

# Florida Tree Snail

## *Liguus fasciatus*



Photograph by Randy Grau, FWC.

## Species Overview

**Status:** Removed from Florida’s Endangered and Threatened Species List.

### Current Protections

- 68A-4.001, F.A.C., General Prohibitions and Requirement – Prohibits the take, transport, sale, and possession of wildlife.
- 68A-1.004, F.A.C., Take – The term take shall include taking, attempting to take, pursuing, hunting, molesting, capturing, or killing any wildlife or freshwater fish, or their nests or eggs by any means whether or not such actions result in obtaining possession of such wildlife or freshwater fish or their nests or eggs.

## Biological Background

This section describes the biological background for the Florida tree snail and provides context for the following sections. It focuses on the habitats that support the Florida tree snail, and the threats faced by the species.

Florida tree snails (*Liguus fasciatus*) have historically been found in Collier, Palm Beach, Broward, Miami-Dade, and Monroe counties (Deisler-Seno 1994). Currently the species is primarily known from Miami-Dade, Monroe, and Collier counties (Emmel and Cotter 1995; see [range map](#)). The Florida tree snail has a conical shell 40 to 70mm (1.6 to 2.7 in) in length. The shell color is extremely variable and can be matte or glossy (Pilsbry 1946). There are 58 named color morphs in Florida (Jones et al. 1981, Roth and Bogan 1984, Emmel and Cotter 1995; Figure 1). Research shows very low genetic variation and suggests that all color morphs belong to a single species, *Liguus fasciatus* (Hillis 1995). The tremendous variety of color morphs is an iconic feature of the Florida tree snail, and a reason why the species is so easily recognized and appreciated by visitors to South Florida tropical hardwood hammocks. That’s also why the species has historically been so popular with shell collectors (Close 2000), with many thousands being collected in the last century. The range of the Florida tree snail overlaps with several species that are similar in appearance, including the federally-Threatened Stock Island tree snail (*Orthalicus reses*). Deisler (2000) provides [a key](#) and an overview of identifiable differences between the Florida tree snail and other similar species.

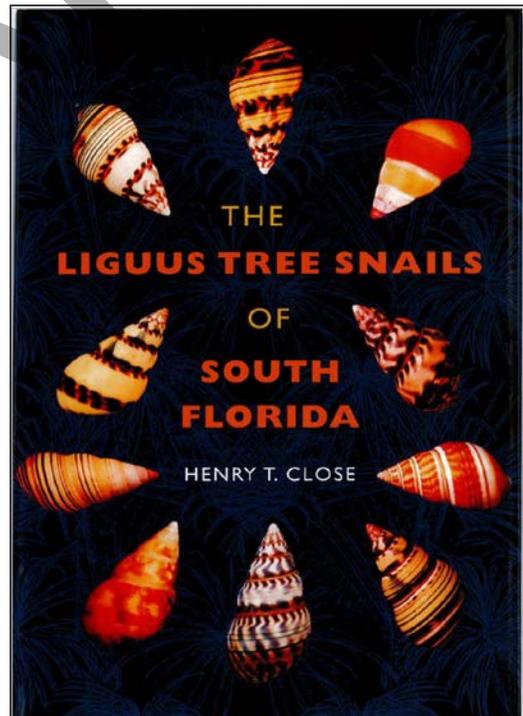


Figure 1. Cover of “The Liguus Tree Snails of South Florida” book by H. T. Close (2000), showing examples of color morph variations. Reprinted with permission of the University Press of Florida.

