Asian Journal of Conservation Biology, July 2026. Vol. 15 No. 1, pp. 200–204 AJCB: SC0076/87840
ISSN 2278-7666 ©TCRP Foundation 2026 https://doi.org/10.53562/ajcb.87840

Short Communication

Range extension of the Paper shell *Hanleyanus vestalioides* (Yokoyama, 1920) to Sundarbans, West Bengal, India

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(Received: October 25, 2025; Revised: March 4, 2026; Accepted: March 20, 2026)

ABSTRACT

A new record of a rare paper shell, tellinid bivalve, *Hanleyanus vestalioides* (Yokoyama, 1920), is reported for the first time from Sundarbans, West Bengal, India. After comparing with the type illustration and malacological collections present in the National Zoological Collections of the Zoological Survey of India, it revealed the species was found to be a new record to India. The shell compressed, thin, inequilateral, posterior side short than the anterior, anterior part rounded and broader going over gradually on one side into the sloping dorsal margin and on the other into the broadly arcuate ventral margin, posterior broader with obliquely truncate with characteristic *Hanlayanus* notch, making an obtuse angle with the gradually sloping dorsal margin as well as with the ascending ventral margin. This species earlier was reported from Japan and some parts of Southeast Asia; however, it had not been recorded so far from Indian waters. Specimens were obtained and examined for their taxonomic identity. This study has information on taxonomy, morphology, habitat and distribution. The finding significantly expands the distribution of *H. vestalioides,* and may also shed light on the biodiversity of the Sundarbans.

Keywords Bivalve, new record, Indian waters, Sundarbans, mangrove, estuarine, marine mollusc

INTRODUCTION

Among the shallow water marine molluscan fauna, family Tellinidae of Bivalvia, commonly known as Paper Shell, constitutes one of the most distinctive groups for their ecological significance in benthic habitats (Dey, 2006).

Members of Tellinidae are represented in all oceans and seas from Polar to tropical regions and found from "the level of high water neap tides" (Young, 1949) to the depths in excess of 600 fathoms (Dall1889). Tellinidae is the third largest marine family after Galeommatids and Veneridae. Hanley in Sowerby II (1846) recognized 207 species; Huber (2015) illustrated 550 species worldwide and believes once it may cross 600 species. Indian Tellinids have been inadequately treated so far (Dey, 2006). Melvill and Abercrombie (1893) reported four species from Mumbai. Smith (1899,1906) described three species from Andaman and Lakshadweep Islands. Preston (1908,1914,1915 and 1916) described eighteen new species from Andaman Islands, Chilika Lake and Ennur backwater, Chennai, out of which 13 have been synonymised with the existing species, 2 valid, 2 of them belongs to other families and one type untraced. Gravely (1941) reported twenty-two species of Tellina from Chennai coast. Hornell and Tomlin (1951) recorded fifteen species from Mumbai. Patil (1954) listed four genera from Karwar coast. Satyamurti (1956) reported five species from Gulf of Manner. Kundu (1965) reported six species from Gulf of Kutch. Surya Rao and Subba Rao (1991) reported five species from of tellinids from Lakshadweep. Subba Rao *et al.*(1992) recorded seven species of tellinids from West Bengal.In India 66 are Indo-Specific forms, sixty two species are known from Indian waters of which 13 known from literature only (Dey, 2006). Subba Rao (2017) dealt with sixty five species which are known to occur in Indian waters.

