

**Aquatic Nuisance Species Status Report**  
**Nonnative Fish and Wildlife Program**  
Florida Fish and Wildlife Conservation Commission  
October 2020 through March 2021  
Prepared for Gulf & South Atlantic Regional Panel on Aquatic Invasive Species

**MARINE NONNATIVE SPECIES STATUS REPORT**

**Lionfish**

**2021 Lionfish Removal and Awareness Day and Lionfish Challenge**



Figure 1. Join in the 2021 Lionfish Removal and Awareness Day!

The 2021 Lionfish Awareness and Removal Days (LRAD) is scheduled to be held May 15-16, 2021 in Destin, FL. Visitors will get to taste lionfish, watch fillet demonstrations, participate in family-friendly games and much more (Figure 1). This event is held in conjunction with the state's largest lionfish removal tournament, the Emerald Coast Open Lionfish Derby on May 14-16, 2021. The four days leading up to LRAD are called Restaurant Week. Each day, one of four participating restaurants will create and sell a lionfish dish that will highlight the great taste and versatility of this unique seafood option.

The Florida Fish and Wildlife Conservation Commission (FWC) is also planning to hold the 2021 Lionfish Challenge. The goal of the Challenge is to encourage and reward recreational and commercial divers for removing lionfish from Florida waters. The Lionfish Challenge is scheduled to begin May 21 and run through September 6, 2021. The Challenge is a statewide event open to recreational and commercial divers. Checkpoints will be set up around the state for recreational divers to submit their catch and commercial divers will provide copies of trip tickets to document the weight of lionfish they harvested. At the end of the Challenge the recreational diver with the most lionfish and the commercial diver with the most weight of lionfish will be crowned the Lionfish King or Queen for their category. To keep divers interested, the event organizers created a tiered prize system based on the number or weight of lionfish submitted to encourage continued harvest. Participants can also win bi-weekly raffles for anyone that submitted a qualified entry. This event is a fun and potentially rewarding way to help reduce the number of lionfish on Florida's reefs. Additional information on the 2021 Lionfish Challenge can be found at <http://fwcreefrangers.com/lionfish-challenge>.

## Green Mussel (*Perna viridis*)



Figure 2. Green mussels (*Perna viridis*) collected from floating dock on Little Lake Worth.

Palm Beach County. The FWC and other partners are currently undertaking major restoration projects in the Lake Worth Lagoon including creating nesting islands surrounded by rip rap intended for native oyster habitat. Green mussels are a bio-fouling organism and there are concerns that they could displace native oysters and cause substantial economic fouling issues for ships and structures such as floating docks, channel markers, pilings, and intake pipes.

The initial survey of Little Lake Worth discovered green mussels at four locations with floating docks. Little Lake Worth is directly connected to the main Lake Worth Lagoon on the northern end. Concern that green mussel larvae could spread into Lake Worth Lagoon and settle on critical restoration habitats and submerged infrastructure (intake pipes, ship hulls, navigation buoys, etc.) initiated additional surveys for presence of this species. Palm Beach County Environmental Resources Management staff sampled 25 sites in this area between October 2020 and March 2021. All but one of the 25 sites sampled in Lake Worth Lagoon were free of green mussels, but they were present in three of the five sites in Little Lake Worth Lagoon (Figure 3). Additionally, FWC staff have confirmed green mussels at several locations further north in the Intracoastal Waterway including the Ft. Pierce and Sebastian inlets. Green mussels have been reported from these areas in the past, but they were assumed eradicated due to cold water

In October 2020, the FWC's Nonnative Fish and Wildlife Program (NFWP) received a report of green mussels (*Perna viridis*) in Little Lake Worth, Palm Beach County. Photographs of mussels removed from a private dock and ladder were confirmed by FWC as nonnative green mussels (Figure 2). This nonnative species was first discovered in Tampa Bay in the late 1990s and rapidly increased in abundance. They soon spread south along the west coast, into the Keys and then up the east coast of Florida to several locations north of Lake Worth Lagoon in

