



2022 Intern Squad holds a Burmese Python in Big Cypress National Preserve. Pictured from left to right; Brandon Gross, Marcellus Murray, Kendra Treichel, Jose Torres, Teah Evers, Kyra Woytek, Ricky Ribas, Shannon Thrasher, and Peter Crawford.

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Getting Things Done! Invasive Reptile Internship Program in the Greater Everglades Ecosystem

By: Lisa M. McBride¹ and Christina Romagosa²

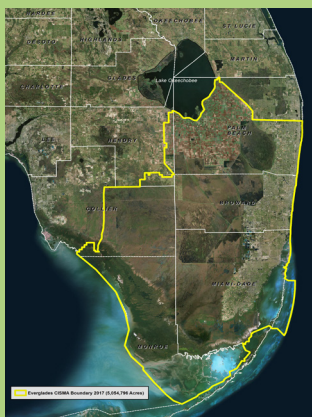
¹U.S. Geological Survey, Fort Collins Science Center

²Department of Wildlife Ecology and Conservation, University of Florida

Have you heard that research is being done on Burmese pythons? For over 15 years, the U.S. Geological Survey (USGS) has been conducting invasive reptile research in Southern Florida’s Greater Everglades Ecosystem with various partners. A combination of federal staff and interns, the USGS team works in Everglades National Park, Big Cypress National Preserve, Crocodile Lake National Wildlife Refuge, and beyond. In 2013, scientists from the Invasive Species Science Branch of USGS’s Fort Collins Science Center established an ongoing interagency partnership with the National Park Service (NPS) stationed in Everglades National Park to carry out the important work, currently focused on research contributing to the control and containment of Burmese pythons (*Python molurus bivittatus*) and black and white tegus (*Salvator merianae*),

among other species of concern. But how is so much field-based research on invasive reptiles accomplished in Southern Florida’s vast jungle?

In 2014, USGS, NPS, and the University of Florida developed the Invasive Reptile Internship Program that is at the core of our ongoing research. This internship complements the Everglades BioCorps Internship Program, both of which trains early-career biologists to conduct rigorously scientific field and laboratory work. The programs provides research interns opportunities to develop their skills in wildlife research and conservation while expanding their networks for graduate school and enriched careers in the biological sciences. Interns participate in field-based research on Burmese python



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ecology, survival, reproduction, and diet in Big Cypress National Preserve, Early Detection and Rapid Response and removals of black and white tegu lizards in Everglades National Park, and may also participate in related lab-based research. Throughout the 6-12-month research internships, interns utilize radiotelemetry equipment to track transmitted pythons throughout the various habitat types in Big Cypress National Preserve and practice navigating through rugged and remote terrain within Southern Florida using GPS and satellite units, all while collecting detailed data that will serve as the basis for scientific analyses and publication. Interns in our program will spend 6-8 hours every day using these skills, becoming truly confident in their abilities. Laboratory research in

Everglades National Park offers various opportunities to investigate the biology of Burmese pythons, black and white tegus, and other invasive reptiles found in Southern Florida through detailed necropsy investigations.

One of the hallmarks of this internship program is providing an opportunity to grow professionally. As our internship program continues to develop over the years, so too do our partnerships with resource managers and research collaborators. Since its inception, the internship program has provided excellent research, mentorship, and career building opportunities to recent graduates from across the United States. Several former interns have contributed to peer-reviewed publications, pursued graduate degrees in the biological

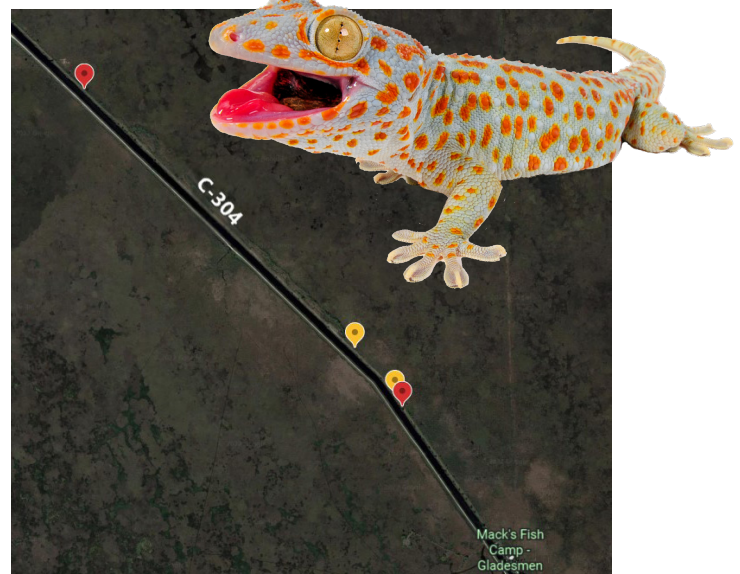
sciences, or gone on to become wildlife professionals across the globe.

