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ORIGINAL ARTICLE

Sphaeromopsis jayaraji sp. nov. (Crustacea: Isopoda), a new species of intertidal Sphaeromatidae from the Andaman Islands, northern Indian Ocean

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ABSTRACT

Sphaeromopsis jayaraji sp. nov. is described from intertidal habitats on the coast of South Andaman, Andaman Islands, the second record of the genus from India. *Sphaeromopsis jayaraji* sp. nov. is characterized by the following: epistome being widest anteriorly, with a broadly rounded anterior margin and sub-parallel lateral margins, anterior margin with widely spaced plumose setae; pleotelson posterior margin produced to narrowly rounded apex with five setae; uropodal exopod dorsal surface with two deep longitudinal mesial grooves; endopod lateral margin weakly sinuate with long setae, apex with deep mesial groove with plumose setae.

KEYWORDS

India, new taxon, Peracarida, South Andaman, taxonomy

INTRODUCTION

The family Sphaeromatidae Latreille, 1825 of the Indian region was recently reviewed by Anil and Jayaraj (2021) but still remains poorly studied, with only sporadic studies over time. The family is represented in India by 22 species belonging to 11 genera (Kensley, 2001; Dev Roy, 2012; Dutta *et al.,* 2019; Anil and Jayaraj, 2021), a low total compared, for example, to the recorded diversity from Queensland, Australia (62 species in 31 genera), a known high-diversity region (Boyko *et al.,* 2020), or the lower-diversity region of the Caribbean (40 species in 16 genera) (Boyko *et al.,* 2020). This low number of Indian species is largely due to the lack of sustained research on the isopod fauna of India.

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The genus *Sphaeromopsis* Holdich and Jones, 1973 has fifteen species, including *Sphaeromopsis jayaraji* sp. nov. which mostly occur in the warm tropical waters of the Pacific Ocean, Atlantic, Caribbean and from the Indian Ocean in intertidal and shallow water habitats (Khalaji-Pirbalouty and Wägele, 2009; Anil and Jayaraj, 2021). Nine species are known from the Indian Ocean, having been recorded from the western (*Sphaeromopsis amathitis* Holdich and Jones, 1973 from Kenya; *Sphaeromopsis sulcifera* Schotte and Kensley, 2005 from Seychelles) and northern Indian Ocean regions including Pakistan (*Sphaeromopsis minutus* Javed and Yousuf, 1995; *Sphaeromopsis petita* Javed and Yousuf, 1997), Thailand (*Sphaeromopsis sei* Storey, 2002), Red Sea (*Sphaeromopsis reticulata* Stebbing, 1910), Persian Gulf (*Sphaeromopsis sarii* Khalaji-Pirbalouty and Wägele, 2009; *Sphaeromopsis persikolpos* Khalaji-Pirbalouty and Wägele, 2009), and India (*Sphaeromopsis sikata* Anil and Jayaraj, 2021 and *S. jayaraji* sp. nov.).

Materials and Methods

Sampling was carried out on intertidal sandy beaches at two locations in South Andaman: Corbyns Cove, 11°37'48.3"N 92°45'14.0"E, and Chottabalu, 11°30'39.00"N 92°40'55.00"E (Fig. 1). Samples were randomly collected to a depth of 15 cm using a polyvinyl corer, with a 15 cm internal diameter and 25 cm height from the sediment. The collected samples were washed through a 0.5 mm mesh size test sieve and the collected fauna were transferred to a pre-labeled zip-lock polyethylene bag and fixed with 7 % formalin. Isopod specimens were later sorted and preserved in 95 % ethanol. For description, all appendages were prepared and temporarily mounted in 85 % lactic acid solution stained with lignin pink.

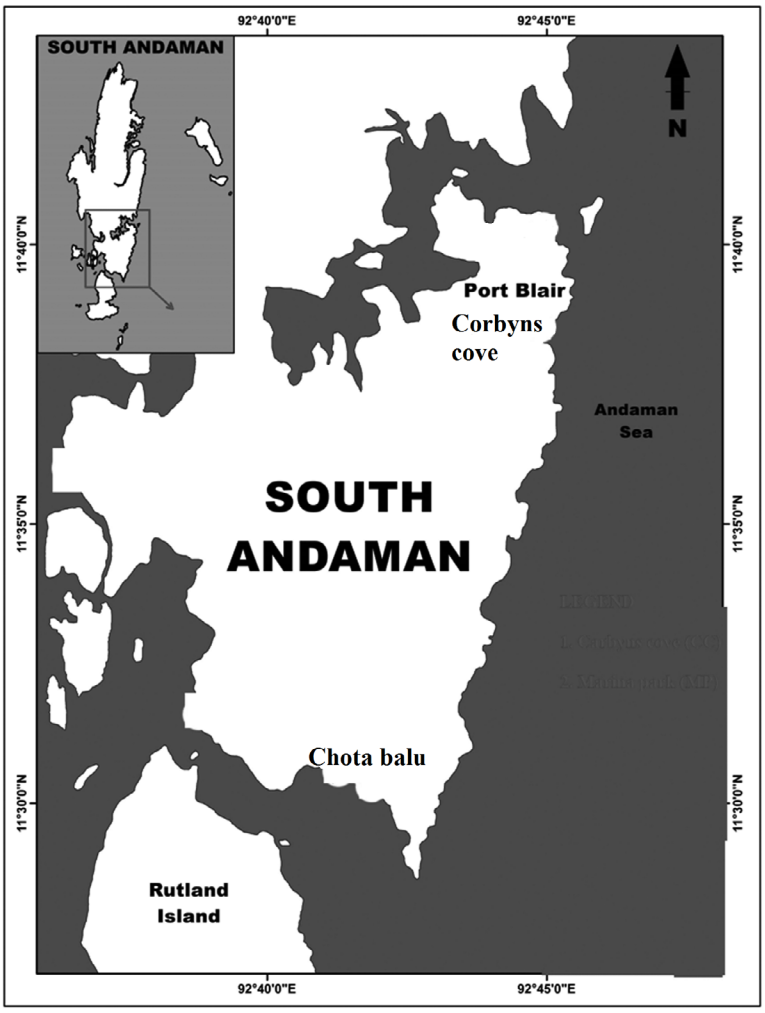

Figure 1. Map showing the study area.

