The giant African land snail (*Lissachatina fulica*) is an invasive mollusk. This presentation will discuss the threat and health risks associated with the Giant African Land Snail as well as eradication efforts taking place to remove this pest from Florida.
The Giant African Land Snail is an invasive species that originated in Eastern Africa. It can grow up to 8 inches in length. It displays nocturnal behavior where it will rest during the day and becomes active at night. These snails can be found in a variety of habitats including agricultural areas, natural forests, wetland and urban areas as well.
Giant African land snails are hermaphrodites, meaning that any two individuals can reproduce together, however they cannot self-fertilize. Instead, they undergo “reciprocal copulation” where the sperm of snail A fertilizes the eggs of snail B, while the sperm of snail B fertilizes the eggs of snail A. These snails have the ability to store sperm, which means that a single copulation can produce multiple clutches of eggs.

The giant African land snail typically reaches sexual maturity in 12 months (range = 5 to 15 months depending on temperature) and they can live up to 9 years (average = 3-6 years). The typical time frame for maturation may be delayed by hibernation or aestivation. Aestivation is similar to hibernation, except it refers to dormancy that occurs during hot or dry period.
Why is the Giant African Land Snail a major concern?

- Very diverse diet:
  - Over 500 types of plants
  - Native snails
  - Plaster and stucco

- Carry multiple parasites:
  - Rat lungworm
  - Round worm
  - *Aeromonas hydrophila*

Major threat to agriculture industry and native ecosystem

Human health concern

The Giant African Land Snail has the potential to become a major agricultural pest. They are capable of eating over 500 different types of plants, including economically important crops like banana, tomato, cucumber and papaya. They can feed on both living and dead plant matter along with algae, fungi and feces. The GALS can also vector fungal plant pathogens.

The Giant African Land Snail requires calcium to grow their large shell, they will often eat other native snails, this can disrupt native snail populations, this can put endangered snail species at risk. They also can become a nuisance to homeowner because they will also consume plaster and stucco on the side of houses to satisfy their calcium need.

In addition to the threat to agriculture and the ecosystem, the Giant African Land Snail presents a human health risk. They can carry rat lungworm, which can cause eosinophilic meningitis, a rare form of meningitis in people. Symptoms of this meningitis include headaches, vomiting, fatigue, numbness of skin and even paralysis. The Giant African Land Snail can be also harbor round worms and a bacteria called *Aeromonas hydrophila*. *A. hydrophila* can cause gastroenteric and skin infection.
Theses pathogens can be spread by eating snails not cooked properly or through eating vegetables that the snails have come in contact or by directly touching the snail. For this reason it is important to properly wash vegetables and to not touch the snail without gloves.
The Giant African Land Snail is native to parts of East Africa, but through trade and introductions has spread to many different parts of the world including other parts of Africa, Asia, South America, the Caribbean, Spain and the United States.

The spread of giant African land snails is due to accidental and intentional introduction by humans. They can come in as small snails or eggs on agricultural and nursery trade products, through international travel, on vehicles, and as human food resource in the food trade, or in the pet trade. The natural movement of this snail is minimal (up to 50m overnight, 125m per month, and 250m per year), so dispersal to large areas by natural means is limited.
Potential U.S. Range

Moisture, temperature, availability of calcium seems to be a limitation on the spread of giant African land snails. They require above freezing temperatures and high humidity (at least part of the year) in order to survive. But they can also survive in temperatures of 35.6°F (2°C) by hibernating and by aestivating (staying dormant) in temperatures above 86°F (30°C) and under moisture stress. During these periods, the snail usually buries itself 4 to 6 inches (10-15cm) deep in soft soil for up to 10 months.

Given this, if established on the U.S. mainland, they could survive the climate in non-mountainous regions of the following states: Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas, Texas, New Mexico, Arizona, California, and potentially parts of Oregon and Washington.
The Giant African Land Snails was first introduced to Florida in 1966 by a Miami boy that smuggled 3 of them back with him after a trip to Hawaii. These were subsequently released into his grandmother’s garden. The Florida Department of Agriculture and Consumer Services in partnership with the United States Department of Agriculture found and eradicated over 18,000 live snails and countless eggs. This eradication effort took 10 years at a total cost of $1 million.

In 2011 the Giant African Land Snail was again detected in Miami-Dade County. The specific cause of this introduction remains unknown. Since 2011, 168,500 snails have been collected from Miami-Dade and Broward counties. An eradication effort is still ongoing.
Control and Management in Florida

• **Detect**
  • Survey areas to determine if GALS is present
  • Intercept new introduction of GALS from imports

• **Monitor**
  • Observe populations in areas where GALS were previously found

• **Eradicate**
  • Complete elimination of GALS from Florida

Control and management of the Giant African Land Snail in Florida has 3 key components, the first is Detection. It is the goal of FDACS and USDA is to detect new occurrences of GALS in Florida. FDACS and US Custom and Border Protection also work to prevent accidental introductions of GALS that may be brought to Florida through international trade.

The 2nd component of GALS management is Monitoring. This entails surveying areas where GALS have been detected previously to monitor populations in those areas.

