

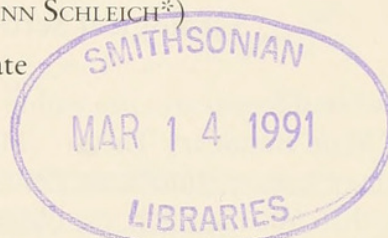
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An Eocene Crocodile Record from Bhainskati Khola (Dumri Area), South Nepal

By RAM BAHADUR SAH and HANS HERMANN SCHLEICH^{*)}

With 1 text figure and 1 plate

Abstract



A fossil crocodile tooth referred to the *Pristichampsinae* is reported from Eocene sediments of Bhainskati Khola area (S-Nepal). As far as to our knowledge, this is the first Eocene crocodile record for Nepal.

Kurzfassung

Ein fossiles Krokodilzahn-Fragment aus eozänen Sedimenten von Bhainskati Khola (S-Nepal) wird zur Unterfamilie der *Pristichampsinae* gerechnet und beschrieben. Dies ist der erste, uns bekannte eozäne Krokodilier-Nachweis für Nepal.

Introduction

A fossil crocodile tooth has been found in Eocene sediments of the Bhainskati Khola area, exposed in the road cut of Pokhara-Butwal highway, situated about 2 km SE of Dumri. This fossiliferous area lies in the southwestern part of Lesser Himalayan Range of Nepal (see text fig. 1).

STEEL (1973, 1989) and BERG (1969) inform on the status and occurrence of *pristichampsine* crocodiles. BUFFETAUT (1981) mentions about the biogeography of cenozoic crocodiles together with *pristichampsine* forms. He described Eocene material from Punjab/India and referred it to the *Dyrosauridae* and to the *Pristichampsinae*. Amongst his figured *pristichampsine* teeth are very similar ones from the Kala Chitta Range (Eocene, Punjab). He also refers the *sebecosuchian* teeth to the *pristichampsines* that were mentioned by SAHNI & SRIVASTAVA (1976). BUFFETAUT also discusses fossil crocodiles from several localities from India and Pakistan, but for Eocene deposits from Nepal this is supposed to be the first crocodile record. SCHLEICH (1990) gives a review on literature references for the neo- and palaeoherpetology of Nepal and adjacent Siwaliks.

^{*)} Dr. R. B. SAH, Central Department of Geology, Tribhuwan University, Kathmandu, Nepal; Dr. H. H. SCHLEICH, Bayerische Staatssammlung für Paläontologie und historische Geologie, Richard-Wagner-Straße 10, 8000 Munich 2.

