RESEARCH HIGHLIGHTS

2023 - 2024

FRESHWATER FISHERIES RESEARCH

A MESSAGE FROM THE SECTION LEADER

Welcome to the 12th edition of the Freshwater Fisheries Research Section Annual Research Highlights. The Integrated Research Management (IRMT) Team and the Annual Research Highlights document were two of my first moves as Section Leader with simple but critical objectives – to ensure that we were conducting the highest priority research projects for our management partners and the information is effectively communicated as broadly as possible to inform management actions. The IRMT and Research Highlights have both evolved over time, but the main objectives are the same and both have become core elements of our section. The annual Research Highlights document is intended to relay summary information in an easily digestible format (with photos) for the various research projects and programs conducted by scientists in Freshwater Fisheries Research. We are conducting about 50 different research projects/programs on a wide diversity of topics relevant to research and management partners from various sections, divisions, agencies, and institutions. You may be interested to learn more about our freshwater invertebrate program, trends in fisheries and habitat from long-term monitoring programs, conservation genetics, stock enhancement evaluations, threatened and imperiled species critical data gaps investigations, directed sport fish research, and more in this year's edition. While the Research Highlights document provides a snapshot of highlights from our research projects and programs, more detailed annual reports, and publications of select research projects are available. Every year I look forward to sending out this report to showcase the incredible quantity, quality, and diversity of research that we are conducting. I want to thank all the research scientists for their exceptional work at executing such high-quality research on high priority issues, as well as our management partners that are actively involved as collaborators on much of the work we do.

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Jason Dotson
Jason.Dotson@MyFWC.com

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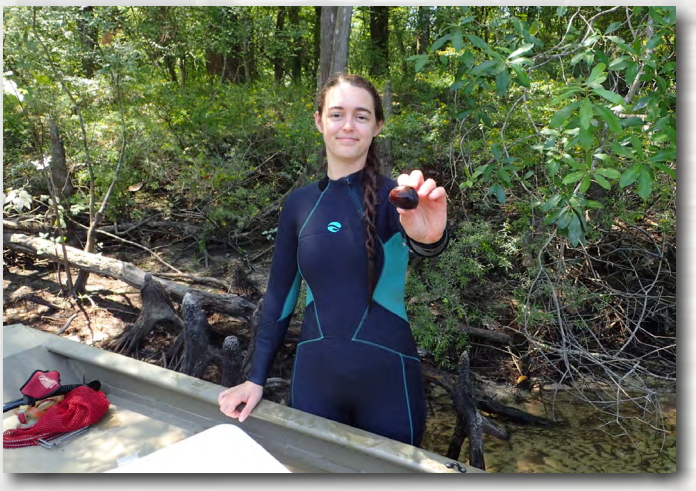
FLORIDA'S STATEWIDE FRESHWATER MUSSEL CONSERVATION PROGRAM

Lauren Patterson, Amber Olson, Jacob Lanning, Anna Raney, and Susan Geda

The program has conducted 1,261 discrete surveys and recorded 146,896 individual mussels. During this fiscal year, 45 surveys were performed in six basins where 4,363 individual mussels were collected representing 36 species. Two additional species were observed by the evidence of shell. The total number of federally listed mussels collected was 252, representing 11 of the 16 listed species in the state.

The most heavily sampled drainage basins were the Escambia and Ochlockonee. Program biologists focused on filling sampling gaps in the Escambia basin (Pine Barren Creek and Delaney River) and on checking the status of the Ochlockonee Moccasinshell (*Medionidus simpsonianus*) population in the lower Ochlockonee basin.

Advancement was made towards recovery efforts for the Ochlockonee Moccasinshell. The program worked with state and federal partners towards captive propagation of this species. We aided in locating gravid females and collecting fully developed larvae. The larvae were taken to national fish hatcheries where they were used to inoculate a potential host fish (Blackbanded darter, *Percina nigrofasciata*). This is important as larval freshwater mussels depend heavily on a host fish to metamorphose into a juvenile mussel, and also to disperse to upstream habitats. Some transformation did occur, and now the juvenile mussels will continue to grow until they can be re-released back to the Ochlockonee basin. A current population estimate, habitat preferences, and potential reintroduction sites for the Ochlockonee Moccasinshell are in progress.



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EVALUATION OF BLACK CREEK CRAYFISH (PROCAMBARUS PICTUS) POPULATION STATUS, 1976-2024

Kasey Fralick, Isabel Evelyn, and Caleb Shively

The Black Creek Crayfish (BCC) is a state-listed crayfish that is only found in a small portion of the Lower St. Johns River watershed, mainly within the Black Creek basin. It is also found in other nearby watersheds outside of the Black Creek basin that feed into the St. Johns River (EX: Etoniah Creek, Clarkes Creek, Julington Creek).

In 2008, a crayfish native to parts of Florida, but not the St. Johns River Basin– the White Tubercled Crayfish (WTC) – was first observed at two nearby sites in Black Creek.

Both BCC and WTC are specialists that require stream/river habitats that do not reach high temperatures in the summer.

FWC conducted surveys from October 2018 – June 2024 to determine the current distributions of the BCC and the WTC within watersheds that contain records of BCC.

As of June 2024, WTC have replaced BCC throughout most of the Black Creek basin. In general, WTC has completely replaced BCC in the higher order streams. The sites where both species currently co-occur are located in lower order streams. This period of co-occurrence is temporary, as WTC eventually replaces BCC in the sites it colonizes.

The only sites within the Black Creek basin where BCC are present without WTC are located upstream of some kind of natural or artificial barrier that is at least temporarily preventing WTC from moving upstream.

No WTC were found in the sampled watersheds outside of the Black Creek basin, where only BCC or other native crayfish species were found.

FWC will continue to monitor and survey known BCC populations within and outside the Black Creek basin. FWC is also researching the life history and habitat requirements of BCC in order to inform future conservation strategies, such as habitat restoration and captive breeding.

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EVALUATION OF LAKE OKEECHOBEE LITTORAL AND SUBLITTORAL ZONE INVERTEBRATE COMMUNITIES

Isabel Evelyn, Kasey Fralick, and Gary Warren

The purpose of this project is to obtain information on the current status of the Lake Okeechobee macroinvertebrate community in both the sub-littoral and littoral zones of the lake.

Sub-littoral zone sampling occurred in fall 2021, fall 2022, and February/March 2024.

Littoral zone sampling occurred in September 2023 and February 2024. A third littoral zone sampling event is scheduled for August/September 2024.

Invertebrate communities will be compared across spatial (habitat type, site) and temporal (season, year) scales.

The results of our surveys will be compared to the findings of previous FWC Lake Okeechobee invertebrate community surveys (1987 – 1996; 2005 – 2008) to assess long-term trends.

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PHYLOGENY AND POPULATION STATUS OF IMPERILED SILTSNAILS ENDEMIC TO FLORIDA SPRINGS

Kasey Fralick, Isabel Evelyn, and Caleb Shively

Florida has eleven snail species in the genus *Floridobia* and six species in the genus *Aphaostracon* that were described as endemic to a single spring system. All are ranked as critically imperiled/imperiled by NatureServe and are classified as SGCN in Florida. There are also two *Floridobia* and three *Aphaostracon* species with wider ranges in FL.

FWC is conducting a project to develop survey methods, determine current status and habitat preferences, and analyze phylogenetics and population genetics of *Floridobia* and *Aphaostracon* specimens.

During site visits conducted in 2021 - 2023, seven of the narrow-range endemic *Floridobia* species – *Floridobia mica* (Coffee Spring), *F. helicogyra* (Hunter Springs), *F. petrifons* (Rock Springs), *F. wekiwae* (Rock Springs), *F. parva* (Volusia Blue Springs), *F. alexander* (Alexander Springs), and *F. porterae* (Green Cove Springs) –were confirmed as present at their type locality. *F. ponderosa* (Sanlando Springs) and *F. leptospira* (Glen Branch) were not located at their type localities. In addition, four of the endemic *Aphaostracon* species – *A. monas* (Wekiwa Spring), *A. pycnus* (Alexander Spring), *A. asthenes* (Volusia Blue Spring), and *A. theiocrenetus* (Clifton Spring) –were confirmed as present in their type locality.

Both *Floridobia* and *Aphaostracon* species are found at the highest densities vegetated habitats (aquatic plants, macroalgae) and have a high relative abundance there.

Preliminary phylogenetic analyses supported *A. pycnus*, *A. theiocrenetus*, *F. wekiwae*, and *F. petrifons* as distinct species. *A. monas* and *F. mica* each formed a distinct clade with congeners collected from nearby sites (Sanlando Spring and Ichetucknee Spring, respectively). The status of the other putative single-spring endemic *Floridobia* and *Aphaostracon* was inconclusive. Additional specimens and outgroup taxa will be collected and analyzed in FY 24-25 to address these ambiguities and finalize the phylogenetic analysis.

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ANALYSIS OF SOCIAL MEDIA PERFORMANCE AND PRACTICES FOR FRESHWATER FISHERIES RESEARCH

Justin Hill

Outreach through social media is an integral part in taking the Florida Fish and Wildlife Conservation Commission's (FWC) collective information and data to the stakeholders. The Florida Fish and Wildlife Research Institute (FWRI) focuses on sharing quality scientific information through various social media platforms with Freshwater Fisheries Research (FFR) being a major contributor. Social media post totals were mostly the same as previous years. A new addition this fiscal year was a Northeast regional newsletter. These go out monthly through email to stakeholders that sign up, letting them know of research projects and management activities near them. If successful, there are plans to expand to the other regions. Currently the Northeast regional newsletter has nearly 200 contacts.

As percentages of FWRI content, Freshwater Fisheries is one of the most popular sections within the Institute. Because of our self-reliance and quality content we have gained the trust of not just the outreach leadership within the FWRI, but also that of the Division of Freshwater Fisheries Management (DFFM) and have helped bridge a connection between the two allowing for content to be shared to mutual social media benefit.

In the coming fiscal year, I recommend we continue to probe to find alternative ways to communicate with stakeholders. Focusing on quality of interaction versus quantity can build meaningful connections with those who are more engaged. For example, we have had success with waterbody clean-up days as well as attending small, local, community events.

There was a total of 107 outreach interactions in 2023/24.

- Facebook posts: 16
- YouTube uploads: 3
- Web content: 23
- Instagram posts: 16
- Other: 48
- Regional Newsletters: 1

Notable posts: A post titled "Elusive Fish in the Chipola" featuring a Shadow Bass reached 83,392 Facebook accounts and another 13,000 accounts on Instagram.

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ANNUAL UPDATE OF FWC'S FRESHWATER CITIZEN-SCIENCE PROGRAM, TROPHYCATCH

Summer Lindelien, Kristen Eser, KP Clements, Drew Dutterer, John Cimbaro, Michelle Kerr, Jason Dotson, and Bill Pouder

TrophyCatch (TC) has approved more than 15,000 entries across 414 public waterbodies over 12 seasons as of June 30th, 2024. These citizen-science data collected for Florida Bass greater than eight pounds surpass data collected from standard electrofishing samples and the Trophy Bass Tagging Study (1,782 tagged fish from 167 public waterbodies).

TrophyCatch had 38,229 registrants as of June 30th, 2024 and during Season 12, the program surpassed 15,000 approvals. the Lunker Club surpassed 12,000 approvals, the Trophy Club surpassed 3,000 approvals, and the Hall of Fame Club surpassed 150 approvals.

FWC fisheries scientists tagged trophy-size bass with unusually-high-reward pink dart tags in water bodies in all 5 FWC regions of the state this spring (NW Winter Haven Chain of Lakes, Lake Beauclair, Lochloosa Lake, Lake Okeechobee, and Porter Lake). For the first pink-tag capture on each water body, TC awarded $1,000 from American Fishing Tackle Company (AFTCO), $1,000 from 888-BOAT-LAW, and $500 from Bass Pro Shops. The second pink-tag capture from each water body was awarded $1,000 from 888-BOAT-LAW, $500 from AFTCO, and $100 from Bass Pro Shops. All TC approved bass from pink-tag water bodies were entered into a random drawing (called "Pink Tag" Chasers) for a chance to win a pair of Bajio sunglasses. Pink-tag bass have been caught, reported, and approved for TC from Lake Rochelle and Porter Lake. Porter Lake had more approved catches than any past season. Lake Okeechobee had more approved catches than Seasons 1 and 7–11.

Orange Lake had the most Trophy Club catches (25). The second highest was the Withlacoochee River (14). Rodman Reservoir had the most Hall of Fame Club catches (3).

We attended Bassmaster and MLF Florida Tournaments, ICAST, MarineQuest, Florida State Fair, Florida Outdoor Expo, News Channel 8 Outdoor Expo, and other local events. We presented about TC at the American Fisheries Society national meeting in the "Challenges and Solutions for Using Citizen Science in Fisheries Management" symposium and served on the panel at the Florida meeting for Advancing Participatory Sciences.

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CREEL ESTIMATES REPORTED FROM TROPHYCATCH REGISTERED ANGLERS

Summer Lindelien

Starting in 2019, creel surveys around the state added a question to determine anglers who are registered for the TrophyCatch (TC) program. These data were collected to evaluate current TC registration rates, residency, targeted species, and TC registered angler effort, catch, and success. Tracking TC approved bass through the program is helpful, but we have no way to scale approved bass between water bodies. By capturing statewide-standardized TC registered angler effort we can better evaluate if TC approvals for a waterbody are higher because there is more TC registered angler effort or if the waterbody produces more TC bass.

