

Common Indian Apple Snail (*Pila globosa*)

Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, March 2022

Revised, June 2022

Web Version, 7/28/2022

Organism Type: Mollusk

Overall Risk Assessment Category: Uncertain

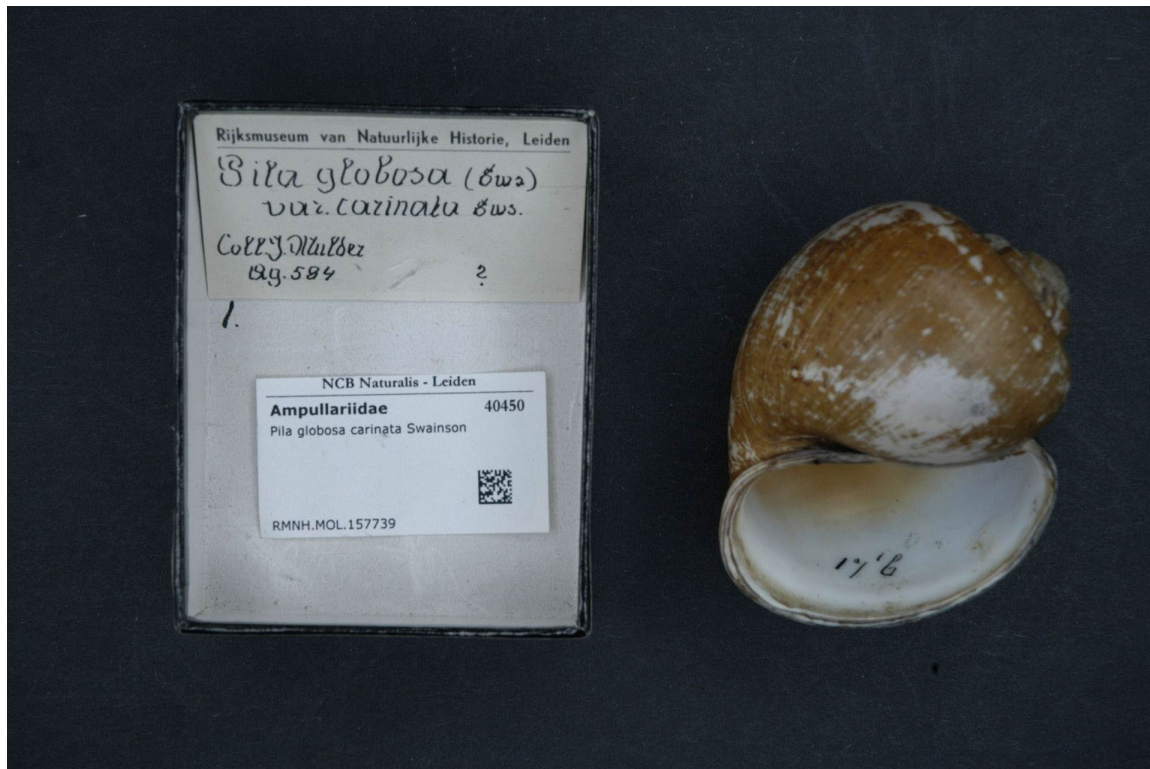


Photo: Naturalis Biodiversity Center/Wikimedia Commons. Licensed under the Creative Commons CC0 1.0 Universal Public Domain Dedication. Available: https://commons.wikimedia.org/wiki/File:Naturalis_Biodiversity_Center_-_RMNH.MOL.157739_-_Pila_globosa_carinata_Swainson_-_Ampullariidae_-_Mollusc_shell.jpeg (March 2022).

1 Native Range and Status in the United States

Native Range

According to MolluscaBase (2022), *Pila globosa* is present in India and Myanmar.

From Horgan et al. (2014):

“Bangladesh, India (North) [Jahan et al. 2001]”

From Perera and Epa (2008):

“There is only one species of apple snails (Family: Ampullariidae) native to Sri Lanka and it is *Pila globosa*.”

Status in the United States

No records of *Pila globosa* in trade or in the wild in the United States were found.

Means of Introductions in the United States

No records of *Pila globosa* in the wild in the United States were found.

Remarks

According to MolluscaBase (2022), *Ampullaria globosa* Swainson, 1822 is a synonym of *Pila globosa*. Information searches were conducted using both names for this screening.

