Article

First record of *Alpheus leptocheles* Banner and Banner, 1975 (Crustacea, Alpheidae) in southeast coast of India

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Received 22 April 2024; *Accepted 15 May 2024*; *Published online 20 May 2024*; *Published 1 September 2024*

Abstract

Alpheus leptocheles Banner and Banner, 1975 (Decapoda, Alpheidae) is a compressed chela snapping shrimp which was reported from Papua New Guinea earlier. The compressed nature of major chela, the shape of the orbitorostral front and the flattened dactyli of the third pereopod put this species in the Brevirostris group of the genus Alpheus (Banner). Most of the characteristic features are very close to the type specimen of *A. leptocheles* collected in New Guinea. This shrimp usually inhabits low depth river mouth region of marine bottoms; however, recently we have record for the first time in muddy bottom at an unusual depth of about 250-300 m in Southeast coast of India. This record may extends the distribution pattern of *A. leptocheles* in Bay of Bengal. Moreover, it may perhaps represent an additional alpheid species for the Indian marine faunal list.

Keywords snapping shrimp; Alpheus; first record; Bay of Bengal; muddy bottom.

Arthropods
ISSN 2224-4255
URL: http://www.iaees.org/publications/journals/arthropods/online-version.asp
RSS: http://www.iaees.org/publications/journals/arthropods/rss.xml
E-mail: arthropods@iaees.org
Editor-in-Chief: WenJun Zhang
Publisher: International Academy of Ecology and Environmental Sciences

1 Introduction

The caridean shrimp family Alpheidae, includes over 660 known species from at least 45 genera (De Grave and Fransen, 2011) are ecologically diverse group of decapod crustaceans. Alpheus is the species-rich genera within the family Alpheidae (Scioli and Anker, 2020).According to the previous reports in India, 19 species were recorded under Alpheus genus. Amongthem, seven species such as *Alpheus armatus, A. edwardsii, A. euphrosyne, A. lobidens, A. macroskeles, A. distinguendus* and *A. mannaresis* were recorded from East coast of India, five species like, *A. digitalis, A. malabaricus, A. paludicola, A. samudra* and *A. bisincisus* were from West coast of India, four species such as, *A. acutofemoratus, A. crockeri, A. frontalis, A. strenuus* were from Andaman Islands and three species such as *A. miersi, A. rapax, A. spongiarum* were recorded from Lakshadweep Islands (Thomas, 1976; Radhakrishnan et al., 2012; Samuel et al., 2016; Jha et al., 2019., Ramachandran et al., 2019; De Grave et al., 2020). Most of the species were identified based on their colour

and few morphological characters and there is no detailed morphological description except *A. samudra*. Presumably, it might be under or over estimation and many of them are cryptic. Hence, a detailed morphological and molecular study is needed to solve this problem in the case of Indian Alpheids.

More reports are available on shallow water Alpheids across the Indo-West Pacific, and very few studies have been reported about the deeper water counterparts (Banner and Banner, 1981; Chace, 1988; Hayashi and Nagata, 2000; Komai and Ohtomi, 2018). As on date, the deepwater Alpheus in India is *A. macroskeles*, which occurs on muddy bottoms at depths exceeding 500 m and *A. samudra* found at 275-375 m (De Grave *et al*., 2020). Although there have been several further records of this species from across the Indo-West Pacific (Komai and Ohtomi, 2018), *A. macroskeles* is restricted to the Bay of Bengal, Andaman Sea and *A. samudra* was found in Arabian Sea.

To date, *A. leptocheles* Banner and Banner, 1975 has not been reported from Indian waters. Here, we report this species as first-time occurrence in South east coast of India and describe the morphological characters.

2 Materials and Methods

Totally, 49 male (mean CL 10.31 mm) and 25 female (mean CL 10 mm) of specimens were examined. The specimens were collected from the trawl net trash in Mudasalodai landing centre (Lan. 11° 29' N; Lat. 79°46' E), Tamil Nadu, India during February to April 2022. The samples were kept in the ice box and transferred to the laboratory. The colour pattern and morphological characteristics of male and females were noted before preservation. Among the collected specimens, 64were preserved in formalin and 10were stored in 95% ethanol for DNA isolation.

