

A new species of *Grandidierella* Coutière, 1904, *G. nioensis* sp. nov. (Amphipoda, Aoridae), from the east coast of India.

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Abstract

A new species of *Grandidierella* Coutière, 1904, *G. nioensis* **sp. nov.** is described from the east coast of India. It is close to *G. mahafalensis* Coutière, 1904, from Madagascar and *G. halophilus* Wongkamhaeng, Pholpunthin & Azman 2012 from Thailand. A key is provided to facilitate the identification of species in the *Grandidierella mahafalensis* Coutière 1904 species-complex.

Key words: Taxonomy, Crustacea, Amphipoda, India, new species, *Grandidierella*.

Introduction

The aorid genus *Grandidierella* currently contains over forty described species worldwide. Of these, eight species, *Grandidierella magna* (Giles, 1888); *G. gilesi* Chilton, 1921; *G. macronyx* Barnard, 1935; *G. gravipes* Barnard, 1935; *G. lignorum* Barnard, 1935; *G. bonnieroides* Stephensen, 1948; *G. exilis* Myers, 1981 and *G. trispinosa* Bano and Kazmi, 2010, have been recorded from the Indian Ocean region. They are detritus feeders and in some cases can be opportunistic predators. They generally occur in areas high in silt, which makes some species adaptable to fouling (Jourde *et al.*, 2013; Lo Brutto *et al.*, 2016). It also makes them amenable to cultivation as aquaculture fish-food. Provision of nutritionally balanced live feeds for early stages of fish plays a pivotal role in successful rearing of commercially important finfish and shellfish species. Relatively higher shrimp survival and growth have been observed in culture ponds stocked with amphipods (pers. comm. Umesh NR, shrimp farmer). Standardisation of captive breeding and mass-scale rearing of Indian seahorse species is one of the major ongoing projects at CSIR-National Institute of Oceanography (CSIR-NIO), Goa (India). Considering the need for continuous provision of live feeds during the captive breeding, rearing and culture of Indian seahorse species, mass-culture trials of amphipods have been initiated. Furthermore, species belonging to the Genus, *Grandidierella* (*G. japonica* Stephensen 1938 and *G. bonnieroides* Stephensen, 1948) are the standard species for assessing sediment quality and have been widely used in sediment toxicity studies (Nipper *et al.* 1989 Lee *et al.* 2005 Hindarti *et al.* 2015).

In the present work, a new species of the *Grandidierella mahafalensis* species-complex, *G. nioensis* **sp. nov.** is described from the east coast of India. It is currently under trial as a live fish-feed and test species for sediment toxicity assays.

Material and Methods

Specimens were collected from brackish-water shrimp ponds located at Palakayatippa village, Machilipatnam, Andhra Pradesh, east coast of India using a hand scoop net (mesh size, 0.5 mm) and transported to the Aquaculture laboratory, CSIR-National Institute of Oceanography, Goa (India) in oxygen filled polythene bags. In the laboratory, amphipods were maintained in Fiber reinforced plastic (FRP) tanks with an aeration system with optimum water quality parameters (water temperature $27\pm 1^\circ\text{C}$; dissolved oxygen 6.2 ± 0.5 mg/l; salinity 20 ± 2 ppt; pH 7.4–8.6).

Specimens for study were dissected in 70% alcohol and body parts were mounted on glass microscope slides in glycerine. They were examined under a Nikon Optiphot compound microscope with interference contrast attachment and drawn with the use of a drawing tube. Type material is

deposited in the Natural History Museum, London (NHMUK) and voucher material is deposited in the specimen repository at CSIR-National Institute of Oceanography, Goa, India (Deposition ID: NIO1010).

Abbreviations used in figures: G1, 2 = gnathopods 1, 2; Md = mandible palp; P4, 7 = pereopods 4 & 7; U3 = uropod 3; M = male; F = female.

Systematic section

Suborder Senticaudata Lowry & Myers, 2013

Infraorder Corophiida Leach, 1814

Parvorder Corophiida Lowry & Myers, 2013

Superfamily Aoroidea Stebbing, 1899

Family Aoridae Stebbing, 1899

***Grandidierella nioensis* sp. nov.**

(Figs 1, 2)

Type Material. Male holotype (NHMUK 2018.XXX) Palakayatippa village, Machilipatnam, Andhra Pradesh, east coast of India (15°58'54.32"N; 81°05'51.88"E), shrimp pond bottom, silty-clay, R.A. Sreepada, 30 May 2009.

