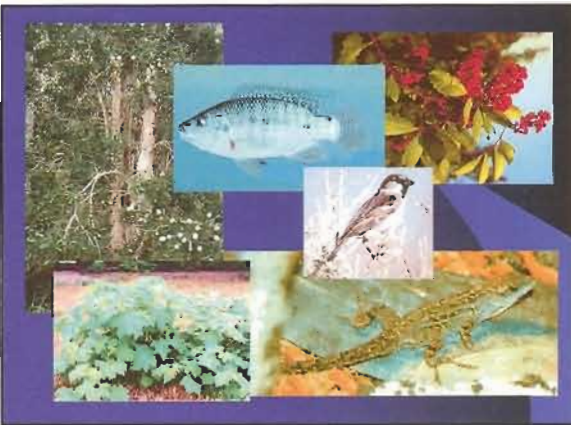


Channeled Apple Snails – a big, nasty problem

Adapted from a presentation by
Dana R. Denson
Aquatic Biologist, FDEP Orlando

Impacts of invasive species

- Outcompete native species
 - lack of natural predators, parasites, and diseases
 - reproductive success often higher
 - crowd natives out of their niches
- About 42% of the species federally listed as endangered or threatened in the U.S. have been so designated primarily because of impact of invasive species.*



Impacts of invasive species

- Reduce native species populations
 - directly consume or kill many or all individuals in native populations
 - have other lethal effects (toxins, etc.) on native species

Impacts of invasive species

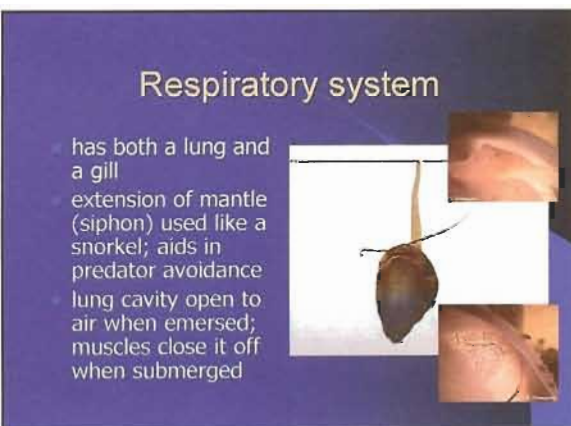
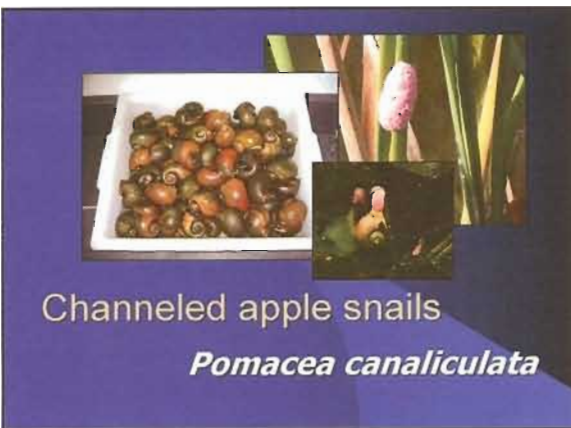
- Reduce or destroy habitats
 - dense monocultures create limited habitat; reduce needed sunlight, nutrients, etc.
 - often provide monotonous and unproductive habitat themselves
 - activities destroy habitats



Impacts of invasive species

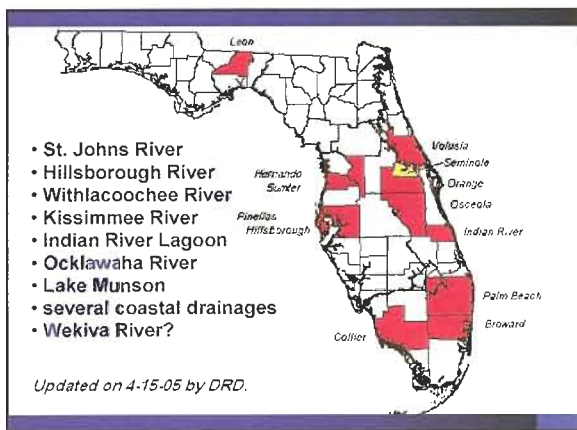
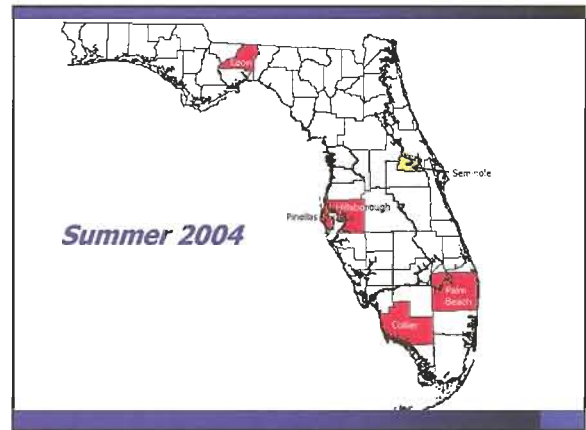
Economic damage