3 Results

3.1 Systematic position

Phylum : Arthropoda von Siebold, 1848
Class : Malacostraca Latreille, 1802
Order : Decapoda Latreille, 1802
Infraorder : Caridea Dana, 1852
Family : Alpheidae Rafinesque, 1815
Genus : Alpheus Fabricius, 1798
Species : *Alpheus leptocheles* Banner and Banner, 1975
Type species : *Alpheus leptocheles*- Banner and Banner, 1975: 261-265, Fig. 1

3.2 Species description

Carapace tuberculate, rostrum acute (Fig. 1A-B), sharp, longer than broad at base, reaching to middle of the first article of antenullar peduncle; slightly rounded carina (Fig. 1C) reaching posteriorly only base of orbits. Orbits moderately inflated, forming moderately deep rounded grooves between rostral carina and orbits. Orbitorostral margin slightly concave. Carapace densely papillose and less in on dorsal surface and the entire carapace sparsely pubescent. First antennular article 0.52 times as long as second in male and 0.50 times in female, a little longer than third article. Second article, two times as long as broad. Stylocerite reaching almost to end of first antennular article, distal tooth turned slightly outward. Scaphocerite reaching slightly past antennular peduncle, lateral margin straight, squamous portion narrow, attaining level of tip of lateral tooth. Carpocerite stout, reaching to end of third antennular peduncle.

Mouthparts are very typical for the genus Alpheus in external observation. Third maxilliped (Fig. 1H) slender, pediform; antepenultimate article granulated, penultimate article relatively short, about 1.5 times as long as wide, ultimate article richly setose, unarmed distally.

