

# New Paleontological Finds In Cretaceous Deposits Of The Basin Of Aksak-Ata River (Chatkal Ridge)

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**Abstract:** In the Aksak-ata river basin (the Chatkal Ridge), in the Cretaceous deposits of fluvial genesis, for the first time, the inclusions of bones, probably, of a small plant-eating dinosaur have been found as well as the fragments of tortoise shell of an Adocidae family turtle. The find adds new information regarding the geological history of development of the region, sedimentation of precipitates and representatives of fauna.

**Index Terms:** adocidae, Aksak-ata, bone remains, Chatkal-Kurama, cretaceous, dinosaurs, modern turtles, ornithomimidae, paleogeographic, sand gravelite.

## 1 INTRODUCTION

In the Chatkal-Kurama region of Uzbekistan, the Paleozoic volcanogenic formations and parts of the early Mesozoic are widely developed, and the Mesozoic-Cenozoic sedimentary deposits are established in much smaller areas. The problems of studying the Cretaceous and Paleogene sedimentary deposits of the area near Tashkent were studied by N.Y.Minakova [10], S.H.Mirkamalova and G.A.Belenkiy [12], N.D.Arapova et al [2]. Their works were the basis for many subsequent researchers in solving the problems of the stratigraphy of these strata and the specific features of their sedimentation. Many questions of the stratigraphy of these deposits were solved in the study of the evolutionary development of oysters, which shells are often present in the sections, sometimes forming shell rocks. Based on paleogeographic reconstructions carried out by the predecessors, the surface morphology of the area near Tashkent was largely preconditioned due to the presence of numerous volcanic buildings of the Late Paleozoic – Early Mesozoic, which caused its compartmentalization. The warm climate contributed to development of the hydraulic network, which was manifested in the frequent presence of coarse fluvial deposits in the sections. At this time (Cretaceous-Paleogene) in many areas of the planet, terrestrial areas were actively conquered by vertebrates. In some places, in the sections of sedimentary formations of Mongolia, China, Europe and the USA, numerous bones-remains of various fossil animals are known, sometimes in the form of entire skeletons, giving the valuable information about the organic world of the past eras and the ways of its evolution. It has been established that the bone remains of terrestrial vertebrate organisms from the Cretaceous deposits of the Central Asia and Kazakhstan were mainly represented by turtles and dinosaurs, to a lesser extent by crocodiles and pterosaurs [13].

According to I.A. Efremov [4] who visited many manifestations of fossil terrestrial fauna known by that time in the outcrops of Central Asia, all of them were of no scientific interest due to poor preservation of bones. This allowed him to consider them as obvious signs of redeposition. Later, similar conclusions were made by his closest associate, A.K. Rozhdestvensky [14]. However, in subsequent years, during the thematic and geological surveys, new discoveries of the bones of vertebrate animals in the Mesozoic-Cenozoic deposits of Uzbekistan were made, the information on which made certain corrections to the history of geological development of the Tien Shan. In the adjacent area of the Tashkent district, in the area of the Syuk-Syuk well, G.A.Belenkiy [3] found a hadrosaurus skeleton in the Cretaceous sediments. In the Cretaceous stratum of Northern Fergana in Balaban-sai, at almost the same time, N.N. Verzhilin discovered a part of skeleton of a predatory dinosaur [13]. The further development of the biostratigraphy of the Cretaceous and Paleogene deposits of Uzbekistan was realized in the works of L.A. Nesova [11], who studied many sections of these deposits from the mountain bordering of the Fergana depression to the Kyzylkum plains. The most interesting were the collections of the remains of fossil organisms in the sections of the Cretaceous formations in the Mynbulak Basin (Central Kyzylkum). He collected and studied collections of bone remnants not only of vertebrate terrestrial organisms, but also of inhabitants of marine basins. The data on the sequence of changes in the Cretaceous fauna of vertebrates in northern Eurasia were summarized and their age was substantiated. Taxonomic and quantitative analysis of the composition of oryctocoenoses was also carried out, and regularities of changes of faunistic complexes in time were revealed, reflecting the stages of evolution of the ecosystems. Based on the analysis of vertebrate Cretaceous faunas, new data on paleogeography and paleoclimates of Northern Eurasia [11] have been compiled. The first catalog of the vertebrate Cretaceous locations of the region is compiled with complete faunistic lists of oryctocoenoses. Recently, H.A.Toychiev et al. [16] reported about finding of a part of skull of the southern mammoth (?) in the watercourse of Ovjajsai (region of Okhangaran settlement). The preliminary age of the enclosing sediments is defined as the lower-middle Eopleistocene. However, the traces of vital activity of vertebrate animals in the Mesozoic-Cenozoic in Chatkal-Kurama area were not found for a long time, although they were known in a number of other regions of Central Asia,