- Losses due to invasive species in the U.S. are as much as \$138 billion per year.
- Most are impacts to agriculture and recreation.
- About \$100 million is spent annually on aquatic weed control in the U.S. alone.



Reproduction

- dioecious, but may change sexes
- no apparent external sexual differences
- reproductive as early as 2 – 3 months of age
- repeatedly lay masses of 100-1000 small, **bright pink** eggs above water line; especially active with full moon
- 2mm juveniles hatch in about 2 weeks
- viable sperm storage up to one month



Threats from channeled apple snails

- They are voracious and non-specific consumption of aquatic macrophytes:
- (They eat many different species of plants)!

They will definitely eat.....

- *Najas guadalupensis*
- *Sagittaria gramminea*
- *Cabomba caroliniana*
- *Hydrilla verticillata*
- *Bacopa caroliniana*
- *Websteria confervoides*
- *Utricularia foliosa*
- *Ceratophyllum demersum*
- *Vallisneria americana*

- *Myriophyllum spicatum*
- *Potamogeton diversifolius*
- *Nymphoides aquatica*
- *Ludwigia repens*
- *Nymphaea odorata*
- *Limnobium spongia*
- *Pistia stratioides*
- *Ceratopteris thalictroides*
- *Nitella* sp. (algae)

In our tests, they didn't eat...

- *Pontederia cordata*
- *Alternanthera phyloxeroides*
- *Colocasia esculenta* (???)

Potential environmental impacts

- reduction in macrophyte diversity
- habitat loss → reduced overall biodiversity
- outcompeting native species
- potential water quality deterioration
 - ✓ extensive macrophyte grazing
 - ✓ nutrient uptake by phytoplankton
 - ✓ proliferation of phytoplankton
 - ✓ oxygen sags
 - ✓ fish and invertebrate kills

What we have seen thus far...

- obvious reductions in macrophyte biomass, especially in certain areas of the lake
- some slight reduction in water clarity
- macroinvertebrate community apparently not yet affected

Channeled apple snail FAQs

Can you eat them?

Yes, **BUT**, they are a host for rat lung worm, a nematode which can cause eosinophilic meningitis.

Symptoms include severe headache, stiff neck, prickly tingling or numbness in skin, potential facial paralysis, and, rarely, death. YUCK!!

Channeled apple snail FAQs

How have they gotten into Florida waters?

We don't know. Possibilities include...
aquarium release (most likely)
boat hulls (eggs and/or adults)
aquatic plantings
escape from food cultivation
intentional release to control unwanted "weeds"

Channeled apple snail FAQs

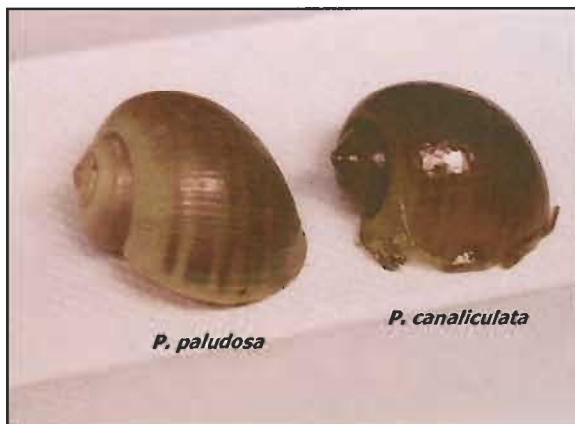
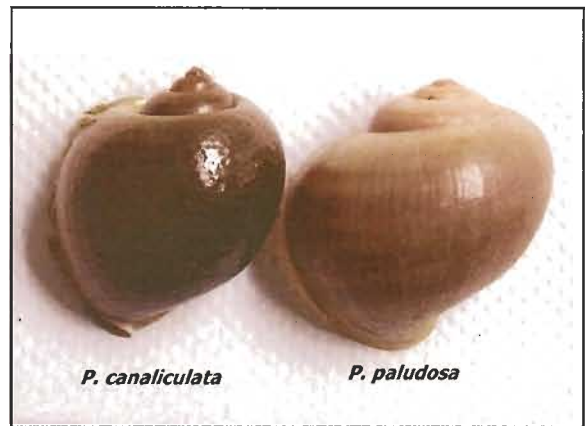
- How can you tell the difference between channeled and native apple snails?

