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New species of *Georissa* (Gastropoda: Hydrocenidae) and *Acmella* (Gastropoda: Assimineidae), with new records of *Georissa* from Northeast India

Nipu Kumar DAS [1,*] & Neelavar Ananthram ARAVIND [2,*]

[1,2]SM Sehgal Foundation Centre for Biodiversity and Conservation, Ashoka Trust for Research in Ecology and the Environment (ATREE), Royal Enclave, Sriramapura, Jakkur PO, Bangalore 560064, India.
[1,2]Manipal Academy of Higher Education (MAHE), Madhav Nagar, Manipal, Udupi 576104, India.
[1]Department of Zoology, Kamrup College, Chamata, Nalbari, 781306, Assam, India.
[2]Yenepoya Research Centre, Yenepoya (Deemed to be University), University Road, Derlakatte, Mangalore 575018, India.

[*]Corresponding authors: aravind@atree.org and nipukdkcc@gmail.com

Abstract. The present study describes one new species each of *Georissa* and *Acmella* from Northeast India. *Georissa meghalayaensis* sp. nov. and *Acmella bensoni* sp. nov. are described from Krem Puri, Meghalaya. In addition, *Georissa* sp. was newly recorded from a soil-leaf litter sample collected at the Sadu Chiru waterfall area in Manipur, and *Georissa sarrita* was newly recorded from Tuipui in Mizoram. All species were identified based on morphological features, with shell sculpture and suture being the primary distinguishing characters. Notably, all the species from Meghalaya were found inside caves, except for *Georissa meghalayaensis* (Krem Puri), which was found at the edge of the cave entrance on a wet, moss-covered rocky wall. Further studies are required to confirm the true cavernicolous nature of these microsnails.

Keywords. Biodiversity hotspot, cave biodiversity, conchology, conservation, endemics.

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Introduction

Northeast India, situated south of the Brahmaputra River, is part of the Indo-Burma biodiversity hotspot (Myers *et al.* 2000). This region exhibits a high biodiversity and a high degree of endemism in both plants and animals. Its faunal composition includes elements from Southeast Asia, China, and mainland India, making this region unique. Northeast India harbours a variety of habitats, such as wet evergreen forests, high-altitude grasslands, deciduous forests, limestone caves, and both lentic and lotic water bodies, which support rich biological communities, including a significant diversity of molluscs.

Within India's political boundaries, 1138 species of land snails have been reported to date (Tripathy *et al.* 2024), of which nearly 600 species are from Northeast India alone, representing the highest diversity within the country. Taxonomic research on land snails in this region has primarily focused on small geographic areas within Meghalaya, Arunachal Pradesh and Assam, with isolated studies conducted before India's independence by European naturalists. Post-independence efforts have generally been limited to developing state and habitat-level checklists (Mookherjee *et al.* 2000; Dey *et al.* 2003; Surya Rao *et al.* 2004).

Recently, there has been a resurgence of interest in molluscan taxonomy in Northeast India. Notably, recent surveys conducted in the Mawsmai Cave, Meghalaya, have led to the documentation of two microsnail species, *Acmella tersa* (W.H. Benson, 1853) and *Georissa mawsmaiensis* Das & Aravind, 2021, as well as the redescription of lesser-known microsnails. Preece *et al.* (2022) conducted a comprehensive study on W.H. Benson's type descriptions, providing detailed taxonomic photo plates of the type species of *Georissa* W.T. Blanford, 1864 and *Acmella* W.T. Blanford, 1869, along with other relevant specimen images. This is particularly valuable, as many earlier species descriptions lacked illustrations of the type specimens. The genus *Acmella* has been divided into two informal groups based on shell sculpture: Group 1, which exhibits predominant radial sculpture, and Group 2, characterised by predominant spiral sculpture, or radial and spiral sculpture about equally strong, or virtually no sculpture present (Vermeulen *et al.* 2015). Similarly, Das *et al.* (2021) summarised the different kinds of shell sculpture in species of *Acmella*, including the typical patterns: radial, irregular, or radial with irregular + weak spiral sculpture, thereby indicating that the variation in shell sculpture extends beyond the two groups recognised in the earlier study (Vermeulen *et al.* 2015). These studies also provided details of their natural history and outlined the threats they face (Harries *et al.* 2020; Das & Aravind 2021, 2024; Das *et al.* 2021; Aravind & Páll-Gergely 2023).

Globally, 118 species (117 extant and 1 extinct) of *Georissa* W.T. Blanford, 1864 have been described (MolluscaBase 2026), distributed from the Pacific Islands and the Hawaiian Islands to Madagascar, the westernmost distribution of this genus. The highest species diversity has been reported from Malaysia, Australia, Madagascar, and China, with more than 10 species, whereas Borneo has 29 species (Thompson & Dance 1983; Vermeulen *et al.* 2015; Khalik *et al.* 2018, 2019; Marzuki *et al.* 2021; MolluscaBase 2026). Within the Asian region, six species of *Georissa* have been reported from Myanmar (Benson 1856, 1860; Stoliczka 1871; Theobald & Stoliczka 1872; Godwin-Austen 1889; Möllendorff 1894), 11 from China (Möllendorff 1885; Gredler 1889; Pilsbry & Hirase 1908; Yen 1969; Chen & Zhang 1998); six from Thailand (Möllendorff 1894; Klongklaew *et al.* 2024), one from Laos (Inkhavilay *et al.* 2019); five from Vietnam (Mabille 1887; Möllendorff 1900; Inkhavilay *et al.* 2019; Vermeulen & Aiken 2020), three from Cambodia (Benson 1856; Godwin-Austen & Nevill 1879; Foon *et al.* 2007; Sutcharit *et al.* 2020); and 29 from Malaysia (Godwin-Austen & Nevill 1879; Thompson & Dance 1983; Khalik *et al.* 2018, 2019). However, only two species have been documented from India until now (Benson 1851; Das & Aravind 2021).

In contrast, 29 species and one subspecies of *Acmella* W.T. Blanford, 1869 are currently recognised globally (MolluscaBase 2026), distributed across Northeastern India, the Andaman and Nicobar Islands, Borneo, Indonesia, Peninsular Malaysia, Laos, Thailand, and Vietnam, extending eastwards to the Philippines and Japan. Specifically, only one species of *Acmella* has been documented from Meghalaya, Northeast India (Benson 1853; Das *et al*. 2021), three from the Andaman and Nicobar Islands (Nevill 1878; Godwin-Austen 1895), six from the Philippines (Zilch 1967; Auffenberg & Páll-Gergely 2020), 10 from Borneo (Vermeulen & Junau 2007; Vermeulen *et al.* 2015; Marzuki *et al.* 2021), eight from Indonesia (Tapparone Canefri 1883; Boettger 1891; van Benthem Jutting 1963; Maassen 2000; Páll-Gergely 2020), one each from Myanmar (Theobald & Stoliczka 1872), Japan (Fukuda & Mitoki 1995), Laos (Inkhavilay *et al.* 2019), Thailand (Wangkiri *et al.* 2018) and Vietnam (Vermeulen *et al.* 2019).

Despite the ecological diversity of Northeast India, investigations into microsnails have been limited, with research mainly concentrated on a few caves. This paper describes one new species each of *Georissa* and *Acmella*, from Northeast India, along with new distribution records of two species of *Georissa*.

Material and methods

The present study describes species of *Acmella* and *Georissa* found during a survey of limestone caves in the Khasi Hills, Meghalaya, India, as well as from the Sadu Chiru waterfall area in Manipur and Tuipui village in Mizoram, India (Fig. 1). Meghalaya, a Northeastern Indian state, borders Bangladesh to the west and south and Assam to the east and north. It is characterised by a hilly plateau with an average altitude of 1000 m a.s.l. (Harries *et al.* 2008). Similarly, Manipur borders Assam to the west, Myanmar to the east, Nagaland to the north and Mizoram to the south. Mizoram borders Assam to the north, Myanmar to the east and south, and Bangladesh to the west.

As part of our study, we conducted a mollusc survey in the limestone caves of Khasi Hills, Meghalaya. The specimens were collected through opportunistic sampling both inside the caves (up to approximately 10 m, focusing on the cave floor and walls; Fig. 2) and outside the caves (within 150–200 m of the cave entrance, on the forest floor). Soil-leaf litter samples were collected from each forest plot and stored for later sorting. Visual searches were conducted outside the caves, targeting tree trunks and under logs to collect arboreal and cryptic species. Site characteristics such as canopy cover, litter depth, vegetation cover, altitude, soil pH, and microhabitat type were also recorded to assess habitat variables and cave ecosystem characteristics.

