ELSEVIER

Archaeology Ethnology & Anthropology of Eurasia 38/2 (2010) 7–13
E-mail: Eurasia@archaeology.nsc.ru

ARCHAEOLOGY, ETHNOLOGY & ANTHROPOLOGY OF EURASIA

PALEOENVIRONMENT. THE STONE AGE

M.V. Sablin[1] and E.Yu. Girya[2]
[1]Zoological Institute, Russian Academy of Sciences, Universitetskyaya Nab. 1, St. Petersburg, 199034, Russia
E-mail: msablin@yandex.ru
[2]Institute for the History of Material Culture, Russian Academy of Sciences, Dvortsovaya Nab. 18, St. Petersburg, 191186, Russia
E-mail: kostionki@narod.ru

THE EARLIEST EVIDENCE OF HUMAN OCCUPATION IN SOUTHEASTERN EUROPE: A PROCESSED CAMEL BONE FRAGMENT FROM THE LOWER DON

A fragment of a metatarsal of an extinct camel with chop marks found in the lower horizon of the Khapry alluvium on the Lower Don is described. The analysis demonstrated that the marks were left by a single tool with a robust and sharp edge (either a chopper or a large flake) during the butchering of a camel carcass. The animal belonged to the species Paracamelus alutensis – a typical member of the Khapry fauna (Middle Villafranchian, 2.1–1.97 Ma BP). The context of the find and the distinct traces of processing indicate an early human settlement of Eurasia.

Keywords: *Chop marks, use-wear analysis, Khapry fauna, Middle Villafranchian, camels, Paracamelus alutensis.*

The first unambiguous evidence of human presence in the Caucasus during the Oldowan period was detected more than 20 years ago (Dzaparidze et al., 1989). Over the past seven years, our knowledge of the distribution and chronology of man's presence in the region and in areas adjacent to it has increased to a considerable degree.

In 2002, the Kuban Paleolithic Expedition of the Institute for the History of Material Culture RAS discovered a cluster of Early Paleolithic sites Bogatyri–Rodniki on the Taman Peninsula (Kulakov, Schelinsky, 2004; Bosinski et al., 2003). From 2003 on, the Expedition from the Institute of Archaeology and Ethnography of the Siberian Branch RAS (headed by A.P. Derevianko) and the North Caucasus Paleolithic Expedition from the Institute of Archaeology RAS (headed by H.A. Amirkhanov) have conducted systematic investigations in Dagestan. As a result, in 2003–2005, dozens of stratified sites of the Oldowan and the Early Acheulian periods were discovered (Amirkhanov, 2007; Derevianko et al., 2009).

These discoveries have led to the considerable growth of information relating to the earliest human presence in the Caucasus. A technological and morphological classification of the Early Paleolithic Caucasian stone tools has been developed (Derevianko, 2009). Their "primitivism" notwithstanding, the earliest tools fall into distinct categories (Amirkhanov, 2006; Taimazov, 2009; Schelinsky, Kulakov, 2009), and their comparative typology was suggested (Amikhanov, 2007, 2009; Liubin, Beliaeva, 2006).

The present study was conducted under the Presidium of RAS Program for Basic Research "Historical and Cultural Heritage and Spiritual Values of Russia" (Project "Raw Material Resources and Lithic Technologies of the Early and Middle Paleolithic in the Southern Part of European Russia (Caucasus and Azov Region)").

doi:10.1016/j.aeae.2010.08.003

Finds from Dmanisi in Georgia are currently considered the earliest in the Caucasus and in the whole of Eurasia. They are ca 1.8 Ma years old. The recent re-examination of paleontological collections housed at the Zoological Institute RAS (St. Petersburg) revealed even earlier evidence of humans in the Eurasian continent.

