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A clarification for the subgenera of *Paramacrobiotus* Guidetti, Schill, Bertolani, Dandekar and Wolf, 2009, with respect to the International Code of Zoological Nomenclature

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The recent re-description of *Paramacrobiotus* Guidetti, Schill, Bertolani, Dandekar and Wolf, 2009 has inadvertently led to the description of an objective synonym within its subgenera nominal taxa. To resolve this issue, we have re-described both subgenera, and proposed a new substitute name for one subgenus, in line with the International Code of Zoological Nomenclature. Additionally we have confirmed the placement of two recently published *Paramacrobiotus* species, not included in the last revision, within the respective subgenera established herein.

The nominal taxa *Macrobiotus areolatus* Murray, 1907 and *Macrobiotus richtersi* Murray, 1911 were, along with 18 other nominal taxa, transferred to a newly described genus, *Paramacrobiotus* Guidetti, Schill, Bertolani, Dandekar and Wolf, 2009. Two other taxa were either conditionally transferred or transferred with a designation of *species dubium* (Guidetti *et al.* 2009).

Paramacrobiotus was described as follows: “Diagnosis. Macrobiotids with Y-type claws, cuticle smooth and without pores; mouth ring with ten evident peribuccal lamellae; buccal armature showing ventrally and dorsally a posterior crown of strong triangular or bicuspidal teeth followed (at least dorsally) by three robust transverse crests; large buccal tube; three clearly rod-shaped and elongated macroplacoids; microplacoid clearly distant (more than its length) from the third macroplacoid, or absent; eggs with large and (under light microscope) reticulate processes; very long and thin spermatozoa, with head longer than the tail. Type species: *Macrobiotus richtersi* Murray, 1911 (Guidetti *et al.* 2009).” More recently, Kaczmarek *et al.* (2017) have re-examined a wide range of specimens and species from this genus, analyzing a range of morphological characters of the buccal apparatus, claws, and sculptured eggs, resulting in two groupings of taxa based primarily on the presence/ absence of the microplacoid.

Whilst the analysis was correct and two groups of nominal taxa were designated as subgenera, the final designation and description of these new taxa did not adhere to the ICZN Code. Namely, the designation of two new subgenera failed to acknowledge and apply the Principle of Coordination, Article 43 (ICZN 1999) and more specifically Article 43.1, the “Statement of the Principle of Coordination” applied to genus-group names. This clause states that “a name established for a taxon at either rank in the genus group is deemed to have been simultaneously established by the same author[s] for a nominal taxon at the other rank in the group; both nominal taxa have the same type species, whether it was fixed originally [as in this case] or subsequently”. Consequently, the subgenus *Paramacrobiotus* (*Paramacrobiotus*) *sensu* Guidetti *et al.* (2009) already existed and is therefore a senior objective synonym, see ICZN (1999, Article 61.3.3).

Additionally, Article 44 on Nominotypical Taxa is also applicable. Article 44.1 states “When a genus is considered to contain subgenera, the subgenus that contains the type species of the nominal genus is denoted by the same name as the genus, with the same author and date [Art. 43.1]; this subgenus is termed the nominotypical subgenus”, (ICZN 1999),

which specifically in this case refers to *Paramacrobotus* (*Paramacrobotus*) *sensu* Guidetti *et al.* (2009). Consequently, the nominal subgenus taxon was not available to be re-used by Kaczmarek *et al.* (2017).

To correct this situation, and in accordance with the International Code of Zoological Nomenclature, we propose to reinstate the nominotypical taxon *Paramacrobotus* (*Paramacrobotus*) *sensu* Guidetti *et al.* (2009), with the taxonomic description amended from *Microplacoidus sensu* Kaczmarek *et al.* (2017), and then designate a substitute name for the second subgenus in accordance with the Code.

Moreover, according to Article “51.3.2. The use of parentheses enclosing the name of the author and the date is not affected by the presence of a subgeneric name, by transfer to a different subgenus within the same genus, by a change of rank within the species group, or by transfer of a subspecies to a different species within the same genus”, (ICZN 1999). For this reason the following species names have to be corrected: *Paramacrobotus fairbanksi* Schill, Förster, Dandekar & Wolf, 2010, *P. intii* Kaczmarek, Cytan, Zawierucha, Diduszko & Michalczyk, 2014, *P. kenianus* Schill, Förster, Dandekar & Wolf, 2010, *P. klymenki* Pilato, Kiosya, Lisi & Sabella, 2012, *P. palaui* Schill, Förster, Dandekar & Wolf, 2010 and *P. pius* Lisi, Binda & Pilato, 2016 as they were mistakenly accompanied with parentheses in Kaczmarek *et al.* (2017).

According to the revision by Kaczmarek *et al.* (2017), the genus *Paramacrobotus* comprised 36 species, but just after its publication two new *Paramacrobotus* species were described without their inclusion in any of mentioned subgenera. This prevents an update of “Actual checklist of Tardigrada species” (Degma *et al.* 2009–2017) since only published taxonomical acts can be acknowledged by the checklist’s authors. In order to fill this gap we examined also a type series of *Paramacrobotus lachowskiae* Stec, Roszkowska, Kaczmarek & Michalczyk, 2018 and studied the original description of *Paramacrobotus sagani* Daza, Caicedo, Lisi, & Quiroga, 2017. We confirm the placement of these two taxa into respective subgenera established herein.

Taxonomic Account

Phylum Tardigrada Doyère, 1840

Class Eutardigrada Richters, 1926

Order Parachela Schuster, Nelson, Grigarick and Christenberry, 1980

Superfamily Macrobotoidea Thulin, 1928 in Sands *et al.* 2008, Marley *et al.* 2011

Family Macrobotidae Thulin, 1928

Genus *Paramacrobotus* Guidetti, Schill, Bertolani, Dandekar and Wolf, 2009

Type species. *Paramacrobotus richtersi* (Murray, 1911).

