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2010-12

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Technical note

A case of vertebrate fossil forgery from Madagascar

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Received 19 July 2010. Accepted 3 December 2010

INTRODUCTION

The high value of rare fossil specimens results in some fossil dealers and collectors purchasing these specimens from dubious and even illegal sources. Complete vertebrate fossils in particular are rare, and are therefore more easily sold at relatively high prices. As a result there is a demand for the production of fake fossils particularly in developing countries where the trade in fossils represents a means to economic survival (Mateus *et al.* 2008). Most dealers, however, have little or no scientific knowledge on the fossils they purchase and may therefore inadvertently purchase fake fossils. Both China and Morocco, for example, are known to produce both genuine and fake fossils (Dalton 2000, 2004a, b; Milner *et al.* 2001; Padin 2000). As a result, China, among many other countries, including South Africa, has instituted very strict legislation regarding the trade and export of fossils. Fraudulent fossils do not just affect dealers and collectors, but have also embarrassingly deceived scientists. The best known of these is the famous 'Piltdown Man' from England, a forgery merging the cranium of a modern human and the mandible of an orangutan. This forgery was put forward as an early human ancestor that confused the scientific community for decades (Weiner 1955), whilst the first genuine early hominin, the now famous 'Taung Skull', holotype of *Australopithecus africanus* from South Africa (Dart 1925, 1929; Dart & Craig 1959; Hrdlicka 1925), was forced to take a 'back seat' for many years. More recently, the famous *Archaeoraptor* specimen from the Lianoing Province of China received coverage by a number of publications including *National Geographic* and *Nature* (Sloan 1999; Rowe *et al.* 2001) but in reality the specimen represents at least two and perhaps up to five separate individuals of two or more different species fraudulently merged into a single specimen (Zhou *et al.* 2002).

Invertebrates from Morocco, for example trilobites have been skillfully carved out of rock and sold as genuine fossils. As most trilobites from Morocco are genuine, and the trade in these invertebrates from that country is legal, it is understandable that a fossil trader may be deceived. In other cases, a genuine fossil of a common living species, such as the tooth of a great white shark (*Carcharodon carcharias*), may be sold as a representative of a similar, but extinct species such as a megalodon (*Carcharocles megalodon*). Fossil frauds are therefore committed not only for profit, but also for publicity (Mateus *et al.* 2008).

Mateus *et al.* (2008) suggest a number of methods of fraud recognition and describe three kinds of hoaxes:

1) Those that contain no original fossil material, such as shapes carved in rock;
2) Those that contain original fossil material, but are entirely or partially altered in order to give the appearance of a more complete specimen, for example, a skull carved from a limb bone.
3) Those that are true fossils but a combination of multiple individuals, mostly from the same species.

Here we report on a specimen that was brought to the Bernard Price Institute for Palaeontological Research, University of the Witwatersrand by a fossil dealer for identification. The specimen had been obtained illegally in Madagascar by the fossil dealer, reportedly from the vicinity of known dinosaur localities in the Cretaceous Maevarano Formation of the Mahajanga Basin (Depéret 1896; Besairie 1936, 1972), with the intention of having it prepared in South Africa. The fauna of this formation is well known and is the subject of ongoing research programmes (e.g. Forster *et al.* 1998; Krause & Hartman 1996; Sampson *et al.* 2001; Krause *et al.* 1999; Buckley *et al.* 2000; Curry-Rogers & Forster 2001; Rogers 2005; Fanti & Therrien 2007).

DESCRIPTION

The specimen initially appeared to consist of two articulated vertebral centra in a nodule of matrix. It measured approximately 23 cm by 15 cm. A superficial resemblance to a small skull could be seen. After removal of the 'matrix' it became apparent that the specimen was a forgery using genuine pieces of dinosaur bone that attempted the construction of a vertebrate skull (Fig. 1). The 'matrix' proved to be crushed rock, probably from the Maevarano Formation mixed with commercial cement covering inner layers of resin and plaster of Paris (Fig. 2). The construction of the skull consisted of an 'orbit', a pig-like 'snout', crude 'teeth' a lower 'jaw' and a 'post-orbital' region. The snout and post-orbital region were constructed from genuine fossils of dinosaur vertebral centra (Fig. 2). These are most probably from a titanosaur sauropod; however, this is purely speculative as there is not enough material to be diagnostic. The teeth were constructed with a series of roughly shaped stones cemented to the upper and lower 'jaws' (Fig. 2).