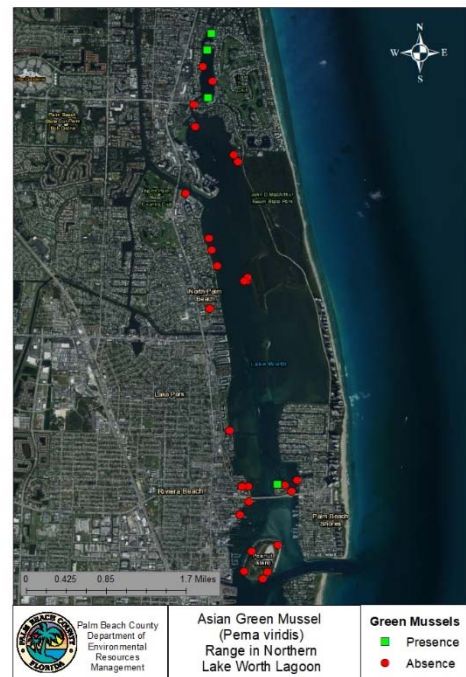


Figure 3. Green mussel (*Perna viridis*) distribution in Little Lake Worth and Lake Worth Lagoon. Map courtesy of Palm Beach County Environmental Resources Management.

temperatures. Green mussels are very cryptic and may have been present in background numbers and only now have been identified in these areas (Figure 4.).

The FWC is working closely with partners to monitor the presence of this species in Lake Worth Lagoon and assess the threats it may pose to the natural environment and ongoing restoration efforts. A flyer is being developed to aid in outreach for the public that provides information on the identification and reporting of green mussels to the FWC using the IveGot1 app or [www.IveGot1.org](http://www.IveGot1.org). FWC staff will review the reports to monitor the presence of green mussels in Lake Worth Lagoon and surrounding areas.



Figure 4. A green mussel (*Perna viridis*) found between the floats of a dock in Little Lake Worth.

## **Risk Screening Updates**

### **Nonnative Fish and Wildlife Bioprofiles and Risk Screens.**



Figure 5. Sailfin catfish (*Pterygoplichthys* sp.).

The FWC recently contracted researchers with the University of Florida (UF) to conduct bioprofiles and AS-ISK risk screen on 10 nonnative fish and wildlife species including African Clawed Frog (*Xenopus laevis*), Western clawed Frog (*X. tropicalis*), Blue-ringed Octopus (*Haplochaena lunulata*), Clown Knifefish (*Chitala ornata*), 4 species of Loricariid catfish (*Pterygoplichthys anisitsi*, *P. disjunctivus*, *P. multiradiatus*, and *P. pardalis*), Cane Toad (*Bufo marinus*), and Spectacled Caiman (*Caiman crocodilus*). The university completed bioprofiles and risk screens for four species of loricariid catfishes with native

ranges in the Orinoco and Amazon river basins, or rivers in Paraguay. These species are large-bodied, heavily armored fish commonly referred to as sailfin catfish due to an elongated dorsal fin (Figure 5). Florida and international aquaculture industry trade *Pterygoplichthys* catfishes and collectively this group of fish (16 species) is within the top five species by trade volume annually. Aquarists that use them to clean algae from their tanks and to eat surplus food. Florida is a major producer of these species with an estimated production and sale of >25 million individuals per year. Due in part to their popularity, catfish in *Pterygoplichthys* are one of the most widely introduced fishes with established populations in many tropical and subtropical regions of the world. They cause a variety of negative ecological impacts over their introduced range including competition for food, spawning burrows, and habitat alteration. Habitat

alteration, either by burrowing activities, alteration of nutrient cycling, or destruction of aquatic macrophytes is most likely to cause ecological harm to Florida. The AS-ISK analyses yielded scores for the four *Pterygoplichthys* species similar to other high-risk species that represent a hazard to Florida (e.g., lionfish). The 10 bioprofiles and AS-ISK risk screenings for species covered in this contract will be completed by June 2021 and the FWC will use the information provided in the risk screen to guide future management actions.

