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New distribution record of *Macrobrachium striatum* (Pillai, 1991) from the Kali estuary, Karwar, Karnataka, West Coast of India

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Abstract

This study reports the first record of Caridean prawn *Macrobrachium striatum* (Pillai, 1991) from the estuarine region of the Karwar coast on the West coast of India. Male and female specimens with total lengths of 84 mm and 58 mm respectively, were studied. The observed female specimen proved to be ovigerous and had an egg size of 0.2 mm. *M. striatum* was mainly collected during the post-monsoon season (October to January). Therefore, a detailed description, morphomeristic characteristics, and color photographic images of male and female prawn of *M. striatum* are explained in the present paper as a new sighting and observation.

Keywords: Caridean; Crustacean; Estuary; *Macrobrachium striatum*; Morphology.

1. Introduction

Caridean prawns are found in a wide variety of aquatic habitats, namely high elevation, year- round streams to coastal seas. They are distributed worldwide and have

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considerable food value to mankind. Their high protein content and the value-added products derived from them provide significant sources of income for country's inhabitants. Moreover, prawn can be considered as a suitable laboratory animal model for ecotoxicological studies (Quddusi and Kazim, 2012). The genus *Macrobrachium* is the ideal species for scampi culture, which is widely distributed in the Indo-West pacific from South and East Africa, India to South China, the RiuKiu Islands and the Malay Archipelago (Holthuis, 1950; Tiwari and Pillai, 1973; Jagadisha, 1977).

In India, freshwater prawns of genus *Macrobrachium* are increasingly used for aquarium and aquaculture trade (Radhakrishnan *et al.*, 2012). Most species of the Caridean prawns have low economic value, so the exact species diversity is uncertain. The infraorder Caridea was first recognized and named by Dana (1852); later this taxon was revised primarily by Holthuis (1955 and 1993). An initial contribution to the study of the Indian Caridian prawns was made by Jayachndran (2005); Valarmathi (2009); Suseelan (1996). The taxonomic status, diversity, and regional distribution of Palaemonidae prawns were listed and regularly revised. Jayachandran (2005) reported 46 species of marine Palaemonidae prawns from the Indian coast. Similarly, a checklist of freshwater prawns of the families Atyidae and Palaemonidae was published by Valarmathi (2009).

In the Indian subcontinent, the family Atyidae represents a single genus Caridina with 28 species and the genus *Macrobrachium* with 62 species, of which 11 species have been reported from the Karnataka region. Along the coastal region of Karwar, Jagadisha (1977) studied the Caridean prawn larvae and reported 18 Caridina species belonging to three superfamilies: Palaemonoidae, Alpheoidae and Crangonoidae, respectively. Consequently, a new species (*Leptocarpus potamiscus*) was recorded by Pednekar and Haragi (2021), which belonged to the family Palaemonidae. The superfamily Palaemonoidae represents three species of *Macrobrachium*, namely *M. rosenbergii, M. equidens, and M. idella*. The species *Macrobrachium striatum* has been reported only from the coast of Kerala, limiting its endemism to the Southwest coast of India. Therefore, the present study reports the first record of *M. striatum* from the Karnataka coast of India with detailed morpho-meristic characters.

2. Methodology

2.1. Sampling area

Specimens of *Macrobrachium striatum* were collected from January 2018 to December 2022 from the Kali River estuary (Long 14° 50' 15"; Lat74° 10' 14" E) from Karwar, Karnataka, India (Figure 1), with continuous observations over a period of four years. Specimens were collected using the indigenous bag net operated by traditional fishermen. The fresh specimens were brought to the laboratory, photographed and preserved in 70% alcohol. Taxonomic identification was based on the available literature by Pillai (1990). Also, the specimens were kept in the museum of the Department of Marine Biology under

the Ref ID- (KWR-PR-MS-05-2020) Karnatak University Post Graduate Centre, Karwar, Karnataka, India.