DISCUSSION

Clearly, this forgery was a poor attempt at creating what seemed to have been intended to resemble a vertebrate skull. As the 'skull' was bound by matrix, it appears that the intent of the forgery was probably not to convince anyone that this was a genuine fossil assemblage, but rather to give a vague impression that the matrix block was indeed fossiliferous and superficially gave the impression that it potentially contained what seemed to be a vertebrate skull. This resulted in the sale of the specimen before the complete contents of the matrix could be determined by the purchaser. According to the classification of fossil forgeries by Mateus *et al.* (2008), this forgery would

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Figure 1. Fossil forgery from Madagascar: **a**, left view; **b**, right view; **c**, inferior view.

fall into the second group; being one that contains original fossil material, but is entirely or partially altered in order to give the appearance of a more complete specimen. As long as fossils are permitted to be legally traded by some countries, it appears that fossil forgeries and similar frauds will occur. Where fossils are purchased for both private and public collections, the legality of the purchase in the absence of formal heritage agency approval, will remain doubtful. A recent debate highlights this where fossils in private collections of questionable origin subjected to scientific study were not accepted for publication in reputable peer-reviewed journals. A controversial new

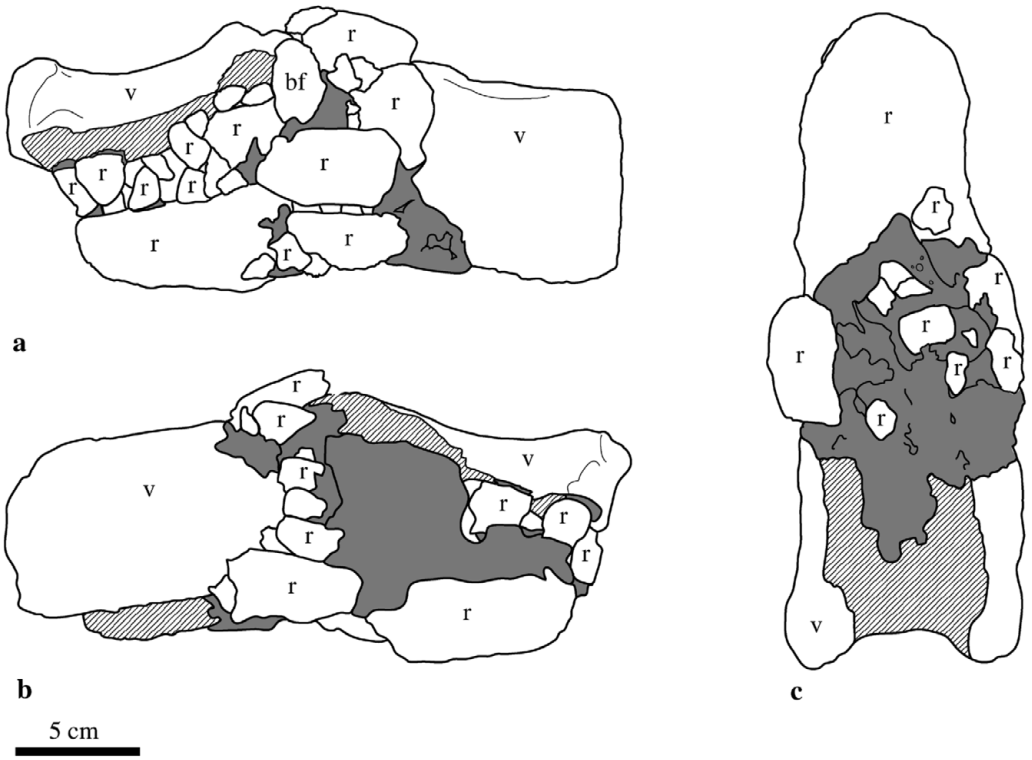

Figure 2. Key to main components of the fossil forgery from Madagascar: **a**, left view; **b**, right view; **c**, inferior view. Hatched area represents artificially ground or cut surfaces of fossil bone, grey areas represent areas of resin or plaster. Abbreviations: bf, fossil bone fragment; r, rock; v, fossil vertebra.

'amateur' journal, the *Journal of Paleontological Sciences*, has angered academic researchers who fear that the project will give some scientific legitimacy to the dealings of commercial fossil hunters (Hopkin 2007). The organizers of the *Journal of Paleontological Sciences* said that they will publish details of privately held fossils, bringing them in from the 'scientific darkness'. Traditional palaeontologists feel that this undermines the field and could fuel the black market in fossil specimens. Triebold (2007) counters this argument and explains that the journal's submission guidelines state that the *JPS* will not publish fossils that cannot be legally exported from their home country, or where ownership cannot be verified.

It appears that to date South Africa has no obviously overt illegal fossil trade. This, however, by no means indicates that such a trade may not exist. South African legislation (National Heritage Resources Act 25 of 1999) is primarily concerned with the protection and preservation of national heritage resources which allows for the trade of foreign fossils, provided that they were obtained legally in the country of origin. This is often difficult to prove, as was the case with the fossil forgery presented here.

CONCLUSION

Here we have reported the first published fossil fraud from Madagascar of which we are aware. Although this crude forgery was easily identified, the possibilities of more sophisticated forgeries of this nature are possible. This serves to draw attention to the potential problem and encourage palaeontologists to report such cases when they occur.

Our thanks go to an anonymous reviewer for helpful comments.

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