The ultimate goal of GALS management is Eradication or the complete elimination of this pest from Florida.
Detect

Snail detector dogs

- **2013** - Detector dogs join the eradication program
- Inspection by K9 team is required before decommission of an area
- **2019** - Snail detector dog Mellon helped find over 100 snails on a cargo ship in Port Canaveral

Starting in 2013 Florida's Department of Agriculture and Consumer Services Division of Plant Industry (DPI) brought on detector dogs as part of the giant African land snail (GALS) eradication program. Now DPI has a K9 unit dedicated to finding GALS. These dogs have been specially trained to alert to the smell of GALS and help detect snails that can be easily overlooked by the human eye. The K9 unit is such an essential part of the fight against GALS that before an area is to be decommissioned from quarantine it must be inspected and cleared by a detector dog team. In the summer of 2019, Mellon, one of the snail detector dogs, helped intercept 100 giant African land snails that were stowed away on a cargo ship that was unloading in Port Canaveral. Interceptions like this are critical to prevent additional introductions of GALS.
Monitor

Monitoring for the GALS involves searching and removal especially in areas where snails have been detected previously. Snails are nocturnal, but may become active if the day is overcast and the soil is moist and warm (though this activity usually occurs at twilight). During the day, they can be found in moist areas such as: heavily vegetated areas, under rocks, logs, branches, and wooden boards, in leaf litter and compost piles, under flower pots and planters, on rock walls or sides of a stucco house, at the base of the plant under leaves or in the “heart of the plant” (for example, in the center of a lettuce plant). They can even be found sheltering in a tree, around the AC unit of a house, or in the housing for the water meter in the ground. Mucus trails (especially big ones) and plant damage due to chewing can also be a helpful clue in finding these pests.
Eradeatie

- Eradication program started in 2011
  - Goal of eliminating the Giant African Land Snail
- Over 168,500 snails collected
- 23 of 32 quarantined areas have been decommissioned
- Monitoring and detection play a key role in eradication

The current eradication program began in 2011, since then 168,500 snails have been removed. There were 32 core areas in Miami and Broward Counties where snail infestation mandated a quarantine. As of January 2020, 23 of 32 core areas of detections have been decommissioned by FDACS. Decommissioning a once quarantined area has many requirements, including several treatment and inspections and at least 36 months of no live snail detection on the property or adjoining properties. The eradication program has made great progress, but there is still work to do before the goal of completely eliminating GALS is accomplished.
Detection of Giant African Land Snails is very key part of the eradication program. You can help with this detection by reporting and suspected Giant African Land Snails to FDACS at the tollfree hotline: 1-888-397-1517.

There are many native snails in Florida, most of which do not consume plants. Many of these snails can be misidentified with juvenile Giant African Land Snails. Proper identification of Giant African Land Snails is important before eradicating them to avoid damaging native snail populations.
The Digital Diagnostic Identification System (DDIS) connects extension clientele, extension agent, specialists, plant disease clinics, and government officials. Users can submit electronic samples through the system to get rapid identification of insect, weed, mushroom, plant pathogens, and abiotic disorder samples. The general public and shareholders must contact their local county extension agent before signing up as extension clientele.
The UF/IFAS faculty is responsible for reporting diseases, insects, weeds, nematodes, or any other invasive species to the Florida Department Agriculture and Consumer Services, Division of Plant Industry (FDACS, DPI). Reporting this information is essential to protect Florida agriculture, communities and natural areas.

Local county extension agents can assist in identifying plant pests or submitting a pest sample to the correct department or agency for identification. Local extension agents can also sign up for DDIS and receive samples electronically.

Lyle Buss is the insect identifier at the University of Florida. Visit the link to download the sample submission form or email him with questions.
Dr. Carrie Harmon is the head of the plant diagnostic center in Gainesville, Florida. Visit the PDC website to download the sample submission forms. She highly recommends calling prior to sample submission.

The diagnosticians and identifiers in each area will also provide management strategies for the sample. If an invasive pest is found, they will send it FDACS, DPI for further testing.
FDACS: Division of Plant Industry

• FDACS, DPI Responsibility
  o Announcing detection or establishment of new invasive species.
  o Reporting is a legal obligation under Florida Statute 581.091.

• Submission Form
  – https://www.fdacs.gov/Agriculture-Industry/Pests-and-Diseases/How-to-Submit-a-Sample-for-Identification

Florida Department of Agriculture and Consumer Services: Division of Plant Industry is a regulatory agency dedicated to the detection and prevention of introduction and spread of pests and diseases that can affect Florida’s native and commercially grown plants. Announcing the establishment of new invasive species can affect Florida’s agricultural producers and trade of agricultural products.

FDACS, DPI provides online submission forms to fill out and send to the agency for proper identification. DPI provides useful videos of how to properly handle the specimens before shipping them for identification.
The DPI contacts provided will assist in determining the next steps if the pest found is of regulatory concern. Additionally, FDACS, DPI has a hotline with both a phone number and email for questions and concerns.
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Collaborating Agencies

• U.S. Department of Agriculture Animal and Plant Health Inspection Service (USDA-APHIS)
• Cooperative Agricultural Pest Survey Program (CAPS)
• Florida Department of Agriculture and Consumer Services (FDACS)
• National Plant Diagnostic Network (NPDN)
• Sentinel Plant Network (SPN)
• Protect U.S.
• University of Florida Institute of Food and Agricultural Sciences (UF-IFAS)
  — http://entnemdept.ufl.edu/creatures/misc/gastro/snail_eating_snails.htm
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