

Bonn. zool. Beitr.	Bd. 48	H. 3–4	S. 353–365	Bonn, Dezember 1999
--------------------	--------	--------	------------	---------------------

Redescription of *Atracheodillo marmorivagus* (Isopoda, Oniscidea, Eubelidae), an arboricolous isopod from Congo and Rwanda

Christian Schmidt

Abstract. The terrestrial isopod species *Atracheodillo marmorivagus* Arcangeli, 1950 (Isopoda, Oniscidea, Eubelidae) is redescribed on the basis of the type-material and new specimens collected by canopy fogging of *Carapa grandiflora* (Meliaceae) trees in rainforests in Rwanda and eastern Congo. A lectotype is designated.

Key words. Crustacea, Isopoda, Oniscidea, Eubelidae, *Atracheodillo marmorivagus*, Congo, Rwanda.

Introduction

Specimens of a terrestrial isopod were recently collected by canopy-fogging of *Carapa grandiflora* (Meliaceae) trees in rainforests in Rwanda and eastern Congo. All major characters of the new material are shared with the poorly known species *Atracheodillo marmorivagus* Archangeli, 1950, which had been described from eastern Congo without any information on its habitat. A detailed description including the structure of pleopodal lungs is provided here.

Material and methods

Type-material examined: Congo: Mombassa: Lubero, 1 male (lectotype, designated herein) 2 females, leg. L. Burgeon, VIII. 1932 (MRAC 37992-37994); Kivu: Kibumba, 1 female with marsupium, leg. L. Burgeon, 07. IX. 1932 (MRAC 37996); Kivu: Tshibinda, 1 female, leg. L. Burgeon, XI. 1932 (MRAC 37995); Lac Mokoto, 1 female, leg. J. Ghesquière, 31. VIII. 1937 (MRAC 21047); the specimens except for the male one, are paralectotypes.

Other Material: Rwanda, Rusumo, Ibanda Makera, on *Teclea nobilis* (Rutaceae), 1 female, leg. Th. Wagner, X 1993 (MRAC 57355); Rwanda, Nyakabuye, Cyamodongo, Rainforest, on *Carapa grandiflora* tree No. 3, 3 males, leg. Th. Wagner, X. 1993 (MRAC 57356); Rwanda, Nyakabuye, Cyamodongo, Rainforest, on *Carapa grandiflora* tree No. 4, 3 males and 4 females, leg. Th. Wagner, X. 1993 (*84; author's collection); Rwanda, Nyakabuye, Cyamodongo, Rainforest, on *Carapa grandiflora* tree No. 7, 1 female and 1 juv., leg. Th. Wagner, X. 1993 (*85; ZFMK); Rwanda, Nyakabuye, Cyamodongo, Rainforest, on *Carapa grandiflora* tree No. 11, 3 females, 1 male (male dissected), leg. Th. Wagner, X. 1993 (SMNS 15515); Rwanda, Nyakabuye, Cyamodongo, Rainforest, on *Carapa grandiflora* tree No. 12, 3 females with marsupium, 8 females without, 15 males, remains of one specimen containing the empty puparium of a Rhizophoridae fly, leg. Th. Wagner, X. 1993 (*87; ZFMK); Congo, Kivu-Sud, Irangi, 900 m, Rainforest, on *Carapa grandiflora* tree No. 15, 3 females, leg. Th. Wagner, X. 1993 (SMNS 15514).

In addition, in his original description, Arcangeli (1950) mentioned a sample with the following data: Koteli, 8 males, 23 females, leg. Schouteneden, 13. I. 1923. This material could not be located.

Abbreviations: ZFMK: Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn; MRAC: Musée Royale de l'Afrique Centrale, Tervuren; SMNS: Staatliches Museum für Naturkunde, Stuttgart.

Methods: Dissected appendages were mounted on slides. For transverse sections, a pleon was dehydrated through a graded ethanol series and then embedded in 'Unicryl'-resin (British Bio Cell). Semithin cross sections (2.5 μm) were prepared and stained with toluidine blue. All drawings were prepared using a microscope or a stereomicroscope fitted with a camera lucida.

Description

Maximum size 5.8 x 2.5 mm; exact measurements could hardly be taken, because most specimens are rolled and became inflated by the preserving medium.

Endoantennal conglobation ability present, cephalothorax with a weak frontal line interrupted in the middle (fig. 1). Eyes composed of 11–18 ommatidia. Tergal surface without any distinct sculpture, but with the pale muscle insertion spots as usual in Oniscidea. The coloration is an irregular pattern of light and dark brown patches (preserved only in part of the material).

First coxal plate with sulcus arcuatus as usual in the Eubelidae, and a conspicuous schisma (fig. 2). All coxal plates with a nodulus lateralis at about the same distance from the lateral and posterior margins. In the specimen dissected, the fourth coxal plate has a pair of noduli laterales on each side in the same position (fig. 2). This is nothing more than an individual aberration, because three other examined specimens showed only one nodulus on the fourth coxal plate. However, the noduli are very small, even smaller than the tricorns, therefore this character could not be confirmed for all specimens.

First antenna (fig. 3, A1) triarticulate, the apical article more slender than the basal and medial ones (in one of the dissected specimens, the first antennae look two-jointed, but this seems to be due to a damage caused by dissection or fixation; in other specimens, the first antennae are triarticulate). Two larger aesthetascs in apical, and some smaller aesthetascs in subapical position on the apical article. Second antenna (fig. 3, A2) with biarticulate flagellum; the apical article is more than twice as long as the basal one.

Mouthparts (fig. 3): Right mandible on the hairy lobe with 1 penicil, left mandible with 2 penicils. Both mandibles with 1 penicil between the hairy lobe and the pars molaris, which consists of several hairy setae. Outer endite of first maxilla bearing 4 thick and 6 slightly thinner teeth (tooth setae), 3 of the latter with distinctly cleft tip. Beside the most medial tooth there is another small tooth, less than half as long as the others. Inner endite with a small, acute tip on its outer angle and three penicils on the inner angle. One of the three penicils is smaller than the other two. Second maxilla apically bilobate. Maxillipede with endite bearing three large spines on its apical margin and a small tip on its inner margin. Endopodite palp 3-articulate, basal article with 2 large setae, medial article with a group of 1 large and 1 small seta and another group of 1 large and several small setae on the inner margin and 1 (2) small setae on the outer margin. Apical article with a small seta on its outer margin and a brush of setae at the tip.

