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New record of bristly crab, *Pilumnus hirtellus* (Linnaeus, 1761) (decapoda: pilumnidae) in Vellar estuary, Tamilnadu, Southeastern India

by

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Abstract

This study provides the initial documentation of the bristly crab, *Pilumnus hirtellus*, within Vellar estuary on India's southeastern coastline, which was collected between January and March 2025. The species was discovered inhabiting oyster beds. Sex was determined based on the size of the major chela and the presence of egg masses, and all individuals were confirmed to be sexually mature. Detailed morphological examinations affirmed their identity as *P. hirtellus* through comparisons with allied taxa. Historically, this species has been recorded across the North Sea to Morocco, including various Atlantic and Mediterranean islands, and throughout the Mediterranean and Black Seas. This report represents a notable range expansion of *P. hirtellus* to Indian coastal waters.

Key words: bristly crab, *Pilumnus*, Vellar estuary, morphology, oyster bed

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1. Introduction

The genus *Pilumnus* Leach, 1815, encompasses numerous species of hairy crabs predominantly distributed in coral reefs, rocky shores, and cobble zones (Oliveira-Biener et al., 2010). Despite a longstanding interest since the 18th century, the genus remains taxonomically unresolved (Schubart & Aichinger, 2014). Current classifications recognize approximately 146 valid species worldwide (Komai & Motoh, 2012; Ng et al., 2007; Oliveira-Biener et al., 2010), though taxonomic revisions are ongoing. Distinctions within *Pilumnus* species often rely on morphological features such as the configuration of the first gonopod and dentition patterns posterior to the orbital margins (Mavidis et al., 2009). Taxonomic efforts, particularly in the Indo-West Pacific, have been extensive, including revisions by Balss (1933), Chopra and Das (1937), and Takeda and Miyake (1968). Deb (1987) reviewed Indian species, and more recent additions were described by Ng (1988) and Komai and Motoh (2012). Although the family Pilumnidae is documented from the Persian Gulf and Gulf of Oman (Apel, 2001; Naderloo, 2017), detailed studies in Indian estuaries remain sparse.

The distribution of *Pilumnus hirtellus* is as follows: Eastern Atlantic: from Norway to Cape Verde Islands (d'Udekem d'Acoz, 1999; Sankarankutty & Fosshagen, 1967). Mediterranean Sea: Western basin (Zariquiey Alvarez, 1968; d'Udekem d'Acoz, 1994 as *Pilumnus* sp.); Central basin (Pastore, 1972); Adriatic Sea (*P. aestuarii*; Stevcic, 1990); Aegean Sea (d'Udekem d'Acoz, 1994; Koukouras et al., 1992; Mavidis et al., 2009); Levantine basin (Holthuis & Gottlieb, 1958). Black Sea (Băcescu, 1967; Türkay et al., 1987 as *P. aestuarii*). West coast of Portugal (Lobo et al., 2013). The present report extends its distribution to Indian waters, especially Southeast coast of India.

The ecological significance of *P. hirtellus* lies in its role as a scavenger and detritivore in marine ecosystems, consuming algae, carrion, and organic matter. As a prey species for other marine animals and a consumer of detritus, it contributes to nutrient cycling and functions as a link in the marine food web. Its hairy claws aid in capturing food particles, and its hairy bodies help it camouflage among rocks and holdfasts, while its presence indicates healthy conditions in its preferred habitats of stony bottoms, seaweed holdfasts, and under rocks. Despite broad documentation of *P. hirtellus* elsewhere, records from Indian waters are absent. The Vellar estuary, a biodiverse region in Tamil Nadu, supports rich brachyuran diversity, with more than 15 species recorded (Ajmal Khan et al., 2005; Manikantan et al., 2020). This report documents the first occurrence of *P. hirtellus* in the Vellar estuary, offering morphological validation and contributing to the growing knowledge of Indian estuarine crab diversity.

2. Materials and methods

2.1. Sample collection

A total of 59 specimens of *P. hirtellus* (25♀, 34♂) were manually collected along with edible oysters at a depth of 0.3–0.5 m in the Vellar estuary (11.4904930°N, 79.7666846°E) (Fig. 1) during January–March 2025. Morphological features and coloration were documented before preservation. Sex was determined based on the size of the major chela and the presence of egg masses, and all individuals were confirmed to be sexually mature. Specimens were preserved in 95% ethanol and archived in the museum of the Centre of Advanced Study in Marine Biology.

