



Designation of *Pseudobiotus kathmanae* Nelson, Marley & Bertolani, 1999 as the type species for the genus *Pseudobiotus* Nelson, 1980 (Tardigrada)

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Abstract

The contents of the application to the International Commission of Zoological Nomenclature, case 3017, are presented with an explanation of how its publication fell between the third and fourth editions of the Code. In so doing, the genus *Pseudobiotus* Nelson, 1980 (*In*: Schuster, Nelson, Grigarick & Christenberry, 1980) was left without a type species, which is hereby designated under article 70 of the fourth edition of the code.

Key words: nomenclature, taxonomy, *Thulinia*, *Thulinus*, *Pseudobiotus*, Tardigrada, ICZN

Introduction

In June 1996 the secretariat for the International Commission on Zoological Nomenclature (ICZN) acknowledged the receipt of an application, designated as case 3017, Anon., 1996. Under Article 80 of the third edition of the Code (ICZN, 1985), existing usage was to be maintained until a ruling of the Commission was published. The aim of this application was to ask the Commission to designate a new type species for *Pseudobiotus* Nelson, 1980 (*In*: Schuster, Nelson, Grigarick & Christenberry, 1980), following the discovery of the misidentification of the original type. The full publication of case 3017 was then delayed until the relevant papers to the application were all published, Nelson *et al.* (1999) and Bertolani *et al.* (1999). Additionally the case was then held pending the publication of the fourth edition of the Code because of relevant changes to Article 70. The fourth edition of the Code (ICZN, 1999) came into effect on 01 January 2000. Case 3017 then became unnecessary for the Commission to see and was left unpublished and without an Opinion from the Commission, and this resulted in *Pseudobiotus* having no designated type species. To rectify this situation the details of case 3017 are briefly presented here with a newly designated type species for the genus.

Taxonomic account

The nominal species *Macrobotus augusti* Murray, 1907 was established for specimens from Scotland (Murray, 1907: 660, Pl. IV, figs. 25a–d) [See Fig. 1]. Subsequently this nominal species was redescribed and/or transferred to a number of other taxa during various revisions of the phylum Tardigrada.

Marcus (1928: 194, fig. 239) transferred *M. augusti* to the genus *Hypsibius*. Thulin (1928: 239–240) described a new genus, *Isohypsibius*, with the type species *Isohypsibius prosostomus* Thulin, 1928 in the

"*Hypsibius*-group" within the family Macrobiotidae. He also transferred *Hypsibius augusti* into this new genus as *Isohypsibius augusti* (Thulin, 1928: 252–253) and placed it into one of three "*Isohypsibius* groups" (the "*annulatus* group"). In addition he described *Isohypsibius megalonyx* Thulin, 1928 in the "*annulatus* group" (Thulin 1928: 252).

Although Marcus (1936: 256–259, fig. 252) did not recognise the generic status of Thulin's *Isohypsibius* but considered *Isohypsibius* to be a subgenus of *Hypsibius*, he still recognised *I. augusti* to be in the "*annulatus* group" [i.e., *Hypsibius (Isohypsibius) augusti*]. In his re-description of the species, Marcus added characters from his specimens, which were not the same species as the original type material. Probably also for this reason he erroneously synonymized *H. (I.) megalonyx* with *H. (I.) augusti*, considering *H. (I.) megalonyx* to be only a "form" of *H. (I.) augusti*. The synonymy was maintained in the monographs of Ramazzotti (1962: 250–251, fig. 56) and Ramazzotti (1972: 480–481, fig. 267).

Van der Land (1966: 310, 312–314, table V, figs. 8–13) [See Fig. 2] re-examined Murray's original material and designated a lectotype of the nominal species *M. augusti* as *Hypsibius (Isohypsibius) augusti*. A few years later, Pilato (1969: 186) re-instated *Isohypsibius* as a genus, and this status was later supported by Schuster *et al.* (1980: 297–298) and Ramazzotti and Maucci (1983: 145).