The samples from Manipur and Mizoram were part of a larger project surveying non-marine molluscs across Northeast India (http://nebiores.atree.org/). The Sadu Chiru waterfall (24.742281° N, 93.743319° E) is a well-known tourist destination in the Bishnupur district of Manipur, while Tuipui village (23.46694° N, 93.2525° E) is situated in the Champhai district of Mizoram, Northeast India.

Species identification relied on various shell characters, with relevant literature (Blanford 1869; Vermeulen *et al.* 2015; Khalik *et al.* 2018, 2019; Das & Aravind 2021; Das *et al.* 2021; Chen & Páll-Gergely 2023; Klongklaew *et al.* 2024) used as references. Live specimens, when found, were preserved in ethanol, while empty dry shells were stored in vials. The type specimens were deposited at the Zoological Survey of India in Chennai. Shell measurements follow Das *et al.* (2021).

Abbreviations

ATREE or AT = Ashoka Trust for Research in Ecology and the Environment, Bangalore, Karnataka, India
NHMUK = Natural History Museum, London, United Kingdom
UMZC = University Museum of Zoology Cambridge, Cambridge
ZSI/SRC = Zoological Survey of India, Southern Regional Station, Chennai, India

AH = aperture height
AW = aperture width
OH = operculum height
OW = operculum width
PrW = protoconch width
SH = shell height
SpH = spire height
SpW = spire width
SW = shell width
Wh = whorls

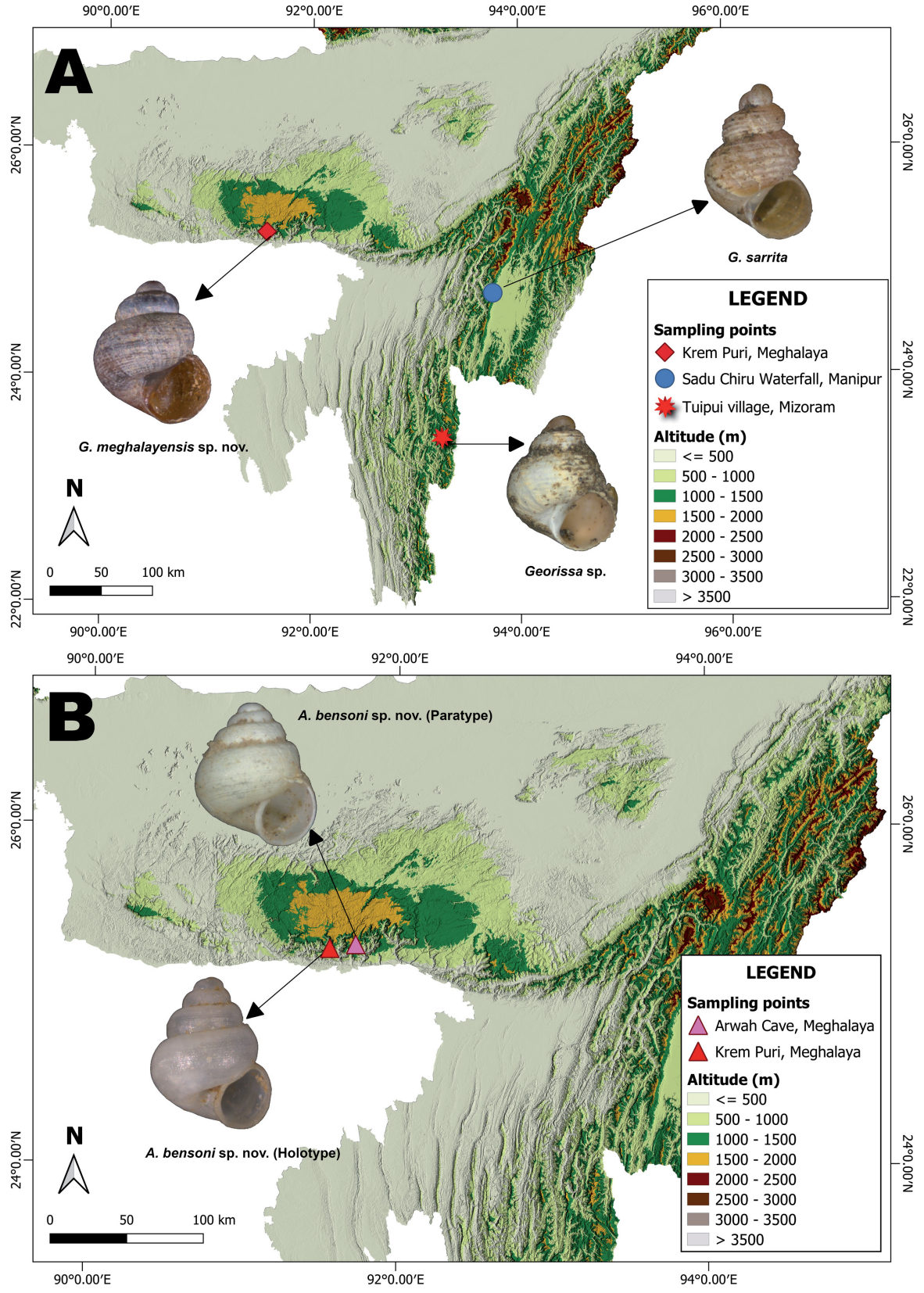

Fig. 1. Distribution maps for *Georissa* W.T. Blanford, 1864 (**A**) and *Acmella* W.T. Blanford, 1869 (**B**) in Northeast India (Meghalaya, Manipur and Mizoram).

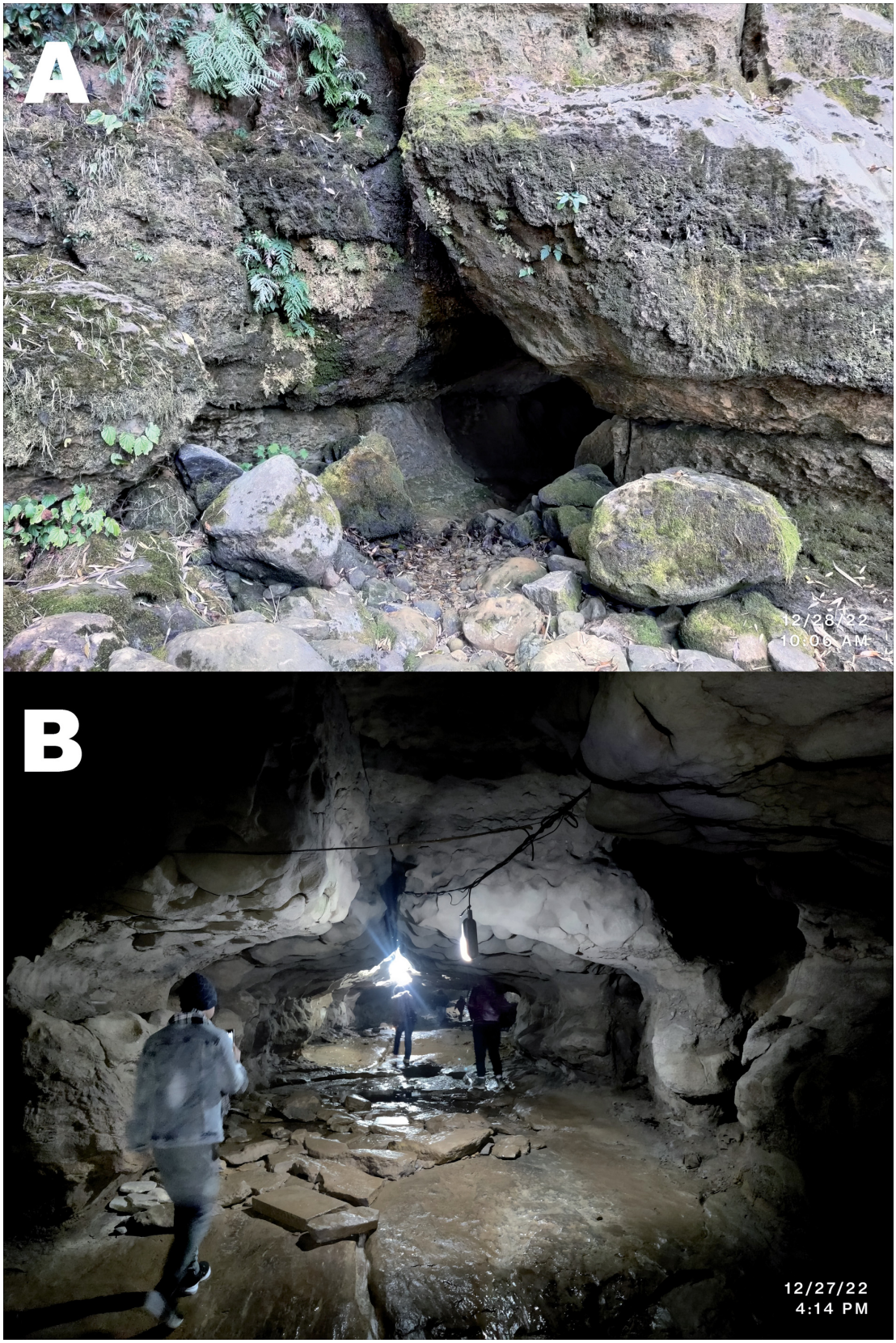

Fig. 2. Photographs of the habitats where the specimens were collected. **A**. Entrance of Krem Puri. **B**. Inside environment of Arwah Cave.

