A NEW REPORT OF A THEROPOD DINOSAUR FROM SOUTH AFRICA

by N. J. MATEER

ABSTRACT. The first unequivocal theropod dinosaur is reported here from the late Jurassic–early Cretaceous of South Africa. The specimens are a third pedal ungual (claw) and two teeth. The ungual is from the Sundays River Formation and the teeth are from the Enon Formation. The age of these formations is discussed.

DINOSAURS from the Jurassic and Cretaceous of South Africa are rare and are known only from fragmentary specimens which are mostly from the non-marine Kirkwood Formation (Jurassic–Cretaceous) in the Algoa Basin surrounding Port Elizabeth in the eastern Cape Province. They comprise principally remains of the sauropod *Algoasaurus* (Broom 1904) and the stegosaur *Paranthodon africanus* (Atherstone 1857, but see Galton and Coombs 1981); fragmentary remains from other specimens may or may not pertain to these genera. The iguanodontid *Kangnasaurus* (Haughton 1915) from Namaqualand in the north-west Cape Province is the only other dinosaur known from outside this southern region of South Africa. Until recently (Rich *et al.* 1983), no theropod dinosaurs had been reported from South Africa, but during field-work in 1978, Rich *et al.* (1983) found a fragmentary, though promising, terrestrial fauna from the Kirkwood Formation which contained, almost certainly, three teeth of a theropod, though they remain unidentified as such. During a recent visit to the South African Museum, I noted a theropod ungual. It was apparently collected from the Sundays River Beds. Two theropod teeth from the Enon Formation are also described from the same collection.

STRATIGRAPHY

The Jurassic–Cretaceous sequence of the Cape Province is concentrated along the southern edge of South Africa in a number of fault-controlled basins stretching throughout the Cape Fold Belt, from about 70 km east of Cape Town to Port Elizabeth in the eastern Cape Province (text-fig. 1). The Algoa Basin is the largest and best developed of these basins and was initiated in close association with the splitting of southern Africa and South America, and the Falkland Plateau during the latest Jurassic. Following the split, marine, paralic and non-marine sedimentation has been continuous until the present day, although the rate of sedimentation was more rapid during basin subsidence in the Jurassic (McLachlan and McMillan 1979).

The non-marine sequence has yielded few fossil vertebrates and plants, and has generally not thought to have been promising palaeontologically. However, the recent report of a diverse terrestrial fauna (Rich *et al.* 1983) of freshwater fish, testudines, crocodiles, sphenodontids and ornithischian and saurischian dinosaurs has changed this. This latter fauna is from the Upper Kirkwood Formation which is thought to be Tithonian to early Valangian (late Jurassic to early Cretaceous) in age (McLachlan and McMillan 1976, 1979), but Winter (1979, fig. 2) regarded it as only Tithonian. The Sundays River Formation is probably early Cretaceous (?Berriasian to Barremian) and is predominantly paralic, thus it is unlikely to contain the theropod in question. The locality given for the theropod ungual is vague, simply 'Kirkwood'; this town lies on the Sundays River Formation, although the Kirkwood and Enon formations outcrop very close by. According to McLachlan and McMillan (1976, p. 205), all three formations (together forming the Uitenhage Group) have