Recently, the USGS Wetland and Aquatic Research Center joined our team (the USGS Fort Collins Science Center, the University of Florida, and the National Park Service) and expanded the intern capacity from six to ten individuals! The 2022 Invasive Reptile Internship Program, mostly pictured above, consisted of; Brandon Gross, Marcellus Murray, Kendra Treichel, Jose Torres, Teah Evers, Kyra Woytek, Ricky Ribas, Shannon Thrasher, Peter Crawford, as well as Daniel Fliehler and Tiffany Hough (not pictured). It is exciting to be a part of so much growth for young biologists, gaining valuable skills for employment in the biological sciences.

Early Detection and Rapid Response to Tokay Geckos and Rainbow Boas in South Florida

By: Ali Courtemanche, Joshua Sands, and Michelle Bassis, Florida Fish and Wildlife Conservation Commission

Due to Florida's subtropical climate and mild winters, the state has become a hotspot for invasive reptile species that can cause negative impacts on the economy, environment, and human health. Coordinated Early Detection and Rapid Response (EDRR) is one strategy used to organize the removal of emerging invasive species immediately following their detection. In June 2022, the Florida Fish and Wildlife Conservation Commission (FWC) responded to new reports of Tokay geckos (*Gekko gecko*) in Everglades and Francis S. Taylor Wildlife Management Area (WMA). Additionally, FWC, the University of Florida, and the South Florida Water Management District started coordinating a response to multiple rainbow boa (*Epicrates cenchira*) reports within a concentrated area of Miami-Dade County. Both species were likely introduced to Florida through the pet trade and may have negative impacts on Florida's ecosystems.



Map of Tokay gecko capture locations in Everglades and Francis S. Taylor WMA. Yellow pinpoints depict the distance extent of capture locations on June 27, 2022. Red pinpoints depict the same with captures on July 1, 2022.

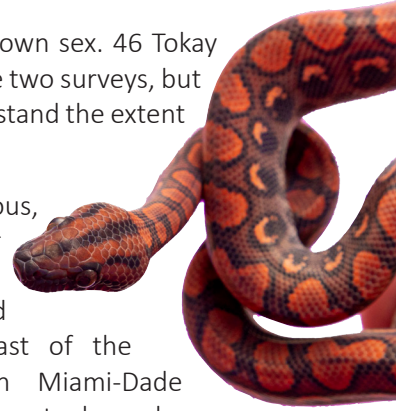
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Early Detection and Rapid Response to Tokay Geckos and Rainbow Boas in South Florida (CONTINUED FROM PAGE 2)

Tokay geckos are a large, carnivorous, and colorful gecko species native to Southeastern Asia. On June 22, 2022, multiple Tokay geckos were observed by FWC staff on the C-304 levee in Everglades Francis S. Taylor WMA during a night survey. FWC responded to the report on June 27, 2022 and removed five Tokay geckos within one hour. An additional night survey was organized on July 1, 2022 and 41 Tokay geckos were removed within five hours of surveying. The shortest gecko had a Total Length (TTL) of 13 cm and the longest had a TTL of 33.5 cm, with an average TTL of 24.8 cm for all 46 Tokay geckos. Twenty-five geckos were male, 17

were female, and 4 were of unknown sex. 46 Tokay geckos were removed during these two surveys, but more surveys are needed to understand the extent of the population in this area.

Rainbow boas are a nonvenomous, medium-sized boa constrictor native to Brazil. Since 2018, four removals have been verified on EDDMaps on two roads east of the Homestead-Miami Speedway in Miami-Dade County. Additional unverified reports have been documented on social media, invoking further investigation in this location. Documented specimens with photograph verification have ranged from hatchling to adult size classes and have been found dead and alive. The FWC is currently coordinating a night survey with ECISMA partners to investigate the possible presence of additional Rainbow boas in this area.



Map of verified rainbow boa removals reported to EddMaps.org from 2018 to 2022 in one location in Miami-Dade County.

EDRR is one strategy to prevent establishment or spread of nonnative species if coordinated quickly. The Tokay gecko removals and rainbow boa reports are two examples of nonnative species detected through interagency communication and public reports. With continued public and partner reporting of nonnative species observations, rapid response, and interagency coordination, emerging nonnative species may be controlled before populations establish or adverse impacts are realized.

Invasive Conehead Termites – Continued Risk of Introductions and Spread of Destructive Pests

By: Sue Alspach¹, Barbara L. Thorne², Katherine E. Tenn¹, and Marah S. Clark¹

¹Florida Department of Agriculture and Consumer Services,

²Department of Entomology, University of Maryland

Due to introduction pressure, ease of spread, and their proficiency in becoming established in diverse habitats, conehead termites (*Nasutitermes corniger*) present a high potential for continued invasion in the Southern United States. Conehead

termites are a destructive pest of natural areas, agriculture, and structures, thus of broad concern. This article highlights characteristics that promote their invasive potential.