### **Asian Tiger Prawns**

During this report period, the FWC received one report of tiger prawn (*Penaeus monodon*) from Biscayne Bay, Miami-Dade County

## **FRESHWATER NONNATIVE AQUATIC SPECIES STATUS REPORT**

### **Fish Slam**

Despite Covid-19 travel restrictions, a “virtual” Fish Slam was held the week of March 15. Forty fish biologists from 10 organizations sampled 33 sites from Jacksonville to Homestead, Florida (Figure 6). This event was one of best attended Fish Slams to date as participants were able to take day



Figure 6. Home bases of participants of the 2021 Virtual Fish Slam. Map courtesy of Dr. Pam Schofield, USGS.

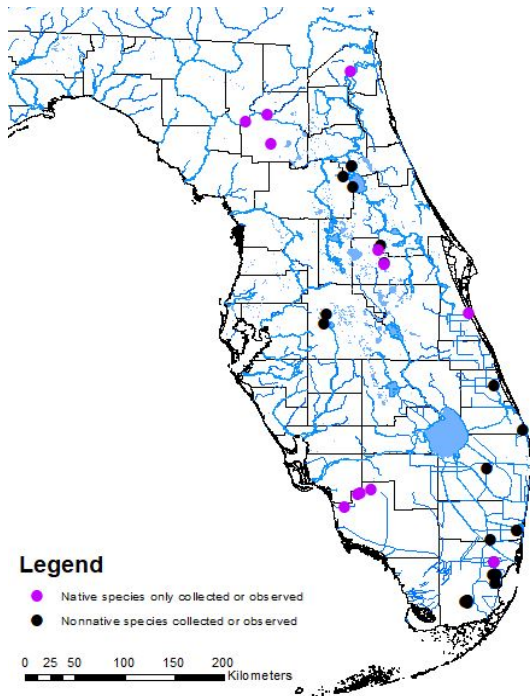


Figure 7. Locations targeted by participants in the 2021 Virtual Fish Slam. Map courtesy of Dr. Pam Schofield, USGS.

trips to sample local areas near their home base. Sampling gear included electrofishing boats, backpack electrofisher, minnow traps, cast nets, seines, dipnets, and hook and line. Eighteen species of nonnative fishes were collected or observed. Of interest is the number and location of sites where only native species were collected (Figure 7). This Fish Slam event is the eleventh since the program began in 2013. For general information on Fish Slam events, please see the webpage for the Florida Non-native Fish Action Alliance at [https://www.usgs.gov/centers/wetland-and-aquatic-research-center-war/science/florida-non-native-fish-action-alliance?qt-science\\_center\\_objects=0#qt-science\\_center\\_objects](https://www.usgs.gov/centers/wetland-and-aquatic-research-center-war/science/florida-non-native-fish-action-alliance?qt-science_center_objects=0#qt-science_center_objects).

No new nonnative species were collected, but the FWC and partners collected some unusual species including Chanchita (*Cichlasoma dimerus*), Jack Dempsey (*Rocio octofasciata*) and Midas Cichlid (*Cichlasoma citrinellum*) from a new location in

Broward County.

### **Bullseye Snakehead, Largemouth Bass, and Butterfly Peacock Habitat Use and Diet Overlap in Lake Ida**



Figure 8. FWC staff collecting stomach contents from a largemouth bass (*Micropterus salmoides floridanus*) using gastric lavage.

Bullseye Snakehead (*Channa marulius*) are present in many canals in southwest Palm Beach County but have only recently moved into the Lake Ida-Osborne chain-of-lakes system in southeastern Palm Beach County. These lakes are part of a large, interconnected canal system and Bullseye Snakehead likely entered Lake Ida via one or more of these canals. These lakes, although highly modified from their natural state, represent aquatic habitats different than what is found in the manmade canals in this area. An FWC multi-Divisional grant proposal was funded to examine how these three species use the 'natural' habitats and to compare stomach contents to Bullseye Snakeheads, Largemouth Bass and Butterfly Peacock collected in manmade urban canals. Stomach content collection of the three species began in July 2020 and will continue for at least a full year