Pereiopods (figs 4–6): Pereiopod 1 with antennal cleaning brush on carpus and propodus. Male pereiopods 1 and 2 with a distinct, 3 with a less distinct ventral brush on the carpus. Dactyli with curved bristle that has an immediately constricted apex surpassed by a very fine tip. Pereiopod 7 without conspicuous modifications (on one leg of the dissected specimen there is a hairy area on the inner surface of the basis).

Pleopods (figs 7–9) provided with open lungs on the exopodites 1–4. On exopodites 1 and 2 there is a large folded area covered only at its basal margin, on exopodite 3 the lung is nearly completely covered by the caudal wall and distinctly smaller, on exopodite 4 it is similar to 3 but smaller, on exopodite 5 only vestiges of a lung are present.

In contrast to the ‘*Oniscus*-type’ lungs, on exopodites 1–4 at least some tubules are penetrating the interior of the pleopod, a condition resembling the type of lung found in *Trachelipus*. All exopodites with a lateral row of setae. First exopodite of male with a short mediocaudal tip that is separated from the lung field, which occupies more than half of the exopodite by a strong constriction. In the type

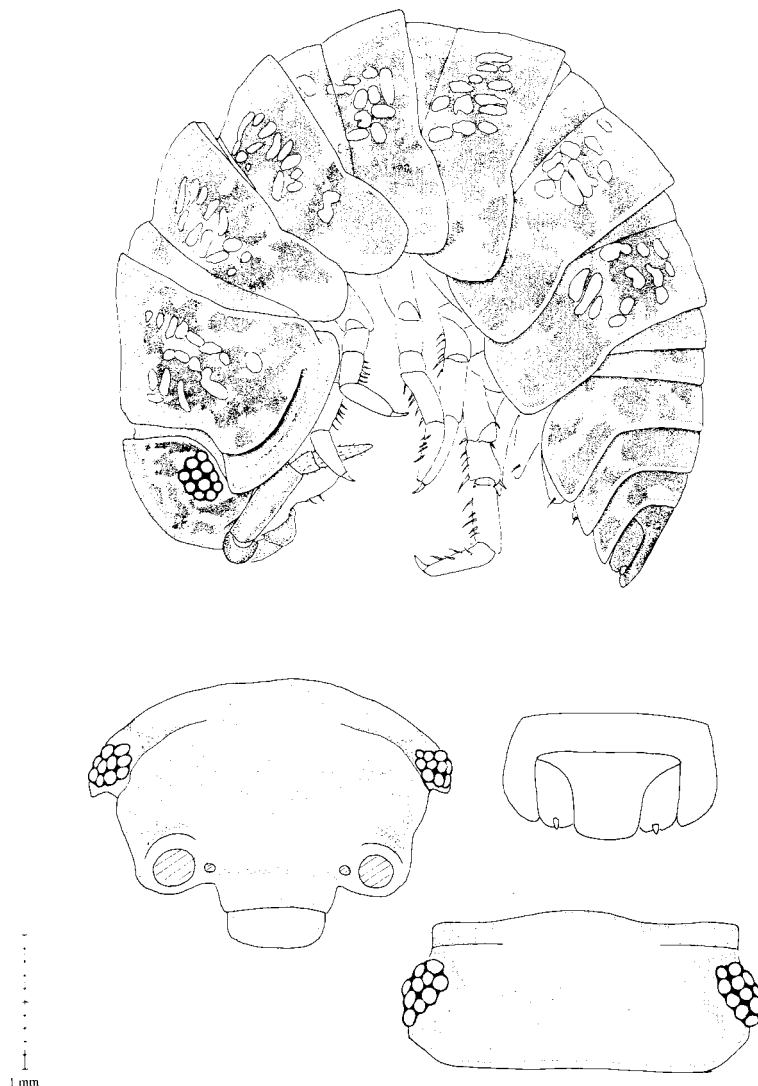


Fig. 1: *Atracheodillo marmorivagus*, male (1.4 mm wide; *87; ZFMK), habitus lateral, pleomere 5, pleotelson and uropods; male (2,3 mm wide; SMNS 15515), cephalothorax, frontal and lateral view.

specimen the medial tip is slightly longer than figured here (compare Arcangeli's 1950 drawing). Endopodites 1 and 2 without any remarkable features.

Uropods with exopodites inserting on the caudal margin of the protopod; pleotelson truncate, with slightly convex apical margin and strongly concave lateral margins.