Bertolani (1976) collected specimens from an Italian stream and redescribed *Isohypsibius augusti* [See Fig. 3] and *I. megalonyx* as separate species, discounting Marcus's synonym (Marcus, 1936). However, Bertolani was not aware of Van der Land's (1966) designated lectotype in the Royal Museum, National Museums of Scotland, Edinburgh. Specimens referred to as *Isohypsibius augusti* by Bertolani (1976) corresponded with the descriptions by Marcus (1936) and Ramazzotti (1972), but they were not the same species as that originally described as *M. augusti* by Murray (1907) from Scotland. This was not discovered until when the lectotype was re-examined (Bertolani *et al.*, 1999). The drawings and descriptions in Bertolani (1976) [Fig. 3] had been previously used to identify specimens from the Ocoee River, Tennessee, USA, (see Kathman & Nelson, 1987), which were the basis for the description of the new genus *Pseudobiotus* by Nelson (Schuster *et al.*, 1980) [See Fig. 4]. They were also used by Bertolani (1982: 47–51, fig. 26–27) and in the monograph by Ramazzotti and Maucci (1983: 899–901, fig. 608 for *Pseudobiotus augusti*; 901–904, fig. 611 for *Pseudobiotus megalonyx*). Van der Land's (1966) lectotype was also unknown to Schuster *et al.* (1980).

Bertolani's specimens (originally reported as *I. augusti*) from the stream Tiepido, near Torre Maina in the province of Modena, Italy, and Nelson's specimens (cited as *Pseudobiotus augusti* in Kathman & Nelson, 1987) collected from the Ocoee River, Tennessee, USA, have been re-examined and are definitely the same species (Bertolani *et al.*, 1999; Nelson *et al.*, 1999). These specimens represented a species new to science, *Pseudobiotus kathmanae* Nelson, Marley & Bertolani, 1999 [See Fig. 5].

The genus *Thulinia* Bertolani, 1981 was established with the type species *Thulinia stephaniae* (Pilato, 1974) and the description of a new species, *Thulinia ruffoi* Bertolani, 1981. Originally *T. stephaniae* was described as *Isohypsibius stephaniae* Pilato, 1974 and then transferred erroneously to *Pseudobiotus* (Schuster *et al.*, 1980).

Bertolani *et al.* (1999) transferred the nominal species *Macrobiotus augusti* to *Thulinia* (i.e., *Thulinia augusti* comb. nov.), thereby removing it from the genus *Pseudobiotus* and eliminating the designated type species for the genus *Pseudobiotus*. Both Bertolani *et al.* (1999) and Nelson *et al.* (1999) were accepted for publication prior to the completion and implementation of the fourth edition of the Code. Therefore no designation of a new type species could be made by these authors at that time.

The name *Thulinia* used by Bertolani (1981) for his new genus was then found to have been used by Gibson & Bray (1979) for a genus of Trematoda. Consequently the name was unavailable for Bertolani's taxon. To correct this situation, Bertolani (2003) amended the genus name for the Tardigrada to *Thulininus*. The species are now known as *Thulininus ruffoi*, *Thulininus stephaniae* and *Thulininus augusti* (see Bertolani, 2003). Additionally a fourth species, *Thulininus itoi* (Tsurusaki, 1980) was transferred from the genus *Isohypsibius* (see Kaczmarek and Michalczyk, 2006).

