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continued on the back inside cover

Cover: Tamil Lacewing *Cethosia nietneri* with colour pencils and watercolours for the background; detailing with fine liners by Elakshi Mahika Molur.

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COMMUNICATION

Sphaeroma taborans sp. nov., a new species of wood-boring isopod (Crustacea: Isopoda: Sphaeromatidae) from Munroe Island, Ashtamudi Estuary, Kerala, India

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Abstract: *Sphaeroma taborans* sp. nov. is described from Munroe Island, part of Ashtamudi Estuary, Kerala, India. This wood-boring species can be distinguished from all other congeners by its dorsal surface with three longitudinal bands between eyes, a prominent blackish tubercle on the anterior band, and scattered weak tubercles. Epistome subtriangular and nontruncated. Pleon and pleotelson bearing appressed hair layers. Pleotelsonic dorsal surface with six stout tubercles in a transverse row near the anterior followed by three pairs of median prominent blunt tubercles. Apex curved triangle, slightly curved upwards. Uropodal exopod with 4–5 external teeth and an acute apex thorn-like setae along lateral margins with acute apex extending beyond pleotelsonic apex.

Keywords: Ashtamudi Lake, epistome, holotype, mangrove ecosystems, paratype, pereopod, pleopod, pleotelson, Ramsar wetland, Sphaeromatidae, uropodal exopod, taxonomic description, tubercle.

Malayalam: ഫെറോമാ താബോറൻസ് എന്ന പുതിയ ഇനം തടിതുരപ്പൻ ഐസോപോഡ് സ്പീഷീസിനെ ഇന്ത്യയുടെ തെക്കുപടിഞ്ഞാറൻ സംസ്ഥാനമായ കേരളത്തിലെ അഷ്ടമുടി കായലിന്റെ ഭാഗമായ മൺറോ ഐലൻഡിൽ നിന്നും കണ്ടെത്തി. തലയുടെ ഭാഗത്തായി രണ്ടു കണ്ണുകൾക്കുമിടയിലായി കാണപ്പെടുന്ന മൂന്ന് ബാൻഡുകളും അതിലെ മുന്നിലുള്ള ബാൻഡിലായി കാണുന്ന കറുത്ത വ്യത്താകൃതിയിലുള്ളതുമായ ഒരു ട്യൂബർക്കിളിനോടൊപ്പം ചിതറി കിടക്കുന്നഏതാനും ചെറിയ ട്യൂബർകിളുകളുമാണ് ഈ പുതിയ സ്പീഷിസിനെ മറ്റു സ്പീഷീസുകളിൽ നിന്നും വ്യത്യസ്തമാക്കുന്നത്. ഉപത്രികോണാകൃതിയിലുള്ളതും മുകളിലേക്ക് ചെറുതായി വളഞ്ഞിരിക്കുന്നതുമായ എപ്പിസ്റ്റോം, പ്ലിയോണിലും പ്ലിയോടെൽസണിലും അമർന്നുകിടക്കുന്ന രോമപാളികൾ, തിരശ്ചീനമായ ആറ് ട്യൂബർക്കിളുകളുള്ള പ്ലിയോടെൽസോണിക് ഡോർസൽ ഉപരിതലം, തുടർന്ന് മൂന്ന് ജോഡി മൂർച്ചയുള്ള ട്യൂബർക്കിളുകൾ, ത്രികോണാകൃതിയിലുള്ളതും അല്പം മുകളിലായി വളഞ്ഞിരിക്കുന്നതുമായ ശരീരത്തിന്റെ താഴത്തെ അഗ്രം, കൂർത്ത അഗ്രമുള്ളതും ഇരു വശങ്ങളിലും മുള്ളു പോലെയുള്ള കുറ്റിരോമങ്ങളുടെ ഘടനയോടുകൂടിയതും പ്ലിയോടെൽസന്റെ അഗ്രത്തിന് അപ്പുറത്തേക്ക് നീണ്ടുകിടക്കുന്നതും നാലു മുതൽ അഞ്ചു വരെയുള്ള ബാഹ്യ പല്ലുകളുമുള്ള യൂറോപ്പോഡൽ എക്സോപോഡ് എന്നിവയൊക്കെയാണ് ഫെറോമാ താബോറൻസിന്റെ സവിശേഷതകൾ.

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Author contributions: AMS and DB carried out fieldwork, identification, and manuscript preparation, BA reviewed the manuscript.