to examine seasonal differences in diet and diet overlap between species (Figure 8). Baseline fish community data in the major canals and lakes in the study area were collected in December 2020

by conducting 61,10-minute electrofishing transects in which all fish were collected, weighed, and measured. An additional 75 Bullseye Snakehead presence/absence transects were conducted in lateral canals in the study area. Staff will repeat these transects to detect potential changes in the fish communities and to monitor the distribution and abundance of Bullseye Snakehead. In March 2021, staff surgically implanted radio transmitters into 25 of each of the three target species (Figure 9). Fish movements will be monitored by three shore-based remote receivers stationed at the mouth of canals leading out of the lake to determine if fish move out of the lakes and by handheld receivers on boats to document movement and habitat use by individual fish. The fish were also tagged with reward tags to encourage anglers that catch these fish to report it to the FWC. These tags are bright yellow dart tags inserted along the dorsal fin that are printed with a phone number for the angler to call and claim the reward. Anglers will need to provide catch information (tag number, date, location, harvested or released, guided trip, etc.) and return the radio transmitter to claim their reward but may keep the harvested fish.



Figure 9. FWC staff surgically implant a radio transmitter into a Bullseye Snakehead (*Channa marulius*) from Lake Ida.

### **Standardized Electrofishing Survey for Nonnative Freshwater Fish**



Figure 10. Bullseye Snakehead (*Channa marulius*) collected from Cypress Creek Canal during standardized electrofishing.

The goal of the FWC's standardized electrofishing program is to monitor native and nonnative fish populations in southeast Florida urban canals. This proactive means of detecting new or rare species can assist with early detection and rapid response to introductions of new nonnative freshwater fishes in south Florida (Figure 10). To increase the power of this approach, the FWC's Wildlife Impact Management Section coordinated with FWC's Division of Freshwater Fish Management staff to develop a modified sampling protocol based on their long-term monitoring program. The new protocol keeps three fixed-starting

point transects that the FWC's NFWP has used since 1997. Additionally, three to five randomly chosen daytime transects were added to this protocol to increase the probability of detecting a new nonnative fish species.

In October 2020, the FWC's NFWP sampled six core canals using these modified protocols. The core canals: Cutler Drain (C-100) and Tamiami Canal (C-4) in Miami-Dade County, Snake Creek (C-9) and Cypress Creek (C-14) in Broward County and the Boynton (C-16) and West

Palm Beach (C-51) in Palm Beach County have fish communities representative of those found in the metropolitan Miami-West Palm Beach area. Collectively, these canals have been sampled using standardized methods since 2000. The addition of new transects increased the mean number of nonnative fish species collected in the six historically sampled canals by 33% and the number of native species collected increased by 35%. These efforts did not collect any new nonnative species, but staff documented a range extension for Clown Knifefish (*Chitala chitala*).

A total of 3,662 fish were collected in 570 daytime electrofishing pedal minutes from six urban canals. Native fish (27 species) comprised 56% of the total catch and nonnative fish (18 species, Figure 11) comprised the remainder. Overall, one additional nonnative and five native fish species were collected from the supplemental transects but combined, represent <1% of the total number of native fish collected in these samples. Native sportfish, primarily Redear Sunfish (*Lepomis microlophus*), Bluegill (*L. macrochirus*), and Largemouth Bass (*Micropterus salmoides floridanus*) comprised 81% of the native fish catch, and 46% of all fish collected. Spotted Tilapia (*Tilapia mariae*), Butterfly Peacock (*Cichla ocellaris*), Mayan Cichlid (*Cichlasoma urophthalmus*), and African Jewelfish (*Hemichromis letourneuxi*), were the principal nonnative fish species collected, making up 73% of the nonnative fish collected in these samples and 32% of the total number.



Figure 11. Nonnative fish species collected in standardized electrofishing.



Figure 12. Moss balls removed from the shelves at a Florida pet store.

