay, specifically the Bonnethead Sphyrna tiburo, Bull Shark Carcharhinus leucas, and Blacktip Shark Carcharhinus limbatus populations near the Alafia River. From June 2021 to February 2022, we captured Bonnetheads, Bull Sharks, Southern Stingrays Dasyatis americana, and Cownose Rays Rhinoptera bonasus using gill nets. A full health workup was performed on each elasmobranch, and each was tagged using a variety of external and internal tags. Fifteen acoustic tags were implanted in the Bonnethead and Bull Sharks, depending on health and stress levels. We captured 6 Bonnetheads, 33 Bull Sharks, 21 Cownose Rays, and 15 Southern Stingrays. The majority of the elasmobranchs were caught within 3.5 kilometers upriver of the mouth of the Alafia River. Our results may provide a better understanding of how habitat loss and degradation due to pollution, global warming, and development are affecting shark populations in Hillsborough Bay. Sharks are vulnerable to a

number of threats and understanding their habitat needs and the specific niches they occupy is key to the future development of effective conservation plans.

Integrating eDNA Data into the Nonindigenous Aquatic Species Database
Presenter: Jonathan Freedman *he/him/his*
Institution: CNSS-USGS
Coauthors:
Jason Ferrante | USGS
Wesley Daniel | USGS
Margaret Hunter | USGS

Abstract:
One of the most powerful new tools to detect the spread and distribution of aquatic invasive species is environmental DNA (eDNA). Defined as DNA that has been shed, excreted, or sloughed from an organism into its environment, eDNA from many species can be found in a single sample of water. However, with great analytical power comes great responsibility for interpretation. Thus proper sampling and analytical procedures need be followed in order to avoid false detections and/or non-detections leading to misinformed management decisions. The U.S. Geological Survey's Nonindigenous Aquatic Species database (NAS; nas.er.usgs.gov) is working with scientists to include eDNA data alongside verified observation and collection data. This presentation will share how the authors worked with experts in the eDNA field to reach consensus on questions for a Pre-Submission Survey intended to verify certain experimental controls and standard methods were employed to produce the data applicants wish to submit to the database. This was accomplished by holding virtual town halls with resource managers, regular meetings by a core scientific advisory panel, and outreach to the broader eDNA community for critical feedback and review of the application. Additionally, we will share how eDNA data will be presented to users of the database and the communication plan that will be implemented with our partner agencies to inform them of eDNA findings within their jurisdictions.

Distribution, habitat associations, and fishery characteristics of Wenchman (Pristipomoides aquilonaris) in the Gulf of Mexico
Presenter: Bridgette Froeschke
Institution: The University of Tampa
Coauthors:
John Froeschke | Gulf of Mexico Fishery Management Council

Abstract:
Wenchman is an abundant snapper species that is widely distributed in the Gulf of Mexico and supports a small fishery. Wenchman occupy hard bottom habitats of the mid to outer shelf where they feed mainly on small fish; they are found at depths ranging from 19-481 m, but are most abundant between 80-200 m. Wenchman is a federally managed reef fish species managed in the mid-water snapper complex and harvest is limited based on the annual catch limit for this group. Historically, catch levels were low for this complex but have increased in recent years and as required fishery closures. This species is primarily encountered by trawl

fisherman targeting other species and thus, the closure has wider ranging impacts, yet there is little information to evaluate if the established catch limits are appropriate or should be reexamined in light of the changing characteristics of this fishery. To examine habitat associations and distribution patterns for this stock, we examined fishery independent trawl survey data in the Gulf of Mexico collected through SEAMAP program to identify hot spots of distributions and habitat characteristics that influence abundance. This information could inform management by providing an improved estimate of distribution and abundance necessary to evaluate appropriate harvest limits. This information may also help fishery participants avoid wenchman in geographic hotspots while targeting other species that may avoid fishery closures and associated socioeconomic consequences.

Findings of EwE South Atlantic Region Ecosystem Model Exploration of High Red Snapper Recruitment Impacts

Presenter: Lauren Gentry *She/her*
Institution: Florida Fish and Wildlife Research Institute
Coauthors:
David Chagaris | University of Florida
Lucas McEachron | Florida Fish and Wildlife Research Institute

Abstract:
In pursuit of ecosystem-based fisheries management (EBFM), the South Atlantic Fisheries Management Council partnered with the Florida Fish and Wildlife Research Institute to develop an ecosystem model to test the potential impacts of management decisions. After two decades of refinement, this Ecopath with Ecosim model has expanded to include 700+ species and over 500,000 km2 of ocean habitat from North Carolina to the Florida Keys. We used this model to explore the impact of recovering red snapper populations on other species of interest, including black sea bass, groupers, and red porgy. Recent high recruitment of red snapper has led to questions about the consequences of the rapid recovery of such a large predator. Scenario testing involved simulating future red snapper biomass and examining the predicted effects of high vs. low red snapper recruitment on other species' biomasses. The results indicated that increased levels of red snapper biomass have only minimal impacts, both positive and negative, on other species via direct predation and trophic cascade. These conclusions are consistent with those of other modeling efforts on generalist predator reef fishes. As management of fisheries and habitats becomes further integrated with EBFM, ecosystem models will be a vital tool for informing management discussion and decisions.

Mercury Accumulation and Trophic Position of a Dominant Mesopredatory Fish Family (Alepisauridae) and Prey in the Pelagic U.S. South Atlantic Bight

Presenter: Daria Ghegan *She/Her*
Institution: Nova Southeastern University
Coauthors:
Ellyn Willse | Halmos College of Arts and Sciences, Nova Southeastern University
James Gelsleichter | University of North Florida
David Kerstetter | Halmos College of Arts and Sciences, Nova Southeastern University

Abstract:
Numerous studies of smaller neuston and upper-level predatory vertebrates feeding in the mesopelagic zone (200-1000 m depths) have suggested a reservoir of mercury that can transfer into apex predators at higher trophic levels. However, little is known regarding mercury transfer in mesopredators. We present novel trophic position and mercury level data on two mesopredatory alepisaurid lancetfishes and 13 of their main prey items, including invertebrates, cephalopods, and mesopelagic fishes. Mean mercury levels in the alepisaurids were 23.67 µg/kg (wet wt), with individuals in larger size classes (85-100cm, >120cm) having higher levels than smaller size classes (<15cm, 35-50cm). In the prey items, mean mercury levels were 13.80 µg/kg (wet wt), with argonauts (36.70 µg/kg) and combined teleost fishes (21.91 µg/kg) having higher levels than all other invertebrates combined (5.86 µg/kg), and the differences in mean mercury levels between predators and prey were highly significant. Comparisons of mercury levels between predators and prey also indicate that there is evidence of mercury bioaccumulation and biomagnification. This study provides the first mercury content analysis for a mesopelagic mesopredator with an opportunistic diet.

Some Like it Hot: Thermal Tolerance of Common Snook Centrompomus undecimalis at Three Salinity Treatments.