Florida tree snails are hermaphroditic, meaning each individual is both male and female. Although there is



Figure 2. Florida tree snails are typically found on smooth-barked trees in tropical hardwood hammocks in South Florida. Photograph by David Cook, FWC.

evidence for partial self-fertilization (Hillis et al. 1987, Hillis 1989, Hillis 1995), individuals still must come together to mate. Florida tree snails mate during the rainy season from July through September. Snails follow mucus trails to find mates. Nests are laid in the humus layer at the base of trees 3 to 6 weeks following copulation. The mean clutch size for tree snails is 19 eggs, and hatching is synchronized with a heavy rain in April or May (Voss 1976). They reach sexual maturity in approximately 2.5 years (Emmel and Cotter 1995). During the dry season (November to March) tree snails protect themselves against desiccation by secreting a mucus seal that locks the snail to the tree. This period of inactivity is called aestivation. Tree snails are nocturnal and are most active after rain (Voss 1976). They are thought to feed on confervoid algae (Simpson 1929), fungus (Pilsbry 1946), and lichens (Voss 1976). Florida tree snails are iconic inhabitants of tropical hardwood hammock and typically live and feed on smooth-barked trees (Figure 2). Several tree species are favored hosts, including wild tamarind (*Lysiloma latisiliquum*), poisonwood (*Metopium toxifera*), Jamaica dogwood

(*Piscidia piscipula*),

strangler fig (*Ficus aurea*), paradise tree (*Simarouba glauca*), sea grape (*Coccoloba uvifera*) (Voss 1976), pigeon plum (*Coccoloba diversifolia*), and gumbo-limbo (*Bursera simaruba*) (Bennetts et al. 2000).

#### A Year in the Life of a Florida tree snail:

- Breeding season is July-September
- Aestivation is November-March
- Hatching season is April-May

Further background information pertaining to the Florida tree snail may be found in the [Florida tree snail Biological Status Review Report](#) (BSR; FWC 2011) and [A Species Action Plan for the Florida Tree Snail](#) (FWC 2013).

### Threats

Based on information available at the time, a biological status review of the Florida tree snail (FWC 2011) found that the species did not meet any criteria of state listing in Florida (FWC 2013). Historically, the major threat to the Florida tree snail has been habitat loss due to human development (Emmel and Cotter 1995). For example, habitat loss of hardwood hammocks in the Upper Keys was estimated to be 31% from 1991 to 2004 (Karim and Main 2009). Tropical hardwood hammock, also referred to as rockland hammock, forms on the limestone outcroppings of South Florida and the Florida Keys (FWC 2019). This habitat type is globally imperiled, and has been rapidly decreasing due to development, agricultural pressures, and invasive plants (FWC 2019). Besides loss of the Florida tree snail's habitat, habitat disturbance in the form of humus removal, tree cutting, and alteration of sunlight penetration in the hammock, can threaten tree snails (FNAI 2001). Other potential threats have included predation by red imported fire ants, *Solenopsis invicta* (Forys et al. 2003), unusually cold temperatures, overcollection for shell collections, and impacts from mosquito control pesticides (Emmel and Cotter 1995). Florida Keys populations of tree snails may be especially vulnerable to impacts related to climate change, including more severe hurricanes and storm surge, and sea level rise inundating coastal habitats (Florida Reef Resilience Program 2010). Rockland hammock is projected to experience severe declines due to sea level rise, with up to 68% of total habitat inundated with three meters of sea level rise (FWC 2019).

Since the Florida tree snail BSR was published, a novel threat to the species has appeared – the nonnative invasive New Guinea flatworm, *Platydemus manokwari*. This primarily nocturnal predator was first discovered in South Florida in 2012, although this was not reported until 2015, and has now become common in many parts of South Florida (Collins and Cook 2019). In other regions of the world where the New Guinea flatworm has been introduced it has been considered the cause of extinction or dramatic decline of native species, particularly land snails, and for this reason has been named one of the world’s 100 worst invasive species (Justine et al. 2014, 2015). The New Guinea flatworm (Figure 3) is highly efficient at locating and eating land snails and slugs of all kinds. Steep declines in the number of native tree snails has coincided with documented presence of the New Guinea flatworm in some South Florida locations. Hammock preserves in Miami-Dade County formerly renowned for their conspicuous tree snail populations are instead now littered with hundreds of empty shells. Studies are underway to determine the flatworm’s distribution in Florida and the extent of its impact on the Florida tree snail throughout its range. Planned research (Collins and Cook 2019) may help determine ways to slow the spread of the flatworm, exclude it from as yet unimpacted tree snail populations, and reverse the trend of tree snail population decline.



