

Importance of Diliska Vertebrate Fauna for the Biostratigraphy of South Caucasus

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ABSTRACT. Diliska fauna is of outstanding biostratigraphic significance. The presence of *Anancus arvernensis*, *Equus stenonis* and *Mimomys polonicus* undoubtedly dates the fauna to the end of Pliocene and indicates that fauna corresponds to the terminal part of the MN17 unit. The fauna occupies an intermediate position between Dmanisi and Kvabebi faunas. Diliska is a rare site where *Anancus* and *Equus* are found together in a primary position and thus a chance of the mixture of sediments is excluded. Diliska mastodon is the latest representative of this form in Eurasia and *Equus* is represented by the earliest species (*Equus stenonis vireti*). © 2009 Bull. Georg. Natl. Acad. Sci.

Key words: Diliska, Georgia, vertebrate fauna, Villafranchian, biostratigraphy.

Introduction

Several interesting Neogene sites of vertebrates are found on the territory of eastern Georgia. Research of fossil remains from David Gareji Udabno (Sarmatian-Maeotian), Bazaleti (Maeotian), Dzedzvtakhevi (Maeotian), Kvabebi (Akchagylia) and other sites allowed professionals [1-6] to establish the biostratigraphic position of these fossil faunal assemblages as well as to give a wide scale review of several key issues about the evolution of Neogene wild life of South Caucasus [1-6].

The final stage of Pliocene is characterized by diverse fauna in Georgia. This time is represented by Dmanisi fauna, the absolute age (1.85 m.y.a.) the paleomagnetic and isotopic data [7-11] of which are in accordance with the biostratigraphic position (MN17) [7-9]. It is remarkable that the earliest hominid in Eurasia is found together with rich Late Villafranchian faunal remains and artifacts (Oduwan, mode I) in Dmanisi site.

According to scientists [9], Dmanisi hominid is in direct phylogenetic relation with the *Homo ergaster* group and represents the earliest undoubted evidence of out of Africa migration of the genus *homo* [8].

Until these times transition from the Middle to Late Villafranchian (Late Pliocene) – the period of important faunal changes, was weakly documented in the region. The discovery of Diliska fossil fauna (village Diliska, Akhalkalaki region) allowed us to fill in the existing gap in the history of wild life and to illustrate the changes which took place at the end of the Middle Villafranchian. Hereby it should be mentioned that South Caucasus was the territory where migratory routes of some faunal representatives passed.

History of discovery and exploratory work

In 1980 the geologist D. Jigauri transferred to the Institute of Paleobiology of the Academy of Sciences of Georgia, Tbilisi, a small collection of fossil vertebrates, which after him was collected in Khertvisi (Southern

Georgia). The fossil material was mainly represented by mastodont (*Anancus arvernensis*) and horse (*Equus stenonis*). In the work of L. Gabunia and A. Vekua [12] it is mentioned that faunal material from Khertvisi is interesting biostratigraphically, and that the geological age and actual location of the site needed specification. Relatively later, in 1991 a monograph "Georgia in the Anthropogene" was published, and one of the co-authors of the monograph - D. Jigauri [13], in the discussion regarding volcanism in Southern Georgia, remarks that he has found remains of fossil vertebrates in the vicinity of the village Diliska (and not in the vicinity of the village Khertvisi, as it was previously mentioned), on the right bank of the Paravani river (and not Khertvisi, as it was indicated by him earlier). The age of this fossil fauna was determined as lower Apsheronian by Gabunia and Vekua, and that site was indicated as Khertvisi. In such an unexpected way a regrettable mistake about the location of the site was revealed. However, the most important thing is that this fauna exists in reality and allows us to describe the history of the Caucasian fauna in more detail.

In 1995 a joint Georgian-American expedition undertook exploration in the Akhalkalaki region, geological and paleontological works were carried out. The members of the expedition were: D. Lordkipanidze (Georgian National Museum), R. Ferring (geologist, Texas University), Z. Kikodze (archaeologist, Tbilisi State University), B. Tutberidze (geologist, Tbilisi State

University), M. Tvalchrelidze (geologist, Institute of Geology), and A. Vekua (paleontologist, Institute of Paleobiology). The expedition investigated in detail the geological situation of the region, found a bone-bearing horizon and several bone accumulations in the village of Diliska. Extremely interesting, though not numerous paleontological material was collected. Small-scale excavations in Diliska took place in 1996-97 and 2007-2008; as a result, enough material was accumulated. The article is dedicated to the results of an investigation of the mentioned material.

