

USGS Maculata Apple Snail *(Pomacea maculata)* **Research Along the** **Northern Gulf of Mexico Coast.**

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Aquatic Invasive Species
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**Maculata Apple Snails (*Pomacea maculata*) a relatively new
invasive for southern Louisiana.**



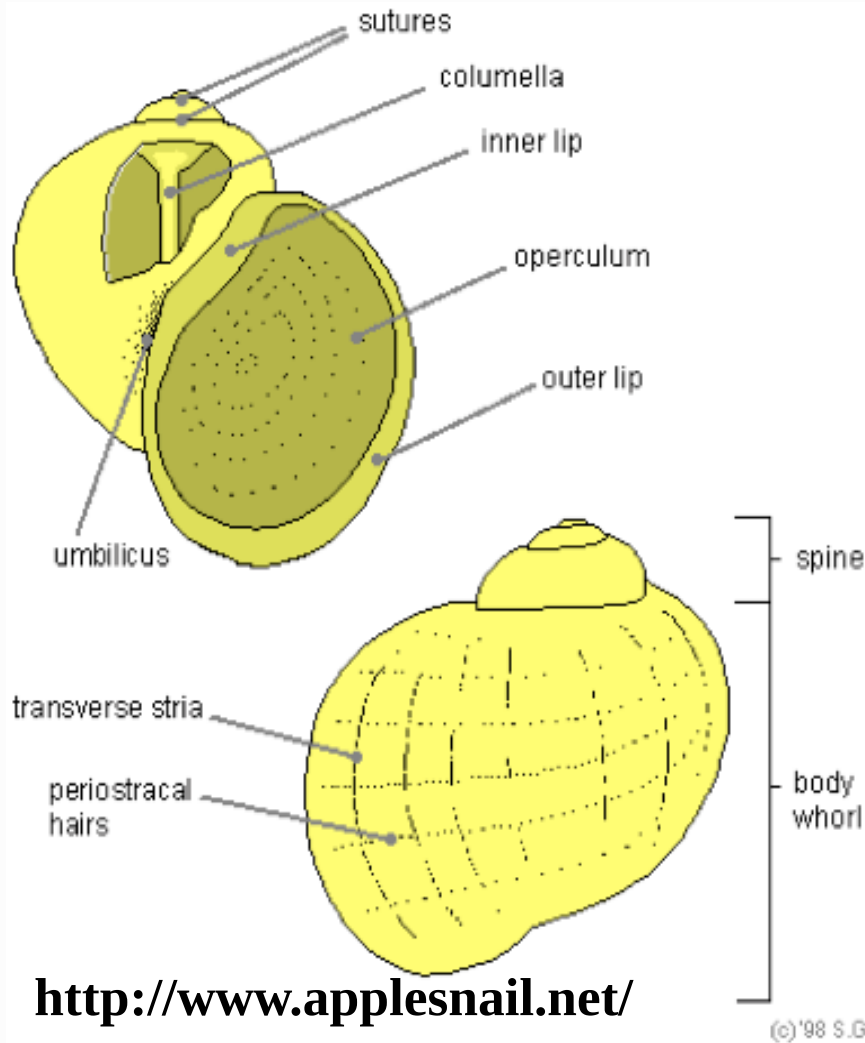
**Demonstrated risk for rice
agriculture and aquatic
macrophytes in forested
wetland systems.**

**Unlike many other
invasive species, they are
easy to detect. However,
they are hard to estimate
densities and even harder
to control.**



**Maculata apple snails are,
to my knowledge, the only
freshwater snail in our
region that eats primarily
aquatic macrophytes.
Most are algivores or
detritivores.**

Traditionally we identify snails by their morphology.



However, there is so much overlap between species. Using DNA is the current 'standard' for distinguishing species.