To explore this further, we used TC catch date within water body creel periods and TC registered angler effort (LMB/day) to calculate catch per unit effort (LMB ≥8 lbs./day) of trophy bass. We can identify locations where additional TC promotion is needed and assess if TC registered angler effort is increasing to document growth of the program. These data could also help us evaluate changes in TC submissions and participation.

Creel survey data will expand information gained from TC collected data and allow for more scientific and management applications.

Out of the total number of FWC-creel surveyed anglers (9,304), 15% were registered for TC.

Lake Istokpoga, Rodman Reservoir, and Orange Lake had the highest percentage of Florida residents that were registered for TC (31% to 32%).

Stick Marsh/Farm 13 and Lake Trafford had the lowest percentage of Florida residents that were registered anglers for TC (2%). Lake Trafford was lowest last year, too.

Santa Fe Lake had the highest percentage of non-resident anglers that were registered for TC (29%). Last year it was also highest with 25%.

Clermont Chain, Lake Weir, Lake Victor, Lake Trafford, and Lake Marian all had zero non-resident anglers registered for TC.

Based on creel data from 11 water bodies, the percentage of TC registered angler effort out of the total FLB effort was highest at Orange Lake and Lake Tarpon (49%).

Lake Istokpoga had the highest TC registered angler catch.

TrophyCatch registered angler success was highest at Lakes Weir and Talquin (1.10 and 1.09 FLB per hour).

TrophyCatch registered angler success was lowest at Newnans Lake.

Trophy bass success (TC approved FLB ≥8 lbs. per day) was highest at Rodman Reservoir.

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COMMUNITY BASED FISHING PROJECT

Nick Tripple, Eric Johnson, Josh Wilsey, Hayden Wennerdahl, Scott Coerver, Allen Martin, Courtney Stachowiak, Madison Fishman, and Ed Camp (UF)

This fiscal year brought about many challenges. Plans changed mostly due to the extremely high rate of employee turnover FWC faced during this fiscal year. Positions are now re-filled for each region so we should be back on track for the 2024-2025 fiscal year. Florida Bass stocking was completed in two treatment lakes in the South Region. Both the two stocking treatment lakes and two control lakes are currently being monitored with game cameras. However, most camera data is not yet entered so up to date total effort estimates are not completed. Game cameras are running at all lakes in the Southwest and North Central regions to collect pre advertising/marketing angler effort data as well. Photos from these surveys are awaiting analysis also.

Future plans for this project include continued evaluation of stocking of various fish species and sizes, continued evaluation of marketing/advertising methods, and various facility setups where possible (piers, bathrooms, parking, etc.), all of which stakeholders who participated in year-one survey, listed as reasons why they may or may not fish at certain locations. Data from these evaluations will help to determine how to increase usage and satisfaction of stakeholders using these resources. The final goal is to have a research-backed set of options for managers to utilize to better manage community based fisheries.

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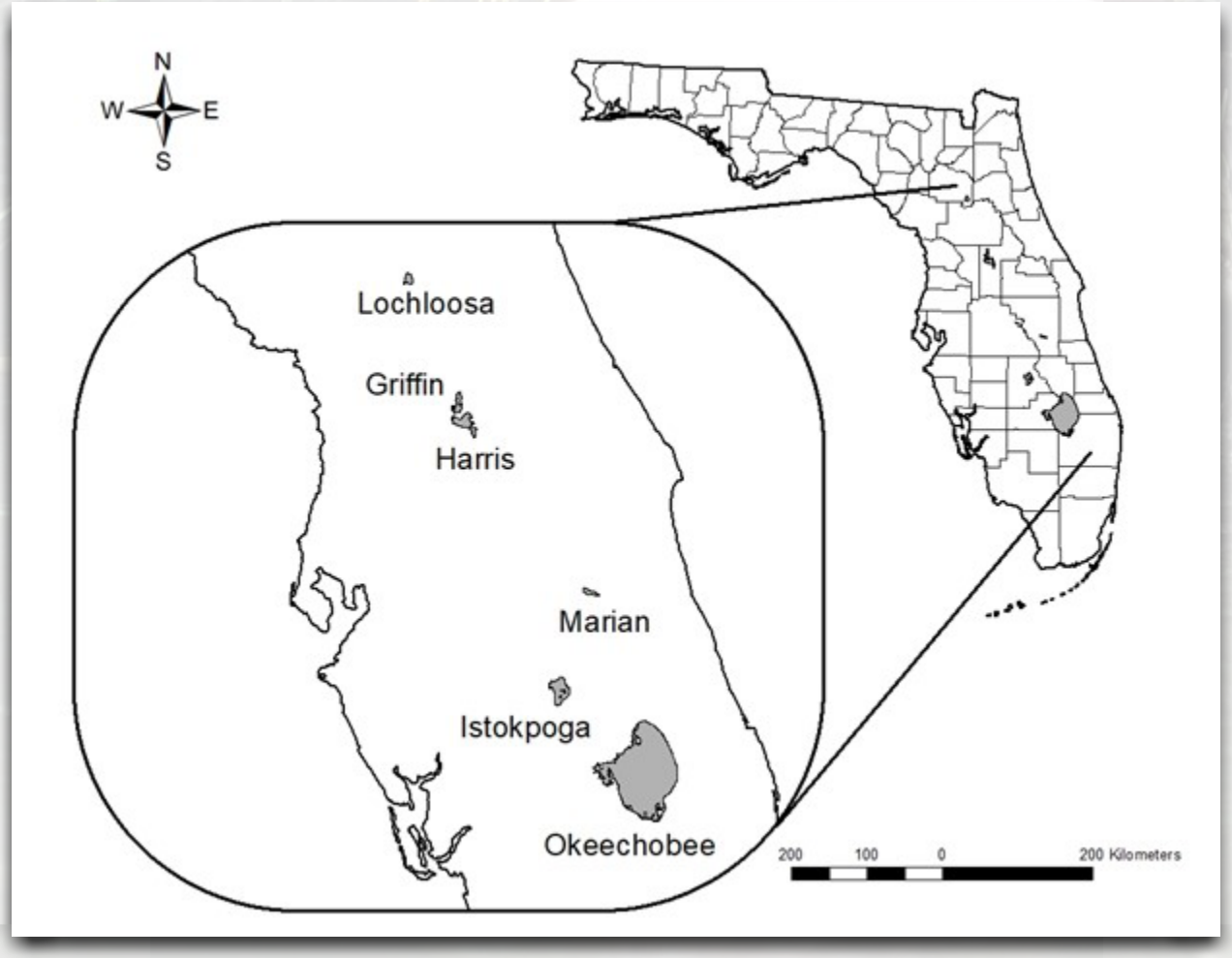
VIRTUAL POPULATION ANALYSIS OF BLACK CRAPPIE POPULATIONS IN FLORIDA

Ryan Howard, Chris Anderson, Sara Menendez, Reid Hyle, and Matt Stevens

The VPA sampling was largely successful in the seventh year of collection with few problems in any of the sampled lakes this year. The key to collecting accurate, sufficient data for this ten-year, statewide, management/research partnership project is communication and collaboration between all biologists involved. The effort of management and research biologists continues to improve, even with high position turnover throughout many offices involved.

Gaps in creel data are a continuing problem and creel managers need more support and connection with other creel managers statewide. With some potential issues already apparent in data collection in past years, it is imperative to maintain the consistency and quality of the data in future years, which the new Black Crappie VPA data coordinator strives to do.

- This is the second year the Lake Okeechobee creel methodology incorporated the entire lake.
- Data has been compiled in a single location that all parties can access.



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DEVELOPMENT OF A CO-PARENTAGE GENETIC ANALYSIS OF BLACK CRAPPIE AT TENOROC FMA

Logan Masterson, Ted Lange, Brandon Barthel, Ryan Howard, Brandon Thompson, Aaron Entrekin, and Eric Johnson

Tenoroc pits have undergone large declines in Black Crappie angling effort and managers are using stocking in attempts to enhance the fishery. A 20-year decline in crappie angler effort, catch, and harvest rates has prompted concerns about crappie abundance. To address this, fisheries managers determined that supplemental stocking of Black Crappie was the best management strategy to meet their goal of improving angler effort and harvest. This study investigates the effectiveness of stocking to enhance year-class strength and examines factors influencing stocking success, including system productivity, zooplankton densities, and lake morphometry.

In 2022, brood fish were collected in the wild and spawned at the Richloam Bass Conservation Center, producing 52,000 fingerlings for stocking in 3 lakes at Tenoroc Fish Management Area. Again in 2023, broodfish were collected in the wild and spawned at the Welaka National Fish Hatchery, producing approximately 75,000 fingerlings which were stocked into six lakes at Tenoroc in April of 2024. Post-stocking mortality of fingerlings averaged 6.5% and 1.5% over a 72-hour period in 2023 and 2024, respectively.

A major challenge in performing any kind of stocking enhancement is determining success of the management action; therefore, we are investigating marking techniques to be able to identify stocked vs wild fish in recipient waterbodies. Crappie stocked in 2023 were chemical marked with OTC. Fish held in hatchery ponds had no retention of the chemical marks at 32-132 days. Crappie stocked in 2024 are part of a process to develop co-parentage analyses to use genetic markers to identify hatchery vs wild fish. Broodfish, hatchery fingerlings and wild fish from the recipient Tenoroc lakes are being used to develop primer sequences that will allow microsatellite loci to be genotyped to identify cohorts of stocked crappie.

This research aims to provide insights into effective crappie stocking practices and effective stocking assessment techniques to improve management strategies for maintaining sustainable crappie fisheries in Florida's freshwater systems. Next year will include a third year of stocking crappie in our six Tenoroc study lakes. Future assessments will focus on assessing the contribution of genetically identified stocked fish to the crappie population and the Tenoroc lakes fisheries to provide measures of the viability and long-term success of the crappie stocking efforts.

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DART TAGGING INVESTIGATIONS OF BLACK CRAPPIE COLLECTED FROM ELECTROFISHING AND HOOK-AND-LINE

Dan Nelson and Brandon Thompson

Several actions items in the Black Crappie management plan included developing age-structured population models, implementing tagging studies that measure fishing mortality, and expanding our understanding of natural mortality. These actions could be informed by future high-reward tagging studies at select Florida crappie fisheries.

Electrofishing is often used to collect and tag a representative population of crappie but there are waterbodies where other techniques would need to be used to collect fish. Collecting crappie using hook and line sampling has been considered for tagging studies in combination with electrofishing and/or when electrofishing is not an efficient means of collection. However, no previous studies have assessed tagging mortality for crappie collected by hook and line. Therefore, a study was conducted at Lake Dora, FL to compare tagging mortality for crappie collected by electrofishing (N=40) and crappie collected hook and line (N=34).

In this preliminary study, crappie were collected and tagged (dart tags) on January 30th, 2024 and placed into large floating holding pens for up to 80 days. After three weeks post tagging, mortality was similar for the electrofishing (2.6%) and angling (0%) treatments.

- Tagging mortality was estimated at 5% through 80 days for the electrofishing treatment.
- Tag retention was also assessed through this study and was 100% for both treatments.

Researchers plan to replicate this study in the winter of 2025 to confirm that tagging mortality is similar between treatments.

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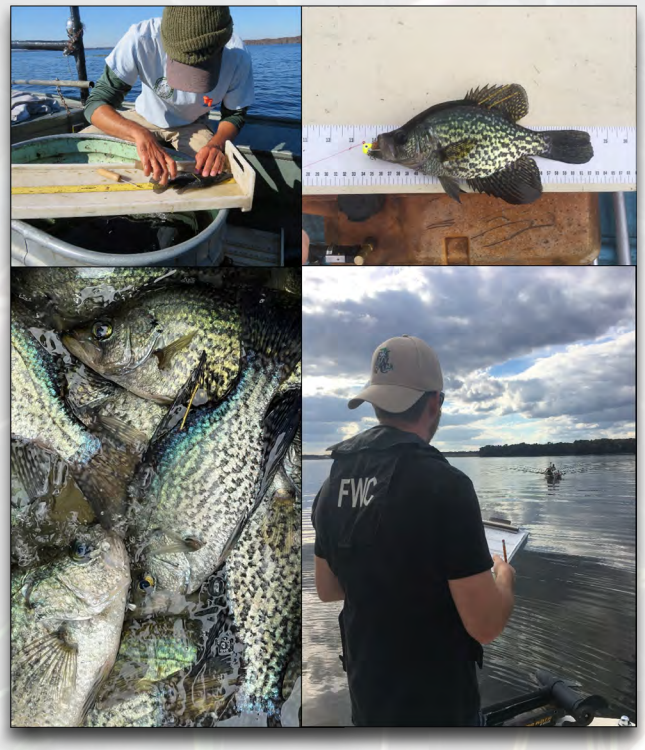
ANNUAL VARIABILITY IN ANGLER EXPLOITATION OF BLACK CRAPPIE AT NEWNANS AND LOCHLOOSA LAKES

Travis Tuten, Steve Beck, Chris Anderson, Paul Ramsey, Joseph Barnett, and Allen Martin



FWC has observed significant relationships between Black Crappie abundance estimated from trawl sample CPUEs and angler effort, catch, and harvest estimated from creel surveys at multiple lakes. Our objectives are to determine how exploitation in Black Crappie fisheries varies annually and with fish abundance and angler response at lakes Lochloosa and Newnans.