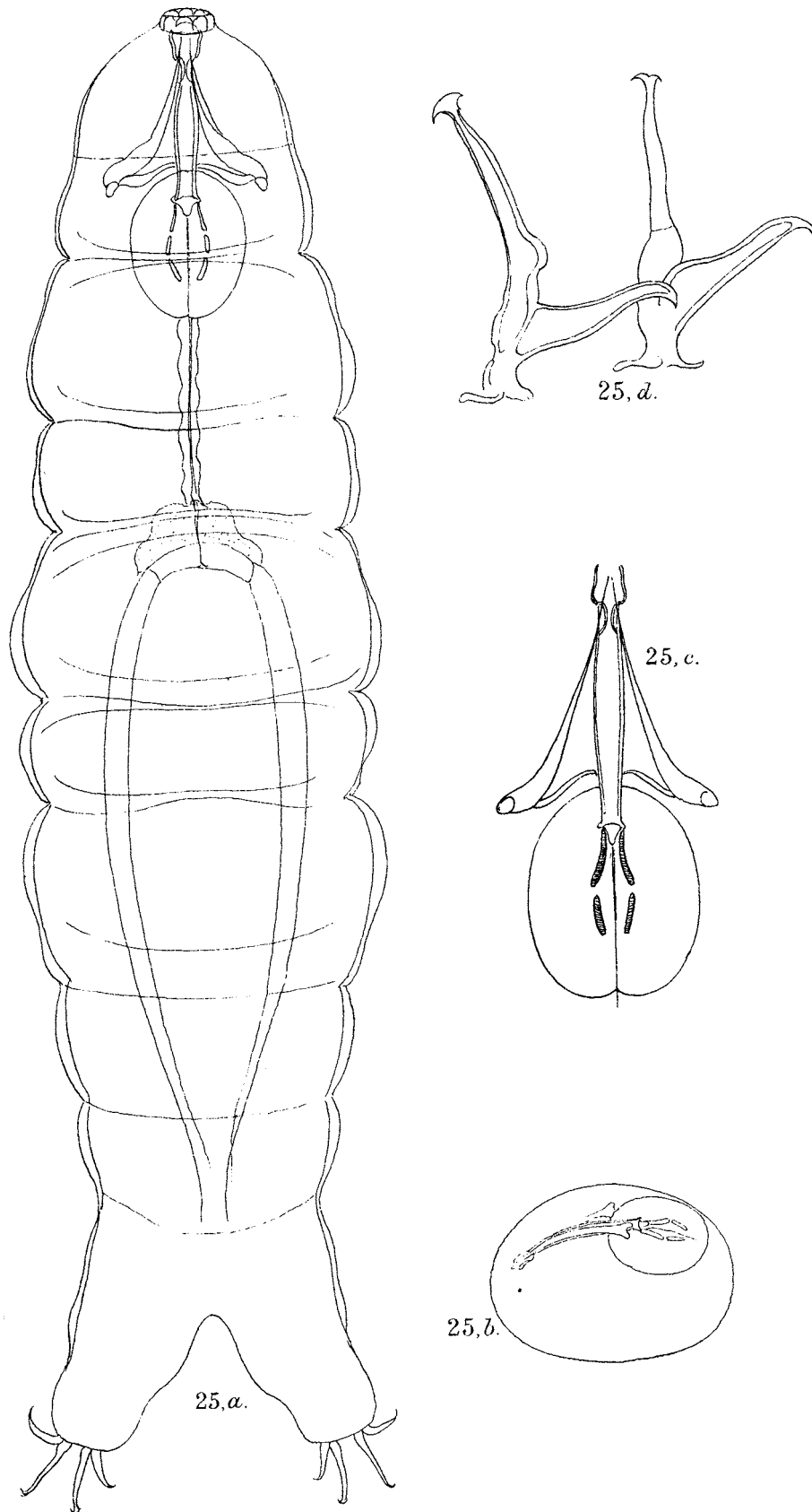


FIGURE 1. *Macrobotus augusti* Murray, 1907, as illustrated in the original description. [25a) *M. augusti*, **sp. n.**, 25b) *M. augusti* egg, 25c) *M. augusti* pharynx of young in the egg, 25d) *M. augusti* claws. Reproduced by permission of the Royal Society of Edinburgh from *Transactions of the Royal Society of Edinburgh*, volume 45 (1907), pp. 641–668.]