Results

Systematics

Class Gastropoda Cuvier, 1797
Family Hydrocenidae Troschel, 1857

Genus ***Georissa*** W.T. Blanford, 1864

Type species

Hydrocena pyxis W.H. Benson, 1856 (Thyet Myo, Myanmar), by original designation.

Georissa meghalayaensis sp. nov.
urn:lsid:zoobank.org:act:BA54A3F3-52D5-4CA5-8949-3C03FFC0FAF8
Figs 3, 7

Etymology

Named after the state where the species has been collected.

Type material

Holotype

INDIA • preserved in alcohol; Meghalaya, Krem Puri [‘Krem’ means ‘cave’ in Khasi language of Meghalaya]; 25.278599° N, 91.559557° E; 1261 m a.s.l.; 28 Dec. 2022; Nipu Kumar Das leg.; ZSI/SRC/LM2161.

Paratypes

INDIA • 2 specs (preserved in alcohol); same data as for holotype; ZSI/SRC/LM2162a, ZSI/SRC/LM2162b.

Measurements (in mm)

Holotype: SH 1.91, SW 1.56, SH/SW 1.22, AH 0.91, AW 0.94, AH/AW 0.97, SpH 0.98, SpW 1.35, PrW 0.47. Paratype ZSI/SRC/LM2162a: SH 2.26, SW 1.72, SH/SW 1.31, AH 1.03, AW 0.98, AH/AW 1.05, SpH 1.21, SpW 1.44, PrW 0.52.

Description of the shell

Shell dextral, small, oval, turbinate; spire acuminate; colour orangish-red; shell sculpture meshed pattern, spiral ribs present, somewhat strong, very densely arranged, 3–4 spiral ribs/0.1 mm on the body whorl, and around regularly spaced across shell surface immediately after protoconch, sometimes distorted by radial ribs or growth lines, radial ribs present, irregular and weakly sculptured across the shell; suture well-impressed with slightly extended shoulder; umbilicus narrow; whorls 3.5, convex; protoconch/teleoconch transition zone distinct; protoconch dark brownish, round and globular, nearly smooth with pits, whorls 1.5; aperture ovate, oblique or sub-vertical; peristome simple, thin and continuous, parietal lip angular, palatal and basal lips or edges roundish; columellar callus dark brownish, prominent and oblique; operculum oval, calcareous, multispiral with growth lines.

Differential diagnosis

Georissa meghalayaensis sp. nov. shows similarity in shell shape with *G. sarrita* (W.H. Benson, 1851), *G. mawsmaiensis* Das & Aravind, 2021, *G. pyxis* (W.H. Benson, 1856), and *G. hungerfordi* Godwin-Austen, 1889, but differs in having mesh-like striations across the shell surface, unlike the others, with strong or sharp spiral striations and in shell colour (yellowish in *G. sarrita* vs orangish-red in

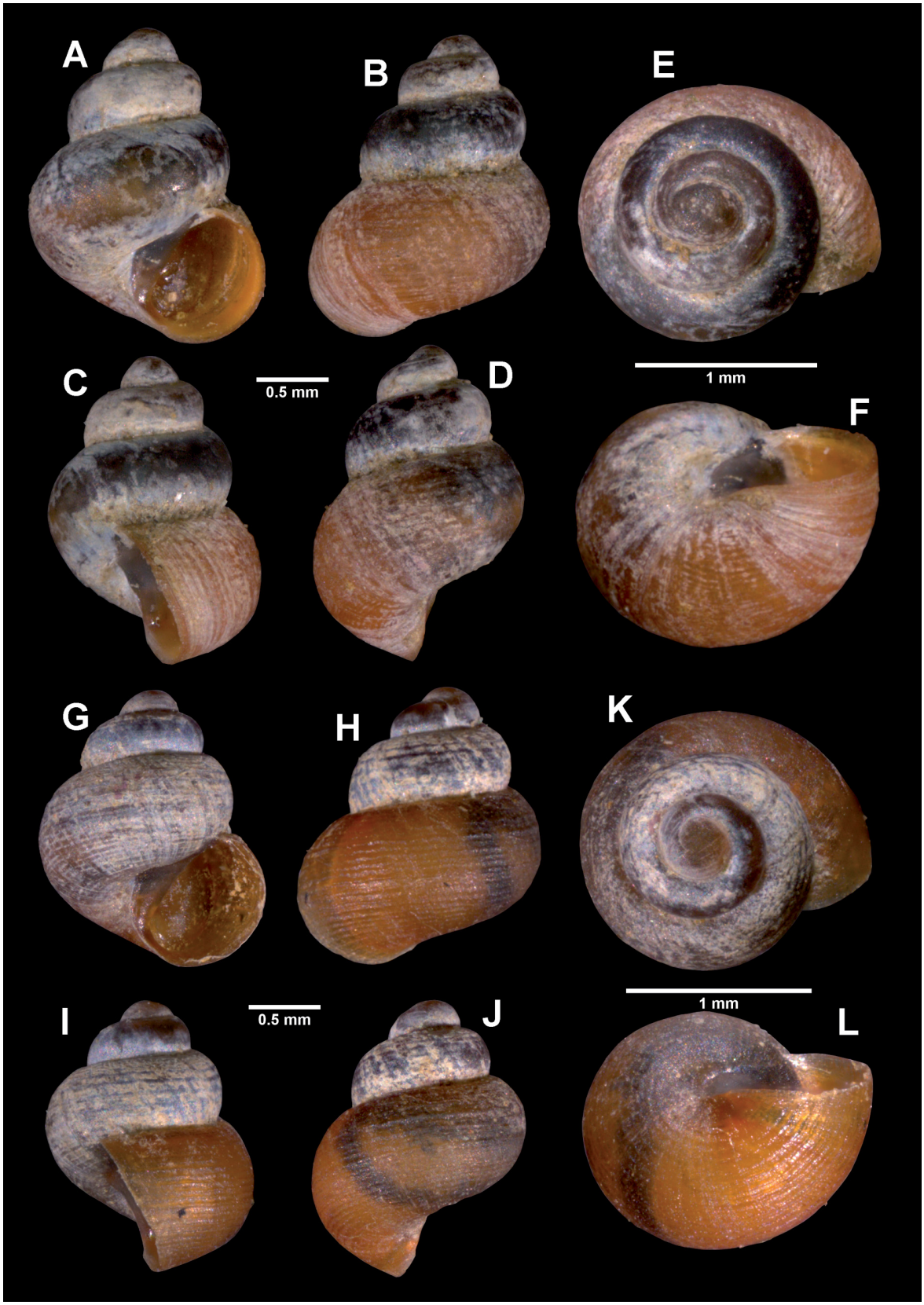

Fig. 3. *Georissa meghalayaensis* sp. nov. from Krem Puri, Meghalaya. Six different views of the two of type specimens. **A–F**. Paratype (ZSI/SRC/LM216sa). **G–L**. Holotype (ZSI/SRC/LM2161).

G. meghalayaensis). There are also denser spiral striations in *G. meghalayaensis* compared to the four above-mentioned species. The mesh-like shell sculpture pattern of *G. meghalayaensis* is similar to the scaly *G. niahensis* Godwin-Austen, 1889 (Niah Hills, Borneo), but it differs in the shape of the first whorl of the scaly teleoconch. *Georissa meghalayaensis* is slightly smaller, with fewer whorls, and less densely arranged spiral striations on the shell compared to *G. digitinota* Klongkaew, Poeaim & Dumrongrojwattana, 2024 (Satun Province, Thailand). *Georissa monterosatiana* Godwin-Austen & Neville, 1879 (Perak State, Malaysia) differs from *G. meghalayaensis* in having a small, elongate-conic shell with strong, regularly spaced spiral ribs on the shell surface. A detailed comparison of various shell features of *G. meghalayaensis* with its congeners is provided in Table 1, and the shell size comparison is shown in Fig. 7A.

Habitat and distribution

Live individuals of *Georissa meghalayaensis* sp. nov. were collected at the edge of the cave entrance on a wet, moss-covered rocky wall, with 50% canopy cover. *Georissa meghalayaensis* is known only from the type locality.

Remarks

The holotype and paratypes differ slightly in shell sculpture. The body whorl of the paratype is finer and more polished than that of the holotype. Additionally, the aperture neck of the paratypes shows stronger, more distinct, and densely packed radial ribs, whereas the holotype has only very fine ribs or a nearly polished neck, which are nearly invisible to the naked eye.

