Tropical Natural History 23 (2023): 52-55

Rediscovery and Redescription of Snail *Pupoides karachiensis* Peile, 1929 (Gastropoda: Pupillidae) with Notes on *P. coenopictus* (Hutton, 1834) from the Karachi Tidal Marsh

FAIZA IQBAL[1], KURT AUFFENBERG[2*], SAFIA KHANAM[1] AND JAVED MUSTAQUIM[1]

[1]*Centre of Excellence in Marine Biology, University of Karachi, Karachi, PAKISTAN*
[2]*Florida Museum of Natural History, P. O. Box 117800, University of Florida, Gainesville, Florida 32611, USA*
[*]Corresponding author. Kurt Auffenberg (kurtauffenberg@gmail.com)
Received: 31 August 2022; Accepted: 22 February 2023

ABSTRACT. – *Pupoides karachiensis* Peile, 1929 was described from beach sand taken from near Karachi (then British India, now Pakistan). To our knowledge this species has not been reported in the scientific literature for 92 years. During an ecological survey of intertidal mud flat of Korangi Creek, Karachi, we found specimens of *P. karachiensis* associated with *P. coenopictus* (T. Hutton, 1834). This is the first subsequent record of *P. karachiensis* since Pilsbry (1931) and we take the opportunity to redescribe the species and include notes on *P. coenopictus*. Shell measurements and the distributions of shells collected during the ecological study on the mud flat are also given.

KEYWORDS: Pulmonata, Pakistan

INTRODUCTION

The Pupillidae Turton, 1831 is a group of air-breathing terrestrial gastropods distributed over much of the world. Most pupillids are small-sized (< 5 mm) and dull in colour which make them easily overlooked by casual shell collectors. The genus *Pupoides* L. Pfeiffer, 1854, (type species = *Bulimus nitidulus* L. Pfeiffer, 1839, now *Pupoides albilabris* (C. B. Adams, 1841)), is characterized by a small, cylindrical (very rarely somewhat ovate) shell (< 7 mm high) and most species are coiled dextrally. The shell is usually without strong sculpture (growth lines or ribs may be present). The adult apertural lip is expanded, but not reflected. The parietal area is usually with a small tooth at the insertion of the upper lip, palatal area toothless. Umbilicus slit-like.

The Pupillidae in Pakistan is represented by *Pupilla* J. Fleming, 1828 and *Pupoides*, with 8 and 2 species respectively (Piele, 1929; Auffenberg, 1997; Pokryszko *et al*., 2009; Altaf *et al*., 2017). *Pupoides karachiensis* has been reported only from coastal habitats in Pakistan (Peile, 1929; Auffenberg, 1997). Karachi is the type locality of *P. karachiensis* from where it is now again recorded after a hiatus of 92 years. We describe the shell morphology of both species below.

MATERIALS AND METHODS

Specimens of the two species were collected from Korangi Creek (24º48′42″N; 67º12′11.5″E), Karachi, during an ecological survey of marine macrobenthic invertebrates of the intertidal mud flat, from January to December 2018. Korangi Creek is located in the eastern portion of Karachi metropolitan city, Pakistan. It is one of the major creeks of the Indus River Delta with dense mangrove forest (*Avicenna marina*), tidal creeks, mud flats, and sandy patches. Sediment samples were collected from high, mid, and low tide levels during ebb tides. The samples were sieved through 1 mm mesh and the small gastropods were sorted under an Olympus stereomicroscope (Model SZX9). All measurements were taken to the nearest 0.1 mm with an ocular micrometer fitted in the stereomicroscope. Dry shells were sputter coated with gold and examined with a Joel scanning electron microscope (Model JSM 6380A), housed in the Centralized Science Laboratory, University of Karachi. These voucher specimens are stored in the Centre of Excellence in Marine Biology, University of Karachi.

Abbreviations: ApH = aperture height, ApW = aperture width, H = shell height, W = shell width, NHMUK = The Natural History Museum, London

RESULTS AND DISCUSSION

Ten specimens of *Pupoides karachiensis* (five intact and five broken) and 13 specimens of *P. coenopictus* (six intact and seven broken) were found during this study. All the shells were empty. The shell morphology of *P. karachiensis* is redescribed below while that of *P. coenopictus* is briefly discussed.

