

Apple Snail Risk Analysis for Arizona



Lower Salt River (Jeff Sorensen)



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Name

Apple snail (Family: *Ampullariidae*, Genus: *Pomacea*) a.k.a. channeled apple snail or golden apple snail (*P.canaliculata*), island apple snail (*P.insularum*), spike-topped apple snail (*P.diffusa*) and Florida apple snail (*P.paludosa*).

Description

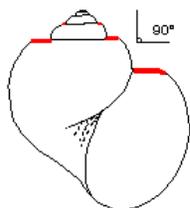
Members of the freshwater gastropod family *Ampullariidae* (sometimes referred to as *Pilidae*) known as apple snails are tropical and sub-tropical freshwater snails divided into several genera. The *Ampullariidae* family is divided into several genera with about 120 different species. The genera *Asolene*, *Felipponea*, *Marisa*, and *Pomacea* are the New World genera (South America, Central America, the West Indies and the Southern U.S.A.), while the genera *Afropomus*, *Lanistes* and *Saulea* are found in Africa. The genus *Pila* is native in both Africa and Asia. (applesnail.net)

The shells of the snails are globular in shape. Normal coloration typically includes bands of brown, black, and yellowish-tan; color patterns are extremely variable. The size of the shell can get up to 150 mm in length and have a shell with 5-6 whorls separated by a deep, indented suture. The snails produce bright pink egg clusters (Global Invasive Species Database).

Channeled Apple Snail (*Pomacea canaliculata*) has been designated one of the Top 100 Globally Invasive Alien Species by the Invasive Species Specialist Group. Island apple snail is also recognized as an invasive nuisance species in the SE United States in particular by Florida (www.snailbusters.wordpress.com).



A quick guide to help identify apple snail species based on the shape of the shell shown below (from applesnail.net).

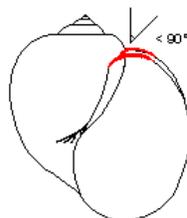


(c) 2000 S. Ghesquiere

Pomacea diffusa): flat shoulders and 90° sutures (scalariform).

The flat shoulder, however, becomes less apparent in the last whorls of the shell.

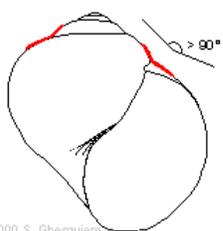
Pomacea bridgesii is not known to be available in the aquarium trade.



(c) 2000 S. Ghesquiere

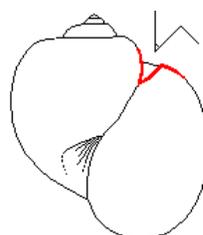
Pomacea canaliculata and *Pomacea insularum*: indented sutures, less than 90° angle.

This shell is more globose (rounder) than the *Pomacea diffusa* shell.



(c) 2000 S. Ghesquiere

Pomacea paludosa: Almost flat sutures with an over 90° angle, which gives the snail a cone shaped shell top (spine).



Pomacea haustum and *Pomacea insularum*: Deeply indented sutures with a sharp shoulders.

Life History

Apple snails are voracious herbivores with a wide menu (rice seedlings, taro, duck weed, water hyacinth, algae, azolla, and other succulent leafy plants). They prefer young, soft plants, but will clip mature, rooted plants at the soil surface. Apple snails will eat eggs and juveniles of other snails and will also eat decomposing organic matter. They can detect food at a distance using chemical cues. Longevity is up to 4 years. Reproductive maturity is reached in 3 months to 2 years, depending on ambient temperature regime (Rawlings, T.A., et al. 2007).

Reproductive Strategy

Pomacea snails are dioecious and have internal fertilization with very high fecundities. High fecundity serves as the most successful indication of mollusk invasive potential (Global Invasive Species Database). In temperate climates, the egg-laying period of this genera extends from early spring to early fall, while in tropical areas reproduction is continuous. Every 12-15 days, females lay bright pink clutches of 25-500 eggs, usually 200-300 eggs. Snails can reach maturity 60-85 days after hatching. One female can produce up to 15,000 offspring per year (Snail Busters website). Eggs are laid on emergent structures because the eggs of apple snails require air exposure to develop. Exposure to water decreases hatching efficiency of apple snails clutches (Global Invasive Species Database).

