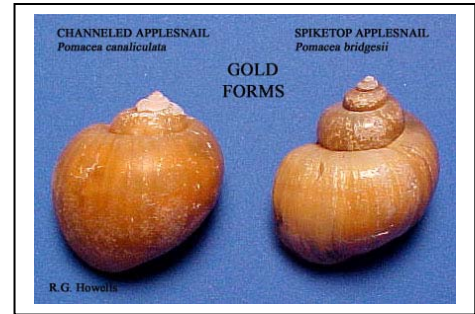


INVASIVE APPLESNAILS IN TEXAS: STATUS OF THESE HARMFUL SNAILS THROUGH SPRING 2005

Robert G. Howells – April 2005



Exotic applesnails with channeled shells (above left and center) have been introduced in Texas; but, recent genetic analysis indicates they are not true channeled applesnail (*Pomacea canaliculata*). Channeled applesnail (left) and spiketop applesnail (right) may occur in gold and other color morphs.

INTRODUCTION:

Applesnails (*Pomacea* spp.) are native to South and Central America, some Caribbean Islands, and peninsular Florida. They are in the family Ampullariidae (previously Pilidae), along with giant rams-horn snail (*Marisa cornuarietis*) from South and southern Central America, and a number of other genera. None are native to Texas. Applesnails have been introduced outside their native ranges, including Texas. In some areas outside North America, these introductions have caused extensive agricultural damage, threatened aquatic and wetland ecosystems, and even posed risk to human health. Despite initial concerns about similar impact on local rice crops, to date, no significant damage has been reported in Texas rice fields (but this could change in the future). Thus far, exotic applesnails appear to represent a greater threat to aquatic and wetland ecosystems in the Lone Star State.

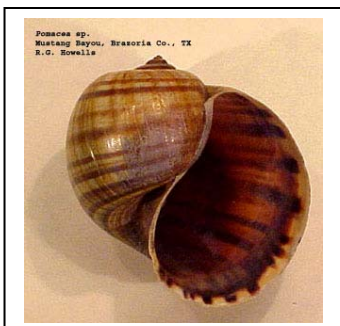
IDENTIFICATION PROBLEMS:

Identification of applesnail species can be difficult and ongoing DNA studies show that “channeled” applesnail introductions include multiple species. Florida applesnail (*Pomacea paludosa*) is native to the U.S. Spiketop applesnail (*P. bridgesii*) from South America has been introduced elsewhere. The channeled applesnail-group (*P. canaliculata*-group) may include 3-15 species with channeled shells. True channeled applesnail (*P. canaliculata*) from South America, has been introduced in Hawaii, the Philippines, and elsewhere. At least some populations of the “channeled” applesnail-group (*Pomacea* spp.) introduced in Texas and Florida are not *P. canaliculata*, but are one of the other channeled species (exact identity yet to be determined). Titan applesnail (*P. haustrum*) from South America has been introduced in Florida; it has not been found elsewhere in the U.S. and now appears to be less related to the channeled applesnail-group than long thought. Giant rams-horn has only a single species. Dealers also use the old name *Ampullaria cuprina* & *A. gigas* for any larger, channeled species.

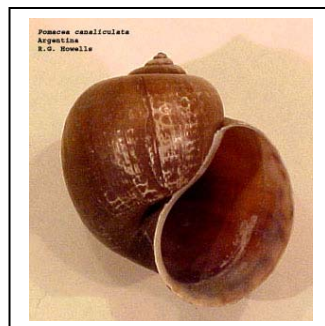
DESCRIPTION:

Typical applesnails are globular in shape (hence their name). Some reach shell heights of 4-6” (102-152 mm) and giant rams-horn snail grows to ca. 1.5” (38 mm) in diameter. They have a trap door (operculum) that covers the shell opening when the animal withdraws. Wild-type specimens are usually colored in bands of black, brown, and yellowish-tan; however, color patterns are extremely variable. Some may be completely dark or light, without bands. Additionally, color variants occur including white, gold, yellow, and even red in some species. Shells and bodies may be different colors. Snails with white shells and black bodies may appear blue. Some species have characteristic channels or grooves between the shell whorls.