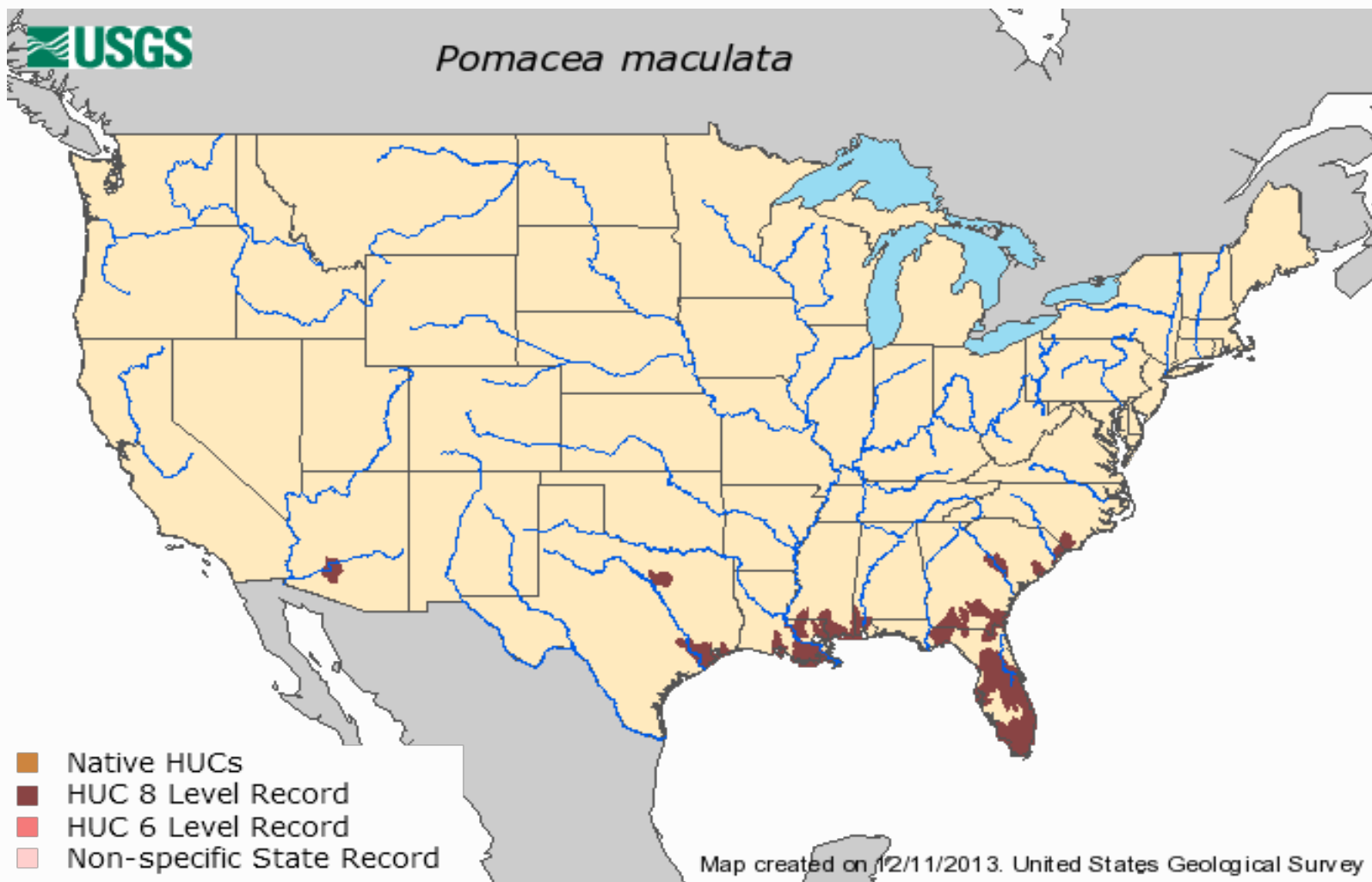
Recent revision of taxonomy: *P. insularum* & other species have been folded into *P. maculata*. No official common name but I am calling them maculata apple snails.

