

Revision of the genus *Karripurcellia* Giribet 2003 (Opiliones: Cyphophthalmi: Pettalidae)

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Summary. The genus *Karripurcellia* is redefined morpho-anatomically. A tripartite sensorial organ on male tarsus IV is described for the first time. A new genus, *Milipurcellia* n. gen., is established based on *Karripurcellia sierwaldae* Giribet, 2003. The species *Karripurcellia harveyi* Giribet, 2003 is synonymised with *Karripurcellia peckorum* Giribet, 2003, since characters used in species descriptions were found to be preservation artifacts and misinterpretations. Relationships between the two Southwest Australian genera within Pettalidae are discussed. The superficial approach to Pettalidae taxonomy in the present literature is discussed.

Keywords: *Milipurcellia*, morpho-anatomy, new genus, Southwest Australia, superficial taxonomy, synonym.

Introduction

Cyphophthalmi are terrestrial organisms that are very important for the study of historical biogeography. Their low dispersal rate and assumed old age makes them ideal candidates for such studies. Christian Juberthie, the most prolific author studying Cyphophthalmi, was the first to analyze the group from a biogeographical aspect (Juberthie 1970; Juberthie and Massoud 1976; Juberthie 1988). He associated distributions of certain genera and related species with the disjunction of Continental plates, indicating the significant potential of Cyphophthalmi in biogeographical research.

Recently, a number of papers by Gonzalo Giribet and collaborators, based on cladistic analyses of molecular and morphological data, also considered the biogeography of this group (Boyer and Giribet 2007; Boyer et al. 2007b; Clouse and Giribet 2010; Giribet et al. 2010; Giribet et al. 2012) again suggesting their importance for such studies. However, the detailed molecular analyses in these papers are supplemented with inadequate morpho-anatomical studies. In some

cases, the morpho-anatomical section of these studies had been reduced to a limited number of characters of minor taxonomic importance (Boyer et al. 2007a). In other studies the morpho-anatomical characters have been either individually or superficially analysed within the scope of adding to the morphological data matrix (Giribet and Boyer 2002; de Bivort and Giribet 2004, 2010), or represent quantitative studies (Clouse et al. 2009; de Bivort et al. 2010). Unfortunately, because such an approach does not require a detailed knowledge of the subject, it could possibly lead to a degree of randomness that can in reverse generate mistakes in biogeographical interpretations.

In order to fully realize the significant potential of Cyphophthalmi for biogeographical research, one must first clearly determine the composition of, and phyletic relationships among the taxa. Therefore, in the the present study I focus on zoogeographically interesting fauna from the southwestern part of the Australian continent, which appear to be non-monophyletic after consideration of the new data presented here.

Through the kindness of Prof. Dr. Jochen Martens,

and as part of my broader research, I had the opportunity to analyse specimens of the genus *Karripurcellia* from two localities near Pemberton in southwestern Australia. I have received specimens of two *Karripurcellia* Giribet, 2003 species – *K. peckorum* Giribet, 2003 and *K. sierwaldae* Giribet, 2003, from separate localities. Based on a detailed analysis of the specimens, I determined a series of taxonomically hitherto unknown but important characters that, along with those already known, clearly indicates that these two species are neither congeneric nor closely related, as might be presumable from their close and isolated geographic localities. For one of these I establish a new genus – *Milipurcellia* n. gen. Later in the course of this study, I included one holotype and four paratypes of the species *Karripurcellia* from the Western Australian Museum collection (WAM), through the kindness of Dr. Mark Harvey.

Materials and methods

Specimen dissections and slide mountings were performed as previously described in Karaman (2009). The separated body parts were prepared by dehydration through graded alcohol and acetone and cleaned in a sonicator. Dried samples mounted on stubs were prepared in a Baltec SCD005 and AGAR sputter coater. Scanning electron microscopy (SEM) photographs were taken with a JEOL-JSM-64601v and a Philips XL30 ESEM SEM microscope under high vacuum. Drawings were made using a camera lucida on an Olympus BHS microscope. Microscopic photography was conducted using a Zeiss Axio Imager A1 with DIC.

Results

Milipurcellia n. gen.

Typus generis: *Karripurcellia sierwaldae* Giribet, 2003.

Derivatio nominis. The genus is dedicated to Milivoj Krvavac, a PhD student, as an apology for the inconvenience he experienced in his attempt to provide the necessary pettalid material for my study. The genus is named after his South Asian nickname and the pettalid genus *Purcellia*.

Diagnosis. A genus of medium-sized Cyphophthalmi of the family Pettalidae, characterised by the

presence of one anal gland opening on the male tergite IX followed by a longitudinal carina on the operculum anale. Spermatopositor with a pair of short hook-like movable fingers; a swollen ornamented area of coxae IV surrounding the gonostome laterally and frontolaterally. Pedipalp trochanter with a strong ventral process. Chelicerae basal article with a strong transverse dorsal ridge and without a ventral process. Ozophores in a dorsal position.

Although Giribet (2003) mentions modified, “V-shaped”, opisthosomal sternites VII-IX for his species *M. sierwaldae* comb. nov., I have not detected this character in the present studied specimens (Fig. 1C), and consider it to be a character of the genus *Karripurcellia* (Fig. 3C).