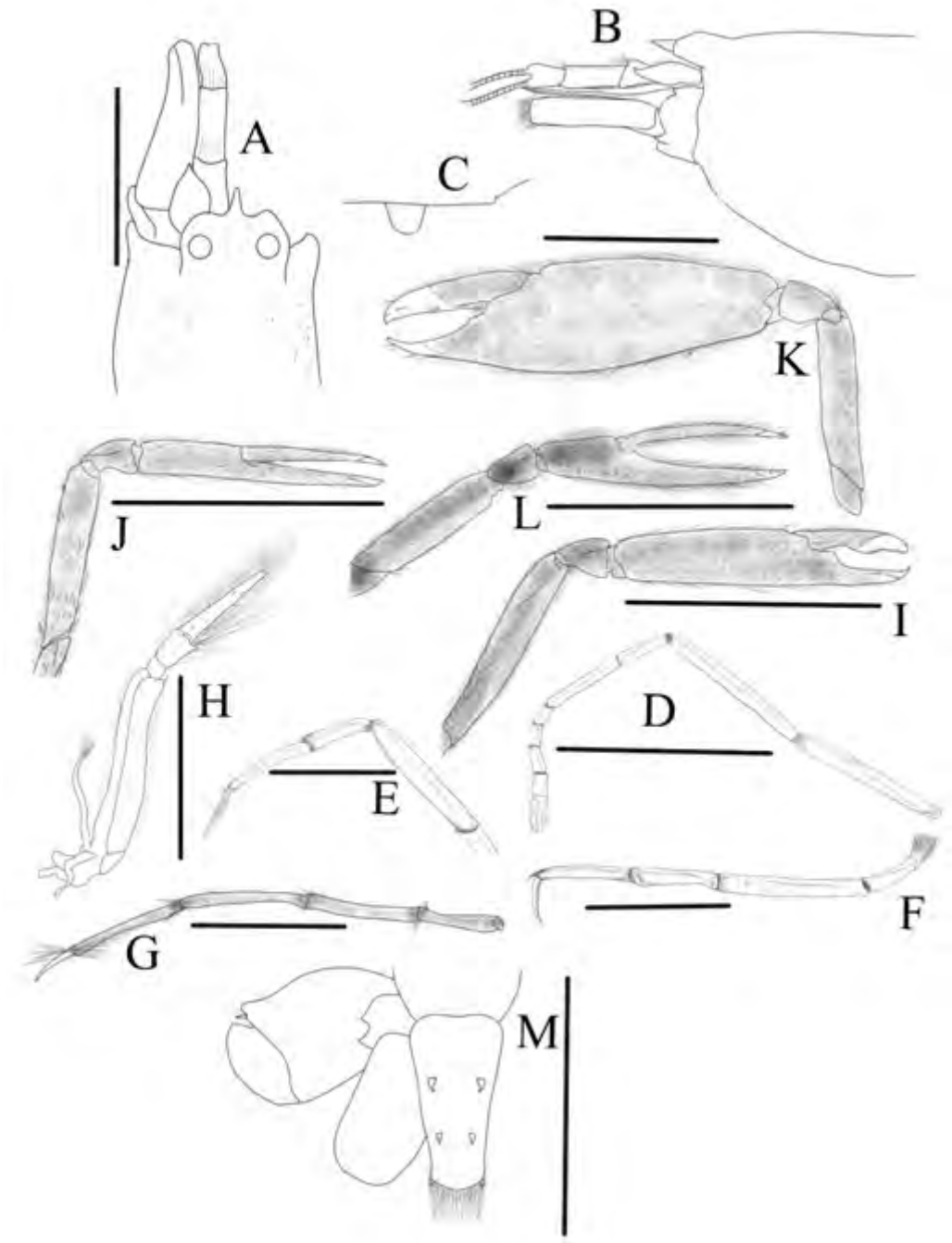

Fig. 1 *Alpheus leptocheles* Banner and Banner, 1975. A, Anterior region, dorsal view; B, Anterior region, lateral view; C, Carina below right first antennular segment; D, Second pereopod; E, Third pereopod; F, Fourth pereopod; G, Fifth pereopod; H, Third maxilliped; I, Female major first pereopod; J, Female minor first pereopod; K, Male major first pereopod; L, Male minor first pereopod; M, Telson and uropods. Scale bars: 5 mm (A, D, E, F, G, H, M); 10 mm (I, J, K, L).

Entire surface of majorcheliped of male and female (Fig. 1I, K) finely papillose. Chela 4.5 times as long as broad in male and 4.6 times in female. Palm with extreme lateral compression, 4.4 times as high as thick in male and 2.6 times in female; area of maximum longitudinal thickness lying above middle with lower half of chela blade-like; both superior and inferior margins thinned to knife edges. Palm highest immediately proximal to dactylar articulation, tapering proximally, 1.6 times as broad immediately proximal to dactylar articulation as at carpal articulation. Dactylus sharply carinate, fingers very slim, curved slightly outward. Superior margin of palm with moderately long forward-sweeping hairs, superior margin of fingers also bearing hairs, but shorter than those of palms. Carpus, cup-shaped, 0.15 timeas long as chela in male and 0.18 times in female. Lateral margins of proximal region bearing subacute teeth directed proximally. Merus, 4.5 times as long as broad in male and female, without armature. Lateral face near superior margin bearing deep groove extending from distal end of proximal portion of ischium. Large chela of female 4.6 times as long as broad also with knife-like margins but with margins almost parallel. Surface, papillose, similar to that of male; superior and inferior margins bear long, fine forward-sweeping setae. Merus and carpus similar to those of male.Major chela elongate, extremely laterally compressed, about 1.4 times as long as wide in male and 1.8 times in female; palm about 2.7 times as longerthan fingers in male and female.

Minor cheliped (Fig. 1 J, L) sexually dimorphic, length 2.1 times shorter than major cheliped in male and 1.3 times shorter in female; ischium short, granulated; merus elongate, about 4.7 times as long as wide in male and 4.5 times in female, granulated, distomedial margin unarmed; carpus cupshaped; chela elongate, slender, with palm sub-cylindrical in cross-section, about1.6 times long as fingers in male and female, surface smooth, without any grooves, crests or notches; fingers sub-equal in length, tapering to tips, distally slightly arched, with simple, blade-like cutting edges; long setae covering chela and palm.

