New genus and new species of Metapseudidae – *Muvi schmallenbergi* gen. nov., sp. nov. (Crustacea, Tanaidacea) from the southeastern Australian coast (#45854)

First revision

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New genus and new species of Metapseudidae – *Muvi schmallenbergi* gen. nov., sp. nov. (Crustacea, Tanaidacea) from the southeastern Australian coast

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Based on materials collected from the shelf of SE Australia (off Portland) a new genus and new species – *Muvi schmallenbergi* gen. nov., sp. nov., of the tanaidacean family Metapseudidae is described. *Muvi* is distinguishable from other genera within the subfamily Chondropodinae by having equally long antennular flagellae. It also differs from other chondropodines by a combination of characters such as: eyelobes with a group of visual elements, rostrum with smooth lateral edges, pereonites with lateral processes and pleotelson lacking lateral process, antennule article-1 with single apophysis, maxillule inner lobe well-developed, labial palp bearing three distal setae, cheliped exopod well developed and setose, pereopod-1 coxa with distinct apophysis, pleopods in five pairs and uropod basis without apophysis. Genus *Deidamiapseudes* Sganga & Rocatagliata, 2016 is moved from Chondropodinae (Metapseudidae) to Apseudoidea incertae sedis. An identification key for genera within Chondropodinae is given and the distribution of chondropodines is discussed.

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Abstract

Based on materials collected from the shelf of SE Australia (off Portland) a new genus and new species – *Muvi schmallenbergi* gen. nov., sp. nov., of the tanaidacean family Metapseudidae is described. *Muvi* is distinguishable from other genera within the subfamily Chondropodinae by having equally long antennular flagellae. It also differs from other chondropodines by a combination of characters such as: eyelobes with a group of visual elements, rostrum with smooth lateral edges, pereonites with lateral processes and pleotelson lacking lateral process, antennule article-1 with single apophysis, maxillule inner lobe well-developed, labial palp bearing three distal setae, cheliped exopod well developed and setose, pereopod-1 coxa with distinct apophysis, pleopods in five pairs and uropod basis without apophysis. Genus *Deidamiapseudes* Sganga & Rocatagliata, 2016 is moved from Chondropodinae (Metapseudidae) to Apseudoidea incertae sedis.

An identification key for genera within Chondropodinae is given and the distribution of chondropodines is discussed.

Introduction

Tanaidacea, the small benthic peracarid crustaceans, is a poorly recognized component of marine ecosystems, and until the late 1990's the Australian fauna was known only from a few taxonomic publications (e.g. *Haswell, 1882a, b; Haswell, 1885 ; Whitelegge, 1901; Boesch, 1973*; *Băcescu, 1981*; *Sieg, 1993*; *Edgar, 1997*;). The turning point comes with the beginning of this millennium when a series of surveys were dedicated to tanaidacean fauna (*Larsen, 2000*; *Larsen, 2001*;

Larsen & Heard, 2001; *Larsen & Hansknecht, 2002*; *Guţu & Heard, 2002*; *Guţu, 2006a*; *Błażewicz-Paszkowycz & Bamber, 2007a*; *Błażewicz-Paszkowycz & Bamber, 2007b*; *Edgar, 2008; Błażewicz-Paszkowycz & Bamber, 2009*; *Błażewicz-Paszkowycz & Bamber, 2012*; *Bamber & Błażewicz-Paszkowycz, 2013*). As the outcome *Guţu (2006a)* described 13 new species from tropical Australian region, *Edgar (2008)* found 12 new species off Tasmania and finally *Błażewicz-Paszkowycz & Bamber (2012)* added 44 new species to the list from Bass Strait. The results from those few papers demonstrate that coast of Australia is characterised by inordinate diversity (*Bamber & Błażewicz-Paszkowycz, 2013*), but also high level of endemism (*Błażewicz-Paszkowycz & Bamber, 2012*; *Błażewicz-Paszkowycz, Bamber & Anderson, 2012*). A total number of Tanaidacea living in the Australian coast is still far from complete (*Stępień, Pabis & Błażewicz, 2018*). *Poore et al. (2015)* has summarized the total number of known tanaidaceans from Australian waters is close to 200. However this number is probably only a fraction of tanaidacean fauna. The studies on the lower shelf and upper bathyal depths of the western and southwestern Australia demonstrated that Tanaidacea is the most abundant taxon in terms of individuals and species (*Poore et al., 2015*).

The metapsudid subfamily Chondropodinae is currently represented by 29 species classified to nine genera (*WoRMS, 2019*) distributed in tropical to temperate waters. So far, the Chondropodinae is recorded from e.g., the Adriatic Sea, Brazilian coast, Gulf of Guinea, Mauritania, Gulf of Mexico, the Caribbean Sea, and Coast of Malaysia (*Guţu, 1984*; *Guţu, 1996*; *Guţu, 2002*; *Bamber & Sheader, 2005*; *Guţu, 2006a*; *Guţu, 2014*; *Jakiel et al., 2015*). In Australian waters the subfamily is known so far from two species – *Julmarichardia gutui* Ritger & Heard, 2007 found in NW Australian coast (*Ritger & Heard, 2007*), and *Bamberus jinigudirus* Stępień & Błażewicz-Paszkowycz, 2013 collected from Ningaloo coral reefs (*Stępień &*

Błażewicz-Paszkowycz, 2013). Described herein *Muvi schmallenbergi* sp. nov. is the third Chondropodinae species recorded from Australia.

Materials and methods

The analysed sample was taken during the SLOPE campaign off Portland, Victoria, Australia at the depth of 49.5 m using a Smith-McIntyre grab. The sample was preserved in formaldehyde, and after identification was fixed in 70% ethanol. Images of body habitus were taken with Leica M125 stereomicroscope combined with DFC295 camera and LAS V4.5 software. Appendages were dissected in a glycerine solution using chemically-sharpened tungsten needles, mounted in glycerine on slides, and sealed with nail varnish. Drawings were made using a Nikon Eclipse 50i microscope combined with a camera lucida; redrawn with china ink and finally combined and cleared with Corel PHOTO-PAINT X7. The body length to width ratio was calculated using measurements from the tip of the carapace to the end of the pleotelson, and of the widest part of carapace, while the length and width of articles were measured along their central axes. The general morphological terminology follows that proposed by *Błażewicz-Paszkowycz, Bamber & Jóźwiak (2013)*. To simplify species descriptions, the expression '*N*x' replaces '*N* times as long as' and '*N* L:W' replaces '*N* times longer than wide'. The type material is deposited in Melbourne Museum (NMV, Australia). Distribution maps were generated using the freeware QGIS.