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INTRODUCTION

The *Sphaeroma* Bosc, 1801, is a widely distributed genus worldwide in tropical and subtropical waters. Seven species of *Sphaeroma* have been identified from the Indian waters: (*Sphaeroma annandalei* Stebbing, 1911, *S. travancorensis* Pillai, 1955, *S. globicauda* Dana, 1851, *S. terebrans* Bate, 1866, *S. triste* Heller, 1865, *S. tuberculatum* Purusotham & Rao, 1971, and *S. walkeri* Stebbing, 1905). These wood-boring isopods inhabit the trunks and prop roots of mangrove plants, thus affecting their structure and stability. Moreover, sphaeromatid isopods reduce the root production and growth rate which leads to altering the nutrient supply (Thiri & Yang 2022). Previous investigations revealed that the burrowing activity of *Sphaeroma* isopods also has harmful effects on manmade coastal wooden structures such as jetties (Dodge-Wan & Nagarajan 2020).

Munroe Island is a critically vulnerable ecosystem in Kerala, south India (Rafeeque et al. 2023). This Island is between the Kallada River and the Ashtamudi Estuary (Arya et al. 2023). Specimens collected from the Peringalam Station in Munroe Island proved to be a new species of *Sphaeroma* genus and are described here as *Sphaeroma taborans* sp. nov. This isopod builds burrows in substrates such as dead wood and decaying roots of mangroves. It is generally supposed that the burrow serves as a shelter for the *S. taborans* sp. nov. rather than as a food resource.

MATERIALS AND METHODS

Specimens for this study were collected from Munroe Island, part of Ashtamudi Estuary, Kerala (Image 1). Specimens were preserved in the field in 70% ethanol and dissected in diluted glycerine. Followed by the examination using a dissecting microscope (Weswox SZM105). Drawings were made using a standard camera lucida mounted on a compound microscope (Olympus CX33), and all images were processed with Photoshop CS5. Terminology of the morphological characters follows that of Bate, 1866; Harrison & Holdich 1984; Khalaji-Pirbalouty & Waegele 2010). The holotype (ZSI/WGRC/1.R.-INV.28482) was deposited in the Zoological Survey of India Kozhikode, Kerala, India. Paratypes (SSCDZ/Iso/01/2024 and SSCDZ/Iso/02/2024) were deposited in the Department Museum, Zoology Research Centre, St. Stephen's College, Pathanapuram.

Image 1. The type locality of *Sphaeroma taborans* sp. nov. in Munroe Island, India.

RESULTS

Systematics

Suborder Sphaeromatidea Wägele, 1989
Superfamily Sphaeromatoidea Latreille, 1825
Family Sphaeromatidae Latreille, 1825
Genus *Sphaeroma* Bosc, 1801

***Sphaeroma taborans* sp. nov.**

(Figures 1A–F, 2A–C, 3A–D)

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Type Locality: Munroe Island, 8.996 ^{0}N, 76.596 ^{0}E, Asthamudi Estuary, Kerala, India.

Material examined: Holotype: Female (8 mm), India, Kerala, Munroe Is, 8.996 ^{0}N, 76.596 ^{0}E, 7 September 2023, Perungalam stn. 5 m (ZSI/WGRC/1.R.-INV.28482). Paratypes: 1 female (8 mm) (SSCDZ/Iso/01/2024), 1 male (10 mm) (SSCDZ/Iso/02/2024) same data as holotype.

Description of female: Body about two times as long as highest width.

Head (Figure 1) dorsal surface with three longitudinal bands between eyes and a prominent blackish tubercle on the anterior band and scattered weak tubercles on the surface. Eyes bulbous.

Pereonites (Figure 1; Table 1) 1–4 with weak tubercles, 5–7 with a transverse row of continuous prominent, conical, setigerous tubercles; 6–7 with two transverse rows of thorn-like structure laterally.

