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A NEW SPECIES OF *ACMELLA* (GASTROPODA: ASSIMINEIDAE) FROM PENINSULAR MALAYSIA

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ABSTRACT: A new species *Acmella paeninsularis* from the limestone hills of Perak, Peninsular Malaysia is described based on an ample material. Its diagnostic characters in comparison with related species are given.

KEY WORDS: land snail; Peninsular Malaysia; limestone hills; karst; taxonomy

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INTRODUCTION

The genus *Acmella* was erected to accommodate *Acmella tersa* (Benson, 1853) from Assam, India (BLANFORD 1869). DAS et al. (2021) redescribed the type species *A. tersa* as possessing a shell with a finely granulose protoconch, somewhat pronounced wavy radial sculpture and elongate-ovoid aperture. THIELE (1931) diagnosed the genus as having a minute shell, tall spire, with curved radial sculpture on the whorls and a small, ovoid aperture. VERMEULEN et al. (2015) treated *Acmella* species in Sabah, Malaysian Borneo, which can be diagnosed as having a slight periomphalic thread that starts on the columellar side of the peristome and spirals steeply upwards, and a generally thin peristome. Two informal groups were distinguished: Group 1 has predominantly radial sculpture on the whorls; Group 2 has predominantly spiral sculpture, or radial and spiral sculpture about equally strong, or no sculpture at all. The new species described herein and those in Group 1 of VERMEULEN et al. (2015) are probably typical of *Acmella*, whereas all other species currently assigned to the genus may belong to other genera pending a genus-wide revision (DAS et al. 2021).

In Sundaland and adjacent regions, *Acmella* has hitherto been reported from Borneo (VERMEULEN et al. 2015, PHUNG et al. 2017, MARZUKI et al. 2021), Sumatra (MAASSEN 2000), Sumba (VAN BENTHEM-JUTTING 1958), the Philippines (AUFFENBERG & PÁLL-GERGELY 2020), Vietnam (VERMEULEN et al. 2019), Thailand (WANGKIRI et al. 2018), Laos (INKHAVILAY et al. 2019) as well as the Andaman and Nicobar Islands (GODWIN-AUSTEN & NEVILL 1879, GODWIN-AUSTEN 1895, SUBBA RAO & MITRA 1991). In Peninsular Malaysia, MAASSEN (2001) reported *A. roepstorffiana* Nevill, 1878 from Pahang. However, this record is doubtful and needs to be checked considering that *A. roepstorffiana* was previously described and known only from Katchal, Nicobar Islands (India), 1,000 km northwest of Pahang (GODWIN-AUSTEN & NEVILL 1879). Here, we describe a new species of *Acmella* from the limestone karsts of Peninsular Malaysia.

MATERIAL AND METHODS

The materials examined were obtained from leaf litter during the Perak limestone malacofauna survey of Foon et al. (2017). These materials are deposited in the BORNEENSIS collection (BOR/MOL), Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah. Additional materials from the second author's collection (ME) were also examined. To ensure unambiguous reference to the localities of the examined materials, we provide the unique code numbers, names and coordinates of limestone outcrops derived from the Malaysian limestone karst database, Mykarst 2.0 (Liew et al. 2021a, 2021b, 2021c, 2021d, 2021e).

This study is based on shell characters only. The holotype (BOR/MOL 9839) and seven paratypes (1 shell in BOR/MOL 9781, 1 shell in BOR/MOL 12502, 5 shells in BOR/MOL 10453) of the new species were photographed and measured with a Leica DFC495 Digital Microscope Camera mounted on a Leica M205C microscope. Next, the holotype was gold-dusted and viewed under high vacuum with a Scanning Electron Microscope (JEOL JSM-5610LV, JEOL Ltd., Tokyo) to reveal the shell microsculpture.