Hanleyanus vestalioides was first described by Yokoyama (1920) from Japan, and its distribution has been limited to the Indo-Pacific region (Higo et al. 1999). The Sundarbans, the world's largest mangrove ecosystem, is a biodiversity hotspot and a critical habitat for different marine molluscs. This study reports the first record of *H. vestalioides* from this region, expanding its known distribution. Huber (2015) made a new genus *Hanleyanus* which is based on inequilateral, posteriorly furrowed and notch species (A special 'Hanleyanus Notch') with anteriorly detached pallial sinuses with a weak irregular sculpture.*Hanleyanus*is composed of 6 medium sized species. This group is well represented in South China Sea.One species extends west to Arabia, a large species east to Hokkaido, two species from Australia. This unique group has been recognised by Hanley in Sowerby II (1846) who placed here *T.* "*psammotella*" (*H. immaculatus*), *T.emerginatus* (=*H. oblongus*), *H. truncatulus*, and *H.vestalis.* Later two species have been added within this group *H. amboynensis* and *H. vestalioides* (Huber, 1915). Past 50 years such above mentioned species were commonly misplaced in *Angulus* (e.g. Scarlato 1965) followed by Thai, Japanese and Chinese authors.

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Figure 1. Collection locality of *Hanleyanus vestalioides* (Yokoyama, 1920) from Indian waters.

MATERIALS AND METHODS

Field surveys were conducted during low tide in April 2023 in the Gobardhanpur (GDHN) and the surrounding areas of Dhanchi Reserve Forest, Indian Sundarbans (21°57'N, 88°42'E) in South 24 Parganas, West Bengal, India (Fig. 1). All the sites were thoroughly explored and several biological remains including different osseous remains of vertebrates, mollusc shells and plant remains were found. The animal and plant remains were recovered from the peat sediment and layer beneath it. The soil was exposed at the study sites due to erosion caused by natural calamities like *Amphan*, *Bulbul* like cyclones. These sites were at 0 to 10m from sea level and the bio-remains were recorded at different depth intervals of the litho-sediments. Channel samples i.e. peat sediments from which the bio-remains were recovered, were also collected separately. The sub fossil remains of the bivalve specimens were collected using a van Veen grab and by hand picking at the depth of 9ft. from the surface within the slightly exposed peat layer beneath the thick alluvium sediment (Fig. 2). The alluvium sediment was totally removed to get the total peat. layer of about 1 ft. and to recover all the sub-fossilized remains. The recovered specimens were preserved in 70% ethanol and transported to the laboratory for morphological examination. The assemblage of several bivalve shells was found there and the key specimen was a part of it. Morphological examination of the shells was carried out with the help of magnifying glass (10X) and under a binocular microscope. Shell measurements were taken using digital callipers and all the measurements are given in millimetres (mm).Shell measurements are given in terms of maximum dimension along the longitudinal axis (Length), maximum dimension along ventral axis i.e. dorsal to ventral margin (Height) and maximum inflation of the valve when joined (Depth).Identification was conducted following Huber (2015) and Yokohama (1920), and specimens were deposited in the Malacology Division of Zoological Survey of India (ZSI), Kolkata, for future reference.

