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ORIGINAL ARTICLE **OPEN ACCESS**

Study on Seasonal Diversity of Molluscan Species of Salaguri Area, Sivasagar, Assam

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ABSTRACT
Molluscs are used as bio-indicators to monitor the health of aquatic environments in both freshwater and marine environment. So far very less work has been done in the estimation of the diversity, distribution, and conservation of Molluscan species in a particular area. Hence detailed survey and distribution pattern has become very essential for the conservation of these species. The main objective of the study is to estimate the population of molluscs on a seasonal basis. The study was carried out from July 2022 to April 2023 in the Salaguri Village of Sivasagar district, India. During this study, a total number of 12 species were recorded. Corbicula assamensis, belonging to the family Cyrenidae is endemic to Assam and Achatina fulica is exotic. The Shannon-Weiner index was 2.31, 2.23, 2.39, and 2.22 during pre-monsoon, monsoon, post-monsoon and winter seasons respectively. The Margalef's index of richness was observed to be 1.81, 1.78, 1.92 and 2.68, whereas Pielou's evenness index was 0.93, 0.89, 0.96, and 0.89 during the season pre-monsoon, post-monsoon, and winter seasons respectively.
Keywords: *Diversity, Distribution, Richness, Evenness*

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INTRODUCTION

The Mollusca is the second largest phylum after Arthropoda which includes clams, snails, slugs, squids, octopods and nautili etc. It is not possible to assess accurately the total number of known species. But probably 1,00,000 living and a good number of fossil species(35,000) exist, as compared with ten times as many insects but only half as many vertebrates. Three-quarters (80,000) species of mollusca are gastropods with about 1700 genera and about 1000 bivalves. In India, there are 5050 molluscan species found distributed, out of which 3370 species are exclusively marine coming under 220 families and 591 genera [1]. Molluscs are classified into six classes according to their symmetry and the characteristics of food, shell, mantle, gills, nervous system, muscles, and radula– Monoplacophora, Amphineura, Scaphopoda, Gastropoda, Pelecypoda, and Cephalopoda. Molluscs are renowned for their adaptations to various lifestyles. They are distributed in almost all parts of the earth and exhibit different forms. Besides their abundance in space, they have left behind continuous paleontological records since the Cambrian period. The majority of the Molluscs are aquatic and a few are adapted to terrestrial environments. Usually, the snails and slugs lead a land life. The aquatic Molluscs are mostly marine. Few bivalves and snails inhabit freshwater or brackish water. Molluscs are usually herbivorous and live on available vegetables by scraping with the radular apparatus. Most of the bivalves live on micro-organisms, but the larval forms for some time lead to ectoparasitic life in the gill of fishes. Small fish and crustaceans are the main sources of food for all cephalopod predators. Different foods are preferred by the gastropods. Most of them are herbivores, while some are predatory. The gastropods in the order Pyramidellacea have a semiparasitic existence, whereas the endoconchidae family is made up of all endoparasitic forms that inhabit the bodies of holothurians. [2]. Molluscs' development and life cycle is complex, particularly in the early stages of development. Molluscs breed and reproduce in water, but they all find homes in seas and on land once they reach adulthood [3]. Bivalve mollusca is used as bio-indicators to monitor the health of aquatic environments in both freshwater and marine environment. Ever-increasing human population, habitat destruction, and pollution are some of the major threats to Molluscan fauna. Mollusca that live on land and in freshwater are particularly susceptible to becoming extinct. The quantity of non-marine molluscs is estimated to vary greatly, in part because no location has been thoroughly investigated [4]. Additionally,