Paratypes (NHMUK 2018.XXX), 300+ males and females, same data as holotype.

Type locality. Palakayatippa village, Machilipatnam, Andhra Pradesh, east coast of India.

Etymology. Named after the Institute where the species is presently being cultured.

Description. Based on male holotype 6.0 mm.

Head. *Ocular lobes* obtuse; eyes of moderate size, black. *Antenna 1* peduncular articles in the ratios 8:11:3; primary flagellum sub-equal in length with peduncle with 22 articles; accessory flagellum minute with one rudimentary articulate. *Antenna 2* subpediform, subequal in length with antenna 1; articles 4 and 5 subequal in length; flagellum with 6 articles each with robust seta and several fine setae. *Mandible* palp article ratios 3:4:4, article 3 subrectangular, with long apical and subapical setae.

Pereon. Pereonite 1 with large, forward directed sternal spine. *Gnathopod 1* coxa a little broader than long, subrectangular, anterior margin rounded, unproduced; basis 2.5 × as long as broad, weakly setiferous; carpus large, subrectangular, the posterior margin substraight, 2.5 × as long

as broad, the posterior distal margin produced into a short, triangular, weakly deflected spine, proximal to which on the distal margin is a shorter conical tooth, inner face of posterior margin with a small mediobasal spine; propodus moderately expanded distally, posterior margin convex distally, weakly concave proximally; dactylus elongate, scythiform, the posterior margin crenulate. *Gnathopod 2* coxa subquadrate; basis elongate, more than $4 \times$ as long as broad, anterior margin straight; carpus elongate, a little less than $3 \times$ as long as broad, anterior margin weakly setiferous; propodus a little over two thirds length of carpus with weakly convex anterior and straight posterior margin, palm oblique; dactylus slightly overlapping palm. Pereopods 3-4 coxae evenly convex anteriorly, produced into a triangular process posteriorly. *Pereopods 5-7* in the length ratios 4:6:7; *pereopod 7* basis with long plumose setae on the posterior margin.

Pleon. *Epimera 1-3* rounded, each with a single posteroventral seta. *Uropod 1* peduncle a little longer than rami, with a stout, distal, inter-ramal spiniform process; rami subequal. *Uropod 2* peduncle broad, subequal in length with outer ramus, lacking an inter-ramal process; inner ramus longer than outer. *Uropod 3* uniramous; peduncle subsquare, with strongly expanded flange on inner margin; ramus $3 \times$ length of peduncle with a small second article and many long marginal and distal setae. *Telson* as broad as long with nearly straight ventral margin, dorsolateral crests each with a group of 3 long setae, lateral margins each with 2 setae.

Female 5.0 mm (sexually dimorphic characters). *Gnathopod 1* basis nearly $4 \times$ as long as broad, anterior margin concave; carpus $2 \times$ as long as broad; propodus about four fifths length of carpus, subovoid, palm oblique, not clearly defined from posterior margin, which bears 6 strong robust setae; dactylus elongate, three quarters length of propodus.

Remarks. *Grandidierella nioensis* **sp. nov.** is almost similar to *G. mahafalensis* Coutière 1904, from a fresh-water lake in Madagascar. It differs primarily in the shape of the male gnathopod 1 in which the posterodistal spine is short and triangular in *G. nioensis* **sp. nov.** but long and slender in *G. mahafalensis*. It also differs from *G. mahafalensis* in its much more slender gnathopods. The basis of the male gnathopod 1 is $2.5 \times$ as long as broad in *G. nioensis* **sp. nov.** but only $2 \times$ as long as broad in *G. mahafalensis*. Similarly in male gnathopod 2 the basis is over $4 \times$ as long as broad in *G. nioensis* **sp. nov.**, but less than $3 \times$ as long as broad in *G. mahafalensis*. In the female, the basis of gnathopod 1 of *G. nioensis* **sp. nov.** is very long and slender (nearly $4 \times$ as long as broad) and the anterior margin is strongly concave, whereas in *G. mahafalensis*, the basis is short and stout (about $2 \times$ as long as broad) with the anterior margin substraight. It is also very similar to *G. halophilus* Wongkamhaeng, Pholpunthin & Azman 2012, from salt pans in the Gulf of Thailand. That species has a very similar male gnathopod 1 to *G. nioensis* **sp. nov.**, however, in *G. halophilus* the male coxa