Presenter: Brittany Hall-Scharf
Institution: University of Florida
Coauthors:
Quenton Tuckett | University of Florida
Philip Stevens | Florida Fish and Wildlife Conservation Commission
Jeffrey Hill | University of Florida

Abstract:
Abiotic factors such as temperature and salinity can affect fish physiological and behavioral responses, resulting in environmentally induced variation in thermal tolerance. Such variation in ecological conditions may therefore influence species distributions across geographic ranges and habitat types. Local adaptations may account for differences in thermal tolerance to allow fish to survive in thermal refuges and thus persist in regions where environmental conditions may be otherwise unsuitable. For example, euryhaline fishes may occupy waters of salinity near 12 ppt to be isotonic with their environment, maximizing energy available for growth and survival. The Common Snook Centropomus undecimalis is one of Florida's most popular sport fish. It occupies various coastal habitats spanning from artificial reefs to freshwater rivers where they are exposed to fluctuating temperatures and salinities. We ran chronic lower-lethal temperature experiments on juvenile Common Snook (239 - 377 mm total length) for three salinity treatments (3 ppt, 15 ppt, and 30 ppt) to better understand how salinity affects survival and ultimately the availability of thermal refuge habitat. Cessation of feeding, loss of equilibrium, and death were recorded. Unexpectedly, our finding showed that this species is the least cold-tolerant (10.49°C) at the mid-salinity treatment (15 ppt). Lower-lethal temperature (9.17°C) for the high-salinity treatment (30 ppt) was similar to previous studies; however, our lower-lethal temperature (9.21°C) for the low-salinity treatment (3 ppt) was much lower than published findings and suggests potential habitat and thermal refuge characteristics

during cool winter periods. We plan to further investigate lower-lethal temperatures for this species at the northern limit of their range.

Planning for Coral Reef Ecosystem Conservation and Enhancement in the Face of Climate Change

Presenter: Joy Hazell *She/Her*
Institution: University of Florida, School of Forest, Fisheries and Geomatic Sciences
Coauthors:
Susana Hervas | University of Florida, School of Forest, Fisheries and Geomatic Sciences
Kai Lorenzen | University of Florida, School of Forest, Fisheries and Geomatic Sciences

Abstract:
Fisheries stakeholders in the Kristin Jacobs Coral Reef Ecosystem Conservation Area (Coral ECA) are part of a multi-year stakeholder process to enhance conservation of the Coral ECA ecosystem and resources. The process is funded by the Florida Department of Environmental Protection, supported by the Florida Fish and Wildlife Conservation Commission, the NOAA Coral Program, and facilitated by the University of Florida. The stakeholders consist of diverse fishers from Southeast Florida, including recreational anglers and spearfishers, headboat and charter operators, commercial fishers targeting reef-associated species, marine life collectors, marine industry (bait and tackle shops, marinas) and their respective organizations. The goal of the process is to develop recommendations for potential fisheries and environmental management actions to help conserve the coral reef ecosystem. The recommendations will be made to agencies where they will be subject to further deliberation through each agencies rule making process. The focus of the recommendations are water quality and fisheries. Discussions around each recommendation inevitably includes the realization that climate change could impact the future state of the Coral ECA in ways that are predictable and unforeseen. Some fisheries recommendations include plans to mitigate for climate change impacts, for example by establishing a comprehensive set of artificial reefs to replace reef habitat lost to the immediate threat of Stony Coral Tissue Loss Disease (SCTLD) and the longer-term threat of climate change. Including potential outcomes of climate change is proving particularly challenging in the water quality recommendations. The reality of climate change impacting the Coral ECA has been discouraging for the fisheries stakeholders and is making it more difficult to arrive at clear recommendations due to the added uncertainty about their effectiveness under environmental change.

Identifying management gaps in the prevention of Aquatic Invasive Species for the U.S.

Presenter: Zoey Hendrickson *She/Her*
Institution: School of Forestry, Fisheries, and Geomatics Sciences University of Florida
Coauthors:
Wesley Daniel | USGS Wetlands Aquatic Research Center, Gainesville, FL
Charles Martin | University of Florida IFAS Nature Coast Biological Station, Cedar Key, FL

Abstract:
Aquatic invasive species (AIS) are recognized globally as a major threat to the structure and function of native ecosystems with a high economic impact, often millions of dollars, and are

nearly impossible to eradicate once established. Therefore, the most effective approach to minimizing negative effects that these species impose is to prevent initial introduction. Despite this knowledge, new introductions of AIS occur each year in the United States, indicating that current prevention measures are either ineffective or non-existent. To develop comprehensive management recommendations, we conducted a gap analysis of invasive species' primary and secondary pathways of introduction to determine and quantify where prevention measures are lacking. This analysis will assist thirteen federal agencies as well as state and local governments responsible for AIS prevention. We reviewed the U.S. Geological Survey's Nonindigenous Aquatic Species Database to identify 15-20 AIS representative of 7 taxonomic groups (amphibians, reptiles, crustaceans, fishes, marine fishes, mollusks, and plants) and 8 introduction pathways, including stocked, shipping, aquarium/bait release, aquaculture, canals, pet escape, and hitchhiker, to serve as case studies outlining the current state of management. Here we present preliminary results from several case studies including the Cuban Treefrog (Osteopilus septentrionalis), Burmese Python (Python molurus), Regal Damselfish (Neopomacentrus cyanomos), and Dreissenid mussels (Dreissena polymorpha and rostriformis bugensis).

Hypoxic Conditions Within Dense Submerged Aquatic Vegetation in a Restored Wetland

Presenter: Ryan Howard
Institution: Florida Fish and Wildlife Conservation Commission
Coauthors:
Ted Lange | Florida Fish and Wildlife Conservation Commission
Brandon Thompson | Florida Fish and Wildlife Conservation Commission

Abstract:
Emeralda Marsh, located on the eastern side of Lake Griffin, was a historically a 10,000-acre wetland which was converted to farmland in the 1940s. The state acquired the land in 1974 and began the process of restoring the former wetlands. Emeralda Marsh Conservation Area 3 (EMCA3) is a 2,000-acre wetland within the complex that was reconnected to Lake Griffin in 2016 yet remains divided by historic farm levees into three distinct cells: Q, T, and Z. Biologists attribute improvements in Lake Griffin water quality and sport fish populations to EMCA restoration actions. Fish now utilize these reconnected wetlands throughout most of the year, as they provide optimal habitat for feeding, spawning, and rearing cover for juvenile fishes, which improves survival and contributes to the year class strength of Lake Griffin. Each cell in EMCA has a varying level of connectivity to open water areas and submerged aquatic vegetation (SAV) which is dominated by Hydrilla Hydrilla verticillate. Managers have noted varying levels of both water exchange and SAV among cells which influences water quality among them. During late summer, warm water coupled with topped-out hydrilla, creates hypoxic conditions which appear to be most severe in Z cell. To quantify water quality differences among cells with varying hydrilla coverages, aerial drone imagery was collected in July 2021. Imagery was processed in GIS Pro using a Green Chromatic Coordinate Index (GCC) and was used to estimate the percent coverage of topped-out hydrilla within each cell. Water quality was measured at random sites across a range of hydrilla densities within each cell. Topped-out hydrilla coverage ranged from 67 to 78% among cells and the frequency of

encountering hypoxic conditions (< 2 mg/L dissolved oxygen) increased with increasing coverage. Here we present findings from the first summer of this investigation.