Pupoides karachiensis Peile, 1929

Pupoides karachiensis Peile, 1929, p. 130, one text figure; Pilsbry, 1931: 80 – 81, pl. 18, fig. 8
Type Material. — Holotype NHMUK 1903.7.1.3922.

TABLE 1. Measurements of shell height (H), width (W), aperture height (ApH), and aperture width (ApW) in mm and ratios between H/W, H/ApH, and ApH/ApW of *Pupoides karachiensis* and *P. coenopictus* collected from Korangi Creek, Karachi.

	P. karachiensis						***P. coenopictus***						
	1	**2**	**3**	**4**	**5**	**Mean ± SD**	**1**	**2**	**3**	**4**	**5**	**6**	**Mean ± SD**
H	4.7	4.9	5.0	4.9	5.4	5.0 ± 0.27	4.3	4.4	4.3	4.1	4.7	4.6	4.4 ± 0.26
W	1.8	1.7	2.0	1.8	2.0	1.9 ± 0.14	2.1	2.1	2.0	1.9	2.2	2.0	2.1 ± 0.09
ApH	1.7	1.7	1.7	1.9	1.9	1.8 ± 0.10	1.7	1.8	1.8	1.6	1.8	1.7	1.7 ± 0.09
ApW	1.3	1.4	1.4	1.6	1.5	1.5 ± 0.12	1.5	1.6	1.4	1.3	1.4	1.3	1.4 ± 0.10
H/W	2.6	2.9	2.5	2.7	2.7	2.7 ± 0.15	2.1	2.1	2.1	2.1	2.2	2.3	2.1 ± 0.09
H/ApH	2.8	2.9	2.9	2.6	2.8	2.8 ± 0.16	2.5	2.5	2.3	2.6	2.6	2.6	2.5 ± 0.12
ApH/ApW	1.3	1.2	1.3	1.2	1.3	1.2 ± 0.06	1.2	1.2	1.3	1.2	1.3	1.3	1.2 ± 0.07