2 has the ventral margin produced into a strong spine, absent in *G. nioensis* **sp. nov.** and the female gnathopod 1 has a broad basis like that of *G. mahafalensis* and a carpus with a strong posterodistal spine not present in *G. nioensis* **sp. nov.** It is also broadly similar to *G. bonnieroides* Stephensen, 1948, originally described from islands off Venezuela, but now known to be distributed worldwide probably through anthropogenic means. *Grandidierella nioensis* **sp. nov.** differs from *G. bonnieroides* in the shape of the male gnathopod 1. In *G. bonnieroides*, the carpus is distinctly subovoid, with the posterior margin convex, whereas in *G. nioensis* **sp. nov.** the posterior margin is substraight. In addition, the posterodistal spine in *G. bonnieroides* is elongate and slender not short and triangular as it is in *G. nioensis* **sp. nov.** In large adult *G. bonnieroides*, the dactylus of the male gnathopod 1 becomes short and swollen medially, with a smooth posterior margin, but in *G. nioensis* **sp. nov.** it remains elongate and develops a crenulate posterior margin. *Grandidierella nioensis* **sp. nov.** differs from *G. spinicoxa* Myers 1972, in lacking the dense brush of setae on the anterior margin of the male gnathopod 2 carpus in that species.

Habitat. Specimens of *G. nioensis* **sp. nov.** were collected from the silty-clay/muddy bottom of shrimp ponds. Average depth of ponds was 1.2 ± 0.2 m and salinity of water in the range: 15–20 ppt.

Distribution Currently known only from the type locality.

Discussion. *Grandidierella nioensis* **sp. nov.** belongs to a group of five extremely similar and difficult to separate *Grandidierella* species that constitute the *Grandidierella mahafalensis* Coutière 1904, species-complex. It is probable that further species currently attributed to *G. bonnieroides* Stephensen, may prove to be distinct species in this species complex.

***Grandidierella mahafalensis* Coutière, 1904 species-complex**

Included species. *G. bonnieroides* Stephensen, 1948; *G. nioensis* **sp. nov.**; *G. halophilus* Wongkamhaeng, Pholpunthin & Azman 2012; *G. mahafalensis* Coutière, 1904; *G. spinicoxa* Myers, 1972.

Diagnosis. *Male Gnathopod 1* carpus large, at least $1.5 \times$ as long as broad, the posterior distal margin produced into a medium sized tooth, proximal to which on the distal margin is a shorter conical tooth, inner face of posterior margin with a small medio-submarginal tooth; propodus much less than half length of carpus. *Gnathopod 2* basis anterior margin smooth; carpus elongate; propodus less than three quarters length of carpus. *Uropod 1* peduncle with a stout, distal, inter-ramal spiniform process. *Uropod 2* peduncle lacking an inter-ramal process. *Uropod 3* uniramous; peduncle broader than long; ramus more than $2 \times$ as long as peduncle.

Key to *Grandidierella mahafalensis* Coutière species-complex

1. Male gnathopod 2 carpus anterior margin with no or few setae ... 2
Male gnathopod 2 carpus anterior margin with dense brush of setae ... *G. spinicoxa* Myers
2. Male gnathopod 1 carpus subovoid, posterior margin weakly convex; dactylus not greatly elongate, swollen medially ... *G. bonnieroides* Stephensen
Male gnathopod 1 carpus subrectangular, posterior margin substraight; dactylus elongate, scythiform, not swollen medially ... 3
3. Male gnathopod 2 coxa ventral margin produced into a strong spine, female gnathopod 1 carpus with posterodistal spine ... *G. halophilus* Wongkamhaeng, Pholpunthin & Azman
Male gnathopod 2 coxa ventral margin without spine, female gnathopod 1 carpus without posterodistal spine ... 4
4. Male gnathopod 1 carpus posterodistal spine long and slender, female gnathopod 1 basis broad, little over 2 × as long as broad ... *G. mahafalensis* Coutière
Male gnathopod 1 carpus postero-distal spine, short, triangular, female gnathopod 1 basis slender, 4 × as long as broad ... *G. nioensis* **sp. nov.**

