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Cover: Nile Crocodile *Crocodylus niloticus* regulating body temperature on a warm day. Digital art on Procreate by © Aakanksha Komanduri.

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COMMUNICATION

First record of leucosiid crab *Lyphira perplexa* Galil, 2009 (Decapoda: Brachyura: Leucosiidae) from the eastern coast of India in West Bengal

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Abstract: This study documents the occurrence of the leucosiid crab, *Lyphira perplexa* Galil, 2009, along the West Bengal coast of India. Specimens were collected from the Petuaghat seabeach and adjacent fishing harbor in Purba Medinipur District. The findings contribute to the limited understanding of the diversity and distribution of leucosiid crabs in Indian waters, specifically in the Bay of Bengal region. The observations include detailed morphological descriptions, habitat preferences, and geographic distribution. This contribution highlights the need for more extensive research on marine biodiversity along the Indian coast, emphasizing its ecological and conservation significance.

Keywords: Bay of Bengal, Crustacea, geographic distribution, Indian coast, marine biodiversity, morphological descriptions, pebble crab, Petuaghat seabeach, purba medinipur, taxonomy.

সারসংক্ষেপ: এই গবেষণায় ভারতের পশ্চিমবঙ্গ উপকূলে লিউকোসিডি (Leucosiidae) গোত্রভুক্ত কাঁকড়া *Lyphira perplexa* Galil, 2009-এর উপস্থিতি নথিভুক্ত করা হয়েছে। নমুনাগুলি পূর্ব মেদিনীপুর জেলার পেটুয়াঘাট সমুদ্রসৈকত এবং সংলগ্ন মৎস্য অবতরণ কেন্দ্র (ফিশিং হারবার) থেকে সংগ্রহ করা হয়। এই অনুসন্ধান ভারতীয় জলসীমায়, বিশেষত বঙ্গোপসাগরীয় অঞ্চলে, লিউকোসিডি কাঁকড়ার বৈচিত্র্য ও বিস্তার সম্পর্কে সীমিত জ্ঞানের পরিধি বৃদ্ধিতে সহায়ক হবে। পর্যবেক্ষণের অন্তর্ভুক্ত ছিল প্রজাতিটির বিস্তারিত আকৃতিগত (morphological) বৈশিষ্ট্য, আবাসস্থল পছন্দ এবং ভৌগোলিক বিস্তার। ভারতীয় উপকূলীয় সামুদ্রিক জীববৈচিত্র্য সম্পর্কে আরও বিস্তারিত গবেষণার প্রয়োজনীয়তা এই গবেষণার মাধ্যমে তুলে ধরা হয়েছে, যা এর পরিবেশগত ও সংরক্ষণগত গুরুত্বকে বিশেষভাবে গুরুত্ব দেয়।

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Author contribution: Prabir Sahoo: Resources, Investigation; Sagar Samanta: Resources, Validation; Avik Bhanja: Writing- Original draft preparation, Formal analysis; Final manuscript preparation; Manas Das: Software, Validation; Pijush Payra: Conceptualization, Methodology

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INTRODUCTION

Leucosiidae, commonly referred to as nut crabs or pebble crabs, is a distinctive family of small brachyuran crabs widely distributed on soft-bottom substrates and coral rubble habitats from the intertidal zone to continental slope depths (Alcock 1896). The family is particularly diverse in the Indo-West Pacific region (Tan 1995; Poore & Ahyong 2023), 765 leucosiid crabs (Brachyura: Leucosiidae) are considered one of the major brachyuran families worldwide (Ng et al. 2008; Beleem et al. 2017; Mohanty et al. 2019; WoRMS 2024). The crabs belong to leucosiid group are popularly known as nut and pebble crabs (Lee et al. 2009; Beleem et al. 2017). A checklist of marine brachyuran crabs from the Western Coast of India documented 84 species of the family Leucosiidae, out of which 22 species were reported from the western coast, whereas 52 species were recorded from the eastern coast of India (Dev-Roy 2013). Leucosiids are commonly associated with shallow seagrass meadows and, less frequently, rocky reef habitats. On tropical coral reefs, certain species possess highly eroded and flattened carapaces that closely resemble broken coral fragments or pieces of the calcareous alga Halimeda, providing effective camouflage within reef environments (Man 1888; Beleem et al. 2017). A higher diversity of the leucosiid group of the crabs is found along the Indian coast of the Bay of Bengal (Chopra 1933; Sarkar et al. 2024).