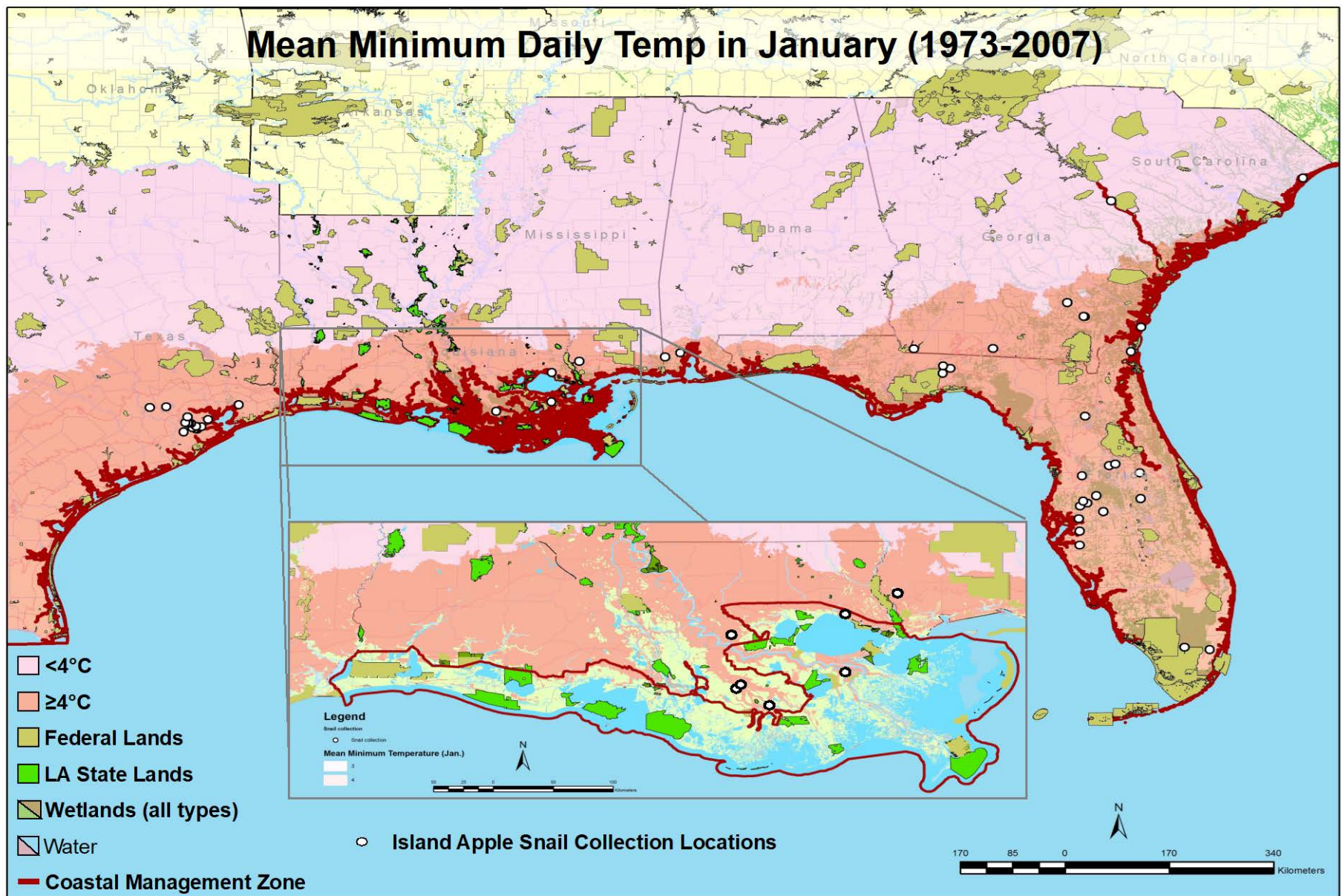
But there is hope for distinguishing them in the field. In the introduced range the two most frequently introduced species *P. canniculata* & *P. maculata* seem to have consistently different egg mass characteristics. *P. maculata* has egg masses with smaller and more numerous eggs (600-1,200).

Also, DNA can be extracted from the egg masses so you don't need the eggs in hand. All apple snails tested for DNA from Louisiana have been maculata!