The bone fragment in question was discovered in May, 1954, by N.K. Vereschagin at Liventsovka quarry (this find numbered 35676 is presently held in the collection of the Zoological Institute). The fragment was found in association with other faunal remains incorporated into the Khapry alluvium. At that time, it was not identified as an artifact. The quarry was located at the southern end of Rostov-on-Don; currently it is unexploited. The Liventsovka locality (47° 13′ N; 39° 34′ E; Fig. 1) has been judged to be the parastratotype of the Khapry fauna complex recognized by V.I. Gromov (1939). The Khapry layers comprise Don terrace alluvium. Most researchers subdivide the layers into two depositional units whose thickness totals 20 m. The lower unit is 7–9 m thick. It contains coarse debris and the bones of large mammals (Bajgusheva, 1971; Aleksandrov, 1976). As follows from Vereschagin's records, the faunal remains were found in the lower horizons of alluvium (Fig. 2).

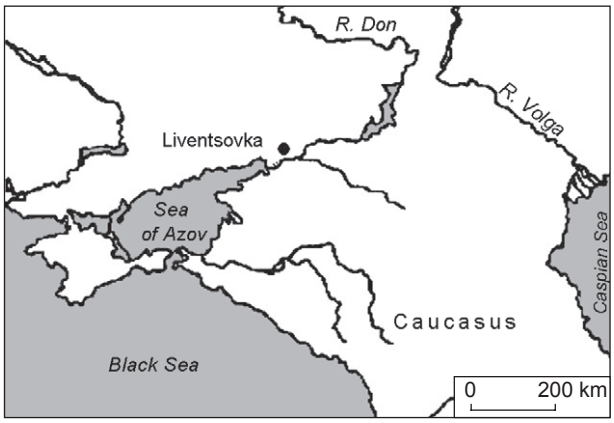

Fig. 1. Map showing the location of Liventsovka quarry.

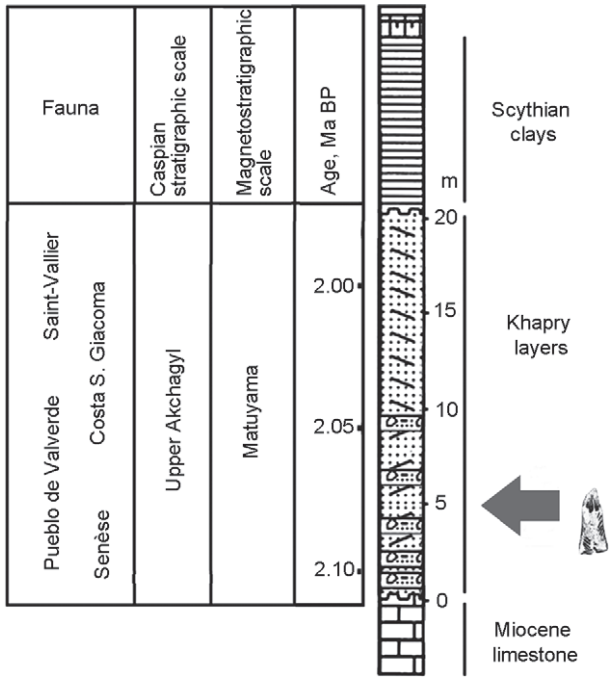

Fig. 2. Schematic section of Liventsovka.

All in all, over 33,000 identifiable bone fragments exhibiting relatively uniform levels of fossilization were collected from the paleo-Don channel deposits. The bones represent 33 species of large mammals (Titov, 1999, 2008). Isolated bones of animals dominate the assemblage, although complete skeletons and skeletal parts preserved in anatomical order are also present. The bones are of a brown or light gray color; most bones are in a uniform state of preservation. The assemblage formed during a single sedimentation cycle of the paleo-Don. Thus the Khapry fauna complex of large mammals can be regarded as unvarying in age. This association existed in a dry savanna climate: the faunal assemblage is dominated by horse *Equus livenzovensis* (24 %), southern elephant *Archidiskodon meridionalis* (23 %), and camel *Paracamelus alutensis* (13 %); bones of ostrich *Struthio*, giant rhinoceros *Elasmotherum*, and extinct giraffe *Palaeotragus* are also encountered (Titov, 1999, 2008; Bajgusheva, Titov, Tesakov, 2001; Bajgusheva, Titov, 2004). The existence of a hot and dry climate during the formation of the fossiliferous horizons is also evidenced by the mineralogical characteristics of their components and by the presence of warm-loving freshwater mollusk *Bogatschevia tamanensis* (Razrez…, 1976). According to mollusk experts, the alluvium was formed during the Upper Akchagyl (Rudyuk, 2003). The molluscan data as well as the reversed magnetization of the entire 20-meter-thick Khapry alluvium (Tesakov et al., 2007) point to a pre-Oldowan age of the sediments.