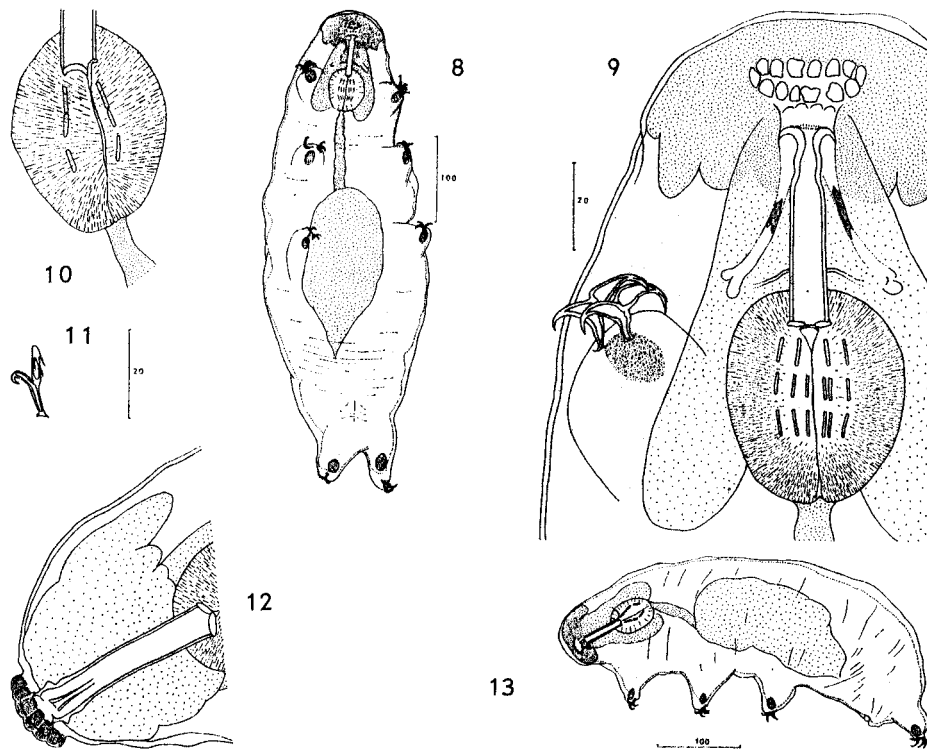


FIGURE 2. *Hypsibius augusti* (Murray), as illustrated in Land, van der. (1966), when the lectotype was designated. [8–13. – *Hypsibius augusti*. (8) ventral view (lectotype, slide no. 172); (9) head region, ventral (lectotype, slide no. 172); (10) bulbous (paralectotype 8, slide no. 173); (11) claw; (12) head, lateral (paralectotype 8, slide 173); (13) lateral view (paralectotype 6, slide no. 172). Reproduced by permission of the Royal Society of Edinburgh from *Proceedings of the Royal Society of Edinburgh, Section B (Biology)*, volume 69 (1966), pp. 298–320.]

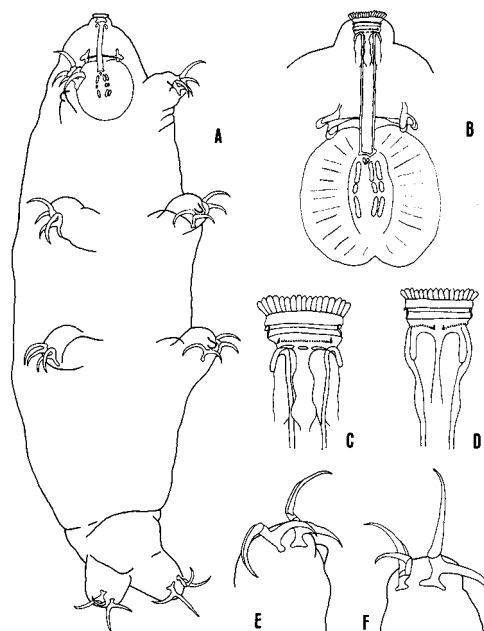


FIGURE 3. *Isohypsibius augusti* (Murray), as illustrated in Bertolani, R., (1976) based on specimens from Italy. [Fig. 1 – *Isohypsibius augusti* (Murray, 1907). A: animal in toto; B: buccal-pharyngeal apparatus; C: dorsal view of buccal armature; D: lateral view of buccal armature; E: doubleclaws of leg pair 1; F: doubleclaws of leg pair 4. Reproduced by permission of the Italian Journal of Zoology from *Bollettino di Zoologia*, 43, pp. 221–234.]

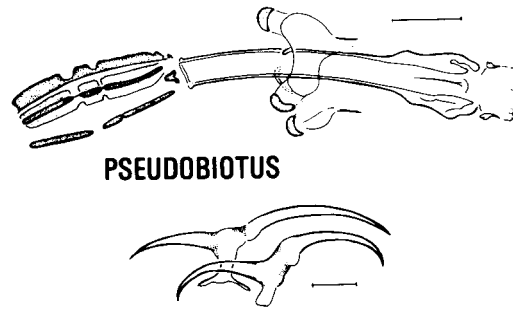


FIGURE 4. Buccal-pharyngeal apparatus and claws of *Pseudobiotus* as illustrated in Schuster *et al.* (1980), (when the genus was described based on specimens from Tennessee, USA). [Figure 25. Buccal-pharyngeal apparatus and claws of *Pseudobiotus*. Reproduced by permission of Wiley-Blackwell from *Transactions of the American Microscopical Society*, volume 99, pp. 284–303.]