The whole animal features and appendages were drawn under a dissection microscope (Nikon SMZ 1500) or a phase contrast microscope (Olympus BX 41), respectively. The type material is deposited in the Museum of the Department of Ocean Studies and Marine Biology of Pondicherry University of Andaman and Nicobar Islands, India, and the Zoological Research Laboratory, Buchi Anjamma and Kotireddy Degree and PG College, Prakasam District, Ongole, Andhra Pradesh, India. Terminology of morphological characters follows that of Khalaji-Pirbalouty *et al.* (2013).

Abbreviations: PUMB – Pondicherry University Marine Biology; BAKRZRL – Buchi Anjamma and Kotireddy Degree and PG College Zoological Research Laboratory; RS – robust seta/ae; PMS – plumose marginal seta/ae; CP – circumplumose seta/ae.

Systematics

Suborder Sphaeromatidea Wägele, 1989

Superfamily Sphaeromatoidea Latreille, 1825

Family Sphaeromatidae Latreille, 1825

Genus *Sphaeromopsis* Holdich and Jones, 1973

Sphaeromopsis Holdich and Jones, 1973: 386.— Holdich and Harrison, 1981: 287.— Kensley and Schotte, 1994: 502.— Kensley and Schotte, 1999: 707.— Storey, 2002: 142.— Ortiz *et al.,* 2004: 1.— Schotte and Kensley, 2005: 1275.— Khalaji-Pirbalouty and Wägele, 2009: 2305.— Anil and Jayaraj, 2021: 37.

Type species. *Sphaeromopsis amathitis* Holdich and Jones, 1973; by monotypy; type locality: Watamu Marine Park, Kenya.

Diagnosis. Diagnoses to genus are found in Schotte and Kensley (2005) and Anil and Jayaraj (2021).

Remarks. Comparison of the new species to the different descriptions, figures, and specimens of *Sphaeromopsis* revealed some inconsistencies in what are usually considered generic character states. In the Sphaeromatidae pleon sutures are a critical and usually highly consistent character in genus definitions. This is not the case in *Sphaeromopsis*, as pleonal sutures differ in morphology and number. For example, in *S. sulcifera* the sutures are not clearly visible (see Schotte and Kensley, 2005 : fig. 37A), whereas in *Sphaeromopsis merohirsutus* Ortiz *et al.,* 2004 and *S. persikolpos* there is a single suture on either side of the posterior margin of the pleon rather than the more usual two sutures. The sutures of the coxal plate are similarly not visible in some species (*S. sei*, *S. persikolpos*, *S. sikata*). The pereon and pleon of most species in the genus do not exhibit any dorsal ornamentation. In *S. heardi* Kensley and Schotte, 1994 there is obvious sculpturing on the pleotelson, whereas in *S. persikolpos, S. sikata*, and *S. jayaraji* sp. nov., there are some scattered setae on the surface of these sclerites. Among all known *Sphaeromopsis* species, only *S. sulcifera* and *S. sarii* have a faint longitudinal, dorso-medial furrow on the pleotelson. Moreover, the pleotelson varies in shape from broadly truncate in *S. amathitis* to broadly rounded in *S. minutus*, to elongated with a narrow apex in *S. persikolpos*, *S. sikata*, and *S. jayaraji* sp. nov. Lastly, the relative length of the uropodal rami varies somewhat, with the exopod ranging from slightly shorter than the endopod to longer than the endopod. This variation at the species level is not of generic merit, and therefore not comparable to the endopod being reduced to a stub (*Paracilicaea* Stebbing, 1910) or the exopod minute or even absent (*Cassidina* H. Milne Edwards, 1840; *Apemosphaera* Bruce, 1994), for example.

Included species. See Anil and Jayaraj (2021).

Sphaeromopsis jayaraji sp. nov.

(Figs. 2–6)

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Material examined (all material is from the South Andaman, Andaman Islands). Holotype: male (2.9 mm), station Corbyns Cove, 11°37'48.3"N 92°45'14.0"E, South Andaman, Andaman Islands, intertidal, high-tide line sand, coll. Pathan Anil, 7 April 2017 (PUMB 35104). Paratypes: 4 males (2.7, 2.8, 2.9, 2.9 mm); 3 subadult males (2.4, 2.4, 2.6 mm); 2 juveniles (2.0, 2.1 mm); 2 ovigerous females (2.8, 3.0 mm);

3 non-ovigerous females (2.1, 2.1, 2.3 mm), same data as holotype (PUMB 35105; BAKRZRL 2704, 2705, 2706). 2 males (2.5, 2.8 mm); 5 subadult males (2.3, 2.3, 2.4, 2.6, 2.6 mm); 3 juveniles (2.1, 2.3, 2.3 mm); 1 ovigerous female (2.7 mm); 2 non-ovigerous females (2.2, 2.4 mm), station Chotta Balu, 11°30'39.00"N 92°40'55.00"E, South Andaman, Andaman Islands, intertidal, mid-tide line sand, coll. Pathan Anil, 9 April 2017 (PUMB 35106, 35107; BAKRZRL 2707).

Diagnosis. Body 2.5 times as long as wide; head with weakly developed rostrum; pereonites 2–7 with coxal plate sutures on lateral sides; pleon with posterior margin bearing 2 short, separate sutures at either side; pleotelson posterior margin produced to narrowly rounded apex with 5 setae; epistome widest anteriorly, with broadly rounded anterior margin and sub-parallel lateral margins, anterior margin with widely spaced plumose setae; pereopods 1–3 with setulose fringe on inferior margins of ischium, merus, carpus, and propodus; uropodal exopod longer than endopod, dorsal surface with 2 deep longitudinal mesial grooves; endopod lateral margin weakly sinuate with long setae, apex with deep mesial groove with plumose setae.