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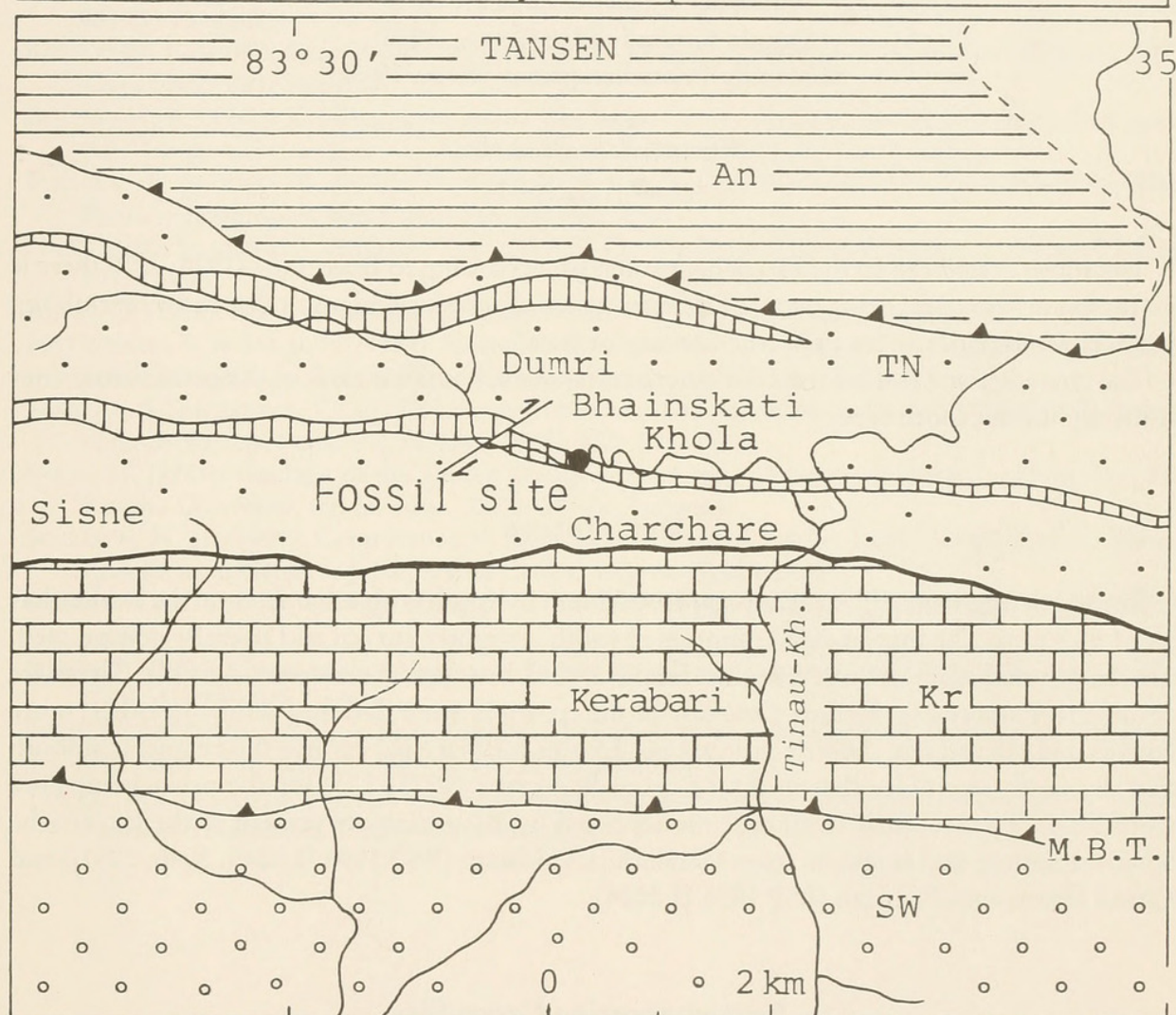
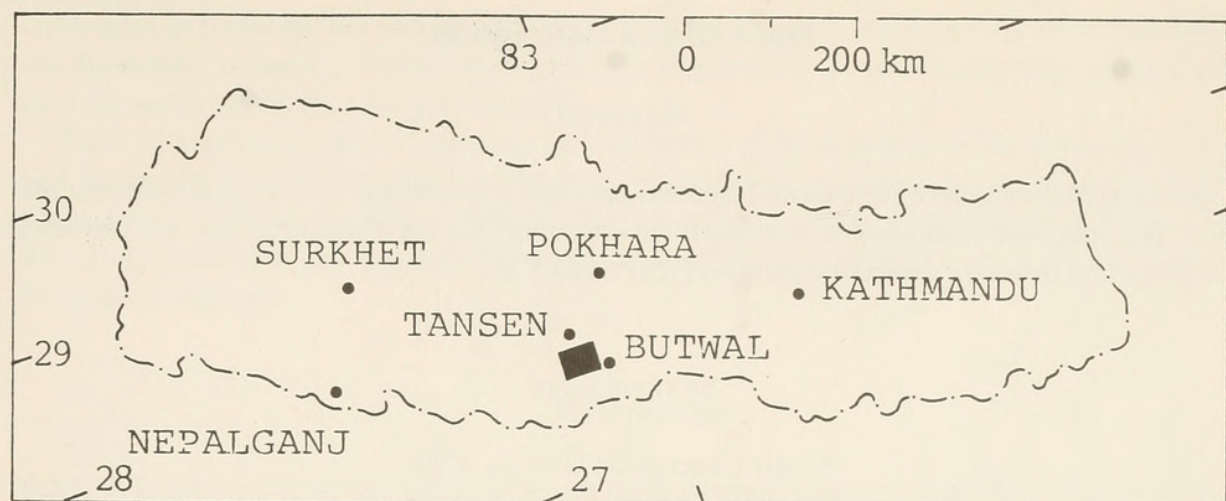
Geological Setting and Palaeontological Background