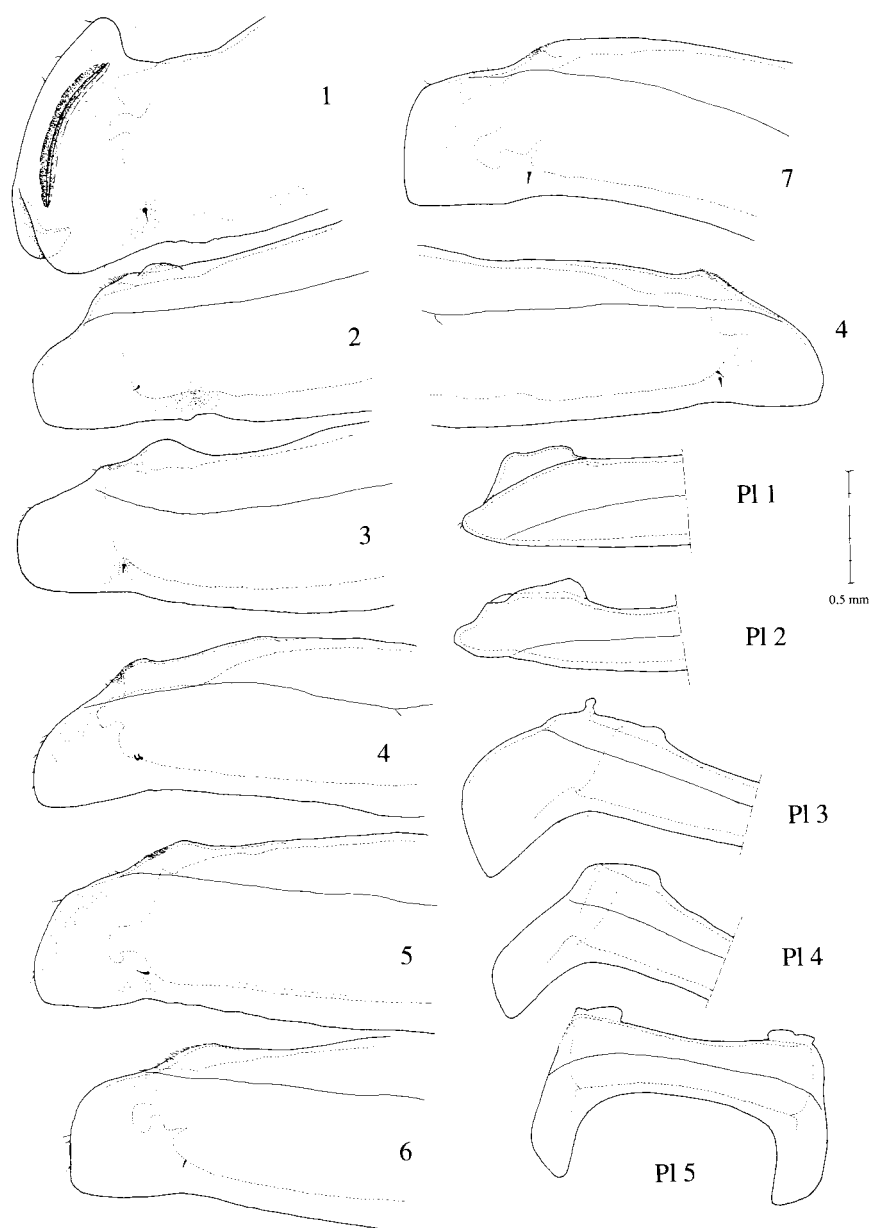


Fig. 2: Male (2,3 mm wide; SMNS 15515), tergites.

Biology

From the scarce information available, the following can be noticed: (1) The new specimens were obtained by canopy fogging from *Carapa grandiflora* trees in rainforests, in one case from a *Teclea nobilis* tree (Rutaceae) in gallery forest. The bark of the trees in the rainforest and to a lesser extent in the gallery forest provides an environment with soil-like condition, due to its epiphytic Bryophyta and the humus

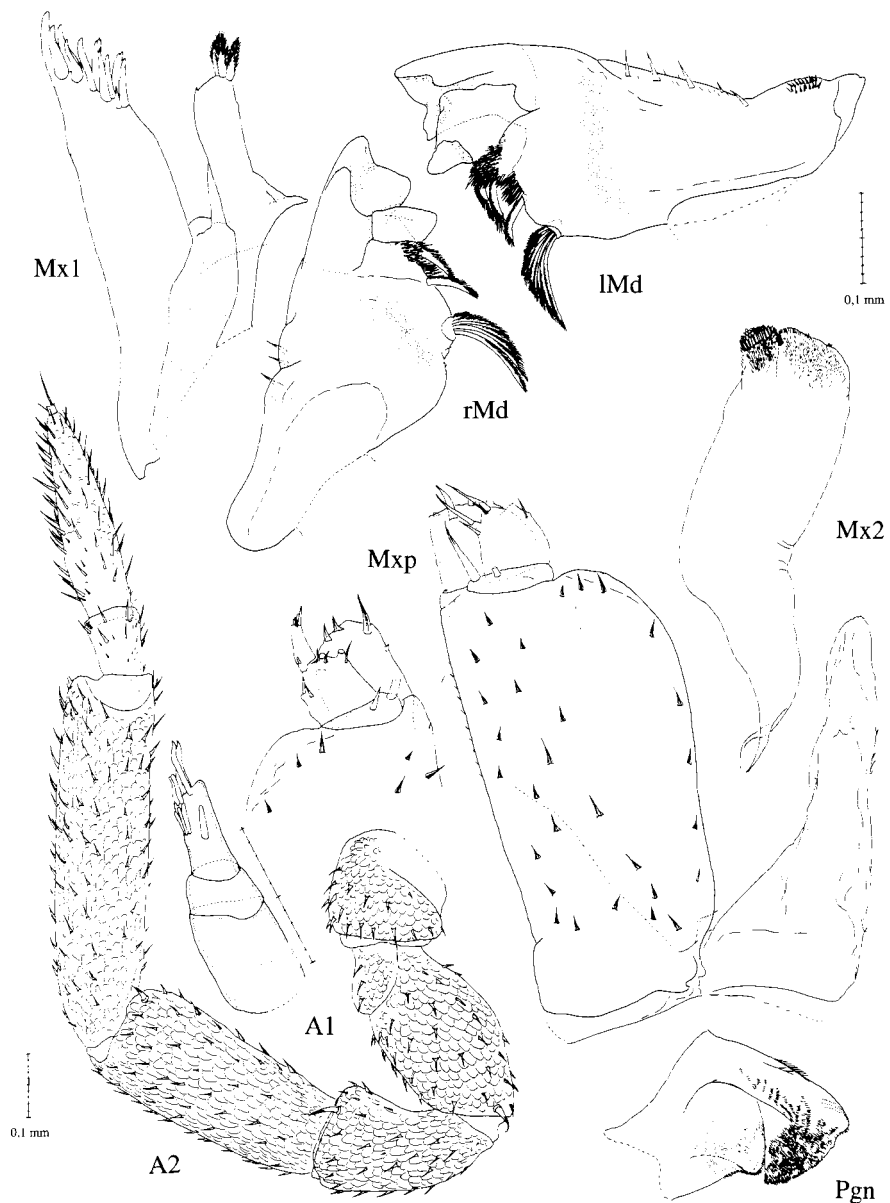


Fig. 3: Male (2,3 mm wide; SMNS 15515), antenna 2 and mouthparts (the scale-bar in the lower left corner refers only to antenna 2); male (2,4 mm wide; SMNS 15515); antenna 1.

held by these. The situation in which the type material was collected is not known. (2) Females with marsupium were found in November and October, but more females did not have a marsupium. (3) One sample contained the remains of one specimen that was killed by a parasitoid fly larva (Diptera, Rhinophoridae), as could be concluded from the presence of an empty puparium inside the isopod exoskeleton.