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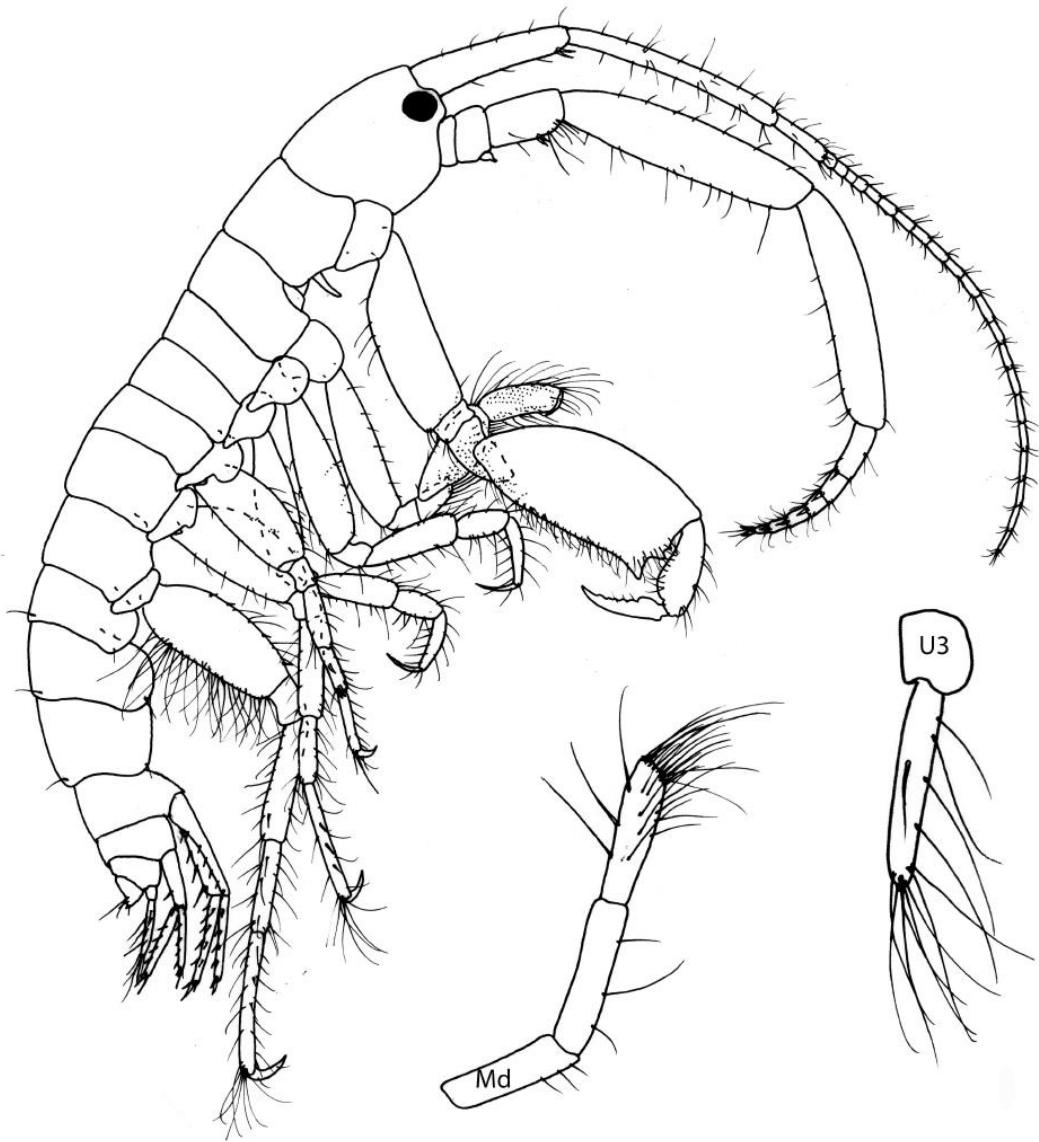