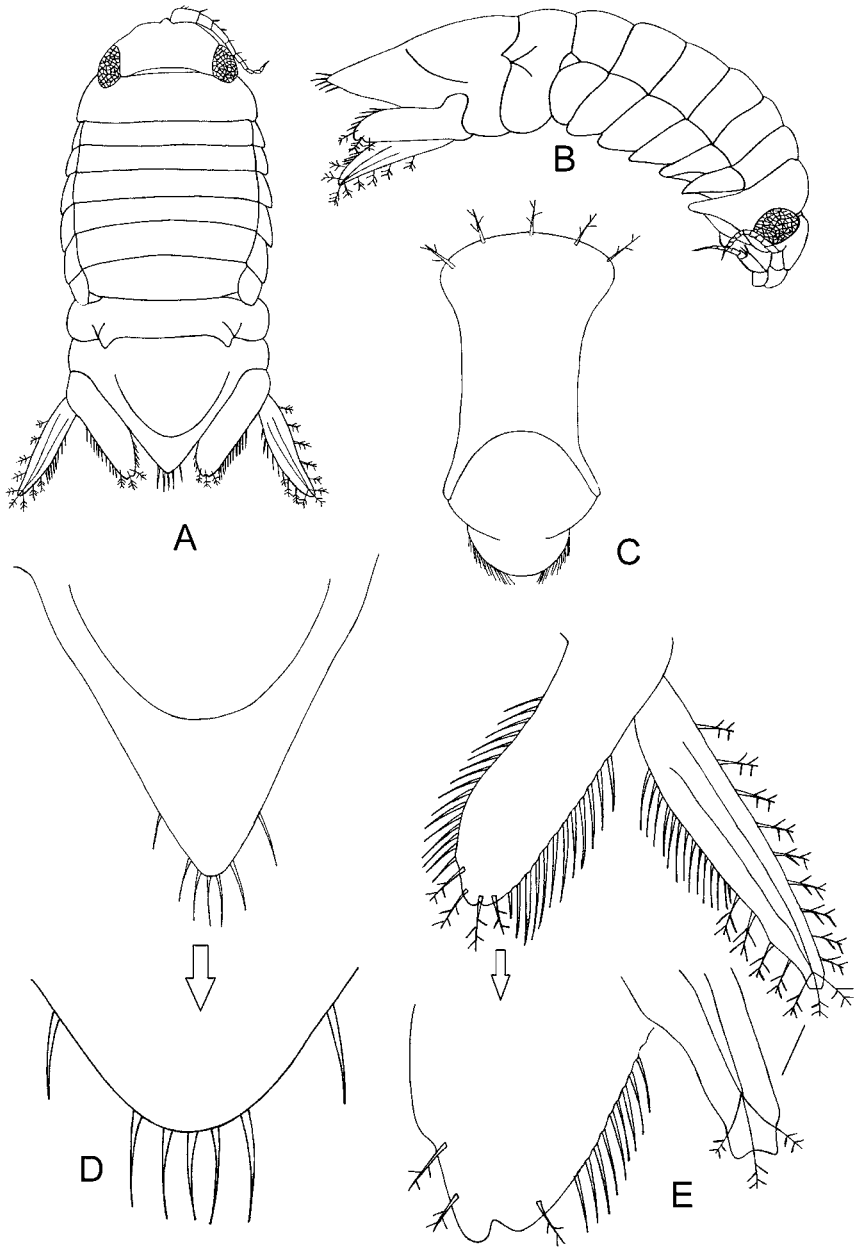

Figure 2. *Sphaeromopsis jayaraji* sp. nov., holotype male (2.9 mm) (PUMB 35104). **A**, dorsal view; **B**, lateral view; **C**, frontal lamina; **D**, pleotelson; **E**, uropods.

Description of male holotype (Figs. 2–6). Body 2.5 times as long as greatest width; head smooth, rostrum weakly developed (Fig. 2A). Coxae 2–7 subequal, coxae 2–4 posterior lateral margins triangular, coxae 5 slightly rounded on posterior lateral margin and more rounded laterally in pereonites 6–7 (Fig. 2B). Pleotelson 0.9 times wider than long, forming dorsal arch in posterior view and some scattered setae over surface; posterior margin produced to narrowly rounded apex with 5 setae, lateral margins folded ventrally (Fig. 3A).