During the sampling period, estuarine water parameters were as follows: temperature 26–27°C, salinity 17–30 ppt, dissolved oxygen 4.5–5.8 mg/L, and pH 7.5–7.9.

Co-occurring benthic faunas, including polychaetes (families: Syllidae, Nereidae, Terebellidae, Eunicidae, Polynoidae); mollusks (*Perna viridis, P. indica, Modiolus metcalfei, Neritina violacea, Barbatia foliata, Clithon oualaniense*); brachyuran crabs (*Metapograpsus* sp., *Parasesarma* sp., *Heteropanope glabra, Nanosesarma* sp., *Thalamita crenata, Scylla serrata);* and amphipods *(Grandiderella japonica, G. bonnieroides, Hornellia incerata, Maera othonides, M. hemigera, Eriopisella* sp., *Melita* sp.), were recorded in the Vellar estuary during this study period.

2.2. Morphometric measurements

Morphometric characters were measured for all specimens following the method of Kaarmugilan and Thangaraj (2025). The measurements included: Carapace length (CL): distance from the anterior edge of the groove between the horns above the eyes to the posterior margin of the carapace along the mid-dorsal line. Carapace width (CW): maximum lateral distance across the carapace. Abdomen length (AL): distance from the anterior margin of the first abdominal segment to the posterior margin of the last segment. Abdomen width (AW): maximum width across the abdomen. Carapace final width (CFW): width across the posterior part of the carapace. Major chela length (MCL): distance across the propodus of the major chela. CW/CL ratio: proportion of CW to CL. Measurements were taken with a digital caliper (Mitutoyo, Japan;