there is a lack of experts that are capable of classifying every species and subspecies of animal. However, approximately 2,000 endangered non-marine molluscs were included on the IUCN Red List of Threatened Species in 2004. To put things into perspective, the vast majority of molluscs species are marine, but just 41 of them were included on the 2004 Red List. Since 1500, molluscs extinctions have been documented in around 42% of cases, with virtually exclusively non-marine species [5]. Detailed survey and distribution pattern has become very essential for the conservation of the molluscan fauna in a particular area. Hence the present investigation will be carried out to find out the biodiversity of Molluscan fauna. The main objective of the study is to estimate the population of molluscs on a seasonal basis. (Monsoon, Post-Monsoon, Winter, and Pre- Monsoon). Garg *et al*., 2009 recorded a total of 13 species of molluscs in the Ramsagar reservoir, India. The dominant class, Gastropoda was represented by 12 species, which were observed throughout the year [6]. Gupta *et al*., 2010 observed a total of 16 molluscan taxa belonging to 2 classes, viz., Gastropoda and Bivalvia, 4 orders, 5 families, and 9 genera from 12 different sites on river Barak and its tributaries like Chiri, Sonai, Rukni, Ghagra and Katakhal [7]. Kumar & Vyas, 2012 recorded 19 species (13 gastropod and 6 bivalve species) of molluscs in river Narmada, India [8]. Mishra *et al.,* 2013 collected as many as 18 species of Molluscans comprising 13 species of gastropods and 5 that of bivalves in Govindgarh Lake in Rewa District (M.P.) [9]. Sarwade *et al*., 2015 collected molluscs of 10 species and identified seven families i.e. Physidae, Lymnaeidae, Viviparidae, Corbiculidae, Thiaridae, Planorbidae, and Littorinidae included in class Gastropods and Bivalve [10]. Tripathy *et al*., 2015 studied molluscan diversity and the conservation status of molluscs in India and reported five classes of molluscs of the 279 global families [11]. Banerjee *et al.,* 2015 observed a total of 17 dominant species under the molluscan community encompassing two major classes namely Bivalvia and Gastropoda [12]. In a study in Kondakarla Freshwater Lake, Visakhapatnam, Andhra Pradesh, Sekhar, *et al.,* 2019 found 28.571% of class Bivalvia and 71.429% of Gastropoda at four stations [13].

MATERIALS AND METHODS

Study Area

Sivasagar district is one of the 32 districts of Assam in North-East India. It is located at 354 km. west towards the state capital Dispur. Sivasagar district is the 11th largest district in the state by population. This historic location is well known for its diverse and abundant biodiversity. The district covers an area of 1598 square kilometers as against the total area of 78438 square kilometers of Assam as per census of 2001. Sivasagar district is located between 94.25°E and 95.25°E longitudes and latitudes of 26.45°N and 27.15°N. The district is bordered on the north by the Brahmaputra River, on the south by Nagaland, on the east by Charaideo, and on the west by the Jhangi River [14]. The area selected for the present study covers the Salaguri Village of Sivasagar district including its aquatic and semi-aquatic habitats, a part of Demow pathar and up to Kalugaon. The area, covering 5.3 km^2, is situated about 10 km. south to the Sivasagar town and lies between latitude 26°92'N to 26°93'N and longitude 94°63'E to 94°64'E. The village has a male population of 1,426 and a female population of 1,338 individuals. The literacy rate of the villagers is 87.41% out of which 88.08% of males and 86.70% of females are literate. A total of 586 houses are there in Salaguri village [15].

Period of study

The study was carried out from July 2022 to April 2023.

Collection of Molluscs:

The specimens were collected on Sundays and holidays in a month from the entire area selected for the present investigation. The specimens were photographed in their natural habitats. Sample specimens were collected manually and/or with the help of nets and preserved in 70% Ethyl Alcohol. The samples were identified by comparing them with standard literature. Populations of the samples were estimated on a seasonal basis (Monsoon, Post Monsoon, winter, and Pre Monsoon).

Data Analysis

Community-level diversity was calculated using Shannon-Weiner Index:

$$H' = \sum PilnPi \quad (1)$$

Where *Pi* = Ni/N or the number of individuals of species

'i' divided by the total number of individuals of all the species,

ln is the natural logarithm

and H′ is the Shannon-Weiner index.

Richness was calculated using Margalef's Index:

$$R = \frac{(s-1)}{\ln N} \quad (2)$$

Where S is the total number of species

and N is the total number of individuals.

Evenness was calculated using Pielou's Evenness Index:

$$J = \frac{H\prime}{lnS} \quad (3)$$

Where, J Pielou's Evenness Index,
H' is the Shannon-Weiner Index
and S is the total no of species.