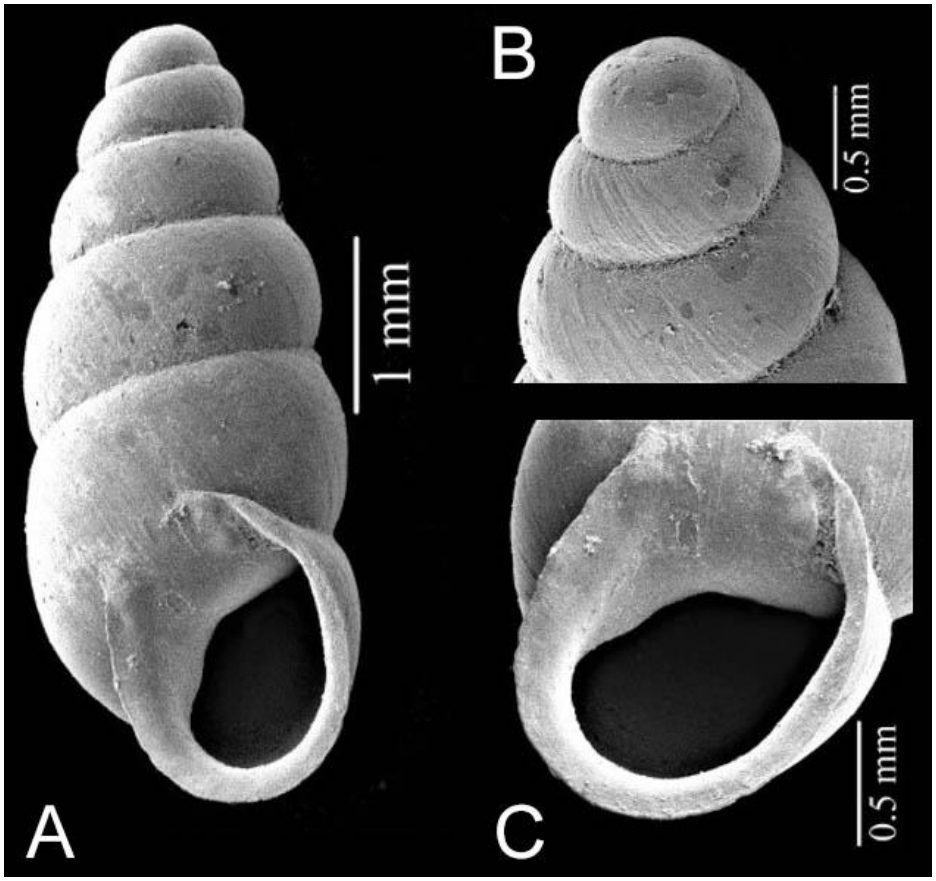

FIGURE 1. SEM photographs of *Pupoides karachiensis*, A: entire shell, B: eroded protoconch and first two whorls of teleoconch with axial growth lines, and C: aperture with expanded peristome and weakly-developed angular tubercle.

Description. — Shell small (H = 4.7 - 5.4 mm, W =1.7 - 2.0 mm, H/W = 2.5 – 2.9) (Table 1), sub-cylindrical, slightly tapering toward apex (Fig. 1A), deeply rimate; 5-6 whorls usually moderately convex with impressed sutures, penultimate whorl often more swollen than others, about 2 embryonic whorls; granulose, later whorls with similar sculpture and weak, irregular axial growth lines and very weak spiral lines (Fig. 1B, sculpture not visible on eroded shells). Aperture sub-circular (ApH =1.7 - 1.9 mm, ApW = 1.3 - 1.6 mm, ApH/ApW = 1.2 – 1.3 (Table 1); columella somewhat truncated at termination. Peristome expanded laterally, including over the umbilical region and basally, not reflexed, thickened internally. Prominent to weak angular tubercle at insertion of outer lip (rarely absent), often connected to peristome with callus; parietal callus present, thin to moderately thickened; palatal area smooth (Figs. 1A and C). Light brown to light tan in color, whitish when faded, outer lip whitish.

