ISSN 0012-4966, Doklady Biological Sciences, 2006, Vol. 411, pp. 508–509. © Pleiades Publishing, Inc., 2006.
Original Russian Text © V.V. Titov, A.S. Tesakov, I.G. Danilov, G.A. Danukalova, E.N. Mashchenko, A.V. Panteleev, M.V. Sotnikova, E.K. Sychevskaya, 2006, published in Doklady Akademii Nauk, 2006, Vol. 411, No. 5, pp. 715–717.

GENERAL BIOLOGY

The First Representative Vertebrate Fauna from the Late Miocene of Southern European Russia

V. V. Titov[a], A. S. Tesakov[b], I. G. Danilov[c], G. A. Danukalova[d], E. N. Mashchenko[e], A. V. Panteleev[c], M. V. Sotnikova[b], and E. K. Sychevskaya[e]

Presented by Academician V.N. Bol'shakov April 17, 2006

Received May 15, 2006

DOI: 10.1134/S001249660606024X

The land vertebrate fauna from the Miocene of southern European Russia is poorly investigated. This is caused by a wide spread in this region of marine deposits of the Paratethys and restricted occurrences of continental sediments. Only isolated specimens mostly belonging to large mammals have been recorded in this area [1–3]. Therefore, a particularly rich and diverse Late Miocene vertebrate fauna recently collected in the Morskaya 2 locality of the Sea of Azov region is of special interest.

The Morskaya 2 locality[1] (near the Morskaya railroad station, northeastern Sea of Azov region, 47°17′ N 39°06′ E) was discovered by V.V. Bogachev [4]. In the coastal cliff of the Taganrog Gulf of the Sea of Azov, dark clays (approximately 5 m thick) and limestones (2–3 m thick) of the Middle Sarmatian (Middle Miocene) are overlain by a member of greenish clay and gray sand (2–5 m). These deposits yielded shells of freshwater mollusks [4–6] and bones of turtles and hares [7]. Upward in the section, there are Upper Pliocene white quartz sands of the Khapry alluvial sequence (up to 7 m thick); red clayey beds tentatively referred to the Lower Pleistocene[2] (3–5 m); a thin layer of loess-like loams dated Upper Pleistocene (2–4 m); and modern soil (0.5 m).

Based on the characteristic fauna of freshwater mollusks, primarily *Viviparus* (= *Paludina*), the member of greenish clays was named the *Paludina* beds of the Morskaya station [4]. Judging from the position in the section above the Middle Sarmatian deposits and from the mollusk association, the fauna was referred to the Miocene (Late Sarmatian) [5, 8] or Late Pliocene (Kuyalnikian) [4, 6, 7]. There was an attempt to support the latter viewpoint by the data on drilling in a site several kilometers east of the Morskaya station [9]. Based on rich material of vertebrate remains which were collected and investigated by the authors of the present study, this association is dated Late Miocene. New material includes mollusk shells, isolated bones of fish, amphibians, reptiles, birds, and large and small mammal. Many taxa are recorded in Russia for the first time.

Malacofauna. Mollusk remains from the Morskaya 2 locality include redeposited shells of Middle Sarmatian mollusks and a representative association of thin-walled freshwater and terrestrial taxa: *Vallonia* sp. (cf. *V. lepida steinheimensis*), *Limax* sp. (Limacinae), *Punctum* cf. *pygmaeum, Vitrea* cf. *procrystallina, Helicella* sp., *Lymnaea* sp. (cf. *L. palustris*), *Anisus solenoides, Borysthenia naticina, Lithoglyphus acutus* (cf. *L. acutus carinatus*), *Viviparus* cf. *achatinoides, V.* cf. *karaganicus, Sphaerium* sp., and *Pisidium* sp. The fish assemblage is dominated by the cyprinids *Rutilus* sp., *Leuciscus* sp., *Scardinius* sp., *Abramis* sp., and *Tinca* sp. and the pike *Esox* sp. Bones of small catfishes (*Silurus* sp.) and gobies (*Neogobius* (?) sp.) are less numerous. *Amphibians* and *reptiles* are represented by isolated anurans (*Rana* sp. and *Bufo* sp.), lizards (Lacertidae indet. and Anguidae indet.), snakes (Colubrinae indet. and Viperidae indet.), and numerous shell plates of turtles. The majority of turtle specimens belong to *Sakya* sp., while some are identified as *Melanochelys* sp., *Emys* sp., and Testudinidae indet. *Birds* from the locality are represented by two species of small river ducks closely resembling shoveler and teal (*Anas* spp.);

