



Freshwater Molluscs of Konaseema District, Andhra Pradesh, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Field surveys conducted in Konaseema district of Andhra Pradesh, especially from river Korangi and Coringa wildlife sanctuary area, revealed 21 species of molluscs belonging to 18 genera and 12 families. Of which 7 species viz., *Tricula montana*, *Stenothyra woodmasoniana*, *Stenothyra deltae*, *Stenothyra ornata*, *Gangetia miliacea*, *Assiminea francessi* and *Sermyla riquetii* recorded for the first time from the state. The shell characters, distribution and the current status of these species are discussed in this paper.

Keywords: *Freshwater mollusca; gastropod; distribution; Andhra Pradesh.*

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1. INTRODUCTION

Molluscs are the second largest and one of the most successful animal groups [1,2] and are colonized in marine, freshwater and terrestrial habitats. They play a vital role in nutrient recycling and food chain in the ecosystem they thrive in. Freshwater species are those that live at least a part of their life cycle in freshwater. They are divided into primary freshwater and secondary freshwater fauna. Primary freshwater fauna spend their entire life in freshwater and are intolerant to salt water, whereas secondary freshwater fauna are originally natives of estuarine ecosystem but are able to sustain themselves in freshwater. Most of the brackish water species cannot tolerate high levels of salinity and venture into freshwater ecosystems [3].

Molluscs constitute around 4% of total freshwater species described [4] and 6% of total described species in the world [2]. Globally, about 26 gastropod families of Mollusca are considered as primary freshwater and 4 families (Neritidae, Assimineidae, Hydrobiidae and Stenothyridae) as secondary freshwater [5] out of 402 families. In India, 217 species of freshwater molluscs belonging to 22 families were reported, of which 150 species are gastropods belonging to 16 families [6]. Mitra et al [7] reported 103 species of molluscs from undivided Andhra Pradesh. Of these, 60 species are terrestrial and 43 species are freshwater molluscs comprising 30 species of gastropods and 13 species of bivalves. Sajan et al. [8] added 3 terrestrial species viz., *Trachia asperella*, *Kaliella barrakporensis*, *Pterocyclos rupestris*. The present study contributes seven species to the knowledge of malacofauna exclusively from Andhra Pradesh state. Hence, currently a total of 113 species of molluscs are known from the state of Andhra Pradesh.

2. MATERIALS AND METHODS

2.1 Study Area

The study was carried out in Konaseema district, erstwhile East Godavari district (16°30' to 18° 20' N and 81° 30' to 82°36' E) of Andhra Pradesh. It occupies a geographical area of 2081 sq.km. It lies between the East Godavari, West Godavari and the Bay of Bengal with Amalapuram as its district head quarters. It is drained by Godavari, the second longest river in the country. Soils are mostly alluvial. Climate is hot and humid, January being the coldest month and May being

the hottest. Major rainfall is received during Southwest Monsoon.

The present study is based on a collection of Molluscan specimens from different sampling sites near river Korangi and other water pools surveyed during 2018-2020. The specimens were collected qualitatively by visual and tactile search method [9]. Specimens clinging to the floating aquatic weeds in the Korangi River were also collected using forceps. Dip nets of an appropriate size were used to collect gastropods from the aquatic habitat. Minimum one specimen of each species was collected. All the live specimens were narcotized and then carefully washed to get rid of dirt and excess mucus. They are then treated with ascending grades of alcohol and finally preserved in 70% Ethanol. The dried shells collected were dry preserved. After sorting, specimens were identified was done using standard literature [10-14]. The specimens were studied and photographed using Leica M205 microscope. The specimens were then labeled, and deposited in the National Zoological Collection of Freshwater Biology Regional Centre, Zoological Survey of India, Hyderabad.