Georissa sarrita (W.H. Benson 1851)
Figs 4, 7

Material examined

INDIA • 8 shells; Mizoram, Champhai district, Tuipui, approximately 2 km NW of the bridge over Tuipui River; 23.46694° N, 93.2525° E; 851 m a.s.l.; 31 Jan. 2019; Nipu Kumar Das leg.; AT/2019/LS5010 to 5017.

Measurements (in mm)

Shell 1 (AT/2019/LS5010, Fig. 4A–F): SH 1.63, SW 1.12, SH/SW 1.45, AH 0.68, AW 0.69, AH/AW 0.98, SpH 0.95, SpW 0.99, distance between spiral ribs on body whorl (apertural view) 0.09, PrW 0.35, OH 0.51, OW 0.38. Shell 2 (AT/2019/LS5011, Fig. 4G–M): SH 1.74, SW 1.24, SH/SW 1.40, AH 0.73, AW 0.74, AH/AW 0.99, SpH 1.00, SpW 1.10, distance between spiral ribs on body whorl (apertural view) 0.10, PrW 0.37.

Description of shell

Shell dextral, small, oval, turbinate; spire acuminate; colour yellowish; shell sculpture spiral ribs present, strong, widely arranged and at nearly regular interval across shell surface, 6 very strong spiral ribs on body whorl above aperture (in apertural view), spiral ribs sometimes distorted or discontinuous due to growth lines, very densely spaced spiral ribs on basal part of body whorl or in umbilical view, radial ribs absent, weak growth lines across shell, mesh visible in umbilical view, nearly indistinct on rest of shell; suture well-impressed with narrow shoulder; umbilicus narrow; whorls 3.5–4, convex; protoconch/teleconch transition zone distinct; protoconch brownish or horny, round and globular, nearly smooth with evenly distributed pits, Wh 1.25; aperture round or slightly ovate, oblique or sub-vertical; peristome simple, thin and continuous, parietal lip angular, palatal and basal lips or edge roundish; columellar callus prominent and oblique, shiny or sometimes transparent; operculum thick, oval, multispiral or concentric, with characteristic calcareous slender peg on inner side or surface, OH 0.51 mm, OW 0.38 mm.

Table 1 (continued on next two pages). Comparison of conchological characters of all species of *Georissa* W.T. Blanford, 1864 from India and Myanmar (adopted from Das & Aravind 2021).

Characters	***G. meghalayaensis*** sp. nov.	***Georissa* sp.**	***G. mawsmaiensis*** Das & Aravind, 2021	***G. saritta*** W.H. Benson, 1851	***G. liratula*** Stoliczka, 1871	***G. illex*** W.H. Benson, 1856	***G. pyxis*** W.H. Benson, 1856	***G. fraterna*** Theobald & Stoliczka, 1872	***G. frustrillum*** W.H. Benson, 1860	***G. rawesiana*** W.H. Benson, 1860	***G. blanfordiana*** Stoliczka, 1871
Size (SH × SW) (in mm)	1.91 × 1.56	1.98–2.05 × 1.53–1.63	1.82 × 1.42	2 × 1.25	2.2 × 1.8 (Maj), 2.2 × 1.5 (Min)	2.65 × 1.65	1.5 × 1.25	1.4 × 0.95	2.5 × 1.75	2 × 1.5	1.8 × 1.2(Maj), 1.8 × 1 (min)
Shell shape	oval, turbinate	oval, turbinate	ovate-conical	ovate-conical	globose-conical, solid	ovate-sharp, succineous	ovate-conical	cylindrical, conoid, solid	ovate-elongated, solid	almost globose-conical, more slender than *G. liratula*	globose-conoid, moderately solid
Color	dark brownish	amber	amber	reddish-white with a rusty tint	yellow	translucent, reddish-brownish towards spire	translucent, reddish towards the spire	pale, yellow-green	translucent, amber-colored (?)	yellowish-white	yellowish, apex reddish
Liration	multilirate, meshed pattern	multilirate	multilirate	multilirate	multilirate, a little more numerously spirally ribbed than *G. sarrita*	multilirate	multilirate	multilirate	multilirate	multilirate	–
Sculpture	spiral ribs present, somewhat strong, very densely arranged, and around regularly spaced, sometimes distorted by radial ribs or growth lines, radial ribs present, irregular and weakly sculptured across the shell	spiral ribs present, strong, somewhat closely arranged, and nearly regularly spaced across shell except protoconch, somewhat fine or less sharp and more densely spaced spiral striations on basal part of body whorl (umbilical view), radial ribs absent	strong, spirally striated whorls	numerous close spiral ridges separated by narrow grooves	spirally lirate with sharp, simple, closely equidistant ribs	very finely striated, spirally closely and delicately lined	–	spirally coarsely lirate	very closely spaced spiral striations	closely spirally striated	very fine transverse growth striae, somewhat polished

Table 1 (continued). Comparison of conchological characters of all species of *Georissa* W.T. Blanford, 1864 from India and Myanmar (adopted from Das & Aravind 2021).

Characters	*G. meghalayaensis* sp. nov.	*Georissa* sp.	*G. mawsmaiensis* Das & Aravind, 2021	*G. saritta* W.H. Benson, 1851	*G. liratula* Stoliczka, 1871	*G. illex* W.H. Benson, 1856	*G. pyxis* W.H. Benson, 1856	*G. fraterna* Theobald & Stoliczka, 1872	*G. frustrillum* W.H. Benson, 1860	*G. rawesiana* W.H. Benson, 1860	*G. blanfordiana* Stoliczka, 1871
Umbilicus	narrow	narrow	imperforate	sub imperforate, covered by thickened callus	imperforate	scarcely perforate	perforate	imperforate, with umbilical region slightly impressed	imperforate	imperforate, umbilical region slightly depressed	imperforate
Whorls	3.5, convex	3.5, convex	3.62, convex	4, very convex	3–3.5, convex	4, very convex	4, convex	3.5, convex, somewhat flattened above	5, convex	4, very convex	3.5, somewhat convex
Spiral striae/ ribs from suture to aperture (in apertural view)	7–9	6–9	4	7	5	6	5	8	6	much finer spiral striation, 7–8	nil, no spiral ribs; longitudinal ribs are present
Spire	acuminate	acuminate	conical	conical	conical	shining, elongate-conical	conical	conical	sub pyramidal	conical	subacute
Apex	blunt, roundish	blunt, roundish	blunt, roundish	obtuse or blunt, reddish	subobtuse, forming slightly prominent mammillate tip, smooth, yellow actually reddening	slightly obtuse	obtuse	strongly mammillate	obtuse	obtuse or blunt	reddish, nipple like, very smooth
Suture	well-impressed	well-impressed, with narrow shoulder	well-impressed	well-impressed	deep, simple	deep	deep	very deep	impressed	deep	–
Aperture	ovate, oblique or sub-vertical	round or slightly ovate, oblique or sub-vertical	sub-circular	hardly oblique, ovate, equaling ⅔ of shell's length, columellar margin angular above, with callous inner wall	semilunar, nearly equaling height of spire, somewhat dilated	oblique, ovate, angular above	oblique, semicircular, columellar margin expanded and somewhat reflexed	almost semi circular	oblique, truncated-ovate, angled at upper left side	slightly oblique, semicircular, angled at upper left side	broadly semicircular

Table 1 (continued). Comparison of conchological characters of all species of *Georissa* W.T. Blanford, 1864 from India and Myanmar (adopted from Das & Aravind 2021).