We tagged 202 Black Crappie in Newnans Lake and 208 in Lochloosa Lake with high reward tags ($100) in November 2023. There were 43 tag returns from Lochloosa Lake, and 37 (86.0%) of those fish were harvested. This resulted in an exploitation estimate of 18.5%. There were only 43 tag returns from Newnans Lake, and 38 (88.4%) of those fish were harvested. This resulted in an exploitation estimate of 19.5%.

The 2023-2024 18.5% exploitation estimate at Lochloosa Lake was at the lower end of the range observed in nine years of the study (12.2-37.5%), but the fourth highest estimate we've made there. The estimate for Newnans Lake (19.5%) was on the high end of the range (1.0 - 22.9%) and the third highest estimate made there.

- There is a strong, positive relationship between Black Crappie exploitation estimates and creel survey estimates of angler catch, harvest, and harvest success at both lakes.
- There is a positive relationship between Black Crappie exploitation and angler effort at Newnans Lake, but that relationship is weak at Lochloosa Lake.
- Relationships between exploitation and relative abundance of Black Crappie > 203 mm TL based on trawl CPUEs were positive, but weak at both lakes.
- Relationships between exploitation and relative abundance of Black Crappie > 229 mm TL based on trawl CPUEs were positive at both lakes, and stronger compared to smaller fish > 203 mm TL.

This was the ninth year of the study. As additional estimates of annual exploitation are available in future years, more detailed relationships between exploitation and fish abundance will be evaluated. Findings from this study played a key role in the Black Crappie regulation review process completed in 2021.

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EVALUATING BIOLOGICAL AND SOCIAL EFFECTS OF THE NEW STATEWIDE FLORIDA BASS REGULATION

Daniel Nelson, Brandon Thompson, and Rachel Bratton

July 1, 2016, the statewide Florida Bass regulation was changed to a five-fish bag, of which only one fish can be 16” or larger. Six years of the ten-year evaluation have been completed.

Creel surveys were conducted on a subset of lakes to assess changes in directed effort, catch, and harvest of Florida Bass, as well as social changes like regulation satisfaction and awareness. Electrofishing samples have shown no trends in catch rates, size structure, or condition of bass that can be related to the regulation change.

Regulation awareness remains high during the creels of 2023-24 (67%) and satisfaction remains high (4.60/5). Angler bass catch rates, harvest rates and overall effort have been relatively stable since the regulation. Age-at-length growth rates show no trends since the regulation change.

Five hundred seventy-nine (579) Florida Bass were tagged in fall 2022 to assess changes in size selective harvest post-regulation change. Exploitation rates remain low statewide, yet some interesting trends are appearing.

- In some regions the exploitation rates of small bass (<16”) are declining, while exploitation rates for larger bass (>16”) are increasing.
- Although no positive biological impacts are occurring, the new regulation has not had any negative impacts.

The new regulation is meeting the objectives of protecting mature female fish and allowing maximum harvest potential for a five-fish bag. Positive social impacts have been documented in continual high angler satisfaction. Continued evaluations at the variety of waterbodies through multiple sample types will allow biologists to detect any changes to bass populations and angler dynamics.

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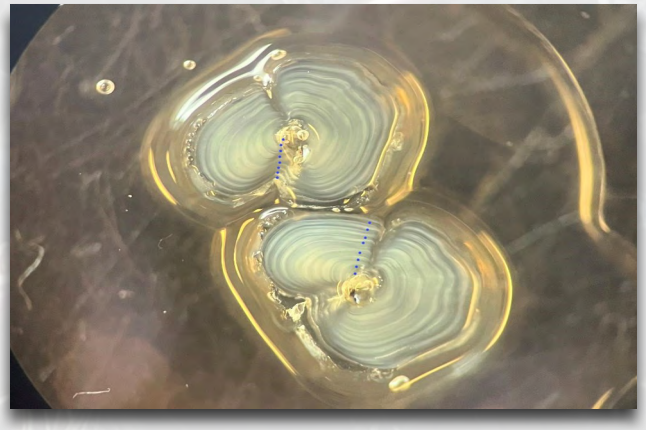
ADVANCING NONLETHAL AGE ESTIMATION METHODS AND APPLICATIONS FOR FLORIDA BASS IN FLORIDA

Summer Lindelien, Drew Dutterer, Jason O'Connor, and Paul Schueller



Dorsal spines provide viable and uncommon age information about trophy-size Florida Bass (FLB) without sacrificing this socially and biologically important segment of the population. Incorporating a nonlethal aging method in fishery-dependent activities (e.g., citizen-scientist data collection) expands age data sources and fosters increased angler interest and participation, generating a valuable new tool for bass research, management, conservation, and stakeholder engagement.

Two aging methods were least biased when estimating population metrics from our simulation study, one was a hybrid approach of using both otoliths and dorsal spines. This included using otoliths to age Florida Florida Bass (FLB) <56 cm MTL and using dorsal spines to age FLB ≥56 cm MTL. The second was using otoliths to age FLB <56 cm MTL thus not collecting any FLB or aging structures from the biggest FLB in the population.

We received 24 total dorsal spine samples from eight anglers during the pilot program from July 2023 to June 30th, 2024.

- We received the most age samples from Lake Placid (12).
- The longest measured bass were documented from Orange Lake.
- Estimated ages from dorsal spines were oldest from Kingsley Lake (13).
- Orange Lake bass displayed the highest weight gain per year (growth = 1.64 lbs./yr.).

We collected a 1-cm^2 piece of the left pelvic fin and matching sagitta otoliths from FLB in Lake Okeechobee (n = 311), Lake Tarpon (n= 307), Rodman Reservoir (n= 174), Lake Harris (n = 321), Porter Lake (n = 1), and Kingsley Lake (n = 4). Two readers aged and chose the most straightforward and unambiguous sagittae to select candidate fin clips for subsequent analysis. We stratified our subsample of fin tissues by age and picked five fin tissue samples per age from age 1 to the maximum age encountered in the sample from each water body for inclusion in genetic analysis. These tissue samples were transferred from 95% ethanol to dimethyl sulfoxide (DMSO) and shipped to Texas A & M University-Corpus Christi for processing by their genomics Lab.

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STATEWIDE EVALUATION OF ANGLER CATCH AND EXPLOITATION RATES OF TROPHY FLORIDA BASS

Drew Dutterer

The trophy bass tagging study was designed to evaluate components of Florida's statewide trophy-bass fishery during the operation of TrophyCatch, an angler-recognition, citizen-science, trophy-bass conservation program because it promotes catch and release for trophy-size bass (≥ 8 lbs).

Bass ≥ 8 lbs have been tagged with high-reward ($100) external dart tags during routine annual sampling across the state since 2011, and tagging efforts remain ongoing. Tag returns have been monitored to meet the objectives of measuring mean annual statewide catch, exploitation, and release rates of trophy-size bass and to measure awareness and participation rates of TrophyCatch.

Cumulatively through 13 years of operating the tagging study, FWC biologists have tagged 1,782 trophy-size bass (60–194 per year; this year: 60) from 167 public waterbodies (29–56 per year; this year: 33) within Florida. Throughout the study, estimates of mean annual catch of trophy-size bass have varied 12%–27% (this year: 14%), and annual exploitation varied 1%–6% (this year: 2%).

- Low annual exploitation rates were due to high release rates (77%–95%; this year: 95%), which were largely voluntary.
- Long-term trends of release rate showed a significant increase through time, and harvest for taxidermy has shown a statistically significant decrease.
- TrophyCatch awareness increased rapidly through its first four seasons (31% to 72%), and it remains steady only varying between 63% and 83% during the last eight seasons.
- TrophyCatch participation rate has varied through time, with greatest estimated participation rates of 42% in seasons 4 and 5 and lowest estimated participation rates in seasons 1 (6%) and 12 (7%).

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PREDATION RATES OF STOCKED RAINBOW TROUT AS TROPHY BASS FORAGE IN KINGSLEY LAKE, FLORIDA

Drew Dutterer, Summer Lindelien, and Allen Martin

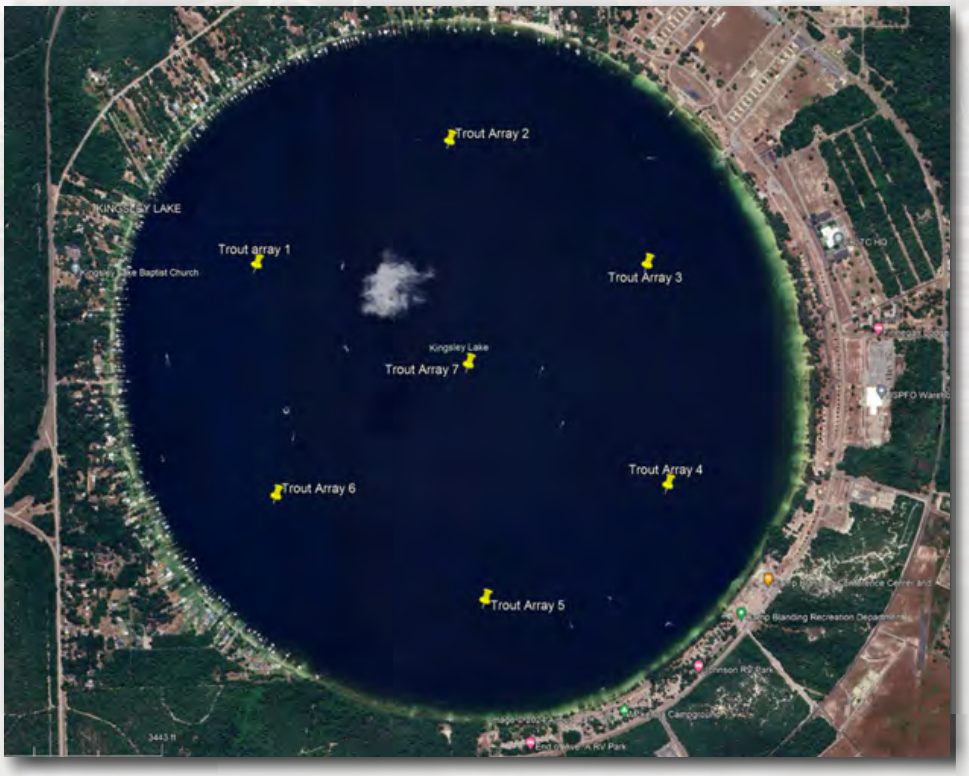
We stocked 6,400 pounds of live Rainbow Trout across four stocking events at Kingsley Lake during winter of 2023-2024 as supplemental forage to enhance growth and abundance of trophy Florida Bass. These trout averaged 312 mm in length (12.29 inches) and 331 g in weight (0.73 pounds).

To evaluate the timing and degree of predation on Rainbow Trout, we implanted 20 of them with internal acoustic telemetry tags with predation sensors. The telemetered trout spaced to include 10 from the first stocking event on 18 December 2023 and 10 from the last stocking event on 19 February 2024.

To evaluate an additional candidate species for supplemental forage stocking, we released 20 Lake Chubsucker with the same acoustic telemetry tags as the trout. These were also divided into two release events on 28 February and 12 April 2024.

Overall, 45% of the tagged trout and 30% of the tagged chubsucker were eaten by Florida Bass.

We will repeat this evaluation in winter of 2024-2025.



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NEWNANS LAKE FLORIDA BASS STOCK ENHANCEMENT EVALUATION

Steve Beck, Chris Anderson, Paul Ramsey, Kyle Olivencia, Erik Griffen, Summer Lindelien, and Steve Hooley

Stocking results generally appear insignificant with hatchery-raised fish accounting for only 13% in 2023, CPUE not reaching more than 0.18 (Bass/min), effort since stocking events remaining relatively low, and angler bass catch currently as low as pre stock estimates.

Electrofishing mean catch-per-unit-effort from bass targeted sampling in the spring remained similar with 0.17 ± 0.03 bass/min in 2024 relative to 0.13 ± 0.02 bass/min in 2023.

Creel estimates for bass angler effort remained relatively similar from 1198 ± 270 angler hours in 2022-23 to 1159 ± 268 angler hours in 2023-24.

Angler catch success rates of bass remained similar with 0.04 ± 0.04 bass/hr in 2023-24 compared to 0.06 ± 0.04 bass/hr in 2022-23.

The percent of trips where anglers targeting bass successfully caught at least 1 bass remained similar with 0.04 ± 3% of trips in 2023-24 compared to 0.06 ± 3% of trips in 2022-23.

Angler awareness of the 2019-2021 Newnans stocking events has remained low, peaking at 15% in the 2023-24 season.

The top 3 ways anglers heard about the stocking were by word of mouth, creel surveys, and signs.

Anglers decision to fish Newnans generally was not influenced by their knowledge of the stocking, with a small number of individuals strongly influenced by their stocking awareness.

Hatchery contributions of bass from the 2019-2021 stocking events made up 4% in 2020, 0% in 2021, 8% in 2022, and 13% in 2023 of the bass sampled during spring-season, bass-targeted electrofishing.

