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A preliminary study on occurrence of fresh water snails in different snail habitats in some parts of Puducherry

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Abstract

Ponds, lakes and water bodies near paddy cultivation lands were examined for presence of fresh water snails from some parts of Union territory of Puducherry. A total of 439 snails were collected from during the period from September, 2015 to August, 2016 to know the type and intensity of different species of snails. The collected snails were identified as *Lymnaea luteola*, *Pila globosa*, *Bellamyia* sp., and *Indoplanorbis exustus* based on their shell morphological features. Among the various types of snails, *Lymnaea luteola* (41.68%) was found to be more followed by *Pila globosa* (33.25%), *Bellamyia* sp., (15.71%) and *Indoplanorbis exustus* (9.33%). Snails were found attached to the vegetation in these water bodies and the eggs of snail were enclosed in a slimy material attached to the water plants. Egg masses vary in the egg numbers varying from 30 to 50 eggs. Immature/ juvenile stages of snails were more in group and attached to roots, leaves and stem of the different water plants. Snails were found mostly on water plants *Egeria* sp. (Anacharis), *Eichornia* sp. (Water hyacinth), *Ceratophyllum* sp. (Hornwort), *Ipomoea asarifolia* (Palachedi) and *Nelumbo nucifera* (Indian lotus). Few cercariae released from infected *Lymnaea luteola* snails were identified as amphistome cercariae confirming snails as intermediate hosts for parasitic trematodes.

Keywords: Fresh water snails, Puducherry, *Lymnaea luteola*, *Indoplanorbis exustus*, *Bellamyia*, *Pila globosa*

Introduction

Snails and slugs are highly diverse group of invertebrates belong to the phylum Mollusca and class Gastropoda. Slugs are often described as snails without a shell, while snail bodies are enclosed in calcareous shells [1, 2]. The members of class Gastropoda have extraordinary diversification of habitats. They live in gardens, woodland, ponds, rivers, lakes, oceans and other ecological niches. Distribution of snails within the habitat may be patchy, which can be detected by repeated examination of different sites in their habitats. Moreover, snail densities vary significantly with the season. Snails are mainly classified as land living 'terrestrial snails' and water living 'aquatic snails' based on their habitats. The taxonomical characterization of snail is based on few important identical features like size, direction of the spiral, position of opening of the snail, tentacles, operculum and colour of the snails [3] and shell plays very important role than the soft parts for the taxonomy [4].

Some snails act as intermediate host of some trematode parasites of both medical and veterinary importance by harbouring larval stage of trematodes [5]. Only *Lymnaea* spp. harbour 71 species of trematodes [6]. Similarly *Indoplanorbis* sp. is responsible for transmission of different *Schistosoma* spp. as well as other trematodes such as *Echinostoma* spp. and some spirorchids [7]. The released cercariae may have zoonotic importance (eg. *Schistosoma* sp.) or pathogenic importance causing cercarial dermatitis or swimmers itch.

The snails and slugs also cause severe economic loss in field of livestock health, agriculture and forestry [8]. In Tamil Nadu, only a few reports available on the occurrence of snails. But not many reports are available from Puducherry. Considering the economic importance of snails, the present work was undertaken as a preliminary study to know the presence of fresh water snails, their habitats in some parts of Union Territory of Puducherry.

Materials and Methods

The present study was conducted in fresh water bodies from some parts of Union Territory of Puducherry lies at 11.93 °N 79.13 °E during the period from September, 2015 to August, 2016. Locations of places were selected randomly in relation to availability of water bodies, livestock and veterinary services for animals. Five ponds (1 in Ariyankuppam, 2 in Vilianur and 2 in Pangur), 2 lakes (Velrampet lake and Ossudu lake) and few water bodies in and surrounding areas near paddy cultivation lands (1 in Ariyankuppam, 2 in Manaveli, 1 in Thavalakuppam and 1 in Kirumambakam) were the places examined for the snails and their habitats (Fig. 1).

