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TAXONOMIC NOTES ON *MEGAPNOSAURUS* AND '*SYNTARSUS*' (THEROPODA: COELOPHYSIDAE)

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ABSTRACT - The genus name *Syntarsus* Raath 1969 is preoccupied by the genus *Syntarsus* Fairmaire 1869. The replacement name *Megapnosaurus* Ivie et al. 2001 was proposed but its usage is inconsistent due to both controversy on the validity of the nomenclatural act proposing *Megapnosaurus* and possible synonymy between it and *Coelophysis* Cope 1889. The nomenclatural act proposing *Megapnosaurus* is found to be valid, while synonymy between the genera *Megapnosaurus* and *Coelophysis* is considered uncertain. Therefore, the names *Megapnosaurus rhodesiensis* and *Coelophysis rhodesiensis* are both considered possibly correct names for the type species of *Syntarsus* Raath 1969, though here the name *Megapnosaurus rhodesiensis* is preferred.

Keywords: *Megapnosaurus*, *Coelophysis*, Theropoda, Taxonomy

INTRODUCTION

The theropod dinosaur genus *Syntarsus* Raath 1969, with type species *Syntarsus rhodesiensis* Raath 1969, was named based on fossils from Nyamandhlovu, Zimbabwe (then Rhodesia). (Raath, 1969) Its generic name is preoccupied by the genus *Syntarsus* Fairmaire 1869, a modern beetle from Madagascar. (Ivie et al., 2001) In accordance with the *International Code of Zoological Nomenclature*, Ivie et al. (2001) proposed the replacement name *Megapnosaurus*. Most recent authors (e.g., Griffin and Nesbitt, 2016; Barta et al., 2018; Griffin, 2018; Ezcurra et al., 2021; Brody, 2021, Spiekman et al., 2021) have followed this and used the name *Megapnosaurus rhodesiensis* to refer to the species originally described as *Syntarsus rhodesiensis*. However, this has not been followed universally. The genus *Syntarsus* Raath 1969 has been considered by some authors to be synonymous with the genus *Coelophysis* Cope 1889. (Paul, 1993; Bristowe and Raath, 2004; Yates, 2005; Paul, 2016). Some authors have continued to refer to the

dinosaur genus as *Syntarsus* despite a replacement name being proposed. (Bristowe and Raath, 2004; Tyloski and Rowe, 2004.) Additionally, Ezcurra (2007) considers *rhodesiensis* a species of *Coelophysis* but treats *Syntarsus* as a valid genus containing the species *Syntarsus kayentakatae* Rowe 1989, which was originally described as a second species of *Syntarsus* Raath. (Rowe, 1989) Ezcurra and Brusatte (2011) follow Ezcurra (2007) in their usage of *Coelophysis rhodesiensis*, though they refer to the species originally described as *Syntarsus kayentakatae* as '*Syntarsus*' *kayentakatae*, with quotation marks in recognition of the preoccupied status of *Syntarsus*, despite the replacement name *Megapnosaurus* having been proposed.

INSTITUTIONAL ABBREVIATIONS

AMNH - American Museum of Natural History, New York, United States

BP - Bernard Price Institute for Palaeontological Research (University of the Witwatersrand), Johannesburg, South Africa

CMNH - Cleveland Museum of Natural History, Cleveland, United States

NHMUK - Natural History Museum, London, United Kingdom

QG - Zimbabwe Natural History Museum, Bulawayo, Zimbabwe

TAXONOMIC VALIDITY OF *Syntarsus Fairmaire* 1869

The genus *Syntarsus* Fairmaire 1869 is a modern beetle (Insecta: Coleoptera) from Madagascar. (Marie and Lesne, 1940) According to Ivie and Ślipiński (1990), the genus is a junior synonym of *Cerchanotus* Erichson 1845. The publication proposing the name is found to fulfill the requirements of the *International Code of Zoological Nomenclature*. Furthermore, multiple later sources refer to it (e.g., Marie and Lesne, 1940; Ślipiński, 1985, Ivie and Ślipiński 1990; Ivie et al., 2001) and none question the validity of the nomenclatural act. Therefore, it is here considered to have been validly named. Even though it is a junior synonym of *Cerchanotus*, the name *Syntarsus* remains unavailable for a new genus per the *Code*. (Ivie et al., 2001; ICZN 1999)