Genetic analysis of bass sampled during spring 2024 bass-targeted electrofishing are still being analyzed. These metrics will continue to be monitored and an in-depth data analysis will be conducted upon completion of data collection in spring 2025.

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TERN LAKE RENOVATION AND FEMALE BASS ONLY STOCKING

Brandon Thompson, Sara Menendez, Aaron Entrekin, and Tony Perrone

The Florida trophy bass project selected Tern Lake as a waterbody to conduct intensive management to increase the potential of producing giant bass over 15 pounds.

A lake renovation was initiated in January of 2024 where the water was pumped down and a rotenone treatment was conducted to remove the remaining fish.

After water began to rise in the spring of 2024, adult forage species such as Bluegill, Redear, Golden Shiners, and Lake Chubsuckers were stocked to allow spawning through the spring and summer months prior to bass being introduced.

Four fish feeders were set up shortly after forage stocking to maintain a high carrying capacity of forage.

The success of this renovation relies on maintaining a low density of bass by only stocking females.

In the spring of 2025, biologists plan to stock approximately 200 female bass into Tern with half being hatchery reared and half being collected from the wild.

All bass will have a unique identification (PIT tags) to allow biologists to compare survival and growth between the two stocking strategies.

As bass grow, innovative forage stocking will be considered to push bass beyond typical trophy size.

Tenoroc managers will keep Tern Lake closed from angling to reduce fishing mortality and size structure information will inform when angling should be reopened to the public.

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SHOAL BASS MONITORING AND PRELIMINARY STOCKING EVALUATION

Ryan Henry, Andy Strickland, Stephen Stang, Chris Paxton, Brandon Barthel, and Bryan Winston

Relative abundance of Chipola River Shoal Bass appears to be improving following Hurricane Michael; likely due to a combination of natural reproduction and the 2022 and 2023 stocking.

63% (43 of 68) of age-0 Shoal Bass collected were hatchery fish.

71% (45 of 62) of age-1 Shoal Bass collected were hatchery fish.

Reach C had the highest percentage of stocked age-0 fish (96%).

Hatchery fish were found as far as 14-km upstream and 17-km downstream from the 2022 stocking location and 6-km downstream from the 2023 stocking location. No stocked age-0 fish were found upstream of the 2023 stocking location.

Stocked age-0 and age-1 fish were larger on average than wild age-0 and age-1 fish.

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GULF STRIPED BASS MOVEMENTS IN PENSACOLA BAY

Brandford Warland, Matthew Wegener, and Calvin Beech

The population status of Striped Bass in Pensacola Bay is currently unknown but on a declining trend due to stocking rates.

Electrofishing, hook and line, and gillnetting were all methods used to capture Striped Bass in FY 2023-2024.

Electrofishing yielded the largest mean total length when compared to other methods (MTL = 743 mm TL, n=27), while hook and line accounted for a higher number of captures (MTL= 527 mm TL, n=43).

Active and passive telemetry was used to estimate movements of 20 tagged Striped Bass. Eighteen of the tagged individuals were relocated within the array.

Telemetry results are preliminary, but several large scale movements were observed with two individuals traveling over 85 miles, both in under two months.

Broodstock collection attempts in FY 2023-2024 showed promise with 8 mature fish collected, however none were able to be used in hatchery production.

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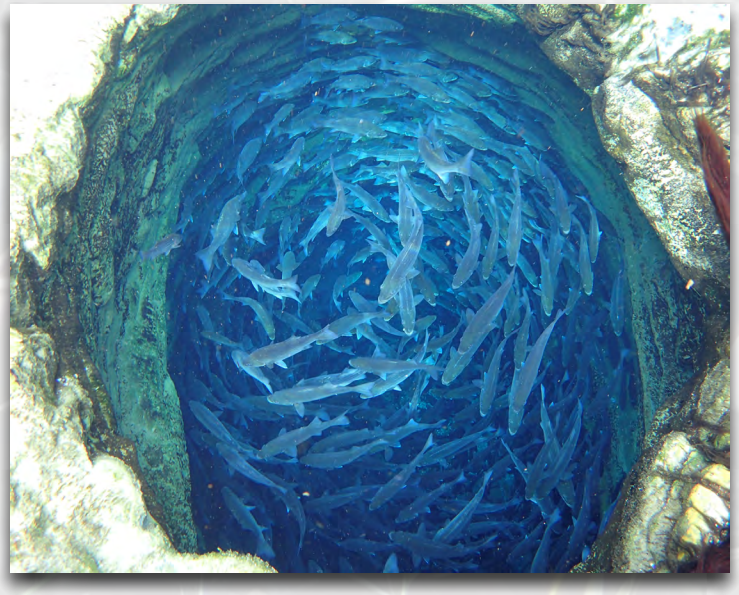
ST. JOHNS RIVER MORONE SPP. STOCKING PROGRAM ASSESSMENT

Susanna Harrison, Earl Lundy, Jamie Casteel, and Chelsea Buescher



Directed electrofishing efforts and snorkeling surveys throughout the SJR system have indicated that Silver Glen Springs (SGS), a first magnitude spring discharging into Lake George via a one-kilometer run, holds one of the largest summer aggregations of Morone spp.

From early July 2023 through June 2024, we made visual snorkel/video observations on at least a monthly basis of Striped Bass Morone saxatilis and Sunshine Bass Morone chrysops x M. saxatilis at SGS. Count numbers for FY 2023-2024 have returned to levels comparable with previous observations in both the main boil and the user-restricted secondary boil (the “chimney”) after dropping to all-time lows in FY 2022-2023.

Our diet study in FY 2021-2022, in which we collected specimens via spearfishing in SGS, may have impacted Morone spp. behavior, causing them to seek alternative thermal refugia. Further research is needed to determine the reasons behind the sudden disappearance of Morone spp. from SGS in FY 2022-2023 and their eventual return in FY 2023-2024.

The proportion of Striped Bass stocked in the SJR compared to Sunshine Bass increased considerably in 2022 and 2023. We expect to see this increase reflected in our surveys in the coming years.

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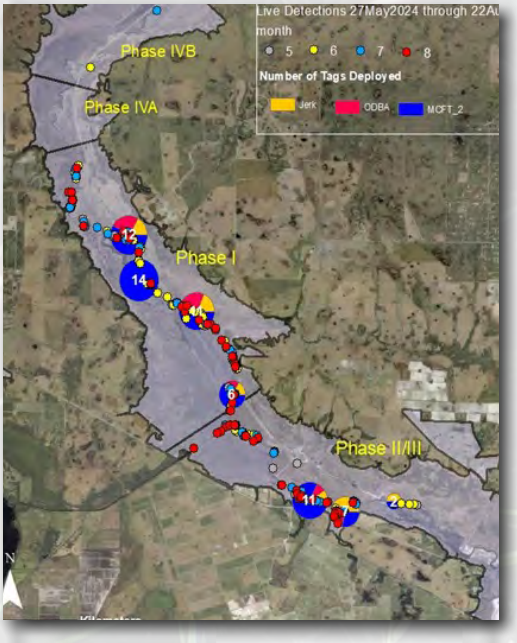
FLORIDA BASS MOVEMENT AND SURVIVAL IN KISSIMMEE RIVER RESTORATION AREAS

Reid Hyle, Rachel Reinhard, Arthur Bernhardt, Sam McPherson,
Chuck Hanlon (SFWMD), and Steve Bousquin (SFWMD)



FWRI partnered with the South Florida Water Management District in a two-year study, 2024 through 2025, to investigate movement and survival of Florida Bass in the Phase I restoration area where floodplain plant management is ongoing and in the most recently restored section of the Kissimmee River, Phases II and III, where backfilling was completed in 2021.

Our objectives are to test whether bass survival and habitat use difference between newly restored areas, prior restoration areas, and area where plant management has occurred.

We are testing biologging tags to see if we can gather more detailed information about movement under differing environmental conditions in addition to position data from telemetry.

Sixty-three Florida Bass were implanted with radio transmitters during late April 2024 with an attempt to distribute the capture and release locations throughout the study area. All fish had high reward external tags to encourage anglers to report capture. Three types of tags were deployed.

43 MCFT-2 Motion Sensor tags that indicate active/inactive
10 MCFT-3 TPA Temperature, Pressure, Jerk-Acceleration logging tags
10 MCFT-3 TPA Temperature, Pressure, Overall Dynamic Body Acceleration logging tags

Water remained low through the summer with 56 of the 63 tagged fish located a total of 450 times between May 27th and August 22nd.

Five fish were confirmed mortalities during that period.

- Three tags were located on the bottom of the river broadcasting inactive. Cause of death of these fish is unknown.
- A TPA tag was confirmed to be inside an alligator on May 31st. We tracked this alligator until August and were able to retrieve the tag from a sandbar on August 22nd. Data logged onboard the tag indicate that it was expelled on August 18th.
- An angler harvested a bass containing a TPA tag on July 28th and returned both the external tag and transmitter/data-logger.

Logging temperature, pressure, and acceleration in individual fish is providing detailed information on fish behavior relative to time of day and changing water quality. It also allows precise accounting of when a fish dies, is preyed, or harvested.

At the time of reporting we are waiting for wet-season high water and plan to retrieve the TPA tagged fish at the end of the wet season and leave the other fish without logging tags to over-winter.

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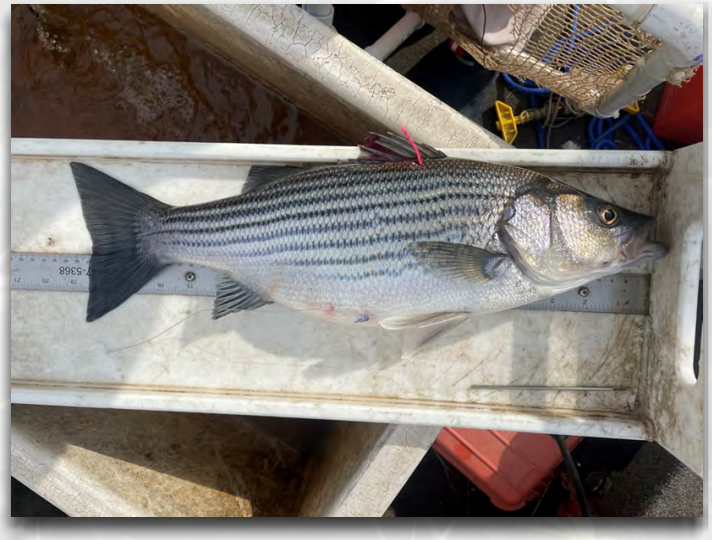
USING TELEMETRY TO IDENTIFY HABITAT FOR STRIPED BASS IN LAKE TALQUIN AND THE OCHLOCKONEE RIVER

Stephen Stang, Andy Strickland, Ryan Henry, Chris Paxton, Jacob Cunningham, and Sam Burke



Forty-three Striped Bass were surgically implanted with radio-tags and external dart-tags from February 15, 2023, to March 1, 2023 before being released into Lake Talquin. These tagged fish ranged in size from 457 to 879 mm. Four passive radio-receivers were placed around Lake Talquin and lower Ochlockonee River to detect emigration and supplement active tracking.

Forty of 43 Striped Bass were relocated 30 days post-surgery for a survival rate of 93%

Thirty-five percent of the tagged sample size emigrated through the Jackson Bluff Dam from February through June 2023

Ocklawaha Creek, Little River, and Rocky Comfort were the three areas of the lake that were used as thermal refuge in summer of 2023.

Hubbard's Branch and Telogia Creek were the areas of thermal refuge identified in the lower Ochlockonee River.

Premature battery failure limited the ability to relocate fish beyond September of 2023

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ANGLER SATISFACTION, EXPLOITATION, CATCH, AND HARVEST OF STRIPED BASS IN LAKE TALQUIN

Stephen Stang, Andy Strickland, Chris Paxton, Ryan Henry, Morgan Winstead, Sam Burke, and Jacob Cunningham

Eighty-seven of 211 Striped Bass tagged at Lake Talquin were recaptured by 49 anglers. Eighty-two of these were recaptured in lower Ochlockonee while five were recaptured in Lake Talquin. Twenty-eight fish escaped through dam before being recaptured, which supports findings from a previous tagging study that as much as 50% of Striped Bass population emigrates through the dam each year.

The total exploitation of fish tagged in tailrace was 38% compared to 33% in 2021. Exploitation of fish over 24'' TL was 28% compared to 29% in 2021, and the harvest rate of fish over 24" TL was 66% compared to 65% in 2021. Exploitation of fish less than 24" TL was 40% compared to 32% in 2021, and the harvest rate of fish less than 24" TL was 77% compared to 56% in 2021.

A weak 2020 year-class could have inflated exploitation and harvest rates for fish over 24" TL, where there were fewer fish over 24" TL for anglers to catch than typical years, which could result in lower release rates and higher harvest rates. An additional year of tagging could be beneficial to estimate exploitation when the adult population is made up of typical fingerling stocking numbers

Anglers are highly satisfied with new Striped Bass regulation. Forty-three of the 49 anglers returning tags were aware of new Striped Bass regulation, with and average satisfaction rating of 4.4 on a scale from 1 to 5. 54 Striped Bass anglers interviewed during creel were aware of the new regulation, with an average satisfaction of 4.36 on scale from 1 to 5.