The fossiliferous area lies within the southwestern part of Lesser Himalayan Range of Nepal. The "Main Boundary Thrust" (M. B. T.) lying in the southern part of the area separates the Northern Lesser Himalayan Zone from the Southern Churia (Siwalik) Range (see text fig. 1). More than 5000 m thick, the oldest Precambrian to (?) early Paleozoic rocks of Lesser Himalaya consist of alternating beds of purple and green shales with dolomites containing abundant stromatolites (Angha Khola Formation) and of monotonous thick beds of dolomite with thin beds of cherts and slate (Kerawari Formation). About 2400 m thick, Late Carboniferous to Early Miocene deposits (Tansen Group) comprises of diamictite, dark green to purple shales, quartzose sandstone with some intercalations of siltstone and calcareous beds rich in fossils. Eocene deposits of this area are distributed in the central part, and on average they are about 100 m thick. The lower – middle part of the succession is composed of black shale with many thin calcareous beds containing foraminifers, molluscs and vertebrates. Oolitic hematite beds and red-purplish and green mottled shale characterize the upper part of the sequence. From the middle of this Eocene succession, comprising variegated shales, the crocodile tooth has been collected. The location of this fossil is probably the same as indicated by SAKAI (1983: 33) as "BMV3".

Within the rock-succession of Lesser Himalaya, fossiliferous beds are rare. Eocene deposits have been studied mainly by FUCHS et al. (1970), HASHIMOTO et al. (1973), SINGH (1973), TEWARI & GUPTA (1976), SHARMA (1977), SAKAI (1983), MATSUMARU & SAKAI (1989) and others. SINGH (1973) noted for the Eocene Toshi formation north of Dang protists and molluscs. TEWARI & GUPTA (1976) described a large foraminiferal assemblage supposedly from Eocene deposits of Surkhey Valley of Western Nepal, 200 km further west of Tansen area. SHARMA (1977) mention that the Eocene sediments of Nepal bear a good amount of fossils but made no comments on vertebrates. The first findings of vertebrate fossils from Eocene deposits of Tansen area were reported by SAKAI (1983: 34) including some terrestrial mammals, fishes and shells of turtles (Trionychidae a. o.). This fossil crocodile tooth is the first record from Eocene deposits of the Lesser Himalaya Area of Nepal.

SAKAI (1983) and MATSUMARU & SAKAI (1989) reported by means of foraminifera a middle Eocene (Lutetian; Middle Kirthar) age for the next undisturbed overlying strata.

Fig. 1: Map on the geographical and geological (after SAKAI, 1983) frame of the fossil bearing locality in S-Nepal. (Drawing by R. B. SAH and K. DOSSOW)



- | | |
|-------------------------|------------------------------|
| Alluvial deposits | Angha Khola Formation (An) |
| Siwalik sediments (SW) | Main Boudary Thrust (M.B.T.) |
| Tansen Group (TN) | Fault. |
| Eocene Beds | Geological Boundary |
| Kerawari Formation (Kr) | |

Material and Description

Material

The material consists of one tooth fragment partially imbedded in the original sediment matrix. The specimen is housed at Bayerische Staatssammlung for Palaeontology and historical Geology and bears the collection number: BSP 1990 I 18.

Systematics

Order Crocodylia GMELIN, 1788
Suborder Eusuchia HUXLEY, 1875
Family Crocodylidae CUVIER, 1807
Subfamily Pristichampsinae KUHN, 1968

Pristichampsinae indet.

(plate 1, fig. 1–2)

The tooth is referred to the Pristichampsinae as, according to BUFFETAUT (1978: 279) there is no reason or “no convincing proof of” the existence of sebecosuchians – that show resembling tooth characteristics – “in the early Tertiary of Asia”.

The characteristic feature used for determining the subfamiliar rank of the pristichampsines is the ziphodont tooth type.

