



A taxon with no name: ‘*Ubirajara jubatus*’ (Saurischia: Compsognathidae) is an unavailable name and has no nomenclatural relevance

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On December 13, 2020, it was made available online the in press version of an article describing a Brazilian fossil from Crato Formation of the Araripe Basin (NE, Brazil) that had preserved elaborate feathers (Smyth *et al.* unpublished results). This specimen (SMNK PAL 29241) would therefore consist of the first record of feathers in a non-avian Dinosauria from the gondwanan paleocontinent. In addition, aside from the supposed report of one ‘*Spinosauroidea*’ (= *Megalosauroidea*) tooth in Martill *et al.* (2007; p. 603) (whose lithostratigraphic provenance was likely mislabelled as it was not cited elsewhere in that book), SMNK PAL 29241 would also be the first body fossil of a non-avian dinosaur to ever be confirmed for Crato Formation. All other reportings for that unit are limited to Sauropoda footprints (Carvalho *et al.* 2021). In Smyth *et al.* (unpublished results), SMNK PAL 29241 was intended to receive the formal name of ‘*Ubirajara jubatus*’, with both genus and species being considered new to science. The phylogenetic inference conducted recovered ‘*Ubirajara*’ as nested within an exclusive group also containing *Compsognathus longipes* Wagner, *Huaxiagnathus orientalis* Hwang *et al.*, and *Sinosauropteryx prima* Ji & Ji. This led the authors to treat it as a Compsognathidae. As a consequence, ‘*Ubirajara*’ is only the third taxon from South America to ever be textually attributed to (and at some point accepted as a member of) that family, with solely *Mirischia asymmetrica* Naish *et al.* and *Aniksosaurus darwini* Martinez & Novas preceding it (Naish *et al.* 2004; Choiniere *et al.* 2010). If correct, this has significant biogeographic implications, as already pointed out by Naish *et al.* (2004) for *Mirischia*.

Therefore, the relevance of ‘*Ubirajara*’ to Science and to the Brazilian geoh heritage is evident. However, this specimen was housed at the German museum Staatliches Museum für Naturkunde Karlsruhe, instead of any scientific institution in Brazil (Smyth *et al.* unpublished results). Brazilian researchers, together with the public in general, used social media to question the legal status of the fossil, to point out possible irregularities concerning the export permission for the fossil presented by the authors of the manuscript, and to ask for the repatriation of ‘*Ubirajara*’. The hashtag ‘#UbirajaraBelongsToBR’ was massively adopted in their commentaries in protest, with its first usage being traced back to a post written by paleontologist Aline Marcele Ghilardi. During the first days after the online availability of the in press version of the manuscript, the hashtag trended, being used by a very large numbers of posts (Cisneros *et al.* 2022).

Consequently, on 23 December, 2020, just 10 days after *Cretaceous Research* made available the preliminary version of the manuscript, the Chief Editor of the journal decided to temporarily remove the manuscript until all legal and ethics issues surrounding the fossil were clarified (Knuck 2020). However, almost one year later, the situation had not been solved and additional polemics regarding the fossil appeared. Hence, the editor decided to permanently remove the manuscript from the *Cretaceous Research* website by the end of September, 2021. Providing a detailed history of the path (and controversies) that led that manuscript to be withdrawn is beyond the scope of the present paper, but it will be published elsewhere in the future. Nevertheless, it can be found in the bachelor’s thesis of Caetano (2022), whose content is partially published here. One must notice, however, that the legal status of the fossil has no relevance for nomenclatural purposes. The journal’s decision not to publish the manuscript is relevant and has impact on the name validity and availability. But the reasons why the journal did so are irrelevant for Zoological Nomenclature.

According to Art. 11.1. of the International Code of Zoological Nomenclature (ICZN), only published names can be considered available. Art. 8.1.1. states that for a work to be considered published, it must have been issued with the aim of being a public and permanent record. According to Art. 8.1.3.2., it must also have a fixed content. When it was permanently removed, Smyth *et al.* (unpublished results) was considered an in press article. According to the definitions of the journal *Cretaceous Research*, it is considered that all three types of in press articles may undergo changes in the text, and that that version will be later removed and replaced by a final one (ScienceDirect Support Center 2022a,b,c). This indicates that they do not have fixed content and are not considered permanent records, thus they do not fulfill the requirements of Art. 8.1.1. and Art. 8.1.3.2. Furthermore, the category in which the manuscript is found ('Withdrawn Articles in Press') is defined as that of articles removed before being published (ScienceDirectSupport Center 2022d). Smyth *et al.* (unpublished results) also falls within Art. 9.9. and Art. 21.8.3. conditions, which consider that preliminary versions of works made available online do not constitute publication.

