Aquatic Nuisance Species Status Report
Florida Fish and Wildlife Conservation Commission
April-September 2020
Prepared for Gulf & South Atlantic Regional Panel on Aquatic Invasive Species

MARINE NONNATIVE SPECIES STATUS REPORT

Lionfish (*Pterois volitans/miles*)

Figure 1. 2019 Lionfish Removal and Awareness Day.

The Lionfish Removal and Awareness Day (LRAD) was canceled this year due to COVID-19 but has been rescheduled for May 15 and 16, 2021 (Figure 1). However, the Lionfish Challenge 2020 kicked off on May 22, 2020 and has been extended through November 1, 2020. The goal of the Lionfish Challenge is to encourage and reward recreational and commercial divers to remove lionfish from Florida waters. Divers compete for prizes for removing the most lionfish and participants qualify for prizes based on the number or weight of lionfish removed. New this year are monthly mini-challenges to encourage divers to continue harvesting lionfish throughout the Challenge period. To date, 641 people have registered for the Lionfish Challenge and 157 divers (150 recreational, 7 commercial) have submitted lionfish. A total of 12,580 lionfish have been submitted to one of 48 checkpoints scattered around the state. When the Lionfish Challenge wraps up in November 2020, the lionfish will be tallied and the recreational diver that brings in the most lionfish will be crowned the Lionfish King or Queen and the commercial diver with the most weight of lionfish will earn the title of Commercial Champion.

Asian Tiger Prawns (*Penaeus monodon*)

During this report period, two reports of Asian Tiger Prawn were received; one in July from Volusia County and one in September from Brevard County.

FRESHWATER NONNATIVE AQUATIC SPECIES STATUS REPORT

Bullseye Snakehead Study in Lake Ida

Bullseye Snakehead (*Channa marulius*) have recently expanded their range into Lake Ida (Palm Beach County, Figure 2) one of the most natural waterbodies in the metro West Palm Beach-Miami area. Florida Fish and Wildlife Conservation Commission (FWC) staff have been monitoring the presence of Bullseye Snakehead in urban canals since their discovery in 2000, but Lake Ida offers a unique opportunity to study this fish in a more natural aquatic system. The findings of this project will better inform managers of potential impacts that Bullseye Snakehead might have in the hundreds of lakes that occur within their predicted range. Biologists from FWC and National Oceanic and Atmospheric Agency (NOAA) are collaborating on a multi-pronged project to compare movement, diet overlap, and habitat utilization of Bullseye Snakehead, Butterfly Peacock Bass (*Cichla ocellaris*) and Largemouth Bass (*Micropterus salmoides floridanus*). Collection of stomach content data from the three species began in July 2020 and will continue monthly for at least one year (Figure 3). Later this fall, radio telemetry will be used to track movement of these species and PIT tags will be used to determine species-specific preferences for temperature and depth as well as estimating population size and catchability of each species. Some fish will be externally tagged with a reward tag to promote angler participation to assess harvest rates and collect preference data.

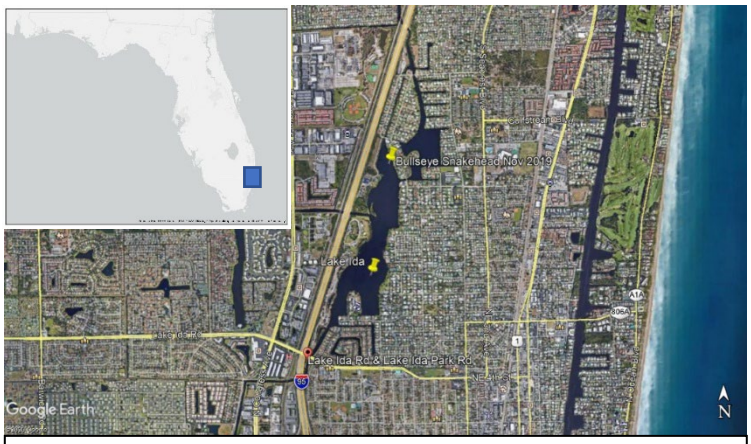

Figure 2. Lake Ida in east central Palm Beach County.

Figure 3. Use of gastric lavage to collect stomach contents from a Largemouth Bass. The bass is released unharmed.

