

A Review on Taxonomy and Anatomy of Golden Apple Snail (*Pomacea canaliculata*)

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ABSTRACT

Pomacea canaliculata is typically linked to the introduction of *Pomacea* snails in the Americas and the Indo-Pacific region. The species *P. bridgesii*, *P. paludosa*, and *P. haustum* of *Pomacea* snails are others. Unlike *P. canaliculata*, the majority of these species are not harmful to plants (macrophytes), such as *P. bridgesii*. Due to the variety in these snails' biology, identification issues won't be solved until investigations at the DNA level or other types of genetic analysis are conducted. *Ampullaria canaliculata* Lamarck, 1822 is the alternate name for the *Pomacea canaliculata* species. The golden apple snail's morphological features include a cylindrical, ball-shaped convoluted shell with 5 to 6 strands divided by deep indentations, a head portion with tentacles and eyes, flat feet on the back ventral, large, oval to round openings in the shell, more rounded openings in males than females, a large, deep umbilicus, and body colors ranging from yellow to blackish brown. The golden snail can grow to be up to 10 cm long. Golden apple snails for aquariums typically come in smaller sizes. The shell's coloration is often brownish or greenish, and it frequently has a spiral band pattern wrapped around it. Many aquarium-bred species feature a brilliant golden yellow color. A person's body color might be anything from dark, almost black, to light beige.

Keyword: anatomy, apple snail, mollusca, taxonomy, characteristic

1. INTRODUCTION

About 50 species of snails are reported to have been categorized into the genus *Pomacea* but the identification process was too confusing and required many revisions especially on the biochemical genetic techniques. About 15 of these 50 species have channeled shells including *Pomacea canaliculata*. Even so, generally the introduction of *Pomacea* snails in the Americas and the Indo-Pacific region is usually associated with *P. canaliculata*. It is possible that other species also played a role in the introduction. For example, in the Hawaiian region there are differences in feeding habits among different types of golden snails and this may indicate a different species or strain of the snails. Due to the diversity in the nature of these snails, identification problems such as these will remain unresolved until studies at the DNA level or other genetic analysis are carried out. Other *Pomacea* snail species include *P. bridgesii*, *P. paludosa* and *P. haustum*. Most of these species, such as *P. bridgesii*, are harmless to plants (macrophytes), unlike *P. canaliculata* [1].

The history of the golden snail as a rice pest in Indonesia is almost similar to its history in other countries. The apple snail or also known as golden apple snail was introduced in 1981, to Yogyakarta as an aquarium fauna, but only around 1985-1987, this animal spread very quickly and became popular in Indonesia [2]. Until 1990 there were two common perspectives regarding this golden apple snail. The first view assumes that the golden apple snail is a rice pest while the second view considers the golden snail as an export commodity. Even so, golden snails are often reported on the islands of Java and Sumatra [3].

2. TAXONOMY

The golden snail belongs to the kingdom Animalia, phylum Mollusca, class Gastropods, subclass Prosobranchia, order Architaenioglossa, family Ampullariidae, genus Pomacea, species *Pomacea canaliculata* (Lamarck, 1828) [4]. The synonymous name of this snail species is *Ampullaria canaliculata* Lamarck, 1822, common names are known as apple snail, channeled apple snail, golden apple snail (English), *Gelbe Apfelschnecke* (Germany), golden *kuhol*, miracle snail (English-Philippines), golden snail, the mulberry snail (Indonesia) [5],[6].



Figure 1. Golden snail *Pomacea canaliculata*
Source: [7]

3. ANATOMY

The golden snail has the following morphological characteristics: it has a conical, ball-shaped twisted shell, quite heavy with 5 to 6 threads separated by deep indentations, the apex of which is located on the dorsal side. The head can be well developed equipped with tentacles and eyes, the flat feet are located on the back ventral and can be removed from the shell. The opening of the shell is large and the shape is oval to round. Male snails are known to have more rounded openings compared to female snails. The umbilicus is large and deep. Snail body color varies from yellow to blackish brown [8],[9].