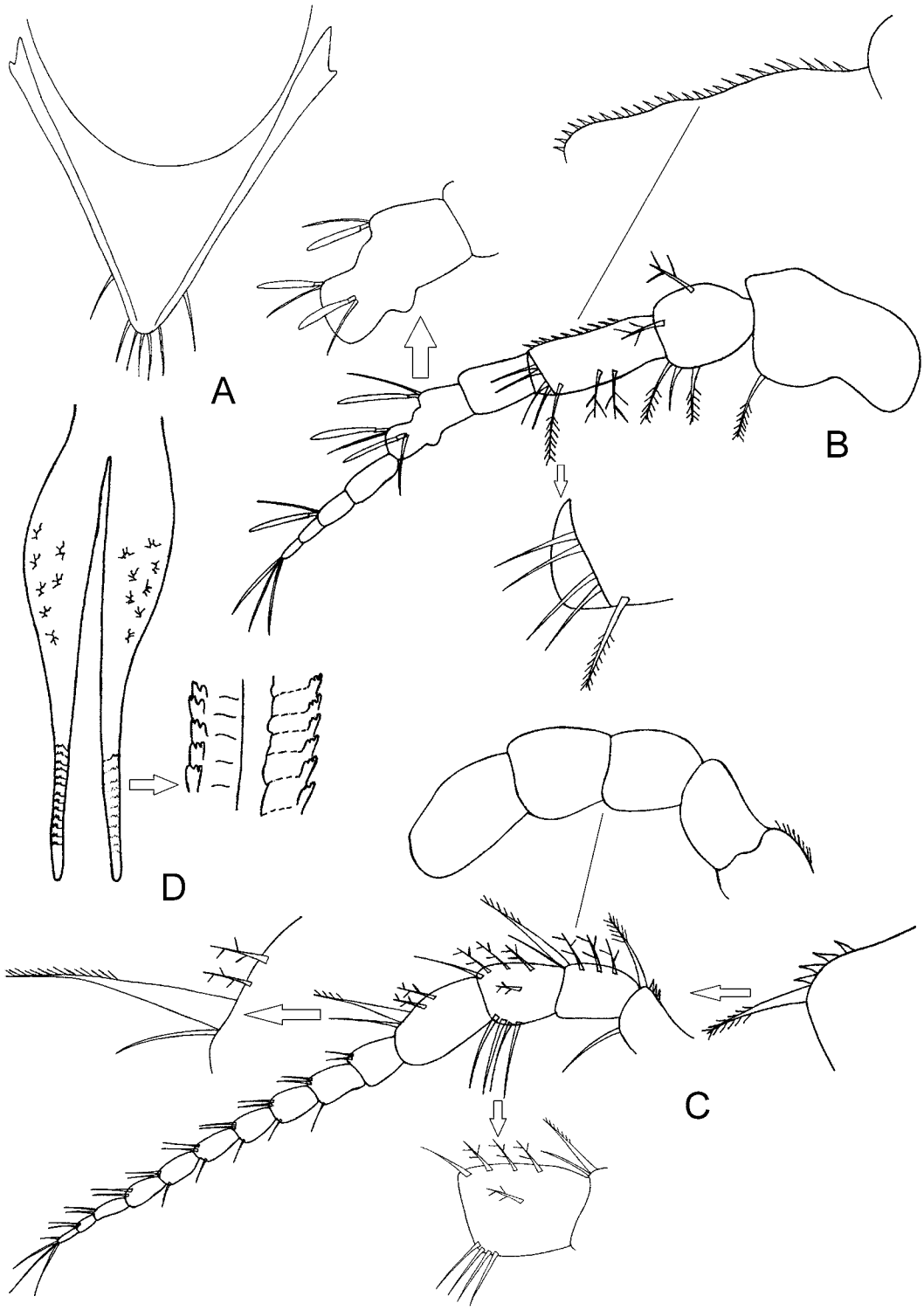

Figure 3. *Sphaeromopsis jayaraji* sp. nov., holotype male (2.9 mm) (PUMB 35104). **A**, ventral view of pleotelson; **B**, antennula; **C**, antenna; **D**, penes.

Antennula basal article about 1.9 times as long as article 2, inferior distal margin with one plumose seta; article 2 short, 0.27 length of article 1, superior margin with 2 widely spaced plumose setae, inferior distal margin with 2 plumose setae and 1 simple seta; article 3 about 1.3 as long as article 2, superior margin with 25 short acute setae, inferior mesial margin with 2 widely spaced plumose setae, distal margin with single plumose seta and dorsal distal margin with 4 long simple slender setae; flagellum 6-articled, extending near to posterior margin of pereonite 1, articles 3–5 each bearing aesthetascs (Fig. 3B). Antenna with peduncle article 2 being 1.2 times as long as wide, 1.1 as long as article 1, superior distal margin with 4 short acute setae, 1 long plumose seta, inferior distal margin with 1 long slender simple seta; article 3 is 1.4 times as long as wide, 1.2 as long as article 2, superior mesial margin with 2 widely spaced plumose setae, distal margin with single RS uni-serrated, single simple and single widely spaced plumose seta; article 4 1.5 times as long as wide, 1.7 times as long as article 3, superior margin with 3 widely spaced plumose setae, single long seta, dorsal mesial margin with single short widely spaced plumose seta, inferior distal margin with 4 long simple slender setae; article 5 1.9 times as long as wide, 2.0 times as long as article 4, superior mesial margin with 2 short widely spaced plumose setae, distal margin with single RS uni-serrated, single simple seta; flagellum with 10 articles, extending to mid pereonite 2 (Fig. 3C).

Epistome 1.4 times as long for maximum length and width, and 1.6 times as long for median length and width, epistome widest anteriorly, anterior margin broadly rounded with widely spaced plumose setae, lateral margins straight to very weakly concave, postero-lateral margins elongated with weakly concave, posterolateral lobes extending to mid-length of labrum (Fig. 2C).

Maxilliped endite lateral margin weakly sinuate, distal margin with 2 blunt RS, set in amongst 7 distal and single sub-distal circumplumose RS; mesial margin with single coupling hook and many short simple setae; palp article 2 mesial margin with 5 slender setae; article 3 mesial margin with 7 slender setae; article 4 mesial margin with 3 slender setae; article 5 mesial margin with 5 slender setae (Fig. 4A). Mandible incisor with 3 cusps, lacinia mobilis with 4 cusps; spine row with 3 serrate, 3 simple spines; molar process round (Fig. 4B); palp article 1 about 0.6 times as long as article 2, article 2 distolateral margin with 5 bi-serrate setae becoming progressively longer distally; article 3 with 7 bi-serrate setae, terminal seta being longest (Fig. 4C). Maxillule lateral lobe lateral margin fringed with simple short setae, apical margin with 7 RS, some inferiorly serrate, mesial lobe with 3 comb, 2 simple setae (Fig. 4D). Maxilla lateral and middle lobes with 4 curved nodular serrate RS; mesial lobe with 4 serrate RS, 3 pectinate RS (Fig. 4E).

Pereopod 1 basis about 2.3 times as long as greatest width, superior margin with 3 short sensory palmate setae and many short setae, inferior distal margin with single long simple seta; ischium to propodus inferior margin fringed with short setae; ischium about 1.9 times as long as greatest width, inferior margin with several simple setae and many short setae, superior margin with 5 long distally bi-serrate setae; merus 0.4 times as long as ischium, inferior distal margin with 2 RS, superodistal angle with 3 bi-serrate setae; carpus as long as wide, subtriangular, inferodistal angle with single bi-serrate RS; propodus 2.8 times as long as wide, inferior margin with 2 bi-serrate RS and some long setae; dactylus secondary unguis curved, with 3 simple setae at base, superior margin with single short seta, distal margin with single long seta (Fig. 5A).