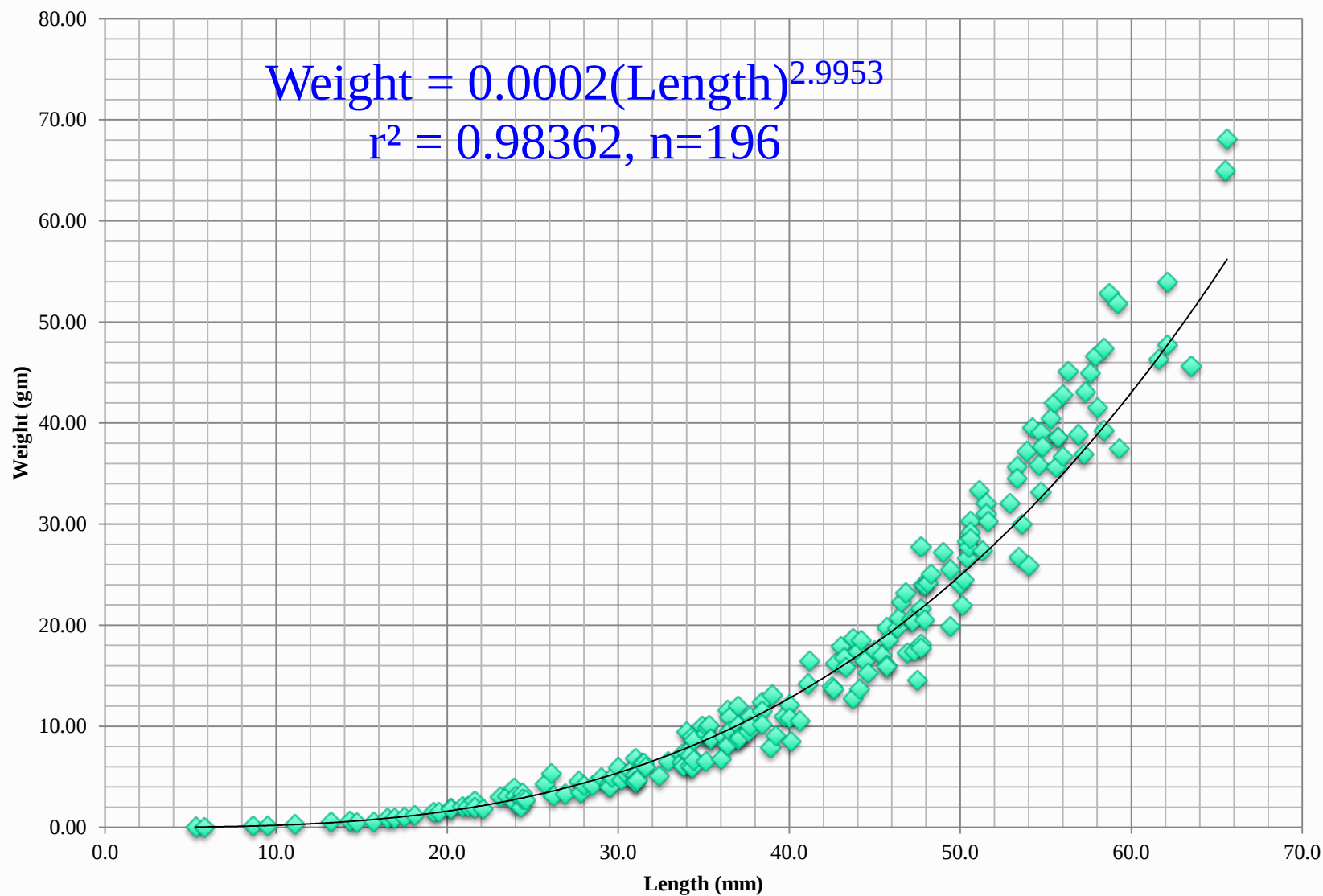
Pomacea maculata





This map was based on literature. Experimental data from Dr. Lewis Deaton's lab at ULL indicates that maculata apple snails can better tolerate low temperatures than previously thought. Given their ability to reproduce a 50% mortality at 10°C for a week leaves a significant number surviving.

Allometric Relationship of Shell Length to Wet Weight of Snails from Jean Lafitte NP-Barataria Preserve