Thus, the names '*Ubirajara*' and '*Ubirajara jubatus*' are not available. Caetano (2022) had treated both names as *nomina nuda*, but as pointed out by Richard L. Pyle (pers. comm.), administrator of ZooBank, this nomenclature applies only to published names. In fact, according to the glossary of the ICZN, a *nomen nudum* is any *published* name that does not fulfill the requirements of Art. 12 (if published before 1931) or Art. 13 (if published after 1930). Thereby, '*Ubirajara*' and '*Ubirajara jubatus*' are here considered unavailable, but not *nomina nuda*. Contrary to the manuscript describing *Oculudentavis khaungrae* Xing *et al.*, which was published prior to retraction and thus *Oculudentavis* is an available name (Dubois 2020), the manuscript introducing the genus '*Ubirajara*' and its type species was never published. This means that other authors could use these names in the future to formally designate SMNK PAL 29241 or even other taxa. This would be the same case of *Teleocrater rhadinus* Nesbitt *et al.*, whose name first appeared in Charig's (1956) PhD thesis as '*Teleocrater tanyura*'. However, the generic name was only formalized after the publication of Nesbitt *et al.* (2017).

On the other hand, both the generic name '*Ubirajara*' (urn:lsid:zoobank.org:act:9467530F-3807-4B95-BCE4-28776E811182) and the species name '*Ubirajara jubatus*' (urn:lsid:zoobank.org:act:BA4771E2-F0EF-4198-BF1C-9F46E2195EA9) were still registered at ZooBank by 17 November, 2022. Art. 8.5.3. of the ICZN dictates that names introduced in works published electronically must be registered in ZooBank. For instance, some papers published online needed to get corrections due to lack of evidence of registration in ZooBank in the original paper (e.g. Sayão *et al.* 2020). The fact that the both mentioned names still presented active registers in that website could preclude future authors to formally introduce them. Caetano (2022) recommended that one requests the International Commission on Zoological Nomenclature to remove those registers from that database. Following his advise, the present authors decided to contact the administrator of ZooBank, Richard L. Pyle, requesting him to remove both names of ZooBank. Thereby, on 18 November, 2022, the names '*Ubirajara*' and '*Ubirajara jubatus*', as well as their publication record (urn:lsid:zoobank.org:pub:7687AF55-2520-46B5-984E-B29B68D82879), were finally deleted from the mentioned database. The '*Ubirajara*' case might also be responsible for rendering modifications to the ICZN in a future edition, albeit this possibility is expected to be better evaluated in the future (Pyle, pers. comm.).

During the review process of the present paper, it has been stated that it had no new scientific content because statement that the name was unavailable was already present on the Internet in some websites such as Wikipedia. However, besides being informal literature, such websites may be frequently edited and, in some cases (e.g. Wikipedia), any person can modify their contents with no or little regulation. It is therefore important to provide here a permanent record of this statement. Also, online discussions only refer to the name as being invalid, not discussing its availability status and whether one could use it to formally designate other taxa without falling into a homonymy case under the Code. In addition, most of these statements available online do not discuss the exact articles of ICZN that are not fulfilled and do not furnish the important distinction between this case and that of *Oculudentavis* (pers. obs.), which may lead unaware scientists to erroneously equate them. Further, the present paper bears as scientific novelty the report of the removal of the LSID links from ZooBank, which were not discussed elsewhere.

Also during the review process, some ambiguity arouse regarding supposed questions about the scientific merits of the '*Ubirajara*' unpublished manuscript (Smyth *et al.* unpublished results). The manuscript (as well as the name '*Ubirajara jubatus*') has no nomenclatural relevance but has its taxonomic merits. Unpublished documents may still provide important scientific data, as it is the case for many PhD theses (e.g. Charig 1956). In other words, the description of SMNK PAL 29241 and its phylogenetic assessment are not automatically doomed to invalidation and irrelevance just because they were never published, despite the phylogenetic matrix with the coded data of '*Ubirajara*' being limited to Supplementary Information that has never been made available online, what limits the principle of scientific testability and replicability. Still, Smyth *et al.* (unpublished results) is irrelevant for the formal Zoological Nomenclature despite its taxonomic merits.

In sum, both ‘*Ubirajara*’ and ‘*Ubirajara jubatus*’ are names that absolutely have no relevance for nomenclatural purposes and must be treated as they had never ever existed. The paper introducing them, in fact, never existed in the realm of the published literature. There are, however, discussions regarding the taxonomic usefulness in adopting informal names (according to ICZN) for specimens rather than taxa, being part of what has been called ‘grey nomenclature’ (Minelli 2019). It is advisable that those who desire to refer to SMNK PAL 29241 as ‘*Ubirajara*’ in the sense of grey nomenclature do so by enclosing the name in quotes and clearly indicating that it is an unavailable name in the Code sense. Nevertheless, since the repatriation of the specimen to Brazil is confirmed (Greshko 2022), it might receive a formal (and possibly different) name relatively soon in the coming years. Thereby, referring to it exclusively by its collection number may avoid potential nomenclatural instability. Still, only the future and the scientific community will decide the better way to refer to this specimen. According to Fitzhugh (2015), taxa are explanatory hypotheses. They try to explain the observed distribution of character states seen in semaphoronts, including the differences between two or more comparable semaphoronts. These hypotheses (taxa) exist regardless of being named. Therefore, the explanatory hypothesis inferred from the preserved semaphoront of SMNK PAL 29241 is a taxon with no (formal) name.

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