

# Adapisoriculidae from the Southern Hemisphere

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**Abstract:** Adapisoriculidae is a family of primitive small mammals known from India, Europe and Northern Africa ranging in age from Late Cretaceous to early Eocene. The 2019 sample of limestone from Black Crow, Namibia, yielded an upper molar which is interpreted to belong to this enigmatic family, thereby greatly extending the geographic range of the group. The specimen is described and illustrated but is left in open nomenclature, pending recovery of more complete remains.

**Key words:** Adapisoriculidae, Ypresian/Lutetian, Upper molar, Namibia

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## Introduction

This paper reports the discovery of an upper molar interpreted to belong to Adapisoriculidae, the first record the family in the Southern Hemisphere. The specimen was collected from the middle Eocene limestones at Black Crow, Namibia. The systematic and phylogenetic relationships of this family of mammals remain enigmatic (De Bast *et al.* 2012; Kapur *et al.* 2017a, 2017b). Until the Black Crow discovery,

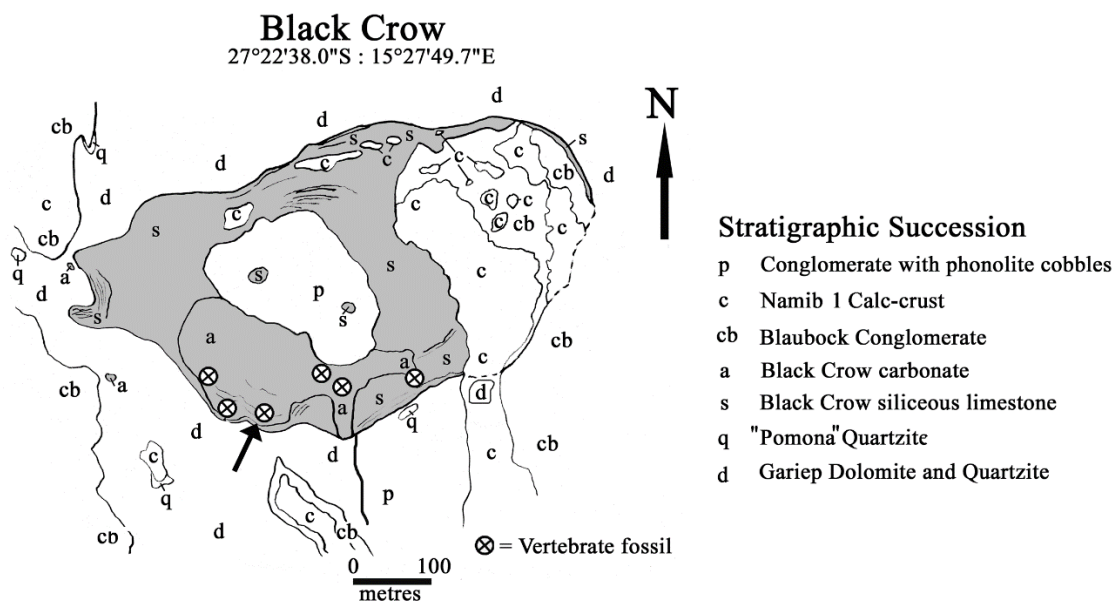
the geographic distribution of the family was restricted to India, Western Europe and Northern Africa, and its known stratigraphic range spanned the Late Cretaceous to Early Eocene.

The fossil from Black Crow therefore greatly enlarges the geographic range of the family and extends its stratigraphic record upwards into the Ypresian/Lutetian.

## Geological context

The geological context and age of the freshwater limestone at Black Crow have been

mentioned on several occasions (Pickford *et al.* 2008a, 2008b, 2014, 2015a) (Fig. 1).



**Figure 1.** Geological sketch map of the freshwater limestone outcrops at Black Crow, Sperrgebiet, Namibia, showing the locality from which the adapisoriculid tooth discussed in this paper was collected (large black arrow).

