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**GEOLOGY AND PALAEOBIOLOGY OF THE
NORTHERN SPERRGEBIET, NAMIBIA**

by

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Crocodiles from the Northern Sperrgebiet, Namibia

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Crocodile remains are extremely rare in the Early Miocene deposits of the Northern Sperrgebiet, in strong contrast to their abundance in sediments of the Orange River Valley. The first remains discovered in 2006 belong to a crocodyline, probably *Crocodylus*, but the fossils are too fragmentary to identify to the species level.

Introduction

The Early Miocene valley deposits in the Northern Sperrgebiet have yielded abundant fossils of aquatic animals and plants but until 2006 no remains of crocodiles were found. In April, 2006, Dr B. Senut found part of a crocodile maxilla and an isolated tooth at GT 6, one of the more extensive outcrops of Early Miocene sediments in the Grillental. The fossils are crocodyline, lacking the alveolar extensions common in tomistomines, but the specimens are too fragmentary to identify beyond the family level, although they provide a good match with specimens of *Crocodylus gariensis*, known from abundant material excavated at Arrisdrift, Orange River Valley, Namibia (Pickford, 2003).

Systematic description

Family Crocodylidae Cuvier, 1807
Genus *Crocodylus* Laurenti, 1768
Species indet.

Material: GT 134'06, fragment of right maxilla ; GT 135'06, isolated tooth.

Locality and age: GT 6, Grillental, Northern Sperrgebiet, Early Miocene.

Description: The right maxilla fragment, GT 134'06, represents the region round the 'canine', recognisable as such because of the diastemata in front of and behind the alveolus and the ventral bend in the lateral outline of the fragment. The dorsal surface of the fragment is deeply scored by vermicular pits (Pl. 1 (1a)) as in crocodiles in general, and the fractured internal part shows extensive small sinuses interconnecting with each other. The alveolar capsule is broken in half, revealing a hemispherical base and cylindrical sides (Pl. 1 (1b, c)). The capsule is lined with a thin sheet of bone penetrated by multiple foramina which contrasts strongly with the more coarsely vermicular bone of the rest of the maxilla. This is the usual situation in crocodile alveoli. The modest di-

mensions of the specimen indicate that it came from a small individual, about the same size as the holotype of *Crocodylus gariensis* (Pickford, 2003).

From the same locality, an isolated crocodile tooth was found. It is a simple conical tooth, slightly curved from base to apex, with fluting on the outer surface (Pl. 1, (2a)) and a persistent pulp cavity (Pl. 1 (2b)).

Discussion: Fossil crocodiles were unknown in the Northern Sperrgebiet until April, 2006, when two specimens were found. The discovery was not unexpected in the sense that the Early Miocene sediments in the region have yielded abundant remains of aquatic plants (charophytes), invertebrates (*Lymnaea*, *Bulinus*, *Hydrobia*, ostracods) and vertebrates (fish, pipid frogs), yet, despite the recovery of well over 10,000 fossils, these are the first crocodiles reported from the region. Their rarity in the Northern Sperrgebiet contrasts strongly with their abundance in the Orange River deposits (Pickford, 2003) where they are among the most common fossils.

Crocodiles can survive in remarkably arid areas by aestivating in burrows during the dry seasons, but they cannot survive in areas where the ambient temperature during the breeding season is too cold or too hot or if the nesting environment departs several degrees from optimum temperature (Pickford, 2003). This is because gametogenesis is seasonally activated and depends on body temperature, and nests that are hotter or colder than the optimum incubating temperature (31.5-32.5°C) results in hatchlings of one sex only or if extreme, in adding of the eggs. The presence of crocodiles at Grillental is not incompatible with the palaeoenvironmental reconstructions based on other fossil groups, all of which indicate that at the time of deposition the valley lay within a region of summer rainfall and had an annual precipitation of between 125 and 750 mm.