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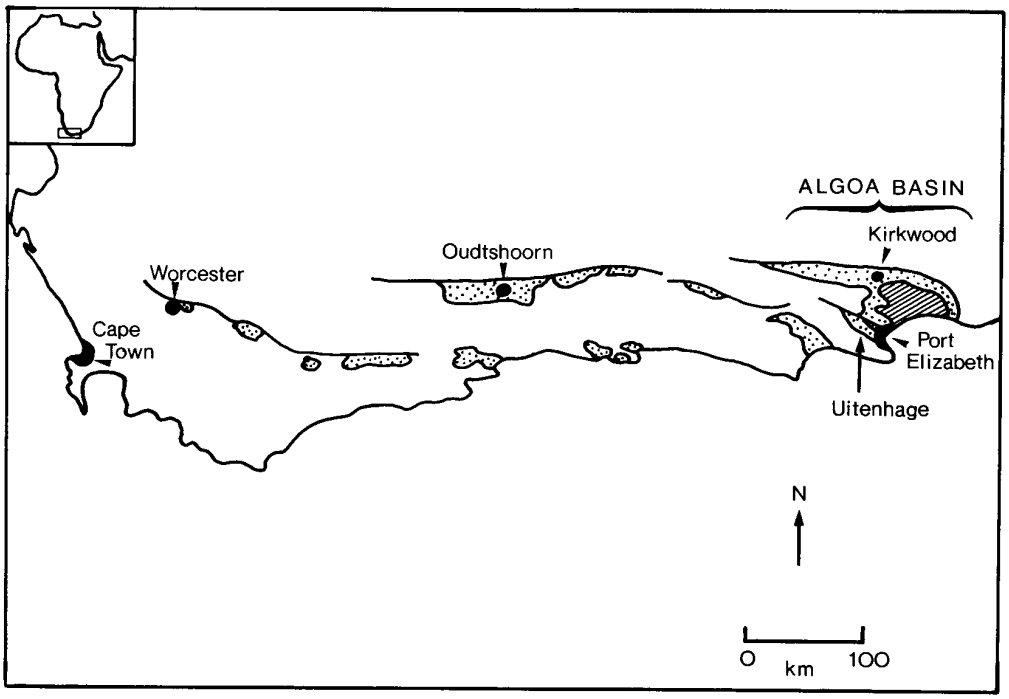
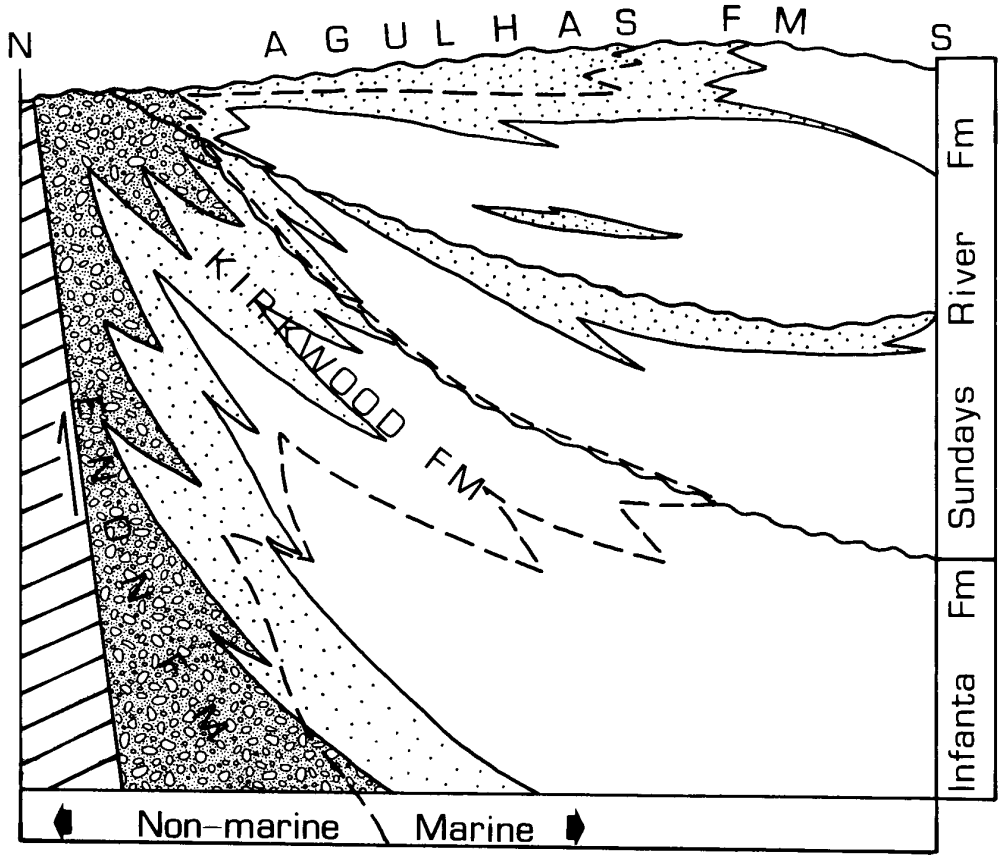


TEXT-FIG. 1. Location of Jurassic–Cretaceous sedimentary basins in the Cape Fold Belt, South Africa. The Enon and Kirkwood formations are cross-hatched, the Sundays River Formation is stippled. Modified after McLachlan and McMillan (1976).

yielded reptile fossil fragments (an imperfect lacertilian femur, and a dinosaur centrum and tooth are reported from the Sundays River Formation). Owing to the complex stratigraphic intertonguing between the terrestrial and marine units during this regressionary–transgressionary period, the Jurassic and Cretaceous boundary within these formations is imprecisely known thus leaving the age of these specimens as either latest Jurassic or earliest Cretaceous (text-fig. 2).