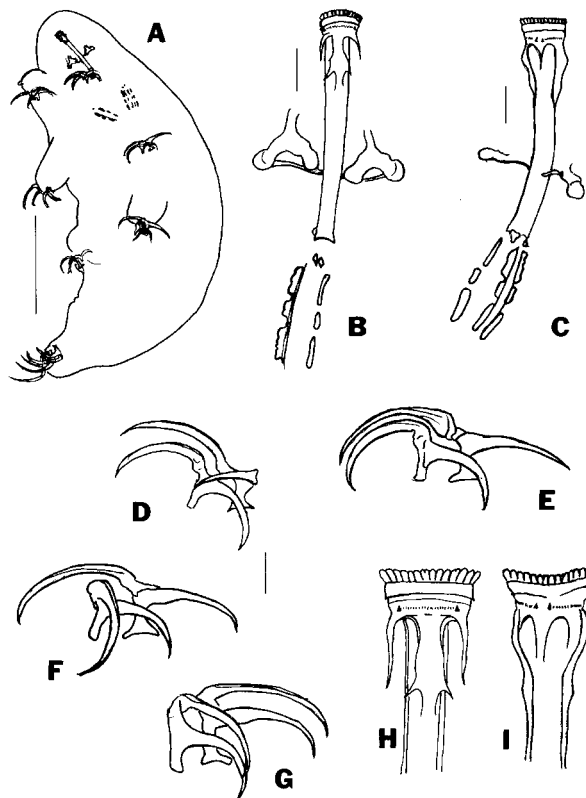


FIGURE 5. *Pseudobiotus kathmanae* Nelson *et al.* (1999) as illustrated in the original description. [Fig. 1. A–I. Illustrations of *Pseudobiotus kathmanae* sp. n. Reproduced by permission of Elsevier Limited from *Zoologischer Anzeiger*, 238, pp. 139–145.]

McInnes (1994) cited 63 references for *Pseudobiotus augusti* (Murray, 1907), which are actually references for a combination of *M. augusti*, *H. augusti*, *I. augusti*, *H. (I.) augusti* and *P. augusti*. She named it (*P. augusti*) as one of 22 eutardigrade species with a cosmopolitan distribution. Many of these references only cite the name of the species or have inadequate descriptions or figures; therefore it is not possible to determine whether the specimens reported in the literature actually belong to *T. augusti* or *P. kathmanae* or another similar species.

Isohypsibius megalonyx was transferred to the genus *Pseudobiotus* by Schuster *et al.* (1980). Clearly the

specimens described by Bertolani (1976) as *I. megalonyx* and as *P. megalonyx* (Bertolani, 1982) are a species of *Pseudobiotus*. Although Bertolani identified the species from Italy based on the drawings of von Wenck (1914), type material is not available and the status of *megalonyx* (*sensu* Thulin) remains somewhat uncertain. Therefore, *P. megalonyx* was not recommended as the designated type species of *Pseudobiotus* (Nelson *et al.*, 1999).

The best described species of *Pseudobiotus*, *P. kathmanae*, was based on the original material used to determine the generic characters reported by Schuster *et al.* (1980). Therefore it is clear that this species should become the designated type species for the genus.

To date the genus *Pseudobiotus* contains the following species, *P. kathmanae*, *P. matici* (Pilato, 1971), *P. megalonyx*, *P. spinifer* (Chang, Kaczmarek, Lee & Michalczyk, 2007) and *P. vladimiri* (Biserov, Dudichev & Biserova, 2001). A key to all of these species is present in Chang *et al.* (2007).

Conclusion

Under Article 70.3.2 of the fourth edition of the Code of Zoological Nomenclature, *Pseudobiotus kathmanae* Nelson, Marley & Bertolani, 1999 is hereby designated as the type species for *Pseudobiotus* Nelson, 1980 (*In*: Schuster, Nelson, Grigarick & Christenberry, 1980).

The Commission is asked to place on the Official List of Generic Names in Zoology the name *Pseudobiotus* Nelson, 1980 (*In*: Schuster, Nelson, Grigarick & Christenberry, 1980); gender masculine; type species by designation under Article 70.3.2 above, *Pseudobiotus kathmanae* Nelson, Marley & Bertolani, 1999.

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