Based on the evolutionary stage of the field moles, the community of rodents (*Borsodia newtoni*, *Borsodia arankoides*, *Mimomys reidi*, *Clethrionomys kretzoii*, *Mimomys pliocaenicus*) from the upper 15 m of the Khapry alluvium, relates to the end of MN17 zone; in magnetostratigraphic scale, it can be placed between the upper boundary of the Reunion event and the lower boundary of the Oldowan (Tesakov, 2004). The presence of large mammals such as *Canis* cf. *senezensis*, *Nyctereutes megamastoides*, *Ursus* cf. *etruscus*, *Sus strozzii*, *Libralces gallicus*, *Leptobos* cf. *etruscus* makes it possible to synchronize the Khapry fauna with

mammal assemblages from Pueblo de Valverde, Saint-Vallier, Senèse, and Costa S. Giacoma. According to recent data, all these faunas are located between the upper boundary of the Reunion event and the lower boundary of the Oldowan (Sotnikova, Bajgusheva, Titov, 2002; Torre et al., 1992; Roger et al, 2000; Channell, Labs, Raymo, 2003; Guerin et al, 2004; Sinusia et al., 2004). Thus the stratigraphic range of the Khapry fauna distribution is confined by the terminal Middle Villafranchian (2.1–1.97 Ma BP).

The artifact under study is the distal portion of the right hind metapodium (metatarsus) belonging to the extinct camel *Paracamelus alutensis* – a typical representative of East European faunas in the terminal Pliocene (Fig. 3). In total, over 200 bones of this animal were found in the Khapry alluvium. As the morphological analysis of bone remains has shown (Titov, 2003, 2005), *Paracamelus alutensis* had a slender neck and gracile legs, resembled the South American llama in proportions, and matched the dromedary and the Bactrian camel in height. Compact white quartz sand typical of the Khapry sediments has been preserved within the medullary cavity. The bone was possibly buried in this sand. This precludes the possibility that the artifact could originate from horizons other than the Khopry alluvium.

The examination revealed two types of damage of the camel's metatarsus (Fig. 4): (1) fractures – the proximal epiphysis, the proximal end of diaphysis, and the largest portion of distal epiphysis are absent; (2) chop marks (Fig. 4, *a*, on the right) and cut marks (Fig. 4, *a*, on the left) on the posterior surface of the metatarsus, at the distal part of the diaphysis, on both sides.

The metatarsus surface shows two contrasting types of microrelief: the general relief of the surface and the relief of fracture surfaces. The entire surface of the metatarsus fragment, with the exception of the fracture surfaces, is covered with brownish-yellow and rust-colored spots of patina. At the microlevel, the general relief is characterized by a slightly rounded and smoothed surface and by continuous burnishing that resembles varnish and covers all elements of the microrelief. Under relatively low magnification (× 10–20), the polished surface is glossy (Fig. 5). The character of burnishing points to a chemical origin (it covers all minor depressions and cavities of the microrelief) and suggests that it appeared after the bone had been mineralized. This kind of chemical weathering is typical of the Liventsovka bone assemblage, although it normally affects minerals rather than bones. The chemical weathering is overlaid by traces of mechanical polishing which possibly occurred during the recent laboratory examination of the artifact.

Fractures display microrelief of another sort. It has no glossy areas or traces of chemical weathering. Visually it is fresher; rust-colored spots of patina are absent.