Using Acute Stressors to Suppress Escape Responses of Two Marine Copepods: Oithona colcarva and Parvocalanus crassirostris

Presenter: Sarah Hutchins
Institution: University of Florida
Coauthors:
Brad Gemmell | University of South Florida
Matthew DiMaggio | University of Florida

Abstract:
Copepods are an important live feed for the larvae of many marine ornamental fishes. Copepods are nutritious, typically small, and exhibit movement patterns thought to stimulate feeding behaviors in larval fishes. However, larvae must be able to efficiently capture these evasive plankton to obtain sufficient energy reserves required for growth and development. Aspects of the copepod's escape response, such as speed and response latency, can be species-specific and influenced by their environment. The goal of these experiments was to identify acute stressors that would suppress the escape responses of the copepod species Parvocalanus crassirostris and Oithona colcarva and ultimately improve larval feeding success. Both copepod species were subjected to three experimental stressors (salinity, temperature, viscosity), each with three treatment levels, to assess changes in escape response behavior. Copepods were exposed to the chosen stressor for a set time and then returned to normal seawater, where their escape responses were recorded hourly. The movement patterns of copepod nauplii were recorded using an Edgertronic high-speed video camera (500fps) paired with a 4x long working distance objective lens, piezoelectric stimulus probe used to simulate a predator, 10 MHz pulse generator, and fiber optic light. The first 10 in-focus copepods were selected (n=30 at each time point) and recorded as responsive or non-responsive to the stimulus. For each responsive copepod, their trajectory over time was measured using ImageJ software. Total distance travelled, average and maximum speeds, response latency, and total escape duration were calculated. Future experiments will take the most effective treatment(s) for dampening nauplii's escape responses and feed these slower copepods to larval fishes, with the goal of improving prey capture success and in turn increasing larval growth rates and survival.

Assessment of Microplastics in South Florida Forage Fishes

Presenter: Maria Kappos *She/her*
Institution: Nova Southeastern University
Coauthors:
D. Renegar | Nova Southeastern University
David Kerstetter | Nova Southeastern University

Abstract:
Microplastics threaten the health of numerous marine organisms at all trophic levels. Currently, the topic is well studied among larger predators such as marine birds, dolphins, pelagic fishes, and even herbivorous organisms such as manatees with the assumption that microplastics are

ingested through prey or from direct accidental consumption. However, documentation of microplastics within organisms at lower trophic levels is poorly known. The aim of this study is to assess the presence of microplastics in smaller forage fishes, also known as 'baitfish,' that are known components of local apex predator diets. Four sample locations in southeast Florida were classified into two categories: urban (Port Everglades and Northern Biscayne Bay) and non-urban (Islamorada and Marathon, in the Florida Keys). Five species are being sampled: Striped Mullet Mugil cephalus, Atlantic Threadfin Herring Opisthonema oglinum, Redfin Needlefish Strongylura notata, Pinfish Lagodon rhomboides, and Irish Pompano (a gerreid mojarra) Diapterus auratus. The GI tract and liver are extracted and digested via 10% KOH solution in glass jars. After digestion, the solution is passed through a glass filter via a Buchner funnel and vacuum flask. A blank 50 mL of 10% KOH is also filtered for each fish and tissue type to account for outside contamination. Visual analysis via dissecting microscope is then used to identify and quantify microplastics present. Preliminary results to date have found microplastics present in all 14 fish processed, from all sample locations. Total microplastics count in is 477, including microbeads (n= 149), fibers (n=262), and fragments (n=66).

What the Clip?! Assessing the Effect of Cull Clips on Mortality, Behavior, and Physiology of Largemouth Bass

Presenter: Ted Lange
Institution: Fl Fish and Wildlife Conservation Commission
Coauthors:
Nick Trippel | FWC
Kim Bonvechio | FWC
Lee Grove | Alabama Department of Conservation & Natural Resources

Abstract:
In live-release Largemouth Bass Micropterus salmoides fishing tournaments, fish are typically held within an onboard live-well system until they are weighed-in at the end of the tournament. During confinement, bass can be "culled" (i.e., released) and replaced with larger fish as the tournament progresses. Anglers mark fish with cull clips so they can easily identify individual fish by weight, thereby reducing handing time during culling. Various types of culling devices are utilized by anglers at all levels of club and professional level tournaments; however, very little is known about the physiological effects these devices have on fish. Both the Florida Fish and Wildlife Conservation Commission (FWC) and Bass Anglers Sportsman Society (BASS) recommend that if culling devices are used, the newer clamping style should be used in lieu of the traditional piercing style to move away from having to pierce a hole in the fish's lower jaw. However, based on anecdotal reports, BASS and BASS Angler Magazine contacted FWC with concerns that the new clamping style cull-clips are potentially causing higher mortality. Thus, a study was initiated at FWC's Florida Bass Conservation Center at Richloam Hatchery to assess bass mortality (winter and summer), bass behavior, and metabolic stress for three treatment groups including clamping and piercing style cull clips and control fish (no cull clip). Here, we report the results of three study components: 1) treatment and control fish ranging in size from 12-22 inches exposed to simulated live-well conditions for 5 hours and then placed in hatchery ponds to monitor delayed mortality for seven days; 2) video recording five fish per treatment group in a livewell-size observation tank to assess fish behavior changes; and 3) exposing fish

within each treatment group to 5 hour live-well exposures and measuring whole blood stress parameters to assess physiological effects. Findings will be used to inform FWC and BASS guidance for tournament best management practices.

Evaluating the effects of dorsal spine ageing error on Largemouth Bass population metrics

Presenter: Summer Lindelien
Institution: Florida Fish and Wildlife Conservation Commission (FWC)
Coauthors:
Jason O'Connor | Florida Fish and Wildlife Conservation Commission
Andrew Dutterer | Florida Fish and Wildlife Conservation Commission
Kim Bonvechio | Florida Fish and Wildlife Conservation Commission

Abstract:
Using dorsal spines to estimate the age of Largemouth Bass (LMB) is a non-lethal alternative to using sagitta otoliths, which require that LMB be killed prior to removal. Previously, we (three FWC biologists) estimated ages from dorsal spines and compared them to ages estimated from otoliths for the same LMB across six Florida waterbodies. Mean percent agreement (PA) between age estimates of dorsal spines and otoliths was 42%. The PA±1yr (i.e., percent of age estimates within a year of the exact age), however, varied from 71% to 93%. Our results suggest that dorsal spines are useful for ageing LMB in some situations, and accuracy can be improved by training and using reference sets of known-age structures. We evaluated the sensitivity of von Bertalanffy growth parameters ($L\infty$ and K) and mortality estimates (A) to different levels of known LMB dorsal spine ageing error. We tested three scenarios: 1) PAs = 60, 40, and 20% assigned to three age strata (1–2, 3–6, and ≥7 years, respectively), 2) only LMB ≥ 40 cm TL aged using dorsal spines with corresponding ageing error, and 3) only LMB ≥ 56 cm TL aged using dorsal spines with corresponding ageing error. By quantifying the effect dorsal spine ageing error has on population estimates, managers can better assess the trade-offs between the benefits of non-lethally removing LMB dorsal spines and increased error in age estimation.