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where they were the objects of visits of specialized geological excursions with participation of the leading experts [1]. The preliminary age of the enclosing sediments inspected during the excursions was determined as the lower-middle Eocene (Paleogene). It is known that in the Cretaceous and Paleogene age in the areas of the Western Tien Shan there were transgressions of shallow seas. Maritime transgressions contributed to abrasion of the denudation plains formed there earlier. But in most of the territory, continental, mainly molasse sediments prevail among the Paleogene and Neogene deposits. The beginning of Eocene is marked with the global warming of the planet's climate, and at the beginning of the Oligocene there is a global cooling. This coincided with the fall of the Chesapeake meteorite, which occurred about 35 million years ago. A similar explanation about the connection of the disappearance of a significant part of the organic world on the border of the Cretaceous and Paleogene is associated with the fall of the Chicxulub asteroid (Mexico). Until recently, most scientists believed that the extinction of dinosaurs was caused by the fall of an asteroid on the Yucatan Peninsula in Mexico, as a result of which wildfires raged around the world, several kilometers high tsunami appeared, and, subsequently, the onset of the "nuclear (explosive) winter" effect. It was believed that the dinosaurs died, first from the explosion of a meteorite, then burned in forest fires and, eventually, froze due to reduction of temperatures and the death of green vegetation as a source of food. But now, some scientists believe that there are more evidences that this theory is not entirely correct. This assumption has caused some of the most contentious scientific debates in the recent time. It has been suggested that some of the dinosaurs and other extinct animals could actually safely survive these catastrophic events at the border of the Cretaceous and Paleogene. Within this version, their extinction occurred tens or even hundreds of thousands of years later, yet in the end of the early Cenozoic. Regardless of the different points of view on the causes and timing of extinction of many terrestrial vertebrates by the end of the Cretaceous, subsequent finds of bone remains will undoubtedly help to resolve controversial issues of biostratigraphy. Therefore, each new discovery of traces of vital activity of ancient vertebrate organisms or their bone remains in sedimentary formations of the Cretaceous-Paleogene of Uzbekistan is the missing link in the complex history of the geological history of the region. When conducting research in the area of the Angren quarry of the brown coal field, A. A. Koldaev [8] discovered a series of casts and footprints of vertebrates. The traces are found in large fragments of a light lumpy carbonate, down the slope from their primary outcrop. In terms of age, according to V.A. Zakharevich [7], limestones belong to the "limestone suite" deposits of the Middle Eocene (the Alai layers), accordingly overcovered with oyster marls (Turkestan layers). Footprints of predatory animals with characteristic claws, frequent traces of dragging reptile tails (?) and a single three-toed footprint, like those of dinosaurs known in literature, had been found among the tracks. In some blocks, the winding holes of crustaceans, according to O.S. Vyalov [5] it is the order Crustolithida Vyalov ordo nov., and traces of large sandworms crawling (Repichnia). Places of inclusion of thin-wall sections of mollusca – the indicators of the absence of significant land-swell and flatness of the beach. The abundance of morphologically diverse traces in a small area is characteristic of a watering site of reservoir, which has led in some places to

the superimposition of traces of various animals. Based on the material composition of the sediment containing traces, they are associated with a poorly watered coastal strip of a large water body (a sea?). Fixation of imprints occurred under the condition of rapid dewatering – surface drying of the track-carrying soil, as a result of which the traces turned into fossils, bypassing the usual stage of diagenesis. Indirectly, this is also confirmed by the lumpy texture of the rock. In the surf zone, clear traces could not be preserved due to the action of waves. It can be assumed that the coast was rather flat and visually accessible for various animals, both predatory and herbivorous. During the work, already in 2015, at the same location, A.A.Koldaev [9] produced new finds of traces of vertebrates. Among them is a single footprint of a small hoofed animal. In the recent years, many fossil-remains of large dinosaurs have been found in the countries of Central Asia. Especially numerous are the collections of dinosaur bone fragments from the Cretaceous sediments in the Mynbulak Basin. Paleontologists from the Zoological Institute of the Russian Academy of Sciences and their colleagues from the American Smithsonian Institution found out that the largest dinosaurs on the territory of modern Central Asia were titanosaurs – the giant herbivorous dinosaurs whose weight could reach 100 tons with a body length of 25-30 meters. The extreme rarity of their remains in the rocks of the Cretaceous age in Uzbekistan, Kyrgyzstan, Tajikistan and Kazakhstan suggests that it's unlikely that they dominated among the herbivorous dinosaurs of that time, and were rarely found in the ecosystems. According to preliminary assessment by the Russian paleontologists, about 200 new species of ancient animals were found in Central Asia, and their continued systematization will help to restore the organic world as it was 90 million years ago.