Milipurcellia sierwaldae (Giribet, 2003) comb. nov.

Figs 1-2

Karripurcellia sierwaldae: Giribet, 2003: 396-398.

Material examined. SW Australia, Pemberton, Warren National Park, in karri base litter, leg. S. Peck and J. Peck, 5.07.1980, 1 paratype ♀ (ex WAM T47014).

SW Australia, Pemberton, Warren National Park, old Eucalyptus forest, sieved from leaf litter, leg. H. Franz, 21.09.1970, 1 ♀, 1 juv (Collection J. Martens: CJM 6469);

SW Australia, Pemberton, Five Mile Brook, burned forest, 22.09.1970, leg. H. Franz, 1 ♂, 2 ♀ (CJM 6464).

This is the only known species of the genus, described in detail in Giribet (2003). Here, I emphasize some of the characters that I consider to be important for reconstruction of phyletic relationships within the family Pettalidae, which have either been omitted from the original description or have not been sufficiently underlined.

Spermatopositor (Fig. 2) – with a pair of short hook-like diverging movable fingers; distal margin of the terminal lobe short, rounded with six terminal setae; lobi laterales with four long setae each; on the ventral side a group of three setae; lobus medialis without denticles.

Anal gland with an orifice on tergite IX, medially (Fig. 1D): it opens in front of the short shallow groove on the posterior end of the longitudinal carina of the

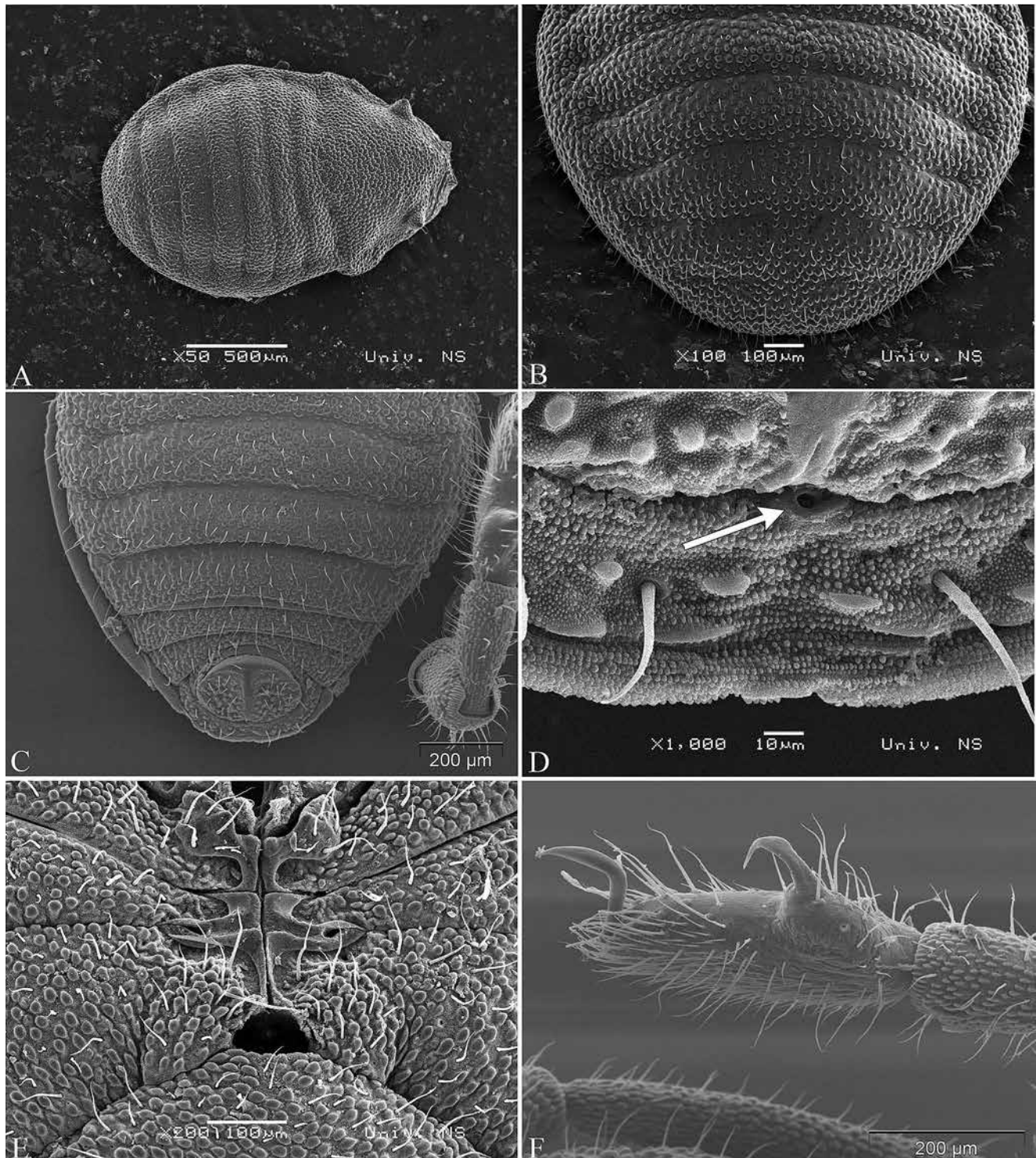


Figure 1. *Milipurcellia sierwaldae* (Giribet, 2003), male. **A**, dorsum; **B**, opisthosomal part of dorsum; **C**, opisthosomal sternal region (without elevated concave hind margins of opisthosomal sternites); **D**, anal gland orifice (arrow); **E**, gonostome surrounded with swollen ornamented area; **F**, tarsus IV, retrolateral view.