Game cameras were an effective tool at capturing Striped Bass effort in the tailrace. Based on results of game cameras and access creel survey, 445 Striped Bass over 24" TL were caught and 191 were harvested. 129 of the 445 Striped Bass caught be anglers were not legal to keep based on the new regulation (3 fish per day, only 1 over 24" TL). Our creel survey estimated that 1016 Striped Bass under 24" TL were caught and 466 were harvested .

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ALLIGATOR GAR RESEARCH IN PENSACOLA BAY

Amanda Mattair and Matthew Wegener

The population status of Alligator Gar in Florida is currently unknown but is thought to be declining throughout its historical range.

Large-mesh gill nets were used to sample Alligator Gar and captured individuals were surgically implanted with ultrasonic-telemetry tags and externally implanted with PIT tags. Active and passive tracking were used to estimate movement and habitat use of these fish.

- All Alligator Gar captured in FY 23-24 were captured in the Escambia River.
- Majority of detections occurred in bay habitats, followed by Escambia River.
- Most of the river detections occurred during the warmer months (May-September).
- Alligator Gar are going through the biological review process for state threatened listing.
- Long-range movement coincided with rising river levels and could have been related to a spawning event.
- Telemetry results suggest Alligator Gar in Pensacola Bay are panmictic, likely traveling to a single tributary of Pensacola Bay to spawn.
- Telemetry and genetic analysis combined suggest a mark/recapture estimate in the Escambia River during the spring could be representative of the entire Pensacola Bay population.
- Collaborative approaches were successful at increasing sampling efforts.

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SEASONAL MOVEMENTS OF YELLOW AND SILVER AMERICAN EELS WITHIN THE PENSACOLA BAY COMPLEX

Chelsea Myles-McBurney, Kallie Thornhill, and Kim Bonvechio

The American Eel (*Anguilla rostrata*) is a facultatively catadromous species that occurs from Greenland to Venezuela and comprises a single panmictic population that exhibits random mating across its range. American Eels have a complex life history and undergo several morphological and physiological stages.

In the 2017 American Eel Stock Assessment, the Atlantic States Marine Fisheries Commission cited a need for tagging studies of eels at different life stages to address habitat use, movement, migration, and behavior.

Sampling occurred between 13 October 2023 and 24 April 2024 on the Escambia and Yellow Rivers using boat electrofishing and baited eel pots.

American Eels that displayed features associated with the yellow phase (i.e., yellow in color with white/cream undersides (> 450 mm TL) were targeted. Any American Eel (> 600mm TL) showing signs of maturation were considered as possible migrants (silver phase).

A preliminary tagging study was conducted in November 2023 and concluded that absorbable monofilament sutures were the best surgical method for future tagging events.

American Eels collected in the field were PIT tagged at location of capture before being transported to the Blackwater Research and Development Center (BRDC) in Holt, FL for tagging. American Eels were anesthetized and surgically implanted with an acoustic transmitter (V9) following a surgery protocol developed by a FWC veterinarian.

Seven Yellow American Eels were collected and implanted with an acoustic transmitter (V9) across Yellow (2) and Escambia (5) Rivers.

Detected tags were from the first tagging event that was released on 19 December 2023. No eels from the second tagging event were detected.

Two individual eels traveled > 50 km from the upper Yellow River downstream to East Bay between 22 December 2023 and 8 January 2024. The last individual traveled 0.5 km downstream on 15 March 2024 and seemingly remained in the same location where it was released.

Two of the three detected eels made downstream movements that coincided with high water events.

Between all tagged eels, nearly all detections of downstream movement occurred at night (7:00 pm – 6:00 am), specifically on darker nights (near new moons). For all three eels, all downstream movement stopped at the full moon and resumed after the third quarter.

Though few conclusions can be made due to the short sampling period (< 8 months), preliminary analyses have shown potential patterns associated with downstream migrations with high-flow events and lunar phases.

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SHAD AND RIVER HERRING MONITORING. ST. JOHNS RIVER

Reid Hyle, Susanna Harrison, Earl Lundy, and Jay Holder

FFR continued to collect spawning stock, creel, and juvenile data for Alosa species in the St. Johns River as part of the ASMFC Shad and River Herring Management Plans for Florida.

The spawning stock abundance index for 2024 was the lowest in the 22-year time series and the 8th consecutive year below the action threshold set forth in the management plan.

The water level was above bank full in the Harney-SR50 stratum for the entire January-April period. Dissolved oxygen was low due to high BOD from the inundated marsh and ranged from 3.3 mg/l to 4.7 mg/l in the samples collected. This anomalous condition likely led to shad avoidance of the area during the season.

Anglers expended an estimated 3,293 hours in 2024 targeting shad in the primary fishing areas which ranked 11th in the 14-year time series.

Angler CPUE was 0.54 fish/hr which ranked 10th out of 14 years.

The juvenile abundance index for 2023 was 6.72 which was the 2nd highest in the 17-year time series. The juvenile abundance index has an increasing trend, counter to the adult spawning stock index. Note that juvenile sampling spans the summer, so the reported value lags the spawning stock and creel by one year.

The low spawning stock abundance triggered management review. Regulation changes are not recommended at this time on the grounds that angling effort remains low and harvest is minimal. Additionally, the juvenile abundance index remains well above the action threshold set for that index.

Adult Hickory Shad and Blueback Herring were also collected in the 2024 spawning stock survey at typical low abundance.

The abundance index of yoy Blueback Herring in the 2023 pushnet survey was the highest on record at 11.11.

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EVALUATING THE HABITAT SUITABILITY INDEX FOR BLUENOSE SHINER POPULATIONS IN FLORIDA RIVERS

Gerald Reidenbach, Kallie Thornhill, Jamie Casteel, Chelsea Myles-McBurney, Earl Lundy, and John Knight

Peninsular sampling was performed in Alexander Springs Run, Rock Springs Run, and the Wekiva River.

Panhandle sites were identified from 29 springs and their associated spring runs within the Choctawhatchee, Escambia, and Yellow River drainages.

We began sampling peninsula rivers in July 2022 and panhandle rivers in August 2022, with sampling ongoing.

Currently there are 260 sites completed in peninsular rivers, with 108 total encounters and 285 Bluenose Shiners collected.

A total of 66 sites have been completed in panhandle rivers, with 47 encounters and 141 Bluenose Shiners collected.

Bluenose Shiners have been detected farther downstream in Alexander Springs Run than previously documented. Additionally, Bluenose Shiners have been observed in larger areas along Rock Springs Run than previously seen. In the Wekiva River, researchers have observed a contraction of the range away from the SR 46 bridge, possibly due to perturbation from construction.

Sampling has resulted in the identification of new populations of Bluenose Shiners on the Escambia River. Populations in the Escambia River appear to be more common on the lower stretches than previously believed. Bluenose Shiners occurrences have been more extensive at historical locations than previously recorded on Holmes Creek and Escambia River. Low detections have been observed for both Choctawhatchee and Yellow Rivers, although we believe this could be a result of sub-optimal sampling conditions and low sample sizes.

We noted contrasts with the previously derived HSI for Bluenose Shiners, with Bluenose Shiners selecting a lower water velocity than previously thought.

We also noted that Bluenose Shiners in the peninsula selected shallower depth than previously believed. Panhandle populations selected overall deeper depths.

For habitat, peninsular and panhandle Bluenose Shiners selected woody debris with vegetation. However, secondary and tertiary habits showed a divergence between panhandle and peninsula, with peninsular populations selecting exposed roots with large woody debris and vegetation, while panhandle populations selecting emergent vegetation and a mix of aquatic vegetation.

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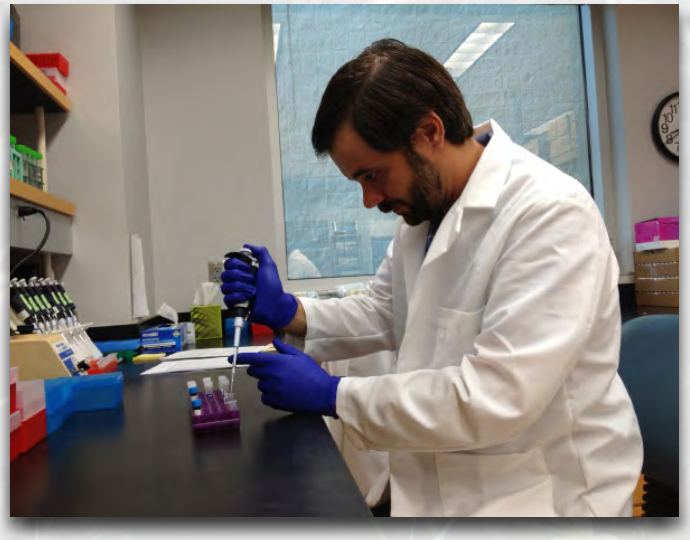
POPULATION GENETICS FOR MANAGEMENT AND STOCK ENHANCEMENT – HATCHERY RELATED PROJECTS

Brandon Barthel and Bryan Winston



Genetic screening analyses were conducted on three sets of fish to confirm they were Florida Bass before they were added to the brood stock and allowed to spawn at the Florida Bass Conservation Center. One hundred twenty-two fish were added to the brood stock and five hybrids were identified and removed.

The FWRI freshwater genetics program completed a number of projects that involved post-release assessments of hatchery reared Florida Bass.

Thirteen of the 63 fish collected from Newnans Lake in spring 2023 were determined to be fish released from the hatchery.

Six of the 402 fish collected from Lake Pierce in spring 2023 were hatchery releases.

None of the 18 fish collected from Lake Trafford in fall 2022 were identified as hatchery fish.

One of the three fish captured in Trafford in spring 2023 were from the hatchery.

Twenty-two of the 187 fish collected from Lake Talquin in fall 2023 had been released from the hatchery.

Genetic co-parentage was used to determine that 14 Shoal Bass brood fish formed 11 spawning pairs that produced the 251 offspring that had been collected from the Blackwater hatchery pond when it was drained in May 2023.

Genetic tracking was used to determine that 43 of the 68 age-0 Shoal Bass collected from the Chipola River in fall 2023 had been released from the hatchery earlier that year. This wild caught sample was used to estimate the effective sizes of the hatchery and wild spawned fish that had been collected from the river. Wild fish had an effective size that was more than ten times larger than the fish from the hatchery.

Genetic tracking also determined that 45 of the 62 age-1 fish captured in the Chipola River in fall 2023 had been released from the hatchery in May 2022. This suggests that more than 70% of the fish in the 2022 year-class were hatchery fish more than a year and a half after they had been stocking into the river.

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IMPLEMENTING A STATEWIDE PROTOCOL FOR MONITORING FLORIDA BASS ABNORMALITIES

Dan Nelson

Florida bass have been examined for abnormalities since 2021.

Bass abnormalities are noted using the 'FLOPS' notations:

F: Fin rot

L: Lesion

O: Other (melanism, angler wounds, etc)

P: Parasitic infection

S: Skeletal malformation

In FY 2023-24, 116 waterbodies were sampled, of which 66 (57%) waterbodies contained at least one bass that was observed to have an abnormality.

The statewide average for bass abnormalities was 3%.

The most common abnormality observed was lesion (1.1% of all bass sampled) followed by 'other' abnormalities (0.8%).

Lake Marian (43%), Lake Trafford (37%), and Newnans Lake (20%) were waterbodies with the highest proportion of bass were observed to have abnormalities. Sample sizes of bass were low in all systems (N = 92, 19, 87, respectively).

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ASSESSING SUMMERTIME DELAYED MORTALITY FOR FLORIDA BASS TOURNAMENTS IN FLORIDA

Ryan Howard, Brandon Thompson, Ted Lange, and Scott Bisping

While bass tournaments have a high value in Florida's fisheries, bass dying after tournaments during the warm summer months has been concerning to stakeholders and biologists. Managers are interested in mortality rates for bass caught in summer tournaments; however, delayed mortality has been a difficult parameter to estimate. In a previous telemetry study, researchers designed a custom enclosure and validated them to produce unbiased estimates of delayed mortality. Using similarly designed enclosures, this current study estimated the delayed mortality of bass caught and weighed-in at 20 summer and 13 winter bass fishing tournaments

Tournament-caught bass were placed into enclosures alongside reference bass (bass collected via electrofishing) and the enclosures were monitored daily to check for mortalities of both groups.

Average total mortality of tournament-caught Florida bass was greatest in the summer months at 43% (n = 20 tournaments, range 20% to 85%) compared to 5% (n = 13 tournaments, range 0% to 25%) during the winter months.

Reference bass experienced lower mortality than tournament-caught bass with 9% dying on average during the summer, and 0% during the winter.

On average in the summer, delayed mortality contributed 90% of total mortality.

The majority of the delayed mortality (83%) occurred in the first 5 days after an event.

Larger bass (≥508mm TL) did not die at greater proportions than smaller bass (< 508mm TL) during the 9-day detainment period (p-value = 0.99); delayed mortalities were 30% and 40% respectively.

We will proceed with developing educational materials to perform outreach with tournament organization and other interested groups.