Second pereiopod slender (Fig. 1D), ischium somewhat shorter than merus, both with rugose surfaces; carpus with five divisions, with approximate ratios (proximal to distal) of 12:19:4:4:4.

Third pereiopod (Fig. 1E) relatively robust, ischium without spine.Merus about 5.9 times as long as wide in male and 6.5 times in female, unarmed. Carpus, 0.45 times as long as merus in male and 0.4 times in male; superodistal margin slightly projected. Propodus 0.6 times as long as merus, bearing on inferior surface a few stiff setae and long hairs but no spines. Superior margin bearing several long hairs. Dactylusspatulate, 0.5 times as long as propodus in male and 0.6 times in female, superior surface with longitudinal ridge which bears patches of very short stiff setae on both sides.

Fourth pereiopod (Fig. 1F) relatively robust; ischium somewhat short and granulated, merus about 6.4 times as long as wide in male and 6.1 times in female, unarmed; carpus about 1.6 times shorter than merus in male and 2 times shorter in female, unarmed; propodus about equal length of carpus in male and female; unarmed; dactylusspatulate, about 2.1 times shorter than propodus in male and 1.8 times shorter in female, lateral surface with cluster of setae; mesial surface with 4-5 rows of setae.

Fifth pereiopod (Fig. 1G) much slenderer than third and fourth; ischium unarmed; merus about 6.1 times as long as wide in male and 5.2 times in female; carpus 0.9time length of merus in male and 1.1 times in female; propodussub-equal in length to carpus, ventromesial margin unarmed, cleaning brush well-developed; dactylussubspatulate, simple, about 0.4 times length of propodus in male and 0.45 times in female.

Male second pleopod with appendix masculina slightly longer than appendix interna, adorned with setae on mesial and lateral margins, as well as on apex.

Telson (Fig. 1M) elongate, gradually tapering lateral margins, about 3.3 times long as proximal width; dorsal surface with two pairs of spines small, posterior margin broadly convex, furnished with long plumose setae and short, spiniform setae present. Uropod (Fig. 1M) with lateral lobe of protopod unarmed, mesial lobe in male terminating in subacute tooth; exopod broad, somewhat truncate distally, diaresis weakly sinuous, with

small triangular tooth adjacent and mesial to short spiniform seta; endopod without special features.

3.3 Colour pattern

Traces of transverse brown banding remain on the pleon, whilst the chelipeds have an olive-green colour, with the fingertips of the major cheliped being milky white coloured. Fresh specimens have been noted to also display orange banding on the distal part of each pereiopod article, uropod and telson being translucent-red.

3.4 Distribution

Papua New Guinea (Banner and Banner, 1975), the present report extends its distribution to Indian waters, especially East coast of India.