[1] The Morskaya 1 locality is associated with the Khapry Late Pliocene alluvial deposits.

[2] In this study, we follow the West European stratigraphic scheme.

[a] *Southern Scientific Center, Russian Academy of Sciences, pr. Chekhova 41, Rostov-on-Don, 344006 Russia*

[b] *Geological Institute, Russian Academy of Sciences, Pyzhevskii per. 7, Moscow, 119017 Russia*

[c] *Zoological Institute, Russian Academy of Sciences, Universitetskaya nab. 1, St. Petersburg, 199034 Russia*

[d] *Institute of Geology, Ufa Scientific Center, Russian Academy of Sciences, ul. K. Marksa 16/2, Ufa, 450000 Russia*

[e] *Paleontological Institute, Russian Academy of Sciences, Profsoyuznaya ul. 123, Moscow, 117997 Russia*

two species of small pheasants (Phasianidae), one of which is similar to Pliocene *Plioperdix ponticus*; two species of meadow chickens (Rallidae), including the crake *Crex* sp.; a small bustard (*Otidae*); doves (Columbidae); a small eagle owl (*Bubo* sp.); a large owl resembling the tawny owl *Strix* sp.; warblers resembling the blackcap *Sylvia* aff. *atricapilla*; and the bunting *Emberiza* sp.

The mammal association includes a shrew (*Blarinella* cf. *dubia*), a desman (Desmanidae gen.), a bat (*Vespertilio* cf. *villanyiensis*), a hare (*Hypolagus igromovi*), a porcupine (*Hystrix primigenia*), beavers (*Castor* sp. and *Trogontherium* sp.), a chipmunk (*Tamias* sp.), a mole rat (*Nannospalax compositodontus*), hamsters (*Pseudocricetus* cf. *kormosi*, *Kowalskia* sp., and Cricetini gen.), a gerbil (*Pseudomeriones* sp.), mice (*Apodemus* ex gr. *gudrunae-gorafensis*, *Apodemus* ex gr. *dominans-atavus*, *Micromys* sp., *Occitanomys* (*Hansdebruijnia*) sp.), martens (Mustelidae gen. cf. *Martes*), *Promephitis maeotica*, Lutrinaea gen. (?*Enhydriodon* sp.), hyaenids (*Hyaenotherium wongii*), felids (*Felis attica* and *Metailurus parvulus*), a lophodont mastodont (*Mammut borsoni*), a hipparion (*Hipparion* sp.), and a deer (Cervidae gen.). *Hypolagus igromovi* is the most abundant species of the association. A large proportion of small mammals belongs to mice of the family Muridae. *Mammut borsoni* is represented by an incomplete skeleton of adult male. This is the first record in Russia of almost complete mandible with p4–m3 tooth rows and small, relatively straight tusks.