The habitats of snails were studied by examining the availability, type of water plants and their distribution in the water. The snails were collected randomly (Fig. 2a, 2b) in polythene bags from each place separately and washed in dechlorinated water. The shells of the dead snails were also collected from these areas. Snails were kept in different Petri dishes with dechlorinated water and subjected for identification following the keys of Mandahl-Barth, Rao and Lloyed [2, 4, 9]. Live snails were maintained in the aquarium with dechlorinated water with grass and some water plants collected from their habitats. Some snails were kept in test tubes with water in sunlight for 2-3 days at morning for release of cercariae of helminths. The dead snail's shells were stored in different plastic containers and labeled after identification. The authors also examined the ruminants slaughtered in corporation slaughter house located at Aatuthotti, Puducherry and some local meat selling shops in Ariyankuppam, Manaveli, Thavalakuppam areas of Puducherry to know the occurrence snail borne parasitic infections.

Results and Discussion

All the fresh water snails collected in this study from the places mentioned in Table 1 were identified as *Pila globosa*, *Lymnaea luteola*, *Indoplanorbis exustus* and *Bellamyia* sp., (Fig. 3, 4, 5 & 6) based on their morphological characters. *Pila globosa* and *Bellamyia* sp., were operculated snails whereas *Lymnaea luteola*, *Indoplanorbis exustus* were not. Out of 439 snails screened in this study from different places of Puducherry, 183 were *Lymnaea luteola* (41.68 %), 146 were *Pila globosa* (33.25 %), 69 were *Bellamyia* sp. (15.71 %) and 41 were *Indoplanorbis exustus* (9.33 %). In this study, the snail *Pila globosa* was seen in all the fresh water bodies. Most of the water bodies near paddy irrigation channels and ponds were seen with *Pila globosa* and *Lymnaea luteola* snails whereas *Indoplanorbis exustus* and *Bellamyia* sp. snails were seen both in ponds and lakes. *Pila globosa* snails were seen in more density during rainy seasons in Puducherry. *Indoplanorbis* sp. snails were also seen in the shallow water areas near the lakes and ponds. Fresh water snail species can survive outside water for short periods only. However, different species of snails died during the dry season, but some adult stages of *Pila* sp. snails were able to withstand desiccation by buried into the mud bottom. *Pila globosa* and *Bellamyia* sp. were found to have operculum that covers the opening of the shell but *Lymnaea luteola* and *Indoplanorbis exustus* snails were devoid of operculum.

Similarly Soundararajan [10] reported the occurrence of snails *Stenothyra blanfordiana* (43.73%), *Indoplanorbis exustus* (23.69%), *Radix luteola* (15.16%), *Pila globosa* (7.18%), *Bellamyia* sp. (5.16%), *Melanoides tuberculatus* (3.19%) and

Gyraulus convexiusculus (1.19%) out of 3259 snails collected from Kanchipuram district of Tamil Nadu. Also Muthu [11] reported the prevalence of aquatic snails like *Bithynia* sp., *Bellamyia* sp., *Radix* sp., *Melanoides* sp. and *Indoplanorbis* sp. from north eastern regions (Kanchipuram and Vellore districts) of Tamil Nadu.

Out of the different snails (*Indoplanorbis exustus*, *Bellamyia* sp., *Lymnaea luteola* and *Pila globosa*) examined randomly in separate test tubes under sunlight, only *Lymnaea luteola* discharged few amphistome cercariae, which were identified on the basis of posterior acetabulum and eye spots (Fig. 7). Tigga [12] earlier also reported that *Indoplanorbis* sp., *Lymnaea* sp. and *Gyraulus* sp. were common snails found positive for trematode cercariae in and around Ranchi district, Jharkhand, India.