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From MolluscaBase (2022):

“Biota > Animalia (Kingdom) > Mollusca (Phylum) > Gastropoda (Class) > Caenogastropoda (Subclass) > Architaenioglossa (Order) > Ampullarioidea (Superfamily) > Ampullariidae (Family) > Ampullariinae (Subfamily) > *Pila* (Genus) > *Pila globosa* (Species)”

“Status accepted”

Size, Weight, and Age Range

From Thomas (1975):

“[...], while *Pila globosa* measures 4-6 cm in diameter.”

Environment

From Budha et al (2010):

“This species lives in permanent and temporary stagnant water bodies and uses dry areas for breeding. Adults survive the dry season buried in soil.”

According to Budha et al. (2010), *Pila globosa* is a terrestrial and freshwater species.

From Navan and Kathy (2019):

“It is widely distributed in all types of temporary and permanent water bodies, such as ponds, canals, ditches, beels (a large surface static water body that accumulates surface runoff water through internal drainage channel), haors (a wetland ecosystem which physically is a bowl or saucer shaped shallow depression, also known as a back swamp), and baors (closed water body equivalent to an ox-bow lake, up to several hundred hectares) (Nath et al., 2008).”

Climate

From Cowie (2006):

“*Pila virens* and *Pila globosa* cannot survive 2 days at 40°C (Meenakshi, 1964).”

“*Pila virens* and *Pila globosa* cannot survive 4 days at 20°C and die within 1 day at 10°C (Meenakshi, 1964).”

Distribution Outside the United States

Native

According to MolluscaBase (2022), *Pila globosa* is present in India and Myanmar.

From Horgan et al. (2014):

“Bangladesh, India (North) [Jahan et al. 2001]”

From Perera and Epa (2008):

“There is only one species of apple snails (Family: Ammpullariidae) native to Sri Lanka and it is *Pila globosa*.”

Introduced

According to Horgan et al. (2014), *Pila globosa* has been introduced outside of its range in northern India to Kerala, a state near the southern tip of India. Horgan et al. (2014) also state that there are no recent records of this species in Kerala.

Means of Introduction Outside the United States

From Horgan et al. (2014):

“Food, commerce, potential biological control of schistosomiasis vectors”

Short Description

From Ghesquiere (2021):

“The shell is globose with an oval opening. [...] *Pila globosa* has a large and deep umbilicus. The colour varies from olive green to grey green with a tinge of red. A large number of

variations are known. The interior of the shell is dull reddish with very faint spiral bands visible, white at the columella.”

Biology

From Navan and Kathy (2019):

“Snail [*Pila globosa*] plays an important role in the ecosystem in maintaining healthy aquatic environments by acting as a biofilter, a pre-requisite for conserving biodiversity (Jahan et al., 2001)”

From Lal and Saxena (1952):

“This particular form, besides being amphibious, develops through a cleidoic egg. The most active period of this snail's life is during the rainy season, when it lives in fresh water and feeds and also breeds on the banks. With the approach of the winter it becomes less active and burrows in the mud to restivate for the rest of the year until the onset of the next rainy season”

From Cowie (2006):

“[...] those [eggs] of *Pila globosa* (Swainson) take 10-14 days at 32-38°C and 3 weeks at 21-27°C (Demian and Yousif, 1973).”

“*Pila virens* and *P. globosa* (and other species of *Pila*) aestivate buried very deep in the ground; their anaerobic aestivation metabolism may be an adaptation to this, [...]”

From Thomas (1975):

“It was also noticed that *Pila [globosa]* had the ability to rise to the water surface from below or effectively sink to the bottom by expelling air bubbles.”

“*Pila [globosa]* has the advantage of being able to live under water, since it has gills for breathing, and outside the water with its rudimentary lung or air-breathing organ.”

Human Uses

From Thomas (1975):

“In India, many states face serious problems on account of *Salvinia* infestation. [...] Biological control by snails, especially *Pila globosa*, a common tropical snail found in Kerala and other parts of India is suggested. It was found to feed voraciously on *Salvinia*, but not on paddy which forms a major crop in Kerala and other parts of India.”

From Hossain and Hasan (2017):

“Farmers have traditionally used the meat from apple snail (*Pila globosa*) as a feed for prawn. As prawn farming became more popular, the demand for snail meat grew and harvest of snails intensified, so much so that they have disappeared from many local wetlands.”

From Budha et al. (2010):

“In certain part of the distributional range of *Pila globosa*, [...] it is also used as food in poultry industry; however, this is not a threat to the species.”