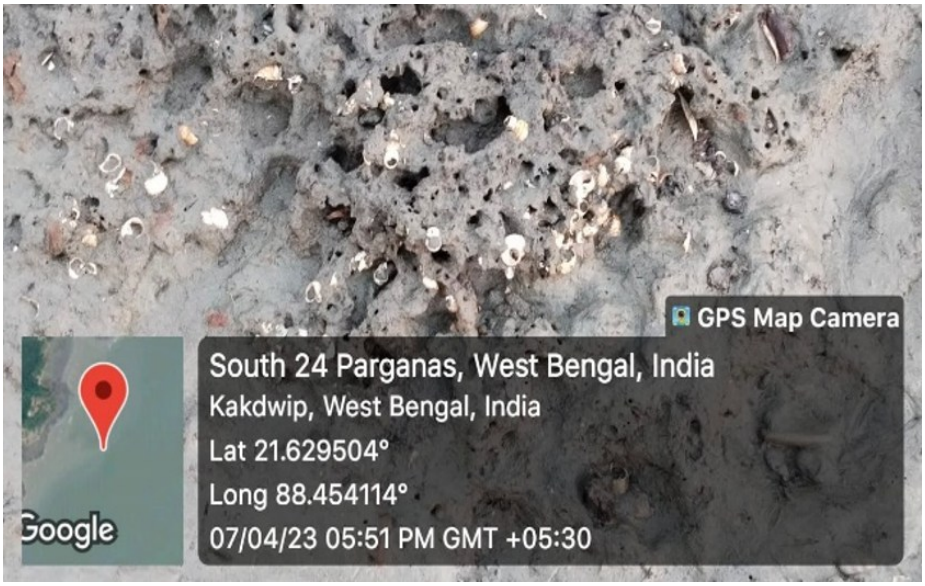


Figure 2. Bivalve shell assemblage at collection locality of *Hanleyanus vestalioides* (Yokoyama, 1920)

RESULTS

Taxonomy

Class: Bivalvia
Order: Cardiida A. Ferussac, 1822
Superfamily: Blainville,1814
Family: Tellinidae Blainville,1814
Genus: *Hanleyanus* M. Huber, Langleit & Kreipl, 2015
Species: *Hanleyanus vestalioides* (Yokoyama, 1920)
Type Species: *Tellina vestalioides* Yokoyama, 1920 [Accepted as *Hanleyanus vestalioides* (Yokoyama, 1920)]

Distribution

Yokoyama 1920: 114 described *Tellina vestalioides*, as fossil (Naganuma Zone) and living in Northern Japan (Hakodate) and noted close similarities to *T. vestalis* Romer. The verified range of *Hanleyanus vestalioides* is Hainan (Coll. Auctt.), along the Chinese coast to S. Hokkaido. The largest *H. vestalioides* nearly 49.1 mm, collected at Osaka Bay by Hondo-san and illustrated by Huber (2015). The Chinese specimens studied are smaller, thinner, and more compressed. Huber (2015*)* wrongly mentioned that all the Hanlayanus group of species are recorded from INDIA. But Huber (2015) mentioned that *H. oblongus* (*T. emerginatus*) an older lot of NHMUK general collection bears the precise location Bombay(Mumbai), Subba Rao (2017) mentioned *H. oblongus* from Maharashtra (Mumbai-Hornell &Tomnlin, 1951), Tamil Nadu (Pulicat Lake- Winckworth, 1931) and (Dey, 2006) mentioned *Tellina vestalis* recorded from India. After that there are no such reports which illustrates that other four *Hanlayanus* group of species available from India.

The species was previously reported from Japan, Taiwan, and parts of Southeast Asia (Higo et al., 1999; Okutani, 2000; Huber, 2015). This is the first record from Indian waters.

Type Locality: Northern Japan (Hakodate); Holotype: Deposited at the University Museum, University of Tokyo, Japan

Material Examined

One intact shell (Fig.3) with right valve and left valve was collected from a peat layer beneath the thick alluvium sediment of the Sundarbans, South 24 Parganas, West Bengal, India, on 7 April, 2023 and deposited in Mollusca Section, Zoological survey of India (ZSI), Kolkata (Registration no. ZSIM39236/11). The sub fossil remains of the bivalve specimens were collected at the depth of 9ft. from the surface within the slightly exposed peat layer beneath the thick alluvium sediment indicating a preference for sheltered estuarine environments. The specimens were recorded at the coastal margin adjacent to mangrove forests of Indian Sundarbans in association with the sub fossil remains of other bivalve mollusc shells viz. *Tegillarca granosa* (25 shells) and *Pristipagia subtruncata* (3 shells) that constituted the assemblage.

Diagnostic Characters

Shell thin but solid, moderately inflated, compressed, elongate-oval, inequilateral; surface smooth with fine concentric growth lines; hinge yellow white in live condition, short protruding RV anterior lateral; pallial sinus deep, extending towards the on third length of the shell.