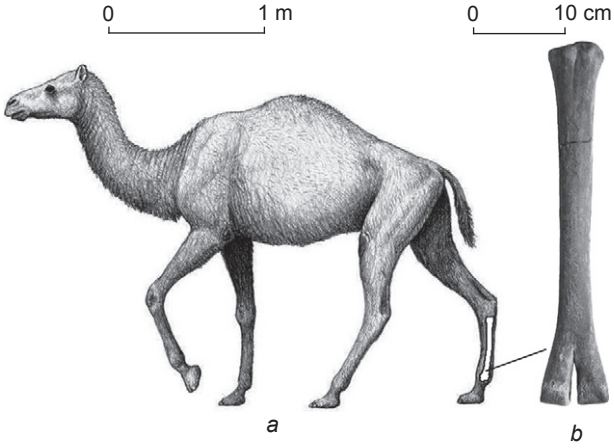

Fig. 3. Reconstruction of the extinct camel *Paracamelus alutensis* (*a*) and its right hind metapodium (*b*). Drawing by Mauricio Antón.

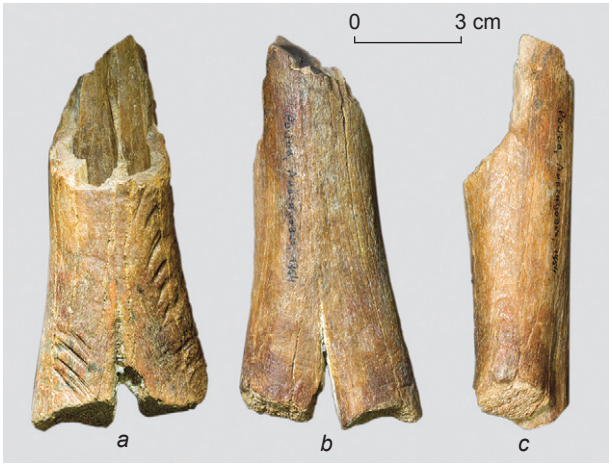

Fig. 4. Distal fragment of the right hind metapodium of *Paracamelus alutensis* (ZIN No. 35676) with traces of sawing/cutting (*a*, on the left) and chopping (*a*, on the right).

Fig. 5. Traces of burnishing over cut marks on the surface of the mineralized bone.

Chop and cut marks on the bone form two groups. The left group (Fig. 4, *a*) contains at least seven traces of sawing/cutting. Cut grooves have a V-shaped cross-section. The marks run oblique to the long axis of the bone. They were made by single and strong cuts directed at the same angle (Fig. 6). The right group consists of at least nine traces of chopping. Grooves generally have asymmetric V-shaped cross-sections. They run oblique to the long axis of the bone and were made by gentle vertical strokes (Fig. 7). The marks are wide, and their profile is U-shaped in the central part and V-shaped in the ends. Only one groove in the center of the group has other than a V-shaped cross-section.

Fig. 6. Saw/cut marks on the Liventsovka metatarsus.

Fig. 7. Chop marks on the Liventsovka metatarsus.

All groves are slightly rounded (prominent parts of the microrelief are smoothed), which is typical of the whole surface of the preserved diaphysis and metaphysis. The thinnest and most shallow grooves, normally situated at the ends of notches and cuts, are also smoothed.

Animal gnawing marks normally correspond to grooves with U-shaped profiles. The morphology of such marks depends on the size of the animal's mouth, the character of grasping the bone, and the bones' shape and size. Such gnawing marks are accompanied by isolated dents which occurred when the tooth pressed into the bone without sliding on its surface or leaving a U-shaped groove. In addition, traces of carnivore teeth have a symmetrically flattened profile and are located on both sides of the bone (marks left by the lower and the upper jaws). In our case, the reverse side of the bone bears no evidence of gnawing (Fig. 4, *b*). Gnawing marks are also absent on metatarsus' lateral sides (Fig. 4, *c*).

We interpret the grooves described above as artificial since they are V-shaped in cross-section, not uniform, and resultant from different kinds of action – sawing/cutting and chopping. In other words, their position, distribution, and shape make it highly unlikely that they were left by carnivore or rodent teeth.

Experimental data confirm this conclusion. Fresh and dry bones were cut and chopped with a tool made of silicified limestone (Fig. 8). Traces left by sawing and cutting (Fig. 9) suggest that when fresh bone is processed, the bifurcation of grooves at the ends (or, much less frequently, at the beginning) results not from

Fig. 8. Silicified limestone chopper used in the experiments.