Bullseye Snakehead Range Expansions

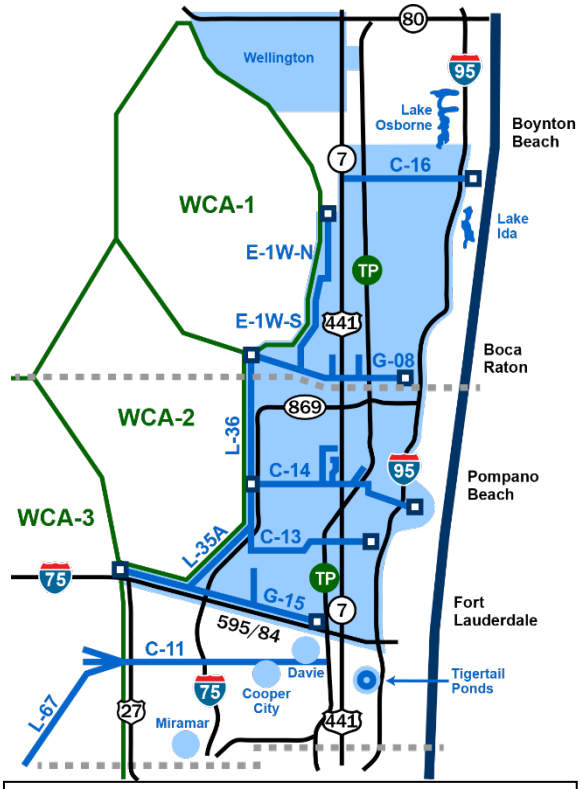

Figure 4. Known range of Bullseye Snakehead north of I595 (blue shade) and south of I-595 (blue points) including the C-11 and C-11S canals that connect to the L-67A canal.

Bullseye Snakehead in the main South New River Canal (C-11) and in two lateral canals that drain into this main canal. Water in the South New River Canal can be pumped westward into canals flowing south through Everglades habitat. This finding provides some insight of why positive eDNA hits for Bullseye Snakehead were detected in Everglades canals 25 miles southwest without managers able to confirm the physical presence of these fish (Figure 5). FWC and partners will continue to monitor for Bullseye Snakehead in this novel area by standardized electrofishing and angler reports.

Bullseye Snakehead are primarily found in the interconnected canal systems in eastern Broward County and southern Palm Beach County (Figure 4). Historically, the I-595/I-75 corridors in central Broward County have acted as a barrier to the southern movement of Bullseye Snakehead. Several populations of Bullseye Snakehead have been discovered in isolated waterbodies south of the I-595/I-75 barrier but until recently, none were known to occur in the canal systems in south Broward County. In response to an anglers report, FWC staff conducted electrofishing in the Cooper City/Davie area south of I-595 and documented

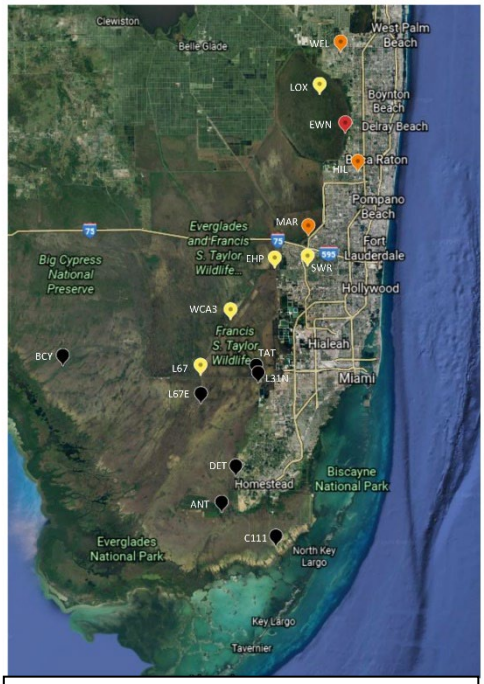

Figure 5. Bullseye snakehead eDNA levels from southeast Florida sites sampled between 2015 and 2018. Black = No eDNA, Yellow = Low, Orange = Medium, Red = High. USGS documented positive eDNA for Bullseye Snakehead from four sites south of I-595 including the south end of the L-67A Canal but no Bullseye Snakehead had been collected from these sites.