Geological setting

D. Jigauri describes the geological section of Diliska. The lowermost part is represented by normally magnetized spheroidal basalts (Fig. 1,5), the mentioned basalts disconformably overlie the denuded tufogenic Goredzi suite. Several massive lava flows, basaltic breccia and dolerite basalts of the lower part of the Akhalkalaki suite follow the spheroidal basalts in ascending section. According to L. Vekua and M. Maisuradze [14], the lower part of the dolerites (Akhalkalaki suite) is normally magnetized, and the upper part is magnetized reversely. According to these authors, the mentioned dolerites in Diliska correspond to Tsalka-Trialeti dolerites and andesite-basalts in absolute age (K/Ar) 2.36 m.y.a. (Upper Akchaglyian) [14]; in the section an important part is taken by volcanic sandstones, conglomerates, breccia and volcanic ash layers (Fig. 1,4). A small thickness (2-2.5m) of sandy clays

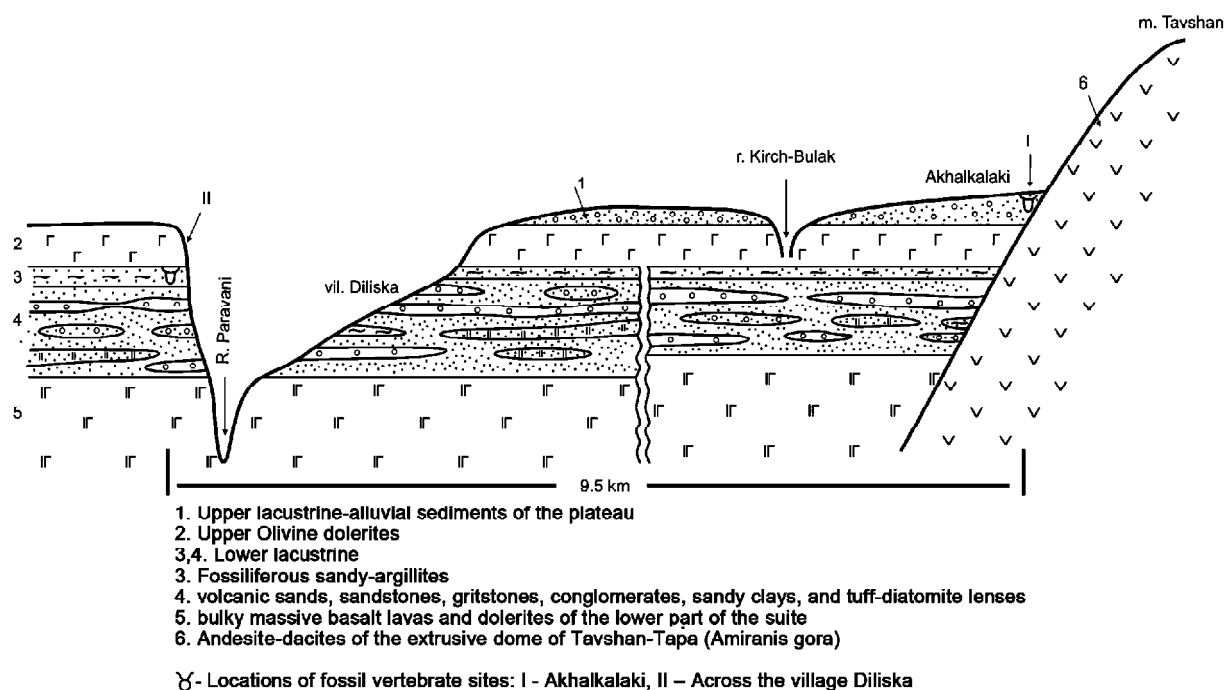


Fig. 1. Position of vertebrate fauna in the section of Akhalkalaki suite. Schematic section across the line Akhalkalaki-Diliska (according to D. Jigauri)

are represented in the upper part of the mentioned section, the latter contains fossil remains (Fig. 1,3). The section ends in an olivine dolerite lava flow, which is followed by lacustrine-alluvial sediments containing the Akhalkalaki vertebrate fauna (Fig. 1,2), [15].