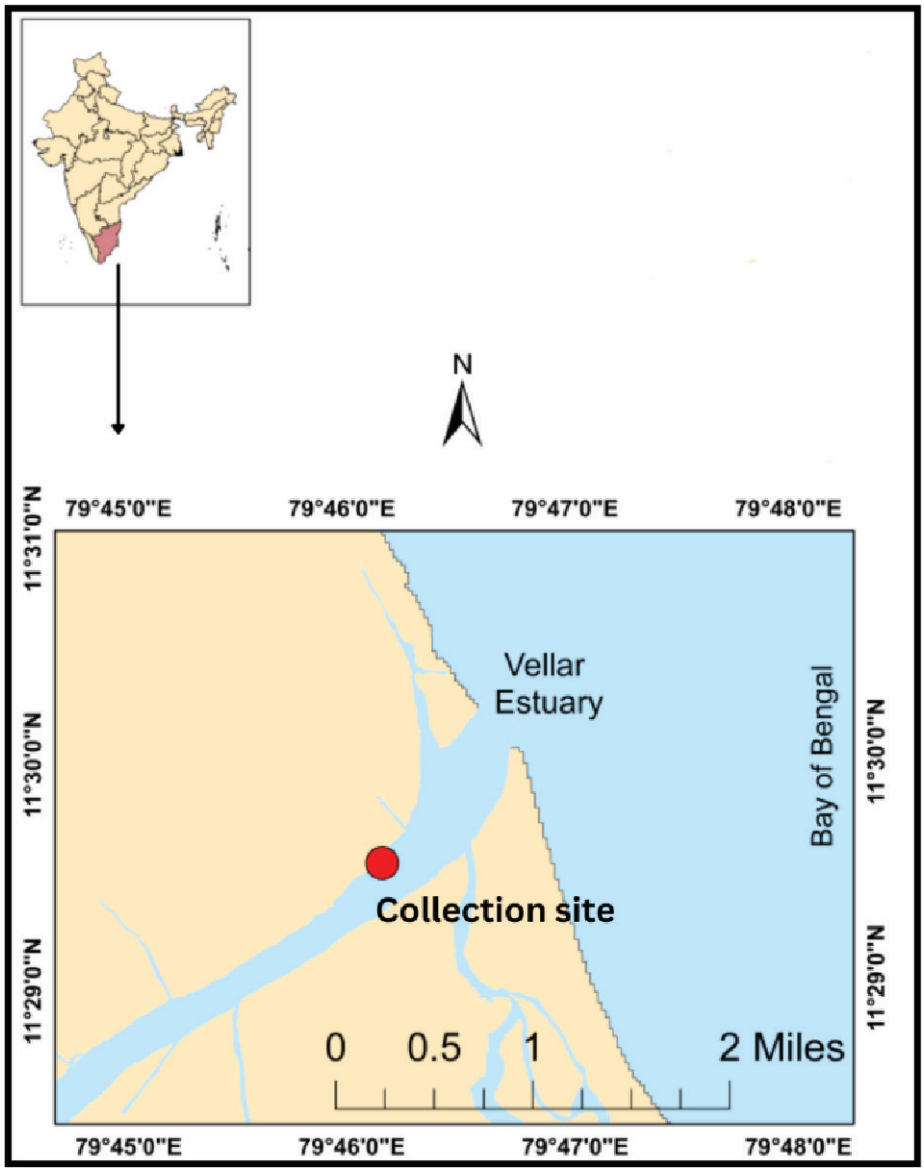

Figure 1

Map showing the collection site of *Pilumnus hirtellus*.

accuracy 0.1 mm). Body weight was recorded using a digital balance (g).

3. Results

3.1. Description

Based on the description of Türkay (2001), the collected specimens of *P. hirtellus* in this study showed the following characters. The coloration of the crabs ranged from dark green to brownish (Fig. 2). The carapace is broader than long (CW/CL = 1.46), trapezoidal in shape, slightly convex, and has a rough texture (Fig. 3A). Plumose setae or bristles (Fig. 3J) are scattered across the carapace, with no long, flexible simple setae present. Female crabs had a broader carapace compared to their male counterparts. The anterolateral margin of the carapace features three sharp teeth, with a small denticle between the first anterolateral tooth and the outer orbital angle (Fig. 3A). The supraorbital margin has a distinct fissure but lacks denticles on the inner margin, though some rounded granules are present. In the sub-hepatic region, a small denticle is located between the first anterolateral tooth and the outer orbital angle. The frontal width is relatively small,

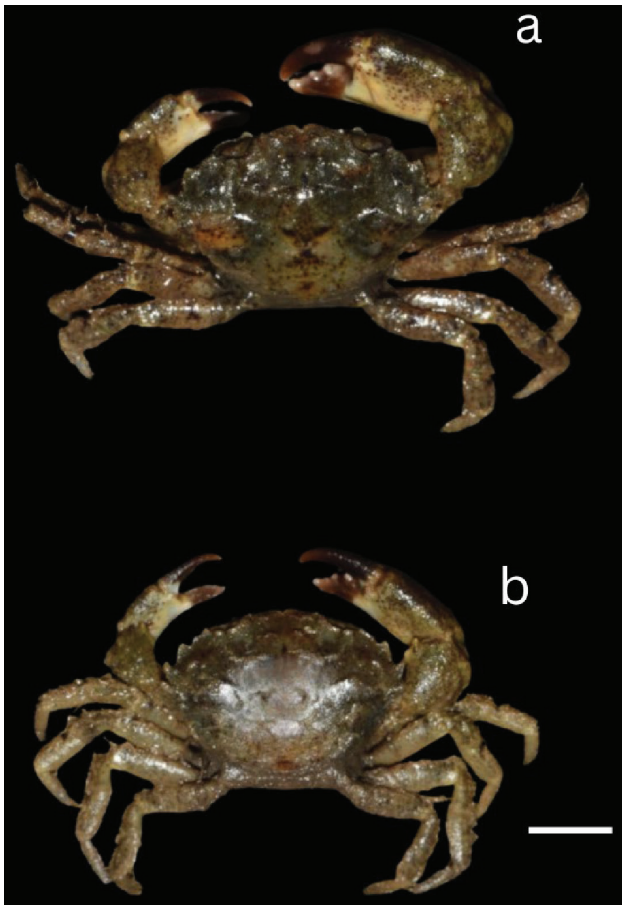

Figure 2

Pilumnus hirtellus. **(A)** male and **(B)** female (Scale bar: 5 mm).