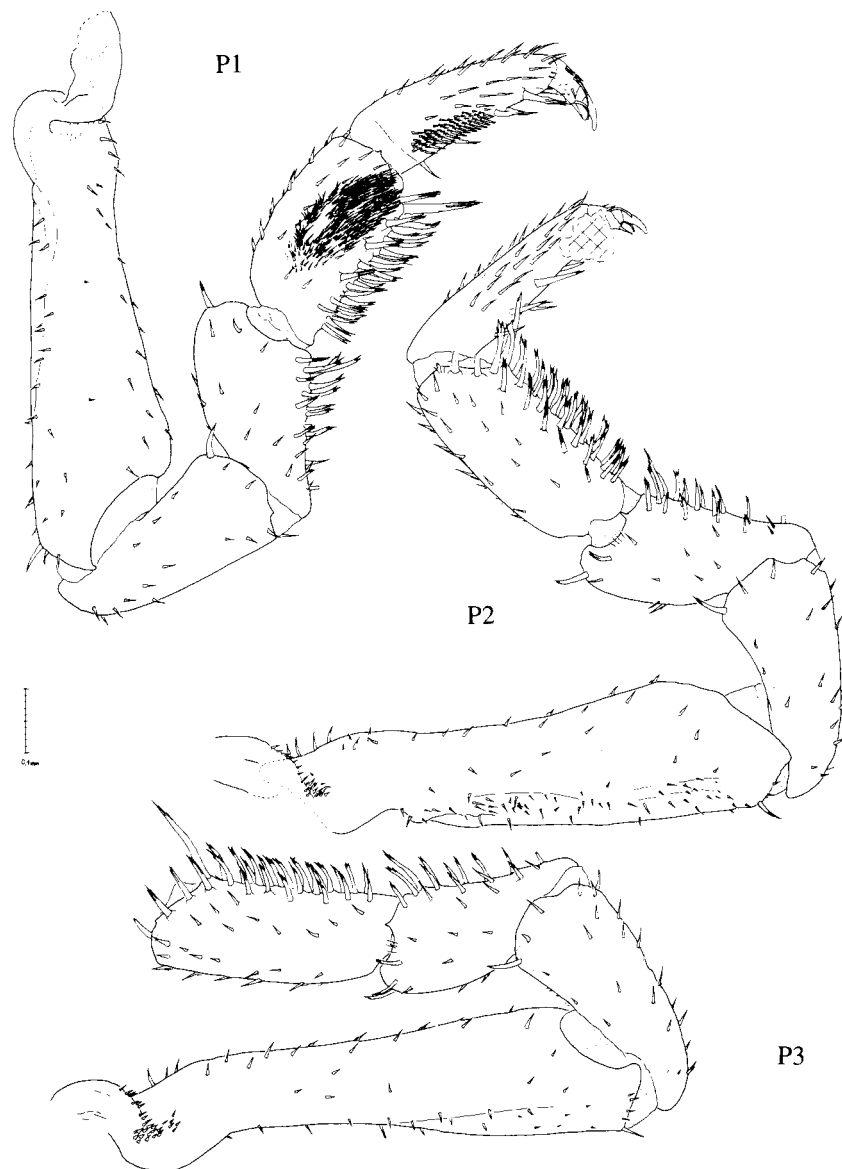


Fig. 4: Male (2,3 mm wide; SMNS 15515), pereopods 1–3, frontal view.