Adult channeled apple snails are bigger

Channeled apple snails are BIGGER



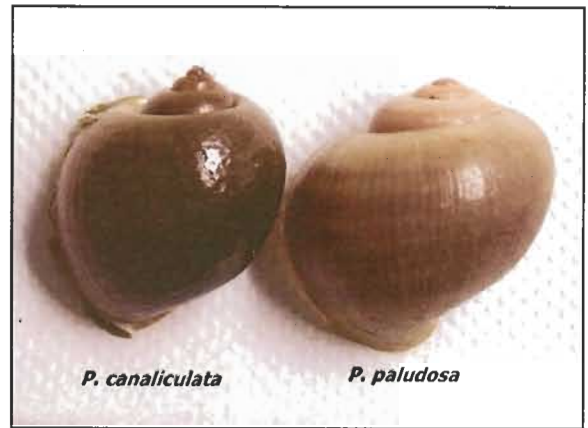
*but... a not fully-grown
channeled apple snail may be
the same size as an adult
native apple snail!*



Channeled apple snail FAQs

3 How can you tell the difference between channeled and native apple snails?

channeled apple snails are bigger
channeled apple snails have a groove (channel) between the whorls



Channeled apple snail FAQs

How can you tell the difference between channeled and native apple snails?

channeled apple snails are bigger
 channeled apple snails have a groove (channel) between the whorls
 their eggs are very different

Their eggs are different

- Channeled apple snail eggs are very small, numerous, bright pink.
- Native apple snail eggs are larger, fewer, and white or light pink.

Pomacea canaliculata eggs ↓

Pomacea paludosa ↑ eggs

Channeled apple snail FAQs

Can we get rid of them?

-- Probably not. --

molluscicides – high cost and non-target mortality

predators – some present, but not enough to substantially effect snail populations

physical removal – will help somewhat (esp. eggs), but probably of limited effectiveness

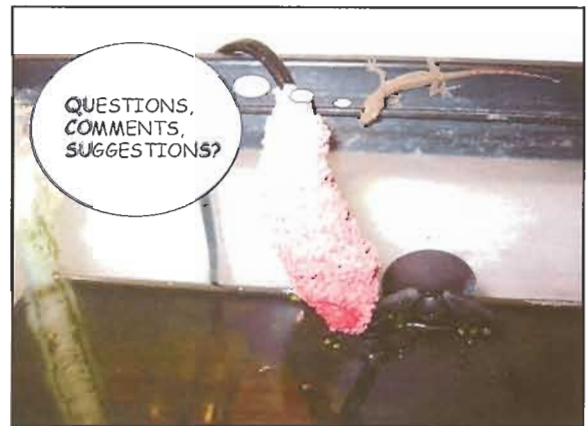
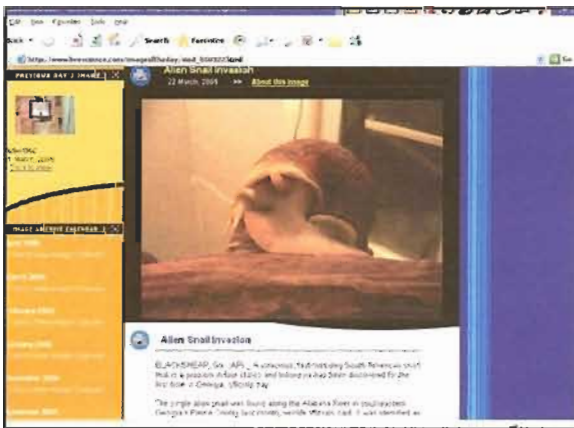
education – best strategy; will help to prevent their spread

So what *can* we do to control the slimy things?

Scrape the eggs from the substrate and dump 'em in the water. (Fish will eat them).

Bag and smash (or freeze) the adults. Use plastic bags.

Carefully check your boat hull every time you remove it from the water. Check the trailer too!



CHANNELED APPLE SNAILS INVADE NUMEROUS FLORIDA WATERS

Dana Denson, Aquatic Biologist
FL Department of Environmental Protection
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Photo courtesy of Katasha Cornwell, FDOT.