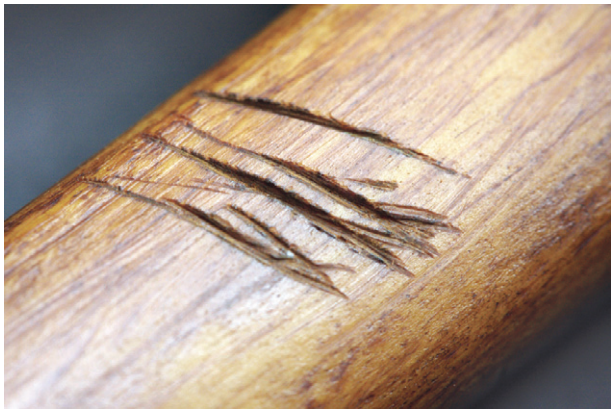

Fig. 9. Experimental cuts on fresh bone made with the silicified limestone chopper.

Fig. 10. Experimental notch on dry bone made with the chopper.

Fig. 11. Experimental notches on crude fresh bone.

repeated cutting but from irregular movement and from the curvature of the working edge. Chopping the dry bone results in a massive destruction of the sides of the furrows (Fig. 10), and when fresh bone is chopped, the destruction is minor (Fig. 11, 12).

While the small-scale destruction of the edges of the cuts has been obliterated by wear, the shape of the traces and the absence of large facets of destruction suggest that fresh bone was processed. In experiments with bones of old animals and with dry bones, large facets appear virtually always. Therefore the animal must have been relatively young and the bone was relatively fresh.

Both groups of marks, then, result from processing a fresh carcass with a single tool having a robust and sharp working edge – probably a chopper or a large flake.

The metatarsal of a camel consists almost exclusively of skin, tendons, and bone. The processing therefore was not aimed at separating flesh. More likely, it was aimed at severing tendons and separating the callous hoof. The nature of the marks and their position in the lower posterior part of the bone where the robust flexors of the digits are situated (Fig. 13) support our interpretation. The reason why hooves should be cut off is unclear. This could be done either to facilitate the transportation of the fleshy upper parts of the legs or to separate tendons from the bone or even to skin the carcass.

The Liventsovka specimen suggests that the early settlers of the Lower Don area successfully competed with large carnivores living in the vicinity – the Etruscan bear (*Ursus* cf. *Etruscus*), hyena (*Pliocrocuta Perrieri* and *Pachicrocuta brevirostris*), caracal (*Lynx issidorensis*), cheetah (*Acinonyx* cf. *Pardinensis*), and the saber-toothed cat (*Homotherium crenatidens*).

As our study demonstrates, not only the shape of the specimens but also the results of use-wear analysis can be utilized to identify bone specimens processed by humans and thereby to reconstruct human activities. In an earlier study, traces of processing were detected on

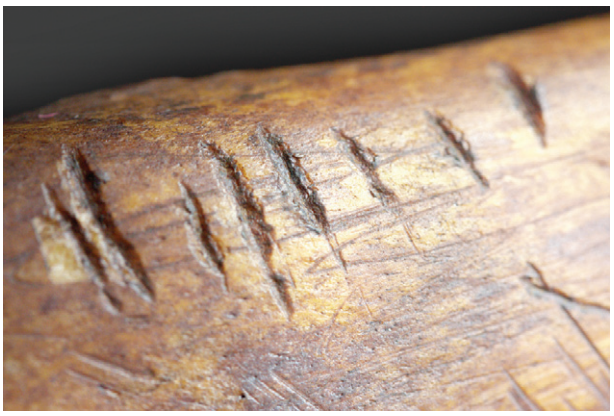

Fig. 12. Chop marks on fresh bone after cleaning.

Fig. 13. Position of flexors of the digits on the metatarsus of an extant camel.

bones of extinct African ungulates from deposits dating to 2.5 Ma BP (Heinzelin et al., 1999).

In sum, the context of the Liventsovka specimen, its preservation, and the distinctiveness of cut marks indicate the early appearance of humans in the Lower Don area.