Fig. 1. *Grandidierella nioensis* **sp. nov.**; Md: mandible palp; U3: uropod

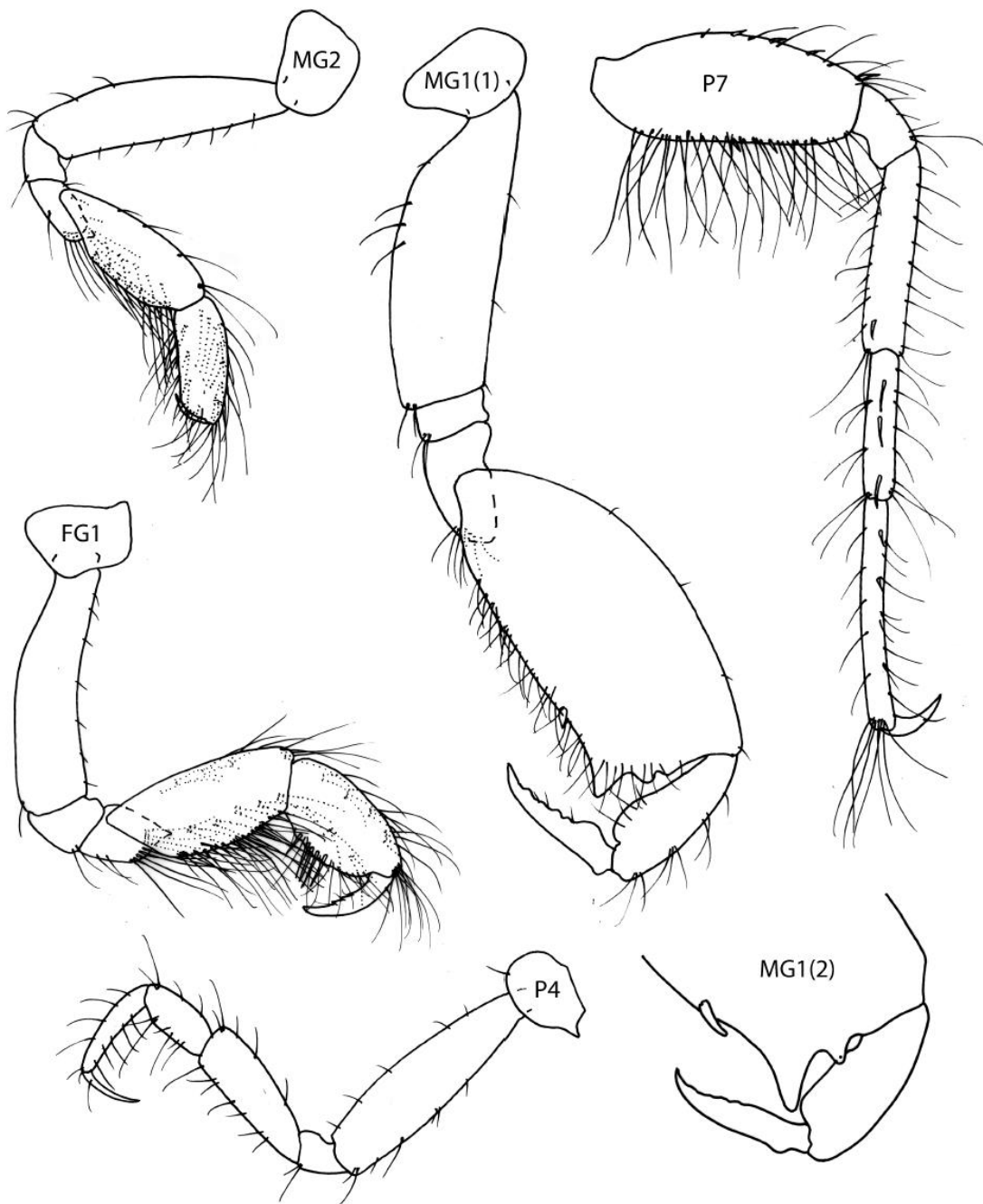


Fig. 2. *Grandidierella nioensis* sp. nov; MG1: male gnathopod 1; MG2: male gnathopod 2; P4 % P7: pereopods; FG1: female gnathopod 1