“*Pila globosa* is commonly used as food by some people, mainly the tribals and lower economic groups in Nepal, the Sunderbans as well as the people of West Bengal, Bihar, Uttar Pradesh and other parts of India. It is one of the most preferred gastropod species utilised by tribal people as food. This species is also valuable source of nutrition for ducks and hybrid fish Magur (*Clarias batrachus*). In addition, soup prepared from the flesh is used as medicine that is believed to cure asthma, arthritis, joint swelling, rheumatism and in quick healing of wounds. The snail is cleaned and kept in water for a few hours and then the water is used like an eye drop to cure conjunctivitis (Subba Rao 1989).”

Diseases

No records of OIE-reportable diseases (OIE 2022) were found for *Pila globosa*.

From Biswas and Mukherjee (1981):

“The following species were recorded from hosts collected in and around Calcutta, West Bengal, India: [...] *Nyctotherus kemp* (170 × 84 µm) and *Balantidium depressum* (50 × 37 µm) from *Pila globosa* [...]”

From Budha et al. (2010):

“A number of trematodes like *Artyfechinostomum sufraginense*, *Echinostoma cercaria*, *Cercaria andhraensis*, *C. pigmentata*, *Diplodiscus* sp., and *Xiphidocercaria* sp. are reported from this species (Subba Rao 1989).”

MolluscaBase (2022) lists *Cephalogonimus mukerjii* as a parasite of *Pila globosa*.

Murty (1973) records *Pseudodiplodiscoides pilai* as a parasite of *Pila globosa*.

Threat to Humans

No information available.

3 Impacts of Introductions

A record of introduction was found but there was no information on impacts of introduction.

4 History of Invasiveness

There was one record of introduction of *Pila globosa* outside of its native range. *P. globosa* is native to areas of northern India but is reported as introduced to a state in southern India. It is unknown if this population was established but it was noted that the species has not been

recorded recently. While important in local trade within the native range, there were no records of *P. globosa* in trade outside of its native range. The history of invasiveness for this species is classified as No Known Nonnative Population.

5 Global Distribution



Figure 1. Known global distribution of *Pila globosa*. Map from GBIF Secretariat (2022). The location in Africa was not used to select source points for the climate match as it does not represent an established wild population. The two locations in southern India were not used to select source points for the climate match as it could not be verified that they represent established populations.

6 Distribution Within the United States

No records of *Pila globosa* in the wild in the United States were found.

7 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Pila globosa* was generally low for the contiguous United States. The southern edge of peninsular Florida had a high climate match. Areas that had a medium match were found in the in the desert southwest, along the Gulf and southern Atlantic coasts, and the remainder of peninsular Florida. Everywhere else had a low climate match. The overall Climate 6 score (Sanders et al. 2021; 16 climate variables; Euclidean distance) was 0.011, medium (scores between 0.005 and 0.103, exclusive, are classified as medium). Florida had a high individual Climate 6 score; all other States had a low individual climate 6 score.