Figure 2. *Milipurcellia sierwaldae* (Giribet, 2003), spermatopositor.

operculum anale.

Male tarsus IV without a “sensory organ” retrolaterally. Adenostyle lamelliform, on swollen dorsal area of tarsus (Fig. 1F). Male opisthosomal tergites IV-VIII with inconspicuous median line (Fig. 1A-B) formed by a change in granulation pattern, which can be an indication of a median furrow (*i.e.* a former bilobed opisthosomal structure). Ovipositor apical lobes stout and short versus *K. peckorum*.

Remarks. The genus *Milipurcellia* n. gen., with its combination of characters (spermatopositors, chelicerae and pedipalp trochanter structure), shows a close affinity to the pettalid genus *Manangotria* Shear & Gruber, 1996 from Madagascar (Shear and Gruber, 1996). A distinct difference is the absence of an anal gland in *Manangotria*, the ozophore position, and the female body profile. Based on the presence of a ventral process on the palp trochanter, the structure of the chelicerae basal article and the position of the anal gland orifice, the genus is also close to the New Zealand genus *Rakaia* Hirst, 1925. Because representatives of most of the pettalid genera are not properly described and illustrated, and many important details are not presented (and because of the lack of important comparative material) I am not at present able to provide a

convincing hypothesis regarding the phyletic position of the genus *Milipurcellia* n. gen. However, it is clear that this genus is not closely related to the genus *Karripurcellia*. The genus *Milipurcellia* n. gen. clearly differs from the genus *Karripurcellia* as follows: in spermatopositor structure, the absence of “V-shaped” opisthosomal sternites VII-IX in males, the presence of an anal gland opening on IX male tergite and a longitudinal carina on operculum anale, the different structure of the area of coxae IV surrounding the male gonostome, the absence of a median furrow on male opisthosomal tergites, the absence of sensorial structure on male IV tarsi, the presence of a strong ventral process on pedipalp trochanter and the absence of the ventral process on chelicerae basal article.

***Karripurcellia* Giribet, 2003**

Typus generis. *Karripurcellia peckorum* Giribet, 2003 (by original designation)

Diagnosis. Because *Milipurcellia* n. gen. was excluded from *Karripurcellia* Giribet, 2003, and there is a lack of appropriate autapomorphies and important characters in the original description, a more accurate diagnosis of the genus is provided.

A genus of generally larger Cyphophthalmi species characterized by elevated concave hind margins of opisthosomal sternites (“V-shaped”) VII-IX in males; male IV tarsi retrolaterally with a tripartite sensorial structure at a position comparable to Ramblas organ (Schwendinger & Giribet, 2005); male opisthosomal tergites with an inconspicuous median furrow; the presence of conical protrudings on male coxa IV in front of the gonostome; spermatopositor with elongated movable fingers covered with scale-like structures; lobus medialis covered with denticles. Male anal gland(s) absent. Chelicerae basal article with a transverse dorsal ridge and a ventral process. Pedipalp trochanter without a ventral process. Ozophores in a dorsal position.

***Karripurcellia peckorum* Giribet, 2003**

Figs 3-5

Karripurcellia harveyi: Giribet, 2003: 398-400. **syn. nov.**

Material examined. SW Australia, Pemberton,

Warrren National Park, in karri base litter, leg. S. Peck and J. Peck, 5.07.1980, paratypes 1♀ 1♂ (ex WAM T47012);

SW Australia, Pemberton Crowea, Forest Coupe, leg. S. J. Curry, pitfall trap week ending 12 November 1976, *K. harveyi* holotype ♂ (WAM T42519);

SW Australia, Pemberton Crowea, Forest Coupe, leg. S. J. Curry, pitfall trap week ending 31.x.1977, *K. harveyi* paratype ♀ (WAM T42520);

SW Australia, Pemberton, Warrren National Park (type locality), old Eucalyptus forest, sieved from leaf litter, leg. H. Franz, 21.09.1970, 4♂, 4♀, 1juv (CJM 6468);

SW Australia, Pemberton, Five Mile Brook, burned forest, 22.09.1970, leg. H. Franz, 4♂, 3♀ (CJM 6463).

Male tergites (VI and VII almost bilobed) with opisthosomal median furrow not formed by a change in granulation pattern as suggested by Giribet (2003), but representing a medial depression of tergites (Fig.3A-B). Ventral prosomal complex includes conical protrudings fronto- laterally from the gonostome (Fig. 3D, arrow) covered with cuticular ornamentation. Similar structures are present in the genus *Pettallus* from Sri Lanka (more distinct) (see Sharma and Giribet 2006; Sharma et al. 2009), and in at least some Queensland pettalids and some stylocelids.