Characters	***G. meghalayaensis*** sp. nov.	***Georissa* sp.**	***G. mawsmaiensis*** Das & Aravind, 2021	***G. saritta*** W.H. Benson, 1851	***G. liratula*** Stoliczka, 1871	***G. illex*** W.H. Benson, 1856	***G. pyxis*** W.H. Benson, 1856	***G. fraterna*** Theobald & Stoliczka, 1872	***G. frustrillum*** W.H. Benson, 1860	***G. rawesiana*** W.H. Benson, 1860	***G. blanfordiana*** Stoliczka, 1871
Peristome	simple, thin and continuous	simple, thin and continuous	simple and slightly thickened	simple, sharp, slightly expanded, margins separate	simple, curve, within grooved, thick, whitish	thin, non-continuous, margins joined, right margin straight, sharp, columellar margin reflexed	thin, sharp, non-continuous	simple, slightly receding in front, provided with somewhat thickened inner margin	thin, non-continuous	thin, parietal margin callous, inside straight, narrow	uniformly curved, angled at posterior (or upper) side, very slightly arched, slightly expanded above, below constricted
Operculum	oval, calcareous, multispiral with growth lines	unknown	paucispiral, has calcareous peg emerged from inner surface	unknown	testaceous, thin, transparent, broadly semilunar, with eccentric nucleus, covered externally with wrinkled growth-striae	thin, horny, transparent, paucispiral, with a basal nucleus	unknown	testaceous„ thin, almost transparent, paucispiral	unknown	unknown	unknown
Habitat	moss, at cave entrance	soil-leaf litter near waterfall	wet walls of inside cave	on mossy tree trunks	–	adhering to stones	–	–	–	near caves	near caves
Distribution	Krem Puri, Meghalaya, India	Sadu Chiru waterfalls, Manipur, India	Mawsmai cave, Meghalaya, India	Cherra Poonjee (present Cherrapunjee), Khasi hills, Meghalaya, India; Tuipui, Champhai district, Mizoram, India (**Present study**)	Damotha, near Moulmein, Myanmar	Phie Than, Tenasserim, Myanmar	Thyet-Mio, Myanmar	Ataran River Valley, near Moulmein, Myanmar	Ava, Myanmar	Near Moulmein in Farm Caves, Myanmar	Farm Caves, near Moulmein, Myanmar

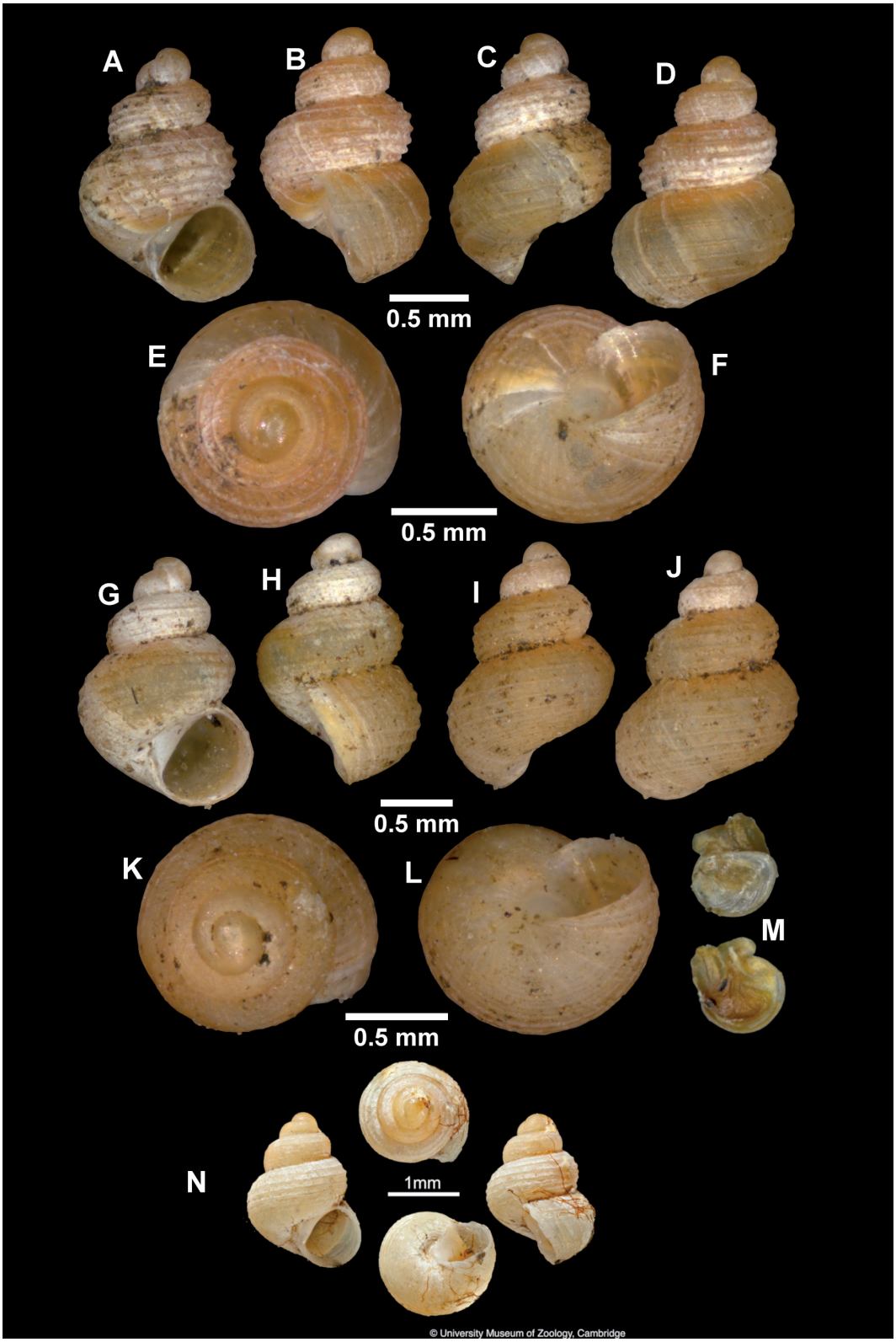

Fig. 4. A–M. *Georissa sarrita* (W.H. Benson, 1851) from Tuipui, Mizoram. Six different views of the newly collected shells. **A–F**. Shell 1 (AT/2019/LS5010). **G–L**. Shell 2 (AT/2019/LS5011). **M**. Operculum of shell 2 (AT/2019/LS5011). **N**. *Cyclostoma sarritum* W.H. Benson, 1851, syntype, from Cherrapunji, Meghalaya, India (UMZC I.103725).

Habitat and distribution

The shells of *G. sarrita* were found in the soil-leaf litter sample collected near Tuipui village, Champhai district, Mizoram, whereas the type material of the species was originally reported from mosses in deep valleys near Cherrapunji, Meghalaya (Benson 1851). The temperature at the soil, soil leaf litter depth, and % canopy cover at the new collection site were 21–22°C, 2–3.5 cm, and 30%, respectively. Other gastropod species, namely *Glessula* sp. and *Tanychlamys* sp., were also present at the collection site. The site was located by the roadside near a dry stream with abundant leaf litter.

Remarks

The present material is slightly smaller (SH 1.63–1.74 mm, SW 1.12–1.24 mm) than the dimensions given in the original description (SH 2 mm, SW 1.25 mm) (Benson 1851). Benson's collection, including the syntype specimen (UMZC I.103725.A), is worn and exhibits whitish or yellowish colouration, whereas the new shells from Mizoram are reddish. This new collection represents the first record of *Georissa* from Mizoram, NE India.

Georissa sp.
Fig. 5A–K

Material examined

INDIA • 2 shells; Manipur, Bishnupur district, Sadu Chiru waterfall area; 24.742281° N, 93.743319° E; 1319 m a.s.l.; 28 Jul. 2018; Nipu Kumar Das leg.; AT/2018/LS6010, AT/2018/LS6011.

Measurements (in mm)

Shell 1 (AT/2018/LS6010, Fig. 5A–F): SH 2.05, SW 1.53, SH/SW 1.34, AH 0.89, AW 0.90, AH/AW 0.99, SpH 1.05, SpW 1.27, distance between spiral ribs on body whorl (apertural view) 0.08, PrW 0.31. Shell 2 (AT/2018/LS6011, Fig. 5G–K)*:* SH 1.98, SW 1.63, SH/SW 1.21, AH 0.91, AW 0.98, AH/AW 0.93, SpH 1.06, SpW 1.35, distance between spiral ribs on body whorl (apertural view) 0.09, PrW 0.35.

Description of shell

Shell dextral, small, oval, turbinate; spire acuminate; colour amber; shell sculpture spiral ribs present, strong, somewhat closely arranged, and nearly regularly spaced across shell surface except protoconch, with 6–9 strong spiral ribs on body whorl, somewhat fine or less sharp and more densely spaced spiral striations on basal part of body whorl or in umbilical view, distance between spiral ribs on body whorl (apertural view) 0.09 mm, the radial ribs absent, fine growth lines across the shell; suture well-impressed, shoulder narrow; umbilicus narrow; whorls 3.5, convex; protoconch/teleconch transition zone distinct; protoconch brownish, round and globular, shiny and smooth, PrW 0.35; aperture round or slightly ovate, oblique or sub-vertical; peristome simple, and thin, parietal lip straight to concave, palatal lip continuous with body whorl, basal lip convex; columellar callus prominent and oblique, whitish; operculum unknown.

Habitat and distribution

The shells of *Georissa* sp. were collected from the soil-leaf litter sample near the Sadu Chiru waterfalls, Manipur. The area experienced heavy tourist footfall during the summer season.