Populations of channeled apple snails (*Pomacea* sp.), a larger relative of the native Florida apple snail (*Pomacea paludosa*), are exploding in many locations across the state. Breeding populations of these snails have been reported in scattered locations in Florida since as early as 1978, but only in the past few years has their range expanded dramatically, and has the numbers of snails occurring in many areas become so very large.

Originating in South America, channeled apple snails (also known as golden apple snails) have become serious agricultural pests in many Asian countries. In the Philippines, more than half of all rice fields are infested with these pests. Some wetlands in Thailand have become virtually devoid of aquatic vegetation due the aggressive and non-discriminate herbivory of these snails (Carlsson *et al.* 2004).

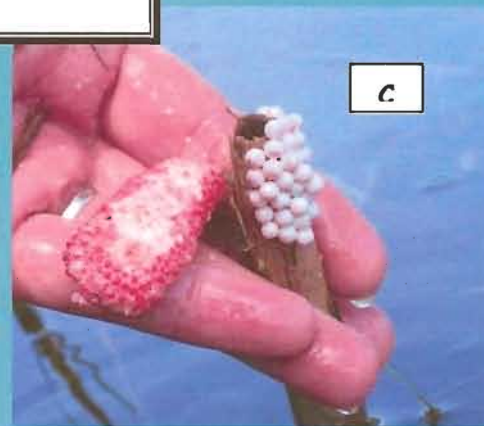
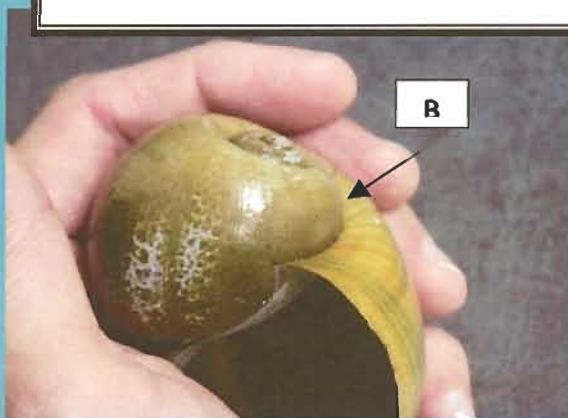
Populations of channeled apple snails have been reported in Florida, California, Texas, Georgia, Alabama, Hawaii, and Louisiana. In Florida, they pose a potentially serious threat to the ecological health of rivers, lakes, and wetlands, due to their affinity for aquatic plants, their extremely high fecundity, and their tolerance for a range of environmental conditions.



Females lay masses of 100-1200 bright pink eggs an average of 1.4 times per week on any type of firm substrate available about 6 to 8 inches above the water line. Egg-laying continues year-round in central and south Florida, though it appears to slow down during the winter. Neonate snails 2mm in length hatch out in about two weeks, drop into the water, and immediately begin feeding on periphyton. At about an inch in diameter, they switch to vascular plants.

How do you tell the difference between native and channeled apple snails?

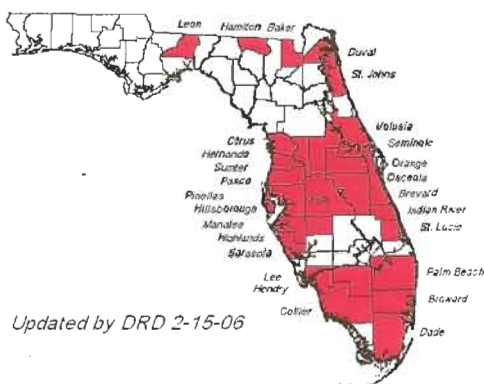
1. adult channeled much larger (A)
2. channeled have deep groove (channel) between whorls of shell (B)
3. eggs are smaller ('grit-sized'), bright pink and much more numerous (C)



In tests, they have been shown to consume almost every submersed aquatic plant species offered. *Unfortunately, they do not appear to prefer hydrilla*, but are more fond of plants like southern naiad, red ludwigia, *Cabomba*, and bladderworts. Young snails may become reproductive as early as 2 to 3 months of age.

Like native *Pomacea*, channeled apple snails possess both a lung and a gill, as well as a snorkel-like siphon through which they can breathe atmospheric air, at the same time reducing the risk of attack by terrestrial predators. They can resist desiccation by closing their shells using their opercula, as well as by estivating in sediments for up to 5 months. They can tolerate salinity to 8 parts per thousand, and seem unaffected by nutrient enrichment and low oxygen levels.

