



Mollusca fauna of the campus of Arunachal Pradesh Regional Centre, Zoological Survey of India, Itanagar Wildlife Sanctuary, Arunachal Pradesh, along with two new records

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Abstract

A total of 13 Mollusca species belonging to eleven genera, six families, and two orders are reported from Arunachal Pradesh Regional Centre of Zoological Survey of India, situated inside Itanagar Wildlife Sanctuary, Papum Pare district. Two new distributional records of semi slug species from the state are also reported here in this paper. The presence of many invasive species during the present report is not a good indication in biodiversity-rich areas like Arunachal Pradesh.

Keywords: Exotic Species, Invasive Species, Mollusca, New Records, Wildlife Sanctuary

Introduction

Arunachal Pradesh Regional Centre of Zoological Survey of India spreading on 28,328 sq meter area is located within Itanagar Wildlife Sanctuary which was declared on 1978. The sanctuary which is about 140 sq km. area is located in Papum Pare district of Arunachal Pradesh with the geographical boundary as Pam River in the East, Pachin in the South, Neorochoi on the North-East and Chingke stream in the North. Interestingly, Itanagar city, which is the state's capital, is situated at the heart of the Itanagar Wildlife sanctuary. The sanctuary is home to numerous indigenous flora and fauna. There are multiple areas with rugged terrain with steep slopes and dense vegetation, yet explored and adequately documented.

The campus of the Zoological Survey of India is a part of the sanctuary and situated at the bank of the Senki river, which flows on the northern side of the sanctuary. The river becomes the Dikrong river after joining with Pare river and flows towards Assam as a major tributary of the mighty Brahmaputra river. The campus is rich with various types of wild fauna, including vertebrates animals like monitor lizards, squirrels, and mongooses. Different types of skinks, garden lizards are frequently sighted inside the campus. The campus is also a foraging ground for different kinds of birds. Invertebrate animals belonging to Odonata, Dermaptera, Orthoptera, Ephemeroptera,

Hemiptera, Megaloptera, Hymenoptera, Coleoptera, Lepidoptera, Diptera etc., are abundantly found inside the campus. Other lesser-seen groups like spiders and scorpions are also available. A total of 94 Lepidoptera species have been recorded from the campus (Sharma and Goswami, 2020).

So far there is no consolidated report of malacofauna of the state. However, lots of works on inventorisation of mollusca have been done during British India. Besides the Fauna of British India (Mollusca) series, works of Ramakrishna and Mitra (2002), Preston (1915), Mitra *et al.* (2004), Hutton (1834), Gude (1915), Dey *et al.* (1985), Blanford and Blanford (1861) and Benson (1859) have contributed to the study of malacofauna of the state. The rich malacofauna of the state was reflected by the report of many new species and genera described from the state (Ramakrishna *et al.* 2005). Ramakrishna *op. Cit.* reported 18 species of mollusca under 16 genera and 12 families from Itanagar Wildlife Sanctuary.

Material and Methods

The study was carried out from August 2019 to July 2020. Molluscan examples were hand-picked randomly from the campus areas during the period on a monthly basis to see the seasonal availability. Empty shells of dead animals were kept in dried form while live animals were preserved

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in 70% ethanol solution. All the samples collected were deposited in the National Zoological Collection (NZC) of Arunachal Pradesh Regional Centre, Zoological Survey of India, Itanagar. The molluscans were identified using relevant literature. The classification followed is that of Vaught (1989), and the name of the species is after Mollusca Base (2020), available on <https://www.molluscabase.org>. Systematic list and accounts of the 13 Mollusca species belonging to eleven genera, six families, and two orders reported from the campus is given below.

Systematic Account

Family ACHATINIDAE

Genus *Lissachatina* Bequaert, 1950

1. *Lissachatina fulica* Bowdich, 1822

1822. *Achatina fulica* Bowdich, *Elements of Conchology, Univalves*. 79 pp., 19 pl. Paris.