Environmental Tolerances and Restrictions

Apple snails are exceptionally well adapted to tropical regions, with periods of drought alternated with periods of excessive rainfall. This adaptation is reflected in their life style; moderately amphibious and being equipped with a shell door enabling the snail to close its shell to prevent drying out while hiding in the mud during dry periods (Putnam, A.H., 2011). Apple snails will have competitive interactions with most native aquatic fauna, especially native snails (www.snailbusters.wordpress.com).



Preferred Habitat

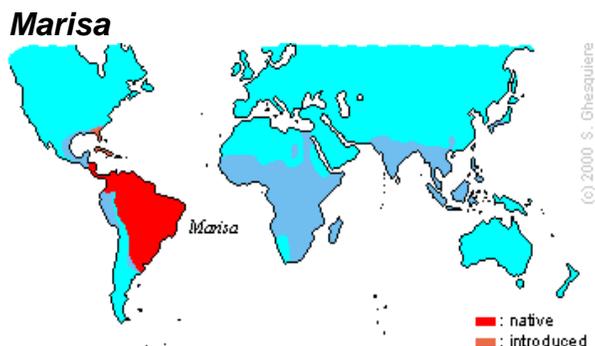
Apple snails are amphibious but mostly aquatic. Apple snails inhabit a wide range of ecosystems from swamps, ditches and ponds to lakes and rivers (Putnam, A.H., 2011). They can bury themselves in bottom sediments for up to 5 months and survive periods of extreme low water. Snails can move upstream by crawling and downstream by floating (www.snailbusters.wordpress.com).

Distribution

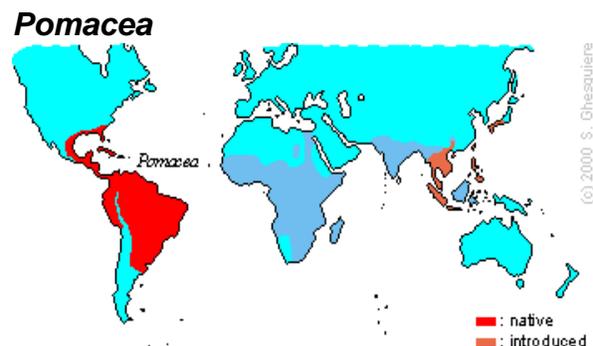
Native Range: Native to Rio Parana, north of Buenos Aires, Argentina (Rawlings, T.A., et al 2007).

Introduced Range: Most of southern, eastern and south-east Asia, Hawaii, Guam, Papua New Guinea; The Dominican Republic; and the USA (Rawlings, T.A., et al 2007).

The maps below show two genera of apple snails that are native to N. America which includes their native and introduced ranges (applesnail.net).



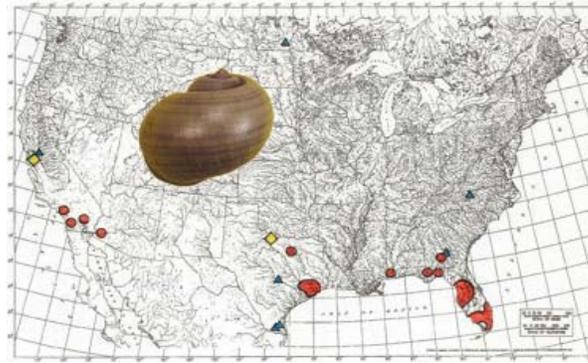
Marisa inhabits a large area in South America and was introduced in Central America and the Southern parts of the US.



Pomacea inhabits a large area in South and Central America and was introduced in South Asia (1980's).

Expanded Range in United States

Established populations have been found in six states: Alabama, Arizona, California, Florida, Georgia, and Texas (Rawlings, T.A., et al 2007).



Current Status in Arizona

Found in the Colorado River at Yuma, Yuma County and in the Lower Salt River, Maricopa County. Apple snails are not on Arizona's Restricted Live Wildlife list (R12-4-406).