References

Aleksandrova L.P. 1976
Gryzuny antropogena evropeiskoi chasti SSSR. Moscow: Nauka.

Amirkhanov H.A. 2006
Kamennyi vek Yuzhnoi Aravii. Moscow: Nauka.

Amirkhanov H.A. 2007
Issledovaniya pamyatnikov oldovana. Moscow: Izd. TAUS.

Amirkhanov H.A. 2009
Otkrytiye industrii oldovana na o. Sukotra. In *Drevneishiye migratsii cheloveka v Evrazii: Materialy Mezhdunar. simpoziuma*. Novosibirsk: Izd. IAE SO RAN, pp. 29–35.

Bajgusheva V.S. 1971
Iskopaemaya teriofauna Liventsovskogo karera (Severo-Vostochnoe Priazovye). *Trudy ZIN AN SSSR*, vol. 29: 5–29.

Bajgusheva V.S., Titov V.V., Tesakov A.S. 2001
The sequence of Plio-Pleistocene mammal faunas from the south Russian Plain (the Azov Region). *Bollettino della Societa Paleontologica Italiana*, vol. 40: 133–138.

Bajgusheva V.S., Titov V.V. 2004
Results of the Khapry Faunal Unit revision. In *18th International Senckenberg Conference 2004 in Weimar*. Weimar: pp. 72–73.

Bosinski G., Scelinskij V.E., Kulakov S.A., Kindler L. 2003
Bogatyri (Sinaja Balka) – ein altpalaolithischer Fundplatz auf der Taman-Halbinsel (Rubland). In *Erkenntnisjager. Kultur und Umwelt des fruhen Menschen. Veroffentlichungen des Landesamtes für Archaologie*, Bd. 57/I. Halle (Saale): VEB Deutscher Verlag, pp. 79–89.

Channell J.E.T., Labs J., Raymo M.E. 2003
The Reunion Subchronozone at OPD site 981 (Feni Drift, North Atlantic). *Earth and Planetary Science Letters*, vol. 215: 1–12.

Derevianko A.P. 2009
Drevneishiye migratsii cheloveka v Evrazii v rannem paleolite. Novosibirsk: Izd. IAE SO RAN.

Derevianko A.P., Anoikin A.A., Zenin V.N., Leschinsky S.V. 2009
Rannii paleolit Yugo-Vostochnogo Dagestana. Novosibirsk. Izd. IAE SO RAN.

Dzaparidze V., Bosinski G., Bugianisvili T., Gabunia L., Justus A., Klopotovskaja N., Kvavadze E., Lordkipanidze D., Majsuradze G., Mgeladze N., Nioradze M., Pavlenisvili E., Schmincke H. U., Solosgavili D., Tusabramisvili D., Tvalerelidze M., Vekua A. 1989
Der Altpalaolithische Fundplatz Dmanisi in Georgien (Kaukasus). *Jb. Romish-Germanisches Zentralmuseum*, vol. 36: 67–116.

Gromov V.I. 1939
Kratkii sistematicheskii obzor chetvertichnykh mlekopitayuscikh. In *Akademiku V.A. Obruchevu k 50-letiyu nauchnoi i pedagogicheskoi deyatelnosti*, vol. 2. Moscow: Izd. AN SSSR, pp. 163–224.

Guerin C., Faure M., Argant A., Argant J., Cregut-Bonnoure E., Debard E., Delson E., Eisenmann V., Hugueny M., Limondin-Lozouet N., Martin-Suarez E., Mein P., Mourer-Chauvire C., Parenti F., Pastre J-F., Sen S., Valli A. 2004
The Late Pliocene site of Saint-Vallier (Drome, France): Synthesis of biostratigraphic and palaeoecological conclusions. *Geobios*, vol. 37: 349–360.

Heinzelin J., Clark J. D., White T., Hart W., Renne P., Gabrel G. W., Beyene Y., Vrba E. 1999
Environment and behavior of 2,5-million-year-old Bouri hominids. *Science*, vol. 284: 625–629.

Kulakov S.A., Schelinsky V.E. 2004
Raboty na Tamani. In *Arkheologicheskiye otkrytiya 2003 goda*. Moscow: Nauka, pp. 271–272.