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Results

Systematics

Order Tanaidacea Dana, 1849

Suborder Apseudomorpha Sieg, 1980

Superfamily Apseudoidea Leach, 1814

Family Metapseudidae Lang, 1970

Subfamily Chondropodinae Guţu, 2008

Diagnosis (after *Guţu 2008*). Body dorsoventrally flattened, with small lateral or anterolateral acute or rounded processes at the level of pereonites. Pleon with five short pleonites (having or not lateral plumose setae) and a short pleotelson (with a small acute lateral process in the first half). Antennule peduncle with at least one conspicuous denticle on the inner margin of the first article; at least outer flgellum long, multiarticulated. Antenna with second article long, in very rare cases without spiniform denticles on the inner margin; squama present (small). Mandible with triarticulated palp. Maxillule with biarticulated palp. Maxilliped with third article of the palp evidently longer than broad, sometimes shorter than the second one; second article of palp with a great distoexternal spine and exceptionally with numerous plumose setae on the outer side. Cheliped obvious dimorphic or not, with exopod. Pereopod-1, well developed, much larger than the following pereopods, with exopod; basis thick with long plumose setae which alternate with spiniform denticles on the dorsal margin; sometimes coxa with a spiniform prolongation (more or less developed). Pereopods 2–6 thin, different from pereopod-1; pereopods 2, 3 and 5 with long and similar propodus (much longer than the carpus, the last having about the same length with the merus), slightly curved, having at most four sternal spines; dactylus also thin and long, with well developed claw. Pleopods present, biramous, in three or five pairs. Uropod with multiarticulated (but not very long) rami.

Remarks

Chondropodinae appears to be monophyletic taxon and its diagnosis precise and consistent among included genera (Guțu 2008, 2009, Stępień & Błażewicz-Paszkowycz 2013). Stępień and Błażewicz-Paszkowycz (2013) suggested even that Chondropodinae might be raised to the family level. It was till the moment of classification of genus *Deidamiapseudes* Sganga & Roccatagliata, 2016 within Chondropodinae (WoRMS 2019). The definition of chondropodines given by Guțu (2008) and later with some ammendments by Guțu (2009) and Stępień and Błażewicz-Paszkowycz (2013) put much emphasis on: pereopod-1 basis with row of plumose setae on dorsal margin and pereopods 2, 3 and 5 with propodus clearly longer than the carpus, with at most four sternal spines, while carpus having about the same length as merus. In *Deidamiapseudes* pereopod-1 basis lacks of plumose setae, with pereopods 2, 3 and 5 propodus is just shorter than carpus and on pereopods 2–3 has seven or eight ventral spines.

Intriguingly, Sganga and Rocatagliata (2016) decided to not classify theirs genus to any subfamily nor even apseudoidean family, and pointed out that *Deidamiapseudes* shows some morphological similarities to both: Apseudidae and Metapseudidae families. To clarify the systematics of Chondropodinae and to keep consistent diagnosis of this subfamily we decided to move genus *Deidamiapseudes* to Apseudoidea incertae sedis. The reason we avoided to place *Deidamiapseudes* within Apseudidae or Metapseudidae, is fact that they are clearly polyphyletic taxa (Stępień & Błażewicz-Paszkowycz 2013), and this classification might complicate even more status of any of those families.

Genus *Muvi* gen. nov.

urn:lsid:zoobank.org:act:60F20E13-CC0C-4779-828F-50A561E1BB85

Diagnosis. Rostrum triangular pointed, lateral margin smooth. Eyelobes with visual elements. Pereonites wider than long. Antennule peduncle of four articles, article-1 with only single apophysis on outerodistal corner; flagella equal in length, each with twelve segments. Maxillule inner lobe well developed. Labial palp with three distal setae. Exopod on cheliped and pereopod-1 well developed, with nine and eleven plumose setae, respectively. Pereopod-1 coxa with distinct apophysis. Pereopods 1–6 bases without apophyses. Pereopod-1 propodus 1.5 times as long as wide. Pleopods in five pairs. Uropod basal article without hyposphaenium; endopod of seven segments, exopod of three segments.

Etymology. The name is an acronym for Museum Victoria, where the studied material is deposited.

Remarks

Muvi gen. nov. is classified to subfamily Chondropodinae based on a combination of the following subfamilial characters: pleon of five free pleonites, antennule peduncle article-1 with apophysis, antenna peduncle article-2 elongated, mandibular palp of three articles and pereopod-

1 basis with row of plumose setae dorsally. *Muvi* can be immediately distinguished from other members of the subfamily by having elongated, multiarticled inner flagellum of antennule, that is equal in size and in number of the articles to outer flagellum. Moreover *Muvi* differs from:

- *Bamberus* Stępień & Błażewicz-Paszkowycz, 2013 by pleotelson without lateral process, antennule article-1 with single apophysis, well developed inner lobe of maxillule, labial palp with three setae distally and uropod basal article without apophysis. In *Bamberus* the pleotelson has a single process on the lateral sides, antennule article-1 lacks apophyses, the inner lobe of maxillule is reduced and bears only two distal setae, the labial palp has two seta while the uropod basis has a distinct apophysis (*Stępień & Błażewicz-Paszkowycz, 2013*)
- *Calozodion* Gardiner, 1973 by having three strong setae distally on labial palp; there is only one distal spine in *Calozodion* (*Guţu, 2002*);
- *Chondropodus* Guţu, 2006 by having eyelobes with visual elements, pereonites with lateral processes, pleotelson without lateral process, labium with three distal setae, pereopod-1 coxa with distinct apophysis, propodus only 1.5 L:W, pleopod exopod with single article. In *Chondropodus* the eyelobes lack visual elements, pereonites do not have lateral processes, labial palp has a single distal spine, pereopod-1 lacks coxal apophysis and propodus is at least twice as long as wide and the pleopod exopod is biarticled (*Guţu, 2006a*);
- *Hoplopolemius* Sganga & Roccatagliata, 2016 in antennule peduncle article-1 with only single apophysis. Article-1 of antennule peduncle in *Hoplopolemius* has clearly more than one apophysis (*Richardson, 1902*; *Guţu, 2002*; *Larsen & Shimomura, 2006*);

- *Julmarichardia* Guţu, 1989 by having rostrum with smooth lateral edges and antennule peduncle article-1 with single apophysis. The lateral edges of *Julmarichardia* rostrum are distinctly serrated and antennule peduncle article-1 in members of this genus has more than one apophysis (*Barnard, 1914*; *Guţu, 1989a*; *Guţu, 1989b*; *Bamber & Sheader, 2005*; *Ritger & Heard, 2007*);
- *Trichapseudes* Barnard, 1920 by having five pairs of pleopods – in *Trichapseudes* only three pairs of pleopods are present (*Barnard, 1920*);
- *Vestigiramus* Guţu, 2009 in well-developed and setose cheliped exopod. *Vestigiramus* has a reduced uniarticled and naked cheliped exopod (*Guţu, 2009*);
- *Zaraza* Guţu, 2006 by three setae distally on labial palp and five pairs of pleopods. *Zaraza* has a labial palp with single terminal seta (spine) and three pairs of pleopods (*Guţu, 2006b*).