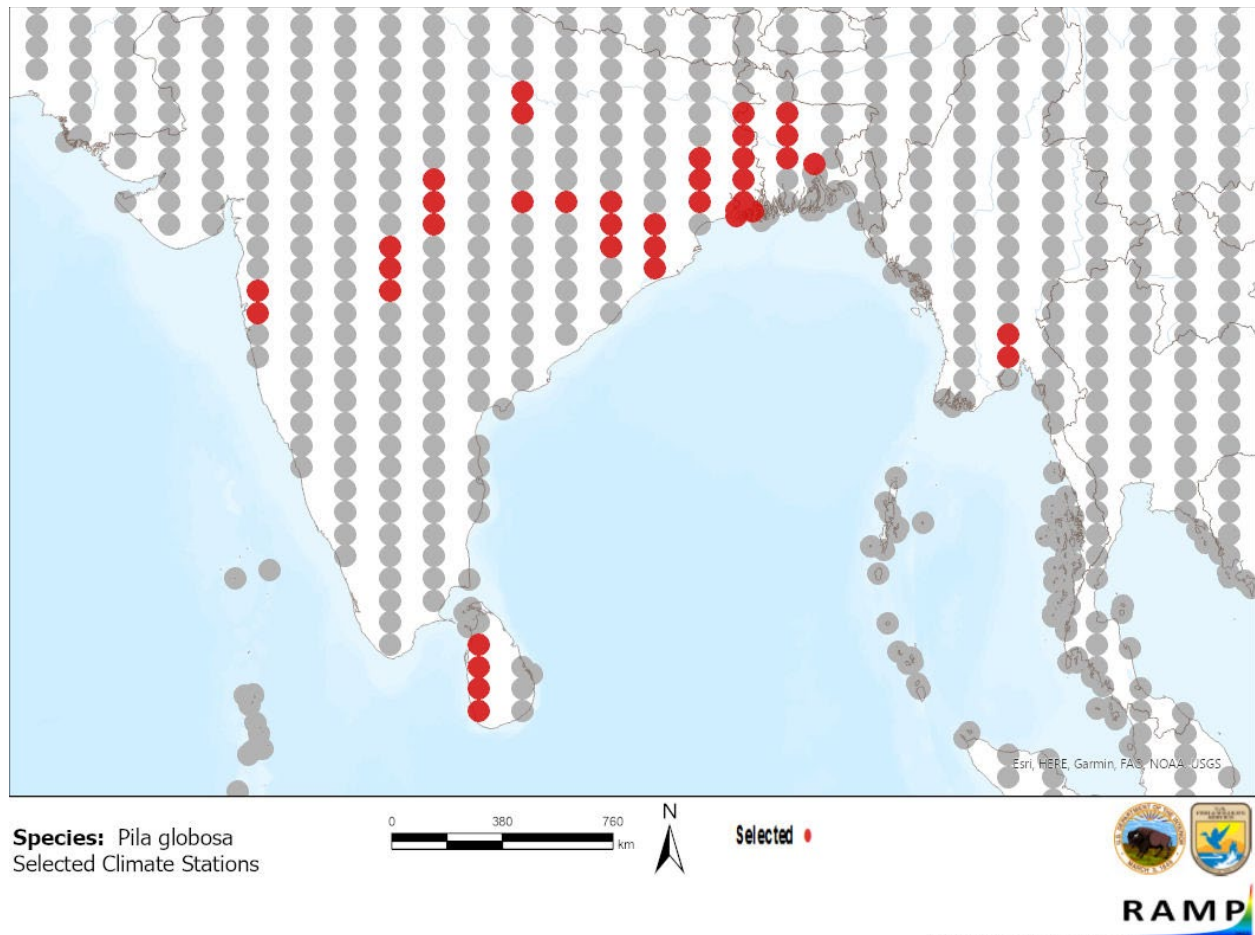


Figure 2. RAMP (Sanders et al. 2021) source map showing weather stations in South Asia selected as source locations (red; India, Sri Lanka, Bangladesh, Myanmar) and non-source locations (gray) for *Pila globosa* climate matching. Source locations from GBIF Secretariat (2022). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