3. RESULTS

Konaseema is one of the newly formed districts in Andhra Pradesh and supports a great diversity of flora and fauna. However, the non-marine malacofauna of this district is poorly studied. The present investigation recorded 21 species of freshwater molluscs accommodating under 12 families. Among these, *Tricula montana*, *Stenothyra woodmasoniana*, *Stenothyra deltae*, *Stenothyra ornata*, *Gangetia miliacea*, *Assiminea francessi* and *Sermyla riquetii* are reported for the first time from the state and all are listed under Least Concern as per IUCN Red List category. *Stenothyra* sp. was found to be prevalent and *Tricula* sp. was rare among collected specimens. Systematic list of 21 species and a systematic account of 7 newly recorded littorinid species are mentioned. The number of species reported under each family is shown in Fig. 4. The present findings reveal that Thiariidae was most diverse family comprising 5 species followed by Stenothyridae (4 species), Planorbidae (2 species), Viviparidae (2 species), and all other families are represented by one species each. Gastropods are represented by 10 families whereas bivalves are reflected by two families. Gastropods were found to be predominant both in species richness and density.

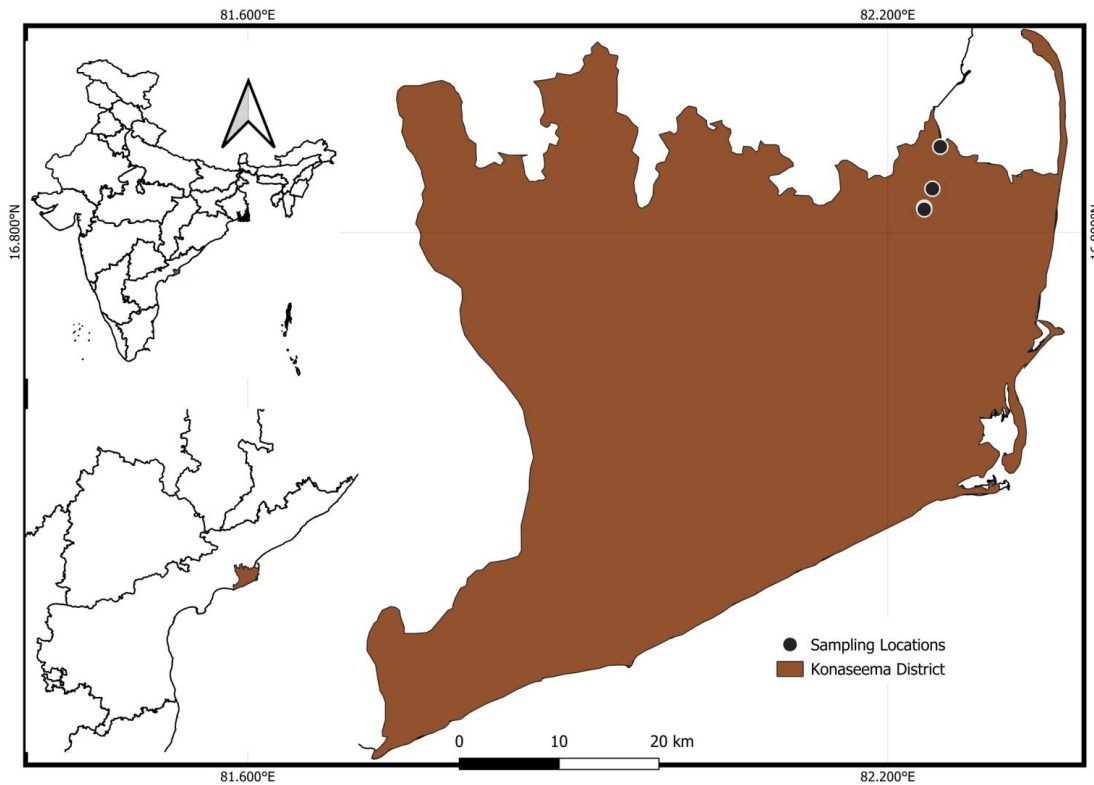


Fig. 1. Map showing the sampling sites of seven newly reported freshwater molluscan species

Systematic account of seven newly reported freshwater molluscan species

Phylum : Mollusca

Class : Gastropoda

Subclass : Caenogastropoda

Order : Littorinimorpha

Superfamily : Truncatelloidea

Family : Pomatiopsidae

Subfamily: Pomatiopsinae

Tribe: Triculini

Genus: *Tricula* Benson, 1843

1. *Tricula montana* Benson, 1843

Material Examined: India: Andhra Pradesh, Pond near Coringa sanctuary, 19.12.2018, (4 exs.), FBRC/ZSI/INV/2006, Latitude: 16.8803 N, Longitude: 82.24938 E; Coll. Dr. Karuthapandi & Party.

