

Alien Invasive Snail, *Pomacea* sp. in Sri Lanka

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Abstract

Pomacea sp. was introduced into Sri Lanka through the aquarium trade although the exact year is unknown. The first wild populations were observed in the early 1980s in Colombo, Western Province and in Galle, Southern Province. Its range of distribution has been slowly expanding. Presently, the snail has dispersed into Colombo, Galle, Gampaha, Kaluthara, Kandy, Matara, and Ratnapura districts. It has also invaded Bellanwila Attidiya wildlife Sanctuary in Western Province. The snail is found in both nonpolluted and highly polluted freshwater canals as well as in wetlands. *Pomacea* sp. has not yet done any significant damage to rice plants in the country. However, Sri Lanka being an island with diverse aquatic habitats the threat of an invasive aquatic snail should be given considerable attention. Therefore, it is necessary to investigate its impact on native flora and fauna. Studies of its potential range and pattern of distribution, and identification of its natural enemies would be beneficial to control its further spread.

Key Words: Invasive, Snail, *Pomacea*, Sri Lanka

Introduction

Sri Lanka, with a total of 65,610 km², is a biodiversity-rich tropical island in the Indian Ocean. Alien invasive species are presently considered as one of the immediate threats to Sri Lankan biodiversity (Pethiyagoda 2005). Alien species have been introduced both deliberately

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and accidentally to the ecosystems of the country. The alien invasive fauna include eight species of vertebrates (six freshwater fish and two mammals) and two species of invertebrates (two mollusc spp.) (Bambaradeniya et al. 2004). The two mollusk species have been identified as the giant African land snail *Lissachatina fulica* (formerly known as *Achatina fulica*) and the golden apple snail *Pomacea* spp. *L. fulica* is widely distributed in natural and managed terrestrial habitats, and its negative effects on agriculture are well known (Mordan et al. 2003). Identification of aquatic *Pomacea* found in Sri Lanka up to the species level is not clear. Therefore this article refers to *Pomacea* sp.

Sri Lanka being an island with diverse aquatic habitats, the threat of invasive alien aquatic species should be given considerable attention. The country has 260,000 ha of freshwater bodies, which include 70,000 ha of large irrigation reservoirs, 17,000 ha of seasonal village tanks, 39,000 ha of minor irrigation tanks, 4,000 ha of flood lakes, 8,000 ha of upland reservoirs, and 22,000 ha of Mahaweli reservoirs (FAO 1998).

Introduction of *Pomacea* sp. into Sri Lanka

Pomacea sp. has been imported to many Asian countries as a food source (Yusa and Wada 1986, Halwart 1994, Halwart et al. 1998). This may not be the case in Sri Lanka, where terrestrial and freshwater snails are not popular as food sources. Therefore, it is generally believed that *Pomacea* sp. was introduced into Sri Lanka through the aquarium trade, but just when is unknown. The aquarium shops in the country largely serve the local hobbyist market and are sited mostly in the cities (Wijesekara and Yakupitiyage 2001). Ornamental fish and other aquatic species are imported from Indonesia, Japan, Malaysia, Maldives, Singapore, Thailand, and others. However, detailed information about importation is not available (Wijesekara and Yakupitiyage 2001).

Pomacea sp. became popular among ornamental fish hobbyists in Sri Lanka because of its beauty. Pet shop owners also commented on its effectiveness in scavenging on uneaten fish food, algae, and feces in home aquaria. However, the egg masses produced, which adhere to the sides of the tanks and ponds are visually unpleasant. This has led to the snails being discarded live in outside waters by hobbyists as well as aquaculturists (Kumara et al. 1999). Currently, *Pomacea* sp. is neither sold in pet stores nor reared in home aquaria.

Pomacea sp. was first observed in the water bodies in Colombo, Western Province (Gunawardena 1996) and in Galle, Southern Province (personal observation) in the early 1980s. The distance between these two locations is around 120 km. The expansion of the snail's range may thus have been promoted by human transport, whether intentional or accidental. People involved in the aquarium trade and/or ornamental fish hobbyists may have released this snail to the wild.

Pomacea sp. has now become one of the most destructive pests in rice fields in Indonesia, Malaysia, Philippines, Taiwan, and Vietnam (Lach et al. 2000, Cowie 2002). However, it has not yet assumed the status of rice pest in Sri Lanka. As such, neither the government, the public, nor scientists have paid much attention to these introduced snails.