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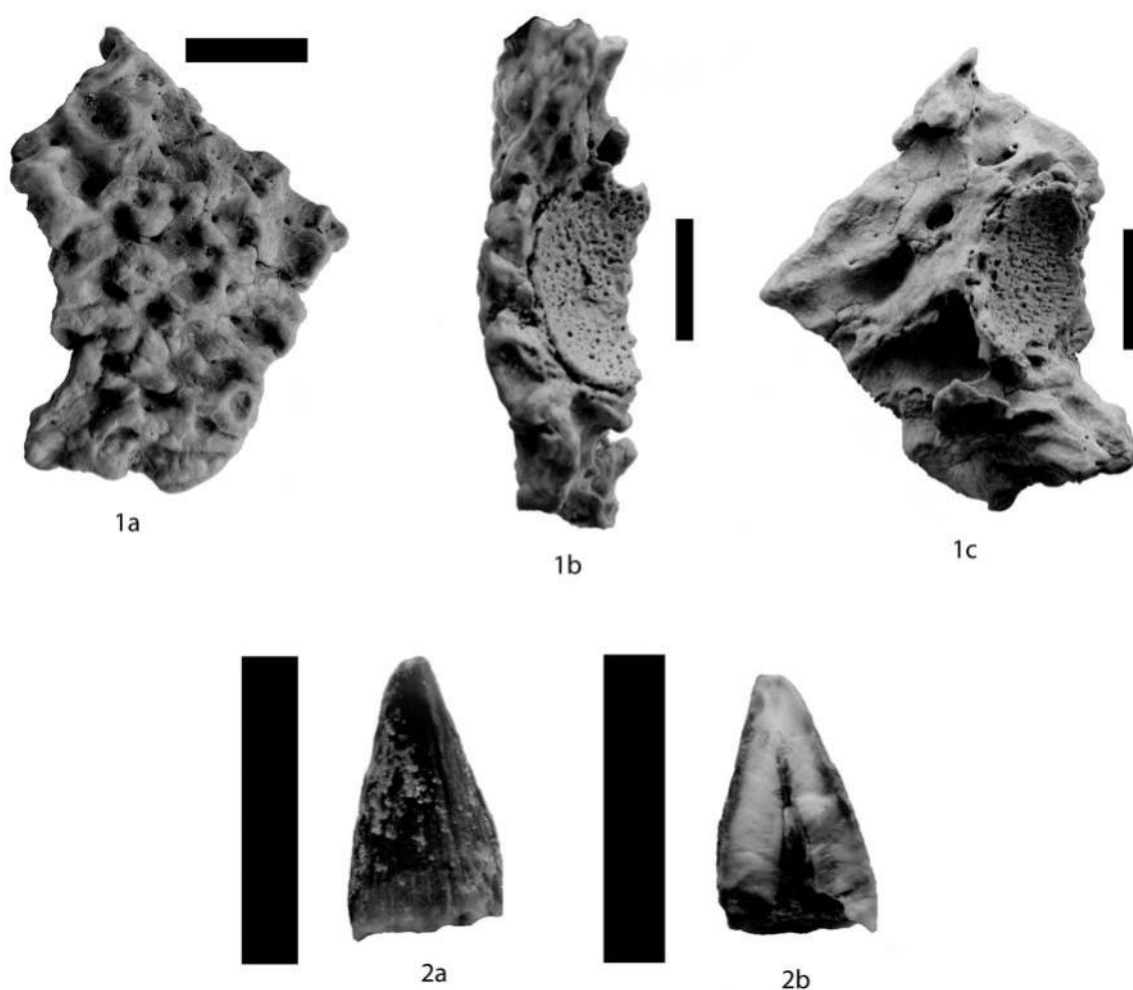


Plate 1. *Crocodylus* sp. from locality GT 6, Grilental, Northern Sperrgebiet, Namibia. (Scales : 10 mm).

1. GT 134'06, maxilla fragment, a) dorsal view, b) ventral view showing diastemata anterior and posterior to alveolus, c) internal view showing broken 'canine' alveolar capsule.
2. GT 135'06, isolated tooth, a) outer view, b) naturally broken section of tooth.

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