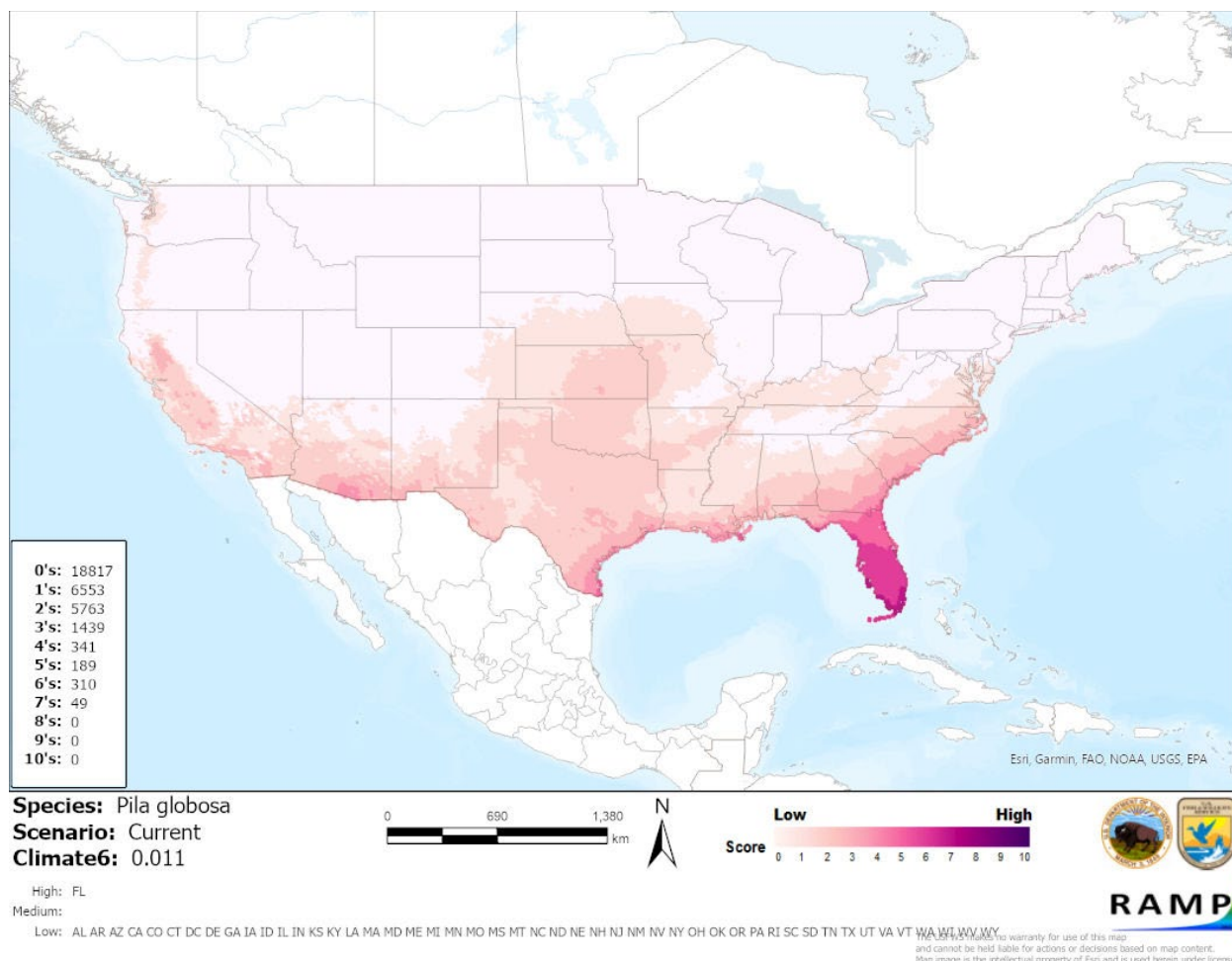


Figure 6. Map of RAMP (Sanders et al. 2021) climate matches for *Pila globosa* in the contiguous United States based on source locations reported by GBIF Secretariat (2022). Counts of climate match scores are tabulated on the left. 0/Light Pink = Lowest match, 10/Dark Purple = Highest match.

The High, Medium, and Low Climate match Categories are based on the following table:

Climate 6: (Count of target points with climate scores 6-10)/ (Count of all target points)	Overall Climate Match Category
$0.000 \leq X \leq 0.005$	Low
$0.005 < X < 0.103$	Medium
≥ 0.103	High

8 Certainty of Assessment

The certainty of assessment is low. There is some information available about the biology and ecology of *Pila globosa*. There is adequate information available on the native range. One record of introduction was found, however, there is no information on impacts of introduction and no evidence of establishment outside its native range.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Pila globosa, the common Indian apple snail, is a freshwater and terrestrial snail that is native to India, Bangladesh, Myanmar and Sri Lanka. It is widely used as a food source for humans and livestock and as a control for weedy aquatic plants in its native range. *Pila globosa* has been reported as introduced outside its native range within India, but establishment is unknown. No information on impacts from the introduction was found. There was no indication this species is in trade beyond its native range. The history of invasiveness for this species is classified as No Known Nonnative Population. The overall climate match for the contiguous United States for this species was Medium. Peninsular Florida had a medium-high climate match. Areas of medium match were also found along the Gulf and southern Atlantic coasts. The remainder of the contiguous United States had a low match. The certainty of assessment is Low due to a general lack of information on introductions. The overall risk assessment category for *Pila globosa* is Uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 4): No Known Nonnative Population**
- **Overall Climate Match Category (Sec. 7): Medium**
- **Certainty of Assessment (Sec. 8): Low**
- **Remarks, Important additional information:** No additional remarks
- **Overall Risk Assessment Category: Uncertain**

10 Literature Cited

Note: The following references were accessed for this ERSS. References cited within quoted text but not accessed are included below in Section 11.

Biswas MK, Mukherjee R. 1981. On some parasitic ciliates (Ciliophora: Protozoa) of invertebrate hosts from Calcutta and its environs. *Journal of the Zoological Society of India* 33(1/2):153–156. (Abstract only.)