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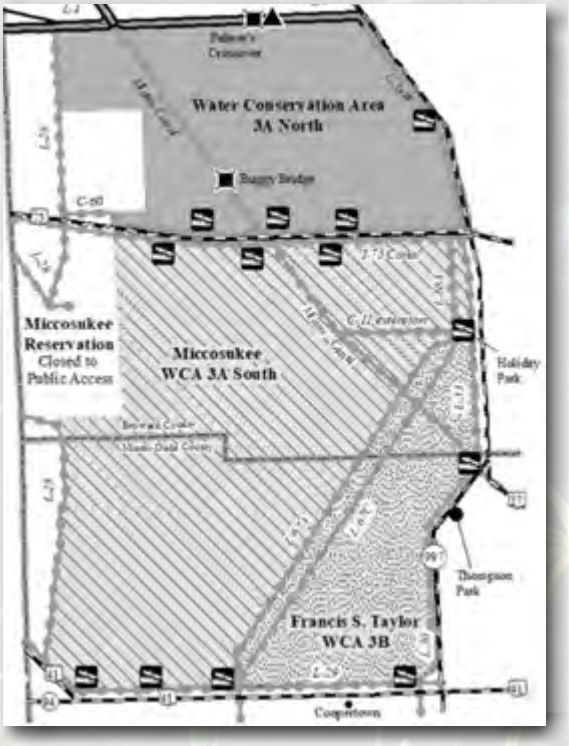
STATEWIDE MERCURY INVESTIGATIONS

Ted Lange, Doug Richard, Mike Mitchell (FL DOH), and David Tyler (FL DEP)



FWC staff collected and processed 1,365 fish for contaminants testing. FWC maintains data to support human health risk assessments and monitor spatial and temporal trends in fish mercury (Hg) bioaccumulation in the Everglades and statewide.

Management partners use contaminant specific criteria for the protection of human health to issue fish consumption advisories (FLDOH) and to identify waters as impaired for designated use under the federal Clean Water Act (FLDEP) where fish consumption; recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife are maintained.

Advisories are recommendations only and come under the authority of the State Health Officer; Advisories are primarily due to Hg (476), but also for Arsenic (2), Dioxin (1), Lead (1), PCBs (2), Pesticides (4), and Saxitoxins (1).

There are 524 waterbodies with advisories in Florida. The most are found in Water Conservation Area 3, part of the Francis Taylor WMA, where fish have been collected for research and monitoring projects since 1993.

During the 80s and 90s, Hg concentrations declined in Florida Bass. Since 2000, Hg concentrations in fish have remained steady throughout the state. Bass are the most extensively sampled due to their importance as a sport fish and as a top-level predator which bioaccumulates high levels of Hg. Other important sport fish have about 50% less Hg than bass. The USEPA action level for Hg in fish is 0.3 mg/kg; however, FLDOH advisories start much lower for recommendations of limiting consumption to 2 meals/week.

In the 1940s, the northern 1/3 of Lake Apopka was isolated with levees and drained to support row-crop farming. Over 40 years, farming was sustained through the use of organochlorinated pesticides (OCPs) which included chemicals such as DDT, toxaphene, dieldrin, and chlordane. These legacy pesticides are no longer labeled for use due to their persistence in the environment. In the late 80s farms were purchased by the state and named the North Shore Restoration Area (NSRA). Periodic testing of Lake Apopka fisheries resulted in fish consumption advisories starting in 1999. DDT and its breakdown metabolites DDD and DDE, were most common in Lake Apopka fish and wildlife. The latest advisories based on 2004-2008 data, limited consumption of Lake Apopka Black Crappie, Bluegill, Blue Tilapia and Brown Bullhead due to pesticides. Testing in 2020 revealed further declines in pesticide levels and advisories for OCPs are being removed.

During the year, staff assisted with assessments of legacy pesticide levels in ducks from the Apopka West Marsh in anticipation of opening for future recreational activities. We are planning to collect sportfish to evaluate pesticide levels prior to consideration of opening up the marsh for harvest of fish.

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LONG-TERM MONITORING OF LAKES – STATEWIDE SUMMARY

Kim Bonvechio

Standardized fish community electrofishing samples were collected from 27 waterbodies in late summer and fall (September to December 2023) and from L67A canal in spring (April 2024).

- A total of 76 identified species of freshwater and marine taxa were collected during community sampling.
- Inverse Simpson diversity index varied from 1.50 to 7.08 and averaged 4.16 for all systems combined.
- Bluegill, Eastern Mosquitofish, and Threadfin Shad were the most abundant numerically, whereas Bluegill, Bowfin, Florida Gar, and Florida and Florida Bass dominated the catch by weight.
- Targeted sampling for Florida Bass were collected during spring 2023 on 27 waterbodies.
- Florida Bass electrofishing catch rates were variable and averaged (± 1 SE) between 0.06 ± 0.02 fish/min at Lake Trafford to 1.95 ± 0.12 fish min at Lake Tarpon.
- Black Crappie were collected with a standard otter trawl at seven lakes from October to December 2023. Mean catch rate (+ 1 SE) ranged from 0.41 ± 0.12 fish/min at Lake Istokpoga to 4.37 ± 0.48 fish/min at Lake Trafford.
- A subsample of Black Crappie was collected for age and growth (N=740). Overall age ranged from 0 to 8 yrs.
- Roving creel surveys were conducted on 22 waterbodies during 2023-24. All surveys were conducted during the “peak” sportfishing season(s) for each system.
- Mean species directed effort (number of angler-hours/hectare/100 days) ± 1 SE was greatest for Florida and Florida Bass and Black Crappie (3.26 ± 0.57 and 2.45 ± 0.67, respectively), followed by sunfishes Lepomis spp. (0.83 ± 0.27). Ictalurid catfishes were only targeted by interviewed anglers at nine systems and effort was low (0.32 ± 0.19).
- Mean catch and catch rate ± 1 SE for Florida and Florida Bass were estimated as 2.07 ± 0.39 fish/ha/100 d and 0.59 ± 0.05 fish/h.

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LONG-TERM MONITORING OF RIVERS - STATEWIDE SUMMARY

Eric Nagid

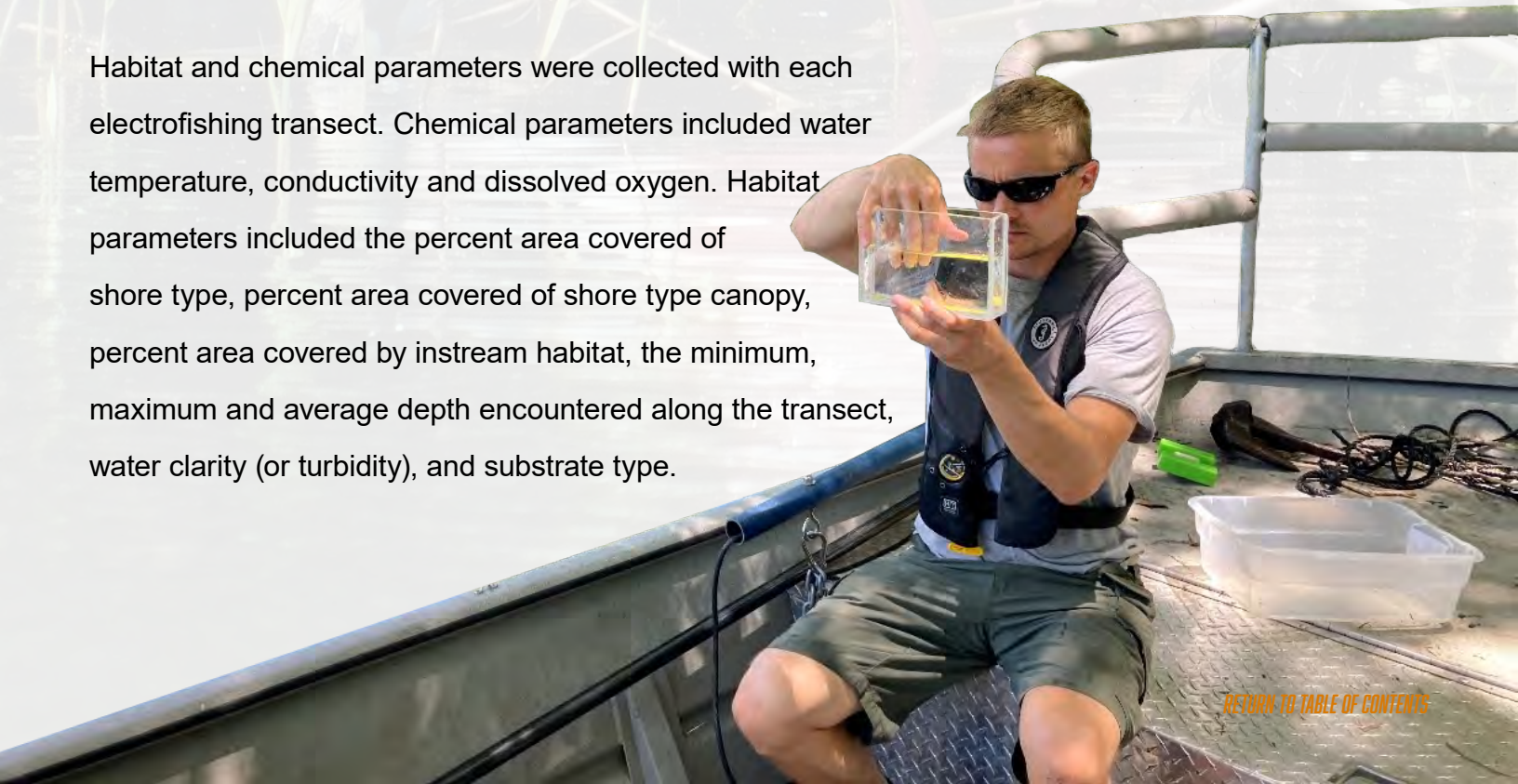
Fish community samples were collected by standard electrofishing protocols from 10 rivers between the fall of 2023 and spring of 2024 to assess and track trends in lotic fish communities.

A total of 114 fish species were collected during sampling and species richness ranged from 19 in the Upper St. Johns River to 64 in the Escambia River.

Diversity as represented by the modified Simpson's diversity ranged from 4.8 in the Upper St. Johns River to 11.2 in the Escambia River.

Visual fish health inspections were made on individual fish species for abnormalities with fin erosion, lesions, parasitic infections, and skeletal malformations. Abnormalities were only present in 0.10% of all fish examined across all rivers.

Habitat and chemical parameters were collected with each electrofishing transect. Chemical parameters included water temperature, conductivity and dissolved oxygen. Habitat parameters included the percent area covered of shore type, percent area covered of shore type canopy, percent area covered by instream habitat, the minimum, maximum and average depth encountered along the transect, water clarity (or turbidity), and substrate type.



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LONG-TERM AQUATIC HABITAT MONITORING OF FLORIDA LAKES

Kevin Johnson, Jennifer Moran, Kirk Dunn, Jamie Casteel, Rachel Liebman, Destiny Beltran, Brady Dickerson, and Aleah Koskinen

We teamed with the Florida Fish and Wildlife Conservation Commission's (FWC) Invasive Plant Management Section, Aquatic Habitat Restoration and Enhancement Subsection, Division of Freshwater Fisheries Management, Freshwater Fisheries Research Section, and several external partnering universities and agencies to map vegetation at 34 out of the 50 lakes that were considered important for management and research needs in 2023.

Submersed vegetation and point-intercept mappings were completed May 2023 through November 2023 at 50 Florida lakes, 16 of which were LTM program core lakes.

These mappings provided estimates of submersed vegetation percent area covered (PAC) and percent volume infested (PVI), and point-intercept vegetation speciation data including submersed vegetation species distribution, density, and a PAC (i.e., frequency of occurrence estimates); point-intercept data generated maps of individual vegetation species distribution and density with frequency of occurrence estimates; and species richness.

Vegetation maps for the 16 LTM core lakes mapped in 2023 were stored on FWC's internal freshwater fisheries LTM program SharePoint Reports website. Maps, data, and reports from all lakes mapped in 2023, including depth data, were also cataloged in the internal FWC S: share drive AVM folder.

We have begun to reassess the list of lakes that we map for a given mapping season. This reassessment process has and will include for future years, rotating the mapping of certain lakes, selection of lakes for mapping in particular mapping season that are most important for management and research needs, and the inclusion of some lakes within a mapping season that have never been mapped before to create a baseline of habitat conditions. This process will include creating the upcoming season's mapping lake list further in advance to allow for a more rigorous assessment and prioritization of the lake list, starting at the section leader level.

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HARRIS CHAIN OF LAKES MANAGEMENT REPORT

Andrew Marbury, Brandon Thompson, KristieRae Saenger, and Ryan Howard

Extensive monitoring occurs at the Harris Chain of Lakes (HCOL) as it is one of the premier freshwater fisheries in Florida and numerous research studies and evaluations utilize this data. In general, most lakes have shown a trend of improved water quality, water clarity, and expansion of SAV; resulting in an improved bass fishery but a declining crappie fishery. Bass effort decreased on Lakes Beauclair, Dora, and Harris, but increased on Lake Griffin.

The most recent plant maps from summer of 2023 showed PAC decreased or stayed the same on all lakes except for Lake Dora (increased from 81 to 90%). The SAV on Lakes Dora, Beauclair, Carlton and Griffin are primarily natives whereas hydrilla is the primary SAV at Apopka, and Yale. Most notable decrease in PAC from 2022 to 2023 was Lake Apopka (40 to 25%).

As the population of bass has increased with expanding vegetation, there has been a noticeable decrease in bass relative weights at all lakes over the last two decades.

