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The Latest Cretaceous fauna with dinosaurs and mammals from the Haţeg Basin — A historical overview

Dan Grigorescu

Department of Geology and Geophysics, University of Bucharest, 1 Bălcescu Blvd., RO-010041 Bucharest, Romania

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ABSTRACT

Research on the uppermost Cretaceous continental deposits with dinosaur remains from the Haţeg Basin has behind it a history of more than 110 years. The first studies were by Franz Nopcsa (1877–1933) who published between 1897 and 1929 a series of notes and papers on this fauna, including five monographs dedicated to the Haţeg dinosaurs. Nopcsa described 10 vertebrate taxa, including dinosaurs, crocodilians and turtles, from the Haţeg Basin, out of which 6 are still valid. He recognized the primitiveness and the small size of most of the taxa from the Haţeg palaeofauna, characters that he related to the isolated island environment within which this fauna lived for a long time span.

After Nopcsa, systematic research on the Haţeg fauna was interrupted for many decades, being resumed after 1977 when D. Grigorescu, leading a small group of students in Geology started to explore the deposits outcropping along the Sibişel valley, near Sânpetru village, from where Nopcsa made most of his collection of fossil bones. Since then the fieldwork continued every summer until now, numerous remains of dinosaurs, crocodiles and turtles being unearthed. The list of the Maastrichtian fauna from Haţeg currently includes 56 taxa from all vertebrate classes. More than half of the recorded taxa were discovered in micropalaeontological samples through screen-washing. The most spectacular discoveries made after 1977 include a large variety of small theropods, several sites with dinosaur egg clutches, one of these also yielding hatchling remains, one of the largest pterosaurs in the world, representing a new genus and species, *Hatzegopteryx thambema*, and several taxa of multituberculate mammals.

Studies of the Haţeg fauna were not restricted to systematic palaeontology, but also covered all the fields that contribute together to an accurate reconstruction of the environment within which the Maastrichtian fauna existed. This overview includes a list of contributors to the actual knowledge on the Haţeg fauna, during the last 30 years, divided by fields of scientific interest.

1. Introduction

Although the fossil bones of dinosaurs from the Haţeg Basin were not mentioned in a scientific publication before the last years of the 19th century, undoubtedly they were known many centuries before, at least to the local villagers who walked along the river terraces or on the hilly slopes of the region. The bones were naturally unearthed after the snow melt during the spring or following the summer rains and remained exposed close to their host rock or transported by streams far away into the river channels. Neither the villagers, nor anybody in the world knew at that time that the bones belonged to dinosaurs but, because their resemblance to the bones of known animals was obvious, the theological conviction that they were remains of biblical giants became standard. Thirty years ago, when the author of this review started palaeontological research in the Haţeg Basin, he met a few old villagers who still held on to this belief.

"Haţeg Country", as the Haţeg Basin is generally known, following the name given by geographers to regions encircled by mountains, is a region with pregnant identity in the history and culture of Romania. Here the first Roman capital of the conquered Dacia was settled and centuries after the Roman period, during Medieval times, several churches and monasteries were built from stones and bricks. The remains of many of these places of faith are preserved in this area, making "Haţeg Country" the region of Romania with the highest density of Medieval holy places.

2. The beginning (1897–1933)

The first record of fossil vertebrates from strata that afterwards became known as the "uppermost Cretaceous dinosaur-bearing deposits of the Haţeg Basin" goes back to 1897, the year when two papers were published, one by Gyula Halaváts in Budapest (Halaváts, 1897), and another by Franz Nopcsa (Fig. 1) in Vienna (Nopcsa, 1897).

At that time Halaváts, born in 1853, was already an experienced geologist, employee of the Geological Institute in Budapest and undertaking

E-mail address: dangrig84@yahoo.com.

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Fig. 1. Portrait of Franz Nopcsa; drawing by F. Márton, 1926 (from Fözy, 2000).

geological mapping in Banat and Transylvania. He described the lithology of the clastic deposits with fossil bones and freshwater molluscs from the Sibişel and Strei valleys, assigning them to the Aquitanian, based on their facial similarities with the coal deposits from the Petroşani Basin, east of Haţeg. In assigning this age, Halaváts ignored the vertebrate remains that he collected, but could not determine properly. Afterwards, the fossil bones were examined by the Austrian palaeontologist Gustav Arthaber who recognized among them a lower jaw and tooth of "an *Iguanodon*-like animal", and vertebral centra of an "apparently small, pterosaur-like animal" (Nopcsa, 1899, p. 332). On this basis, three years later Halaváts corrected his opinion, giving a Middle Cretaceous age to the non-marine deposits of the Haţeg Basin (Halaváts, 1900).