Distribution: Uttarakhand, Assam and Andhra Pradesh.

Shell characters: Small shell measuring about 8 mm in length and 3 mm in width. Shell is thin, conical and olive to grayish brown in color. Poorly developed growth lines and thickset of spiral lirae are present on the shell.

Elsewhere: Sri Lanka, Bhutan, Nepal

IUCN Status: Least concern

Family: Stenothyridae

Genus: *Stenothyra* Benson, 1856

2. *Stenothyra woodmasoniana* Nevill, 1880

Material Examined: India: Andhra Pradesh, Pond near Korangi river, 14.12.2018, (35 exs.), FBRC/ZSI/INV/2008, Latitude: 16.8213 N and Longitude 82.2345 E; Pond near Coringa sanctuary, 19.12.2018, (45 exs.), FBRC/ZSI/INV/2009, Latitude: 16.8803 N, Longitude: 82.24938 E; Coll. Dr. Karuthapandi & Party.

Shell characters: The average total shell length is 3.8 mm and shell width is 2.1 mm. The shell is devoid of any pits or ridges. The spire of the shell is acute and pointed. The shell has about 5 whorls and body whorl is slightly obtuse.

Distribution: West Bengal.

Elsewhere: Myanmar, Bangladesh

IUCN Status: Least concern

3. *Stenothyra deltae* (Benson, 1837)

Material Examined: India: Andhra Pradesh, River Korangi near Ramannapalem, 10.12.2020, (07 exs.), FBRC/ZSI/INV/2819, Latitude: 16.840905 N, Longitude: 82.241942 E; Pond near Coringa

sanctuary, 12.12.2020, (12 exs.), FBRC/ZSI/INV/2823, Latitude 16.8803 N, Longitude: 82.24938 E; Coll. Dr. Karuthapandi & Party.

Shell characters: The average total shell length is 4.78 mm and shell width is 2.95 mm. Shell is smaller than *S. ornata*. It has minute grooves aligned in spiral lines over the surface of the shell. Ventral surface of the shell seems to be little flattened. Aperture is circular. Mouth is small.

Distribution: West Bengal and Bihar.

Elsewhere: Myanmar, Bangladesh

IUCN Status: Least concern

4. *Stenothyra ornata* Annandale & Prashad, 1921

Material Examined: India: Andhra Pradesh, River Korangi near Ramannapalem, 10.12.2020, (02 exs.), FBRC/ZSI/INV/2820, Latitude: 16.840905 N, Longitude: 82.241942 E; Coll. Dr. Karuthapandi & Party.

Shell characters: The average total shell length is 5.5 mm and shell width is 2.89 mm. Shell is small but comparatively larger than other species of the genus. Shell is thick, ovoid, brown in color and ornamented with spiral rows of black horny spines projected towards the apex. It was collected from the mud settlements.

Distribution: West Bengal, Uttar Pradesh and Bihar.

Elsewhere: Bangladesh.

IUCN Status: Least concern

Genus: *Gangetia* Ancey, 1891

5. *Gangetia miliacea* (G. Nevill, 1880)

Material Examined: India: Andhra Pradesh, River Korangi, 12.12.2020, (5 exs.), FBRC/ZSI/INV/2824, Latitude: 16.840905 N, Longitude: 82.241942 E; Coll. Dr. Karuthapandi & Party.

Shell characters: The average total shell length is 3.72 mm and shell width is 2.09 mm. Shell is minute and sub cylindrical to conical in shape. Whorls in the upper part of the shell are flat while it is rounded in basal portion. The shell is smooth. Aperture is ovoid with a paucispiral operculum. Mouth is large. The central denticle of radula is prominent. This species is often found associated with *Stenothyra blanfordiana* [15]. But unfortunately the authors were not able to collect the latter species.

Distribution: Canning port, Chilka Lake and Sunderbans. Gangetic delta in India. The species

was found attached to weeds in Korangi river and thus corroborates the findings of Nevil *Elsewhere:* Burma, Bangladesh, Gulf of Oman.