## Material and methods

The fossil tooth discussed herein was recovered from the insoluble residue left after acid treatment of limestone from Black Crow. It was consolidated in plexigum dissolved in acetone. Photographs were taken by placing the lense of a Sony Cybershot Camera over the eyepieces of a stereo microscope.

Dental nomenclature (Fig. 2) follows the system of Williamson *et al.* 2014.

Comparisons were made with illustrations of *Afrodon* Gheerbrant, 1988; *Adapisoriculus* Lemoine, 1885; *Bustylus* Gheerbrant & Russell, 1991; *Deccanolestes* Prasad & Sahni, 1988; *Garatherium* Crochet, 1984; *Bharatlestes* Kapur *et al.* 2017b; *Proremiculus* De Bast *et al.* 2012; and *Remiculus* Russell, 1964.

## Abbreviations

**BC** - Black Crow

**BSIP** - Birbal Sahni Institute of Palaeontology, Lucknow, India

**GSN** - Geological Survey of Namibia, Windhoek

**MNHN** - Muséum National d'Histoire Naturelle, Paris

**NHMUK** - Natural History Museum of the United Kingdom, London

## Systematic Palaeontology

### Class Mammalia Linnaeus, 1758

### Infraclass Eutheria Gill, 1872

### Order *Incertae sedis*

### Family Adapisoriculidae Van Valen, 1967

### Genus and species indet.

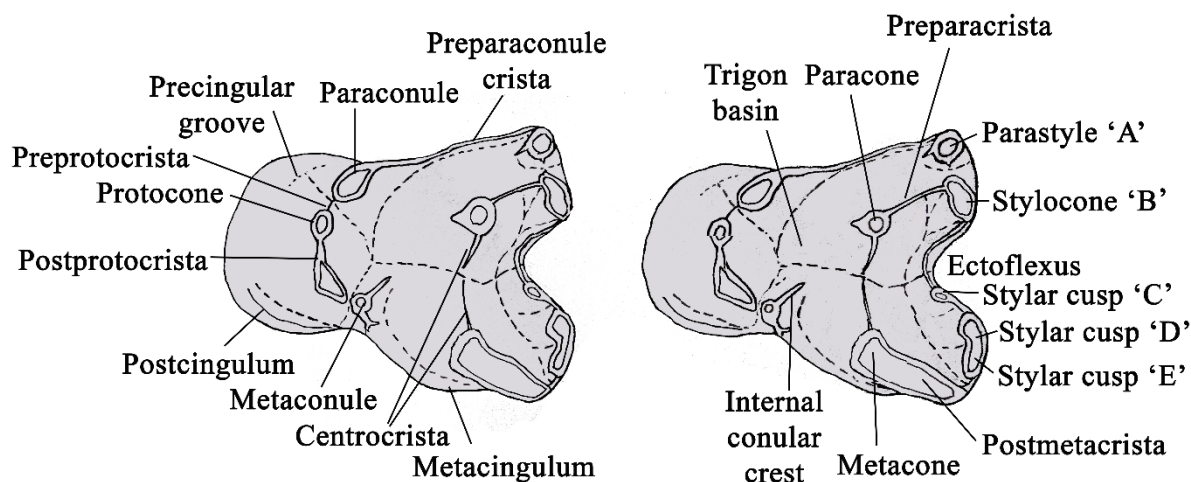
## Description

The upper molar of the Adapisoriculidae from Black Crow (GSN BC 6'19) is in light wear, with small dentine exposures at the apices

of the main cusps and wear facets on the subsidiary cusps and along the crests.

**Table 1.** Measurements (in mm) of GSN BC 6'19, left upper molar of Adapisoriculidae from Black Crow, Namibia, compared to the M2/ of *Proremiculus lagnaui* from Belgium (De Bast *et al.* 2012).

M2/	GSN BC 6'19	<i>Proremiculus lagnaui</i>
Mesio-distal length	1.49	2.02
Bucco-lingual breadth	1.91	2.64



**Figure 2.** Stereo occlusal view of GSN BC 6'19, upper left molar (likely M2/) of Adapisoriculidae. The stereo drawing defines the nomenclature used in this paper based on Williamson *et al.* 2014 (scale : 1 mm).

