Reprint Series
17 May 1996, Volume 272, pp. 971-972

SCIENCE

Out of Africa: Meet-Eating Dinosaurs That Challenge *Tyrannosaurus rex*

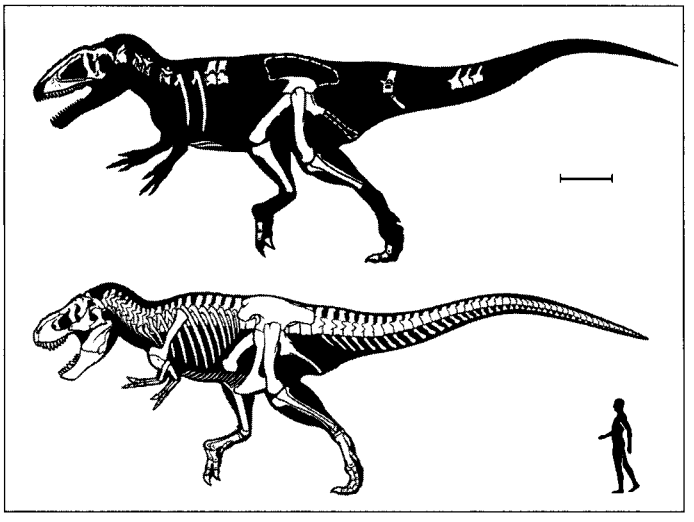
Philip J. Currie

Out of Africa: Meat-Eating Dinosaurs That Challenge *Tyrannosaurus rex*

Philip J. Currie

In recent years, the Kem Kem region of Morocco has been the site of increasing interest by those scientists hoping to get a first good look at dinosaur life on the isolated continent of Africa. An international expedition from the University of Chicago visited this paleontologically rich area in 1995 to see if they could recover better specimens. After several months in the field, enough fossils, data, and information had been gathered to establish a framework within which thousands of teeth and bones could be placed. As the field season wore on, the hope of finding significant dinosaur remains was rapidly dying. But, as often happens, that was when two superb discoveries were made in quick succession. As described by Sereno *et al.* on page 986 of this issue (*1*), the skull of one animal and much of the skeleton of another represent two of the best Cretaceous meat-eating dinosaurs (theropods) ever discovered in Africa and have ended some of the speculation that arose from more than 80 years worth of intriguing but enigmatic fragmentary discoveries.

Sereno and his colleagues describe a new genus and species of coelurosaurian theropod characterized by long, slender limbs suggestive of speed and agility (*1*). The remarkable thing is that the length dimensions of this animal seem to have been as large as those of *Allosaurus* and most other genera of large theropods. Its bones are dwarfed in comparison with the second specimen, however. This skull has been identified as *Carcharodontosaurus saharicus*, a species first recognized in 1927. Incomplete, usually fragmentary remains of this dinosaur have been recovered across northern Africa, leading to speculation about its size and relationships. The new specimen is as long or longer than any skull of *Tyrannosaurus rex*, which has always been referred to as the largest known terrestrial carnivore. At least that was the case until last September when Coria and Salgado announced the discovery of *Giganotosaurus carolinii* in Argentina (*2*). The head of *Giganotosaurus* is significantly longer than that of any known tyrannosaur skull (*3*). However, as Sereno and his colleagues point out, *Tyrannosaurus* is still longer limbed and taller than the apparently heavier *Giganotosaurus* and *Carcharodontosaurus*. Which of the two latter animals was larger remains to be determined. Fortunately, this rather simple problem will be resolved shortly thanks to the discovery of most of the rest of the skull of the Argentinian form in March of this year.



Predator pair. Skeletal silhouette drawings showing the known bones of two of the largest Late Cretaceous predators. *Carcharodontosaurus saharicus* (top), from northern Africa, is based on bones from Morocco and Egypt. *Tyrannosaurus rex* (bottom) is known from several skeletons from western North America. Scale bar equals 1 m; average-height human silhouette, 1.8 m). [Courtesy P. Sereno and C. Abraczinskas]

To a paleontologist, the size of an animal is of less interest than its adaptations, relationships, distribution, behavior, and a host of other characteristics. It is rather interesting that two of the largest theropod specimens ever discovered—Sereno's *Carcharodontosaurus* and *Giganotosaurus* from Argentina—were found within a year of each other. What is even more amazing, however, is the fact that these specimens, found on two different continents, have turned out to be closely related to each other. The shared characteristics cited in the Sereno *et al.* paper are just the tip of the iceberg, and more features are being discovered to strengthen this relation. The Moroccan *Carcharodontosaurus* has a well-preserved brain case, formed of the bones that surrounded the brain. Brain cases are conservative, which makes them excellent tools for studying relationships because they are less susceptible to the rapid evolutionary changes that characterize skeletal structures associated with feeding and locomotion. Brain case studies by the Sereno team on *Carcharodontosaurus* and by Coria and his colleagues on *Giganotosaurus* are revealing unique characteristics. A few additional features are suggestive of the sinraptorids, large theropods from the Jurassic of China.

Such discoveries are changing our rapidly evolving concepts of paleogeography during the Cretaceous. In 1995, Rauhut noted the partitioning of the world by tyrannosaurids, which dominated the northern continents, abelisaurid theropods (such as *Carnotaurus*) that were at the top of the food chain in South America, and carcharodontosaurids, which controlled Africa (*4*). With the recognition of *Giganotosaurus* as a carcharodontosaurid and the discovery of abelisaurids in Africa and southern Europe, it is clear that these families were free to intermix well into the Cretaceous. The coelurosaur reported in the current paper and dromaeosaurid remains reported by Rauhut from the Sudan show that these animals dispersed from the northern continents into Africa during the Late Cretaceous, demonstrating that there were no physical boundaries to prohibit the overlap of tyrannosaurid and carcharodontosaurid predators. It would be interesting to know what was happening in the zone of contact.

When Sereno published his paper on *Afrovenator* in *Science* 2 years ago (*5*), African dinosaur faunas were more poorly known than those of all continents except Antarctica. The discoveries by Sereno's team (*1*) and another report on Moroccan fossils (*6*) have done much to rectify this situation. At least this is true insofar as the saurischian dinosaurs are concerned. The paucity of African ornithischian dinosaurs continues to be noteworthy. Ornithischians, like the duck-billed hadrosaurs, the armored ankylosaurs, and the horned ceratopsians, were the dominant herbivores of Asia and North America during Late Cretaceous times and apparently were common in some environments in South America. Did the advanced ornithischian lineages fail to get into Africa? Or have the right kinds of paleoenvironments never been sampled? This is a problem that particularly vexes Forster and Krause (State University of New York at Stony Brook), who are part of an international team search-

The author is at the Tyrrell Museum of Palaeontology, Box 7500, Drumheller, Alberta T0J 0Y0, Canada. E-mail: pcurrie@dns.magtech.ab.ca

ing for the answers in Madagascar. It is one of the many problems that can only be resolved by further fieldwork and research. And it is one of the reasons why the discoveries of Late Cretaceous dinosaurs by the Sereno team in northern Africa will continue to attract international attention.

References

1. P. C. Sereno *et al. Science* **272**, 986 (1996).
2. R. A. Coria and L. Salgado, *Nature* **377**, 224 (1995).
3. ———, unpublished data.
4. O. W. M. Rauhut, *Berl. Geowiss. Abh. E* **16**, 357 (1995).
5. P. C. Sereno, J. A. Wilson, H. C. E. Larsson, D. B. Dutheil, H.-D. Sues, *Science* **266**, 267 (1994).
6. D. Russell, *Bull. Mus. Natl. Hist. Nat.*, in press.