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First record of Cylindrostethus costalis costalis Schmidt, 1915 (*Hemiptera*: *Gerromorpha*: *Gerridae*) from mainland India

Susmita Khanra[1], Swetapadma Dash[2*]
[1] *Hemiptera* Section, Zoological Survey of India, Prani Vigyan Bhawan, Kolkata, West Bengal, India
[2] Zoological Survey of India, Prani Vigyan Bhawan, Kolkata, West Bengal, India

Abstract
Cylindrostethus costalis costalis (Schmidt, 1915) [5] has been recorded for the first time from mainland India, specifically in riverine and saline environments on Sagar Island and Kalindi river of south 24 pargana, West Bengal. This finding extends the known distribution of the species previously restricted to the Andaman and Nicobar Islands and provides valuable new data on the zoogeography of the subfamily Cylindrostethinae.

Keywords: *Cylindrostethus Costalis*, distribution, *Gerridae*, India

Introduction
The family *Gerridae* is one of the largest families within the suborder *Gerromorpha* and is commonly known as water striders. It comprises more than 100 recognized genera and over 700 described species (Damgaard et al., 2005; Polhemus & Polhemus, 2008) [2, 4]. These semi-aquatic bugs are cosmopolitan in distribution, with the exception of Antarctica (Andersen, 1982) [1]. *Gerridae* is divided into eight subfamilies: Charmatometrinae, Cylindrostethinae, Gerrinae, Eotrechinae, Halobatinae, Ptilomerinae, Rhagadotarsinae, and Trepobatinae (Andersen, 1982) [1]. The subfamily *Cylindrostethinae* includes three genera: *Cylindrostethus* Mayr, 1865, *Platygerris* Buchanan-White, 1883, and *Potamobates* Champion, 1898, of which the latter two are strictly confined to the Neotropical region (Jehamalar et al., 2018) [3].
The genus *Cylindrostethus* can be distinguished from the other two genera by its very large cylindrical body, the presence of abdominal spiracles closes to the anterior margin of the segments, a straight posterior margin of the pronotum, and an unrotated male pygophore. At present, the genus comprises 18 species, of which only two have been reported from India. Among them, *Cylindrostethus productus* (Spinola, 1837) is widely distributed across different Indian states, while *Cylindrostethus costalis* Schmidt, 1915 [5] has so far been restricted to the Andaman and Nicobar Islands.
The present study reports *C. costalis* from mainland India for the first time, thereby adding a new distributional record to the Indian fauna. Such records are crucial for understanding zoogeography, and the occurrence of *C. costalis* on the mainland is particularly significant in tracing patterns of dispersal and the intrusion of Southeast Asian elements into India.

Material and Methods
Specimens were collected from a slow-flowing riverine stream connected to the Kalindi River. The stream was shallow and narrow, with muddy banks lined with tall grasses and dense bushy vegetation. Additional specimens were collected from the surface of saline water near Muriganga Ghat of the Muriganga River on Sagar Island, where the margins of the sampling site were bordered by mangrove vegetation. Sampling was carried out using a D-frame aquatic insect net, and specimens were preserved in 75% ethanol. Photographs and morphometric measurements were taken with a Leica stereo zoom microscope (Leica M205A) equipped with the Leica Application Suite software (LAS V3.8). All measurements are given in millimetres. The examined material is deposited in the National Zoological Collection, *Hemiptera* Section, Zoological Survey of India, Kolkata, India.

Results
Cylindrostethus costalis costalis Schmidt, 1915 [5]
Material examined
2 examples (2♂), Muriganga Ghat, Sagar Island, South 24 pargana, West Bengal, 21° 40''57'' N, 88° 09''5''E, 14.iii.2019, Coll. S.K. Gupta; 5 examples (2♀, 3♂), riverine stream connected to Kalindi river, Tushkhali, South 24 pargana, West Bengal, 22° 20''6''N, 88° 52'51''E, 5.vi.2025, Coll: S. Khanra

Diagnosis
Male: Body length 16.74 mm, width 2.75 mm. Dorsum black and shiny, venter yellow. Head between eyes yellow to orange, relatively broad, with eyes convergent anteriorly; antennal segment IV slightly curved; costal margin of forewing yellowish (Fig.1A, E). A yellow median line extends from the thorax to abdominal tergum IV, indistinct on tergum II and absent on the metanotum. Connexival margin yellow, tergum VIII laterally yellow. Black spinules present from the metasternum to abdominal sternum VII, but absent on the mesosternum (Fig. 1C, K). Fore femur with a broad antero-ventral black stripe, not confluent with the apical ring; subapically bearing a blunt tooth. Fore tibia slightly curved inward apically, with a blunt inner apical process (Fig. 1E). Hind tibia orange, with a longitudinal black stripe on the outer margin; mid and hind legs clothed with minute spines; hind tibia and tarsus fringed with short, curved setae. Pygophore of the male genital part is abruptly acuminate near apex (Fig. 1M); proctiger strongly sclerotised, apical margin armed with 11 stout spines and paired lateral processes, the left process broader than the right (Fig. 1L). Endosomal sheath highly sclerotised. Parameres slightly visible externally, symmetrical, and narrowed medially.