Key to the genera of the subfamily Chondropodinae (modified after *Guţu 2008*)

1 - Rostrum with marginal denticles ... *Julmarichardia* Guţu, 1989

- Rostrum without marginal denticles ... 2

2 - Pereopod-1 propodus cylindrical, much longer than its thickness or the length of carpus...3

- Pereopod-1 propodus wide, not much longer than its thickness or the length of carpus ... 4

3- Uropod peduncle with strong apophysis dorsally … *Bamberus* Stępień & Błażewicz, 2013

Uropod peduncle without strong apophysis dorsally … *Chondropodus* Guţu, 2006

4 - Antennule inner flagellum bi-rticulate ... 5

- Antennule inner flagellum multi-articulate ... 6

5 - Cheliped exopod tri-articulate, with terminal setae … *Calozodion* Gardiner, 1973

Cheliped exopod uni-articulate, without terminal setae … *Vestigiramus* Guţu, 2009

6 - Antennule inner flagellum equal in length to outer flagellum … *Muvi* gen. nov.

Antennule inner flagellum shorter than outer flagellum … 7

7 - Pereopod-1 exopod with last article round (and large), having more than 20 plumose marginal setae ….. … *Trichapseudes* Barnard, 1920

- Pereopod-1 exopod with last article normal (elongated), having clearly less than 20 plumose marginal setae ... 8

9 - Five pairs of pleopods ... *Hoplopolemius* Sganga & Roccatagliata, 2016

- Three pairs of pleopods ... *Zaraza* Guţu, 2006

Muvi schmallenbergi sp. nov.

urn:lsid:zoobank.org:act:14743564-C6F2-42CE-A181-CE30F5C5A2C2

(Figs 1 – 3)

Material examined. Holotype female (MNV J74649), 4.5 mm, SLOPE 99, Victoria, Off Portland, 38° 31´ 34´´ S, 141° 58´ 46´´ E, depth 49.6 m, 11 May 1994, Smith-McIntyre grab, coll. G.C.B. Poore. Paratype, female (MNV J74648), 5.9 mm, the same locality, dissected on slides.

Diagnosis. As for the genus.

Etymology. The new species is dedicated to Barbara Schmallenberg.

Description of female (body of holotype, appendages from paratype)

Body (Fig. 1A, B) 4.5 mm long. Cephalothorax 21% of total body length; rostrum triangular and pointed (Fig. 1A, 2C); eyelobes pointed with visual elements (Fig. 1A, B). Pereon 47% of total body length; pereonites length-width ratio: 0.3, 0.4, 0.5, 0.5, 0.5 and 0.3; pereonites 2–5 with dorsoproximal apophyses on lateral margin. Pleon 32% of total body length; pleonites equal in length about 0.2 L:W, with pointed lateral margins; pleotelson just longer than last three pleonites combined.

Antennule (Fig. 2A) peduncle article-1 2.1 L:W and 1.9x article-2, with four simple and two penicillate setae on inner margin and one simple, one plumose and four penicillate setae on outer margin; single apophysis present in disto-outer corner; article-2 1.2 L:W and 1.9x article-3, with five simple and two penicillate setae subdistally; article-3 as long as wide, with two simple setae distally; common article short and naked; flagella subequal, each with 12 segments, setation as figured (no aestethasc present).

Antenna (Fig. 2B) peduncle article-1 short and naked; peduncle article-2 1.7 L:W and 3x article-3, with three minute distal and subdistal setae; squama narrow, 4.5 L:W, with simple subdistal seta and three distal setae; peduncle article-3 0.8 L:W and 0.7x article-4, with two long simple setae distally; article-4 1.2 L:W and 0.9x article-5, with three penicillate distal setae; article-5 1.4 L:W, with two short simple, two long simple and two penicillate setae distally and one mid-length simple seta; flagellum of six segments, setation as figured.

Mouthparts. Labrum (Fig. 2D) rectangular with numerous minute setae on distal and lateral margins. Right mandible (Fig. 2E) incisor with four well calcified triangular teeth; outer margin with tubercles and with minute setae distally. Left mandible (Fig. 2F) outer margin with distally setulose tubercles; incisor with four distal teeth; *lacinia mobilis* as long as incisor, with four teeth, setiferous lobe with four complex-tip setae; molar broad, distally serrated; palp (Fig. 2G) article-1 1.1 L:W, with five inner setae; article-2 2.1 L:W with outer margin serrated, two simple distal setae and row of about 14 inner setae started from middle of article, setae decreasing in length towards distal end of article; article-3 3.7 L:W, with five outer setae and row of about 18 setae along inner margin. Maxillule (Fig. 2H) inner endite with five setae distally (at least three setulated), inner and outer margins serrated, outer margin with tuft of setae and sub-proximal tubercle; outer endite with eleven spines (one appearing serrated), outer margin setulate. Maxilla (Fig. 2I) outer lobe of moveable endite with two subdistal simple and six distal serrated setae, outer margin with microtrichiae; inner lobe of moveable endite with ten serrated setae distally; outer lobe of fixed endite distally with three tri-furcated and three serrated setae; inner lobe of fixed endite with 22 setae (at least five of them serrated). Labium (Fig. 2J, K) outer and inner margins with setation distally; palp (Fig. 2K) lateral margins setulated, distally, with three simple spines.

Maxilliped (Fig. 2L) coxa naked. Basis 1.1 L:W, with distolateral seta and three subdistal long setae, additionally outer margin with teeth and inner margin with proximal microtrichiae. Palp article-1 0.4 L:W, with long simple seta on inner margin, and one simple and two plumose setae on outer margin; article-2 1.2 L:W, with two rows of setae on inner margin (first with 11 setae second with five setae, at least one seta plumose) and two long distolateral setae; article-3 about as long as wide, with row of about 10 setae along inner margin (at least one plumose); article-4 1.3 L:W, with row of nine distal setae (at least five of them serrated) and one outer seta. Endite (Fig. 2M) outer margin setulated; inner margin with three coupling hooks and five short plumose setae; distal margin with nine short plumose setae/spines (some with complex tip) and one long plumose seta; subdistal seta simple (not leaf-like).