Remarks

The newly collected shells are highly worn-out; hence, we are not describing them as a new species here, although they differ significantly from *G. pyxis* W.H. Benson, 1956. Shell 1 has a broken body whorl and aperture, with most of the shell sculpture eroded, while shell 2 has a broken aperture and partially

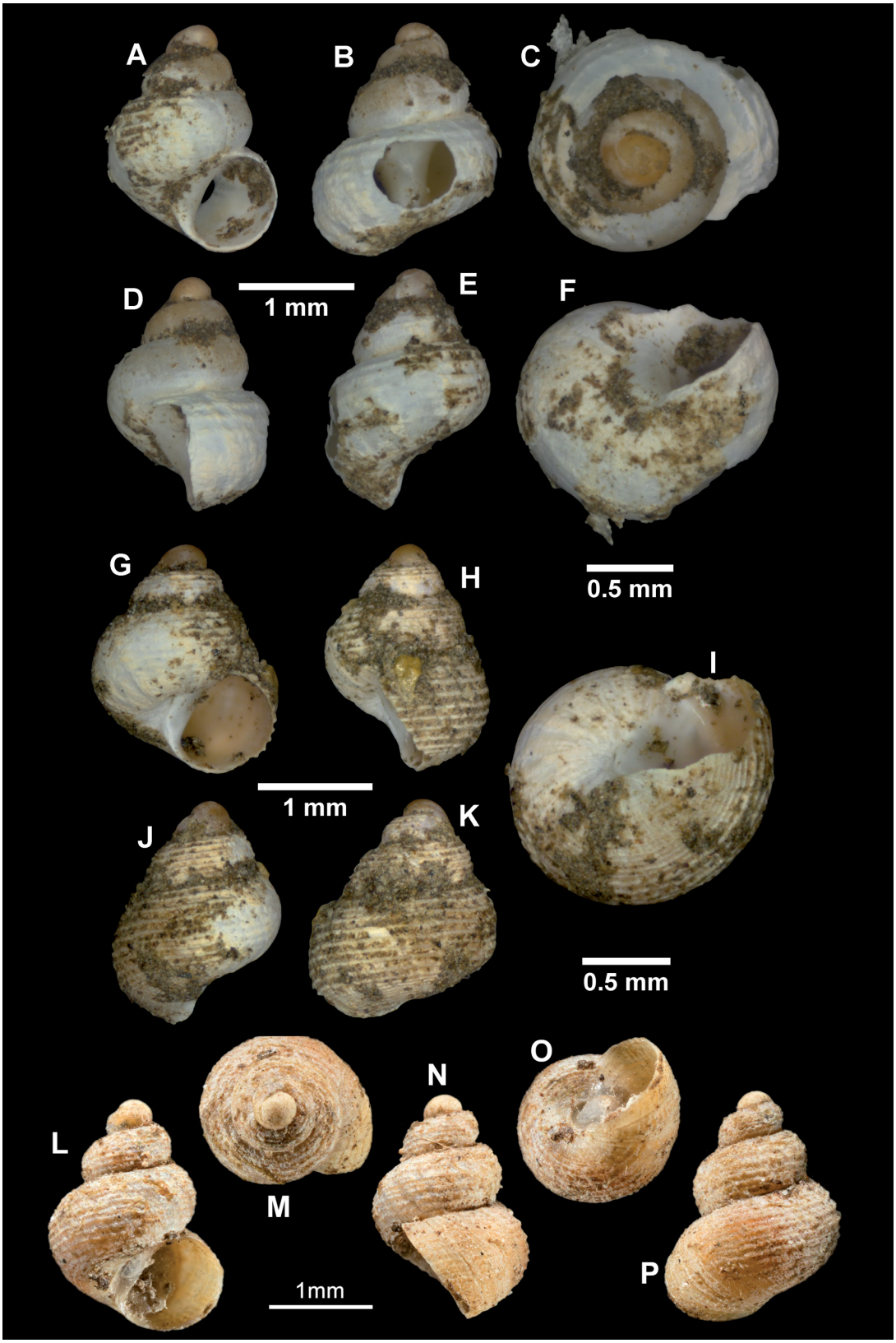

Fig. 5. A–K. *Georissa* sp. from Sadu Chiru waterfalls, Manipur, India. Different views of newly collected shells. **A–F**. Shell 1 (AT/2018/LS6010). **G–K**. Shell 2 (AT/2018/LS6011). **L–P**. *Hydrocena pyxis* W.H. Benson, 1856, syntype, from Thyet-Mio, Myanmar (NHMUK 1888.12.4.298).

eroded sculpture. Both shells retain some adhering dirt that is difficult to remove, given their poor condition and delicate state. The two shells differ from *G. pyxis* in several conchological characters. They are slightly larger (SH 1.98–2.05 mm, SW 1.53–1.63 mm) than *G. pyxis* (SH 1.5 mm, SW 1.25 mm) (Benson 1856). Additionally, they are proportionally wider than the syntype of *G. pyxis*, with shell 2 being markedly broader and possessing a more inflated body whorl, thereby resulting in a relatively lower spire compared to the more conical shell of the syntype. In shell 2, the spiral striation at the base of the shell (umbilical view) is conspicuously denser than in the syntype. Furthermore, the collection locality in Manipur, India, is more than 500 km from the type locality of *G. pyxis* (Thyet-Mio, Myanmar). Although microsnails are generally believed to have limited dispersal ability, recent studies have shown that some taxa may exhibit wider than expected distributions (e.g., *Angustopila elevata* Thompson & Upatham, 1997 – 2060 km, *A. fabella* Páll-Gergely & Hunyadi, 2015 – 640 km, *A. szekeresi* Páll-Gergely & Hunyadi, 2015 – 650 km, *A. huoyani* Jochum, Slapnik & Páll-Gergely, 2014 – 500 km; Páll-Gergely *et al*. 2023). Therefore, geographic distance alone cannot be regarded as definitive evidence for species-level delimitation. Nevertheless, when considered in conjunction with the observed shell morphological differences, the geographic disjunction provides additional support for treating the present material as distinct from *G. pyxis* and assigning it to *Georissa* sp., pending further evidence, such as anatomical or DNA evidence. The new collection represents the first record of the genus *Georissa* from the state of Manipur, India.

Family Assimineidae H. Adams & A. Adams, 1856
Subfamily Ekadantinae Thiele, 1929

Genus ***Acmella*** W.T. Blanford, 1869

Type species

Cyclostoma tersum W.H. Benson, 1853 by monotypy (in muscis arborum ad Musmai, prope Cherra-Poonje).

Remarks

Recently, Vermeulen *et al.* (2015) divided the genus *Acmella* into two informal groups based on shell sculpture: Group 1 characterized by predominant radial sculpture, and Group 2 defined by predominant spiral sculpture, or radial and spiral sculpture about equally strong, or virtually no sculpture present. Similarly, Das *et al.* (2021) summarised the different kinds of shell sculpture in species of *Acmella*, including the typical patterns: radial, irregular, or radial with irregular + weak spiral sculpture, thereby indicating that the variation in shell sculpture extends beyond the two groups recognised by Vermeulen *et al.* (2015).

Acmella bensoni sp. nov.
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Figs 6–7

Etymology

Named in honour of William H. Benson, the pioneer of Indian malacology. He has contributed significantly to the taxonomy of Indian land and freshwater molluscs.

Type material

Holotype

INDIA • shell; Meghalaya, Krem Puri; 25.278599° N, 91.559557° E; 1261 m a.s.l.; 28 Dec. 2022; Nipu Kumar Das leg.; ZSI/SRC/LM2163.

Paratypes

INDIA• 1 shell; same data as for holotype; ZSI/SRC/LM2164 • 6 shells; Meghalaya, Arwah Cave; 25.301939° N, 91.72691° E; 168 m a.s.l.; 22 Dec. 2022; Nipu Kumar Das leg.; ZSI/SRC/LM2165a to ZSI/SRC/LM2165f.

Measurements (in mm)

Holotype SH 1.37, SW 1.09, SH/SW 1.26, AH 0.60, AW 0.51, AH/AW 1.18, SpH 0.77, SpW 0.97.

Description of the shell

Shell dextral, minute, conical-oval, turbinate, shiny and somewhat transparent; spire acuminate or conical; colour white; shell sculpture indistinct, fine and densely spaced spiral and radial ribs or growth lines across shell surface, 5–7 spiral ribs/0.1 mm on body whorl, fine radial ribs clearly visible on neck of aperture; suture moderate to well-impressed with slightly extended shoulder; umbilicus open and wide, umbilicus width 0.06–0.13 mm, slightly covered by angular callus extension of columellar lip; whorls 4.25–4.5, convex; protoconch/teleoconch transition zone distinct; protoconch shiny, whitish, obtuse, nearly smooth with pits, Wh 1.25, PrW 0.28–0.31 mm; aperture ovate-lunate, oblique or sub-vertical; peristome simple, somewhat thick and continuous, parietal lip straight and sometimes indistinct, and merged with body whorl, parieto-palatal juncture distinct and sharply angulated, palatal, basal and columellar lips or edges roundish; columellar lip thick and roundish; operculum unknown.