Lower Salt River (Jeff Sorensen) – note pink egg masses

Pathways

In the 1980's, channeled apple snails were introduced in Taiwan to start an escargot industry. Instead of becoming a useful human food resource, they escaped to rice fields and became serious rice eating pests. Through human introduction, this apple snail has rapidly spread to Indonesia, Thailand, Cambodia, Hong Kong, southern China, Japan, Philippines, and Hawaii and there are indications that they are invading Australia. The channeled apple snail also has been distributed and used in the United States to control nuisance aquatic plants. Other forms of introductions have been through pet and aquarium trade, live food trade, nursery trade and smuggling. Local dispersal methods are also noted from aquaculture, voluntary release of domestic aquarium snails, and water currents (applesnail.net).

Potential Impacts

Wildlife/Habitat

Apple snails present a major risk to native wetland ecosystems and agriculture, potentially competing with native species for limited resources (www.snailbusters.wordpress.com). These species have the potential to alter native freshwater habitats significantly, causing shifts in ecosystem state and function. Aquatic plants stabilize and are dominant primary producers in wetland ecosystems, creating structurally diverse habitats and offering refuge to invertebrates and fish, as well as playing a key role in nutrient cycling. Herbivory by exotic gastropods can influence the structure of macrophyte communities and affect nutrient and energy fluxes in wetlands. Exotic gastropods may also outcompete/exclude native snails, introduce parasites, and threaten endangered species. Their rapid and profuse reproduction in the United States, coupled with their lack of predators, could make their population explode causing additional, compounding problems (Global Invasive Species Database).

Infrastructure

None known at this time.

Economic

The ability of snails to escape population control and explode in ephemeral habitats could increase the devastating impacts seen in agricultural crops in southeast Asia and the southeastern United States. Several *Pomacea* species have become serious agricultural pests of wetland crops (Global Invasive Species Database).

Human Health

Apple snails are an intermediate host for the rat lungworm (*Angiostrongylus cantonensis*), a nematode that can be transmitted to and cause meningitis in humans (Global Invasive Species Database), through the consumption of improperly prepared flesh of escargot.

Benefits

It is unclear whether apple snails may serve as a biological control agent for regionally invasive aquatic plants, such as Hydrilla (*Hydrilla verticillata*) or purple loosestrife (*Lythrum salicaria*) (Global Invasive Species Database). In addition, these particular snails can produce revenue from being a popular pet trade species.



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Threats to Arizona

These exotic gastropods (mainly from South America) have the high potential to exclude native snails, introduce parasites, and further threaten aquatic endangered species. Apple snails could present a major risk to our State's native wetland ecosystems and agricultural community, potentially competing with native species for limited resources. These species have the potential to alter freshwater habitats significantly, causing shifts in ecosystem state and function. Aquatic plants stabilize and are dominant primary producers in wetland ecosystems, creating structurally diverse habitats and offering refuge to invertebrates and fish, as well as playing a key role in nutrient cycling. This all could be disrupted by the presence of apple snails and their rapid and profuse reproduction in the United States. Coupled with their lack of predators, their population could explode and cause additional, compounding problems to our state's aquatic resources. Once established, there appears to be no effective way to eradicate apple snails. There are currently no molluscicides available that will selectively eliminate these invasive snails. The best results for control are obtained by hand picking as a community effort on a large, laborious scale.

Recommendations

The genus (*Pomacea*) should be listed as Restricted Live Wildlife (R12-4-406) and formally placed on AGFD Aquatic Invasive Species Director's Orders (A.R.S. §17-255). Education and awareness measures are needed, both in terms of regulation and public education, to reduce the negative consequences of future introductions and the spread of this exotic species in Arizona.

References

Rawlings, T.A., Hayes, K.A., Cowie, R.H., and Collins, T.M. 2007. The identity, distribution, and impacts of non-native apple snails in the continental United States. *BMC Evolutionary Biology* 7:97.

Denson, D. and Eby, G. Lake Brantley infested with invasive snails. Ghesquiere, Stijn. *Pomacea canaliculata*.

Ghesquiere, Stijn A.I. www.applesnail.net

Snail Busters website: <http://snailbusters.wordpress.com/biology>

Global Invasive Species Database (100 worst): <http://www.issg.org/database/species/ecology>
Pomacea insularum and *Pomacea canaliculata*.

Putnam, Adam H. 2011. Apple Snails. Commissioner of Agriculture. Technical Bulletin No. 8.