Climate Change Impacts on Florida's Fisheries and Options for Adaptation: A Discussion Primer

Presenter: Kai Lorenzen
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Jason R. Dotson | Fish and Wildlife Research Institute, Florida FWC, Gainesville, FL
Sarah E. Lester | Department of Geography, Florida State University, Tallahassee, FL

Abstract:
Florida supports diverse marine and freshwater fisheries with a combined economic impact of approximately 15 billion US$. We briefly describe the characteristics of the different fisheries sectors before outlining relevant climate change and confounding drivers. Using an integrated social-ecological systems framework, we then analyze potential climate change impacts on the different fisheries and aquaculture sectors, highlighting how the characteristics of each sector give rise to distinct expected impacts and potential adaptation measures. We conclude with general considerations for monitoring and adaptation.

Effects of Algal and Prey Density on Survival, Growth, and Feeding Incidence of Larval Dascyllus auripinnis

Presenter: Olivia Markham *she/her/hers*
Institution: Tropical Aquaculture Lab, Program in Fisheries and Aquatic Sciences, School of Forest, Fisheries, and Geomatic Sciences, Institute of Food and Agriculture Science, University of Florida
Coauthors:
Matthew DiMaggio | Tropical Aquaculture Lab, Program in Fisheries and Aquatic Sciences, School of Forest, Fisheries, and Geomatic Sciences, Institute of Food and Agriculture Science, University of Florida

Abstract:
Larval culture protocols for golden domino damselfish (Dascyllus auripinnis) do not currently exist. Consumer demand and previous success with culturing other damselfish species has served as reasoning for the development of commercial production strategies. Numerous bottlenecks can prevent the successful culture and commercialization of a species. The “first feeding” period, where larvae transition from endogenous to exogenous feeding, is responsible for significant mortality due to starvation. Environmental conditions can influence identification of prey items as well as the rate at which they are encountered. Culture conditions can be species specific and must be optimized to improve prey capture success and ultimately larval survival and growth. A series of experiments were conducted to assess the effects of microalgal and prey densities on growth, survival, and feeding success in golden domino damselfish. Experiments were conducted over three days post hatch (DPH) and evaluated various densities (150,000 - 600,000 cells mL-1) of the microalgae Tisochrysis lutea or feeding densities (2.5 – 10.0 nauplii/ml) of the copepod Parvocalanus crassirostris. Findings indicate that T. lutea densities of 150,000 cells mL-1 resulted in the greatest larval survival and growth, with no significant differences in feeding incidence among treatments. Prey density of P. crassirostris had no significant effect on survival and feeding incidence. Results from these experiments will contribute to the development of a standard production protocol for this species and provide important insights into larval feeding behavior.

Primed and Cued: Linking Interannual and Seasonal Variations in Freshwater Flows to the Spawning Migrations of Common Snook in the Florida Everglades

Presenter: Jordan Massie
Institution: Florida International University
Coauthors:
Rolando Santos | Florida International University
Ryan Rezek | Coastal Carolina University
Natasha Viadero | Florida International University
Ross Boucek | Bonefish & Tarpon Trust
David Blewett | FWC, FWRI
Alexis Trotter | FWC, FWRI
Philip Stevens | FWC, FWRI
Jennifer Rehage | Florida International University

Abstract:
Spawning migrations are a widespread phenomenon among fishes, often occurring in response to environmental conditions prompting movement into habitats favorable to reproduction (migratory cues). However, for many species, individual fish may choose not to migrate, and research suggests that conditions preceding the spawning season (migratory primers) may influence this decision. Few studies have provided empirical descriptions of these prior conditions, partly due to a lack of long-term data allowing for robust multi-year comparisons. To investigate how primers and cues interact to influence spawning migrations of coastal fishes, we use eight years of acoustic telemetry data (2012-2019) from tagged Common Snook (Centropomus undecimalis) in the Shark River, Everglades National Park. In Florida, many Snook migrate between rivers and coastal spawning sites, varying annually in both the proportion of the population that migrates and the timing of migration within the spawning season. We hypothesize that 1) interannual differences in hydrologic conditions preceding the spawning season contribute to the number of individuals migrating each year, and 2) specific environmental cues trigger the timing of migrations during the spawning season. We used GLMMs to model both the annual and seasonal Snook migratory response in relation to flow characteristics (river stage, rate of change), other key hydrologic/abiotic conditions (temperature, salinity), fish size, and phenological cues independent of riverine conditions (photoperiod, lunar cycle). Our results indicate that the timing/extent of minimum water levels (stage) prior to migration and fish size act as primers for migration, and that high stage and daily rates of change serve as cues triggering spawning migrations. Research providing mechanistic descriptions of conditions that promote migration and reproduction can help inform management decisions that seek to conserve ecologically and economically important species.

Utilizing digestive physiology to refine larval culture protocols for the x-ray tetra (Pristella maxillaris)

Presenter: Casey Murray *she/her*
Institution: University of Florida Tropical Aquaculture Lab
Coauthors:
Nathan Evans | University of Florida
Sophie White | University of Florida
Matthew DiMaggio | University of Florida

Abstract:
The x-ray tetra (Pristella maxillaris) is a tropical ornamental characid that is highly desirable in the aquarium community due to its unique transparent body and peaceful temperament. Although P. maxillaris has been successfully bred in captivity, challenges associated with cost efficiency of the larval rearing process are still prominent. Expanding our knowledge of larval development and digestive physiology in this species would help improve larval culture protocols, especially the transition of larvae from expensive live feeds to a cost-effective microdiet (MD) as early as possible. To gain insight into the larval development of P. maxillaris, the digestive enzyme ontogeny and digestive tract morphology was characterized at 20 timepoints throughout a 35-day trial. Standard microplate assays were conducted to quantify pepsin, trypsin, and lipase activities and histology was used to describe digestive tract morphology. Pepsin activity and the development of gastric glands indicated the presence of a functional stomach at 22 DPH (days post hatch). A 45-day dietetics trial was conducted to determine which of three commercially available MDs best promoted growth and survival in larval P. maxillaris compared to an Artemia reference diet. Survival was greatest for larvae fed Artemia compared to those fed MDs and standard length (SL) did not significantly differ among treatments. Lastly, a 35-day trial was conducted to identify the best timing for weaning P. maxillaris larvae from Artemia to a MD. Larvae were subjected to one of five treatments: Artemia reference diet, exclusively MD, or MD introduction at 12, 18, or 24 DPH. Survival was greatest for larvae fed Artemia compared to groups weaned onto MDs and SL did not differ significantly between the Artemia treatment and the W2 and W3 treatments. Additional trials will be conducted to determine the long-term effects of MD feeding to market size.