**Apple snail (*Pomacea maculata*)
laying an egg mass on the wall of
a mesocosm tank.**



Egg mass, less 1 week old

Biological Control and Chemical Control



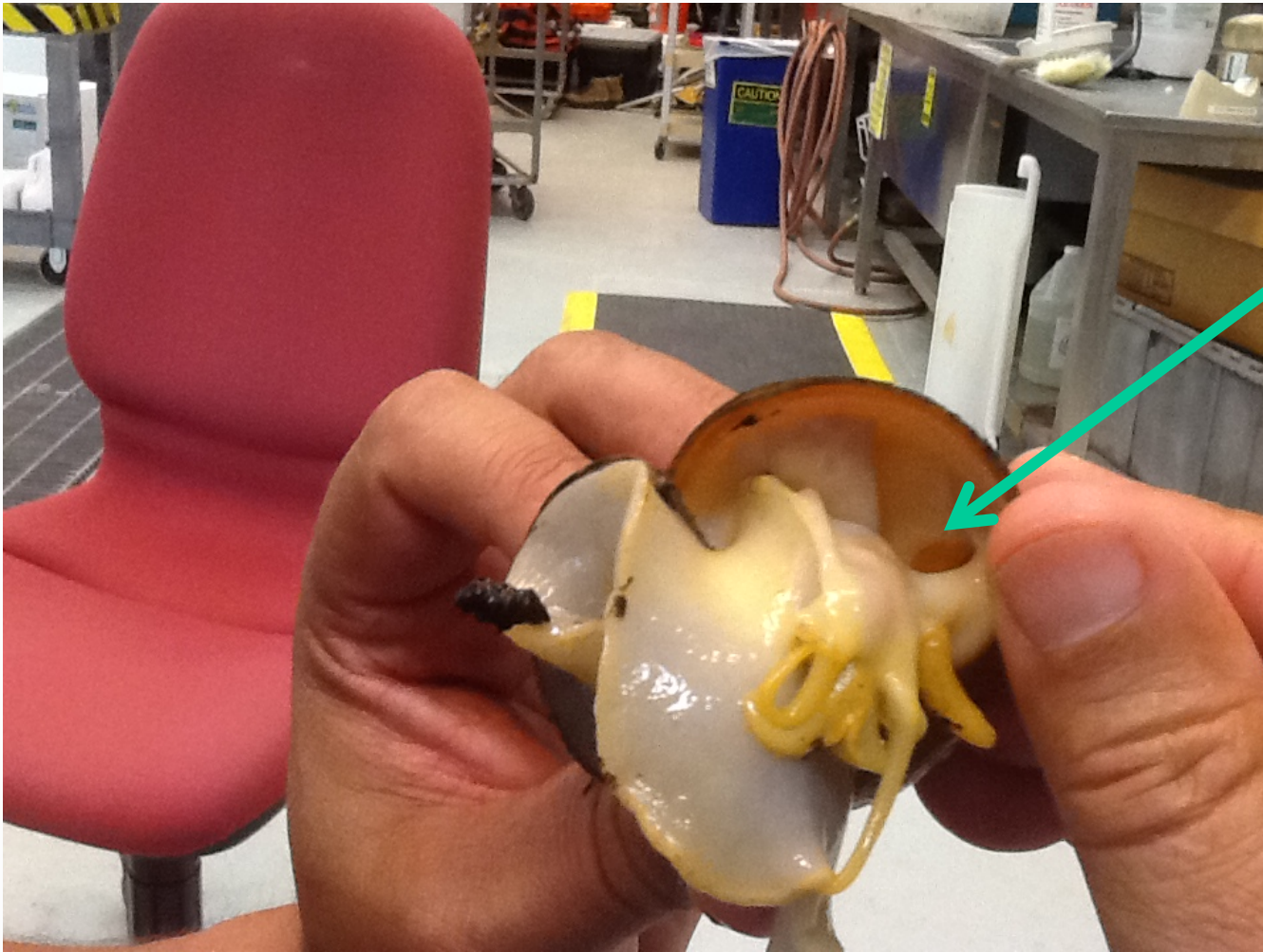
(right) Red Swamp Crawfish (*Procambarus clarkii*) and (left) Redear Sunfish (*Lepomis microlophus*).

Snail chemical exposure setup

% mortality	Molluscicide				
	Tea Tree Extract		Niclosamide		
Dose	High	Low	High	Low	Control
Snail Large	100	100	100	17	0
Snail Small	100	100	100	17	0
Crawfish	0	0	0	0	0
Sunfish	100	100	-	21	0