Differential diagnosis

Acmella bensoni sp. nov. shows a close morphological similarity to *A. tersa* in shell shape, but differs by having a smaller, whitish shell, with well-impressed sutures and indistinct sculpture, characterised by fine, densely spaced spiral and radial ribs or growth lines across the shell surface. The shells of *A. bensoni*, *A. moreletiana* G. Nevill, 1878, *A. roepstorffiana* G. Nevill, 1878, and *A. hyalina* Theobald & Stoliczka, 1872 are shiny and transparent; however, they differ in shell sculpture and size according to the type images and original descriptions. *Acmella hyalina* is the smallest, with a smooth shell sculpture, unlike *A. moreletiana*, which has a distinct sculpture around the umbilicus in a very characteristic manner, with regular, distinct plications beneath the suture. *Acmella roepstorffiana* possesses distinct, strong, closely, and evenly or regularly spaced striae that are thread-like, oblique, and more prominent toward the base, especially around the umbilical region. *Acmella minutissima* Maassen, 2000 from Western Sumatra shows close morphological similarity to *A. bensoni*, sharing a somewhat similar shell sculpture consisting of fine radial lirae between the spiral lirae. However, *A. minutissima* differs in having a much smaller shell size (SH 0.8 mm), a smaller shell aperture, fewer whorls, and a less elongate spire than *A. bensoni*. A detailed comparison of various shell features of *A. bensoni* with its congeners is provided in Table 2, and the shell size comparison is shown in Fig. 7B.

Habitat and distribution

The shells of *Acmella bensoni* sp. nov. were found on both dry and wet cave walls, approximately 4–12 m inside the cave from the entrance. *Acmella bensoni* is reported only from the type localities.

Arwah Cave, Meghalaya, attracts a large number of tourists and tends to be crowded. Artificial lighting installed throughout the cave creates a very bright environment inside. Additionally, man-made staircases have been built at the entrance to facilitate tourist access.

Remarks

The shells of *A. bensoni* sp. nov show a slight morphological variability. Some shells are slightly larger and less ovoid, with a well-impressed suture and a slightly extended shoulder compared to the holotype.

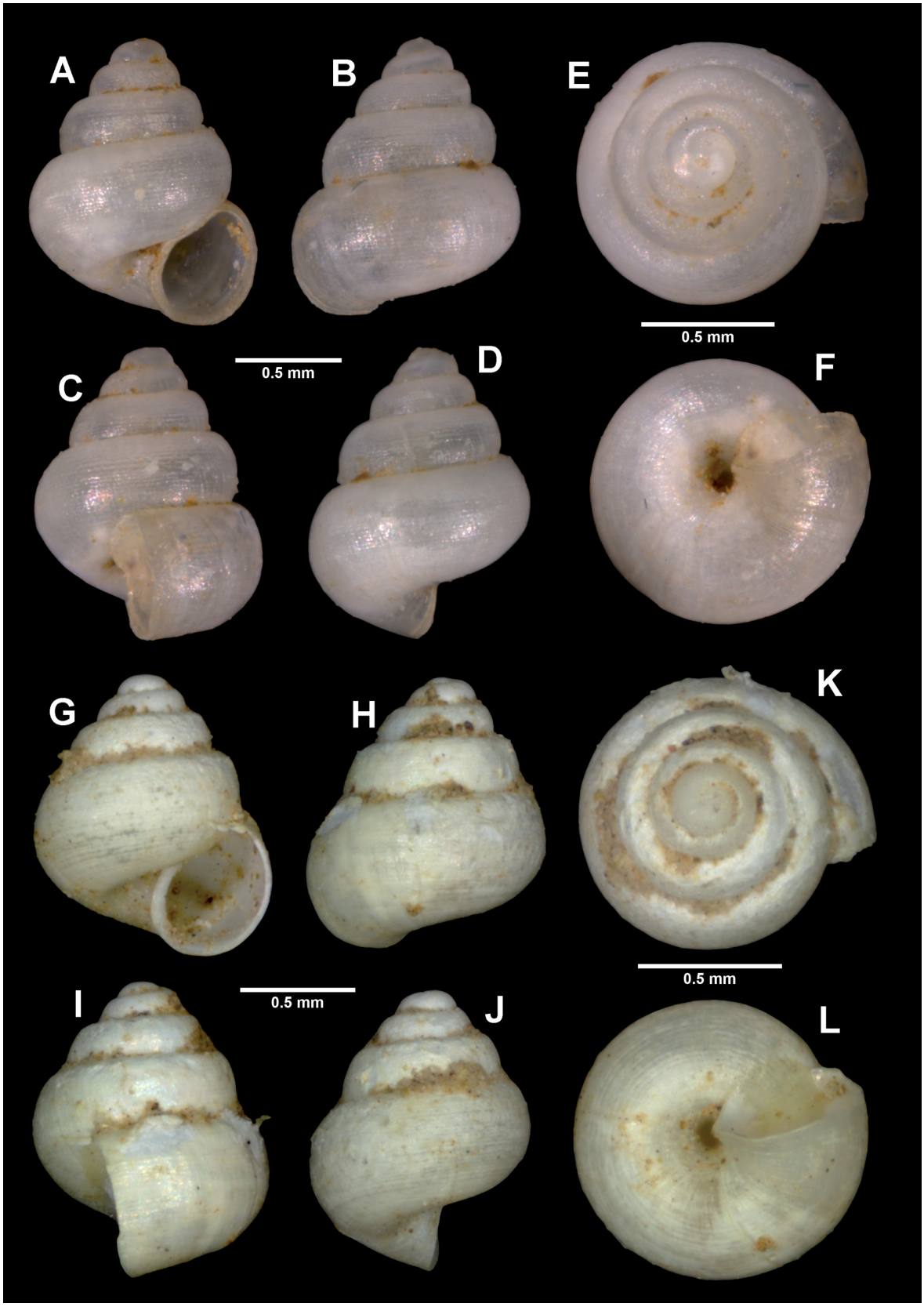

Fig. 6. *Acmella bensoni* sp. nov. **A–F**. Holotype (ZSI/SRC/LM2163), from Krem Puri. **G–I**. Paratype (ZSI/SRC/LM2165a), from Arwah Cave, Meghalaya.

Table 2 (continued on next page). Comparison of conchological characters of all species of *Acmella* W.T. Blanford, 1869 from India and Myanmar.

Characters	***A. bensoni*** sp. nov.	***A. tersa*** W.H. Benson, 1853	***A. mellilla*** Godwin-Austen, 1895	***A. moreletiana*** G. Nevill, 1878	***A. roepstorffiana*** G. Nevill, 1878	***A. hyalina*** Theobald & Stoliczka, 1872
Size (SH × SW) (in mm)	1.22–1.37 × 1.03–1.09	2.14–2.38 × 1.45–1.66	1.75 × 1.25	2 × 1.33	1.5 × 1	1 × 0.7
Shell shape	conical-oval, turbinate, shiny and somewhat transparent, and depressed	typical assimineid (conical to ovoid), somewhat semi-transparent	ovately turreted, somewhat semi-transparent	conical-turreted, hyaline/ glossy, transparent, polished, and shining	conico-turrited, shining, translucent, silky	ovately conical, hyaline
Color	white	brownish corneous	pale umber	white	–	dirty whitish
Umbilicus	open and wide	narrow, nearly closed	widely open	widely open	open	moderately perforated
Whorls	4.25–4.5, convex	4.5–5, convex	5–5.5, sides flat	5, highly convex, last whorl globular, convex below	5, slightly convex whorls, gradate, last whorl subcylindrical, slightly compressed at periphery, convex beneath	4.5, somewhat convex
Liration	indistinct, fine and densely spaced spiral and radial ribs or growth lines across shell surface, fine radial ribs clearly visible on neck of aperture	protoconch finely granulose, teleoconch with irregular, rather strong, somewhat wavy ribs, some of which may converge	sculpture oblique, fine, close costulation, radially ribbed across shell, very densed and overlapped at aperture neck	sculptured round umbilicus in very characteristic manner, with regular distinct plications, beneath suture, faint striation is discernible, with lens	entirely distinct, somewhat strongly, closely, evenly or regularly striated; striae thread-like, oblique, more prominent toward base, especially around umbilical region	smooth
Spire	acuminate	acuminate	depressedly conic	depressedly conical	acuminate	blunt
Apex	conical	conical	very blunt	blunt	blunt and conical	conical
Suture	moderate to well-impressed with slightly extended shoulder	well-impressed	impressed	well-impressed	well-impressed	simple and deep suture

Table 2 (continued). Comparison of conchological characters of all species of *Acmella* W.T. Blanford, 1869 from India and Myanmar.