Diagnosis (according to Kaczmarek *et al.* 2017, amended): Most characters as described by Guidetti *et al.* (2009, p. 319) and additionally: oral cavity armature (OCA) of *harmsworthi* type (*sensu* Michalczyk and Kaczmarek 2003), almost always comprising three bands of teeth (except for three species in which the first band of teeth is not visible under light microscopy or for *P. richtersi* and *P. areolatus* in which the OCA is unknown but probably present; see Kaczmarek *et al.* 2017, Table 2–3). Buccal tube with ventral lamina. Macroplacoid configuration: 2<1<3. Lunules under claws present. Egg types: *areolatus*, *beotiae*, *chierегоi*, *csotiensis*, *huziori*, *richtersi*, *submorulatus* and *tonollii*.

Subgenus *Paramacrobotus* Guidetti, Schill, Bertolani, Dandekar and Wolf, 2009

Type species: *Paramacrobotus richtersi* (Murray, 1911).

Diagnosis (according to Kaczmarek *et al.* 2017, see subgenus *Microplacoidus*): Pharynx with microplacoid that has two lateral “wings”. The other characters as in the genus *Paramacrobotus*.

Composition: *P. (P.) alekseevi* (Tumanov, 2005) comb. nov., *P. (P.) beotiae* (Durante Pasa and Maucci, 1979) comb. nov., *P. (P.) chierегоi* (Maucci and Durante Pasa, 1980) comb. nov., *P. (P.) corgatensis* (Pilato, Binda and Lisi, 2002) comb. nov., *P. (P.) danielae* (Pilato, Binda, Napolitano and Moncada, 2001) comb. nov., *P. (P.) danielisae* (Pilato, Binda and Lisi, 2006a) comb. nov., *P. (P.) fairbanksi* Schill, Förster, Dandekar and Wolf, 2010 comb. nov., *P. (P.) garynahi* (Kaczmarek, Michalczyk and Diduszko, 2005) comb. nov., *P. (P.) gerlachae* (Pilato, Binda and Lisi, 2004) comb. nov., *P. (P.) halei* (Bartels, Pilato, Lisi and Nelson, 2009) comb. nov., *P. (P.) hapukuensis* (Pilato, Binda and Lisi, 2006b) comb. nov., *P. (P.) kenianus* Schill, Förster, Dandekar and Wolf, 2010 comb. nov., *P. (P.) lorenae* (Biserov, 1996) comb. nov., *P. (P.) magdalenae* (Michalczyk and Kaczmarek, 2006a) comb. nov., *P. (P.) palaui* Schill, Förster, Dandekar and Wolf, 2010 comb. nov., *P. (P.) peteri* (Pilato, Claxton and Binda, 1989) comb. nov., *P. (P.) pius* Lisi, Binda and Pilato, 2016 comb. nov., *P. (P.) privitera* (Binda, Pilato, Moncada and Napolitano, 2001) comb. nov., *P. (P.) richtersi* (Murray, 1911) comb. nov., *P. (P.) rioplatensis* (Claps and Rossi, 1997) comb. nov., *P. (P.) sagani* Daza, Caicedo, Lisi, & Quiroga, 2017 comb. nov., *P. (P.) savai* (Binda and Pilato, 2001) comb. nov., *P. (P.) sklodowskiae* (Michalczyk, Kaczmarek and

Węglarska, 2006) comb. nov., *P. (P.) submorulatus* (Iharos, 1966b) comb. nov., *P. (P.) vanescens* (Pilato, Binda and Catanzaro, 1991) comb. nov. and *P. (P.) wauensis* (Iharos, 1973) comb. nov. (see Kaczmarek *et al.* 2017).

Subgenus *Amicrobiotus* nom. nov.

Type species: *Paramacrobotus areolatus* (Murray, 1907).

Diagnosis (according to Kaczmarek *et al.* 2017, see subgenus *Paramacrobotus*): Pharynx without microplacoid. The other characters as in the genus *Paramacrobotus*.

Etymology: *A-* prefix from Greek without, *micro-* prefix from Greek meaning small; [*Amicro*] refers to the lack of a microplacoid, with the latter sometime referred with the vernacular *micro*; *-biot* from Greek bios meaning life, *-us* for gender masculine, Lawrence (1998). *Amicrobiotus*, gender masculine.

Composition: *P. (A.) areolatus* (Murray, 1907) **comb. nov.**, *P. (A.) centesimus* (Pilato, 2000) **comb. nov.**, *P. (A.) crenatus* (Maucci, 1991) **comb. nov.**, *P. (A.) csotiensis* (Iharos, 1966a) **comb. nov.**, *P. (A.) derkai* (Degma, Michalczyk and Kaczmarek, 2008) **comb. nov.**, *P. (A.) huziori* (Michalczyk and Kaczmarek, 2006b) **comb. nov.**, *P. (A.) intii* Kaczmarek, Cytan, Zawierucha, Diduszko and Michalczyk, 2014 **comb. nov.**, *P. (A.) klymenki* Pilato, Kiosya, Lisi and Sabella, 2012 **comb. nov.**, *P. (A.) lachowskiae* Stec, Roszkowska, Kaczmarek & Michalczyk, 2018 **comb. nov.**, *P. (A.) spinosus* Kaczmarek, Gawlak, Bartels, Nelson and Roszkowska, 2017 **comb. nov.**, *P. (A.) tonollii* (Ramazzotti, 1956) **comb. nov.** and *P. (A.) walteri* (Biserov, 1997/1998) **comb. nov.** (see Kaczmarek *et al.* 2017).

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