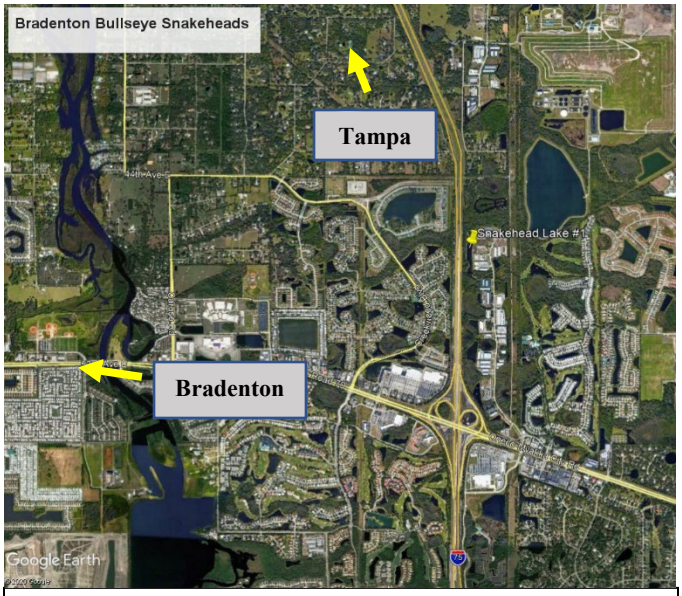

Figure 6. Location of retention pond (yellow thumbtack) in Bradenton, FL with confirmed population of Bullseye

Also, in June 2020, a USGS fisheries biologist confirmed an angler's report of Bullseye Snakehead in one of a series of retention ponds in Bradenton, FL just south of Tampa (Figure 6). This disjunct population is approximately 150 miles northwest of their known range in Broward and Palm Beach counties. Several size classes of Bullseye Snakehead were collected by USGS including young of year indicating reproduction had occurred. Follow-up electrofishing by FWC fisheries biologists collected Bullseye Snakehead from only one pond approximately 5 acres in size that ranged in size from 91 to 687 mm TL (n = 13; Figure 7). However, additional backpack electroshocking of a nearby creek will be necessary to determine potential presence of additional Bullseye Snakehead in nearby waterbodies since the infested pond can flow into the creek and ultimately into the brackish water section of the Braden River during a high-water event. Unseasonably high rain amounts have prevented follow-up sampling in the creek, but attempts will be made during the winter dry season. This extreme range expansion is most likely the result of an illegal introduction by an angler.

Figure 7. Retention pond where Bullseye Snakehead were discovered in east Bradenton, FL. To date this location is the only retention pond in this system with a confirmed population of Bullseye Snakehead.

Arapaima Reports

The FWC has recently received four reports of Arapaima (*Arapaima gigas*) from the west coast of Florida. Two reports were posted by separate anglers on Instagram (Figure 8) and two additional reports from the a third angler indicated they caught two fish from two disjunct areas nearly a year apart. These are unusual reports as arapaima are on FWC's Conditional Species List and it is illegal to have them as pets. There are several aquaculture facilities in the area that are permitted to raise arapaima for food, but none have reported any losses of fish. The canal systems where anglers caught these fish connect to the Myakka River, one of Florida's Wild and Scenic Rivers. Follow-up electrofishing by FWC in the canals did not yield any additional specimens. Social media platforms appear to be an increasingly popular way for "influencers" and others to encourage potentially illegal activities with little regard to the ecological consequences of their actions.

Figure 8. Angler with Arapaima caught in Venice, FL. The fish was kept, cooked, and eaten.

Nonnative Freshwater Fish Surveys and Control in Natural Waterbodies

Figure 9. FWC fisheries biologists using experimental gillnets and electrofishing to remove tilapia (*Oreochromis* sp.) from Silver Glen springs in central Florida.

FWC's Nonnative Fish and Wildlife Program (NFWP) staff are working with other FWC biologists to conduct electrofishing surveys and remove nonnative fish (primarily tilapia; *Oreochromis* sp.) and sailfin catfish (*Pterygoplichthys* sp.) from springs associated with the St. Johns River in central Florida that support large populations of these fish. Many of these springs serve as important winter habitat for manatess providing both thermal refuge and forage (eelgrass *Vallisneria spiralis*). Blue tilapia spawn in these springs and there is concern that their nesting activities will uproot the eelgrass and reduce the amount of available manatee forage. Sailfin catfish burrow up to 1 meter into the banks to lay their eggs. This activity may destabilize the banks and cause shoreline erosion. Sailfin catfish have been observed "grazing" on manatees utilizing the springs during the winter. This behavior may stress the manatees and put them at risk of cold-related health issues. FWC biologists used experimental gillnets to remove tilapia

from several springs in central Florida (Figure 9). The nets did not catch any tilapia (probably due to the tilapia being able to see the nets in the crystal clear water) but created an interim "fence" that corralled them, making them susceptible to electrofishing. Timing was critical as tilapia and sailfin catfish removals need to be conducted when adult fish are bedding in the springs and the manatees that use the springs as thermal refuge leave for warmer waters. March looks like it could be the month to try again.