Discussion - Diliska Fauna and its importance

Today Diliska vertebrate fauna is represented by: Amphibians – *Rana* sp. (frog), Reptilia – *Lacerta* sp., Mammals – *Canis* sp., *Panthera* sp., *Anancus arvernensis*, *Equus stenonis vireti*, *Cervus* sp., *Capreolus* sp., *Cavicornia* indet., *Mimomys polonicus*. Fish vertebra, undeterminable rodent and avian remains are also found among the fragmentary fossil material (Fig. 2-4).

Due to the coexistence of Pliocene mastodons and relatively recent horses Diliska fauna has outstanding biostratigraphic significance. The presence of *Anancus arvernensis*, *Equus stenonis* and *Mimomys polonicus* (the latter determined by A. Muskhelishvili) undoubtedly dates

the fauna to the end of Pliocene and indicates that the fauna corresponds to the terminal part of the MN17 unit.

Anancus arvernensis inhabited the territory of Eurasia mainly during Villafranchian times. Its earliest record in Eurasia is in Moldova fauna, which is undoubtedly dated to Early Villafranchian (approx. 3 m.y.a.). At the end of the Villafranchian (1.9-2.0 m.y.a.) this proboscidian became almost extinct in Eurasia (in Africa this mastodon lasted longer and is found in the Pleistocene sediments).

In the Middle Pliocene of Eurasia *A. arvernensis* is found at almost every site and is always accompanied by *Hipparion* and *Zygodontomys borsoni* (another mastodon). Very rarely, *Anancus arvernensis* is found together with *Equus stenonis*. These kinds of discoveries usually are interpreted as a result of sediment mixture. Diliska is exactly the rare site where these two forms are found together, and where a chance of the mixture of sediments is excluded, because all fossil material is found in a primary position.