The genus *Lyphira* currently comprises 10 recognised species worldwide, including three species reported from Indian waters: *L. georgei* Trivedi et al., 2016; *L. heterograna* (Ortmann, 1892); and *L. perplexa* Galil, 2009. Members of the genus can be readily distinguished by a combination of morphological characters, including the ovate exopod of the third maxilliped, a transversely narrow first male pleonal somite, fused male pleonal somites 2–6 bearing a subterminal denticle, and the presence of a short apical process on the first male gonopod (Mohapatra et al. 2026).

This report represents the first documented occurrence of *Lyphira perplexa* along the West Bengal coast of India.

MATERIALS AND METHODS

Two male *L. perplexa* samples were collected from the Petuaghat seabeach area (21.7868° N, 87.8897° E) and near the Petuaghat fishing harbour (21.7947° N, 87.8833° E) in the Purba Medinipur District (Figure 1).

The specimens were measured with precision using Vernier calipers to the nearest 0.1 mm and a plastic ruler graduated to the nearest 0.1 cm. Specimens were identified, measured, and subsequently preserved in 10% formalin. Taxonomic identification was confirmed at the species level according to standard taxonomic keys (Galil 2009; Sudharma et al. 2014; Ebadi et al. 2018; Beleem et al. 2019; AL-Maliky 2020). Diagnostic assessments of the specimens were conducted in the Aquaculture Lab of the Department of Biological Sciences, Midnapore City College, Paschim Medinipur, West Bengal, India, and the Crustacea Division laboratory of the Zoological Survey of India, Prani Vigyan Bhawan, M-Block, New Alipore, Kolkata, India. One representative specimen was registered (Registration No. CR501) and deposited in the Crustacea Division of the Zoological Survey of India, Prani Vigyan Bhawan, M-Block, New Alipore, Kolkata, India for further reference and study.

RESULTS AND DISCUSSION

Systematic accounts

Class: Malacostraca Latreille, 1802
Order: Decapoda Latreille, 1802
Infraorder: Brachyura Latreille, 1802
Family: Leucosiidae Samouelle, 1819
Genus: *Lyphira* Galil, 2009

***Lyphira perplexa* Galil, 2009** (Image 1)

Materials examined: Two males, Petuaghat seabeach (Bay of Bengal), India, coll. Prabir Saho. 16.i.2024.

Description: Carapace is broadly oval and smooth. The posterior region of the carapace exhibits a prominent dome-shaped elevation, contributing to a trilobate appearance that is more pronounced compared to the anterior region. Lack of spines or sharp ridges, dorsal surface of the carapace exhibits a dense arrangement of closely spaced granules. Larger granules are prominently distributed in the hepatic, branchial, and intestinal regions. Along the posterior margin of the carapace, granules of varying sizes are organised in series, with finer granulation observed along the frontal margin and external maxillipeds. The pterygostomial region is distinctly adorned with prominent granules.

Anterior edge of the epistome displays a central indentation bordered by two acute inner angles located adjacent to the afferent branchial canals. The anterior margin of the abdominal sulcus is densely granulated, contributing to its distinct texture. Granulation on the cheliped's merus is notably coarse on the anterior-