Pereopod 2 basis about 3.9 times as long as wide, superior margin with 2 sensory palmate setae, single simple seta, and many short acute setae, inferodistal angle with single long simple seta; ischium to propodus inferior margin fringed with short setae; ischium about 3.2 times as long as greatest width, inferior margin with few long setae and several short setae, superior margin with 9 long distally biserrate setae; merus 0.4 times as long as ischium, inferior margin with 2 long simple setae and distally single RS, superior distal margin with 5 long distally bi-serrate setae; carpus inferior margin with 3 simple long setae, superior distal margin with 4 long distally bi-serrate setae; propodus about 0.6 times as long as ischium, supero-distal corner with single long bi-serrate seta and single small short seta; dactylus secondary unguis curved, with 3 simple setae at base, superior margin with single short seta, distal margin single long seta (Fig. 5B).

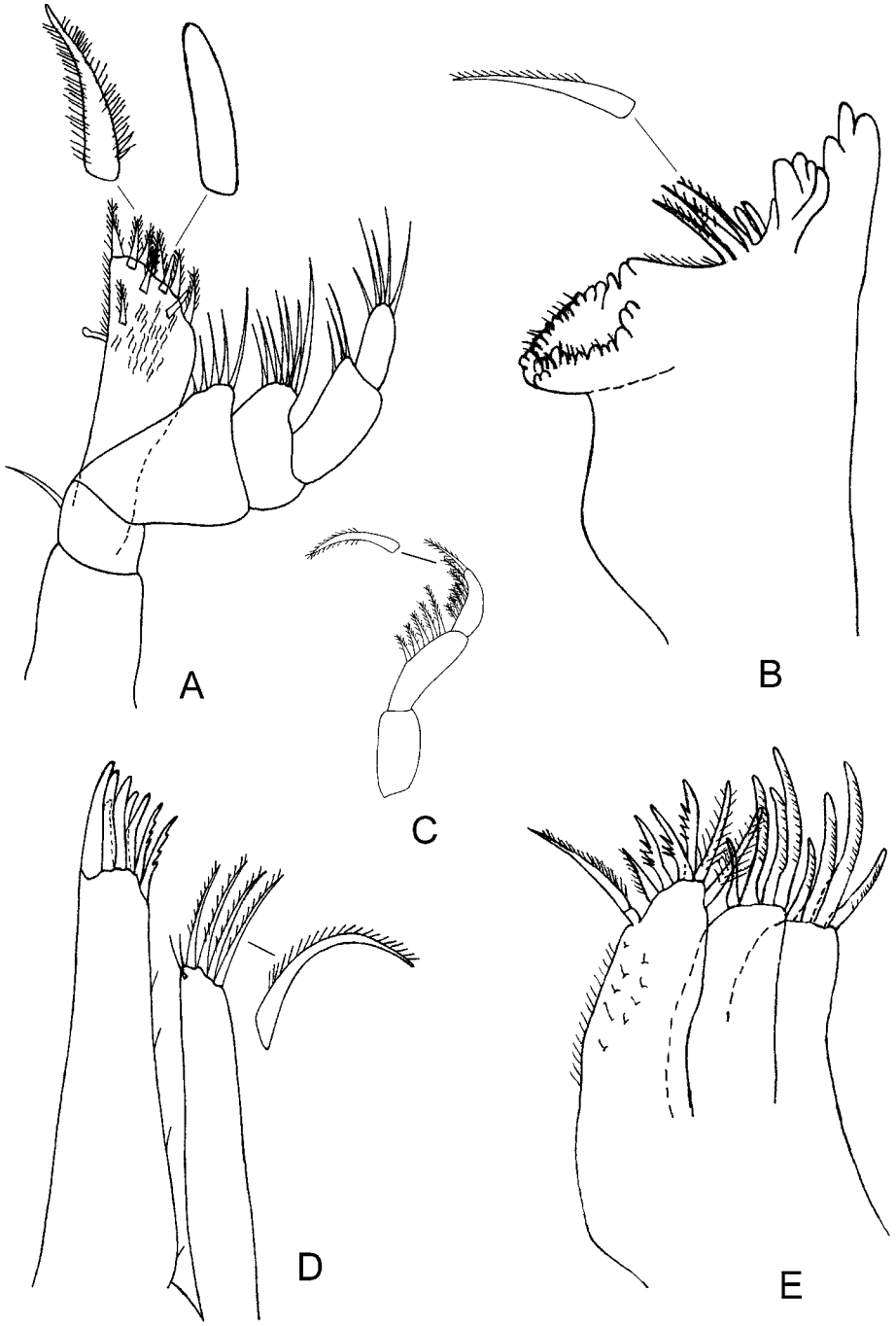

Figure 4. *Sphaeromopsis jayaraji* sp. nov., holotype male (2.9 mm) (PUMB 35104). **A**, maxilliped; **B**, mandible; **C**, mandible palp; **D**, maxillula; **E**, maxilla.

Pereopod 3 similar to pereopod 2. Pereopod 4 basis about 3.4 times as long as wide, superior margin with 3 sensory palmate setae and many short acute setae, inferior distal margin with single simple long seta; on ischium to propodus inferior margin fringed with many short setae; ischium about 2.9 times as long as greatest width, inferior margin with 3 simple long setae, superior margin with 8 long distally bi-serrate setae; merus about 0.6 times as long as ischium, inferior margin with 2 simple long setae and distally single RS, superior distal margin with 7 long distally bi-serrate setae; carpus inferior margin with 3 simple long setae, superior distal margin with single sensory palmate seta and single simple short seta; propodus about 0.7 times

as long as ischium, inferior margin with 5 long simple setae, superior distal corner with single sensory palmate seta and single simple long seta; dactylus secondary unguis curved, with 3 setae at base and superior mesial margin with 2 short setae distal margin with single long seta (Fig. 5C). Pereopod 5 similar to pereopod 4.