Introduction Pressure

The United States Department of Agriculture (USDA) classifies the conehead termite's genus *Nasutitermes*, and species *Nasutitermes corniger*, as

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Invasive Conehead Termites – Continued Risk of Introductions and Spread of Destructive Pests (CONTINUED FROM PAGE 3)

pests of potential economic importance, and lists them in the U.S. Regulated Plant Pest Table. Their importation is thus regulated and quarantinable. The source pool for potential conehead termite introductions is extensive; the species ranges throughout Central America as well as most countries in South America and the Caribbean.

The ability of conehead termites to hide in plants, boats, and wooden items such as wood packaging material enhances the risk of conehead termites moving undetected from country to country. Less than 2% of international cargo is inspected at U.S. borders and ports, yet USDA data show that between 1984 and 2019 *Nasutitermes* termites were intercepted 122 times in 19 states. Twenty-one of those interceptions were identified as *Nasutitermes corniger* (or synonym *N. costalis*), conehead termites. Over the past 100 years, conehead termites were the most commonly intercepted non-native termite.

Ease of Spread

Amplifying the invasion potential of conehead termites is their ease of spread to new locations. Coneheads live above ground, consume almost anything made of cellulose, easily hide in infested items, and are adept at establishing in new habitats. Humans risk transporting them long distances by moving materials containing hidden coneheads, such as infested trees, railroad ties, pallets,



Interior crosscut of an infested dead tree in a mangrove forest showing areas of solid conehead termite nest material just under the surface bark. If removed whole, this tree could have transported an entire colony to a new location.

wood debris from landscapes, and/or cardboard boxes.

The only known established introduction of conehead termites into the U.S. was likely via a boat docked at a marina in Broward County, Florida. First discovered in 2001, conehead termites spread to 136 properties in four cities in the county. Most of the spread resulted from natural dispersal flights of winged reproductives which shows the importance of rapid intervention response and containment. Their movement from city to city,

however, resulted from human transport, evidencing their ability to successfully establish colonies at distant locations.

Proficiency in Becoming Established

The reality that a conehead termite population became established in Florida and spread through Broward County is evidence of the species' exceptional adaptability and skill in dispersal, making them successful colonists. Young Queen and King parents are experts at keeping their family invisible as it grows within host wood. Hiding helps protect the immature colony from predators, diseases, and detection by humans. It can be several years before a colony emerges from the host wood and becomes visible by building foraging tunnels and a conspicuous nest. This cryptic early phase enables the colony to grow undetected, increasing its chance of being moved while concealed and establishing successfully.

Unlike nearly all other termite species and most other invasive pests worldwide, conehead termite colonies often have multiple queens (196 in one Florida nest) laying eggs concurrently, powering extremely rapid colony growth. Nests can double in size in one month. This extraordinary growth rate strengthens colony viability and resiliency, and empowers conehead termites to infest an area quickly.

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Conehead termite nest found inside stack of wooden industrial pallets in Pompano Beach, FL.

Existing and Future Impacts to Natural Areas

The Florida Department of Agriculture and Consumer Services (FDACS) has successfully controlled conehead termite infestations in urban environments. Recently finding this pest thriving in a mangrove forest has heightened concern of future impacts if it spreads. If conehead termites spread to other natural areas including coastal mangroves, state forests or the Everglades ecosystem (which is located only 12 miles from the

current infestation), the species could be beyond the scope of eradication.

Conehead termite invasion into natural areas in the U.S. could spark huge ecological disruptions, for example plant composition and habitat change through destruction of ground litter; altering rates of decomposition and addition of nutrients to soils; impacting ants, lizards, native termites, and other predators and competitors; and making trees more susceptible to blow overs by impacting their structural integrity. Community impacts may cascade to affect other species. For example, the natural roost sites of the endangered Florida Bonneted Bat (*Eumops floridanus*) include dead trees, tree snags, and trees with cavities, hollows, crevices, or loose bark, all of which are potential nesting sites and forage for conehead termites, may be disturbed if the pest invades Everglades National Park.

The vigor of native plant communities is jeopardized by conehead termites. Results of a dead wood removal project that FDACS and ECISMA accomplished in the heavily infested mangrove forest showed that red and white mangrove trees and native palms have been heavily damaged by conehead termites, including deep within their trunks and high into the canopy. In the case of impacts to mangroves, similar impacts of these termites on health of mangrove communities in Puerto Rico, documenting mangrove dieback and death associated with proximity to conehead termite nests.

Eradication Potential

Conehead termite infestations are known to currently remain on only 13 properties covering approximately 12 acres in Broward County. Of 136 properties

that have or had conehead termites in the county, 123 are currently under control and being monitored for possible emergence of young colonies. Due to their high risk of invasion and destructive potential as pests, investments in proven conehead termite eradication protocols now, while the infested area is small (still early in the invasion curve), will prevent lasting economic and environmental burdens on future generations if this species persists and spreads in Florida and the U.S.