4 Discussion

The compressed nature of major chela, the shape of the orbitorostral front and the flattened dactyli of the third pereopodput this species in the Brevirostris group of the genus Alpheus (Banner). As per our observation, we have been able to determine the distal broadening and proximal tapering of the palm of the major chela and its strong compression are unique to the deep water alpheid group (Komai and Ohtomi, 2018). Most characteristic features are very close to *A. leptocheles* which is a previously known species. *Alpheus leptocheles* holotype (Banner and Banner, 1975), a shallow water (< 20m) specimen found in the mouth of the Sepik River in north-western Papua New Guinea. But our specimens were caught from 250-300 m depth as per the fishermen statement. It is very similar to the description of *A. leptocheles* by a male holotype and two female paratypesby having transverse notch behind the dactylar articulation of the large chela, and by the fact that the rostral crest or ridge does not extend posteriorly to well behind the orbital hoods (Banner and Banner, 1975). The description and figures of *A. halesi* (Kirk, 1887) (pl. 6d) leaves ambiguities, but the heavy longitudinal ridge on the cuter face of the major chela simply separates it from this species. *A. macroskeles* (Alcock and Anderson, 1894), *A. distinguendus* (De Man, 1909) (pl. 7, Fig. 9-14), *A. pustidosus* (Banner and Banner, 1968)(Fig. 2), *A. nonalter* (Kensley, 1968) (Fig. 15) and *A. stephensoni* (Banner and Smalley, 1969) (Fig. 2) have some manner of armature, either spines or teeth on merus of the large and small chelae, and only in *A. distinguendus* is the palm of the minor chela of the male shorter than the fingers. In *A. stephensoni* the palm of the minor chela of the male is about equal in length to the fingers, not distinctly shorter than the fingers as in this species. Our specimens were looks like *A. samudra* described as one holotype female (cl 13.7 mm), one paratype female (11.7 mm) collected from Kollam, Kerala, India. In our observation, there is clear sexual dimorphism in major and minor cheliped of *A. leptocheles*. But in the report of De Grave et al. (2020) they described that, there is no sexual dimorphism and no major difference in major and minor cheliped of male and female *A. samudra*. In our observations, carpocerite stout, reaching to end of antennular peduncle as like Banner and Banner (1975) report. Whereas, in *A. samudra* (De Grave et al., 2020), carpocerite reaching to about distal margin of second article of antennular peduncle. In *A. leptocheles*, the carina is round in shape reaching posteriorly only to base of orbits (vs. carina weak not extending posterior to orbit in *A. samudra*). The major chela of *A. samudra* is compressed as like the holotype of *A. leptocheles*. Both species can however be distinguished by the relative proportion and shape of the fingers of the major cheliped. As per Banner and Banner (1975), in *A. leptocheles*, the finger to palm ratio was 0.36 and the dactylus was relatively robust, and we also observed the same finger to palm ratio (0.36) in *A. leptocheles*in this study. But, in *A. samudra* of Arabian sea the fingers were longer (0.50–0.55) and the dactylus is more elongate as showed in Fig. 2A, B (De Grave et al., 2020). But, the Fig. 5 of De Grave et al. (2020) report is contradictory to their statement. The major cheliped carpus cup shaped and 0.15 times long as chela in male and 0.18 times long in female (vs. 0.15 times long in *A. leptocheles* (Banner and Banner, 1975)). The major chelipedmerus 4.3 times long as wide and it was similar to *A. leptocheles* (Banner and Banner, 1975) and *A. samudra* (De Grave et al., 2020). The minor

chelipedmerus 4.7 times as long as wide in male and 4.5 times long in female (vs. about 5 times long in *A. samudra*). In third periopod, carpus and merus ratio as well as dactylus and propodus length ratio were similar with *A. samudra* and *A. leptocheles*. When comparing the third pereopod with fourth one, it was similar in *A. samudra* whereas, in our observation both are dissimilar in *A. leptocheles*. Asides from the differences in the major cheliped, *A. samudra* (De Grave *et al*., 2020) differs from *A. leptocheles* by the rostrum reaching the distal margin of the first article of the antennular peduncle (vs. falling short in *A. leptocheles*). The same observation was recorded in *A. leptocheles* by Banner and Banner (1975). The length of the fingers of the minor cheliped being shorter in relation to the palm (2.2 times in *A. leptocheles* vs. 1.7–1.8 in *A. samudra*), the general shape of the telson (more elongate and more distally concave in *A. samudra*), the weakly convex distal margin of the telson (vs. strongly convex in *A. samudra*) and the distolateral tooth of the scaphoceritebeing in tip level with blade (vs. over-reaching the blade in *A. samudra*). Most of the characters in our observation is very close to *A. leptocheles* than *A. samudra*. The descriptions of *A. samudra* by De Grave et al. (2020) werenot clear and madesome complications in some figures and their descriptions. The distribution pattern and ecological niches may wider for *A. leptocheles*as they found in 1–20 m depth from the mouth of the Sepik River, Papua New Guinean (Banner and Banner, 1975) and about 250-300 m depth in South east coast of India (present study). An intensive survey is needed along the Indian coast to find the stock structure of *A. leptocheles*.

Fig. 2 *Alpheus leptocheles* Banner and Banner (1975). Colour pattern, A, female, B, male.

Acknowledgement

The authors thank the Ministry of Environment, Forests and Climate Change, New Delhi for the financial assistance in the form of research project (F.No.22018-30/2019-CS (Tax)).

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