Antennule (Figure 1) first peduncle article bearing

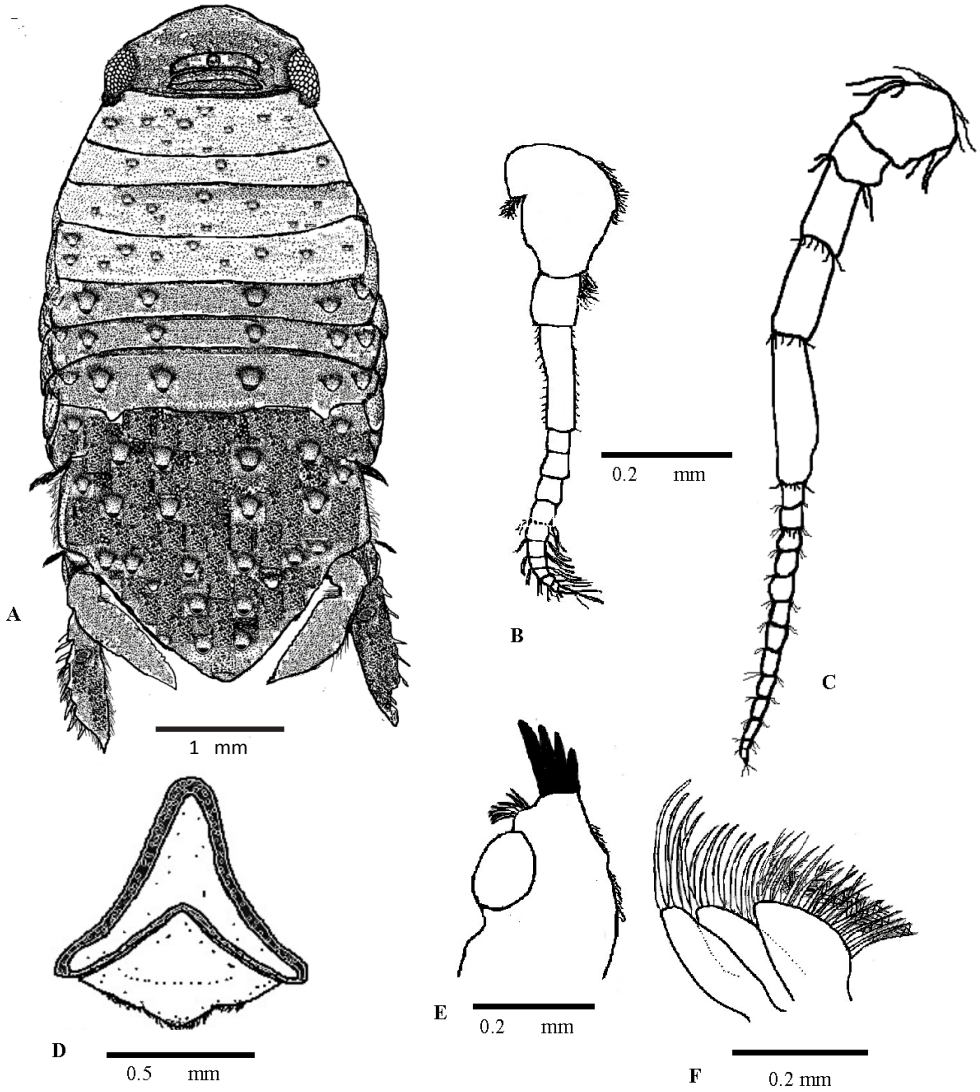

Figure 1. *Sphaeroma taborans* sp. nov. (ZSI/WGRC/1.R.-INV.28482) holotype: A — dorsal view | B — antennule | C — antenna | D — epistome | E — right mandible | F — maxilla.