Budha PB, Madhyastha A, Dutta J. 2010. *Pila globosa*. The IUCN Red List of Threatened Species 2010: e.T166694A6261849. Available: <https://www.iucnredlist.org/species/166694/6261849> (March 2022).

Cowie RH. 2006. Apple snails as agricultural pests: their biology, impacts, and management. Honolulu, Hawaii: Bishop Museum.

GBIF Secretariat. 2022. GBIF backbone taxonomy: *Pila globosa* (Swainson, 1822). Copenhagen: Global Biodiversity Information Facility. Available: <https://doi.org/10.15468/dl.tb2sx7> (March 2022).

- Ghesquiere S. 2021. *Plia globosa* (Swainson, 1822). The Apple Snail Website. Available: https://www.applesnail.net/content/species/pila_globosa.htm (March 2022).
- Horgan FG, Stuart AM, Kudavidanage EP. 2014. Impact of invasive apple snails on the functioning and services of natural and managed wetlands. *Acta Oecologica* 54:90–100.
- Hossain MA, Hasan MAR. 2017. An assessment of impacts from shrimp aquaculture in Bangladesh and prospects for improvement. Rome: FAO. FAO Fisheries and Aquaculture Technical Paper 618.
- Lal MB, Saxena BB. 1952. Uricotelism in the common Indian apple-snail, *Pila globosa* (Swainson). *Nature* 170:1024.
- MollucsaBase. 2022. *Pila globosa* (Swainson, 1822). World Record of Marine Species. Available: <https://www.marinespecies.org/aphia.php?p=taxdetails&id=842943> (March 2022).
- Murty AS. 1973. Life cycle of *Pseudodiplodiscoides pilai* (Trematoda: Diplodiscidae) from the gut of the apple snail, *Pila globosa* (Swainson). *The Journal of Parasitology* 59(2):323–326.
- Navan A, Kathy G. 2019. Worth chain examination of freshwater apple snail (*Pila globosa*) utilized for on-homestead feeds in the freshwater prawn cultivating segment in Bangladesh. *Journal of the Austrian Society of Agricultural Economics* 15(2):39–48.
- [OIE] World Organisation for Animal Health. 2022. Animal diseases. Available: <https://www.oie.int/en/what-we-do/animal-health-and-welfare/animal-diseases/> (March 2022).
- Perera GDT, Epa UPK. 2008. Habitat characteristics and population parameters of invasive alien golden apple snail, *Pomacea diffusa* in Western province, Sri Lanka. Pages 84–102 in Ranwala SMW, editor. *Proceedings of the National Symposium on Invasive Alien Species*. Sri Lanka Association for the Advancement of Science.
- Sanders S, Castiglione C, Hoff M. 2021. Risk Assessment Mapping Program: RAMP. Version 4.0. U.S. Fish and Wildlife Service.
- Sugunan VV. 1989. Annex VI Status of molluscan fishery resources in India and their sanitation and marketing. Report of the Workshop and Study Tour on Mollusc Sanitation and Marketing October 1989. France.
- Thomas KJ. 1975. Biological control of *Salvinia* by the snail *Pila globosa* Swainson. *Biological Journal of the Linnean Society* 7(4):243–247.

11 Literature Cited in Quoted Material

Note: The following references are cited within quoted text within this ERSS, but were not accessed for its preparation. They are included here to provide the reader with more information.

Demian ES, Yousif F. 1973. Embryonic development and organogenesis in the snail *Marisa cornuarietis* (Mesogastropoda: Ampullariidae) I. General outlines of development. *Malacologia* 12:123–150.

Jahan MS, Akter MS, Sarker MM, Rahman MR, Pramanik MN. 2001. Growth ecology of *Pila globosa* (Swainson) (Gastropoda: Pilidae) in simulated habitat. *Pakistan Journal of Biological Science* 4(5):581–584.

Meenakshi VR. 1964. Aestivation in the Indian apple snail *Pila* - 1. Adaptation in natural and experimental conditions. *Comparative Biochemistry and Physiology* 11:379–386.

Nath RD, Rahi ML, Hossain GS, Huq KA. 2008. Bangladesh status of fresh water snail in Khulna district. *Bangladesh Research Publications Journal* 1(4):337–347.

Subba Rao NV. 1989. Handbook: Freshwater Molluscs of India. Calcutta: Zoological Survey of India.