Literature cited:

Blumenthal, A. J. and E. L. Vargo. 2020. *Geography, opportunity and bridgeheads facilitate termite invasions to the United States. Biol. Invasions 22:3269-3282.*

National Research Council Committee on the Scientific Basis for Predicting the Invasive Potential of Nonindigenous Plants and Plant Pests in the United States. *Predicting Invasions of Nonindigenous Plants and Plant Pests. Washington (DC): National Academies Press (US); 2002.*

Thorne, B.L., E. L. Vargo, E. S. Adams, and L. N. L. Johnson. 2019. *Genetic analysis of invasive conehead termites, Nasutitermes corniger (Blattodea: Termitidae), reveals a single origin for two populations in Florida. J. Econ. Entomol. 112: 2545-2557.*

U.S. Fish and Wildlife Service Environmental Conservation Online System, "Florida Bonneted Bat (*Eumops floridanus*)", <https://ecos.fws.gov/ecp/species/8630> (accessed November 1, 2022).

Wier, A. M. 2004. *A Nasute termite and a Buprestid beetle enhance necrotrophy of Cytospora canker of Puerto Rican red mangroves. Symbiosis 36: 29-40.*



Python Patrol Program

By: Jan Fore, Florida Fish and Wildlife Conservation Commission

Python Patrol is a no-cost training program presented by the Florida Fish and Wildlife Conservation Commission (FWC) that aims to create a network of individuals throughout Florida who can identify Burmese pythons, report sightings, and when possible, safely capture and humanely kill these invasive constrictors. During the pandemic, all in-person offerings of this class were suspended indefinitely. To continue to meet the high demand from partners and the public, the FWC's Nonnative Fish and Wildlife Program Education and Outreach Team created a virtual version of this training as a regularly scheduled online class held on the third Thursday of every month. Beginning in

September 2021, the team presented the first Virtual Thursday Python Patrol using the Microsoft Teams Live platform with more than 150 people in attendance. The monthly Python Patrol schedule was posted on [MyFWC.com](https://www.myfwc.com) and featured in FWC social media posts to

raise awareness for the new course. As of September 2022, the team has presented 12 months of Virtual Thursday Python Patrols reaching 985 attendees. Audiences have included FWC staff, external partners, academic institution staff, and members of the public from Florida and beyond.



As part of an update to the Python Patrol curriculum, the team added graphics and language to improve guidelines for humane killing methods for removal of nonnative reptiles. The updated protocol details a two-step humane method based on the 2020 American Veterinary Medical Association Guidelines for Euthanasia of Animals. The new protocol has been widely shared in in the Virtual Thursday Python Patrol training and online at [MyFWC.com](https://www.myfwc.com) and flypythonchallenge.org.

Natives Bite Back! Are Burmese Pythons Beginning to Encounter the Resilience of the Everglades Ecosystem?

By: Andrea Currylow, U.S. Geological Survey, Fort Collins Science Center

Burmese pythons are a large invasive reptiles known in Florida for devastating impacts on native species in the Greater Everglades Ecosystem. Several organizations and individuals are researching and/or removing the snakes, including the U.S. Geological Survey (USGS). Since 2018, scientists from USGS's Fort Collins Science Center have been working closely with the National Park Service (NPS) in Big Cypress National Preserve to use radiotelemetry and track Burmese pythons for various ecological research project and management (enabled by invaluable partnerships with the University of Florida and Zoo Miami). Over those years, we have encountered some incidental, but intriguing findings.

Because Burmese pythons are seemingly ubiquitous in the wildlands of Southern Florida and known as eating their way through the Everglades, we imagined that there were

very few threats to pythons; that the relationship between the glades and the pythons was one-way: the Everglades produces, and the pythons take. It is encouraging to think that the story is more complex than that.

Initially, we were tracking only adult pythons during the breeding season so that they could lead us to additional pythons in breeding aggregations (i.e., scout animals). After a few years of radiotelemetry, we were surprised to find that one of our adult male scout pythons was killed by a bobcat while another python was attacked but survived a Florida black bear attack! Not long after those discoveries, we started tracking females to start learning about python sex differences, reproduction, nesting, and timing. We were floored to find we had accidentally documented the very first python nest predator in the US, and that it was a native species

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Natives Bite Back! Are Burmese Pythons Beginning to Encounter the Resilience of the Everglades Ecosystem? (CONTINUED FROM PAGE 6)

, a bobcat! Not only that, but we had also captured on the game camera the very first, ever, wild Burmese python actively defending her nest from a predator. Fortunately for our research, we were able to acquire hatchlings from another nest and more with the help of the South Florida Water Management District and the Florida Fish and Wildlife Conservation Commission python contractor programs, and we started to track that age class.