Female: The overall structure of the head, antennae, thoracic segments, and legs in the female is almost identical to that of the male. However, the female is generally slightly larger and more robust than male and with a relatively broader abdomen, especially toward the posterior region (Fig. 1B, D). Sexual dimorphism is most apparent in the terminal abdominal structures: males have a more elongated and complex genital segment equipped with parameres for copulation, while females possess a rounded terminal segment with a short, concealed ovipositor. Additionally, the male's forelegs are often slightly curved and modified for grasping during mating, whereas those of the female are comparatively straighter.

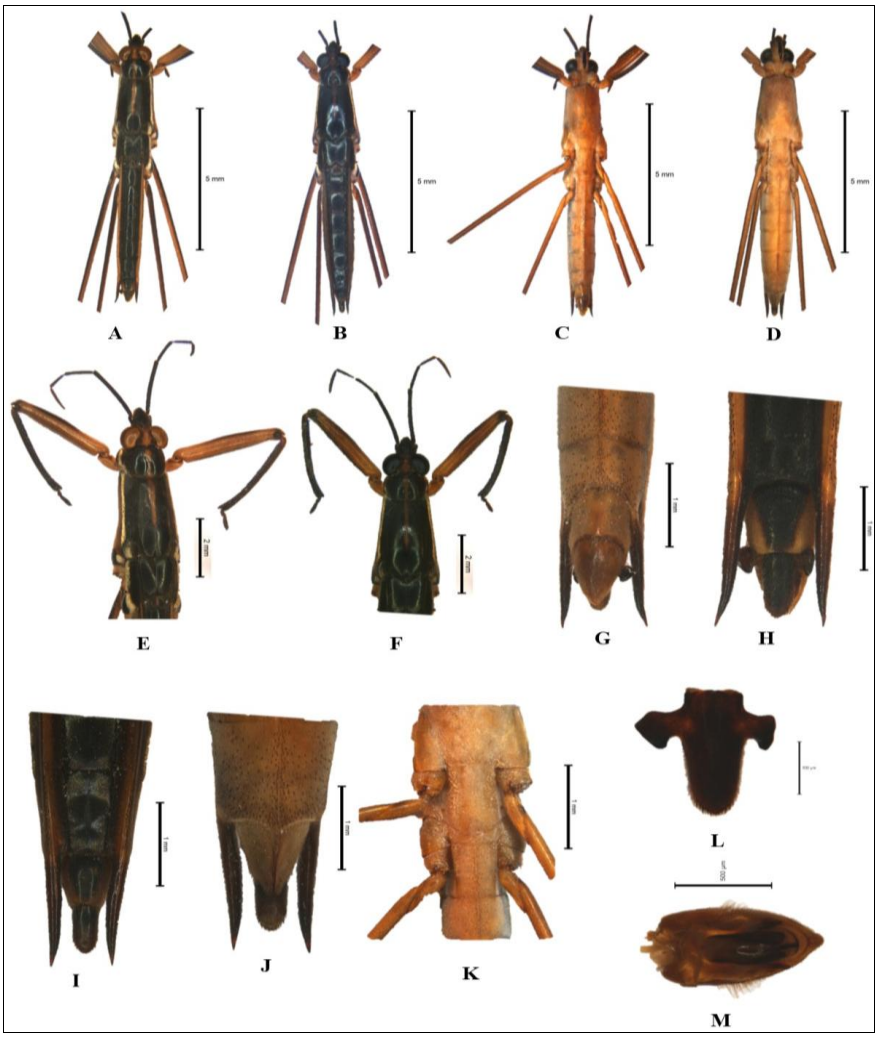

Fig 1: General morphology of *Cylindrostethus costalis costalis* Schmidt, 1915 [5]

Legends

Figure 1. General morphology of *Cylindrostethus costalis costalis* Schmidt, 1915 [5]: (A) male habitus, dorsal view; (B) female habitus, dorsal view; (C) male habitus, ventral view; (D) female habitus, ventral view; (E) male head and thorax, dorsal view; (F) female head and thorax, dorsal view; (G) male abdominal tip, ventral view; (H) male abdominal tip, dorsal view (I) female abdominal tip, dorsal view; (J) female abdominal tip, ventral view; (K) male mesosterna, metasterna and abdominal sterna I to III (L) male proctiger (M) male pygophore, ventral view.

Discussion

The present record of *Cylindrostethus costalis costalis* Schmidt, 1915 [5] from mainland India represents a significant extension of the known distributional range of the species, which was previously restricted to the Andaman and Nicobar Islands. The occurrence of this species in the estuarine and riverine habitats of Sagar Island, West Bengal, suggests its potential dispersal along the coastal and deltaic ecosystems of eastern India. Such an extension may be attributed to passive dispersal through tidal currents, cyclonic events, or the movement of floating vegetation that often serves as a medium for the spread of aquatic and semi-aquatic *Hemiptera*.

The detection of *C. costalis* in the Gangetic delta region also highlights the ecological connectivity between island and mainland faunas. This distributional pattern indicating that the Bay of Bengal coast and associated estuaries may act as natural corridors for dispersal. Besides, the presence of both freshwater and slightly saline habitats in the sampling sites further supports the adaptability of *C. costalis* to a wide range of aquatic environments. The discovery of both males and females in the collection suggests that a stable population may exist in the surveyed locality rather than a chance occurrence.

This new record contributes valuable information to the faunal inventory of Indian *Gerridae* and underlines the need for further systematic surveys in coastal and deltaic regions, which remain underexplored. Continuous monitoring and

detailed taxonomic studies will help clarify the distributional limits, ecological preferences, and potential biogeographic pathways of *C. costalis* and related species in the region.

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Competing Interests
The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

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