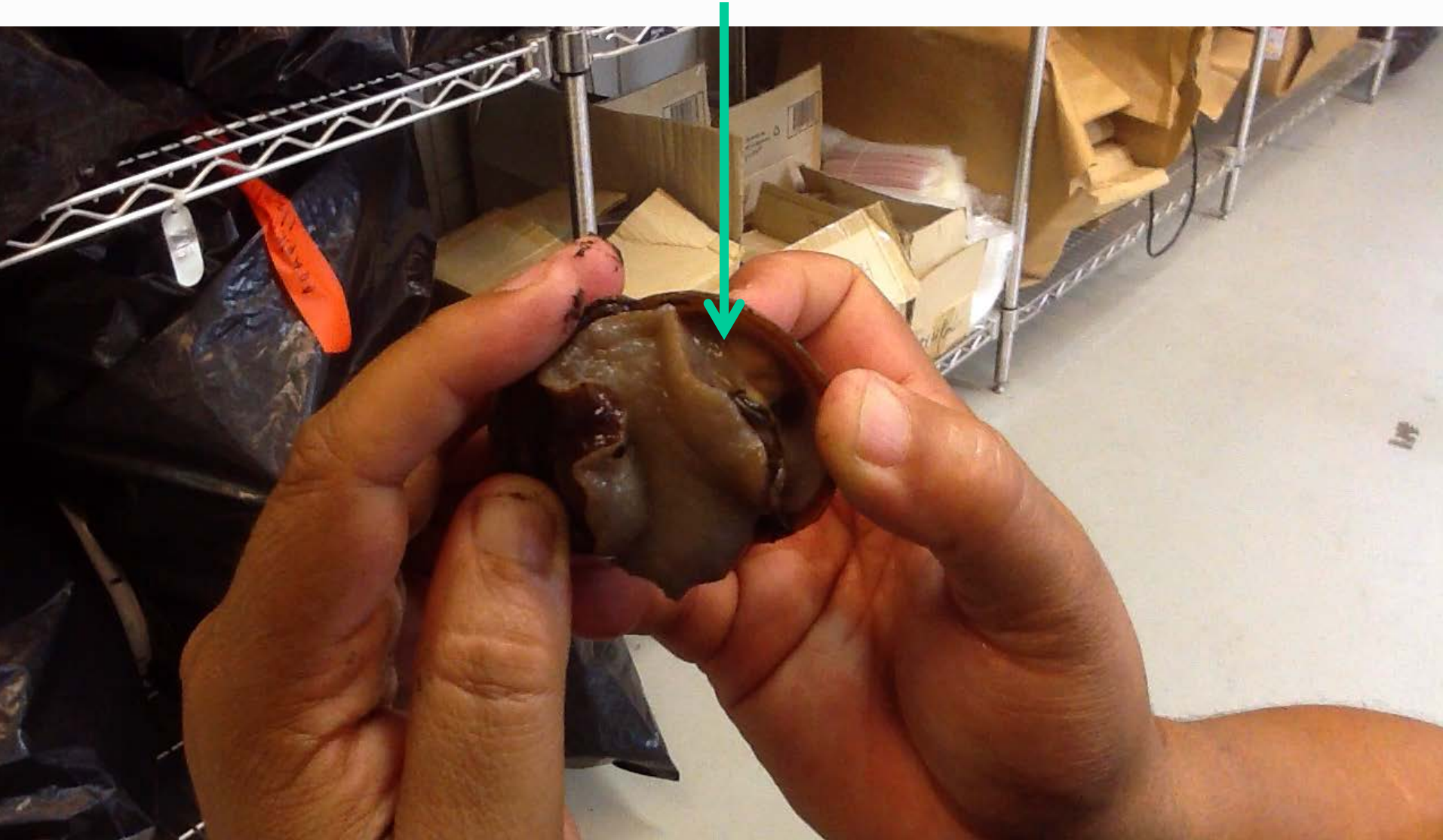
In collaboration with Jill Jenkins USGS-WARC

Male



Thanks to John Teem

Female



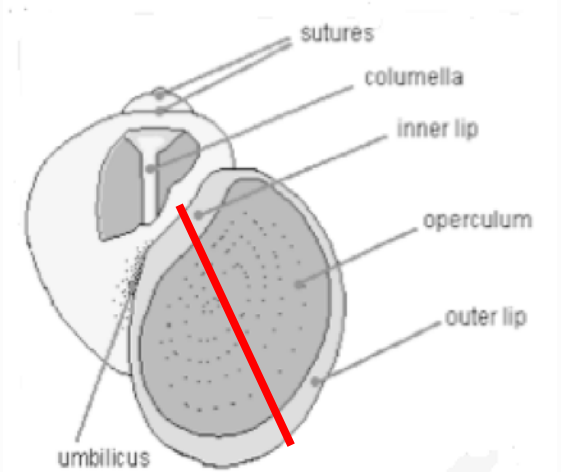
Shape of the Operculum (when seen in cross section)