Almost immediately, we and partners at the Conservancy of Southwest Florida found a new native predator of pythons, cottonmouths. Though we may have suspected there would be some mortality in hatchlings considering the sheer number of eggs and hatchling pythons found on the landscape, we had absolutely no idea that they could die in such a variety of ways. We found mortalities caused by more cottonmouths (16%), alligators (26%), mesomammals (25%), and prey animal (5%), as well as several unattributable deaths (36%) some of which indicated possible avian predators and starvation. We were delighted to discover that native predators, especially other reptiles, are starting to recognize pythons as prey items, and the failure for some of these hatchlings to thrive in an environment with which they did not co-evolve indicates that there may be more to discover about possible maladaptation exhibited by pythons, potentially including some reproductive problems.

It may be enchanting to think there could be more of an interaction between the glades and pythons than previously thought: where the Everglades produces, the pythons take, and the Everglades bites back! However, these observations are very few, and more work is needed to further substantiate those types of hypotheses. Additionally, we cannot rule out that our study itself affects the interactions and mortalities. Certainly, we each need to do our part in reporting invasive species like pythons (<https://www.eddmaps.org/florida/report/>), as well as continue to work together, explore, and pursue research avenues that may aid in the control and management invasive Burmese pythons.



Figure legend: Photographic evidence and representation of some of the variety of confirmed native Everglades threats to invasive Burmese pythons in the Greater Everglades Ecosystem. From left to right; American alligator depredations, mesomammal depredations (e.g., bobcat nest predator), Florida cottonmouth depredations, Florida black bear attacks, and the mishandling/misidentification of appropriate prey (e.g., hispid cotton rat mortal wounds).

Literature Cited

Anderson GE; Ridgley FN; Josimovich JM; Reed RN; Falk B; Yackel Adams AA; Currylow AF. (2022) Egg retention in wild-caught *Python bivittatus* in the Greater Everglades Ecosystem, Florida, USA. *The Herpetological Journal* 32(3): 109–113. <https://doi.org/10.33256/32.3.109113>

Bartoszek I; Anderson GE; Easterling I; Josimovich JM; Furst A; Ridgley FN; Fitzgerald AL; Yackel Adams AA; Currylow AF. (2021) *Agkistrodon conanti* (Florida Cottonmouth) and *Python bivittatus* (Burmese Python). Diet and Predation. *Herpetological Review* 52(4): 860-862. <https://www.researchgate.net/publication/357712691>

Currylow AF; BG Falk; AA Yackel Adams; C Romagosa; JM Josimovich; M Rochford; M Cherkiss; MG Nafus; K Hart; FM Mazzotti; R Snow; RN Reed. (2022a) Size distribution and reproductive phenology of the invasive Burmese python (*Python molurus bivittatus*) in the Greater Everglades Ecosystem, Florida, USA. *NeoBiota* 78: 129-158. <https://doi.org/10.3897/neobiota.78.93788>

Currylow AF; Fitzgerald AL; Goetz MT; Draxler JL; Anderson GE; McCollister MF; Romagosa CM; Yackel Adams AA. (2023) Natives bite back: Depredation and mortality of invasive juvenile Burmese pythons (*Python bivittatus*) in the Greater Everglades Ecosystem. *Management of Biological Invasions* 14(1): 107–122. <https://www.reabic.net/journals/mbi/2023/Issue1.aspx>

Currylow AF; McCollister MF; Anderson GE; Josimovich JM; Fitzgerald AL; Romagosa CM; Yackel Adams AA. (2022b) Face-off: Novel depredation and nest defense behaviors between an invasive and a native predator in the Greater Everglades Ecosystem, Florida, USA. *Ecology and Evolution* 12(2): e8639. <https://doi.org/10.1002/ece3.8639>

Fitzgerald A; Josimovich J; Robinson CJ; Reed R; Currylow AF. (2021) Identifying negative sentiment polarity in the Judas Technique. *Conservation Science and Practice* 3(11): e532. <https://doi.org/10.1111/csp2.532>

McCollister M; Josimovich J; Fitzgerald A; Jansen D; Currylow AF. (2021) Native mammalian predators can depredate adult Burmese pythons in Florida. *Southeastern Naturalist* 20(2): N55-N59. <https://doi.org/10.1656/058.020.0205>

National Invasive Species Awareness Week ECISMA North African Python Surveys

By: McKayla Spencer¹, Ali Courtemanche¹, and Christina Romagosa²

¹Florida Fish and Wildlife Conservation Commission

²Department of Wildlife Ecology and Conservation, University of Florida

National Invasive Species Awareness Week (NISAW) is an international event to raise awareness on the impacts invasive species have on native ecosystems. The Florida Fish and Wildlife Conservation Commission (FWC) organized two days of North African python (NAP; *Python sebae*) surveys, March 4th and 7th, 2022, during NISAW, in response to five NAPs being captured in the Bird Drive Basin (BDB) area of Miami-Dade County on December 27th and 28th, 2021. For over two years, between December 2018 and December 26, 2021, zero NAPs had been removed from Miami-Dade County. NAPs are an invasive species in Florida that were first observed in the wild in 2001. They are a large constrictor snake species introduced through the pet trade causing similar negative impacts on the environment as the Burmese python (*Python molurus bivittatus*).