Description

The tooth fragment still measures approx. 22 mm in length with a diameter on the broken basis of 11.8 mm. The monocuspid pinpointed tooth is slightly curved and laterally compressed. On the whole length of both marginal flanks a weak but typical serration is visible. There are about 6 to 8 serrations per mm. One side of the crown is more flattened while the other, more convex and curved one shows a pointed tip. Except for marginal carinae the enamel is smooth and the tooth resembles that of fig. 6E from BUFFETAUT (1978: 273) for the pristichampsines from Kala Chitta. Similar teeth to those reported by BUFFETAUT are present in the Bayerische Staatssammlung and originate from Ganda Kas/Pakistan: (BSP 1956 II 2045, 2046, 2051,) and Chinji Hessuwala/Pakistan (BSP 1956 II 2024).

Pristichampsine Crocodiles

The pristichampsine crocodiles are members of the modern crocodiles (Eusuchia) and regarded as a separate subfamily with a very distinctive tooth pattern. The laterally somewhat flattened teeth show marginal serrations, called ziphodont dentition. As that feature is known for carnivorous dinosaurs one is liked to interpret the pristichampsine crocodiles as being terrestrial forms. There are also further characteristics on the skull, development of osteoscutal protection and development of extremities. The pristichampsines are known since the Late Cretaceous, probably extending into the Pleistocene. STEEL (1989: 91) interpretes that group of

crocodiles as replacing the not yet existing large mammalian carnivores after the extinction of the dinosaurs, as having “immediately evolved a predominantly terrestrial group to fill the vacant ecological niche for a large predator.”

Pristichampsus and related forms are known from various localities of the European, Asian and American Eocene. The oldest ziphodont pristichampsine tooth is recorded for the Upper Cretaceous of Wyoming (STEEL, 1989: 92) and according to STEEL they died out in Europe and North America after the Eocene. However, in Australia such typical teeth were still found in Pleistocene deposits.