Angling effort at Apopka increased by 44% in 2023 (from camera effort data) and bass catch rates (electrofishing) have been historically high.

Bass remains the primary target of anglers on Lake Griffin. The crappie fishery continues to have a lower level of effort but is highly variable.

Lakes Dora and Beauclair have the highest electrofishing catch rates of quality sized bass on the chain for the past several years and expanding SAV has corresponded with five consecutive years of high age-1 catch rates. Recent creel surveys show that Lakes Dora/Beauclair have a similar pattern to Griffin and Harris where bass has replaced crappie as the primary targeted species.

TrophyCatch submissions for season 12 (Oct 2023-Sept 2024- last full season) fell notably, with much fewer submissions coming from the HCOL than in past years.

While additional exotic species have been encountered in recent years on the HCOL, numbers have not substantially increased after initially falling off in the 2010 cold kill.

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LOWER ST. JOHNS RIVER LONG-TERM LAKE MONITORING

Earl Lundy, Jamie Casteel, and Susanna Harrison

We conducted both community and single-species (Florida Bass) electrofishing surveys in LTM study lakes in FY 2023-2024. Florida Bass surveys were also conducted on Lakes Dexter and Woodruff. Community data were collected from November – December 2023, and Florida Bass data from February – April 2024. Creel surveys were performed on Lake George and Crescent Lake to determine angler preference, utilization, and harvest.

Community abundance indices and species composition for Crescent Lake, Lake Monroe, and Lake George were within historical ranges but were on the lower end of historical data. Crescent Lake and Lake Monroe biomass catch showed a significant decrease using Kendall's Tau analysis.

All community samples were dominated numerically by Bluegill, while biomass was dominated by Florida Gar.

A Mayan Cichlid was captured on Lake Monroe. This is the first time that we have captured this species on any of the three LTM lakes since sampling began in 2006. Continued monitoring is needed to determine whether this invasive cichlid has expanded its range into the middle St. Johns River basin.

Abundances for Florida Bass in Lake George, Lake Monroe, and Crescent Lake were among the lowest recorded since monitoring began, likely due to continuing Hurricane Irma-induced vegetation loss. However, they were higher than last year, most likely because elevated water levels allowed us to access more shoreline habitat than we could in 2023. Kendall's Tau analyses show strong evidence of a decreasing trend in catch rates for lakes George and Monroe and moderate evidence of a decreasing trend in catch rates for Crescent Lake.

The Lake George creel survey indicated total effort was greatly reduced over the previous year. Anglers still primarily target Florida Bass on Lake George, although there was a 19% drop in effort over the previous year. Black Crappie effort on Lake George showed a 24% increase over the previous year.

Submersed vegetation was largely absent on all lakes, and emergent vegetation could at best be described as "sparse." This continues a trend first seen after Hurricane Irma impacted the state in 2017, and seems to be driving low catch rates on all lakes.

The percentage of standardized Florida Bass transects on Lake George with zero catch rose from 2018 to 2023, it currently accounts for 25% of all sampled sites which is less than the 68% in 2023.

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LOWER ST. JOHNS RIVER LONG-TERM MONITORING

Earl Lundy, Jamie Casteel, and Susanna Harrison

We were unable to conduct community electrofishing surveys on the St. Johns River for the second year in a row in 2023 due to high water levels resulting from an unusually wet winter in central Florida. Although water levels did not approach the historic highs they reached in 2022 following Hurricanes Ian and Nicole, they remained above 3.0 ft from September 28, 2023 until January 28, 2024. Prior sampling has shown that electrofishing in water levels this high is ineffective for this stretch of the St. Johns River. If we continue to experience high water levels in the fall and winter seasons, we may need to consider shifting this sampling to late winter or early spring to take advantage of what is typically central Florida's dry season.

Fewer species were collected in Silver Glen Springs Run in 2024 than in 2019 or 2020.

The counts of several large-bodied fish species increased while the counts of some of the small-bodied fish species decreased.

Based on habitat data collected during each transect the amount of vegetation in Silver Glen Springs Run has drastically decreased since 2019.

UPPER ST. JOHNS RIVER LONG-TERM LAKE MONITORING

Sam McPherson, Arthur Bernhardt, Reid Hyle, and Kirsten Humphries

Electrofishing surveys of fish communities were conducted in fall and winter of 2023/2024 on Blue Cypress Lake, Lake Poinsett, and the Upper St. Johns River. Florida Bass were sampled from LTM lakes in spring of 2023.

Lake Washington was not sampled and only nine of 40 planned sites were sampled in the Upper St. Johns River due to prolonged high water. The nine sites sampled in the river were attempted during a brief period of declining water level but sampling was terminated when the water rose again above bank-full.

The CPUE of all species across sites on Blue Cypress Lake was the second lowest in the time series at 2.11 (SE = 0.56) fish/min. Community composition has been stable since 2020. A single Dollar Sunfish (*Lepomis marginatus*) was collected and is the first collected since the LTM electrofishing survey began in 2006.

The mean CPUE of Florida Bass collected from Blue Cypress was 0.20 (SE = 0.036) fish/min, on par with the 10-year average of 0.191 (SE = 0.074) fish/min. The mean relative weight was 86.12 (SE – 1.08). Wr was the lowest in the last 10 year and reflects a decreasing trend, concurrent with similar trends for several reservoirs in the Upper St. John's River basin.

Lake Poinsett was sampled in December 2023 during a brief window when the water level was at bank full. The CPUE was 1.94 (SE = 0.46) which was half the prior year's value and well below the 10-year average of 4.74 (SE = 1.13). Eastern Mosquitofish were numerically dominant (46.2%) whereas Florida Bass (27%), Redear Sunfish (26.4%), and Bluegill (11.5%) comprised the three highest contributors to biomass.

Although Florida Bass contributed the most biomass to fall community samples in Lake Poinsett, the mean CPUE in spring sampling was 0.189 (SE = 0.021) fish/min; higher than in 2023 (0.116 fish/min, SE = 0.028), but still down from the 10-year average of 0.347 (SE = 0.061) fish/min. The sportfish populations on Lake Poinsett still have not recovered from losses due to low dissolved oxygen following Hurricane Ian in 2022.

The CPUE of Florida Bass in spring 2024 samples from Lake Washington was 0.854 (SE = 0.147) fish/min, an increase from the previous year (0.244 fish/min, SE = 0.182), and the 10-year average of 0.626 (SE = 0.073) fish/min. A total of 346 individuals were collected, ranging from 122 to 525 mm total length; the majority (~80%) of fish collected were 250 mm or less total length. Relative weight Wr is stable over time in Lake Washington with the 2024 mean of 94.63 (SE = 0.514).

The abbreviated community sample from the Upper St. Johns River yielded only 177 individuals from nine sites. Eastern Mosquitofish, Bluegill, and Taillight Shiner were numerically dominant. High water during sampling and low sample size precludes including these data in trend analysis.

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FISHERY RESOURCE ASSESSMENT OF WATER MANAGEMENT IMPOUNDMENTS OF THE UPPER ST. JOHNS

Arthur Bernhardt and Reid Hyle

The impoundments (Farm 13/Stick Marsh, Lake Garcia, Kenansville Lake, Fellsmere Reservoir) of the Upper St. Johns River Project are unique water bodies and widely considered among the best fisheries in the area.

We collected 1,507 Florida Bass in 102 transects using boat-mounted electrofishing.

Peak season access creels were conducted on Garcia and Stick Marsh while an annual access creel continues on Fellsmere.

Florida Bass electrofishing CPUE in 2024 is consistent across years (2007-2024) on Garcia, Stickmarsh, and Kenansville around 1 fish/min. Fellsmere CPUE for LMB was 0.9 fish/min, indicating a plateau of the EF catch rate.

Juvenile (< 21cm) bass were abundant in all lakes (except Stick Marsh), indicating successful recruitment into the fishery. Loss of SAV and a draw-down during the 2023 spawn are likely the reason for the lower abundance of juvenile LMB at the Stick Marsh.

Lake Garcia was very clear with abundant SAV. This is a continuation of the last two year's vegetation coverage and clarity. Kenansville Lake SAV (mostly Hydrilla) is abundant and covers most of the lake. The shallow areas of Farm 13/ Stick Marsh have grown in with dense cattail following the drawdown of 2023. Fellsmere WMA is a heavily vegetated marsh and will require maintenance vegetation control. Continued treatment of cattail and para grass creates open-water habitat and has been replaced by SAV.

Relative weights have had an overall decreasing trend and only Stick Marsh saw an increase from 2023 to 2024.

Florida Bass Peak Season Angling Success was high at Lake Garcia (1.65 fish/min) and Fellsmere Reservoir (1.78 fish/ min), while anglers at Farm 13/Stick Marsh found post drawdown conditions more challenging (0.75 fish/min)

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FELLSMERE RESERVOIR LONG-TERM MONITORING FOR FISH COMMUNITIES, FLORIDA BASS, AND CREEL

Arthur Bernhardt, Sam McPherson, and Reid Hyle

Electrofishing surveys of fish communities were conducted in Fall/Winter 2023. Florida Bass Micropterus salmoides surveys were conducted in spring 2024.

Fellsmere Reservoir is unique to other LTM lakes in that there is quality fish habitat that extends beyond the shoreline. Therefore, offshore sampling sites were selected in addition to shoreline sites.

The fish community composition has been stable over the past few years, Sunfish and Forage are generally the most common guilds collected at Fellsmere Reservoir.

African Jewelfish *Hemichromis bimaculatus* present in the basin, were found in Fellsmere Reservoir for the first time this year.

The overall catch rate of the fish community was 8.9 ± 0.67 fish per minute, CPUE was lower in 2023 than the previous two years.

Electrofishing catch rates for Florida Bass were 0.98 ± 0.13 fish/min.

Florida Bass relative weight has shown an overall decline over the past 5 years.

On-going large scale vegetation treatments, converting thousands of acres of dense cattail and tussock into areas of open water that have been colonized by SAV including hydrilla and coontail. In many of these areas, there is complete coverage of topped-out hydrilla.

There is an abundance of nursery habitat and a high catch of age-1 fish (40% of LMB collected in 2024)

Angler effort and CPUE remain high. Florida Bass fish caught/hr is 1.78.

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LONG-TERM MONITORING OF SELECTED RIVERS AND STREAMS IN NORTHWEST FLORIDA

Chelsea Myles-McBurney

Monitoring efforts are important in freshwater ecosystems due to their sensitivity to anthropogenic change, invasive species, climate change, sedimentation, and other environmental factors.

Escambia River, Yellow River, and Shoal River were sampled to assess their sport fish populations and species compositions during FY 23-24.

Sampling of large rivers were conducted in the fall for the Escambia and Yellow River and in the spring for the Shoal River.

All sport fish collected was sorted by species, individually measured (mm, TL), and weighed (g). Non-sport fish were sorted by species and individually measured (mm, TL) and weighed (g), or sorted by species, counted, and batch weighed (usually by cm size).

Thirty-two sites were sampled on the Escambia River between 13 October 2023 and 1 November 2023.

Sampling resulted in the collection of 64 species of fish and 2,564 individuals. Percent composition was numerically dominated by Cyprinid fishes (>34% of total catch).

Thirty-one sites were sampled on the Yellow River between 17 October 2023 and 9 November 2023.

Sampling collected 53 species of fish and 3,201 individuals. Percent composition was numerically dominated by Cyprinid fishes (>52% of total catch).

Thirty-one sites were sampled on the Shoal River between 29 May 2024 and 13 June 2024.

Sampling resulted in the collection of 35 species of fish and 806 individuals. Percent composition was numerically dominated by Cyprinid fishes (>62% of total catch) with Weed Shiners (Notropis texanus; 34%) accounting for the majority of fish collected from the Shoal River.

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ASSESSING EAST LAKE TOHOPEKALIGA HABITAT RESTORATION ON THE SHALLOW WATER FISH COMMUNITY

Chris Anderson, Ted Lange, Doug Richard, Travis Tuten, Jason O'Connor, Jen Moran, Arthur Bernhardt, Steve Beck, Brad Fontaine, John Saxton, Kirk Dunn, Kyle Miller, Chelsea Buescher, Kyle Olivencia, Sam Burke, Rachel Liebman, Jamie Casteel, Steve Hooley, Ryan Howard, Tim Coughlin, and Marty Mann

Water level stabilization and excessive growth of invasive aquatic plants have contributed to the accelerated rate of lake succession in East Lake Tohopekaliga (ELT).

A lake drawdown began on October 1, 2019 when water levels were lowered from 56.41 ft (NGVD) to 52.31 ft (NGVD) on May 24, 2020 (> 1,133 ha of lakebed exposed).

Littoral habitat restoration was conducted by AHRE in spring/summer 2020 by controlling/removing monocultures of invasive emergent vegetation via herbicide treatment and prescribed burning on the north and west shore as well as the mechanical removal of woody vegetation, tussocks, and associated organic material from the littoral zone on the east shore.

Our study evaluated impacts to shallow water fish communities, site-specific water quality (e.g., diel dissolved oxygen regimes) and habitat structure/composition (e.g., aquatic vegetation density and depth of organic sediment) across a range of habitat restoration and enhancement actions (i.e., pre- vs post-treatment).