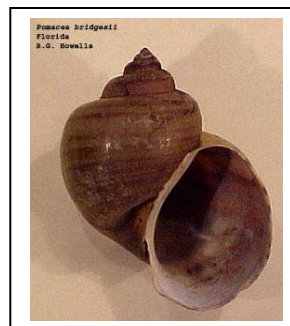
The American Fisheries Society uses applesnail as one word, but apple snail is often used by others. In the aquarium trade, applesnails are usually sold as mysterysnails or mystery snails, but true mysterysnails are in another family. Pet trade dealers sometimes call large specimens giant or Peruvian apple snails. Throughout much of Southeast Asia, the Indo-Pacific, members of the channeled applesnail-group are often known as golden apple snails (also golden kuhol, golden snail, and miracle snail). When applesnails were first taken to Taiwan, they were promoted as “golden apple snails” to represent how much money snail growers would make raising them for Asian escargot. “Golden” was a marketing ploy and not necessarily an indication of snail color. But, use of the term “golden apple snail” has gained wide use outside the Americas. It remains important to recognize that “golden” can be both a color variety and a species (or group of species). Giant rams-horns have also been called Columbian rams-horns and it too may occur in gold and albino forms.



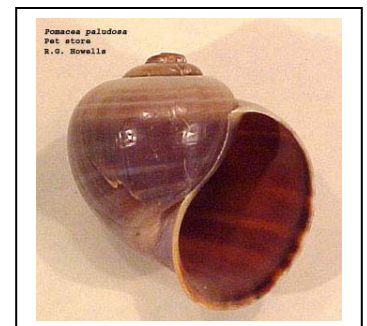
Applesnail from Texas with a channeled shell (*Pomacea* sp.)



Channeled applesnail (*Pomacea canaliculata*)



Spiketop applesnail (*Pomacea bridgesii*)



Florida applesnail (*Pomacea paludosa*)

BIOLOGY:

Applesnails (*Pomacea*) have both gills and a lung-like structure that allows foraging on land as well. Applesnails feed on many types of vegetation. Some species even attack emergent and terrestrial plants. Several have been known to consume other snails. Giant rams-horn snail eats aquatic plants, but rarely, if ever, leaves the water to feed. Members of the channeled applesnail-group are especially aggressive feeders, damaging crops like rice and taro (elephantears), as well as native aquatic plants (but usually will not graze on algae). Florida applesnail consumes aquatic plants, but is less destructive than some channeled-types. Spiketop applesnail eats algae and sometimes, if particularly hungry, soft or rotting aquatic plants. Applesnails (*Pomacea*) lay hard-shelled eggs in masses on solid objects above the water line. Egg masses are often pink, red, or orange, but may be white, yellow, or green in some species. Giant rams-horns lay eggs under water in jelly-like masses that resemble frog eggs. Some “channeled” applesnail-group species are sufficiently cold tolerant that they survive in northern Texas, Korea, and Japan. Florida and spiketop applesnails and giant rams-horn are less cold tolerant.

INTRODUCTION HISTORY:

International – Members of the channeled applesnail-group were apparently taken to Taiwan in 1979, and then distributed to other Southeast Asian and Indo-Pacific countries 1980s, others were documented in Hawaii in 1989 and in the Dominican Republic in 1990-91, where they have now become major crop pests.

U.S. Releases – Native Florida applesnail has been introduced outside its native range in northern Florida and at a site in Alabama. Spiketop applesnail established in peninsular Florida and one site in Alabama. Members of the channeled applesnail-group are established in Florida (1978), California (1997), Alabama (ca 2003), and Arizona (2005), with an unsuccessful introduction in North Carolina (1992) and recent collections in Georgia (2005). Giant rams-horn snail has also become established in southern Florida.

Texas Records – In historic collections, shells of Florida applesnail were found at two sites and “channeled” applesnail at a third. More recently, “channeled” shells were found at two additional sites (all apparently unsuccessful introductions). A breeding population of the channeled applesnail-group was found in Houston in 1989. In 2000, channeled applesnail-group specimens were found established in Galveston and Brazoria counties. Since then, channeled applesnail-group members have been found to be established at multiple sites in six counties in southeastern Texas, where they seem to be expanding their range, and in a pond near Fort Worth. **True channeled applesnail (*P. canaliculata*) has not been confirmed genetically in Texas.** Giant rams-horn snail has also been introduced in the headwaters of the San Marcos, Comal, and San Antonio rivers. Spiketop applesnails found in Waco in 2004 appeared to have been killed by cold temperatures.