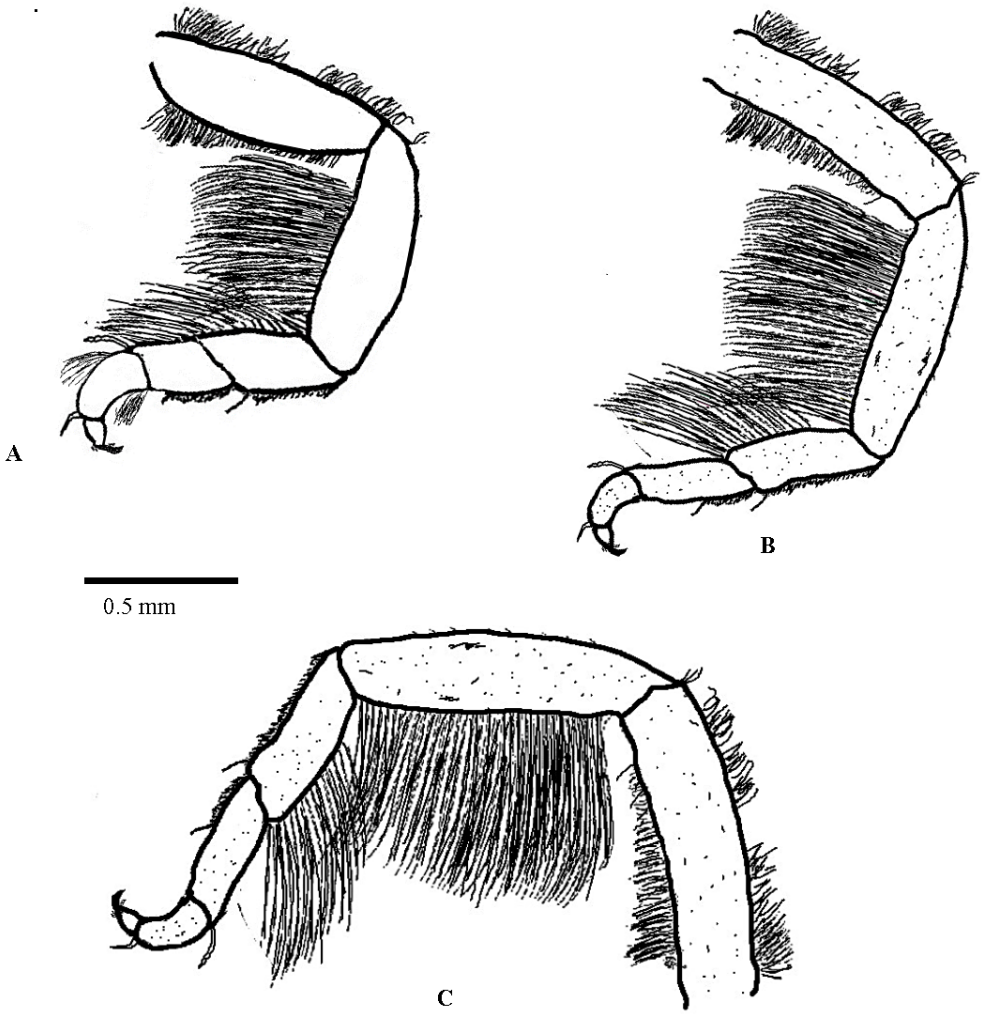

Figure 2. *Sphaeroma taborans* sp. nov., holotype: A–C—pereopods 1–3.

weak tubercles and short setae, with some short plumose setae on the upper surface; article two with some short plumose setae on dorsal and ventral margins, article three slender, 1.7 times as long as article two; flagellum with 11 articles, articles 4–9 each bearing single aesthetasc.

Antenna (Figure 1) peduncle article one setose; articles 2–4 each with long setae on posterior end; article five about 0.84 times as long as article four; flagellum with 15 articles.

Epistome (Figure 1) granulate, subtriangular apex, lateral margin concave and sublinear.

Left mandible (Figure 1) incisor with four cusps; incisor processes are blackish, indicating a high degree of sclerotization; molar processes are almost oval; reduced lacinia mobilis.

Maxillule lateral lobe apex without robust setae.

Maxilla (Figure 1) lateral and middle endites with long, slender, curved spines; mesial endite with dense internal plumose setae.

Maxilliped endite wide distally, with plumose setae, fine simple setae in distal margin, mesial margin bears one hook, ventral surface with a row of long robust plumose setae.

Pereopod 1 (Figure 2) basis about 2.5 times as long as greatest width; ischium and merus inner lateral margin with dense long setae; carpus inner lateral margin with fine setae; propodus superior margin setose; dactylus inferior margin with fine setae, fused to a blackish claw.

Pereopod 2 (Figure 2) ischium lateral margins with long comb setae; merus inner margin with long comb setae; carpus inferior end with one long fine setae; propodus inferior margin with long setae; dactylus fused to a blackish claw.

Pereopod 3 (Figure 2) is similar to pereopod 2.