Mini-fyke nets and dissolved oxygen sondes were used to sample the fish community and DO regimes, respectively in September 2016, 2018, 2019 (i.e., pre-treatment), and 2020, 2021, and 2022 (i.e., post-treatment).

A total of 79,134 fish were collected using mini-fyke nets post-treatment compared to 22,648 fish collected pre-treatment.

Shallow water fish community composition was significantly different between pre- and post-treatment for all treatment areas with post-treatment communities displaying increased total fish and species evenness relative to pre-treatment.

Species whose relative abundance increased the most post-treatment included Flagfish *Jordanella floridae*, Bluefin Killifish *Lucania goodei,* Sailfin Molly *Poecilia latipinna*, and Bluegill *Lepomis macrochirus*.

Species whose relative abundance decreased the most post-treatment included Eastern Mosquitofish *Gambusia holbrooki* and Warmouth *Lepomis gulosus*.

Our results indicate that drawdowns and large-scale mechanical removals are highly effective management tools for improving shallow water fish community composition, habitat, and water quality.

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EMERALDA MARSH CONSERVATION AREA DISSOLVED OXYGEN STUDIES

Ted Lange, Brandon Thompson, Scott Bisping, and Dan Kolterman

EMCA consists of historic wetlands, farmed for 50 years, and restored starting in 1994. Farms flooded via rainfall until hydrologic connections with Lake Griffin were re-established for EMCA 2, 3, and 4 between 2005 and 2016 while EMCA7 was not re-connected. Connected marshes contribute to the Lake Griffin fishery during much of the year by providing habitat for feeding and spawning. Tagging studies have documented Griffin fish utilizing the marsh. Marshes support excellent duck hunting and bird watching opportunities year-round.

Seasonal growth of SAV (primarily Hydrilla, Hydrilla verticillata) continues to persist in EMCA marshes. Cells with hydrologic connections (EMCA3) tend to have more open water areas while isolated marshes (EMCA7) remain near 100% covered throughout the year (EMCA7).

We monitored dissolved oxygen (DO) concentrations in EMCA to document seasonal trends in DO levels among cells with varying SAV coverages and hydrologic connectivity to open waters of Lake Griffin. We assessed minimum size of open water areas required to support aquatic life.

Dense growth of SAV can depress dissolved oxygen (DO) concentrations to levels that do not support fisheries. We define DO levels < 2 mg/l as “hypoxic” with DO concentrations of < 1.0 mg/l as “severely stressful” and 1.0 - 2.0 mg/l as being “stressful” to Centrarchid fishes as well as other aquatic life. DO > 2 mg/l was “normoxic”.

During summer, the frequency of hypoxic conditions ranged from 80-100% of all readings in EMCA3 and were associated with topped out conditions when water temperature was highest. EMCA7 was always hypoxic and Lake Griffin was never hypoxic.

EMCA3 is divided by interior levees with breaches into 3 cells with EMCA3-Q having the most connectivity to Lake Griffin, EMCA3-T less, and EMCA3-Z has no connections to Griffin except through the other cells. SAV coverage was lowest in -Q and highest in -Z.

Hypoxic conditions occurred most often in cells -Z and -T. These findings prompted FWC and SJRWMD to create additional breaches connecting EMCA3-Z to Lake Griffin in spring 2024.

During 2021, 2022, and 2024, percent volume infested (PVI) of SAV reached close to 80% in EMCA3-Q; however, in 2023, PVI was not mapped but aerial photography indicated lower PVI during July. Hypoxic conditions did not exist in cell -Q during summer 2023, suggesting reduced coverage of SAV (natural or managed) would be beneficial to sustaining fisheries through the warm summer months in EMCA3.

EMCA marsh fisheries benefit from creation of hydrologic connections to Lake Griffin; however, seasonal growth of SAV in topped out conditions can create extended hypoxic conditions during summer months. Management options will be explored.

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INVESTIGATING THE BEHAVIOR AND SURVIVAL OF GRASS CARP IN LARGE FLORIDA LAKES

Logan Masterson and Brandon Thompson

Managed introduction of Grass Carp is an effective biological tool used to control Hydrilla in Florida lakes, but managers are concerned with effects on native vegetation along with the potential for Grass Carp to move to connected water bodies (i.e., emigration).

We designed a radiotelemetry study to investigate the habitat use, movement, emigration, and survival of Grass Carp after stocking.

Over two years, we radio tagged both juvenile (lakes Yale, Apopka, and Parker) and adult (lakes Apopka and Parker) Grass Carp.

This report provides findings from the two-year study. Tracking will continue through the next fiscal year.

Within two weeks of stocking in all study lakes, juvenile and adult Grass Carp dispersed from a single stocking point to multiple areas of hydrilla infestation—some individuals moved up to seven miles from the stocking location within just several days.

Dispersal patterns can inform Grass Carp stocking strategies for large Florida lakes by demonstrating that stocked fish exhibit lake-wide dispersal to numerous—rather than small-scale dispersal to few—areas of hydrilla infestation. Hence, Grass Carp stocking efforts can be concentrated at one stocking location, as opposed to multiple locations, with the capacity to provide system-wide hydrilla control.

After dispersing lake-wide in the first two weeks after stocking, many tagged fish developed smaller home ranges in areas of dense hydrilla, whereas other fish were more mobile, moving among different hydrilla-infested areas. Across all study lakes, over 80% of Grass Carp detections occurred in hydrilla, indicating that Grass Carp will have little impact on native vegetation when substantial hydrilla is present. From the two open study lakes (Apopka and Parker), we observed low rates of emigration (<15%) for adult Grass Carp.

In both systems, emigration was limited by water control structures at normal water levels; fish emigrated (although not at a high rate) during a high-flow event in summer 2022.

Annual survival for juvenile Grass Carp for all lakes in both years was near zero based on active tags, but it is likely that tag loss greatly influenced inactive tags as fish seemed to be able to shed tags while moving through dense hydrilla compared to those held in tanks or cages.

Adult Grass Carp had higher survival, but there is some evidence of tag loss.

Mortality of Grass Carp increased during the summer during warmer water temperatures.

Further investigation could focus on assessing survival using small transmitters without a trailing antenna.

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IDENTIFYING PROBLEMATIC HERBIVORES OF *VALLISNERIA AMERICANA* IN THE ST. JOHNS RIVER BASIN

Susanna Harrison, Earl Lundy, Jamie Casteel, and Chelsea Buescher

Submersed aquatic vegetation (SAV) plays a vital role in aquatic ecosystems, providing critical ecosystem services, acting as an important food resource for many organisms, and offering vital habitat for numerous aquatic taxa, including economically important sport and commercial fishes.

Globally, SAV abundance and diversity are declining in both marine and freshwater systems. Herbivory, especially by non-native and/or nuisance species, may play a role in inhibiting SAV expansion and establishment.

In recent years, American eelgrass *Vallisneria americana* and most other non-algal SAV has disappeared from the St. Johns River (SJR) basin. This initially resulted from wave action and an extended period of flooding due to the impacts of Hurricane Irma in 2017.

Results from ongoing efforts to restore eelgrass in the SJR basin suggest that plantings succeed when they are protected by an exclusionary fence or cage. When that protection is removed, damaged, or breached, the plantings disappear within days of exposure. These results offer strong evidence that herbivores may be limiting SAV recovery in the SJR.

Our objectives are to identify which herbivores are impacting the re-establishment of eelgrass in the SJR basin and use that data to inform targeted management strategies to mitigate the effects of herbivory on current and future restoration efforts.

We will use camera surveys at locations with established eelgrass plantings throughout the SJR basin to identify species that are consuming, uprooting, or otherwise damaging unprotected plants.

In situ and ex situ grazing intensity studies will be used to determine which of the species identified in the camera surveys have the highest potential to negatively impact eelgrass restoration in the SJR.

Test camera deployments at Silver Glen Springs showed turtles to be by far the most common and destructive grazers of exposed vegetation. Striped Mullet *Mugil cephalus* also tampered with the plants, possibly to graze on the periphyton growing on the surface of the leaves, but their impact was minimal and left the plants intact.

Camera surveys will begin in summer of 2024 at Lake George, Silver Glen Springs, and the lower river near San Mateo. Future surveys are planned for lakes Poinsett, Washington, Harney, and Monroe, as well as a location in the low er river near Green Cove Springs. This project is expected to continue through 2027.

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USE OF A COMMERCIAL HAUL SEINE FISHERY AS A MANAGEMENT TOOL FOR TILAPIA IN UPPER SJR LAKES

Arthur Bernhardt, Reid Hyle, Steve Miller (SJRWMD), and Randy Fink (SJRWMD)

Commercial Tilapia Haul Seine fishing took place in February-June 2024. Lakes fished include Lake Washington, Lake Florence, Lake Poinsett, and Lake Sawgrass.

Prior to fishing, reward tags were deployed into 513 tilapia in Lake Washington and 476 tilapia in Lake Florence as part of a mark-recapture population estimate.

FWC and SJRWMD were present during haul-seine fishing events to observe and subsample the catch to identify catch composition.

Tag returns were used to calculate population estimates for study Lakes Washington and Florence.

Haul-Seine nets were 1000 ft long and 19 ft deep, with a 3-inch stretched mesh.

Area Swept by each net set ranged between 30-60 acres.

Fisherman kept and sold tilapia and brown hoplo; and were required to keep and dispose of vermiculated sailfin catfish. Non-target species were released alive.

There were 12 fishing events in 2024.

60,531 lbs of tilapia were caught, representing a value of $45,287 to the fishermen.

6,898 lbs of Vermiculated Sailfin Catfish were caught and cost the fisherman $117 to dispose.

Tilapia and exotic fish made up 58-89% of the catch from Lake Poinsett; 16-36% of the catch were gamefish.

Few tags were returned n=43, and we could not estimate accurate population sizes from recapture data.

Nineteen tags were returned from Lake Washington resulting in a preliminary estimate of 190,360 tilapia in Lake Washington (Swept Area calculation-133,488).

Rwenty-two tags were recaptured from Lake Florence, although the population estimate from tags was unrealistically high (291,373 would mean 2,774 fish/acre; swept area calculation ~28,000 tilapia in Lake Florence). Lake Florence's unconfined outlet may have permitted emigration of tagged fish prior to operation of the fishery.

Two tags from Lake Florence were recaptured in Lake Poinsett, one of which was 5.3 miles from the entrance to Lake Florence.

The Lake Poinsett swept-area population estimate was 276,172 tilapia.

SJRWMD estimates 588 lbs of phosphorous removed directly from the USJRB.

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THERMAL HABITAT SUITABILITY FOR NONNATIVE FISHES IN FLORIDA'S LOTIC ECOSYSTEMS

Chris Anderson, Andrew Carlson, and Alexandra Scott

Climate change is a major phenomenon altering the distribution of nonnative fishes and their ecological and socioeconomic impacts.

The influence of climate change on water temperature has substantial implications for the distribution of nonnative fish because water temperature 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 in Florida now and in the future.

Thermal habitat research in Florida's lotic systems has not been conducted at sufficient spatiotemporal and ontogenetic resolution to predict when and where nonnative fishes are likely to occur throughout their life histories in the context of climate change.

We will address these knowledge gaps by supplementing Florida's network of 200 water temperature loggers by deploying additional loggers in high-priority rivers and canals that are not currently well-monitored (e.g., Upper Santa Fe, Ocklawaha, Kissimmee, L67A).

We had 22 HOBO Tidbit MX Temp 400' temperature loggers measuring water and air temperatures for the Ocklawaha, Santa Fe, and Suwanee rivers in FY2023-24.

In the Ocklawaha River, we had 16 total loggers at sites from the headwaters above Lake Griffin to 0.2-km above the St. Johns River confluence with 9 measuring water temperature and 7 measuring air temperature.

In the Santa Fe River, we had 5 total loggers at sites distributed from above the Alachua Sink to 0.1-km downstream of the Olustee Creek confluence with 3 measuring water temperature and 2 measuring air temperature.

We deployed an air temperature logger to supplement USGS water temperature monitoring stations in the lower Suwannee River near Fowler's Bluff.

We will use these water and air temperature data to create water temperature models that predict nonnative fish survival, reproduction, recruitment, and dispersal under different climate change scenarios from 2022–2070.

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CHIPOLA RIVER FLATHEAD CATFISH ASSESSMENT

Morgan Winstead, Ryan Henry, Andy Strickland, Stephen Stang, Jacob Cunningham, Sam Burke, and Chris Paxton

Flathead Catfish were the most abundant ictalurid species collected in the Chipola River (0.28 fish/min ± 0.06). Other ictalurid species abundance: Channel Catfish (0.16 fish/min ± 0.08), Snail Bullhead (0.11 fish/min ± 0.04), and Spotted Bullhead (0.03 fish/min ± 0.01).

Crayfish made up 63% of diet items, followed by unidentified fish remains (19%) when empty stomachs are excluded.

Ictalurid species (Madtom, Channel Catfish, & Snail Bullhead), Shoal Bass, Florida Bass, Catostomidae spp., and Bowfin were also found in stomachs.

In Flathead Catfish from 150-550 mm, crayfish made up a majority of their diet (81%), followed by fish remains (19%) when excluding empty stomachs.

Flathead Catfish from 550-950 mm size range had a diet that consisted of fish (84%), followed by crayfish (46%) when excluding empty stomachs.

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