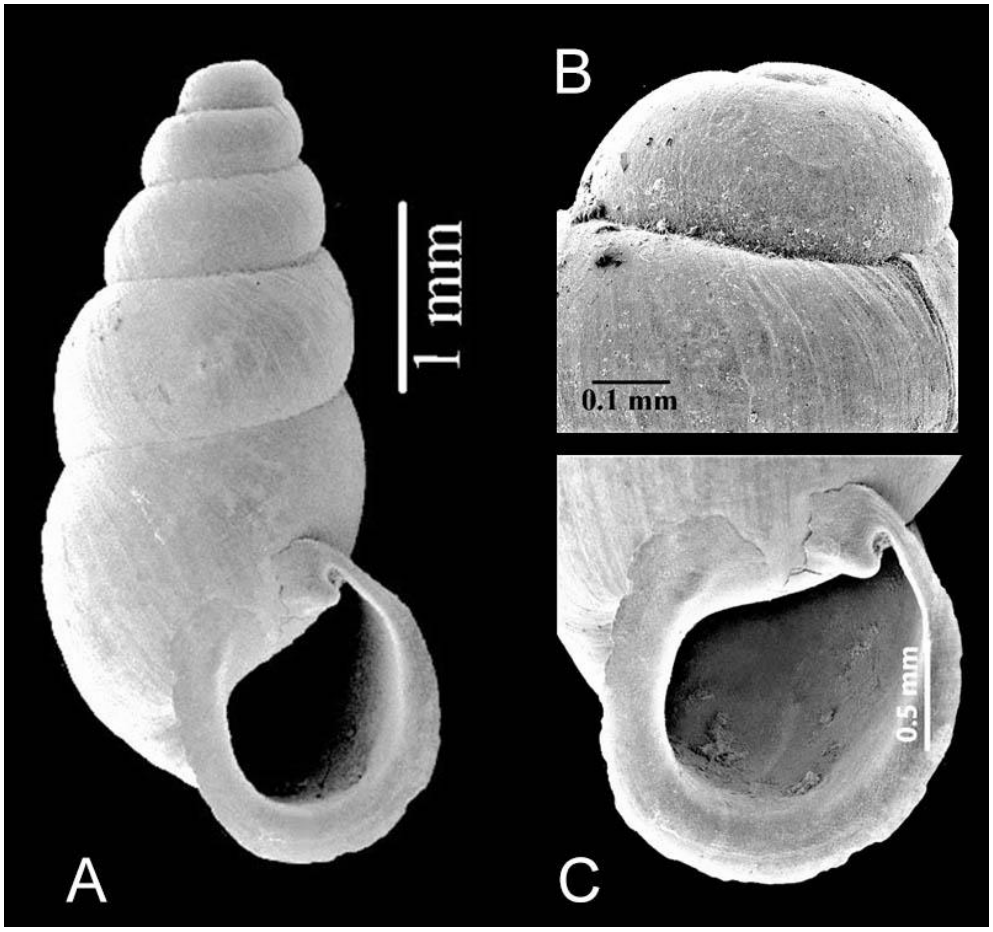

FIGURE 2. SEM photographs of *Pupoides coenopictus*, A: entire shell showing umbilicus and parietal tooth, B: eroded protoconch and first teleoconch whorl with axial growth lines, and C: aperture with expanded peristome and well-developed angular tubercle.

Distribution. — Reported from Karachi by Peile (1929) and Pilsbry (1931); apparently endemic to southern Sindh Province, Pakistan. All known records of this species are from beach sand or marine mud flats. This indicates that these drift specimens were carried for some distance to the coast from more inland habitats.

Remarks. — The species was described from a specimen in the Godwin-Austen's collection in the British Museum labelled as "*Buliminus* sp. nov. Karachi" and a few specimens collected in beach sand near Karachi from Peile's collection (Peile, 1929). This species may co-occur with *Pupoides coenopictus*, but they are easy to separate. *Pupoides karachiensis* is often slightly longer, but narrower than *P. coenopictus* (see Table 1); the former has less deeply impressed sutures; the angular tubercle is usually weaker and may be absent, while that of *P. coenopictus* is usually well-developed; the aperture of *P. karachiensis* is not as round and narrower; *P. coenopictus* has 1.5 embryonic whorls while *P. karachiensis* has two.

Ten specimens were collected during the mud flat ecological study; three, five, and two were found at high tide, mid tide and low tide levels, respectively.

***Pupoides coenopictus* (T. Hutton, 1834)**

Pupa coenopicta Hutton 1834, p. 85, 93.
Pupoides coenopictus, Pilsbry, 1921, 123, pl. 13, figs 1–3; Schileyko 1984: 194, fig. 113; Seddon 1992: 151, fig.; Neubert 1998: 364, figs 41–48, 53; Verdcourt 2006: 16; Ali and Hausdorf, 2017, 2038, fig. 3.

Type Specimens. — Lectotype (NHMUK 1928.07.28. 144/1), Paralectotypes (NHMUK 1928.07.28.145-152).

Description. — (based only on specimens collected during this ecological study): Shell often smaller and usually relatively wider than *P. karachiensis* (Fig. 2A). H = 4.1 - 4.7 mm, W = 1.9 - 2.2 mm, and H/W = 2.1 – 2.3 (Table 1). Shell with five convex whorls and a moderately deep suture. 1.5 embryonic whorls, smooth or microscopically granulose (Fig. 2B, sculpture not visible on eroded shells). Later whorls with weak axial growth lines. ApH = 1.6 - 1.8 mm, ApW = 1.3 - 1.6

mm and ApH/ApW = 2.5 ± 0.12 (Table 1). Aperture ovate, peristome expanded throughout, but not reflexed, parietal area with blunt angular tubercle at insertion of upper lip (Fig. 2C). Shell light brown in colour, dirty white when faded; apertural lip whitish.

Distribution. — Africa (Seddon, 1992); Egypt (Ali and Hausdorf, 2017), Afghanistan, (Solem, 1979; Seddon, 1992), India (Gude, 1915; Mitra *et al*., 2004), Pakistan (Peile, 1929, Auffenberg, 1997).