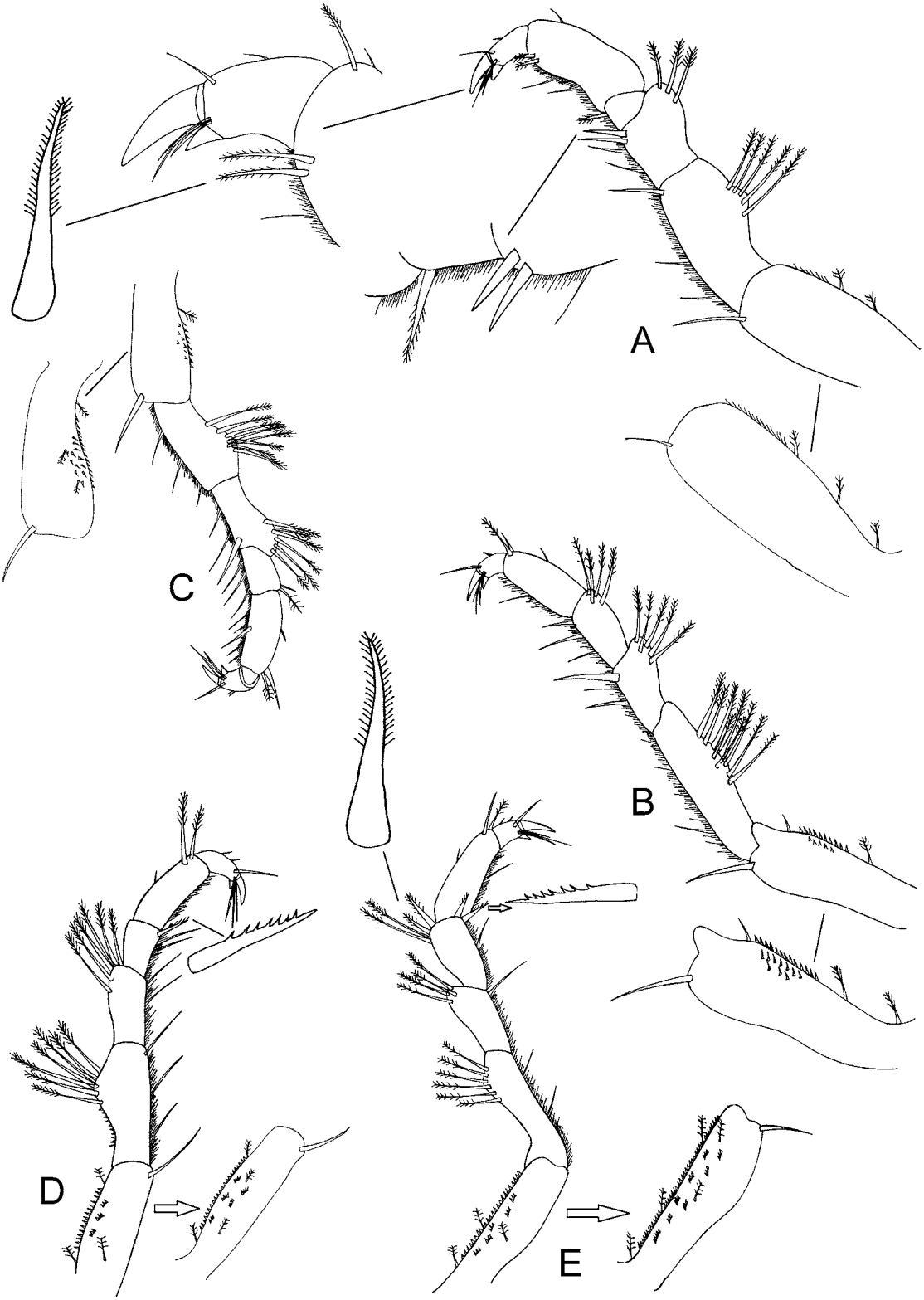

Figure 5. *Sphaeromopsis jayaraji* sp. nov., holotype male (2.9 mm) (PUMB 35104). **A**, pereopod 1; **B**, pereopod 2; **C**, pereopod 4; **D**, pereopod 6; **E**, pereopod 7.

Pereopod 6 basis about 3.5 times as long as greatest width, superior margin with 4 sensory palmate setae and many short acute setae, inferior distal margin with single long seta; on ischium to propodus inferior margin fringed with short setae; ischium about 2.5 times as long as greatest width, inferior margin with 3 simple long setae, superior margin with short acute setae and 7 long distally bi-serrate setae; merus 0.4 times as long as ischium, inferior margin with 2 simple long setae, superior distal margin with 6 long distally bi-serrate setae; carpus subequal in length to merus, inferior margin with 2 simple long setae and single uni-serrated RS; propodus about 0.8 times as long as ischium, superior distal margin with 2 long distally bi-serrate setae; dactylus secondary unguis curved, with 3 simple setae at base, superior margin with 2 short setae, distal margin single long seta (Fig. 5D).

Pereopod 7 basis about 3.7 times as long as greatest width, superior margin with 5 sensory palmate setae and many short acute setae, inferior distal margin with single long seta; ischium to propodus inferior margin fringed with short setae; ischium 0.6 times as long as basis, 6 times as long as greatest width, inferior margin with 2 simple long setae, superior margin with 6 long distally bi-serrate setae; merus 0.4 times as long as ischium, inferior distal margin with single long simple seta, superior distal margin with 4 long distally bi-serrate setae; carpus subequal in length to merus, superior distal margin with 2 long distally bi-serrate setae, 4 bi-serrate RS, inferior distal margin with 2 uni-serrated RS; propodus about 0.9 times as long as ischium, inferior margin with single simple long seta, superior distal margin with single sensory palmate seta and single simple long seta; dactylus secondary unguis curved, with 3 simple setae at base, superior margin with 2 short setae, distal margin single long seta (Fig. 5E).

Penes elongate, slender, tapering to narrowly rounded apices, length more than 6 times basal width, lateral margins with proximally directed hand-like scales on distal third (Fig. 3D).

Pleopod 1 exopod and endopod with 22 and 10 PMS respectively; exopod 1.4 times as long as wide, lateral margin weakly straight, distally narrowly rounded and mesial margin weakly convex; endopod 1.3 times as long as wide, distally narrowly rounded, lateral margin strongly convex with short setae and mesial margin concave; sympodite 0.6 times as wide as long, mesial margin with 3 coupling hooks (Fig. 6A). Pleopod 2 exopod and endopod with 23 and 9 PMS respectively; appendix masculina arising sub-basally, straight with parallel lateral margins from proximal to mesial, distally broad with rounded apex, appendix masculina 0.8 as long as endopod, projects slightly beyond by one third of its length; sympodite with 3 distomesial coupling hooks (Fig. 6B). Pleopod 3 exopod and endopod with 22 and 10 PMS respectively; sympodite with 2 distomesial coupling hooks (Fig. 6C). Pleopod 4 endopod narrower than exopod, mesial margins with some fine simple setae (Fig. 6D). Pleopod 5, exopod longer than endopod, with incomplete transverse suture distally, bearing 3 scale patches (2 distally and 1 above the transverse suture) (Fig. 6E).