## 2 MATERIALS AND METHODS

The authors of this message in 2016 had found a manifestation of bone remains in the Cretaceous sand gravelite of the on-ground genesis in the Aksak-ata river basin (the Chatkal Ridge). The rock consists of grains and small fragments of Paleozoic rock effusives, giving a purple-brown color to the host rock. The photographs of the finds have been transferred to A.O. Averyanov, the Head of Laboratory of Zoological Institute of the Russian Academy of Sciences at the St.Petersburg State University. In his opinion, the dinosaur bones have been determined in the presented collection, most likely – ornithomimids (photo 2-5). According to Wikipedia, ornithomimids were bipedal omnivorous dinosaurs widespread in the late Cretaceous time in the areas of the modern North America and Asia. Also, the remains of ornithomimids found in Sudan and Uruguay. Exteriorly, they resembled modern ostriches, it's suggested that they could have feather cover. The group originated during the Cenomanian age. Ornithomimidae extincted at the end of the Cretaceous period, along with the rest of the dinosaurs.

## 3 RESULTS AND DISCUSSION

Fragmentation of the bones in the host rock allows for slight movement of the body in the channel stream. This probably explains the joint presence of the remains of ornithomimid (?) and two fragments of the canine teeth of a predatory animal (photo 1). They have a conical shape, rectilinear, very small grooves are observed along the entire length.

to a small body.



**Photo 1.** Fragments of canines.



**Photo 4.** Vertebra.

The average length of the found bone remains does not exceed 5-6 cm. The color of the bones is yellowish-white, with a hollow internal channel, many have an incorrect cleavage. Rib fragments (photo 2-3),



**Photo 2.** Rib fragment.



**Photo 5.** A fragment of a limb bone.



**Photo 3.** Isolated fragments of ribs.

Together with the dinosaur bones, fragments of the dorsal and abdominal shells of turtles Trionychidae indet., Shachemys sp. (Adocidae) (photo 6-7).

a single small vertebra (photo 4), limb fragment (photo 5) had been found. The size of all the bones found can be attributed



**Photo 6.** Fragment of the dorsal plate of the turtle shell.



**Photo 7.** Fragment of the abdominal plate of the turtle shell.

According to A.O. Averyanov, the Head of Laboratory of Zoological Institute of the Russian Academy of Sciences at the St.Petersburg State University, who kindly acquainted with the photographs, the fragments belong to representatives of the Adocidae family. The study of turtles of this family began more than 150 years ago with the work of A. Jocus based on the finds from the Late Cretaceous of North America. In the end of the last century, there were numerous publications about the finds of adocides from Asia [11, 6, 15]. It was found that, compared with dinosaurs and other vertebrate families, turtles, at least at the family level, were almost not affected by extinction in the Cretaceous. A feature of turtle shell, both fossil and modern turtles, is its segmental structure, which leads to disintegration after the death of an organism into composite fragments. Due to this feature of turtle shell, its full specimens or large fragments are very rarely found in locations. It is believed [15] that the adocides were freshwater forms, preferred habitation conditions in the humid subtropical climate in the border areas with extensive coastal lowlands. At the same time, representatives of the genus Adocus were widely distributed within the Asian continent. According to E.V. Syromyatnikova [15], in Asia, Adocidae turtles were distributed in the time interval from the Late Jurassic to the Oligocene.

#### 4 CONCLUSION

1. In the area near Tashkent, there is a well-developed pattern of biostratigraphic breakdown of deposits for sedimentation masses of Cretaceous and Paleogene.

2. In the above-ground channel deposits Cretaceous, for the first time a set of bone remains had been found, which had been preliminarily attributed by the specialists to the ornithomimid group dinosaurs.
3. Also for first time, the fragments of Adocidae family turtle shells also had been found, which were not previously known for this region.
4. The finds show that another discovery of residues of ancient animals can be associated in future with the Mesozoic masses of the area near Tashkent.
5. Each find will bring the novelty in the apprehension of the paleogeography of the Mesozoic of the region and fauna that inhabited millions of years ago.

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