Pereopod 4 (Figure 2) ischium superior margin with biserrate setae on a medial angle; merus and carpus inferior margin with fine setae; propodus inferior margin

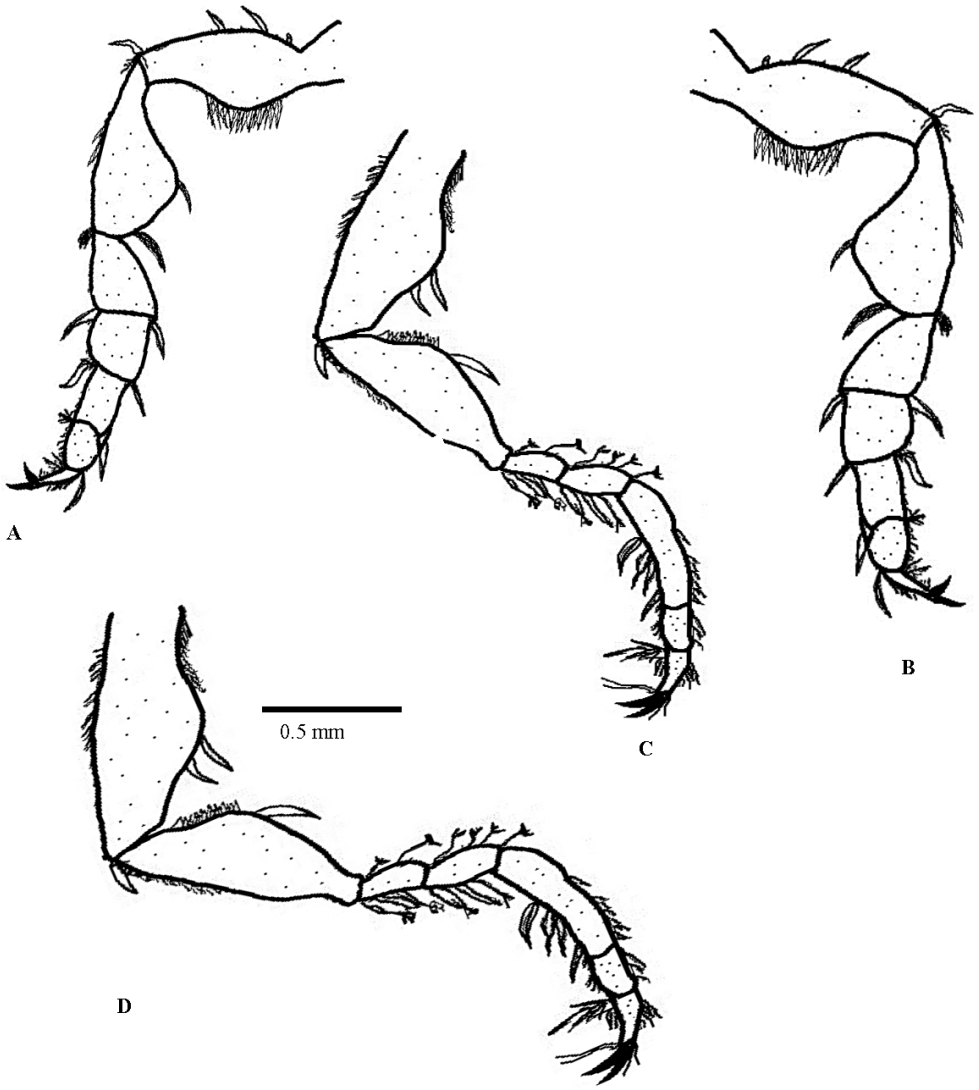

Figure 3. *Sphaeroma taborans* sp. nov., holotype: A–D—pereopods 4–7

with three long robust setae; dactylus with fine setae fused to blackish claws.

Pereopod 5 (Figure 3) is similar to pereopod 4.

Pereopod 6 (Figure 3) basis about 3.2 times as long as greatest width, superior margin with several fine and two robust setae; ischium superior margin with long and small serrate setae distally; merus superior distal margin with fine setae, inferior margin with biserrate seta and a long robust seta; carpus subequal in length to merus, inferior margin with two palmate setae, distal margin with simple setae; propodus superodistal corner with four slender setae; dactylus with fine setae fused to blackish claws.

Pereopod 7 (Figure 3) is similar to 6.

Pleon (Figure 1) with a transverse row of prominent tubercles at the middorsal surface and weak dense tubercles and two transverse rows of a tuft of setae over two sutures at lateral sides, posterior margin with two pointed extensions; posterolateral end with a long thorn-like structure.

Pleopod 1 subtriangular endopod, subequal in length to apically truncate exopod; bearing coupling hooks.

Pleopod 2 with rami as in pleopod 1; appendix masculina absent; bearing coupling hooks.