NISAW Burmese python capture (photo credit Austin Fitzgerald - U.S. Geological Survey).

This year 34 members of ECISMA, from 10 different agencies, participated in the NISAW NAP surveys. Approximately 31 hours of surveys were completed at 10 sites in the BDB and one Burmese python and one NAP were removed during surveys. There have now been 44 NAPs removed from this area since the first one was found in 2001. The five NAPs captured in December 2021 were humanely killed and necropsied revealing two reproductively active, over 13 feet long, females (each had over 60 developing eggs inside them), one sub-adult female, one sub-adult male, and one male over 13 feet long. They had a variety of gut contents in various stages of digestion including an unidentified canid, an opossum, cotton rats, and two unidentified birds. These recent findings support the establishment of NAPs in this area and multi-organizational efforts, such as the ECISMA NISAW surveys, continue to expand our knowledge on this NAP population to help in future control efforts.

2022 NISAW North African Python Survey Site Map



Figure showing the locations where NISAW NAP surveys took place in 2022. Yellow lines indicate survey locations.



Group photo of ECISMA NISAW NAP survey participants on the second day of surveys.

Increasing the Efficiency and Power of Camera Traps for EDRR & Ecological Monitoring

By: Gretchen Anderson and Amy Yackel Adams, U.S. Geological Survey, Fort Collins Science Center

Invasive species are an ever-growing concern for Florida, especially in important environments like the Greater Everglades Ecosystem. One of the best ways to fight back against the establishment of invasives is the use of the “Early Detection, Rapid Response” (EDRR) system. The earlier we can detect the presence of a nonnative species, and the faster we respond, the better our chance of slowing or stopping its spread. For years, the U.S. Geological Survey (USGS) Fort Collins Science Center has been working closely with the National Park Service (NPS) to monitor Everglades National Park for new invading species using trail cameras. We have also been working with NPS staff in Big Cypress National Preserve, using our trail cameras to research the invasive Burmese python and monitor their nest sites.

Trail cameras are a useful conservation tool, but they have drawbacks. Cameras need to be checked frequently so we can rapidly review the photos for invasives and respond as quickly as possible. This can take dozens of personnel hours each week and cause human disturbance to sensitive habitats or study sites. Cameras also require a significant amount of energy in the form of batteries. On average, we change trail camera batteries over 250 times per year, using over 6,500 batteries. With the high cost of labor hours, batteries, and possibility of undesired human disturbances to habitats or research animals, we needed a cost-effective renewable energy technology for remote areas.

An exciting solution to the drawbacks of using trail cameras was to switch to using solar panels to supply green energy to power our cameras. Overall,



Clockwise from top left: A trail camera attached to a tree with a solar panel supplying power. A trail camera aimed at a baited trap, monitoring for the presence of black and white tegu lizards. A black and white tegu lizard caught on a trail camera inspecting an open trap. Kyra Woytek (left) and Kendra Treichel (right), two University of Florida/USGS interns, deploy a new trail camera in Everglades National Park.

this has reduced battery waste and lessened the number of visits needed to maintain our cameras! Additionally, cellular trail camera technology is quickly developing, enabling researchers to remotely access and examine new photos within 24 hours of being taken. This means that researchers and managers can have a faster response time whenever invasive species are detected or important research developments occur. Our labor-saving upgrades will also enable us to expand our camera array so we can monitor more areas.

In the future, we are hoping to use artificial intelligence (AI) to make our detection and response even faster! New AI technologies can be used to recognize patterns and automatically detect invasives in our photos, enabling

us to sift through thousands of photos at lightning speed. With these exciting new technologies, we are reducing labor, cost, and waste, all while increasing our ability to detect and respond to invasives!

See footage USGS discovered of a bobcat depredating a python nest here: <https://www.youtube.com/watch?v=4ZUYHXiUrs8>



The Exotic Pet Amnesty Program

By: Taylor Apter, Florida Fish and Wildlife Conservation Commission

The Florida Fish and Wildlife Conservation Commission’s (FWC) Exotic Pet Amnesty Program (EPAP) strives to prevent the release of nonnative fish and wildlife species by helping pet owners rehome their animals when owners can no longer care for them. This year, EPAP staff emphasized adopter recruitment to better provide in-state and out-of-state rehoming options for surrendering owners in Florida. To facilitate the rehoming process, the EPAP requires a network of pre-approved adopters willing and able to provide these animals with a forever home. This adopter recruitment initiative included a redesign of online EPAP and educational resources, increasing outreach tabling events, and collaborating with both internal and external entities. Staff were able to present to the FWC Florida Youth Conservation Centers Network, Florida

Veterinary Medical Association, Florida Association of Zoos and Aquariums and Florida Animal Control Association on this unique program and provided these partners with outreach materials and information to distribute to their constituents.

Materials included educational kits with EPAP pamphlets, contact information, stickers and magnets now displayed at over 20 sites.