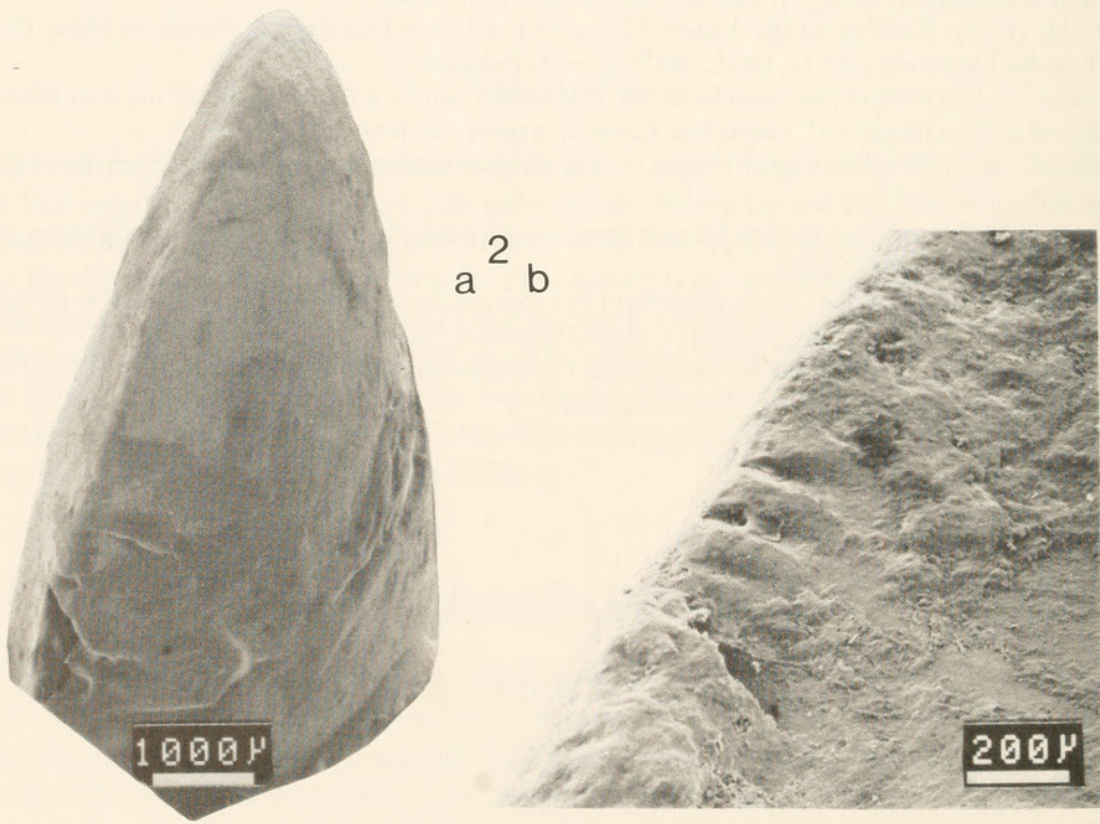
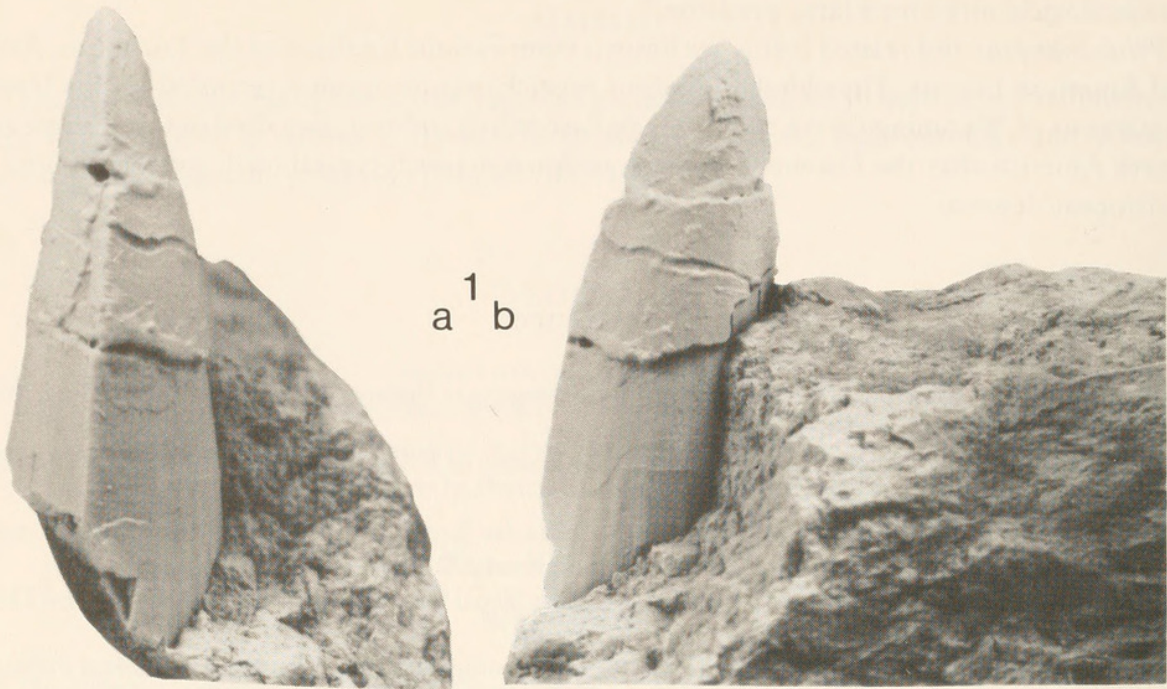
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Tafelerläuterung

Plate 1

- Fig. 1a: *Pristichampsinae* indet., fossil tooth showing serrated margin, Middle Eocene (Lutetian), Bhainskati Khola/S-Nepal. BSP 1990 I 18. (×3).
- Fig. 1b: Photograph of the same specimen in different view. (×3).
- Fig. 2a: SEM-photograph of the tip of the crown.
- Fig. 2b: SEM-photograph, detail showing the serrated tooth margin.



SAH, R. B. & SCHLEICH, H. H.: Eocene Crocodile from Nepal

Plate 1



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