Measurements of shell height (SH), shell width (SW), aperture height (AH), aperture width (AW) and number of ribs per mm were taken for the holotype (largest specimen among materials examined) and seven paratypes. The whorl counting (NW) followed Vermeulen & Whitten (1998). The new species is described and compared with illustrations and descriptions of its congeners in Benson (1853), Blanford (1869), Godwin-Austen & Nevill (1879), Godwin-Austen (1895), Van Benthem-Jutting (1958), Maassen (2000), Vermeulen & Junau (2007), Vermeulen et al. (2015), Phung et al. (2017), Wangkiri et al. (2018), Vermeulen et al. (2019), Inkhavilay et al. (2019), Auffenberg & Páll-Gergely (2020), Páll-Gergely (2020), Das et al. (2021), Marzuki et al. (2021) and references therein.

SYSTEMATIC PART

Family Assimineidae Adams et Adams, 1856

Genus *Acmella* Blanford, 1869

Acmella paeninsularis sp. nov.

Figs 1–5

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Acmella 'Kanthan 1' Foon et al. 2017: 10–11, fig. 4A; Phung et al. 2018: table 1.

Examined material. **Holotype**, Malaysia, Peninsular Malaysia, State of Perak: mykarst-781, formerly labelled as "mykarst-184 Bat Cave" in Foon et al. (2017) (04°54.34'N, 101°08.83'E) (BOR/MOL 9839). **Paratypes**, Malaysia, Peninsular Malaysia, State of Perak: mykarst-781, formerly labelled as "mykarst-184 Bat Cave" in Foon et al. (2017) (04°54.34'N, 101°08.83'E) (BOR/MOL 9781, 3 shells; BOR/MOL 12502, 1 shell); Prk 47 Kanthan (04°45.99'N, 101°07.19'E) (BOR/MOL 9079, 4 shells; BOR/MOL 9157, 19 shells); Prk 64 Bt Kepala Gajah (05°07.52'N, 100°58.45'E) (BOR/MOL 10192, 1 shell); Prk 23 G. Rapat (04°33.23'N, 101°07.84'E) (BOR/MOL 10237, 1 shell); Prk 36 Gua Datok (04°37.63'N, 101°09.64'E) (BOR/MOL 10453, 59 shells); Prk 42 G. Bercham (04°38.71'N, 101°08.05'E) (BOR/MOL 10583, 21 shells; BOR/MOL 12497, 1 shell; BOR/MOL 12498, 1 shell; BOR/MOL 12503, 2 shells); Prk 53 Hill KF (04°51.95'N, 101°07.38'E) (BOR/MOL 10784, 5 shells); Prk 01 G. Tempurung (04°24.39'N, 101°11.21'E) (BOR/MOL 11397, 2 shells; BOR/MOL 12501, 2 shells). Malaysia, Peninsular Malaysia, State of Kelantan: Ktn 45 unnamed (05°5.31'N, 102°13.17'E) (ME 2195, >10 shells); Ktn 109 part of G. Panjang (04°48.71'N, 101°58.58'E) (ME 2196, 1 shell); mykarst-168 (04°55.44'N, 102°10.64'E) (ME 2198, 3 shells). Malaysia, Peninsular Malaysia, State of Pahang: Phg 73 Bt Charas (03°54.42'N, 103°08.81'E) (ME 634, >10 shells); Phg 01 Kota Gelanggi (03°53.63'N, 102°28.74'E) (ME 633, 8 shells); Malaysia, Peninsular Malaysia, State of Kedah: Kdh 04 Gunung Keriang (06°11.38'N, 100°19.88'E) (ME 9890, 1 shell).

Description. Dimensions (Table 1): height 0.94–1.35 mm; width 0.80–1.10 mm; height/width ratio 1.16–1.31; number of whorls 4–5. Shell minute, thin, opaque, translucent white or cream-coloured. Surface dull. Spire conical with rounded periphery, apex obtuse, whorls convex. Suture deep, slightly shouldered. Shell almost scalariform. Protoconch with numerous small pits. Teleoconch radial sculpture predominant: densely and regularly spaced (32–60 ribs per 1 mm), prosocline ribs distinctly sinuous at the periphery, and below the periphery are as strong as above, rarely bifurcated from the periphery toward base. Spiral threads present but generally inconspicuous, somewhat densely and regularly spaced. Aperture obliquely elliptic in outline, parietal portion rather concave,