Investigating the ontogeny of digestive function in larval Chinese algae eater (Gyrinocheilus aymoneiri) to inform feeding and weaning protocols

Presenter: Casey Murray *she/her*
Institution: University of Florida Tropical Aquaculture Lab
Coauthors:
Olivia Markham | University of Florida
Nathan Evans | University of Florida

Abstract:
The Chinese algae eater (Gyrinocheilus aymoneiri) is a small-bodied fish native to rivers of the Mekong Basin in Southeast Asia. It is popular within the aquarium trade due to its ability to control algal growth in home aquariums. This species has been raised in aquaculture ponds however, the short time to market size results in increased labor due to frequent harvesting and restocking. Raising G. aymoneiri in recirculating aquaculture systems (RAS) would greatly reduce labor requirements, however significant challenges associated with larval survival of G. aymoneiri in RAS have been documented. Knowledge of the digestive tract development of this species is needed to understand the appropriate feeding and weaning schedule that best promotes survival and growth. Newly hatched G. aymoneiri (n=7800) were distributed equally among three 10 L tanks and fed a microdiet (MD) twice daily to satiation from two to 30 DPH (days post hatch). Larvae were sampled at 17 timepoints throughout the trial, photographed, measured, and assessed for developmental milestones. Larvae were preserved for either

digestive enzyme analysis via standard microplate assays or histological processing. Eye pigmentation was observed at 1 DPH, with subsequent mouth formation and the onset of feeding at 2 DPH. Inflation of a single lobed swim bladder occurred at 3 DPH. Larvae began to undergo flexion at 11 DPH and completed flexion at 19 DPH, with the swim bladder now exhibiting a bi-lobed appearance. Lipase and trypsin activity was detectable at mouth opening and increased dramatically after 17 and 23 DPH, respectively. A functional stomach was found at 25 DPH, indicated by the presence of gastric glands and a peak in pepsin activity. These data provide insight into the chronology of digestive capacity, which will aid in improving larval diet and culture conditions to optimize growth, survival, and production efficiency.

Hatchery Rearing Optimization: Accounting for Management Objectives

Presenter: Diana Perry *she/her*
Institution: School of Natural Resources and Environment, University of Florida
Coauthors:
Conor McGowan | U.S. Geological Survey, Florida Cooperative Fish & Wildlife Research Unit, University of Florida
Ed Camp | School of Forest Resources and Conservation, University of Florida

Abstract:
Stock enhanced freshwater recreation fisheries require the efficient use of hatcheries to address ecosystem needs and stakeholder preferences. The challenge is that hatchery space is limited each rearing season and managers and stakeholders alike often have preferences for different species and sizes of fish to be stocked. Each species and life stage reared requires a certain amount of space, time, and other resources. Managers must balance diverse stakeholder preferences, ecological needs, and hatchery constraints appropriately to successfully develop and maintain a recreational fishery. Efficiently delegating space in the hatchery can be optimized by addressing it as a knapsack problem—a combinatorial optimization problem that solves for the highest value attainable given a combination of weights and values of the possible stocking options within the constraints of the hatchery. By modeling the space required to rear each species and its value to the ecosystem and to stakeholder satisfaction, the knapsack optimization can deliver a solution that could result in high fishery management success given the parameters laid out by the state. We collaborated with Florida Fish and Wildlife Conservation Commission hatchery and stocking managers and researchers to develop rearing option weights, based on the space required to rear each stocking option, and values, based on ecosystem impacts and stakeholder preferences. This optimization helps illustrate the impact of specific stocking options and the sensitivity to stakeholder preferences and could prove useful as it can be adapted to other regions' or states' parameters for use in their stocking programs. Additionally, this optimization can be used to increase transparent communication between fisheries and hatchery managers as well as to contribute to increasingly informed hatchery decisions.

Development of Culture and Marking Techniques for Hogfish (Lachnolaimus maximus)

Presenter: Brandon Ray *he/him*
Institution: University of Florida
Coauthors:

Casey Murray | University of Florida
Matthew DiMaggio | University of Florida

Abstract:
Populations of hogfish (Lachnolaimus maximus), a popular sport and food fish, have been impacted by overfishing for the past 30 years. Aquaculture and stock enhancement are promising solutions, but limited understanding of biological and technical aspects of culture have stymied these efforts. Information on salinity tolerance and chemical marking in this species is noticeably absent. Research in these areas would help to advance aquaculture potential and fisheries application for hogfish. Thus, we propose a series of experiments to characterize the osmoregulatory capacity and define effective calcein marking protocols for this species.

Osmoregulatory control is metabolically expensive, which limits somatic growth. Culturing fish in isosmotic environments should reduce bioenergetic requirements, thereby improving growth. Acute salinity transfers (32à 4, 8, 16, 24, 32 g/L) were conducted on 170 DPH (days post hatch) hogfish and survival was monitored over 96 hours. Complete mortality was observed in the 0 and 4 g/L treatments. Results demonstrate that hogfish can tolerate acute salinity transfers to salinities as low as 8 g/L, which may allow for extensive pond production. Further experiments evaluating the ontogeny of salinity tolerance and the effect of salinity on growth and physiology will be pursued.

Calcein is an efficient, non-lethal, fluorescent chemical marker used in fisheries science. Standard calcein marking practices use osmotic induction, however, protocols and marking efficacy may be species-specific. Experiments with hogfish are currently underway to define safe and effective calcein marking procedures. Mark retention will also be evaluated to assess viability over protracted time scales.

Bottom-Up Conservation: Using Stakeholder Knowledge to Inform Conservation Priorities for an Unregulated and Recreationally Valued Fish Species

Presenter: Jennifer Rehage *she/her/hers*
Institution: Florida International University
Coauthors:
Carissa Gervasi | Florida International University

Abstract:
Translational ecology defines a collaborative effort among scientists and stakeholders with the goal of rapidly translating environmental problems into action. This approach can be applied in a fisheries management context when information needed to inform regulations is unavailable, yet conservation concerns exist. Our research uses a translational ecology framework to assess the stock status and develop research priorities for the Crevalle Jack, an unregulated and data-poor fish species, by collaborating with recreational fishing guides in the Florida Keys. We initially used interview data that compiled fishing guide knowledge to develop hypotheses about Crevalle Jack stock status that we then tested using existing fisheries-dependent datasets. Results revealed that Crevalle Jack populations in the Florida Keys appear to be in

decline since at least the 1990s, that the decline has been gradual, and that Crevalle Jack are seasonal residents, inhabiting the Florida Keys mainly in the winter months. We then built upon these results by using two complementary techniques to describe the daily, seasonal, and lifetime movement and migration patterns of Crevalle Jack in Florida and the northern Gulf of Mexico. Results revealed that Crevalle Jack reside in inshore habitats as juveniles before engaging in ontogenetic migrations to cooler, more offshore habitats between ages 1 and 2. Florida Keys and Alabama fish appeared to inhabit distinct regions on average with some possible connectivity. Adult Crevalle Jack were shown to make regular long-distance movements to the northern Gulf of Mexico, suggesting that multi-state management efforts may be necessary to restore and conserve the population in the future. Finally, we applied the results of our previous research to creation of a data-limited stock assessment for Florida Crevalle Jack. The stock assessment results revealed that Florida Crevalle Jack have been overfished and fully exploited for the past two decades, highlighting a need for management action.