In Florida, populations are now reported in all central Florida counties, most south Florida counties, and Leon County in the panhandle (see map). It is likely that they will spread to many other areas, and perhaps throughout the state.



No effective control measures have yet been found. The use of molluscicides would be expensive, and would likely have significant negative effects on non-target organisms. Although there are predators which feed on channeled apple snails (snail kites, large

herons, large turtles, probably alligators, and most notably, limpkins), the relative abundance of these predators is eclipsed by the huge populations of channeled apple snails that have been seen in many locations. The use of water-level manipulations to drown eggs in controlled



situations would probably help in reducing egg densities somewhat, but at a rate of one clutch laid every 4 or 5 days, the impact to snail populations would probably be limited. Physical removal projects have been carried out in Seminole County's Lake Brantley, and are being considered in some locations in Osceola and Leon counties. These will help to reduce snail densities somewhat, but are probably most valuable as educational and media events. The most important step in lessening their impact and, especially, reducing their spread, is to educate the public about them. School groups, scientific and professional meetings, conservation

organizations, and the media are all good outlets for disseminating information. Research aimed at determining the specific effects these snails might have on water quality, endangered species, and ecosystems as a whole are sorely needed.

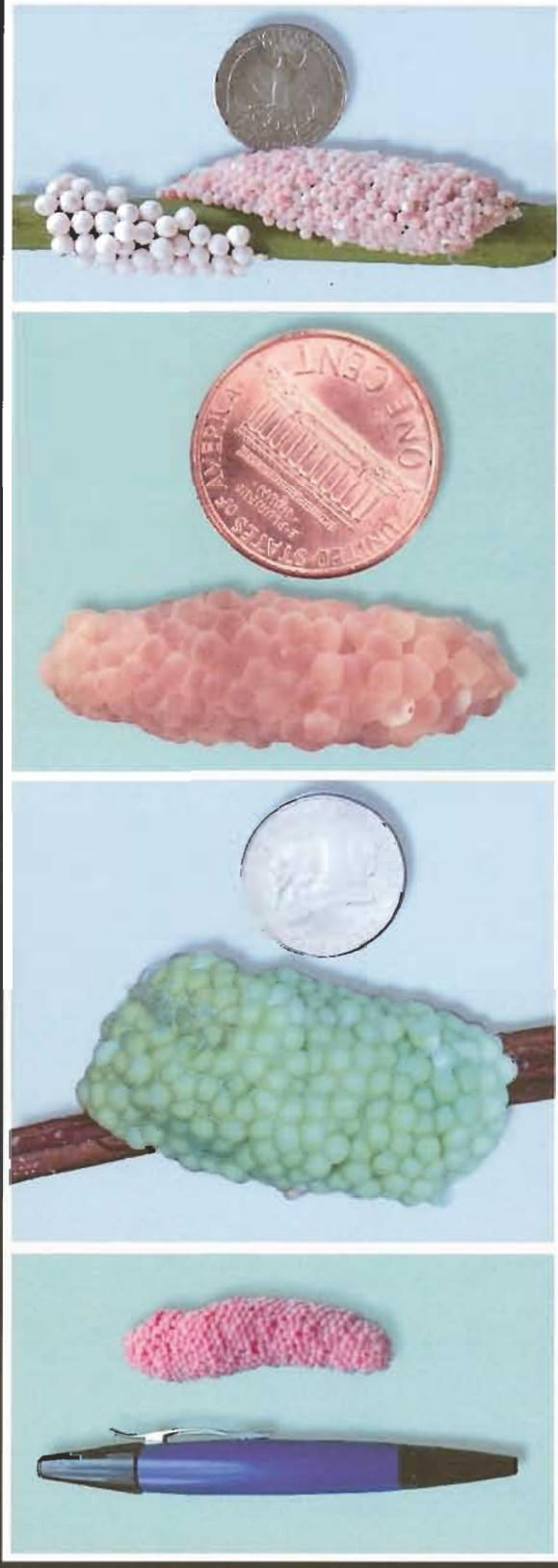
If you find these channeled apple snails and/or their eggs, please contact Dana Denson, Aquatic Biologist, Florida Department of Environmental Protection, at dana.denson@dep.state.fl.us, or call (407) 894-7555, ext. 2355.

Note: Many people ask whether or not these snails are edible. They are, BUT they are known to carry a parasite called *Angiostrongylus cantonensis* or rat lung worm, which can cause a serious form of meningitis. Consumption is not recommended.