Contrary to Halaváts, in 1897, when his first paper was published, Ferenc (Franz) Nopcsa was only 20 years old; in that year he became a student in Geology at Vienna University, after graduation from the Theresianum secondary school in Vienna.

However, in spite of his young age and presumed lack of geological experience, Nopcsa already had a good knowledge of the geology and palaeontological content of the continental deposits from Haţeg, as well as on the anatomy of dinosaurs. All of these were achieved in only two years of restless studies in the field, museums and libraries, following the accidental discovery of some fossil bones on the family estate at Sânpetru (Fig. 2) made in 1895 by his sister Ilona. These bones incited the young Nopcsa to search the area intensively; as result, before the autumn of the same year, when he had to return to the Theresianum, he collected new bones, including an incomplete articulated skull, were collected by himself. This was undoubtedly the starting point in Nopcsa's remarkable palaeontological career dedicated to dinosaurs and other fossil reptiles.

He had to study the bones by himself from the beginning, because, contrary to his expectations, nobody in Vienna could help him to determine them. The renowned professor of Geology Eduard Suess, to whom Nopcsa showed the bones he brought to Vienna, was excited by the discovery and planned systematic searches in the region, which never took place (Tasnádi-Kubacska, 1945). Neither could Suess help the young Nopcsa in describing the bones; instead, he advised him to study them by himself. It was exactly what Nopcsa did. Still a secondary school student, Nopcsa started an intensive scientific documentation focused on the comparative osteology of dinosaurs and reptiles in general. The efforts were tremendous and, as he mentioned in his diary, "(T)he exhausting work threw me into a sickly condition, but at the end of the year (*i.e.* 1896) my first manuscript was finished" (Tasnádi-Kubacska, 1945, p. 24).

In 1897 Nopcsa became a student of Vienna University, having Suess and his assistants, Gustav Arthaber and Othenio Abel, among his professors and scientific advisors. Abel in particular, only two years older, and one of the founders of the emerging new science of palaeobiology, was solicited, the palaeobiology of dinosaurs becoming one of the favourite areas of interest for Nopcsa.

In spite of the fact that no one could help Nopcsa in describing the bones and he had to do this by himself, Vienna, with its cultural and scientific background, represented a very favourable place to support Nopcsa's endeavour. In addition to the mentioned reputed professors of the University, Vienna had impressive museums which hosted major collections in all the fields of Natural Sciences, as well as impressive libraries. In Vienna, Nopcsa read through the publications of the great dinosaur specialists of the time, such as Othniel C. Marsh and Edward D. Cope, the two combatants in the "Bone War" or "The Great Dinosaur Rush" as their competition in collecting dinosaur bones from quarries in the Wild West, is known (e.g., Colbert, 1984), or, of the European researchers, Harry Seeley (the author of the twofold division of the dinosaurs into Saurischia and Ornithischia; Seeley, 1887) or Louis Dollo, another co-founder of the field of palaeobiology, who studied the *Iguanodon* remains from Bernissart, Belgium (Dollo, 1883).

The studies continued "day and night, on work-days as well as on holidays" (Tasnádi-Kubacska, 1945, p. 24). The studies in the laboratory and the libraries of Vienna were followed during the summer holidays by field prospecting in the Haţeg Basin, but also in other neighbouring regions where deposits with dinosaur remains crop out (Nopcsa, 1905a). The knowledge he acquired in only two years, by his great efforts motivated by increasing interest in geology and dinosaurs, allowed Nopcsa to present in 1897 his first note on the dinosaur-bearing deposits from the Haţeg Basin. In this first note Nopcsa (1897) introduced the name of "Szentpéterfalva (*Sânpetru*) sandstone", as a lithostratigraphic unit referred to the *Danian* (at that time included as the uppermost stage in the Cretaceous); this endeavour demonstrates that the author knew the fossiliferous deposits on a regional scale, but chose to select Sânpetru as the type-locality for the dinosaur-bearing deposits of the Haţeg Basin. The name remained the reference lithostratigraphic unit for the dinosaur-bearing deposits from the Haţeg Basin for many decades. In the same paper, contrary to Halaváts, Nopcsa referred correctly the deposits to Upper Cretaceous, based on their fossil vertebrate content.

Two years later, again at a meeting of the Academy of Natural Sciences in Vienna, Nopcsa presented the detailed description of the skull discovered by him in 1895, assigning it to a new dinosaur taxon — *Limnosaurus transsylvanicus* (Nopcsa, 1900). The paper, presented in June 1899 and published in 1900, represents his first work dedicated to the systematic description of dinosaurs from the Haţeg Basin, in a series of five monographs published under the heading "Dinosaurierreste aus Siebenbürgen" ("Dinosaur remains from Transylvania"), the others following from 1902 to 1929 (Nopcsa, 1902a, 1904, 1928a,b, 1929).