Pleopod 3 subtriangular, and broad endopod, subequal in length to apically truncate exopod; bearing coupling hooks.

Pleopod 4 endopod with an internal indentation.

Pleopod 5 endopod with rounded apex.

Pleotelson (Figure 1; Table 1) bearing weak dense appressed hair layers over surface, pleotelsonic medial lobe rounded triangle, lateral lobes weak and blunt;

Table 1. Comparison among the congeners in the genus *Sphaeroma*.

Characteristics	Pereon segments	Pleotelson	Uropod rami	Type locality
S. walkerii	2–4 each bearing two irregular transverse rows of low tubercles; 5–7 with a transverse row of prominent tubercles.	Dorsal surface granulated with scattered tubercles, either side of midline bearing a longitudinal row of five prominent tubercles, broadly rounded posteriorly with upturned and crenulated borders.	Uropodal exopod slightly longer than endopod with 5–6 external teeth and an acute apex; endopod margins fringed with dense simple setae, narrowly rounded apex, dorsal surface bearing 2–3 prominent tubercles, and an oblique ridge on the basal region.	Jokkenpiddi Paar, Sri Lanka
S. annandaelei	1–7 posterior margin with a fringe of small setules; 2–7 with coxal plate sutures clearly visible; 4–7 dorsally with transverse ridges.	Dorsal surface with two pairs of prominent blunt tubercles followed by a single median prominent tubercle, Posterior margin curved upwards with rounded apex.	Uropodal rami subequal, extending well beyond pleotelsonic apex; endopod margins fringed with numerous simple marginal setae; exopod lateral margin clearly serrate, with 4–5 prominent and proximally further tiny teeth.	Port Canning, western India.
S. terebrans	2–7 with a transverse ridge; 5–7 with four equidistant posterior submarginal tubercles each carrying a bunch of long stiff hairs; 4, 6, and 7 each bear four large tubercles.	Dorsal surface with four stout tubercles in a transverse row near the anterior margin, apex subtriangular, narrowly rounded, slightly curved upwards with minute apical hairs.	Uropodal exopod bears five prominent teeth at the outer edges, endopod apically acute, extending just beyond pleotelsonic apex, margins straight bearing fringes of long setae, and dorsal surface with a pronounced proximal tuft of long setae.	Hinchinbrook Island, Australia
S. travancorensis	Peraeon segments with simple ridges.	Pleotelsonic apex narrow, dorsally tuberculated.	Uropodal exopod serrate, with prominent and tiny teeth.	Kerala Coast, India
S. taborans sp. nov.	1–4 weak tubercles, 5–7 transverse rows of prominent tubercles; 6–7 two transverse rows of thorn-like structures.	Dorsal surface with six stout tubercles in a transverse row near the anterior followed by three pairs of median prominent blunt tubercles. Apex curved triangle, slightly curved upwards with appressed hairs.	Uropodal exopod longer than endopod with 4–5 external teeth and an acute apex; endopod surface with dense hairs, thorn-like setae along lateral margins with acute apex extending beyond pleotelsonic apex.	Munroe Island, India

medial lobe surpassing the apex of lateral lobes; five pairs of internal pouches. Pleotelson apex is very short and not reaching to the distal end of the uropod and endopod.

Uropod rami (Figure 1; Table 1) are perfectly knife-shaped and noticeably shorter than endopod, both bear blackish spots, appressed setae on the surface, and long thorn-like setae along lateral and distal margins; endopod laterally serrated and distal margin slightly pointed.

Diagnosis of an adult female. Pleon and pleotelson with appressed hair layers, pleotelsonic dorsal surface with six stout tubercles in a transverse row near the anterior followed by three pairs of median prominent setigerous tubercles. Apex curved triangle, slightly curved upwards bearing a prominent blackish tubercle on the anterior band on the head; epistome subtriangular; flagellum of antennule and antenna with 11 and 15 articles respectively; long thorn-like structures at the lateral margins of 6–7 pereonites and posterolateral end of pleon; knife-shaped uropodal exopod and endopod longer than pleotelsonic apex, both bears blackish spots.

Male. Apart from sexual characteristics similar to females, the body size is slightly larger than in female and pleotelson is longer than female.

Etymology

This specific epithet 'taborans' refers to the Mount Tabor Ashram, the Headquarters of the Institution where this significant research was conducted at the Zoology Research Centre, St. Stephen's College, Pathanapuram.