Cheliped (Fig. 3A) basis 1.1 L:W, with plumose dorsodistal seta, simple seta ventroproximally, spine ventrally at mid-length and four long setae ventrodistally; exopod of three articles, article-3 with nine plumose setae (drawn as simple for figure clarity); merus 1.2 L:W and 0.7x basis, with one simple seta, one plumose seta, four spines and apophysis ventrally; carpus 0.9 L:W and 1.2x merus, with row of seven setae along dorsal margin, three setae ventrally and distal apophysis; propodus 0.9 L:W and 1.8x carpus, with three short setae dorsally, three setae on outer surface and one serrated inner spine near dactylus insertion; fixed finger about 0.8x propodus, with two proximal outer setae, four setae ventrally, cutting margin with two long setae near dactylus insertion, four setae distally and small teeth accompanied with minute setae in proximal half; dactylus just longer than fixed finger with two subdistal setae and row of teeth and spinules along cutting edge.

Pereopod-1 (Fig. 3B) coxa long and with smooth margins, with two setae; basis 2.2 L:W and 2.0x merus, with two ventral setae and four ventrodistal setae, row of plumose (five) and simple (five) setae along dorsal margin; exopod of three articles, article-3 with 11 plumose setae; ischium with three ventrodistal setae; merus 1.3 L:W and 1.1x carpus, with one dorsodistal spine, one ventrodistal spine, four ventral and three dorsal setae and four setae on inner surface; carpus 1.1 L:W and 1.1x propodus, with two ventrodistal spines, three setae ventrally, one short seta distally and six setae dorsally; propodus 1.5 L:W and 1.5x dactylus, with three spines and four setae ventrally, and two spines and two setae dorsally; dactylus 2.9 L:W and 2x unguis, with dorsal seta and ventral apophysis; dactylus and unguis combined as long as propodus.

Pereopod-2 as peropod-3 (not figured).

Pereopod-3 (Fig. 3C) coxa with seta; basis 2.1 L:W and 1.8x merus, with tuft of three setae ventrodistally, one simple and three penicillate setae dorsally, and three simple setae ventrally; ischium with two ventrodistal setae; merus 1.7 L:W and 1.3x carpus, with one small and one bigger spines ventrodistally, one seta dorsodistally, one seta ventrally and two setae ventrodistally; carpus 1.2 L:W and 0.65x propodus, with ventral spine in subproximal part, two ventrodistal spines, one short and two long setae and three spines dorsodistally; propodus 2.5

L:W and 1.5x dactylus, with three ventral spines in proximal part, one ventrodistal spine, one dorsal subdistal spine, one dorsodistal spine, one ventral seta, two short ventrodistal setae, two dorsal setae and one dorsodistal seta; dactylus 3.2 L:W, with ventral tooth, ventrodistal seta and two dorsal setae; unguis about 0.5x dactylus; together about as long as propodus.

Pereopod-4 (Fig. 3D) coxa with two penicillate setae; basis 2.1 L:W and 2.0x merus, with one ventroproximal seta, two short and one long setae ventrodistally, and two simple and three penicillate setae dorsally; ischium with three ventrodistal setae; merus 1.5 L:W and 0.9x carpus, with two short ventrodistal spines, two ventral setae, one ventrodistal seta, and two long dorsodistal setae; carpus 1.8 L:W and as long as propodus, with two short and one longer dorsal spines, two ventrodistal spines, two ventrodistal setae and three dorsodistal setae; propodus 3.3 L:W and 2.0x dactylus, with one penicillate seta dorsally and eight serrated setae distally; dactylus damaged, 2.0x unguis, with two short setae ventrally.

Pereopod-5 (Fig. 3E) coxa with one simple and one plumose setae; basis 2.3 L:W and 2.2x merus, with simple ventroproximal seta, mid-length ventral seta, one plumose and three simple setae ventrodistally, dorsal margin with one simple, five plumose and three penicillate setae; ischium with one plumose and one short simple setae ventrodistally; merus 1.7 L:W and as long as carpus, with short ventrodistal spine, one plumose seta ventrally, one simple ventrodistal seta, and one plumose dorsodistal seta; carpus 1.5 L:W and 0.8x propodus, with four increasing in size spines along ventral margin and one dorsodistal spine, one plumose dorsal seta, and one plumose and two simple dorsodistal setae; propodus 2.0 L:W and 1.7x dactylus, with two ventral spines, three ventrodistal serrated minute spines, one serrated dorsodistal spine and one dorsodistal plumose seta; dactylus with mid-length minute ventral spine, medially and dorsally with one seta, combined length of dactylus with that of unguis 0.9x propodus.

Pereopod-6 (Fig. 3F) basis 3.1 L:W and 3.4x merus, with two dorsal plumose setae and four ventral plumose setae; ischium with ventrodistal plumose seta; merus 1.3 L:W and 0.6x carpus, with one subdistal plumose seta dorsally and two ventrodistal plumose setae; carpus 1.9 L:W and 0.9x propodus, with two ventrodistal spines, one dorsodistal spine, one ventrodistal simple seta, one distal simple seta and one dorsodistal plumose seta; propodus 2.2 L:W and 1.2x dactylus, with one mid-length spine ventrally and at least nine minute serrated spines ventrodistally and dorsodistally, and dorsal mid-length penicillate seta; dactylus with ventrodistal seta, ventral serration and three dorsal setae; dactylus with mid-length minute ventral spine, medially and dorsally with one seta, combined length of dactylus with that of unguis 1.1x propodus.

Pleopods (Fig. 3G) basal article 1.7 L:W, with distal plumose seta; endopod just longer than exopod, with two plumose setae subdistally, seven plumose setae distally and one dorsal and one ventral mid-length setae; exopod with eleven plumose setae along distal end and plumose ventroproximal seta.

Uropod (Fig. 3H) basal article 1.8 L:W, with seven simple setae distally; exopod of three segments, segment-2 with two distal setae, segment-3 with three distal setae; exopod of seven segments 3.7x endopod, some of them with mid-length setae apparently indicated fusion of segments; segment-3 with two distal setae, segment-4 with four mid-length setae and two penicillate and three simple setae distally, segment-5 with two mid-length setae and two penicillate and two simple setae distally, segment-7 with two penicillate and four simple setae distally, other segments naked.

Distribution. Species is known only from the type locality **-** off Portland, Australia from depth 49.6 m, sediment was with high number of red algae.

Discussion

Distribution of Chondropodinae

Depth and type of sediment

Bathymetrically, Chondropodinae, like other metapseudids, are mostly a shallow water group with vertical distributions usually not exceeding shelf depths (Table 1). So far, only a few species have been recorded from greater depths, namely: *Julmarichardia thomassini* Guţu, 1989 found at 250 m, *Calozodion pabisi* Jakiel & Jóźwiak, 2015 found at 386 m and *Julmarichardia alinati* Guţu, 1989 with an extremely wide range of from 6 to 450 m.