Figure 3. Nonnative invasive New Guinea flatworm, *Platydemus manokwari*, feeding on nonnative Cuban brown snail, *Zachrysis provisorio*, in a Miami-Dade County preserve, July 2017. Photograph by Tim Collins and Alície Warren.

## Distribution and Survey Methodology

The range map represents the principal geographic range of the Florida tree snail, including intervening areas of unoccupied habitat. This map is for information purposes only and not for regulatory use.

**Counties:** Collier, Miami-Dade, and Monroe (including the Florida Keys).

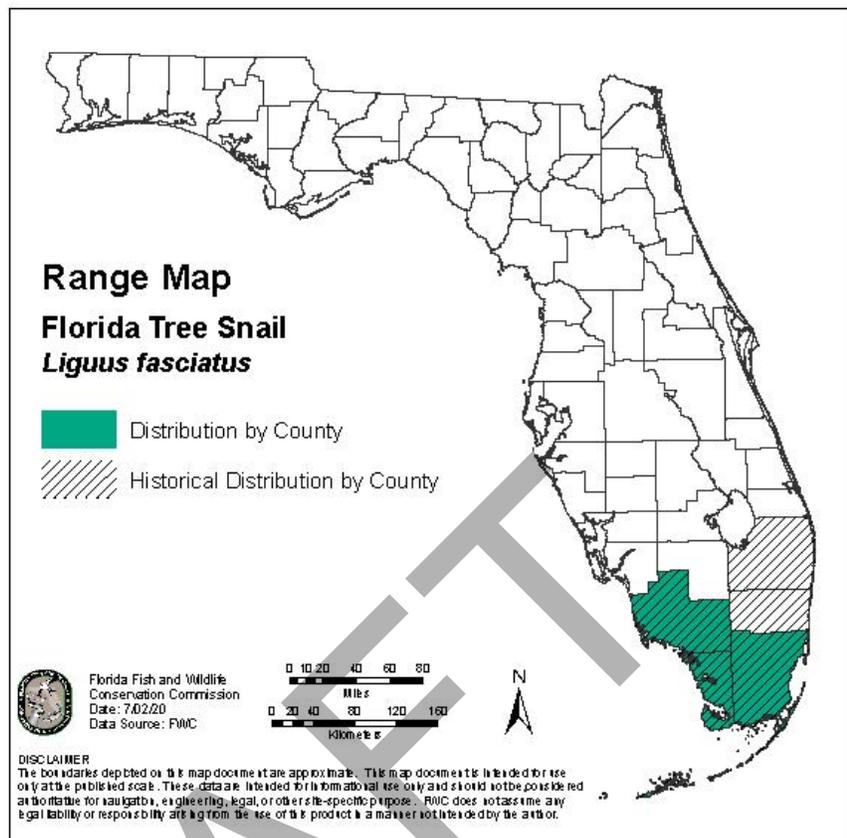
### Recommended Survey Methodology

Surveys, though not required, can be used to determine if Florida tree snails are present in an area.

Florida tree snails have an annual cycle of active and inactive periods. They are most active when moisture levels are high, which occurs from April - September during Florida's wet season. Snails hatch, feed, grow, mate, and lay eggs during this time. During the dry season, October – February, they seal themselves to tree trunks and branches to conserve vital body moisture and are in a state of inactivity, called aestivation. They may temporarily emerge from aestivation, however, if rains occur during the dry season (Jansen et al. 2002). Therefore, although surveying for tree snails can take place year-round, snails are most active and typically more conspicuous during the wet growing season.