### **Zebra Mussels (*Dreissena polymorpha*)**

In March 2021, the FWC was notified of the presence of Zebra Mussels (*Dreissena polymorpha*) and their microscopic larvae in “moss balls” being sold in some pet shops under a variety of names throughout the United States, including Florida (Figure 12). A rapid, multi-Divisional response within FWC resulted in contact with distributors of this infected aquarium product within the state and their customers to encourage pet stores to remove moss ball products from their shelves and properly dispose of them. The FWC updated the Zebra Mussel species

profile website with decontamination protocols for pet stores and home aquarists to prevent

Zebra Mussels from being released into waterways. The FWC also issued a news release to inform home aquarists of the potentially serious environmental impacts of Zebra Mussels, how to safely dispose of moss balls and how to decontaminate aquarium water that might have contained Zebra Mussels. The FWC continues to work with state and federal partners to address this national issue. For additional information on Zebra Mussels, please visit:

<https://myfwc.com/wildlifehabitats/profiles/invertebrates/zebra-mussel/>

### **Arapaima (*Arapaima gigas*)**

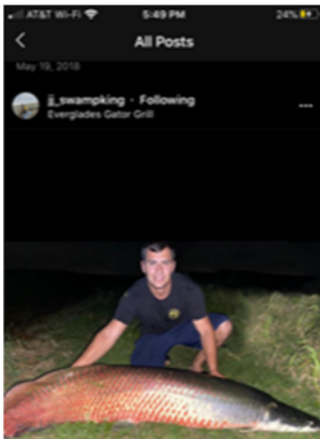


Figure 13. Adult Arapaima (*Arapaima gigas*) reportedly caught by angler from a pond in southwest Florida. Photo courtesy of jj\_swampking.

The FWC has received a small number of singleton reports of Arapaima (*Arapaima gigas*) through social media posts, anglers, and concerned citizens (Figures 13,14). Arapaima are one of the largest freshwater fish and can reach lengths of 10 feet and weigh 400 pounds. They are listed as a Conditional species in Florida which limits their possession to individuals or institutions conducting research, commercial import or export business, and for public exhibition. Arapaima cannot be kept as pets by



Figure 14. Dead Arapaima (*Arapaima gigas*) recovered from the bank of the Caloosahatchee River in Cape Coral, FL.

Aquaculture facilities that are permitted by the Florida Department of Agriculture and Consumer Services and meet Best Management Practices for the possession, culture, and transportation of Conditional species can raise and sell Arapaima only as a food fish. Most Arapaima reports are of fish >6 ft in length with estimated weight of 140-160 pounds. This size of fish would be sexually mature but there is no evidence of reproduction in the wild. The FWC Law Enforcement Division is investigating these reports to ascertain the source(s) of the released Arapaima.

The FWC and U.S. Geological Service are working collaboratively with the U.S. Fish and Wildlife Service to develop a proposal to fund an Early Detection/Rapid Response project to prevent the establishment of this potentially detrimental fish species in the United States. One component of this project will include development of outreach materials to inform the public on the potential environmental consequences of releasing Arapaima and to encourage the public and anglers to report observations or catches to FWC's Exotic Species Hotline.

## **Upcoming Events**

**2021 Lionfish Removal and Awareness Day:** May 15-16 in Destin, Florida held in conjunction with the emerald Coast Lionfish Derby May 15. The Lionfish Challenge is scheduled to run from May 21 through September 6, 2021. The goal of the Challenge is to encourage and reward recreational and commercial divers for removing lionfish from Florida waters.

**FWC/USGS Nonnative Fish Slam:** Fall 2021. We hope to focus this event on waterbodies in the Ruskin-Sarasota area to continue sampling for Arapaima reported in this area.

**Snakehead Round-Ups:** Postponed until September or October 2021. The FWC will act as the weigh-master and provide outreach materials to participants and spectators. These tournaments provide valuable data on effort and harvest of Bullseye Snakehead and catch rates of co-occurring Largemouth Bass.

**ECISMA Nonnative Fish Round-Up:** Canceled.

**SWCISMA Nonnative Fish Round-Up:** Canceled