The chondropodines and family Metapaseudidae in general are often considered as being associated with coral reefs or hydroid colonies (*Sieg, 1986a*; *Stępień & Błażewicz-Paszkowycz, 2013*); however, they are known to occur in or on a variety of different substrata, e.g., sand, silt clay, rubble, algae or dead corals (Table 1).

Geographical distribution

The Chondropodinae have a worldwide distribution (although with some latitudinal restriction, Figs 4, 5), with the highest number of species presently known occurring in the tropical Northwest Atlantic region – six species from Eastern Gulf of Mexico, Cuba, Hispaniola, SE Mexico; five species were found from East African coasts, and four species were found from West Africa. In most cases at the genus level, chondropodines are not restricted to one marine basin, e.g.: *Julmarichardia* is found in the Mozambique Channel as well as on the Malaysian coast, North-west Australia and North-east Atlantic, and *Calozodion* was found on the Brazilian coast, off Angola, off Mauritania, from Malaysia, Caribbean and the Gulf of Mexico (Figs 4 and 5). Some others genera are monotypic – *Bamberus*, *Trichapseudes* and *Zaraza*, making impossible to comment any zoogeographical patterns. So far, only two non-monotypic genera of

Chondropodinae show restricted distribution, namely *Vestigiramus* with three species recorded along the East coast of South America, and *Chondropodus* with two species described from the coast of Mauritania.

The most striking aspect of Chondropodinae distribution is fact that they are limited to the tropics and to some extend to temperate areas, and completely absent in higher latitudes (Figs 4 and 5). The most northerly record of this subfamily is subboreal (latitude 49° N) occurrence of *Julmarichardia dollfusi* (Guţu, 1989) described from Jersey Island in the Northeast Atlantic (English Channel) (*Guţu, 1989a*). Till this time, the most southerly records of Chondropodinae were for species described by Barnard - *Julmarichardia deltoides* (Barnard, 1914) found off Gt. Fish Point Lighthouse and *Trichapseudes tridens* Barnard, 1920 taken off East London, South Africa, both locations about 33°S (coordinates not specified in original descriptions) (*Barnard, 1914; Barnard, 1920*). *Muvi schmallenbergi* was however found about 38°S. The absence of the Chondropodinae in polar regions is not biased by a low sampling effort. In fact, in relation to their tanaidaceans faunas, the Atlantic sectors of Arctica and Antarctica are among the most studied areas of the World Ocean (*Sieg 1986b, Sieg 1986c Bird, 2010*; *Błażewicz-Paszkowycz, 2014*; *Jakiel, Stępień & Błażewicz, 2018*).

The longitudinal gradient in diversity from the peak in the tropics and decrease towards the poles is observed in many marine groups of invertebrates e.g., decapods, gastropods and bivalves (*Clarke & Crame, 2010*) or vertebrates e.g., fishes (*Rabosky et al., 2018*).

One of the possible explanation of this phenomenon is that the tropical climates are older and larger and the tropical regions diversify faster due higher rates of speciation and lower extinction rates (*Mittelbach et al., 2007*; *Brown, 2014*).

At the same time the main factor assumed to be responsible for extinctions of shallow-water taxa in the polar regions are glaciation events, especially when the shelf may have been completely covered by ice (*Clarke & Crame, 2010*; *Thatje, 2012*). Then the potential recolonization of shelf in polar areas might be limited for some tropic or even temperate taxa because of their physiology (*Thatje, 2012*; *Brown, 2014*). As was pointed by Brown (2014) tropical species and lineages that have a long evolutionary history in relatively equable environments, may not tolerate the abiotic stresses at higher latitudes with emphasis on cold temperature and extreme seasonality.

Within Tanaidacea the pantropical and pantemperate distribution with no representatives on high latitudes, as is the case with the Chondropodinae, is an often-described phenomenon. It was so far assigned for most of shallow-water families of Apseudomorpha (*Błażewicz-Paszkowycz, 2014*) and some Tanaidomorpha families considered as plesiomorphic: Tanaididae, Pseudozeuxidae, Paratanaidae and Leptocheliidae (*Błażewicz-Paszkowycz, Bamber & Anderson, 2012*).

For the Antarctic scenarios, Sieg (1992) suggested the extinction of shallow-water tropical or temperate tanaidacean taxa during glaciations, followed in postglacial periods by the colonisation of vacant habitats by deep-sea forms. At the same time, he pointed out that according to fossil records all recent tanaidacean families had evolved before the Eocene and thus their representatives were theoretically able to colonize the Antarctic Shelf. To support his extinction hypothesis Sieg stated that Antarctic tanaidacean fauna is characterised by the high ratio between deep-sea and shallow-water taxa, presence of relatively phylogenetically young taxa and lack of species with functional eyes on the shelf (*Sieg, 1992*).

Over two decades later, Błażewicz-Paszkowycz (2014) developed Sieg's hypothesis by indicating that some tanaidaceans might have survived the glaciations in shelf or slope refugia or colonized the Antarctic via the Scotia Arc. This idea is strongly supported by the presence in Antarctica of representatives of typically tropical families - *Paratanais oculatus* (Paratanaidae), *Allotanais hirsutus* (Tanaididae) and *Synapseudes aflagellatus* Sieg, 1986 (Metapsudidae).

The Arctic tanaidacean fauna share some species with temperate Atlantic and to a lesser extent with temperate Pacific and is thus characterised by lower level of endemism (*Sieg, 1986a*). Still this area is underrepresented by some taxa like e.g. shallow-water Apseudomorpha and similarly to the Antarctic area it may be a result of glaciation events.

In particular, majority of Apseudomorpha including Chondropodinae appeared to have radiated in Indo-West Pacific and at the same time theirs physiology adapted to tropics making them unable to recolonise polar regions (*Błażewicz-Paszkowycz, 2014*).

Conclusions

This is a new tanaidacean genus and species from family Chondropodine and it can be immediately distinguished from other chondropodines by having equally long antennular flagellae. At the same time, *Muvi schmallenbergi* gen. nov., sp. nov. is the third Chondropodinae species recorded from Australia after *Bamberus jinigudirus* and *Julmarichardia gutui*.

The morphological analysis of genus *Deidamiapseudes* allows to move this genus from Chondropodinae (Metapseudidae) to Apseudoidea incertae sedis. One of the crucial argument supporting this reclassification was absence of row of setae on pereopod-1 basis.

Analysis of chondropodines preferences regarding to type of sediment shows that they have no clear preferences and can be found in fact on a variety of different substrata.

The lack of Chondropodine in higher latitudes is suggested to be a result of extinction during glaciation events and further theirs physiology adapted to tropics is responsible for the inability to recolonise polar regions.

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Figure 1

Muvi schmallenbergi sp. nov. holotype female (cat. no. MNV J74649), length 4.5 mm. Habitus illustration.