EPAP staff focused on expanding adopter recruitment beyond Florida

and were able to connect with 10 reptile-focused rescue entities in multiple states across the country. These entities

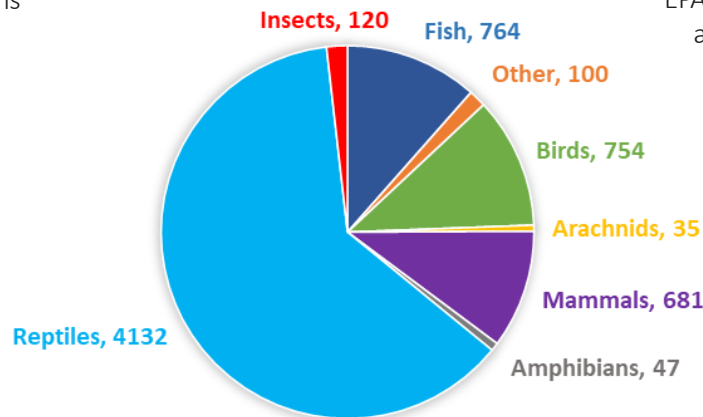
became invaluable partners, connecting animals in need with new homes outside of Florida via a partnership with Southwest Cargo for safe animal shipments.

This partnership has been vital in rehoming species now listed as prohibited in

Florida, including 44 tegus and green iguanas. EPAP staff plan

to continue growing the program and adopter base to better support nonnative pet owners in need of rehoming options.

ANIMALS SURRENDERED



Since its inception in 2007, the Exotic Pet Amnesty Program has processed over 6,000 animal surrenders, 62% of which are reptiles. Since its inception in 2007, the Exotic Pet Amnesty Program has processed over 6,000 animal surrenders, 62% of which are reptiles.



EPAP staff (Taylor Apter) tabling at the Oscar Scherer State Park 33rd Annual Earth Day Festival.



EPAP staff (Jan Fore) presenting on EPAP at the Florida Animal Control Associates Conference in Orlando, FL.

Burmese Python Size and Reproduction: Fact vs Fiction

By: Mark Sandfoss, U.S. Geological Survey, Fort Collins Science

We've probably all heard rumors of monster 25-foot snakes or baby pythons emerging from under neighbors houses year-round, but what is fact vs fiction? To help us sort truth from myth, invasive pythons that were removed from the Everglades and surrendered to the National Park Service (NPS) were scientifically investigated via a partnership with the U.S. Geological Survey Fort Collins Science Center's (USGS FORT) Invasive Species Science Branch. Other contributing partners were South Florida Water Management District and Florida Fish and Wildlife Conservation Commission's python contractor and agent programs. Over the past 25 years more than 4,000 wild Burmese pythons have been found and removed from southern Florida's Greater Everglades Ecosystem.

The analysis of data collected throughout the years on the size and reproductive condition of snakes allowed us to characterize the size distribution of Burmese pythons in southern Florida

and identify windows of breeding activity, nesting, and emergence of baby snakes. Scientists at USGS FORT recently published a summary of those data that describes what was learned from all those specimens and details python size and timing of reproductive activity in Florida.

The publication included lots of interesting findings and can be used to bust many python myths. The most frequent fiction that is perpetuated in Florida concerns the size of pythons in the wild aka "fish stories." Female pythons were documented up to a total length of 18.5 ft (500 cm snout-vent length[SVL]), which is longer than the males that only get up to 13.5 ft (400 cm SVL) but is certainly not as big as what has been recounted to many in python fish tales (Fig 1).

The breeding season of Burmese pythons is characterized by mate searching where males search for females. In Florida, we now know that this lasts about 100 days between December and March. Following successful mating, females then look for areas suitable to lay their eggs (oviposit). Females lay eggs in May with approximately 40 eggs per clutch. Interestingly, female Burmese pythons will guard their nest and actively keep it warm through repeated contractions of their muscles while coiled around the eggs. This behavior is called shivering thermogenesis.

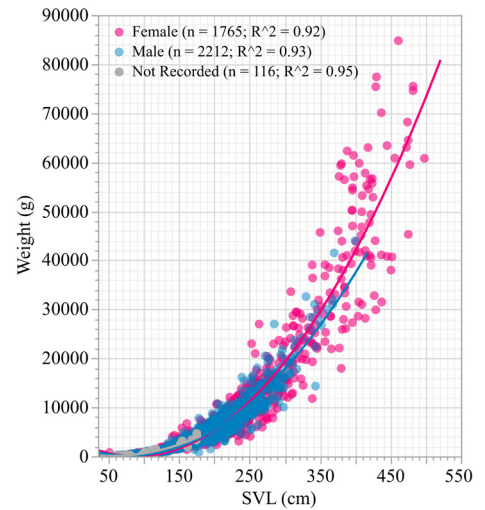


Figure 2: Graph of snout-vent length (SVL; 50-550 cm [1.6-18 ft]) and weight in grams of Burmese pythons from 1995 through 2021 in Southern Florida.