Male tarsus IV with a characteristic tripartite sensorial organ positioned retrolaterally (Fig. 4). Each circular structure is covered by a characteristic pore field

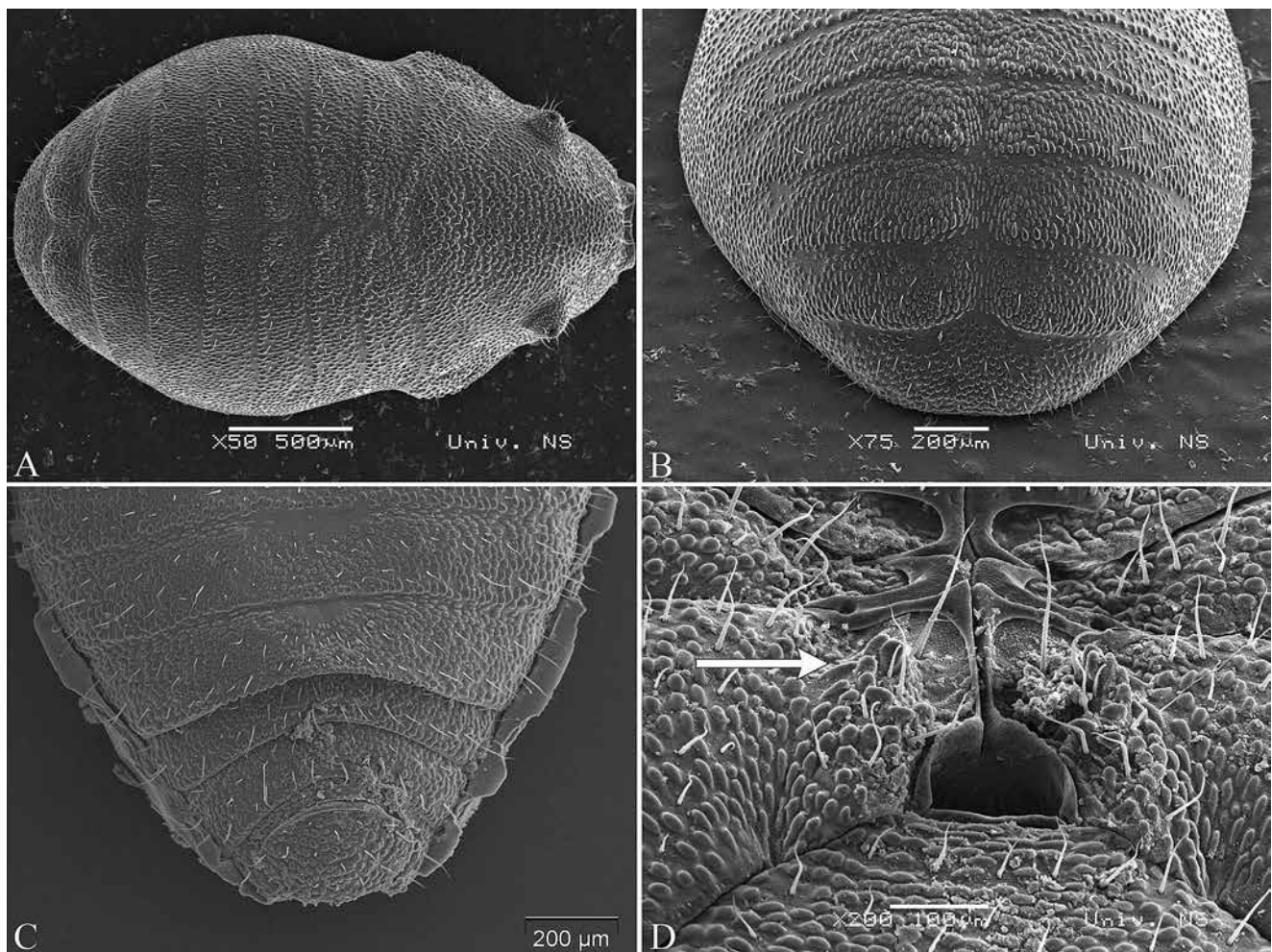


Figure 3. *Karripurcellia peckorum* Giribet, 2003, male. **A**, dorsum; **B**, opisthosomal part of dorsum with median furrow; **C**, opisthosomal sternal region (convexly modified sternites VII-IX); **D**, gonostome with conical protrudings of swollen area of coxae IV (arrow).