APPLESNAIL EGGS:

Channeled applesnail-complex and spiketop applesnail lay bright pink, red, or orange eggs in clusters on solid objects above the water line. Egg clusters are 1-4” (25-102 mm), or more, in length. Incubation takes 2-4 weeks and coloration lightens over time. Even after hatching, egg masses persist for extended periods. Introduced applesnails may be revealed by their eggs before snails themselves are observed.

WHERE APPLESNAILS MAY BE FOUND:

Aquarium and pet trade – applesnails, especially spiketop applesnail, have long been sold for aquarium culture; even with legal restrictions, sales in pet stores and over the internet have continued. **Ornamental water gardens** – because algae-eating species are not especially cold tolerant and species that can endure cold damage plants, applesnails are only occasionally sold. **Human consumption** – applesnails appear occasionally in Asian markets in Texas and elsewhere, but they are not primary escargot species in most areas. **Feral specimens** – due to wide

distribution by the pet trade, introductions can occur almost anywhere; known locations are indicated above. **Educational uses and biological supply houses** – sales and distribution related to class room uses occur.

TRUE MYSTERYSNAILS:

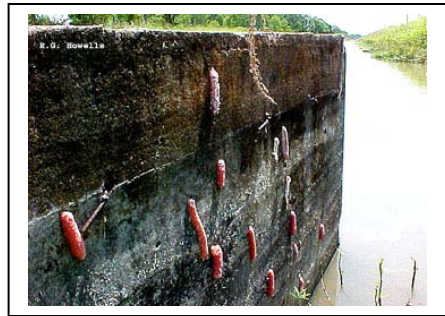
Mysterysnails (Family Viviparidae) include American and European *Viviparus* snails and Asian *Bellamya* (previously *Viviparus* and *Cipangopaludina*). These large snails were one used in aquarium culture, but were replaced in the mid-1990s by applesnails (*Pomacea*) that were more tolerant of warm temperatures in tropical fish aquaria. However, the name “mystery snail” was retained by the pet trade for applesnails. Chinese mysterysnail (*B. chinensis*) and Japanese mysterysnail (*B. japonica*) are often sold for use in water gardens and both have been widely introduced in the U.S. Neither has caused major ecological problems here.

THREATS TO HUMAN HEALTH:

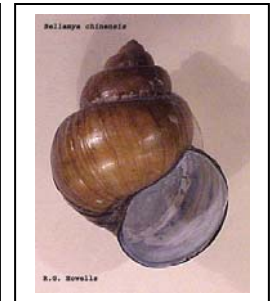
Members of the channeled applesnail-group are known to host rat lungworm (*Angiostrongylus cantonensis*), a parasite that can infect humans. This worm is not currently known in applesnails in Texas or elsewhere in the mainland U.S., but does occur in other applesnails in the Caribbean and is present in native snails in New Orleans.

LEGAL RESTRICTIONS:

Currently (April 2005), TPWD only prohibits channeled applesnail (*Pomacea canaliculata*) and giant rams-horn snail (*Marisa cornuarietis*). However, proposed regulation revisions would expand restrictions to all members of the applesnail family, except spiketop applesnail (*P. bridgesii*). U.S. Department of Agriculture also restricts importation and shipment across state lines of gastropods including applesnails.



Above left: applesnail eggs on a wall in southeastern Texas.



Above right: Chinese mystery-Snail (*Bellamya chinensis*).

Right & below: giant rams-horn snail (*Marisa cornuarietis*).



CLARIFICATION:

Materials and publications relating to applesnails in Texas written prior to April 2005 may contain statements now known to be incorrect due to results of recent DNA analysis, expanding ranges, and other new discoveries.

REPORT APPLESNAIL SIGHTINGS IN TEXAS TO:

Robert Howells (830-866-3356; Robert.Howells@tpwd.state.tx.us), Texas Parks and Wildlife Department, Heart of the Hills Fisheries Science Center, 5103 Junction Highway, Ingram, Texas 78015, or Dr. Alex Karatayev (936-468-5195; akaratayev@sfasu.edu) or Dr. Lyubov Burlakova (936-468-2322; lburlakova@sfasu.edu), Stephen F. Austin State University, Box 13003 SFA Station, Nacogdoches, Texas 75962.