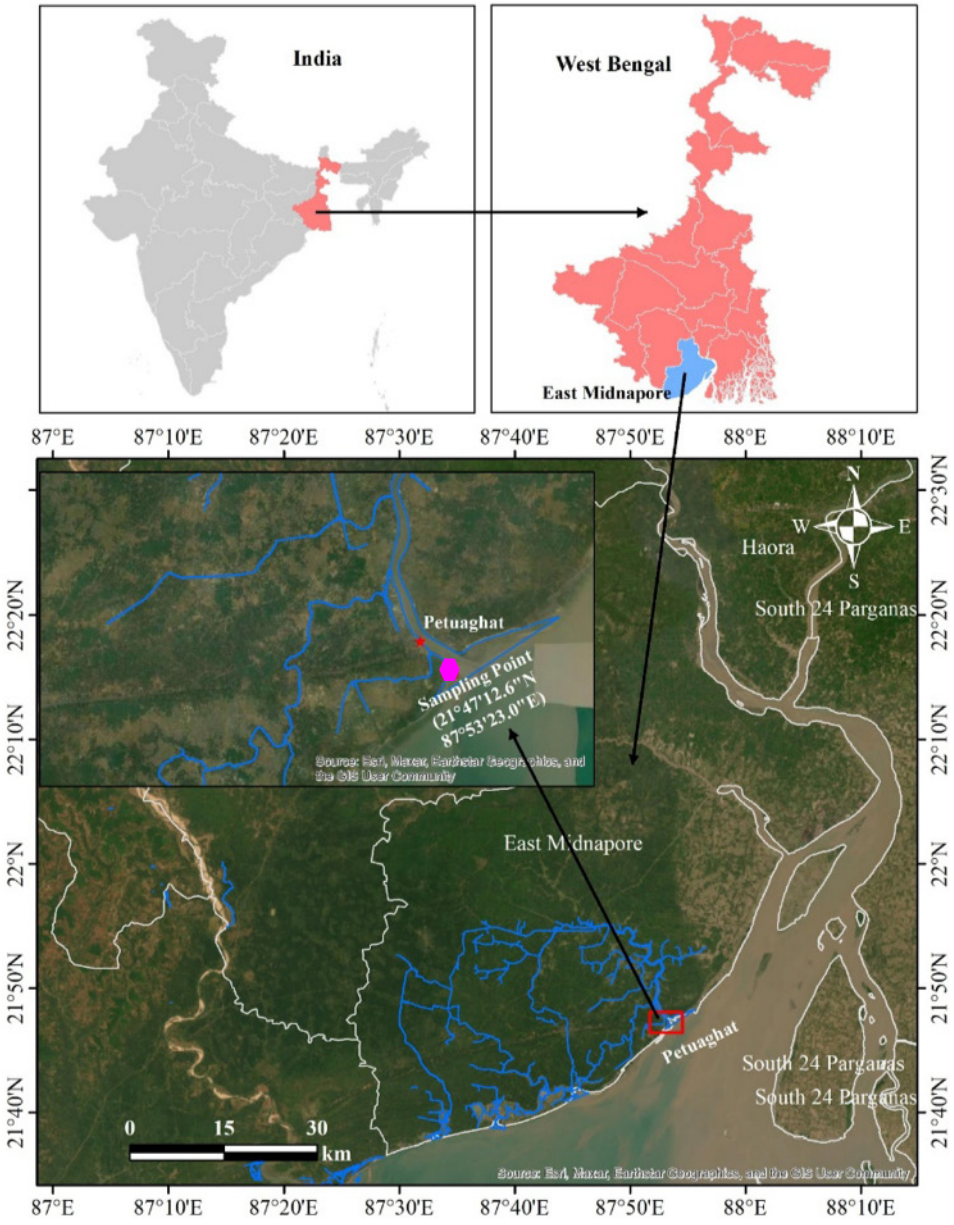

Image 1. Collection sites of *Lyphira perplexa*: ⬣ —Petuaghat seabeach area sampling site | *—Petuaghat fishing harbour sampling site.

posterior surface and the proximal region, gradually diminishing in size and prominence towards the distal region. The dorsal and ventral surfaces of the propodus, as well as the ventral inner surface, exhibit a pattern of conical granules (Image 2).

In the case of pereiopods, merus of the first pereiopod is characterized by a ventral row of spherical granules, whereas the meri of the second to fourth pereiopods possess elongated clusters of finer granules along their ventral margins. The thoracic sterna exhibit fine granulation, particularly in the anterior segments, with an absence of granules noted on the dorsal aspect of the apron. The gonopod is elongated, with its apical region covered in dense, hair-like structures. The tip of the gonopod is smooth and devoid of setae, culminating in a prominent, pointed aperture (Image 3).