Female: concave



Male: concave with a convex bump



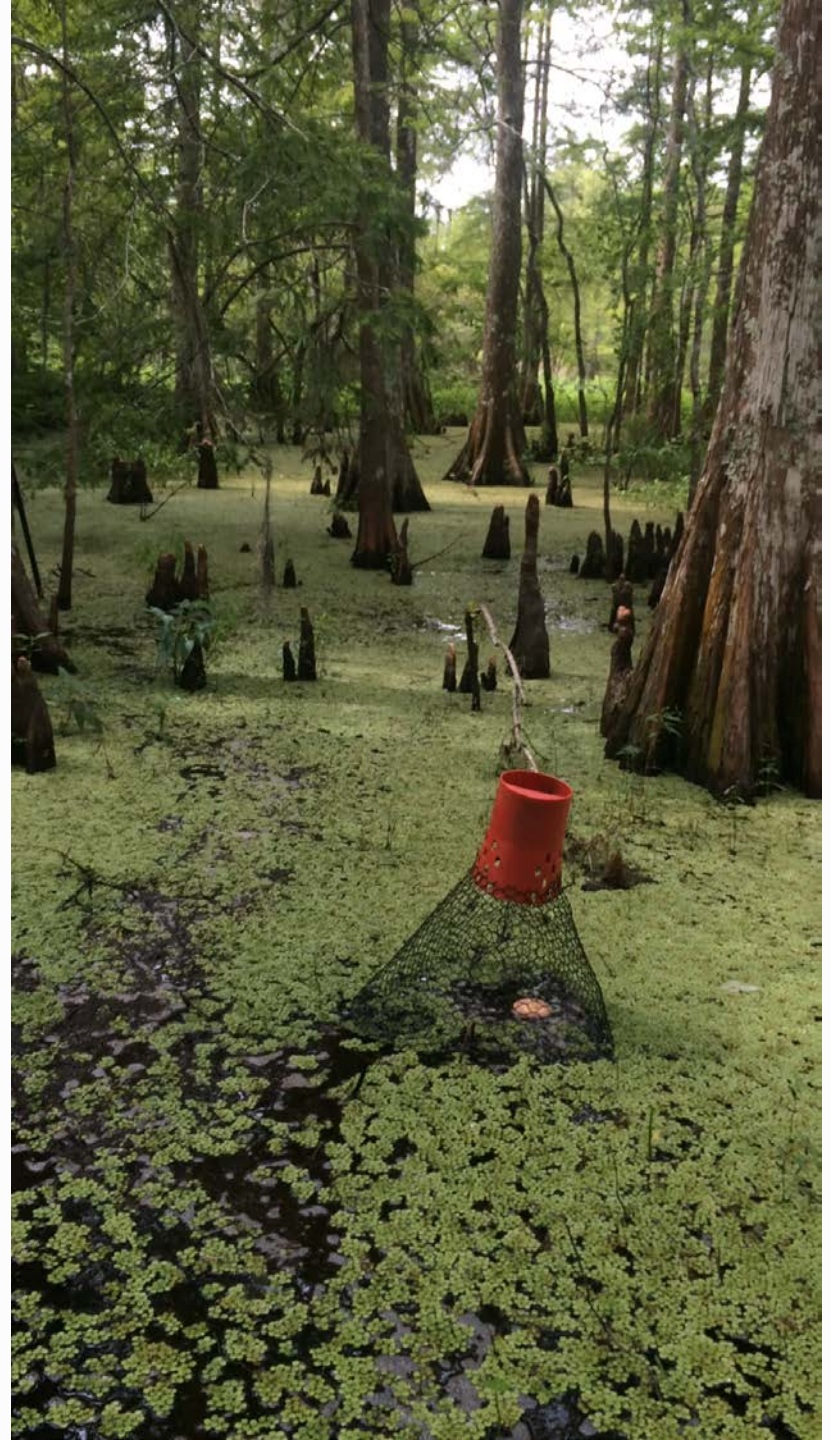
By running your finger along the operculum from the inner lip to the outer lip of the shell, you can feel the 'bump' on the operculum. The larger the snail, the more pronounced it is.

**In our laboratory population
our sex ratio is 4 males for every 9
females (4:9).**

**A skewed sex ratio has been reported
for wild populations as well.**

**We don't know what controls this, but
it will have a big impact on both
modeling and control options.**

Jean Lafitte National Park, Barataria Preserve



Van Dyke's Snail Trap

Discontinued due to by-catch issues,
low capture rates, handling time
and cost.



In Swamps
Large Snail Bias
> 10 gr

Modified Crawfish Trap
(mouth widened)