Although there is no standardized methodology for surveying Florida tree snails, a typical survey to determine if Florida tree snails are present on a site would include the following:

- Walking either a set distance along one or more established transects, or for a set amount of time in a meandering survey, through the area to be surveyed.
- Looking for snails on the trunks and branches of trees and large shrubs, where they are either aestivating or actively feeding on minute lichens, algae, and fungi that grow on the bark and leaves. Preferred trees include wild tamarind (*Lysiloma latisiliqua*), Jamaica dogwood (*Piscidia piscipua*), poisonwood (*Metopium toxiferum*), pigeon plum (*Coccoloba diversifolia*), and members of the stopper (*Eugenia* spp.) family. (Jansen et al. 2002)
- Using binoculars to spot tree snails located in or near the hammock canopy.
- Looking in tree crevices, and at branch intersections for hidden or partially hidden snails.
- Checking the leaf litter at the base of trees for snails laying eggs.
- Scanning the forest floor for dead empty tree snail shells.
- Recording the presence of all species of tree snails present. Depending on the location, other tree snail species encountered besides the Florida tree snail (*Liguus fasciatus*) include the Stock Island



tree snail (*Orthalicus reses* not including *nesodryas*), the Florida Keys tree snail (*Orthalicus reses nesodryas*), the banded tree snail (*Orthalicus floridensis*), and the wide-banded forest snail (*Drymaeus multilineatus latizonatus*). See Deisler (2000) for [a comparison of these species](#).

One of the priority objectives of the Species Action Plan for the Florida Tree Snail (FWC 2013) is to map existing color morphs using data obtained from baseline surveys. If the intent of a survey is to record different color morphs of the Florida tree snail, a color-morph identification guide should be consulted. Emmel and Cotter (1995) present a series of ink-drawings depicting 58 recognized forms of *Liguus fasciatus* in Florida. There may be other such guides available, and one may be developed as part of the pending distributional research (Collins and Cook 2019).

Persons conducting tree snail surveys should be careful to prevent transporting nonnative invasive New Guinea flatworms into hammocks. Vehicles and footwear should be carefully inspected to ensure no flatworms or their egg capsules are accidentally brought from infected areas to uninfected natural areas.

## Recommended Conservation Practices

Recommended Conservation Practices are general measures that could benefit the Florida tree snail but are not required. No FWC permit is required to conduct these activities.

The long-term survival of the Florida tree snail is closely tied to the conservation of tropical hardwood hammock, also known as rockland hammock (FWC 2019). The importance of tropical hardwood hammocks, ways to conserve them, and recommendations for how to restore them are presented in U.S. Fish and Wildlife Service's Multi-Species Recovery Plan for South Florida (USFWS 1999). The largest areas of intact tropical hardwood hammock remaining are on public conservation lands, such as Everglades National Park, Big Cypress National Preserve, Biscayne National Park, Crocodile Lake NWR, Dagny Johnson Key Largo Hammock Botanical State Park, and Miami-Dade County preserves. The long-term conservation of Florida tree snails depends on the responsible stewardship of such lands, including efforts to exclude or eradicate New Guinea flatworms.



Figure 4. Tropical hardwood hammock habitat. Photograph by Jim Duquesnel.

The Species Action Plan for the Florida Tree Snail (FWC 2013) presents conservation actions aimed to maintain or improve the species' status so it would not meet criteria for state listing. Some of those conservation actions outline FWC-related tasks, while others are relevant to interested persons in both the public and private sectors.