Females eventually leave their nests a short time before the eggs hatch in mid- to late-July. The time of year when hatchling pythons can be frequently found as they disperse is during July, August, September, and into October (Fig 2). Don't let the idea of baby snakes fool you; a baby python is 2-2.5 feet (60-70 cm SVL) long! So, if you are around the Everglades and see a small snake (< 2 ft) outside of the late summer/early fall months, you can be relatively safe in presuming it is not a Burmese python and is more likely one of our beneficial native snakes.

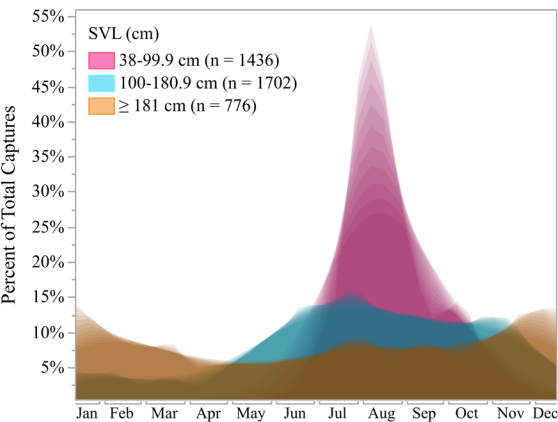


Figure 1: Graph of percent total captures throughout the year of Burmese pythons separated by size class. Most young pythons captures occur between July and September.

For more details on Burmese python size and reproduction in Florida, see the published manuscript:
 Size distribution and reproductive phenology of the invasive Burmese python (*Python molurus bivittatus*) in the Greater Everglades Ecosystem, Florida, USA.
 By Currylow AF; BG Falk; AA Yackel Adams; C Romagosa; JM Josimovich; M Rochford; M Cherkiss; MG Nafus; K Hart; FM Mazzotti; R Snow; and RN Reed. (2022) in *NeoBiota* 78: 129-158. <https://doi.org/10.3897/neobiota.78.93788>.

Snakelife Carvings

By: Edward Mercer

As a former volunteer python hunter and Florida Fish and Wildlife Conservation Commission (FWC) Invasive Species Wildlife Technician, I've racked up a lot of experience with snakes. After I left FWC and moved out of state, I missed my daily interaction with pythons.

When the pandemic started, I began looking for something creative to do with my time, so I started whittling wood. When I upgraded to power carving, this is when I knew that I had found a new passion. Since carving my first snake, I have grown as a carver; learning new techniques and improving the quality and likeness of my subjects. I've been featured in two different woodcarving publications and one of my carvings was recently selected by Arbortech as one of the top carving projects of 2022.



Brazilian Rainbow boa wall sculpture

My carvings take about three weeks or longer to complete. After I've completed the carving process, I then wood burn thousands of individual scales on the snake. I finish by hand painting each carving to look as realistic as possible.

I think that these lifelike sculptures can be great reference pieces for educating people about invasive species without having the challenges of keeping, handling, and transporting live animals.

I would be happy to work with any agency interested in having educational pieces. I can even make flexible "wiggle" snakes. You can see more of my carvings on Facebook and Instagram at @SnakeLifeCarvings or email me at snakelifecarvings@gmail.com.



3' Burmese Python flexible "wiggle" snake



Burmese pythons emerging from egg clutch pedestal: 12 full snakes; 11 Burmese, 1 Labyrinth, 3 heads coming out of eggs, 2 Burmese, 1 Labyrinth, 1 Gopher tortoise, 40 egg clutch. Artwork selected as a top carving project of 2022 by Arbortech.



ECISMA was created to formalize cooperation among land management agencies to improve the effectiveness of exotic species control by sharing information, innovation and technology across borders through a memorandum of understanding with the ultimate goal of helping to ensure the success of the Comprehensive Everglades Restoration Plan.

www.evergladescisma.org

ECISMA Contact Information:

LeRoy Rodgers
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, FL 33406
(561) 682-2773
lrodgers@sfwmd.gov

Dennis J. Giardina
Florida Fish & Wildlife Conservation Commission
298 Sabal Palm Road
Naples, FL 34114
(239) 229-5403
Dennis.Giardina@myfwc.com

Agency/Organizations Abbreviations

- ECISMA- Everglades Cooperative Invasive Species Management Area
- EDDMapS- Early Detection & Distribution Mapping System
- EDRR- Early Detection & Rapid Reponse
- EPAP- Exotic Pet Amnesty Program
- FOE- Friends of Everglades Cisma, Inc.
- FDACS- Florida Department of Agriculture & Consumer Services
- FWC- Florida Fish & Wildlife Conservation Commission
- NPS- National Park Service
- SFWMD- South Florida Water Management District
- UF- University of Florida
- USDA- U.S. Department of Agriculture
- USGS- U.S. Geological Survey

2022 ECISMA Newsletter

Editors:
Elena Suarez, Broward Co.
Caroline Geertz, Broward Co.
Logo:
Erik Eckles, Broward Co.



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