Description

Right Valve (Fig.3): Shell length up to 22.90 mm, width 13.33 mm, depth of the shell 03.88 mm; moderately inflated and solid, colour varies from yellowish to yellow white; inner surface glossy with weak radial internal striae; anterior margin rounded; ligament external and short. The hinge plate is narrow, bearing well-developed cardinal teeth. The interior is glossy with a distinct deep pallial sinus extending halfway into the shell but not touching anterior scar. Muscle scar strongly impressed. Adductor scars rather large, sub equal, posterior scar broader. Short protruding anterior lateral present which is a significant character of this species is Hanlayanus notch prominent.

Left Valve (Fig.3): Shell length up to 22.97 mm, width 13.40 mm, depth of the shell 03.51 mm Transversely oblong, compressed, thin, and somewhat inequilateral, the shell's posterior side is shorter than its



Figure 3. Interior and Exterior view of *Hanleyanus vestalioides* (Yokoyama, 1920). **a & b.** Original illustration of interior and exterior of left valves (AfterYokoyama, 1920). c-i. present collected specimen from the coast of Dhanchi reserve forest, Sundarbans, West Bengal, India c. Left valve and d. Right valve, e. orientation of right valve and left valve, f. orientation of left valve and right valve, g. Lunule view of the intact shell, h. interior part of left valve and i. interior part of right valve.

anterior; the anterior border is rounded, extending gradually into the dorsal margin on one side and into the broadly arcuate ventral margin on the other; the posterior border truncates obliquely, creating an obtuse angle with both the ascending ventral margin and the gradually sloping dorsal margin. Except for the area enclosed by a highly obtuse umbonal edge and a posterior dorsal boundary that is somewhat depressed along the midline, the surface is evenly and bluntly convex. The sculpture is made up of very weak and uneven radiating lines as well as concentric incremental lines. Two cardinal teeth and a bifid anterior are present. indistinct laterally. The posterior fold is not particularly noticeable. Very deep pallial sinus that nearly reaches the anterior muscle impression.

Remarks

This record extends the known range of *H. vestalioides* and suggests the possibility of undiscovered populations in the northern Bay of Bengal. Further studies on population genetics and ecology are necessary to understand its adaptation to new habitats. *Hanlaynus vestalioides* has close affinity with *H. vestalis* (Yokohama, 1920), but *vestalis* is very thin, translucent, with a single tooth in the left valve instead of two and absent of faint radiating lines. Sometimes it is misidentified as *Macoma*, *Psammacoma* and *Psammotreta* but present of RV anterior lateral which is protruding and deep pallial sinus together with shape and biogeography exclude from the above genera (Lynge, 1909). Zoological Survey of India is the largest repository of zoological collection of south east Asia with having only 50 species of Tellinidae (Voucher specimens) but not any Hanlayanus group of species. New record of this species is a significant addition in this list.

DISCUSSION

The Sundarbans' vast but little-known molluscan diversity is highlighted by the finding of *H. vestalioides* there. New molluscan records from Indian coastal waters have been reported by earlier studies (Mukhopadhyay et al, 2019), highlighting the necessity of ongoing biodiversity assessments. The distribution of marine bivalves may be impacted by anthropogenic pressures and environmental changes; therefore, routine monitoring is crucial for conservation. The tellinid diversity in Indian waters may have been underestimated, as evidenced by the discovery of *H. vestalioides* in the Sundarbans. Prior research on bivalves in this area has mostly concentrated on species that are significant to the economy (Subba Rao, 2017). The necessity of ongoing biodiversity evaluations in this ecologically valuable and fragile area is highlighted by the presence of *H. vestalioides.* Oceanographic currents that facilitate larval migration from Southeast Asian populations may be responsible for its prevalence.

ACKNOWLEDGEMENTS

The authors are grateful to the Director, Zoological Survey of India, Kolkata and Bangabasi College authority for providing necessary facilities for the study. We are indebted to Mr. Biswajit Sahoo, his son Palash and Mr. Surya Raha for their immense help during the present survey. We are also thankful to the forest officials of Dhanchi beat office, Ramganga Range, South 24 Parganas, Sundarbans Biosphere Reserve to permit us to carry out the field study at our own.

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