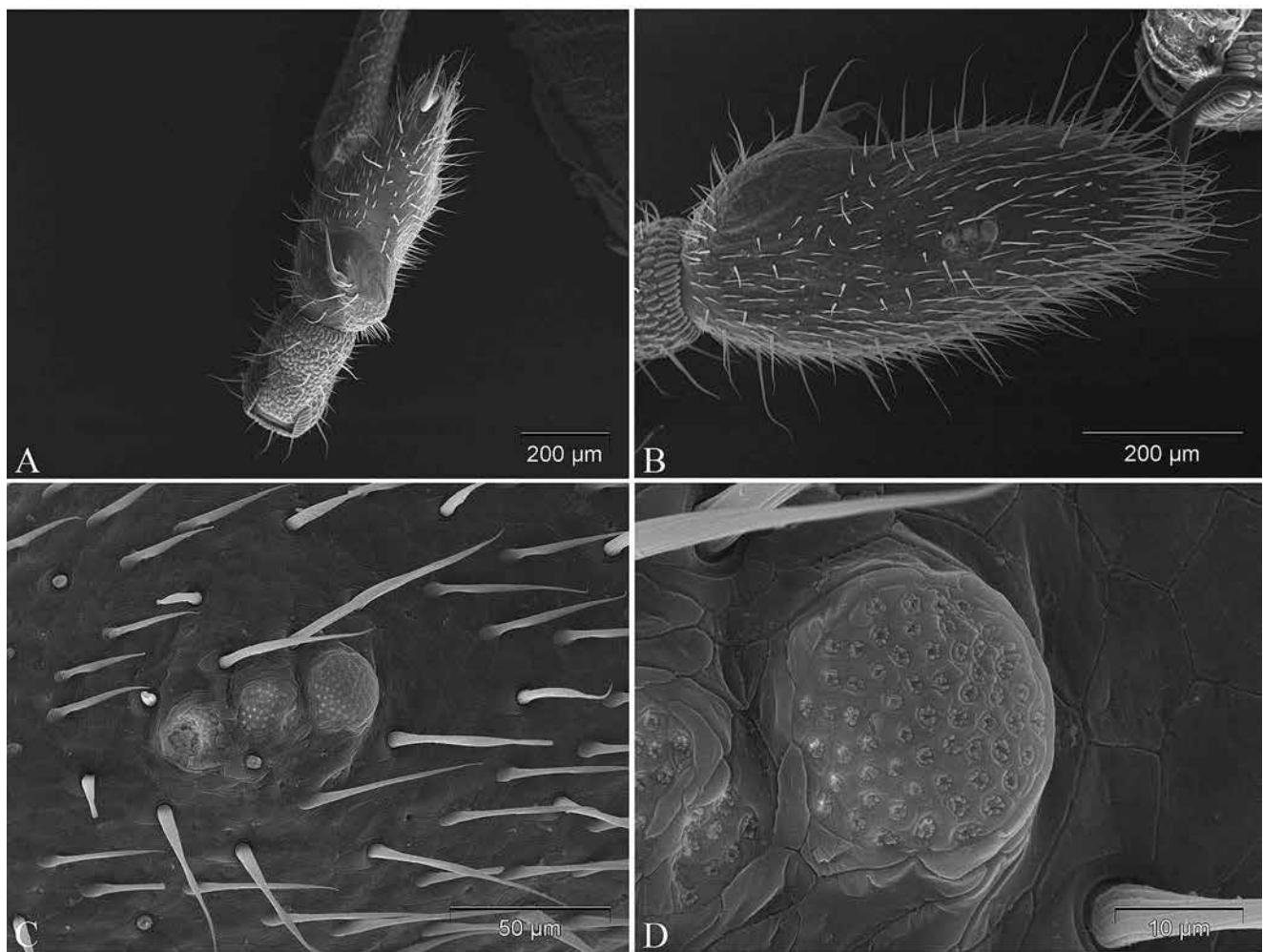


Figure 4. *Karripurcellia peckorum* Giribet, 2003, male. **A**, tarsus IV, dorsal view; **B**, tarsus IV, retrolateral view (arrow indicate sensorial organ); **C**, tripartite sensorial organ; **D**, detail of sensorial organ.

(Fig. 4D), which makes it significantly different from the Rambla's organ present in the genus *Fangensis* Rambla, 1994 (Stylocellidae) (Schwendinger and Giribet 2005), in the same position. The same tarsus with a swollen area positioned retrolaterally, which carries the adenostyle (Fig. 4A, B). Adenostyle spiniform.

Spermatopositor with elongated movable fingers covered with scale-like denticles (Fig. 5A). Movable fingers diverging terminally in hook-like tips; lobus medialis covered with denticles (Fig. 5B). The setation as given in Giribet, 2003 (Figs 32-34), the terminal lobe is narrow and short with four terminal and two subterminal setae placed on the ventral side of the margine; lobi laterales with seven long setae each; a group of three setae on the ventral side.

Remarks. The short description of the species *K. harveyi* provided in Giribet (2003) does not provide many species specific characters and has no taxonomic value. The mentioned differences in the positions of the chelicera and pedipalp coxal endites can change, since they are movable structures. In *K. peckorum* (presented in Giribet 2003, Fig. 3), the cheliceral basal articles are extremely extracted distally ("protruding chelicerae" in Giribet), because of the relaxed cheliceral musculature and increased inner body pressure as a result of the decay of soft tissues in dead specimens that were not adequately preserved soon after collection. This is obvious from comparison of specimens of the sympatric *M. sierwaldae* comb. nov., which are in the same state of preservation, and is conspicuously

