

## PRELIMINARY DATA ON THE DISCOVERY OF DINOSAURS IN THE DEPOSIT OF BOULAHFA (SW OF BOULEMANE, CENTRAL MIDDLE ATLAS)\*

Mohammed CHARROUD & Bouazza FEDAN

While working in geological cartography in the region of Boulemane (central Middle Atlas) in March 1987, one of us (Ch. M.) located an important deposit of dinosaur bones in the Bathonian gypsum marls of Boulhafa. Exploratory excavations in the summer of 1988 (Ch. M. and F.B.) resulted in the collection of a large number of well-preserved bones, complete or in pieces.

The deposit of Boulhafa is situated 9 km as the crow flies SW of Boulemane, in the central Middle Atlas. One reaches it by the R.P. 20. It is between the Boulahfa plain and Jebel Azougagh.

The collected bones occupy a surface of about 230 m<sup>2</sup> in the deposit. A first analysis of the distribution of the bones and their mode of burial shows that some pieces were loose and others in place. In this layer, enormous bones are very frequent. We already possess more than 45 pieces: 2 long bones (femora) that measure between 230 and 240 cm, the heads of long bones in large number, large vertebrae whose measurement reaches 60 to 80 cm. These bones are those of the skeleton of an animal of very large dimensions: a femur measures 236 cm. As a comparison, we note that the femur of the cetiosaur from El Mers (Middle Atlas) measures 160 cm long and that from Tilouguit (High Atlas) 200 cm.

In Morocco, dinosaur deposits have been known since 1927: - the oldest and also one of the most famous in the world is the deposit of Iouaridène (Demnate, central High Atlas) where prints of theropods were discovered in 1937; - the locality of El Mers (Middle Atlas) where a new species of cetiosaur (*Cetiosaurus mogrebiensis*) has been identified from bones collected since 1927; - the deposits of Asseksi (Taguelft basin, Atlas of Béni Mellal) where sauropod bones are similar to those from El Mers; - the layer of Gara Sba (Anti-Atlas) where a new genus and species of large sauropod (*Rebbachisaurus garasbae*) has been discovered; - since 1978 new localities have been discovered (Wawmda and those from the region of Asseksi, High Atlas). The discovery of the Boulahfa locality can be added to this important list of deposits.

The dinosaur bones from the Boulahfa deposit appear to be confined especially to the top of the Bathonian gypsum marls. These correspond to the second portion of the trilogy that forms the series of subsidence of the Middle Atlas Jurassic basin. It is characterized by the development of inshore evaporitic lagoons on the borders of which

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lived dinosaurs. The geological context (situation and characteristics) of these deposits are comparable to those of El Mers and the High Atlas.

The Boulahfa layer presents undeniable interest and deserves a paleontological survey that is as complete as possible.

### **Observations:**

R. du DRESNAY: 1) - The slab with traces of dinosaur footprints from the base of the red El Mers formation announced by B. Feddan was found in September 1968 by Messrs. T. Hallam and H. Torrens and was presented by oral communication to the W. Smith Symposium in London in 1969.

2) - An important dinosaur deposit must be added to the list of B. Feddan: that of Anoual Ksar Mellili in the eastern High Atlas, because it is being restudied and has brought new data: finds in 1960 by J. Agard and R. du Dresnay contain fossil wood, dinosaur bones, lago-marine organisms like lamellibranchs and echinoderms. Further explorations by M. Monbaron and Mrs. Russell of the Museum d'Histoire naturelle de Paris have produced the most ancient tooth of an African mammal.

3) - It brings some age details to the dating of a comprehensive red series ("continental intercalaire") whose age has always been disputed, but whose standard lithostratigraphy has been established by B. Feddan in the d'Imouzzer region of Marmoucha. These details are:

a) - the Barremian age (confirmed here by M. Souhel) based on the ostracods of the formation by J. Sidal (synclines of the red layers from Aït Ibirène and from Guettioua in the High Atlas) and brought by M. Haddoumi (Thèse Nancy, 1987);

b) - the layer of Anoual Ksar Mellili would bring new data: Monbaron distinguishes from laboratory analyses two assemblages, A and B, in the red sediments, the deposit of Ksar Mellili belonging to the B assemblage; which would be reinforced by the studies in progress at the Museum d'Histoire naturelle de Paris, based on faunas associated with the dinosaur bones and that would indicate a higher age in the Jurassic-Cretaceous succession (Symposium S.G.F. on the Tethys, Paris, November 1989) (Note has appeared in Geobios) (Mr. Monbaron, Symposium on the red sediments of Africa P.I.C.G., Marrakech, 1989, has appeared in the J. Afric. Earth Sciences).