Liubin V.P., Beliaeva E.V. 2006
Rannyaya preistoriya Kavkaza. St. Petersburg: Peterburg. vostokovedeniye. (Archaeologica Petropolitana; vol. XIX).

Razrez noveishikh otlozhenii Severo-Vostochnogo Priazovya. 1976
K.K. Markov (ed.). Moscow: Izd. Mosk. Gos. Univ.

Roger S., Coulon C., Thouveny N., Feraud G., Van Velzen A., Fauquette S., Cocheme J.J., Prevote M., Verosub K.L. 2000
40Ar/39Ar dating of a tephra layer in the Pliocene Seneze maar lacustrine sequence (French Massif Central): Constraint on the age of the Reunion-Matuyama transition and implications for paleoenvironmental archives. *Earth and Planetary Science Letters*, vol. 183: 431–440.

Rudyuk V. 2003
Stratiphication and correlation of Quaternary alluvial deposits of the south-western part of the Eastern-European platform according to unionidae data. In *16th INQUA Congress*. Reno (Nevada): p. 244.

Schelinsky V.E., Kulakov S.A. 2009
Kamennye industrii eopleistotsenovykh rannepaleoliticheskikh stoyanok Bogatyri (Sinyaya Balka) i Rodniki na Tamanskom poluostrove (Yuzhnoye Priazovye, Rossiya). In *Drevneishiye migratsii cheloveka v Evrazii: Materialy Mezhdunar. simpoziuma*. Novosibirsk: Izd. IAE SO RAN, pp. 188–206.

Sinusia C., Pueyo E.L., Azanza B., Pocovi A. 2004
Dataciyn magnetoestratigrafica del yacimiento paleontolygico de la Puebla de Valverde (Teruel). *Geo-Temas*, vol. 6, Bd. 4: 339–342.

Sotnikova M.V., Bajgusheva V.S., Titov V.V. 2002
Khischnye mlekopitayuschiye khaprovskogo faunisticheskogo kompleksa i ikh stratigraficheskoye znacheniye. *Stratigrafiya, geologicheskaya korrelyatsiya*, vol. 10, iss. 4: 62–78.

Taimazov A.I. 2009
Choppery iz kollektsii Ainikab I. In *Drevneishiye migratsii cheloveka v Evrazii: Materialy Mezhdunar. simpoziuma*. Novosibirsk: Izd. IAE SO RAN, pp. 175–187.

Tesakov A.S. 2004

Biostratigrafiya srednego pliotsena – eopleistotsena Vostochnoi Evropy (po melkim mlekopitayuschim). Moscow: Nauka.

Tesakov A.S., Dodonov A.E., Titov V.V., Trubikhin V.M. 2007

Plio-Pleistocene geological record and small mammal faunas, eastern shore of the Azov Sea, Southern European Russia. *Quaternary International*, vol. 160: 57–69.

Titov V.V. 1999

Fauna krupnykh mlekopitayuschikh pozdnego pliotsena Severo-Vostochnogo Priazovya. Cand. Sc. (Biology) Dissertation. Rostov-on-Don.

Titov V.V. 2003

Paracamelus from the Late Pliocene of the Black Sea region. In *Advances in Vertebrate Paleontology "Hen to Panta"*. Bucharest: Emil Racovita Inst. of Speleology, Romanian Academy, pp. 17–24.

Titov V.V. 2005

Osobennosti ekologii i morfologii verblyudov roda *Paracamelus*. In *Sovremennaya paleontologiya: Klassicheskiye i noveishie metody*. Rostov-on-Don: Yuzh. nauch. tsentr RAN, pp. 161–166.

Titov V.V. 2008

Krupnye mlekopitayuschiye pozdnego pliotsena Severo-Vostochnogo Priazovya. Rostov-on-Don: Izd. Yuzh. nauch. tsentra RAN.

Torre D., Ficcarelli G., Masini F., Rook L., Sala B. 1992

Mammal dispersal events in the early Pleistocene of Western Europe. *Courier Forschich Institut Senckenberg*, vol. 153: 51–58.

Received October 28, 2009.