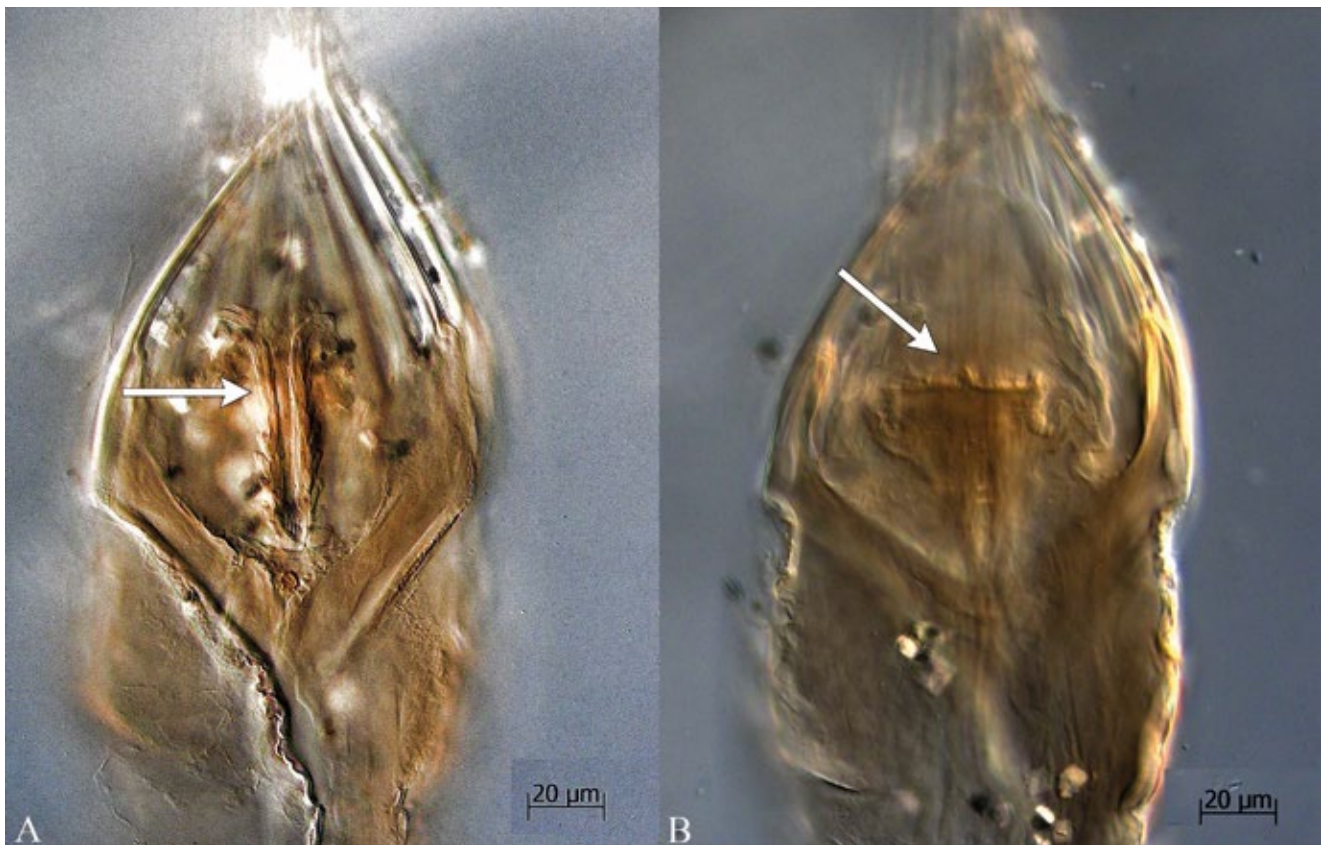


Figure 5. *Karripurcellia peckorum* Giribet, 2003, spermatopositor. **A**, movable fingers with scale-like denticles (arrow); **B**, lobus medialis covered with denticles (arrow).

visible in the bloated bodies of the holotypes (Giribet 2003, Figs. 2, 38). Further evidence comes from a note in the Remarks section of the original description of *M. sierwaldae* comb. nov.: “In both species, the chelicerae are protruding and the opisthosomal dorsal shield is considerably wider than the sternal region.” (Giribet 2003: 398). All *K. harveyi* specimens (in Giribet 2003) were collected by traps, followed by immediate preservation, so they are not bloated and do not display protruding chelicerae. There are absolutely no differences between dissected chelicera of *K. peckorum* and *K. harveyi*, neither in shape nor in proportions (Giribet 2003, Figs. 12, 51). In the material I have examined, most of the specimens show such “protruded chelicerae”, although there are several without this character. The collector, Herbert Franz, as an expert in Scydmenidae and Pselaphidae (Coleoptera), while using adequate dry techniques for these two groups, has not properly preserved collected Cyphophthalmi

specimens. Thus, the “character” of “protruding chelicerae” which was used as a morphological character state for phylogenetic analysis in Giribet (2003) and Boyer and Giribet (2007), and as a character in the species description in Sharma and Giribet (2006) and Sharma et al. (2009) should be omitted in the future.