RESULT AND DISCUSSION

The present investigation is an outcome of 9 months (July 2022 – April 2023) of a survey in the Salaguri area of Sivasagar district. During this study, a total number of 12 species of molluscs were recorded. Out of them, 6 species belong to different orders of the class Gastropoda, 3 species belong to the class Bivalvia and 3 species of slugs. Corbicula assamensis, belonging to the family Cyrenidae is endemic to Assam and Achatina fulica is exotic. In the Salaguri area, it is seen that among the snails Achatina fulica has the highest abundance in all the seasons with a relative abundance of 14%, 16%, 10% and 25% during premonsoon, monsoon, post monsoon and winter seasons respectively, which is followed by Pila globosa with a relative abundance of 13%, 13%, 10%, and 18% during premonsoon, monsoon, post-monsoon and winter respectively. During premonsoon, and monsoon seasons Corbicula assamensis (relative abundance of 2% and 0% respectively) and during post-monsoon and winter seasons Macrochlamys indica was found in the least in number (relative abundance of 2%). Among the three slugs, found in this area the unidentified-1 spp. is mostly abundant in all seasons. Species diversity index, richness, and evenness were calculated, which gives us an idea about the variety and diversity of species in the study area. The Shannon-Weiner index was 2.31, 2.23, 2.39, and 2.22 during pre-monsoon, monsoon, post-monsoon, and winter respectively. The Margalef's index of richness was observed to be 1.81, 1.78, 1.92, and 2.68, whereas Pielou's evenness index was 0.93, 0.89, 0.96, and 0.89 during the season pre-monsoon, monsoon, post-monsoon and winter respectively. Typically values of the Shannon-Weiner index are generally between 1.5 and 3.5 in most ecological studies, and the index is rarely greater than 4. The conservation status of all the species recorded from Salaguri area is in the least concern. Of the species found in the study area, no species are legally protected.