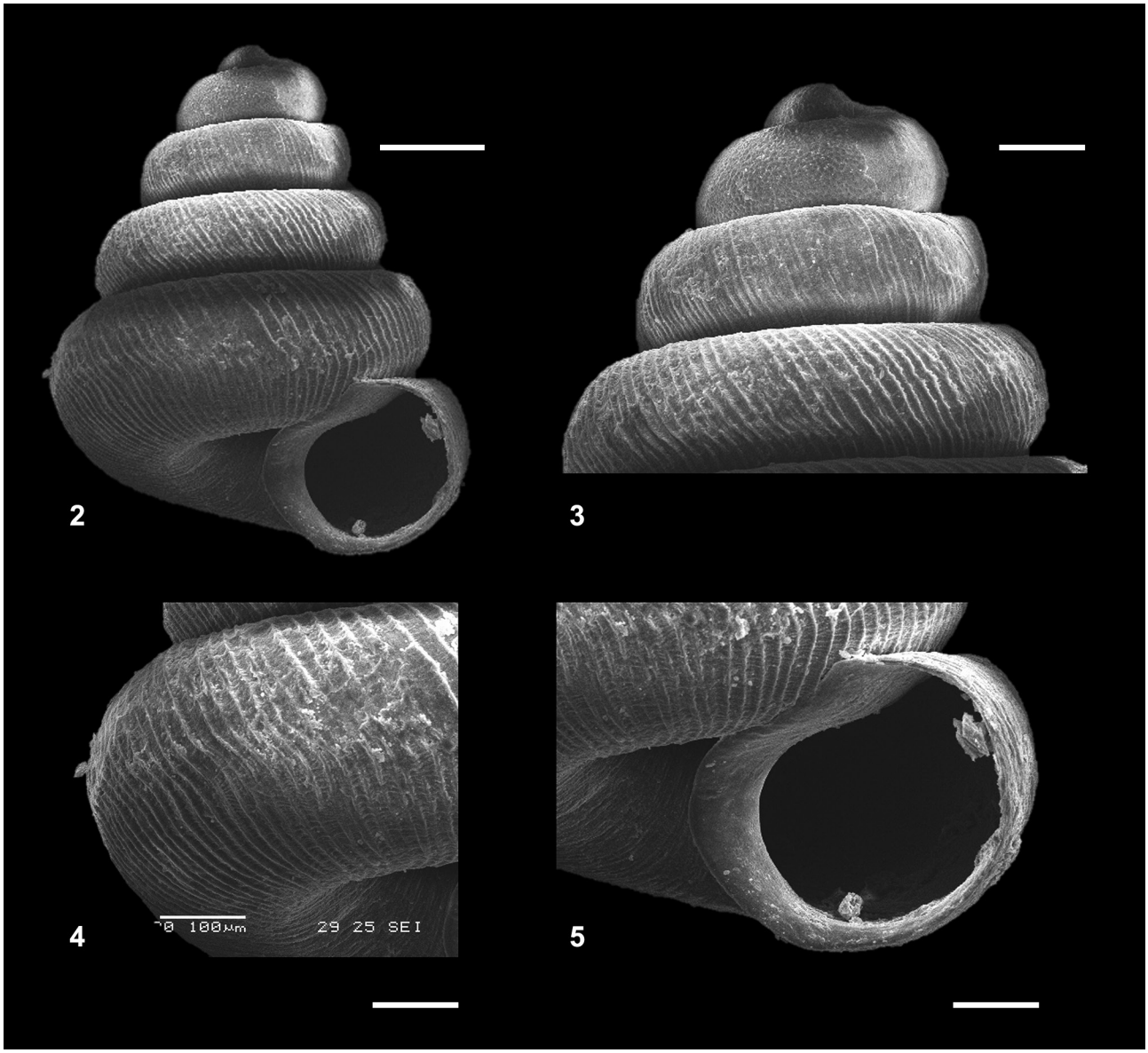
transition from parietal portion to base rounded to obtusely angular. Aperture height 0.36–0.44 mm; aperture width 0.37–0.51 mm. Peristome thin, not expanded. Umbilicus open, narrow. Ratio of umbilicus width to shell width 0.13.

Ecology. On limestone outcrops in primary and secondary forests.

Distribution. Known only from limestone karsts on the eastern and western lowlands of Peninsular Malaysia.