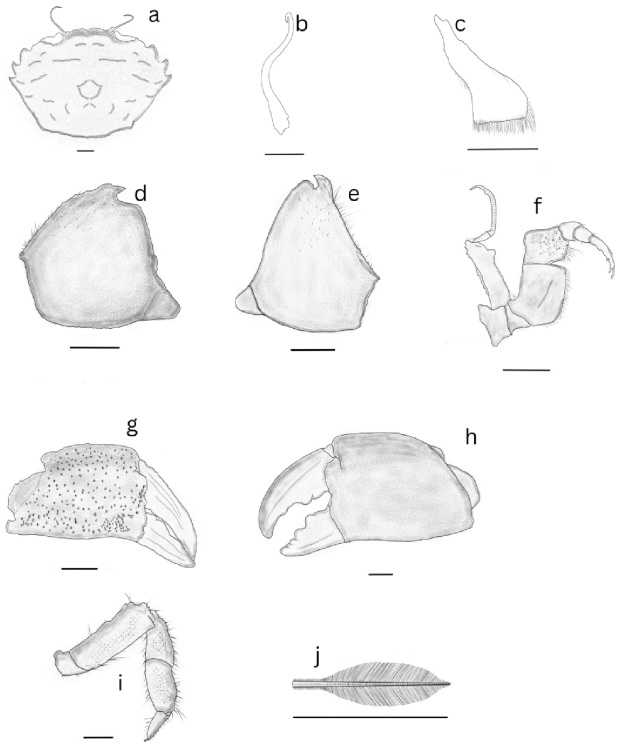

Figure 3

Pilumnus hirtellus male. **(A)** carapace; **(B)** first gonopod; **(C)** maxilla endite; **(D)** merus of minor chela; **(E)** merus of major chela; **(F)** third maxillipeds; **(G)** minor chela; **(H)** major chela; **(I)** fourth periopod; and **(J)** Plumose setae/bristle (Scale: A, D, F, G, H, I = 2 mm; B, C = 1 mm; J = 0.5 mm).

with densely arranged tubercular teeth. The external margin of the maxilla endite lacks a notch (Fig. 3C). In the major chela, the propodus length-to-width ratio is 1.32, while the propodus-to-non-movable-finger length ratio is 2.52 (Fig. 3H). In the minor chela, spines are present on both the upper and lower halves of the palm (Fig. 3G). The second, third, fourth, and fifth pereiopods lack spines on the dorsal distal margin of the carpus. In the third pereiopod, the merus length-to-width ratio is 2.4, while in the fifth pereiopod, it is 2.2 (Fig. 3I). All pereiopods possess brush-like setae. The chelipeds are subequal, with one slightly larger than the other is. In males, the carpus and merus of the major chela have a smooth surface, whereas females have low granules on the upper surface (Fig. 3E). In the minor chela, the upper surface of the carpus and merus have some granules, with a single spine-like structure present (Fig. 3D). The third maxillipeds cover the buccal cavern, with the ischium being rectangular and the merus semi-quadrate, granular, and covered with plumose setae (Fig. 3F). The apical part of the gonopod is slightly curved in a question-mark shape, with the tip nearly directed in the ventral view. It bears two lines of minute setae covering the apical part, while slightly longer setae are present on the ventral margin (Fig. 3B). The morphometric characteristics of male and female *P. hirtellus* are provided in Table 1.

4. Discussion

Zariquiey Alvarez (1968) considered *Pilumnus aestuarii* Nardo, 1868, a distinct species, distinguishing it from *P. hirtellus* based on the absence of spinulation on the palm of the major chela and the slenderness of its pereiopods. Specifically, the P3 merus length-to-width ratio was reported as 3.56 in *P. aestuarii* and 2.31 in *P. hirtellus*, while the P5 merus length-to-width ratio was 3.56 in *P. aestuarii* and 1.65 in *P. hirtellus*. In *P. hirtellus*, the carapace width-to-length ratio (CW/CL) was 1.46, whereas in *P. persicus* and

Table 1

Morphometric parameters of *P. hirtellus*

Morphological parameters (mm)	Male (*n* = 34)	Female (*n* = 25)
CL	9–10	8.4–8.7
CW	13–14	12.6–13
CFW	4.8–5.6	4.4–4.6
AL	4.8–5.3	5.3–6
AW	2.1–3.2	5.3–5.7
MCL	10–11.6	7.7–9.2
Major chela position (*n*)	Right (20) left (14)	Right (17) left (8)
Weight (g)	0.81–1.15	0.66–0.81

AL, abdomen length; AW, abdomen width; CFW, carapace final width; CL, carapace length; CW, carapace width; MCL, major chela length.