Recommended conservation practices for persons who own, manage, or visit tropical hardwood hammock

include:

- Conduct surveys (see [Recommended Survey Methodology](#)) for Florida tree snails and other tree snail species on the property, and contribute the resulting information to ongoing efforts to determine their current status and distribution (Collins and Cook 2019). Survey data may be reported to [imperiled@myfwc.com](mailto:imperiled@myfwc.com).
- Look for New Guinea flatworms or evidence of their presence (suggested by intact but empty snail shells on the ground). The New Guinea flatworm is primarily nocturnal, with its greatest activity occurring between 8 and 11 pm (Collins and Cook 2019). More information about this species, including precautions against directly handling them, may be found on [FWC's New Guinea flatworm webpage](#).
- Remove any New Guinea flatworms encountered by using the following guidelines:
  - Avoid direct handling in favor of wearing gloves and/or using implements.
  - If you have handled New Guinea flatworms, slugs, or snails with bare hands, wash your hands carefully.
  - New Guinea flatworms may be collected into a jar or other container and later humanely euthanized using boiling water.
  - Be certain that you have collected New Guinea flatworms and not other species of flatworms, slugs, caterpillars or other animals sometimes mistaken for them.
  - Unfortunately, methods to systematically rid a property of New Guinea flatworms have not yet been devised.
- As noted above, be careful to prevent transporting New Guinea flatworms into hammocks or any other habitat. Vehicles and footwear should be carefully inspected to ensure that no flatworms or their egg capsules are accidentally brought from infected areas to uninfected natural areas.
- Any Florida tree snails attached to branches being removed during tree trimming as a part of routine yard maintenance may be carefully moved to nearby intact habitat. Best practices for the relocation of Florida tree snails can be found in [FWC's Tree Snail Relocation Protocol](#). For large-scale projects that fall outside routine yard maintenance activities which would require the relocation of large numbers of Florida tree snails, see the [Other Permits](#) section of these guidelines. The range of the Florida tree snail overlaps with that of the Stock Island tree snail, a federally-Threatened species. Relocation of the Stock Island tree snail requires consultation with the US Fish and Wildlife Service. See Deisler (2000) for [a visual comparison of the Florida and Stock Island tree snail](#).

Recommended conservation actions for persons who live near tropical hardwood hammock include:

- Encourage local governments to support existing laws for protection of native tropical hardwood hammock. As noted above, this rare habitat is under threat from clearing, disturbance, and nonnative invasive plants. Encourage efforts to limit regional groundwater withdrawal, which may impact the local hydrology and its long-term support of the overlying hammocks.
- Encourage public and private landowners to adopt and follow habitat management recommendations to conserve Florida tree snails and their tropical hardwood hammock habitat. Maintaining an intact canopy may discourage invasive plants from moving into open areas; conserving a humus layer will help provide egg-laying habitat for tree snails.
- Plant native tropical hardwood hammock species, especially in areas adjacent to existing hammock. Consult native plant nurseries, the Florida Native Plant Society, county extension offices, and other knowledgeable entities for practical advice on appropriate species and their requirements.
- Remove nonnative invasive plants and discourage their growth and establishment in natural areas.

- Start or support an adopt-a-hammock conservation program for school children, families, and other interested persons.

## Prohibitions and Permitting

Florida tree snails are protected by the general prohibitions outlined in Rule 68A-4.001, F.A.C.: no wildlife or freshwater fish or their nests, eggs, young, homes, or dens shall be taken, transported, stored, served, bought, sold or possessed in any manner or quantity at any time except as specifically permitted by these rules nor shall anyone take, poison, store, buy, sell, possess or wantonly or willfully waste the same except as specifically permitted these rules. Take is defined in Rule 68A-1.004, F.A.C., as pursuing, hunting, molesting, capturing, or killing (or attempting to do those things). A permit is required for any other activity that involves the possession, capture, sale, purchase, transport, hunting or killing of Florida tree snails. These permits are issued for justifiable purposes as outlined in Rule 68A-9.002, F.A.C. Justifiable purposes are scientific, educational, exhibition, propagation, management or other justifiable purposes.