With respect to pedipalp coxal endites, no differences were observed in their dimensions as stated by Giribet (2003, Figs. 9, 49). In type specimens of *K. peckorum* and *M. sierwaldae* comb. nov., they are only bloated along with other membranous structures of the stomotheca as a result of soft tissue decay. As a consequence, the orientations of these movable structures in the aforementioned type specimens are slightly different versus *K. harveyi*. By comparing SEM photographs and scaling (Giribet 2003, Figs. 7, 8, 50), it is obvious that the anal plate is not considerably smaller in *K. harveyi* than in *K. peckorum*, as suggested by the descriptions (Giribet 2003, p. 400).

Finally, the collection localities for both species are in the same small area near Pemberton, not more than 20 km apart. It is worth mentioning that the image of “*K. harveyi*” presented in Giribet et al. (2012, Fig. 1) is from Warren National Park, which is also the type locality of *K. peckorum*. In addition, it was probably identified as *harveyi* based on the “non-protruding chelicerae” character. Thus, based on the combined evidence stated above, I conclude that the species *K. harveyi* is synonym of the species *K. peckorum*.

Relationships. Regarding previous studies on the phyletic position of the genus *Karripurcellia*, there are three suggested possible relationships given in Boyer and Giribet (2007) and Giribet et al. (2012).

Boyer and Giribet (2007) suggest two possible relationships for *Karripurcellia*: (1) closely related to *Pettalus*, based on a study using direct optimization analysis of 18S rRNA, 28S rRNA, 16S rRNA, histone H3 and COI; and (2) closely related to *Chileogovea* – *Purcellia* group, based on Bayesian analysis of 18S rRNA, 28S rRNA, histone H3 and COI. Both analyses show insufficient jackknife support for these hypotheses.

Based on analysis of the combined molecular data in Giribet et al. (2012), *Karripurcellia* and *Pettalus* form a clade without significant nodal support. However, from a morphological aspect, the same study concludes that Malgasy *Managotria* is a sister to *Karripurcellia*, without providing further evidence. The same study further combined molecular and morphological data, placing *Managotria* close to *Karripurcellia* with low support. Since *Karripurcellia harveyi* was used in these analyses (true *Karripurcellia*) (Giribet et al. 2012, Fig. 9), the author’s arguments for such a conclusion are unclear. The only character shared by these two genera is the absence of anal glands in males and, as a dependent character, the presence of an operculum anale without modifications. However, since a shared lost character is unlikely to have great value in phylogenetic reconstructions, it is clear that such a relationship does not have any morphological support.

Based on all of the known characters, it is obvious that *Karripurcellia* and *Pettalus* are markedly different from all previously defined genera within Pettalidae Shear (1980) (which is not the case with the genus *Milipurcellia* n. gen.). In addition, *Karripurcellia* and

Pettalus are significantly different from one another. However, there are other characters that suggest that they form a monophyletic unit: The structure of the spermatopositor with elongated movable fingers; the lobus medialis covered with denticles; the dorsal side with 14 or more setae (on lobi laterales); the male coxae IV with conical protrudings frontolaterally from the gonostome; and the male opisthosomal tergites forming a bilobal structure. This last structure is present in traces in *Karripurcellia* since anal glands are reduced. Despite the statement that *Pettalus* species lack anal glands (Sharma and Giribet 2006; Sharma et al. 2009), they nonetheless should be present on male tergite VIII, as functionally indicated by the concentration of a large number of elongated setae. The presence of denticles on the basal part of movable fingers, a larger number of elongated setae on the dorsal side of the spermatopositor, and protrudings on male coxae IV in Queensland pettalids, are characters that could connect them with *Karripurcellia* as well.

Some of the above mentioned characters, such as the spermatopositor lobus medialis covered with denticles, a larger number of elongated setae on the dorsal side of the spermatopositor, conical protrusions on coxae IV, and the presence of a sensorial organ on male tarsus IV, are also present in the Southeast Asian genus *Fangensis* Rambla, 1994 (family Stylocellidae). However, because the inner structure and function of the organs on males’ coxae IV are unclear at this moment, it is not possible to determine if this structure in *Karripurcellia* is homologous to the Ramblas organ of *Fangensis*. Thus, this remains a very interesting detail in the reconstruction of Cyphophthalmi phylogeny.

Discussion

The family Pettalidae was established by Shear (1980), based on characters presented in Juberthie’s (1970) substantial study: Shear raised the group of genera from the temperate southern hemisphere, which were already defined by Juberthie (1970), to family rank.

In contrast to Juberthie, who has been somewhat reserved regarding the position of the genus *Parapurcellia* from South Africa (which combines diagnostic characters from both groups: genera from

the temperate southern hemisphere and genera from the temperate northern hemisphere), Shear clearly separated the cyphophthalmid fauna of these two geographic regions into two families: Sironidae (temperate northern) and Pettalidae (temperate southern hemisphere). Unfortunately, none of the characters in Shear's diagnosis of these families (with the exception of geological history, which is not a character in itself) is sufficiently discriminate. Thus, in the case of specimens of unknown origin, it is possible that incorrect family associations can be given.

Boyer and Giribet (2007) verified a monophyletic family Pettalidae according to the results of genetic analyses, and confirmed this in later studies (Boyer et al. 2007b; Boyer and Giribet 2009; Giribet et al. 2010; Giribet et al. 2012).