NFWP staff only sampled one natural water body this year: the Loxahatchee Slough. Nonnative and native fish were collected by electrofishing, counted, measured, and weighed. Loxahatchee Slough has been sampled annually since 2018, and in 2016 (Table 1).

Table 1. Comparison of electrofishing sampling of Loxahatchee Slough, a natural water system in Palm Beach County. CPM = Catch Per Minute.

Year	# Transects	# Nonnative Fish Species Collected	# Nonnative Fish Collected	Pedal Minutes	CPM Nonnative Fish
2020	6	3	3	60.03	0.05
2019	6	4	19	60.21	0.31
2018	6	1[1]	0	60.11	0.00
2016	6	4	18	60.07	0.30

[1] One Spotted Tilapia was observed but not collected

RISK SCREENINGS OF NONNATIVE SPECIES

Pomacentrids

Figure 10. Regal Demoiselle (*Neopomacentrus cyanomos*). Photo: John E. Randall, Hawaii Biological Survey

AS-ISK risk screenings were completed for 11 species of pomacentrids (damselfishes), one of the most important groups of marine ornamental fish including the top nine fish species imported into the United States. Collectively, over 4 million individuals of these species are imported annually representing about 40% of all marine fish imports in the U.S. Mean AS-ISK scores for the Basic Risk Assessment (BRA) ranged from 17 to -8.5 and BRA + CCA (Climate Change Assessment; 5 questions related to the effect of future climate change on risk of establishment and impact) scores ranged from 15 to -7.5. All the high-volume species scored low or medium risk. Based on these findings, it appears that despite high volume in the aquarium trade, most pomacentrids represent relatively little or moderate risk of invasiveness in Florida.

Only one species, Regal Demoiselle (*Neopomacentrus cyanomos,* Figure 10) with a BRA score of 17 exceeded 12.75, the calibrated medium-high threshold score for global marine fish invaders. However, the BRA + CCA score for this species of 15 placed it in the medium risk category. This species scored as high as it did in large part to its invasion history, a major component of the AS-ISK scoring. Regal Demoiselle are already established in the western Gulf of Mexico (GOM) and are spreading eastward towards Florida. Despite its success in the western and northern GOM, little evidence suggests Regal Demoiselle are having adverse impacts where they are established. Regal Demoiselle are also a minor component of the aquarium trade. The pathway of introduction of this species into the GOM can likely be attributed to their movement between oil rigs and other oil machinery in the GOM. Four species of damselfish included in this assessment have been collected from the wild in Florida, Spiny Chromis Damselfish, *Acanthochromis polyacanthus* (n=1), Clown Anemonefish, *Amphiprion ocellaris* (n=1), Whitetail Dascyllus, *Dascyllus aruanus* (n=3), and Threespot Dascyllus, *D. trimaculatus* (n=1).

Bioprofiles and AS-ISK Risk Screening for 10 Nonnative Fish and Wildlife Species

FWC contracted with University of Florida (UF) to generate bioprofiles and complete AS-ISK risk screens for African Clawed Frog (*Xenopis laevis*), Western clawed Frog (*X. tropicalis*), Blue-ringed Octopus (*Hapalochaena lunulata*; Figure 11), Clown Knifefish (*Chitala ornata,* Figure 11), 4 species of Sailfin catfish (*Pterygoplichthys anisitsi, P. disjunctivus, P. multiradiatus*, and *P. pardalis*), Cane Toad (*Bufo marinus*, Figure 11), and Spectacled Caiman (*Caiman crocodilus*, Figure 11). The completed assessments will provide a relative risk estimate for each species (low, medium, or high). FWC will use this information to inform future management recommendations for these species.