Diagnosis. *A. paeninsularis* shares the typical *Acmella* character of predominantly radial ribs that occasionally converge with four species: *A. tersa* (Benson, 1853), *A. cyrtoglyphe* Vermeulen, Liew et Schilthuizen, in VERMEULEN et al. (2015), *A. roepstorffiana*

Fig. 1. *Acmella paeninsularis* sp. nov.: holotype (BOR/MOL 9839), from Peninsular Malaysia, State of Perak, mykarst-781. Scale bar 1 mm



Figs 2–5. Various views of the holotype of *Acmella paeninsularis* sp. nov. (BOR/MOL 9839). SEM photo showing the shell and sculpture details: 2 – overview of the shell; 3 – protoconch and teleoconch view; 4 – penultimate whorl view; 5 – aperture view. Scale bars 200 µm (2) and 100 µm (3–5)

Nevill, 1878 and *A. umbilicata* Vermeulen, Liew et Schilthuizen, in VERMEULEN et al. (2015). *A. paeninsularis* is smaller, has a more conical shell and a wider umbilicus compared to *A. tersa*. The new species has a much narrower umbilicus compared to *A. umbilicata*. *A. paeninsularis* is most similar to the Bornean *A. cyrtoglyphe* and *A. roepstorffiana* from Katchal (India) in its shell size, dimensions and the prosocline radial ribs. It differs from *A. cyrtoglyphe* in having a more scalariform shell with a slight shoulder, a deeper suture and an umbilicus that is slightly obstructed by the peristome. *A. paeninsularis* differs from *A. roepstorffiana* in having a slight shoulder, deeper suture, taller spire and an umbilicus less obstructed by the peristome. *A. paeninsularis* has a simple peristome while that of *A. roepstorffiana* is thickened. *A. paeninsularis* differs from all other non-typical *Acmella* species listed in DAS et al. (2021) in the presence of fine radial ribs.

Remarks. We placed this species in *Acmella* as it exhibits the typical *Acmella* character of predominant radial ribs that occasionally converge (DAS et al. 2021). The shells of *A. paeninsularis* also lack a spire constriction and the peristome is not thickened (VERMEULEN et al. 2015). *A. paeninsularis* belongs to *Acmella* Group 1 as defined by VERMEULEN et al. (2015). The record of *A. roepstorffiana* in Pahang (MAASSEN 2001) should be compared with *A. paeninsularis* to verify the identification.

Etymology. Named for Peninsular Malaysia, where the species occurs.

Table 1. Shell measurements for *Acmella paeninsularis* sp. nov.

Specimen	Locality	Shell height	Shell width	Height / width ratio	Number of whorls	Aperture height	Aperture width	Number of ribs per mm
BOR/MOL 9839	mykarst-781	1.35	1.10	1.23	5	0.44	0.51	38
BOR/MOL 9781	mykarst-781	1.28	1.06	1.21	4.5	0.42	0.49	41
BOR/MOL 12502	mykarst-781	1.00	0.85	1.17	4	0.39	0.39	41
BOR/MOL 10453/1	Prk 36 Gua Datok	1.01	0.82	1.23	4	0.38	0.40	43
BOR/MOL 10453/2	Prk 36 Gua Datok	1.04	0.80	1.30	4	0.37	0.40	41
BOR/MOL 10453/3	Prk 36 Gua Datok	1.05	0.80	1.31	4	0.39	0.40	32
BOR/MOL 10453/4	Prk 36 Gua Datok	0.95	0.81	1.17	4	0.37	0.39	43
BOR/MOL 10453/5	Prk 36 Gua Datok	0.94	0.81	1.16	4	0.36	0.37	60
Range, mean and standard deviation (no. of specimens)		0.94–1.35 1.08 ± 0.15 (n=8)	0.80–1.10 0.88 ± 0.12 (n=8)	1.16–1.31 1.23 ± 0.06 (n=8)	4–5 NA (n=8)	0.36–0.44 0.39 ± 0.03 (n=8)	0.37–0.51 0.42 ± 0.05 (n=8)	32–60 NA (n=8)

Measurements of shell height, shell width, aperture height and aperture width are in millimetres, NA – not acquired.

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