Means of expansion

The snail has dispersed into Colombo, Galle, Gampaha, Kalutara, Kandy, Matara, and Ratnapura. Bellanwila-Attidiya Wildlife Sanctuary (372 ha) is the first legally protected area that has been invaded. Since first recorded in the wild nearly 25 years ago, the range of the

snail has been slowly expanding. Irrigation canals can facilitate its further dispersal as eggs or small juveniles attached to aquatic plants.

Identification of species

The number of species present in the country has not been fully investigated. Therefore, the names *P. canaliculata* and *P. bridgesii* have been used in a number of publications without any scientific evidence of their exact identity (Gunawardena 1996, Kumara et al. 1999, Nugaliyadde et al. 2001, Chandraratne 2005). Mordan et al. (2003) and Cowie et al. (2006) have identified one of the species as *Pomacea diffusa*. *P. diffusa* has not become a rice pest in any of the countries in which it is presently found (Cowie 2002). However, further research based on molecular studies should be carried out to determine whether there are species of *Pomacea* other than *P. diffusa*.

Features of the snail habitat

Pomacea sp. is widely distributed in the lowland wet zone. The major habitats are swamps and wetlands with clean waters as well as highly polluted canals in the urban centers. *Pomacea* sp. survives in canals in Colombo and Galle, which do not have any aquatic vegetation. It is found mainly in and around towns and has not yet spread to the major rice-farming areas. The reason might be the low popularity of rearing ornamental fish in rural areas, where rice fields are concentrated. However, *Pomacea* sp. is already found in rice-growing areas surrounding the Bellanwila-Attidiya Wildlife Sanctuary, such as Boralagamuwa, Kotte, and Rajagiriya. These areas are highly populated, and the rice fields are highly scattered. There are no complaints so far regarding damage to rice plants by the snails in these areas.

The lowland wet zone where *Pomacea* sp. has dispersed widely contains the majority of land snail species of the country (Mordan et al. 2003, Naggs et al. 2005). However, the aquatic snail composition in this area has not yet been investigated. Hence, the impact of these snails on the native mollusk fauna is not known.

Control and management

According to Kumara et al. (1999), *Pomacea* sp. found in Sri Lanka prefer *Hydrilla* sp. to *Azolla* sp. and *Salvinia* sp. as a food source. *Salvinia* is one of the most economically important invasive aquatic plants, while *Hydrilla* is abundant in most of the freshwater habitats of the country. Two other aquatic invasive weeds, *Eichornia crassipes* and *Pistia stratiotes*, widely distributed in freshwater bodies of Sri Lanka, are also not relished by apple snails (Lach et al. 2000). Therefore, the usefulness of this snail as an aquatic weed control agent, as suggested by some scientists (Okuma et al. 1994, Yusa and Wada 1999) is doubtful in the Sri Lankan context.

Sri Lanka exports a number of freshwater ornamental plants (ruffled sword plant, *Aponogeton*; fanwort, *Cabomba*; hornwort, *Ceratophyllum*; *Cryptocoryne*; water wistaria, *Hygrophila*; false loose strife, *Ludwigia*; common eel grass, *Vallisneria*), which earns all-important foreign exchange for the country. Even though *Pomacea* sp. has not done any economical damage to rice farming, it might significantly affect the aquatic ornamental plant industry in the future.

However, the National Aquaculture Development Authority still considers *Pomacea* sp. as an export commodity in the ornamental fish trade (Chandraratne 2005). The official figures on export and the names of the countries to which these snails are dispatched are not available.

Research needs

The following studies are suggested:

- Habitat modifications by this snail and its effects on native aquatic fauna and flora have not yet been investigated. It is important to investigate the ecology of the snail before it does major damage to native aquatic plants and animals.
- *Pomacea* sp. lives close to the mouth of the Dutch canal in Galle, Southern Province, where saline conditions prevail. The salinity tolerance levels of the snail should be investigated to identify its potential range of distribution.
- The pattern and total area of the snail's distribution have not been investigated. This information is required to manage any harmful effects it might have on the native aquatic fauna and flora.
- The natural enemies of *Pomacea* sp. should be identified and their potential as biocontrol agents evaluated.