Snails were most common in waters where water plants are abundant and in water moderately polluted with organic matter, such as faeces and urine, particular near the livestock and human habitations. Water plants serve as substrates for feeding and oviposition as well as providing protection from high water velocities and predators like fish and birds. The water plants were available in all the water bodies examined in this study. It was observed that young stages of snails were more attached in groups to roots, stem and leaves of water plants namely *Egeria* sp. (Anacharis), *Eichornia* sp. (Water hyacinth), *Ceratophyllum* sp. (Hornwort), *Ipomoea asarifolia* (Palachedi) and *Nelumbo nucifera* (Indian lotus) plants.

The eggs of snails in batches of 30-50 were found enclosed in a slimy or jelly transparent masses attached firmly to the roots, stems and leaves of water plants (Fig. 8). Microscopic examination of jelly masses revealed oval shaped eggs with developing embryo inside (Fig. 9). Authors also observed the development of juvenile snails from these egg masses and eggs masses freshly laid by snails attached to the sides of containers while maintaining these snails in fresh water with some water plants.

Various snail borne helminthic infections like paramphistomosis, nasal schistosomosis as reported from ruminants of Puducherry by different authors [13, 14] and also from animal cases presented to Teaching Veterinary Hospital, RIVER, Mettupalayam, Puducherry and from different veterinary dispensaries in Puducherry reveals the role of different snails in transmitting the helminth infections for ruminants. Examination of the ruminants slaughtered in corporation slaughter house, local meat selling shops of Puducherry revealed that amphistomosis was the most common infection in much number of slaughtered sheep, goats, cattle and buffaloes. Similarly, Das [13] reported that amphistomosis was 23.8 % and *Schistosoma* sp. was 0.37 % among the helminths infections of ruminants in Puducherry. From slaughter houses of Puducherry, 37.34 % of cattle, 20.73 % of goats and 28.73 % of sheep had amphistome infection during the year 2004 and the amphistomes recorded were *Paramphistomum epiclitum*, *Gastrothylax crumenifer*, *Cotylophoron cotylophorum*, *Fischoederius elongatus*, *F. cobboldi*, *Gigantocotyle explanatum*, *Carmyerius* sp., *Orthocoelium* sp., and *Calicophoron* sp. with *G. crumenifer* and *P. epiclitum* were predominant among the amphistomes recorded from Puducherry [13]. Latchumikanthan [14] also reported the occurrence of nasal schistosomosis by *Schistosoma nasale* infection from bullocks of Puducherry during 2011.

The water plants *Egeria* sp. (Anacharis), *Eichornia* sp. (Water hyacinth), *Ceratophyllum* sp. (Hornwort), *Ipomoea asarifolia*

(Palachedi) and *Nelumbo nucifera* (Indian lotus) were found abundant in the snail habitats and probably helps in breeding and development of snails. The authors also observed that local people working in and near snail prevalent paddy cultivation fields were often reporting problems of itching in their hands and legs mainly areas below the knee. They also reported topical application of neem and *Aloe vera* leaves paste helped them in reduction of itching problems. This itching might be due to the penetration of schistosome cercariae emerged from snails or allergic dermatitis. The presence of water bodies help in snail survival and maintenance of the infective stages of trematode parasites. Animals and avian schistosome parasites cercariae released in water by infective snails can cause allergic dermatitis/swimmer's itch in humans coming in contact with infected water bodies. Local people working in and near the paddy fields are at high risk for dermatitis. In the present study, animal grazing activities were followed by farmers near the snail prevalent areas (Fig. 10, 11) and these farmers were

given awareness about snails, snail borne parasites and their importance in disease transmission to animals and human beings. Further detailed study on other snail species, prevalence of cercariae in snails and snail control measures in Puducherry are warranted. This preliminary study by authors highlights the occurrence of snails, snail habitats and the risk of transmission of parasitic diseases from aquatic snails to animals and humans in Puducherry.