The Black Crow adapisoriculid tooth, an upper molar (probably M2/) is bucco-lingually appreciably broader than its mesio-distal length. It has a deep ectoflexus and the paracone and metacone are widely separated from each other, the centrocrista from each cusp not quite joining in the midline of the crown, meaning that the bases of the paracone and metacone are separated from each other. The paraconule and metaconule are clearly expressed and the metaconule has an internal conular crista. The buccal margin of the tooth sports five cusplets, from mesial to distal, the parastyle ('A'), Stylocone (stylar cusp 'B'), Stylar cusp 'C',

Stylar cusp 'D' which is accompanied by a small accessory cusplet ('E' in Fig. 2) (unnamed by Williamson *et al.* 2014). There is a well-developed metacingulum and a sharp preparaconule crista. The protocone has a short, shallow groove on its mesial surface, probably corresponding to a precingulum, and it has a clear postcingulum (a structure that was not illustrated by Williamson *et al.* 2014, but which is present in the upper molars of the larger genus *Proremiculus* De Baast *et al.* 2012).

The trigon basin in GSN BC 6'19 is capacious and the buccal shelf quite broad.

### Discussion

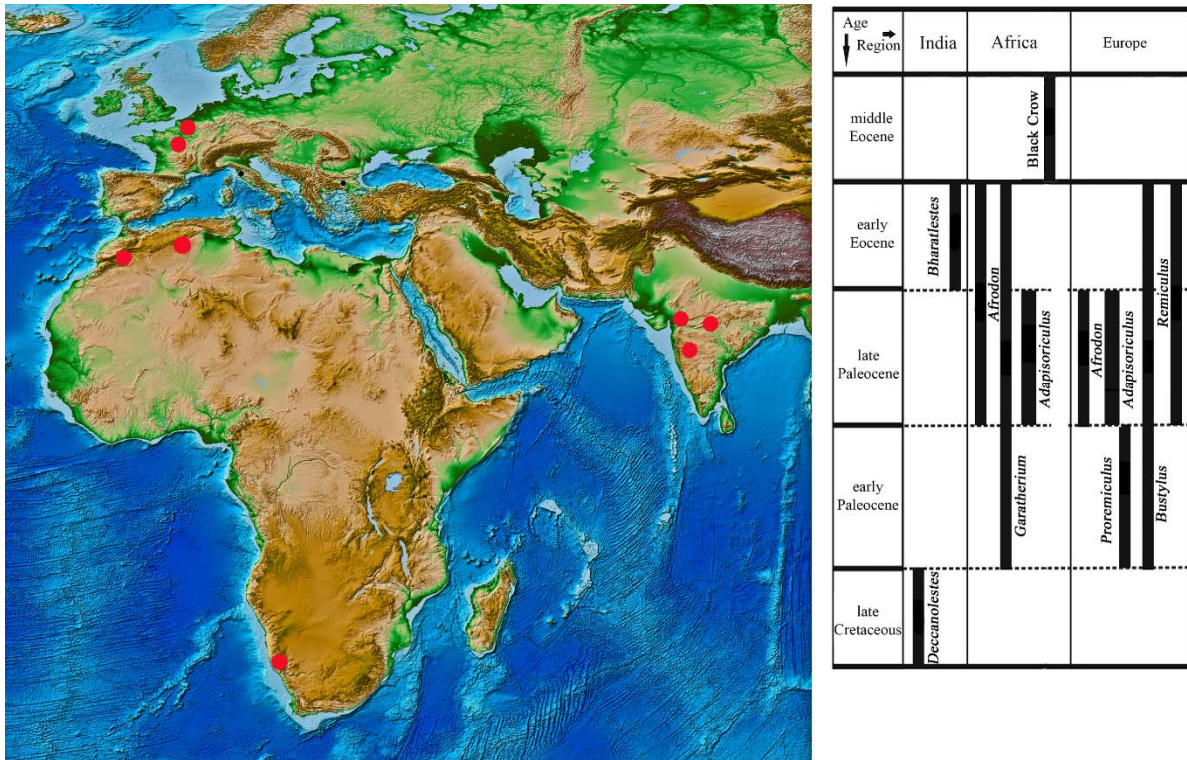
The morphology of GSN BC 6'19, an isolated upper molar from the middle Eocene limestone of Black Crow, Namibia, accords in most pertinent details to those of most genera of Adapisoriculidae, with one exception, the presence of a cingular structure on the distal surface of the protocone (present, however, in