(A) Body dorsal view. (B) Body lateral view. Scale bar = 1 mm. Photographs: Magdalena Błażewicz.


A
B

Figure 2

Muvi schmallenbergi sp. nov. paratype female (cat. no. MNV J74648). Antennule, antenna, and mouth parts illustrations.

A) Antennule. (B) Antenna. (C) Rostrum. (D) Labrum. (E) Right mandible. (F) Left mandible. (G) Mandibular palp. (H) Maxillule. (I) Maxilla. (J) Labium. (K) Labial palp. (L) Maxilliped. (M) Maxillipedal endite. Scale bars = 0.1 mm.

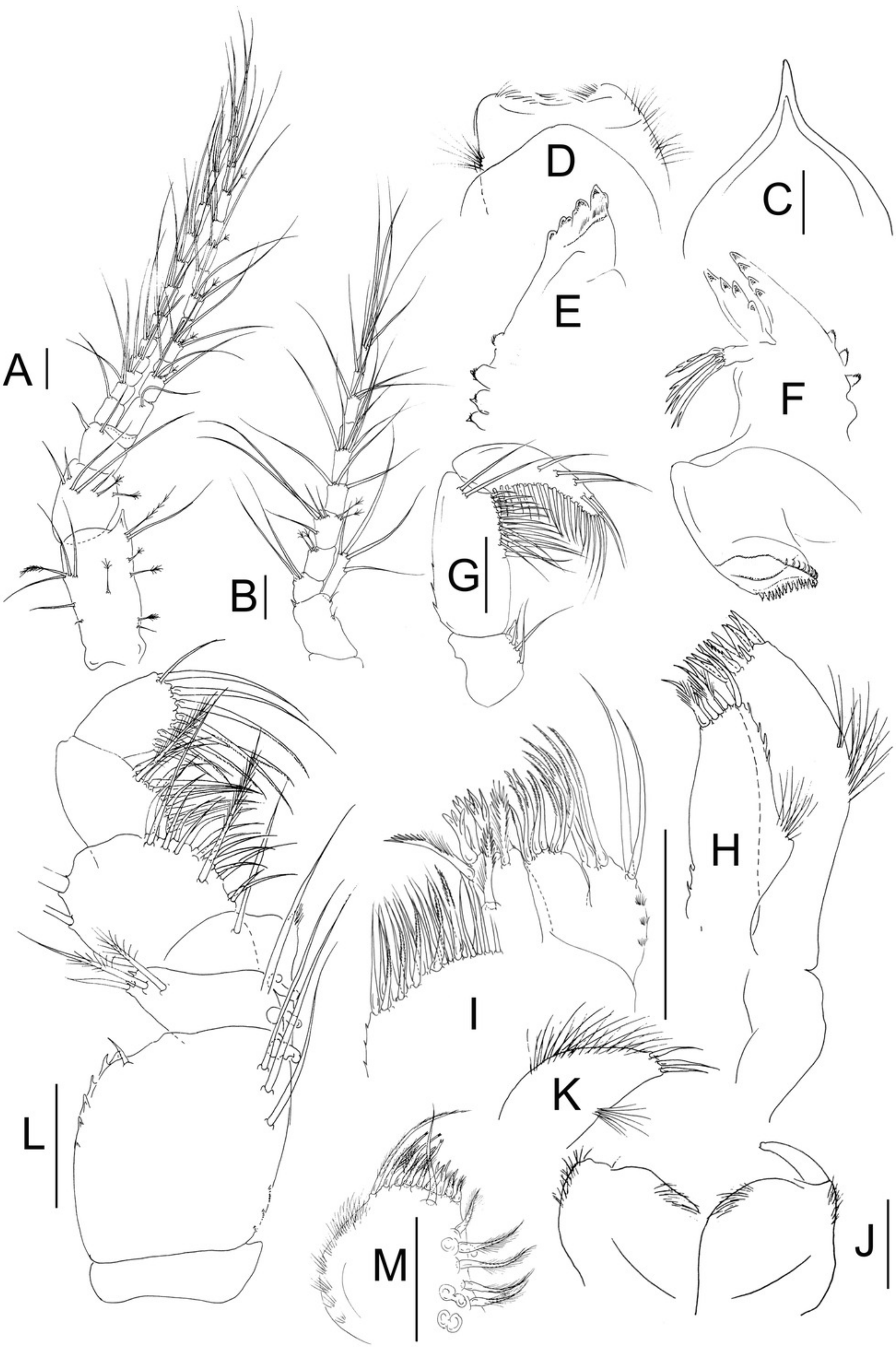
A
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Figure 3

Muvi schmallenbergi sp. nov. paratype female (cat. no. MNV J74648). Cheliped and pereopods illustrations.

(A**)** Cheliped. (B) Pereopod-1. (C) Pereopod-3. (D) Pereopod-4. (E) Pereopod-5. (F) Pereopod-6. (G) Pleopod. (H) Uropod. Scale bars = 0.1 mm.