The small mammal fauna from the Morskaya 2 locality includes a murid association that is typical for the European Turolian (Late Miocene). The lower stratigraphic limit of this fauna is marked by the presence of the genus *Apodemus*, which appeared for the first time in southern Europe in the middle of the Late Miocene [10]. The upper stratigraphic limit is most precisely indicated by the presence of two taxa. The first is the complex-toothed mole rat *Nannospalax compositodontus*, which is known from the Cherevichnian and Fontanian faunal assemblages of southern Ukraine [11] (correlated with the Maeotian and the first half of the Pontian (MN12 Zone)) [12]. The second taxon is *Hyaenotherium wongii*, which has not been recorded in Europe later than the Middle Turolian (MN12) [13]. The skunk genus *Promephitis*, large *Aonyx*-like otter Lutrinae gen. (*?Enhydriodon* sp.), and small lynx-like felid (*Felis attica*), which are recorded in the fauna studied, frequently occur in Turolian faunas of Eurasia [14]. The molars and tusks of *Mammut borsoni* are similar in morphology to those of European representatives of this species from the end of the Miocene to the Early Pliocene (MN12–MN14).

Environmental analysis of the taphocenosis shows that animals were buried in a coastal part of a silty, partially overgrown freshwater water body with fluctuating currents. The vertebrate assemblage contains taxa characteristic of riparian, woodland, and open biotopes.

Available data suggest that the fauna of Morskaya 2 fits the Middle Turolian (MN12 Zone) of the European Biostratigraphic Chart. The fact that mollusks and fishes predominantly belong to freshwater taxa indicates that the locality was formed in continental conditions, without direct contact with the sea. This probably occurred during a regressive phase of the Late Miocene sea basin of the Eastern Paratethys at the Maeotian–Pontian boundary.

ACKNOWLEDGMENTS

This study was supported in part by the Russian Foundation for Basic Research (project nos. 06-05-64049a, 02-05-39018) and by Taganrog State Pedagogical Institute.

REFERENCES

1. Rodzyanko, G.N., *Stratigrafiya SSSR: Neogenovaya sistema* (Stratigraphy of the Soviet Union: The Neogene System), Moscow: Nedra, 1986.
2. Averianov, A., *Acta Zool. Cracov.*, 1996, vol. 39, no. 1, pp. 61–66.
3. Bajgusheva, V.S., Titov, V.V., and Tesakov, A.S., *Boll. Soc. Paleontol. Ital.*, 2001, vol. 40, no. 2, pp. 133–138.
4. Bogachev, V.V., *Tr. Geol. Kom. Nov. Ser.*, 1924, no. 135, pp. 80–82.
5. Bogachev, V.V., *Materialy k istorii presnovodnoi fauny Evrazii* (Materials on the History of Eurasian Freshwater Fauna), Kiev: Izd. Akad. Nauk Ukr. SSR, 1961.
6. Popov, G.I., *Tr. Kom. Izuch. Chetvert. Per.*, 1962, vol. 20, pp. 92–97.
7. Vasil'ev, Yu.M., *Formirovanie antropogennykh otlozhenii lednikovoi i vnelednikovoi zony* (The Formation of Anthropogene Sediments of the Ice Age and Postglacial Time), Moscow: Nauka, 1969.
8. Kolesnikov, V.P., *Stratigrafiya SSSR* (Stratigraphy of the Soviet Union), Moscow: Akad. Nauk SSSR, 1940.
9. Zaitsev, A.V., *Razrez noveishikh otlozhenii Severo-Vostochnogo Priazov'ya* (The Sequence of Recent Sediments on the Northeastern Azov Sea Coast), Moscow: Mosk. Gos. Univ., 1976.
10. Storch, G. and Dahlmann, T., *Münchner. Geowiss. Abh. A*, 1995, vol. 28, pp. 121–132.
11. Nesin, V.A. and Nadachowski, A., *Acta Zool. Cracov.*, 2000, vol. 44, no. 2, pp. 107–135.
12. Pevzner, M.A., Semenenko, V.N., and Vangengeim, E.A., *Stratigr. Geol. Korrel.*, 2003, vol. 11, no. 5, pp. 72–81.
13. Werdelin, L. and Solounias, N., *Foss. Strata*, 1991, no. 30, p. 104.
14. Semenov, Yu.A., *Beitr. Paläontol.*, 2001, no. 26, pp. 139–144.