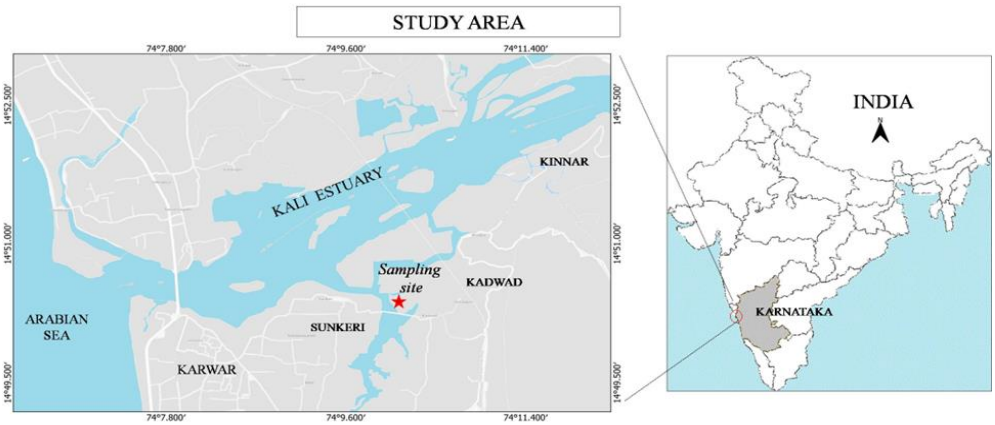

Figure 1. The location of the sampling site along Kali River Estuary, Karnataka, West coast of India. (Source: QGIS-Quantum Geographic Information System)

2.2. Morphological characters examined

Morphometric measurements were obtained using a standard measuring equipment by using ruler, with precision in millimeters (mm) to assure accuracy in the recorded dimensions of the specimens. Abbreviations used: total length (TL), carapace length (CL), carapace with the presence of spines, Mouth parts: rostrum length (RL), number of dorsal and ventral teeth, shape of rostrum; telson (T), telson length (tl), uropod (U); structure of second pereopod, position of spines on the telson, and color pattern.

3. Results and Discussion

3.1. Systematic accounts

The species *Macrobrachium striatum* (Pillai, 1991) belongs to the following taxonomic classification:

- Order- Decapoda Latreille, 1802
- Infraorder- Caridea Dana, 1852
- Family- Palaemonidae Rafinesque, 1815
- Genus- *Macrobrachium* Spence Bate, 1868
- Species- *Macrobrachium striatum* Pillai, 1991

3.2. Synonymised names

The species *Macrobrachium striatum* (Pillai, 1991) has been documented under various names in scientific literature, reflecting changes in its taxonomic classification over time. These synonymized names were verified using the World Register of Marine Species (WoRMS, 2024).

- *Macrobrachium* Spence Bate, 1868

- *Macrobrachium striatus* Pillai, 1991 (unaccepted)
- *Macrobrachium striatum* Pillai, 1991 (accepted)

3.3. Material examined

The following specimens of Macrobrachium striatum (Pillai, 1991) were examined for morphometric analysis, these measurements are essential for understanding the size, morphology, and reproductive characteristics of M. striatum from the Karwar estuarine region. This detailed examination also supports species identification and highlights diagnostic features essential for taxonomic clarity.

Male: TL- 84 mm; CL- 22mm; RL-19 mm; tl -10 mm; rostrum: number of teeth – dorsal- 11, ventral- 4; second chelate leg (pereopod): ischium- 14 mm, merus- 22 mm, carpus- 39 mm, propodus + dactylus- 49 mm, dactylus – 18 mm (Figure 2A).

Ovigerous female: TL- 58 mm; CL- 15 mm; RL-12 mm; tl -7 mm; rostrum: number of teeth – dorsal- 12; ventral- 5; second chelate leg (pereopod): ischium- 6 mm, merus- 8 mm, carpus- 10 mm, propodus + dactylus- 14 mm; dactylus – 6 mm; egg- 0.2 mm (Figure 2B, H).

3.4.Diagnosis and Identification Key for Macrobrachium striatum (Pillai, 1990)

The body is dense and strapping (males), male and ovigerous females are greenish-brown in color with narrow longitudinal stripes and unbanded stripes on the carapace, followed by abdominal somites, pereopods, and telson (Figure 2A-H).

The rostrum of adult specimen is well developed and rigid, slightly curved upwards with a dark brown color in the male prawn (Figure 2A) and a vivid color in the female prawn (Figure 2B), dorsal and ventral rostrum teeth present, dorsal arm with 11-12 teeth and a ventral arm represents 4-5 teeth (Figure 2C).

Carapace laterally lined with patchy bands, antennal and hepatic spines forming a single straight line one above the other (Figure 2D); mouth parts: maxillula bilobed with well-developed palps (Figure 3a). The mandible has three common palps with one incisor (three blunt teeth) and one molar (Figure 3b). Maxilliped I, II and III with exopodite, endopodite and epipodite present (Figure 3c, d, e). Maxilla deeply cleft with setae (Figure 3f).

The first pair of pereopods is mottled with brittle chelate and covered by tufts of setae. Similarly, the second pair of pereopods are mottled with brittle chelae and covered with setae tufts and tiny spines on the entire pereopods, mobile fingers (chela) with two fixed teeth and immobile with one fixed tooth (Figure 2F). Subsequently, the third, fourth and fifth pereopods are non-chelate, dactylus and are spotted with dark and light bands; pleopods are non-banded.