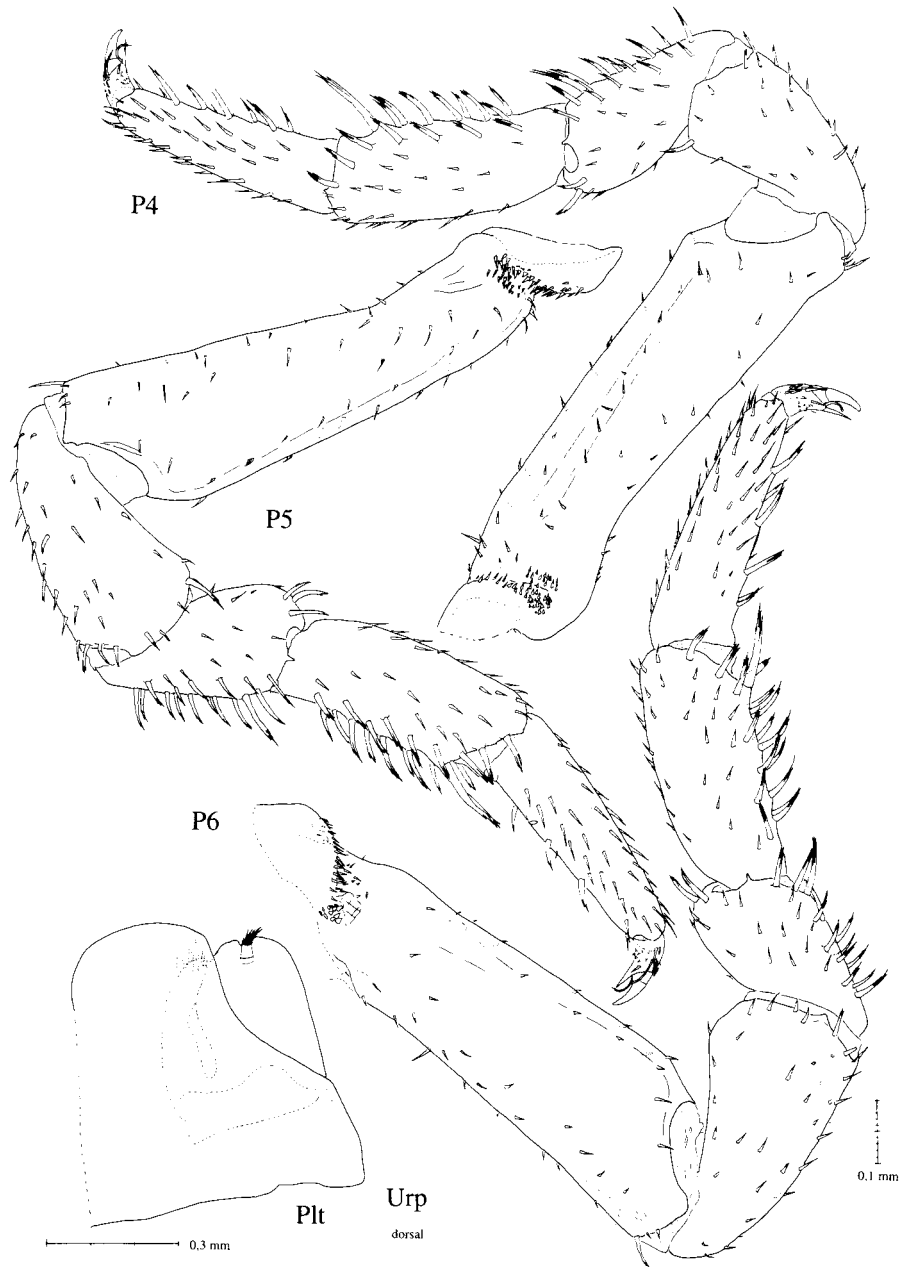


Fig. 5: Male (2,3 mm wide; SMNS 15515), pereopods 4–6, frontal view, telson and uropod, dorsal.

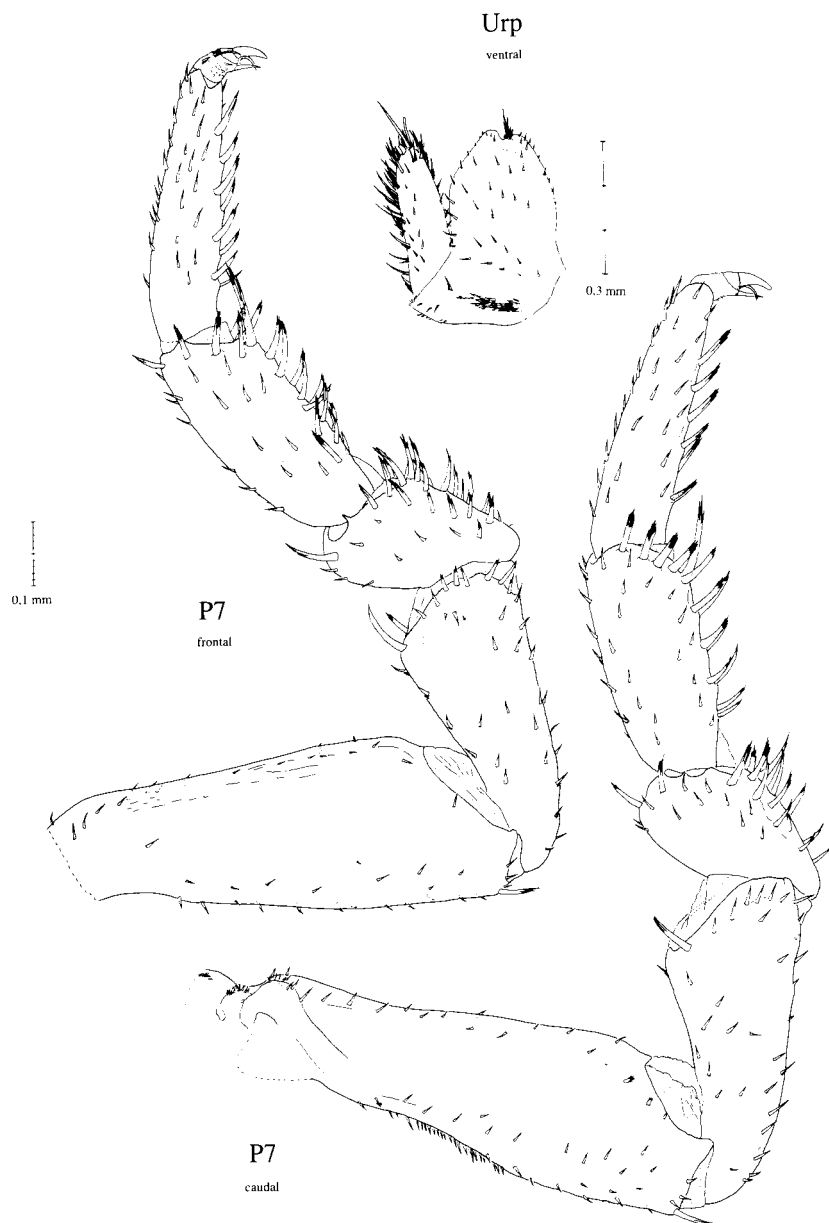


Fig. 6: Male (2,3 mm wide; SMNS 15515), pereopod 7, frontal and caudal view, uropod, ventral.