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References

- Bambaradeniya, C. N. B., S. P. Ekanayake and J. Gunawardena. 2004. Preliminary observations on the status of alien invasive biota in natural ecosystems of Sri Lanka. <http://www.rbp-iucn.lk/books/alien/Chapter%206.pdf>.
- Chandraratne, N. 2005. Ornamental fish exports from Sri Lanka: A profile of species. National Aquaculture Development Authority News Letter 2(2)3-5.
- Cowie, H. R. 2002. Apple snails (Ampullaridae) as agricultural pests: Their biology, impact and management. Pages 145-192 in: Barker, G.M. (ed) Molluscs as crop pests, CAB International. Wallingford, Oxfordshire, United Kingdom.
- Cowie, R.H., K.A. Hayes, and S.C. Thiengo. 2006. What are apple snails? Confused taxonomy and some preliminary resolution, this volume.
- FAO (Food and Agriculture Organization). 1998. Fishery country profile. FID/CP/SRL. www.fao.org/fi/fcp/FICP_LKA_A.asp, Food and Agriculture Organization of the United Nations, Rome.
- Gunawardena, A. 1996. The submerged threat of golden apple snail. The Island, 1 December 1996. 9 pp.
- Halwart, M. 1994. The golden apple snail *Pomacea canaliculata* in Asian rice farming systems: Present impacts and future threat. International Journal of Pest Management 40:199-206.
- Halwart, M., M. C. Viray, and K. Kaule 1998. *Cyprinus carpio* and *Oreochromis mossambicus* as biological control agents of the golden apple snail, *Pomacea canaliculata*: Effects of predator size and prey density. Asian Fisheries Science 11:31-42.

- Kumara, P. A. D. A., W. U. Chandrasekara, and H. H. Costa. 1999. Effect of crowding, food quality and body size on food utilization of the exotic snail, *Pomacea canaliculata*, a potential pest of rice in Sri Lanka. *Sri Lanka Journal of Aquatic Sciences* 4:23-29.
- Lach, L., K. B. David, R. J. Rundell, and R. H. Cowie. 2000. Food preference and reproductive plasticity in an invasive freshwater snail. *Biological Invasions* 2:279-288.
- Mordan, P., F. Naggs, K. Ranawana, S. Kumburegama, and B. Grimm. 2003. A guide to the pest and exotic gastropods of Sri Lanka. Department of Zoology, The Natural History Museum, London. 10 pp.
- Naggs, F., D. Raheem, K. Ranawana, and Y. Mapatuna. 2005. The Darwin Initiative Project on Sri Lankan land snails: Patterns of diversity in Sri Lankan forests. Pages 23-30 in: Yeo, D.C.J., P.K.L. Ng, and R. Pethiyagoda (eds) *Raffles Bulletin of Zoology Supplement*.
- Nugaliyadde L., Y. Yusa, T. Hidaka, and A. A. L. Amarasinghe. 2001. Distribution of an alien snail, *Pomacea bridgesii*, in fresh water habitats and the potential threat to faunal diversity and rice cultivation in Sri Lanka. *Annual Symposium of the Department of Agriculture* 2:239-252.
- Okuma, M., Y. Fukushima, and K. Tanaka. 1994. Feeding habit of snail (*Pomacea canaliculata*) to paddy weeds and damage avoidance to rice seedlings. *Weed Research* 39:109-113.
- Pethiyagoda, R. 2005. Exploring Sri Lanka's biodiversity. Pages 1-4 in: Yeo, D.C.J., P.K.L. Ng, and R. Pethiyagoda (eds) *Raffles Bulletin of Zoology Supplement* 12.
- Wada, T. 1997. Introduction of the apple snail *Pomacea canaliculata* and its impact on rice agriculture. Pages 170-180 in: Yano, E., N. Suisansho, N. Kankyo, and G. Kenkyujo (eds) *Proceedings of the International Workshop on Biological Invasions of Ecosystems by Pests and Beneficial Organisms*. National Institute of Agroenvironmental Sciences, Tsukuba, Japan.
- Wijesekara, R. G. S., and A. Yakupitiyage. 2001. Ornamental fish industry in Sri Lanka: Present and future trends. *Aquarium Sciences and Conservation* 3:241-252.
- Yusa, Y., and T. Wada. 1999. Impact of the introduction of apple snails and their control in Japan. *Naga, The ICLARM Quarterly* 22(3):9-13.