Considering the conserved stomotheca structure in Cyphophthalmi, the families Pettalidae and Sironidae appear to be clearly separated on the basis of this complex character (Karaman, unpublished data). The unique combination of stomotheca and spermatopositor structure clearly defines the family Pettalidae among the Cyphophthalmi, and includes the genus *Suzukiellus* Roewer, 1916 from Japan (which is presently in Sironidae). Pettalidae currently includes approximately 60 described taxa in 13 genera: *Austropurcellia* Juberthie, 1988, *Chileogovea* Roewer, 1961, *Karripurcellia* Giribet, 2003, *Manangotria* Shear and Gruber, 1996, *Neopurcellia* Forster, 1948, *Parapurcellia* Rosas Costa, 1950, *Pettalus* Thorell, 1876, *Purcellia* Hansen & Sørensen, 1904, *Rakaia* Hirst, 1925, *Speleosiro* Lawrence, 1931, *Aoraki* Boyer and Giribet, 2007, *Suzukiellus* Roewer, 1916 and *Milipurcellia* n. gen. (described here).

More recently, there have been a number of investigations on pettalid phylogeny which are mostly based on molecular data analysis. In Boyer et al. (2007a) and Boyer and Giribet (2007), these analyses are supplemented with morpho-anatomical details. However, unfortunately, these details are not convincing from a comparative-morphological view. For example, the revision of the pettalid genera from Australia and New Zealand in Boyer and Giribet (2007) does not explain how to identify representatives of the genus *Austropurcellia* (Queensland).

A high quality phyletic analysis based on mor-

pho-anatomy is not possible at present, because most of the available pettalid descriptions are not presented with reliable details. It is understandable to a certain extent why these descriptions were poor or incomplete in the past, since the study of Cyphophthalmi in general requires sophisticated morphological techniques. However, current technical advances enable the presentation of all relevant details, and should thus be standard in every description, especially revisions. Although photographs (which are increasingly used in Cyphophthalmi descriptions) can give a general impression of the exterior appearance of the specimen (particularly if the whole body of an animal is photographed), they cannot provide any useful taxonomical information if no significant details are clearly visible. In such cases they simply serve as "decorations" in the paper. For example, in a study by de Bivort and Giribet (2010), the ventral prosomal complexes of the species *Purcellia lawrencei* de Bivort & Giribet, 2010, *Parapurcellia natalia* de Bivort & Giribet, 2010, and *Parapurcellia staregai* de Bivort & Giribet, 2010 (Figs 4I, 8F and 9F, respectively) are presented as blurred automontage photographs, followed by drawings that were most likely based on these photographs. From these drawings, these three species are very different from the congeners and, considering the taxonomic relevance of this character, could be identified as different genera. However, I believe that the presented drawings are erroneous. Because of the current practice to display but not understand characters, important details, such as the spermatopositor structure in SW Australian pettalids (Giribet 2003), are overlooked on a regular basis. In their characterization of the Pettalidae, Giribet and Boyer (2007), in spite of great and marked differences in the structure of the spermatopositor between pettalid genera presented in papers they explicitly reference, state: "Spermatopositor quite uniform...". Thus, this very important character has clearly never been studied, and is now absent from most recent descriptions of the Cyphophthalmi species. This practice is uncomprehensible, especially considering that treatment of male genital morphology is mandatory in modern descriptions of other opiliones which have been studied by the same authors.

Character neglect is also reflected for a small number of characters included in the morpho-anatomical

part of studies, such as in Boyer et al. (2007a), which is reduced to two characters of lesser taxonomic significance: “Taxonomy within the genus *Aoraki* relies heavily on the tarsus of the male leg IV and on the anal region of males”. However, according to the illustrations presented in Boyer et al. (2007a), distinct morpho-anatomical differences have been overlooked and not recognised as indicative. More realistically, this is a simple case of a complex of related species that are clearly morpho-anatomically well-defined; while statistical support of the provided genetic analysis does not even allow for conclusions to be made concerning monophyly of their proposed species *Aoraki denticulata* (Forster 1948).

In various morphological dataset analyses of de Bivort and Giribet (2010), all species of the genus *Karripurcellia* (including *Milipurcellia* n. gen.) constantly appear as a monophyletic group, even though they are actually not (as previously discussed above). In a phylogenetic study by de Bivort et al. (2010), which is based on morphometrics, the same situation is apparent. In both cases, their analyses show that the genus *Karripurcellia* is a monophyletic with three species, although they are comparing two species of phyletically distant genera. These facts make this type of study effectively useless. Thus, I believe that these types of studies, which introduce an “objective” approach with random assignment of characters beforehand, and assumes that they have phyletic value, is detrimental for our field of science.

Geographical distributions of certain pettalid phyletic lineages overlapped and intersected even during the time of the unique Southern Gondwanan Land. Currently, this is manifested in the presence of non-related sympatric genera, the relatives of which can be found on very distant lands and continents. Hence, there is a sympatric presence of two genera in SW Australia that are not closely related to each other. The same situation applies to New Zealand and South African pettalids, which makes this family particularly interesting from a biogeographic perspective.

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