IUCN Status: Least concern

Family: Assimineidae

Genus: *Assimineia* J. Fleming, 1828

6. *Assimineia francesiae* (Wood 1828)

Material Examined: India: Andhra Pradesh, Pond near Koringa wild life sanctuary road, 19.12.2018, (2 exs.), FBRC/ZSI/INV/2821, Latitude: 16.8803 N, Longitude: 82.24938 E; Dr. Karuthapandi & Party.

Shell characters: The average total shell length is 8 mm and shell width is 6.6 mm. Shell is small and elongated with pointed apex. Shell color varies from yellow to brown with dark spiral bands. Aperture is oblique. Shell has seven whorls.

Distribution: Maharashtra, West Bengal, Tamil Nadu, Kerala, and Karnataka

Elsewhere: Viet Nam, Bangladesh, Philippines, Myanmar and Sri Lanka.

IUCN Status: Least concern

Superfamily: Cerithioidea

Family: Thiaridae

Genus: *Sermyla* (H. Adams & A. Adams, 1854)

7. *Sermyla riquetii* (Grateloup, 1840)

Material Examined: India: Andhra Pradesh, Pond near Koringa wild life sanctuary road, 19.12.2018, (2 exs.), FBRC/ZSI/INV/2053, Latitude: 16.8803 N, Longitude: 82.24938 E; Dr. Karuthapandi & Party.

Shell characters: The average total shell length is 24 mm and shell width is 9 mm. Shell is medium sized and turreted. The upper part of the shell is sculptured with axial ribs and basal part of the body whorl has spiral grooves and ridges or furrows. About 8 whorls are present. The radula has a central triangular denticle with three other smaller denticles on both sides of central denticle.

Distribution: Maharashtra, West Bengal, Tamil Nadu, Kerala, and Karnataka

Elsewhere: South East Asia, Australia, Philippines, China, Japan and Taiwan

IUCN Status: Least concern

Systematic list of freshwater mollusks from Andhra Pradesh

Kingdom Animalia

Phylum Mollusca

Class Gastropoda
Order Cycloneritimorpha
Family Neritidae

1. *Neripteron violaceum* (Gmelin, 1791)
Order Archaitaenioglossa
Family Viviparidae
2. *Filopaludina bengalensis* (Lamarck, 1822)
3. *Idiopoma dissimilis* (Mueller, 1774)
Family Ampullaridae
4. *Pila globosa* (Swainson, 1822)
Order: Sorbeoconcha
Family Hydrobiidae
5. *Gabbia stenothyroides* (Dohrn, 1857)
Order Littorinimorpha
Family Pomatiopsidae
6. *Tricula montana* Benson, 1843
Family Stenothyridae
7. *Stenothyra woodmansoniana* Nevill, 1880
8. *Stenothyra deltae* (Benson, 1837)
9. *Stenothyra ornata* Annandale & Prashad, 1921
10. *Gangetia miliacea* (G. Nevill, 1880)
Family: Assimineidae
11. *Assimineia francesiae* (Wood 1828)
Family Thiaridae
12. *Meiniplotia scabra* (Muller, 1774)
13. *Sermyla riqueti* (Grateloup, 1840)
14. *Melanoides tuberculata* (Mueller, 1774)
15. *Tarebia lineata* (Gray, 1828)
16. *Tarebia granifera* (Lamarck, 1816)
Order Hygrophila
Family Physidae
17. *Haitia acuta* (Draparnaud, 1805)
Family Planorbidae
18. *Gyraulus labiatus* (Benson, 1850)
Tribe Segmentininae
19. *Indoplanorbis exustus* (Deshayes, 1834)
Class Bivalvia
Family Unionidae
20. *Lamellidens marginalis* (Lamarck, 1819)
Family Cyrenidae
21. *Corbicula striatella* Deshayes, 1854