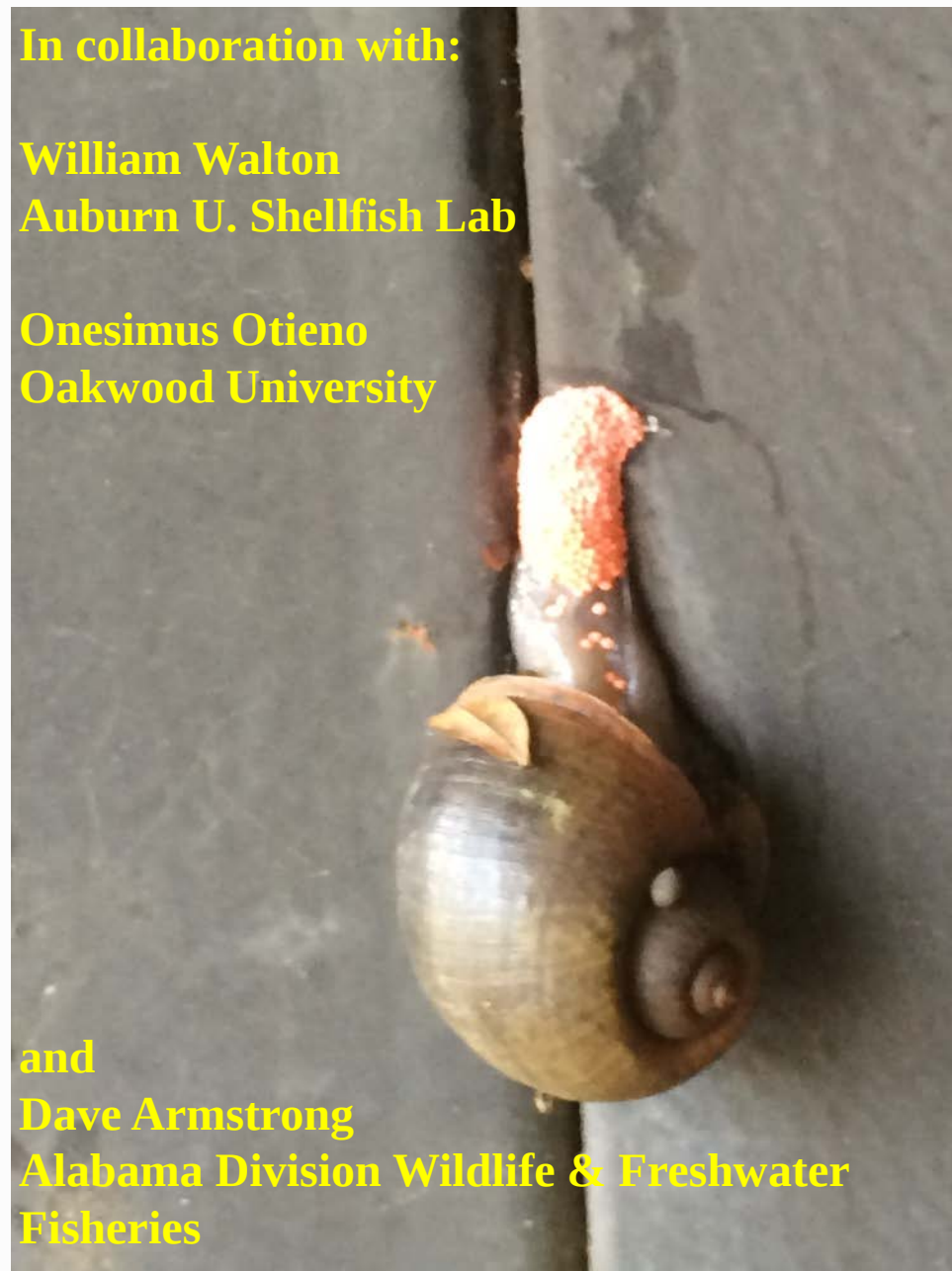
In Swamps
Small Snail Bias
 ≤ 10 gr



Snail Telemetry



To date only one transmitter has been deployed.
The snail's location was checked every two weeks for 6 weeks until we found it depredated.
The distance between relocations varied between 7 and 20 meters.



Egg Treatment Study, Mobile Alabama



Currently the only approved treatment is copper sulfate. A broad spectrum biocide and will have only limited application.

Exploring other options.

Recent discussions with the EPA indicate that the molluscide, Metaldehyde, has recently been approved for use in Hawaiian taro fields.

You can test molluscides without a special EPA permit in areas under ½ acre.

Certain chemicals, such as food grade oils, are exempt from permitting.

**Summary of USGS WARC Apple Snail Research
(in collaboration with Jill Jenkins*)**

Use of molluscides (chemical control)*.

Tested nicolamsides and compounds based on tea-tree extracts.

Use of biological control*. Tested sunfish and red swamp crawfish.

Use of hydrological control*. Tested the effects of flooding egg masses.

Capture techniques: Tested two different apple snail trap designs.

Marking techniques for population estimation

Estimations of growth rates, survivorship, and allometric relationships for models.

Surveys of current distributions in Louisiana.

Rat Lung Worm surveillance (in collaboration with John Teem, FL Dept. of Agri.)

Feeding rates of submerged aquatic vegetation (SAV)

CURRENT

Population dynamic models

Studies of population size, predation, movement and impact on SAV at JLNP-BP and study sites near Houma, LA

Experimental attempts to control egg mass survivorship.