### No Permit Needed

The following activity could cause take, but is authorized to be conducted without an FWC-issued permit:

- Careful removal of Florida tree snails from branches that will be trimmed or removed as part of routine yard maintenance activities, and placement onto branches in nearby intact habitat. Refer to [FWC's Tree Snail Relocation Protocol](#) for appropriate handling methods. The range of the Florida tree snail overlaps with that of the Stock Island tree snail, a federally-Threatened species. Stock Island tree snails may not be handled or relocated without authorization from the U.S. Fish and Wildlife Service. See Deisler (2000) for [a visual comparison of the Florida and Stock Island tree snail](#).
- Vegetation removal or trimming in the linear right of way for power restoration. This applies only in cases where there is an immediate danger to the public's health and/or safety (including imminent or existing power outages that threaten public safety, or in direct response to an official declaration of a state of emergency by the Governor of Florida or a local government entity), and only to non-routine removal or trimming of vegetation within the linear right of way, in accordance with a vegetation management plan that meets applicable federal and state standards. If conducted under these circumstances, no FWC take permit is required.

### Permits for Justifiable Purposes - Scientific Collecting and Educational Use

Scientific collecting permits may be issued for the Florida tree snail. Activities requiring a permit include any research that involves capturing, handling, or marking Florida tree snails; conducting biological sampling, including collecting blood or genetic material for taxonomic analyses; or other research that may cause take. Visual encounter surveys that do not involve handling animals do not require a permit. A scientific collecting permit is required to use Florida tree snails for education and outreach events. A scientific collecting permit will not be issued for the sole purpose of removing a tree snail from the wild to use as an educational or outreach animal. Florida tree snails permitted for educational and outreach purposes should be used for a minimum of 12 educational engagements equating to a minimum of 48 hours of contact time.

- Applicants can apply for scientific collecting permits on the FWC's [online permitting site](#). Scientific collecting permit applications should include a justification, objectives, and scope of the project.
- Applications should include detailed description of project methods, including duration, sample size, disposition of individuals, and capture/handling procedures (including measures taken to reduce the risk of injury or death). Handling protocols, and a justification of methods, must be included in the permit application and should identify measures to lessen stress for captured snails.
- Permit amendment and renewal applications must be "stand-alone" (i.e., include all relevant information on objectives and methods).

- Permits may be issued to display a specimen if the specimen was obtained via rehabilitation facility or was encountered dead.
- Permits may be issued for captive possession (removal from the wild) if the individual is deemed non-releasable.
- Disposition involving captive possession for any period must include a full explanation of whether the facility has appropriate resources for accomplishing the project objectives and for maintaining the animals in a safe and humane manner.
- Any mortality should be reported immediately to FWC at the contact information below. FWC will provide guidance on proper disposition of specimens.
- Geographical or visual data gathered must be provided to FWC in the specified format in the permit conditions.
- A final report should be provided to FWC in the format specified in the permit conditions.

### Other Permits

For permits that do not fall under the justifiable purposes of scientific collecting or educational use as outlined in 68A-9.002, F.A.C., please submit your request to [WildlifePermits@myfwc.com](mailto:WildlifePermits@myfwc.com).

Permits would be issued upon reasonable conclusion that the permitted activity will not be detrimental to the survival potential of the species. Examples would include the permitted moving of tree snails prior to utilities and road maintenance activities (e.g., vegetation clearing, tree trimming, mowing) and activities associated with development, provided that there is an approved plan to mitigate tree snail and tree snail habitat loss. In the former example, a permit is issued to utilities that encounter tree snails while conducting tree-trimming operations along powerline rights-of-way. Under this permit, a protocol is followed to safely handle and relocate snails out of harm's way. Many thousands of tree snails have been so relocated over the last 3 decades (e.g., see Florida Keys Electric Cooperative 2012).

### Additional Information

Information on the economic assessment of these guidelines can be found at <http://myfwc.com/wildlifehabitats/imperiled/management-plans/>

### Contact

For more species-specific information or related permitting questions, contact FWC at (850) 921-5990 or [WildlifePermits@myfwc.com](mailto:WildlifePermits@myfwc.com). For regional information, visit <http://myfwc.com/contact>.

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