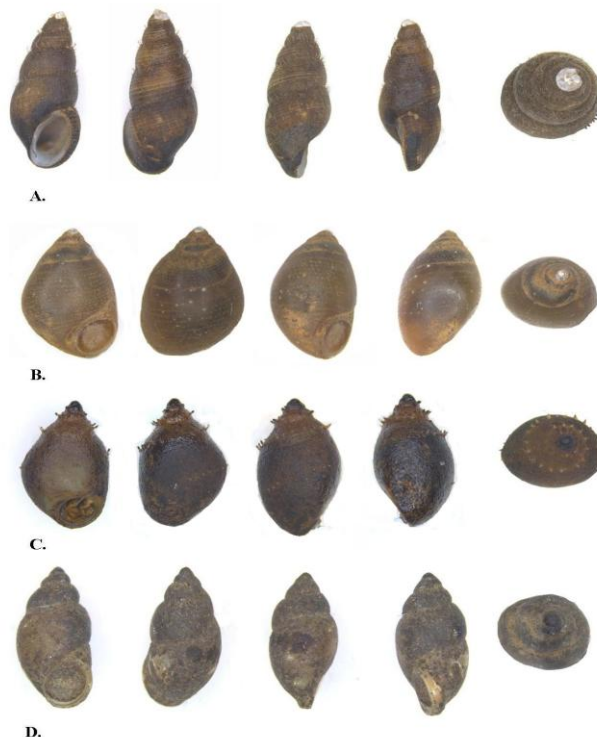


Fig. 2A. *Tricula montana* Benson, 1843; B. *Stenothyra deltae* (Benson, 1837); C. *Stenothyra ornata* Annandale & Prashad 1921; D. *Gangetia miliacea* (G. Nevill, 1880)

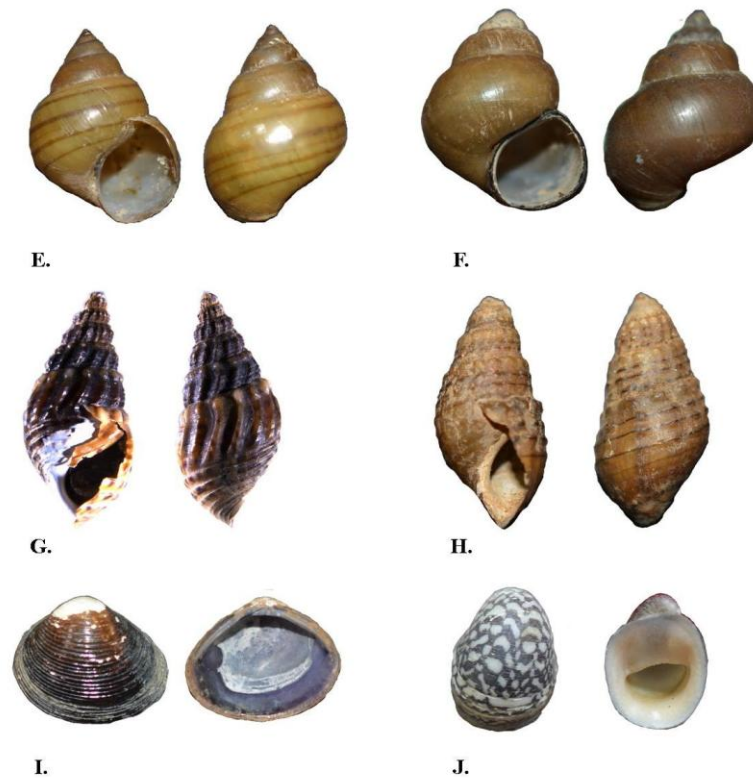


Fig. 3E. *Filopaludina bengalensis* (Lamarck, 1822); F. *Idiopoma dissimilis* (Mueller, 1774); G. *Sermyla riqueti* (Grateloup, 1840); H. *Tarebia granifera* (Lamarck, 1816); I. *Corbicula striatella* Deshayes, 1854; J. *Neripteron violaceum* (Gmelin, 1791)