PALAEONTOLOGY

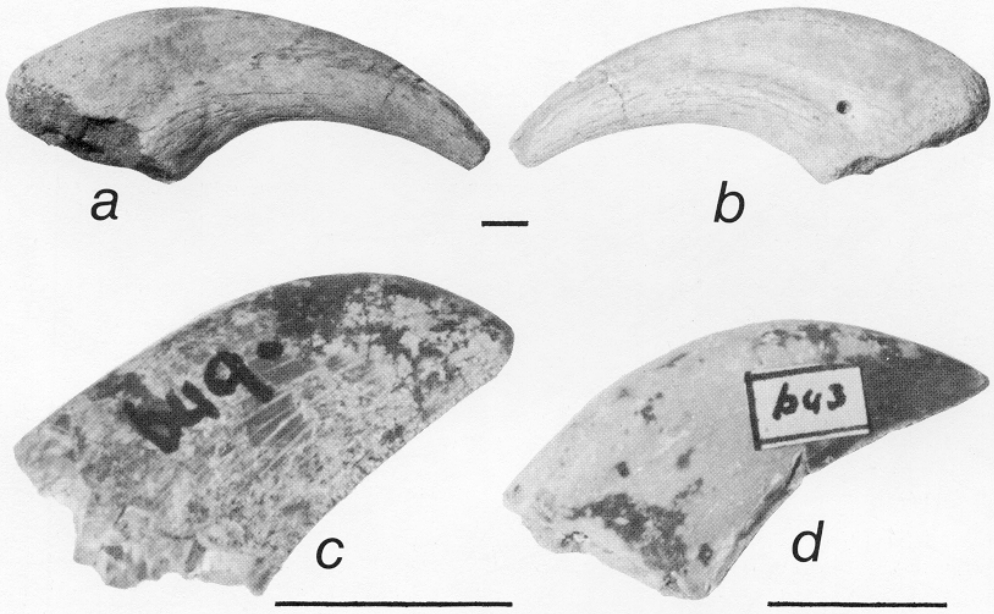
The ungual specimen reported here (SAM K1475 in the South African Museum) is well preserved except for the proximal articular facet which is missing (text-fig. 3*a*, *b*). The ungual is 9·4 cm long and is gently curved and moderately robust. The large size would indicate that this is a pedal ungual. The lateral grooves are low proximally, rising upward distally, a pattern which seems to be characteristic of the third terminal phalange rather than the second or fourth. Comparison with other theropods (e.g. Ostrom 1969, p. 152) shows this specimen to be too robust, large, and gently curved to have been a coelurosaur despite the missing proximal end, thus it should be placed within the carnosaurs. This group has a number of late Jurassic–early Cretaceous genera to which this specimen may belong, the most likely candidate being within the Allosauridae or Megalosauridae (grouped in one family, the Megalosauridae, by Romer (1966)), on account of the gentle curvature of this large ungual. This specimen is identical with a similar ungual in *Allosaurus fragilis* (see Madsen 1976, pl. 54, fig. 3,). The other two carnosaur families known from the late Jurassic–early Cretaceous, Ceratosauridae (Marsh 1884) and Spinosauridae (Stromer 1915), do not have the same



TEXT-FIG. 2. Stratigraphic relationships of Upper Jurassic and Lower Cretaceous strata of the Algoa Basin, South Africa. Modified after Winter (1979).

ungual form. Ostrom (1976) noted variability in the ungual curvature of *Deinonychus*, the type specimen being more pronounced than a second specimen he described. Such variability has not been noted in other carnosaurs, but the diagnostic value of unguals should be treated with utmost caution.

In addition to this ungual, two theropod teeth (SAM 643, 649) are in the same collection (text-fig. 3*c*, *d*) although there is no record of their stratigraphic provenance; they were collected from the area around Oudtshoorn (about 350 km west of Port Elizabeth). According to McLachlan and McMillan (1976, fig. 1), only the Enon Conglomerate is exposed in this region, thus indicating a late Jurassic age for these teeth, and possibly older than those reported by Rich *et al.* (1983). Specimen SAM 643 (text-fig. 3*d*) is nearly complete with serrations on the posterior side only and is 2·8 cm in length (crown to anterior lower point). The crown is unworn and quite sharply recurved. Specimen SAM 649 (text-fig. 3*c*) is also serrated on the posterior side and is similar in size (3·2 cm, although the base is partially missing), though the crown is more worn than SAM 643. Both specimens have poorly preserved serrations but reveal an estimated eighteen to twenty posterior serrations per 5 mm. It was not possible to count the anterior serrations. It would appear that these



TEXT-FIG. 3. Specimens of theropod dinosaurs from South Africa. *a*, ?third ungual of a carnosaur pes (SAM 1475) from the Sundays River Formation, Kirkwood, South Africa; *b*, same as *a*, opposite side; *c*, theropod tooth (SAM 649) from Oudtshoorn (?Enon Conglomerate), South Africa; *d*, theropod tooth (SAM 643) from Oudtshoorn (?Enon Conglomerate), South Africa. All scale bars = 1 cm.

teeth are not from *Allosaurus* since they do not have vertical striations noted in Madsen (1976, fig. 9). These teeth reported are quite different from those described by Rich *et al.* (1983, fig. 6) as possibly being theropod.

DISCUSSION

The carnosaurs had a wide geographic range during the late Jurassic and early Cretaceous with specimens reported from the Western Interior of North America (e.g. Madsen 1976), Argentina (Bonaparte 1980), Australia (Molnar *et al.* 1980), Europe (Taquet and Welles 1977), northern and eastern Africa (Stromer 1931, respectively Janensch 1925), and China (Dong *et al.* 1978; Zhen *et al.* 1985). Valid early Cretaceous carnosaurs are comparatively rare comprising *Acrocanthosaurus* (Stovall and Langston 1950) from Oklahoma, ?*Allosaurus* from Australia (Molnar *et al.* 1980, *Carcharodontosaurus* (Stromer 1931) from North Africa, *Erectopus* (Huene 1923) from France, and ?*Megalosaurus* from Wyoming (Ostrom 1970). Despite these several forms that could have been present in South Africa during the early Cretaceous, Theropoda *incertae sedis* is the most accurate assignment that can be given to these specimens. The presence of theropods in southern Africa is not unexpected in view of the abundant dispersal routes at that time with close continental connections (Galton 1977, 1980)

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