Fresh Colouration: The carapace exhibits a rosy-brown hue. The merus of the anterior cheliped transitions from pinkish-brown at the proximal region to a lighter brown towards the propodus and dactylus. The distal portion of the chelae is whitish, with the tips of the fingers distinctly white. The carpus, thoracic sternum, and abdominal regions are uniformly creamy white, providing a distinct contrast to the darker appendages.

Habitat: Inhabits sandy or muddy seabed in shallow marine environments, such as intertidal zones, estuaries,

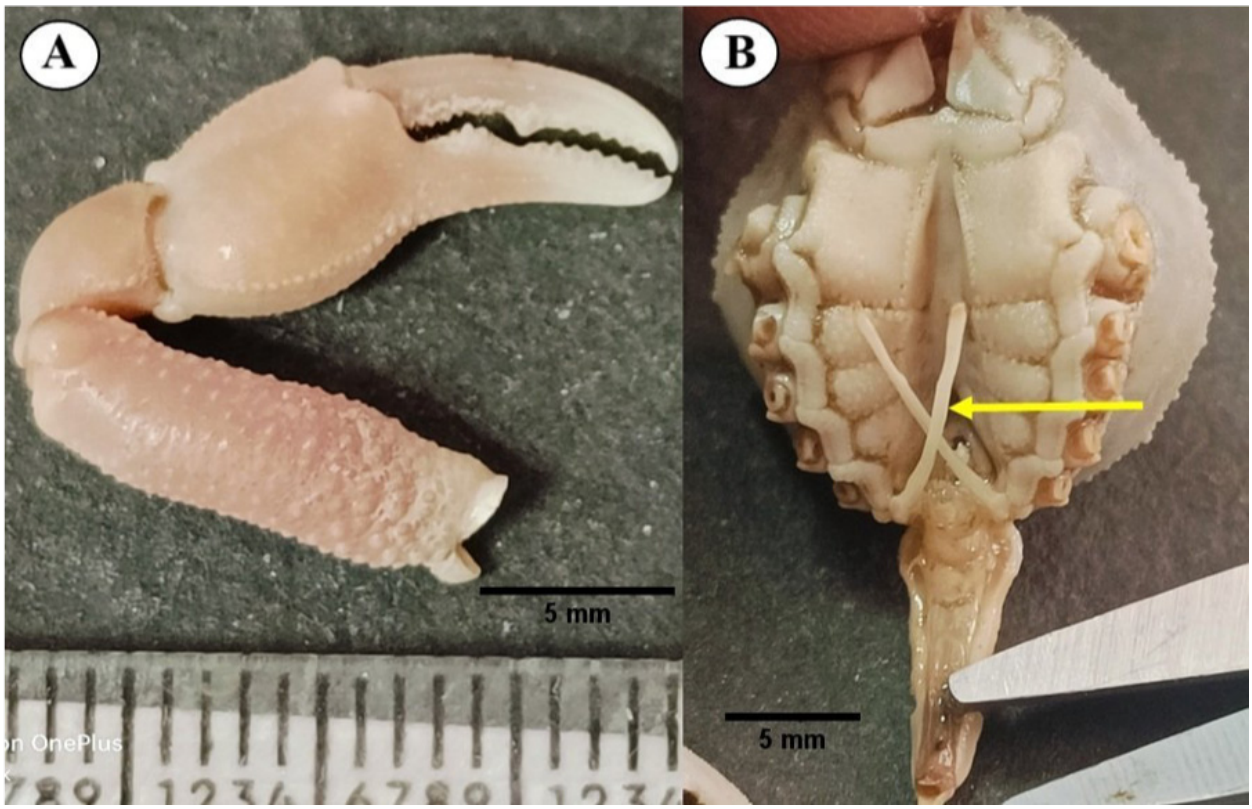

Image 2. *Lyphira perplexa* (male): A—Dorsal view | B—Ventral view. © Authors.

and coastal areas.