Distribution: Known only from Munroe Island, Ashtamudi Estuary, Kerala, India.

Ecological notes

The specimens of *Sphaeroma taborans* sp. nov. were collected from the dead wood in the mangrove areas of Munroe Island.

Remarks

Sphaeroma taborans can be recognized by the dorsal surface with three longitudinal bands between eyes a prominent blackish tubercle on the anterior band and scattered weak tubercles. Epistome with subtriangular apex. Pleon and pleotelson bearing appressed hair layers. Pleotelsonic apex curved triangle, slightly curved upwards with appressed hairs and surpassing the apex of lateral lobes. The new species *S. taborans* differs from *S. walkerii* Stebbing, 1905 (known from Jokkenpiddi Paar, Sri Lanka). The latter has crenulated pleotelsonic

Key to the species of the genus *Sphaeroma* (females)

1. Epistome with triangular apex 2
- Epistome with subtriangular apex 3

2. Pleotelsonic apex broadly rounded posteriorly with upturned and crenulated borders; Uropodal exopod with 5–6 external teeth and an acute apex; lacinia mobilis with two cusps ..... ***S. walkerii***
- Pleotelsonic posterior margin curved upwards with rounded apex; lacinia mobilis absent; Uropodal exopod lateral margin serrate, with 4 –5 prominent and proximally further tiny teeth ..... ***S. annandaelei***

3. Pleotelsonic apex subtriangular, narrowly rounded, slightly curved upwards with minute apical hairs; Uropodal exopod with five prominent teeth at outer edges, endopod apically acute, extending just beyond pleotelsonic apex, dorsal surface with a pronounced proximal tuft of long setae; ..... ***S. terebrans***
- Pleotelsonic apex narrow, dorsally tuberculated; Peraeon segments with simple ridges; Uropodal exopod serrate, with prominent and tiny teeth; ..... ***S. travancorensis.***
- Pleotelsonic apex curved triangle, slightly curved upwards with appressed hairs; Uropodal exopod with 4–5 external teeth and an acute apex; endopod surface with dense hairs, thorn-like setae along lateral margins with acute apex extending beyond pleotelsonic apex; three longitudinal bands between eyes and a prominent blackish tubercle on the anterior band ..... ***S. taborans* sp. nov.**

borders, triangular epistomal apex, cusped lacinia mobilis, and distinct surface ornamentation. *S. taborans* is similar to *S. terebrans* Spence Bate, 1866 in having an equal number of antennular segments, and prominent teeth at the outer edges of the exopod. *S. taborans* differs from *S. terebrans* in having distinct pleotelsonic apex and surface ornamentation. Investigation of *S. taborans* showed that this species is more similar to *S. annandalei* Stebbing, 1911 (known from Port Canning, western India) and *S. travancorensis* Pillai, 1954 (known from Kerala Coast, southern India). *S. taborans* differs from *S. annandalei* and *S. travancorensis* in having the following distinct features such as surface ornamentation, three longitudinal bands between the eyes, a prominent blackish tubercle on the anterior band; pleotelsonic apex with appressed hairs; pleon with a long thorn-like structure at the posterolateral end; Antennal flagellum with 15 articles; Epistome with subtriangular apex; Uropodal exopod with 4–5 external teeth, endopod surface with dense hairs, thorn-like setae along lateral margins.

DISCUSSION

Although the *Sphaeroma* is one of the largest and most widely distributed genera in the Sphaeromatidae family (Khalaji-Pirbalouty & Gagnon 2023), the taxonomic information on the genus is scanty in Kerala. According to Roy (2019), only seven species of *Sphaeroma* were reported in the Indian waters. The present study increases the *Sphaeroma* record to eight species with the description of *Sphaeroma taborans* sp. nov. The discovery of this new species after 61 years is indicative of the imperative to discover the isopod diversity from this region, particularly from the Indian mangrove estuaries. Hence, a comprehensive sampling at various estuarine locales, and mangrove ecosystems of India would expose more undescribed species of these sphaeromatid isopods.

Sphaeroma taborans sp. nov. is closely related to *S. travancorensis*, which was originally described from the Thiruvananthapuram District (formerly known as Travancore), Kerala, India. It is morphologically distinct, with notable differences including a curved triangular pleotelsonic apex, a uropodal exopod featuring 4–5 external teeth, and an acute apex. Consequently, *S. travancorensis* is considered a valid species.

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