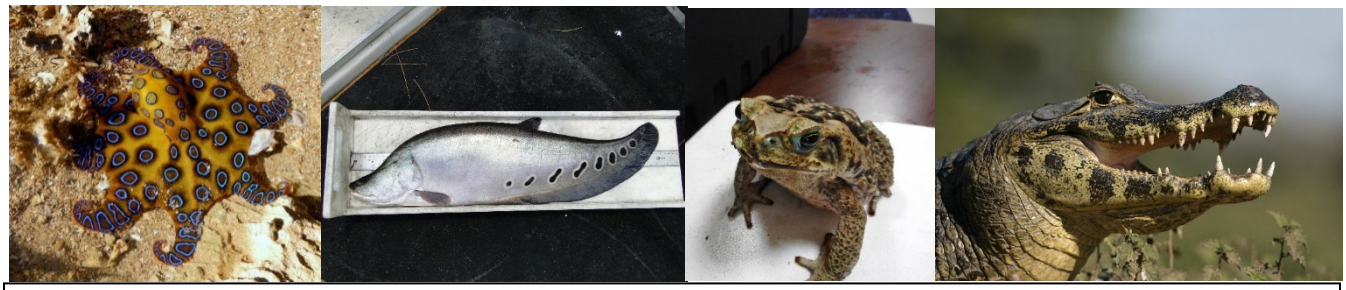

Figure 11. FWC will have completed risk screens for the following nonnative aquatic or semi-aquatic species at the end of the fiscal year: Blue-ringed Octopus (Photo courtesy of reddit.com); Clown Knifefish, Cane Toad, Spectacled Caiman (Photo courtesy of shutterstock)

HIGH RISK REPTILE RULE DEVELOPMENT

The FWC is currently considering new rule changes for certain high-risk nonnative reptiles including Burmese pythons, Nile monitors, tegus, and green iguanas. The proposed rules would add these species to the state's Prohibited list thereby limiting their possession to qualifying,

permitted educational exhibitors and researchers; create new caging and biosecurity requirements; limit breeding and import of these high-risk species in the state; and provide some limited exceptions to people in possession of these animals for exhibition, commercial sale, or personal use prior to their listing as Prohibited. Staff brought a first draft of rule proposals to the FWC's July 2020 Commission meeting, where Commissioners approved staff to move forward with publishing those drafts and seek public comment. FWC staff have since held a series of 10 public workshops with over 200 individual participants, collected over 1,000 written comments, and had over 5,500 respondents to two surveys on this topic. Staff recently completed a set of three focus groups to refine further the proposed rules based on the public comment received. Final proposed rule drafts will be brought to a future FWC Commission meeting for final Commissioner approval.

UPDATES ON WESTERN CLAWED FROGS

Figure 12. Western Clawed Frog collected from Riverview, FL.

FWC has received both final reports from two separate two-year long research contracts on a Western Clawed Frog population (*Xenopus tropicalis*) conducted by UF and the University of Central Florida (UCF). These contracts were developed after several attempts to eradicate Western Clawed Frogs from retention ponds in the Riverview area were unsuccessful. Staff had concern that these frogs might be vectors of amphibian diseases harmful to native species including chytrid fungus and ranavirus. Of note is the discovery that the clawed frogs were misidentified for several years as African Clawed Frogs (*Xenopus laevis*) before researchers confirmed using genetic analyses (qPCR) that they are the closely related Western Clawed Frog (Figure 12).

UF set out to identify the spatial extent of clawed frogs in Riverview, dispersal patterns and environmental associations with occupied water bodies, and modeled potential for spread throughout Florida. The results of the study indicated that the clawed frogs are likely continuing to spread and clawed frog presence was positively associated with occupied ponds within 400 m and the amount of submerged vegetation at a site but was negatively associated with the presence of fish and mean dissolved oxygen content (Figure 13). The frogs were capable of dispersing nearly 400 m, primarily during summer months. Modeling efforts demonstrated that the clawed frogs could likely survive through much of

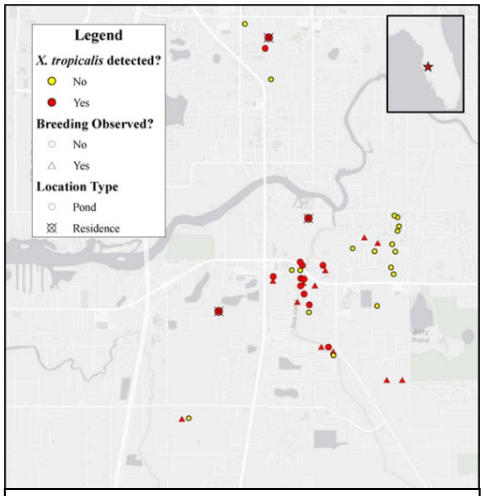

Figure 13. Current distribution of Western Clawed Frog (*Xenopus tropicalis*) in Riverview, FL.

south Florida but were limited by seasonal temperature and precipitation ranges in northern Florida.