Vertical and diel patterns of adult lemon sharks (Negaprion brevirostris) around the southeastern Florida and western Bahamas coastal shelves

Presenter: Jacquelyne Reuder
Institution: Nova Southeastern University
Coauthors:
David Kerstetter | Nova Southeastern University
Steven Kessell | John G. Shedd Aquarium

Abstract:
The lemon shark (Negaprion brevirostris) is a large tropical species found in the western Atlantic Ocean from Virginia to Brazil, including the Bahamas and Caribbean Sea. Previous studies on habitat utilization and habitat preferences were conducted on juveniles in the Bahamas, but little is known about vertical depth and temperature preferences of adults. Given the species' risk to overexploitation and habitat degradation, the IUCN Red List recently listed lemon sharks as Vulnerable. Pop-up satellite archival tags (PSATs) were deployed on lemon sharks (n=7) in 2008 and 2009 off Jupiter, Florida and Tiger Beach, Bahamas for programmed periods ranging from 10 days to 120 days. Two of the PSAT-tagged sharks were also fitted with acoustic tags associated with the Florida Atlantic Coast Telemetry (FACT) Network array. Previous studies showed an annual seasonal aggregation around Jupiter from December to March, and a northern migration in the spring and summer months. Preliminary analyses of PSAT data show two female sharks, one from Tiger Beach and one from Jupiter, made distinctive deep dives over several nights, up to 118 m and 55 m, respectively. A third PSAT recovered from Altahama Sound, GA, did not exhibit the same distinctive dives, however, the three tags showed similar depth patterns during the day and night. A fourth PSAT was attached to an individual in Jupiter, which then crossed the Gulf Stream, and the tag detached near Tiger Beach, Bahamas – only the second known case of a lemon shark crossing the Gulf Stream. Additional information on lemon shark habitat utilization will enable further bycatch reduction strategies for sustainable management.

Finding a home in a fragmented world: Multi-scale habitat selection of Spotted Seatrout in an area of seagrass recovery

Presenter: Jonathan Rodemann *He/Him*
Institution: Florida International University
Coauthors:
Rolando Santos | Florida International University
W. Ryan James | Florida International University

Abstract:
A pressing need throughout South Florida, particularly in the coastal Everglades, is understanding the factors that promote sustainable ecosystem services. Of particular interest is the sustainability of recreational fisheries (one of the most economically and ecologically valuable ecosystem services provided by the Everglades) and the seagrass beds on which they rely. However, the seagrass and associated faunal communities have continuously experienced degradation over the past several decades. In particular, major reductions in freshwater inflows have led to 2 large-scale seagrass die-offs in Florida Bay, resulting in a reconfiguration of the seagrass seascape in the northcentral region. Using machine learning and resource selection functions, we investigated the habitat selection of Spotted Seatrout within this recovering northcentral region of Florida Bay at multiple scales. Preliminary results indicate that Spotted Seatrout prefer areas of either high or low variation in submerged aquatic vegetation (SAV) cover and early succession SAV beds (beds dominated by Halodule wrightii and/or calcareous algae). These results indicate that mixed beds, a target of Everglades restoration, could have a positive influence on Spotted Seatrout occurrence in Florida Bay.

Age and growth of the yellow stingray (Urobatis jamaicensis) in Southeast Florida

Presenter: Jessica Schieber
Institution: Nova Southeastern University
Coauthors:
Daniel Fahy | Nova Southeastern University
John Carlson | National Oceanic and Atmospheric Association, National Marine Fisheries Service

Abstract:
The use of hard-part ageing techniques is a widely accepted method for understanding life-history patterns in fishes. However, the influence of non-annual growth marks, such as double banding patterns or somatic growth, may lead to errors in growth estimates. The yellow stingray (Urobatis jamaicensis) is a tropical batoid species with a biannual reproductive pattern reaching maximum estimated ages of 5 and 6 years old for males and females, respectively. Using marginal increment analysis and size-at-age data fit to five different growth models, we found that yellow stingrays attain more than 40% of their asymptotic size by birth with rapid, inconsistent growth within the first few years of life, followed by slower, more consistent growth as age and size increases. This is the first study to assess the age and growth patterns of U. jamaicensis with comparison to a biannual reproductive pattern. With band deposition most likely influenced by somatic growth or their tropical environment rather than seasonality, the estimates provided in this study could be used as a proxy for related species that not only lack

life history information but are of commercial importance, making yellow stingrays a vital contributor for fisheries management practices.

Spatiotemperporal patterns in Atlantic Swordifish habitat distributions
Presenter: Michael Schirripa
Institution: NOAA Fisheries, Southeast Fisheries Science Center, Miami, FL
Coauthors:
Francesca Forrestal | NOAA Fisheries, SEFSC, Miami, FL
C. Phillip Goodyear | Independent
Walter Bubley | Dept. of Natural Resources, South Carolina, USA
Rui Coelho | Portuguese Institute for the Ocean and Atmosphere, I.P. (IPMA), Olhão, Portugal
Alex Hanke | St. Andrews Biological Station, St. Andrews, N.B. Canada

Abstract:
A species distribution model (SDM) for Atlantic Swordfish (Xiphias gladius) based on habitat suitablity is presented. The model used detailed biological and oceanographic data combined with habitat affinities gleened from pop-up satellite tags (PSAT) to define the spatial distribution of Swordfish. The SDM adequately predicted Swordfish habitat (and thus fish) distributions such that it was found suitable for investigations into the spatiotemporal distribution of habitat. Results of this preliminary investigation supports the current hypothesized stock boundaries between the north and south Atlantic stocks used for management. HOwever, based on chaning oceanography, these boundaries may not be static in time. Both the north and south Atlantic may be experiencing an expansion of habitat. This could result in decreased density of swordfish into a larger area and/or change MSY production metrics.