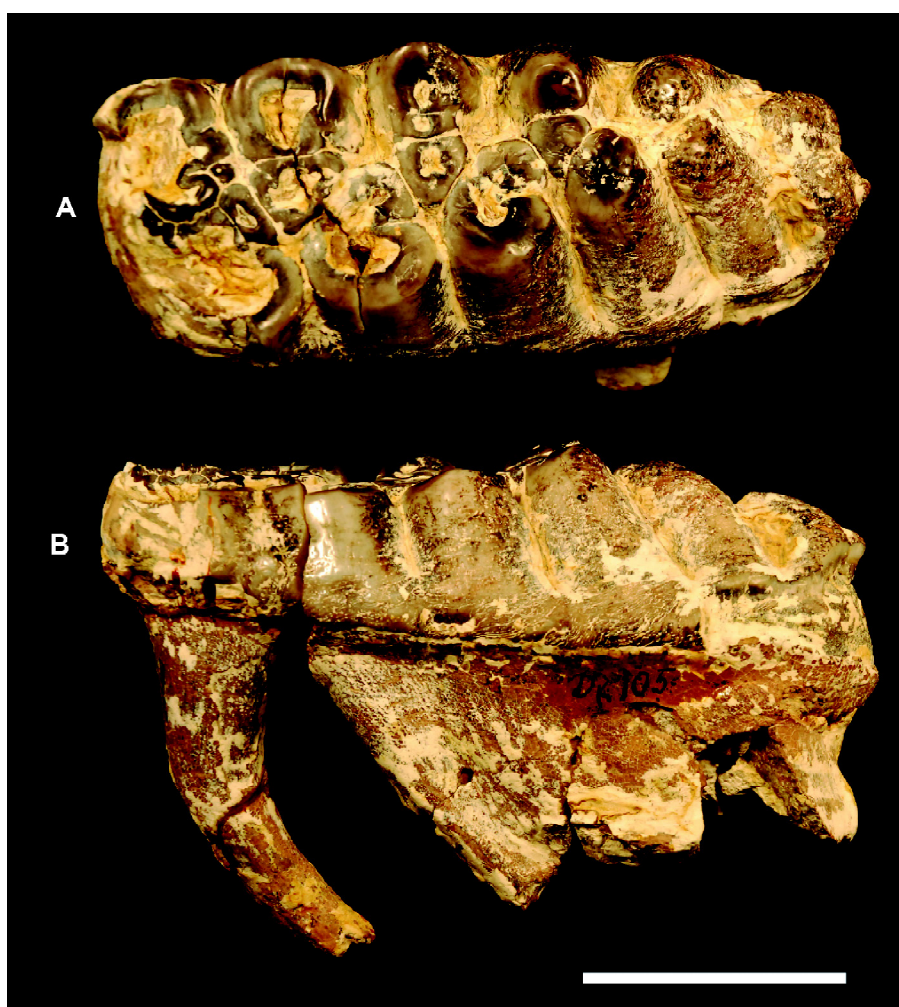


Fig. 2. Diliska, *Anancus arvernensis* Cr. et Job., Right M₃, A. Occlusal view, B. Lingual view. Scale bar 60 mm.

Anancus arvernensis is a rare form in South Caucasus. Until now this mastodon was found only in Kvabebi (Late Pliocene, 2.5-3 m.y.a) where it was accompanied by *Hipparion* and in Gomareti (Late Pliocene, 2.5 m.y.a.) also together with *Hipparion*. In Diliska (Late Pliocene, 2.2 m.y.a. as it was supposed by us on the basis of biostratigraphy) *Anancus arvernensis* is found together with *Equus stenonis*. This means that the Diliska mastodon is the latest representative of this form in South Caucasus. Our supposition that the date of the Diliska fauna should have been 2.2 m.y.a. was recently confirmed by a group of specialists, who have undertaken geochronological research on the Javakheti plateau (Southern Caucasus). They date the upper lava flows of Diliska section by 2.12-2.18 m.y.a (K/Ar) [16] which is in accordance with our opinion of the Diliska age, based on fauna remains.

The finding noted above was not at all unexpected. We have remarked that the South Caucasus, namely Georgian territory, represented a kind of refugium where climatic conditions of Mio-Pliocene - warm and temperate climate and mosaic landscape were preserved. Due to this circumstance, early representatives of flora and fauna were preserved here as relicts.

We can list several examples below. In Udabno (Maeotian, 7,8 m.y.a.) the latest hominid primate (*Udabnopithecus garedziensis* Burt. & Gabashvili) [17] was found. On the territory of the former Soviet Union Pleistocene primates (we consider monkeys) were not found anywhere before the discovery of macaque in Kudaro (Djava district) [18]; macaque from Kudaro was found in the Acheulian-Moustierian cultural layers. Remains of the giraffid *Palaeotragus*, found in Georgia, are the latest finds of this form in Europe; cave bears (*Ursus spelaeus*) still lived in Western Georgia in the Holocene and its fossils are found in many prehistoric caves [19]. Similar examples are abundant in the history of flora as well.

Equus stenonis is a reference fossil species. Complete upper tooth row of this species was found in Diliska. Morphological features (short and high protocone, doubled mesostyle, etc.) indicate that the Diliska horse belongs to the archaic species of the genus *Equus* – *E. stenonis vireti*. It should be underlined that the discovery of horse remains together with mastodon in Diliska enhances the stratigraphic importance of this fauna.

The second half of the Pliocene (Early Villafranchian) is represented by diverse fauna from Kvabebi. The Middle Akchagylia age of the fauna is confirmed by malacofauna, and the absolute dates (2.5-3 m.y.a.). In Kvabebi *Anancus arvernensis* and *Hipparion* are found. The Middle Villafranchian in Georgia is represented by Diliska fauna where *Anancus arvernensis* is found not together with three-digit horse (*Hipparion*) but with a one digit horse (*E. stenonis vireti*), *Hipparion*, the genus, widely spread in Neogene, becomes completely extinct by this time from the fauna.

Diliska fauna is followed by Dmanisi faunal complex, the absolute age of which (1.85 m.y.a.) cannot be doubted. It is remarkable that in Dmanisi fauna mastodon is replaced by a real elephant – southern elephant (*Mammuthus (Archidiscodon) meridionalis*), which coexists with *Equus*.