P. parvusi, this ratio was recorded as 2.2 (Fahimi et al., 2021). The carapace of *P. hirtellus* features three sharp teeth, with a small denticle located between the first anterolateral tooth and the outer orbital angle (Fig. 2A). In contrast, *P. persicus* possesses three conical spines and a similar small denticle in the same position (Fahimi et al., 2021). The spinulation of the large cheliped serves as a key distinguishing feature among species. In *P. hirtellus*, the chelipeds are smooth, whereas in *P. spinifer*, they bear spinules. Additionally, the distribution of setae types on the walking legs differentiates *P. hirtellus* from related species. The presence of plumose setae on the carapace distinguishes *P. hirtellus* from *P. spinifer*, which exhibits a different setal pattern. In *P. villosissimus*, the carapace lacks plumose setae and is instead covered with long, flexible setae, whereas in *P. hirtellus*, plumose setae are present. In *P. longicornis*, the chelipeds are subequal, with the upper surface of the merus exhibiting low granulation, the carpus bearing a thorn, and the palm and dactylus covered in granules and thick setae. In contrast, in *P. hirtellus*, the major chela in males has a smooth surface, while the female chela has low granules on the upper surface. The minor cheliped of *P. hirtellus* features granules on the upper surface of the carpus and merus, along with a single spine-like structure. The first gonopod morphology also serves as a key taxonomic trait. In *P. longicornis* and *P. incanus*, the first gonopod is cylindrical, with the apical part laterally curved at a 35°, its tip nearly directed in the ventral view, and bearing two lines of minute setae that do not completely cover the apical part. In contrast, the gonopod of *P. hirtellus* has an apical part that is slightly question-mark-shaped, with the tip nearly directed in the ventral view and two lines of minute setae fully covering the apical region. Another distinguishing characteristic is the external margin of the maxilla endite. In *P. hirtellus*, the maxilla endite lacks a notch, whereas in *P. spinifer*, a distinct notch is present (Mavidis et al., 2009).

Based on the above diagnostic characteristics, the presence of *P. hirtellus* in the Vellar estuary is confirmed. Earlier, brachyuran crab diversity in the Vellar estuarine mangroves was reported to comprise only eight species (five grapsids and three ocypodids) (Ajmal Khan et al., 2005). Since then, the diversity has expanded with continued colonization, and several additional species have been recorded, including *Neosarmatium asiaticum*, *Episesarma versicolor*, *Perisesarma bidens*, *Parasesarma plicatum*, *Nanosesarma minutum*, *Plagusia dentipes*, *Ocypode platytarsis*, *Cardisoma carnifex*, *Macrophthalmus depressus*, *Metopograpsus frontalis*, *Metopograpsus latifrons*, *Grapsus albolineatus*, *Uca lactea*, *Uca triangularis*, and *Ocypode brevicornis* (Manikantan et al., 2020).

Previously, *P. hirtellus* was considered a strictly marine crab. However, the present study confirms its occurrence in brackish water habitats of the Vellar estuary. Available literature highlights its occurrence and its opportunistic scavenging diet, which suggests a high level of adaptability. However, there is no documented evidence of human-mediated introductions, ecological impacts, or economic consequences outside its native range. Its widespread distribution is generally attributed to natural oceanic currents, although shipping and other human activities could potentially aid dispersal. Ecologically, *P. hirtellus* may compete with other benthic organisms and influence local community structures, yet no invasive impacts have been reported. Likewise, there is no indication of economic damage, such as effects on fisheries or aquaculture. Unlike some other widely distributed marine species, *P. hirtellus* has not been classified as invasive in any region, and current knowledge remains limited to its natural habitats.

5. Conclusion

This report documents the presence of *P. hirtellus* in Vellar estuary for the first time, extending its known range to India's southeastern coastline. Such findings enhance regional biodiversity inventories and inform conservation efforts. Accurate species identification is vital for ecological studies, particularly amid escalating threats to marine ecosystems from climate change and anthropogenic pressures. Continued taxonomic surveys are essential for managing and conserving estuarine biodiversity.

Ethical approval

Not applicable.

Author's contribution statement

GJ: Conceptualization, Sample collection, Identification, Drawing. VS: Sample collection. SA: Visualization, Validation. AA: Methodology, Data curation. MT: Conceptualization, Writing – review & editing, Writing – original draft, Validation, Supervision, Methodology.

Conflict of interest

The authors declare that they have no conflict of interests or personal relationships that could have appeared to influence the work reported in this paper.

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