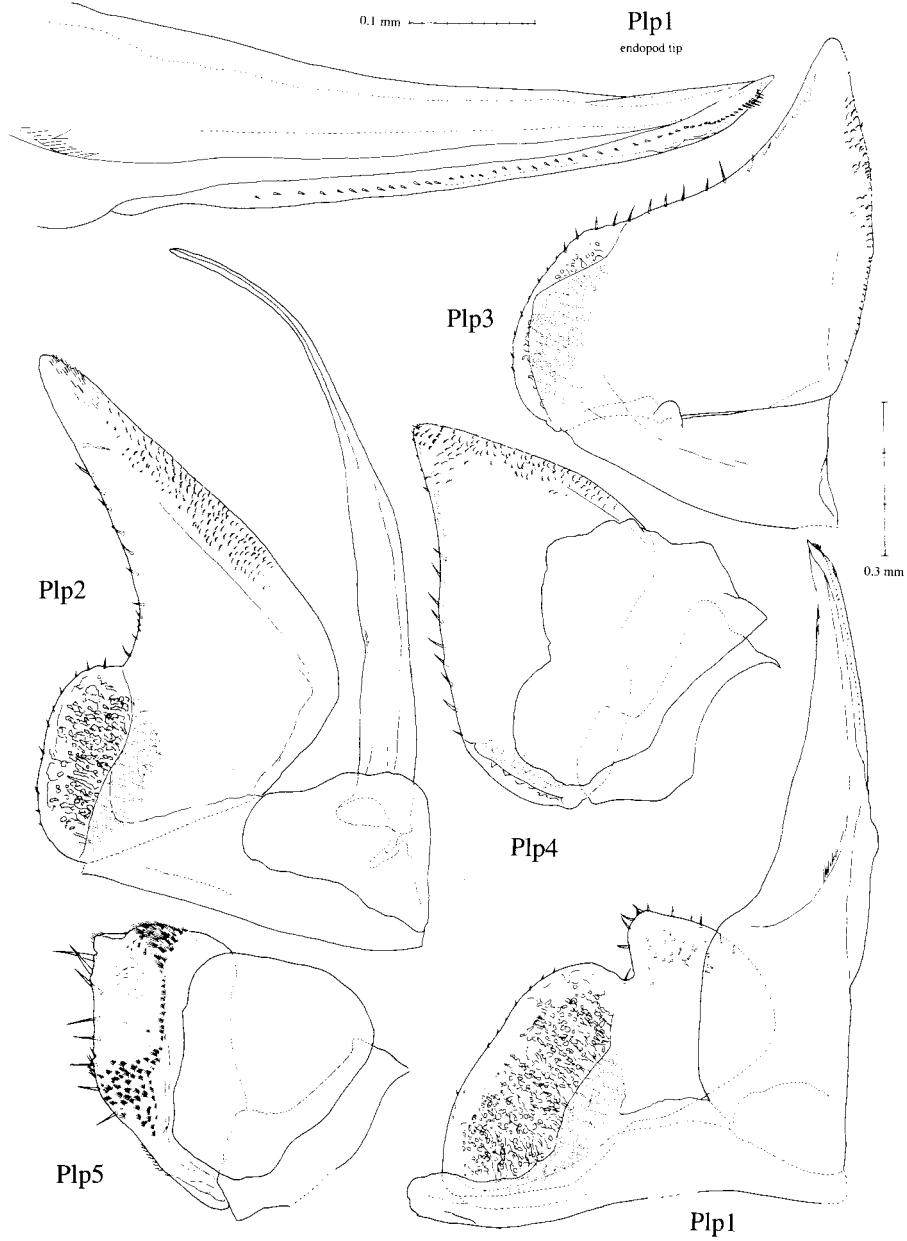


Fig. 7: Male (2,3 mm wide; SMNS 15515), pleopods 1–5, dorsal view.

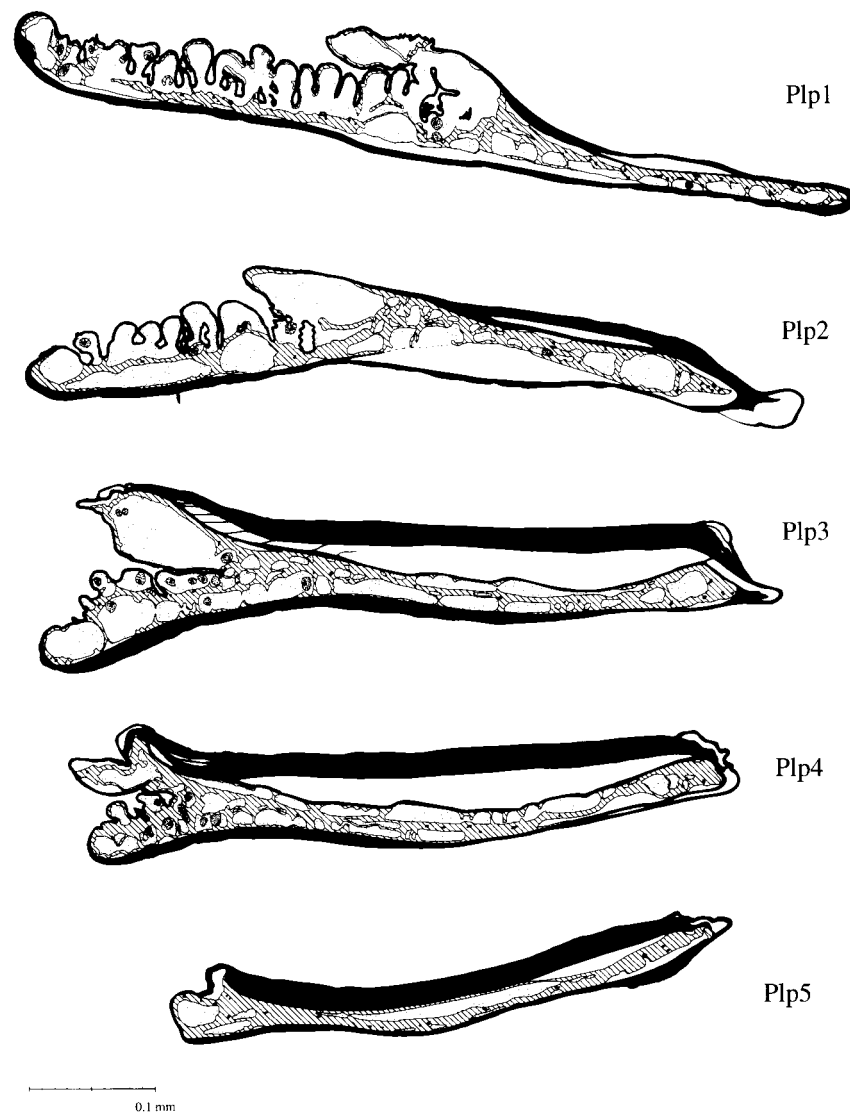


Fig. 8: Male (2,4 mm wide; *87; ZFMK), pleopods 1–5, transverse sections (drawn at a level where the lungs have maximum extension at each exopodite; “transverse” refers to the longitudinal axis of the animal). Black = cuticle; light stippled = hemolymph; dark stippled = hemolymph cells; white = outside medium including air tubules (some gaps caused by fixation are also left white), stippled = tissue.

