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SNAKES FROM LEMUDONG'O, KENYA RIFT VALLEY

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ABSTRACT

We examined snake fossils collected through 2003 from Lemudong'o Locality 1 in Kenya. Taxonomic identifications were made based on derived apomorphic features preserved in the fossils. The disarticulated and sometimes fragmentary nature of the fossils themselves, combined with the relatively few apomorphic characters of vertebrae, restricted our ability to diagnose the fossils to fine-scale taxonomic levels. Identified specimens represent at least two taxa. Specimens diagnosable as members of Pythoninae are most common, but a single specimen records the presence of a colubroid snake in the fauna.

Introduction

The Lemudong'o Locality 1 is situated in the southern Rift Valley, approximately 100 km west of Nairobi, Kenya (Ambrose et al., 2003). Snake specimens collected through 2003 from Lemudong'o consist of a relatively small number of incomplete and broken vertebrae. We adopted an apomorphy-based approach to the identification of these elements. Although this is not a common approach for Neogene paleoherpetologists, the decreased reliance of phenetic similarity in favor of apomorphy yields more readily testable taxonomic identifications (Head, 2002; Bell et al., 2004) and reduces the potential for circularity of arguments that are based, at least in part, on the modern geographic distributions of taxa (Bell and Gauthier, 2002). When applied to many (but not necessarily all) isolated snake vertebrae, one consequence of this approach is a reduced taxonomic resolution relative to identifications derived from more traditional approaches. This is a result of several factors, including inadequate exploration of vertebral apomorphies for species-level resolution in snakes (apomorphies for higher-level systematic categories of snakes were only recently explored and identified [see Head, 2002; Bell et al., 2004]) and considerable ontogenetic and intracolumnar variation in vertebral morphology which limits recognition of apomorphic characters for isolated elements.

Methods

Our identifications were made from high-quality, detailed casts of the original fossils housed in the National Museums of Kenya, under the general locality designation Lemudong'o Locality 1. The casts were prepared by Leslea Hlusko. We compared these specimens with extant specimens of snakes in the collections at the University of Texas at Austin and the United States National Museum (Smithsonian Institution) in Washington, D.C. Vertebral apomorphies were derived, with some modification, from those discussed and illustrated by Head (2002).

Paleontology

Most squamate skeletal elements are represented by broken fragments. We were able to identify 14 specimens, representing at least two taxa. Numerous characteristics that diagnose Alethinophidia permit identification of these specimens as members of that group of snakes, although not all characters are preserved on all specimens. These diagnostic features include the presence of synapophyses with strongly differentiated dia- and parapophyseal articular facets, paired and symmetrical sub-central foramina, presence of an expanded condylar rim, approximately circular cotylar-condylar margins, a well-developed haemal keel, sub-central paralymphatic fossae on more posterior precloacal

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vertebrae, and a prominent posterior median notch of the neural arch.

Systematic Paleontology

Alethinophidia Nopcsa, 1923
Subfamily Pythoninae Fitzinger, 1826
Genera and species indeterminate

Description

Four specimens (KNM-NK 41363, KNM-NK 41415, KNM-NK 41440, and KNM-NK 44829) are diagnosed as Pythoninae by a combination of characters including the presence of a triangular neural canal, a straight interzygapophyseal ridge, and tall zygosphene, and the absence of paracotylar foramina. Individually, these characters are not apomorphic for pythonines (for example, a straight interzygapophyseal ridge is also present in many boine and additional taxa, e.g., Kluge, 1988; Rage and Albino, 1989), however, their combined presence occurs only within pythonines among Neogene taxa. Seven vertebral fragments catalogued under number KNM-NK 40892 display the same character combination with the exception of the triangular neural canal, which is not preserved in these specimens. We also refer these to Pythoninae. Two additional specimens are only tentatively referred to Pythoninae. One of these (KNM-NK 41329) consists only of a centrum and a small portion of the neural arch. The second (KNM-NK 41226a) is a poorly preserved and somewhat fractured centrum with a small portion of the arch. Both specimens demonstrate at least a suggestion of a straight interzygapophyseal ridge.

Remarks

The specimens compare better in both size and shape with extant large-bodied *Python* than other pythonine genera. Among extant African taxa, the Lemudong'o specimens are most similar to *Python sebae*; however, we refrain from using geographic proximity in taxonomic determination for the aforementioned reasons (see also Bell et al., 2004).

Colubroidea Oppel, 1811
Genus and species indeterminate

Description

Specimen KNM-NK 40897 is an isolated vertebra identified as an indeterminate colubroid snake. Assignment to Colubroidea is based upon the combined presence of paracotylar foramina and a well-developed neural spine that extends onto the zygosphene anteriorly. A wide, well-developed haemal keel is present and a distinct hypapophysis is suggested, but if originally present, it is broken and missing.

Discussion and Conclusion

Higher-order taxonomic composition of the Lemudong'o record is identical to the rest of the African Neogene record: pythonine and colubroid taxa were described previously from the early Miocene of Namibia (Rage, 2003), early and middle Miocene of Kenya (Madden, 1972; Rage, 1979), middle Miocene of Morocco (Hoffstetter, 1961; Rage, 1976), late Miocene and Pliocene of Chad (Brunet et al., 2000; Vignaud et al., 2002) and Uganda (Bailon and Rage, 1994), Pliocene of Morocco (Bailon, 2000), and Pliocene and Pleistocene of Tanzania (Rage, 1973; Meylan, 1987). Although this record does not increase the taxonomic diversity of the African fossil snakes, it contributes to our understanding of snake evolution in Africa, because it is part of a fossil record the quality and density of which was only recently recognized.

The evolutionary history of African snakes is poorly understood relative to other continents. Patterns of endemicity and estimations of divergence timings are difficult to elucidate among extant taxa (e.g., Gravlund, 2001), and histories of immigration and emigration are controversial (Underwood and Stimson, 1990; Kluge,1993). Reports of derived snakes from the early Late Cretaceous of Sudan (Rage and Werner, 1999) suggested radically different divergence timings and biogeographic patterns than previously considered. Given the comparative paucity of the African fossil record, documenting the snakes of Lemudong'o is important in building a dataset for reconstructing evolutionary patterns and processes in African snakes.

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