TAXONOMIC VALIDITY OF *Megapnosaurus* Ivie et al., 2001

Megapnosaurus was proposed as a replacement for the preoccupied *Syntarsus* Raath 1969 by Ivie et al., (2001). The publication proposing this name fulfills all requirements of the *International Code of Zoological Nomenclature* for a replacement name. It is therefore considered to have been validly named, despite a possible synonymy with *Coelophysis* discussed later.

ETHICS OF THE NAMING OF *Megapnosaurus*

If a taxonomic name is invalid (preoccupied or incorrectly formulated), then it is considered ethical to contact its original describer or describers to inform them of the problem so that they can correct their own error. If the original describer or describers are unreachable (for example if they are deceased or do not respond to correspondence) then the person who learns of the error will typically publish a correction. Ivie attempted to contact Raath but never received a reply. He and coauthors proceeded with publication of the replacement name after two years, and after being (incorrectly) told by dinosaur paleontologist John “Jack” Horner that Raath was deceased. (Michael Ivie, pers. comm.)

The naming of *Megapnosaurus* was described as “facetious” by Bristowe and Raath (2004), likely due to it having a humorous etymology. *Megapnosaurus* is derived from Ancient Greek and translated by Ivie et al. (2001) as “big dead lizard,” though perhaps a more accurate translation would be “big lizard without breath.” They say they chose this name because “to the scale of an entomologist, [*Megapnosaurus*] looks like a big dead lizard.” Although humorous etymologies are uncommon in vertebrate paleontology, they are common in entomology. The entomologists who named *Megapnosaurus* were acting in a manner that is standard in their field, and compliant with the *Code of Ethics* of Zoological Nomenclature, which requires waiting one year before considering the original describer unreachable. (Appendix A of ICZN, 1999)

Regardless of the ethics surrounding the naming of *Megapnosaurus*, the publication naming it is taxonomically valid, and it remains the correct name for the dinosaur originally described as *Syntarsus* Raath 1969 if it is not considered a member of the genus *Coelophysis*.

SYNONYMY OF *Megapnosaurus* AND *Coelophysis*

The genus *Megapnosaurus* was validly named as a replacement for the preoccupied name *Syntarsus*, and therefore is the correct name for the dinosaur genus if there is no older synonym. (ICZN, 1999) There are no older names that are definitively synonymous with *Megapnosaurus*, though there is one possible senior synonym: *Coelophysis*. In fact, Paul (1993) suggested that *Coelophysis bauri* was a possible nomen dubium and suggested the use of *Syntarsus colberti* for the Ghost Ranch theropods. A diagnostic neotype (AMNH 7224) was later selected from among the Ghost Ranch specimens to replace the possibly non-diagnostic lectotype of *Coelophysis bauri*, making *Coelophysis bauri* the correct name for the Ghost Ranch theropods. (ICZN, 1996)

Bristowe and Raath (2004) argued that *Coelophysis* and *Megapnosaurus* were synonymous and treated the name *Megapnosaurus* as invalid, instead using the name '*Syntarsus*' *rhodesiensis* with the genus in quotation marks to indicate that the species *rhodesiensis* could not be assigned to the preoccupied genus *Syntarsus*. In this same paper, they described a juvenile skull (QG165) which they referred to *Coelophysis rhodesiensis*. This skull is similar to CMNH 50957, a juvenile *Coelophysis bauri* skull from Ghost Ranch, which will be described by us in detail in a later publication.