Affinities

The presence of a sulcus arcuatus on coxal plate 1 and the shape of the uropods indicate that the species described above is included in the Eubelidae. Arcangeli (1950) described the respiratory structures of the pleopod exopodites 1–3 as belonging to the *Trachelipus*-type, or more precisely, as similar to those of *Oniscus*; the exopodites 4 and 5 showed only traces of respiratory structures. Arcangeli (1952) referred to “3 pairs of *Trachelipus*-type respiratory organs” while Ferrara, Paoli &

Taiti (1991) ascribed "5 pairs of *Oniscus*-type lungs" to the same species. Actually the present specimens have '*Trachelipus*-type' lungs on all 5 pairs of pleopod exopodites, the fifth pair vestigial. Within the Eubelidae, they could belong to the genera *Benechinus*, *Gelsana*, *Mesarmadillo* or *Periscyphops*, according to the review of Ferrara, Paoli & Taiti (1991). *Benechinus* can be excluded because of its strongly developed surface sculpture. Of the remaining three genera only *Gelsana* Budde-

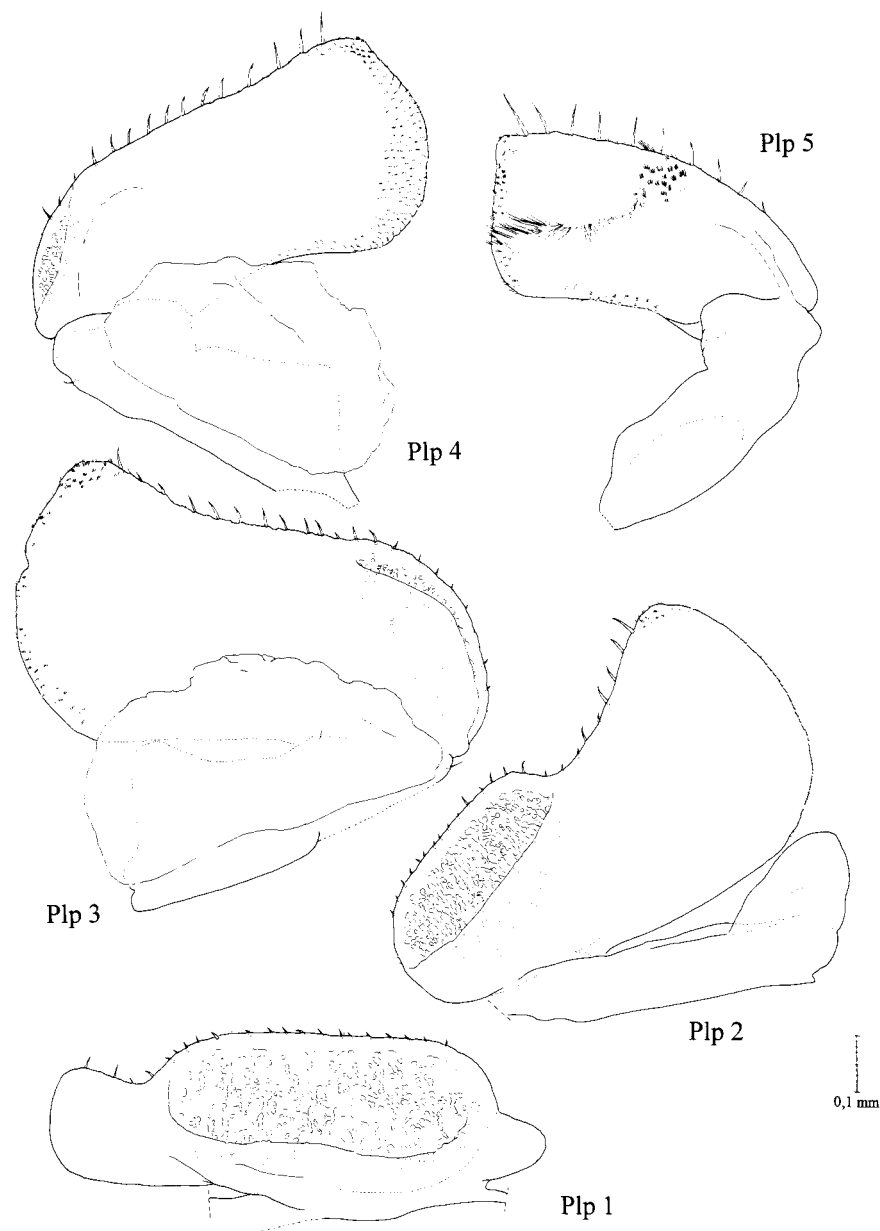


Fig. 9: Female (5,8 x 2,5 mm; *87; ZFMK), pleopods 1–5, dorsal view.