Remarks. — This species is widely distributed and has been described under several names. See Pilsbry (1921), Seddon (1992), and Neubert (1998) for detailed synonymies. This species has been reported earlier from the Thar Desert region near the locality of this ecological study and the Himalayan foothills of Pakistan by Auffenberg (1997).

A total of 13 specimens of this species were found during the mud flat ecological study, five from high tide, six from mid tide and two from low tide levels.

ACKNOWLEDGMENTS

The first and the third authors are grateful to PMDC (South) project for partial financial support. We thank Barna Páll-Gergely, Plant Protection Institute, Budapest, Hungary for assistance.

LITERATURE CITED

Ali, R.F. and Hausdorf, B. 2017. First land snail records from Gebel Elba in southeastern Egypt at the border between the Palaearctic and Ethiopian regions. Check List, 13(1): 2038, figs. 1-4.

Altaf, J., Qureshi, N.A. and Siddiqui, J.I. 2017. Taxonomic studies on the occurrence of the snails (Mollusca: Gastropoda) in the agroecosystem. Journal of Biodiversity and Environmental Sciences, 10(1): 240-252.

Auffenberg, K. 1997. The biogeography of the land snails of Pakistan, pp. 253–275. In: S. A. Mufti, C. A. Woods, S. A. Hasan (eds). Biodiversity of Pakistan. Pakistan Museum of Natural History, Islamabad and Florida Museum of Natural History, Gainesville.

Gude, G.K, 1915. Zoological Results of the Abor Expedition, 1911-12. Records Indian Museum, 8: 505-513.

Hutton, T. 1834. On the land shells of India. Journal of the Asiatic Society of Bengal, 3: 85-93.

Mitra, S.C., Dey, A. and Ramakrishna. 2004. Pictorial Handbook-Indian Land Snails (Selected Species), Zoological Survey India, Kolkata. 344 pp.

Neubert, E. 1998. Annotated checklist of the terrestrial and freshwater molluscs of the Arabian Peninsula with descriptions of new species. Fauna of Arabia, 17: 333–461.

Peile, A.J. 1929. *Pupoides karachiensis* sp. nov. Proceedings of the Malacological Society of London, 18: 189.

Pilsbry, H.A. 1920-1921. Manual of Conchology. Structural and Systematic. With illustrations of the species. Second series: Pulmonata. Vol. XXVI. Pupillidae: Vertigininae and Pupillinae. Academy of Natural Sciences of Philadelphia. Conchological Division. 192 pp., 18 pls. (1920: pp. 1–128, 1921: pp. 129–192).

Pilsbry, H.A. 1928–1935. Manual of Conchology. Structural and Systematic. With illustrations of the species. Second series: Pulmonata. Geographic Distribution of Pupillidae; Strobilopsidae, Valloniidae and Pleurodiscidae. Vol XXVIII. Academy of Natural Sciences of Philadelphia, Conchological Division, xii + 226 pp., 32 pls. (1927: 1–48, pls. 1–8, 1931: 49–96, pls. 9–12, 1934: 97–160, pls. 13–23, 1935: 161–226, pls. 24–31).

Pokryszko, B.M., Auffenberg, K., Hlaváč, J.Č. and Naggs, F. 2009. Pupilloidea of Pakistan (Gastropoda: Pulmonata): Truncatellininae, Vertigininae, Gastrocoptinae, Pupillinae (in part). Annales Zoologic (Warszawa), 59(4): 423-445.

Schileyko, A.A. 1984. [Terrestrial molluscs of the suborder Pupillina of the USSR fauna]. Fauna SSSR 3, 3. Nauka, Leningrad. (in Russian). 399 pp.

Seddon, M. 1992. The distribution of *Pupoides coenopictus* (Hutton, 1834) in N.W. Africa (Gastropoda, Pupillidae). Journal of Conchology, 34: 149-158.

Solem, G.A. 1979. Some mollusks from Afghanistan. Fieldiana, Zoology, new series, 1: vi + 1–89.

Verdcourt, B. 2006. A revised list of the non-marine Mollusca of East Africa (Kenya, Uganda, Tanzania, excluding Lake Malawi). Maidenhead, UK: published by the author. 75 pp.