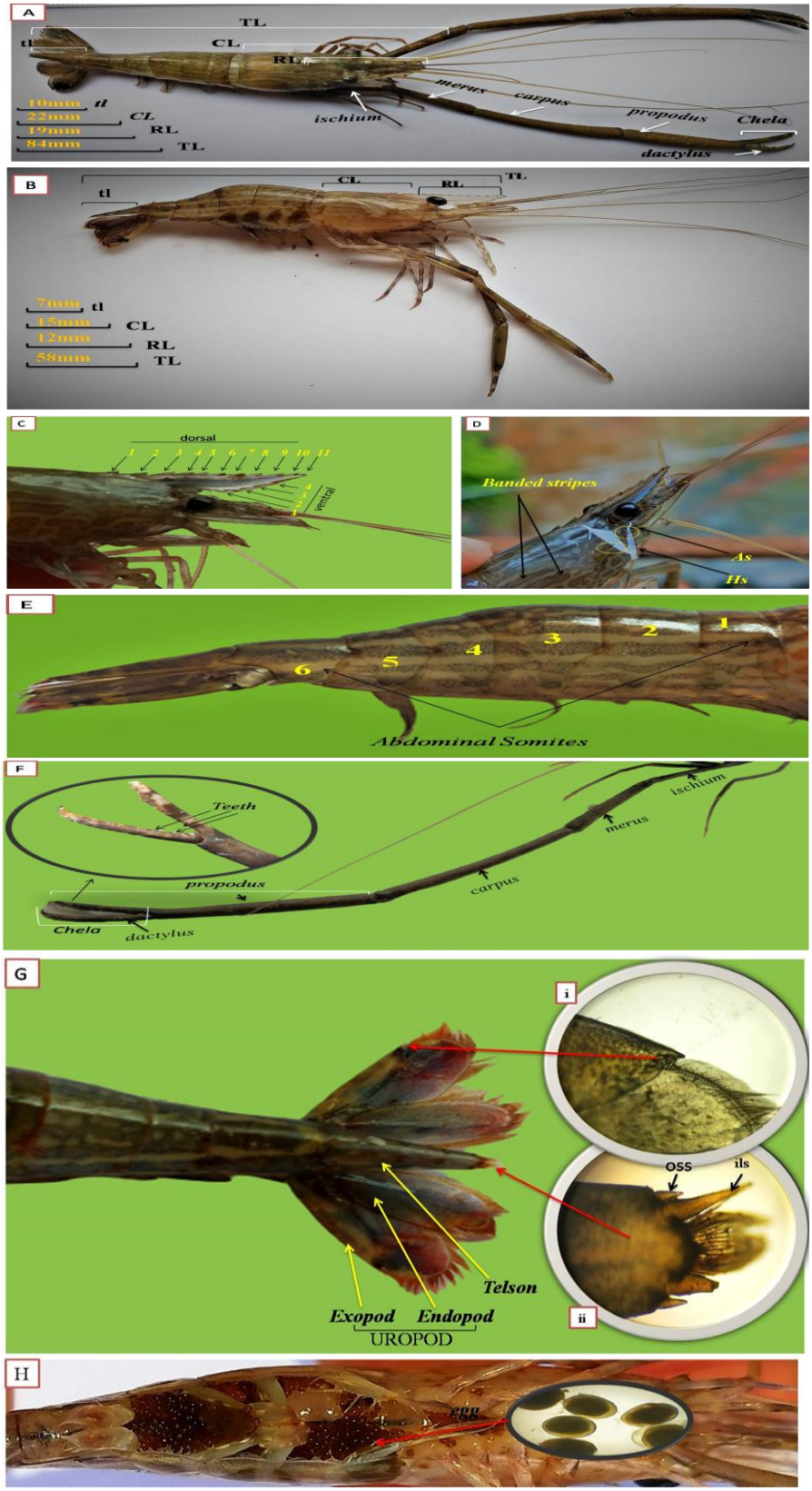

Figure 2. *Macrobrachium striatum*: A. Male prawn; B. Female prawn; C. Rostrum (number of teeth - dorsal and ventral); D. Carapace (As- antennal spine, Hs-hepatic spine); E. Abdomen (somites with bands); F. Second pereopod (male); G. Telson (i. exopod with distolateral projection- ii. oss- external short spine & ils- internal long spine); H. Egg.

Abdomen: Ventral view of somites with continuous bands and dorsal side with patchy bands. The first, second, and third pleura of the abdomen are straight, but the fourth, fifth, and sixth pleura are directed backward, and the sixth pleura ends with the spine. All pleural tips are hairy (Figure 2E). The appendix comprises the appendix internal and the appendix maxculina, both featuring setae, with the appendix maxculina specialized for male reproduction (Figure 3g).