Uropodal exopod lateral margin straight, smooth with plumose setae, apex concave with 3 plumose setae and mesial proximal margin weakly convex with simple setae, distal margin concave with plumose setae; dorsal surface of the exopod with 2 deep mesial longitudinal grooves; endopod lateral margin weakly sinuate with long setae, apex with deep mesial groove and plumose setae, mesial anterior proximal margin weakly concave with long setae, distal margin convex with plumose and simple setae (Fig. 2E).

Female. Slightly differs from male, particularly pleotelson posterior margin elongation less than in male, uropod rami are smaller than in male, exopod subequal or smaller than endopod and differs from male in sexual characters.

Remarks. *Sphaeromopsis jayaraji* sp. nov. can be recognized by the epistome being widest anteriorly, with a broadly rounded anterior margin and sub-parallel lateral margins; the anterior margin has widely spaced plumose setae; the uropodal exopod is longer than the endopod and the dorsal surface has two deep mesial grooves running from anterior to posterior margin; the endopod lateral margin is weakly sinuate with long setae, apex has deep mesial groove with plumose setae.

Sphaeromopsis jayaraji sp. nov. is most similar to *S. sikata*, which was also described from intertidal habitats of South Andaman. Both species share some characters such as pleotelson posterior margin

produced with narrow apex and pleon with posterior margin bearing two sutures at either side. The new species differs from *S. sikata* in pleotelson lateral margins being folded ventrally (*vs.* not folded ventrally), epistome apical margin broadly rounded with plumose setae and straight lateral margins (*vs.* triangular apex, lateral margins distinctly concave), uropodal exopod lateral margin smooth with plumose setae (*vs.* lateral distal margin is serrate with three teeth), exopod dorsal surface with two deep mesial longitudinal grooves (*vs.* dorsal surface smooth, without grooves), and appendix masculina distally broad with rounded apex (*vs.* narrowly rounded apex).

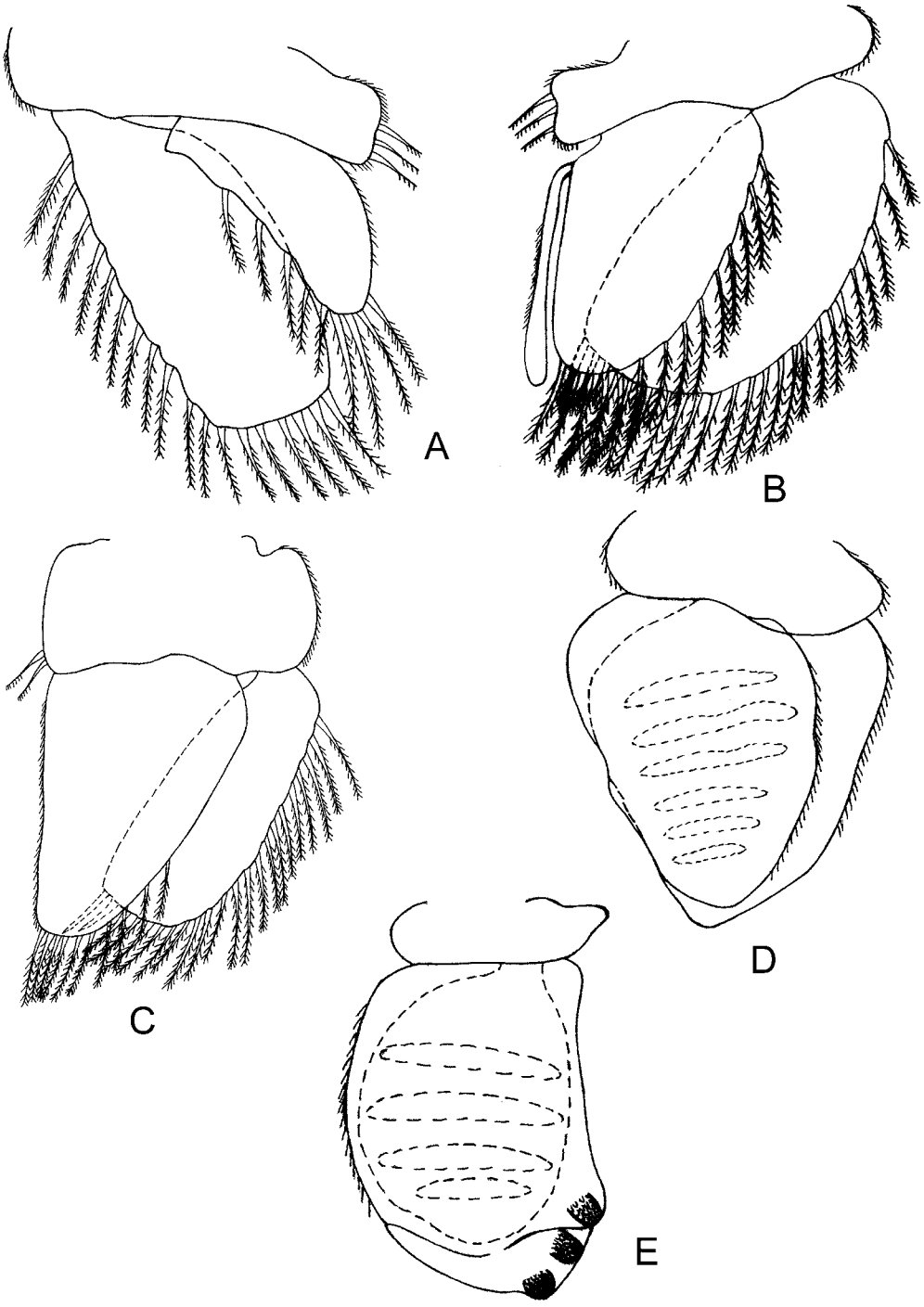

Figure 6. *Sphaeromopsis jayaraji* sp. nov., holotype male (2.9 mm) (PUMB 35104). **A**, pleopod 1; **B**, pleopod 2; **C**, pleopod 3; **D**, pleopod 4; **E**, pleopod 5.