Population Dynamics of Striped Bass Morone saxatilis in the Ochlockonee River Drainage
Presenter: Stephen Stang
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Coauthors:
Andy Strickland | Florida FWC
Micheal Allen | University of Florida

Abstract:
Lake Talquin and the tailrace located below the Jackson Bluff Dam provide a popular Striped Bass Morone saxatilis fishery in the Florida Panhandle. The system also serves as an important broodfish repository for hatchery programs participating in gulf Striped Bass restoration efforts. In recent years, larger Striped Bass caught by anglers and sampled by biologists have become increasingly rare. Researchers aimed to understand the underlying causes behind the reduction of fish numbers, particularly larger size classes. Water temperatures and dissolved oxygen concentrations of refuge areas in Lake Talquin were measured during the summers of 2020 and 2021. Ocklawaha Creek, Hammock Creek, Rocky Comfort Creek, Freeman Creek, and the Little River offer marginal thermal refuge for adult Striped Bass during summer. A total of 201 Striped Bass were tagged in Lake Talquin and below the Jackson Bluff Dam between December 2020 - February 2021. Annual exploitation was 24% and there was evidence of dam escapement.

Exploitation was focused below the dam on two cohorts of fish, and the harvest rate appears to be greater for fish of larger sizes. An age sample was obtained from December 2021 to January 2022 to examine population structure and total annual mortality. While the resulting length at age data made it difficult to generate a catch-curve to estimate total mortality, it did show that Striped Bass appear to be growing very quickly until age 3 before experiencing high levels of mortality.

Prevalence and antibiotic resistance characteristics of the indicator bacteria, Enterococcus species and Escherichia coli isolated from coastal marine sport fish in Florida

Presenter: Maki Tabuchi *she*
Institution: FWC, Fish and Wildlife Research Institute
Coauthors:
Valerie Harwood | University of South Florida
Kyle Luba | FWC, Fish and Wildlife Research Institute
Theresa Cody | FWC, Fish and Wildlife Research Institute

Abstract:
An ever-increasing population and degradation of wastewater infrastructure systems have resulted in sewage discharges from onsite and central systems into the coastal waters of Florida. These discharges have often contained infectious microorganisms, including antibiotic-resistant bacteria. Enterococcus spp. and Escherichia coli (E. coli) are conventionally used as indicator bacteria to estimate the level of fecal contamination in water. In this study, we isolated the indicator bacteria from the feces of six fish species: Red Drum (Sciaenops ocellatus), Common Snook (Centropomus undecimalis), Spotted Seatrout (Cynoscion nebulosus), Sheepshead (Archosargus probatocephalus), Hardhead Catfish (Ariopsis felis), and Striped Mullet (Mugil cephalus). In the Indian River Lagoon (IRL), prevalence of Enterococcus spp. was 43% in 97 fish and E. coli was 19% in 118 fish. The indicator bacteria carriages were different among the fish species and those categorized as obligate carnivores (snook, Red Drum, and seatrout) contained significantly lower prevalence of these bacteria than the other feeding types. Relatively high prevalence of Enterococcus spp. isolated from IRL fish is of particular concern since Enterococcus spp. are emerging opportunistic pathogens causing anorexia, muscle necrosis, septicemia, and mortalities in cultured fish. Out of 146 Enterococcus spp. isolates tested, 42% of them exhibited resistance to at least one antibiotic. Multidrug resistant Enterococcus spp. (resistant to three or more antibiotics) were isolated from a catfish and two mullet samples. Our findings indicate that carriage of the fecal indicator bacteria and their antibiotic resistance characteristics are largely differ among fish species, perhaps due to feeding behaviors and anatomy of their digestive tracts. Fish intestines are characterized by highly diverse and highly dense bacterial communities. As such, antibiotic resistance genes might be more easily transferred through conjugation in fish intestinal bacterial communities than those in surrounding water or sediment, threatening human health as well as the health of Florida coastal ecosystems.

Reproductive Dynamics of Common Snook in a Range Expanding Population in the Northern Gulf of Mexico

Presenter: Alexis Trotter

Institution: FL FWC/FWRI, St. Petersburg
Coauthors:
Kyle Williams | FL FWC/FWRI, St. Petersburg
Philip Stevens | FL FWC/FWRI, St. Petersburg
Michael Allen | UF/IFAS/NCBS, Cedar Key

Abstract:
Since 2010, the population of Common Snook, Centropomus undecimalis, has increased exponentially in the Nature Coast region of FL. Research has focused on age, growth, genetics, movement patterns, and overwintering habitat requirements. Substantial differences in these life history parameters have been found between snook in the Cedar Keys area and snook in the historic range farther south. Less research has focused on the reproductive dynamics of snook in the range expanding population. This project uses histology samples from snook collected during standardized Fisheries Independent Monitoring seining (n = 528; 2018-2021), and biopsy samples from females collected by hook and line at suspected spawning sites (n = 39; 2021), to estimate the spawning season duration, spawning aggregation size distribution, and sex ratio. It is also necessary to identify the receiving nurseries. Pilot work is currently being conducted to locate the young-of-the-year (yoy) and age-1 snook, which are likely in remote reaches of tidal creeks and coastal ponds outside of the current sampling universe. Data on the reproductive biology will be needed when managers begin to assess the population status of the species in the newly established range, while mapping the locations of spawning aggregations and nurseries throughout the Cedar Keys will aid in habitat conservation.

State response to Lacey Act changes; a survey of state Aquatic Nuisance Species coordinators

Presenter: Quenton Tuckett
Institution: University of Florida
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Carole Engle | Virginia Tech University
Jonathan van Senten | Virginia Tech University

Abstract:
Under provisions of the Lacey Act, the USFWS not only regulated the importation of injurious wildlife into the United States and its territories, but it was also further interpreted since the 1960s as banning interstate movement within the continental United States. Following a challenge by the U.S. Association of Reptile Keepers, the U.S. Court of Appeals for the District of Columbia on April 7, 2017 affirmed a lower court ruling that the government lacks authority to regulate shipment of injurious species across state lines. Thus, depending on the outcome of state agency decisions following this court ruling, and potential changes to state regulation, there may be increased uncertainty and complexity for aquaculture producers if regulations are added on a state-by-state basis. Our goal was to identify anticipated changes at the state level, the strengths and weaknesses of these and other identified policy/regulatory approaches, to provide clarity to producers. A formal telephone survey of state Aquatic Nuisance Species coordinators was used to identify current and anticipated regulatory practices. Response rate was 98%. Following the Lacey Act ruling, 43 states made no changes, 3 added species to their prohibited list, and 1 state harmonized regulations with USFWS injurious wildlife lists. Of the 43

states yet to make changes, 33 had no plan for changes, 9 were assessing their options, and 1 had plans for harmonization with USFWS lists. With respect to procedures for evaluating invasiveness risk of aquaculture species, 32 states had no standardized procedure, 13 had a standardized process, and 2 used common processes but were not standardized. Ultimately, this survey indicated there were few regulatory changes following the court ruling in 2017. However, with new and expansive proposed amendments to the Lacey Act in the current version of the America COMPETES Act, the potential for future changes remains.