FOR MORE INFORMATION:

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- Cowie, R.H. 2004. Ecology of *Pomacea canaliculata*. Global Invasive Species Database. <http://www.iissg.org/database/species/ecology.asp?si=135&fr=1&sts=>
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- Ghesquiere, S. 2003. The apple snail website. http://www.apple-snail.net/content/species/pomacea_canaliculata.htm
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- <http://pestalert.apple-snail.net/conferences/icam07/>
- Mohan, N. 2002. Introduced Species Summary project, Columbia University: Apple snail (*Pomacea canaliculata*). http://www.columbia.edu/itc/cerc/danoff-burg/invasion_bio/inv_spp_summ/Pomacea_canaliculata
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- Warren, G. 2003. Florida applesnail. *Lakewatch Journal*, Volume XXIV, p. 7.
- 2000. "Pilidae" (On-line), Animal Diversity Web. Accessed July 07, 2004 at <http://animaldiversity.ummz.umich.edu/site/accounts/information/Pilidae.html>.

Egg Masses For Three Exotic and One Native *Pomacea* Species



Tim Collins, Tim Rawlings, FIU

From left: Channeled applesnail (*P. canaliculata* group); titan applesnail (*P. haustrum* – tentative id); spiketop applesnail (*P. bridgesii*); native Florida applesnail, white eggs, top left (*P. paludosa*) and *P. canaliculata* group. Note difference in egg size in photo four.

Channeled Apple Snails

(*Pomacea canaliculata*)

Useful websites:

DACS (Div. of Plant Industry – Cooperative Agricultural Pest Survey Program):
<http://www.doacs.state.fl.us/pi/caps/surveys.html>

DEP (exotic snails home page):
<http://www.floridadep.org/central/Home/Watershed/snails/Snails.htm>

DEP slide show on invasive species, including channeled apple snails (Power Point):
<http://www.floridadep.org/central/Home/Watershed/snails/ChanneledAppleSnails.pdf>

FWCC fact sheets and reports about problem species, including channeled apple snails:
http://www.google.com/u/FWC?q=channeled+apple_snails&sa=GO
(or simply go to www.myfwc.com and conduct your own search)

Useful contacts (in addition to the agency reps for the Harris Council):

Larry Connor, FL Fish and Wildlife Conservation Commission (Eustis)
Phone: 352-742-6438 or larry.connor@myfwc.com

Dana Denson, FL Dept of Environmental Protection (Orlando)
Phone: 407-894-7555 ext. 2355 or dana.denson@dep.state.fl.us

Remember!

- Adult channeled apple snails (CAS) may be the size of a baseball (or your fist).
- Channeled apple snails have a noticeable groove (“channel”) between the whorls on the shell.
- Channeled apple snail eggs are grit-sized and bright pink. Native apple snail eggs are pea-sized and white or pale pink.
- Follow these steps to control the spread of CAS: Carefully inspect your boat and trailer after being on the water. Remove adult CAS and destroy them - by bagging and either freezing or smashing them. Scrape or otherwise remove CAS eggs from the substrate and drop them into the water or onto land, where they will not survive.

WANTED: DEAD



Channeled Apple Snail

Adult Channeled Apple Snails are much larger than native Apple Snails (They can grow to baseball size). CAS eggs are bright pink and much smaller (grit-sized) than native snail eggs (pea-sized). Also; Channeled Apple Snails have a deep groove between the spirals of the shell, unlike native Apple Snails.

For crimes including, but not limited to:

Disturbing the peace of the food chain.

Destruction of aquatic vegetation and habitat of other lake dwellers

They reproduce continuously, laying hundreds of pink eggs on seawalls, docks, boats, trailers & aquatic vegetation.

Take matters into your own hands:

Do NOT spread adult snails or eggs via your boat to other water bodies. Check your boat and trailer each time you remove it from a stream or lake.

DO destroy any eggs or adult snails you may find. Stomp on em or freeze em, either method works fine. You can also scrape the eggs off into the water, where they will drown.

Just don't eat 'em!

Channeled Apple Snails can carry rat lung worm, a parasite which can cause a type of meningitis.



If spotted:

Please contact Dana Denson of the Florida Department of Environmental Protection at (407) 894-7555 ext 2355 or Larry Connor with the Florida Fish and Wildlife Conservation Commission at (352) 742-6438 ext 238 or e-mail larry.connor@myfwc.com