UCF used disease ecology, population genetics and eDNA to understand potential impacts from the clawed frog population in the Tampa Bay area. The conclusions of the project determined little evidence exists to suggest clawed frogs in Riverview, FL are impacting amphibian disease ecology (i.e., ranavirus, chytrid, and perkinsea) in the area. Developed eDNA protocols displayed low false positives but relatively high false negatives (i.e., high specificity but low sensitivity). Based on analysis between sampling areas, the study showed that clawed frogs were not differentiating genetically in Riverview over time/space, likely due to the recent nature of the release. The results also indicated that the animals were likely introduced via pet or aquaculture trade.

PERMITTING

During this report period, a total of 73 Conditional Species Permits (CSP) were issued (Figure 14). The 9 research permits issued covered a range of species, mainly nonnative reptiles like Burmese pythons and Argentine black and white tegus. Twenty-two permits were issued for possession for personal use of Prohibited species; twenty for Yellow Anacondas (*Eunectes notaeus*) and two for Java Sparrows (*Lonchura oryzivora*). Three permits were issued for commercial use, all for Conditional aquatic species including freshwater stingrays (*Potamotryon* sp.), dorados (*Salminus* sp.) and Australian Red claw Crayfish (*Cherax quadricarinatus*). Fourteen CSPs were issued for importation and possession for public exhibition, particularly at zoological facilities and publicly owned educational facilities. One CSP was issued for the importation of African tortoises, specifically for an African spurred or Sulcata tortoise. Nineteen CSPs were issued for the importation of Conditional reptiles, mainly red-eared sliders and pythons, the majority for the purpose of commercial use. Lastly, five CSPs were issued for red-eared sliders possessed as personal pets.

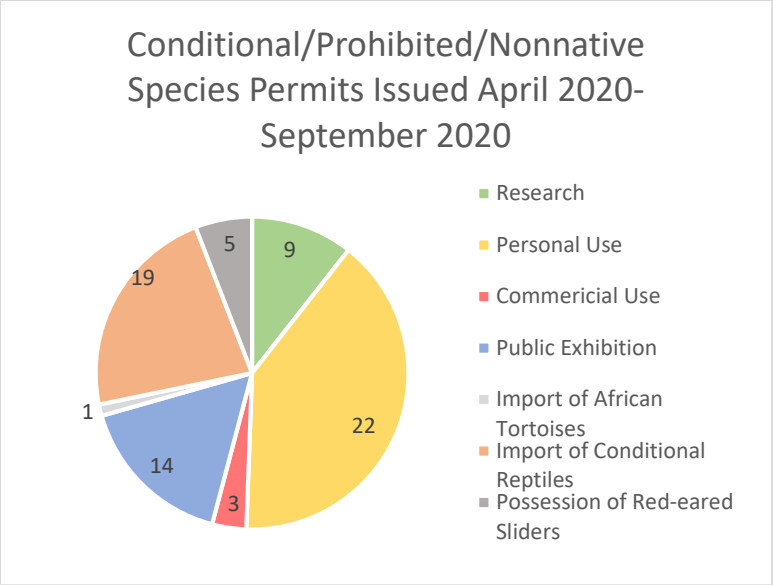

Figure 14. Conditional/Prohibited/Nonnative Species Permits from April 2020 through September 2020.

Upcoming Events

Natural Waterbodies Surveys/Nonnative Fish Removals: Waterbodies in state parks will be surveyed by electrofishing to determine presence/absence of nonnative fish species. Nonnative fish control methods will be tested in selected waterbodies.

Radio telemetry of Largemouth Bass, Butterfly Peacock and Bullseye Snakehead: Up to 30 individuals of each species will be implanted with radio transmitters to monitor movement and habitat utilization in Lake Ida, a natural lake in eastern Palm Beach County into which Bullseye Snakehead have recently expanded their range.