2006. *Lissachatina fulica*: Gerlach, Justin. *Mollusca of the Seychelles islands*. Backhuys BV, Leiden, 1-141: 36.

Material examined: ZSI/IV/APRC/M-265 (3 exs), 16.xii.2019; ZSI/IV/APRC/M-270 (1 ex), 20.vi.2020.

Distribution: Throughout the country. *Elsewhere*: A widely distributed species.

Remarks: The species is native to the east coast of Africa (Rowson *et al.*, 2010) but widely introduced in many parts of the world. The snail is the most frequently occurring invasive snail, commonly known as Giant African land snail. It is a highly invasive species listed in the 100 most invasive species of the world by the Global Invasive species database of IUCN because of its fast-growing voracious polyphagous feeding habit. The species is reported for the first from the state.

Genus *Allopeas* H. B. Baker, 1935

2. *Allopeas gracile* (Hutton, 1834)

1834. *Bulinus gracile* Hutton, *J. Asiat. Soc. Beng.*, 3: 84: No.5 *Bulinus (mithi) gracilis*: 93.

2010. *Allopeas gracile*: Rowson, Warren, Ngereza, *ZooKeys*, 70: 1-39.

Material examined: ZSI/IV/APRC/M-266(17 exs). 16.xii.2019; ZSI/IV/APRC/M-271(15 exs), 15.vi.2020.

Distribution: Arunachal Pradesh, Common throughout. *Elsewhere*: A widely distributed species in the whole of Southeast Asia.

Remarks: This species causes considerable damage to various vegetable plants because of its omnivorous feeding habit. The species is invasive as per Invasive

Species Compendium (<https://www.cabi.org>). However, the species could not be termed a significant pest except under restricted circumstances (Capinera, 2017). This species occurs very close to human habitations, on damp walls on potted plants etc.

Genus *Glessula* Martens, 1860

3. *Glessula naja* Pilsbry, 1909

1909. *Glessula naja* Pilsbry, *Man. Conch.* (2) 20: 90, pl.12, fig.10.

2000. *Glessula naja*: Dey & Mitra. *Rec. zool. Surv. India*, 98(2): 27.

Material examined: ZSI/IV/APRC/M-269 (4 exs), 16.xii.2019; ZSI/IV/APRC/M-285 (6 exs), 02.v.2020.

Distribution: India: Arunachal Pradesh, Assam, Meghalaya, and Tripura.

Remarks: The species is found along with *Rishetia tenuispira* inside the campus, however lesser in abundance.

Genus *Rishetia* Godwin-Austen, 1920

4. *Rishetia tenuispira* (Benson, 1836)

1836. *Achalina tenuispira* Benson, *J. Asiat. Soc. Beng.*, 5: 353.

1909. *Glessula tenuispira*: Pilsbry, *Mall. Conch.*, (2)20: 88, pl. 9, figs. 1, 4.

2014. *Rishetia tenuispira*: Raheem, Taylor, Ablett, Preece, Aravind, Naggs. *Tropical Natural History. Supplement 4*: I-XIV, 1-244.

Material examined: ZSI/IV/APRC/M-268 (5 exs), 16.xii.2019; ZSI/IV/APRC/M-275 (2 exs), 05.vii.2029; ZSI/IV/APRC/M-286 (2 exs), 02.v.2020.

Distribution: Arunachal Pradesh, Maharashtra, Meghalaya, Mizoram, Sikkim, West Bengal. *Elsewhere*: Bangladesh, Myanmar.

Remarks: The species is found abundantly inside the campus; though there is no report of its invasive nature, these species were observed under the stone and decaying vegetation.

5. *Rishetia nevillei* (Godwin-Austen, 1876)

1876. *Opeas nevillei* Godwin-Austen, *Journal of the Asiatic Society of Bengal*. 45(2): 311-318, plate VIII.