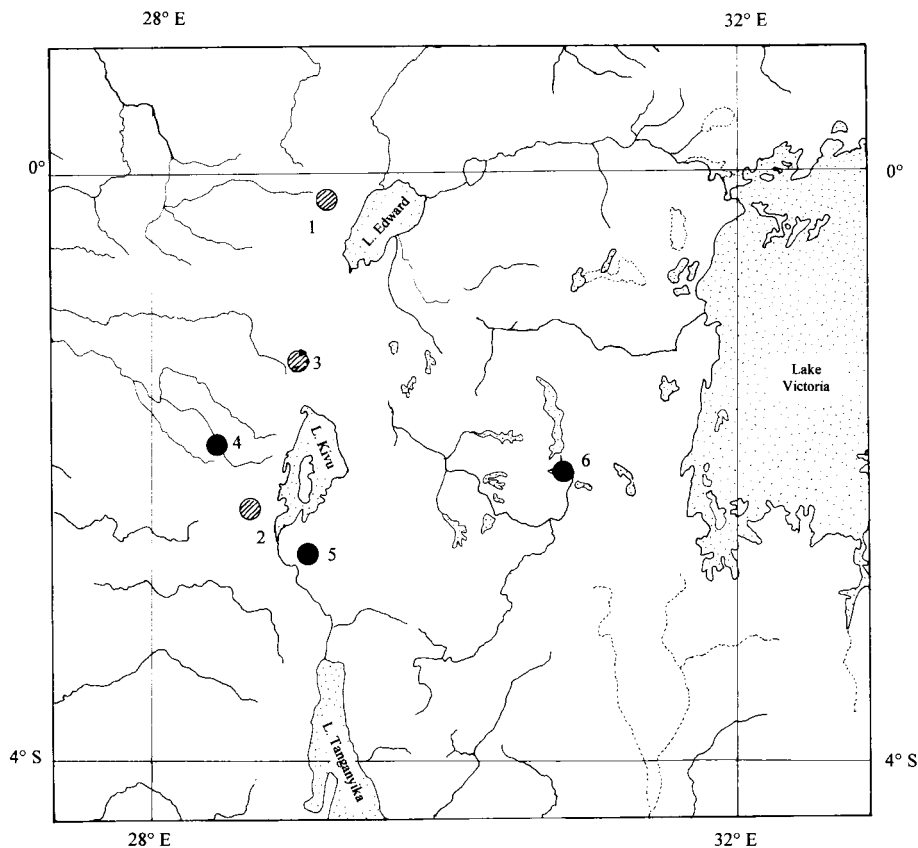


Fig. 10: Known distribution of *Atracheodillo marmorivagus*. — Congo: 1 Lubero, 2 Tshibinda, 3 Lac Mokoto, 4 Irangi; Rwanda: 5 Cyamudongo, 6 Ibanda Makera.

Lund, 1910 has a 2-articulate flagellum of the second antennae, but this is a non-conglobating species. Reexamination of the syntypes of *Gelsana abnormis* Budde-Lund, 1910 further showed that it does not have five pairs of 'Trachelipus-type' lungs. On the exopodite 1 there is a lung that might be partially covered (this cannot be confirmed due to the bad condition of the specimen), on the remaining exopodites only vestiges of respiratory structures are present.

The inner endite of the first maxilla has 3 penicils, which is apomorphic in respect to the groundpattern of the Eubelidae.

One presumptive autapomorphy of the species is the arboricolous life. The only other arboricolous species of the Eubelidae is *Panningillo schultzei* Verhoeff, 1942. The latter is probably more closely related to other genera by the presence of 'Porcellio-type' lungs.

Further on it might be taken into consideration that partly covered respiratory fields or *Trachelipus*-type lungs were present in the groundpattern of Eubelidae.

Acknowledgements

I thank Dr. Thomas Wagner (Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn), who collected the new specimens. I am also indebted to Dr. Franco Ferrara for information on the specimens of *Atracheodillo marmorivagus*, to Dr. R. Jocqué for the loan of the type specimens kept in the MRAC, and to Prof. J. W. Wägele and Andreas Leistikow for comments on the manuscript.

Zusammenfassung

Atracheodillo marmorivagus Arcangeli, 1950 aus dem Kongo wird auf der Basis des Typenmaterials und neuer Exemplare aus Ruanda wiederbeschrieben und ein Lectotypus festgelegt.

Literature

- Arcangeli, A. (1950): Isopodi terrestri. — Exploration du Parc National Albert Mission H. Damas (1935–1936) 15: 1–80 + pls 1–121.
- Arcangeli, A. (1952): Le caratteristiche della famiglia Eubelidae. — Boll. Ist. Mus. Zool. Univ. Torino 3 (4): 61–80.
- Budde-Lund, G. (1910): Isopoda. — In: Sjöstedt B. Y., Ed.: Wissenschaftliche Ergebnisse der Schwedischen Zoologischen Expedition nach dem Kilimanjaro, dem Meru und den umgebenden Massai-Steppen Deutsch-Ostafrikas 1905–1906 unter der Leitung von Y. Sjöstedt. Herausgegeben mit Unterstützung von der Königlichen Schwedischen Akademie der Wissenschaften (Stockholm), 3 (21): 3–20 + 2 pls.
- Ferrara, F., P. Paoli & S. Taiti (1991): Morphology of the pleopodal lungs in the Eubelidae (Crustacea, Oniscidea). — pp. 9–16 in: Biology of Terrestrial Isopods III (Third International Symposium on the Biology of Terrestrial Isopoda 1990), (P. Juchault & J. P. Mocquard, eds.), Université de Poitiers, France.
- Ferrara, F. & H. Schmalfuss (1976): Terrestrial isopods from West Africa. Part 1. Family "Eubelidae" Budde-Lund, 1899. — Monitore zool. ital. (N.S.) Suppl. 7: 1–114.
- Ferrara, F. & H. Schmalfuss (1985): Terrestrial Isopods from West Africa. Part 4: Addenda and conclusions. — Monitore zool. ital. (N.S.) Suppl. 20: 55–120.
- Lincoln, R. J. & J. P. Ellis (1974): Catalogue of the types of terrestrial isopods (Oniscoidea) in the collections of the British Museum (Natural History) I. Superfamily Pseudotracheata. — Bull. Br. Mus. nat. Hist. (Zool.) 27: 189–246.
- Taiti, S., F. Ferrara & H. Schmalfuss (1991): Evolution and biogeography of the family Eubelidae (Crustacea, Oniscidea). — pp. 23–30 in: Biology of Terrestrial Isopods III (Third International Symposium on the Biology of Terrestrial Isopoda 1990), (P. Juchault & J. P. Mocquard, eds.), Université de Poitiers, France.
- Verhoeff, K. W. (1942): Äthiopische Isopoda terrestria des Hamburger Zoologischen Museums II. — Zool. Anz. 140 (5/6): 61–87.

Christian Schmidt, Ruhr-Universität Bochum, Fakultät für Biologie, LS Spezielle Zoologie, Gebäude NDEF 05, D-44780 Bochum, e-mail: Christian.Schmidt-2@ruhr-uni-bochum.de