Sphaeromopsis jayaraji sp. nov. is also similar to *S. persikolpos*, both species with a produced pleotelson (which is also shared with *S. sei*), but differ in the pleon posterior margin bearing two sutures at either side (*vs.* single suture), epistome with straight lateral margins (*vs.* concave lateral margins).

Sphaeromopsis jayaraji sp. nov. differs from *S. sei* in having uropodal exopod lateral margin smooth with plumose setae (*vs.* serrate).

Distribution. Known only from the type locality, South Andaman, Andaman Islands.

Etymology. This species is named in honour of Dr. K.A. Jayaraj, Assistant Professor, Department of Ocean Studies and Marine Biology, Pondicherry University, the mentor of the author and a well-known ecologist and taxonomist in India.

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Additional Information And Declarations

Conflict of Interest

The author declares that there is no conflict of interest.

References

Anil, P. and Jayaraj, K.A. 2021. A new species of *Sphaeromopsis* Holdich and Jones, 1973 (Crustacea: Isopoda: Sphaeromatidae) from the Andaman Islands, northern Indian Ocean. *Thalassas: An International Journal of Marine Sciences*, 37: 279-285.

Boyko, C.B.; Bruce, N.L.; Hadfield, K.A.; Merrin, K.L.; Ota, Y.; Poore, G.C.B.; Taiti, S.; Schotte, M. and Wilson, G.D.F. (eds) (2008 onwards). World Marine, Freshwater and Terrestrial Isopod Crustaceans database. Cirolanidae Dana, 1852. Available from http://www.marinespecies.org/isopoda. Accessed on 10 February 2020.

Bruce, N.L. 1994. The *Cassidininae* Hansen, 1905 (Crustacea: Isopoda: Sphaeromatidae) of Australia. *Journal of Natural History*, 28: 1077–1173.

Dev Roy, M.K.D. 2012. An updated systematics list of Isopod fauna of India. *Journal of Environment and Sociology*, 9: 163–175.

Dutta, A.; Retnaraj, C. and Chowdula, S. 2019. First distribution record of the isopod *Afrocerceis kenyensis* Müller, 1995 (Crustacea: Isopoda: Sphaeromatidae) from Indian Waters. *Journal of Biodiversity*, 10: 31–37.

Holdich, D.M. and Harrison, K. 1981. The sphaeromatid isopod genus *Sphaeromopsis* Holdich and Jones in African, Australian and South American waters. *Crustaceana*, 41: 286–300.

Holdich, D.M. and Jones, D.A. 1973. The systematics and ecology of a new genus of sand beach isopod (Sphaeromatidae) from Kenya. *Journal of Zoology*, 171: 385–395.

Javed, W. and Yousuf, F. 1995. A new species and a new record of *Sphaeromopsis* Holdich and Jones, 1973 from Pakistan waters (Isopoda, Sphaeromatidae). *Pakistan Journal of Marine Science*, 4: 51–58.

Javed, W. and Yousuf, F. 1997. A new species and a new record of *Sphaeromopsis* (Isopoda: Sphaeromatidae) from the Arabian Sea. *Proceedings of Pakistan Congress of Zoology*, 17: 135–144.

Kensley, B. 2001. Biogeography of the marine Isopoda of the Indian Ocean, with a check-list of species and records. p. 205–264. In: B. Kensley and R.C. Brusca (eds), Isopod systematics and evolution. Crustacean Issues, 13. Rotterdam, A.A. Balkema.

Kensley, B. and Schotte, M. 1994. Marine isopods from the Lesser Antilles and Colombia (Crustacea: Peracarida). *Proceedings of the Biological Society* of *Washington*, 107: 482–510.

Kensley, B. and Schotte, M. 1999. New records of isopods from the Indian River Lagoon, Florida (Crustacea: Peracarida). *Proceedings of the Biological Society* of *Washington*, 112: 695–713.

Khalaji-Pirbalouty, V. and Wägele, J.W. 2009. Two new species of *Sphaeromopsis* (Crustacea: Isopoda: Sphaeromatidae) from the Persian Gulf. *Zootaxa*, 2305: 33–50.

Khalaji-Pirbalouty, V.; Bruce, N.L. and Wägele, J.W. 2013. The genus *Cymodoce* Leach, 1814 (Crustacea: Isopoda: Sphaeromatidae) in the Persian Gulf with description of a new species. *Zootaxa*, 3686: 501–533.

Latreille, P.A. 1825. Familles naturelles du règne animal, exposées succinctement et dans un ordre analytique, avec l'indication de leurs genres. J. B. Baillière, Paris, 570p.

Milne Edwards, H. 1840. Histoire Naturelle des Crustaces, Comprenant l'Anatomie, la Physiologie et la Classification de ces Animaux, Vol. 3, Paris, Librarie Encyclopedique de Roret, 605p.

Ortiz, M.; Lalana, R. and Varela, C. 2004. Especie nueva del género *Sphaeromopsis* (Crustacea: Isopoda: Sphaeromatidae) de la plataforma Sur oriental de Cuba. *Solenodon*, 4: 1–5.

Schotte, M. and Kensley, B. 2005. New species and records of Flabellifera from the Indian Ocean (Crustacea: Peracarida: Isopoda). *Journal of Natural History*, 39: 1211–1282.

Stebbing, T.R.R. 1910. Reports on the marine biology of the Sudanese Red Sea. XIV. On the Crustacea Isopoda and Tanaidacea. *Journal of the Linnean Society of Zoology*, 31: 215–230.

Storey, M. 2002. New species and a new record of sphaeromatid isopods (Crustacea) from the Andaman Sea, Thailand. *Phuket Marine Biological Center of Special Publication*, 23: 133–148.

Wägele, J.W. 1989. Evolution und phylogenetisches System der Isopoda. Stand der Forschung und neue Erkenntnisse. *Zoologica*, 140: 1–262.