The authors also suggest some points for public health personnel during snail collection that (i) Random collection of snails can be followed for covering the larger area, (ii) Do not collect fresh water snails directly picking by bare hands since the risk of becoming infected with *Schistosoma* sp. is more, (iii) Use of rubber or plastic gloves protect perfectly against parasitic infections, (iv) The use of long-handled net is preferable, especially where there is more submerged vegetation, (v) Snails can be preserved easily in 70 % ethanol and shell of the snails can be kept as dry preservation.

Table 1: Occurrence of fresh water snails in some parts of Union Territory of Puducherry

Sl. No	Name of the place in Puducherry	Water bodies (No. of snails examined)	Snail species identified (in numbers)			
			<i>Lymnaea luteola</i>	<i>Indoplanorbis exustus</i>	<i>Bellamyia</i> sp.	<i>Pila globosa</i>
1	Ariyankuppam	Pond 1 (38 snails)	+	-	+	+
			(21)		(12)	(5)
2	Vilianur	Pond 1 (25 snails)	-	-	+	+
					(14)	(11)
3	Pangur	Pond 2 (32 snails)	+	-	-	+
			(20)			(12)
3	Pangur	Pond 1 (28 snails)	-	-	+	+
					(20)	(8)
3	Pangur	Pond 2 (19 snails)	+	-	+	+
			(6)		(3)	(10)
4	Velrampet	Velrampet lake (64 snails)	-	+	+	+
				(41)	(9)	(14)
5	Ousteri	Ossudu Lake (45 snails)	-	-	+	+
					(11)	(34)
6	Ariyankuppam- Tollgate	Paddy irrigation lands (35 snails)	+	-	-	+
			(28)			(7)
7	Manaveli-Odaiveli	Paddy irrigation channels (43 snails)	+	-	-	+
			(30)			(13)
8	Manaveli- Maanjalai	Paddy irrigation channels (38 snails)	+	-	-	+
			(31)			(7)
9	Thavalakuppam	Paddy irrigation lands (32 snails)	+	-	-	+
			(19)			(13)
10	Kirumambakam	Paddy irrigation lands (40 snails)	+	-	-	+
			(28)			(12)
Total		439 snails	183 (41.68 %)	41 (9.33 %)	69 (15.71 %)	146 (33.25%)