2000. *Lamellaxis nevillei*: Dey and Mitra, *Rec. zool. Surv. India*, 98(2): 28.

2021. *Rishetia nevillei*: Mollusca Base. <https://molluscabase.org/aphia.php?p=taxdetails&id=1398689>.

Material examined: ZSI/IV/APRC/M-267 (4 exs), 16.vii.2019; ZSI/IV/APRC/M-272(2exs), 06.vii.2029; ZSI/IV/APRC/M-287 (2 exs), 02.v.2020.

Distribution: India: Arunachal Pradesh.



Figure 1. *Girasia crocea* (Godwin-Austen, 1872).

Remarks: Closely similar with *Allopeas gracile*, however, differentiated by the more elongate body. For the first time, the species was described from Dafla hills, Arunachal Pradesh and endemic to the state.

Family HELICARIONIDAE

Genus *Girasia* Gray, 1855

6. *Girasia crocea* (Godwin-Austen, 1872) (Figure 1)

1872. *Helicarion (Hoplites) crocea* Godwin-Austen, *Proc. zool. Soc. Lond.*, 517, pl. 30, figs. 9,9a.

2000. *Girasia crocea*: Dey & Mitra, *Rec. zool. Surv. India*, 98(2): 32.

Material examined: ZSI/IV/APRC/M-283 (2 exs), 02.v.2020; ZSI/IV/APRC/M-288 (2 exs), 22.vi.2020; ZSI/IV/APRC/M-278 (3 exs), 06.vi.2019.

Distribution: India: Arunachal Pradesh, Assam, and Meghalaya.

Remarks: The animal is bright saffron-yellow and reported for the first time from the state.

7. *Girasia hookeri* Gray, 1855 (Figure 2)

1855. *Girasia hookeri* Gray *Cal. Pulm., Brit. Molls.* p. 61.

2000. *Girasia hookeri*: Dey & Mitra, *Rec. zool. Surv. India*, 98(2): 32.

Material examined: ZSI/IV/APRC/M-281 (4 exs), 08.viii.2019; ZSI/IV/APRC/M-283 (3 exs), 21.vi.2020.

Distribution: Arunachal Pradesh, Manipur, and Nagaland.

Remarks: Commonly spotted during rainy season. The species is reported for the first time in the state.

Family ARIOPHANTIDAE

Genus *Macrochlamys* Gray, 1847

8. *Macrochlamys atricolor* (Godwin-Austen, 1875)

1875. *Helix (Nanina) atricolor* Godwin-Austen, *J. Asiat. Soc. Beng.*, 44(2): 2, pl. 1, fig. 2.



Figure 2. *Girasia hookeri* Gray, 1855.

2010. *Macrochlamys atricolor*: Ramakrishna, Mitra & Dey, *Rec. zool. Surv. India, Occ. Paper No.*, 306: 262.

Material examined: ZSI/IV/APRC/M-276 (5 ex), 8.x.2019; ZSI/IV/APRC/M-289 (6 exs), 03.iv.2020.

Distribution: Arunachal Pradesh, Assam, Manipur, Meghalaya, and Nagaland. *Elsewhere:* Myanmar.

Remarks: Shell is smooth and polished and is abundantly occurring species inside the campus.

9. *Macrochlamys indica* Godwin-Austen, 1883

1883. *Macrochlamys indica* Godwin-Austen, *Land and Freshwater Moll. India*, 1: 76, 97, pl. 18, figs.1-8; pl. 21, fig. 7; pl.25, figs. Y, 16.

2010. *Macrochlamys indica*: Ramakrishna, Mitraand Dey, *Rec. zool. Surv. India, Occ. Paper No.*, 306: 271.

Material examined: ZSI/IV/APRC/M-263 (15 exs), 16. xii. 2019; ZSI/IV/APRC/M-290 (12 exs), 26.vi.2020.

