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Morphological diversity of habrobathynellids (Parabathynellidae, Bathynellacea) in India, with the description of a new species

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Abstract

A new species, *Habrobathynella indica*, is described. The male thoracopod VIII of this species is unique within the Parabathynellidae in its penis-like extension of the internal lobe reaching thoracopod VII. The other two species known from India also have features unique to either the family or the genus. *Habrobathynella schminkei* has a seta on the uropod distally of the thick terminal spine of the spine row, a seta otherwise unknown in the family, and *H. nagarjunai* has a homonomous spine row on the uropod, which is lacking in other species of the genus.

Keywords: *Habrobathynella*, India, male thoracopod VIII, morphological diversity

Introduction

Bathynellacea are known from all continents except Antarctica; they are a typical element of the groundwater fauna. Until recently there were two large gaps which are now being filled gradually: North America and India. From India, two bathynellid species have recently been described by Ranga Reddy (2002, 2004). Both belong to the genus *Habrobathynella* Schminke, 1973 as does the new species reported here. Before its discovery in India the genus *Habrobathynella* was known only from Madagascar where it is represented by two species: *H. jeanneli* and *H. milloti*, both described by Delamare Deboutteville and Paulian (1954).

As was to be expected the Indian species have added new features to those already known from the Madagascan species so that the diagnosis of the genus *Habrobathynella* had to be amended by Ranga Reddy (2002). The new species reported here contributes another surprising novelty. The resulting picture is that of a morphologically diverse genus with a few features unique within the Parabathynellidae as a whole.

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***Habrobathynella indica* sp. n.**
(Figures 1–3)

Type locality and material examined

River Krishna at Vijayawada city (16°31'N, 80°39'E), south India; close to the southern end of Kanaka Durga Varadhi, a road-bridge. Four males and five females from fine sand, about 50 m from the water's edge at a depth of 25–40 cm, 31 August 1998. Water temperature 30°C. Holotype (female), allotype (male), paratypes (one male, one female), all undissected were deposited in the Natural History Museum, London. Registration numbers: holotype 2000.1433, allotype 2000.1434, paratypes 2000.1435–1436. Dissected paratypes are kept in the Department of Zoology, Nagarjuna University. The description of the type locality, the methods used for collecting the material, and the co-occurring meiofauna are as given in Ranga Reddy (2001).

Description

Adult female. Total length of holotype 0.82 mm (abdominal segments telescoped into one another); paratypes 0.99–1.04 mm. Body elongate and 13 times longer than maximum width. Abdominal segments wider than thoracic ones. Head 27.5% longer than wide and slightly longer than first three thoracic segments combined.

Anal operculum deeply concave medially (Figure 1a).

Pleotelson (Figure 1a) with one seta on either side at base of furcal ramus; seta bare, as long as caudal ramus.

Caudal furca (Figure 1a, b) 25% longer than maximum width, distal part expanded and rounded, with two terminal and two inner, pointed, serrulate spines and two unequal dorsolateral setae. Furcal organ small, ventral.

Antennule (Figure 1f) consisting of six short, thick segments, 37.5% longer than head; first segment thickest, the remainder becoming progressively thinner. Length of first three segments distinctly greater than that of last three; apophysis of segment 4 slender, nearly as long as the next segment. No sexual dimorphism. Segments 5 and 6 with three aesthetascs each. Setation as observed under light microscopy (see Figure 1f).

Antenna (Figure 1g) small, with two segments; proximal segment smaller than distal one and unarmed; distal segment almost twice as long as wide, with a total of four setae: two unequal terminal ones of which one is plumose, one subterminal and one outer proximal.

Labrum (Figure 1d, e) with eight main, nearly uniform apical teeth and two smaller marginal ones on each side.

Mandible (Figure 1h–j): distal part of *pars incisiva* with four somewhat unequal teeth, distalmost two largest. Proximal tooth of *pars incisiva* large. *Pars molaris* (Borstenlobus) developed into somewhat pyriform structure, carrying two isolated, lateral teeth and three small, pointed teeth occurring in a group at distal end, as illustrated; all teeth articulate; no setae discernible. Palp absent.

Maxillule (Figure 1k) with two endites. Proximal endite small, with four claw-like spines of different sizes. Distal endite elongate, 2.6 times as long as proximal endite and with four terminal claws, distal one large, and with two unequal spines and one denticle on inner margin, three subterminal setae on distal outer margin.

Maxilla (Figure 1l) three-segmented; basal segment twice as long as wide and with three unequal setae on small protuberance at distal inner corner; second segment 1.3 times as

Figure 1. *Habrobathynella indica* sp. n. female. (a) Pleotelson, dorsal (right uropod omitted); (b) Pleotelson, lateral; (c) Th. VIII, lateral; (d) labrum, ventral; (e) labrum, ventral, in paratype, in situ; (f) antennule, dorsal; (g) antenna; (h) mandible, lateral; (i) mandible, lateral, in paratype; (j) mandible, *pars incisiva*, frontal; (k) maxillule; (l) maxilla. Scale bars: 50 μ m.

Figure 2. *Habrobathynella indica* sp. n., female. (a) Th. I; (b) Th. II; (c) Th. III; (d) Th. IV; (e) Th. V; (f) Th. VI; (g) Th. VII; (h) Th. VIII male (lateral external). Scale bars: 50 μm.