+ Presence of snails

- Absence of snails

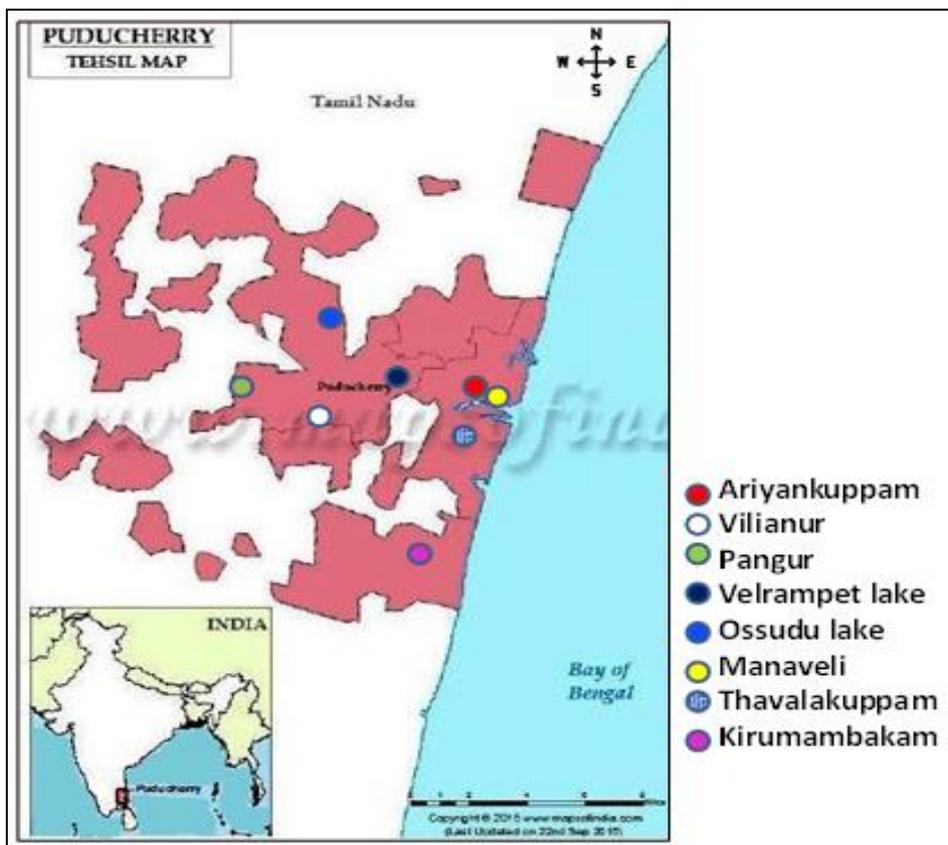


Fig 1: Location map of snail collection areas in Puducherry



Fig 2a: Collection of snails



Fig 3: Snail- *Lymnaea luteola*



Fig 2b: Collection of snails



Fig 4: Snail- *Indoplanorbis exustus*



Fig 5: Snail- *Bellamyia* sp.



Fig 6: Snail- *Pila globosa*

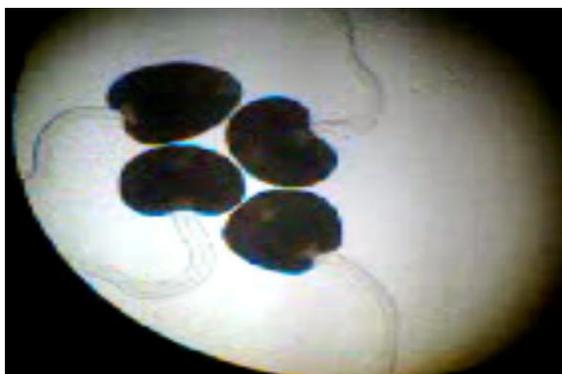


Fig 7: Amphistome cercariae released by *Lymnaea luteola* (x40)



Fig 8: Snail eggs enclosed in a jelly mass

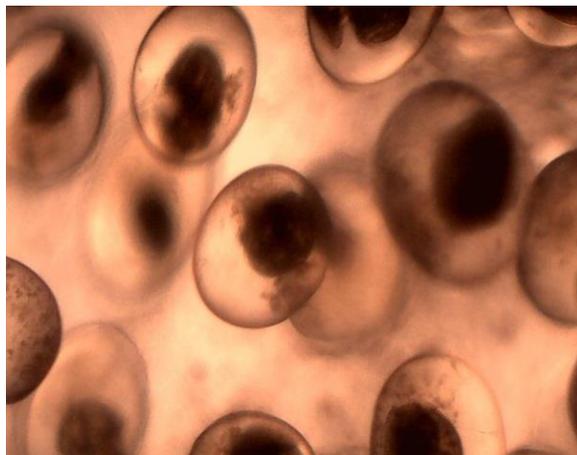


Fig 9: Eggs of *Lymnaea luteola* (x40)



Fig 10: Animal grazing near snail prevalent areas in Ariyankuppam, Puducherry



Fig 11: Snail habitat in Vilianur, Puducherry with *Ipomoea* sp. and grass

Conclusion

This preliminary study confirmed that the presence of snail species *Lymnaea luteola*, *Pila globosa*, *Bellamyia* sp., and *Indoplanorbis exustus* in some parts of Union Territory of Puducherry. Correlation between the incidence of parasitic diseases in a locality and prevalence of snail population in some areas helps in identifying the point of source of infection and development of preventive measures for helminth infections of livestock at the field level.

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