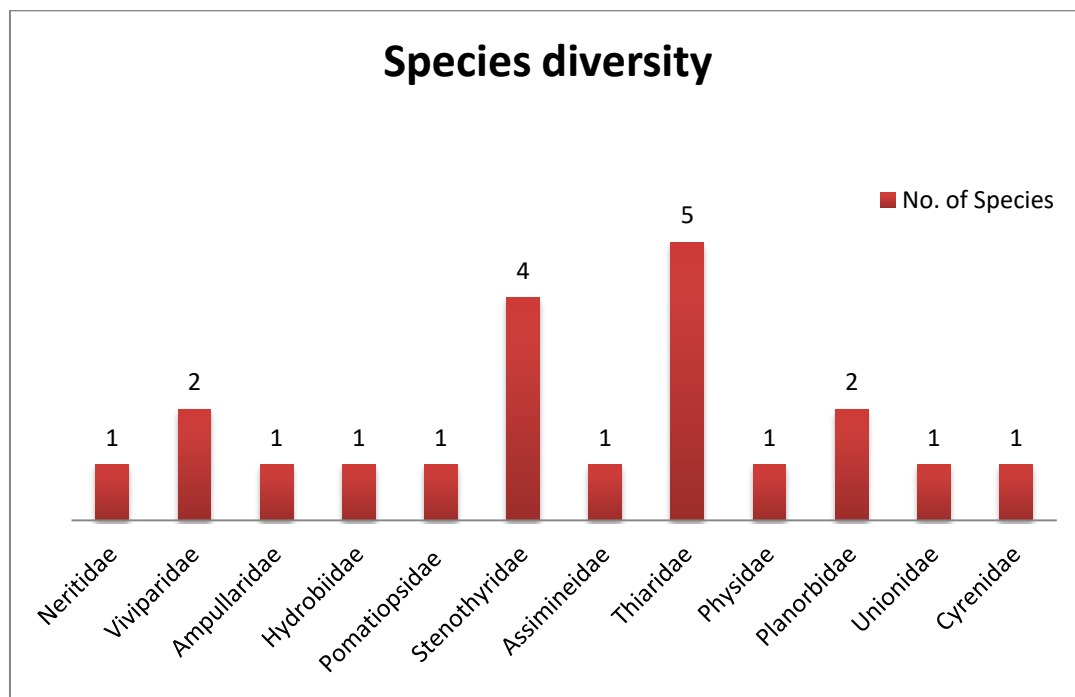


Fig. 4. Family wise composition of molluscs of Konaseema district, Andhra Pradesh, India

4. DISCUSSION

Tricula montana was initially recorded from Bheemtal lake [16]. Later, Davis et al. [5] studied the anatomy of the species. Nesseman et al [17] considered it to be restricted to Western and Central Himalayas and widely distributed in Uttarakhand and Nepal. The presence of this specimen in Andhra Pradesh reveals the range extension and dispersal abilities of *Tricula*. The family Stenothyridae has approximately more than 200 species belonging to 10 genera, of which genus *Stenothyra* alone has about 75 extant species [18]. Four species belonging to this family were identified in the present study. *Stenothyra woodmasoniana* was documented from 24 South Parganas, Chandpal ghat and gangetic delta of West Bengal. *Stenothyra deltae* was observed from Chandpal ghat of Canning, West Bengal and Bihar. It is considered to be restricted to low salinity areas and absent in high salinity waters [19]. *Stenothyra ornata* was recorded from Uttar Pradesh, West Bengal and Bihar. *Gangetia miliacea* was noted earlier from Canning port, Chilka lake, Orissa, Ganga River, Patna, Yamuna River, Allahabad. It is commonly found among weeds in brackish water pools at Port Canning [3]. *S. ornata* was also collected from the weeds floating in the river and hence corroborate with the research findings of Rao [3]. *Assiminea francesiae* was first reported from Bombay. It is also observed in Maharashtra, West Bengal, Tamil Nadu, Kerala, and Karnataka mainly from estuarine water. This is the only species of *Assiminea* found in the freshwater near tides. *Sermyla riquetii* was first noted in Bombay. This is found in the fresh to estuarine waters. It is documented from Maharashtra, West Bengal, Tamil Nadu, Kerala, and Karnataka mainly from estuarine water. Altogether 21 species [20].

5. CONCLUSION

The need for taxonomic studies has become apparent to fill the gaps in our knowledge of faunal diversity of a particular region. The attempt provides baseline information about freshwater molluscs of Konaseema district of Andhra Pradesh and helps in future ecological and conservation research. Most of the places in Andhra Pradesh are poorly explored. Further systematic exploration of the possible habitats may add more malacofaunal diversity to the state.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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