The snail shell (shell) is light brown in color, the flesh is milky white to golden red or orange. The size of the golden snail is highly dependent on the availability of food. The operculum of the female mulberry snail is concave white and the male is convex. The edge of the mouth of the adult female cochlea curves inward, while the edge of the male cochlea curves out [6].

The shells of most snails of the Ampullariidae family are oval, conic (conical round), the shell opening is on the right (dextral). Whorl or coil is a round or winding of the shell and the shape varies. The suture is the line on the shell surface where the two whorls meet. The golden snail usually has curved sutures. The umbilicus is the deep space in the middle of the shell. The columella is the central axis of the shell from the top of the shell to the umbilicus) The body of the snail is attached to the shell by the columellar muscles, which attach to the columella. This muscle is also known as the retractor muscle because it is able to gently pull the snail into the shell. If this muscle is damaged, the snail will lose its shell and die.

The golden snail is an amphibian animal. The organ that is important for the golden snail to adapt is a combination of a branched respiratory organ similar to the gills of a fish and a lung on the left side of its body. This combination of organs increases the distance the snail travels in search of food. In addition, the golden snail has a tubular siphon on its left side which is used to breathe when the snails are underwater and makes them less vulnerable to bird predation [9].

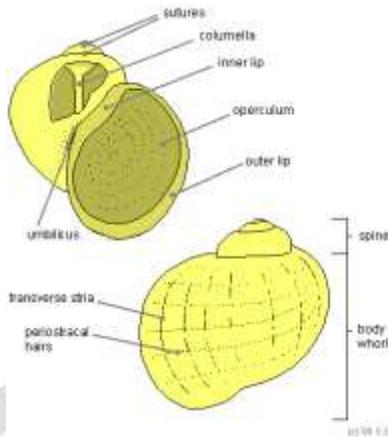


Figure 2. Anatomy of the shell of the Ampullariidae family snail
Source: [7]

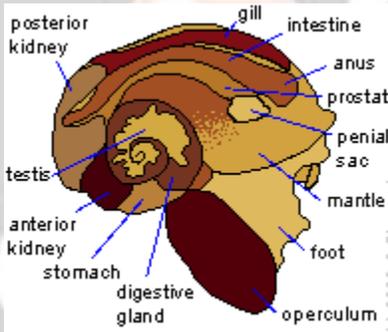


Figure 3. Anatomy of the Ampullariidae snail when it rolls up in the shell
Source: [7]

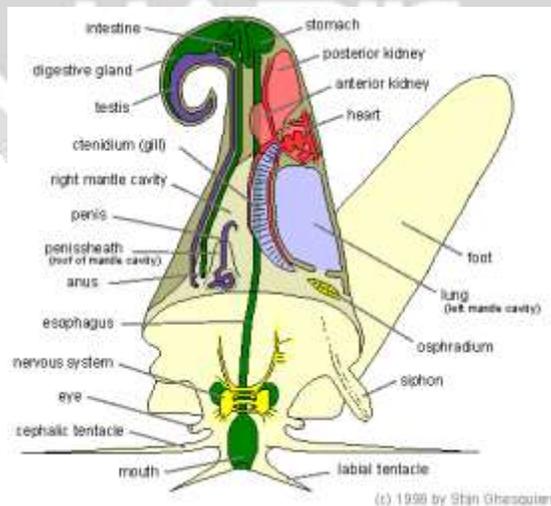


Figure 4. Anatomy of male Ampullariidae snails
Source: [7]