Telson is triangular with two pairs of spines at the distal end, the inner spine being longer than the outer. Between inner spines are plumose setae; the uropod banded and curved with numerous setae; exopod extends beyond the endopod with distolateral projection (Figure 2G).

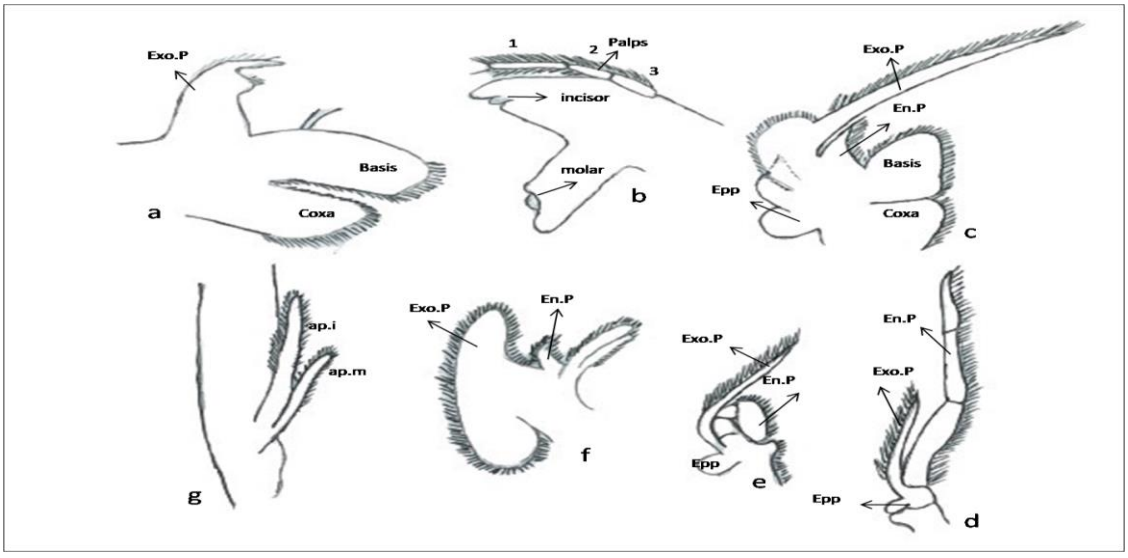

Figure 3. a. Maxillule (Exo.P- exopodite); b. Mandible; c. Maxilliped I (Epp- epipodite, En.P-endopodite, Exo.P- exopodite); d. Maxilliped II (Epp- epipodite, En.P-endopodite, Exo.P-exopodite); e. Maxilliped III (Epp- epipodite, En.P- endopodite, Exo.P-exopodite); f. Maxilla (En.P- endopodite, Exo.P- exopodite) g. appendix (ap.i- appendix internal, ap. m – appendix maxculina).

3.5. Geographic distribution

The global distribution of *Macrobrachium striatum* is restricted yet ecologically significant, predominantly in tropical and subtropical areas. In India, it has primarily been documented in the backwaters of Kerala, an area renowned for its abundant biodiversity and complex estuary systems. These backwaters provide an ideal habitat for this species due to their brackish water conditions, which are crucial for its survival and growth.

Color: Coloration serves as a vital characteristic in the identification of species, distinguishing it from other species. The specimens collected during the investigation reveal a distinctive greenish-brown color, with longitudinal stripes that are present in both male and female individuals.

Size: The difference in size may be linked to ecological roles, reproductive strategies, or competition within their brackish water environment. The size of species demonstrates

strong sexual dimorphism, a common trait among crustaceans. In the collected specimens, the male reached a size of 84 mm, while the female had a maximum length of 58 mm.

Ecology: *M. striatum* species were collected from the brackish water environments, showcasing its adaptability to estuarine ecosystems.

Local economic importance: *M. striatum* has notable economic value in coastal communities. They are sun-dried before being marketed with other prawn and shrimp species. This traditional preservation method extends its utility and serves local markets, supporting the livelihoods of fishermen and traders while contributing to the regional seafood economy.

Conclusion

The species *Macrobrachium striatum* is mainly observed in the post-monsoon season (October to January) in Kali estuary at Karwar on the coast of Karnataka. Although, this species is not commercially important due to its limited abundance, when caught in abundance it is sun-dried for local consumption along with the predominant shrimp fishery. The morphological characteristics studied are consistent with the description given by Pillai (1990). Thus, this is the report of the new distribution of *M. striatum* from Karnataka on the west coast of India.

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Conflict of interest

Authors declares no conflict of interest.

Data availability statement

The specimen *Macrobrachium striatum* described in this paper was deposited in the Department of Marine Biology Museum, Karnatak University, Post Graduate Centre, Karwar, Karnataka with the following reference number (KWR-PR-MS-05-2020) which can be freely accessible.

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