Figure 3. *Habrobathynella indica* sp. n., male, Th. VIII. (a) Lateral external view, in situ; (b) apical view. Scale bar: 25 μ m.

long as proximal segment and armed with 14 setae and one reduced claw-like spine at distal inner corner; third segment small, almost squarish, fused with large terminal claw.

Thoracopods I–VII (Figure 2a–g): thoracopods I short and without epipodite; thoracopods II–VII of nearly similar size, with two-segmented club-shaped epipodite, two-thirds as long as basipodite. In all thoracopods, coxa with distinct conical projection at distal inner border and basis with one weak seta at distal inner corner. Exopodite two-segmented; first segment with one dorsal and one ventral seta; second segment with two terminal, unequal divergent setae, dorsal one short and plumose, ventral one long and spiculated. Endopodite four-segmented, fourth segment very small. Setal formulae: Th. I 1+0/0+1/0+1/2(0); Th. II–VII: 0+0/0+1/0+1/1(0).

Thoracopod VIII (Figure 1c) small, crescentic, papillate structure.

Pleopod 1 absent.

Uropod (Figure 1a, b): sympodite four times longer than wide, bearing four spines in a row on inner distal margin; distal spine straight (slightly curved in dorsal view), distinctly stouter and 43% longer than others; proximal spine slightly longer than other two; lateral margins of all spines serrulate. Endopodite sickle-shaped (doubly curved in dorsal view; Figure 1a), reaching 66% of sympodite length; distal inner margin serrate; two unequal plumose setae at proximal third of outer margin. Exopodite cylindrical, four times longer than wide, measuring 30% of sympodite length and carrying two apical, unequal, plumose setae, outer seta twice as long as inner one.

Adult male. Total length of allotype 0.99 mm (telescoping of abdominal segments minimal), and of paratypes 0.74–0.82 mm. Body and all appendages except thoracopod VIII as in female.

Thoracopod VIII (Figure 3a, b): large and grotesque in appearance. Protopodite much expanded laterally and nearly spherical in outline. Outer lobe (*lobus externus*) not

discernible. Dentate lobe (*lobus denticulatus*) small, with a row of fine denticles along free margin and two rows of similar denticles on its surface; no accessory lobe present. Inner lobe (*lobus internus*) enormously developed into an elongate penis-like organ, extending forward up to thoracopod VII (Figure 2h); a duct running throughout the length of the penial organ. Basipodite small and carrying a seta. Exopodite with a large tooth beneath which are three rows of denticles. Endopodite represented by a smooth seta.

Discussion

The new species clearly belongs to the genus *Habrobathynella*. This is shown by the following characters: first antenna six-segmented, second antenna two-segmented, with the terminal segment having four setae of which one is located basally, the rest terminally; mandible palpless; prehensile second maxilla three-segmented; exopodites of thoracopods I–VII two-segmented; furca with four spines; and anal operculum medially deeply concave.

On the other hand, there is one character which is absolutely unique and that is the male thoracopod VIII. The most spectacular feature of it is the greatly produced internal lobe extending up to the preceding thoracopods. Such a penis-like extension is not known in the Parabathynellidae so far and it is tempting to justify with it the erection of a new genus. If this were done, however, the genus *Habrobathynella* would become paraphyletic because no features would be left to characterize it except those it has in common with the hypothetical new genus (A.II, palpless mandible, concave anal operculum, etc.). At present, the unusual Th. VIII leaves no doubt, however, that the specimens described here represent a new species. Delamare Deboutteville and Serban (1974) have made a very detailed study of the male Th. VIII of *Habrobathynella milloti*. It agrees with that of the new species in having a small basipodite with two setae of which the one next to the exopodite is regarded as the only remnant of the endopodite. Both species have a serrated exopodite and a dentate lobe with rows of denticles. They differ in that *H. indica* lacks the external lobe and has the internal lobe so greatly produced.

There are three species of *Habrobathynella* known from India so far (Figure 4) and each one of them has a feature unique either within the genus or even like the male thoracopod VIII of *H. indica* within the family. The spine row of the uropod of *H. schminkei* (Ranga Reddy 2004) looks quite like a normal spine row with a long and thick distal spine and three smaller and more slender proximal spines. The unique feature is a seta, which is located distally of the thick spine. This seta is either a completely new element or it must be homologous with the distalmost spine which becomes thicker when an inhomonomous spine row evolves from a homonomous one. In this case it could be that it is the second last spine that has become transformed into a thickened one, while the last spine has become seta-like. This is a constellation not known within the Parabathynellidae so far.

Habrobathynella nargarjunai has a spine row on the uropod which is homonomous, lacking a thick distal spine (Ranga Reddy 2002). This is new for the genus in which all other species have an inhomonomous spine row with the distalmost spine being particularly long as compared with other genera. Habrobathynellids have turned out to be a morphologically diverse group and to surpass other genera in this respect. There are more species in the authors' collections from Madagascar as well as from India.

In the two already known Madagascan species the labrum is vaulted. Therefore this became a generic character (Schminke 1973). In the Indian species this is not so evident.

Figure 4. Map to show distribution of the five known species of *Habrobathynella*.

Habrobathynella schminkei is the only one where there are indications of a vaulted labrum whereas in *H. nagarjunai* and *H. indica* sp. n. this is not the case. It is noteworthy that *H. indica* carries three aesthetascs on the penultimate antennular segment, whereas in the generic diagnosis (Schminke 1973) only two are mentioned.

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