Distribution: This species is primarily distributed across various regions in the Indo-West Pacific including the Gujarat coast, Kerala coast, Andaman Islands, Persian Gulf, Gulf of Oman, Kuwait, Iranian coasts, Arabian Gulf, and in the present study on the West Bengal coast of India (Galil 2009; Sudharma et al. 2014; Trivedi et al. 2016; AL-Maliky 2020).

Remarks: The species *L. perplexa* Galil, 2009 was first recorded from off the coast of Calicut, Kerala, by Sudharma et al. (2014) based on a male specimen, and they conducted the first DNA barcoding of the species in Indian waters. In 2013, Trivedi & Arya collected one male and one female specimen of *L. perplexa* from the Cochin Fishing Harbour, Kerala, India. Subsequently, they conducted a comparative analysis between *L. perplexa* and *L. georgei* to identify distinguishing morphological characteristics (Trivedi et al. 2016). The genus *Lyphira* differs from *Philyra* Leach, 1817 in several morphological features: it has an ovate exopod on the external maxilliped, a transversely narrow first abdominal segment in males, fused second to sixth abdominal segments, and lacks the subterminal denticle typically found on the fused male abdominal segments.

Table 1. Measurements of two *Lyphira perplexa* Galil, 2009 (male).

Parameters	Sample 1	Sample 2
Carapace		
Carapace Width (CW)	18.90 mm	17.67 mm
Carapace Length (CL)	18.68 mm	17.42 mm
Carapace Depth (CD)	3.04 mm	2.67 mm
Abdomen		
Abdomen Width (AW)	4.74 mm	4.50 mm
Total Abdomen Length (AL)	13.03 mm	12.3 mm
Telson Width (TW)	1.78 mm	1.45 mm
Penultimate Segment Length (PSL)	3.44 mm	3.22 mm
Penultimate Segment Width (PSW)	2.59 mm	2.38 mm
Abdomen Area (AA)	39.39 mm^2	37.02 mm^2
Appendage		
Cheliped's Dactylus Length (CDL)	8.83 mm	8.23 mm
Cheliped's Propodus Length (CPL)	13.55 mm	12.59 mm
Cheliped's Propodus Depth (CPD)	4.84 mm	4.51 mm
Cheliped's Carpus length (CCL)	5.86 mm	5.47 mm
Cheliped's Merus Length (CMEL)	13.02 mm	12.15 mm
Cheliped's Merus Width (CMEW)	3.82 mm	3.47 mm
4^{th} Pereiopod Merus Length (4PML)	5.60 mm	5.18 mm
4^{th} Pereiopod Merus Width (4PMW)	1.25 mm	1.13 mm

Image 3. A—Right cheliped of *Lyphira perplexa* (male) | B—The sternopleonal cavity of *Lyphira perplexa* (male) showing G1 (first gonopod). © Authors.

L. perplexa can be distinguished from *L. heterograna* by the finer granule size on the surface and margins of the carapace (AL-Maliky 2020). While *L. georgei* is morphologically closest to *L. perplexa*, the proximal margin of *L. georgei* is gently concave, whereas in *L. perplexa*, it is deeply concave. Additionally, the male first left gonopod of *L. georgei* has a medial angular turn, whereas in *L. perplexa*, it is nearly straight (Trivedi et al. 2016).

CONCLUSION AND FUTURE DIRECTIONS

This study documents the first observation of the brachyuran crab *L. perplexa* Galil, 2009, from the West Bengal coast of India. Previously unreported along the eastern coast of India, this record extends the known distribution range of the species. Such findings enhance our understanding of regional biodiversity and contribute valuable data toward the effective management and conservation of marine ecosystems (Silambarasan et al. 2015). In order to improve these results, future studies should focus on molecular confirmation of the species' identity to strengthen taxonomic accuracy, conduct population ecology studies to assess habitat preferences and conservation requirements, and map out comparative distributions in other coastal areas of India. Through these efforts, we will be able to better understand the ecological significance of *L. perplexa* and develop strategies for managing and protecting it in rapidly changing marine environments.

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