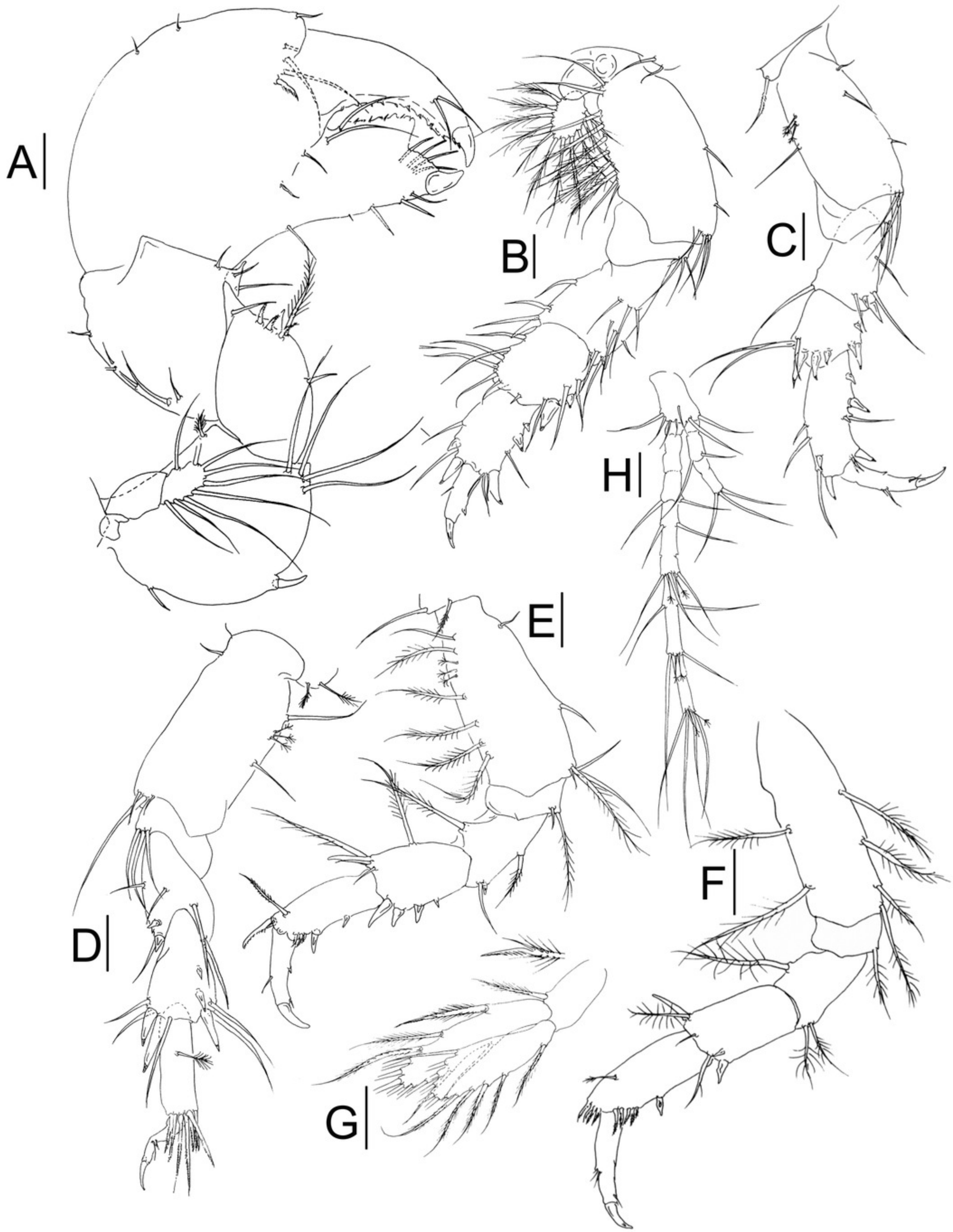
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Figure 4

Distribution of Chondropodinae (1).

Circle – genus *Bamberus* represented only by *B. jinigudirus*. Triangle – genus ***Muvi*** represented only by *M. schmallenbergi*. **Diamond – genus *Calozodion*:** light green – *C. bacescui*; yellow – *C. bogoescui*; red – *C. dominiki*; purple – *C. heardi*; blue –*C. moyas*; orange – *C. multispinosum*; green – *C. pabisi*; pink – *C. simile*; light blue – *C. singularis*; brown – *C. suluk*; black – *C. tanzaniense*; light red – *C. wadei*. **Square – genus *Chondropodus*:** blue – *Ch. curvispinus*; green – *Ch. rectispinus*.

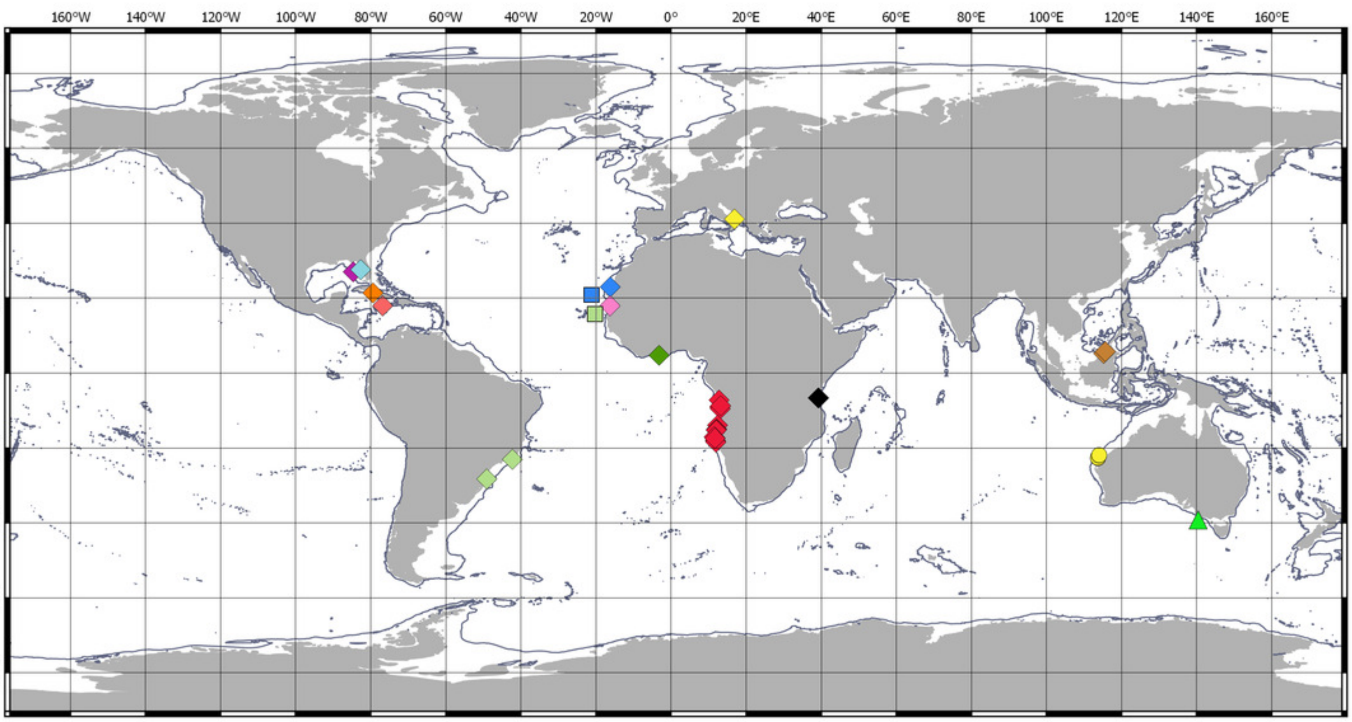

Figure 5

Distribution of Chondropodinae (2).

Circle – genus *Hoplopolemius*: yellow – *H. propinquus*; red – *H. toyoshious*; blue – *H. triangulatus*. **Triangle – genus *Julmarichardia*:** green – *J. alinati*; yellow – *J. bajau*; orange – *J. deltoides*; red – *J. dollfusi*; black – *J. gutui*; blue – *J. thomassini*. **Diamond – genus *Trichapseudes*** represented only by *T. tridens*. **Pentagon – genus *Vestigiramus*:** red – *V. antillensis*; green – *V. codreanui*; orange – *Vestigiramus* sp. Araujo-Silva & Larsen, 2012. **Square – genus *Zaraza*** represented only by *Z. linda*.