Faunal analysis assures us that in South Caucasus, by the end of the Middle Villafranchian, an important turnover takes place in the composition of fauna, such Neogene forms as *Anancus arvernensis*, *Zygolophodon borsoni*, *Hipparion* become extinct and fauna is substantially renewed. A new faunal complex appears, forming the nucleus for the Quaternary fauna.

Evidently, these changes in the Late Villafranchian were not instant changes. The process of renewal was caused by increased iridization of the environment. Important changes of physical and geographic conditions are observable by the beginning of Apsheronian (Late Villafranchian) on the territory of South Caucasus.



Fig. 3. Diliska, *Equus stenonis vireti* Prat. P²-M³, occlusal view. Scale bar 60 mm.



Fig. 4. Diliska, *Equus stenonis vireti* Prat., Right M¹, occlusal view.
Scale bar 20 mm.

During Akchagylian times temperate humid and warm climate becomes relatively drier. Landscape becomes xerophile, which is followed by profound changes in the faunal composition. At the beginning of the Pleistocene aridisation process assumes overwhelming character in the entire Southern Caucasus. The early forms of this fauna are found at the lower Pleistocene Akhalkalaki site, where leading elements of the fauna are rather large horse - *Equus susenbornensis* and relatively small form - *Equus hipparionoides*, a vast group of rodents (*Marmota*, *Citellus*), carnivores (*Vormela*, *Crocuta*, *Canis*), among Proboscidiens - *Mammuthus trogontherii*, among Rhinos - *Stephanorhinus etruscus*.

In South Caucasus we cannot find any stratigraphic analogue of Diliska fauna, tentatively Diliska can be

parallelized with Zemo Melaani fauna. However, the poorness of these faunas precludes the possibility of confirming this opinion. Clearly younger are faunas from Dmanisi, Tsalka and Kotsakhuri. In Western Europe, the following faunas can be put in parallel to Diliska – Saint-Vallier, Roccaneira (France) [20], Puebla de Valverde (Spain) [21], in Eastern Europe – Khapri [22], Livencovka [23], and from Middle Asia - Kuruksay (Tadjikistan) [24].

Conclusion

Diliska fauna is of outstanding biostratigraphic significance. The presence of *Anancus arvernensis*, *Equus stenonis* and *Mimomys polonicus* undoubtedly dates the fauna to the end of the Pliocene, indicating that the fauna corresponds to the terminal part of the MN17 unit. It occupies an intermediate position between Dmanisi and Kvabebi faunas. In Western Europe, the following faunas can be placed in parallel to Diliska – Saint-Vallier, Roccaneira (France), Puebla de Valverde (Spain), in Eastern Europe – Khapri, Livencovka, and from Middle Asia Kuruksay (Tadjikistan). Diliska is a rare site where *Anancus* and *Equus* are found together in a primary position, and thus the chance of a mixture of sediments is excluded. Diliska mastodon is the latest representative of this form in Eurasia and *Equus* is represented by the earliest species (*Equus stenonis vireti*).

პალეობიოლოგია

დილისკის ხერხემლიანთა ფაუნის მნიშვნელობა სამხრეთ კავკასიის ბიოსტრატиграფიისათვის

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სამხრეთ საქართველოში, ახალქალაქის რაიონში სოფ. დილისკის მდამოებში აღმოჩენილია შუაჟილაფრანკული (MN 17) ასაკის საინტერესო ხერხემლიანთა ფაუნა, რომელსაც დიდი მნიშვნელობა აქვს სამხრეთ კავკასიის ნეოგენის სტრატиграფიისათვის. აღსანიშნავია, რომ დილისკის ფაუნაში დადგენილია

ოვერნის მასტოდონტი (*Anancus arvernensis*) და სტენონის ცხენი (*Equus stenonis vireti*). ამ ორი გეოლოგიურად სხვადასხვა სტრატეგრაფიული დონის ცხოველის თანაარსებობა იშვიათია.

ფაუნის ანალიზი მიგვანიშნებს, რომ სამხრეთ კავკასიაში ვილდფრანკის დასასრულისთვის ზერხმლიანთა ფაუნის შემადგენლობაში არსებითი ცვლილებები მოხდა, რაც გამოწვეული იყო გარემოს არიდაციით.

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