Characters	***A. bensoni*** sp. nov.	***A. tersa*** W.H. Benson, 1853	***A. mellilla*** Godwin-Austen, 1895	***A. moreletiana*** G. Nevill, 1878	***A. roepstorffiana*** G. Nevill, 1878	***A. hyalina*** Theobald & Stoliczka, 1872
Aperture	ovate-lunate, oblique or sub-vertical	prosocline, only slightly oblique to shell axis from lateral view, elongate ovoid with pointed parieto-palatal angle	oval, suboblique	perfectly rounded, margins closely approximated but not continuous	very small, subcircular, with margins almost but not continuous, columellar one being abruptly bent back over umbilicus and then beautifully and boldy rounded	regularly ovate, above (or posteriorly) somewhat angled, not oblique
Peristome	simple, somewhat thick and continuous, parietal lip straight, sometimes indistinct, merged with body-whorl, parieto-palatal juncture distinct and sharply angulated, palatal, basal and columellar lips or edges roundish	sharp, not expanded	double, with strong callus on body whorl	slightly thickened, columellar margin gradually rounded, not covering the umbilicus.	thickened, not continuous, externally slightly expanded; columellar margin strongly arched, more or less covering the umbilicus	thin, almost continuous
Operculum	unknown	horny, extremely thin, paucispiral	unknown	unknown	unknown	absent?
Habitat	both dry and wet walls of cave, approximately 4–12 m from cave entrance	moss in forest	tropical rainforest	tropical rainforest	midddy coastal area	on limestone hills
Distribution	Krem Puri, Meghalaya, India; Arwah Cave, Meghalaya, India	Mawsmai Cave, Musmai (= Mawsmai) near Cherrapunji (= Cherrapunjee), Meghalaya, India	South Andaman, India	Batti Malve, Nicobar Islands, India	Katchall, Nicobar Islands, India	South of Moulmein, Myanmar

Discussion

The study of land snails from Northeast India, especially south of the Brahmaputra River, has mainly been limited to regional checklists, aside from some recent works that revised selected genera (Páll-Gergely *et al.* 2015a, 2015b, 2022, 2025). The description of two new micromollusc species and an unidentified *Georissa* sp. (possibly new to science), along with new distributional records of additional species from Northeast India, highlights the Linnean and Wallacean shortfalls regarding the molluscan fauna of this region. The description of one new species each from *Georissa* and *Acmella* from Northeast India has increasedthe known species richness in these genera to three (+ one potentially new) and two, respectively.

Recently, several new species or records of molluscs have been reported from Northeast India, highlighting the region's rich malacological diversity and its potential for further discoveries (Sajan *et al.* 2019, 2020; Das & Aravind 2021, 2024; Sil *et al.* 2021; Aravind & Páll-Gergely 2023; Páll-Gergely *et al.*

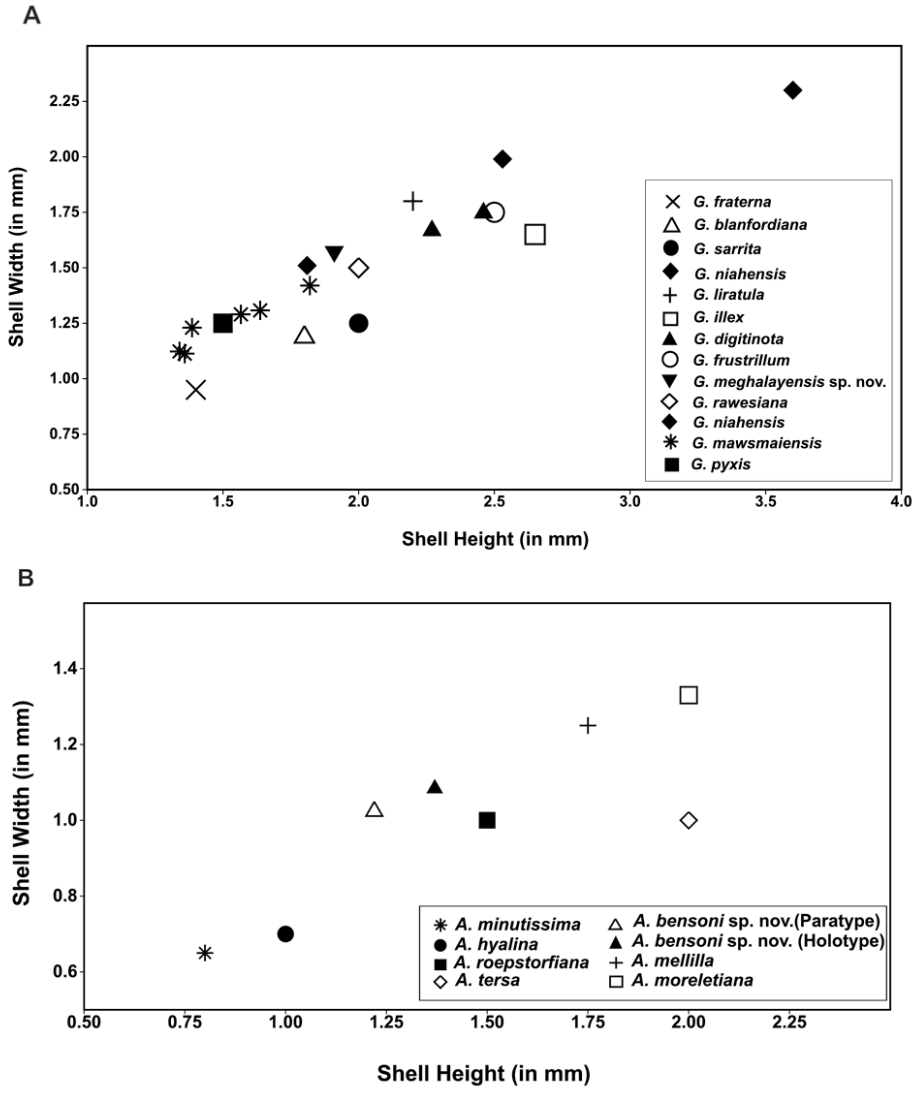

Fig. 7. Shell size comparison of the new species with its congeners from India and Southeast Asia. **A**. *Georissa* W.T. Blanford, 1864. **B**. *Acmella* W.T. Blanford, 1869.

2025). Meghalaya boasts more than 1200 limestone caves, making it a crucial area for cave research and conservation efforts. Furthermore, in the present study, *Georissa* sp. was reported from the Sadu Chiru waterfall area of Bishnupur district, Manipur, suggesting that *Georissa* may be widely distributed in Northeast India and beyond cave habitats. Additional extensive surveys could help us better understand the distribution and microhabitat preferences.

Georissa and *Acmella* are primarily confined to karst landscapes and have a limited distribution range (Berry 1965; Thompson & Dance 1983; Das & Aravind 2021). Research on *Georissa* in Borneo has shown high diversity within the genus, with around one-third of the nearly 100 species described from the region (Khalik *et al.* 2018, 2019). These findings suggest that limestone clusters, even those separated by less than 100 km, can harbour distinct species. Similar patterns of localised endemism have been documented in Thailand (Dumrongrojwattana *et al.* 2020).

In addition, species of *Georissa* inhabit diverse microhabitats, including moss-covered limestone, bare rocks, soil, and tree trunks near limestone hills (Berry 1965); limestone substrates or areas associated with calcareous terrain (Thompson & Dance 1983); damp forest soils (van Benthem Jutting 1948); and moist caves (Saul 1966; Bernasconi 1995; Das & Aravind 2021). These records show that most species of *Georissa* are saxicolous, with *G. monterosatiana* feeding on algae, lichens, and moss fragments (Berry 1961). In the present study, species of *Georissa* were found at cave entrances and on forest floors among leaf litter.

Similarly, species of *Acmella* have been documented from a variety of habitats, including limestone caves (Das *et al.* 2021), the dark zone of caves (troglobitic species), grasslands, tropical rainforests, lowland forests, and muddy coastal areas (Wangkiri *et al.* 2018). The new *Acmella* species described here were observed on both dry and wet or moist cave walls a few metres inside the entrance. This emphasises the potential for discovering additional cave-dwelling microsnail species in Meghalaya, Northeast India.

Although no visible threats were observed for the species collected from Mizoram, the heavy tourist footfall poses a potential threat to the species collected from the caves in Meghalaya and the Sadu Chiru Waterfall area in Manipur. This study highlights the potential for further research into molluscan diversity within unique limestone ecosystems, which provide suitable habitats for snails due to their calcium-rich nature. Also, the true cavernicolous nature of the described microsnails requires further study. Potential non-marine cave mollusc species are suggested to exist in the Naga Hills, in Meghalaya, Arunachal Pradesh, and other northeastern states of India (Grego 2018).

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