Distribution: Arunachal Pradesh, Assam, Mizoram, Sikkim, and West Bengal. *Elsewhere:* Bangladesh and Sri Lanka.

Remarks: The most common species of the genus, widely and abundantly occurring throughout the country, including the Andaman Islands, except the dry north-western parts of India. It is commonly known as garden snails of India.

Family CAMAENIDAE

Genus *Bradybaena* Beck, 1837

10. *Bradybaena cestus* (Benson, 1836)

1836. *Helix cestus* Benson, *J. Asiat. Soc. Beng.*, 5: 353.

2010. *Bradybaena cestus*: Ramakrishna, Mitra & Dey. *Rec. zool. Surv. India, Occ. Paper No.*, 306: 336.

Material examined: ZSI/IV/APRC/M-264 (5 exs), 16.xii.2019; ZSI/IV/APRC/M-274 (43 exs), 20.iv.2019; ZSI/IV/APRC/M-291 (11 exs), 06.06.2020.

Distribution: Arunachal Pradesh, Assam. *Elsewhere:* Bangladesh and Cambodia.

Remarks: It may be called the garden shell of the North Eastern Himalayas. There is a huge population of this species inside the campus.

Family VERONICELLIDAE

Genus *Eleutherocaulis* Simroth, 1913

11. *Eleutherocaulis alte* (Férussac, 1822)

1821. *Vaginulus alte* Ferussac, *Tubl. Syst. Fam. Limaeea*, p. 14.

1979. *Laevicaulis alte*: Subba Rao and Mitra. *Rec. zool. Surv. India*, 75: 10.

2020. *Eleutherocaulis alte*: Mollusca Base, *World Register of Marine Species*.

Material examined: ZSI/IV/APRC/M-276 (1 ex), 08.x.2019; ZSI/IV/APRC/M-281 (1 ex), 06.vi.2019; ZSI/IV/APRC/M-292 (1 ex), 23.v.2020.

Distribution: India: Arunachal Pradesh, Andhra, Andhra Pradesh, Bihar, Delhi, Gujarat, Maharashtra, Meghalaya, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, and West Bengal. *Elsewhere:* Throughout the tropical parts of the world.

Remarks: It is a shell-less terrestrial slug commonly known as leatherleaf. It is the most common slug on Indian plains. The animal voraciously feeds on live and decomposing vegetations. The species is being reported for the first time in the state.

Order HYGROPHILA

Family LYMNAEIDAE

Genus *Radix* Montfort, 1810

12. *Radix rufescens* (Gray, 1822)

1822. *Lymnaea acuminata* form *typical* Lamarck, *Hist. nat. Anim. Sans. Vert.*, 6(2): 160.

2018. *Radix rufescens*: Mollusca Base, *World Register of Marine Species*.

Material examined: ZSI/IV/APRC/M-279 (12 exs), 06.vi.2019; ZSI/IV/APRC/M-293 (15 exs), 05.v.2020.

Distribution: Common throughout India.

Remarks: This species usually occurs mainly in permanent stagnant water bodies within abundant vegetations. The species is found on the back side of the campus, where there is an areas having stagnant water, and also the specimen is collected from the unused cement tanks located inside the campus.

Genus *Racesina* Vinarski and Bolotov, 2018

13. *Racesina luteola* (Lamarck, 1822)

1822. *Lymnaea luteola* Lamarck, *Histoire naturelle des animaux sans vertèbres. Tome sixième, 2me partie*. Paris, 232 pp.

2018. *Racesina luteola*: Vinarski and Bolotov, *Zoosystematica Rossica*. 27(2): 328–333.

Material examined: ZSI/IV/APRC/M-280 (12 exs), 06.vi.2019; ZSI/IV/APRC/M-294 (11 exs), 05.v.2020.

Distribution: Common throughout India.

Remarks: This species usually occurs mainly in permanent stagnant water bodies within abundant vegetations.