Between Dry Rock and a Salty Place: How Hydrology influences the Habitat use of Florida Largemouth bass

Presenter: Natasha Viadero *she/her*
Institution: Florida International University
Coauthors:
Jennifer Rehage | Florida International University, Earth & Environment Department
Rolando Santos | Florida International University, Department of Biological Sciences

Abstract:
Recreational fishing for species such as Florida Largemouth Bass (Micropterus salmoides floridanus) significantly contributes to Florida's economy. The resilience of these recreational fisheries rely on maintaining suitable habitat conditions in the ecosystems that support them. With mounting concerns surrounding climate change and sea level rise, there is a pressing need to understand how these recreational fisheries will respond to changes in habitat distribution expected in the coming decades. The historic fragmentation of southward freshwater flow from Lake Okeechobee leaves Everglades National Park particularly vulnerable to climate change, primarily sea level rise. Fortunately, massive restoration efforts in the Everglades are underway that could potentially mitigate some of these impacts. Yet, whether current restoration efforts will be enough to counteract sea level rise and maintain suitable habitat for key recreational fish species such as Florida Largemouth Bass remains unclear. Shark River Estuary (SRE), in Everglades National Park, provides a permanently inundated refuge for Florida Largemouth Bass and other freshwater fishes when the surrounding marshes experience seasonal drying. However, this dynamic estuary is susceptible to fluctuations in salinity driven by the balance between upstream freshwater deliveries and downstream tidal cycles. In this work, we examine patterns of seasonal habitat use of SRE by Florida Largemouth Bass related to hydrological conditions. Understanding the extent to which the habitat use of Florida Largemouth Bass is driven by abiotic variables is essential for evaluating the habitat suitability of SRE for these economically important recreational sportfish. Ultimately, this work seeks to develop the relationship between the habitat use of Florida Largemouth Bass and hydrologic conditions to inform habitat suitability index models aimed at quantifying how habitat quality changes under a variety of water management, restoration, and sea level rise scenarios.

Species responses to environmental fluctuations within an urbanized estuary

Presenter: Sarah Webb
Institution: Florida Fish and Wildlife Conservation Commission / FAU HBOI
Coauthors:
Erick Ault | FWC

Robert Ellis | FWC
Philip Stevens | FWC

Abstract:
Recently, the waters of the southern portion of the Indian River Lagoon (IRL) and St. Lucie River (SLR) have suffered from multiple stressors. Influx of fresh water due to local run off from weather events as well as discharges from Lake Okeechobee into the SLR, and corresponding harmful algal blooms, have damaged seagrass beds and negatively affected the health of this important ecosystem The degradation of seagrass beds and loss of mangrove habitats due to urbanization may have altered recruitment patterns and assemblages of important fish species that support recreational and commercial fisheries, such as Spotted Seatrout (Cynoscion nebulosus) and Sheepshead (Archosargus probatocephalus), as well as juvenile Goliath Grouper (Epinephelus itajara). Here we report on preliminary research into how these species respond to natural and anthropogenic disturbances in southern IRL and SLR estuary systems and how these disturbances may cause shifts in habitat utilization patterns. To date we have tagged Spotted seatrout (n=30), Sheepshead (n=20), and juvenile Goliath Grouper (n=30) with acoustic transmitter tags (Innovasea brand V9 and V16 tags; 1.5 yr and 6.5 yr battery life) in both the IRL and SLR where established acoustic arrays are located. Pairing movement data with IRLON and other environmental datasets, we will investigate the effects of salinity and temperature changes on the movement patterns and distribution of these species. We hypothesize that the Spotted Seatrout may be the most sensitive to these environmental fluctuations and habitat degradation, whereas the Sheepshead may be the most resilient to environmental fluctuations based on basic life history as well as distribution patters within the SLR, IRL, and offshore environments. The results of our research will provide critical information for management decisions on restoration efforts and water quality control measures to aid in the improvement of the health of the lagoon and estuary.

When worlds collide: multi-directional movement of fishes and their ecological importance
Presenter: Mack White *he/him*
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Abstract:
Fishes have the potential to move large amounts of nutrients throughout the different environments they occupy over the course of their life. This movement of nutrients can subsidize recipient ecosystems and have profound effects on ecosystem function. The roles of many fishes in moving limiting nutrients such as nitrogen (N) and phosphorus (P) is unknown despite their recognized importance in the biogeochemical cycling of these and other elements. Additionally, the magnitude and ecological importance of nutrient subsidies are highly context-

dependent, varying as a result of different abiotic (i.e., temperature and hydrology) conditions. Therefore, there is a need to further resolve our taxonomic and geographic understanding of when fish-mediated nutrient subsidies are important. To accomplish this, I will quantify the magnitude and ecological importance of N and P delivered to the Shark River's marsh-mangrove ecotone from four mesoconsumer fish populations (i.e., Common Snook, Largemouth Bass, Florida Gar, and Bowfin) during the annual dry season via egestion and excretion as they seek refuge in perennial mangrove creeks from falling water levels in adjacent marsh environments or track marsh prey from downstream estuarine environments. On average, these four species make up more than 95% of the fish biomass inhabiting the marsh-mangrove ecotone during the dry season, representing a large potential nutrient subsidy in an otherwise oligotrophic system. I hypothesize that fish-derived N and P will (1) exceed inputs of N and P via upstream marsh and tidal flux contributions, (2) alleviate N and P limitation of primary production, and (3) stimulate litter decomposition via microbial enrichment. Broadly, this study aims to link the importance of biodiversity to ecosystem function. Understanding the conditions in which nutrient subsidies from migratory fishes are likely to be ecologically important is critical given global declines in biodiversity and increased hydroclimatic variability.

Using daily growth estimates of juvenile fish to address contemporary issues of habitat restoration and species range expansions

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Abstract:
Determining fish age from otoliths is a well-established technique and is commonly used for assessing a species population status. For example, annuli counts are used to estimate life-history parameters used in stock assessment including maximum age, age at maturity, and growth rate. Utilizing similar, but more refined ageing methods, daily increment counts on otoliths can be conducted on small juvenile fish. The FWRI Fish Biology section, in cooperation with multiple partners, are using daily counts and estimates of growth rates to address contemporary issues related to habitat restoration and species range expansions. For example, efforts to restore coastal wetlands affected by urbanization have been increasing. A need exists to assess the quality of these habitats. In one study, growth rates of juvenile Common Snook, a species dependent on coastal wetlands, were compared among restored, natural, and degraded habitats as a proxy for habitat restoration quality. Growth rates can also be compared across latitudes, where they may demonstrate counter-gradient variation (faster growth at higher latitudes); a factor to account for when assessing habitat quality or population status for subtropical species that are undergoing range expansion. Back-calculated hatch dates from daily counts can be used to help determine where a fish may have spawned, length of spawning seasons between regions, and duration of nursery use before emigration. Using daily ageing as

a technique to address contemporary issues, biologists can develop management and restoration strategies to improve populations of recreationally important species by protecting suitable habitats.