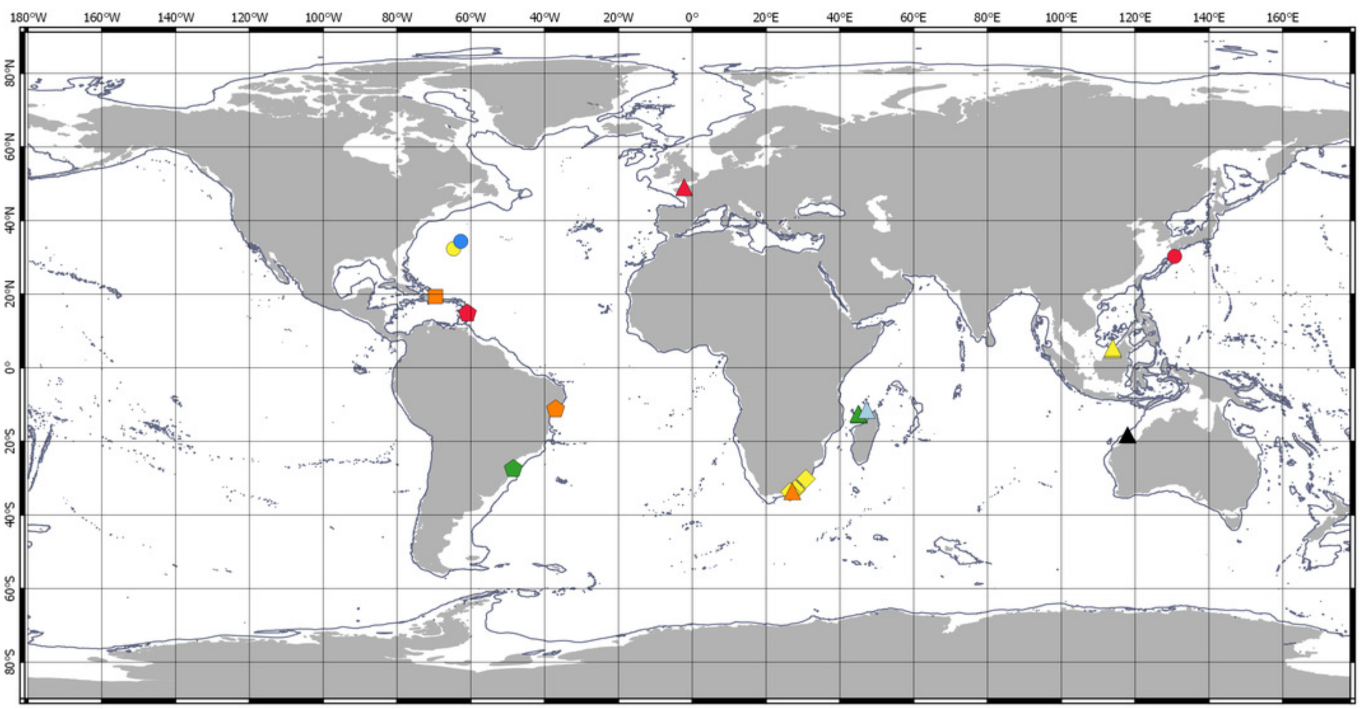

Table 1(on next page)

Depth and sediment type for known Chondropodinae species.

Hyphen was used when the collection details were not specified in paper with description of species.

Species	Depth [m]	Sediment	References
Bamberus jinigudirus Stępień & Błażewicz-Paszkowycz, 2013	4–12	sand, fine rubble in groove, dead Acropora, finger rubble	*Stępień & Błażewicz-Paszkowycz, 2013*
Calozodion bacescui Gutu, 1996	29–50	sandy substratum with biogenic gravel, limestone concretions and algae	*Gutu, 1996*
Calozodion bogoescui Gutu, 2014	shallow waters	-	*Gutu, 2014*
Calozodion dominiki Bochert, 2012	26–117	-	*Bochert, 2012*
Calozodion heardi Gutu, 2002	-	-	*Gutu, 2002*
Calozodion moyas Menioui, 2013	6	-	*Menioui, 2013*
Calozodion multispinosum Gutu, 1984	22	dark grey mud	*Gutu, 1984*
Calozodion pabisi Jakiel & Jóźwiak, 2015	386	*Lophelia* reef	*Jakiel et al., 2015*
Calozodion simile Gutu, 2006	-	-	*Gutu, 2006a*
Calozodion singularis Gutu, 2002	-	-	*Gutu, 2002*
Calozodion suluk Bamber & Sheader, 2005	23–35	2% gravel, 75-78% sand, 9-12% silt, 10-11% clay	*Bamber & Sheader, 2005*
Calozodion tanzaniense Gutu, 2014	shallow waters	-	*Gutu, 2014*
Calozodion wadei Gardiner, 1973	6.1	fine sand, silt and clay	*Gardiner, 1973*
Chondropodus curvispinus Gutu, 2006	-	-	*Gutu, 2006a*
Chondropodus rectispinus Gutu,	-	-	*Gutu, 2006a*

2006			
Hoplopolemius propinquus (Richardson, 1902)	-	-	*Richardson, 1902*
Hoplopolemius toyoshious (Larsen & Shimomura, 2006)	73	shell sand	*Larsen & Shimomura, 2006*
Hoplopolemius triangulatus (Richardson, 1902)	-	-	*Richardson, 1902*
Julmarichardia alinati Gutu, 1989	6–450	-	*Gutu, 1989b*
Julmarichardia bajau Bamber & Sheader, 2005	23–35	2% gravel, 75-78% sand, 9-12% silt, 10-11% clay	*Bamber & Sheader, 2005*
Julmarichardia deltoides (Barnard, 1914)	90	-	*Barnard, 1914*
Julmarichardia dollfusi (Gutu, 1989)	-	-	*Gutu, 1989a*
Julmarichardia gutui Ritger & Heard, 2007	78–83	-	*Ritger & Heard, 2007*
Julmarichardia thomassini Gutu, 1989	250	-	*Gutu, 1989b*
Muvi schmallenbergi sp. Nov.	49.6	-	
Trichapseudes tridens Barnard, 1920	31–155	-	*Barnard, 1920*
Vestigiramus antillensis Gutu, 2009	1–2	dead corals and seagrass beds	*Gutu, 2009*
Vestigiramus codreanui (Gutu, 1996)	29	limestone concretions and algae	*Gutu, 1996*
Vestigiramus sp. Araujo-Silva & Larsen, 2012	71.6	sandy bottom associated with sponge and algae	*Araujo-Silva & Larsen, 2012*

Zaraza linda Gutu, 2006	0.5–2	dead corals covered with algae	*Gutu, 2006b*