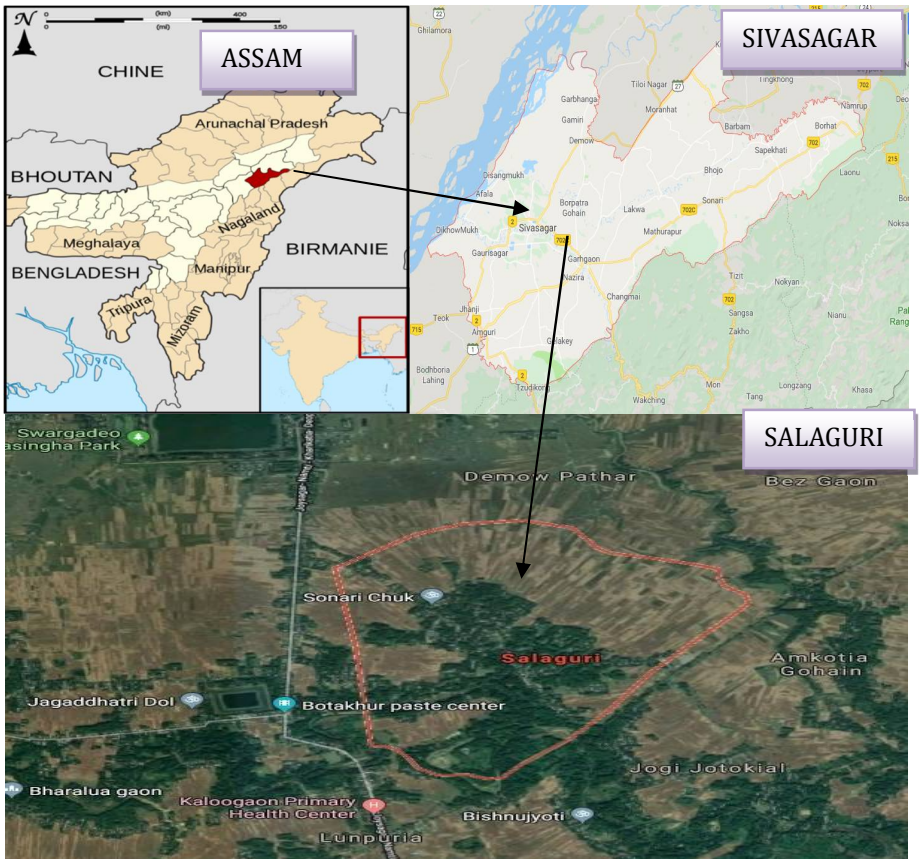

Fig.1: Map showing the study area

SL. NO.	Scientific name	Common name	Family	IUCN Red list Category	Legal protection
1	*Achatina fulica* (Ferussac,1821)	-	Planorbidae	Least Concern	No
2	*Melanoides tuberculata* (Muller,1774)	-	Lymnaedae	Least Concern	No
3	*Lymnaeae accuminata* (Lamarck,1822)	-	Ariophantidae	Least Concern	No
4	*Pila globosa* (Swainson,1822)	Red – rimmed melania	Thiaridae	Least Concern	No
5	*Macrochlamys indica* (Benson,1832)	Apple snail	Ampullaridae	Least Concern	No
6	*Indorplanorbis exustus* (Deshayes,1834)	-	Achatinidae	Least Concern	Not evaluated
7	*Lamellidens corrianus* (Lea,1834)	-	Uninoidae	Least Concern	No
8	*Parreysia favidens* (Benson,1862)	-	Uninoidae	Least Concern	No
9	*Corbicula assamensis* (Prashad,1928)	-	Cyrenidae	Least Concern	No
10	*unidentified 1*	Tropical leather leaf	Veronicellidae	-	No
11	*Laevicaulis alte* (Ferussac,1822)	-	-	-	-
12	*unidentified 2*	-	-	-	-

Table 1: List of species found in the study area with their conservation status

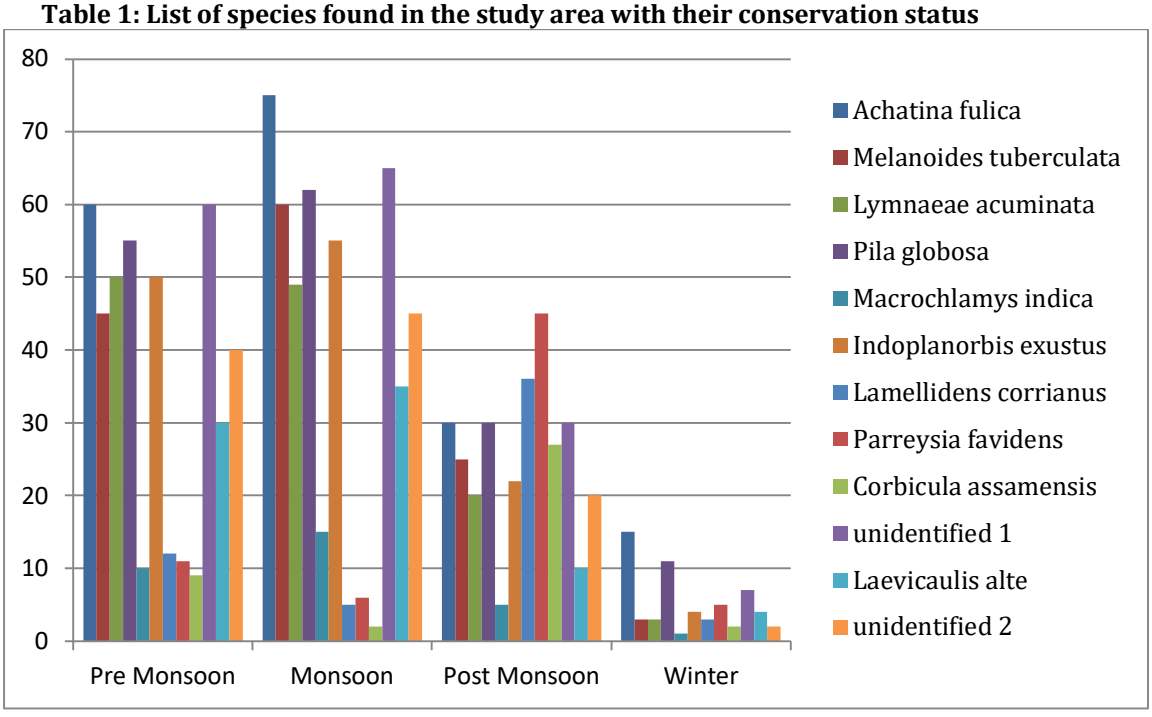

Fig 2: Seasonal diversity of Molluscan species in the study area.