*Proremiculus*). Comparison with illustrations of upper molars of diverse genera of this family indicate that it is closest in overall morphology to the genus *Proremiculus* De Bast *et al.* 2012, from the early Paleocene of Hainin, Belgium. Like his genus, the Black Crow specimen has a horizontal mesial groove on the protocone and

a postcingulum, two structures which also resemble the situation in the todralestid *Todralestes variabilis* from Morocco (Gheerbrant, 1991, 1994) but the buccal shelf of the latter species is narrower than in the Black Crow tooth, the ectoflexus is not as deep and there are no signs of styler cusplets 'B', 'C' and 'D'.

The historical review of the Adapisoriculidae by De Bast *et al.* 2012, indicates an extremely

diverse series of interpretations by the various authors who have studied the fossils, with little consensus emerging about the suprafamilial (and even the familial) affinities of the group. This is fuelled to a great extent by the plesiomorphic condition of the teeth attributed to this family, members of which historically have been linked to Lipotyphla, Dermoptera, Nictitheriidae and even to Marsupialia among others.



**Figure 3.** Geographic and stratigraphic distribution of Adapisoriculidae. Data from Kapur *et al.* 2017a and Crochet, 1984, with addition of the Black Crow specimen.

Given that the Black Crow tooth is isolated and with the exception of *Proremiculus*, differs from most other adapisoriculid upper molars in respect of the presence of a cingulum on the distal surface of the protocone, the genus and species to which it belongs are left in open nomenclature, in the hope of recovering more informative specimens.

Nevertheless, the presence of an adapisoriculid or a close relative of this family in the Ypresian/Lutetian of Namibia is of great interest, not just because of the great geographic extension of the distribution of the family and a stratigraphic extension upwards into the Middle Eocene, but also because, being quite plesiomorphic it could have given rise to more derived mammals, including tenrecomorphs or todralestids, for example.

The relationships of the Black Crow adapisoriculid to other groups of mammals from the same locality are enigmatic, but there could be some link to the genus *Nanogale* (Pickford, 2019) which is considered to be a primitive tenrecomorph, but direct comparisons are not possible because *Nanogale* is known only from a mandible. However, against this possibility is the fact that the hypoconid of the lower molars of *Nanogale* is not in line with the paraconid and metaconid, unlike the situation in adapisoriculids in which these three cusps are disposed in almost the same line (De Bast *et al.* 2012; Kapur *et al.* 2017a) along the almost straight lingual margin of the crown.

## Conclusion

A tiny isolated mammalian upper molar from the Ypresian/Lutetian of Black Crow, Namibia, is compatible in morphology and its minute dimensions to fossils attributed to the family Adapisoriculidae, previously known only from India, Western Europe and the northern extremities of Africa. This discovery, even though limited to a single tooth, indicates that the geographic range of the family was likely considerably greater than previously reported, and that it may have persisted into the Middle

Eocene. Its affinities to other adapisoriculids remain to be established, but it seems to be closest in overall morphology to *Proremiculus* from the early Paleocene of Europe.

The Black Crow fossil is left in open nomenclature, pending the recovery of more complete specimens, this report being a preliminary announcement of the presence of the family in Southern Africa and of the extension of its stratigraphic range into the middle Eocene.

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