On the other hand, phylogenetic analysis by Ezcurra et al. (2021) found that the genus *Coelophysis* would be polyphyletic if it included both *bauri* and *rhodesiensis*, supporting the separation of the genera *Megapnosaurus* and *Coelophysis*. Another analysis by Martínez and Apaldetti (2017) found that *Coelophysis bauri* was the sister taxon to the clade containing *Coelophysis rhodesiensis*, *Camposaurus* Hunt et al. 1998, and *Lucianovenator* Martínez and Apaldetti 2017, with the relationships between the latter three being uncertain, making the genus *Coelophysis* either paraphyletic or polyphyletic if *rhodesiensis* is included. Barta et al.

(2018) also noted anatomical differences between the two species. They treated *Megapnosaurus* as a separate genus from *Coelophysis*, but the differences they described could be argued to represent differences between congeneric species.

The genus *Megapnosaurus* is here considered to be likely distinct from *Coelophysis*, but in need of further research.

**OTHER SPECIES AND SPECIMENS OF '*Syntarsus*'
Raath 1969**

Rauhut and Hungerbühler (1998) referred a theropod specimen from Wales, UK to *Syntarsus* sp. This specimen (NHMUK PV R 37591) was later determined by Spiekman et al. (2021) to be a non-Coelophysid Coelophysoid and placed in the new genus and species *Pendraig milnerae* Spiekman et al. 2021. This interpretation is followed here, and *Pendraig* is considered valid and distinct from *Coelophysis* and *Megapnosaurus*.

Munyikwa and Raath (1999) described a snout tip (BP/1/5278) which they referred to *Syntarsus rhodesiensis* from the Early Jurassic Elliot Formation of South Africa. This specimen was reassessed by Yates (2005) who tentatively referred it to *Dracovenator regenti* Yates 2005. Here we follow Yates' (2005) tentative referral but want to emphasize that this referral is tentative.

Syntarsus kayentakatae was named as a second species of the genus *Syntarsus* Raath 1969, not as a species of the genus *Syntarsus* Fairmaire 1869. (Rowe, 1989) *Syntarsus* Raath 1969, if not synonymous with *Coelophysis*, is properly called *Megapnosaurus*, so the species *Syntarsus kayentakatae* would normally be transferred to the genus *Megapnosaurus* as *Megapnosaurus kayentakatae*. Indeed, this combination is proposed by Ivie et al., (2001) and used by some subsequent authors (e.g., Senter and Robins, 2015). However, multiple phylogenetic analyses found that the placement of *kayentakatae* in either *Megapnosaurus* or its possible synonym

Coelophysis would render its genus polyphyletic. (Martínez and Apaldetti, 2017; Ezcurra et al, 2021) It therefore cannot be considered part of the genera *Megapnosaurus* or *Coelophysis*, most likely representing its own genus. It is thus recommended that this species provisionally be referred to as '*Megapnosaurus*' *kayentakatae*, with quotation marks indicating a problematic genus assignment, until a new genus is formally described for this species.

CONCLUSION

The species originally described as *Syntarsus rhodesiensis* cannot correctly be called *Syntarsus rhodesiensis*. The proper replacement name is *Megapnosaurus rhodesiensis*. *Megapnosaurus* is possibly a junior synonym of *Coelophysis*, but until this is firmly proven or disproven, the placement of the species in either the genus *Megapnosaurus* or *Coelophysis* is considered acceptable. Usage of the name *Megapnosaurus rhodesiensis* is recommended. Usage of the name *Coelophysis rhodesiensis* is neither recommended nor discouraged. Usage of the name *Syntarsus rhodesiensis* is discouraged. The species originally described as *Syntarsus kayentakate* most likely represents a different genus from *Megapnosaurus rhodesiensis*, but until this genus is formally named, the provisional name '*Megapnosaurus*' *kayentakatae* is recommended.

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