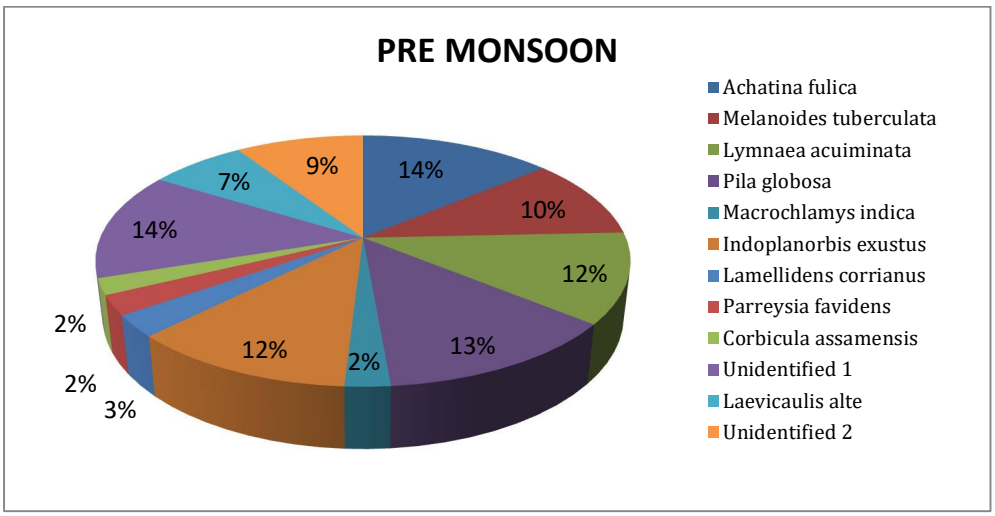

Fig 3: Relative abundance of species during pre monsoon

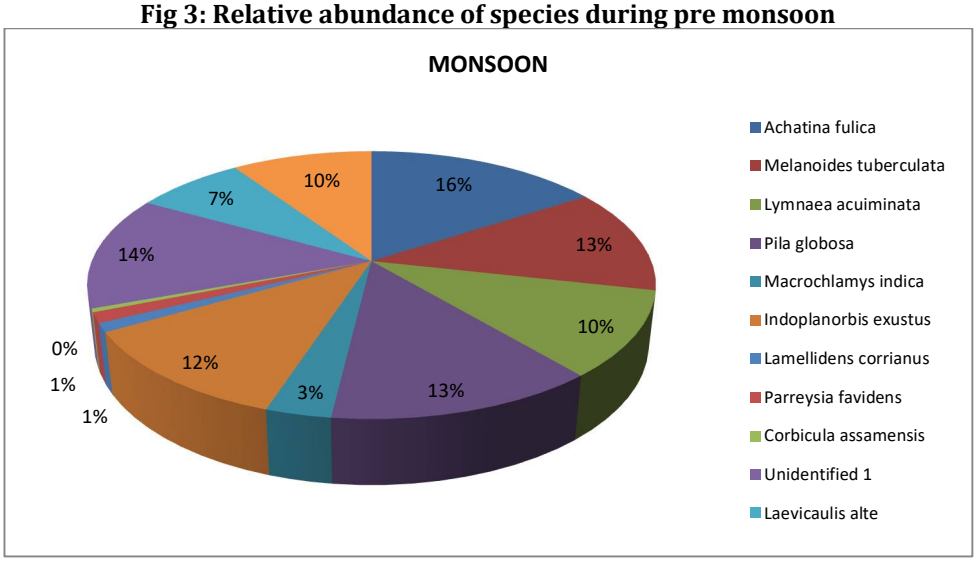

Fig 4: Relative abundance of species during monsoon

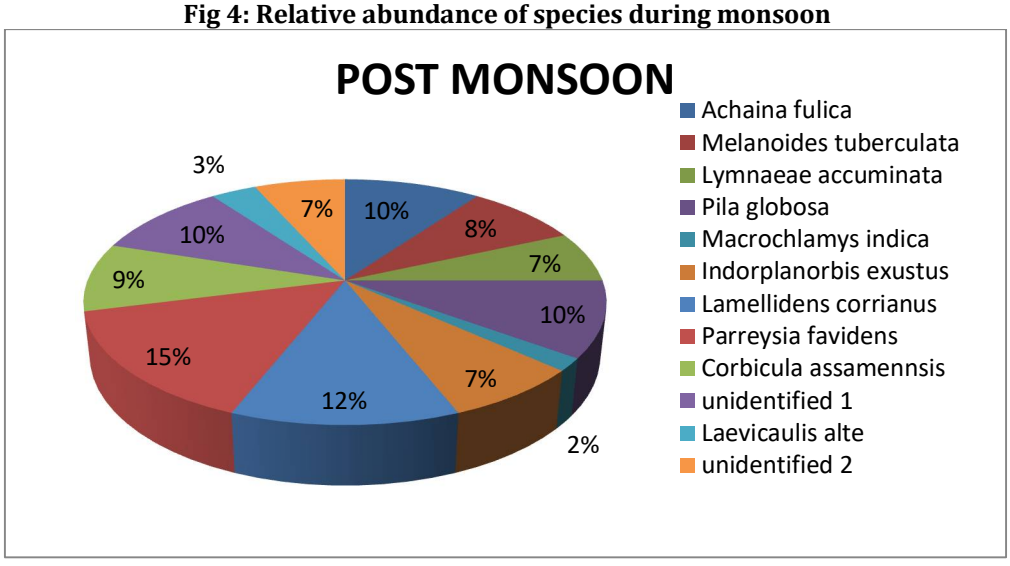

Fig 5: Relative abundance of species during post monsoon

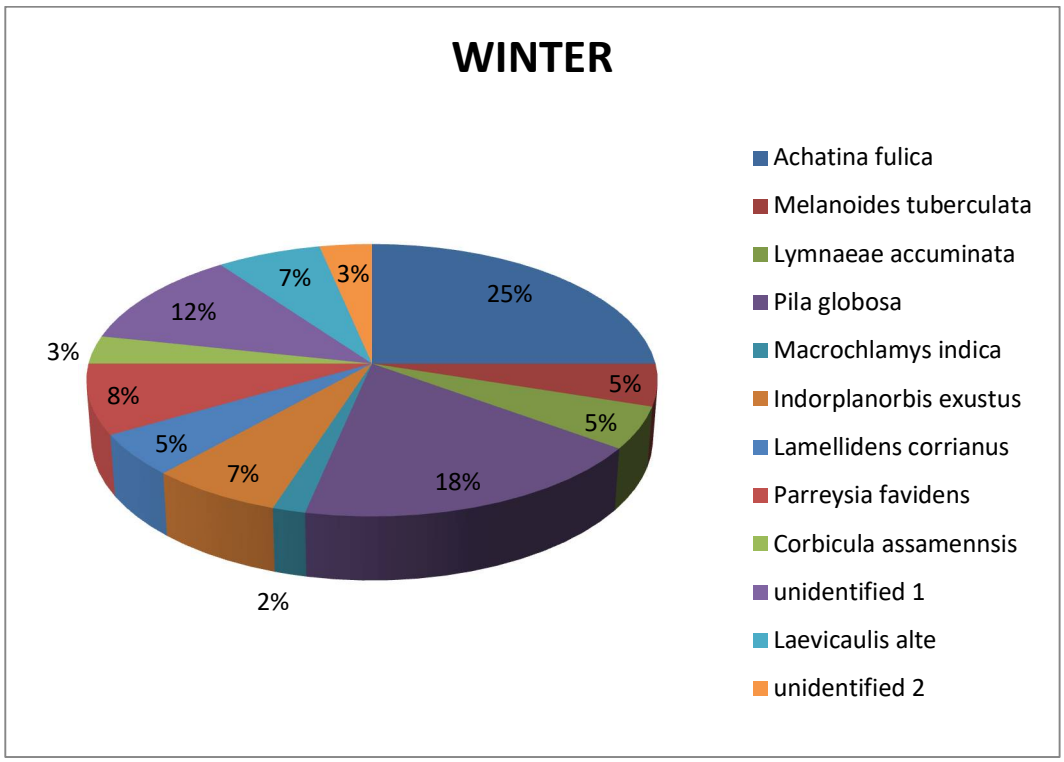

Fig 6: Relative abundance of species during winter

CONLUSION

From the present study, 12 species of molluscs were found, belonging to 9 families but 2 species of slugs are not identified. So far very less work has been done in the estimation of the diversity, distribution, and conservation of Molluscan species, especially in freshwater molluscs. Due to various natural and anthropogenic activities, the number of molluscs decreases day by day. Hence detailed survey and distribution pattern has become very essential for the conservation of Molluscan species in a particular area. Efforts for the study and conservation of these species are to be made to maintain a stable ecosystem.

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