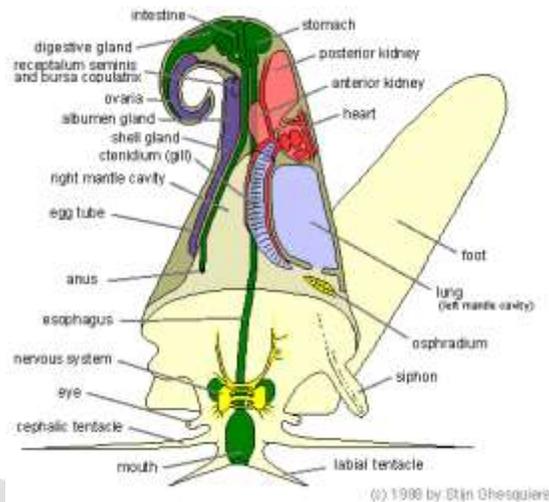


Figure 5. Anatomy of female Ampullariidae snails
Source: [7]

The pigment that determines the color of the shell is located in the organic layer or periostracum on the surface of the shell. The surface of the shell can be soft or rough textured depending on the type and environment. Malleation (surface like forged) occurs mainly because the snails grow fast. Stria (growth lines) form if growth is slow. New shell material is formed piecemeal at the opening of the shell and forms stria each time a new section is formed. The operculum (shell door) is in the form of a disc made of horn-like material with a concentric structure that functions to close the shell for the purpose of survival and protection from predators [9].



Figure 6. Left: Stria and Right: Malleation on a golden snail shell¹

The golden snail's mouth is equipped with a pair of antennae called labial palps and looks like tentacles. There are two pairs of tentacles, a pair of long tentacles are located near the left and right eyes, while another pair is short near the mouth [8]. The golden snail is very dependent on its sense of smell to find food and recognize other snails of the same type for reproductive purposes. The sense of sight is weak and functions as a detector of the light direction. The entire surface of the apple snail's body contains chemical and mechanical receptors. The eyes are located at the base of the tentacles and cannot see color. Tentacles are an important organ because the golden snail is very dependent on the olfactory ability and sensitivity of its tentacles. Osphradia are chemical sensors located in front of the lungs and function to detect chemicals when they are in water. Statocysts are bubbles that contain statoliths and function as balance organs.

When the snail moves, then it will secrete a liquid in the form of mucus as a layer for its movement by contracting the longitudinal muscle fibers of the undulating legs. The mucus functions as a road lubricant and also functions to hold the parts of the foot that are relaxing when the contracting parts move forward [8].

¹ <http://www.applesnail.net/>

The golden snail can reach a large size of up to 10 cm. Types of golden snails for aquariums are usually smaller in size. The color of the shell is usually brownish or greenish, often with a spiral band pattern threaded around the shell. Several species bred in aquariums are bright golden yellow. Body color can range from dark, almost black to pale beige. Their presence is usually first recognized by the presence of a clutch of bright pink eggs on a solid surface at a height of 50 cm above the water surface [5].

4. CONCLUSIONS

About 15 of these 50 species of Pomacea, including *Pomacea canaliculata*, have channeled shells. Apple snail, channeled apple snail, golden apple snail (English), *gelbe apfelschnecke* (Germany), golden *kuhol*, miracle snail (English-Philippines), golden snail, and the mulberry snail are some of the other frequent names for this type of snail (Indonesia). Most Ampullariidae family snails have oval, conical (conical round) shells with an orifice on the right (dextral). The columellar muscles, which connect to the columella, hold the snail's body to the shell. Because it has the ability to gradually pull the snail into its shell, this muscle is also referred as the retractor muscle. The lung on the left side of the golden snail's body and a branching respiratory apparatus resembling fish gills make up the crucial organ for adaptation. Depending on the type and climate, the shell's surface may have a soft or rough texture. The operculum (shell door) is a disc-shaped piece of horn-like material with a concentric structure that serves to close the shell in order to protect the animal from predators and ensure life. The antennae in the golden snail's mouth resemble tentacles and are equipped with two pairs. The eyes, which are situated at the base of the tentacles, cannot distinguish between the colors.

5. REFERENCES

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