Results and Discussion

A total of 13 molluscan species belonging to eleven genera, six families, and two orders were reported based on the mollusca collected during 2019 to 2020 from the campus, which is located inside the Itanagar Wildlife Sanctuary. However, Ramakrishna *et al.* (2005) reported 18 species of mollusca from the entire Itanagar Wildlife Sanctuary. Two semi slug species, *Girasia crocea* (Godwin-Austen, 1872) and *Girasia hookeri* (Gray, 1855) are also reported for the first time from the state. The presence of a large number of *Lissachatina fulica*, an exotic invasive species listed in the 100 most invasive species of the world, is not a good sign from the ecological point of view.

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References

- Benson, W.H. 1859. New Helicidae collected by W. Theobald Esq., Jun in Burmah and the Khasi hills and described by W.H. Benson Esq. *Ann. Mag. Nat. Hist.*, 3, 3: 387-393.
- Blanford, W.T and Blanford, H. 1861. Contribution to the Indian Malacology. *J. Asiat. Soc. Beng.*, 30: 347-366.
- Capinera, J. L. 2017. Entomology and Nematology Department, University of Florida, Gainesville, FL 32611, USA. *Florida Entomol.*, 100, 1: 116-123. <https://doi.org/10.1653/024.100.0117>

- Dey, A., Barua, S. and Mitra, S.C. 1985. Mollusca of proposed Namdhapha Biosphere Reserve. *Rec. zool. Surv. India*, **82**(1-4): 263-274.
- Gude, G.K. 1915. Zoological results of the Abor expedition, 1911-1912. *Rec. Indian Mus.*, **8**: 505-513. <https://doi.org/10.5962/bhl.part.1194>
- Available from: <http://www.marinespecies.org/>
- Available from: <https://www.molluscabase.org/>
- Hutton, T. 1834. On the land shells of India. *J. Asiat. Soc. Berig.*, **3**: 81-93.
- Mitra, S.C., Dey, A. and Ramakrishna, 2004. Pictorial Handbook Indian Land Snails (Selected species). *Zool. Surv. India*: 1-344, C 1 05, figs. 319.
- Mollusca Base eds. 2021. Mollusca Base. Available from: <http://www.molluscabase.org>
- Preston, H.B. 1915. Zoological Results of Abor expedition (1911-1912), Mollusca-V. *Rec. Indian Mus.*, **8**: 537-541.
- Ramakrishna, Mitra, S.C. and Dey, A. 2010. Annotated Checklist of Indian Land Mollusca. *Rec. zool. Surv. India, Occ. Paper No.*, 306: 1-359 (Published by the Director, ZooI. Surv. India, Kolkata)
- Ramakrishna, Mitra, S. C. and Mukherjee, A. K. 2005. Mollusca fauna of Itanagar Wildlife Sanctuary, Arunachal Pradesh, *Rec. zool. Surv. India*, **104**(3-4): 1-12,
- Ramakrishna and Mitra, S.C, 2002. Endemic Land mollusca of India. *Rec. zool. Surv. India, Occ. Paper no.*, 196: 1-65, pls. 1-13.
- Rowson, B., Warren, B., Ngereza, C. 2010. Terrestrial mollusca of Pemba Island, Zanzibar, Tanzania, and its status as an "oceanic" island". *ZooKeys* (70): 1-39. <https://doi.org/10.3897/zookeys.70.762> PMID:21594041 PMCID:PMC3088446
- Sharma N. and Goswami P. 2020. Rhopalocera (Insecta: Lepidoptera) diversity of Zoological Survey of India Campus, Itanagar, Arunachal Pradesh. *J. Ent. Res.*, **44**(3): 455-462. <https://doi.org/10.5958/0974-4576.2020.00076.6>
- Vaught, K. 1989. A classification of the living Mollusca, ed. R.T. Abbott and K.J. Boss. American Malacologist, U.S.A.: 1-189.